PARTS, OPERATION, AND MAINTENANCE MANUAL

WITH BULLETINS
20 AND 48

MA 30, 30H
MA 40, 40H
MA 50, 50H

FORK LIFT TRUCKS

WHITE INDUSTRIAL DIVISION

WHITE MOTOR CORPORATION

SUPPLEMENT TO MANUAL S-345A
MA SERIES FORK LIFT TRUCKS

SUPPLEMENT INCLUDES CHANGES IN MAINTENANCE INSTRUCTIONS, SERIAL NUMBERS, AND REPAIR PARTS

REFER TO PAGE 1-33:
Change items 3 and 4 under paragraph C to read as follows:

3. Insert axle (30) in gear (31). Hold axle stationary and rotate cage. It must require a torque between 5 and 15 foot pounds to turn cage.

4. If torque required to rotate cage is over 15 foot pounds, reduce number of shims (use thinner ones) and repeat procedure in "2" and "3". If torque required is below 5 foot pounds, increase the number of shims and re-check torque.

THESE TORQUE SPECIFICATIONS ARE APPLICABLE TO DIFFERENTIAL CAGES THAT HAVE FOUR PINIONS.

REFER TO PAGE 1-39:
Add note:

CAUTION: THE PRESSURE REGULATOR VALVE (39A9200) USED ON LATER MODEL TRUCKS MUST NOT BE INSTALLED ON ANY TRUCK WITH A 2 PINION DIFFERENTIAL, OR TRUCKS THAT HAVE A 39A2240 REPAIR DIFFERENTIAL INSTALLED. EARLY TRUCKS WITH 2 PINION DIFFERENTIALS OR 39A2240 REPAIR DIFFERENTIALS CAN BE IDENTIFIED BY THE DESIGN OF THE DIFFERENTIAL CASE. THE DIFFERENTIAL CASE (39A5180) USED ON EARLY MODEL TRUCKS DO NOT HAVE THE LARGE PLUG IN THE TOP OF THE CASE AS DO THE CASES (35A7810) USED ON LATER TRUCKS.

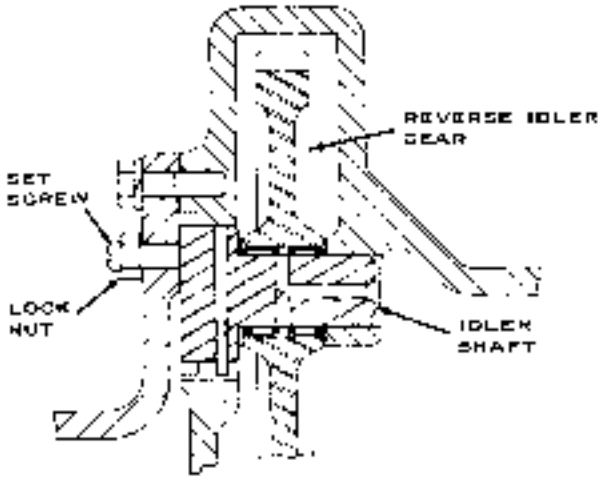
Disregard test pressures given under Fig. 1-39 and use Fig. 1-38 and test pressures listed below it.

ADD TO SERVICING DIFFERENTIAL AND TRANSMISSION:

A set screw and lock nut have been added to adjust the position of the shaft for the reverse idler gear in the transmission. The set screw is located in the upper rear flange of the differential case.

If the set screw has been removed from the differential case during service work, apply Permatex or Locktite thread sealant to the threads in the hole and on the set screw before reinstalling the screw.

Turn in the screw until the idler shaft bottoms, then back out the screw 25 to 40 degrees (1/8 turn or less) and secure with the lock nut. This sets the proper end clearance on the reverse idler gear.



Before reinstalling the bearings (36A7752) for the drive axles, they must be repacked with grease. Use an automotive type, multi-purpose, lithium base grease, containing a moly-disulfide additive.

CASCADE TRIPLEX MAST
(See Figs. 2-37 and 2-39 in Manual S-345A.)

If the crosshead wear shoes (10, fig. 2-37) become loose, it can cause failure of the interlocking latches and mating latch points. If the wear shoes are worn excessively, they must be replaced.

The side clearance between the wear shoes and mating channel members must be kept snug. This can be accomplished by using shims (33) between the shoes and shoe supports (14). Shims should be used on both sides of the crosshead to keep it square in the channels.

Check the side clearance every 150 hours of operation and lubricate the sliding channels, using a graphite base grease.

The bolts that secure the side rollers (5, Fig. 2-39) to the carriage may become loose after the lift truck has been in service for some time. This will allow the side roller to move out of position and can cause failure of the latches and mating latch points. Check these attaching bolts and nuts every 100 hours of operation to be sure they are tight.

Excessive side movement of the carriage can be removed with the adjusting screws (9). Loosen the lock nuts and tighten the four adjusting screws equally until the side play is reduced to a minimum.

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Ref. No.	Part No.	DESCRIPTION	No. Per
		SERIAL NUMBER CHANGES IN S—345A	
		Refer to the following pages: 2-4, 2-5, 2-32, 2-36, 2-54, 2-78, 2-81, 2-86, and 2-69, and make the following changes: Change serial number on MA 30 from 28000126 to 29000111. Change serial number on MA 40 from 26100543 to 26100568. Change serial number on MA 50 from 26200185 to 26200169.	
		Refer to the following pages: 2-5, 2-6, 2-14, 2-34, 2-86, 2-79, 2-61, 2-86, and 2-68, and make the following changes: Change serial number on MA 30 from 28000126 to 29000112. Change serial number on MA 40 from 26100544 to 26100569. Change serial number on MA 50 from 26200186 to 26200170.	
		Refer to the following pages: 2-42, 2-44, 2-56, 2-64, and 2-66, and make the following changes: Change serial number on MA 30 from 28000145 to 28000121. Change serial number on MA 40 from 26100628 to 26100626. Change serial number on MA 50 from 26200205 to 26200184.	
		Refer to the following pages: 2-42, 2-44, 2-36, 2-66, and 2-70, and make the following changes: Change serial number on MA 30 II from 28000146 to 29000122. Change serial number on MA 40 II from 26100629 to 26100627. Change serial number on MA 50 II from 26200206 to 26200185.	
Page 2-9		Change Ref. No. 16 - F6001-802 to F6001-802 and F6001-901 to F6001-901 corr.	
Page 2-46		Add to description on 35A680 spool (Ref. No. 6), 1/2" O.D. x 2" long. Add to description on 86A7766 spring (Ref. No. 8), 1/2" O.D. x 1-11/16" long. Add to description on 35A375 spool (Ref. No. 19), x 2" long. Change description on 35A5177 block (Ref. No. 31 and 45), from 15/16" to 1-1/16". Change description on 35A5187 block (Ref. No. 32 and 48), from 5/8" to 3/4". Add to description on 35A7364 spring (Ref. No. 43), 2-41/64" long. Add to description on 35A7365 spring (Ref. No. 44), 1-13/16" long.	
Page 2-48		Omit Group II line and add the following: Group II Used on MA 30 Lift Trucks to No. 28000121, Inc. Used on MA 40 Lift Trucks to No. 26100626, Inc. Used on MA 50 Lift Trucks to No. 26200184, Inc. Change description on 35A690 spool (Ref. No. 6), from 1-5/8" to 1/2" O.D. x 2". Add to description on 86A8027 spring (Ref. No. 48), 1/2" O.D. x 2-5/8" long. Add to description on 86A375 spool (Ref. No. 19), x 2" long. Add to description on 35A1248 spring (Ref. No. 23), 1-17/32" long. Add to description on 86A880 spring (Ref. No. 27), 2-1/8" long. Change description on 35A5177 block (Ref. No. 31 and 45), from 15/16" to 1-1/16". Change description on 35A5187 block (Ref. No. 32, 38, and 48) from 5/8" to 3/4". Add to description on 35A7364 spring (Ref. No. 43), 2-41/64" long. Add to description on 35A7365 spring (Ref. No. 44), 1-13/16" long.	

Ref. No.	Part No.	DESCRIPTION	No. Req.
Page 2-60, 2-61		Omit entire Group III and add new Group II.	
Page 2-62		Change 50A2930 nut following (Ref. No. 6) to GM120868 jam nut. Change 50A1930 nut following (Ref. No. 7) to 50A3742 jam nut.	
Page 2-64		Change 35A5453 stud to 50A5089 and length to 1-3/4". Change 35A6150 cap (Ref. No. 10) to 35A8244 (35A6150).	
Page 2-68		Add the following hardware to follow 35A7816 case: 50A4139 - Set Screw, slotted head, for idler shaft, 3/8"-16 x 1"	1
		50A1903 - Nut, hex., 3/8"-16	1
Page 2-70		Add "O" ring to follow 35A8245 shaft: 50A5179 - "O" Ring - axle flange to housing	2
		Change 50A3680 bolt to 50A1164 bolt housing, 12 pt.	
Page 2-74		Change 50A4264 clevis (Ref. No. 3) to 50A4279.	
Page 2-84		Change description on 50A8293 knob from tilt to lift.	
Page 2-86		Change 35A6139 hose (Ref. No. 28) to 35A9188 and size from 5/8" to 1/4" (35A6139). Change 35A6140 hose (Ref. No. 29) to 35A9189 and size from 5/8" to 1/4" (35A6140). NOTE: When replacing old hose, replace in pairs with new hoses.	
Page 2-91		Add roller pin 35A5623 for repairs as part of inner rail (Ref. No. 4) and carriage (Ref. No. 11). Change quantity on 35A3688 cap (Ref. No. 35) from 1 to 2. Change quantity on 50A8697 plunger (Ref. No. 39) from 1 to 2. Change quantity on 35A3696 spring (Ref. No. 40) from 1 to 2. Add to description on 50A3698, 50A3697, and 50A3696, on outer rail and carriage block.	
Page 2-118		On cylinder assembly, MA 30 change 35A6740 thru 35A6769 to 35A7962 thru 35A7981. On cylinder assembly, MA 40-50, change 35A5232 thru 35A5261 to 35A7932 thru 35A7951. New cylinders have 3/4" lock nut.	

Ref. No.	Part No.	DESCRIPTION	No. Per
		TRANSMISSION CONTROL VALVE AND REGULATOR	
Page 2-50		Group III. Used on Lift Trucks with Mechanical Inching. Used on MA 80 II Lift Trucks No. 29000122 and after. Used on MA 40 II Lift Trucks No. 26100627 and after. Used on MA 50 II Lift Trucks No. 28200165 and after.	
	38C1545	Valve - control, complete Includes the following 42 parts:	1
1	35A5018	Body - valve	1
		50A8669 - Bolt, hex., 5/8"-18 x 1-1/2"	2
		50A8672 - Bolt, hex., 5/8"-18 x 2-3/4"	2
		*50A1629 - Stat-o-seal, bolts, 3/8"	4
2	35A5848	Spool - directional, 3-7/32" long	1
3		50A4265 - Ball, steel, 5/16"	1
		50A4445 - Plug, pipe, hex. socket, 1/8"-27	2
4	35A6086	Spring - spool ball, 23/32" long	1
5	10A16329	Seal - oil, lever spool, 3/4" I.D., 1/4" wide	2
6	35A090	Spool - inching, 1/2" O.D. x 2" long	1
7	35A639	Spring - centering, inching spool, 3/4" long	1
8	35A6027	Spring - inching spool, 1/2" O.D. x 1-5/8" long	1
9	35B6000	Inching Spool - assembly, complete, mechanical inching	1
15		50A196 - Snap ring, sleeve retainer	1
16	35A6006	Seal - inching spool in valve housing	1
18	35A375	Spool - pressure reducer, 3/4" O.D. x 5" long	1
20	35A374	Spring - pressure spool, 1-3/4" long	1
21	35A1250	Valve - relief	1
22	35A1249	Piston - relief valve	1
23	35A1245	Spring - relief valve, 1-17/32" long	1
24	10A6329	"O" Ring - relief valve	2
25	35A388	Spool - priority valve, 15/16" long	1
26	35A991	Guide - priority valve	1
27	35A390	Spring - priority valve, 2-1/8" long	1
29	35A377	Valve - lube relief	1
29		50A4266 - Ball, steel, 3/8"	1
30	10A18106	Spring - lube relief valve, 1" long	1
31	35A5177	Block - valve, 1-1/16" long	3
32	35A5187	Block - valve, 3/4" long	3
33	10A6329	"O" Ring - valve blocks, 9/16" I.D.	6
34	10A6330	Ring - snap, valve blocks	6
35	35A7687	Switch - neutral starting, with slip type terminals	1
36	35A7304	*Gasket - body to transmission case	1
37	35A9200	Body - pressure regulator valve	1
		50A1626 - Bolt, hex., 3/8"-16 x 3-1/4"	1
		50A1627 - Bolt, hex., cad., 3/8"-16 x 3-1/2"	1
		50A2249 - Bolt, hex., cad., 3/8"-16 x 4-3/8"	1
		*50A1629 - Stat-o-seal, bolts, 3/8"	3
		*NOTE: Parts with single asterisk (*) are part of 35R83.	
38	35A090	Spool - pressure regulator	1
39	35A5187	Block - spool, 3/4" long	1
40	10A6329	"O" Ring - block	1
41	10A6330	Snap Ring - spool	1
42	35A7329	Piston - regulator valve	1
43	35A7384	Spring - piston, regulator valve, outer, 2-41/64" long	1
44	35A7385	Spring - piston to spool, inner, 1-19/16" long	1
45	35A5177	Block - piston, 1-1/16" long	1
46	10A6329	"O" Ring - piston, block	1
47	10A6330	Snap Ring - piston block	1
48	35A7386	Orifice - regulator valve	1
49	35A5187	Block - orifice, 3/4" long	1
50	10A6329	"O" Ring - orifice and block	2

Ref. No.	Part No.	DESCRIPTION	No. Per
		TRANSMISSION CONTROL VALVE AND REGULATOR (Cont'd)	
Page 8-51			
51	10A6380	Snap Ring - block	1
52	35A7867	Screen - orifice	1
53		50A2879 - Snap ring, orifice	1
54		50A4265 - Ball, steel, 5/16"	3
55		50A5081 - Pin, dowel, 1/8" x 11/16"	1
56		50A4445 - Plug, pipe, esk., 1/8"-27	2
57		50A9878 - "O" ring, regulator valve	5

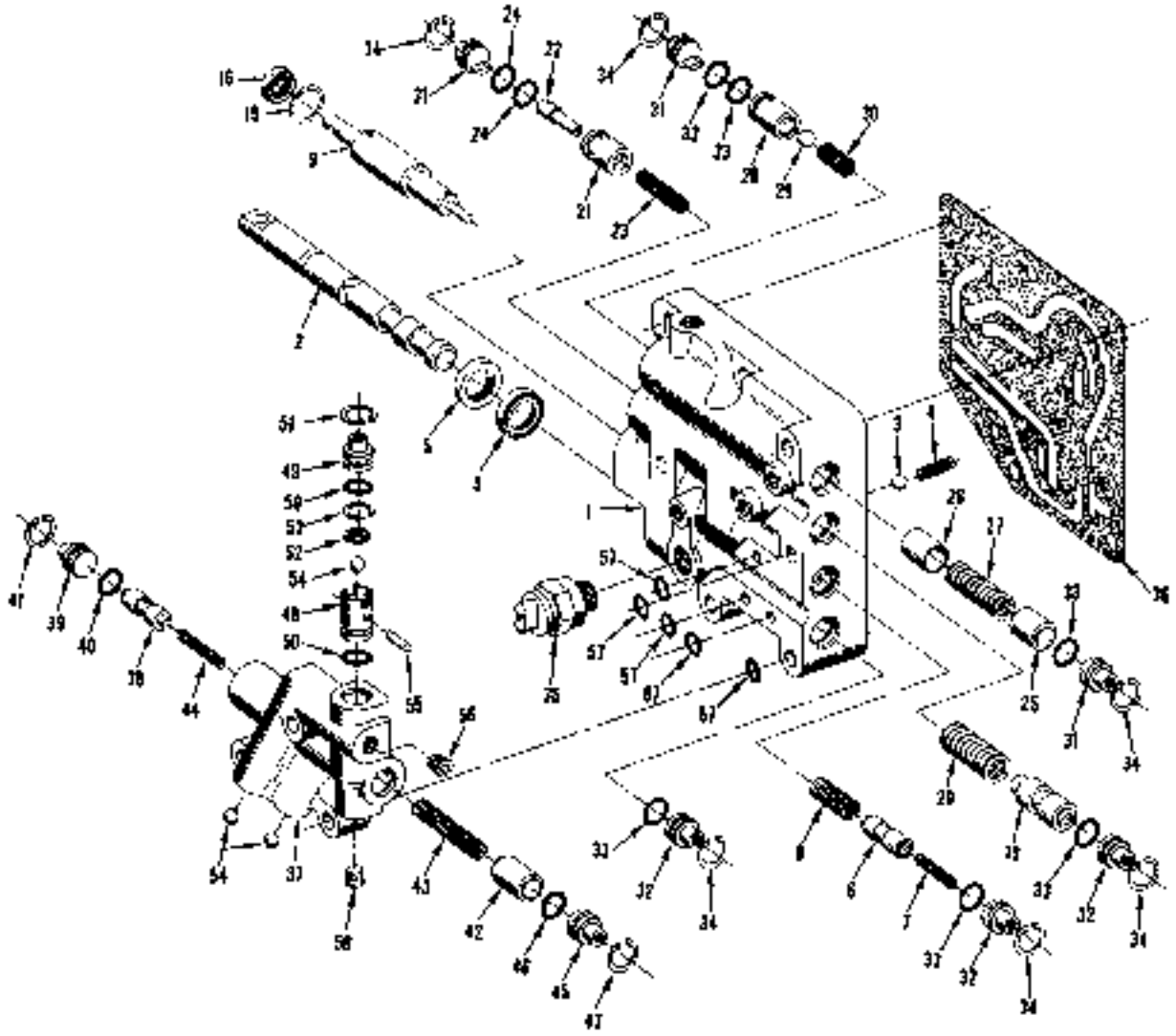

FIG. 2-178 - TRANSMISSION CONTROL VALVE AND REGULATOR

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Technical Publications
10-4-65

C-348

SUPPLEMENT TO MANUAL S-345A

AND SUPPLEMENT C-280

FOR

MA SERIES FORK LIFT TRUCKS

INCLUDING MA 60

WHITE MOBILIFT

WHITE INDUSTRIAL DIVISION
WHITE MOTOR CORPORATION
HOPKINS, MINNESOTA

This supplement covers changes and improvements that have been incorporated into the latest production of MA Series Lift Trucks, and includes the MA 60 Lift Truck. Use this supplement in conjunction with manual S-345A and Supplement C-260.

SPECIFICATIONS (MA60)

The capacity of the MA 60 Lift Truck is 6000 pounds at a 24-inch load center. A Continental engine, Model F163-8026 supplies power for the lift truck. Specifications covering this engine are given below and reference must be made to these specs when performing an engine tune-up.

Governed Speed (No Load)	2650 RPM
Idle Speed	500 RPM
Converter Stall Speed	1000 RPM
Spark Plug Gap	Gasoline .025"
	LP Gas .015"
Breaker Point Gap	.020"
Timing Advance	2° ATDC @ 500 RPM
	6° BTDC @ 850 RPM
	14° BTDC @ 2400 RPM
Firing Order	1-3-4-2
Valve Clearance (Hot)	Intake .014"
	Exhaust .014"

HYDRAULIC SYSTEM RELIEF PRESSURES

REFER TO PAGE 1-5, FIG. 1-3 AND ADD:

POWER STEERING RELIEF (MA60) ..... 1200 ± 50 PSI

NOTE: LIFT SYSTEM RELIEF PRESSURE FOR MA 60 LIFT TRUCKS IS THE SAME AS FOR MA 30 (1000 PSI).

LUBRICATION

Refer to page 1-12, paragraph headings "HYDRAULIC OIL TANK" and "TRANSMISSION, DIFFERENTIAL, AND CONVERTER".

Delete Texaco 1808 and insert Texaco Texamatic Fluid.

ZENITH CARBURETOR ADJUSTMENTS (MA60)

Refer to page 1-32: Carburetor adjustments given in paragraph 3-16 are satisfactory for Zenith gasoline carburetor used on MA 60 lift trucks. Fig. 1 shows Zenith carburetor.

GOVERNOR ADJUSTMENTS (MA 60)

Start engine and allow it to warm up to operating temperature. While engine is warming, back out surge (bumper) screw (4, fig. 1A) so it will have no effect.

IMPORTANT: BE SURE CARBURETOR IS PROPERLY ADJUSTED AND LINKAGE IS FREE OF BINDS BEFORE ADJUSTING GOVERNOR.

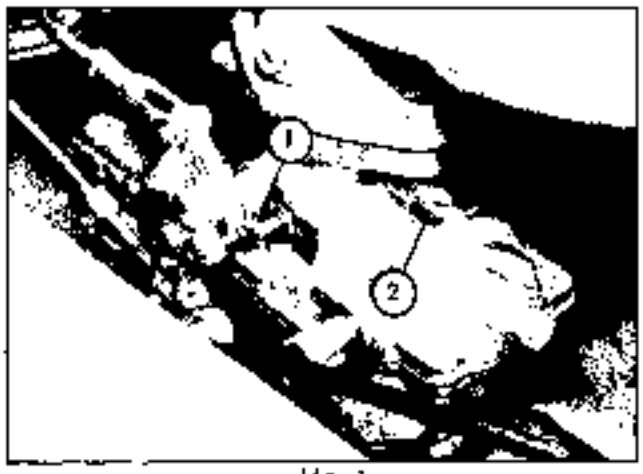


Fig. 1

1. Throttle stop screw
2. Idle adjusting needle

Depress accelerator to operate engine at full throttle, no-load. Turn nuts on speed adjusting screw (1, fig. 1A) to obtain a no-load speed of 2650 RPM. Shortening screw, placing more tension on spring, will increase engine speed.

If governor surges at no-load, turn in surge (bumper) screw (4, fig. 1A) one turn at a time until surge is eliminated. Do not turn screw in far enough to increase no-load speed more than a few RPM, if any.

Governor sensitivity (governor action between load and no-load RPM) is regulated by adjusting screw (3, fig. 1A) in flange bracket. Lengthening adjusting screw (moving speed adjusting screw forward) will alter pull on spring to broaden range of governor and produce more stable governor action. Shortening screw will narrow range and increase governor sensitivity. Maintain a dimension of 1-13/32" between centerline of speed adjusting screw and front edge of bracket for sensitivity adjusting screw for best results.

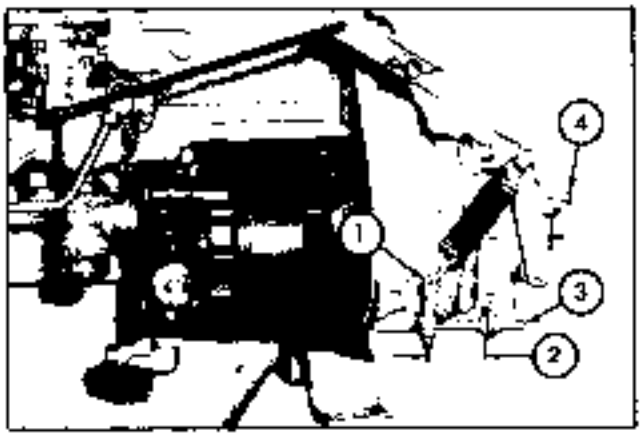


Fig. 1A

1. Speed adjusting screw
2. 1-13/32 inch
3. Sensitivity adjusting screw
4. Surge (bumper) screw

ENGINE TIMING

Follow procedure outlined in paragraph 3-19 on page 1-14 when timing engine, except use timing pointer and mark on crankshaft pulley. Fig. 2. A dab of white paint placed in pulley notch will make notch more legible under timing light.

Make a mark on pointer, 2 degrees AFTER top dead center. Operate engine at an idle speed of 500 rpm or less so automatic advance of distributor is completely retarded. Engine is in correct time when notch in pulley is lined up with mark on pointer that is 2° AFTER top dead center.

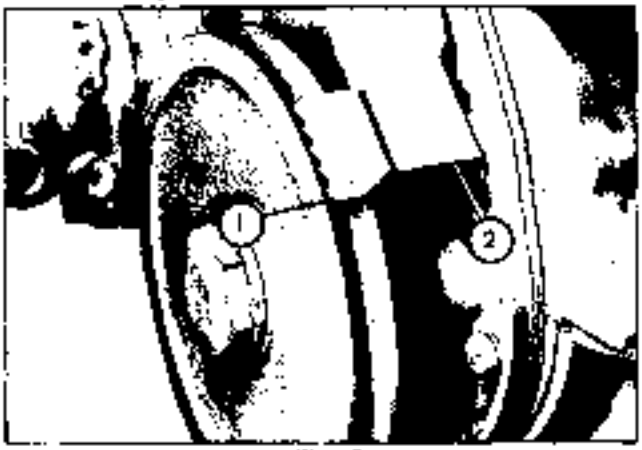


Fig. 2

1. Notch in pulley
2. Timing pointer

NOTE: FIG. 2 SHOWS TIMING POINTER WITH ENGINE REMOVED FROM LIFT TRUCK. POINTER IS LOCATED ON ALTERNATOR SIDE OF ENGINE.

REFER TO PAGE 1-29, PARAGRAPH 4-76C.

Insert the following timing advance for distributors used on MA 60 lift trucks with Model F163-6026 engines.

2° ATDC @ 500 RPM
6° BTDC @ 880 RPM
14° BTDC @ 2400 RPM

ALTERNATOR

The alternator and voltage regulator control the amount of electrical energy supplied to the battery and also maintain battery in fully charged condition.

IMPORTANT: IF IT BECOMES NECESSARY TO DISCONNECT WIRES FROM ALTERNATOR, BE SURE TO IDENTIFY WIRES ATTACHED TO "BAT" AND "GRD" TERMINALS SO THEY CAN BE RECONNECTED TO PROPER TERMINALS. IF WIRES ARE CROSSED WHEN RECONNECTED, JUST A MOMENTARY TOUCH TO ALTERNATOR TERMINALS COULD BE ENOUGH TO DAMAGE ALTERNATOR.

THE FOLLOWING PRECAUTIONS SHOULD BE OBSERVED TO PREVENT SERIOUS DAMAGE TO ELECTRICAL EQUIPMENT.

WHEN INSTALLING A BATTERY, MAKE ABSOLUTELY SURE THE GROUND POLARITY OF THE BATTERY AND THE ALTERNATOR ARE THE SAME. THE ELECTRICAL SYSTEM HAS A NEGATIVE GROUND.

WHEN CONNECTING A BOOSTER BATTERY, MAKE CERTAIN TO CONNECT THE NEGATIVE BATTERY TERMINALS TOGETHER AND THE POSITIVE BATTERY TERMINALS TOGETHER.

WHEN CONNECTING A CHARGER TO THE BATTERY, CONNECT THE CHARGER POSITIVE LEAD TO THE BATTERY POSITIVE TERMINAL AND THE CHARGER NEGATIVE LEAD TO THE BATTERY NEGATIVE TERMINAL.

DO NOT OPERATE THE ALTERNATOR ON OPEN CIRCUIT (NO BATTERY IN CIRCUIT). MAKE ABSOLUTELY CERTAIN ALL CONNECTIONS, INCLUDING BATTERY CABLES, ARE SECURE.

DO NOT SHORT ACROSS OR GROUND ANY OF THE TERMINALS ON THE ALTERNATOR OR REGULATOR.

DO NOT ATTEMPT TO POLARIZE THE ALTERNATOR.

If difficulty is experienced with the alternator or voltage regulator, see your local Delco-Remy dealer or Unired Motor Service as they have the facilities for repairing and testing this equipment.

A booklet covering general maintenance of Delco-Remy electrical systems is available from Delco-Remy, Anderson, Indiana. The number of this booklet is DR 5221 and the price is 25 cents.

Maintain proper tension on the fan and alternator drive belt by means of the adjusting bar. The belt has the correct tension when it deflects about 1/4 to 1/2 inch when approximately 10 pounds pressure is applied midway on the belt span.

STEERING GEAR (HYDRAULIC)

REFER TO PAGE 1-20, PARAGRAPH 4-38, a.

Add to follow paragraph "a":

Assemble worm to rack and align ball return guide holes with worm groove. Load 16 balls into guide hole nearest piston ring while slowly rotating worm counterclockwise to feed balls through circuit. Alternate black balls with standard balls.

Fill one ball return guide with remaining 6 balls. Place other guide over balls and plug ends of guide with heavy grease to prevent balls from falling out when guide is installed in rack.

HYDRALIZER REPAIR

ADD TO PAGE 1-26, PARAGRAPH 4-99, REPAIR.

d. Check condition of bushing (20) on piston (19). If original bushing is damaged or worn, it must be re-

placed. The outside diameter of bushing must be machined to a dimension of 4.996-4.997" after installation on piston.

ADJUSTING STEERING LINKAGE (MA60)

Park lift truck on level surface. Turn steering wheel to place steering housing in straight-ahead position and adjust tie rods if necessary, to place steer wheels in straight-ahead position. Detach booster cylinder from steering housing.

Turn steering wheel to extreme in both directions and adjust stop bolts on frame and steering fork to allow an 83 degree angle of inner steer wheel to side of frame (inner wheel in relation to direction of turn).

With wheel held in 83 degree turn position, tighten stop bolts on center frame against steer housing arm and secure with lock nuts. Tighten stop bolts in steering fork against stop on frame, back out screw 1/4 to 1/2 turn and secure with lock nut.

NOTE: ADJUSTMENT OF STOP BOLTS ON STEERING FORKS MUST BE ACCOMPLISHED ON BOTH FORKS FOR EACH DIRECTION OF TURN.

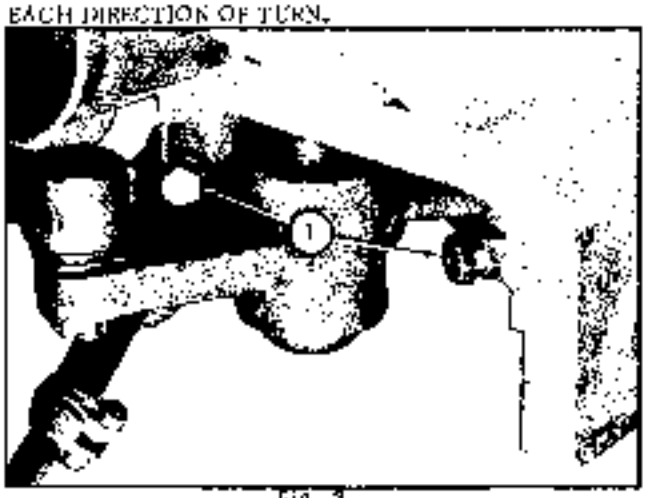


Fig. 3

1. Stop bolts on center frame

Return steer wheels to straight-ahead position and adjust position of socket on steering booster so socket end can be installed in housing without moving housing from straight-ahead position. Recheck steering adjustments with drag link connected to be sure it allows full turn in both directions.

POWER STEERING HYDRAMOTOR (MA60)

REMOVAL AND DISASSEMBLY

Disconnect and cap oil lines connected to hydramotor. Identify lines so they can be properly reconnected. Disconnect transmission control rod by driving pin out of joint. Loosen hydramotor mtg bolts sufficiently to allow hydramotor to escape support brackets. Remove entire assembly, including steering wheel and transmission shift lever.

Remove horn button assembly as described in paragraph 4-21 on page 1-22. Remove nut from steering shaft and remove steering wheel. Loosen nuts on column clamp and remove column, noting its position on steering assembly.

Loosen large nut on shaft near hydramotor, turning it until it is almost flush against hydramotor. Nut is staked so it will be tight at first. Loosen taper ring by tapping it toward hydramotor.

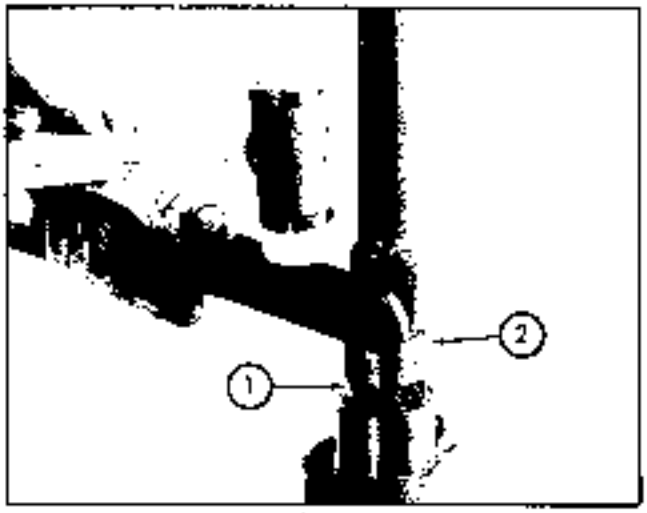


Fig. 4

1. Nut
2. Taper ring

Rotate taper ring until locking ball is exposed in hole. Tilt assembly so ball will fall out of hole. It may be necessary to tap taper ring lightly to dislodge ball. With ball removed, pull steering shaft off stub shaft.

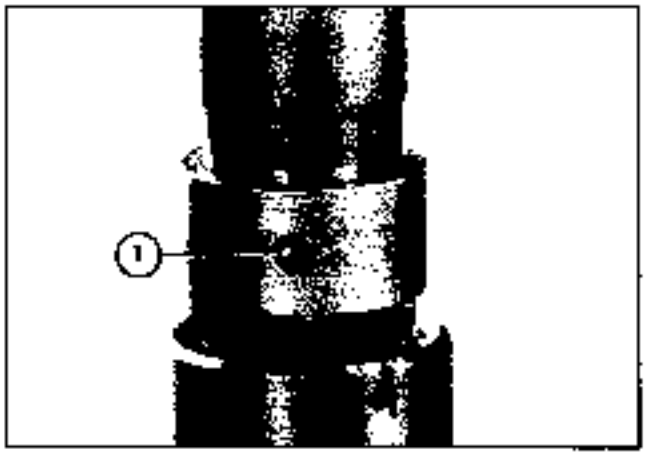


Fig. 5

1. Ball

Remove large retaining ring that holds lower housing cover. Tap ring around until one end is near small hole in cover. Insert punch in hole, tap punch to dislodge ring and pry ring out with screwdriver. When ring reaches anti-rotation lug, grasp ring firmly and pull it around and out from under lug.

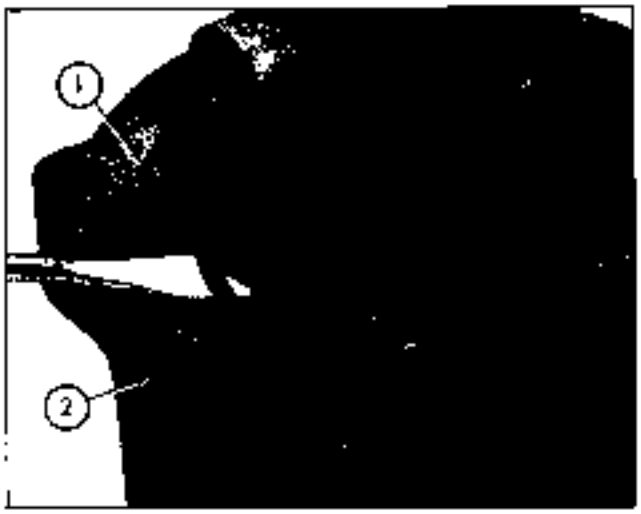


Fig. 6

1. Retaining ring
2. Small hole for punch

Housing cover is spring-loaded and should come off when ring is removed. However, during operation, a small burr may be raised on main housing in contact with ring. If cover does not come off housing, tap mounting lugs with non-metallic mallet to loosen it.

Place unit in vise and remove cover by pulling it upward with a rotating motion. Remove spring from pressure plate. Remove "O" ring and back-up ring from groove in cover.

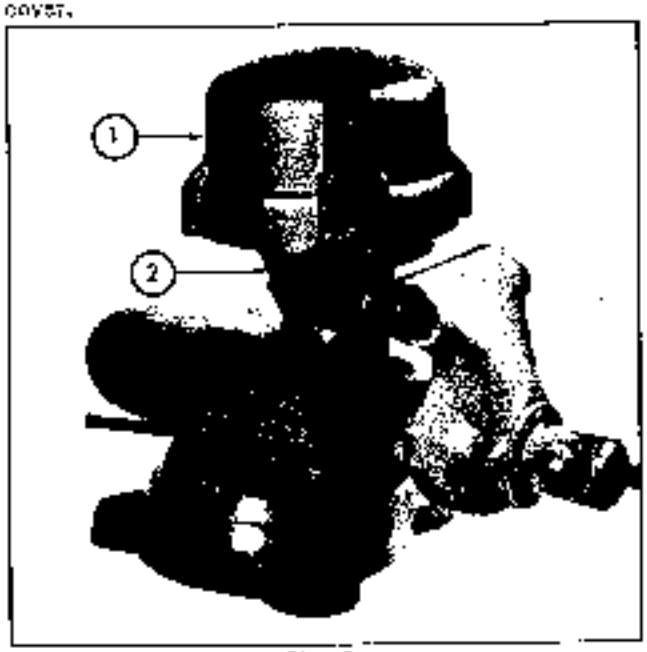


Fig. 7

1. Cover
2. Housing

Grasp pressure plate with both hands and carefully pull it off housing. Remove dowel pins.

Fig. 8

1. Pressure plate

Spread retaining ring for rotor and pry ring away from shaft with screwdriver.

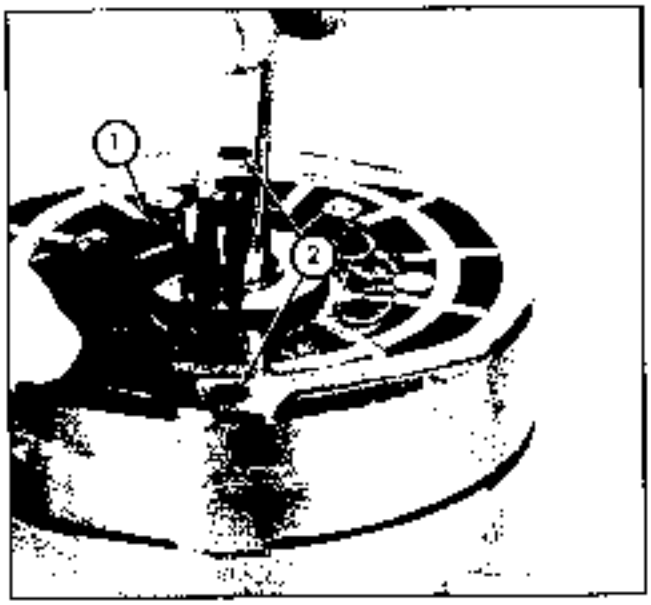


Fig. 9

1. Removing rotor retaining ring
2. Dowel pins removed

Remove ring and rotor assembly by pulling upward on ring with slight rocking motion. If rotor sticks, rock ring and rotor until complete assembly can be removed.

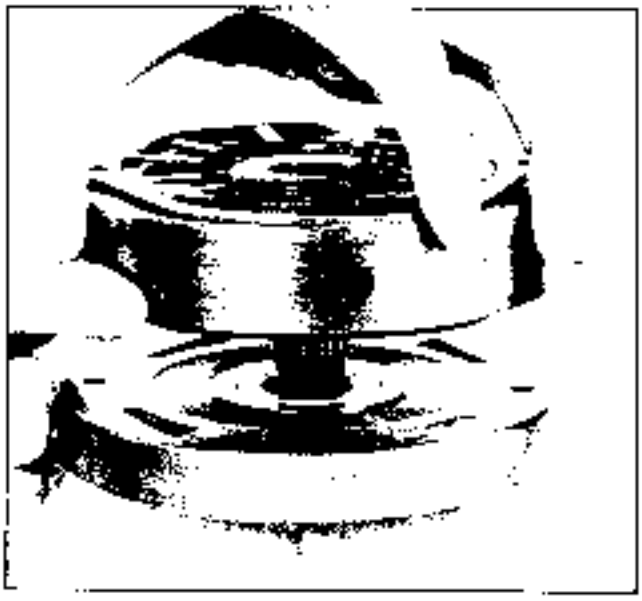


Fig. 10

Slip rotor out of ring and remove vanes. USE CAUTION when removing vanes as they are spring-loaded against ring.

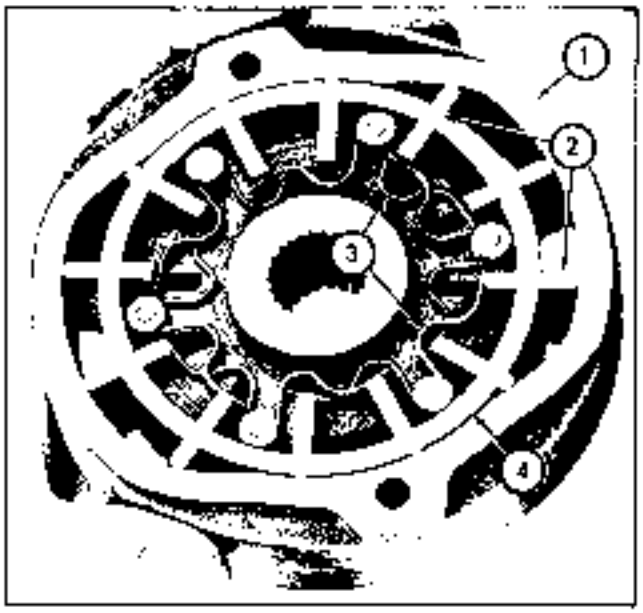


Fig. 11

1. Ring
2. Vanes
3. Vane springs
4. Rotor

Tap end of drive shaft to dislodge bearing support from housing. Remove bearing support.

Withdraw drive shaft from housing. DO NOT USE FORCE TO REMOVE SHAFT. Spool and spool bore tolerances are very close and internal components may be damaged if spool is forced out of housing. If spool jams

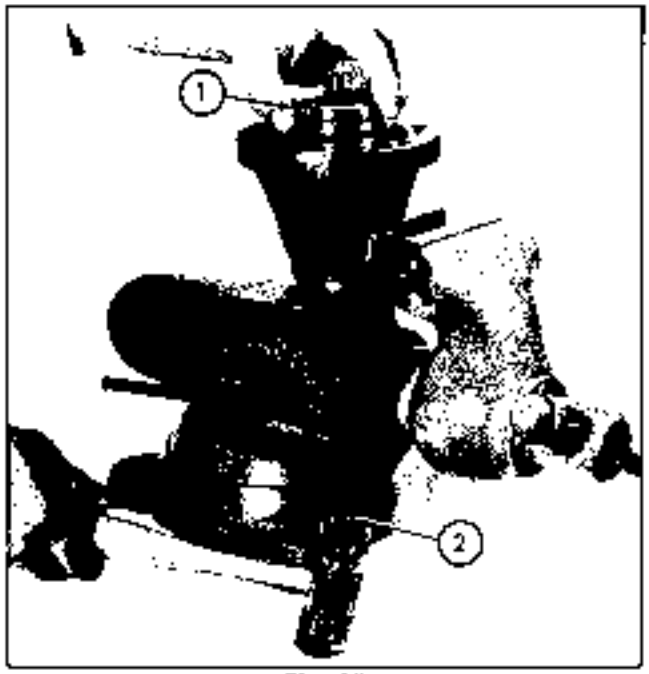


Fig. 12

1. Bearing support
2. Tapered end of shaft

in bore, push assembly back into housing and again attempt removal.

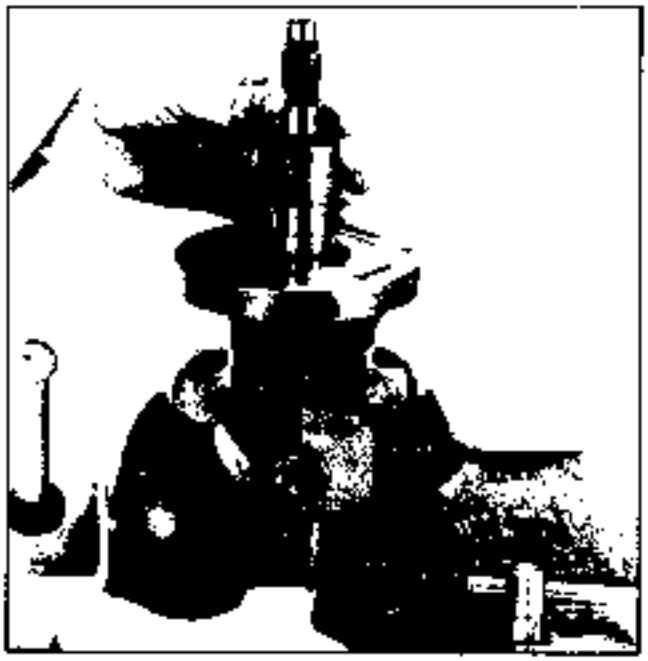


Fig. 13

NOTE: COMPONENTS OF DRIVE SHAFT (ACTUATOR, SPOOL, STUB SHAFT, ETC.) ARE SELECTIVELY FITTED AND FACTORY BALANCED, SO FURTHER DISASSEMBLY IS NOT RECOMMENDED. IF ASSEMBLY IS FUNCTIONALLY DAMAGED, IT WILL BE NECESSARY TO REPLACE ENTIRE UNIT.

Remove seal retaining ring from housing and remove dust shield and oil seal.

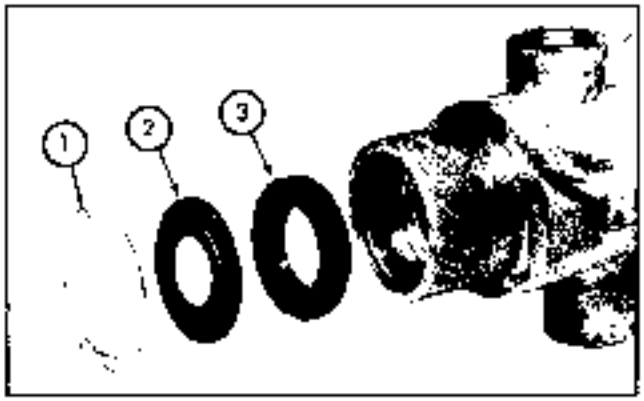


Fig. 14

1. Retaining ring
2. Dust shield
3. Oil seal

REPAIR AND REASSEMBLY

Clean all parts in a petroleum base solvent and blow dry with compressed air. Inspect all parts for wear or damage. Use extreme care when handling parts to avoid nicking or scratching machined surfaces.

Renew all seals when reassembling unit. To remove rotor seal and back-up "O" ring from pressure plate and bearing support, pry parts out with a small screwdriver as shown in Figs. 15 and 16. Use a new "O" ring seal in groove around bearing support.

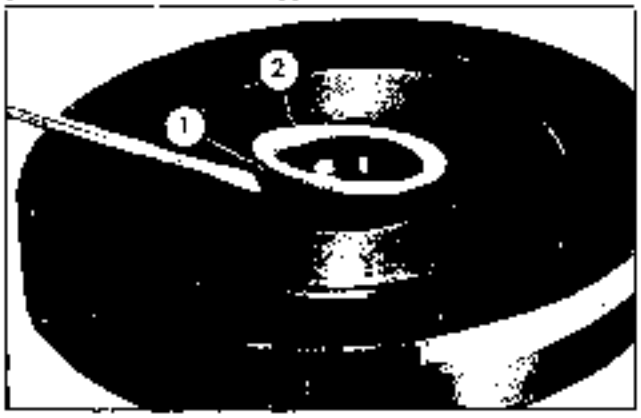


Fig. 15

1. Back-up "O" ring
2. Rotor seal in pressure plate

Check needle bearings in pressure plate and bearing support. Also, check condition of needle bearing in housing. Replace any bearing that is badly worn or damaged. When installing new needle bearings, always press against end of bearing on which number appears.

Install needle bearings in various components as follows:

Press needle bearing into pressure plate until it "bottoms".

Press needle bearing into bearing support until it is .010-.020" under flush with surface of bearing support that is opposite rotor seal cavity.

Press needle bearing into housing until it is flush to .020" under flush with surface of bearing bore in housing that is nearest small end of housing.

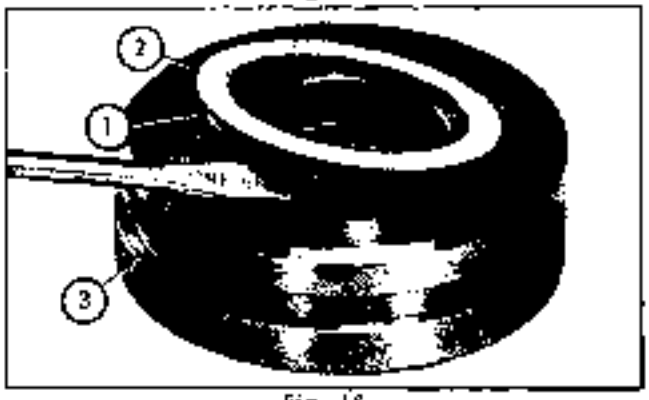


Fig. 16

1. Back-up "O" ring
2. Rotor seal in bearing support
3. Use new "O" ring in groove

Check all bearing surfaces on drive shaft and sub shaft for excessive wear. Check spool drive pin in actuator. If any components are worn or damaged, entire valve and housing assembly must be replaced.

Check fit of valve spool in housing bore. The spool must slide in freely without binding or catching. A small burr on spool or housing bore can usually be removed with a very fine hone. Extreme care must be taken not to cock or jam spool in housing bore when checking spool fit.

Check to be sure spool drive pin is properly engaged. This can be done by pulling spool away from actuator as shown in Fig. 17. If spool does not move axially away from actuator, pin is engaged. If, however, spool does move away from actuator, pin should be relocated in spool by letting spool come back against actuator and inserting pin into either one of two holes in base of spool.

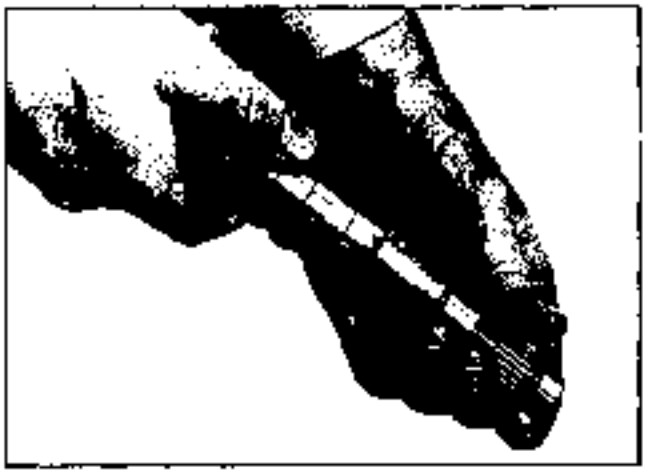


Fig. 17

Check valve spool bore in housing for scoring or nicks. If any defects are found, it will be necessary to renew entire valve and housing assembly. If housing is in serviceable condition, renew oil and dust seals in housing. The spring-loaded lip of oil seal must face to inside of housing. Lip on dust seal must face to outside.

Examine face of pressure plate for heavy score marks or other unusual wear patterns. In normal service, pressure plate face will have a polished surface with symmetrical shallow scratch marks resulting from contact with vanes, rotor, and vane springs. Discard pressure plate if it is badly worn or scored.

Check bore of rotor ring to see that is is not deeply scratched or grooved. A highly polished finish should be present on this surface. Slight irregularities in ring bore can be removed with crocus cloth.

Inspect vanes and rotor for excessive wear. The faces of rotor and all surfaces of vanes usually have a highly polished finish. A circular wear pattern from rotor seals may be present around splined hole.

IMPORTANT: IF ANY PARTS OF ROTOR SET ARE FOUND TO BE DEFECTIVE, THEY MUST BE REPLACED ONLY AS A COMPLETE SET AS SHOWN IN FIG. 18.

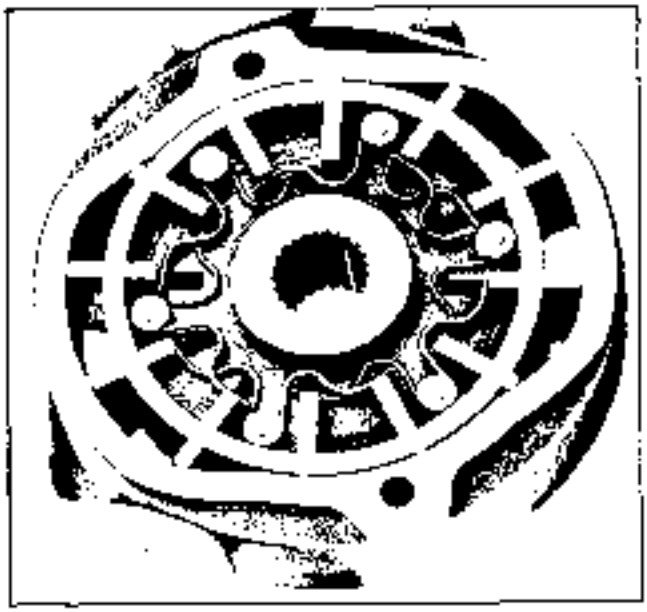


Fig. 18

Begin reassembly of hydramotor by clamping housing in a vise as shown in Fig. 19. Apply a film of grease to inside diameter of oil seal in housing. Insert drive shaft and valve spool assembly in housing from top. Push assembly into housing slowly and evenly with a slight oscillating motion until spool is seated.

CAUTION: BECAUSE OF EXTREMELY CLOSE TOLERANCES BETWEEN SPOOL AND HOUSING BORE, CARE MUST BE TAKEN WHEN INSTALLING VALVE SPOOL ASSEMBLY.

Place bearing support over end of drive shaft with rotor seal facing up. Push shaft upward until bearing is engaged on drive shaft.

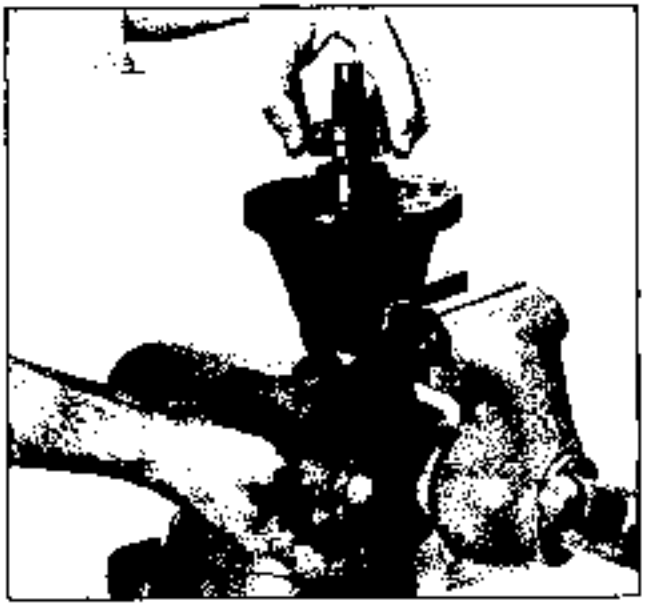


Fig. 19

Apply a light film of grease to "O" ring seal around bearing support and push assembly downward into housing. Be careful not to cock bearing support when applying downward pressure as this could damage "O" ring. Push down on bearing support until it is bottomed.

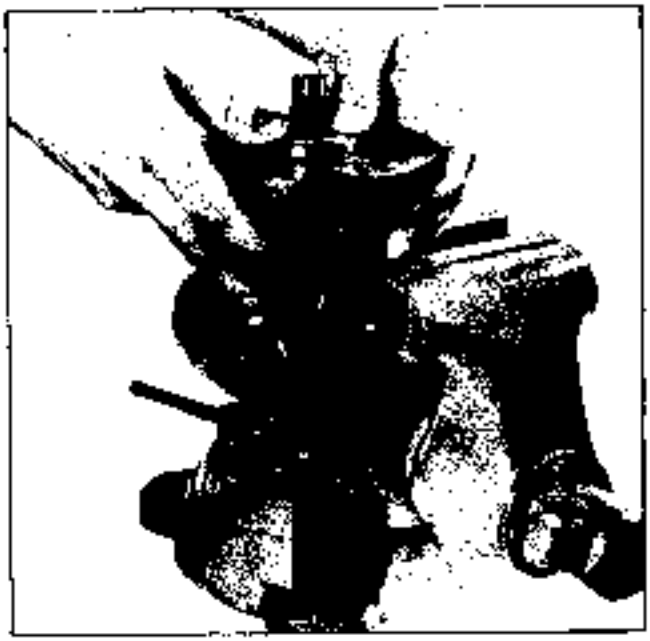


Fig. 20

IMPORTANT: MAINTAIN CLEAN WORKING CONDITIONS TO AVOID GETTING ANY FOREIGN MATERIAL INTO UNIT. CAREFUL THOUGHT TO CLEANLINESS WHILE SERVICING COMPONENTS OF POWER STEERING SYSTEM WILL PREVENT FUTURE TROUBLE.

If rotor ring, rotor, and vanes are found to be in a reusable condition, assemble components of rotor set before attempting to reinstall assembly to hydramotor unit.

Lay rotor ring on a clean, flat surface and place rotor in ring. Assemble vanes in rotor slots in each major diameter of rotor ring as shown in Fig. 21. Be sure rounded side of vanes are to outside (against the pump ring).

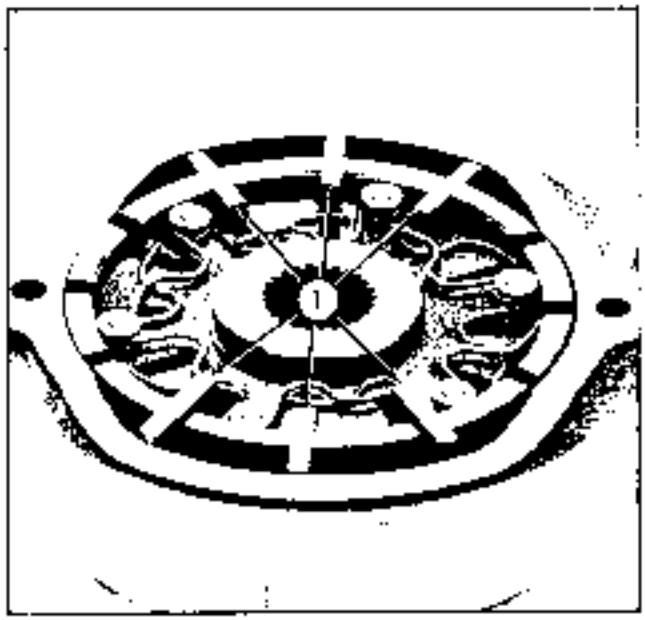


Fig. 21

1. Vanes installed in major diameter

Turn rotor 90 degrees and install remaining six vanes. To aid in installing last six vanes, compress vane springs with a screwdriver.

After all vane springs are engaged with vanes on one side of rotor, turn rotor and ring assembly over and engage springs to vanes on this side.

IMPORTANT: AFTER ALL VANES ARE INSTALLED, CHECK TO BE SURE ALL VANE SPRINGS ARE ENGAGED AND DO NOT PROTRUDE ABOVE SURFACE OF ROTOR.

Align marks made on the rotor ring and housing at disassembly and install ring and rotor assembly. If only one edge of rotor ring O.D. has a chamfer, install ring so chamfer is up, away from housing. The chamfer is most prominent in dowel pin area of ring.

Install dowel pins through ring and into housing. Install a new retaining ring for rotor. Spread ring with a snap ring pliers and work ring into groove with a screwdriver.

Install pressure plate on dowel pins and push plate down onto ring and rotor assembly. Special care must be taken so rotor seal does not drop out of its cavity when pressure plate is installed. Set pressure plate spring in place so it engages hub on pressure plate.

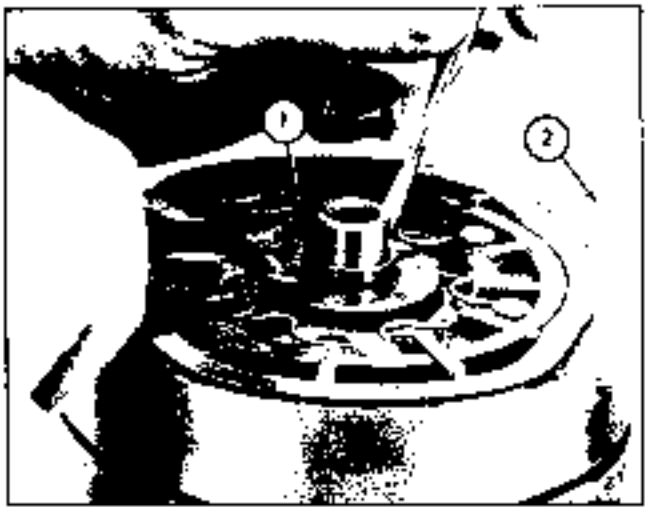


Fig. 22

1. Installing retaining ring
2. Dowel pins installed (1 shown)

Install a new "O" ring and back-up ring in housing cover. Stretch "O" ring before installing. Flat back-up ring must be installed so it is nearest open end of cover. Apply a coat of grease to back-up ring and seat to facilitate installing cover.

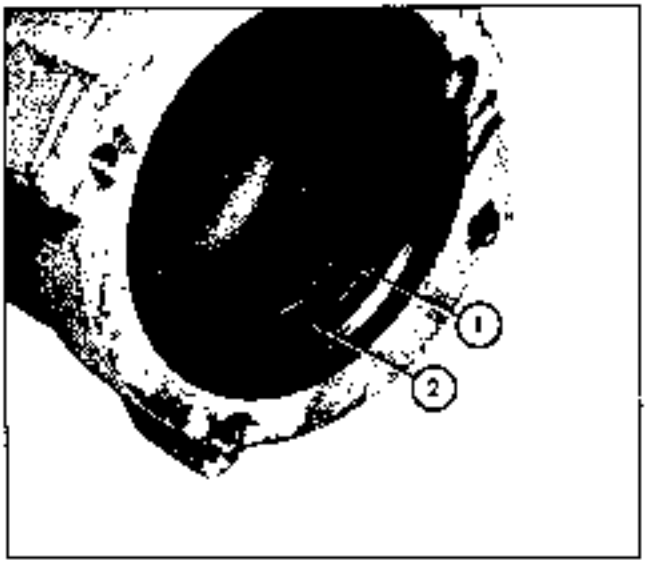


Fig. 23

1. "O" ring (inner)
2. Back-up ring

Carefully place cover on unit, lining up notch in cover with lug on housing. A slight binding of cover can be felt as cover seal engages O.D. of rotor ring. To start seal onto ring, rotate cover back and forth while exerting downward pressure. Keep notch and lug lined up.

CAUTION: BE SURE COVER DOES NOT COCK OR JAM DURING INSTALLATION AS THIS COULD RESULT IN DAMAGE TO SEAL.

Push cover down until pressure plate spring prevents it from being pushed any further. Remove unit from vise and place it in an arbor press. Handle unit carefully to prevent cover from slipping off housing.

Place cover retaining ring on housing, and place a sleeve on housing as shown in Fig. 24. Use a sleeve of sufficient length so that when ram on arbor press is brought down it will not contact drive shaft.

CAUTION: A SLEEVE MUST BE USED TO MOVE HOUSING DOWN INTO COVER. DO NOT APPLY PRESSURE TO SHAFT AS THIS WILL DISLODGE INTERNAL COMPONENTS.

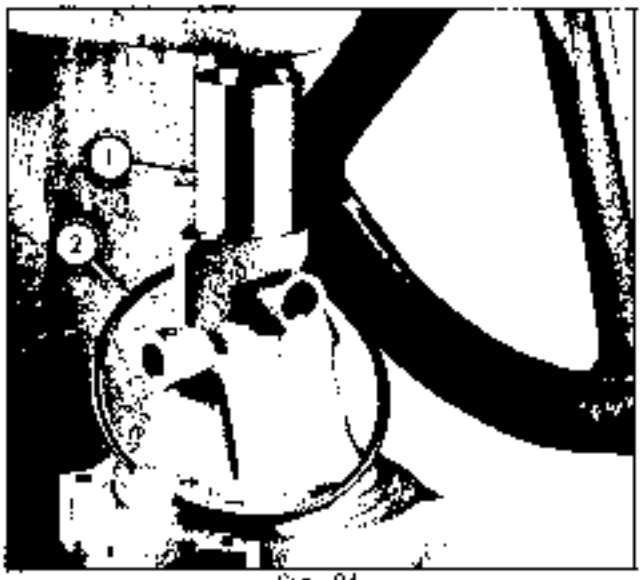


Fig. 24

1. Sleeve
2. Cover retaining ring

Apply pressure to housing to push it down into cover until retaining ring groove is exposed. Be sure housing is pushed squarely into cover. DO NOT USE FORCE. Light taps with a soft mallet, around edge of cover will aid in aligning housing and cover during installation.

Install cover retaining ring, placing one end of ring under anti-rotation lug to begin with. Work ring around cover until it is solidly seated in ring groove. Remove unit from press.

Place taper ring on steering shaft so holes for locking ball are aligned. Install nut on steering shaft so a few threads are engaged.

Install steering shaft on stub shaft so holes in shaft and taper ring are aligned with groove in stub shaft. Hole must not be located above flat on stub shaft since ball will not lock shaft in this position. Locate hole 90 degrees from flat on stub shaft.

Place lock ball in hole, allowing it to fall into place in stub shaft groove. If necessary, push ball into place with a punch. Rotate taper ring 1/4 turn so ball is locked in place.

Tighten steering shaft nut until taper ring is pushed up tightly on steering shaft (40-50 ft. lbs. torque). Stake nut to slot in steering shaft.

Reinstall steering column, placing clamp bolt 180 degrees from anti-rotation lug on hydramotor. Tighten nuts on column clamp to 10-15 ft. lbs.

Reinstall steering wheel and tighten nut to 35-40 ft. lbs. Reassemble horn button in reverse order of disassembly as described in paragraph 4-21 on page 1-42.

Install new "O" rings on elbows for hydraulic lines if there was evidence of oil leakage. When removing an elbow, note its position so it can be reinstalled in its original position.

Dip new "O" ring in hydraulic oil, or coat with Lubriplate, and install on elbow. Be sure there are no twists in "O" ring after it is installed. Screw elbow part way into housing, then tuck "O" ring into recess in housing. Tighten elbow until it points in its original direction, then tighten down lock nut.

CAUTION: DO NOT ATTEMPT TO RELOCATE ELBOW AFTER LOCK NUT IS TIGHTENED, AS DOING SO WILL DAMAGE SEAL. IF IT IS NECESSARY TO REPOSITION ELBOW, FIRST LOOSEN LOCK NUT.

Reinstall hydramotor in its original position. Tighten pivot bolt to hold hydramotor in place and secure bolt with lock nut. Reconnect transmission control rod and reconnect oil lines to hydramotor.

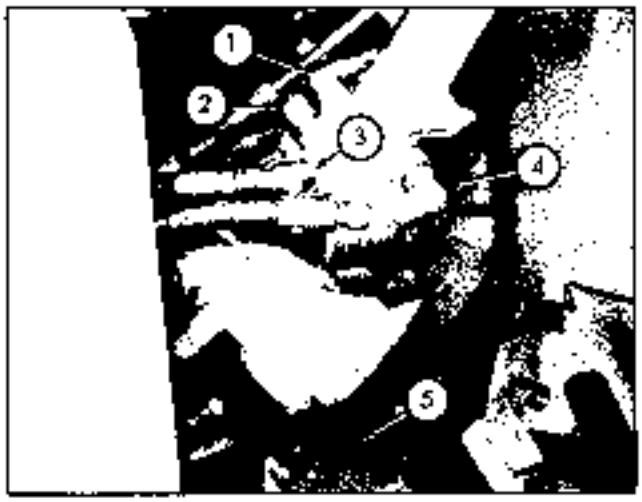


Fig. 25

1. Tube to cylinder - right turn
2. Tube to cylinder - left turn
3. Pressure tube from pump
4. Return tube to pump
5. Latch for steer wheel position

Fig. 25 shows latch that holds steering wheel in one of two positions. Depress latch with foot to tilt steering wheel forward or back.

POWER STEERING BOOSTER (MA60)

REMOVAL (See figure on page 81 of supplement).

Disconnect and cap oil lines (20) attached to booster (10). Identify oil lines so they can be reconnected to original ports. Remove nut (12) and detach socket (11) from steering housing. Remove nut (19) from stud (18) and remove stud from frame bracket. Remove booster.

DISASSEMBLY (See figure on page 84 of supplement).

Remove socket from piston rod, noting its location on rod. Drain oil from booster by moving piston rod back and forth in booster.

Remove 3 slotted head screws and remove end plate (17). Remove rings (13 and 16). Pull out piston and rod assembly (1) to dislodge bearing (7) from housing.

Remove bearing from piston rod and remove items 8 through 15 from bearing. Remove "O" ring (14) and back-up ring (15) from bearing. Remove piston ring (6) and seal (5) from piston.

REPAIR AND REASSEMBLY

Clean all parts in solvent and inspect for wear or damage. Check piston and barrel bore to be sure they are not scratched or scored. Renew any faulty components.

Replace all seals and "O" rings during reassembly. Apply a coat of Lubriplate or clean hydraulic oil to all seals and "O" rings to facilitate installation and prevent seal or "O" ring damage.

Carefully install seal (5) in piston groove, checking to be sure seal was not cut or twisted. Install piston ring (6) in groove, on top of seal.

NOTE: IF NEW PISTON IS INSTALLED ON ROD, TIGHTEN PISTON ROD NUT TO 50 FT. LBS.

Install piston and rod assembly in tube, using care not to damage piston ring.

Install "O" ring (14) and back-up ring (15) on piston rod bearing so "O" ring (14) will enter cylinder tube first at assembly. Install assembly in tube and secure with ring (16).

Install "O" ring (8) over threads and notches in piston rod, being careful not to twist or cut ring. Tuck ring into place in bearing housing. Install back-up ring (9), retainer ring (10), seal retainer (11). Secure parts in bearing housing with ring (13). Reinstall cylinder end plate (17).

Reinstall socket on piston rod in approximately its original position. Reinstall booster in lift truck and reconnect hydraulic lines. Bleed air from cylinder. Check and adjust steering linkage as outlined on page 4 of this supplement.

BLEEDING POWER STEERING SYSTEM

Any time power steering system is opened for service, it will be necessary to bleed system to remove air. Be sure oil in hydraulic reservoir is up to specified level.

Start engine and run at idle speed. Rotate steering wheel as rapidly as possible to unseat control valve spool in hydramotor. Valve spool must be actuated off-center to start oil flowing from hydraulic pump to hydramotor.

Keep valve spool actuated by rotating steering wheel from one stop position to the other. Air will bleed out only at reservoir, therefore, rotate steering wheel rapidly from one stop position to the other to circulate oil repeatedly in both directions.

Oil in lines to steering cylinder does not flow in a circuit, but simply moves back and forth in lines. Oil pumped to cylinder with hydramotor during bleeding operation reaches a "dead end" at piston, so any air in these lines will be slow to move out of system. Large air bubbles in system will allow steering wheel to "free-spin" as air enters hydramotor; small bubbles will cause a spongy feel at steering wheel.

SERVICE BRAKES (BENDIX)

REMOVAL (See figure 2-23A.)

Jack up front of truck and remove drive wheel. Brake drum is an integral part of wheel center.

Remove two flat head screws from axle flange. Thread two 3/8" cap screws evenly and gradually into tapped holes in flange. This will force axle shaft out of housing.

Remove retainer ring (44) and pull bearing housing (40) with items 41 through 45 from housing (33).

DISASSEMBLY (See figure on page 87 of supplement)

Unhook shoe return springs (14 and 15) from wheel cylinder bolt (23) and remove springs.

Move lever (12) for automatic adjuster to obtain slack in cable (16). Unhook cable from cylinder bolt and adjuster lever. Remove lever and spring (13). Remove brake adjusting screw assembly (9 thru 11).

Press down on spring retainer (7) and turn it 90° to remove it from pin (4). Hold pin if necessary to keep it from turning. Remove spring (6) and inner retainer (5). Remove shoes (3).

Remove retainer (31) from parking brake cam (29) and remove cable guide (32) and retainer clip (30). Unhook cable (27) from parking brake levers (24). Levers may be removed by removing retainers (26).

IMPORTANT: IF PARKING BRAKE LEVER (32) OR CAM (28) IS TO BE REMOVED, MAKE A CHISEL MARK ON LEVER AND CAM SO PARTS CAN BE INSTALLED IN SAME RELATIVE POSITION.

Slip rubber dust cups from wheel cylinder body and withdraw pistons. Press in on edge of cup in cylinder to tip cup sideways and remove cups and springs.

To remove wheel cylinder body, disconnect oil line and remove mounting bolts and screws. Backing plate (2) can now be removed if desired.

REPAIR

Discard brake shoes with linings and rubber parts used in wheel cylinder. Check all springs for fatigue cracks. Examine fittings on ends of cables to be sure they are securely attached.

IMPORTANT: CHECK CABLE (36) FOR IDENTIFICATION MARK "A" STAMPED ON ONE EYELET. IF NO IDENTIFYING MARK CAN BE FOUND, AND BRAKE SHOES ARE TO BE REPLACED, A CABLE 35P2194, IDENTIFIED WITH AN "A" ON ONE EYELET, MUST BE USED.

Wipe wheel cylinder bore absolutely clean. Check bore for pits or corrosion. Remove any rough spots with fine crocus cloth.

REASSEMBLY

Reassemble in reverse order of disassembly. Tighten cap screws in backing plates to 110-120 ft. lbs. Tighten cap screws and allen head screws securing wheel cylinder to backing plate to 400-450 inch pounds.

Coat bores in wheel cylinder with clean brake fluid. Install new boots (in kit 35P2200) on pistons. Boots must be installed on pistons so they will engage grooves in cylinder housing when installed.

Coat rubber cups with clean brake fluid, and, with spring centered in cup, install spring and cup in cylinder. Use care to prevent damage to lip on cup.

Install piston in cylinder and slip boot in place in groove around cylinder housing.

If parking brake lever and cam were removed, reinstall them, using marks made at disassembly to be sure they are properly reassembled.

Reinstall parking brake levers on pins in backing plate. Hang retainer clip for parking brake cable on parking brake cam, slip cable in groove in cable guide and install guide on cam. Secure with retainer ring. Attach cable to parking brake lever.

Apply a thin coat of light grease to area of backing plate that shoes rub on. Install brake shoes. Primary shoe does not have cable guide and attaches to forward position on backing plate. Secure shoes with hold-down parts.

Install brake adjuster screw between shoes so star wheel is nearest secondary (rear) shoe. Attach adjuster cable to wheel cylinder bolt and place cable around guide on secondary shoe.

Reinstall spring between primary shoe and adjuster lever. Connect cable to adjuster lever then pull lever toward lower end of secondary shoe and hook lever in hole in secondary shoe. Install return springs at upper ends of shoes. Fig. 26 shows brake assembly installed.

NOTE: A SPECIAL TOOL FOR INSTALLING SHOE RETURN SPRINGS IS AVAILABLE FROM BENDIX CORPORATION, SOUTH BEND, INDIANA, UNDER THEIR PART NUMBER BFD41236F4.

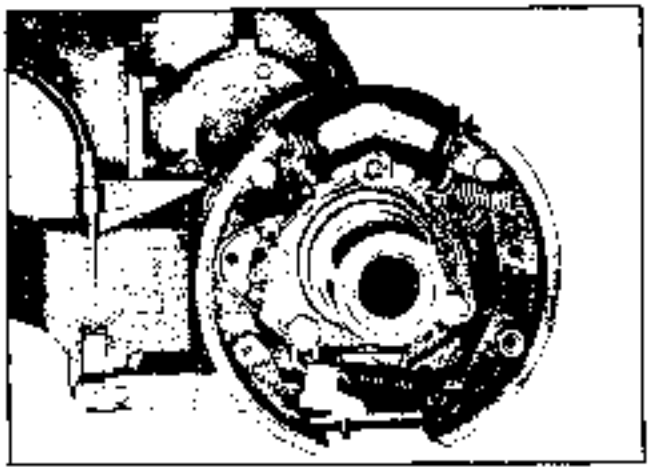


Fig. 26

Reinstall bearing housing and axle in reverse order of disassembly. If bearing adjustment is not correct, refer to revised information found on page 18 of this supplement for procedures to follow for obtaining correct end play and bearing adjustment.

Bleed wheel cylinders after installation is complete. Be sure master cylinder is full before bleeding. Always use a bleeder hose to prevent brake fluid from running down back plate and entering brake drum. Apply foot pressure to brake pedal and hold pedal down while loosening bleed screw. Allow air to escape from wheel cylinder and line. Tighten bleed screw before releasing brake pedal. Replenish fluid in master cylinder if necessary.

Apply brake pedal and hold pressure in system. Check for signs of fluid leaks if pedal slowly travels to floor.

Operate lift truck at slow forward speed to determine that brakes stop truck evenly and quickly.

If pedal travels an excessive amount before braking action begins, it may be due to brake shoes not being adjusted to drums. A series of stops with lift truck travelling in reverse direction will help adjust brakes.

DRIVE WHEEL BEARINGS AND SEALS

THE FOLLOWING INSTRUCTIONS SUPERSEDE THOSE GIVEN IN MANUAL S-548A REGARDING SERVICE OF DRIVE WHEEL BEARINGS AND SEALS.

DISASSEMBLY (See figure 8-22A.)

If a wheel hub must be removed to correct an oil leak, remove drive wheel and axle shaft. If red transmission fluid is noted in wheel hub, axle seal (38) is leaking and requires replacement. Hub seal (41) must be replaced if oil or grease is found on brake drum or outside of hub.

After drive wheel and axle shaft have been removed, drive outer bearing cone inward (away from bearing retaining ring) as far as it will go. Measure clearance between ring and bearing cone with feeler gage. If bearing-to-ring clearance is in excess of .002", a bearing adjustment will be necessary at reassembly. (The recommended end play for wheel bearing cones is zero to .002" loose- zero preferred).

Record measured clearance (if in excess of .002") between snap ring and bearing so, if reassembly is made with original bearing cones and retaining ring, a bearing spacer that is the measured amount thicker than original spacer will result in correct bearing adjustment.

Remove snap ring and wheel hub (bearing housing) containing bearings and seals.

REASSEMBLY

When reassembling seals for axle housing, apply sealant to seal bores. The recommended sealant to use is a silicone-rubber adhesive-sealer manufactured by either Dow-Corning, Inc. (RTV-732), or General Electric Corporation (RTV102). This sealant is generally available in hardware stores. It requires approximately 10 minutes to set after exposure to air.

Use sealant between axle flange and wheel hub on lift trucks that do not use an "O" ring at this location.

Apply a thin, continuous line of sealant on seal bore prior to pressing new seal SA9620 into place. Install seal with lipped edge to inside, using a seal driver large enough to contact outside shell of seal. Use care to avoid cocking seal. Be sure seal is squarely seated against shoulder after installation, but do not apply excessive pressure as shell may buckle.

Install inner bearing cup in housing. Use original cup if possible to minimize bearing adjustment.

Prepare an assembly of wheel bearing cones, shim washer, and snap ring. If new components are being used, it will be necessary to determine correct shim washer to use between bearing cones to obtain a zero to .002" bearing end play.

To determine correct shim washer to use, measure distance between bearing shoulder and OUTER edge of snap ring groove in axle housing. Stack two bearing cones and snap ring and select shim washer so measurement over cones, shim washer, and retainer ring equals dimension obtained from axle housing.

A gauge (tool) for determining correct stack height of cones, shim, and ring can be made by filing a small rod so its length exactly equals distance between bearing shoulder and outer edge of snap ring groove in axle housing. Use gauge, together with straight edge, to determine correct stack height.

NOTE: A NEW GAUGE MUST BE MADE FOR EACH AXLE HOUSING THAT IS SERVICED.

After determining correct shim, pack bearing cones with an automotive-type, multi-purpose, lithium base grease, containing a moly-disulfide additive. Work grease into bearing so spaces around rollers are filled with grease.

Install hub on axle housing, being careful not to damage seal in hub. Install inner bearing cone, selected shim, outer cone, outer cup, and snap ring.

Install axle shaft less shims that are ordinarily used between axle flange and bearing housing. Install countersunk head screws and tighten until they are just snug. Rotate wheel hub several times and measure space between axle flange and hub at both screws. Adjust screws so space between flange and hub at screws, and 90 degrees from each screw is equal. Tap axle shaft sharply several times and again rotate hub and retighten screws evenly. Repeat until no further take-up is obtained. Do not apply pressure with screws.

Wrap a stout string around outside of wheel studs and attach a spring scale. Record pounds pull required to rotate hub.

Prepare a shim pack .002" thinner than space between axle flange and hub. Remove axle, install shim pack and axle, and tighten countersunk screws. Again obtain a rolling torque reading and vary shim pack as necessary so assembled rolling torque is 2 to 4 pounds greater than reading obtained without shims.

Remove axle shaft. Apply sealant to seal bore in axle housing and carefully install seal with lipped edge toward inside. Install collar with flat side toward seal and drive into bore until it contacts seal. The collar serves as a guide when axle shaft is installed to prevent damage to seal.

If no "O" ring is used between axle flange and wheel hub, coat flange on axle shaft that extends into wheel hub with same sealant specified for seal bores before axle is installed. Secure axle with 3 countersunk screws.

ZENITH CARBURETOR (MA60)

REMOVAL AND DISASSEMBLY

Detach air cleaner hose from carburetor and remove air cleaner and mounting bracket. Flow divider must be removed from hydraulic pump before carburetor can be removed. Detach accelerator and governor linkages, choke cable, and fuel line, and remove carburetor from manifold.

Identify or mark relationship of carburetor components as carburetor is disassembled so parts can be reassembled in original position.

Disassembly of carburetor is complete upon removal of all attaching parts of each component.

REPAIR AND REASSEMBLY (See illustration on page 22 of supplement.)

Clean all parts in cleaning solution and dry, using compressed air. Carefully examine all parts for wear or damage.

NOTE: If throttle shaft bushings are found to be badly worn, carburetor throttle body should be taken to a Zenith Service Shop for installation of new bushings. Bushings must be line-reamed after installation and economizer restriction passage and channel from body bore into throttle shaft bore must be redrilled.

Reassemble carburetor in reverse order of disassembly, using parts found in repair kit. Use marks made at disassembly to insure that various components are reinstalled in original position.

The float controls fuel level in carburetor bowl. After float is installed, turn throttle body upside down and measure distance from float bodies to machined surface on body (no gasket). The correct dimension is 1-5/32" plus or minus 1/32". If dimension is incorrect, bend float arms to obtain correct dimension.

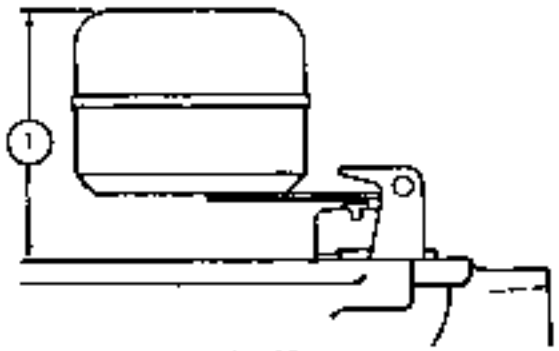


Fig. 27

1. 1-5/32 ± 1/32"

Reassemble remaining carburetor components and reinstall carburetor on engine. Adjust carburetor as explained in paragraph 3-16 on page 1-18 of Manual S-3484.

HYDRAULIC PUMP (MA60)

REMOVAL AND DISASSEMBLY (See figure on page 41.)

Drain hydraulic oil reservoir. Disconnect and cap oil lines connected to pump. Remove lower pump mounting bolt. Remove nut from long bolt that passes through pump and governor, allow pump to tip down and remove long bolt. Withdraw pump from engine.

Remove nut from pump shaft and remove gear (34) and Woodruff key. Remove screws securing adapter (9) to pump. Remove adapter and "O" ring (10).

Mark flow divider body (24) and pump so flow divider can be reinstalled in its original position. Remove flow divider and "O" rings (23).

Scratch a line on side of pump cover (3) gear plate (18), and body (2) so gear plate, if re-usable, can be reinstalled in its original position. Loosen cover-to-body bolts a few turns and tap screws with a soft mallet to separate cover, plate, and body. Remove bolts and carefully lift off cover.

IMPORTANT: DO NOT PRY COVER OFF WITH A SCREWDRIVER OR OTHER SHARP INSTRUMENT AS THIS WILL DAMAGE MACHINED SURFACES OF GEAR PLATE AND COVER.

Remove wear plate (19), noting that bronze-plated side of plate is toward pump gears and that two small holes on one side of plate are toward small (pressure) port in cover.

Before removing gears (6 and 15), check clearance between gears and gear plate as shown in Fig. 28. If clearance exceeds .005 inch, a new gear plate must be used. Remove gears, gear plate, and wear plate (18).

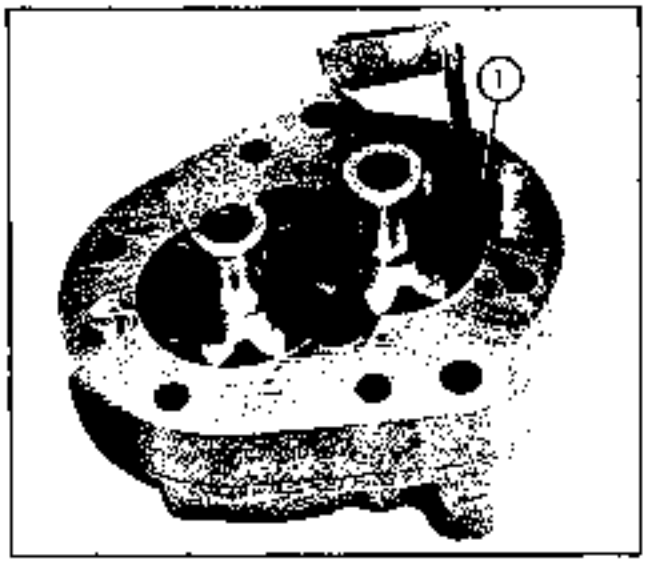


Fig. 28

1. Clearance must not exceed .005"

Remove seals (20), back-up rings (22), and seals (21) from pump cover and body. Note position of back-up ring in relation to molded rubber seal. Also, notice that flat side of molded rubber seal is in bottom of groove in cover and body. Remove "O" rings (23) from pressure ports in cover and body.

Tap splined end of drive shaft (5) to dislodge bearing (7) and shaft assembly from body. Remove thrust washer (11). Disassemble bearing from shaft by removing one snap ring (8). Remove 4 screws in seal plate (12) and remove plate from body. Remove "O" ring (14).

Remove plugs from flow divider body to disassemble flow divider piston and spring, and components of power steering relief valve. Figs. 29 and 30.

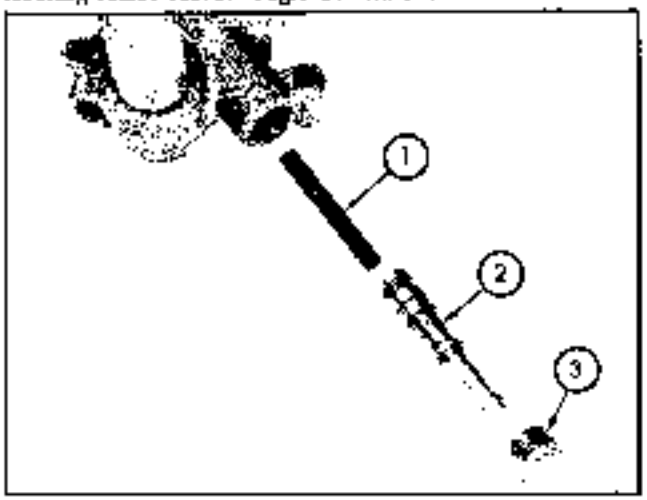


Fig. 29

1. Spring
2. Flow divider piston
3. Plug with "O" ring

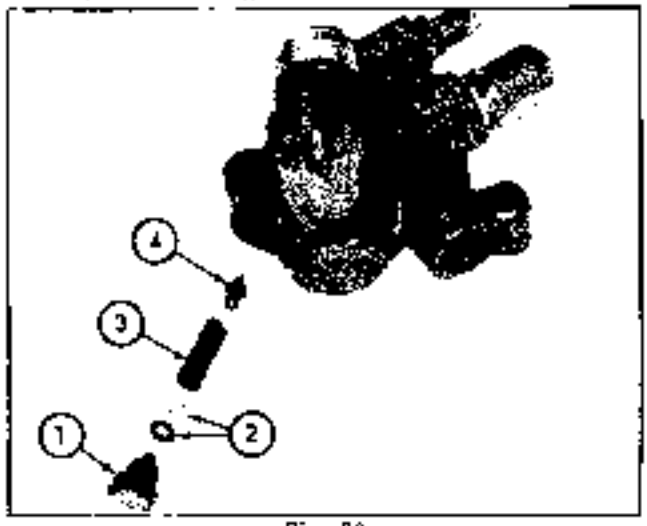


Fig. 30

1. Plug
2. Shims
3. Spring
4. Relief valve

REPAIR AND REASSEMBLY

Select a clean, dust-free area of shop for servicing and reassembling pump. Avoid handling pump parts with extremely dirty hands and do not use rags with excessive amounts of lint for wiping or cleaning pump parts. Keep pump parts immaculately clean during reassembly.

After thoroughly cleaning pump parts, carefully inspect them for wear or damage. Check condition of wear plates and replace them if they are warped or deformed, or worn excessively in gear travel area. (Wear plates will be worn more on pressure side -- side of plates with two small holes.)

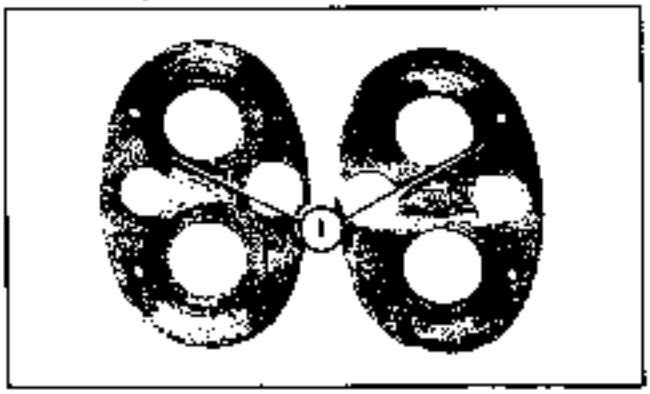


Fig. 31

1. Worn areas on plates

Examine flow divider and relief valve parts. If relief valve or flow divider piston is grooved, scratched, or scored, they must be replaced. Use new springs if original ones are weak or broken. Replace entire flow divider assembly if bore for flow divider piston is damaged.

Check condition of drive and idler gears. If gears are worn, nicked, or otherwise damaged, recommended practice is to replace them as a set.

Check seal seating area on drive shaft. If seat is rough, it can possibly be cleaned up with crocus cloth, however, if seat area is badly grooved, it will be necessary to replace drive shaft.

Check condition of needle bearings in body and cover. These "blind" needle bearings are extremely difficult to remove without specialized pulling tools, so if there is evidence of bearing damage, install a new cover or body assembly with bearings installed.

If clearance between gears and gear plate, checked during disassembly, was not in excess of .005" as specified, and gear plate is to be re-used, check pressure areas of plate. If these areas are badly scored or discolored, replace gear plate.

Always replace all "O" rings, seals, and back-up rings when reassembling pump. Re-using original seals will often lead to leaks soon after overhaul. Dip "O" rings and seals in clean hydraulic oil when they are installed.

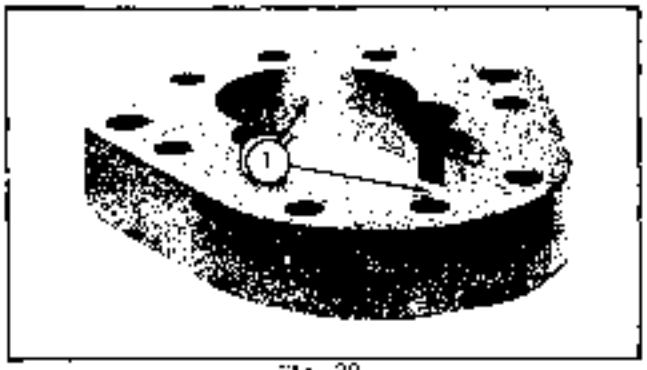


Fig. 32

1. Check for scoring in these areas

Install a new seal in seal plate, pressing seal into place from rear as shown in Fig. 33. Seal must be installed so spring-loaded lip is toward gears when seal plate is installed. Be careful when installing seal so as not to damage seal lip.

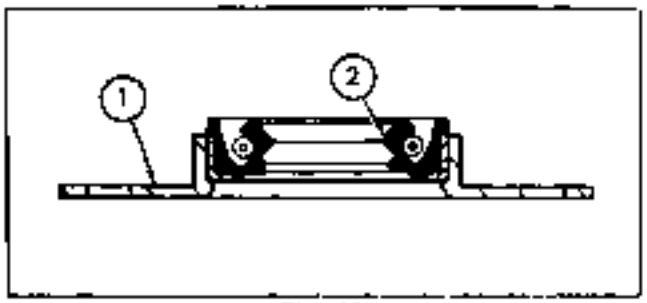


Fig. 33

1. Seal plate
2. Spring-loaded seal lip

Install a new "O" ring in body as shown in Fig. 34, and install seal plate and seal assembly. Tighten attaching screws securely.

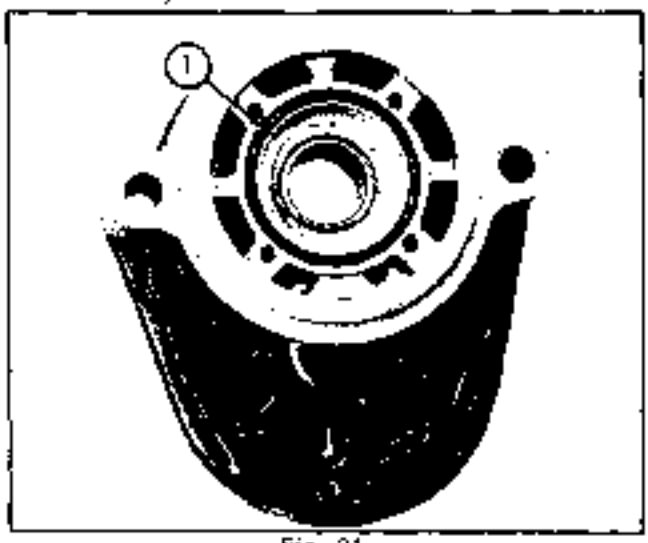


Fig. 34

1. "O" ring for seal retainer plate

Install bearing on drive shaft, securing it with snap rings. Lay thrust washer in place on seal plate and reinstall shaft in body. Tap shaft with soft mallet, if necessary, to seat bearing in body.

Install molded rubber seal (21) in groove in pump body, with flat side of seal in groove bottom. Carefully lay back-up ring (22) in place on top of seal ring. Be sure back-up ring is completely seated around molded rubber ring and that there is no interference between seal ring and back-up ring. Fig. 35 shows a cross section view of molded seal ring and back-up ring in groove.

Install large, oval-shaped seal ring in pump body with flat side down. This oval-shaped ring that surrounds wear plate is molded in an L-shape as shown in Fig. 36.

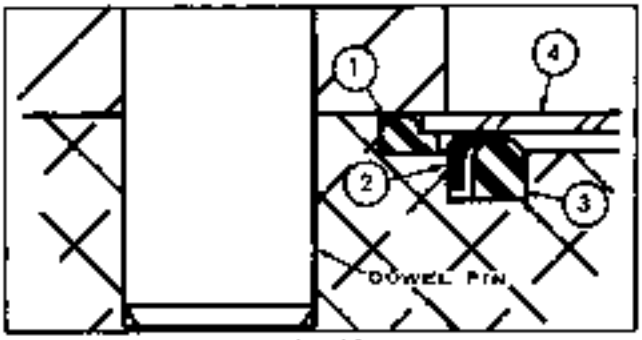


Fig. 36

1. L-shaped seal
2. Metal back-up ring
3. Molded seal with flat side in groove
4. Wear plate

Install a new "O" ring around pressure port in pump body. (Pressure side of pump is area within molded seal and back-up ring.) Fig. 36 shows rings, molded rubber seals, back-up ring, and oval-shaped seal installed in pump cover. These parts are installed in body section in same way.

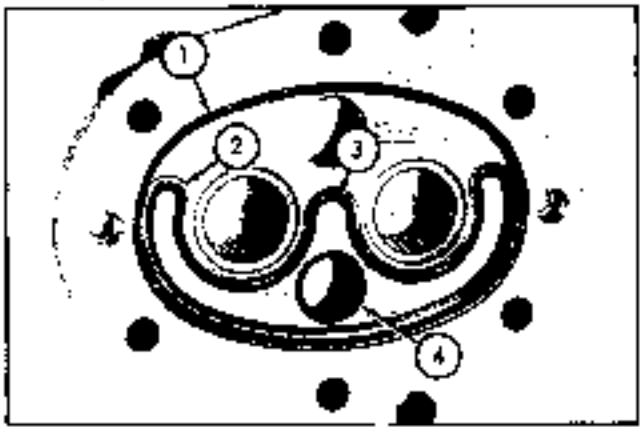


Fig. 36

1. L-shaped seal
2. Metal back-up ring
3. Molded seal
4. "O" ring around pressure port

Lay wear plate in place on body so bronze-plated side of plate will be toward gears, and two small holes (1/8") are located in area within molded seal and metal back-up ring. Wear plate must fit snugly in oval-shaped seal ring (plate should move just slightly from top to bottom).

IMPORTANT: IF NEW WEAR PLATES ARE BEING USED, RUB EDGES OF PLATES WITH A FINE STONE TO REMOVE ANY BURRS.

Reinstall dowel pins and install gear plate so word IN, stamped in side of plate, will be toward suction side of pump. This is side of pump opposite area within molded seal.

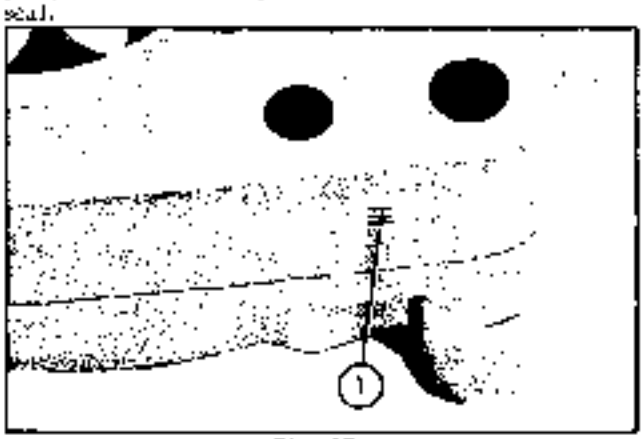


Fig. 37

1. Identification on gear plate

Apply a generous coat of Lubriplate to all surfaces of drive and idler gears and install gears. Lubriplate on gears will aid in initial prime of pump and provide lubrication until hydraulic oil is drawn into pump.

Apply Lubriplate to bronze-plated side of other wear plate and install plate with bronze-plated side against gears.

Install seals and back-up rings in cover as shown in Figs. 35 and 36 and install cover on pump. Use extreme caution when installing cover to body to be sure wear plate is properly seated within oval-shaped "O" ring. If plate is cocked so it does not lay within large seal, pump will not function at capacity.

Reinstall cover-to-body bolts. To avoid distorting cover, tighten bolts evenly, a little at a time, alternating from side to side. Torque bolts to 190-210 INCH pounds.

Install new "O" rings in pump cover and reinstall flow divider body, aligning marks made at disassembly. Tighten flow divider attaching bolts to 17 ft. lbs.

Install new "O" ring for pump mounting adapter and reinstall adapter. Reinstall pump, using a new gasket.

After pump is reinstalled, and before reconnecting oil lines, prime pump by pumping clean hydraulic oil into ports, using a pump-type oil can. Reconnect oil lines.

Power steering relief pressure is to be 1200 PSI, plus or minus 50 PSI. Relief pressure is regulated by using shims between plug and spring (See Fig. 38.) Fig. 38 shows location of plug for relief valve. To check steering relief pressure, install gage in small port in flow divider body.

Fig. 38

1. Plug for relief valve
2. Test port-power steering relief

WIRING HARNESS FUSES

The main wiring harness on lift trucks equipped with an alternator contains two 20 amp fuses and one 14 amp fuse. The 20 amp fuses serve as the main (primary) fuses for the entire wiring circuit and protect all the wiring whether the ignition switch is turned on or off. These fuses are contained in white cases and can be found near the starting motor solenoid. Check both these fuses when replacing.

NOTE: LIFT TRUCKS EQUIPPED WITH A GENERATOR USE TWO 14 AMP FUSES IN PRIMARY WIRING CIRCUIT.

The 14 amp fuse in the main wiring harness, is located up under the instrument panel and protects the ignition and instrument circuit.

The wiring harness (35A8207) for the horn circuit contains a 14 amp fuse to protect this circuit. This fuse can be found up under the instrument panel.

If the lift truck is equipped with lighting equipment, the lights are protected by a 14 amp fuse.

NOTE: WHEN IT BECOMES NECESSARY TO REPLACE A FUSE, USE ONLY AN SFE FUSE OF RECOMMENDED AMPERAGE.

SIMPLEX MAST

REMOVAL AND DISASSEMBLY (See illustration page 45 of supplement.)

Remove forks (42) by disengaging levers (44) and sliding forks to notch in lower carriage bar for removal.

Support mast assembly with hoist or other means to keep it from falling when detached. Disconnect hydraulic tubing from lift cylinder.

Drive out roll pins securing lift cylinder pins to mast. Thread a 3/8"-16 NC bolt into pins and pull out pins. Remove clamp blocks (2) and lift mast assembly up and away from truck. Place assembly on floor, with back of assembly down.

Remove pins (25) to detach chains and roll carriage assembly (13 or 17) out of bottom of mast assembly. Remove pin (25) to detach chain from anchor (27). Remove chains.

Loosen set screw (33) in piston head (32) and slide piston head away from cylinder. Remove bolt in cylinder base and remove cylinder. Remove shoes (34) and shims (35) from piston head and remove piston head.

Slide inner rail assembly (5) toward upper end of outer rail assembly (1) until first set of rollers (9) on inner rails are exposed. Raise upper end of inner rail sufficiently to allow removal of shoes (7) and shims (8) from upper end of outer rail.

Remove stop blocks (36) from back of outer rail assembly and slide inner rail assembly out of outer rail. Remove shoes (7) and shims (8) from inner rail assembly.

Remove snap ring (12) and remove roller assembly from pin. Remove snap ring (11) and remove bearing (10) from roller (9). If carriage is equipped with thrust rollers, remove pin (20) and roller (19). On carriages that have wear shoes, remove shoes (15) and shims (16).

To remove sheave (38) from piston head, drive roll pin into pin (41) just far enough to allow removal of pin. DO NOT drive roll pin in so far as to imbed it in casting. Remove pin (41) and remove sheave (39). Drive roll pin out of sheave pin.

Unscrew pin (20) to remove thrust bearing (18) from carriage (17). Pin is staked at front so will turn hard at first. Loosen set screws before attempting to remove lower pins.

REPAIR AND REASSEMBLY (See Illustration page 45 of supplement)

Examine all parts carefully for wear or damage and discard any unserviceable parts. Clean chains by soaking in kerosene or gasoline. Dry chains thoroughly and lubricate with No. 10 oil.

If roller pins (6, 14 or 18), welded to inner rails and carriage, require replacement, chisel off worn pin and grind off all remaining weld material to obtain a smooth surface. Clean up locating hole for roller so roller will enter hole and fit flat against rail. Weld roller in place, using low hydrogen welding rods.

Reassemble mast components in reverse order of disassembly. Apply a graphite base grease to sliding members when reassembling mast.

Stake thrust bearing pins (20) on front side of carriage, at both ends of slot in pin.

Use shims (8) under mast shoes (7) as required to obtain a minimum clearance between inner and outer rails. Use shims on both sides to keep rail assemblies square in relation to each other. Clearance should not exceed thickness of one shim, but rails must slide freely.

Maintain cylinder alignment by using shims (35) between piston head (32) and guide (34).

Begin lift chain adjustment by placing mast in vertical position. Move forks to extreme ends of fork bar and lower forks until cylinder is completely collapsed. There should be no slack in chains when cylinder is completely collapsed. Do not place a load on forks when adjusting chains.

Loosen jam nuts (30) and turn chain anchor rods (29) into anchors (27) approximately 1-1/4 inches (item 1, Fig. 39). Secure rods in anchors with jam nuts.

Adjust nuts (item 2, Fig. 39) on lower end of anchor rod to obtain a fork-to-floor clearance of 0 to 3/4 inch (item 3, Fig. 39). Make this adjustment on both sides. Keep nuts on lower end of anchor rod as near as possible to end so rods will not protrude below cylinder base.

Raise mast to maximum height and check to be sure a clearance of at least 1/8" exists between stop blocks (item 4, Fig. 39). If stop blocks are contacting each other, readjust nuts on lower end of anchor rod (lengthen chain) to obtain a clearance of at least 1/8 inch.

Attach tension scale (item 5, Fig. 39) and measure chain deflection with pull applied. Attach scale to other chain at same height, apply same pull, and measure deflection. Adjust nuts on lower end of anchor rod (under cylinder base) to equalize deflection with same pull applied.

Tighten nuts on lower end of anchor rod securely. Then, tighten lower nut (item 6, Fig. 39) down against base flange and back off 1/8 turn. Hold nut in this position and secure by tightening upper nut against lower nut. Chain anchor rod must not be locked solid in cylinder base, but must be free so it will tip slightly back and forth as mast is raised and lowered.

Raise mast to maximum height and recheck clearance between stops. Adjust as necessary.

SIMPLEX LIFT CYLINDER

REMOVAL AND DISASSEMBLY (See illustration on page 48.)

Raise forks until 8" block of wood can be inserted under carriage. Lower carriage onto block and detach lift

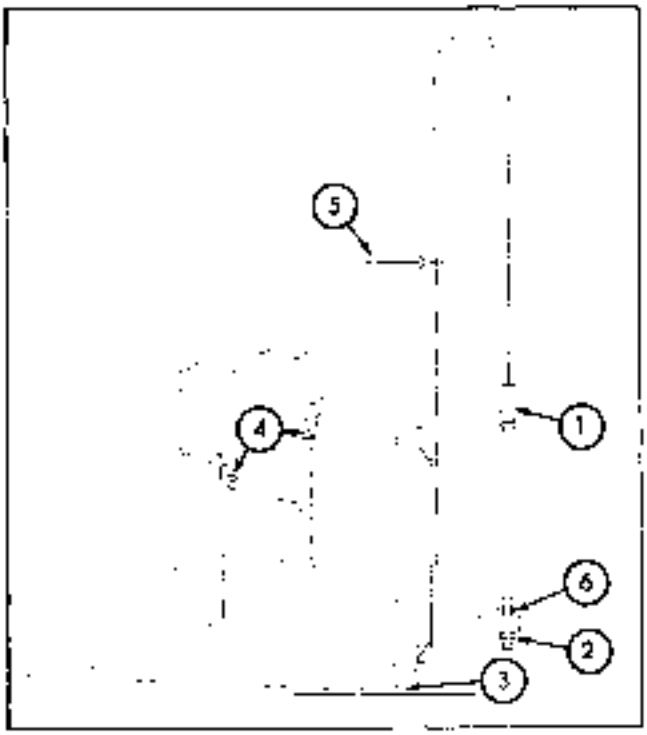


Fig. 39

1. Thin rods into anchors
2. Nuts on lower end of rods
3. Fork-to-floor clearance
4. 1/8" clearance between stops
5. Tension scale
6. Jam nuts (1/8 turn from right)

chains from carriage. Extend lift cylinder, raising piston head a few inches. Secure piston head to top of mast with chain. Loosen set screw in piston head and contract lift cylinder.

Remove clamp (5E, illustration page 46) to disconnect vent line. Disconnect hydraulic line from cylinder base. Remove bolt in cylinder base and lift cylinder up and out of mast.

Mark retainer (6) and shell (1) so retainer can be retightened to same position at reassembly. Remove retainer and "O" ring (7). Wiper ring (4) and garter spring (5) will come out with retainer.

Remove plunger (2) and spacer (3), if used. Remove snap ring (12) to remove piston (8) and packing (9). Remove "O" ring (10) and back-up ring (11) from groove in plunger bottom. Remove flow control parts (items 13, 14, 15, and 16) from cylinder inlet port.

REPAIR AND REASSEMBLY

Clean all parts and examine each one for scratches, pitting, wear, or other damage. Use new "O" rings, seals, packings, etc., found in repair kit during cylinder reassembly.

Dip all "O" rings, seals, and packings in clean hydraulic oil to facilitate assembly and to help prevent damage to these parts. Be sure "O" rings are not twisted during installation.

Install back-up ring (11) and "O" ring (10) in plunger groove. "O" ring must be nearest plunger bottom end. Install packing assembly (9) on piston (8) and install piston with packing, on plunger. Secure piston with snap ring (12).

Lubricate piston and packing generously with clean hydraulic oil and install plunger assembly in shell. Be careful not to damage packing while sliding it past threads in shell.

Install new wiper ring (4) with garter spring (5) in plunger retainer (6). Install new "O" ring (7) on retainer. Install spacer (3), if used, and reinstall retainer. Tighten retainer until mark made at disassembly is aligned with, or past, mark on shell.

Reinstall flow control parts in cylinder inlet port, in order shown in illustration on page 49.

Reinstall cylinder in mast in original position. Reinstall bolt through cylinder base and reconnect hydraulic pressure and vent lines. Start engine, extend cylinder, and reinstall piston head. Tighten set screw securely. Lower cylinder and reconnect lift chains to carriage.

CHANNEL PLUGS FOR CASCADE TRIPLEX MAST

(See page S-36 of Manual S-3460A)

The channel plugs (5) must be kept properly adjusted to eliminate excessive movement of sliding members (channels). When properly adjusted, channels should fit snugly, yet be free to return to nested position without loading. Therefore, plugs must not be threaded in so far that they will cause binding.

When adjusting channel position with plugs, keep channels square in relation to each other to maintain alignment of latch points and latches. Latch points (capscrews) located on back of cylinder and carriage, must engage center of latch throat as carriage is raised. Be sure latches pivot freely.

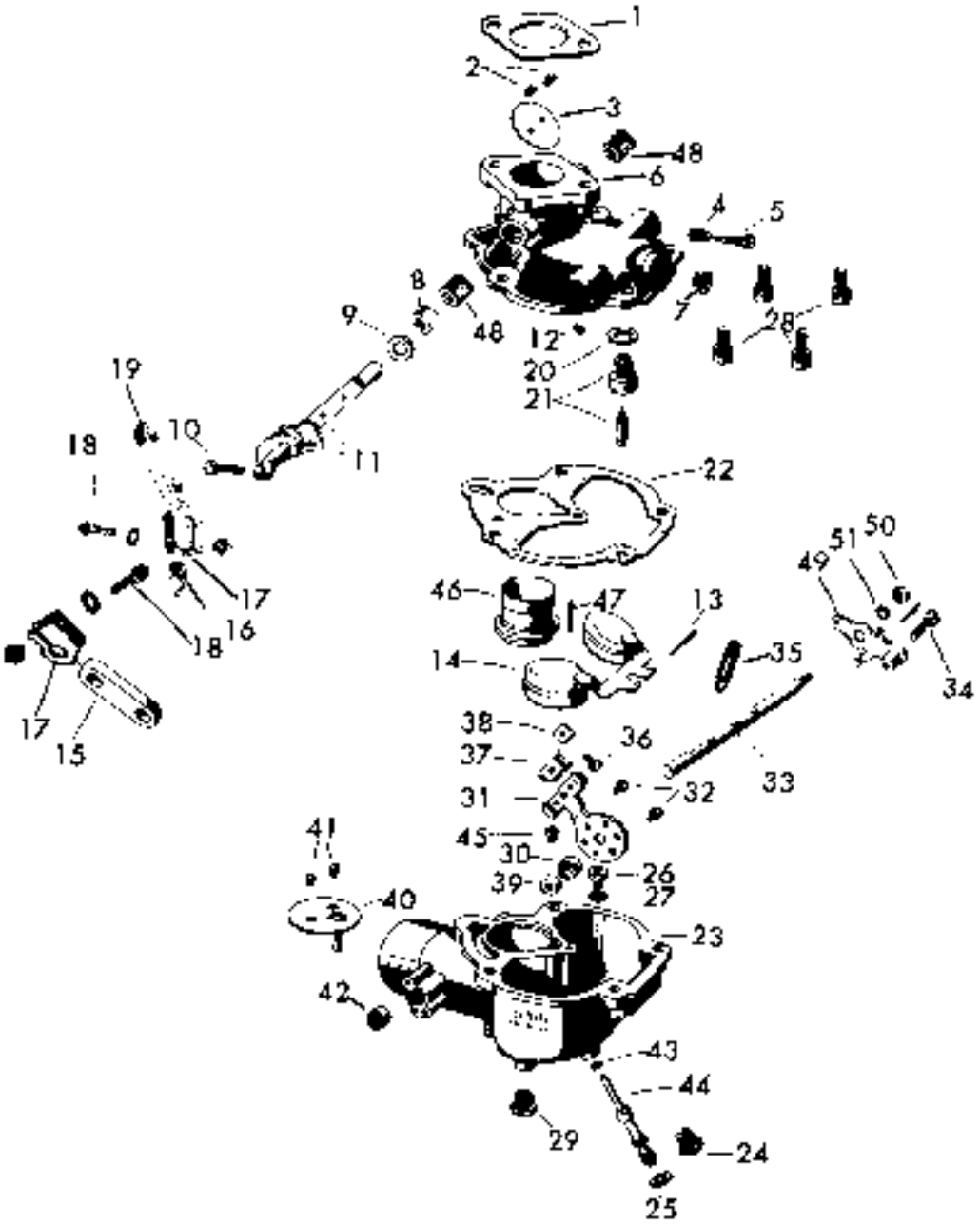
Later production masts have a lock-type channel adjusting plug (35P2220). This plug has an Allenhead expanding lock screw for securing plug after channel position adjustment has been accomplished. This plug may be used to replace plugs (35P1358) in earlier masts.

The Allenhead screw should be tightened into channel plug AFTER correct position of plug has been determined. Do not allow lock screw to protrude on either side of plug or it may contact meeting channel members.

Ref. No.	Part No.	DESCRIPTION		No. Per
		Repair Parts Section of Supplement to Parts, Operation, and Maintenance Manual S245A and Bulletin C-250.		
		This supplement covers the MA 60 Lift Truck. Changes on MA 30 II, 40 II, and 50 II are also included.		
Page 2-6 2-7		Refer to Crankcase Assembly, Cylinder Head and Gas Manifold. Group II.		
		Add the following parts for MA 30 II, 40 II, 50 II with F163-6064 Continental Engine and MA 60 with F153-6026 engine. Used on MA 30 II Lift Trucks No. 28000211 and after. Used on MA 40 II Lift Trucks No. 28100999 and after. Used on MA 50 II Lift Trucks No. 26200270 and after. Used on MA 60 Lift Trucks No. 33200001 and after.		
		Cont. Mfrs.		
17	35P2105	G80616	Tube - oil filler	1
20	35P2109	F400L-4130	Dipstick - oil gauge	1
22	35P2110	F600L-361	Support - dipstick	1
23	35P2128	F400A-5111-A	Cylinder and Crankcase, with bearings, bushings, guides, inserts, plugs and pins	1
		Change 35P797 gasket - oil pan (ref. #66) to 35P2182 Continental Motors No. to F4008-267 on all F163 engines.		
100	35P2115	*F400E-618	Manifold - intake and exhaust	1
124	35P2102	X-6978	Screw - cylinder head	4
130	35P2118	F1408-320	Housing - flywheel	1
	9194S	X-30434	Screw - flywheel pointer	1
	35P2114	*F600B-2640	Plug - timing hole	1
	35P2103	X-6791	Lifting Eye - motor	1
		*Note: Used on MA 60 Lift Trucks only.		
Page 2-8		Refer to Camshaft, Valves, Oil Pump and Oil Filter Group.		
		Add the following parts for MA 30 II, 40 II, 50 II with F163-2064 Continental Engine and MA 60 with F153-6026 engine. Used on MA 30 II Lift Trucks No. 28000211 and after. Used on MA 40 II Lift Trucks No. 28100999 and after. Used on MA 50 II Lift Trucks No. 26200270 and after. Used on MA 60 Lift Trucks No. 33200001 and after.		
		Cont. Mfrs.		
1	35P2104	F400E-200	Camshaft	1
4	35P2105	F400F-404	Gear - timing, camshaft	1
5	35P2106	X-16021	Nut - gear to camshaft	1
13	35P2107	F400E-251	Guide - valve stem	8

Ref. No.	Part No.	DESCRIPTION	No. Per
Page 2-14 2-15		Refer to Crankshaft, Flywheel, Conn. Rods and Pistons Group 11	
		Add the following parts for MA 30 B, 40 B and 60 B Lift Trucks with F163-5334 Continental Engine. Used on MA 30 B Lift Trucks No. 24000211 and after. Used on MA 40 B Lift Trucks No. 26100999 and after. Used on MA 60 B Lift Trucks No. 26200270 and after.	
		Cont. Mtg.	
7	36P2237	F600C-239 Collar - pulley	1
8	36P2238	X6985 Screw - crankshaft pulley retaining	1
34	36P2111	F601C-4050 Flywheel - with ring gear	1
35	36P2112	F244C-317 Ring Gear - flywheel	1
		Add the following parts for MA 60	
		Cont. Mtg.	
5	36P2120	F401C-401 Pulley - fan drive	1
7	36P2122	X-14044 Washer - pulley	1
8	36P2121	X-6796 Screw - crankshaft pulley retaining	1
34	36P2111	F601C-4050 Flywheel - with ring gear	1
35	36P2112	F244C-317 Ring Gear - flywheel	1
	36P2249	F468-308 Pointer - timing, on gear cover	1
Page 2-16		Refer to Air Cleaners - Dry Type, Group 9 Add the following parts for MA 60	
9-10	36A9156	Hose - air cleaner to carburetor, flex 2" I.D. x 15-1/2"	1
		60A4287 Clamp - hose, 2"	2
	36A9563	Band - air cleaner and hose, 1" wide x 2" O.D.	1
		60A4210 Washer - plain, for bracket, 13/32" I.D., 13/16" O.D.	4
Page 2-18		Refer to Fuel Pump, Fuel Lines and Filter Gasoline Group Add the following parts for MA 60	
	36A9147	Pump - fuel (Airtex Products No. 3E3048)	1
		Includes the following 2 parts	
	36P2129	Kit - pump, includes diaphragm, seals, gaskets and valves	1
	36P2130	Gasket - pump mounting	1
		Add to below 36A9421 tube	
	36A9421	*Tube - fuel pump to carburetor, curved, 5/16" O.D. x 14-1/16" long	1
26	36A9426	*Hose - fuel pump to fuel tank, 5/16" I.D. x 10"	1
		*Note: Used on MA 30 B Lift Trucks No. 24000211 and after. Used on MA 40 B Lift Trucks No. 26100999 and after. Used on MA 60 B Lift Trucks No. 26200270 and after. Used on MA 60 Lift Trucks No. 32200001 and after.	
Page 2-22		Add gasoline carburetor group for MA 60.	

Ref. No.	Part No.		DESCRIPTION	No. Pcs.
		Zenith	CARBURETOR	
	35A9148	13152	Carburetor - complete	1
1	10A3617	C141-4-1	*Gasket - flange	1
2	35P1412	T315-35-4	Screw - throttle plate	2
3	35P2168	C21-202	Plate - throttle	1
4	9E7055	C111-9	Spring - idle needle	1
5	35P2169	C46-24	*Needle - idle adjusting	1
6	----	B12-13192	Body - throttle, upper half, order 35A9148 complete	1
7	10P177	CT91-3	Plug - 1/8", fuel inlet	1
8	35P1415	CT48-9	*Seal - throttle shaft	2
9	35P1416	CT52-67	*Retainer - shaft seal	2
10	35P2170	T458-13	Screw - throttle stop	1
11	35P2163	C29-1578	Shaft - throttle and stop levers	1
12	35P2177	C55-22-16	*Jet - idle	1
13	35P2172	C120-69	*Axle - float	1
14	35P2171	C89-115	Assembly - float and hinge	1
15	35P2166	C25-15DTX2	Lever - float	1
16	35P2167	C117-71	Spring - return, float	1
17	35P2165	C25-103	Stop - float lever	2
18	9236H	T8S10-13	Screw - stop	2
19	35P2164	CR25-18C1X2	Lever - floating	1
20	RE7064	T56-29	▲‡Washer - fibre, fuel valve seat	1
21	35P2180	C81-1-40	* Valve and Seat - fuel	1
22	35P2173	C142-65	♦‡Gasket - bowl to body	1
23	--------	B3-120-2	Bowl - fuel, order 35AU148 complete	1
24	35P1422	C126-24	Plug - main jet passage	1
25	RE7064	T56-29	▲‡Washer - fibre, passage plug	1
26	35P2161	C53-7-27	Jet - main	1
27	RE7060	T56-24	▲‡Washer - fibre, main jet	1
28	35P2174	T311312-16	Screw - bowl to body	4
29	10P177	CT91-3	Plug - bowl drain	1
30	35P1425	C131-4X2	*Retainer - choke shaft packing	1
31	35P1426	C100-60C	Bracket - choke	1
32	35P1427	C140-58	Screw - choke bracket	2
33	35P2175	C105-301	Shaft - choke	1
34	35P1429	T358-7	Screw - choke lever swivel	1
35	35P1430	C112-6	Spring - choke lever return	1
36	35P1431	T358-8	Screw - bracket clip	1
37	35P1432	C110-7	Clip - bracket tube	1
38	GM218A53	T31-58	Nut - clamp screw	1
39	GET134	CT57-4	*Washer - choke shaft packing	1
40	35P2176	C101-65	Plate - choke	1
41	35P1418	T31358-4	Screw - choke plate	2
42	35P1436	CR27-1X1	*Plug - choke shaft hole	1
43	RE7062	T56-4	▲‡Washer - fibre, discharge jet	1
44	35P2178	C66-100-70	Jet - discharge	1
45	35P2179	CT7-15-16	Jet - well vent	1
46	35P2160	B26-71-23	Venturi	1
47	35P2102	C20-222	Tube - idle filler	1
48	35P1442	C3-70	Bushing - throttle shaft	2
49	10P189	C126-2	Lever - choke	1
50	GM420910	T2258	Nut - choke shaft	1
51	GM1E496	T41-10	Lockwasher - choke shaft nut	1
	35P218[illegible]	C181-365	Kit - gasket (** parts in gasket set)	1
	35P218[illegible]	K2127	Kit - repair parts (* parts in repair kit)	1
	10A3560		Stud - carburetor to manifold, 3/8"-16 x 1-1/8"	2
			5GA1930 Nut - hex., 3/8"-16	2
			5GA1979 Clevis - clip, on carburetor end	1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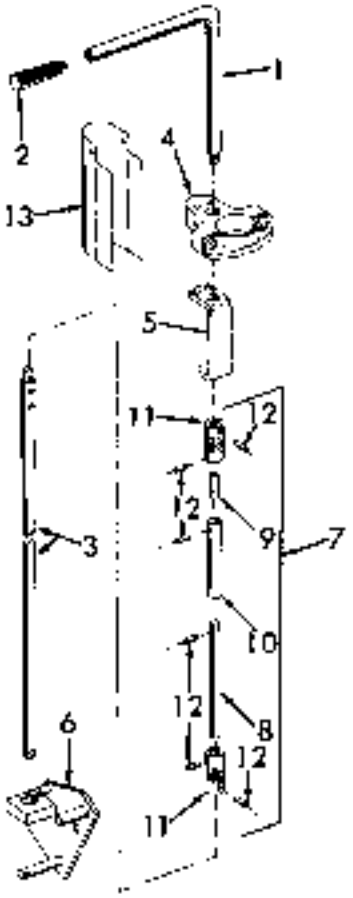
Ref. No	Part No.	DESCRIPTION	No. Per
Page 2-24		Add governor group for MA 60	
		Novi Governor No. — GOVERNOR - MA 60	
	35P2118	------- Governor - complete (Cont. Mtrs. No. P4008-4490)	1
		Includes the following 29 parts:	
		------- 50A4210 - Washer, plain, 13/32" I.D., 13/16" O.D.	1
1	35P2241	50279A Body - assembly	"
		Includes the following 7 parts:	
2	92168	50081 Bearing - needle, lever shaft	1
3	15P77	51208-11 Bushing - lever shaft	1
4	92198	50027 Bushing - drive shaft	1
5	92206	50041 Washer - thrust, drive shaft	1
6	92178	50032-1A Seal - oil, lever shaft	1
10	35P2242	50289 Screw - bumper screw adjusting	1
11		50131-2 50A4932 - Nut, hex., 1/4"-28	1
7	35P2243	53505 Lever - governing, with shaft	1
8	35P859	50986 Fork - lever shaft	1
9	35P584	50306-1 Spring - bumper, lever shaft	1
12	35P666	511849 Base - with bushing	1
	35P957	50313-1 Bushing - base	1
13	35P655	52095C Shaft - drive, assembly	1
14		50042-12 GM145651 - Ball, steel, 3/4"	4
15	35P697	50794-B Race - lower	1
16	35P858	52488 Washer - thrust	1
17	35P699	50129A Place - drive, assembly	1
	135418	50026-18 Washer - ball stop	1
18	15P100	50021 Bearing - thrust	1
19	15P101	50022 Base - lever fork	1
20	35P980	57020-3 Ring - snap	1
21	35P691	50893 Washer - retainer	1
22	15P103	50026-32 Washer - ball stop	A.R.
23	35P2248	511709 Race - upper	1
	35P2244	52004 Bracket - eye bolt	1
	35P2247	50081-1 Screw - self locking	1
		Continental Mtrs. No.	
	35P860	F1623-253 Deflector - oil	1
	35P2245	X-7599 Bolt - eye, mounts in bracket, 5/16"-24	2
		X-18198 50A4864 - Nut, hex., 5/16"-24	2
	35P2246	X-5864 Screw - governor spring to eye bolt, 1/4"-28	1
		X-18187 50A4982 - Nut, hex., 1/4"-28	2
	15P586	V1125208 Spring - governor	1
	35P859	F140V-200 Spacer - governor to gear cover	1
		X-6821 GM179847 - Screw, governor, 3/8"-16 x 2"	1
		X-6531 Screw - governor, 3/8"-16 x 4-3/4"	1
		X-18288 50A1045 - Nut, elastic stop, 3/8"-16	1
	91438	X-14184 Washer - copper, governor screw	1
	15P37	F140M-232 Gasket - spacer and governor	2
	02225	F4008-201 Plate - governor attaching	1
	92238	F4008-202 Gasket - governor plate	1
	86A9564	Rod - carburetor to governor, 1/4" x 8-3/4"	1
		50A4201 - Washer, plain, 9/32" I.D., 5/8" O.D.	1
		50A8629 - Pin, cotter, 9/32" x 5/8"	1

Ref. No	Part No	DESCRIPTION	No. Per
Page 2-29		Add water pump for MA 60 Cont. Mtrs.	
	35P2117	F401K-32E1 | Pump - water, complete Includes same parts as 35P984 pump except for the following:	
8	35P2118	F401K-326 | Body - water pump	1
12	35P2119	F401K-324 | Hub - fan	1
23	10A12727	Belt - fan, 49" O.C., MA 60	
23	35A9760	Belt - fan, 48" O.C., MA 30-40-50 with Alternator	1
	10A9369	Pellet - sealant, for radiator	1
		Change 35P1067 thermostat (ref. #24) to 35P2239 and change Continental Motors No. to F601K302, 170° on all engines.	
Page 2-29		Refer to Alternator Group. Add the following parts for MA 60	
	-------	Alternator - less fan and pulley (Delco-Remy No. 1100771) use 35A9243 alternator for repairs	1
7	10A23146	Pulley - alternator, 3-1/64" O.D. (35A8254)	1
8	10A12727	Belt - alternator, 49" O.C.	1
Page 2-30		Refer to Voltage Regulator, Generator, Starting Motor and Distributor Group. Add the following parts for MA 30 II, 40 II, 50 II and 60. Used on MA 30 II Lift Trucks No. 23020211 and after. Used on MA 40 II Lift Trucks No. 26100999 and after. Used on MA 50 II Lift Trucks No. 26200270 and after. Used on MA 60 Lift Trucks No. 33200001 and after.	
6	35A3145	Motor - starting (Delco-Remy 1107378)	1
	50A3666	Bolt - hex., 5/8"-16 x 1-1/4"	3
		Make the following changes: Add note to 35A8341 adapter (ref. #6), for 35A8387. Change 35P1449 point set to Prestolite IBP-2040L. Change 35P1450 condenser to Prestolite IB8304288S1. Change 35P1778 rotor to Prestolite IAU-1016C.	
	35P2002	Cap - distributor, (Prestolite IBT-10083)	1
10	10R1191	Spark Plug - AC-C66 replaces 10R385-correction	
		Add to 10A16817 Coil ref. #21, (Delco-Remy No. 1116043)	
Page 2-34		Refer to Battery, Battery Box, Cables and Wiring Harness Group. Add the following parts for MA 30 II, 40 II, 50 II and 60. Note: Used on MA 30 II Lift Trucks No. 23020211 and after. Used on MA 40 II Lift Trucks No. 26100999 and after. Used on MA 50 II Lift Trucks No. 26200270 and after. Used on MA 60 Lift Trucks No. 33200001 and after.	
	35A9361	Tray - battery	1
	35A7319	Hold-Down - battery	1
	35A3078	Bolt - hook, battery hold down, 1/4" x 7-1/8"	2
	50A1699	Nut - hex., 1/4"-20	2
	50A3762	Nut - wing, 1/4"-20	2
	50A4201	Washer - plain, 9/32" I.D., 5/8" O.D.	4
	35A8524	Harness - wiring, with 2-20 amp. and 1-14 amp. fuses	1
	GM1130653	Fuse - harness, 20 amp.	2
	GM147865	Fuse - harness, 14 amp.	1
	35A9195	Wire - harness to ground, 14 Ga. x 5"	1
	35A10442	Wire - horn harness, red 14 Ga. x 6" long	1
		Change 10P2047 battery-dry to type 24H, SS34 Change 35A8192 harness to 35A8192 Includes the following part:	
	35A8681	Harness - generator, with 2-14 amp. fuses	1

Ref. No.	Part No.	DESCRIPTION	No. Per
Page 2-36		Refer to Instrument Panel and Instrument Group Change the following gauges, sending units and relay to non fungus treated 35A513 gauge ref. #2 to 35A214 35A512 gauge ref. #3 to 35A411 35A518 unit ref. #4 to 35A893 35A511 gauge ref. #5 to 35A412 35A520 unit ref. #6 to 35A933 35A516 relay ref. #12 to 35A405 Add new white face gauges	
2	35A7788	Gauge - ammeter	1
3	35A7727	Gauge - engine temperature	1
5	35A7789	Gauge - oil pressure	1
7	35A7736	Gauge - fuel, gasoline engine	1
		Change 35A8040 switch (ref. #8) to 10A18228	
	10P2702	Key - switch, set of 2, for 10A18228	1
Page 2-38		Refer to LP Gas Equipment Group. Change 35P519 coupling ref. #14 to ref. #13. Change D1178 coupling ref. #19 to 35P517 and ref. # to 18, D1178 Inter. Add new LP Gas group for MA 60.	
		LP GAS EQUIPMENT - MA 60	
1	D1185	Tank - fuel, with fittings	1
		50A1800 - Nut, hex., 3/8"-16	4
		50A4210 - Washer, plain, 13/32" I.D., 13/16" O.D.	4
		50A3665 Bolt - hex, 3/8"-16 x 7/8"	4
	36A7079	Plate - tank mounting, with studs	1
		50A106 - Bolt, rd. hd., 5/8"-11 x 3"	2
		50A1812 - Nut, hex., 5/8"-11	2
		50A4213 - Washer, plain, 11/16" I.D., 1-1/2" O.D.	4
		50A4209 - Washer, plain, 11/16" x 3-1/2" x .148 thick	As Req.
	35A9508	Spacer - mounting plate, U-shaped, 2" x 6" long	2
2	35P516	Strap - mounting, fuel tank, R.H.	1
2	35P608	Strap - mounting, fuel tank, L.H.	1
	35A7156	Grommet - hood	3
3	35P1088	Vaporizer - assembly, includes thermostat housing	1
	35P1085	Repair Kit - vaporizer (Includes diaphragm, seat, seals and washers)	1
4	35P1084	Solenoid - 12 volt	1
5	35P1085	Regulator - Zenith Model C	1
		Includes the following 3 parts:	
6		GM210056 - Nipple, pipe, 1/4" N.P.T.	2
7		50A973 - Elbow, street, 1/4"	1
		GM105412 - Elbow, steel, 1/8" P.	1
		GM144315 - Adapter, tube, 1/4" N.P.T. x 3/8"	1
	35P1572	Valve - block and spring assembly	1
	35P1573	Screw - adjusting, fuel pressure	1
	35P1574	Orifice - fuel inlet	1
	35P1086	Repair Kit - regulator (Includes diaphragms, gaskets and seals)	1
		GM213197 - Nut, hex., 3/4"-16	1
8	35P3090	Carburetor - LP gas (see breakdown on page 27)	1
	35P2351	Gasket - carburetor	1
9	35P503	Elbow - carburetor, 3/8" N.P.T. x 3/8" tube	1
10	35P514	Bulkhead - filter	1
		Includes the following 2 parts:	
11		GM144366 - Elbow, adapter, 1/4" N.P.T. x 3/8" tube, 90°	2
	35P1605	Element - filter	1
	35P1606	Spring - filter	2
		GM.26700 - Washer, internal lock, 7/8"	1
12	35P515	Relief Valve	1

Ref. No	Part No	DESCRIPTION	No Per
		LP GAS EQUIPMENT - MA 60 (Cont'd)	
	35P2082	Plate - fuel pump cover	1
	35P2083	Gasket - plate	1
	35P530	Dash - plug, instrument gauge	1
		GM178438 - Pipe, cap, gasoline tank	1
13	35P609	Elbow - adapter, 3/8" N.P.T. x 3/8" tube, x 90°	1
		5DA4740 Nut - hex. jam, 7/16"-20	1
	35P1088	Bracket - hose, and clamp	1
14	35P1099	Hose - water bypass	1
15	35P1600	Hose - carburetor to regulator, 25" long (35P1090)	1
16	35P1081	Hose - filter to solenoid	1
17	35P1060	Hose - filter to tank	1
18	35P317	Coupling - hose to tank, male	1
		Includes the following 2 parts:	
	30A1701	"O" Ring - coupling	1
	35P1709	Gasket - coupling	1
19	35P319	Coupling - hose to tank, female	1
20	35P620	Switch - vacuum	1
21	35P1095	Wire - solenoid to pressure switch, 24" long	1
22	35P1094	Wire - pressure switch to starter, 26" long	1
	35P1610	Gasket - thermostat housing	1
		LP Gas Carburetor - MA 60 Lift Truck	
	35P2080	Carburetor - LP gas	1
		Includes the following 32 parts:	
	-------	Body - carburetor, order 35P2080 assembly	1
	35P2141	Shaft - throttle	1
	35P2139	Bushing - throttle (plastic)	1
	35P2142	Plate - throttle shaft	1
	35P2182	Screw - plate, with lock washer, No. 6-32 x 1/4"	2
	35P2185	Seal - throttle shaft	1
	35P2136	Retainer - seal	1
	35P2180	Seal - throttle shaft, lever side	1
	35P2131	Washer - seal, lever side	1
	35P2132	Spring - metering disc	1
	35P2134	Washer - metering disc, plastic	1
	35P2145	Disc - gas metering	1
	35P2149	Plate - cover, metering valve	1
	35P2137	Stop - throttle	1
	35P2133	Screw - idle adjusting, #10-32 x 3/4"	1
	35P2127	Spring - idle adjusting screw	1
	35P2145	Screw - adjusting, idle stop, No. 10-32 x 3/4"	1
	35P2127	Spring - screw, throttle stop	1
	35P2147	Venturi - 1" I.D.	1
	35P2146	Screw - venturi retaining, No. 8-32 x 5/16"	1
	35P2140	Shaft - choke	1
	35P2149	Plate - choke shaft	1
	35P2128	Screw - plate, with lock washer, No. 6-32 x 1/4"	1
	35P1792	Plug - choke shaft	1
	35P1787	Gasket - plug	1
	35P1763	Bracket - choke cable	1
	35P2126	Bushing - choke shaft	1
	35P2125	Screw - main load adjusting, 5/16"-18 x 1-1/8"	1
	35P2124	Spring - load adjusting screw	1
	35P1784	Lever - assembly, choke shaft	1
		GM118625 Screw - fillister head, No. 8-32 x 5/16"	1
	35P1785	Spring - choke return	1
	35P2136	Lever - throttle and screw	1
	35P2144	Sleeve - carburetor	1

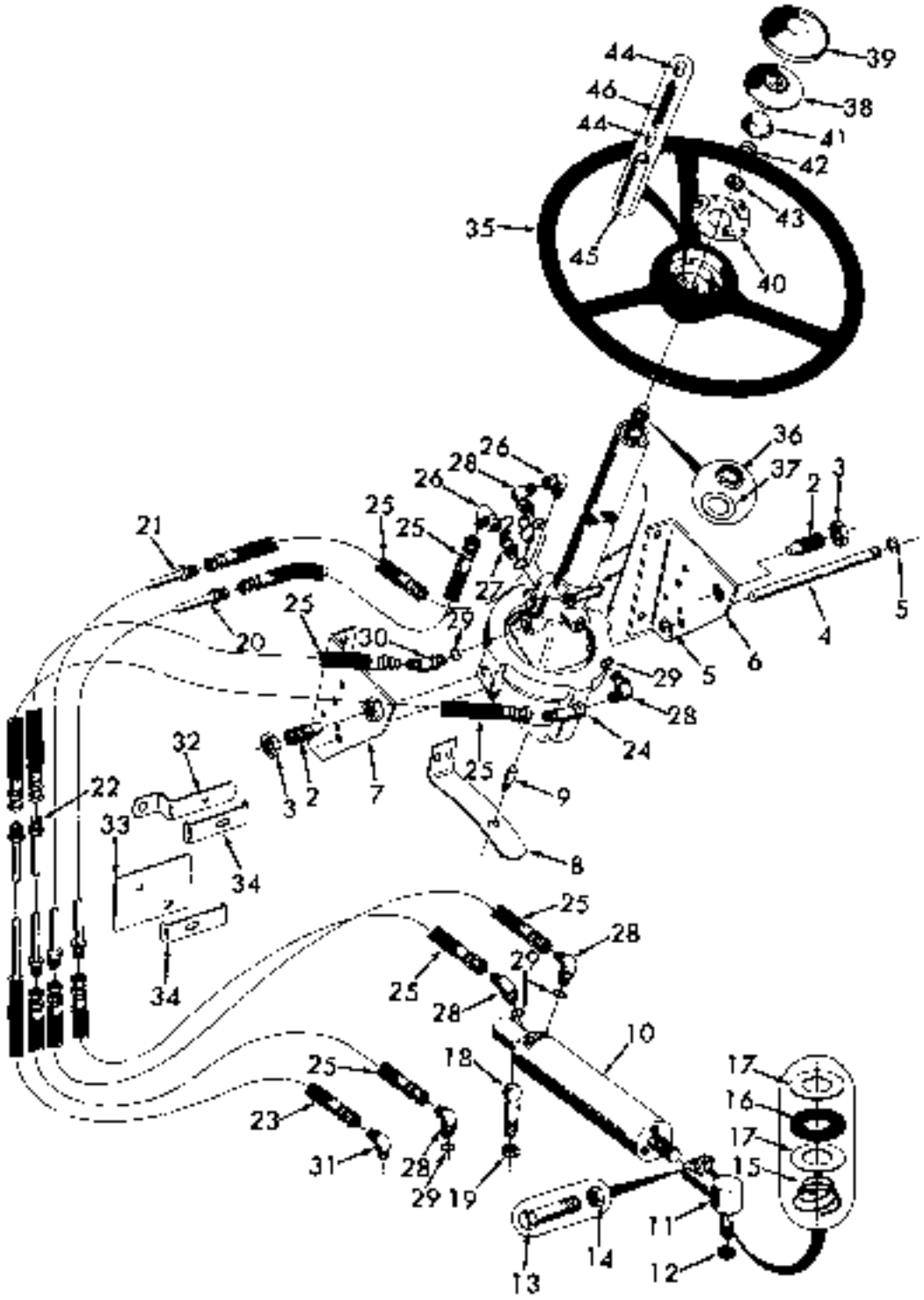
Ref. No.	Part No.	DESCRIPTION	No. Per
Page 2-42		Refer to Transmission Case, Converter and Pump Group.	
		Add set screw and lock nut for reverse idler gear.	
		50A4189 Set Screw - hex. socket, 3/8"-16 x 1"	1
		50A1800 Nut - hex, 3/8"-16	1
Page 2-44		Refer to Transmission Group.	
		Add the following parts for MA 30 II, 40 II, 50 II and 60.	
		Note: Used on MA 30 II Lift Trucks No. 29000211 and after.	
		Used on MA 40 II Lift Trucks No. 26130089 and after.	
		Used on MA 50 II Lift Trucks No. 26200270 and after.	
		Used on MA 60 Lift Trucks No. 33200001 and after.	
15	36A9446	**Gear - forward, with bushing	1
16	36A9448	**Gear - reverse, with bushing	1
27	35A9447	**Gear - forward, output shaft, 21 teeth	1
28	35A9450	**Gear - reverse, output shaft, 49 teeth	1
36	36A9449	**Gear - reverse idler, with bearings, 31 teeth	1
		**Caution: Do not order above gears when the letter "D" is stamped on the Differential Case beside the "Mobilift" in casting. Order replacement gears as they appear on page 2-44 of catalog S343A.	
		Change 36A830 piston ref. #2 to 36A830 on all units. (35A330)	
Page 2-56		Refer to Transmission Controls, Filter and Oil Lines Group.	
		Add the following parts for MA 60	
1	35A9435	Rod - transmission control, upper, L shaped	1
		50A2624 Pin - roll, 1/4" x 1"	2
2	35A6470	Knob - rod, transmission control	1
3	35A9434	Rod - transmission control, lower, 28-1/2" long	1
		50A2624 Pin - roll, 1/4" x 1"	1
		50A2826 Pin - roll, 1/4" x 1-1/4"	1
4	35A9444	Support - control lever	1
5	35A9438	Support - rod, upper, U-shaped	1
		50A3650 Bolt - hex., 1/4"-20 x 1-1/2"	2
		50A1896 Nut - hex., 1/4"-20	2
6	36A9440	Support - bell crank and rod	1
7	36B3887	U-Joint - assembly	1
		Includes the following 5 parts:	
8	35A9640	Shaft - U-joint, long	1
9	35A9641	Shaft - U-joint, short	1
10	35A9642	Tube - shaft	1
11	35A9644	U-Joint - transmission control	2
12	35A9643	Pin - shafts and U-joints	6
13	35A9445	Skirt - steering column	1
		50A3896 Screw - machine, #10-24 x 3/8"	3
		50A4241 Washer - internal lock	3
		50A2478 Elbow - cooler outlet, 90°, to follow 50A4441 elbow	1



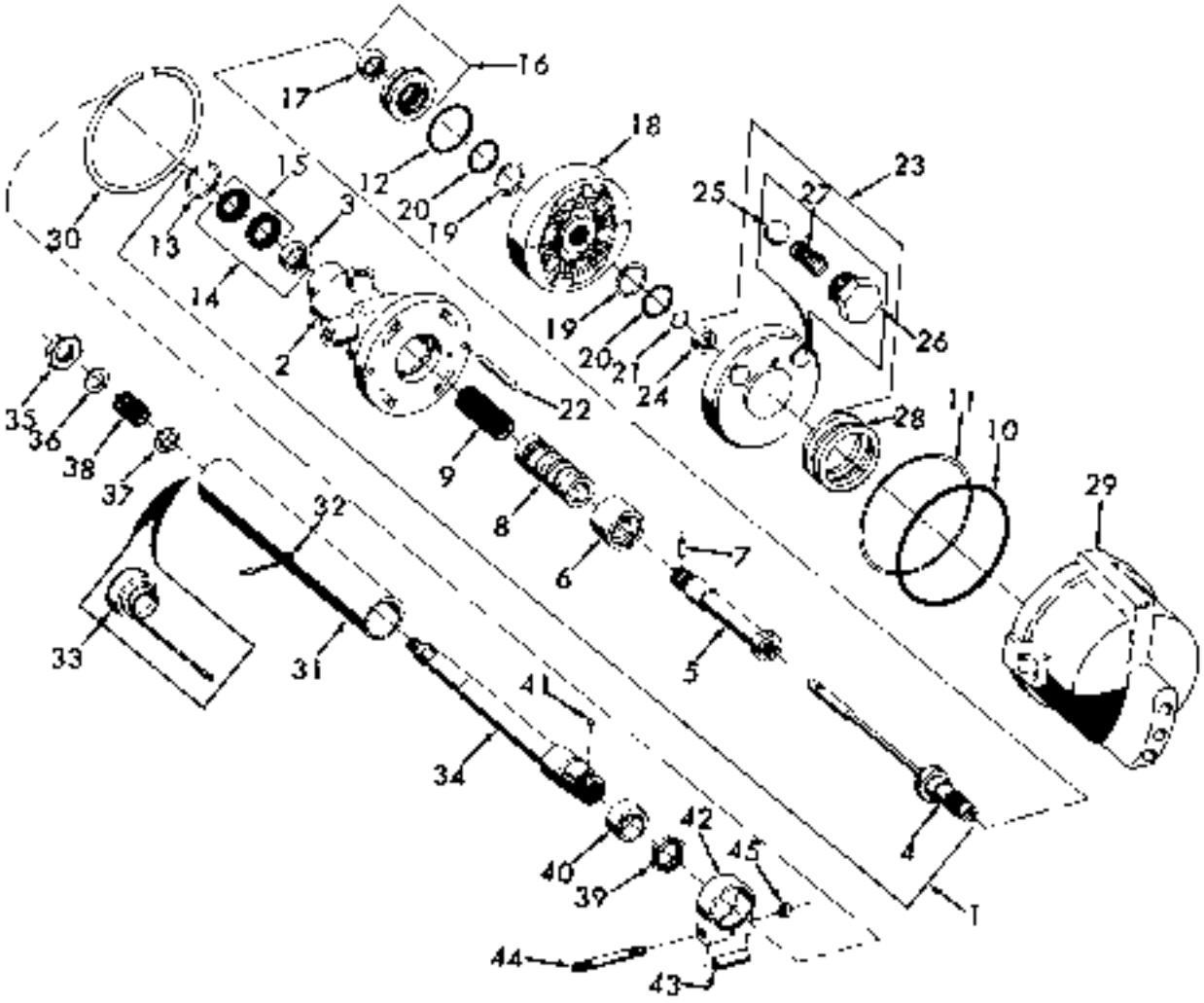
Page 2-56		Refer to Hydralizer, Steering Wheels and Linkage Group.	
		Add the following parts for MA 60	
		Add the following stop bolts for 35A 5194 housing (ref. #35) on MA 60	
		50A 3680 Bolt - hex., 1/2"-13 x 1-1/4"	2
		50A 1911 Nut - hex., 1/2"-13	2
	35A 9075	Wheel - steer, with cushion tire (Includes the following 2 parts:	2
5	35A 9075	Wheel - steer, cushion tire	2
6	35A 9076	Tire - cushion, 6" x 10" x 13-1/2"	2
		Add the following parts for MA Series Trucks with extreme service hydralizers	
10	35A 9160	Retainer - bushing	2
11	35A 9167	Seal - oil, in cylinder	2
19	35A 9164	Piston - with bushing	2
		Refer to 35A 6402 bushing (ref. #30) and add note: Machine O.D. of bushing to 4.996-4.997 after installation on piston.	

Ref. No.	Part No.	DESCRIPTION	No. Per
Page 2-58		Refer to Hydra-Electric Steering Wheels and Linkage Group. Make note that 35A5836 drag link (ref. #42) thru 35A5838 clamp (ref. #43), not used on MA-60.	
Page 2-62		Add new group for Power Steering and Cylinder for MA-60.	
		Steering Motor and Lines	
1	35A9308	Hydrammot - steering assembly, see breakdown on page 32	1
2	35A9376	Pivot - steering motor to supports	2
3		50A3746 Nut - hex. jam, 7/8"-9	2
4	35A9760	Shaft - motor stop, 1/2" O.D. x 7-3/4" long	1
5		50A1827 Ring - snap (Truarc No. 5133-50)	2
6	35A9518	Support - steering motor, R.H.	1
7	35A9519	Support - steering motor, L.H.	1
		50A3068 Bolt - hex., 3/8"-16 x 1"	4
		50A1800 Nut - hex., 3/8"-16	4
8	35A9619	Spring - lock button	1
		50A3647 Bolt - hex., 1/4"-20 x 7/8"	2
		50A1835 Nut - hex., 1/4"-20	2
		50A4201 Washer - flat, 9/32" I.D., 5/8" O.D.	2
9	35A9520	Button - lock	1
		50A3700 Nut - hex., 5/16"-18	1
10	35A9350	Cylinder - steering, see breakdown on page 34	1
11	35A9356	Socker - assembly	1
		Includes the following 4 parts:	
		50A3825 Pin - cotter, 1/4" x 1-1/4"	2
12		50A4983 Nut - hex. slotted, 9/13"-18	1
13	35P2154	Bolt - hex., 3/8"-24 x 1-1/2"	1
14		50A1936 Nut - hex., 3/8"-24	1
15	35P2151	Retainer - washer	1
16	35P2132	Cover - dust, socket	1
17	35P2153	Washer - cover retainer	2
18	35A9057	Ball Stud - steering cylinder anchor	-
19		50A4983 - Nut hex., slotted, 9/16"-18 NF	1
20	35A9507	Tube - steering motor to cylinder, left turn port, 3/8", 13-7/8" to bend	1
21	35A9508	Tube - steering motor to cylinder, right turn port, 3/8", 14-3/4" to bend	1
22	35A9508	Tube - pump to steering motor	1
23	35A9565	Tube and Hose - steering motor to tank	1
24		50A4736 Elbow - steering motor return port, 9/16"-18 x 45°	1
25	10A16387	Hose - power steering pressure lines, 3/8" I.D. x 13-1/8"	2
26		50A4604 Elbow - steering ports, 9/16"-18 x 90°	2
27		50A4426 Connector - straight, steering motor left turn port, 9/16"-18	1
28		50A4423 Elbow - 9/16"-18 x 90°	5
29	10A16405	"O" Ring - elbows	7
30		50A4421 Elbow - steering motor, 9/16"-18 x 45°	1
31		50A4419 Elbow - 90°, tube to tank	1
32	35A9653	Support - tubes, 1" wide x 8-1/2" long	1
33	35A9654	Bracket - tubes, 3" x 4-5/8"	1
34	35A9851	Clamp - tubes, U-shaped, 1" wide x 8-5/8" long	2
		50A5510 Pad - tubes, foam rubber	2
		50A3649 Bolt - hex., 1/4"-20 x 1-1/4"	2
		50A1998 Nut - hex., 1/4"-20	2
		50A4201 Washer - flat, 9/32" I.D., 5/8" O.D.	2
35	35A6138	Wheel - steering	1
36		GM114496 Nut - hex. jam, 1/2"-20	1
37	35P2208	Washer - steering shaft, 17/32" I.D. x 1" O.D.	1
38	35A6142	Button - horn	1
39	35A6141	Cover - horn button	1
40	35A6444	Plate - base	1
		50A5034 Screw - rd. hd., No. 10 x 1/2"	2
41	35A6443	Cup - contact	1
42	35A6441	Spring - contact cup	1
43	35A6445	Cup - contact	1

Ref. No.	Part No.	DESCRIPTION	No. Pcs.
		Steering Motor and Lines (Cont'd)	
44	35A6442	Brush - contact in sleeve	2
45	35A6439	Sleeve - contact brush	1
46	35A6440	Spring - brush in sleeve	1



Ref. No.	Part No.	DESCRIPTION	No. Per
		STEERING MOTOR	
	35A9366	Hydramotor Assembly - complete	1
		Includes parts Ref. No. 1 through 45:	
1	-------	Valve Assembly - (order 35A9366)	1
		Includes parts Ref. No. 2 through 15:	
2	-------	Housing - assembly, hydramotor (order 35A9366)	1
		Includes the following parts:	
3	35P926	Bearing - needle, drive shaft assembly	3
4	-------	Shaft Assembly - drive, lower (order 35A9366)	1
5	-------	Shaft Assembly - stub (order 35A9366)	1
6	-------	Actuator and Pin - assembly (order 35A9366)	1
7	-------	Pin - stub shaft to torsion bar (order 35A9366)	1
8	-------	Spool - valve, select fit (order 35A9366)	1
9	-------	Spring - valve spool (order 35A9366)	1
10	10P2935	Seal - "O" ring, cover, 4-23/32" I.D.	1
11	10P2939	Ring - cover, seal back-up, 4-13/16" I.D.	1
12	10P2940	Seal - "O" ring, bearing support, 1-25/32" I.D.	1
13	10P2941	Ring - snap, seal retaining	1
14	10P2943	Service Kit - stub shaft bearing and seals	1
		Includes the following 2 parts:	
15	10P2942	Service Kit - stub shaft seals	1
3	35P926	Bearing - needle, drive shaft assembly	1
16	10P2937	Support Assembly - bearing	1
		Includes the following part:	
17	35P926	Bearing - needle	1
18	35P2090	Rotor and Ring Assembly - includes vanes	1
19	10P2947	Seal - rotor, 1-3/32" I.D.	2
20	10P2946	Seal - "O" ring, rotor	2
21	10P2949	Ring - retaining, rotor ring, 5/8" I.D.	1
22	10P2953	Pin - dowel, rotor ring, 1/4" x 2-1/4" long	2
23	35P2085	Plate - assembly, pressure	1
		Includes the following 4 parts:	
24	35P2089	Bushing - drive shaft	1
25	10P3033	Ball - steel, 7/32" dia.	2
26	10P3034	Plug - ball check	2
27	10P3035	Spring - ball check	2
28	10P2950	Spring - pressure plate	1
29	35P2096	Cover - lower housing	1
30	10P3352	Ring - retaining, lower housing cover	1
31	35P2085	Jacket - assembly, steering shaft	1
		Includes the following part:	
32		50A4803 Grommet - horn wire	1
33	35P2058	Bearing and Cable - assembly, upper	1
34	35P2091	Shaft - assembly, steering, upper	1
35		GM114496 Nut - hex. jam, 1/2"-20	1
36	35P2232	Washer - steering shaft, 17/32" I.D., 1" O.D.	1
37	35P955	Seat - spring, upper housing	1
38	35P956	Spring - bearing, upper	1
39	35P2094	Nut - steering shaft, lower	1
40	35P2095	Ring - steering shaft	1
41	35P2092	Ball - upper shaft, 11/64" O.D.	1
42	35P2085	Clamp - jacket column	1
43	35P2096	Spacer - clamp	1
44	35P2097	Stud - clamp, 5/16"-18 x 3"	1
45		50A3730 Nut - stud, steering clamp, 5/16"-16	2
		50A4226 Washer - lock, 5/16"	2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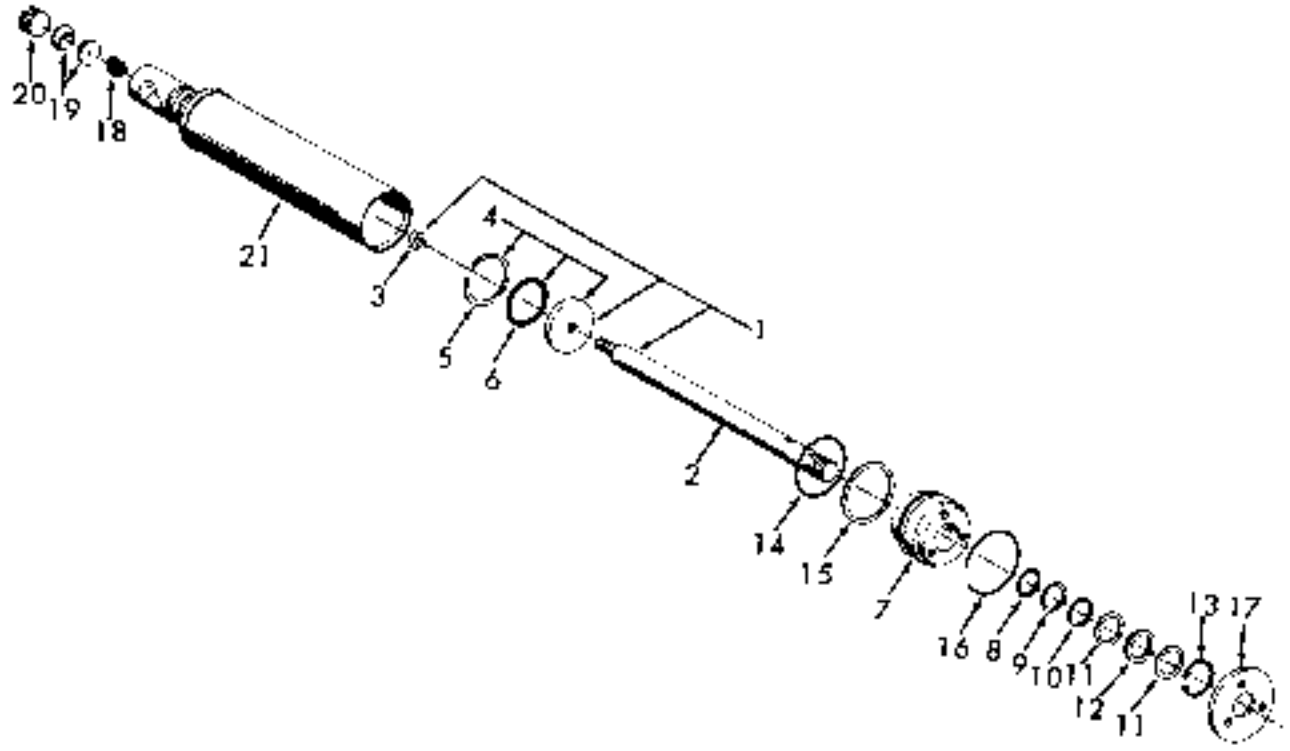
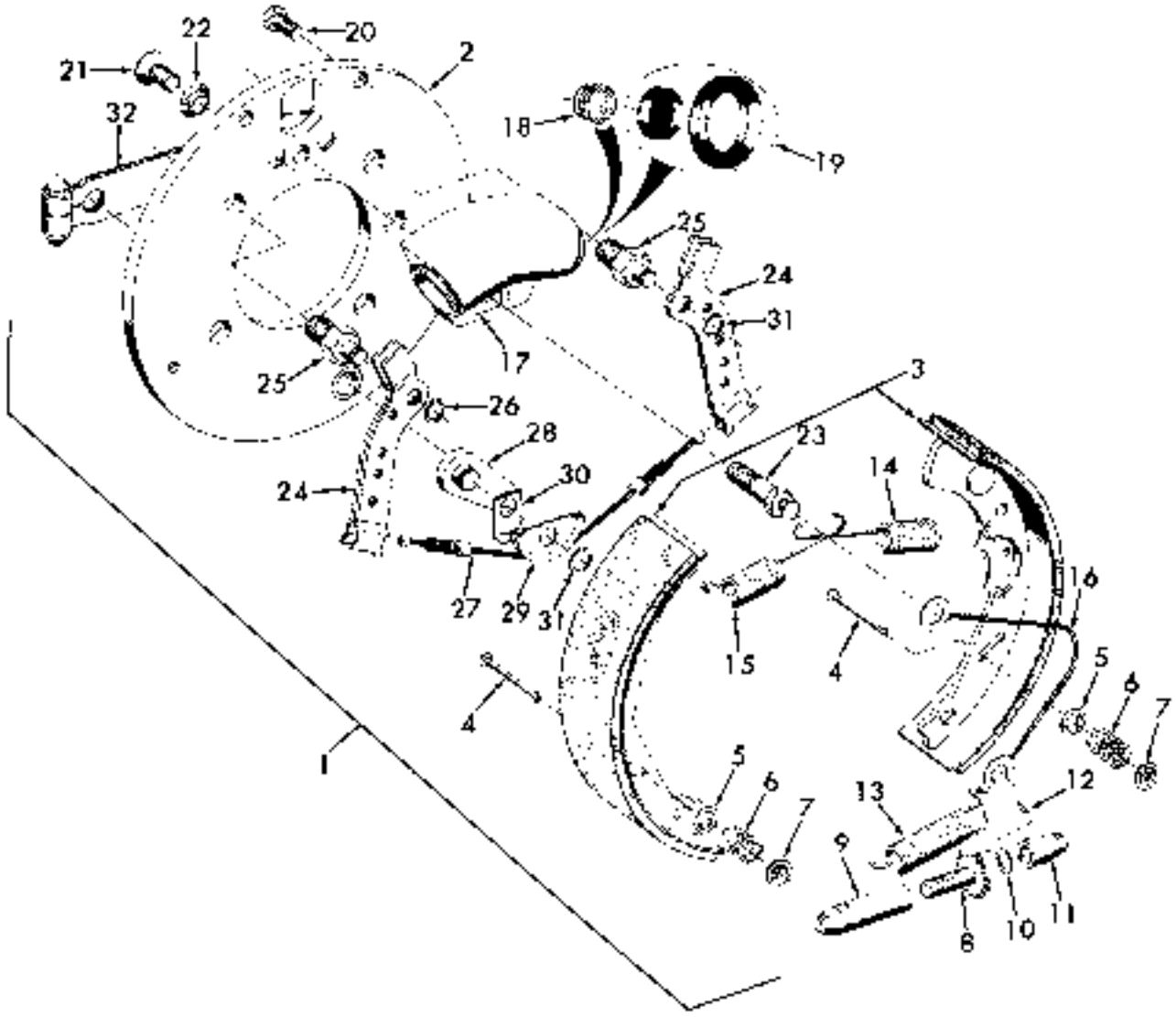
Ref. No.	Part No.	DESCRIPTION	No. Per
		Power Steering Booster	
		Used on MA-60 Lift Truck	
	35A9855	Cylinder - hydraulic, complete	1
		50A4695 Fitting - lubricator, ball stud housing, 1/4"-28 x 1/2"	1
		Includes the following 21 parts:	
2	35P2072	Piston - with rod, rings and seal	1
		Includes the following 3 parts:	
2	35P2099	Rod - cylinder	1
3	35P2100	Nut - hex, lock, 3/8"-24	1
4	35P2073	Piston - assembly	1
		Includes the following 2 parts:	
5	35P2075	Ring - piston	1
6	35P2074	Seal - piston	1
7	35P2076	Bearing - piston rod	1
		Includes the following 9 parts:	
8	10A7799	Seal - "O" ring	1
9	35P189	Ring - back-up	1
10	35P190	Ring - retainer	1
11	35P191	Ring - retainer	2
12	35P192	Seal - oil	1
13	35P193	Ring - retainer, snap	1
14	35P194	Seal - "O" ring	1
15	35P195	Ring - back-up	1
16	35P196	Ring - retainer	1
17	35P197	Plate - end	1
		50A5983 Screw - end plate, No. 10-24 x 1/2"	3
		50A4227 Washer - lock, No. 10	3
18	35P2077	Spring - ball seat	1
19	35P2078	Seat - ball	2
20	35P2079	Plug - adjusting, ball seat	1
21	------	Tube - assembly, other 35A9855 cylinder complete	1



Ref. No.	Part No.	DESCRIPTION	No. Per
Page 2-68 2-70		Refer to Differential and Axle Group. Add the following parts for MA 30 II, 40 II, 50 II and 60. Note: Used on MA 30 II Lift Trucks No. 2900021 and after. Used on MA 40 II Lift Trucks No. 261000999 and after. Used on MA 50 II Lift Trucks No. 262000270 and after. Used on MA 60 Lift Trucks No. 3820000 and after.	
1	35B7816	Case - differential Includes the following 2 parts:	1
36	35A9511	Seal - axle housing and differential case, outer end	1
39	35A9485	Collar - housing, seal retainer	1
4	35A9453	Shim - differential case to transmission case, .010	A.R.
4	35A9454	Shim - differential case to transmission case, .018	A.R.
4	35A9455	Shim - differential case to transmission case, .016	A.R.
4	35A9456	Shim - differential case to transmission case, .020	A.R.
5	35A9485	Shaft - bull pinion, 12 teeth	1
12	35A9459	Cap - bearing, pinion shaft, right hand	1
	50A1440	Screw - cap, 12 pt. ctr. bore, 5/8"-18 x 1"	5
15	35A9458	Cap - bearing, pinion shaft, left hand	1
	50A1440	Screw - cap, 12 pt. ctr. bore, 5/8"-18 x 1"	3
	50A1441	Screw - cap, 12 pt. ctr. bore, 5/8"-18 x 1-1/4"	2
15	36A9511	Cage - differential, with bushing and bull gear, 30 teeth	1
27	35A9461	Pinion - differential cage, 12 teeth	4
	50A5170	"O" Ring - axle flange, 4-11/16" O.D.	2
31	35A9462	Gear - bevel, on axle, 39 teeth	2
35	35B8864	Housing - axle, left hand Includes the following parts:	1
	50A1164	Screw - cap, 12 pt, ctr. bore	11
36	35A9511	Seal - axle housing and differential case, outer end	1
39	35A8499	Collar - housing, seal retainer	1
		Make the following changes for MA 30 II, 40 II and 50 II trucks: Change 35A7816 case ref. #1 to 35B7816, includes ref. #35 and 39. Add note to 36A7618 shaft (ref. #5) and 36A7806 cage, (ref. #12) when replacing use 35A9485 shaft (ref. #5) with 1 - 36A9511 cage (ref. #12) in sets only. 36A9611 cage has only 30 teeth. New shaft and cage used on MA 40 II Trucks No. 261006999 and after. Add new "O" ring for axle shaft (ref. #30). 50A5170 "O" Ring - axle flange to housing, 4-11/16" O.D. Change 35A8864 housing (ref. #35) to 35B8864, includes ref. 38 and 39. Change 36A9626 seal (ref. #36) to 35A9511 (35A9626). Add note to 35A6591, 35A5295 and 35A6397 wheels (ref. #47). Note: Used on MA 30-40 and 50 Lift Trucks with 35A5774 and 35A5775 brakes with 1-1/2" x 10-1/2" linings. Add the following wheel assemblies for trucks with 35A9108 and 35A9109 brakes with linings 2-1/4" x 10-1/4".	2
	36A9522	Wheel - assembly, drive, MA 30 II Consists of the following 2 parts:	2
47	35A9522	Wheel - drive, MA 30 II	2
48	35A6590	Tire - cushion, 8" x 12-1/8" x 18", MA 30 II	2
	36A9521	Wheel - assembly, drive, MA 40 II Consists of the following 2 parts:	2
47	35A9521	Wheel - drive, MA 40 II	2
48	35A6397	Tire - cushion, 7" x 12-1/8" x 18", MA 40 II	2
	36A9523	Wheel - assembly, drive, MA 50 II Consists of the following 2 parts:	2
47	35A9523	Wheel - drive, MA 50 II	2
48	35A6398	Tire - cushion, 9" x 12" x 18", MA 50 II	2
	36A9062	Wheel - assembly, drive, MA 60 Consists of the following 2 parts:	2
47	35A9062	Wheel - drive, MA 60	2
48	35A9063	Tire - cushion, 9" x 12-1/8" x 18" MA 60	2

Ref. No.	Part No.	DESCRIPTION	No. Per
Page 2-72		Refer to Brake Group. Add note to heading, with 1-1/2" x 10-1/2" shoes. Add new group for brakes with 2-1/4" x 10-1/4" shoes.	
		Brakes - 2-1/4" x 10-1/4" Shoes	
		Used on MA 30 H Lift Trucks No. 28000212 and after. Used on MA 40 H Lift Trucks No. 28130999 and after. Used on MA 50 H Lift Trucks No. 28200270 and after. Used on MA 60 Lift Trucks No. 28200201 and after.	
1	35A3109	Brake - complete, R.H., 10-1/4" x 2-3/4"	1
1	35A3108	Brake - complete, L.H., 10-1/4" x 2-3/4"	1
		Each includes the following 35 parts:	
		50A3551 Bolt - hex., 5/8"-18 x 1-1/4"	4
		50A3554 Bolt - hex., 5/8"-18 x 1"	2
		50A4200 Washer - plain, 5/8" I.D., 1-5/16" O.D.	2
2	35P2135	Plate - backing, R.H.	1
2	35P2134	Plate - backing, L.H.	1
3	35P2188	Kit - shoe with linings (enough for 1 truck)	1
		Caution: When replacing brake shoes on some units a new auto. adjusting cable 35P2184 must be used with an "A" stamped on one eyelet.	
4	35P2229	Pin - hold down, brake shoe	4
5	35P2215	Cup - spring, shoe hold down	4
6	35P2210	Spring - hold down pin	4
7	35P2211	Cup - hold down pin	4
8	35P2191	Screw - brake adjusting, R.H.	1
8	35P2190	Screw - brake adjusting, L.H.	1
9	35P2193	Pivot Nut - screw, R.H.	1
9	35P2192	Pivot Nut - screw, L.H.	1
10	35P2215	Washer - adjusting screw	2
11	35P2206	Socket - adjusting screw	2
12	35P2205	Lever - automatic adjustment, R.H.	1
12	35P2204	Lever - automatic adjustment, L.H.	1
13	35P2203	Spring - automatic adjustment (Red)	2
14	35P2208	Spring - shoe return, R.H. (Gray)	2
15	35P2207	Spring - shoe return, L.H. (Maroon)	2
16	35P2184	Cable - shoe, automatic adjustment	2
17	35P2183	Cylinder - wheel, 2-1/4" dia.	2
		Includes the following 5 parts:	
18	35P2199	Spring - cylinder	4
19	35P2200	Kit - cylinder, includes cups and boots (enough for 1 cylinder)	2
20	35P2187	Bolt - cylinder mounting, hex. head, 3/8"	4
		50A4244 Lockwasher - bolt, 3/8"	4
21	35P2189	Bolt - cylinder mounting, flat head, socket, 7/16"	4
22	35P2218	Lockwasher - bolt, 7/16" (Conical)	4
23	35P2201	Bolt - cylinder and anchor for shoe return springs	2
24	35P2195	Lever - parking brake	4
25	35P2185	Bolt - lever, parking brake	4
26	35P2216	Retainer - lever, parking brake	4
27	35P2196	Cable - parking brake	2
28	35P2197	Cam - cable, parking brake	2
29	35P2213	Sheave - cable, parking brake	2
30	35P2214	Retainer - cable, parking brake	2
31	35P2217	Retainer - sheave, parking brake	2
32	35P2202	Lever - brake control	2
		50A3868 Bolt - hex., 3/8"-16 x 1-1/2"	2
		50A1900 Nut - hex., 3/8"-16	2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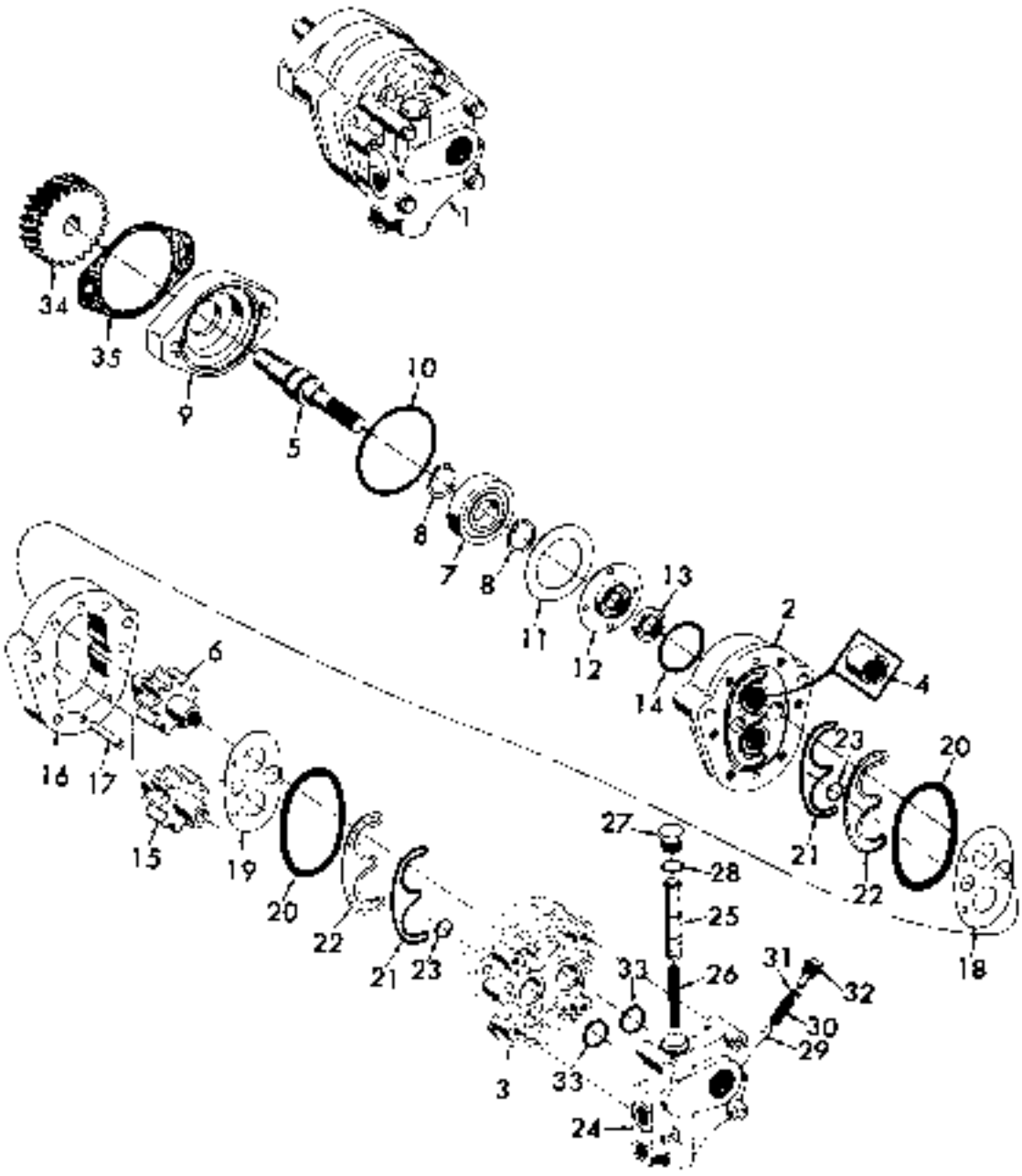
Ref. No.	Part No.	DESCRIPTION	No. Per
Page 2-74		Refer to Brake Linkage and Master Cylinder Group. Change 50A4284 clevis (ref. #9) to 50A4279. Add the following parts for MA 30 II, MA 40 II, MA 50 II and MA 60 Lift Trucks with 35A9108 - 35A9109 brakes with 2-1/4" x 10-1/4" linings. Note: Used on MA 30 II Lift Trucks No. 28000211 and after. Used on MA 40 II Lift Trucks No. 26100099 and after. Used on MA 50 II Lift Trucks No. 26200270 and after. Used on MA 60 Lift Trucks No. 30200001 and after.	
14	35A9090	Cable - lever to right hand brake, 20" long	1
15	35A9050	Cable - lever to left hand brake, 37-3/4" long	1
22	35A9668	Tube - brake, right hand	1
23	35A9667	Tube - brake, left hand	1
	35A9354	Support - brake cable, right hand	1
	35A9353	Support - brake cable, left hand	1
		50A1921 Bolt - hex., 5/16"-18 N.F. x 7/8"	4
Page 2-76		Add new group for Special Dual Stage Master Cylinder for MA 20, 40 and 60 Lift Trucks.	
	35B88	Kit - master cylinder, dual stage Includes the following 9 parts:	1
	-----	Cylinder - assembly (Minnesota Automotive Inc. 7058)	1
		50A2746 Screw - flat head, socket, 3/8"-16 x 1"	2
		50A3668 Bolt - hex., 3/8"-16 x 7/8"	3
	30P8001	Kit - cylinder repair, (includes seals, cups, gaskets, check valve, seat spring and etc.	1
	35A3979	Adapter - cylinder	1
	35A2253	Clevis - bell crank and cylinder assembly	1
		50A4740 Nut - hex., jam 7/16"-20	1
		Add note to Master Cylinder 7/8", used on MA 60 Lift Truck.	

Ref. No	Part No	DESCRIPTION	No. Per
Page 2-78		Refer to Hood, Panels and Seat Group.	
2-78		Change 36A9216 cowl (ref. #19) to 36A9216 on MA 30 II, 40 II and 50 II.	
		Change 50A4996 nut to 35A9468.	
		Add the following parts for MA 60 Lift Truck.	
19	36A9405	Cowl - assembly, MA 60	1
23	35A9367	Panel - instrument, MA 60	
Page 2-80		Refer to Frame, Overhead Guard and Counterweight Group.	
		Add the following parts for MA 60 Lift Trucks.	
3	35A9421	Counterweight - MA 60	1
		50A5165 Bolt - hex., 3/4"-10 x 11", MA 60	
12	36A9406	Plate - floor, MA 60	1
		Add the following parts for MA 30 II, 40 II, 50 II and 60.	
		Note: Used on MA 30 II Lift Trucks No. 28000211 and after.	
		Used on MA 40 II Lift Trucks No. 26100989 and after.	
		Used on MA 50 II Lift Trucks No. 26200270 and after.	
		Used on MA 60 Lift Trucks No. 23200001 and after.	
9	36A9110	Support - axle housing, right hand	1
10	36A9111	Support - axle housing, left hand	1
		50A1316 Screw - cap, 12 pt., 3/4"-10 x 2-3/4"	8
		Add new breakdown for hydraulic pump on MA 60 Lift Truck.	

Ref. No.	Part No.	DESCRIPTION	No. Per
		HYDRAULIC PUMP for MA-60	
1	35A3396	Pump - hydraulic, with flow divider, (Wooster No. 4YD59-0RB)	1
		Includes the following 21 parts:	
		50A1780 - Bolt, hex., 3/8"-16 x 3-1/4"	1
		50A1781 - Bolt, hex., 3/8"-16 x 5-1/4"	1
		50A1829 - Stat-o-seal, pump bolts	3
		50A1048 - Nut, hex., (Each) 3/8"-16	1
		50A1782 - Nut, elastic stop, pump shaft, 5/8"-18	1
2	35P2226	Body - pump, with bearings	1
3	10P3074	Cover - pump, with bearings	1
		Each includes the following parts:	
4	35P207	Bearing - needle, body and cover	4
5	35P2231	Shaft - drive	1
6	35P2227	Gear - drive shaft	-
7	30A164	Bearing - ball, drive shaft	1
8		50A1780 Ring - bearing retainer	2
9	35P2230	Adapter - bearing	1
		GM147185 - Screw, adapter, No. 8-32 x 1	2
10		*50A1744 "O" ring - adapter	1
11	30P276	Washer - thrust, ball bearing	-
12	33P288	Retainer - bearing, with oil seal	1
		Includes the following part:	
13	10P1772	*Seal - oil	1
	10P1960	Screw - retainer, No. 10-24 x 3/8"	4
14	10P2027	*"O" Ring - retainer, 1-15/16" O.D.	1
15	35P2225	Gear - idler	1
16	30P271	Plate - gear	1
17	33P2229	Pin - dowel, gear plate	2
		50A3678 - Bolt, hex., cover to body, 3/8"-16 x 3"	6
18-19	10P2014	Plate - wear, pump body and cover	2
20	10P3077	*Seal - wear plate, outer, rubber	2
21	33P284	*Seal - wear plate, inner, rubber	2
22	10P3067	*Ring - back-up, wear plate seal	2
23	10P2021	*"O" Ring - body and cover, 3/8" I.D., 3/4" O.D.	2
24	35P2240	Flow divider - assembly	1
		Includes the following 8 parts:	
		50A4445 Plug - divider, hex. socket, 1/9"-27	1
25	30P289	Piston - flow divider	1
26	10P1592	Spring - piston	1
27	10P1590	Plug - piston and spring	1
28	35P1394	"O" Ring - piston plug	1
29	30P290	Valve - flow divider	1
30	10P1405	Spring - valve	1
31	30P295	Shim - valve spring	A.R.
32	33P292	Plug - valve spring	1
33	35P1291	*"O" Ring - flow divider to pump	2
		50A3659 - Screw, flow divider to pump, 5/16"-18 x 1-3/4"	4
34	35P311	Gear - hydraulic pump, Continental Motors No. 540011-338	1
		50A5207 Key - Woodruff No. 9	1
35	30A706	*Gasket - hydraulic pump	1
	10A1193	*Kit - seals and gaskets	1
		*Note: Kit consists of items identified with a single asterisk(*).	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Ref. No.	Part No.	DESCRIPTION	No. Per
Page 2-84		Refer to Mast Control Valve Group.	
		Add note to 35A7411 valve, and MA 80.	
		Change description on 35A8299 knob (ref. #92) from tilt to lift.	
Page 2-86		Refer to Hydraulic Oil Lines and Fittings Group.	
		Change 35A8587 hose (ref. #54) to 35A9166 and length to 18".	
		Add clip for lift cylinder tube 35A7466.	
	35A9639	Clip - tube	1
		Add the following parts for MA 80 Lift Trucks.	
4	35A9502	Tube - pump to strainer	1
6		60A4416 Elbow - pump suction port, 1-5/16"-12 x 90°	1
10	35A9501	Tube - pump to control valve	1
16		60A4425 Elbow - pump, 7/8"-14, 90°	1
	10A16235	"O" Ring - elbow to pump	1
52	35A9814	Tube - control valve to lift cylinder	1
Page 2-88		Refer to Tilt Cylinder Group.	
		Add a single asterisk (*) to 35P300 packing (ref. #9).	
		Change GM131643 bolt to 60A9561 and size to 1/2"-13 x 1-1/2".	
		Change GM120809 nut to 60A1900 and size to 1/2"-13.	
Page 2-96		Refer to Upright for Triplex Tri-Free Lift (Cascade Viewmast) Group. Group 1	
		Add the following changes for upright due to different styles of lift chain used.	
12	35P2294	*Rod - lift, assembly	2
12	35P1843	**Rod - lift, assembly	2
13	35P1845	*Pin - rod end anchor	2
13	35P2219	**Pin - rod end anchor	2
15	35P2236	*Anchor - chain, outer channel	2
15	35P1846	**Anchor - chain, outer channel	2
		*Note: Used on uprights with AL-644 lift chain.	
		**Note: Used on uprights with BL-646 lift chain.	

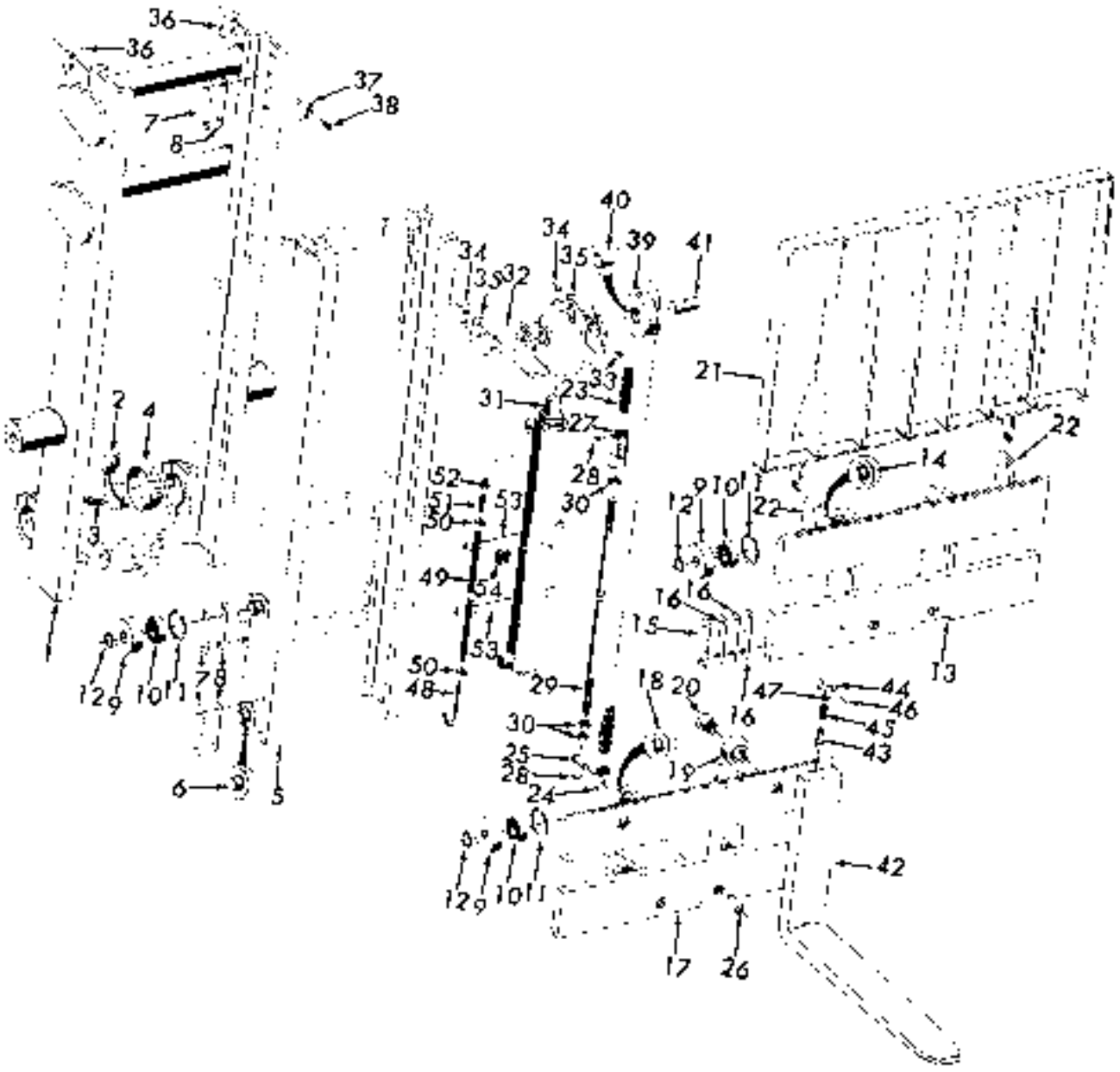
Chain for Lift - 3/8" Pitch BL-646

M.P.H.	O.A.H.L.	Chain Length	M.P.H.	O.A.H.L.	Chain Length
133"	70"	164-3/8"	177"	82"	206-7/8"
137"	70"	164-3/8"	181"	82"	206-7/8"
141"	70"	164-3/8"	185"	82"	215-1/8"
145"	70"	164-3/8"	189"	88"	224-3/8"
149"	70"	170-3/8"	193"	88"	224-3/8"
153"	76"	193-1/8"	197"	88"	230-5/8"
157"	76"	193-1/8"	201"	88"	230-5/8"
161"	76"	199-5/8"	205"	94"	243-1/8"
165"	76"	199-5/8"	209"	94"	249-3/8"
168"	82"	200-5/8"	213"	94"	249-3/8"
173"	82"	206-7/8"	217"	94"	249-3/8"

Page 2-102		Refer to Cross Head for Upright (Cascade Viewmast). Group IV	
		Add note to 35P1829 Cross Head, for BL-646 5/8" P. chain.	
	35P2233	Cross Head - upright, for AL-644 3/4" P. chain	1
		Add note to 35P1886 support (ref. #14) for 35P2233 Cross Head.	
		Add Simplex Mast.	

Ref. No.	Part No.	DESCRIPTION	No. Per.
Page 2-112		Refer to Decals, Paint and Hydraulic Fluid Group. Change 35A8818 decal to 35A10198, White Mobilift, 4" x 12". Change 35A8821 decal to 35A10196, White, 3/4" x 4-1/2". Add the following new decals:	
	35A10199	Decal - R.H. side, 4-1/4" x 8" x 8-3/4"	1
	35A10197	Decal - L.H. side, 4-1/4" x 8" x 8-3/4"	1
	35A9076	Decal - capacity, MA 30 II	1
	35A9075	Decal - capacity, MA 40 II	1
	35A9074	Decal - capacity, MA 50 II	1
	35A8073	Decal - capacity, MA 60	1
	10A32766	Decal - warning, negative ground, 2-1/2" x 8"	1
	35A10194	Decal - O, for MA 60	2
	35A10195	Decal - O, for MA 80	2
	36T2253	Decal - 10' of 2" black strip	1
		Refer to Bulletin C280 and make the following change on page 4: Add to description on 35A7364 spring (ref. #43) for MA 30 II, 40 II, and 50 II Lift Trucks, 20-1/2 coils. Add new spring for MA 60 Lift Truck:	
	35A9357	Spring - piston, regulator valve, outer, 2-41/64" long, 18 coils	1

Ref. No.	Part No.	DESCRIPTION	No. Per	
		SIMPLEX MAST For MA 30 II, 40 II, 50 II and 60 Lift Trucks Group 3	MA 30 II MA 40 II MA 50 II	MA 60
1	-------	Rail - outer assembly, see chart on pages 50-51	1	1
		Includes the following part:		
2	3335034	Cap - bearing, outer rail pivot	2	2
3		50A1288 - Screw, bearing, cap, 12 pr., 5/8"-11 x 2-1/2"	4	4
		50A4629 - Fitting, grease, 1/8" straight	2	2
4	35A5727	Bushing - bearing cap	2	2
5	-------	Rail - inner assembly, see chart on pages 50-51	1	1
		Includes the following part:		
6	35A5529	Pin - tail	4	4
7	35A5558	Shoe - mast	8	8
		50A1676 - Screw, hex. socket, 3/8"-16 x 3/8"	12	12
8	35A5536	Shim - mast shoe	A.R.	A.R.
9	65A706	Roller - mast and carriage	8	8
10	D317	Bearing - mast and carriage roller	8	-
10	35A0369	Bearing - mast and carriage roller	-	8
11		50A577 - Ring, snap, mast and carriage bearings, 3-5/32" I.D.	8	8
12		50A579 - Ring, snap, mast and carriage bearings, 1-3/8" I.D.	8	8
13	-------	Carriage - with wear plates, order from: Mobilift Sales Department	1	1
		Includes the following 5 parts:		
14	35A5529	Pin - carriage	4	4
15	35A5559	Shoe - carriage	4	-
15	35A0315	Shoe - carriage	-	4
		50A1676 - Screw, hex. socket, 3/8"-16 x 3/8"	8	8
16	35A5536	Shim - shoe, .031 thick	A.R.	A.R.
16	95A9099	Shim - shoe, .015 thick	A.R.	A.R.
16	35A9100	Shim - shoe, .010 thick	A.R.	A.R.
17	-------	Carriage - assembly, with side thrust rollers. Order from Mobilift Sales Dept.	1	1
		Includes the following parts:		
18	35A5523	Pin - carriage	4	4
19	35A5817	Bearing - thrust, carriage	4	4
20	35A5755	Pin - thrust bearing	4	4
		50A4136 - Set Screw, cup point, 3/8"-16 x 5/8"	2	2
21	-------	Rack - load safety, order from Mobilift Sales Dept.	1	1
		GM271T2S - Bolt, hex., 5/8"-11 x 2"	6	6
22	35A5871	Bracket - mounting, load rack to carriage	2	2
23	-------	Chain - 3 x 4 lacing, see chart on page 50 for length of chain	2	2
23	-------	Chain - 4 x 6 lacing, see chart on page 51 for length of chain	2	2
24	35A6562	Anchor - chain, 2-1/2" long	2	-
24	35A9067	Anchor - chain, 3" long	-	2
25	35A5766	Pin - chain anchor, 3/4" x 2-1/8"	2	-
25	35A5975	Pin - chain anchor, 1" x 2-3/16"	-	2
26		50A1753 - Ring, retainer, anchor pin	2	-
26	20H5391	Ring - retainer, anchor pin	-	2
27	35A6562	Anchor - chain, 4-1/2" long	2	-
27	35A9066	Anchor - chain, 5" long	-	2
28	35A837	Pin - chain anchor, 5/16" x 1-1/8"	4	4
		50A3819 - Pin, cotter, 3/32" x 1/2"	4	8
29	-------	Rod - chain anchor, see chart on pages 50-51	2	2
30		50A5101 - Nut, hex. jam, 3/4"-16	8	8
31	-------	Cylinder - lift, see chart on pages 50-51	1	1
		50A3671 - Bolt, hex., 3/8"-16 x 2-1/4"	1	1
		50A2742 - Nut, hex. jam, 3/8"-16	1	1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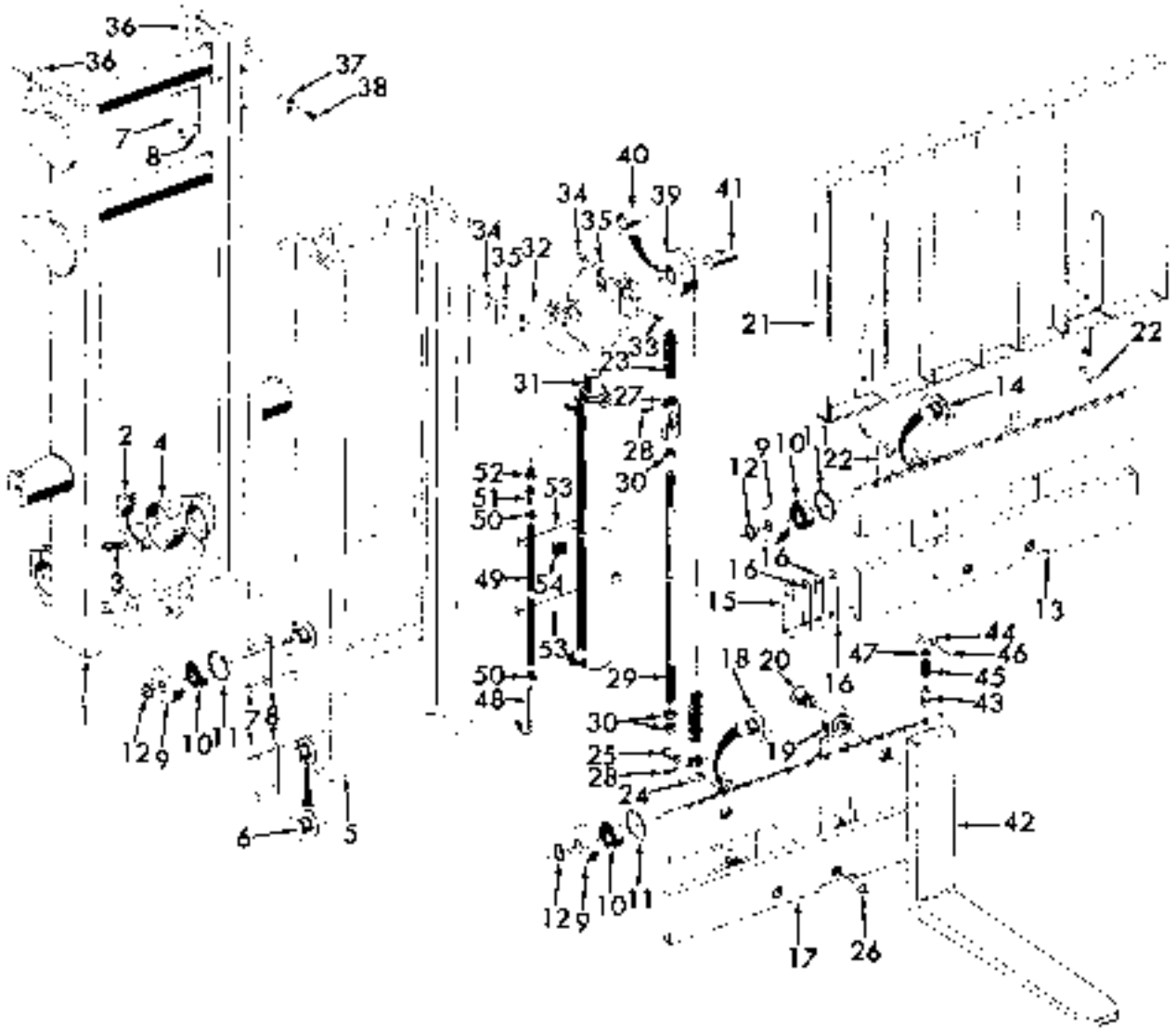
Ref. No.	Part No.	DESCRIPTION	No. Pcs.	
		SIMPLEX MAST (Cont'd)	MA 80 II MA 40 II MA 50 II	MA 60
32	38A9516	Head - piston	1	1
33		50A4198 - Set Screw, cup point, 3/8"-16 x 1/2"	1	1
34	38A9065	Guide - piston head	3	2
		50A3683 - Bolt, hex., 1/2"-13 x 2"	4	4
		50A1911 - Nut, hex., 1/2"-13	4	4
35	80A9206	Spacer - guide, 3/16" x 1-1/4" x 3"	2	-
36	38A3529	Block - stop, outer rail, 1/2" x 2" x 2-7/8"	2	-
		GM2715 - Bolt, hex., 5/8"-11 x 1"	4	-
37	38A8970	Block - stop, outer rail, front	-	2
38		50A3142 - Screw, 12 pt. str. hex (Nylock), 5/8"-16 x 1"	1	4
39	33B9205	Sheave - chain, 5" dia.	2	-
39	33B9514	Sheave - chain, 5" dia.	-	2
		Each includes the following part:		
40	50A417	Bushing - sheave	2	2
41	38A9524	Pin - sheave	2	2
		50A2820 - Pin, roll, 1/4" x 1-1/4"	2	2
		50A3591 - Fitting, grease, 1/4"-28 straight	2	2
42	-------	Fork - lifting, order from Mobilift Sales Dept.	2	2
		Includes the following 4 parts:		
43	38A666	Pin - fork stop, 2-1/16" long	2	2
44	38A669	Lever - stop pin	2	2
45	38A667	Spring - stop pin	2	2
46		50A2882 - Pin, roll, 3/16" x 1"	2	2
47	38A4097	Washer - lock lock, 1/16" x 21/32" I.D., 7/8" O.D.	2	2
48	30A3202	Tube - vent, 5/8" O.D.	1	-
49	-------	Hose - vent tube, see chart on pages 50-51	1	1
50		50A4303 - Clamp, hose, 5/8"	2	2
51		50A1156 - Fitting, hose, 1/4"-18	1	1
52		50A4556 - Reducer, vent Hose, 5/8" to 1/4"	1	1
53	38A1463	Strap - vent	2	2
		50A4002 - Screw, rd. hd., 1/4"-20 x 1-1/4"	2	2
		50A1698 - Nut, hex., 1/4"-20	2	2
54	38A1464	Spacer - strap, U-shaped	2	2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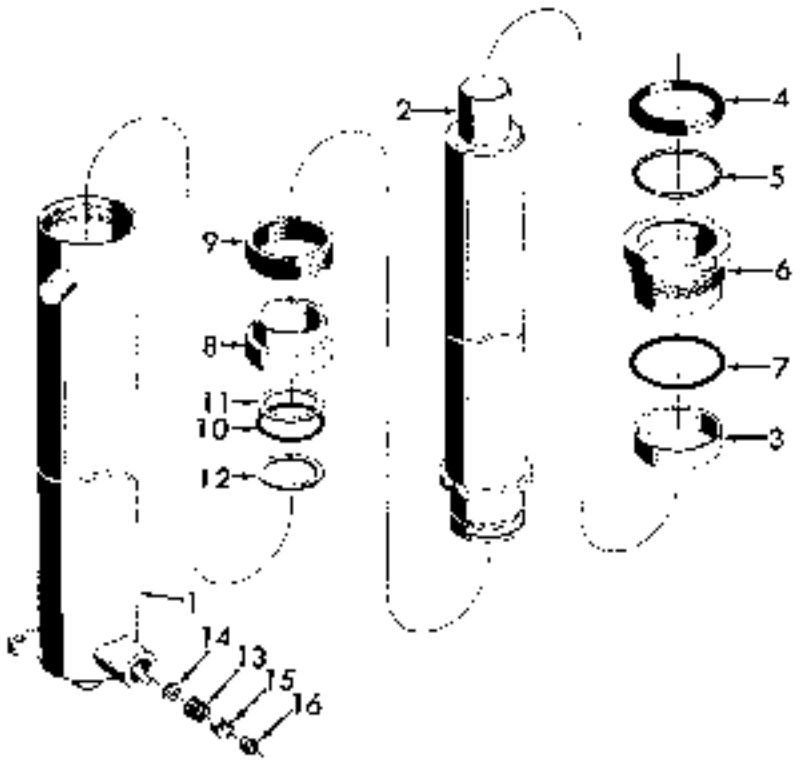
Ref. No.	Part No.	DESCRIPTION	No. Per
		Simplex Lift Cylinder **Group II** **3-1/4" Diameter, for MA 30 Lift Truck**	
	-------	*Cylinder - lift, complete..... Includes the following 3 parts:	1
1	-------	*Shell - cylinder, outer, 3-1/4" O.D.	1
2	-------	*Plunger - cylinder, 2-1/4" O.D.	1
3	-------	*Spacer - cylinder	A.R.
		*Note: Order above parts by M F H and O A H L.	
4	35P2068	**Ring - wiper, plunger	1
5	35P2067	**Spring - garter, wiper ring	1
6	35P2157	Retainer - plunger wiper ring	1
7	35P2069	**"O" Ring - retainer, 2-3/4" I.D., 3" O.D.	1
8	35P2155	Piston	1
9	35P2069	**Packing - piston	1
10	35P2070	**"O" Ring - piston, inner, 1-3/4" I.D., 2" O.D.	1
11	35P2071	**Ring - back-up, "O" ring	1
12	35P2156	Ring - snap, piston retainer	1
	35R103	**Kit - cylinder	1
		**Note: Kit consists of the above items identified by (**) asterisks.	
13	35A7796	Spring - oil restrictor	1
14	35A7706	Washer - perforated, oil restrictor	1
15	35A7792	Spacer - oil restrictor	1
16	35A7793	Bar - spacer	1
		Simplex Lift Cylinder **Group III** **3-3/4" Diameter, for MA 40 II and 50 II Lift Trucks**	
	-------	*Cylinder - lift, complete Includes the following 3 parts:	1
1	-------	*Shell - cylinder, outer 3-3/4" O.D.	1
2	-------	*Plunger - cylinder, 2-3/4" O.D.	1
3	-------	*Spacer - cylinder	A.R.
		*Note: Order above parts by M F H and O A H L.	
4	35P940	**Ring - wiper, plunger	1
5	35P829	**Spring - garter, wiper ring	1
6	35P830	Retainer - plunger wiper ring	1
7	10A11647	**"O" Ring - retainer, 3-1/4" I.D., 3-1/2" O.D.	1
8	35P820	Piston	1
9	35P824	**Packing - piston	1
10	10A4729	**"O" Ring - piston, inner, 2-1/4" I.D., 2-1/2" O.D.	1
11	35P821	**Ring - back-up, "O" ring	1
12	35P822	Ring - snap, piston retainer	1
	35R101	**Kit - cylinder	1
		**Note: Kit consists of the above items identified by (**) asterisks.	
13	35A7792	Spring - oil restrictor	1
14	35P149	Washer - perforated, oil restrictor	1
15	35P148	Spacer - oil restrictor	1

Ref. No.	Part No.	DESCRIPTION	No. Req.
		Simplex Lift Cylinder **Group IV** **4" Diameter for MA 60 Lift Trucks**	
	------	*Cylinder - lift, complete	1
		Includes the following 9 parts:	
1	------	*Shell - cylinder, outer, 4" O.D.	1
2	------	*Plunger - cylinder, 3" O.D.	1
3	------	*Spacer - cylinder	A.R.
		*Note: Order above parts by M F H and O A H L.	
4	35P153	**Ring - wiper, plunger	1
5	35P192	**Spring - garter, wiper ring	1
6	35P172	Retainer - plunger, wiper ring	1
7	35P181	**"O" Ring - retainer	1
8	35P168	Piston	1
9	35P176	**Packing - piston	1
10	35P174	**"O" Ring - piston, inner	1
11	35P175	**Ring - back-up, "O" ring	1
12	35P178	Ring - snap, piston retainer	1
	35R33	**Kit - cylinder	1
		**Note: Kit consists of the above items identified by (**) asterisks.	
13	35A4932	Spring - oil restrictor	1
14	35A4930	Washer - perforated, oil restrictor	1
15	35A4931	Spacer - oil restrictor	1



Used on MA 30 II, 40 II and 50 II Series Lift Trucks

Overall Height Lowered	Max. Fork Height	Outer Rail	Inner Rail	Cyl. Assy. MA 30 II	Cyl. Assy. MA 40 II - 50 II	Chain Assy. 3/4" P. (81634)	Pitches	Length	Chain Anchor Rod Length	Vent Hose Length
69-1/2"	91"	36A9210	36A9240	35A9402	35A9171	35A2650	81	60-3/4"	35A9333-41-1/2"	35A2775-86"
65"	94"	36A9211	36A9241	35A9403	35A9172	35A2652	85	63-3/4"	35A9333-41-1/2"	35A2777-87-1/2"
66-1/2"	97"	36A9212	36A9242	35A9404	35A9173	35A2654	89	66-3/4"	35A9333-41-1/2"	35A2778-89"
68"	100"	36A9213	36A9243	35A9405	35A9174	35A1706	93	69-3/4"	35A9333-41-1/2"	35A2778-40-1/2"
69-1/2"	103"	36A9214	36A9244	35A9406	35A9175	35A1708	97	72-3/4"	35A9333-41-1/2"	35A2780-42"
71"	106"	36A9215	36A9245	35A9407	35A9176	35A1710	101	75-3/4"	35A9333-41-1/2"	35A2781-43-1/2"
72-1/2"	109"	36A9216	35A9246	35A9408	35A9177	35A1706	93	69-3/4"	35A9334-50-1/4"	35A2782-45"
74"	112"	36A9217	36A9247	35A9409	35A9178	35A1709	97	72-3/4"	35A9334-50-1/4"	35A2783-46-1/2"
75-1/2"	115"	36A9218	35A9248	35A9410	35A9179	35A1710	101	75-3/4"	35A9334-50-1/4"	35A2784-48"
77"	118"	36A9219	36A9249	35A9411	35A9180	35A1712	105	78-3/4"	35A9334-50-1/4"	35A2785-49-1/2"
78-1/2"	121"	36A9220	36A9250	35A9412	35A9181	35A1714	109	81-3/4"	35A9334-50-1/4"	35A2786-52"
80"	124"	36A9221	36A9251	35A9413	35A9182	35A1716	113	84-3/4"	35A9334-50-1/4"	35A2787-52-1/2"
81-1/2"	127"	36A9222	36A9252	35A9414	35A9183	35A1712	105	78-3/4"	35A9335-58-1/4"	35A2758-54"
83"	130"	36A9223	36A9253	35A9415	35A9184	35A1714	109	81-3/4"	35A9335-58-1/4"	35A2789-55-1/2"
84-1/2"	133"	36A9224	36A9254	35A9416	35A9185	35A2716	113	84-3/4"	35A9335-58-1/4"	35A2790-57"
86"	136"	36A9225	36A9255	35A9417	35A9186	35A1716	117	87-3/4"	35A9335-58-1/4"	35A2791-58-1/2"
87-1/2"	139"	36A9226	36A9256	35A9418	35A9187	35A1718	121	84-3/4"	35A9336-66-1/4"	35A2792-60"
89"	142"	36A9227	36A9257	35A9419	35A9188	35A2716	117	87-3/4"	35A9336-66-1/4"	35A2793-61-1/2"
90-1/2"	145"	36A9228	36A9258	35A9420	35A9189	35A1720	121	90-3/4"	35A9336-66-1/4"	35A2794-63"
92"	148"	36A9229	36A9259	35A9421	35A9190	35A1722	125	93-3/4"	35A9336-66-1/4"	35A2795-65"
94-1/2"	151"	36A9230	36A9260	35A9422	35A9101	35A1722	125	93-3/4"	35A9337-70-1/4"	35A2796-66-1/2"
96"	154"	36A9231	36A9261	35A9423	35A9192	35A1724	129	96-3/4"	35A9337-70-1/4"	35A2797-68"
97-1/2"	157"	36A9232	36A9262	35A9424	35A9193	35A1726	133	99-3/4"	35A9337-70-1/4"	35A2798-69-1/2"
99"	160"	36A9233	36A9263	35A9425	35A9194	35A1728	137	102-3/4"	35A9337-70-1/4"	35A2799-71"
100-1/2"	163"	36A9234	36A9264	35A9426	35A9195	35A2726	133	99-3/4"	35A9338-77-1/4"	35A2800-73"
102"	166"	36A9235	36A9265	35A9427	35A9196	35A1728	137	102-3/4"	35A9338-77-1/4"	35A2501-74-1/2"
103-1/2"	169"	36A9236	36A9266	35A9425	35A9197	35A2730	141	105-3/4"	35A9338-77-1/4"	35A2802-76"
105"	172"	36A9237	36A9267	35A9429	35A9198	35A1732	145	108-3/4"	35A9338-77-1/4"	35A2503-77-1/2"
106-1/2"	175"	36A9238	36A9268	35A9430	35A9199	35A1730	141	105-3/4"	35A9339-86-1/4"	35A2504-79"
109"	178"	36A9239	36A9269	35A9431	35A9675	35A1732	145	108-3/4"	35A9339-86-1/4"	35A2805-81"

Refer to page 48 for breakdown of cylinder assembly.

CHART FOR SIMPLEX MAST

Used on MA 60 Lift Trucks

Overall Height Lowered	Max. Fork Height	Outer Rail	Inner Rail	Cyl. Assy.	Chain Assy. - 3/4" P. (BL666)	Pitches	Length	Chain Anchor Rod Length	Vent Hose Length
65"	91"	36A8976	36A9005	35A9035	35A9348	81	60-3/4"	35A9078-44"	36A2776-36"
68-1/2"	94"	36A8976	36A9005	35A9036	35A9350	85	63-3/4"	35A9078-44"	35A2777-37-1/2"
71	97"	36A8977	36A9007	35A9037	35A9352	89	66-3/4"	35A9078-44"	35A2778-39"
72-1/2"	100"	36A8978	36A9008	35A9038	35A2064	93	69-3/4"	35A9078-44"	36A2779-40-1/2"
74"	103"	36A8979	36A9009	35A9039	35A2066	97	72-3/4"	35A9078-44"	35A2780-42"
75-1/2"	106"	36A8980	36A9010	35A9040	35A2063	81	60-1/4"	35A9077-51-1/2"	35A2781-46-1/2"
77"	109"	36A9041	36A9011	35A9041	35A2065	85	71-1/4"	35A9077-51-1/2"	35A2782-45"
78-1/2"	112"	36A8982	36A9012	35A9042	35A2067	89	74-1/4"	35A9077-51-1/2"	35A2783-46-1/2"
80"	115"	36A8983	36A9013	35A9043	35A2069	103	77-1/4"	35A9077-51-1/2"	35A2784-48"
81-1/2"	118"	36A8984	36A9014	35A9044	35A2071	107	80-1/4"	35A9077-51-1/2"	35A2785-49-1/2"
83"	121"	36A8985	36A9015	35A9045	35A2073	111	83-1/4"	35A9077-51-1/2"	35A2786-51"
84-1/2"	124"	36A8986	36A9016	35A9046	35A2060	109	77-1/4"	35A9078-60-1/2"	35A2787-52-1/2"
86"	127"	36A8987	36A9017	35A9047	35A2071	107	80-1/4"	35A9078-60-1/2"	35A2788-54"
87-1/2"	130"	36A8988	36A9018	35A9048	35A2078	111	83-1/4"	35A9078-60-1/2"	35A2789-55-1/2"
90"	133"	36A8989	36A9019	35A9049	35A2075	115	86-1/4"	35A9078-60-1/2"	35A2790-57"
91-1/2"	136"	36A8990	36A9020	35A9050	35A2077	119	89-1/4"	35A9079-60-1/2"	35A2791-58-1/2"
93"	139"	36A8991	36A9021	35A9051	35A2079	123	92-1/4"	35A9079-60-1/2"	35A2792-60"
94-1/2"	142"	36A8992	36A9022	35A9052	35A2081	127	95-1/4"	35A9079-60-1/2"	35A2793-61-1/2"
96"	145"	36A8993	36A9023	35A9053	35A2083	131	98-1/4"	35A9079-60-1/2"	35A2794-63"
98-1/2"	148"	36A8994	36A9024	35A9054	35A2079	123	92-1/4"	35A9080-70-1/2"	35A2795-65"
100"	151"	36A8995	36A9025	35A9055	35A2081	127	95-1/4"	35A9080-70-1/2"	35A2796-66-1/2"
101-1/2"	154"	36A8996	36A9026	35A9056	35A2083	131	98-1/4"	35A9080-70-1/2"	35A2797-68"
103"	157"	36A8997	36A9027	35A9057	35A2085	135	101-1/4"	35A9080-70-1/2"	35A2798-69-1/2"
104-1/2"	160"	36A8998	36A9028	35A9058	35A2087	139	104-1/4"	35A9080-70-1/2"	35A2799-71"
107"	163"	36A8999	36A9029	35A9059	35A2089	143	107-1/4"	35A9080-70-1/2"	35A2800-73"
108-1/2"	166"	36A9000	36A9030	35A9060	35A2085	135	101-1/4"	35A9081-78-1/2"	35A2801-74-1/2"
110"	169"	36A9001	36A9031	35A9061	35A2087	139	104-1/4"	35A9081-78-1/2"	35A2802-76"
111-1/2"	172"	36A9002	36A9032	35A9062	35A2089	143	107-1/4"	35A9081-78-1/2"	35A2803-77-1/2"
113"	175"	36A9003	36A9033	35A9063	35A2091	147	110-1/4"	36A9081-78-1/2"	35A2804-79"
114-1/2"	178"	36A9004	36A9034	35A9064	35A2089	143	107-1/4"	35A9347-87-1/2"	35A2805-81"

Refer to page 40 for breakdown of cylinder assembly.

F O R E W O R D

This manual has been prepared as a guide for the owner and operator of a MA Series Fork Lift Truck. The contents of this manual are arranged in five sections which include complete operation and maintenance instructions, overhaul instructions, together with a list of all repair parts used on the lift trucks. In order to attain maximum life and efficiency from the lift truck, thoroughly read Chapters 1, 2, and 3 of the manual, and carefully follow all instructions.

A planned maintenance program, following the procedures outlined in this manual, is of vital importance in obtaining dependable service and long life from the lift truck, and should be initiated when the lift truck is new. The practice of preventative maintenance will reduce "down time" and repair cost.

Whenever lubrication and maintenance procedures are accomplished, record the number of hours of operation, as indicated on the hourmeter, so the interval for next performing these procedures will be known.

SPECIFICATIONS

	MA 30 MA 30 II	MA 40 MA 40 II	MA 50 MA 50 II
Capacity (At 24-inch load center)	3000 lbs	4000 lbs	5000 lbs
Load Pound Rating	109, 500	146, 000	182, 500
Length (Less Forks)	76-3/4"	81-1/2"	85"
Width	37"	38"	40"
Wheelbase	60"	62"	62"
Tread			
Drive	31"	31"	31"
Steer	32"	32"	32"
Turning Radius (Outside)	68-3/4"	72"	75-1/4"
Speeds (MPH) (All Trucks)			
Forward	0 to 9.3	0 to 9.3	0 to 9.3
Reverse	0 to 9.5	0 to 9.5	0 to 9.5
Lift Speed (Manual Steering)			
No Load	126 fpm	- - -	- - -
Full Load	118 fpm	- - -	- - -
Lift Speed (Power Steering)			
No Load	107 fpm	86 fpm	86 fpm
Full Load	97 fpm	77 fpm	77 fpm
Lowering Speed			
No Load	87 fpm	85 fpm	85 fpm
Full Load	120 fpm	75 fpm	75 fpm
Mast Tilt (All Trucks)		6^{0} Forward, 10^{0} Rear	
Maximum Fork Spread	36"	36"	36"
Gradeability, Full Load	31.2%	28%	24%
Drawbar Pull	3140 lbs	3100 lbs	2860 lbs
Tires			
Drive	15 x 6 x 12-1/8	18 x 7 x 12-1/8	18 x 8 x 12-1/8
Steer	15-1/2 x 5 x 10	15-1/2 x 5 x 10	15-1/2 x 5 x 10
Fuel Capacity (Gasoline)	8 gal	8 gal	8 gal
Cooling System Capacity	11 qts	11 qts	11 qts
Transmission + Final Drive Capacity	16-3/4 qts	16-3/4 qts	16-3/4 qts

(Minneapolis-Moline, Inc. is constantly striving to improve its products and, therefore, reserves the right to change design, materials, and/or specifications without notice.)

ENGINE SPECIFICATIONS

Make	Continental
Model	F162 or F163
Cylinders	4
Bore and Stroke	3-7/16 x 4-3/8
Piston Displacement	162 cu. in.
Firing Order	1-3-4-2
Governed Speed (No Load)	2800 rpm
Idle Speed	500 rpm
Horsepower @2400 rpm (Gasoline)	51
Crankcase Capacity W/Filter	4-1/2 qts

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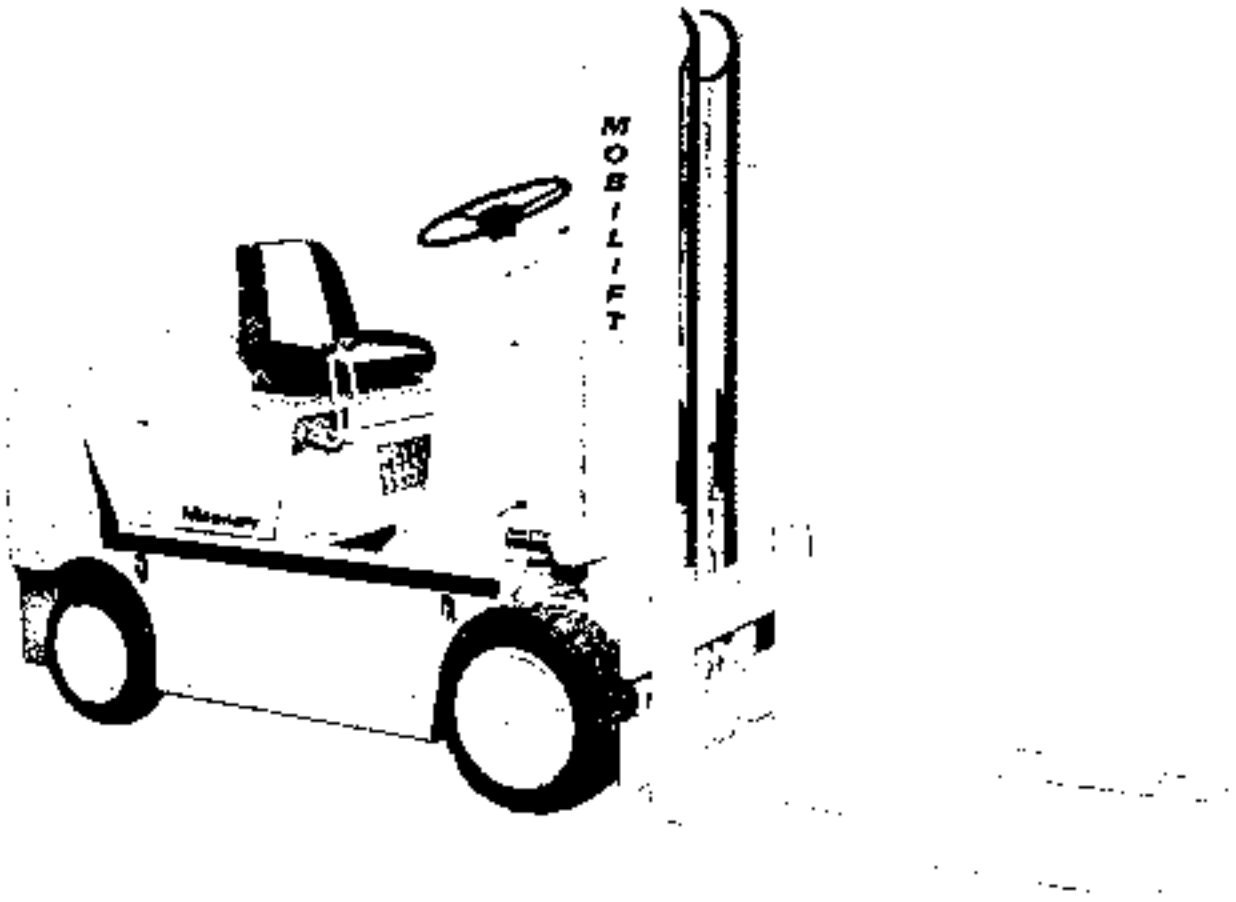


Fig. 1-1. Fork Lift Truck

Chapter 1
INTRODUCTION
Section I. General Description

1-1. SCOPE.

1-2. This manual provides instructions on the operation, maintenance, and overhaul of the MA Series Fork Lift Trucks. Most of the instructions apply to all models. Where differences do occur, they will be noted in the text or paragraph heading.

1-3. The lift truck is equipped with a Continental Engine, Model Number F162 or F163.

1-4. It is strongly recommended that all personnel concerned with the various phases of these lift trucks study this manual thoroughly, to gain knowledge and understanding of the equipment, before performing any procedures with the equipment.

1-5. GENERAL DESCRIPTION.

1-6. Due to its design and intended purpose the equipment will be referred to as "lift truck" or "truck" throughout this manual. Reference to either the right or left sides of the truck are made in respect to the normal direction of travel, which is forward.

1-7. The capacities of the lift trucks, at a 24 inch load center, are as follows: MA 30, 30 II - 3000 lbs; MA 40, 40 II - 4000 lbs; MA 50, 50 II - 5000 lbs.

1-8. The lift truck is a completely self-contained vehicle, its power train consisting of a four-cylinder gasoline engine, a hydraulic torque converter, and a multiple disc clutch and power shaft type transmission. All these assemblies are integrally mounted, forming one compact unit, which in turn drives the front axle differential and the drive wheels. A gear-type pump driven from the engine camshaft, supplies pressure to the hydraulic system. Electrical components of the truck utilize the current supplied from one 12-volt battery.

Section II. Detailed Description

1-9. DETAILED DESCRIPTION.

1-10. ENGINE. The engine (4, figure 1-2) is a four-cylinder, four-cycle gasoline operated, L-head type. Its normal speed with no load is 2600 RPM. One complete stroke is required for intake, compression, power, and exhaust, thereby providing one power stroke per cylinder for each two revolutions of the crankshaft.

1-11. TORQUE CONVERTER. The torque converter (3, figure 1-2) is a compact, complete, sealed unit consisting of an impeller, turbine, and single-stage stator. The charging pump is coupled to the engine flywheel through the impeller hub. The oil from the pump charges the converter, and the torque is multiplied by the stator. The turbine is splined to the input shaft in the transmission.

1-12. TRANSMISSION. The transmission (2, figure 1-2) is a power shaft gear box equipped with a hydraulically actuated multiple disc clutch. The clutch is mounted on the input shaft, and controls the forward and reverse movement of the truck. The control valve receives pressure from an engine-driven hydraulic pump mounted on the transmission cover. The valve is controlled by the hand lever located on the steering column. An "inching" valve incorporated into the control valve, supplies only partial pressure to the clutch when it is activated by the inching pedal. This feature provides very slow ground speeds at full engine speed.

1-13. INCHING SYSTEM. The inching system is controlled by the combination inching-braking pedal (1, figure 1-6). The pedal activates a valve which supplies a restricted pressure to the clutch. The clutch is thus allowed to "slip", thereby delivering only partial power to the drive wheels, with a resultant slow ground speed. The engine speed is not affected, so the lift mechanism can be operated at its normal speed.

1-14. DIFFERENTIAL AND DRIVE AXLE. Coupled to and driven by the transmission pinion shaft (output), is the conventional automotive type differential. A common lubricant is used for the transmission, differential, and axles.

1-15. STEER WHEELS. Independent hydraulic suspension of the steer wheels eliminates the conventional plywood rear axle. The load remains level on uneven surfaces. Coupled hydraulic cylinders give perfect cross-compensation. No strain due to surface variations is transmitted to the frame or power train, since this strain is absorbed in the cylinders.

1-16. HYDRAULIC SYSTEM. The hydraulic reservoir is an integral part of the main frame, on the right hand side. A gear type pump draws fluid from the tank, to a control valve, and to the hydraulic steering valve. Fluid under pressure is available at each of these components when the engine is running. Return lines complete the circuit when the hydraulic components are not in use. The system is controlled by hand levers located conveniently to the right of the operator.

1-17. HYDRAULIC STEERING SYSTEM. Steering of the truck is accomplished by an 17-inch diameter steering wheel, mounted on an automotive-type steering column. A hydraulic steering booster is incorporated into the steering column. (Optional on MA 90.) As the steering wheel is turned, hydraulic pressure assists in turning the rear wheels. The system can be steered manually in case of hydraulic pressure failure.

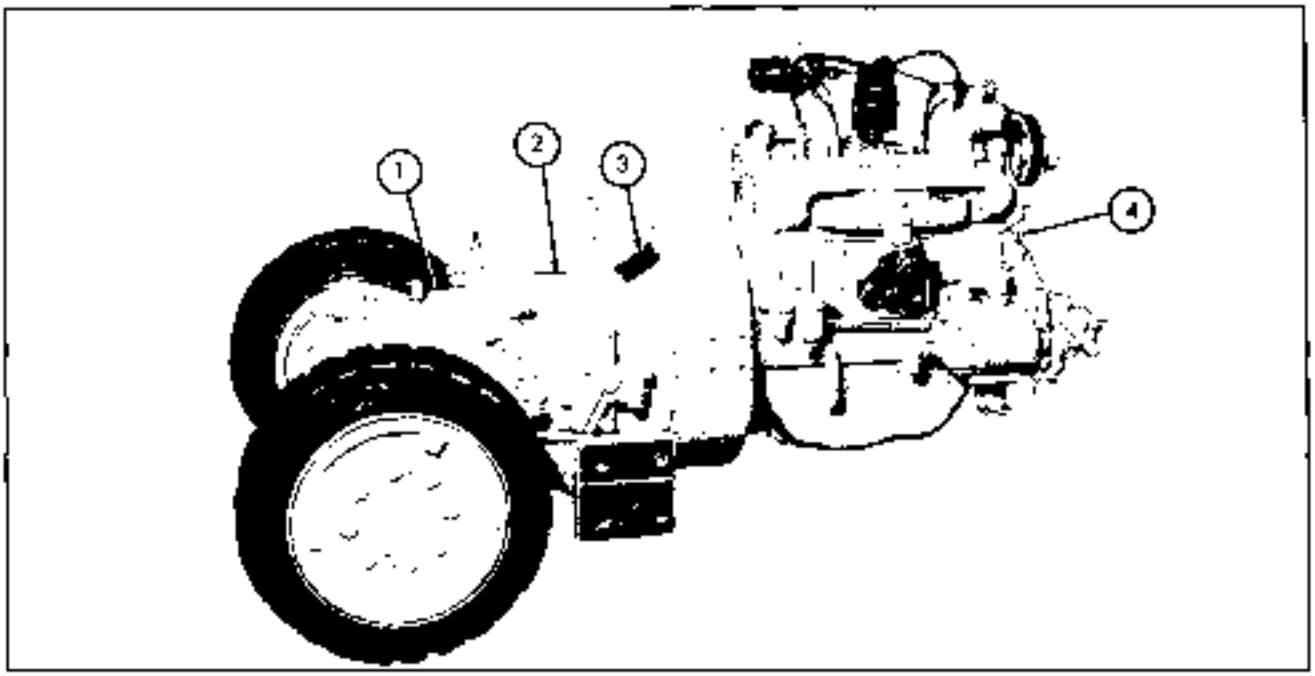


Fig. 1-2. Power train

1. Differential
2. Transmission
3. Torque converter
4. Engine

1-19. ELECTRICAL SYSTEM. The electrical system consists of a 12-volt battery, starter, generator, distributor, coil, and voltage regulator. The battery is the basic source of electrical current; the generator maintains the battery in a charged condition; the voltage regulator governs the amount of voltage output into the electrical system. Head and tail lights are available as optional equipment.

1-19. LIFT AND TILT ASSEMBLY. The lift and tilt assembly consists of an upright, forks, a lift cylinder, and two tilt cylinders. The assembly is controlled by hand levers located to the right of the operator's seat. The truck is capable of lifting its rated load from ground level up to a specified height, depending on the mast assembly on the truck. The upright can be tilted from 6° forward of vertical to 10° to the rear of vertical. A restrictor valve in the system provides that the load will not drop at a rate of more than 60 feet per minute in case of hydraulic failure or damage to the lines.

1-20. SERVICE AND PARKING BRAKES. The service brakes are the floating shoe hydraulic type. Actuation permits the shoes to center themselves in the drum with equal effectiveness in either direction. The same brake shoes are utilized in a cable-operated parking brake.

1-21. FUEL SYSTEM.

a. Gasoline. An eight and one half gallon fuel tank is an integral part of the frame on the left hand side. It contains a "protected" safety filler cap. The fuel suction line originates near the bottom of the tank, and emerges at the top of the tank, thereby preventing the loss of fuel should a fuel line be broken. A plug is provided at the tank bottom for fuel drainage and cleaning. A fuel shut-off valve is installed in the line leading from the tank to the fuel pump.

b. LP Gas. The LP-Gas system consists of a replaceable fuel tank (33-1/2 lb. capacity), a filter, an automatic fuel shut-off valve, a vaporizer, a pressure regulator, and the carburetor. The fuel is confined in the tank as a liquid under pressure. When the valve on the fuel tank is opened, and the ignition switch is turned on to open the solenoid shut-off valve, the liquid flows to the vaporizer where it is turned into a gas. The gas is then metered through the regulator, where the pressure is reduced, to the carburetor.

1-22. COOLING SYSTEM. Cooling of the engine is accomplished by a six-bladed pusher type fan, and a water circulating pressure system radiator. The lower portion of the radiator is designed with coils to cool the torque converter fluid.

1-23. EXHAUST SYSTEM. Engine exhaust vapors are vented out the exhaust manifold on the upper left side of the engine, down through a muffler and out of a tail pipe at the rear of the truck.

1-24. SERVICING ACCESSIBILITY. See figure 1-4. Raising the hood and propping it open provides easy access for servicing the air cleaner, distributor, generator, starter, battery, spark plugs, fan belt, voltage

regulator, engine oil supply and dipstick. The radiator, fuel tank, and hydraulic reservoir can be serviced without raising the hood. The transmission oil supply tube and dipstick, and the brake master cylinder are located under the "flip-up" floor plate. (Figure 1-5.)

1-25. WHEELS AND TIRES. The brake drums for the drive wheels are included in the wheel centers.

1-26. SEAT. The seat is adjustable forward and back. The seat release handle is located on the right side of the seat.

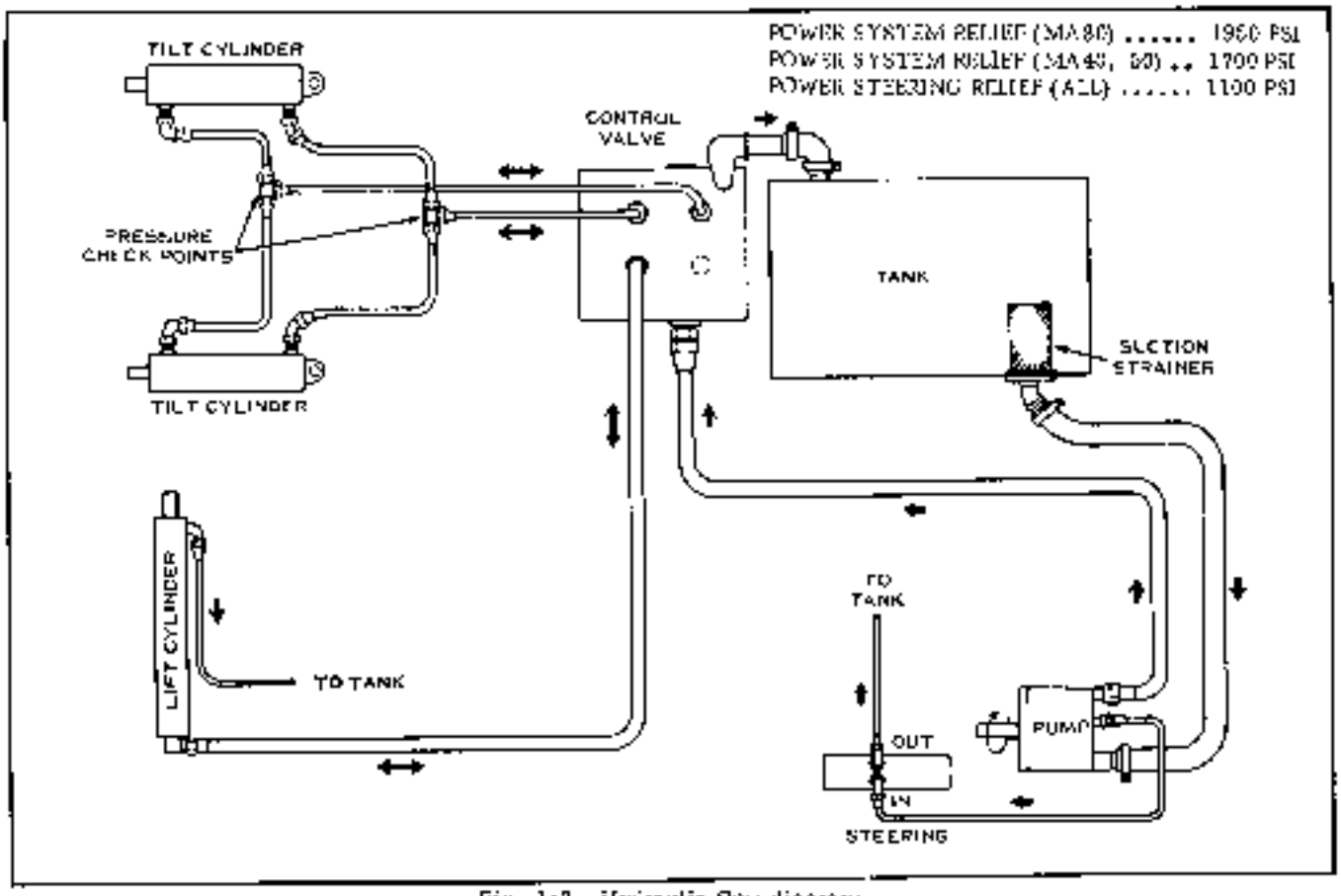


Fig. 1-3. Hydraulic flow diagram

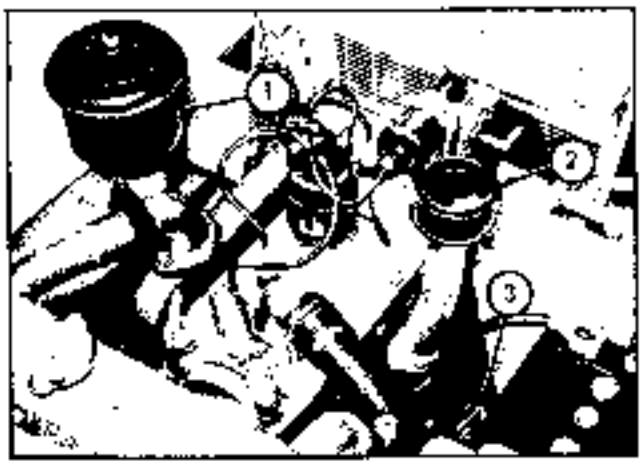


Fig. 1-4. Servicing accessibility

1. Air cleaner
2. Breather cap
3. Crankcase dipstick

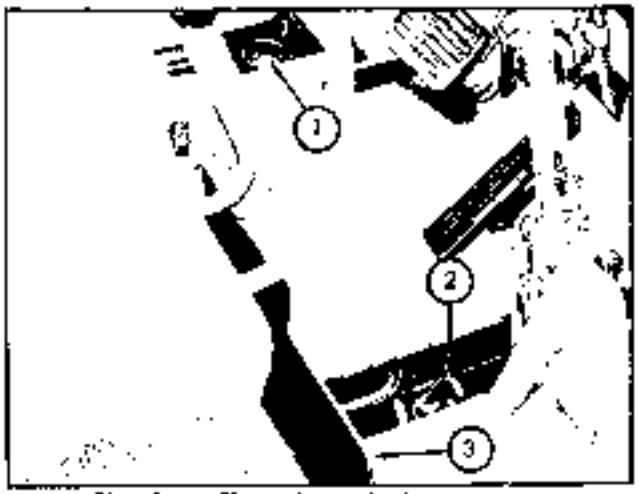


Fig. 1-5. Floor plate raised

1. Master cylinder
2. Transmission dip stick
3. Flip-up floor plate

Chapter 2
OPERATING INSTRUCTIONS
Section I. Initial Preparation for Use

2-1. SERVICE UPON DELIVERY.

2-2. UNLOADING. Since the lift truck may be shipped from the factory in a number of ways, no attempt will be made to cover all methods of unloading procedures. The trucks were shipped from the factory in accordance with standard shipping procedures, and should be unloaded from their carriers in a safe, logical manner.

2-3. REMOVAL OF PROTECTIVE MATERIALS AND DISASSEMBLED COMPONENTS. Remove any protective tape, paper, or other packing. Remove any components that have been packaged separately and attached to the truck. Install these components according to the instructions in this manual.

2-4. VISUAL INSPECTION FOR SHIPPING DAMAGE. Although every attempt has been made at the factory to protect the equipment against damage during shipment it is possible for some damage to be incurred. It is necessary, therefore, that a careful visual inspection be made of the lift truck upon delivery and before placing it in operation. It is further recommended that a written record be maintained, which outlines the nature of the damage, and the urgency required in its correction.

2-5. SERVICE PRIOR TO USE. The following procedures are to be accomplished before operating the lift truck:

2-6. BATTERY.

a. If the battery is shipped without electrolyte, raise the hood, and remove the battery from the truck. Discard any vent plug seals. Fill all cells to the proper level with electrolyte. Allow the battery to stand for at least 20 minutes after filling.

WARNING

Electrolyte can burn or damage the eyes, skin, or clothing. Wear safety glasses to prevent damage to the eyes due to splashed electrolyte. If it is spilled on the skin or clothing, flush off immediately with a solution of baking soda and water, or some other neutralizing agent, then flush off with clean water.

b. Code date the battery according to the month and year. Stamp the code on the intercell connector nearest the negative terminal on the battery. The first number of the code indicates the month (1=January, 2=February, etc.), and the second number indicates the year (6=1966, 6=1966, etc.).

c. Give the battery a booster charge after it has been filled and dated. Fast charge for at least 10 minutes at the rate of 30 or 40 amps, or slow charge for at least 30 minutes at 10 amps.

d. If any electrolyte spilled on the battery flush it off with clean water. Dry the battery before installing.

e. The battery has a negative ground. Install it with the negative terminal toward the rear of the truck. Install the clamp and cables.

2-7. ELECTRICAL SYSTEM. Inspect wiring and connections. Actuate light switch and inspect the lights for proper response. Place ignition switch "on" and test for electrical current to that components. With switch on, test horn.

2-8. FUEL SYSTEM.

a. Gasoline. Open the fill cover of the fuel tank located on the left side of the lift truck. Fill as necessary with a good grade of regular gasoline. Close the tank cover, and padlock if desired. Wipe the tank free of dirt or fuel hose leakage, and inspect fuel line and engine-mounted accessories for signs of fuel leakage. Open shut-off valve in tank-to-pump fuel line.

b. LP Gas. Open the valve (2, figure 1-8) on the fuel tank slowly. An excess-flow valve, built into the fuel supply valve, will close, stopping the flow of fuel, if the valve is opened too fast. If the excess-flow valve closes, close the fuel supply valve and wait until a "click" is heard. This will indicate that the pressure has equalized on both sides of the excess-flow valve and the excess-flow valve has reopened.

c. To open the solenoid-type shut-off valve, turn the ignition switch to the "on" position. Check all fuel line connections for evidence of leaks. A leak will result in the formation of frost at the point of leakage.

2-9. HYDRAULIC SYSTEM. Remove the breather cap from the hydraulic tank located on the right side of the lift truck. Fill as necessary in accordance with the instructions given in figure 1-9. The capacity of the system is approximately 17 quarts (the capacity will vary, depending on the size of the lift cylinder). With the mast fully raised and in a vertical position, the oil should be up to the FULL mark on the dipstick.

2-10. LUBRICATION. The lift trucks are completely serviced prior to delivery with lubricants specified for ambient factory temperatures, and should require no further lubrication at point of delivery unless temperatures differ greatly from those at the factory. If such is the case, lubricate the truck in accordance with instructions in figure 1-9.

2-11. LIFT TRUCK BODY. Inspect all sheet metal and fabricated parts for distortion or damage. Tighten all screws and nuts, particularly those of the steering wheel column, instrument panel, and brake and accelerator pedals.

2-12. COOLING SYSTEM. Remove the radiator cap and inspect the coolant level. If weather is above freezing, add clean water until it covers the radiator core. For operation in sub-freezing temperatures, use a good grade of permanent anti-freeze. Inspect for coolant leakage at all connections.

Section II. Operating Instructions

2-13. STARTING THE LIFT TRUCK.

a. Position the forward-reverse shifting lever in neutral. A neutral starting switch prevents the engine from starting unless this lever is in neutral.

b. Turn the key for the combination ignition-starter switch (7, figure 1-7) all the way to the right to engage the starting motor. Release the key as soon as the engine starts. Do not engage the starting motor for more than 5 to 10 seconds at a time. If the engine fails to start on the first try, allow the engine and starting motor to come to a complete stop before making a second attempt. This will prevent damage to the starting motor housing, drive, and flywheel ring gear.

c. It may be necessary to use the choke (6, figure 1-6) to enrich the gas-air mixture when starting, especially during cold weather. Allow the engine to warm up gradually to its normal operating temperature (approx. 180° F.). Do not race the engine during the warm-up period.

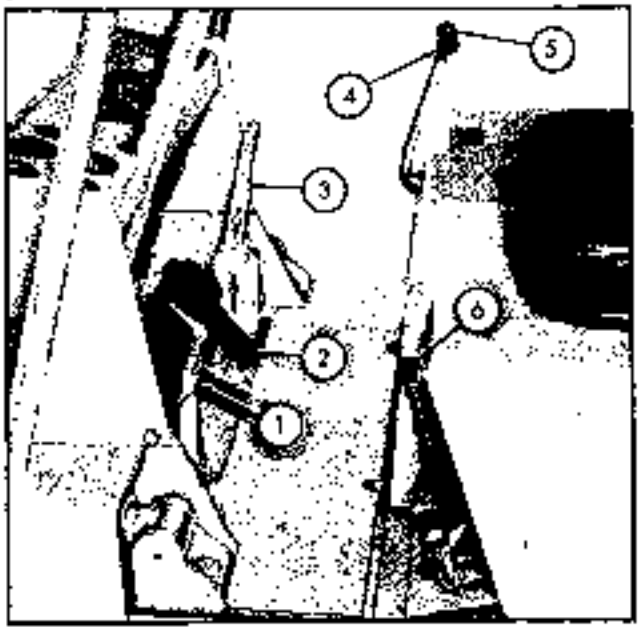


Fig. 1-6. Controls

1. Inching - braking pedal
2. Accelerator pedal
3. Parking brake
4. Lift control lever
5. Tilt control lever
6. Choke button

CAUTION

If, after starting the engine, there is very little or no oil pressure indicated on the oil pressure gauge, or if there is a sudden drop in oil pressure while operating the truck, stop the engine immediately and determine the cause. Correction usually consists of replenishing the crankcase oil supply. Located on the instrument panel is a red warning light (5, figure 1-7). This light will glow only when the temperature of the transmission lubricant is excessive. This indicates a plugged filter or screen, a restriction in the lines, or that the transmission oil supply is dangerously low and must be replenished before further lift truck operations.

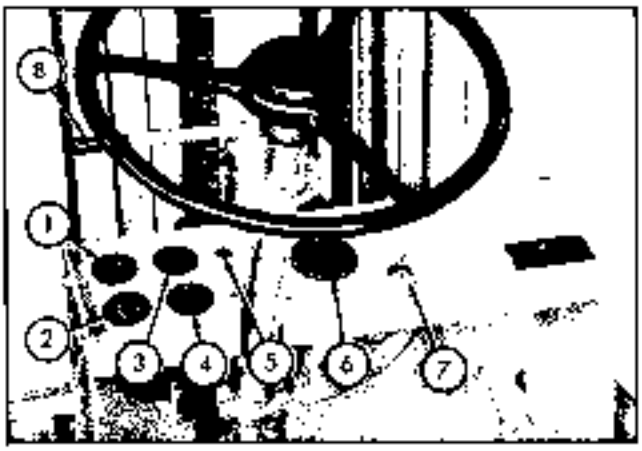


Fig. 1-7. Instrument panel

1. Temperature gage
2. Ammeter
3. Oil pressure gage
4. Fuel gage - gasoline
5. Warning light trans. temperature
6. Hourmeter
7. Ignition-starter switch
8. Transmission shift lever

d. Release the parking brake and shift the forward-reverse lever to the position desired. Apply foot pressure to the accelerator pedal and steer the truck in the direction selected.

e. Refer to the Trouble Shooting Chart in Section III to correct any malfunction of the lift truck or its components under operating conditions.

2-14. LOADING PROCEDURE

a. Drive the truck squarely into position as near the center of weight of the load as possible.

b. Position the forks slightly below the level of the load and drive forward until the forks are completely under the load. If the depth of the load permits, drive forward until the load is against the back rest.

c. Place the shift lever in neutral, apply the service brakes; accelerate the engine slightly, and pull back on the lift lever (4, figure 1-6) to raise the load.

d. If the nature of the load permits, pull back on the tilt control lever (5, figure 1-6) to tilt the load to the rear to prevent it from slipping off the forks.

e. For maximum safety and stability carry the load just high enough to clear obstacles or uneven terrain.

2-15. DRIVING

a. Avoid sudden starting or stopping. Come to a complete stop, with engine at idle speed, before shifting direction.

b. Reduce speed when making a turn.

c. When carrying a load, the view straight ahead is obstructed to a certain degree so be alert for personnel or obstacles in the path of the truck.

d. Watch the top of the load or mast assembly (whichever is higher) to avoid contact with overhead wires, rafters, lights, sprinklers, etc.

2-16. UNLOADING PROCEDURE

a. Drive the truck into position for unloading, shift into neutral, and apply the service brakes.

b. Move tilt control lever so mast is vertical.

c. Push lift control lever forward until load is lowered to ground or at desired stacking height.

d. Release brakes, shift into forward, and slowly move truck until load is in desired position.

e. Shift into neutral and apply service brakes. Lower load until forks are clear of load. Release brakes and back away until forks are clear of load.

f. Lower forks to normal position.

2-17. INCHING INSTRUCTIONS. The inching valve is controlled by the left hand pedal (1, figure 1-6) on the combination inching-brake pedal assembly. Depress the pedal slightly with the left foot: use just the portion of pedal travel before any braking action takes place. Depress the accelerator pedal with the right foot. Extremely slow ground speeds can be attained for operating in confined or dangerous areas, while the speed of the lift remains normal.

2-18. STOPPING THE TRUCK.

a. Drive the truck to an area suitable for parking. Apply the brakes slowly and bring the truck to a gradual stop.

b. Shift into neutral and apply the parking brake.

c. Tilt the mast slightly forward, and lower the forks to the floor.

WARNING

Unless conditions prevent, always unload forks and lower them to surface, to avoid potential danger to personnel.

d. Turn ignition switch to "OFF" position.

2-19. CHANGING LP-GAS TANKS. To change LP-gas tanks, close the fuel supply valve, disconnect the quick coupler, and release the clamps. Lift the tank out of the bracket. Install the new tank, being sure to place the aligning hole in the tank flange over the pin. Secure the tank with the clamps and connect the quick coupler.

IMPORTANT: LP-GAS TANKS MUST BE FILLED IN ACCORDANCE WITH ICC AND LOCAL REGULATIONS.

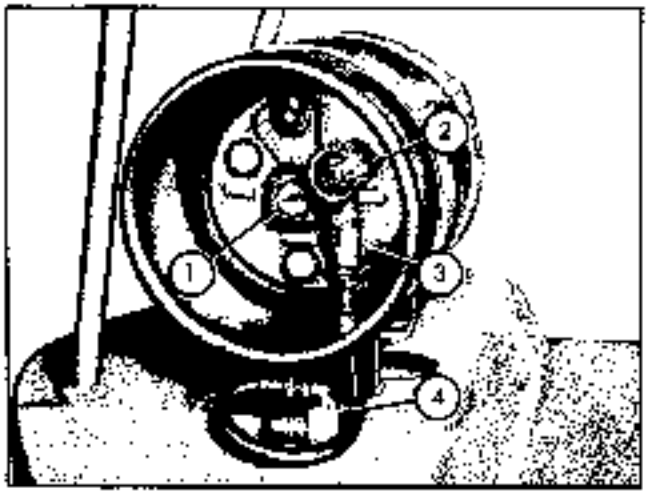


Fig. 1-8. LP-Gas tank

1. Gage
2. Fuel valve
3. Quick coupler
4. Relief valve-filler

2-20. SAFETY PRECAUTIONS. The following safety precautions must always be observed:

a. Driver must be thoroughly familiar with the lift truck, its capabilities and limitations, before attempting its operation. Never attempt operation of a lift truck known to be faulty.

b. Provide adequate ventilation in operational area; avoid prolonged operation in enclosed areas.

c. Constantly check for personnel and obstacles in path of truck and load, keep forks in view whenever possible.

d. Transport load at lowest practical level, for maximum stability and visibility. Avoid sudden stops and starts, sharp turns, and excessive speed.

e. Keep top of mast and load in view to avoid overhead wires, lights, rafters, and other obstructions.

f. Do not leave lift truck unattended with engine running or load elevated. Lower forks to surface, apply brakes, and turn off engine before leaving truck.

g. Strap or otherwise secure load to carriage when descending grades steeper than 10 degrees from horizontal in a forward direction. Do not attempt operation of loaded lift truck on ascents or descents greater than the gradeability of the lift truck. See Specifications.

h. Do not attempt to lift or transport loads that exceed the rated capacity of the truck.

i. Always secure forks to notches in carriage with lock levers.

Section III. Principles of Operation

2-21. OIL PRESSURE GAGE. The oil pressure gage (2, figure 1-7) does not indicate the amount of oil in the crankcase; it indicates the pressure of the oil in the engine lubricating system. The gage electrically senses the oil pressure and reflects it on the gage dial. With the engine at normal operating temperature and speed, the oil pressure should be between 20 and 80 pounds.

2-22. ENGINE TEMPERATURE GAGE. This gage (1, figure 1-7) indicates the temperature of the cooling fluid. Engine operation under normal conditions should register approximately 180 degrees on the gage. Temperatures excessively higher or lower than 180 degrees indicates a dirty or restricted radiator, or loss of coolant. Do not operate the lift truck until these conditions are corrected.

2-23. IGNITION-STARTER SWITCH. The combination ignition-starter switch (7, figure 1-7) opens and closes the ignition circuit, and energizes the starting motor. Turning the ignition switch "off" also opens the solenoid valve in the LP-Gas system. The starting motor is put into operation by turning the ignition key all the way to the right. A neutral starting switch prevents electrical energy from reaching the starting motor unless the transmission shift lever is in neutral.

2-24. AMMETER. The ammeter (4, figure 1-7) indicates the activity of the electrical system. If the needle indicates a continuous discharge when the engine is operating above an idle speed, the trouble would probably be a loose or broken fan belt, a short in some wire or component of the electrical system, or a faulty generator or regulator. The gage needle should move slightly to the positive side of the "0" mark on the ammeter when the engine is running at full governed speed and the battery is fully charged.

2-25. HOURMETER. The hourmeter (6, figure 2-7) reflects the actual hours of engine operation. Its main purpose is to be the determining factor as to when the lift truck components require lubrication or overhaul.

2-26. WARNING LIGHT. The red warning light (3, figure 1-7) senses the transmission oil temperature and glows only when the temperature is in excess of proper operating limits. This condition is usually remedied by bringing the transmission oil level to full.

2-27. FUEL GAGE.

a. GASOLINE. The fuel gage (3, figure 1-7) electrically senses and indicates the amount of fuel in the lift truck fuel tank.

b. LP-GAS. The gage (1, figure 1-8) indicates the amount of LP-gas in the tank.

2-28. CHOKE CONTROL. The choke control button (6, figure 1-6) is cable connected to the choke disc in the carburetor assembly. Pulling forward on the choke button closes the choke disc, thereby enriching the air and gas mixture and providing quicker starting of a cold engine. Push the choke button in as the engine warms up to operating temperature; if all carburetor settings are correct, the resulting fuel mixture will be correct for proper engine operation.

2-29. LIGHTING SYSTEM (OPTIONAL). Pulling outwardly on the light button closes the circuit to the lights, thereby energizing them from the current supplied by the battery. Returning button inwardly toward the panel opens the circuit, and renders the lights inoperative.

2-30. POWER TRAIN (ENGINE AND TRANSMISSION). With the ignition switch in the "ON" position, actuation of the various components is achieved in the following sequence: Turning the ignition key all the way to the right energizes the starting motor which is pinion meshed with the engine flywheel ring gear teeth. As the ring gear is rotated by the starting motor, the crankshaft is forced to rotate. It is at this point that fuel vapors enter the piston chambers and are ignited by the electrical impulse delivered by the spark plugs. The synchronized firing order of the spark plugs produces a continuous source of driving energy for the crankshaft. The transmission is inter-connected to the engine by a torque converter and plate arrangement, and a multiple disc clutch in the transmission allows the operator a selection of either forward or reverse direction, and also a neutral position when no travel is desired. The transmission is in turn geared to the differential of the drive axle by means of a bevel pinion and ring gear.

2-31. HYDRAULIC SYSTEM. The hydraulic pump provides a constant flow of hydraulic fluid under pressure when the engine is running. The control levers direct the flow to the lift or tilt cylinders or to the hydraulically actuated attachments. Fluid is also supplied directly from the pump to the hydraulic steering unit. Return passages in the system provide a complete circuit for the fluid when the cylinders are not being utilized. Figure 1-8 shows the hydraulic oil circuit.

CHAPTER 3

FIELD MAINTENANCE

Section I. Lubrication

3-1. LUBRICATION INFORMATION.

a. The lubrication chart (figure 1-9) illustrates lubrication points on the lift truck and prescribes approved lubricants, recommended intervals, and application procedures.

b. In order that the lubricants can accomplish the protection for which they are intended, they must be kept free from dust, dirt, water, or other contaminants.

c. Wipe each lubrication fitting clean with a cloth before applying lubricant.

d. Apply only the grade of lubricant specified for operation under the temperature ranges indicated.

e. It is recommended automotive practice to operate the truck immediately after a complete lubrication change, in order to distribute the lubricant most effectively.

f. Special or detailed instructions for servicing the lift truck components are outlined under "LUBRICATION NOTES".

Section II. Preventive Maintenance Services

3-2. PERIODIC IN-SERVICE MAINTENANCE.

3-3. GENERAL. The instructions contained in this section are intended to aid the operator in maintaining the lift truck in an efficient, trouble-free condition. It is the purpose of this section to acquaint the operator with the possibilities of equipment malfunction, the indications of malfunction, and the corrective measures to be taken. Thorough understanding of the instructions by the operator is required to prevent minor malfunctions from going unnoticed until a part or a system is damaged beyond repair, resulting in removing the lift truck from service for extended periods.

3-4. SPECIAL MAINTENANCE TOOLS. No special tools are required by operating personnel to maintain the lift truck in serviceable condition. Standard tools, commonly used by automotive mechanics, should be made available to the operator.

3-5. MAINTENANCE CHARTS. In addition to, and summarizing the procedures of this section, a Trouble Shooting Chart is presented to provide the operator with a ready reference as to typical troubles, the probable cause, and remedy procedures required.

3-6. ELECTRICAL SYSTEM. Disconnect battery ground cable before working on electrical components.

3-7. BATTERY. Battery "life" depends greatly upon proper care and thorough periodic inspections. The most important service in maintaining the battery, is to inspect the electrolyte (liquid) level daily. Add distilled water until the tops of the plates are covered approximately 1/8 inch. If distilled water is not available, use clean rain water or regular drinking water that is low in mineral content. Since the water and the electrolyte in the battery will not mix until charged by the generator current, make a practice of operating the engine for a minimum of one hour after filling if the danger of freezing exists.

WARNING

If the battery electrolyte is accidently spilled or comes in contact with skin or clothing, immediately apply baking soda or a similar neutralizing agent.

3-8. Use an accurate hydrometer to check the electrolyte specific gravity. When fully charged, the reading should be 1.240 to 1.260 at a liquid temperature of 80° F. Wide variations from this reading between the cells indicates a faulty battery, and requires replacement with a new battery.

WARNING

Since the batteries release highly flammable hydrogen gas when being charged, keep all forms of sparks or flame away from lift truck.

3-9. Wash batteries clean with solution 1/2 pound baking soda mixed with 1 quart of water, apply with a brush, and flush with clear water. Prevent solution from entering vent holes; make sure holes are open after cleaning. Apply a light film of petroleum jelly to the battery terminals and cable clamps to retard corrosion.

3-10. GENERATOR. In addition to maintaining the generator in a clean condition at all times, a more thorough inspection of the brushes and commutator should be accomplished every 500 hours of operation.

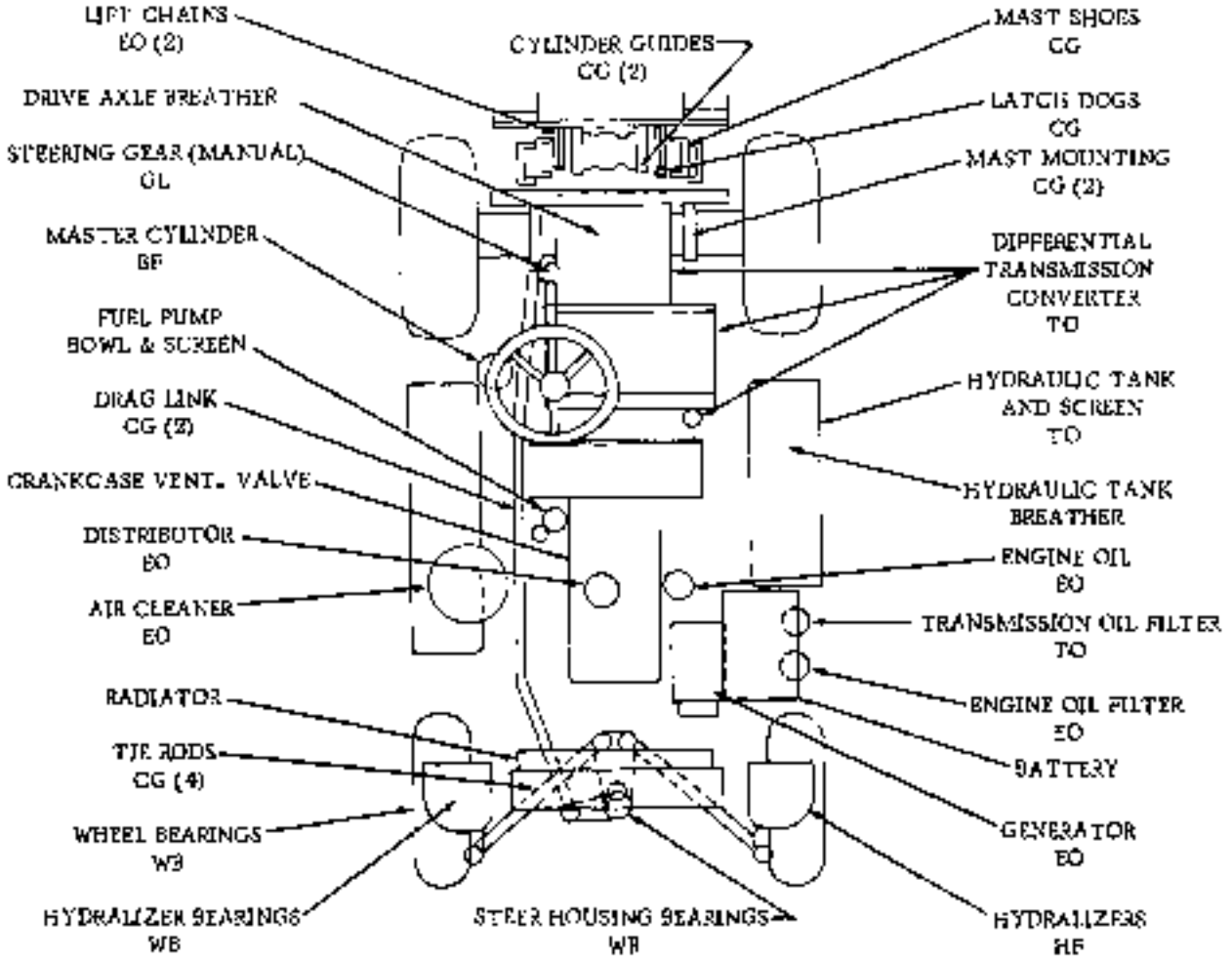
a. To properly examine the generator components, remove the generator from the engine. Tag the wires from the field and armature terminals.

b. A visual inspection of the brushes can be made through the openings in the commutator end frame. Do not pull the brushes against the spring tension by the leads or snap the brush arms against the brushes.

c. To replace worn brushes, remove the commutator end cover. Replace the brush springs if they do not have sufficient tension to hold the brushes tight against the commutator. Keep the brush holders clean to prevent the brushes from sticking.

d. Clean a dirty commutator, using a strip of No. 00 flintpaper, or a brush seating stone. Do not use emery cloth to clean the commutator. Remove dirt from between the commutator riser bars, being careful not to scratch the bars or mica. Blow out all dust and grit with compressed air.

LUBRICATION CHART



CODE AND TYPE

CG	Chassis Grease	WB	Wheel Bearing Grease
EO	Engine Oil	TO	Transmission Oil
GL	Gear Lube	HF	Hydralizer Fluid
BF	Brake Fluid		

APPLICATION SCHEDULE

LUBE POINT	CODE	HOURS	LUBE POINT	CODE	HOURS
*Lift Chains (2)	EO	50	Cylinder Guides (2)	CG	50
*Drive Axle Breather	Clean	400	*Mast Shoes	CG	150
*Steering Gear (Manual)	GL	50	*Latch Dogs	CG	150
*Master Cylinder	BF	50	Mast Mounting (2)	CG	50
Fuel Pump Bowl & Screen	Clean	400	*Trans., Differential, Converter	TO	400
Drag Link (2)	CG	50	*Hydraulic Tank & Screen	TO	2000
*Crankcase Vent. Valve	Clean	150	*Hydraulic Tank Breather	Clean	400
*Distributor	EO	400	*Engine Oil	Check	8
*Air Cleaner (oil bath)	EO	50	Trans. Oil Filter	Change	400
*Radiator	Check	8	Engine Oil Filter	Change	150
Tie Rods (4)	CG	50	Battery	Check	50
Wheel Bearings	WB	1000	*Generator	EO	400
Hydralizer Bearings	WB	2000	*Hydralizers	HF	400
Steer Housing Bearings	WB	2000			

Fig. 1-9. Lubrication Chart (Part 1 of 2)

Brackets ( ) after a lubrication point indicates the number of similar points to be lubricated.

*See "LUBRICATION NOTES" on following page.

LUBRICATION NOTES

ENGINE OIL: Check the oil level every 8 hours of operation. Drain and refill the crankcase every 50 operating hours and change the filter every 150 operating hours under normal service. The crankcase capacity is 4 quarts; the filter holds an additional quart. Clean the crankcase breather every 100 hours.

Engine Oil Viscosity (Use high grade MS oil).

32^{0} F. and below - SAE 10W
32^{0} F. to 60^{0} F. - SAE 20W
60^{0} F. and above - SAE 30

AIR CLEANER (OIL BATH): Service air cleaner every 50 operating hours or oftener as required. Remove and empty oil cup; scrape out sediment, and wash thoroughly. Refill cup to mark with same oil as in engine.

AIR CLEANER (DRY STRAINER): Remove element and shake out accumulated dirt every 50 hours of operation. Renew element every 500 hours or oftener once extreme dust conditions. DO NOT WASH AND REUSE ELEMENT.

AIR CLEANER (DRY CYCLOPAC): Empty dust cup daily. Clean element by passing stream of air from inside to outside. DO NOT USE AIR PRESSURE EXCEEDING 100 PSI AT NOZZLE. Cleaning solutions are available for cleaning element. Follow manufacturers instructions when using. Replace element after 10 washings, or annually, or if ruptured.

STEERING GEAR (MANUAL): Check oil level every 50 operating hours. Keep reservoir filled with SAE 90 gear lube. Use a high grade straight mineral oil.

MASTER CYLINDER: Check fluid level every 50 operating hours. Keep reservoir filled to within 1/4" from top. Keep vent hole in filler cap open at all times. Use Mopar SPECIAL high temperature fluid (SAE 7093).

GENERATOR: Every 400 operating hours, add 8 to 10 drops SAE 10W engine oil to the reservoir oil cups.

DISTRIBUTOR: Each 400 hours place 3 or 4 drops SAE 10W oil in cup. Apply a trace of high quality ball bearing lubricant to breaker cam every 400 hours.

CRANKCASE VENT. VALVE: Remove and clean crankcase ventilator valve every 150 hours; replace every 400 hours. Reinstall with arrow pointing up.

HYDRAULIC OIL TANK: Check oil level every 50 hours. With the mast fully extended and not tilted, and the oil at operating temperature, the oil should be between the "F" and "L" marks on the dipstick. Drain and clean the tank and screen every 2000 operating hours. Use ATF Type A, Suffix A, Texaco 1888 or Mobilfluid 200 oil. Clean the breather every 400 hours.

RADIATOR: Check daily. Refill as required. Add permanent type anti-freeze when air temperature is 32^{0} F. or lower.

TRANSMISSION, DIFFERENTIAL, AND CONVERTER: Check oil level every 50 hours of operation. Check with engine idling, clutch disengaged, and oil at normal operating temperature. Maintain oil level between "F" and "L" marks on dipstick. Change oil and filter and clean screen in transmission every 400 operating hours. (Change filter and clean screen after first 40 hours.) Use ATF Type A, Suffix A Texaco 1888 or Mobilfluid 200 oil.

DRIVE AXLE BREATHER: Remove and clean breather every 400 hours; replace every 1000 hours.

LIFT CHAINS: Do not lubricate chains when operating under extremely dusty conditions.

MAST SHOES: Lubricate full length of rail where shoes run. Replace shoes at approximately 1500 hours.

LATCH LINKS: Disassemble and clean thoroughly every 300 operating hours.

HYDRALIZERS: Recharge hydralizers when distance from rear of frame to floor (when measured directly in front of steer wheels) varies from 4-1/4", plus 1/16", minus 1/4". Place lift truck on level floor with no load and recharge hydralizers as follows:

Jack up rear of lift truck, remove rear side panels, and remove the filler plugs from both hydralizers. Lower the lift truck to raise both wheels to their extreme height.

Pick a measuring point, preferably on the hydralizer piston. Raise the truck to lower the wheels 1-5/8 to 1-3/4 inches and hold in this position.

Fill both cylinders completely full with Mobil Delvac 5-220 DS oil and replace the filler plugs. Lower truck and loosen plugs to bleed all air out of cylinders. Tighten plugs when rear of frame is 4-1/4 ± 1/16" off the floor. (Measure frame height from floor directly in front of steer wheels.)

Approximately 1/3 quart of oil will be vented from the system. This will assure that there will be no air remaining in the system.

Fig. 1-9. Lubrication Chart (Part 2 of 2)

8-11. GENERATOR AND FAN BELT. Frequently inspect belt for proper tension; a loose or slipping belt will cause engine overheating and reduce generator charging rate and rpm of driven pulley. Check belt tension by pressing on belt midway between fan and crankshaft pulleys with a force of approximately 10 pounds. Proper belt deflection should be 5/8 inch. Adjust belt tension by loosening generator mounting bolts and adjusting bar cap screw, pull outwardly on generator until correct tension is applied, then tighten nuts and cap screw. DO NOT USE A PRY BAR TO PLACE TENSION ON BELT.

8-12. STARTING MOTOR. Service starting motor, brushes, and commutator in similar manner as generator.

a. If the starting motor drive pinion fails to engage the engine flywheel ring gear, it indicates a sticking or broken drive assembly.

b. Disconnect the negative cable from the battery and remove and tag all wires from the starting motor solenoid. Remove the bolts that secure the starting motor to the engine and withdraw the motor.

c. Clean the drive pinion and shaft with kerosene. Check the starter drive assembly for damage. If the drive assembly is faulty, tag the motor for repair, and install a new starting motor.

d. Clean the solenoid terminals and make proper connections of the wires. Reconnect the ground cable to the battery.

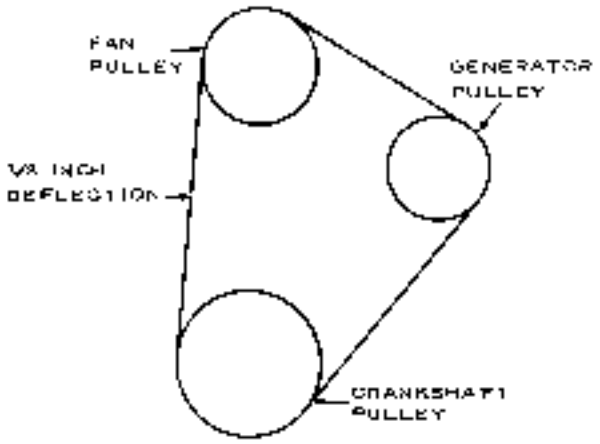


Fig. 1-10. Fan belt

3-13. DISTRIBUTOR. Every 250 hours of operation, clean the distributor cap inside and out, without removing the spark plug or coil wires. Inspect the cap for cracks or chips. Clean the rotor contact point. Examine the contact points and replace if burned or pitted. Adjust the point gap to .020 inch.

3-14. VALVE TAPPET CLEARANCE. Remove the valve chamber cover and check, and adjust if necessary, the tappets every 500 hours of operation. Adjust the tappets for both the intake and exhaust valves to .014 inch clearance. Operate the engine at idle speed and at normal operating temperature when adjusting the tappets.

Fig. 1-11. Adjusting tappets

3-15. SPARK PLUGS. Every 250 hours of operation, remove and clean the spark plugs. Clean the area around the plug ports before removing the plugs. Reset the spark plug gap to .035 inch. Use the same gap setting for both gasoline and LP gas engines. Tighten the plugs to 35 foot pounds torque when they are reinstalled.

3-16. CARBURETOR (GASOLINE). Inspect all linkages for rough edges, paint, or binding. Check all line connections for leaks. If the engine fails to start, or does not operate properly, make the following carburetor adjustments.

a. Screw in the idle adjusting needle (2, figure 1-12) until it just starts to seat. DO NOT USE FORCE. Then, open the needle two full turns.

b. Make certain the throttle stop screw (1, figure 1-12) is holding the throttle disc slightly open.

c. Start the engine and allow it to warm up at an idle speed of approximately 800 RPM. When the engine reaches normal operating temperature (approximately 180°), release the accelerator pedal and allow the engine to idle.

d. Adjust the throttle stop screw to obtain an engine idle speed of approximately 600 RPM.

e. Back out the idle adjusting needle until the engine speed drops from an over-lean gas mixture. Then, turn the screw in JUST FAR ENOUGH until the engine runs smoothly and steadily.

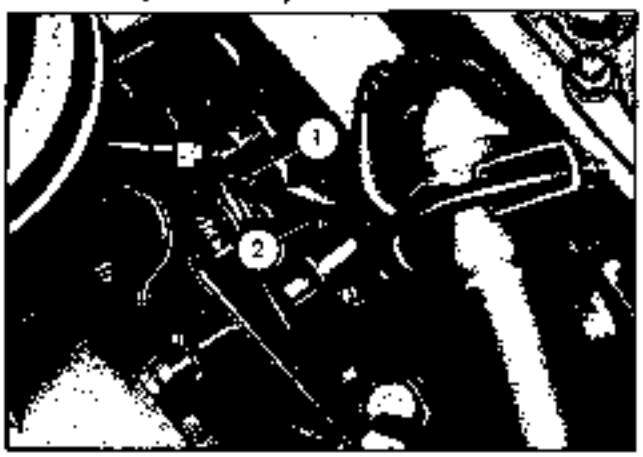


Fig. 1-12. Gasoline carburetor

1. Throttle stop screw
2. Idle adjusting needle

3-17. LP GAS CARBURETOR.

a. Adjust throttle stop screw (1, figure 1-13) so it just touches stop pin, then, turn in screw one additional turn to assure that throttle disc will be held slightly open. Accelerator pedal and linkage must be at absolute idle position when adjusting throttle stop screw.

b. Turn in idle adjusting screw (2, figure 1-13) until it just seats. Then back out screw three complete turns.

c. Turn in main load screw (3, figure 1-13) until it just seats. Then back out screw three complete turns.

d. Start the engine and run it until it reaches normal operating temperature. Check choke position to see that it is completely open.

e. Adjust the throttle stop screw to obtain an engine idle speed of 800 RPM.

f. Set the idle adjusting screw to obtain a smooth idle. If a vacuum gage is used, set idle adjusting screw to obtain peak intake manifold vacuum.

g. The main load screw should be adjusted with the engine under load. A simulated load can be placed on the engine by shorting out all spark plugs except the plug for No. 1 cylinder. Operate the engine at full throttle and turn in the main load screw a fraction of a turn at a time until the carburetor throttle is most nearly closed by the governor. For utmost economy, turn in the main load screw an additional 1/4 turn, and secure with the lock nut.

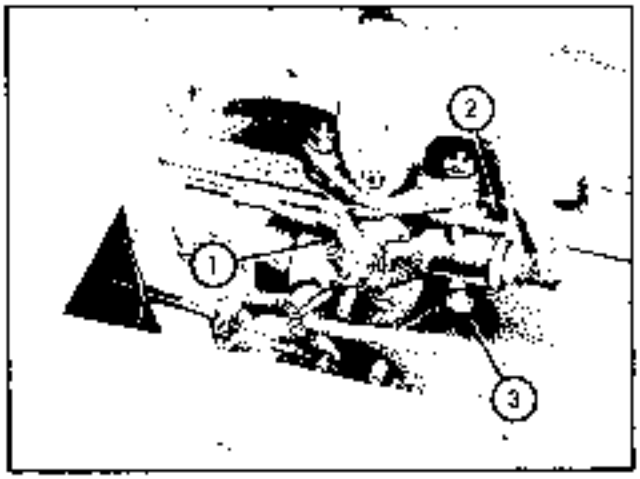


Fig. 1-13. LP Gas Carburetor

1. Throttle stop screw
2. Idle adjusting screw
3. Main load screw

h. See paragraphs 4-187 and 4-198 for instructions on adjusting vaporizer and regulator.

NOTE: FIG. 1-13 SHOWS THE AIR CLEANER REMOVED FOR ILLUSTRATIVE PURPOSES. KEEP THE AIR CLEANER INSTALLED.

3-12. GOVERNOR. To adjust the governed engine speed, proceed as follows:

a. Start the engine and allow it to warm up to operating temperature. While the engine is warming up, back out the surge adjusting screw (3, figure 1-14) so it will have no effect.

b. Back out the speed adjustment locking screw (2, figure 1-14) so it will not interfere with the speed adjustment.

c. Turn speed adjusting screw (1, figure 1-14) to provide a no-load speed of 2600 RPM. Tighten locking screw (2, figure 1-24) against stop to maintain this position.

d. If the governor surges, turn in the surge adjusting screw (3, figure 1-14) one turn at a time until the surge is eliminated. Do not turn the screw in far enough to increase the engine speed more than a few RPM, if any.

e. Be sure all lock nuts are tight to maintain the governor settings.

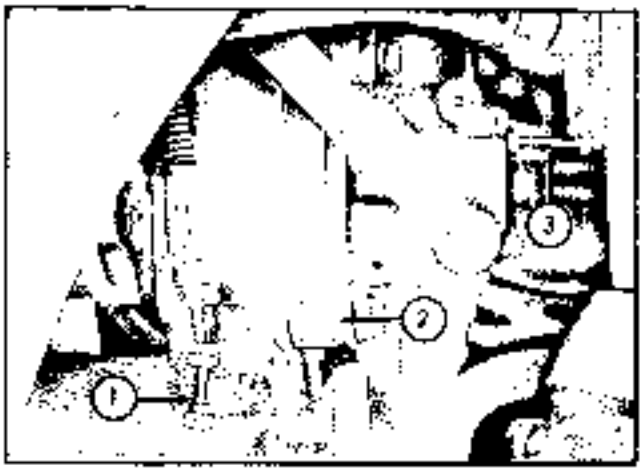


Fig. 1-14. Governor

1. Speed adjusting screw
2. Locking screw - speed adjustment
3. Surge adjusting screw

3-13. ENGINE TIMING.

a. Turn the engine over until the "TDC" mark on the flywheel is visible in the timing opening. Place a chalk or paint line on the "TDC" mark so it will be more legible under the timing light.

b. Attach the battery leads of the timing light to their respective terminals on the battery. Clip the secondary lead of the timing light to the No. 1 spark plug. Leave the spark plug wire on the plug.

c. Start the engine and run at an idle speed of 800 RPM or less, so the automatic advance of the distributor is completely retarded. THIS IS IMPORTANT TO OBTAIN CORRECT ENGINE TIMING!

d. Direct the timing light at the timing opening and note the position of the timing mark in relation to the pointer as the light flashes. The timing mark should line up with the pointer.

e. To advance the timing, turn the distributor body clockwise. To retard timing, turn distributor body counterclockwise.

f. When timing is correct, tighten the distributor clamp securely. Then, recheck the timing with the light.

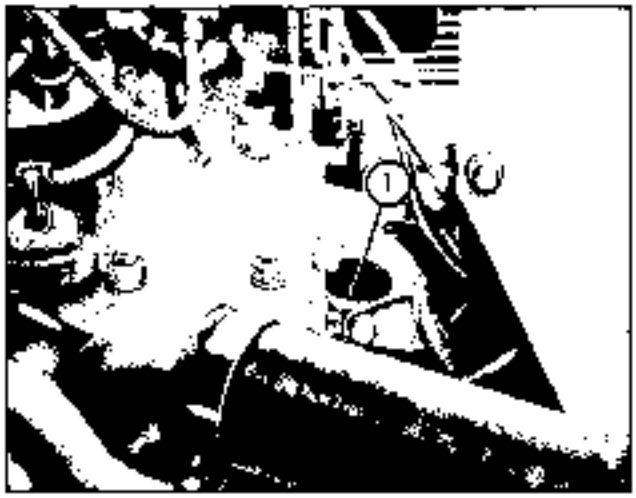


Fig. 2-15. Timing opening

1. Timing pointer

3-20. COOLING SYSTEM. The cooling system plays an important role in the life and efficiency of an internal combustion engine. Overheating not only causes the engine to knock and lose power, but also results in damage to bearings and other moving parts of the engine.

a. Overcooling, although less sudden in effect than overheating, may be equally dangerous to the engine. Low engine temperatures cause the formation of sludge which interferes with proper lubrication; it also creates harmful acids which attack engine parts.

WARNING

Be careful when removing radiator cap when engine is hot. Turn cap slowly to vent position and allow steam pressure to escape before removing.

b. A pressure-type cooling system raises the boiling point of the coolant and permits the engine to operate at higher temperatures without coolant loss. A pressure-type system will not function properly unless it is absolutely airtight; consequently, the system must be kept in good condition. Air in the system will also force coolant out of the overflow pipe, reduce the rate of heat transfer, and accelerate rusting within the system.

c. The cooling system has 2 drains -- the radiator drain, located at the lower side of the bottom tank; and a drain for the engine block (2, figure 1-16). Whenever the system is drained, it should be done at the end of a day's run when any foreign material is in suspension and will be removed with the coolant. To insure complete draining, open all drains and remove the radiator cap.

Fig. 1-16. Drain locations

1. Radiator drain
2. Block drain

d. The type of coolant used in the radiator (18, fig ure 2-9) depends on climatic conditions. If there is no danger of freezing, use a solution of clean, soft water and rust inhibitor; however, if the truck will be exposed to freezing temperatures, use a permanent type anti-freeze.

e. Avoid the use of water having a high mineral content or containing other impurities. Water containing minerals or other foreign material will form deposits throughout the cooling system. These deposits, in addition to restricting the proper flow of coolant, act as an insulator to prevent the effective transfer of heat. Clean rain water and a rust inhibitor is a good coolant solution.

f. If the danger of freezing exists, fill the cooling system with a permanent type anti-freeze solution. Follow the recommendation of the anti-freeze manufacturer to obtain a solution that will give the desired protection for the lowest anticipated temperature. After filling the radiator, run the engine until it reaches normal operating temperature and the thermostat opens. This will establish circulation through the radiator and engine blocks to insure proper mixing of the anti-freeze and water. If the solution is not thoroughly mixed, slush ice may form. Slush ice will stop circulation, causing overheating and subsequent loss of coolant. Another reason for running the engine is to release any air trapped in the engine water jacket by the closed thermostat. When the thermostat opens, the trapped air is released and the water passages fill with coolant. Eliminating trapped air lowers the coolant level of the radiator, and more water must be added to fill it to the proper level.

g. As mentioned previously, rust inhibitors should always be used in a radiator to protect it against corrosion. Most high-quality anti-freeze solutions are compounded with a rust inhibitor or corrosion deterrent. Do not add a rust inhibitor to these solutions as the chemical reaction may damage the system. Maintain full strength corrosion pro-

tection in the coolant system at all times. Corrosion inhibitors tend to lose their effectiveness with use, and we recommend draining the system and renewing the inhibitor every 6 months. In a system that was clean originally, the appearance of rust in the radiator, or in the solution, is an indication that the inhibitor is weakened or exhausted completely. Whenever the cooling system shows signs of rust, the coolant should be drained, the system flushed, and the radiator refilled with fresh coolant containing an inhibitor.

h. After the anti-freeze solution is drained in the spring, it is recommended that the cooling system be flushed thoroughly, cleaned if necessary, and a suitable rust inhibitor added to a summer filling of fresh water. In areas where anti-freeze is not required, add rust inhibitor to a fresh filling of water both spring and fall.

NOTE
Flush the system thoroughly before and after the use of anti-freeze solutions.

i. Efficient operation of the cooling system requires an occasional cleaning -- particularly at seasonal changes when anti-freeze solution is added or drained. The proper method of cleaning depends on the condition of the system. The exterior of the radiator should also be cleaned regularly. Dirt, insects, or other foreign material will clog the radiator fins and reduce cooling efficiency. Clean the fins with forced air or water. Straighten any bent fins noticed during the cleaning operation, but be careful not to injure the tubes or break the bond between the fins and tubes.

j. To check the thermostat, first clean it, and then suspend it in a container of clean water along with a thermometer. Heat the water and check the opening and closing temperatures. If the valve fails to open at 2° or more above the rated opening temperature (180°) or fails to close at 10° to 15° below this temperature, the thermostat should be replaced.

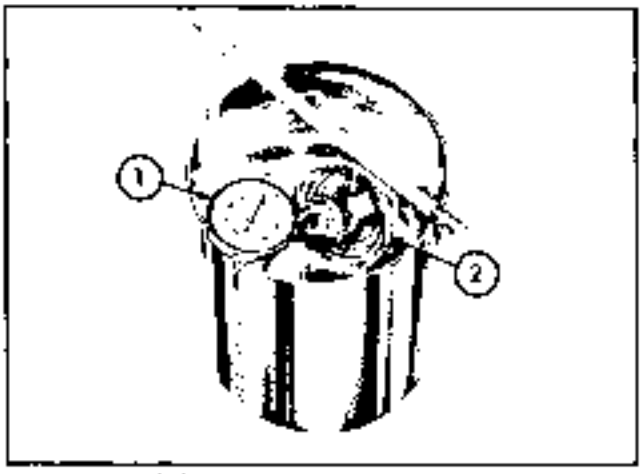


Fig. 1-17. Testing thermostat

1. Thermometer
2. Thermostat

k. When replacing thermostat in water outlet elbow, be sure thermostat seat and adapter counterbore are clean.

l. Assemble thermostat and adapter in housing as shown in Fig. 1-18, and install on engine, using new gasket.

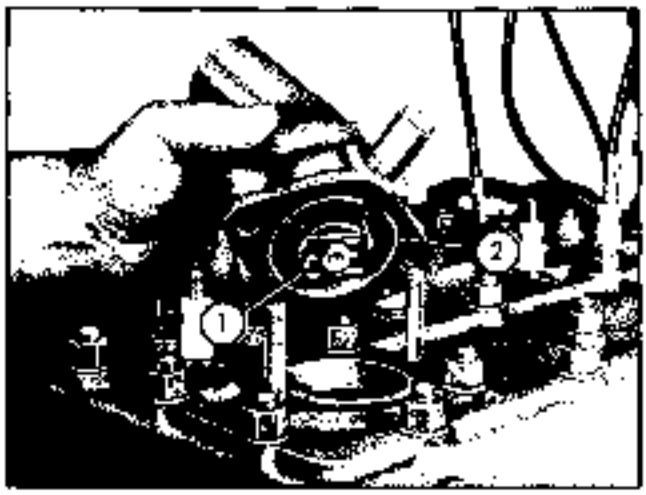


Fig. 1-18

2. Thermostat
2. Adapter

3-21. STORING THE LIFT TRUCK. If the lift truck is to be stored for an extended period of time, the following steps should be taken to prevent unnecessary deterioration and to insure top performance when the lift truck is returned to service.

a. Drain the crankcase, filter, and transmission. Install new filters, and refill the units with the specified grade of fresh oil.

b. Thoroughly lubricate the lift truck, and service the air cleaner and breathers according to the instructions given in this manual. Drive the lift truck for a short distance to distribute the fresh lubricants.

c. Drain and flush the cooling system. Leave the radiator and block drains open to prevent the collection of condensation.

d. Drain the gasoline tank, filter, and carburetor. Make certain the system is completely drained as any fuel remaining in the system will oxidize and form gummy deposits. Leave the shut-off valve and the carburetor drain open. Clean the fuel filter. If the truck has an LP-Gas system, close the fuel valve, remove the tank, and store it in a safety rack.

e. Remove the spark plugs and pour a liberal amount of engine oil into each cylinder. Turn the engine over several times to distribute a protective oil film on the pistons and cylinder walls.

f. Remove the battery and store it in a cool, dry place where it will not freeze. Keep the battery fully charged.

and maintain the proper electrolyte level. A run-down battery will deteriorate rapidly when stored. If the terminals and the top of the battery appear corroded, clean them with a stiff brush and a solution of baking soda and water. Make certain the vent holes in the filler caps are open.

g. Drain and flush the hydraulic system. Remove the strainer from the hydraulic tank and clean. Replace the screen and fill the tank to the specified level in accordance with the lubrication chart. Operate the hydraulic controls for several minutes to distribute the new fluid throughout the system. Contract the cylinders during storage.

h. Thoroughly clean the lift truck. Check for worn or damaged parts, and make any necessary repairs, replacements or adjustments. Touch up any areas where the paint has worn or rubbed off.

i. Store the lift truck in a dry building; however, if it cannot be stored inside, cover it with a tarpaulin.

3-22. TROUBLE SHOOTING. Trouble shooting can be applied to any part of the lift truck that is not functioning properly and follows the same pattern.

a. First, confirm the suspected condition before proceeding with any tests.

b. Next, determine and recognize the possible causes.

c. Finally isolate the cause (or causes) by performing a series of quick tests to eliminate the others.

d. A good rule to follow in locating trouble is to never make more than one adjustment at a time - then locate the trouble by a process of elimination.

e. Operators handling the same lift truck every day, soon develop a sense of impending trouble when abnormal operation occurs. Immediate attention to these danger signals can prevent major failures, insure dependable operation, and increase the life of the lift truck.

f. Some of the normal complaints encountered in routine operation, and their probable causes, are listed on the following pages.

TABLE 1

TROUBLE SHOOTING

A. STARTING MOTOR - WILL NOT CRANK ENGINE:

1. Weak or dead battery.
2. Poor ground connection.
3. Faulty starting switch or relay.
4. Defective starting motor.
5. Internal engine seizure - turn engine manually to determine cause.

B. ENGINE CRANKS - BUT DOES NOT START:

Disconnect one spark plug wire, turn ignition on with starter cranking engine and lay end of wire 1/8" from cylinder head - note spark.

1. NO SPARK:
   a. If ammeter shows no discharge it indicates an open primary circuit due to:
      1. Points not closing.
      2. Open primary wires.
      3. Defective ignition switch.
      4. Faulty coil.
   b. Normal ammeter reading (2.5 amps) this indicates that primary circuit is OK, trouble may be in secondary circuit due to:
      1. Broken or grounded high tension wire from coil to distributor.
      2. Wet high tension wires.
      3. Faulty distributor cap or rotor.
      4. Broken secondary winding of coil.
   c. Excessive ammeter reading (over 5 amps) indicates a "short" in the primary winding which may be due to:
      1. Shorted or grounded primary winding.
      2. Distributor or magneto points not opening.
      3. Grounded breaker point arm.
      4. Defective condenser.

2. WEAK SPARK - may be caused by:
   a. Loose ignition wiring connections.
   b. Burned or pitted distributor points.
   c. Wet spark plug wires.
   d. Defective condenser.
   e. Cracked distributor cap.
   f. Weak ignition coil.

3. GOOD SPARK AT EACH PLUG - indicates that ignition system is OK and trouble is in fuel system - which may be due to:
   a. No gas in carburetor - which may be due to:
      1. No gas in tank.
      2. Clogged filter or lines.
      3. Faulty fuel pump.
      4. Leaky fuel line from tank.
      5. Plugged vent in fuel tank cap.
   b. Gas in carburetor - which may be flooded due to:
      1. Too much choking - plugs are wet.
      2. Wrong float level.
      3. Choke not operating correctly.
      4. Water in gas.

C. ENGINE RUNS WITH CONTINUOUS MIS-FIRING: Due to:

1. Uneven compression.
2. Wet or deteriorated high tension wires.
3. Cracked distributor cap.
4. Faulty spark plugs - if spark plug porcelain is white when removed, use Colder plug - if light brown OK - if black or oily use Hotter plug.

D. ENGINE RUNS UNEVENLY

1. At idling speed - which may be due to:
   a. Too wide spark plug gaps.
   b. Poor carburetor idle adjustment.
   c. Wrong float level.
   d. Carburetor or intake manifold air leaks.
   e. Leaky cylinder head gasket.
2. At high speed - may be due to:
   a. Wide breaker points.
   b. Weak distributor breaker arm spring.
   c. Weak valve springs.
   d. Spark plug of wrong type or incorrect gap.

E. ENGINE RUNS IMPROPERLY

1. Back-firing into manifold - indicates too rich a fuel mixture: into carburetor indicates a too lean a mixture - may be due to:
   a. Late ignition timing.
   b. Clogged air cleaner.
   c. Fuel line restrictions.
   d. Clogged carburetor jets.
   e. Sticking valves.
   f. Weak or broken valve springs.
2. Excessive ping (detonation) results in damaged pistons and bearings and is caused by pre-ignition or using inferior grade of gas.
3. Engine idles too fast - indicates improper throttle adjustment or weak throttle return springs.
4. Engine dies when idling - which indicates incorrect speed or mixture adjustment; clogged idling circuit in carburetor or wrong choke adjustment, or air leaks in intake manifold.
5. Engine "Stumbles" on acceleration - which may be due to defective accelerator pump or air in fuel lines.
6. Defective spark plugs.

F. LACK OF POWER - which may be due to.
1. Poor compression.
2. Wrong timing.
3. Throttle control not opening fully.
4. Air leak in fuel system.
5. Restriction in air cleaner - should have vacuum less than 10" water.
6. Exhaust line obstruction - should have back pressure of not more than 20" water.
7. Poor fuel.
8. Piston rings sticking or worn.

G. POOR COMPRESSION - check with compression gage - if irregular, seal the piston with a teaspoonful of engine oil poured through the spark plug hole, and take a second reading; if pressure does not increase this will indicate that poor seating of valves are at fault. Poor compression may be due to:

1. Valves holding open - no tappet clearance.
2. Leaky cylinder head gasket.
3. Broken or weak valve springs.
4. Burned or sticking valves.
5. Badly worn, broken or stuck piston rings.
6. Wrong valve timing.

H. OVERHEATING

1. Lack of water in radiator.
2. Fan belts slipping.
3. Thermostat sticking or inoperative.
4. Radiator clogged or leaky.
5. Late ignition timing.
6. Back pressure in exhaust line.
7. Defective water pump.
8. Overloading of engine.

I. LOW OIL PRESSURE

1. Low oil level.
2. Oil pressure gauge or line faulty.
3. Oil too light - diluted.
4. Suction screen plugged.
5. Oil in relief valve or broken spring.
6. Worn bearings.
7. Worn or damaged oil pump gears.
8. Worn cam bushings.

J. HIGH OIL PRESSURE - should not exceed recommended pressure except when engine is starting up cold. Abnormally high oil pressure is not desirable because it increases oil consumption - possible causes of high oil pressures are:

1. Engine oil too heavy.
2. Stuck relief valve.
3. Obstruction in distributing line.
4. Faulty oil pressure gauge.

K. HIGH OIL CONSUMPTION

1. Oil leaks.
2. Too high oil level.
3. Incorrect grade of oil used.
4. Clogged crankcase breather.
5. Oil pressure too high - stuck relief valve.
6. Piston rings not run-in, due to too smooth cylinder bore finish or glazed condition.
7. Worn, broken or stuck piston rings and clogged oil control rings.
8. Worn pistons and sleeves.
9. Worn bearings.
10. Worn valve guides.

(Manifold may be removed for visual inspection.)

L. ENGINE KNOCKS AND OTHER NOISES

1. Operating knocks - which may be due to:
   a. Pre-ignition - most common cause is due to wrong type plugs which are too hot.
   b. Carbon - noticeable when engine is accelerated while hot - clean head and pistons.
   c. Timing - early timing causes knocks similar to carbon - but may tend to kick back when starting.
   d. Fuel - detonation knock caused by poor gas.
   e. Overloads - particularly at lower operating speeds.
2. Mechanical Knocks - result from wear, abuse or improper adjustments - which may be due to:
   a. Crankshaft and main bearings:
      1. Worn or burned-out main bearings - a heavy, dull knock when accelerating under load. Locate by shorting out plugs on both sides of the bad bearings.
      2. Crankshaft end-play - excessive end-play is indicated by intermittent knock which come and go when the load is released and engaged.
   b. Connecting rod bearings
      1. Worn or burned-out bearings - the worst condition, a light pound or metallic knock, is noted at idling and to about 3/8 maximum speed. Bad bearings can be determined by shorting out plugs.
   c. Pistons and wrist-pins
      1. Loose wrist pins - noise doubles when the correct plug is shorted out - most noticeable at idling speed.
      2. Piston loose in cylinder. - "Piston-Slap" is noted by metallic knocking at low speed under load; but disappears at high speed - also most noticeable when starting cold - test by shorting out plugs.
   d. Broken piston ring or pin - sharp clicking noise that won't short out.
   e. Valves
      1. Burned valves and seats - engine misses, especially at low speeds, or acceleration under load.
      2. Weak or broken valve springs - missing at low or high speeds when under load.
      3. Sticking valves - loss of power and popping sound when bad.
      4. Tappet noise - excessive clearances cause noise when cold - which diminishes at normal operating temperature.
   f. Camshaft - noise due to loose bearings or end play - usually occurs at half engine speed.
   g. Timing gear noise - loose or worn gears rattle or knock - tight gears hum.
3. Vibration originating at engine - the most common sources of vibration originating in or on the engine, as distinguished from causes created outside the engine are as follows:
   a. Misfiring
   b. Misalignment of engine

c. Bent or off-center coupling.
d. Engine loose on bed and type of mountings.
e. Out of balance condition of flywheel and clutch assembly.

M. SLIPPAGE IN DRIVE SYSTEM

1. Faulty clutch.
2. Faulty pump.
3. Low oil level.
4. Defective torque converter.

N. LIFT TRUCK OPERATES IN ONE DIRECTION BUT NOT IN THE OTHER

1. Defective clutch.

O. DRIVE SYSTEM NOISY

1. Low oil level.
2. Worn or broken gear or shaft.

P. SYSTEM WILL NOT LIFT, LIFTS TOO SLOWLY, OR STICKS WHEN LOWERING

1. Leaks in system.
2. Defective control valve.
3. Defective hydraulic pump.
4. Defective lift cylinder.
5. Dirty plunger assembly.
6. Low hydraulic pressure.

Q. LOW HYDRAULIC PRESSURE

1. Defective pump.
2. Leaks in system.
3. Defective valve.

R. EXCESSIVE HYDRAULIC PRESSURE

1. Defective valve.

S. SYSTEM LIFTS, BUT WILL NOT LOWER LOAD

1. Defective valve.

T. EXCESSIVE NOISE OR HAMMERING

1. Defective pump.
2. Air in system.

U. SERVICE BRAKES NOT EFFECTIVE

1. Worn brake lining.
2. Insufficient brake fluid.
3. Broken or loose line.
4. Faulty brake cylinder.

V. SPONGY BRAKE ACTION

1. Air in system.

W. BRAKES GRAB

1. Dirt in brake drum.
2. Defective lining.
3. Scored brake drum.
4. Brake fluid on lining.

CHAPTER 4

OVERHAUL (SHOP MAINTENANCE)

Section I. General

4-1. GENERAL.

4-2. This chapter consists of instructions relating to the removal, disassembly, repair and reassembly of the components of the truck.

4-3. The overhaul procedures for the engine are contained in Section III.

4-4. No special tools are required to overhaul the equipment. Tools and testing devices required are those commonly employed at a shop having overhaul facilities. Assuming that only skilled automotive mechanics will perform the procedures described in this manual, obvious and elementary instructions have been purposely omitted.

4-5. An attempt has been made, whenever possible to treat the assemblies in their logical order of accessibility sequence. For complete disassembly, refer to the Table of Contents, locate the assembly desired, and note its page number. Repeat for each assembly.

4-6. Unless otherwise indicated, all bolts should be torqued to the following values:

5/16 inch	10-15 ft. lbs.
3/8 inch	20-25 ft. lbs.
7/16 inch	33-39 ft. lbs.
1/2 inch	53-68 ft. lbs.
9/16 inch	75-85 ft. lbs.
5/8 inch	105-115 ft. lbs.
3/4 inch	180-220 ft. lbs.

Section II. Removal, Disassembly, Repair and Reassembly

4-7. BATTERY, CLAMP, AND CABLES. (See figure 2-12 or 2-12A).

4-8. REMOVAL AND DISASSEMBLY.

a. Raise hood and prop it open with overcenter hinge.

b. Remove cables and hold down (2). Remove battery from box. Remove box (1).

4-9. REPAIR.

a. Clean battery and other parts with stiff brush and baking soda and water solution. When foaming stops, flush battery with clean water. Use care not to get solution into vent holes.

b. Inspect and test battery. Inspect cables and other parts. Replace battery if damaged, or if test indicates poor condition. Replace all damaged or corroded parts.

4-10. REASSEMBLY. Reassembly is accomplished in reverse order of disassembly.

4-11. FUEL PUMP, FUEL LINES, AND FILTER. (See figure 2-6).

4-12. REMOVAL.

a. Close the shut-off valve at the tank. Disconnect the fuel lines and remove pump (1). Remove fuel filler assembly and tank unit from tank.

4-13. DISASSEMBLY. (See figure 2-6).

a. Loosen bail nut (13) and remove bowl (10), gasket (11), and screen (12).

b. Remove cover (5). Remove screw and retainer (16). Remove valve and cage assemblies (14) and gaskets (15).

c. Remove diaphragm (2) and spring (3).

d. Remove washer (8), pin (7), rocker arm (6), and spring (9).

4-14. REPAIR.

a. Clean all parts thoroughly and examine carefully. Look especially for worn linkage and worn valves and seats.

b. If diaphragm (2) is stiff or brittle, it should be replaced, even if it is not punctured.

c. To test pump, install gage between pump and carburetor. Pressure should be 3-1/2 to 3-1/4 PSI at 1800 RPM.

4-15. REASSEMBLY. (See figure 2-6).

a. Reassemble in reverse order of disassembly. Use new gaskets.

b. When fuel pump is attached to engine, care must be taken that rocker arm (6) is not installed under cam.

4-16. WATER PUMP.

4-17. REMOVAL. (See figure 2-9).

a. Drain radiator and remove hoses from pump. Disconnect hose (16) from nipple (9) in pump (6).

b. Remove fan (22) by removing four cap screws.

c. Loosen generator enough so fan belt can be slacked off enough to slide over pulley on hub (12).

d. Remove nuts and lock washers holding pump body to block and remove pump assembly.

4-18. DISASSEMBLY. (See figure 2-9). Disassembly must be in the following sequence in order to prevent damage to the pump.

a. Remove hub (12) from shaft.

b. Remove countersunk screws (1), holding cover (2), and remove cover and gasket (3).

c. Use puller to remove impeller (4), taking precautions to prevent damage to the casting.

d. Remove seal (5) and water shedder (6).

e. Remove lock ring (11) holding bearing and shaft assembly in body, after which shaft (10) can be forced OUT THROUGH THE FRONT with an arbor press or lead hammer.

CAUTION: DO NOT ATTEMPT TO DRIVE THE SHAFT OUT THROUGH THE REAR OF THE HOUSING. TO DO SO WOULD DAMAGE THE HOUSING BEYOND REPAIR.

4-19. REPAIR.

a. Replace all worn or failed parts.

b. Seal contact surface must be smooth and flat. If bushing is slightly worn or grooved, it may be refaced and polished for further use. If it is excessively worn or grooved, it should be replaced.

4-20. REASSEMBLY. (See figure 2-9). Reassemble in reverse order of disassembly.

a. A light film of lubricant applied to the face of the seal will facilitate serving and sealing.

b. Use thick soapsuds on both seal and shaft when assembling. In order to prevent damage to the seal.

c. Use a new gasket when mounting the pump on the engine.

d. Torque the mounting bolts to 25 to 30 ft-lbs.

e. Install the belt and adjust tension to have 1/2 inch deflection on the long side. Do not use a bar to pull out the generator, this could cause damage to bearings.

4-21. HORN BUTTON. (See figure 2-21).

4-22. REMOVAL. (See figure 2-21). Removal and disassembly are accomplished at the same time as follows:

a. Disconnect battery ground wire. Disconnect horn button wire or horn relay.

b. Remove cover (36) and button (35). Remove nut (38), spring (40), and cap (41). Remove screws (39) and lift out plate (37).

c. Remove brushes (42), spring (44), and sleeve (46).

4-23. DISASSEMBLY. Disassembly has been accomplished with completion of removal steps.

4-24. REPAIR.

a. Clean and inspect parts. Check wire and insulating grommet (25). Replace damaged or worn parts. Check compression of spring (40). Spring must prevent contact unless button is pressed.

4-25. REASSEMBLY. (See figure 2-21). Reassemble in reverse order of disassembly.

4-26. STEERING GEAR (HYDRAULIC).

4-27. REMOVAL. (See figure 2-21).

a. Turn steel wheels to straight-ahead position. Disconnect accelerator pedal linkage and remove the floor plate.

b. Disconnect horn wire, and hydraulic tubing from steering gear housing. Disconnect drag link from steering arm.

c. Remove clamp (22, figure 2-20), and shift lever clamps. Remove bolts holding gear housing to frame and lift out entire assembly.

4-28. DISASSEMBLY.

a. Drain out as much hydraulic oil as possible. Turn steering wheel back and forth several times to assist draining.

b. Mark worm and coupling flange (20) so they can be reinstalled in the same position. Remove flange from stub shaft.

c. Loosen adjuster plug lock nut (16). Remove adjuster plug assembly (14) with a spanner. Remove the retainer, spacer, thrust bearing, and the races.

d. Remove valve assembly (10) by grasping the stub shaft and pulling the assembly out of the housing.

NOTE

The valve parts are selectively fitted and hydraulically balanced. None of the valve parts (10) are serviced individually except for the seal rings (30), which are included in a service kit (35P941) and the valve spool spring (11). Do not disassemble the valve. If replacement of any part (other than 30 and 11) is necessary, replace the entire valve assembly.

e. Rotate end plug retainer ring at base end of housing until one end is over hole in housing. Insert punch through hole to spring ring enough to allow removal of ring. Turn shaft to force plug (13) out of housing.

f. Pull out plug (9) with channel-lock pliers. Remove assembly (7) from housing, being extremely careful that steel

balls do not fall out.

g. Remove snap ring and seals (30) and cover (17). Tap cross shaft out of housing.

4-29. REPAIR. (See figure 2-21).

a. Discard all seals which show signs of leakage.

b. Discard needle bearings, thrust bearings, shafts, gears, etc., which show excessive wear. Worm and rack (5) must be replaced as a matched assembly.

c. Clean all parts in a solvent. Make sure all the parts are clean.

d. Be sure that openings in guide (7) are not damaged, so balls can enter and leave freely.

4-30. REASSEMBLY. (See figure 2-21).

a. Reassemble in reverse order of disassembly, lining up all marks, so parts are installed in same relative position.

b. Tighten adjuster plug up snug, then back off 1/8 turn and measure valve assembly drag. Adjust thrust bearing so that pre-load is 2 to 3 inch-pounds in excess of valve assembly drag. Tighten lock nut. Total drag bearing adjustment and seal drag not to exceed 6 inch-pounds.

c. Selective fit worm, rack, and balls to give a pre-load of 1-1/2 to 4-1/2 inch-pounds measured on center of worm. Pre-load is altered by using smaller or larger balls.

d. With gear on center, adjust pitman shaft thrust screw so that pre-load is 4 to 8 inch-pounds in excess of total pre-load and drag. Readings are to be made through arc not exceeding 30 degrees, with gear at center. Tighten lock nut. Total over-center load not to exceed 10 inch-pounds.

e. Torque bolts and screws as follows:

Adjuster plug lock nut	50-85 foot-pounds
Flange assembly pinch bolt	20-25 foot-pounds
Lash adjuster nut	25-35 foot-pounds
Side cover bolts (3/8-16)	30-35 foot-pounds
Return guide clamp screws (1/4-28)	9-12 foot-pounds

f. If air becomes trapped in the system due to the disassembly, this air must be bled out. Fill the hydraulic reservoir to the proper level. Start the engine and turn the steering wheel through its full travel two or three times, to allow the air to escape. Check the hydraulic oil level again and replenish as necessary.

NOTE

If air becomes trapped in the system, the pump may be noisy until the air clears up. This may take some time, since air trapped in oil does not bleed out rapidly.

g. To reset the steering after the mechanism has been completely disassembled, position the steer wheels in the straight-ahead position. Position the steering arm (31) at the center of its travel. Adjust the length of drag link to fit between steering arm and hole in steering housing (33, figure 2-19). Adjust tie rods and drag link to allow 83 degree angle of inside wheel to frame.

NOTE

Do not turn the wheels under hydraulic power to their limit until the steering stops have been installed.

h. Power steering relief pressure is to be 1106 PSI, plus or minus 06 PSI. See paragraph 4-125.

4-31. STEERING GEAR (MANUAL).

4-32. REMOVAL. (See figure 2-20.)

a. Turn steer wheels to straight ahead position. Disconnect accelerator pedal linkage and remove floor plate.

b. Disconnect horn wire. Detach drag link from steering arm.

c. Remove shift lever clamps, steering column clamp (20, figure 2-25), and bolts which hold gear housing to frame. Lift assembly out of truck.

4-33. DISASSEMBLY. (See figure 2-20.)

a. Remove horn button components as described in paragraph 4-22. Remove steering wheel.

b. Mark steering arm (24) and sector shaft (17) so they can be reassembled in same position. Remove nut (19) and pull arm off sector shaft.

c. Loosen nut (23) on lash adjusting screw (22) and turn screw sufficiently to remove load from wormshaft bearings.

d. Loosen lock nut (16) and unscrew worm bearing adjuster (15) a few turns.

e. Remove three cap screws which secure cover (20) to housing. Allow lubricant to drain.

f. Pull side cover (20) from housing, withdrawing sector and shaft assembly at the same time. Turn wormshaft as necessary to allow sector to pass through opening in housing. Remove packing (18) from housing.

g. Remove worm bearing adjuster (15), lock nut (16), together with bearing components (8, 9, and 10) from housing.

CAUTION: TO AVOID DAMAGING THE ENDS OF THE BALL GUIDES (12) DURING DISASSEMBLY, DO NOT ALLOW THE BALL BLOCK (14) TO ROTATE TO THE END OF THE WORM.

h. Carefully withdraw wormshaft (4) and ball block assembly from housing.

i. Recommended procedure is not to disassemble ball block assembly if there is no indication of binding or tight fit when block is rotated on worm shaft.

j. To disassemble ball block, remove clamp (13) and withdraw ball guides (12) from block. Turn block upside down and rotate wormshaft until all balls have dropped out. Pull block off wormshaft.

4-34. REPAIR.

a. Wash all parts in solvent and dry thoroughly.

b. Carefully examine all parts for excessive wear or damage.

c. Check ball guides for damage at ends. Replace if damaged.

d. Discard seals and gaskets which show signs of leakage.

4-35. REASSEMBLY. (See figure 2-20) Reassemble in reverse order of disassembly.

a. Assemble ball block and wormshaft by placing block on shaft with ball guide holes up. Assemble 20 balls into each ball circuit. Be sure each circuit is completely full.

b. Reinstall wormshaft and ball block assembly, being sure grooves in block are properly positioned to engage sector. Turn wormshaft to place ball block in center of worm. Reinstall bearing adjuster and lock nut.

c. Check end clearance of lash adjusting screw (22) in sector shaft (17). Use shims (S3P560 kit) as necessary to obtain an end clearance no greater than .002" between screw head and shaft.

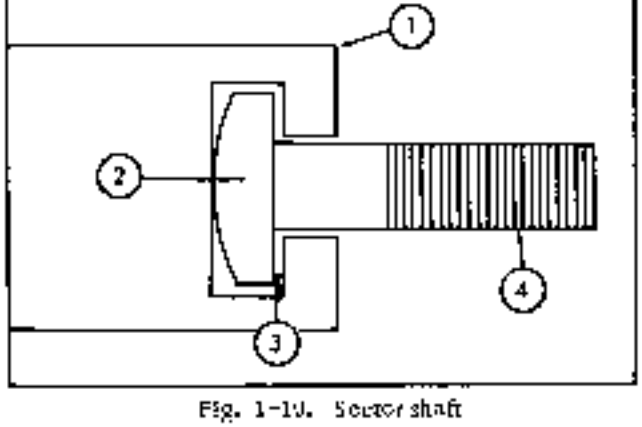


Fig. 1-10. Sector shaft

1. Sector shaft
2. .002" maximum clearance
3. Use shims here
4. Lash adjuster screw

d. Draw sector shaft into cover with lash adjusting screw. Slide sector shaft and cover into housing, being sure center tooth of sector engages center groove in ball block. Tighten bolts in side cover to 25 - 35 foot pounds.

e. Tighten bearing adjuster to remove all end play from wormshaft. Tighten lock nut to 75 - 100 foot pounds.

f. Reinstall steering wheel and tighten wheel attaching nut to 35 - 40 foot pounds.

g. Turn steering wheel to determine center of wheel travel. Hold wheel in centered position and remove all lash between sector and worm nut. Tighten adjuster lock nut to 18 - 27 foot pounds.

h. Check pull required to rotate steering wheel through center position. Pull required should be from 1 to 2 pounds. Readjust bearing adjuster and lash adjuster screw to obtain proper pull.

i. Reinstall steering arm on sector shaft. Refill gear housing with lubricant and reinstall assembly in truck.

j. To reset steering mechanism after it has been completely disassembled, first be sure steer wheels are in straight-ahead position. Position steering arm (24) at center of travel. Adjust length of drag link so socket (47, figure 2-19) will fit freely in hole in steering housing (30, figure 2-19). Adjust tie rods and steering stop bolts (figure 1-22) to allow an 83 degree angle of inside wheel to frame (inside wheel in relation to direction of turn).

4-36. HYDRAULICS, STEERING WHEELS, AND LINKAGE.

4-37. REMOVAL. (See figure 2-19).

a. Remove the counterweight. (See figure 1-60).

b. Jack up rear of lift truck. Remove hub cap (6). Remove nuts, and remove wheel and bearings.

c. Disconnect tie rod sockets (30) from steering forks (1 and 2). Remove dust cover (32).

d. Remove connecting tube (29) between cylinders (13 and 14). Remove side panels (16, 17, figure 2-25).

e. Remove four bolts holding each assembly to frame and remove cylinder and fork assembly.

4-38. DISASSEMBLY. (See figure 2-19).

a. Straighten edges of retaining ring (17) and remove retainer (16). Pull piston and fork out of cylinder (13).

b. Remove piston head (27) by using three 3/8" pusher bolts; turn them in evenly and gradually. Remove nut (6) from fork spindle and remove piston assembly (items 19 through 28).

c. Remove cap (41) and nut (36). Remove steering housing (37) with bearings.

4-39. REPAIR.

a. Examine all bearings and seals carefully. Discard any that are unserviceable.

b. If dust seals (32 and 46) are brittle or damaged, replace them with new.

c. Examine the inside cylinder walls carefully for pits or grooves; smooth any roughness with emery paper. If the walls are grooved so deeply that they will not clean up easily, use a new cylinder.

4-40. REASSEMBLY. (See figure 2-19.) Reassemble in reverse order of disassembly. Tighten cylinder mounting bolts to 210 ft.-lbs. Apply coat of clean oil to piston, cylinder wall, and seals at assembly.

a. Tighten elastic nut (3) to apply preload to bearings (22 and 24) to obtain a rolling torque of 30 to 40 inch pounds on piston (16). Wrap a string around piston, attach a spring scale and tighten nut to obtain a scale reading of 14 to 19 pounds. (Since radius of piston is 2.249 to 2.251 inches, a pull of 14 to 18 pounds is equivalent to a rolling torque of 32 to 40 inch pounds.

b. With piston (16) and related components reinstalled in cylinder, engage tangs of lock ring (17) in notches in ring (18). Tighten retaining ring securely and bend back edge of lock ring up against cylinder. Bend front edge down to avoid interference with frame.

c. Tighten the castellated nut (36) on steering spindle to snug up bearings (27 and 29) so there is no end play.

d. Tighten castellated nut on axle spindle to snug up bearings (9 and 11) until there is a slight amount of bearing drag, then back the nut off one notch and secure with the cotter key.

e. Recharge hydralizers as follows: Place lift truck on level floor with no load. Jack up rear of truck, remove rear side panels, and remove filler plugs from both hydralizers. Fig. 1-20. Lower lift truck to raise both wheels to their extreme height.

f. Pick a measuring point, preferably on hydralizer piston. Raise truck to lower wheels 1-3/8 to 1-3/4" and hold in this position.

g. Fill both cylinders completely full with Mobil Delvac 5-220 DS oil and replace the filler plugs.

h. Lower truck and loosen plugs to bleed all air out of cylinders. Tighten plugs when rear of frame is 4-1/4 ± 1/16" off the floor. (Measure frame height from floor directly in front of steer wheels.)

i. Approximately 1/3 quart of oil will be vented from the system. This will assure that there will be no air remaining in the system.

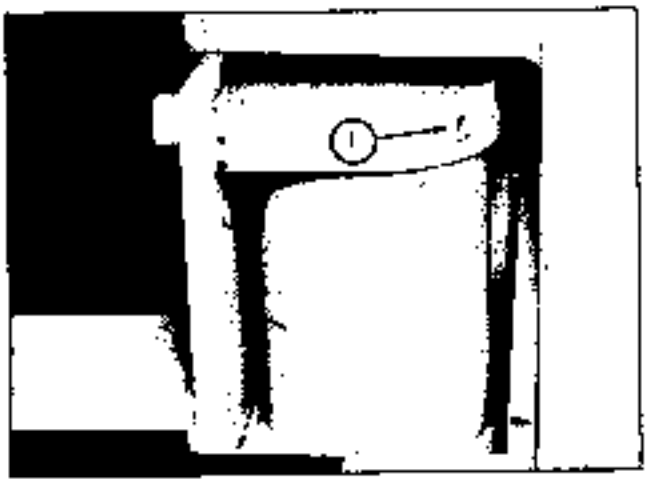


Fig. 1-20. Hydralizer

1. Filler plug

j. Truck must be on level surface to set steering. Disconnect drag link and tie rods. Set steering housing (35) so center of housing is parallel with truck (NO TOE-IN). Connect tie rods and secure. (Note: They should be close to the same length.) Tie rod clamps must be positioned to avoid interference with steering forks.

k. Center steering wheel and connect drag link. Adjust drag link length to allow full turn in both directions.

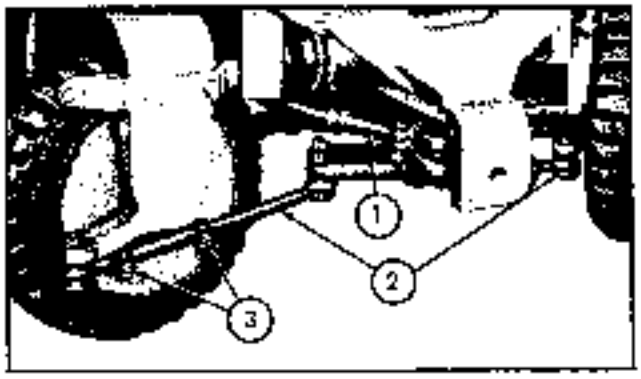


Fig. 1-21. Steer wheel adjustment

1. Drag link
2. Tie rods
3. Clamps

l. Turn wheels to extreme in both directions and adjust stop bolts (against both stops) to allow 63° angle of inner steer wheel with frame (inner wheel in relation to direction of turn). STOPS MUST BE ADJUSTED SO STEERING GEAR DOES NOT BOTTOM IN EITHER DIRECTION.

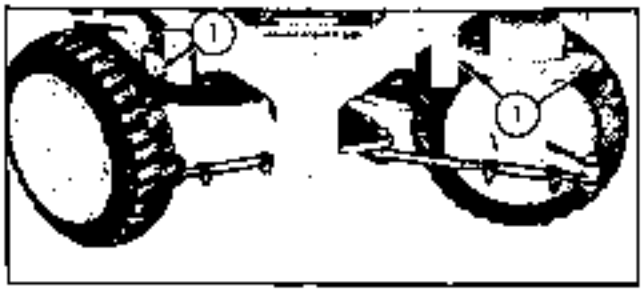


Fig. 1-42. Steering stops

1. Stops

4-41. HEAD AND REAR LAMPS (OPTIONAL). (See figure 2-12A).

4-42. REMOVAL.

a. Disconnect battery ground wire.

b. Disconnect lead wires to lamps and remove lamps.

4-43. DISASSEMBLY. (See figure 2-12A).

a. Remove retainer (13). Pull sealed beam unit (12) out of shell.

b. Remove lens retainer (23) and remove lens (24).

4-44. REPAIR. Inspect and replace all defective parts.

4-45. REASSEMBLY. (See figure 2-12A). Reassemble in reverse order of disassembly.

4-46. INSTRUMENT PANEL AND INSTRUMENTS.

4-47. REMOVAL. (See figure 2-13).

a. Remove clips holding panel to steering column support, and shift lever clamps.

b. Disconnect battery ground cable. Disconnect controls for transmission valve.

c. Remove bolts holding panel (1) to cowl assembly. Lift out panel assembly.

d. Disconnect and tag wires from instruments.

4-48. DISASSEMBLY. (See figure 2-13). Disassembly is complete upon removing switches and gages from the panel, and removing the sending units.

4-49. Repair is limited to checking condition and performance of switches, gages, sending units, and components. Inspect wiring for broken connections, corrosion, and damaged insulation. Discard all unserviceable parts and replace with new parts.

4-50. REASSEMBLY. Reassemble in reverse order of disassembly.

4-51. RADIATOR, HOSES, AND THERMOSTAT.

4-52. REMOVAL. (See figure 2-9).

a. Remove counterweight. (See figure 1-53).

b. Remove radiator cap and open radiator and block drains.

c. Remove upper and lower hoses (20 and 21).

d. Remove bolts (31) holding radiator to frame and carefully lift out radiator.

e. Remove thermostat housing (26), thermostat (24), and adaptor (25).

4-53. DISASSEMBLY. Disassembly is complete upon removal of components from truck.

4-54. REPAIR. Inspect radiator and hoses. Test the thermostat as outlined in Chapter 3. Discard unserviceable parts. Repair minor ruptures in radiator, discard if damage is excessive.

4-55. REASSEMBLY. (See figure 2-9).

a. Reassemble in reverse order of disassembly. Tighten radiator mounting bolts (31) to obtain a dimension of 11/32", plus or minus 1/32", between inside edges of radiator mounting flange and frame bracket. This will just slightly compress radiator mounting pads (30) to provide cushion mount for radiator.

b. Close radiator and block drains. Refill cooling system and check for leaks.

4-56. MUFFLER.

4-57. REMOVAL AND DISASSEMBLY. (See figure 2-4).

a. Remove counterweight. (See figure 1-64).

b. Remove clamps (2 and 4) and remove muffler (1) and exhaust pipe (3).

4-58. REPAIR. Inspect and discard any parts that show excessive rust or deterioration. Muffler restriction should not exceed 20" water or 1-1/2" mercury.

4-59. REASSEMBLY. Reassemble in reverse order of disassembly. Align pipe (3) so it does not contact other parts of the lift truck.

4-60. GENERATOR. Field service of the generator is limited to maintenance procedures which include replacing worn brushes, bearings, and cleaning the commutator.

4-61. REMOVAL.

a. Disconnect ground cable from battery. Disconnect and tag wires from field and armature terminals on generator.

b. Remove cap screw from belt tightener bar, push generator toward engine, and slip belt out of pulley.

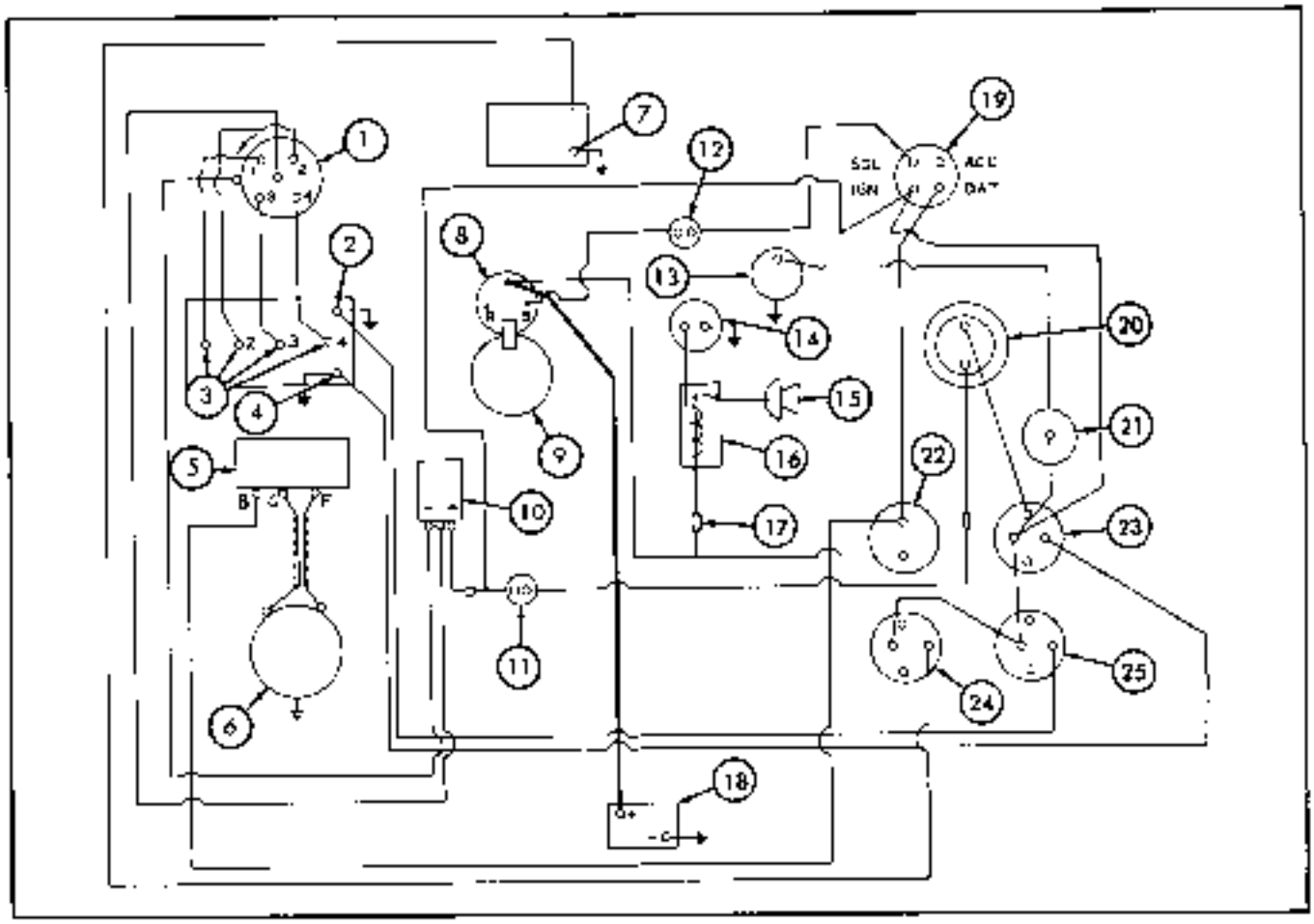


Fig. T-23. Wiring Diagram

1. Distributor
2. Water temp. sending unit
3. Spark plugs
4. Oil pressure sending unit
5. Voltage regulator
6. Generator
7. Fuel tank unit
8. Solenoid
9. Starter
10. Coil
11. Pressure switch
12. Neutral starting switch
13. Transmission oil temp. sending unit
14. Horn buzzer
15. Horn
16. Horn relay
17. Fuse (15 amp.)
18. Battery
19. Ignition-starter switch
20. Hourmeter
21. Transmission oil temp. warning light
22. Ammeter
23. Oil gage
24. Fuel gage
25. Temperature gage

c. Remove two generator mounting bolts and lift generator up and away from engine.

4-62. DISASSEMBLY.

a. Disassembly of the generator should be accomplished only as far as necessary to make repair or replacement of defective parts.

b. Remove the thru bolts and lockwashers. Tap off the commutator end cover to gain access to the brushes, holders, arms and springs.

c. Tap drive end frame to loosen and carefully withdraw frame and armature assembly from field frame.

d. To remove ball bearing in drive end cover, remove pulley, fan, and Woodruff Key, and pull end frame off armature shaft. Remove thru screws which secure bearing retainer plate to frame. Remove bearing and other components.

e. Remove screws which secure brush leads to supports, and remove brushes.

4-63. REPAIR. Major overhaul of the generator should be performed by an authorized electrical equipment service station which has the facilities for properly overhauling and testing the generator.

a. Clean all parts in an approved solvent. Do not soak

field frame or armature in solvent. Clean brush holders, brush arms, and inside of field frame with a cloth dampened with solvent. Dry all parts thoroughly with clean, dry compressed air.

b. Check condition of ball bearing, and bushing in commutator end cover. The entire commutator end cover must be replaced if the bushing is worn or damaged.

c. Clean the commutator portion of the armature, using a strip of No. 00 flintpaper, or a brush seating stone. Do not use emery cloth to clean the commutator. Remove dirt and grit from between commutator riser bars, being careful not to scratch the bars or mica.

4-64. REASSEMBLY.

a. Install new brushes in the holders, attaching the brush leads to the supports. After the armature is installed, check the tension of the brush springs to be sure they have sufficient tension to hold the brushes tight against the commutator.

b. Reassemble the roller bearing and components to the drive end cover. Slip armature shaft through bearing and cover, and reinstall fan and drive pulley.

c. Carefully install armature through field frame, being careful not to damage brushes. Check brush spring tension with armature in place.

d. Reinstall commutator end cover, securing both end covers with thru bolts.

e. Install generator on engine, install drive belt and adjust to proper tension. Reconnect battery ground cable.

f. Before reconnecting voltage regulator-to-generator wires, polarize generator by momentarily connecting a jumper wire between the "F" terminals on the regulator and the "A" terminal on the generator.

g. Reconnect the armature and field wires to their proper terminals on the generator.

h. Start the engine, operate at fast idle, and check generator output on ammeter. Generator output will depend on condition of battery and voltage regulator.

i. If the ammeter needle indicates to the minus (discharge) side of the gage, the generator should be removed and replaced with a new one. Don't forget to polarize a new generator to the electrical system.

j. It is recommended automotive practice to replace the voltage regulator any time a new generator is installed.

4-65. GENERATOR VOLTAGE REGULATOR

4-66. REMOVAL. Disconnect ground cable from battery. Disconnect and tag wires from regulator terminals. Remove regulator from bracket.

4-67. DISASSEMBLY.

a. Remove regulator cover and gasket.

4-68. REPAIR. Field repair of the voltage regulator is limited to cleaning contact points and adjusting point gap.

a. Use a spoon or riffler file to clean the contact points. File points very lightly. Do not use emery cloth or sandpaper to clean the points. If the contact points are badly burned or otherwise damaged, replace the regulator with a new one.

CAUTION: DO NOT CLOSE CUTOUT RELAY POINTS BY HAND WITH THE BATTERY CONNECTED. DOING SO WOULD PLACE A HIGH CURRENT THROUGH RELAY UNITS AND CAUSE SERIOUS DAMAGE.

b. Adjust air gap of voltage regulator and current regulator to .070 inch. Press down on armature arm and adjust air gap by means of the adjusting screws.

c. Adjust air gap of cutout relay to .020 inch. Press down on armature arm until points just close, then raise or lower arm as required by loosening screws in back of relay. Adjust relay point opening to .020 inch by bending upper armature stop.

d. Generator Regulator Settings:

Cutout Relay closing voltage -- 12.6 to 13.5 volts
Voltage Regulator closing voltage -- 13.8 to 14.8 volts
Current regulator setting -- 23 to 27 amps.

e. If regulator adjustments cannot be accomplished to obtain satisfactory performance, discard regulator and replace with a new one.

4-69. REASSEMBLY.

a. Reinstall cover and gasket.

b. Reinstall regulator and reconnect wires. Polarize generator before starting the engine by momentarily connecting a jumper wire between "GEN" and "BAT" terminals on regulator. Failure to polarize the generator may result in serious damage to components of the electrical system.

4-70. STARTING MOTOR. Field service of the starting motor is limited to maintenance procedures, which include replacing the brushes, cleaning or replacing the starting motor drive, and cleaning the commutator.

4-71. REMOVAL.

a. Disconnect ground cable from battery. Disconnect and tag wires from magnetic switch.

b. Remove starting motor mounting bolts and withdraw starting motor from flywheel housing.

4-72. DISASSEMBLY.

a. Disassembly of the starting motor should be accomplished only as far as necessary to make repair or replacement of defective parts.

b. Remove thru bolts and tap commutator end frame off field frame to expose brushes, holders, arms, and springs.

c. Remove brush lead screws, pull brush holder attaching pins, and remove brushes, holders, and springs.

d. Remove bolt through shift lever and remove drive end housing. Withdraw armature and drive assembly from housing.

4-73. REPAIR.

a. Clean all parts thoroughly and inspect closely for damage.

b. Inspect brushes for wear, oil soaked condition, or other damage. Replace brushes if they are worn to less than half of original length when compared to a new one.

c. Check motor drive for broken springs, broken or stripped pinion teeth. Check fit of motor drive on armature shaft. Discard motor drive if damaged.

d. Clean dirt from between commutator riser bars, being careful not to scratch or damage the mica.

4-74. REASSEMBLY. Reassemble in reverse order of disassembly.

a. Apply a light coat of engine oil to bearing surfaces of armature during reassembly.

b. Check tension of brush springs, and also check to see that brushes seat properly on commutator. Replace springs if tension is insufficient to hold brushes against commutator.

c. Seat brushes to commutator by wrapping a strip of No. 00 flintpaper around commutator and slowly turning commutator until brush surface assumes curvature of commutator.

d. Reinstall starting motor and reconnect wires to magnetic switch.

4-75. DISTRIBUTOR.

4-76. REMOVAL.

a. Disconnect battery ground cable. Disconnect high and low tension leads. Disconnect spark plug wires.

b. Remove distributor cap. Note position of rotor and mark distributor housing with spot of bluing so cam can be reinstalled with rotor in same position when reassembling. Remove distributor hold-down clamp and remove distributor.

c. Do not turn over engine while distributor is removed.

4-77. DISASSEMBLY.

a. Lift off rotor and remove dust plate. Remove condenser and breaker lever assembly.

b. Remove breaker plate. Remove snap ring from shaft and lift off cam. Remove spacer, springs, and weights.

c. Drive out roll pin from collar at bottom end of shaft and remove collar and thrust washers.

d. Remove drive shaft from housing.

4-78. REPAIR.

a. Clean parts in solvent and dry carefully.

b. Inspect all parts carefully for excessive wear, cracks, corrosion, or deterioration. Replace unserviceable parts with new ones, particularly the points, condenser, rotor, or distributor cap.

c. If a Distributorscope is available, the advance should be as follows:

9^{0} TDC at 300 RPM
8^{0} TDC at 600 RPM
18^{0} TDC at 2400 RPM

4-79. REASSEMBLY.

a. Reassemble in reverse order of disassembly.

b. Mount distributor on engine, aligning it so cam and rotor will return to spot marked during disassembly.

c. Adjust breaker point gap to .020 inch. Bend the stationary arm so points are properly aligned as well as gapped.

d. Apply a light film of ball bearing lubricant to the breaker cam. Apply a drop of light engine oil to the breaker arm hinge. Lubricate the shaft with engine oil through the oil cup.

e. Time the engine according to instructions in paragraph 3-19.

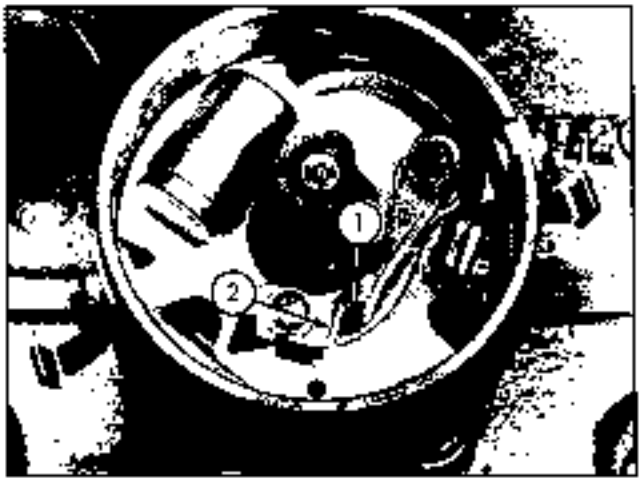


Fig. 1-24. Distributor

1. Points - .020" gap
2. Stationary arm

4-80. SERVICE BRAKES AND REAR AXLES.

4-81. REMOVAL. (See Figure 2-22A.)

a. Jack up the front of the truck.

b. Remove the drive wheel. The brake drum is an integral part of the wheel center.

c. Remove two flat head screws from axle flange. Thread two 3/8" cap screws evenly and gradually into tapped holes in flange. This will force shaft out of housing.

d. Remove retainer ring (44) and pull bearing housing (40) with stems 41 through 46 from housing (26).

4-82. DISASSEMBLY. (See figure 2-23).

a. Remove springs (10 and 11).

b. Press down on spring retainer (6), hold it from turning, turn hold-down pin (7) 1/4 turn and remove spring (8) and retainers (9). Remove shoe (3).

c. Disconnect parking brake cable from link (5 or 6).

d. Disconnect hydraulic line and remove wheel cylinder (14) from backing plate (1 or 2). Remove backing plate.

e. Remove push rods (16), boots (15), pistons (17), cups (18), and spring (19), from cylinder.

4-83. REPAIR. (See figure 2-23).

a. Discard worn linings, and weak or broken springs.

b. Examine cylinder and components carefully. If cylinder bore is pitted or grooved, hone or re a smooth finish. If considerable metal must be removed before the bore will clean up, use a new cylinder.

c. If pistons are scored, or if the boots are brittle or cracked, install new parts.

d. Check pawls for brake shoes, 2 in each backing plate, to be sure they have not become stuck or frozen. The pawls must not turn with less than 150 inch pounds torque applied to the nut, but must turn when no more than 250 inch pounds are applied.

4-84. REASSEMBLY. (See figure 2-23).

a. Reassemble in reverse order of disassembly. Tighten cap screws in backing plates to 110-120 ft.-lbs.

b. Dip cylinder parts in clean brake fluid to facilitate assembly.

c. Brakes are self-adjusting, so no mechanical adjustments are necessary. However, be sure shoes are in proper position (fully countersunk) in drum can be installed.

d. If there has been no evidence of seal leakage, excessive end play or worn or damaged axle bearings, these parts may be reinstalled in reverse order of disassembly with the original number of bearing housing shims. If any of the above conditions exist, see paragraph 4-84 for the procedures to obtain correct end play and bearing adjustment.

e. When installation is complete, loosen bleed screw (19) and depress pedal until air is removed from the system. Replenish fluid in master cylinder (see figure 1-3) as necessary.

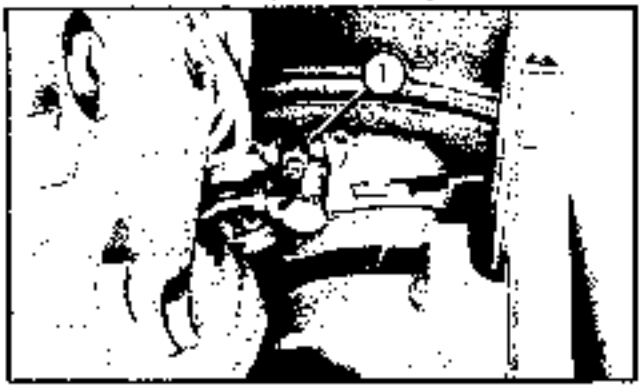


Fig. 1-25. Bleed screw

1. Bleed screw

4-85. BRAKE LINKAGE AND MASTER CYLINDER. (See figure 2-24).

4-86. REMOVAL.

a. Flip up rear section of floor plate. Disconnect accelerator pedal linkage and remove front section of floor plate.

b. Disconnect cables (14 and 15) from brakes and lever.

c. Remove tubing from cylinder, and remove pedal assembly, cylinder, and support as a unit.

4-87. DISASSEMBLY.

a. Remove pins (10) and remove linkage.

IMPORTANT

Do not turn or adjust clevises (8 and 9) unless they are damaged and must be replaced. The length of this assembly is set at the factory and determines the travel of the piston in the master cylinder. This piston travel affects the braking action and inching. If it is absolutely necessary to disassemble the clevises, they must be reset as explained in paragraph 4-110.

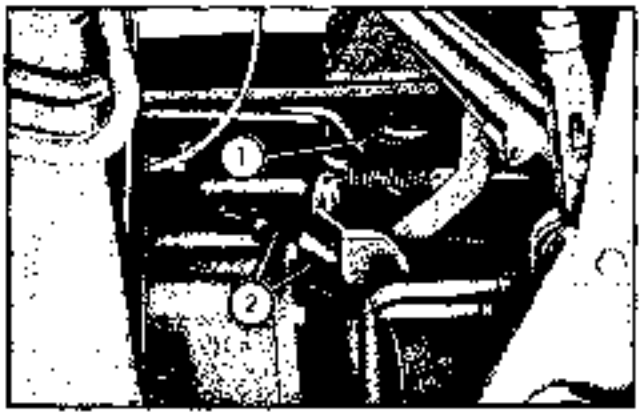


Fig. 1-26. Master cylinder assembly

1. Cylinder
2. Clevises

b. Remove roll pins and remove shafts (4 and 6).

c. Remove cylinder (20) from support (5).

d. See figure 2-24A. Remove internal components of cylinder.

4-88. REPAIR.

a. Replace bushings (3) if they are excessively worn or scored.

b. Discard tubing showing signs of leakage. Discard frayed or damaged cables.

c. Examine bore of cylinder carefully for pits or grooves. If minor defects are present, hone carefully. If bore does not clean up without removing considerable metal, use a new cylinder. Install repair kit anytime the cylinder is disassembled and honed. Dip parts in clean brake fluid to facilitate assembly.

4-89. REASSEMBLY. (See figure 2-24).

a. Reassemble in reverse order of disassembly.

b. If the clevises (8 and 9) have been disassembled, reassemble the pedal, support and master cylinder assembly. Install assembly on lift truck. Connect all tubing. Replenish fluid in cylinder.

c. Loosen bleed screws (figure 1-25) and bleed both brakes. Replenish fluid as necessary.

d. The procedure for adjusting brake linkage and linkage for mechanical inching is described in paragraph 4-110, on page 1-40.

e. When brake linkage is properly adjusted, engage hand brake and pump up brakes with pedal. Remove cover (29) from master cylinder (20). Release hand brake and release brake pedal. A definite "surge" of fluid must be seen entering the fluid chamber when the brake pedal is released.

4-90. DRIVE AXLES AND DIFFERENTIAL (TWO PINION CAGE - See figure 2-22).

4-91. REMOVAL.

a. Remove the upright and fork assembly. (See paragraphs 4-142 and following).

b. Drain the differential. Block up the front end of the truck. Support the transmission case. Disconnect tubing and linkages.

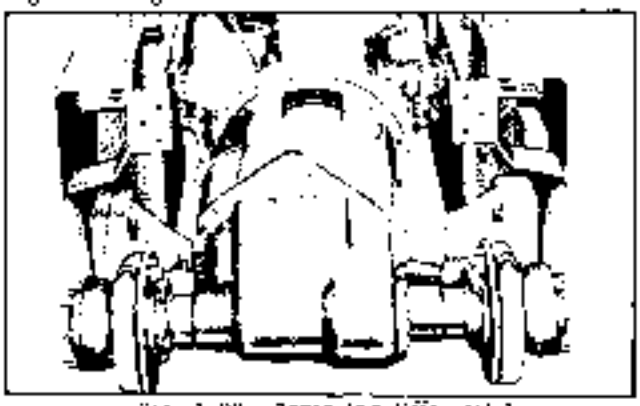


Fig. 1-27. Removing differential

c. Remove the bolts holding the differential to the transmission, and the axle support housing to the frame. Roll the assembly forward out of the truck. (See figure 1-27.)

NOTE: In figure 1-27, the drive wheels and some of the cowling has been removed to more clearly illustrate the parts involved. These parts do not have to be removed to remove the differential.

4-92. DISASSEMBLY. (See figure 2-22).

a. Remove drive wheels and tires (40). Remove two flat head screws in flange of shaft (23). Screw two 3/8"-16 bolts evenly and gradually into tapped holes in flange, to force axle shaft out of housing.

b. Remove retaining ring (42) and remove bearing housing assembly (37). Remove brake assembly.

c. Remove bearing caps (10 and 15) and shims (12, 13, 14, 17, 18, and 19). Remove bull pinion and ring gear assembly (5) with bearing cones (6 and 8).

d. Support differential cage (20) and remove axle housing (32) and shims (34, 35, and 36). Remove cage assembly.

e. Remove right hand cage (58) from cage (20), with cone (24), thrust washer (31), and bevel gear (30).

f. Pull roll pin and remove shaft (27), pinions (26), bevel gear (30) and thrust washers (28 and 31).

4-33. REPAIR. Clean all parts thoroughly and examine carefully. Discard any worn or damaged parts.

4-34. REASSEMBLY. (See figure 2-22.)

a. Do not use Permatex on gaskets.

b. Torque bolts and nuts in differential following chart on page 1-21. Torque counterbore cap screws in cage as follows:

3/8 inch ..... 30-40 foot pounds
5/8 inch ..... 150-175 foot pounds

c. Reassemble differential cage (20) and its components as follows:

1. Use .082" thick thrust washers (31) behind bevel gears (30) when assembling. Torque six cap screws to 30 to 40 foot-pounds.
2. Insert axle (29) into gear (30). Holding the axle stationary, it must require a torque between 15 and 50 foot-pounds to turn the cage.
3. If the torque required to rotate the cage is over 50 foot-pounds, remove the .082" thick washers, and insert .080" thick washers and repeat the above procedure. If the torque required is below 15 foot-pounds, use .085" thick washers.
4. Washers of the same thickness must be used to keep the assembly symmetrical about the drive pin (27).

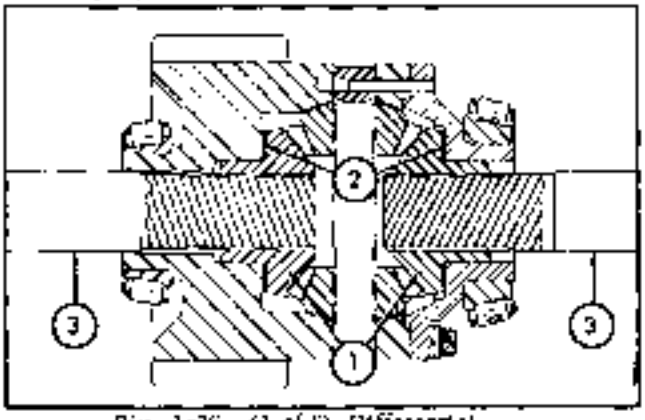


Fig. 1-28. (1 of 2) Differential

1. Bevel gears
2. .035" shims
3. Axles

d. When torque requirements of differential cage have been met, install assembly in case.

e. Install axle housing (32) USING NO SHIMS. Tighten the housing bolts just enough to hold the assembly in place. Wrap a string around the portion of the cage next to the teeth (1, figure 1-28); attach a spring scale to the string; record the number of pounds pull required to rotate the assembly. Then remove the housing and install the proper shims (34, 35, 36) so it requires 2 to 4 pounds MORE PULL than it did with no shims. (This amounts to 5 to 10 inch pounds NET rolling torque.)

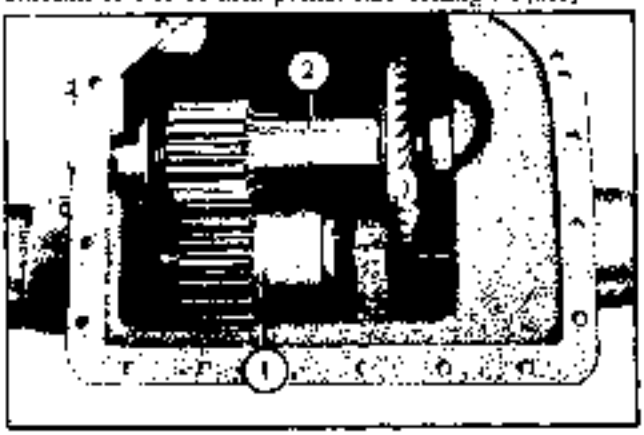


Fig. 1-28 (2 of 2) Differential

1. Place string here for step "e"
2. Place string here for step "g"

f. Install the ring gear and bull pinion assembly (5) with its components (items 6 through 19). Use shims (17, 18, 19) and (12, 13, 14) under caps (10 and 15). Torque cap screws in caps to 30 to 40 foot-pounds.

g. Wrap a string around the center portion of the shaft (2, figure 1-28). Add or remove shims under the caps so it will require a total pull of 4 to 8 pounds MORE PULL than it did with no shims to rotate the entire assembly. This will also obtain a NET rolling torque of 5 to 10 inch pounds on the upper shaft. See figure 1-28.

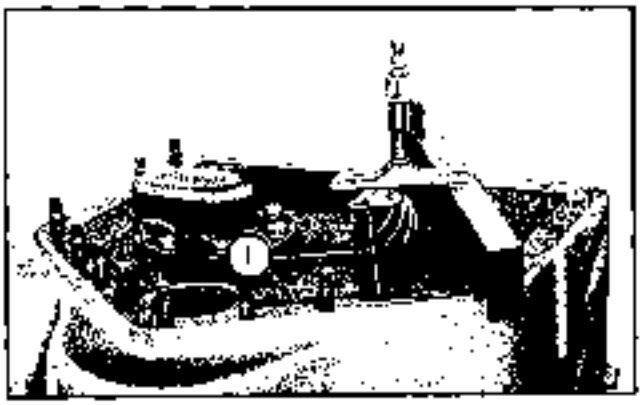


Fig. 1-29. Measuring height of pinion

1. Measure from end of shaft to finished surface of case.

h. To determine the proper amount of shims (3) between the transmission and differential cases (for proper ring gear and pinion contact), proceed as follows: Measure the distance from the end of the pinion shaft to the fin-

ished surface of the transmission case. Record this dimension. (Fig. 1-30.)

i. Measure from finished surface of differential case to finished surface of cap (20). Record this dimension. Fig. 1-30.

IMPORTANT

Be sure the contact point of the gage is on the portion of the cap shown in figure 1-30.

j. Refer to Table A. Look up the dimension obtained in paragraph h in Column 1; obtain the shims required from Column 2.

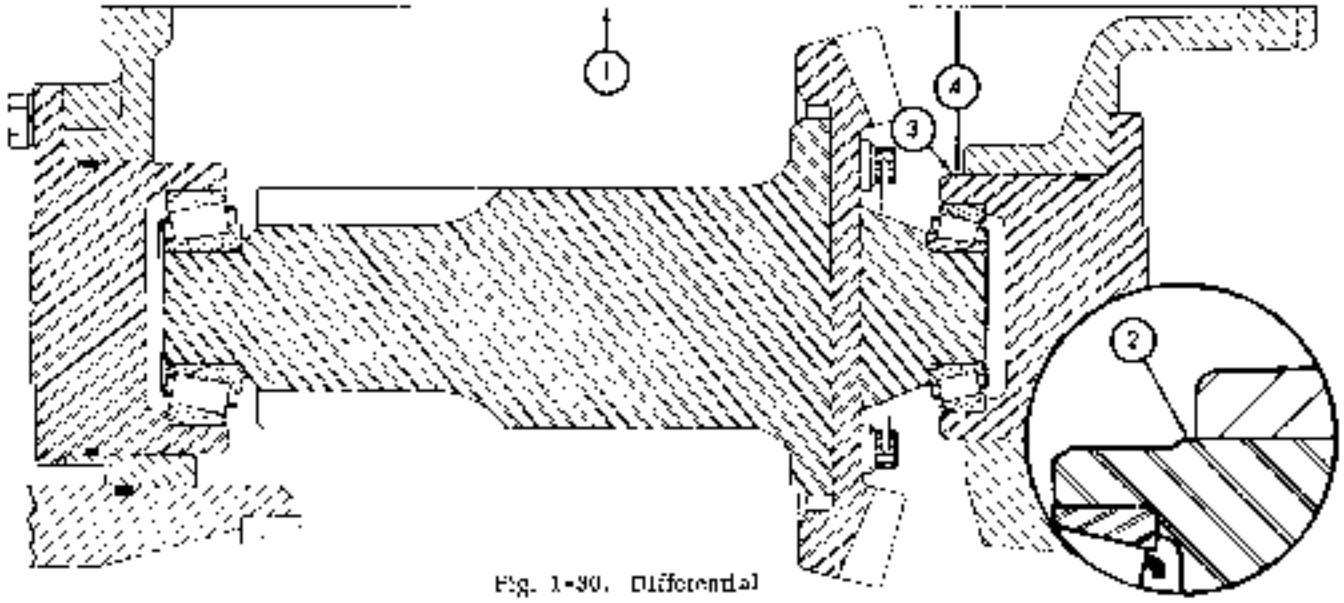


Fig. 1-30. Differential

1. Finished surface of case
2. Shoulder on cap (early trucks)
3. Shoulder on cap (late trucks)
4. Measure from finished surface of case to shoulder of cap

EXAMPLE:

Dimension from paragraph h (Table A)	1.447
Shims (Table A, Column 2)	.019
Dimension from paragraph i (Table B)	2.077
Shims (Table B, Column 2)	+.002
Total Shims required	.020

Table A

Column 1	Column 2
1.434	.005
1.436	.006
1.438	.007
1.437	.008
1.438	.009
1.439	.010
1.440	.011
1.441	.012
1.442	.013
1.443	.014
1.444	.015
1.445	.016
1.446	.017
1.447	.018
1.448	.019
1.449	.020

Table B

Column 1	Column 2
2.074	+.005
2.075	+.004
2.076	+.003
2.077	+.002
2.078	+.001
2.079	.000

NOTE: Shims are available in the following thicknesses: 35A6385 -- .002"; 35A6386 -- .003"; 35A6387 -- .005".

k. Refer to Table B. Look up the dimension obtained in paragraph i in Column 1; read from Column 2 the amount of shims to be used.

l. Remove axle housing (32) and shims. Attach a dial indicator to the case, with the contact point on one of the bull pinion teeth.

m. Attach another indicator to transmission case, with contact point in one of the notches in the lock nut on the end of the pinion shaft.

n. Turn pinion shaft (5) to read backlash, also watch indicator on bull pinion teeth to be sure bull pinion is not turning. Backlash is to be .004 to .006 inch.

o. If reading is greater than .006, remove shims (17, 18, or 19) from under cap (16), and place shims of the same thickness under cap (10).

IMPORTANT

The correct number of shims has been determined (in paragraph 4-84). This same thickness of shims must be used to maintain the correct rolling torque. If shims are removed from one side, shims of the same thickness must be installed on the other side.

p. If reading is less than .004, remove shims (12, 13, or 14) from under cap (15), and add shims of the same thickness under cap (15).

q. Reinstall housing (32) and shims.

r. Install seal (36) in bearing housing (37), with lipped edge toward case. Place bearing housing (37) on axle housing. Install cups and cones (40 and 41) and secure with retainer ring (42).

IMPORTANT: Cones (40), shim (43), and retainer (42) must be considered an assembly with dimension shown in Fig. 1-31. Select shim (43) of the proper thickness to obtain the given dimension.

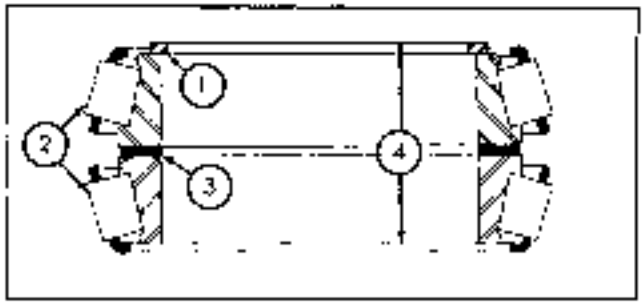


Fig. 1-31. Bearing cones

1. Retainer
2. Cones
3. Shim
4. 1.932 to 1.930 inches

s. Place "O" ring (39) in groove in axle shaft (29). Install axle shaft (29), using shims (43, 44, 45) to obtain .004 to .006 inch end play.

t. Install drive wheel (47) and torque wheel nuts to 90 to 120 foot pounds. Reinstall entire assembly on truck.

4-95. DRIVE AXLES AND DIFFERENTIAL. (FOUR PINION CAGE - See figure 2-22A.)

4-96. REMOVAL.

a. Remove mast assembly. (See paragraph 4-142 and following.)

b. Turn steering wheel to full left position to move steering arm and drag link to rear and out of way.

c. Drain differential. Place blocks under both sides of frame and under transmission.

d. Disconnect linkage for mechanical locking and remove support plate with parts attached. Disconnect brake lines from wheel cylinders and disconnect parking brake cables. See Fig. 1-27.

e. Remove bolts securing axle support to transmission case and frame side members. Remove bolts holding differential to transmission. Roll differential-axle assembly forward and away from truck.

4-97. DISASSEMBLY. (See figure 2-22A.)

a. Remove drive wheels and tires. Remove two flat head screws in axle flange (30). Screw two 3/8"-16 bolts evenly and gradually into tapped holes in flange to pull axle out of housing. Note quantity of shims between axle flange and housing (40).

b. Remove ring (42) from housing (35) and remove bearing housing assembly (40).

c. Remove bearing caps (12 and 15), together with shims (14 and 17) from either side of case. Remove bull pinion (5) and ring gear (6) assembly with bearings (9 and 10).

d. Support differential cage (18) and remove axle housing (35) together with brake assembly and axle housing support. Lift out differential cage assembly.

e. Remove cover (22) from cage (18). Remove bevel gear (31), together with thrust bearing (33), bearing race (32), and shim (34).

f. Remove shaft (cross) (26), bevel pinions (27), and thrust washers (28). Remove other bevel gear (31), bearing (33), race (32) and shim (34).

4-98. REPAIR.

a. Clean all parts thoroughly and examine carefully. Discard all worn or damaged parts.

b. Renew bushings in cage and cover if they are worn. Press in new bushings to position shown in Fig. 1-32. Ream bushings to obtain inside diameter indicated in Fig. 1-32.

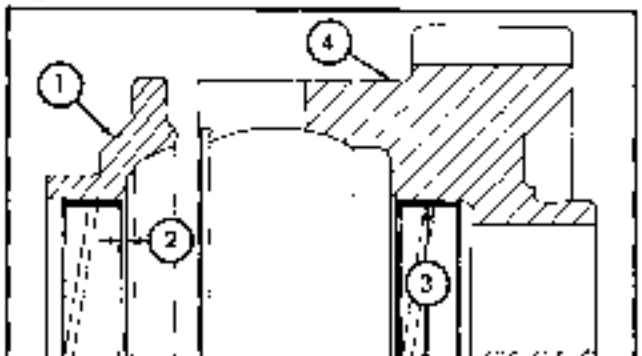


Fig. 1-32. Bushing in cage and cover

1. Cover
2. 1/32 inch (both bushings)
3. Ream inside to 2.2002-2.2003" (both bushings)
4. Cage

4-99. REASSEMBLY. (See figure 2-22A.)

a. Do not use Permatex on gaskets.

b. Torque bolts and nuts in differential following chart on page 1-21. Torque 3/8" screws in cage to 35 ft. lbs. if threads are oiled; 45 ft. lbs. for dry threads. Torque 7/16" cap screws in ring gear to 50 ft. lbs. if threads are oiled; 70 ft. lbs. for dry threads. Secure cap screws with lock wire after proper torque value has been obtained.

c. Reassemble differential cage (19) and its components as follows:

1. Install two .005" thick shims (34) between the bearing races (32) and cage (19) and cover (22) when reassembling. Be sure extended portion of bevel pinion thrust washer (29) engage in slots as pinions are installed.

2. Tighten eight cap screws in cage never to require value specified in paragraph "b".

3. Insert axle (30) in gear (31). Hold axle stationary and rotate cage. It must require a torque between 15 and 50 foot pounds to turn cage.

4. If torque required to rotate cage is over 50 foot pounds, reduce number of shims (use thinner ones) and repeat procedure in "2" and "3". If torque required is below 15 foot pounds, increase the number of shims and recheck torque.

IMPORTANT: KEEP SHIM PACK EQUAL ON BOTH SIDES OF BEVEL GEARS (31) TO MAINTAIN SYMMETRICAL POSITION.

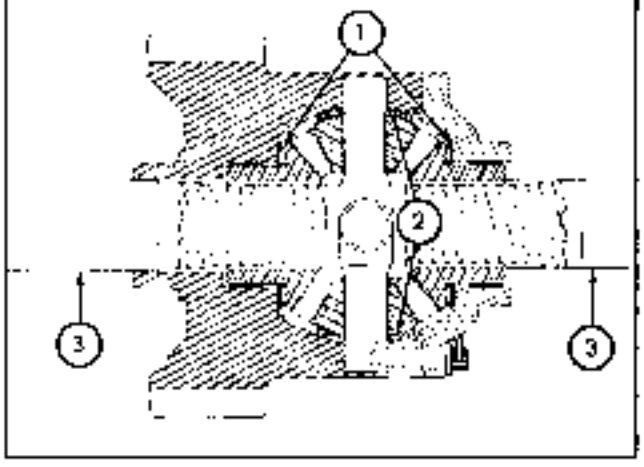


Fig. 1-33. Differential Cage

1. Bearings, races, and shims
2. Thrust washers
3. Axles

d. After correct torque requirements of differential cage have been determined, install assembly in case.

e. Install axle housing (35), USING NO SHIMS. Tighten housing bolts just enough to hold differential cage assembly in place. Wrap a string around cage, next to teeth (1, figure 1-28-2) and attach a spring scale. Record pounds of pull required to rotate cage assembly. Then remove housing and install necessary shims (37) so it requires 2 to 4 pounds MORE PULL to rotate cage than it did with no shims. (This amounts to 5 to 10 inch pounds NET rolling torque.) Replace "O" ring (20) the second time housing is installed.

f. Install ring gear and bull pinion assembly (5 and 6), with all components (items 8 through 10). Use shims (17 and 14) under caps (13 and 15). Torque cap screws in bearing caps to 30 to 40 foot pounds.

g. Wrap a string around shaft, at point midway between bull gear and ring gear (2, figure 1-28-2). Add or remove shims under bearing caps (12 and 16) so it will require a total pull of 4 to 6 pounds MORE PULL than it did with no shims, to rotate entire assembly. This will also obtain a NET rolling torque of 5 to 10 inch pounds on upper shaft.

h. To determine correct amount of shims (4) between transmission and differential cases (for proper ring gear and pinion contact), proceed as follows:

1. Measure distance from end of pinion shaft to finished surface on transmission case. RECORD THIS DIMENSION. Fig. 1-28.

2. Measure distance from finished surface of differential case to finished surface of bearing cap (16). RECORD THIS DIMENSION. Fig. 1-28.

3. Refer to Table A, Column 1. Look up dimension obtained in item 1; obtain necessary shims required from Column 2.

4. Refer to Table B, Column 1. Look up dimension obtained in item 2; obtain necessary shims required from Column 2.

Table A

Column 1	Column 2
1.475	.003
1.477	.006
1.478	.007
1.479	.008
1.480	.009
1.481	.010
1.482	.011
1.483	.012
1.484	.013
1.485	.014
1.486	.015
1.487	.016
1.488	.017
1.489	.018
1.490	.019
1.491	.020

Table B

Column 1	Column 2
2.074	+.005
2.075	+.004
2.076	+.003
2.077	+.002
2.078	+.001
2.079	.000

EXAMPLE:

Dimension from Item 1 (Table A)	1.480
Shims indicated Table A, Column 2	.009
Dimension from Item 2 (Table B)	2.077
Shims indicated Table B, Column 2	+.002
TOTAL SHIMS REQUIRED	.011

NOTE: Shims are available in the following thicknesses: 35A8643 - .002", 35A8644 - .003", 35A8645 - .005".

i. To check backlash between ring gear and pinion, it will be necessary to reassemble differential to transmission. Use shim pack as determined in paragraph "h" and secure differential to transmission with 6 or 8 bolts.

j. Remove plug (51) from top of differential case and mount a dial indicator on ring gear. Hold pinion from turning and check backlash. The backlash must be .006 to .011 inch.

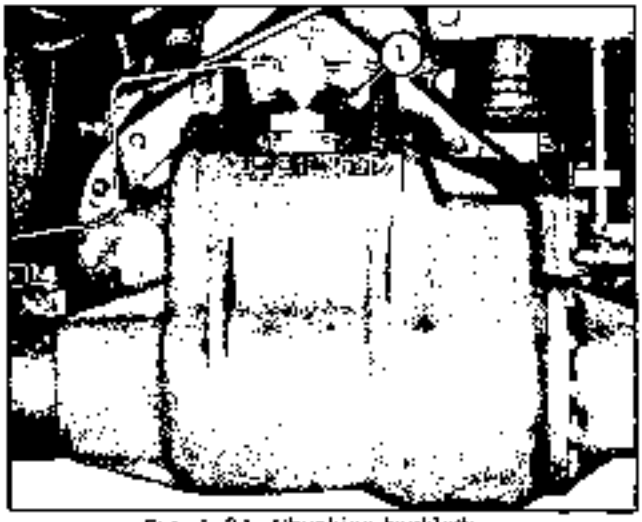


Fig. 1-34. Checking backlash

1. Remove plug to mount indicator

k. If indicator reading is greater than .011", remove shims (17) from under cap (16), and place shims of same thickness under cap (12).

l. If indicator reading is less than .006", remove shims (14) from under cap (12), and add shims of same thickness under cap (15).

IMPORTANT: THE CORRECT NUMBER OF SHIMS HAS BEEN DETERMINED IN PARAGRAPHS "E" AND "G". IF SHIMS ARE REMOVED FROM ONE SIDE, SHIMS OF SAME THICKNESS MUST BE INSTALLED ON OTHER SIDE TO MAINTAIN CORRECT ROLLING TORQUE.

m. Install seal (41) in housing (40), with lipped edge toward bearings. Carefully install bearing housing (40) on axle housing. Install cups and cones (42 and 43) and secure with retainer ring (44).

n. After bearing housing (40) and bearing are installed and secured on housing (35), use a soft driver and drive against inner race of outer bearing to move bearing away from retainer ring as far as it will go. BE CAREFUL NOT TO DAMAGE BEARING.

o. Measure distance between retainer and bearing, using a feeler gage. If dimension obtained is .018" or less, bearing adjustment is satisfactory and does not have to be changed.

p. If dimension between retainer and bearing is .019" or more, it will be necessary to install a shim between the two axle bearings.

q. Remove retainer and pull hub off housing far enough so outer bearing can be removed. BE CAREFUL NOT TO DAMAGE OIL SEAL IN INNER END OF HUB. Install a shim (45) of the proper thickness that will bring dimension between bearing and retainer down to a clearance of less than .018". Use shims to bring clearance down to a minimum, yet allow installation of retainer ring.

r. Press seal (38) into bearing housing (40) with lipped edge toward inside. Install retainer (39) with flat side against seal.

s. Apply vaseline to lips of seal (38), and carefully install axle shaft (30), using shims (46) to obtain .004 to .006 inch end play. Secure axle with two flat head screws.

t. Install drive wheel and <u>secure wheel nuts to 90 to 120 foot pounds.</u>

u. Install remaining bolts that secure differential to transmission and tighten all bolts securely. <u>Tighten bolts holding axle supports to transmission and frame sides to 175 to 230 foot lbs.</u>

v. Reconnect all disconnected linkages and lines. Reinstall removed components in reverse order of disassembly.

4-100. TRANSMISSION CONTROL VALVE (HYDRAULIC ENGINE)

4-101. REMOVAL. (See figure 2-17).

a. Remove the left hand drive wheel. Remove the drag link and turn the steering arm all the way forward. Disconnect control lever cable assembly by removing pins shown in figure 2-18. Disconnect wires from neutral starting switch (35). Disconnect tubing.

b. Remove the pressure regulator valve assembly (37), control valve assembly (1), and gasket (36) from the case. Use care to avoid losing ball (3) and spring (4).

4-102. DISASSEMBLY. (See figure 2-17).

a. Remove snap ring (34). Thread a 1/4"-20 UNC bolt into valve block (31), and pull out the block and "O" ring. Remove valve (28) with "O" ring, and spring and ball (29 and 30).

b. Remove main system relief (items 21 through 24), priority valve (items 25, 26 and 27), and pressure reducing valve (19 and 20), in the same manner as in "a" above.

c. Remove snap ring (15) and remove inching spring plug (14). Remove seat plug (17), spring (7), and filter disc (18) from the plug.

d. Remove spring (13) and inching piston (9), with quad ring (10) and seal (11).

e. Remove snap ring (34) from opposite end of inching port, thread a 1/4"-20 UNC bolt into block (33) and pull out block and "O" ring (35). Remove inching spool (6) and springs (7 and 8).

f. Remove snap ring and block from directional spool port, as outlined above. Push spool (2) through seals (5) and out of valve body. Remove seals if there is evidence of leakage.

g. Remove snap ring (41), thread a 1/4"-20 UNC bolt into block (39), pull out block, "O" ring, spool (38), and spring (44).

h. Remove snap ring (47) and block (45) and "O" ring (46) in same manner as above. Remove piston (42) and spring (43).

i. Remove snap ring (51), block (49), and "O" ring (50) in same manner. Remove orifice assembly (48). Remove snap ring (53), screen (52), pin (55), and ball (54).

4-103. REPAIR. (See figure 2-17).

a. Discard "O" rings, seals, quad rings, and gaskets which show signs of leakage. Discard damaged tubing, and fittings. Discard weak or broken springs.

b. Inspect valves and spools carefully; discard any that are scratched or pitted. If the polished surfaces inside the valve body are pitted or scratched, try to clean them up with a light honing. If the blemishes are so deep that it requires removal of considerable metal to remove them, discard the entire valve body.

c. Clean all parts thoroughly in solvent. Be sure filter disc (18) and screen (52) are clean.

4-104. REASSEMBLY. (See figure 2-17).

a. Reassemble in reverse order of disassembly.

b. Dip all parts EXCEPT INCHING SPOOL (6) in clean hydraulic fluid to facilitate assembly, and to help prevent damage to parts during installation. Inching spool may be dipped in graphite.

IMPORTANT

There are three grooves in the center section of the inching piston (9). The quad rings (10) must be installed in the outer grooves. The center groove must be kept clear for an oil passage. Install seal (11) and washer (12) in large groove, with grooved side of seal toward quad rings.

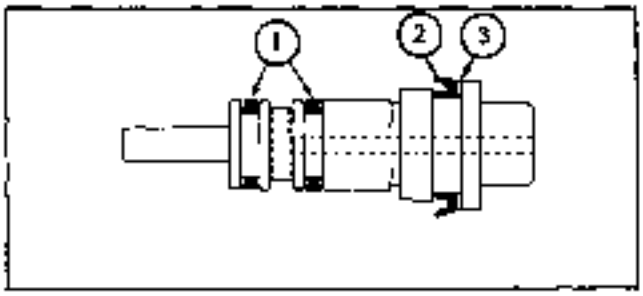


Fig. 1-35. Inching piston

1. Quad rings
2. Seal -- lipped edge toward quad rings
3. Washer

c. Insert directional spool (2) in body. Then slip seals over spool -- DO NOT PUSH SPOOL THROUGH SEALS. The lip end of the inner seal must face in, the lip end of the outer seal must face out.

d. Install assembled valve to case, with gasket (36) and ball and spring (3 and 4) in position.

e. Torque the mounting bolts evenly and gradually to 20 to 25 foot-pounds, in the sequence shown in figure 1-36.

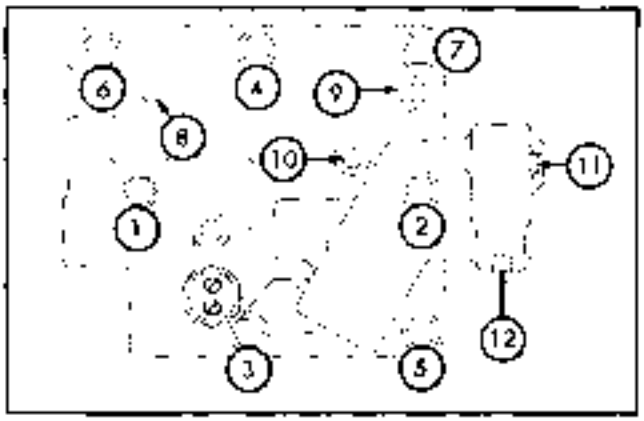


Fig. 1-36. Torque sequence and test ports

1. through 7. Torquing sequence
8. Lube pressure -- 15 to 25 psi
9. Pump pressure -- 90 to 120 psi
10. Converter pressure -- 48 to 68 psi
11. Clutch pressure -- 55 to 60 psi
12. Power piston pressure -- 55 to 60 psi

f. Connect links to spool and reattach control cable. Adjust clevises shown in figures 1-37 and 1-38, to allow full detent position for spool, yet prevent spool from bottoming in valve or pulling too far out. Adjust set screw to keep spool from being withdrawn beyond the detent position.

Fig. 1-27. Clevis and set screw

1. Clevis
2. Set screw

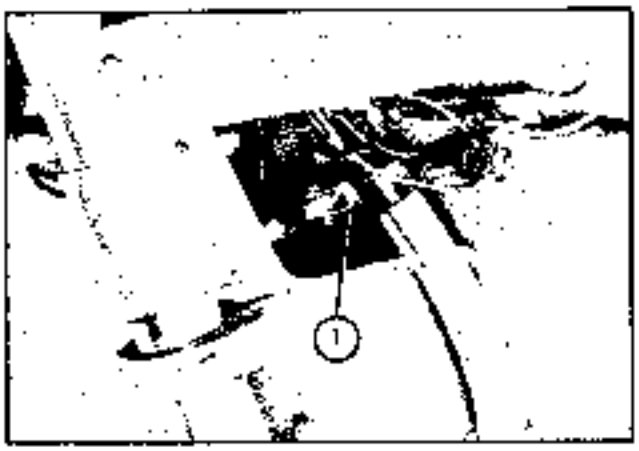


Fig. 1-28. Adjusting clevis

1. Clevis

g. Change transmission oil filter cartridge (See figure 1-8).

h. Connect all lines and start engine. Operate truck through several cycles of forward, reverse, and inching.

i. Check pressures as follows:
   1. Warm up truck until transmission oil temperature reaches 170° to 190°.
   2. Place substantial load on forks.
   3. Engage service brakes, shift into forward, and operate the engine at approximately 1400 RPM (converter at stall).
   4. Fig. 1-30 shows pressures and check ports. Check both forward and reverse clutches.

4-105. TRANSMISSION CONTROL VALVE. (MECHANICAL INCHING.)

4-106. REMOVAL. (See figure 2-17A or 2-17B.)

a. Remove left hand drive wheel. Turn steering wheel to full left position so steering arm and drag link will not be in way. Disconnect links (16 and 18, figure 2-18A) or links (3 and 14, figure 2-18B) from valve spools. Disconnect wires from neutral starting switch and disconnect tubing.

b. Remove regulator valve assembly (37, figure 2-17A), control valve assembly (1) and gasket (36). Be careful not to lose ball (3) and spring (4) as valve assembly is removed.

4-107. DISASSEMBLY. (See figure 2-17A or 2-17B.)

a. Remove snap rings (41, 47, and 51) from regulator valve. Thread a 1/4"-20 NC bolt into blocks (39, 45, and 48) and carefully pull out blocks and "O" rings.

b. Remove pressure regulator spool (38) and spring (44). Remove piston (42) and spring (43). Remove orifice (48) and related components from bore in top of valve. Remove snap ring (50) to disassemble orifice assembly.

c. Remove snap ring (34), thread a 1/4"-20 NC bolt into block (31), and pull out block and "O" ring. Remove tube relief valve (29) with "O" ring, and ball (28) and spring (30).

d. Remove main system relief valve (items 2. through 24), priority valve (items 25, 26, and 27), and pressure reducing valve (19 and 20), in same manner as described in paragraph "c".

e. To remove seal (15), punch 2 small holes in seal back, install 2 small metal screws and pry seal out of valve. Discard seal. Remove snap ring (10) and remove spool (9). The internal components of spool (8) are not serviceable items, so if any are broken or damaged, renew complete assembly.

f. Remove snap ring (34) from opposite end of inching spool port, thread a 1/4"-20 NC bolt into block (32) and carefully pull out block and "O" ring. Remove spring (7), spool (6), and spring (5).

g. Remove snap ring and block from directional spool port as outlined in paragraph "f". Push spool (2) through seals (3) and out of valve body. Remove seals if there is evidence of leakage.

4-108. REPAIR. (See figure 2-17A or 2-17B.)

a. Clean all parts in suitable solvent. Inspect valves and spools carefully; discard any that are scratched, pitted, or badly discolored. If polished surfaces inside valve body are pitted or scratched, try to clean by light honing. If blemishes are so deep that it requires removal of considerable metal to remove them, discard the entire valve body.

b. Discard "O" rings, seals, and gaskets that showed signs of leakage. Discard damaged tubing and fittings. Discard weak or broken springs.

4-109. REASSEMBLY. (See figure 2-17.) Reassemble in reverse order of disassembly.

d. Dip all parts EXCEPT INCHING SPOOL (6) in clean hydraulic fluid to facilitate assembly, and to help prevent damage to parts during installation. Coat inching spool with graphite at assembly.

h. Install directional spool (8) in body. Be sure 3 detent grooves are toward ported side of valve body so as to properly engage detent ball (3).

c. Slip seals (5) over spool, with lip end of inner seal facing in; lip end of outer seal facing out. DO NOT FINISH SPOOL THROUGH SEALS.

d. Apply a light film of 180 AA Lubriplate to inching spool (9), and install spool in body. Install snap ring (15). Carefully slide seal (16) over spool and install in body. (NOTE: An 11/16" socket makes a good seal installing tool.)

e. Install assembled valve to case, with gasket (36), and ball and spring (3 and 4) in position. Install regulator valve (27, figure 2-17A) if used.

f. Use new seal-o-seals (50A1329) on attaching bolts. Torque bolts evenly and gradually to 20-25 ft. lbs. in sequence shown in Fig. 1-39.

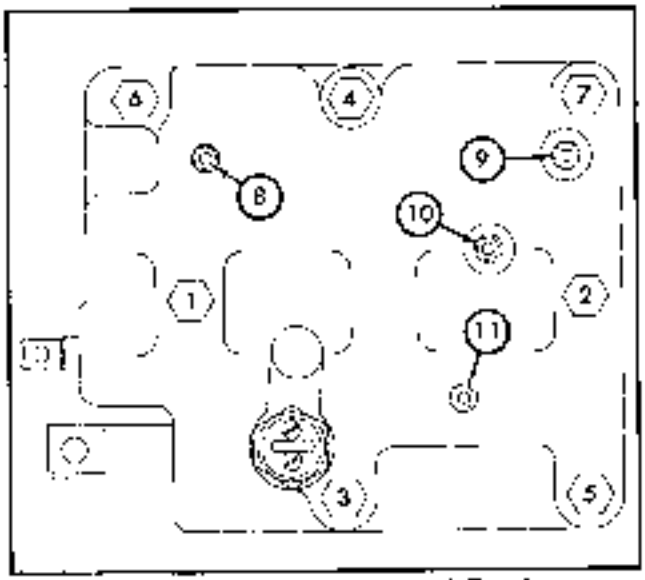


Fig. 1-39. Torque Sequence & Test Ports

1. through 7. Torquing sequence
8. Lube pressure -- 15 to 25 psi
9. Pump pressure -- 98 to 110 psi
10. Converter pressure -- 48 to 68 psi
11. Clutch pressure -- 90 to 110 psi

g. Connect links to inching and directional spools. For lift trucks equipped with cable for controlling directional spool, as illustrated in Fig. 2-18A, adjust clevises, shown in Figs. 1-38 and 1-40, to allow full detent position for spool, yet prevent spool from hotpinning in valve or pulling out too far. Adjust set screw (Fig. 1-40) to keep spool from being withdrawn beyond detent position.

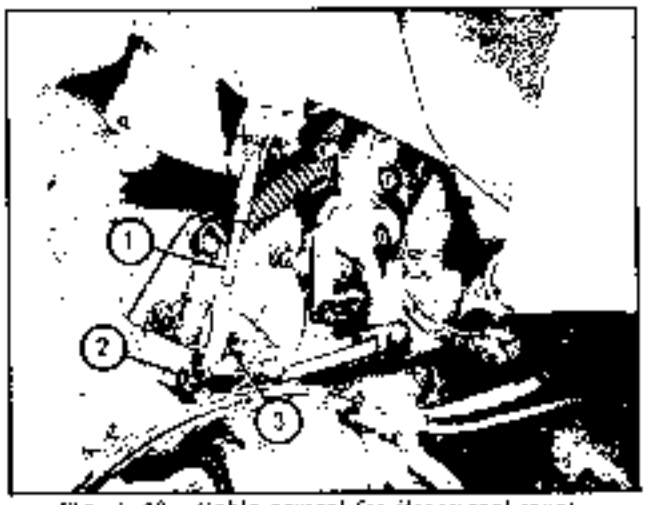


Fig. 1-40. Cable control for directional spool

1. Cable
2. Set screw
3. Adjusting clevis

h. For lift trucks equipped with directional spool control linkage as illustrated in Fig. 2-18B, adjust position of spool in valve with connector (2). Maintain spool position as described in previous paragraph (g). The set screw used with cable type control (Fig. 1-40) to regulate spool position is not used with lever type control (Fig. 1-41).

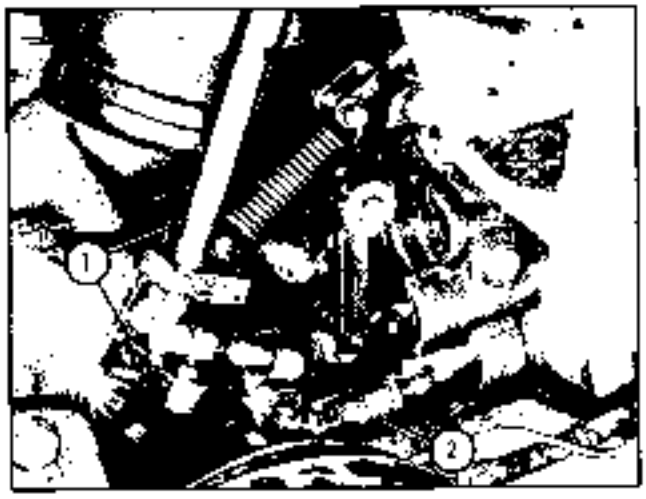


Fig. 1-41. Lever control for directional spool

1. Lever
2. Adjusting connector

i. Check location of lever (4, figure 2-18B) in relation to lug for lower end of lever (1) on support (11). If ball joint (5) is used, with nut on top of lever (4), a dimension of 5/16" must be maintained between upper edge of lever (4) and bottom edge of lug. Fig. 1-42.

j. If ball joint (6) is used, with nut on bottom side of lever (4), a dimension of 1-1/8" must be maintained between the lever and lug. Fig. 1-42.

k. If the dimension is incorrect, loosen the cap screws in hub (3, figure 2-158) and slide the hub up or down on the steering column until the correct dimension is obtained. Tighten cap screws in hub securely.

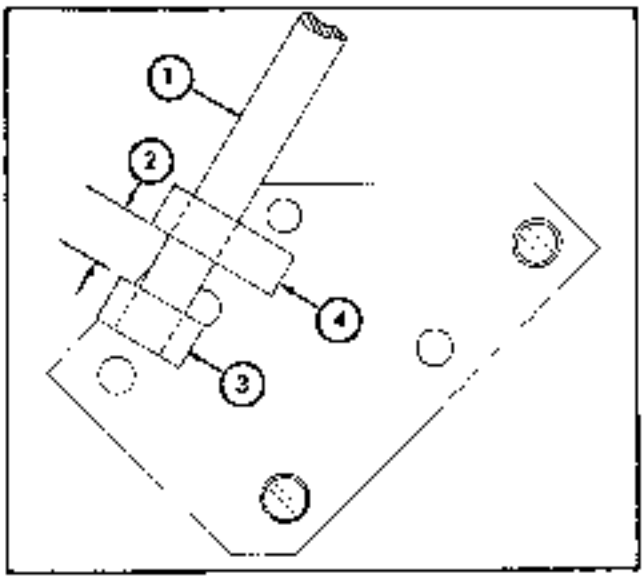


Fig. 1-42. Lever location

1. Hand lever
2. 5/16 inch (see paragraph "l")
   or
2. 1-1/8 inch (see paragraph "j")
3. Lever on end of rod
4. Lug on support plate

l. Reconnect oil line to top of valve. Install new oil in transmission and change oil filter. See Lubrication Chart and notes on pages 1-11 and 1-12.

m. Start engine and operate truck through several cycles of forward, reverse, and inching. Operate truck long enough to warm transmission oil to 170 to 190 degrees. Check transmission operating pressures as follows:

1. Place substantial load on forks.

2. Engage service brakes, shift into forward, and operate engine at approximately 1400 rpm. (converter at stall).

3. Fig. 1-39 shows pressures and check ports. Check both forward and reverse clutches.

4-110. ADJUSTING BRAKE AND MECHANICAL INCHING LINKAGE

a. Release parking brake lever. Remove pin from brake linkage clevis so master cylinder will be disconnected from brake pedal. Check position of pedal to be sure it is at rest against stop (3, figure 1-43).

b. Loosen jam nut securing inching adjustment turnbuckle and adjust turnbuckle so inching spool is bottomed in valve housing -- DO NOT apply pressure on spool, placing undue strain on link, or pedal will be pulled away from stop. Recheck pedal position to be sure it is against stop.

IMPORTANT: IF SPOOL IS NOT BOTTOMED, IT WILL CAUSE CLUTCH SLIPPAGE, RESULTING IN DELAY OF CLUTCH ENGAGEMENT.

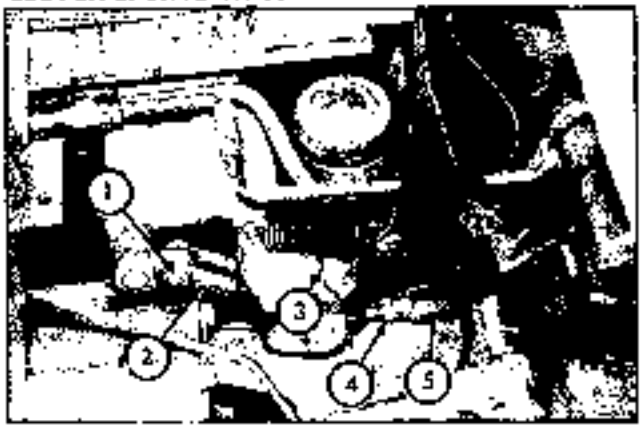


Fig. 1-43. Brake and inching linkage

1. Clevis pin
2. Brake linkage clevis
3. Pedal against stop here
4. Jam nut
5. Inching adjustment turnbuckle

c. Stand at left side of truck, and, while watching inching spool, push brake pedal down by hand. Pedal should travel approximately 1/8 inch before inching spool moves. Readjust position of turnbuckle, if necessary, but do not apply pressure to spool with turnbuckle or pull brake pedal away from stop. Secure turnbuckle with jam nut.

d. Reconnect brake linkage adjusting clevis. Install pressure gage in clutch pressure port (11, figure 1-39). Start engine, apply brakes, and check clutch pressure on gage. Adjust brake linkage clevis as necessary to obtain 10 psi clutch pressure with brakes applied and transmission control lever engaged. Check in both forward and reverse. This clutch pressure is satisfactory for average operating conditions.

e. If conditions exist, such as having to stop or change directions on severe ramps or inclines, brake linkage should be adjusted to more overlap between brakes and inching range. This is accomplished by lengthening linkage to master cylinder by means of the clevis (2, figure 1-43). Lengthening the brake linkage will raise the clutch pressure above 10 psi and will, in effect, raise the full-applied brake pedal position so that it is within the inching range of pedal travel.

IMPORTANT: DO NOT ALTER ADJUSTMENT OF INCHING TURNBUCKLE IN AN ATTEMPT TO OBTAIN ADDITIONAL OVERLAP OF BRAKES TO INCHING RANGE AS IMPROPER ADJUSTMENT WILL CAUSE DELAY IN CLUTCH ENGAGEMENT, OR UNDUE STRAIN ON LINKAGE.

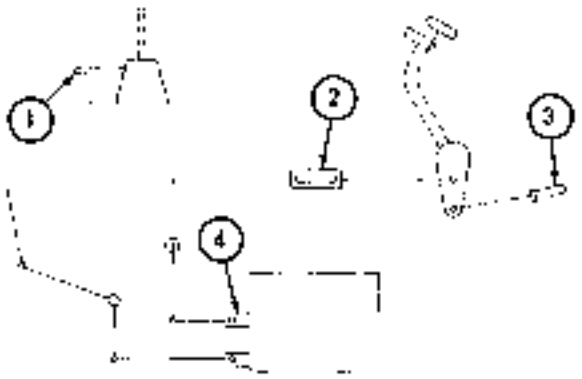


Fig. 1-44. Brake and inching linkage

1. Parking brake disengaged
2. Inching adjustment turnbuckle
3. Brake linkage clevis
4. Inching spool

4-111. TRANSMISSION CASE, CONVERTER, AND PUMP. (See figure 2-15).

4-112. REMOVAL.

a. Remove fork and mast assembly. (See paragraphs 4-142 and following).

b. Block up front end of lift truck. Disconnect all wires, tubing, linkages, etc. that are connected from the brakes, transmission, differential, and control valve, to other components of the truck. Remove the bolts holding the transmission supports to the frame.

c. Disconnect the steering arm from the drag link. Disconnect all wires, cables, tubes to instruments on panel. Remove front cowling, instrument panel, and steering assembly as a unit.

d. Remove floor plates. Remove parking brake lever from frame -- leave cable connected. Disconnect tubing from master cylinder and remove pedals, support, and master cylinder as an assembly.

e. Remove the clip holding the tilt cylinder tubing at the right side of the transmission; lift the tubing and secure it out of the way.

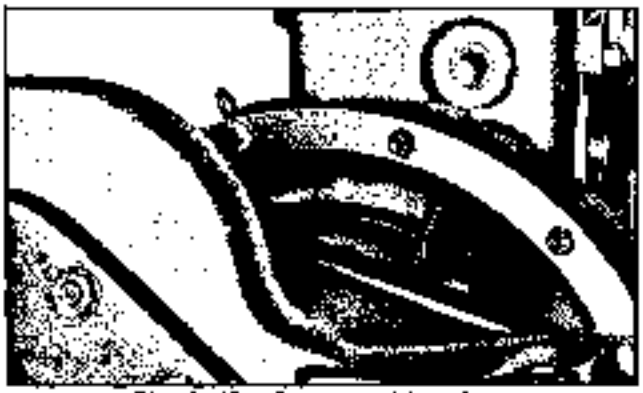


Fig. 1-45. Converter drive plate

f. Remove bolts holding converter drive plate to engine flywheel. Turn engine over to remove each bolt in turn, through opening shown in figure 1-45.

g. Remove bolts holding bell housing (16) to flywheel housing. Remove bolts holding transmission supports to the frame.

h. Roll the entire transmission and differential assembly away from the truck.

4-113. DISASSEMBLY. (See figure 2-15).

a. Remove drive plate (27) and converter (26). Remove bearing cap (33) and "O" ring (19).

b. Straighten out the two bent tabs on washer (3, figure 1-46), and remove the two lock nuts (2, figure 1-46).

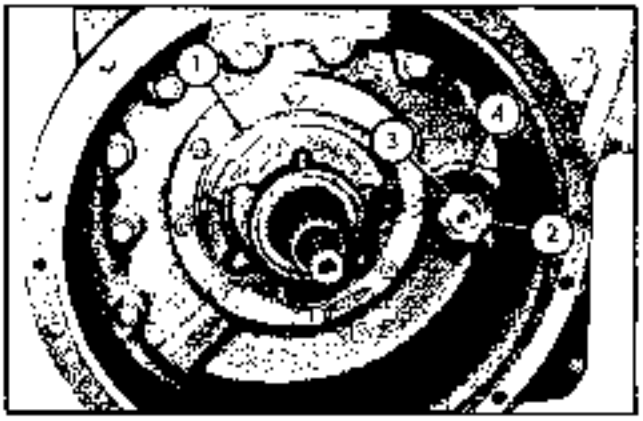


Fig. 1-46. Transmission removed

2. Pump
3. Lock nuts
4. Washer
1. Bearing

c. Remove pump (20) from bell housing (16). Remove seal (29) from pump. Remove bell housing (16) from case. Bearing (30, figure 2-16) will come out with housing.

d. Remove dip stick (6), tube (7), and "O" ring (5).

e. Remove manifold (4) and shim (6).

f. Remove flange (8) and gasket (15). Remove bolt (11) and withdraw tube (12), element (13) and gasket (14).

4-114. REPAIR.

a. Discard defective seals, "O" rings, and gaskets.

b. Discard defective converter and pump.

c. Thoroughly clean sump filter components. Reassemble in original order and tighten bolt (11) to 70-75 inch pounds.

d. Examine bore of manifold (4) carefully. If it is grooved or pitted, clean it up with a light honing. If the blemishes are so deep that it requires considerable honing to clean up, discard the manifold and use a new one.

4-115. REASSEMBLY. (See figure 2-16).

a. Reassemble in reverse order of disassembly.

b. Use new seals and gaskets.

c. When reinstalling lock nuts on pinion shaft adjust per paragraphs 4-120 t, v, and w, page 1-45.

d. Install components previously removed, following instructions under the appropriate headings in this manual.

4-116. TRANSMISSION. (See figure 2-16).

4-117. REMOVAL.

a. Removal of the entire assembly is accomplished as explained in paragraph 4-112.

b. Remove bolts holding transmission case to differential case.

c. Remove control valve as explained in paragraph 4-101.

4-118. DISASSEMBLY. (See figure 2-16).

a. Remove the bearing cap over the end of the pinion shaft. Remove the pump. Straighten out bent tabs of lock washer (35) and remove nuts (34).

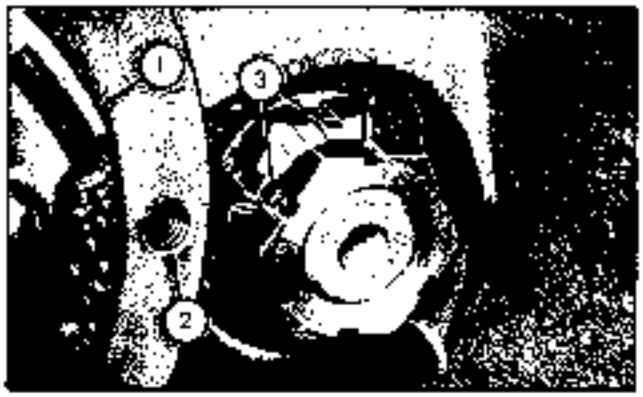


Fig. 1-47. Pinion shaft removal

1. Pump
2. Bearing cap removed
3. Straighten out tabs and remove nuts

b. Remove bell housing from transmission case. Bearing cone and cup (30 and 31) will come off with case.

c. Remove shaft (38). Turn case over so open side is up. Set it on blocks high enough so pinion and manifold are clear of bench.

d. Remove snap ring (29) and remove gear (27).

e. Lift the entire clutch assembly out of the case.

f. Remove snap rings (29) and gear (28). Remove pinion shaft (26) from case. Remove cone and cup (32 and 33). Remove gear (36) and thrust washers (39).

g. Remove retainer ring (25). Remove retainer (24) with ring (23) and collector ring (21) with "O" ring (22).

h. Remove bearing (20) from shaft. Remove thrust washer (19), gears (15 and 16), and thrust washer (18). Mark shaft in relation to the housing and remove shaft (12). (Drive shaft from splined end, use a soft driver).

i. Remove retainer ring (7) and remove back-up ring (5), and friction plates and backing plates (3 and 4). Keep the parts for each side of the assembly separate.

j. To remove the piston (2) it will be necessary to compress spring (9) and remove snap ring (11).

NOTE

An adapter similar to the one shown in figure 1-48 may be made from a length of 3-1/2 inch pipe. Cut approximately a 3 inch slice out of one side and weld a strap across one end.

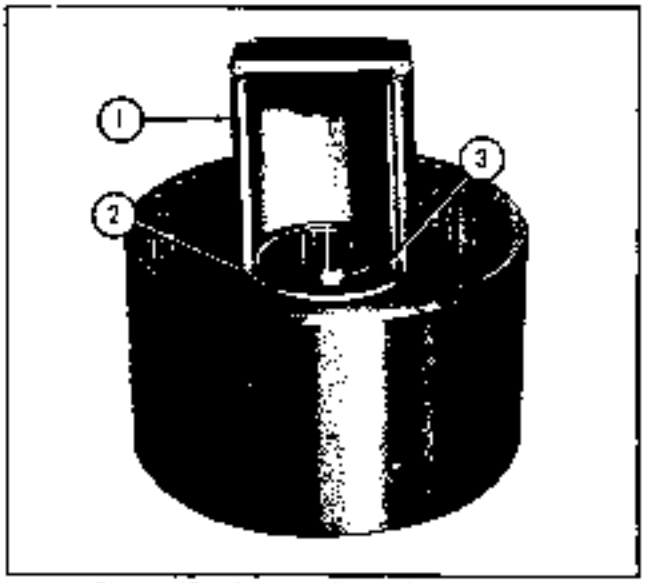


Fig. 1-48. Compressing spring

1. Adapter
2. Spring retainer
3. Snap ring

k. Turn the housing over, hold it square with the bench, and drop it down flat on the bench to dislodge the piston and ring. Remove the rings (6 and 8) from the piston and hub.

l. Repeat the above procedure to disassemble the other side of the clutch housing.

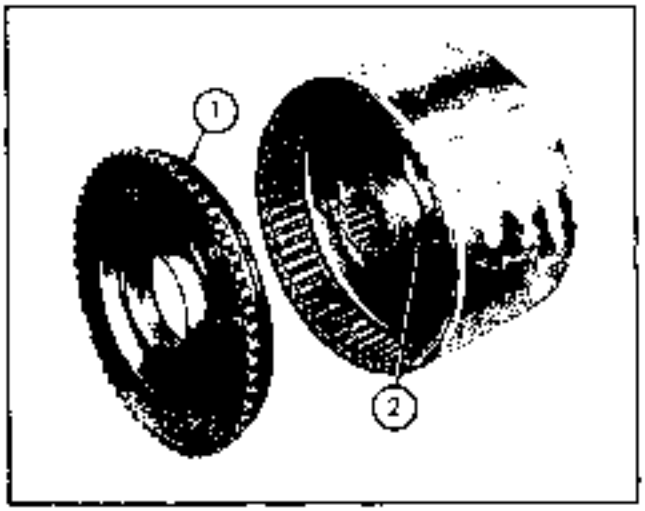


Fig. 1-49. Sealing rings

1. Piston ring
2. Oil seal ring

m. Remove oil seal rings (13) and quad rings (14) from shaft.

n. Remove manifold (4, figure 2-15) from case.

4-110. REPAIR.

a. Clean all parts thoroughly and examine them carefully. Make sure the oil passages in the shaft and pistons are clear. Discard any worn or damaged parts.

b. We recommend using new quad rings (14) each time the unit is disassembled. The oil seal rings (13) should be replaced only if they are worn or damaged. Check the ball plugs in the end of the shaft. Drive tight with a hammer and punch if necessary.

c. Examine bushings (17) in gears -- if they are damaged, press them out, and press in new ones.

d. Examine all bearings -- discard any that are unserviceable.

4-120. REASSEMBLY. (See figure 2-16).

NOTE

Unless otherwise indicated, torque 5/16 inch bolts to 25 foot pounds, and 3/8 inch bolts to 35 foot pounds. Do not use Permatex on gaskets.

a. Assemble in reverse order of disassembly.

b. Coat the quad rings (14) with a light film of clean chassis lubricant and install them in the grooves in the shaft. Coat the oil seal rings with chassis lubricant.

c. Install oil seal ring (8) in hub and piston ring (6) in piston. Coat the rings lightly with clean chassis lube.

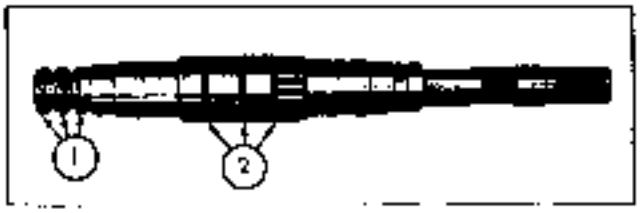


Fig. 1-50. Input shaft

1. Oil seal rings
2. Quad rings

d. Note the position of the bleed hole in the piston, and the lube hole in the splined portion of the hub. Mark the unsplined hub in line with the lube hole. The piston must be installed with the bleed hole 90 degrees from the lube hole. (When the opposite piston is installed, the bleed hole must be 90 degrees from the lube hole in the opposite direction, so the bleed holes are 180 degrees apart).

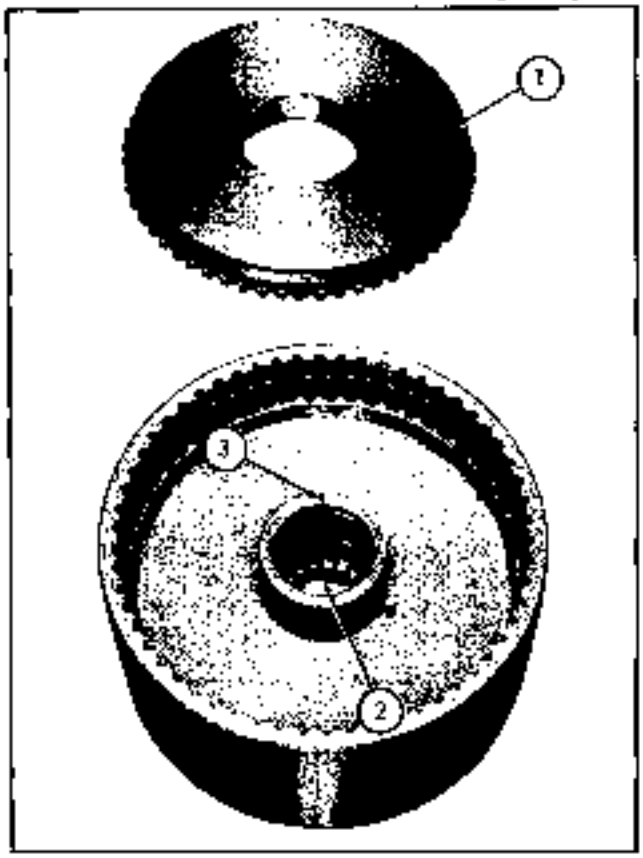


Fig. 1-51. Piston and housing

1. Bleed hole, 90° from lube hole
2. Lube hole
3. Mark on unsplined hub

e. Start the piston very carefully on the hub -- tap it gently all around the edge to allow the ring to enter its bore without damage. Be sure the piston is fully seated all the way around.

f. Place spring (9) and retainer (10) on piston, compress spring, and secure with snap ring (11). (See figure 1-48).

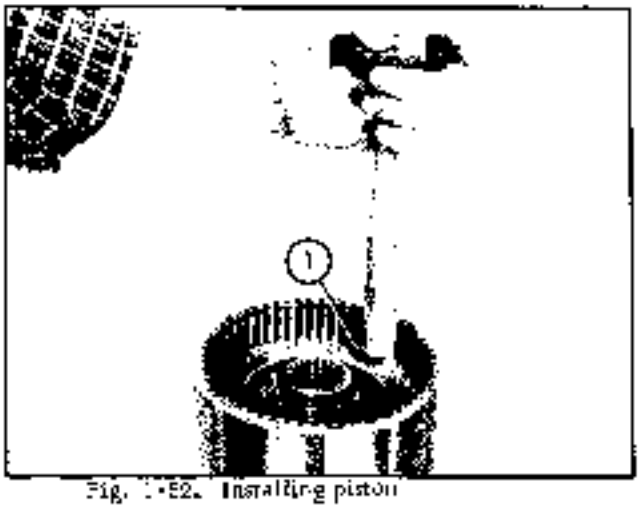


Fig. 1-52. Installing piston

l. Tap gently all the way around

g. Install the friction plates (3) and backing plates (4).

IMPORTANT

A friction plate (with internal teeth) must be used at both ends of the clutch pack. Install the plates alternately, using 3 friction plates and 2 backing plates in each clutch pack.

h. Install the back-up ring (6) and secure the pack with the retainer ring (7). Make sure the ring is firmly seated in the groove.

i. Install the other clutch pack in the housing. Locating the bleed hole 180 degrees from the bleed hole in the other piston.

j. If new parts are being used, note the position of the lube hole in the splined portion of the hub, and place a mark on the unsplined hub, in line with the hole. (The shaft must be inserted from the unsplined end of the hub). See figure 1-53.

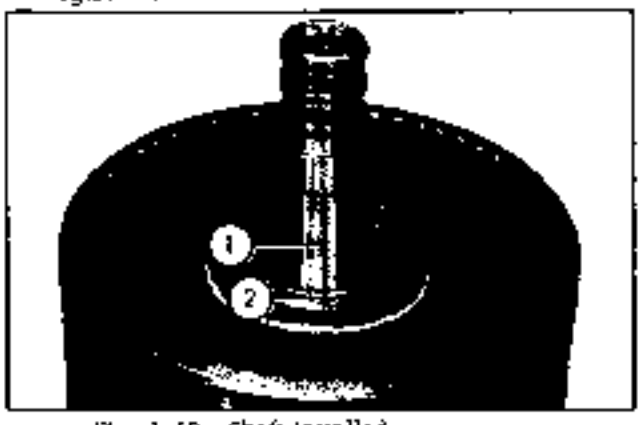


Fig. 1-53. Shaft installed

1. Oil holes in line with mark
2. Mark in line with lube hole in hub

k. Insert the splined end of the shaft into the unsplined hub of the housing. Push the shaft gently in place (to avoid damaging the quad rings), with the oil holes in the shaft in line with the mark previously made. Be sure the shaft splines are fully engaged in the hub splines.

l. Place a round thrust washer (18) over each end of the shaft. Place 28 tooth gear (15) over splined end of shaft; place 27 tooth gear (16) over opposite end of shaft.

m. Place a notched thrust washer (19) over each end of the shaft. Press bearings (20) onto the shaft.

n. Examine the piston ring in the retainer and the "O" ring in the collector ring. If they are worn or damaged, they should be replaced. Coat with a light film of chassis lube.

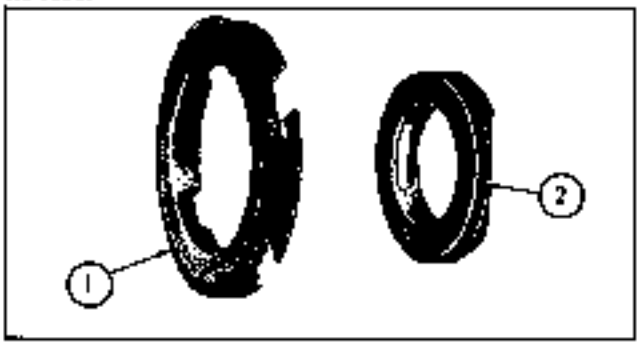


Fig. 1-54. Collector ring and retainer

1. "O" ring in collector ring
2. Piston ring in retainer

o. Install the retainer and piston ring on the shaft and secure with retainer ring (25).

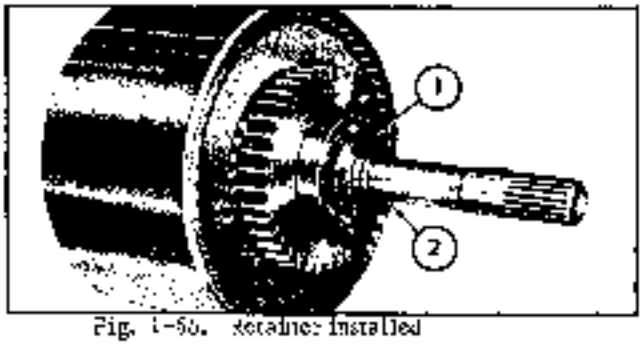


Fig. 1-55. Retainer installed

1. Retainer with piston ring
2. Retainer ring

p. Carefully install collector ring (21) over retainer (24). Side of collector ring with "O" ring must be against ball bearing.

q. Set the case in an upright position. Install gear (30), with a thrust washer (29) on each side of it, and install shaft (38). Secure this assembly with a nut, spacer, and large washer as shown in figure 1-56. Install bearing cone and cup (32 and 33) if they have been removed, and install pinion shaft (26). Install manifold and shim (4 and 5, figure 2-13).

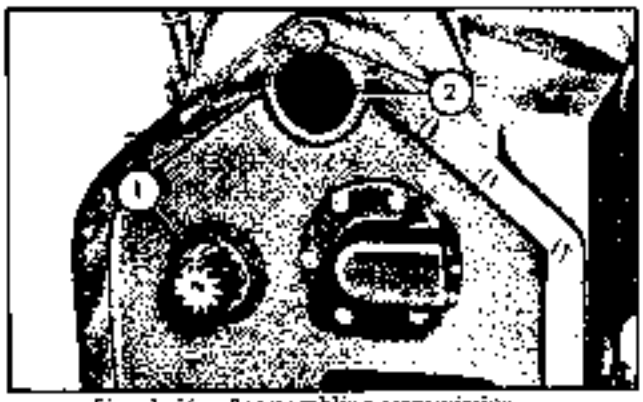


Fig. 1-56. Reassembling transmission

1. Pinion shaft and bearing
2. Idler gear shaft -- secured with nut, spacer, and large washer

r. Tip the case over and back on the blocks. Install 49 tooth gear (28) on pinion shaft, with long hub toward center of case. Secure with snap ring (29).

s. Coat oil seal rings with a light film of chassis lube. Lower clutch assembly in place, using care so oil seal rings are not damaged as they move into the manifold. Install snap ring (29), gear (27), and other snap ring (29) on pinion shaft. Long hub of gear must face the center of the case.

t. Install bell housing and gasket. Torque mounting bolts to 95 foot pounds. Stake retainer (24) to small keyway in shaft.

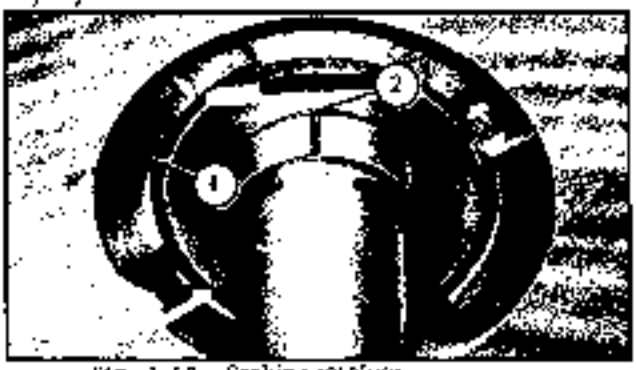


Fig. 1-57. Staking retainer

1. Collector ring
2. Stake retainer to keyway

u. Pinion shaft bearing adjustment:

1. Determine pinion shaft rolling torque with zero bearing preload.

2. Install adjusting nut (34) with beveled side out, and tighten until rolling torque is INCREASED by 30 to 40 inch pounds.

3. Mount a dial indicator on the machined face of the transmission case, as near as possible to the gear end of the pinion shaft.

4. Place the dial indicator point on the face of the pinion shaft. Do not readjust or relocate dial indicator base or point during the tests.

5. Support the transmission assembly on the surface of the bell housing, and apply a 5000 pound load on the gear end of the pinion shaft with an arbor press or other suitable device. Axial movement of the pinion shaft must not exceed .009 inch.

6. Turn the unit over and support it on the transmission housing mounting face. Apply a 5000 pound load to the threaded end of the pinion shaft. Axial movement must not exceed .003 inch.

7. Install lockwasher. Install second nut (34) with beveled side toward first nut. Tighten second nut to 60 to 80 ft-lbs. torque and bend at least one tang of the washer into a slot in each nut.

8. Recheck the total rolling torque to be sure it is correct after tightening the inner nut.

v. See paragraphs 4-94 or 4-99, and following, for ring gear and pinion adjustment. See paragraphs 4-104 or 4-109, and following for installing control valve. Install remaining components in reverse order of disassembly.

NOTE: When installing converter, it must turn freely when transmission case is bolted to crankcase, but before drive plate is bolted to flywheel.

4-121. HYDRAULIC PUMP. (See figure 2-27).

4-122. REMOVAL.

a. Drain hydraulic reservoir. Disconnect hydraulic lines from pump. Disconnect governor linkage. Remove four bolts holding radiator to frame -- it is not necessary to remove radiator hoses.

b. Remove the nut from the long bolt which passes completely through the upper side of the governor and pump. Loosen the lower bolt which passes through the governor and is threaded into the pump body, until the threads are clear of the pump.

c. Raise radiator enough so long upper bolt can be pulled back far enough to clear pump. Remove pump -- bolts can be left in far enough to hold governor in place.

4-123. DISASSEMBLY. (See figure 2-27).

a. Remove the elastic stop nut and remove gear (38) and woodruff key.

b. Remove bolts (4 and 5) and separate rear cover (3 or 3A), body (2), and front cover (7). Remove seal (9), gasket (10), spacer (11), and gasket (12).

c. Remove bearings (13) and gears (13 and 14). Remove seal (8) from front cover.

d. If lift truck has power steering, remove flow divider valve assembly (18) and "O" rings (29, 30, and 31).

4-124. REPAIR.

a. Clean all parts thoroughly and examine them carefully.

b. Discard any damaged seals, gaskets, and "O" rings.

c. Place bearings on gear shafts -- if there is excessive play, install new components.

d. Discard gears with cracks or broken or chipped teeth.

4-125. REASSEMBLY. (See figure 2-27).

a. Assemble in reverse order of disassembly.

b. When installing seal (9), place a light coating of No. 3 Permatex in bore of cover (7). Install seal with lip to inside and stake lightly to cover.

c. Torque mounting bolts (4 and 5) to 28 to 32 foot pounds.

d. Power steering relief pressure is to be 1100 PSI, plus or minus 50 PSI. Adjust pressure by turning adjusting screw (1, figure 1-58). Turn screw in to increase pressure. When desired pressure is attained, stake screw to cartridge, at both ends of slot.

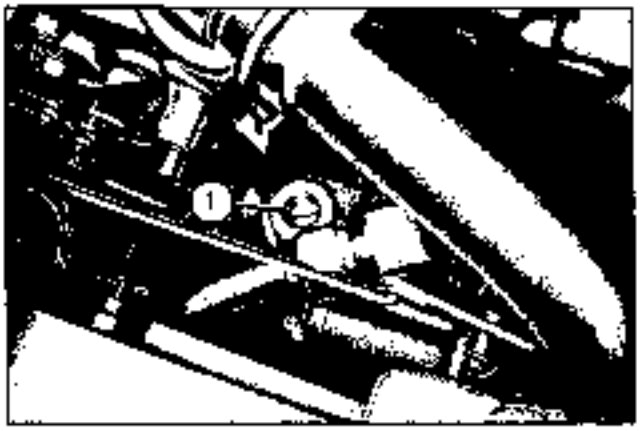


Fig. 1-58. Power steering pressure adjustment

1. Adjusting screw

4-126. MAST CONTROL VALVE. (See figure 2-28).

4-127. REMOVAL.

a. Disconnect hydraulic lines and linkages. Cap ends of lines to prevent the entry of dirt or other foreign material.

b. Remove valve body from support plate.

4-128. DISASSEMBLY. (See figure 2-28).

a. Remove ball check plug (11), O' ring (22), and check valve plunger (15).

b. Remove cap (22), gasket (21), shim (20), washer (19), spring and guide (16 and 17). Remove ball (18). Remove valve seat (14), "O" ring (13), and plunger (13).

c. Remove rubber bonnet (10), snap ring (9), and disc (8).

d. Remove bolt (6), lock washer (7), stop collar (5), centering spring (3), and stop washer (4).

e. Push spool into housing from front of valve (control handle end) until front seal (2) is exposed, then remove front seal. Pull spool out of housing from front end, being very careful that neither spool nor bore is damaged. Remove rear seal (2).

4-129. REPAIR.

a. Clean the seal grooves thoroughly.

b. Install new seals, "O" rings, and gasket (21).

c. Examine all parts carefully and replace any damaged components. If a spool or the valve body is damaged, the entire assembly must be replaced.

4-130. REASSEMBLY. (See figure 2-28). Reassemble in reverse order of disassembly.

a. Wash all parts thoroughly in a mild solvent.

b. The spools MUST be installed in the ports from which they were removed (the spool with 3 grooves must be installed in the port nearest the inlet side of the valve.) Install the spool from the front of the valve, until the spool end reaches the rear seal groove.

c. Dip new seal in clean hydraulic fluid and place seal in seal groove, with the "U" cup of the seal toward the valve body. Straighten the seal by running a smooth rod around the exposed surface of the seal until it fits perfectly.

d. Push the spool further into the valve body with a rotating movement, to ease the spool through the rear seal. Push the spool in just far enough to expose the front seal groove. Dip new seal in clean hydraulic fluid and install front seal with the "U" cup toward the valve body and straighten seal as explained previously.

e. Push spool gently forward with a rotating motion to ease the spool through the front seal. Position spool with 1/4 inch of polished surface of the spool exposed at the front of valve.

f. Install new rubber bonnets (10).

g. Install check valve assembly with new "O" ring (12). Tighten plug (11) to 30 foot pounds.

h. Install relief valve assembly, with new "O" ring (13). Tighten valve seat (14) securely. Install ball (18), guide (17), and spring (16). Use sufficient washers (19) or shims (20), or both, to obtain the relief pressure specified in Fig. 1-2. Each washer (19) affects the pressure approximately 300 psi; each shim (20) affects the pressure approximately 50 psi. Remove the floor plate and the pipe plug from either tee shown in figure 1-59, install a gage and check the pressure.

i. Install new gasket (21). Tighten cap (22) to 45 foot pounds.

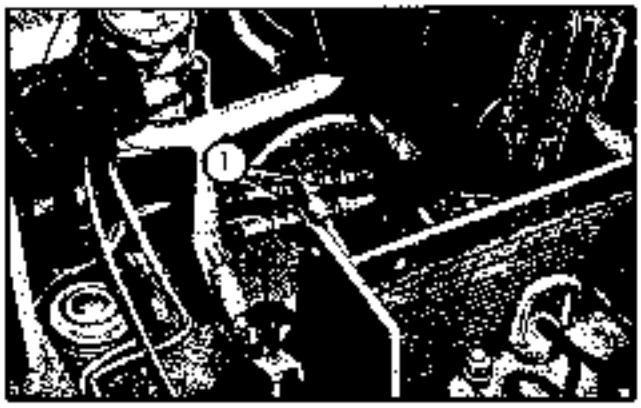


Fig. 1-59. Power system test ports

1. Test ports

4-131. TILT CYLINDERS. (See figure 2-30).

4-132. REMOVAL.

a. Tilt mast forward and place forks on floor. Secure mast with hoist or other means to keep it from tipping. Remove hydraulic hoses.

b. Remove socket head set screw from rear pin and drive out roll pin from front pin.

c. Thread a 3/8-16 UNC-2B bolt into the end of each pin to assist in pulling out the pins. Remove the cylinder to the front.

Fig. 1-60. Removing tilt cylinder

1. Roll pin
2. Set screw

4-133. DISASSEMBLY. (See figure 2-30).

a. Drain cylinder by moving rod back and forth.

b. Unscrew threaded washer (18). Pull piston rod (10) and internal parts out of shell (3 or 4).

c. Remove nut (11). Pull remaining components off rod.

4-134. REPAIR.

a. Replace all parts contained in cylinder repair kit (25R32). See page 2-80.

b. Examine bushings (22) or bearings (23). If they are badly worn, they should be replaced.

c. If piston halves (5 and 6) or bore of shell (3 or 4) are badly scored, install new parts.

4-135. REASSEMBLY. (See figure 2-30).

a. Reassemble in reverse order of disassembly. Dip all "O" rings and packing in clean hydraulic oil to facilitate installation. Install all parts from piston end of rod.

b. If a new cylinder is installed, or if the rod ends (21) have been removed, loosen the clamp bolt in rod end. Place a punch through the hole in the rod, and align cylinders to square up the mast.

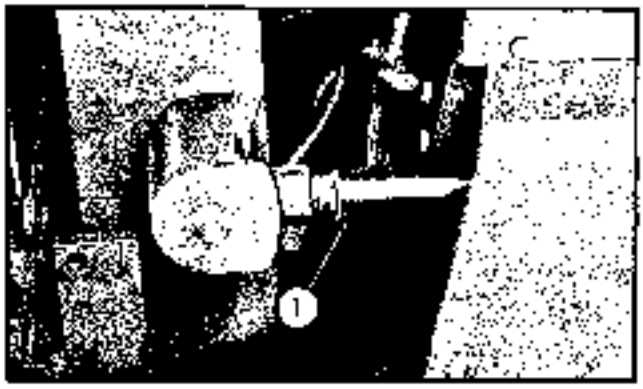


Fig. 1-61. Aligning cylinders

1. Insert punch here

4-136. LIFT CYLINDER. (See figures 2-32 or 2-33).

4-137. REMOVAL.

a. Lower forks to ground. Disconnect lift chains and hydraulic lines.

b. Remove set screw and remove piston head (24, figure 2-31) from mast. Remove the cap screw through the lug at the base of the cylinder. Lift the cylinder up and out.

4-138. DISASSEMBLY. (See figures 2-32 or 2-33).

a. Remove retainer (17), with "O" ring (18), wiper ring (19), and garter spring (16).

b. Remove plunger (6) and spacer (32). Remove snap ring (23) to remove piston (19), packing (20), "O" ring (21), and back-up ring (22).

c. Remove retainer (9), with "O" ring (10), wiper ring

(7), and garter spring (8). Remove button head screw (3) and seal (4).

d. Loosen lock nut (20) and unscrew cylinder head (27). Remove "O" ring (28) and back-up ring (29). If cylinder has lock nut (30) that is 3/4" thick, remove nylon ring (29A). This nylon ring is not used on cylinders having lock nut 1/2" thick.

e. The intermediate tube (5) and its components may then be removed through the bottom of the cylinder assembly. Use extreme care in this removal to avoid scratching or scoring the other sealing surface.

f. Remove snap ring (26). Push bearing (24) onto the tube far enough to expose retainer ring (25). Remove retainer ring and bearing.

g. Remove bushing (11), with packing (14), "O" ring (12), and back-up ring (13).

NOTE: Packing (14) may be serviced without disassembling the entire cylinder as follows: Remove retainer (9) and remove the packing with a small screwdriver or similar tool. Use extreme care so as not to mar the sealing or other surfaces of the intermediate tube.

h. Remove spring (33), washer (34), and spacer (35). When disassembling a 4 inch cylinder, also remove hat-shaped oil restrictor (36, figure 2-32).

4-139. REPAIR.

a. Examine all parts carefully for scratches, pitting, wear or other damage.

b. Replace items identified by an asterisk (*) on pages 2-92 or 2-94, depending on cylinder diameter.

4-140. REASSEMBLY. (See figures 2-32 or 2-33.) Reassemble in reverse order of disassembly.

a. Dip new "O" rings, seals, and packing in clean hydraulic oil to facilitate assembly and to help prevent damage to these parts.

b. Coat the full length of plunger (8) with a film of Lubriplate No. 110, or equal.

c. Install cylinder on mast assembly, with protrusion on bottom of cylinder in guide hole in base of mast. Install cap screw, through flange on cylinder head (27) into tapped hole in base of outer rail assembly (1, figure 2-31). Allow a minimum 1/8" clearance between bottom of cap screw head and flange. Secure with jam nut.

d. Install piston head (24, figure 2-31), secure with set screw, and bolt head to mast.

e. Reinstall hydraulic lines. Secure vent hose with strap and spacer. Install lift chains and adjust per instructions in paragraph 4-145.

f. Check hydraulic fluid level in tank and replenish as necessary. Start engine and run at idle speed. Pull back on lift control lever to fill the cylinder. Cycle the cylinder several times by raising and lowering the mast assembly.

g. Bleed the system as follows: Raise the mast high enough to expose the bleed screw. Loosen the screw to allow the air to escape. Raise and lower the mast until pure fluid -- WITH NO BUBBLES -- is being forced out around the bleed screw, then, tighten the screw. DO NOT RAISE THE MAST ABOVE THE FREE LIFT POSITION WHILE BLEEDING. Replenish the fluid in the tank if necessary.

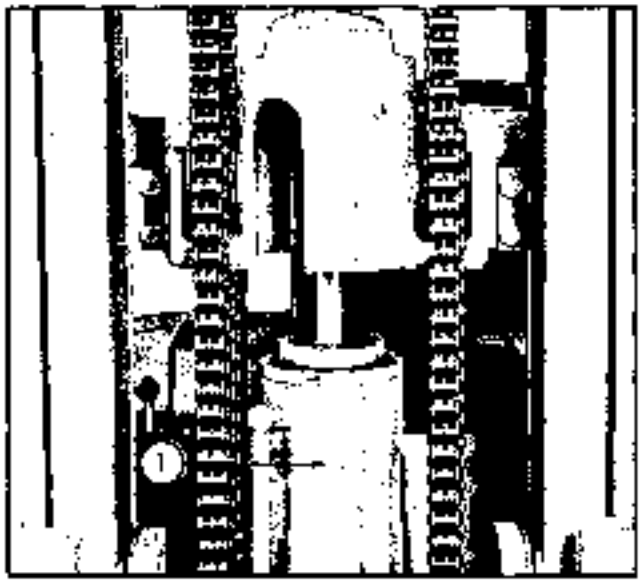


Fig. 1-62. Bleeding lift cylinder

1. Bleed screw

4-141. MAST AND RELATED PARTS. (See figure 2-31).

4-142. REMOVAL.

a. Remove forks (31) and safety rack (14). Disconnect hydraulic oil and vent lines.

b. Disconnect lift cylinders from mast as described in paragraph 4-138.

c. Remove bearing caps (2) and bushing (3). Move the mast away from the truck and lay it down on its back.

4-143. DISASSEMBLY. (See figure 2-31.)

a. Remove lift cylinder as described in paragraph 4-137.

b. Remove snap rings and anchor pins (19). Slide inner rail assembly (4) toward top of outer rail assembly (1) enough to clear carriage assembly (11). Lift carriage away from rails.

c. Remove stop blocks (26). Slide the inner rail toward the top of the outer rail until only the lower set of mast rollers (7) are engaged in the outer rail. Rotate inner rail upward, support in raised position, and remove shims and shims (C and D) from upper end of mast. Slide inner rail from outer rail.

d. Remove roller assemblies from carriage and inner rail. Remove snap ring (10), and remove roller (7) from shaft. Remove snap ring (9) and bearing (8) from roller.

e. Remove thrust bearing pin (13) and bearing (12).

f. Drive roll pin into pin (30) just far enough to allow removal of pin. DO NOT DRIVE ROLL PIN IN FAR ENOUGH TO IMBED IT IN THE CASTING. Remove pin, sheave (27 and 28), and bearing (29).

g. Remove cap (36), plunger (34), and spring (40). Remove latch (35), bushing (39), and pin (37).

4-144. REPAIR. Examine all parts carefully for wear or damage, particularly bushings and bearings. Discard all unserviceable parts.

4-145. REASSEMBLY. Reassemble in reverse order of disassembly.

a. Stake thrust bearing pins (13) from front side of carriage, at both ends of slot in pin.

b. Use shims (6) under mast shoes (5) to obtain maximum clearance between inner and outer rails.

c. To adjust lift chains, first move forks to the extreme ends of fork bar and lower forks until lift cylinder is completely collapsed. Adjusting is to be done with no load on forks. Move the upright to a vertical position.

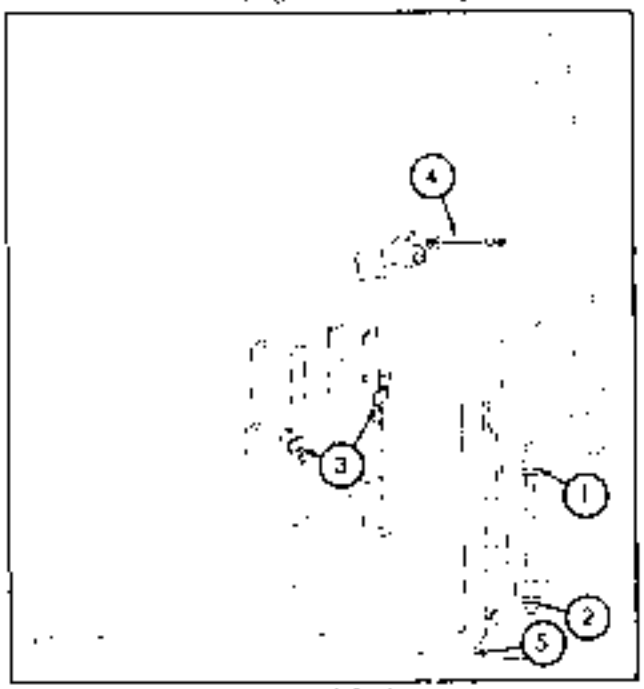


Fig. 1-62. Adjusting lift chains

1. Turn rod into anchor
2. Spherical nuts
3. 1/8" clearance required
4. Tension scale
5. Forks to floor -- 0 to 3/4"

d. Turn rods into chain anchors approximately 1-1/4 turnes (at 1, figure 1-62). Adjust spherical nuts (2, figure 1-62) for fork-to-floor clearance of 0 to 3/4 inch (both sides).

e. Raise upright to its fullest height and check to insure a clearance at 3, figure 1-62. If stop blocks are touching, readjust spherical nuts to obtain a clearance of at least 1/8 inch.

f. Attach tension scale as shown (4, figure 1-62) and measure deflection in chain. Attach the scale to the other chain at the same height, apply the same pull, and measure the deflection. Adjust spherical nuts to equalize deflection with the same pull applied. Tighten jam nuts securely.

g. Check again for clearance at (3) with upright fully extended. Adjust as necessary.

4-146. COUNTERWEIGHT.

4-147. REMOVAL, DISASSEMBLY, AND REPAIR. (See figure 1-64).

a. Remove overhead guard. Remove bolt at bottom of counterweight. Disconnect tail light wires.

b. Insert a suitable hook or eye bolt through the hole in the counterweight and secure with large flat washers and nut.

c. Use a suitable hoist and lift the counterweight straight up and off the truck.

Fig. 1-64. Removing counterweight

4-148. REASSEMBLY. Reassembly consists of replacing the counterweight on truck.

4-149. GENERAL.

a. This section includes instructions for repair and overhaul of the component units of the engine.

b. Provide a clean place to work and clean the engine exterior before you start disassembling -- dirt causes engine failures. Many shop tools have been developed to save time and assure good workmanship; these should be included in your equipment.

4-150. CARBURETOR. (See figure 2-7).

a. Loosen screw (41) and pull the choke cable out of swivel (40).

b. Remove the air intake hose, the fuel line, and the linkage. Remove the cap screws that hold the carburetor to the manifold.

c. Disassembly of the carburetor is complete upon removal of all attaching parts of each component. The following steps outline the various troubles and which components cause them.

d. Some factors other than faulty carburetor operation that could contribute to improper operation of the engine are as follows: Faulty ignition system, incorrect timing, air cleaner restrictions, or air leaks. Check for and correct any of these conditions that may exist.

e. If the engine is not idling properly, check the gasket between the manifold and cylinder head and the gasket between the carburetor and manifold. Air leaks at these points will cause erratic idling.

f. The principal parts subject to wear in the carburetor are the throttle shaft (2) and the float valve and seat assembly (22).

g. Wear of the throttle shaft results in more air entering the carburetor than is necessary. This condition results in too lean a gas mixture when the engine is idling. To compensate for the increased air supply, it is usually necessary to increase the idle gas mixture, this in turn affects fuel economy. In addition, this excess air is unfiltered, and could cause serious damage to the engine.

h. Excessive wear of the float valve and seat will result in too high a fuel level in the carburetor bowl. This high fuel level causes excessive fuel consumption, crankcase oil dilution, and difficulty in maintaining satisfactory adjustment of the carburetor.

i. If the fuel level is too low, the engine will not respond quickly, and it will be very difficult to maintain a satisfactory carburetor adjustment. A sticking float valve or float arm could cause a low fuel level.

j. Inspect all parts taken from the carburetor. Replace any that are damaged or worn excessively. Discard all gaskets, the choke shaft packing (32), and the throttle shaft packing (9).

k. Use a cleaning solution, and thoroughly clean the throttle body (1), the fuel bowl (17), and all parts being used again.

l. Assemble the carburetor in reverse order of disassembly.

m. The float (20) controls the fuel level in the carburetor bowl. Attach the float to the throttle body (1) and turn the throttle body upside down. Measure the distance of the float from the milled surface of the throttle body. This distance should be 1/4 inch. If necessary, bend the float arms in either direction to obtain the correct dimension.

n. Secure carburetor to manifold, and make hose, tube, cable, and linkage connections. Adjust carburetor as explained in paragraph 2-10.

4-151. GOVERNOR. (See figure 2-8).

a. To remove the governor, first disconnect the linkage.

b. Remove the fan and the four bolts holding the radiator. Raise the radiator high enough to allow removal of the governor mounting bolts.

c. Remove drive plate (17) and base (12). Remove weight and shaft assembly.

d. Remove snap ring (20) and remove washers (21 and 22), base (19), thrust bearing (18), and upper race (23).

e. Drive groove pin out of fork (8), and remove lever (7), fork (8), and spring (9).

f. Examine all parts carefully and discard any that are unserviceable. Races (15 and 23)must slide freely on shaft.

g. When balls (14) are in the bottom of the slots, there must be .230 to .240 inch space allowed for movement of upper race (23). Snap ring (20) acts as a stop. Use washers (22) as required.

h. Lubrication is supplied the governor by splash from the gear train through the holes in the governor base (12). Make sure the governor parts are being well supplied with oil.

i. When governor is installed, adjust engine speed as explained in paragraph 6-19.

4-152. CYLINDER HEAD.

a. The cylinder head is an important part of the engine assembly since it contains the complete combustion chamber and cored passage for water flow. Remove the cylinder head in the following sequence:

1. Drain water from engine and disconnect radiator hose.
2. Loosen and remove the nuts holding the cylinder head to the block.
3. Lift the cylinder head off the engine and carry to a clean bench for further disassembly.

b. Remove all carbon from combustion areas using a scraper and wire brush.

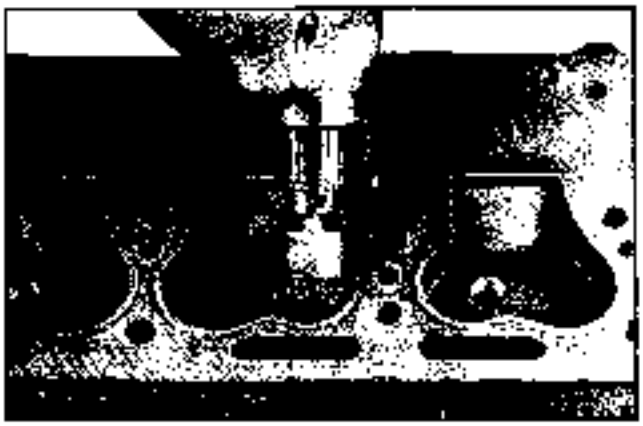


Fig. 1-65. Cleaning carbon from combustion chamber

c. Clean the cylinder head thoroughly with a solvent or degreasing solution and blow it off with air pressure.

d. Make sure that gasket contact surfaces on the head and block are clean, smooth and flat.

e. Check flatness with straight edge and feeler gauge in three positions lengthwise and five crosswise. The maximum permissible is .004 low in the center lengthwise, gradually decreasing towards the ends, or .003 crosswise or in localized low spots.

Fig. 1-66. Checking cylinder head flatness lengthwise. (.004 max.)

4-103. VALVE REMOVAL.

a. With a valve spring lifter, compress the springs and remove the locks or pins from the valve stems which are in a closed position. Close the other valves by rotating the crankshaft and remove the locks (or pins) from these valves in the same manner. Remove all valves and place

Fig. 1-67. Checking cylinder head flatness cross wise. (.003 max.)

in order in a rack, with holes numbered for both intake and exhaust valves so they will not be mixed in handling.

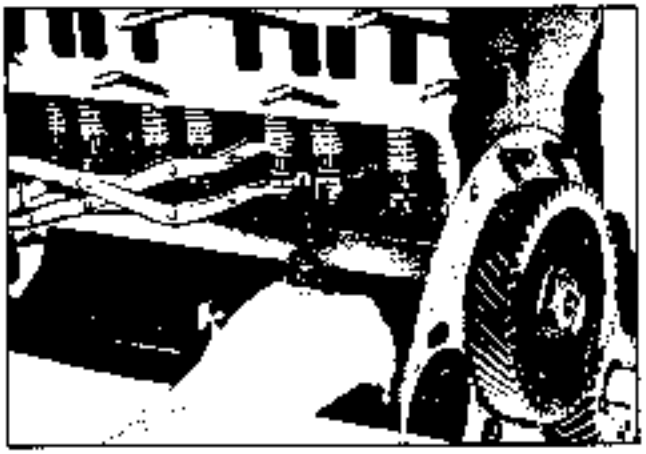


Fig. 1-68. Valve removal

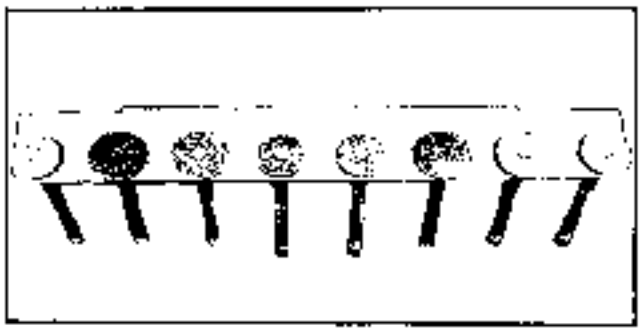


Fig. 1-69. Valves in rack

4-104. VALVE GUIDES

a. Clean the valve stem guides, removing lacquer or other deposits by running a valve guide cleaner or wire brush through the guides.

b. Check guides for wear by using "Go and No-Go" plug gage or a telescope gage and 1" micrometer. Nominal diameter of guide hole is .3438-.3422 for both intake and exhaust valves. Replace all guides that are worn bell-mouthed and have increased .0015" or more in diameter. Remove all guides when necessary by driving them out from the combustion chamber side with a driver slightly smaller than the outside diameter of the valve guide.

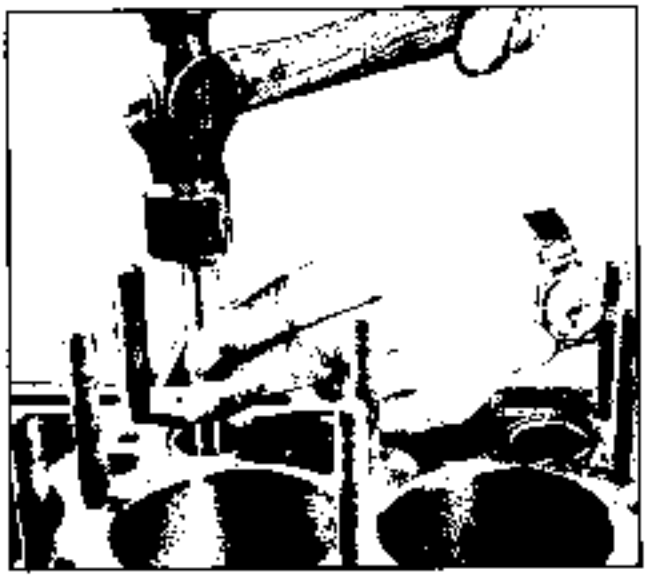


Fig. 1-70. Removing valve guides

c. Using a suitable driver, replace worn guides as required, from the combustion side, and locate so top of guide is 1-5/32 inches below face of block (both intake and exhaust valve guides).

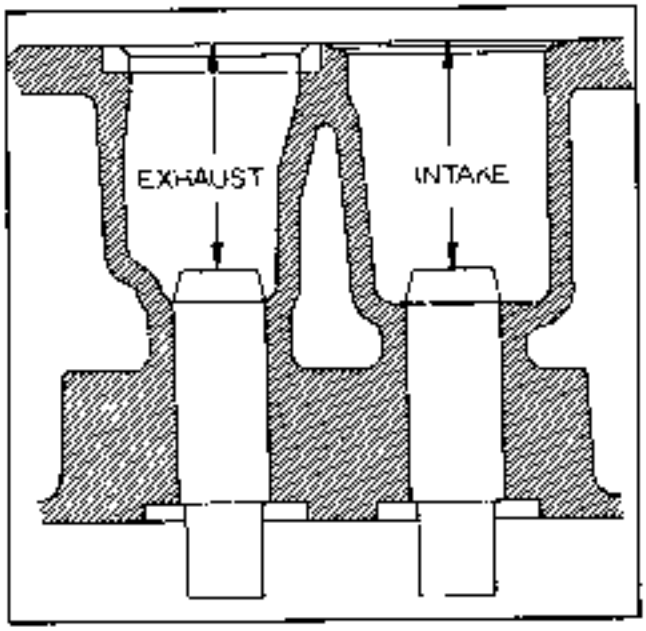


Fig. 1-71. Valve guide locations

d. Ream new valve stem guides to required size, using a straight reamer ground to correct size and having a pilot which will properly locate it and keep it from wandering from the original reamed hole.

CAUTION

When replacing guides that are ferrok coated do not ream since these are all pre-reamed before being ferrok coated - any further reaming will remove the coating.

4-155. VALVE SEAT INSERTS

a. The exhaust valve seat insert is held in place by a shrink fit.

b. Inspect all exhaust valve inserts in the block and replace any that are loose, cracked or otherwise damaged. Use puller for removing faulty insert as shown in Illustration.

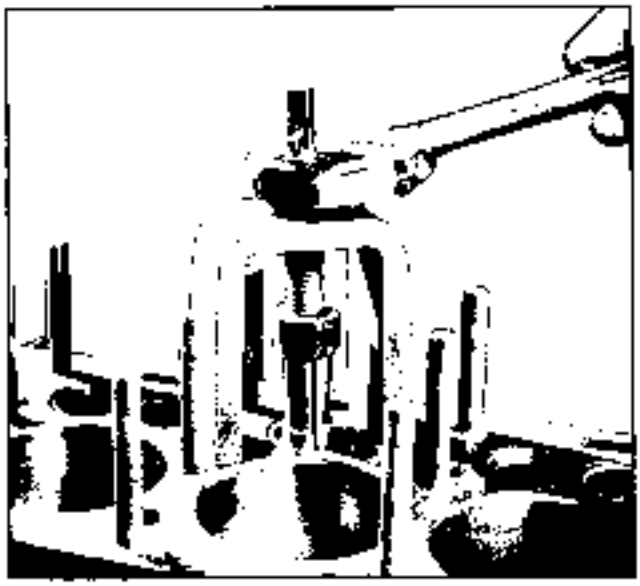


Fig. 1-72. Removing exhaust valve seat insert

c. When required to replace with new insert, clean and counterbore for .010 larger insert using counterbore tool with correct fitting pilot.

d. When machining the counterbore, be sure to go deep enough with the tool to clean up the bottom so that the insert will have full contact to carry away the heat.

e. We do not recommend installing new inserts having the same outside diameter as the one removed. The following chart shows the dimensions of Standard Inserts and counterbores; See figure 1-73.

Outside Dia. of Insert (A)..... 1.3485-1.3475
Inside Dia. of Cubore. (B)..... 1.3445-1.3435

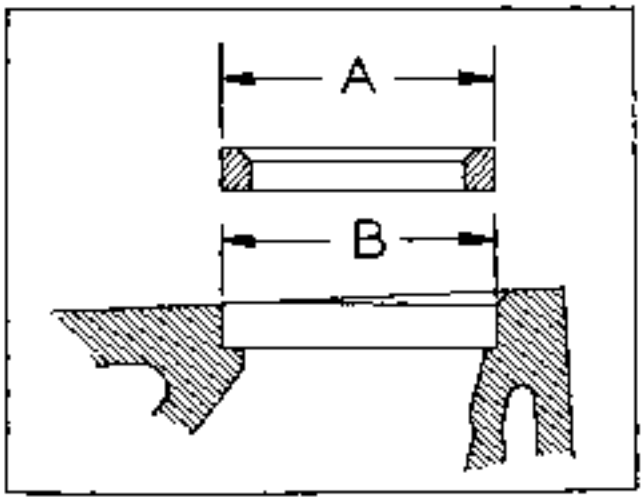


Fig. 1-73. Insert and counterbore

f. When OVERSIZE inserts are used, dimensions of the insert and counterbore increase proportionately (.010, .020, .030 -- depending on the oversize).

g. New insert installation should have a press fit. Chill insert in coolant; with dry ice for 20 minutes before assembling.

h. Insert may then be installed in the counterbore using a piloted driver, tapping in place with very light hammer blows, without the possibility of shearing the side walls. This assures it being seated firmly on the bottom of the counterbore.

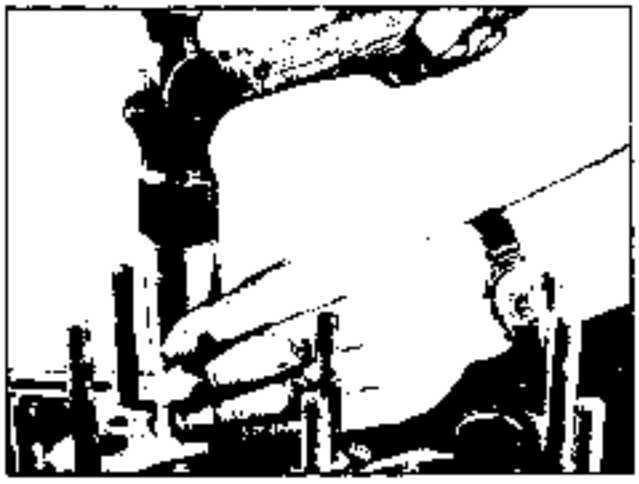


Fig. 1-74. Installing valve seat insert with driver

4-166. VALVE SEATS

a. Grind intake valve seats at a 30° angle, exhaust valve seats at a 45° angle. Before removing the arbor, indicate the seats. Total indicator reading of the run-out must not exceed .002". Use a pilot having a solid stem with a long taper, as all valve seats must be ground concentric and square with either new or worn valve stem guide holes.

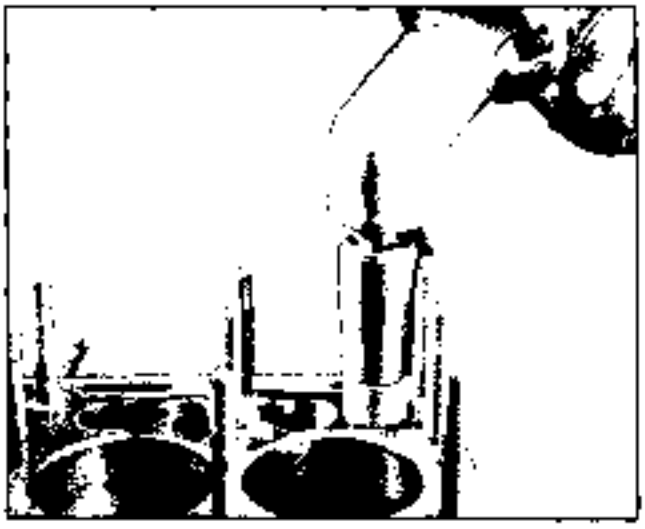


Fig. 1-75. Grinding valve seat

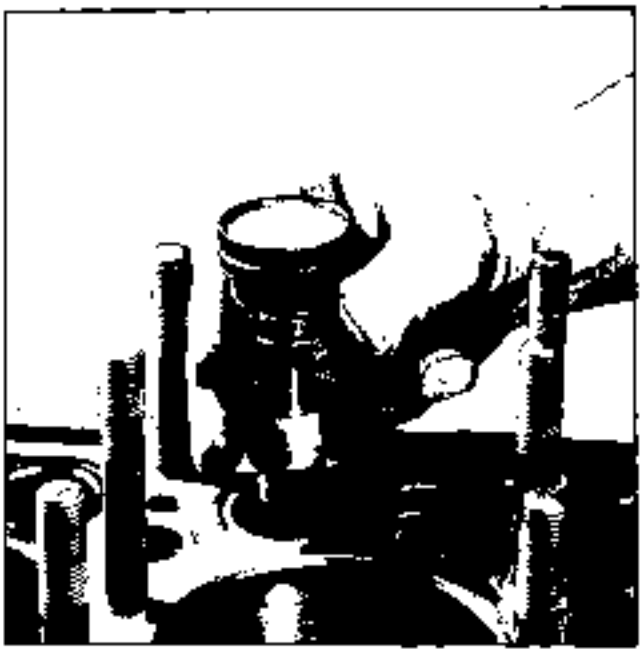


Fig. 1-76. Indicating valve seat

4-167. VALVES

a. Inspect valves for condition and replace any that are "mushed", cracked or burned, also any on which valve stems are bent or worn more than .002 over the maximum allowable limits. Reface or replace all valves.

VALVE SPECIFICATIONS

	Intake	Exhaust
Stem Diameter	.3414-.3401	.3386-.3377
Clearance Limits	.0026-.0008	.0063-.0037
Desired Clearance in Guide	.0015	.0045
Seat Angle	30°	45°

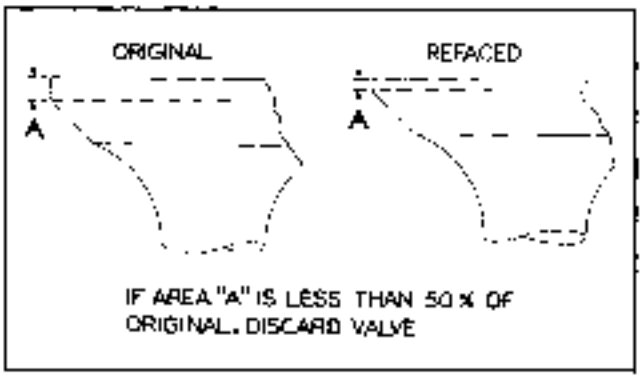


Fig. 1-77. Allowable head thickness of refaced valves

b. All valves having less than 50% margin thickness (outer edge of valve head) after refacing has been completed must be replaced. To check this dimension, compare the refaced valve with a new valve.

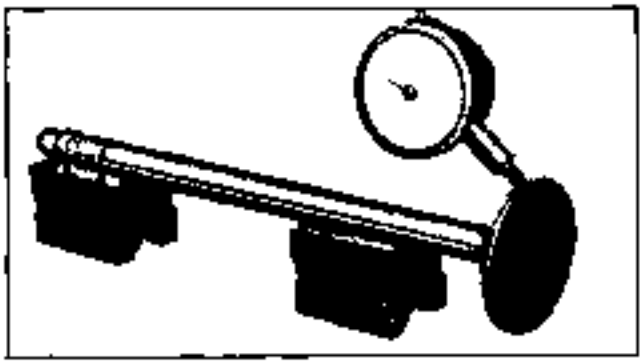


Fig. 1-78. Checking valve face in "V" blocks

c. Check all refaced or new valves in V-blocks with indicator to determine if the contact face is true with the stem within .002. If not, repeat the refacing operation.

d. After the valves and seats have been refaced and reground, coat the seat lightly with Prussian blue and drop the valve into position, oscillating it slightly to transfer the blue pattern to the valve face. This should show a

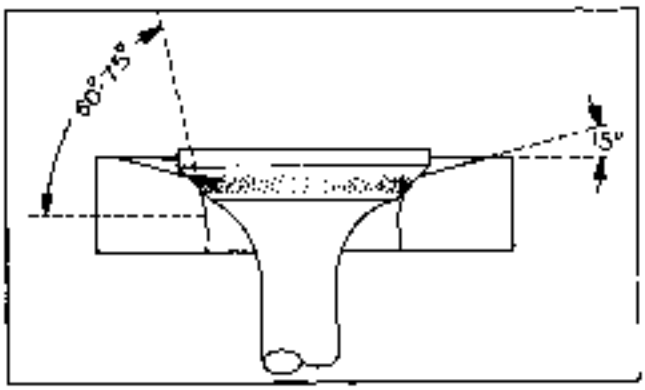


Fig. 1-79. Method of narrowing valve seats

contact width of 1/16" to 3/32" and should fall well within the width of the valve face, leaving at least 1/64" on either side where the blue does not show. If the contact is over 3/32" wide, the seat in the head may be narrowed by using a 15° stone to reduce the outside diameter or using a 60° or 70° stone to increase the inside diameter.

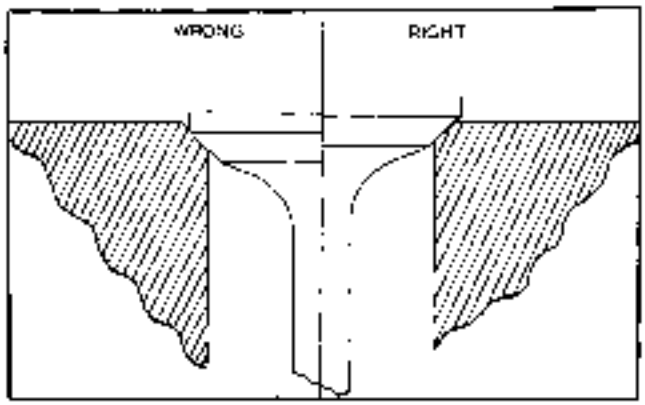


Fig. 1-80. Valve position in block

e. Never allow valves to set down inside the seat.

f. After the narrowed-down seat is brought within specifications, the seat should be retouched lightly with the original stone to remove burrs or deadtered edge.

> A poor valve grinding job cannot be corrected by valve lapping.

g. Coat the valve stem with a light film of engine oil.

4-158. VALVE SPRINGS

a. Check all valve springs on a spring tester (Fig. 1-81) to make sure they meet specifications regarding weight and length. Springs, when compressed to "valve open" or "valve closed" length, must fall within specifications shown below when new, and must not show more than 10% loss in pressure.

VALVE SPRING SPECIFICATIONS

Outside diameter	32/32"
Length - valve closed	1-45/64"
Load - valve closed	47 to 53 lbs.
Wear limits - min. load	42 lbs.
Length - valve open	1-27/64"
Load - valve open	96 to 104 lbs.
Wear limits - min. load	86 lbs.

b. Reassemble the valves and springs in the block with the retainer and retainer lock.

4-159. CYLINDER BLOCK

a. Checking bore wear.

1. Clean the ring of carbon from around the top of the cylinder bore formed above the travel of the top ring.

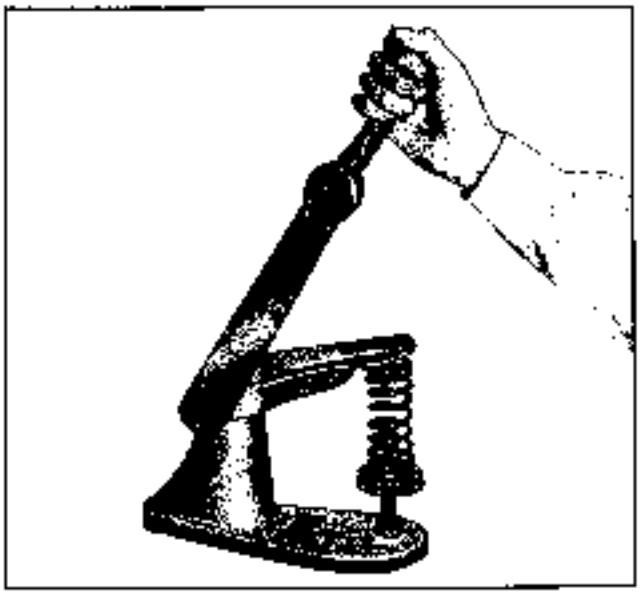


Fig. 1-81. Valve aping tester

2. Determine the original diameter of the cylinder barrel by checking this unworn area with a pair of inside micrometers at intervals of approximately 45°.

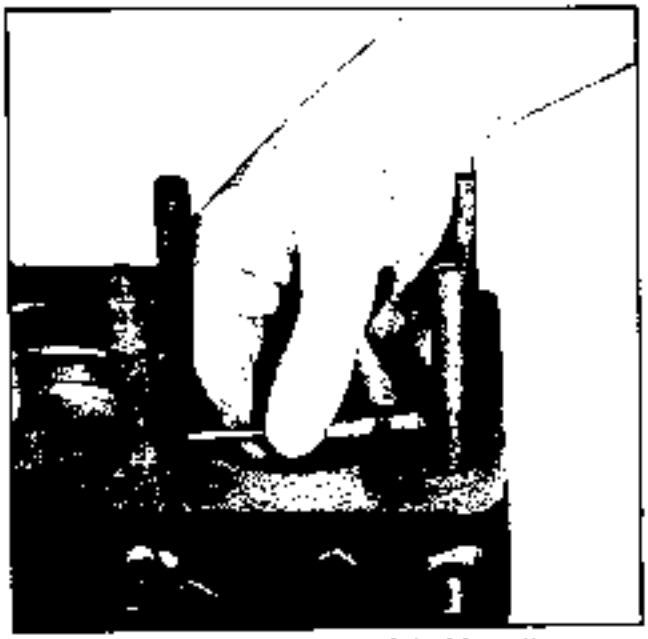


Fig. 1-82. Measuring original bore diameter above ring travel.

3. Check in same manner the top of the ring travel area approximately 1/4" below the shoulder.

4. The maximum difference in the above checks, indicates the amount of cylinder bore wear. If less than .008, re-ringing will be suitable, if over .008 re-boring is recommended.

h. Preparing cylinder walls for re-ringing or re-boring.

1. Ridge ream the cylinders to remove the un-worn area at the top so that the new rings when assembled will not bump and distort both themselves and the piston lands.

Fig. 1-83. Ridge reaming top of cylinder bore

2. Several good makes of ridge reamers are available which will ream the top of the bore in direct relation to the worn area so that should the worn area be off center slightly there will be no partial ridge remaining.

3. Drain the crankcase and remove the oil pan.

4. Remove the cap screws holding the connecting rod caps to the rod. KEEP THE CAP AND BOLTS IN NUMERICAL ORDER SO THAT WHEN THE PISTONS AND RODS ARE REMOVED FROM THE ENGINE, THE CAP CAN BE REASSEMBLED AND KEPT WITH ITS MATING PART.

5. Push the pistons and connecting rods up through the top of the cylinder, carrying with them all the carbon and metal chips left from the cleaning and ridge reaming operation. WHEN DOING THIS, EVERY PRECAUTION MUST BE TAKEN TO PREVENT DAMAGE TO CYLINDER BORES BY THE SHARP CORNERS AND ROUGH EDGES OF THE CONNECTING RODS AND BOLTS.

6. It is important to remove the glaze on the cylinder bores by using a glaze breaker in order to assure quick seating of the new piston rings. If the cylinder glaze is not removed, you will have no assurance as to when the rings will begin to function properly and control the oil.

7. The following step by step procedure is recommended:

A. Cover the entire crankshaft with a clean, slightly oily cloth to prevent abrasives and dirt from getting on the crankshaft.
B. Remove the excess carbon deposits from the top of the cylinder wall before beginning the glaze breaking operation. (This is to prevent loading the stones).
C. Surface hone each cylinder several times; move the glaze breaker up and down in the cylinder rapidly to produce a 45 degree cross

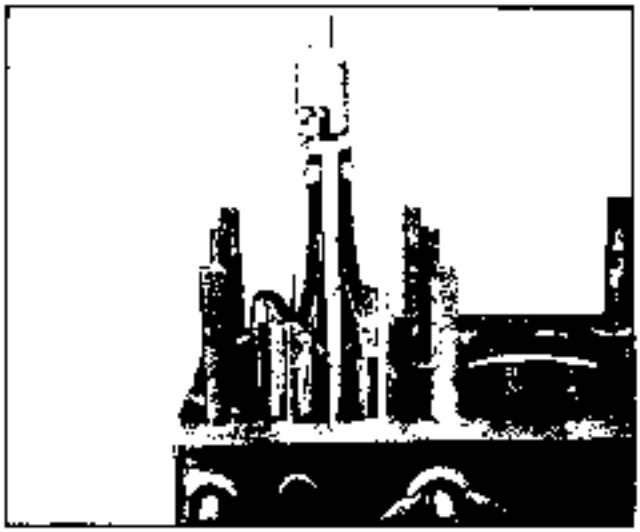


Fig. 1-84. Removing cylinder wall glaze

hatch pattern similar to that illustrated.
D. Clean the loose abrasives from the stones by using kerosene and a wire brush. (Do not use thinner to clean the stones because of the explosion hazard). Dry the glaze breaker before moving to the next cylinder.
E. The most desirable cylinder finish is 30 - 40 micro inches with this finish the depressions in the surface tend to keep the supply of lubrication between the mating parts. This finish can be obtained by using 280 grit stones on the glaze breaker.
F. Clean all bores thoroughly with a clean oiled rag to pick up all the small particles of dirt that may be embedded in the walls. Follow this with a clean cloth to make certain the walls are CLEAN.

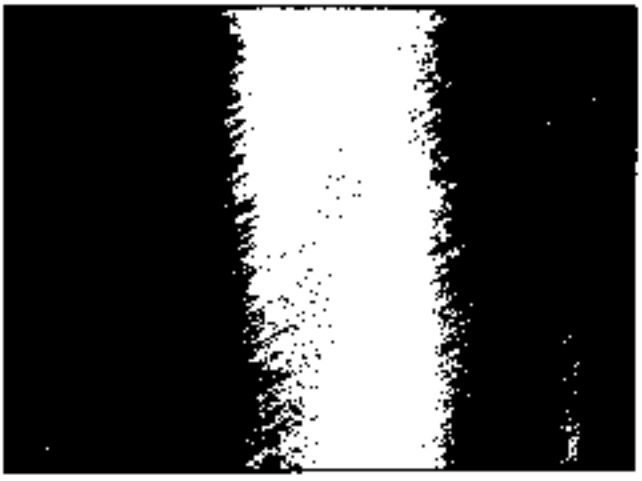


Fig. 1-85. Desirable cross hatch pattern obtained with a glaze breaker

4-100. PISTONS

a. Check the pistons for excessive ring groove wear, and replace any that exceed the allowable limits in the Limits and Clearance Data Chart, page 1-66.

b. The cylinder walls and pistons must be perfectly clean and dry when fitting pistons to the cylinder bores. Pistons should be fitted with the block and pistons at room temperature (68° - 70° F).

PISTON FIT ON STANDARD PISTONS WITH 5 TO 10 POUND PULL ..... .003"

c. Check the piston fit in the bore, using a half-inch wide strip of .003" feeler stock, the feeler being attached to a small scale of approximately 15 pounds capacity.

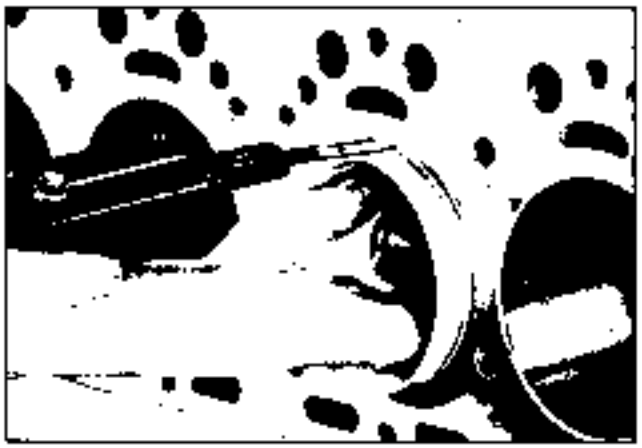


Fig. 1-86. Checking piston fit in bore

d. When the correct fit is obtained you must be able to withdraw the feeler with a pull of 5 - 10 pounds on the scale, with the feeler inserted between the piston and the cylinder midway between the piston pin bosses where the diameter of the piston is the greatest. Check the fit of the piston when it is approximately 2" down in the cylinder bore in an inverted position.

4-101. PISTON PINS.

a. Check the bushing in the upper end of the connecting rod for wear. If worn and you are using the original pistons with a service set of rings, an oversize piston pin may be obtained in .003 or .005" oversize.

b. The piston pin hole in the piston and the bushing in the connecting rod may be bored to increase their diameter to obtain the desired fit as shown in the Limits and Clearance Chart, page 1-65.

Note that while the chart specifies a light push fit of the pin in the piston, there is a definite clearance of the piston pin in the connecting rod.

4-102. CONNECTING ROD.

a. Replace the bushing in the connecting rod if new pistons are used. Using an arbor press, press out the old bushing and press in the new one - after which the bushing must be honed to obtain the correct fit of the pin in the bushings as shown in Limits and Clearance Chart, page 1-69.

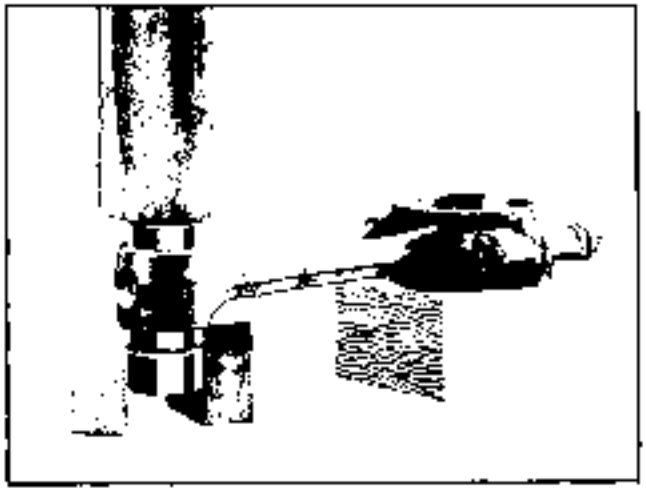


Fig. 1-67. Pressing in piston pin bushing

b. If there is an excess of stock in the piston pin bushing, it may be reamed first, then honed. In any event, the final operation should be done with a hone to obtain the desired fit with better than 70% bearing area on the pin.

4-163. PISTON AND CONNECTING ROD ASSEMBLY.

a. Assemble the pistons on the connecting rod by first heating them in some form of oven or in hot water to a minimum temperature of 100° F. When heated, the piston pin will enter the piston very easily and can be tapped through the connecting rod and into place without distorting the piston.

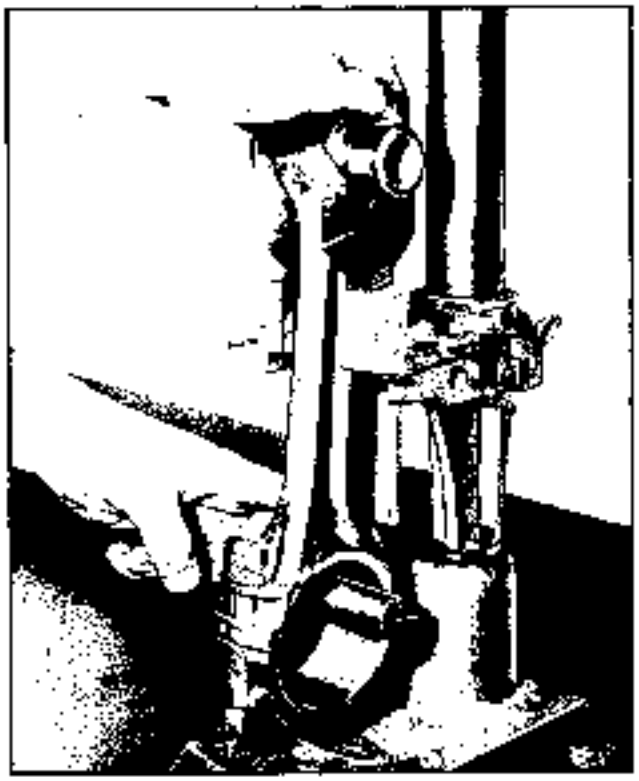


Fig. 1-68. Checking connecting rod for twist

b. The snap rings must be assembled in the grooves, making sure they are fully seated in place.

c. The piston pin hole in the connecting rod must be parallel to and in plane with, the large bore in the bearing end of the connecting rod.

d. This may be checked on a fixture with the piston pin assembled in the rod before assembling the piston; but regardless of this preliminary check, the completed piston and rod assembly must be rechecked and there must not be more than .002" twist or out of squareness checked over a spread of approximately 4 inches. The connecting rod can be bent or twisted to meet this specification.

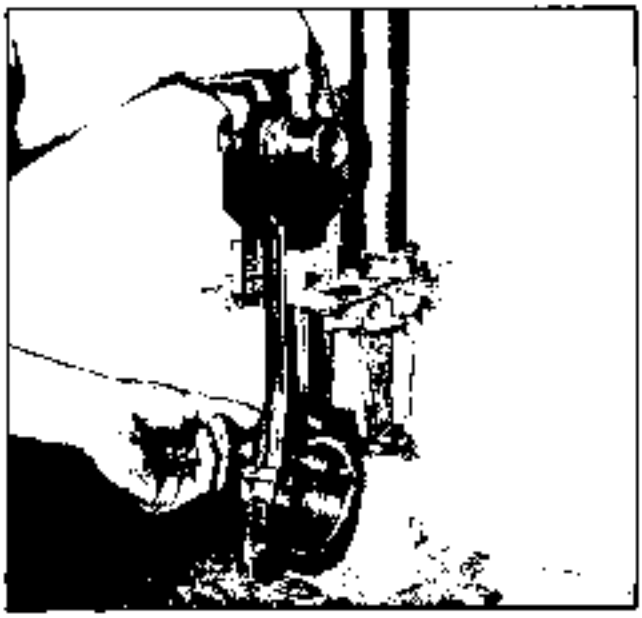


Fig. 1-69. Checking connecting rod for alignment

e. Pistons are cam and taper ground, and this must be taken into consideration when checking alignment of the assembly, since the diameter in line with the piston pin would be less at the top of the skirt than at the bottom.

4-164. PISTON RINGS.

a. Check the piston rings in the cylinders for gap.

b. To do this, insert a piston in the cylinder bore in an inverted position and then insert each ring one at a time about 2" down in the bore and bring the bottom edge of the piston up against the ring to square it up in the cylinder bore.

c. Check the gap between the ends of the ring with a feeler gage in accordance with specifications shown in the Limits and Clearance chart. If any of the rings do not have enough gap, they may be filed either in a ring filing fixture or by clamping the file in a vise and holding the two ends against opposite sides of the file.

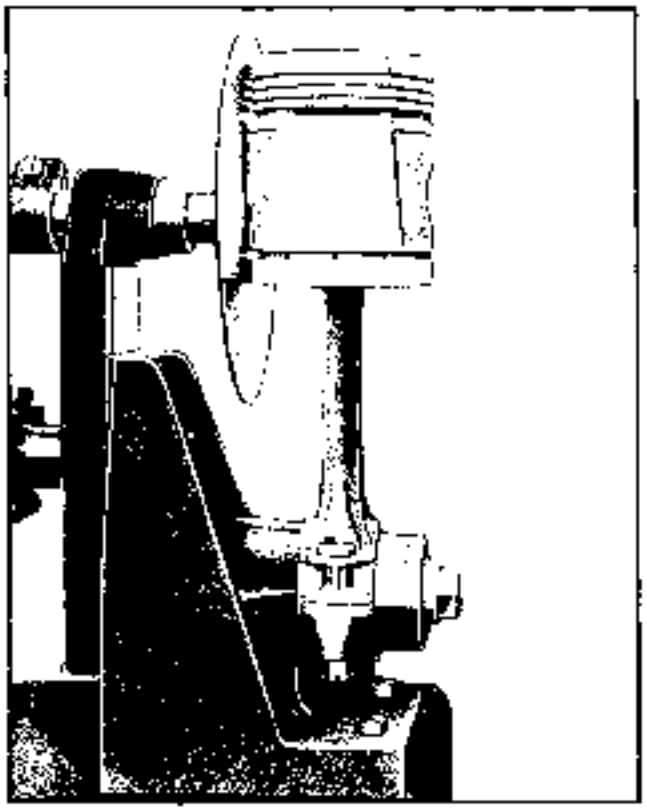


Fig. 1-90. Checking connecting rod assembly for alignment

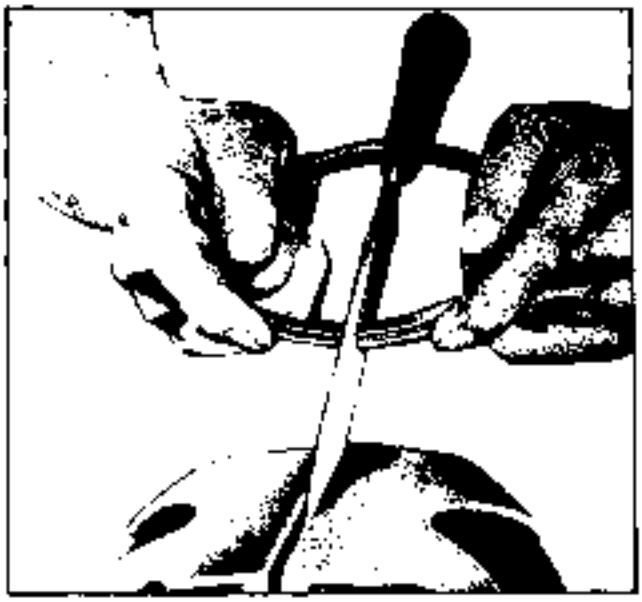


Fig. 1-91. Filing piston ring to increase gap

4-165. RECOMMENDED METHOD OF INSTALLING PISTON RINGS.

a. Grip the connecting rod in a vise with lead lined jaws to hold the piston firmly and roll each of the straight side rings in its groove to be sure there are no burrs or other interference with the free action of the ring in the groove.

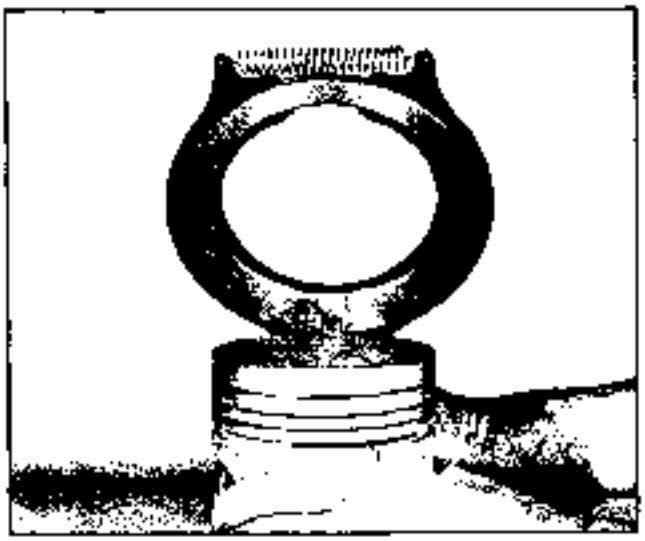


Fig. 1-92. Installing rings with ring expander tool

b. Hold the ring tool with recess side up and place the ring in with the bottom side up. Start with the lowest ring first.

c. Some piston rings are taper faced. These are clearly marked "TOP" on the side to be up when assembled on piston.

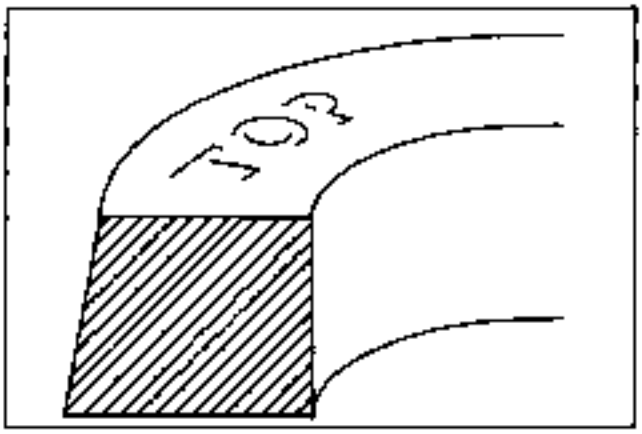


Fig. 1-93. Install tapered rings with "top" side up

d. Position ring in the tool so the expanding fingers will fully engage both ends.

e. Apply pressure on handles so ring is completely expanded. Pass the expanded ring and tool recessed side down over the piston to the proper groove.

f. Check ring side clearance at various positions with a feeler as shown in Fig. 1-94, in accordance with tolerances shown on Limits & Clearance Chart, page 1-68.

4-166. CRANKSHAFT AND MAIN BEARINGS.

a. Using a puller, remove pulley from crankshaft.

Fig. 1-94. Checking ring clearance in groove

b. Take out screws and remove gear cover.

c. Drop the oil pump, by removing nut or cap screws holding pump to center main bearing cap.

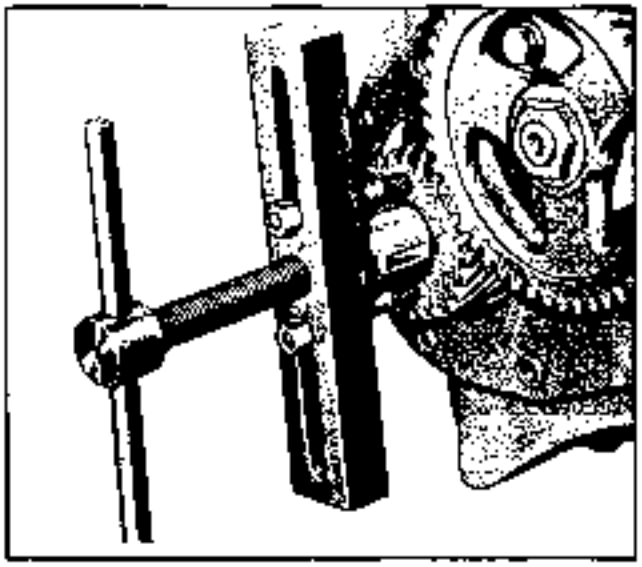


Fig. 1-95. Removing crank gear

d. Remove each main bearing cap, one at a time, and inspect the bearing and crankshaft journals.

e. If there is any indication of flaking out, scoring or actual wear, they may be replaced.

4-267. BEARINGS.

a. Tri-metal bearings when new, are smooth and highly polished. However, a VERY FEW HOURS OF OPERATION WILL CHANGE THEIR APPEARANCE COMPLETELY. The bearing surface becomes a leaden gray in color and develops minute craters, almost cellular in appearance as indicated in figure 1-96, which follow the pattern of the matrix. THIS APPEARANCE IS A NATURAL CHARACTERISTIC OF THIS TYPE BEARING AND IN NO WAY INDICATES FAILURE.

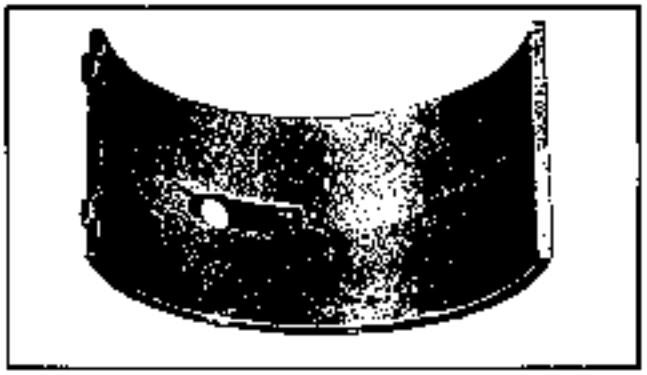


Fig. 1-96. Appearance of a good bearing

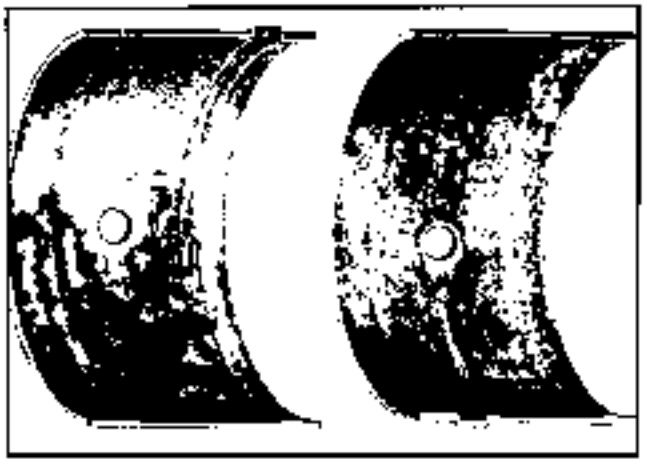


Fig. 1-97. Bearing damage due to corrosion

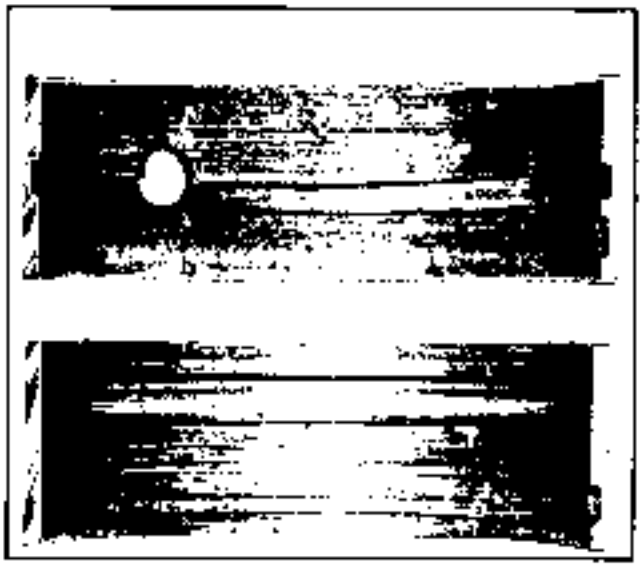


Fig. 1-98. Scored bearing due to dirt or lack of oil

b. If the visual inspection appears satisfactory, the bearings should be removed and checked for thickness with a ball micrometer.

c. To remove the upper half of the bearing shell use a special tool obtainable at most parts houses, which is a pin with an angular head. It may be inserted in the oil hole of the crankshaft and as the crankshaft is turned in a clockwise direction, the head of this pin picks up the bearing shell and forces it out of the bore in the block.

Fig. 1-99. Removing main bearing

d. The thickness of the bearing shells is given in the Limits and Clearance Chart, page 1-19, and if this thickness has been reduced more than .0005 beyond the maximum allowable tolerance, the bearing shell must be replaced.

Fig. 1-100. Measuring bearing thickness

e. If visual inspection of the crankshaft shows no indication of excessive wear or scoring, the clearance of the bearing should be checked.

f. Check each bearing, one at a time by using a piece of Plastigage of a diameter specified to check certain clearances.

g. By placing this Plastigage in the bearing and tightening it in place, the width of the Plastigage, after crushing, determines the bearing clearance as shown in Fig. 1-101.

Fig. 1-101. Checking bearing clearance with Plastigage

CAUTION

When using this method DO NOT TURN the crankshaft, as that would destroy the Plastigage.

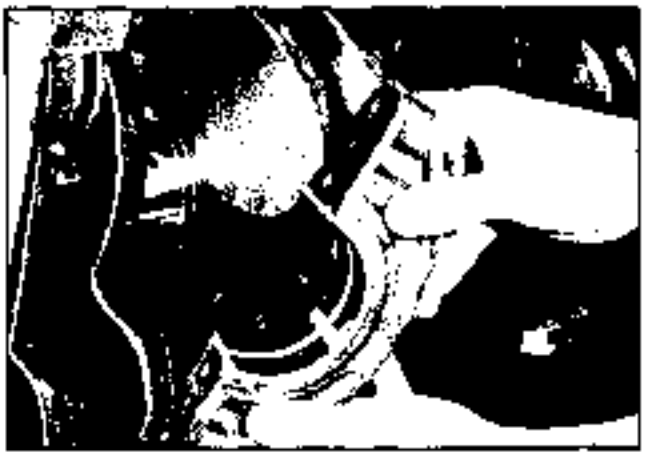


Fig. 1-102. Checking bearing clearance with feeler stock.

h. An alternative method is to use a piece of 1/2" feeler stock (the thickness of which should be equivalent to the maximum clearance permissible in the bearing) lengthwise, in the bearing shell, on a film of oil. Assemble the bearing cap and tighten the screws, torquing them to the specifications. Then try to turn the crankshaft by hand to determine whether or not you can feel a drag.

i. If a definite drag is felt and the piece of feeler stock is equivalent to, but no more in thickness than the maximum clearance specified, you may be sure that neither the crankshaft nor bearing are worn excessively as far as clearance is concerned.

j. When using new bearings and the crankshaft is not worn, checking with a piece of feeler stock as outlined above should lock up the crankshaft, making it possible to turn only by use of a bar or wrench.

k. If crankshaft is scored, or worn enough so that new bearings will not fit with the required clearance, it should be removed and reground.

l. Standard crankshaft may be reground to decrease the diameter a maximum of .040.

m. Before shaft is reground, it must be checked for straightness and straightened if necessary to be within .002 indicator reading. When reground, the fillet radii must be within dimensional limits and must be perfectly blended into thrust and bearing surfaces.

CRANKSHAFT FILLET RADII

3/32" ± 1/64" Radius on all crankpins and mains except rear main.

1/8" ± 1/64" Radius on rear main.

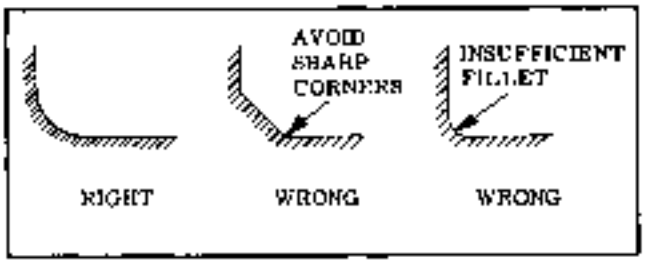


Fig. 1-105. Crankshaft fillet radii

n. Connecting rod bearings and crank pins may be checked in the same manner with one exception. Instead of trying to turn the crankshaft when the connecting rod bearing is tightened on it with a piece of feeler gauge assembled, try to move the connecting rod from side to side.

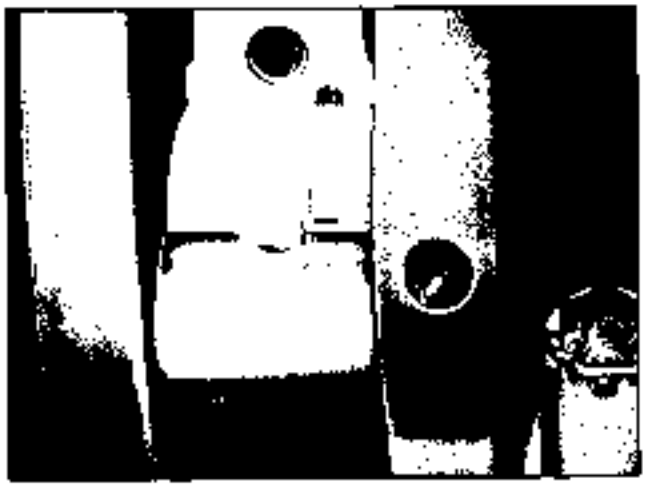


Fig. 1-106. Replacing bearing

o. With new bearing shells and feeler stock equivalent to the specified clearance in thickness, if the crank pin is not worn, you will quite probably have to use a hammer tap to move the rod from side to side, indicating that the clearance is well within the specified range.

Fig. 1-135. Checking rod bearing with feeler stock.

4-26E. CAMSHAFT.

a. Using a puller, remove the cam and crank gears.

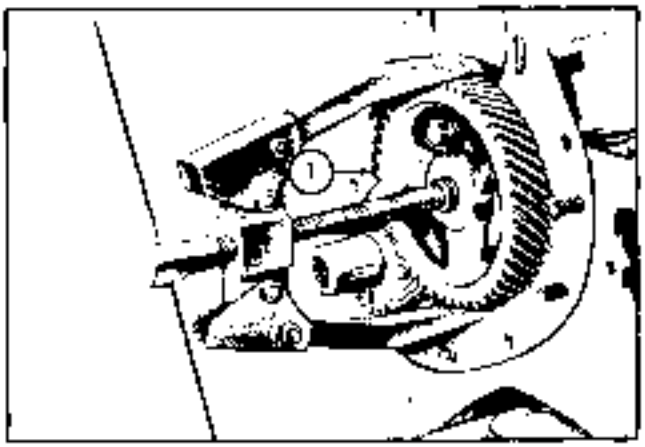


Fig. 1-10C. Removing cam gear with puller

1. Camshaft gear

b. Remove the screws holding the camshaft thrust plate to the front of the cylinder block, which makes it possible to pull the camshaft forward out of the bearings.

c. Unless engine is lying on its side, tappets must be removed or lifted before camshaft can be pulled.

d. Remove tappet chamber covers.

e. Tappets can then be lifted out and lined up in sequence, for installation in the same location unless inspection shows that they require replacement.

f. Before pulling the camshaft completely, check the clearance of the bearing journals in the bushing. To do this use strips of feeler stock 1/4" wide with edges dressed with a stone to eliminate any burrs or feathered edges.

g. If clearance is equal to or greater than the amount indicated under wear limits, check the diameter of the camshaft journals to determine the next step. Excess wear at these positions require replacement of the shaft.

h. If wear is found to be in the bushings instead, these must be replaced, using precision service bushings, available for that purpose, which require no reaming, only care in assembly, to line up oil holes, and not to damage the bushings as they are being pressed in.

4-169. TAPPETS.

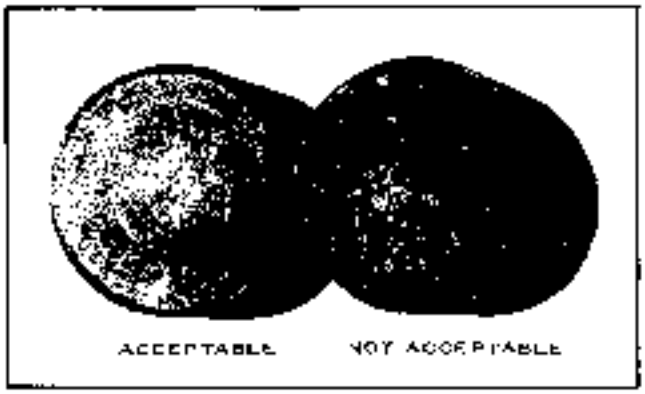


Fig. 1-107. Valve tappet wear comparison

a. Inspect each tappet carefully. Two or more small pits on the contact face is acceptable; more than that calls for replacement of the tappet.

b. Check the outside diameter with micrometers to determine if replacement is necessary because of wear.

c. Tappet guides or guide bushings may be checked for wear with a plug gauge or preferably with a telescope gauge and micrometer.

d. If guide bushings are used, they may be replaced and standard tappets used. If bushings are not used, the tappet bore may be reamed oversize, and oversize tappets installed.

e. When reassembling, adjust tappet clearance to .014" on both intake and exhaust valves.

CAUTION

When installing camshaft, use special care to prevent camshaft bumping and loosening expansion plug, to cause an oil leak.

4-170. TIMING GEARS.

a. Timing gears and timing gear fits must be checked carefully while the engine is being overhauled. To check the fit, use a screw driver to force the mating teeth as far apart as possible and check this clearance with a feeler gauge. If this clearance is .002" or greater, or if the gear teeth are badly scuffed and worn, the gear must be replaced. Timing gears must be replaced in pairs.

Fig. 1-108. Checking timing gear backlash

b. Gears matked same as the original as far as sizes are concerned, should be used as replacements.

c. Examine the camshaft thrust plate carefully for scoring and wear and if any indication of either shows, a new thrust plate should be assembled without question.

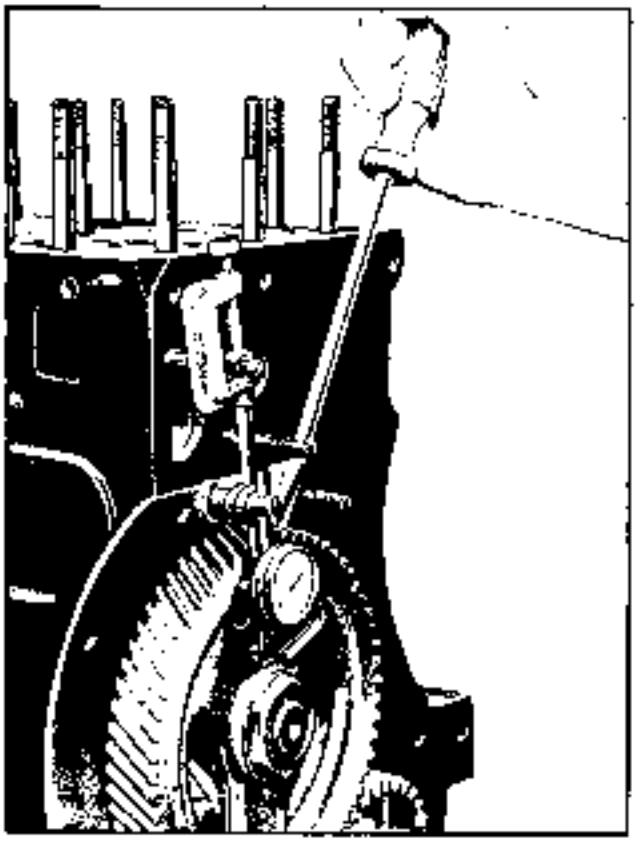


Fig. 1-109. Checking camshaft end play

d. Assemble the cam gear to the camshaft by driving or pressing it on, at the same time holding the camshaft forward with a suitable bar through the fuel pump opening in the block so there is no possibility of the camshaft bumping the expansion plug at the rear end and forcing it out of position, thus causing an oil leak.

e. Check camshaft end play as shown in Fig. 1-109. End play should be .005 to .009 inch.

f. Inspect crankshaft thrust washers for wear and scoring. Replace if necessary before reassembling gear.

g. Drive the crank gear on the shaft making sure that the marked teeth on the cam gear straddle the marked tooth on the crank gear, which assures you of the crankshaft and camshaft being in time.

Fig. 1-110. Gear timing marks

h. Check for clearance with the above gears assembled in place, since it may be possible that it is not within specifications. Repeat the operation previously outlined. Using a screwdriver pry the teeth as far apart as possible and check the clearance with a feeler gauge. If a .0015" feeler will not enter the gap the clearance is not excessive.

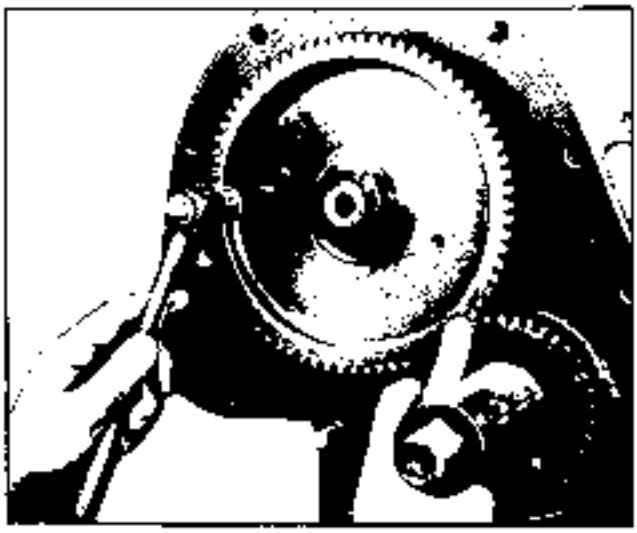


Fig. 1-111. Checking gear fit

i. To be certain that there is enough clearance, hold your finger at the junction of the two gears and with a light hammer tap the rim of the cam gear and note if there is vibration felt at this point.

j. If there is vibration and a .001" feeler gauge will not enter the gap between the two gear teeth, the gear fit is within specifications.

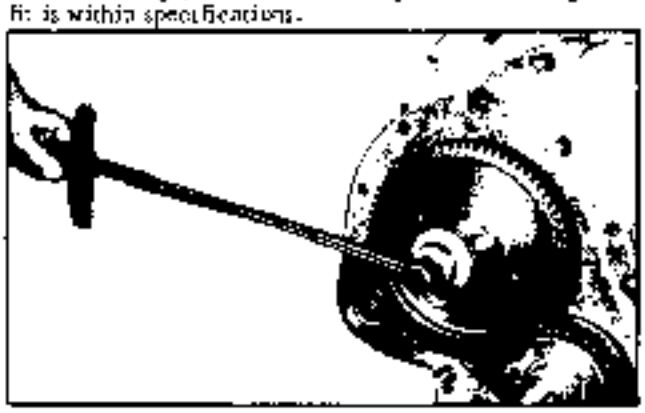


Fig. 1-112. Torquing cam gear nut

4-171. CRANKSHAFT END PLAY.

a. Check crankshaft end play before replacing gear cover. End play must be .003 to .009". Add or remove shims so end play falls within specifications. Crank gear nut must be tightened firmly against shim pack when checking end play.

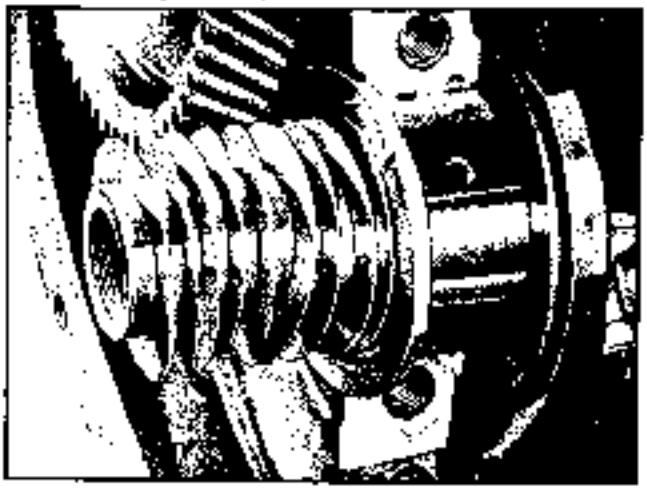


Fig. 1-113. Crankshaft shims, thrust washers

b. The crankshaft thrust on later engines is controlled by flanged center main bearings, which require no shims. Check end play, using a feeler gauge. If end play exceeds .006", replace flanged center main bearings. End play should be between .002 and .006".

4-172. ASSEMBLING OIL SEALS IN FILLER BLOCK AND OIL GUARD.

a. Lip type oil seals.

1. First, remove the filler block and oil guard, the latter

being the semi-circular die casting which fits in the cylinder block just to the rear of the rear bearing bore. Clean out the grooves thoroughly and clean the outer surface of this oil guard so as to remove all dried cement and grease.

2. Jute packing for crankshaft seal as it is received is approximately one-third larger in diameter than the width of the grooves. To fit the grooves in the filler block, this must be crushed in a vise or flattened with a hammer on a flat surface so the jute packing is narrow enough to fit into the grooves.

3. Next, press it into the grooves of both the filler block and the oil guard. Then, using a piston pin, a smooth hammer handle or some other instrument with a rounded surface, ram this packing into the groove so that it is seated firmly and expanded so that it seizes the sides.

Fig. 1-114. Top half of rear seal

4. In its present condition the packing will protrude from the grooves at either end in varying amounts. With a sharp knife, or razor blade, cut this off flush, making the cut parallel to the surface of the casting.

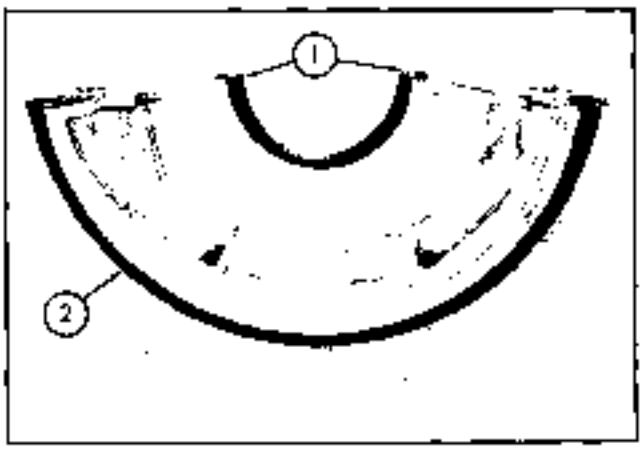


Fig. 1-115. Lower half of rear seal

1. Trim jute seal flush
2. Neoprene seal

Then slip it into place, either around the crankshaft, if the engine is still assembled, or directly into the groove if the crankshaft is out.

b. Neoprene oil seal.

1. To replace neoprene seal, thoroughly clean all cement, dirt, and oil from the contacting surface of the filler block. To hold seal in place for assembly, use only a small spot of non-hardening cement in the center of the contacting surface, before inserting seal in groove. No other cement is required.

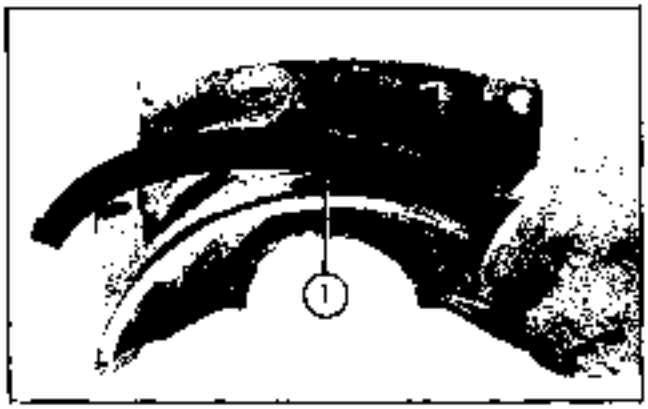


Fig. 1-116. Installing neoprene seal in rear block

1. Cement here

2. Neoprene seal on front filler block is installed in the same manner.

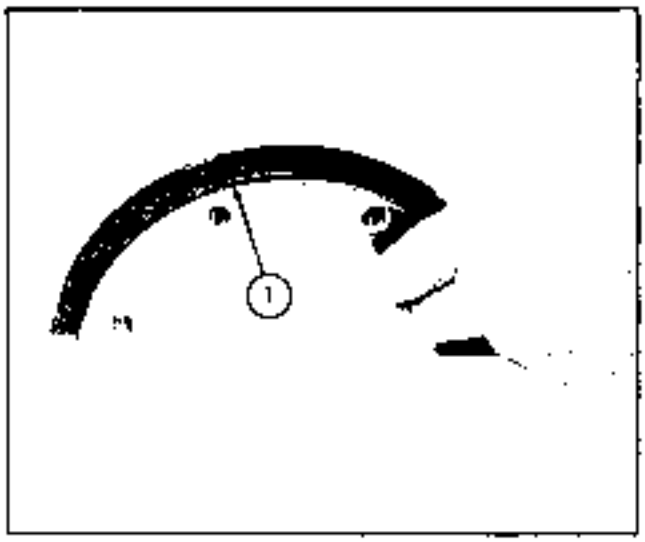


Fig. 1-117. Installing neoprene seal in front block

1. Cement here

3. When replacing gear cover, cement gasket to gear cover with a quick drying gasket cement and reassemble to engine block.

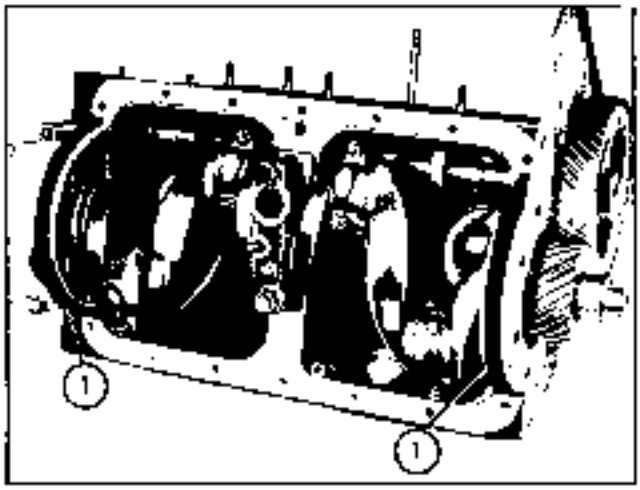


Fig. 1-118. Seals in place

1. Neoprene seals

4-173. OIL PUMP.

a. The oil pump is assembled to the center main bearing, held in position vertically against a machined pad by studs.

b. The extended portion of the body acts as a pilot, fitting closely in a reamed hole in the main bearing web, maintaining definite relationship between the camshaft and the oil pump drive shaft.

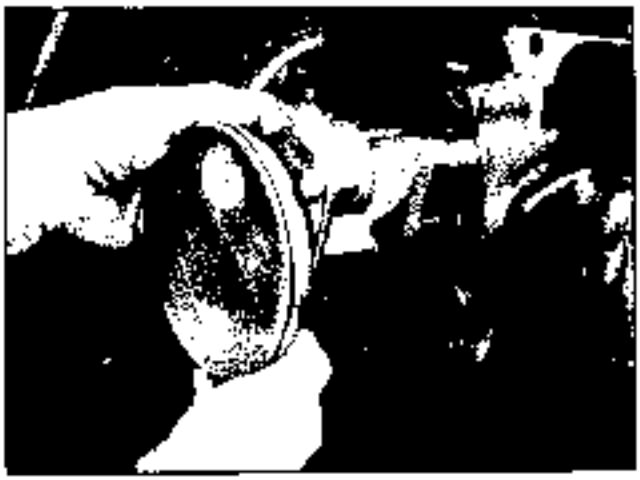


Fig. 1-119. Oil pump removal

c. A gear assembled to the upper end of this shaft is driven by a mating gear cut on the camshaft and drives the oil pump gear which is assembled to the lower end of the pump shaft.

d. The pump shaft is carried in two bronze bushings assembled in the cast iron housing, which is also a part of the oil distributing system, transmitting oil to the drilled passages.

e. The gear type pump has a capacity well in excess of that required by the engine.

f. When the pump is removed, examine the drive gear carefully for wear, inspecting the gear on the camshaft at the same time. If scored or worn badly, both the camshaft and the gear on the pump must be replaced.

g. Examine the pick-up screen for clogging or damage.

h. Remove the cover, being careful not to damage the lead gasket which acts as a spacer as well as a gasket to seal the joint.

i. Examine the gears and pump body for any sign of wear indicating lack of clearance. The gears should have from .001 to .003 clearance in the chamber and should make no contact with the walls.

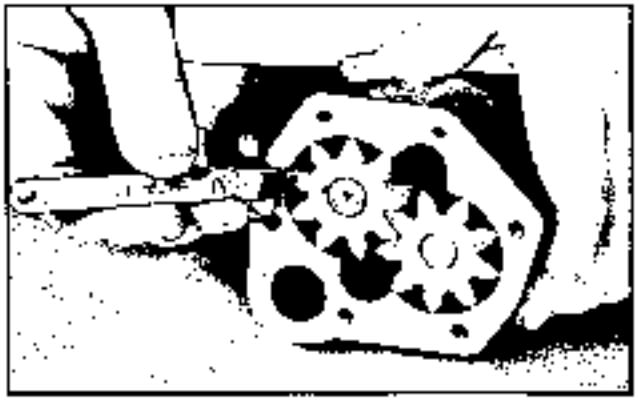


Fig. 1-120. Checking gear clearance in body

j. Inspect the cover and face of the gears for excessive wear or scoring. With the gasket assembled to the body there should be .0015-.003 clearance between the gears and the cover.

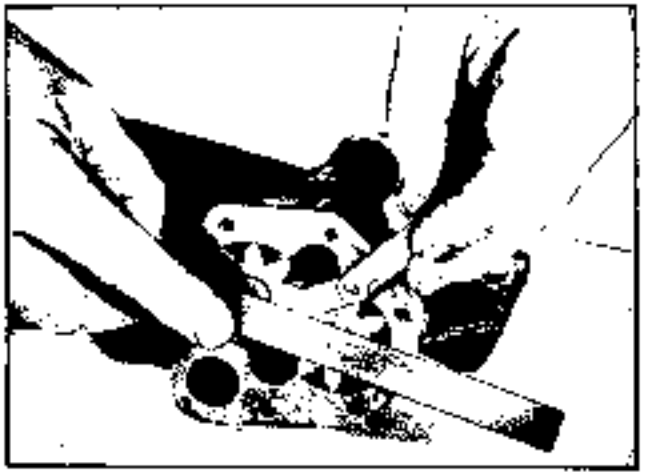


Fig. 1-121. Checking end clearance

k. Worn or scored gears can be replaced, as can a worn cover. If the body shows wear in the chamber, it can be replaced, but in a case like this a new pump would be the most economical.

k. Engine oil pressure must be maintained to specification for satisfactory engine life.

m. Pressure relief is located externally on the right-hand side, near the oil pan flange at the center. Pressure is controlled by a plunger and spring, the latter specifically for a certain range. The only adjustment variation is either to change springs or assemble or remove washers from behind the present spring. Up to four washers are permissible.

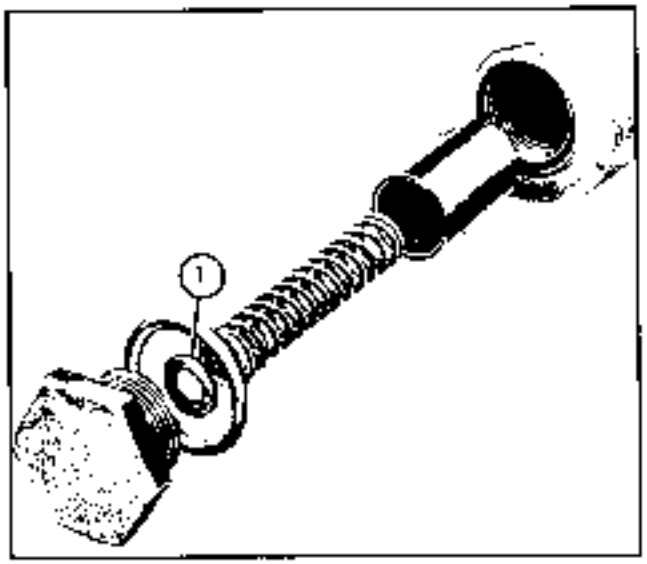


Fig. 1-122. Oil pressure relief valve

1. Washer to adjust pressure

IMPORTANT

A 1/8" thick flat spacer washer is used between the oil pump mounting lug and the center main bearing cap. When reassembling, be sure that this washer is placed on the oil pump mounting stud before the oil pump is installed in place. Failure to do this will cause interference between oil pump and camshaft and will not allow the distributor drive to mesh correctly.

NOTE

When replacing the drive pinion (19, Figure 5-2), it is necessary to line up the hole in the new pinion with the hole in the shaft and drill through the other half of the pinion before pinning it in place.

4-174. FLYWHEEL AND FLYWHEEL HOUSING.

a. The flywheel is machined and balanced so that the clutch face and locating counterbore will run true with its axis.

b. To be sure that the crankshaft flange has not been sprung or otherwise damaged or that the counterbore in the flywheel, which locates it on the crankshaft, is not damaged, mount an indicator on the flywheel housing and check the flywheel for runout. Caution: When checking runout, remove spark plugs to allow engine to be turned over freely.

c. The indicator should be set up so that it contacts the clutch face or the vertical surface of the clutch counterbore, then turn the flywheel at least one full revolution, at the same time holding against the crankshaft to offset the possibility of end play.

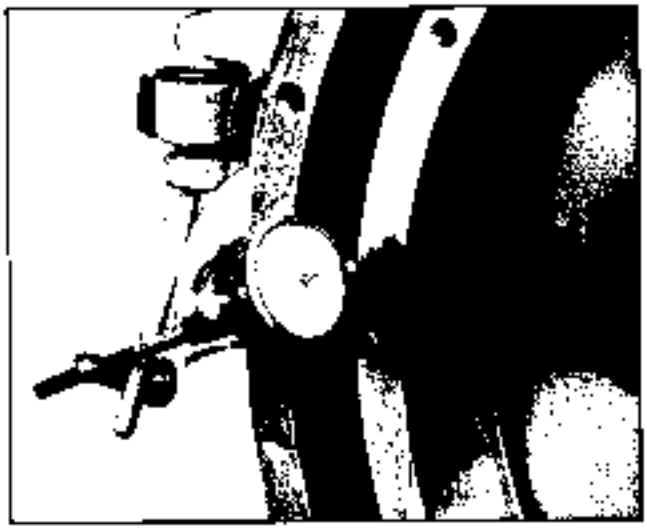


Fig. 1-123. Checking flywheel runout

d. Excessive runout of the flywheel, in either position, is probably caused by dirt in, or damage to counterbore locating the flywheel on the crankshaft flange.

e. Re-locate the indicator to check the inside diameter of the counterbore. In both cases the maximum indicator reading must not be more than .008.

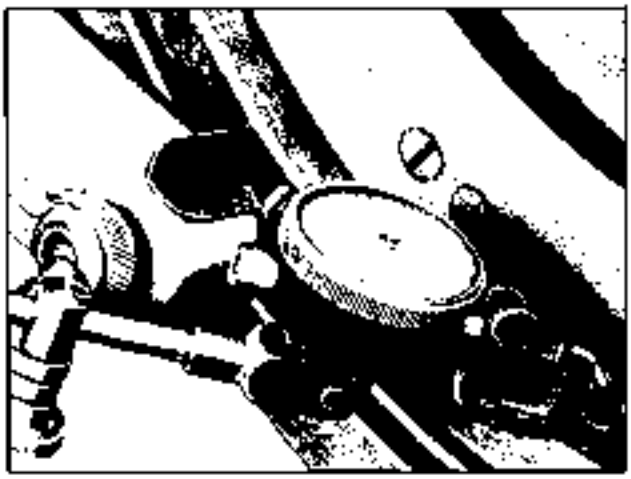


Fig. 1-124. Checking flywheel counterbore

f. When assembled, mount the indicator on the flywheel so that is contacts the housing face and turn the crankshaft, at the same time holding against it to counteract end play. The maximum indicator reading must not exceed .008.

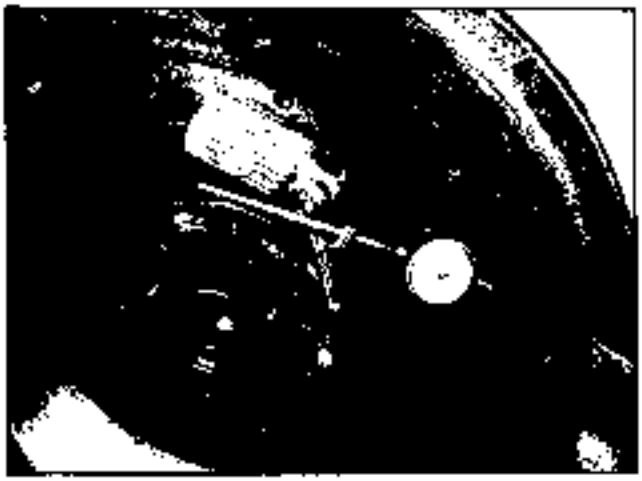


Fig. 1-125. Checking housing face

g. Re-locate the indicator to contact the housing bore and check this in the same manner. The same amount limits prevail.

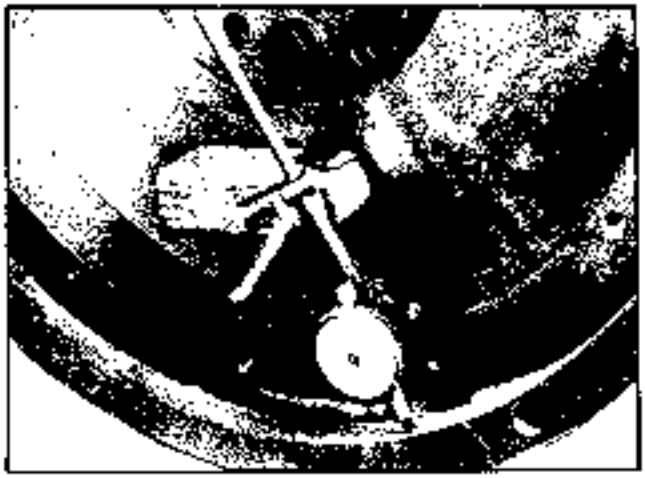


Fig. 1-126. Checking housing bore

h. If more than one engine is being rebuilt at a time, the housing should be identified with its original cylinder block and should be reassembled to that block in the rebuilding process.

4-175. REASSEMBLING ENGINE.

a. In the foregoing, we have outlined procedures for checking, repairing, or replacing the many wearing parts in the engine.

b. In most cases, the instructions have covered the reassembly of parts or subassemblies made up of several parts.

c. When reassembling pistons and connecting rods, use a good ring compressor and oil the bores thoroughly. A hammer handle may be used to bump the pistons out of the ring compressor into the cylinder bore.

d. Once more, we call attention to the care demanded to prevent connecting rods damaging the cylinder bore finish and at the same time as they are assembled over the crank pin, locate them carefully in order to protect the bearing surfaces.

e. Always lubricate the bearings with clean engine oil when assembling, and tighten them to the torque specified. Use lockwires, cotter pins or lockwashers as required to prevent nuts and screws from loosening.

f. Clean cylinder head and block surfaces thoroughly before installing gasket. Tighten all cylinder heads or cap screws evenly and torque in following sequence to the recommended torque.

g. Before assembling the oil pan with new gaskets make certain that gasket surfaces are flat and clean. Tighten screws in accordance with limits prescribed in torque chart ** to avoid looseness or overstressing.

h. Tighten all cylinder head stud nuts evenly and gradually to 70 to 75 foot-pounds, in the sequence shown in Fig. 1-127.

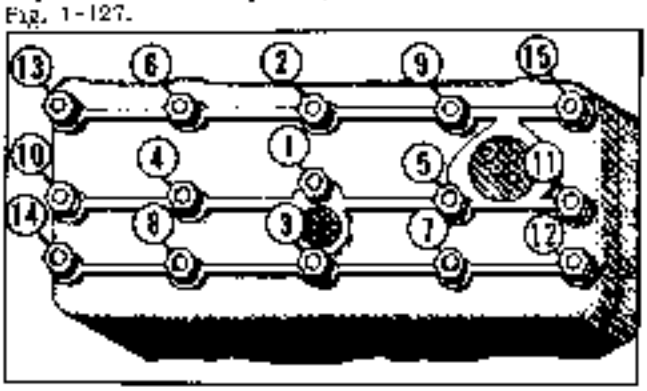


Fig. 1-127. Cylinder head torque sequence

i. When engine is completely assembled and filled with proper oil, set tappets on both intake and exhaust to .014".

Fig. 1-128. Adjusting tappets

TABLE II

TORQUE SPECIFICATIONS (FOOT-POUNDS)

Cylinder head stud nuts	70-75
Main bearing caps	85-95
Connecting rod caps	40-45
Flywheel	25-30
Manifolds	25-30
Gear cover, water pump, rear end plate	25-30
Oil pan	12-15
Flywheel housing	50-55
Camshaft nut	65-70

TABLE III

LIMITS AND CLEARANCE DATA

PISTON	
Cylinder Diameter	3.4995-3.4375
Piston Pin Hole Diameter	.8594-.8592
Ring Groove Width	
No. 1	.1285-.1275
No. 2	.1285-.1275
No. 3	.1285-.1275
No. 4	.253-.252
Fit in Cylinder Bore	.003" Feeler, 5-10 lb. pull
PISTON RINGS	
Ring Width	
No. 1	.124-.123
No. 2	.124-.123
No. 3	.124-.123
No. 4	.249-.2485
Gap clearance (all rings)	.017-.007
Side clearance	
No. 1	.0055-.0035
No. 2	.0055-.0035
No. 3	.0055-.0035
No. 4	.0045 - .003
PISTON PIN	
Length	2.878-2.868
Diameter	.8593-.8591
Pin Bushing Diameter (finished)	.8597-.8595
Pin Clearance in Bushing	.0004-.0002
Desired Pin Clearance	.0004
Pin Fit in Piston	Light push
VALVE GUIDE (INT. and EXH.)	
Length	2-5/16
Outside Diameter	.6575-.6565
Stem hole Diameter	.3432-.3422
Max. Wear Limit-Stem Hole	.3447
Distance - Valve Seat Face to Guide Top	1-15/32
INTAKE VALVE	
Seat Angle	30 degrees
Stem Diameter	.3414-.3406
Stem Clearance Limits	.0026-.0008
Desired Stem Clearance	.0015

TABLE III (Continued)

EXHAUST VALVE
- Seat Angle ..... 45 degrees
- Stem Diameter ..... .3385-.3377
- Stem Clearance Limits ..... .0055-.0037
- Desired Stem Clearance ..... .0046

VALVE SPRINGS
- Outside Diameter 31/32
- Length
  - Valve Open 1-27/64
  - Valve Closed 1-45/64
- Load
  - Valve Open ..... 96-104 lbs
  - Valve Closed ..... 47-53 lbs

CAMSHAFT
- Bearing Journal Diameters
  - No. 1 ..... 1.8725-1.8715
  - No. 2 ..... 1.7495-1.7487
  - No. 3 ..... 1.2475-1.2465
- Tappet Diameter ..... .9995-.999
- Tappet Hole Diameter 1.0005-1.0000
- End Play ..... .009-.005

CAMSHAFT BUSHINGS
- Inside Diameter
  - No. 1 ..... 1.8755-1.8745
  - No. 2 ..... 1.7502-1.7495
  - No. 3 ..... 1.2505-1.2495
- Clearance Limits ..... .004-.002

CONNECTING RODS
- Bushing Hole Diameter ..... .914-.913
- Bearing Hole Diameter .. 2.0620-2.0615 (F162), 2.2870-2.1365 (F163)
- Side Play
  - Possible ..... .030-.006
  - Desired ..... .008

CONNECTING ROD BEARING
- Thickness ..... .06190-.06165
- Clearance ..... .0002-.0022
- Desired Clearance ..... .001

MAIN BEARINGS
- Thickness ..... .09915-.09890 (F162), .09850-.09875 (F163)
- Bearing Bore Diameter... 2.4372-2.4365 (F162), 2.5615-2.5622 (F163)
- Clearance ..... .0024-.0032 (F162), .0028-.0003 (F163)
- Desired Clearance ..... .002 (F162), .0015 (F163)

CRANKSHAFT
- End Play ..... .003-.009 (F162), .002-.006 (F163)
- Diameter - Main Journals . 2.250-2.2490 (F162), 2.3744-2.3752 (F163)
- Diameter - Rod Journals.. 1.9375-1.9365 (F162), 2.0019-2.0027 (F163)

4-176. LP GAS EQUIPMENT.

a. Remove bolts securing rear hood section to hood. Remove overhead guard if lift truck is so equipped. Remove rear hood section. Disconnect battery ground cable.

b. Drain cooling system. Remove water bypass hose between water pump and thermostat housing. Remove pipe nipple from water pump.

c. Detach upper radiator hose from thermostat housing and remove thermostat housing, thermostat and adapter.

d. Disconnect choke, throttle, and governor linkages, air cleaner hose, and fuel line from carburetor. Remove carburetor.

e. Remove fuel pump, fuel lines, and fuel shut-off valve. Install cover and gasket over fuel pump opening in crankcase. Install a 1/8 inch pipe plug in shut-off valve opening in fuel tank.

f. Remove filler assembly from fuel tank and install pipe cap.

g. Disconnect wires from fuel gage, remove gage, and install plug in panel. Wrap wire ends with electrical tape.

h. Disconnect wires from hourmeter pressure switch and remove switch. Install new switch with 9 terminals.

i. Install new carburetor, using new gasket provided, and reconnect choke, throttle, and governor linkages. Check choke linkage to be sure choke disc operates properly. Reconnect air cleaner hose.

j. Use an approved pipe joint sealing compound on all pipe threaded fittings. Make sure all line connections are securely tightened.

k. Install elbow in water pump, and install thermostat housing assembly with thermostat and adapter on engine. Connect water bypass hose attached to thermostat housing to elbow in water pump.

l. Install filter and relief valve assembly in rear hood section. See Fig. 129. Connect 18 inch hose to filter bottom. (This hose connects to solenoid valve.)

m. Install rear hood section on counterweight. Use 5 inch bolts provided to attach hood section if lift truck does not have an overhead guard. On trucks with overhead guard, bolt legs of guard secure rear hood section to counterweight.

n. Install fuel tank supports on rear hood section with toggle clamps to rear. Tank support with tank aligning pin must be installed on the right hand side. Install tank in supports.

o. Install 20 inch hose with coupling half attached, in filter. Install other half of coupling on tank outlet valve.

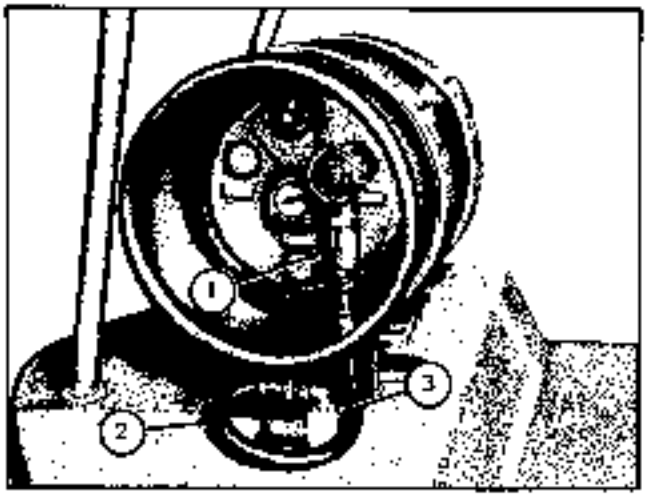


Fig. 129. Tank, supports, and hose

1. Coupling
2. 20 inch hose
3. Relief valve - filter

p. Install hose from filter bottom in solenoid valve.

q. Install 24 inch hose between regulator and elbow on carburetor. Install clip assembly on long run, shown in Fig. 130, to support fuel line.

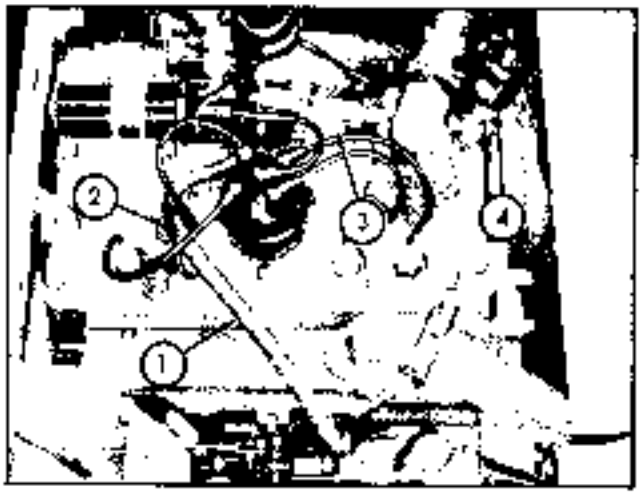


Fig. 130. LP Gas equipment

1. 24" hose
2. Hose support clip
3. Regulator assembly
4. Solenoid

r. Reconnect battery cable and turn on ignition. Test two purple and white wires to determine which one is "hot".

s. Turn ignition off and connect "hot" purple and white wire to "NO" terminal on pressure switch.

t. Connect other purple and white wire, and 24 inch wire supplied in kit, to "C" terminal on pressure switch. Connect 24 inch wire to terminal on side of solenoid valve.

u. Connect 26 inch wire to "NC" terminal on pressure switch and "S" terminal on starting motor solenoid.

v. Install rubber grommets in seat of front hood. If any interference is encountered between hood and solenoid valve when hood is closed, tip solenoid to one side.

w. Open fuel supply valve on tank and turn on ignition switch to open solenoid valve. Apply soap suds to all fuel line connections to check for leaks. Be sure all fuel leaks are eliminated before attempting to start the engine.

x. Close radiator and block drains, and refill cooling system.

y. Adjust carburetor, following instructions given in paragraph 3-19, on page 3-14.

4-177. SERVICING LP GAS REGULATOR.

4-178. REMOVAL.

a. Close fuel valve on tank. Disconnect fuel line from bottom of regulator and unscrew regulator from vaporizer.

4-179. DISASSEMBLY.

a. Unscrew diaphragm assemblies. Remove fuel pressure adjusting screw and two set screws from either side of body.

b. Remove fuel inlet orifice. HANDLE INLET ORIFICE WITH EXTREME CARE, as slightest nick or scratch across seating surface will cause fuel leaks. Keep sharp edge of seating surface well protected while it is removed.

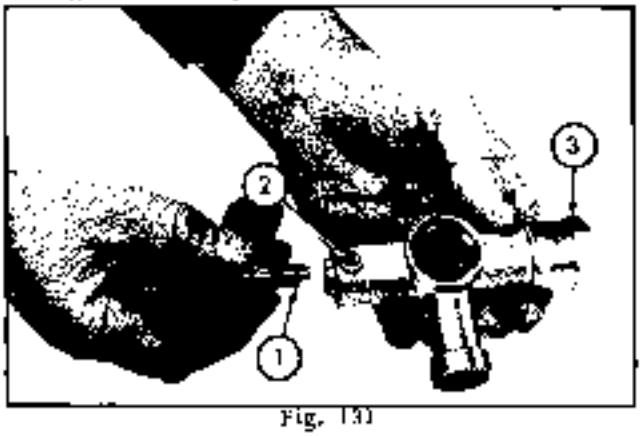


Fig. 131

1. Pressure adjusting screw
2. Set screw removed (both sides)
3. Inlet orifice

c. Withdraw valve assembly from body as shown in Fig. 132.

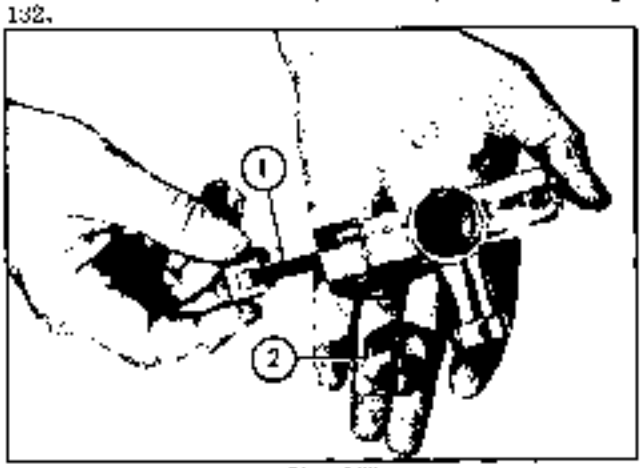


Fig. 132

1. Valve being removed
2. Inlet orifice removed

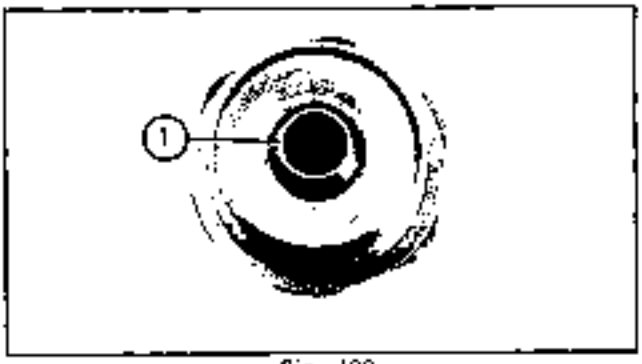


Fig. 133

1. Orifice seating surface

d. Remove and discard valve seat from valve as shown in Fig. 134. The original seat may be turned over and reused, however, it is recommended that a new one (found in repair kit) be used.

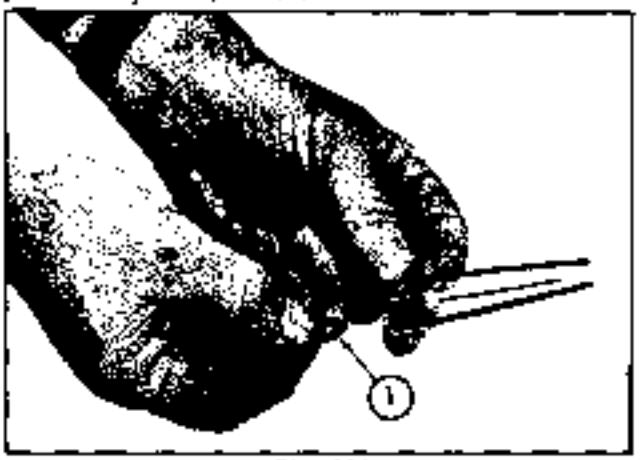


Fig. 134

1. Valve seat

4-180. REPAIR.

a. Clean all parts, except diaphragm assemblies, in carburetor cleaning fluid.

b. Inspect all parts for wear or damage. Renew "O" ring on fuel pressure adjusting screw.

c. A repair parts kit (35P1086) is available for regulator and it is recommended that the parts in the kit be used at reassembly. The kit contains the parts shown below:

2 - Diaphragm assemblies
2 - Gaskets for diaphragms
1 - Seat for regulating valve
1 - Seal for fuel adjusting screw

d. Individual repair items, not included in kit, are available to complete regulator service. These items are as follows:

35P1872 Regulating valve assembly
35P1873 Fuel pressure adjusting screw
35P1865 Fuel inlet orifice

4-181. REASSEMBLY.

a. Install new valve assembly in body, holding body as shown in Fig. 135. Leaf springs must be straight and parallel. Tap body lightly as tips of blades drop into slots. The springs are visible through set screw holes shown in Fig. 136.

b. Install fuel inlet orifice and tighten. Apply Lubriplate to "O" ring and threads on fuel pressure adjusting screw and carefully turn it in with fingers.

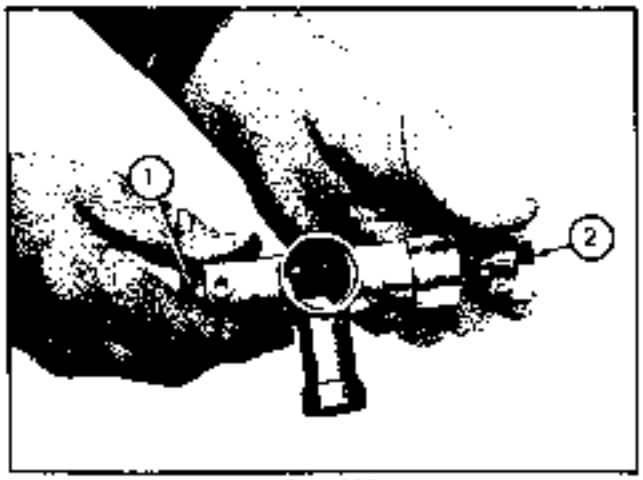


Fig. 135

1. Pressure regulating screw
2. Inlet orifice

IMPORTANT: BE SURE VALVE ROD ENTERS HOLE IN THE ADJUSTING SCREW DURING ASSEMBLY. IF A RESISTANCE IS FELT AT ANY POINT WHILE INSTALLING SCREW, STOP TURNING AND ALIGN ROD.

c. With valve rod in place in screw, turn screw down until it is flush with end of body.

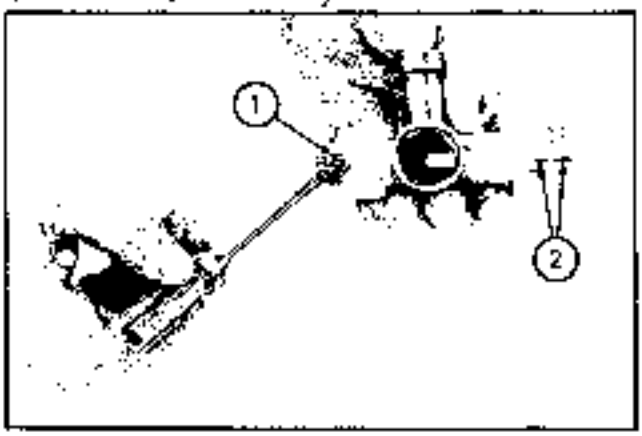


Fig. 136

1. Set screw holes
2. Mark on orifice and body

d. Install set screws for leaf springs, BUT DO NOT TIGHTEN. Make a mark on corner of one of "flats" on inlet orifice as shown in Fig. 136. Loosen orifice distance of half of a flat (one-twelfth turn) and tighten set screws against leaf springs. DO NOT OVERTIGHTEN SET SCREWS. Retighten orifice. The leaf springs are now properly adjusted.

e. Work the leaf springs with finger and thumb a few times and watch valve to see that it moves back and forth (opens and closes). The leaf springs can be aligned with a screwdriver so diaphragm plungers will contact them on center.

f. Install new gaskets on diaphragm covers and install covers.

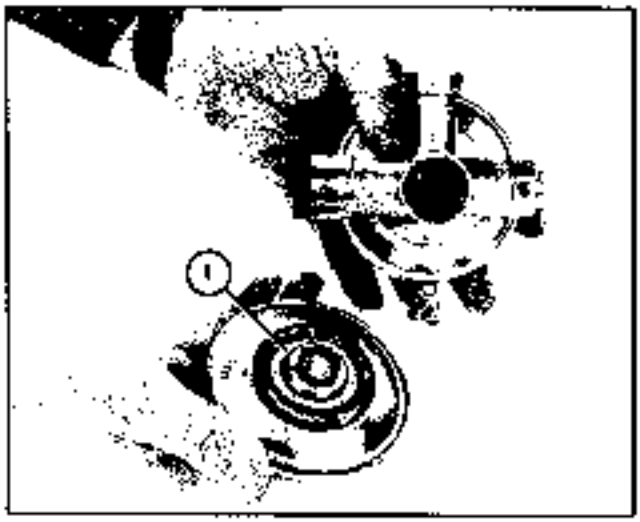


Fig. 137

1. Gasket

g. Fig. 139 shows a cross section of regulator.

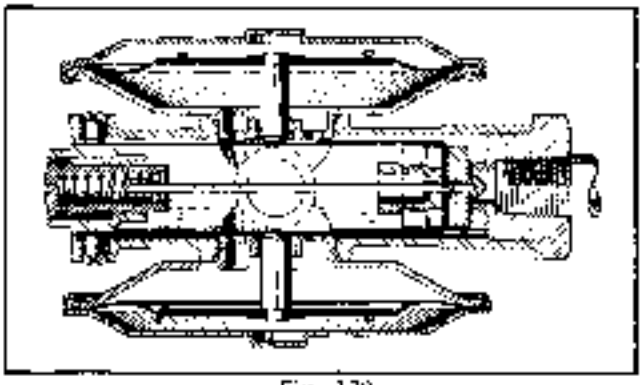


Fig. 138

4-182. SERVICING LP-GAS VAPORIZER.

4-183. REMOVAL.

a. Drain cooling system. Disconnect upper radiator hose and by-pass hose from thermostat-vaporizer housing. Disconnect wire and fuel line from solenoid valve. Remove bolts holding thermostat housing to engine.

4-184. DISASSEMBLY.

a. Mark vaporizer and thermostat housing in some way so they can be reassembled in their original position.

b. To separate vaporizer from the thermostat housing, loosen tie bolt two or three turns and lightly tap bolt and vaporizer head until water seal ("O" ring) works free. Remove and discard "O" ring.

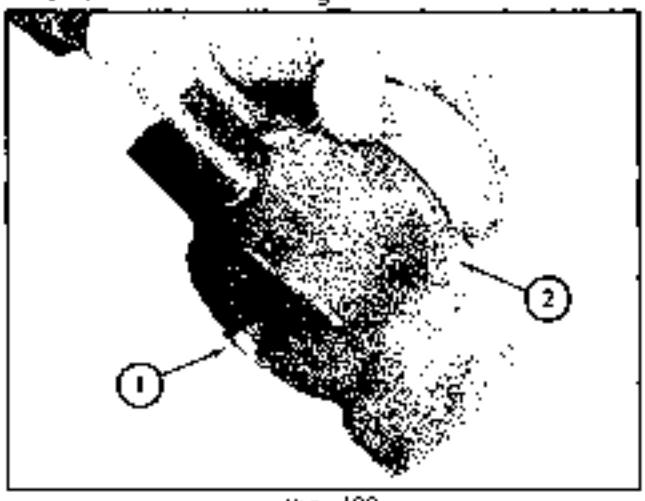


Fig. 139

1. Tie bolt
2. Water seal here

c. To remove inlet orifice, first turn adjusting bonnet down all the way to compress diaphragm spring and push square piston away from orifice. Remove inlet bushing and aluminum washer. Insert a 1/4"-20 bolt in inlet orifice and pull orifice straight out. Take special care not to scratch orifice lip.

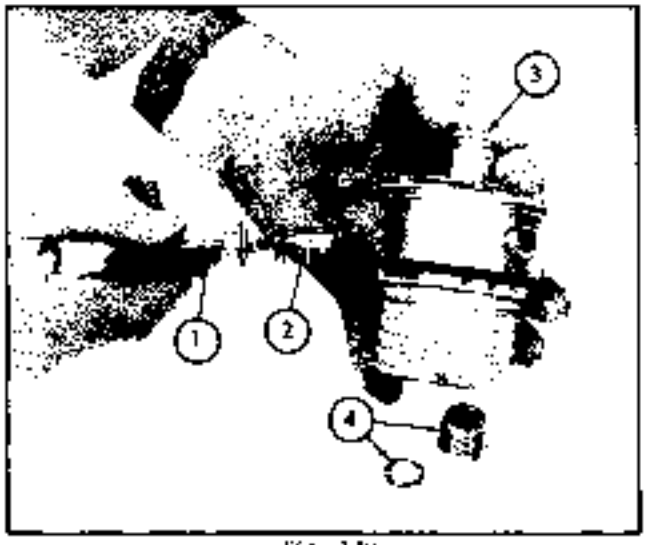


Fig. 140

1. 1/4"-20 bolt
2. Inlet orifice
3. Adjusting bonnet
4. Inlet bushing and washer

CAUTION: ORIFICE AND SEAT WILL BE DAMAGED IF DIAPHRAGM IS NOT PUSHED TO BOTTOM WHILE REMOVING ORIFICE. THE ORIFICE HAS A KEYWAY AND MUST NOT BE TURNED OR TWISTED.

d. Remove adjusting bonnet and diaphragm spring. Mark cover and body. Remove six screws and lift off diaphragm cover. Lift out diaphragm and round piston. Remove screw from center of diaphragm. Discard "O" ring and diaphragm if cracked, dry, swollen, or spongy.

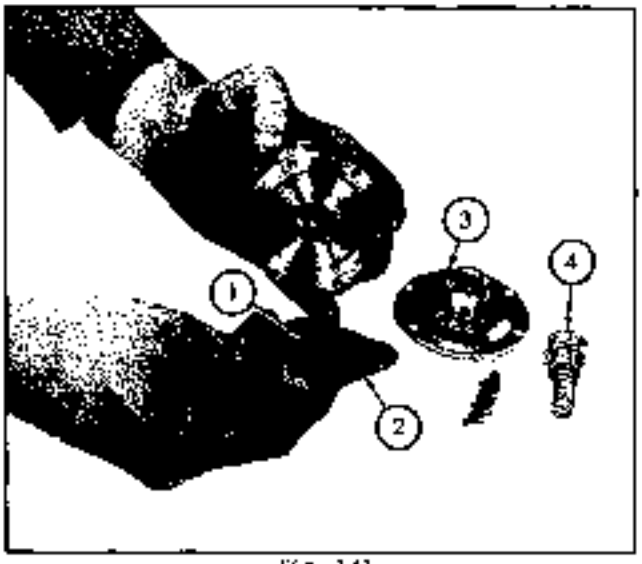


Fig. 141

1. "O" ring
2. Diaphragm
3. Cover
4. Adjusting bonnet

e. Turn vaporizer over to remove square piston seat retainer, cap, and spring. Inspect seat carefully for hardness, cuts, imbedded foreign materials, or wear. Clean out pin hole vents in body and cover.

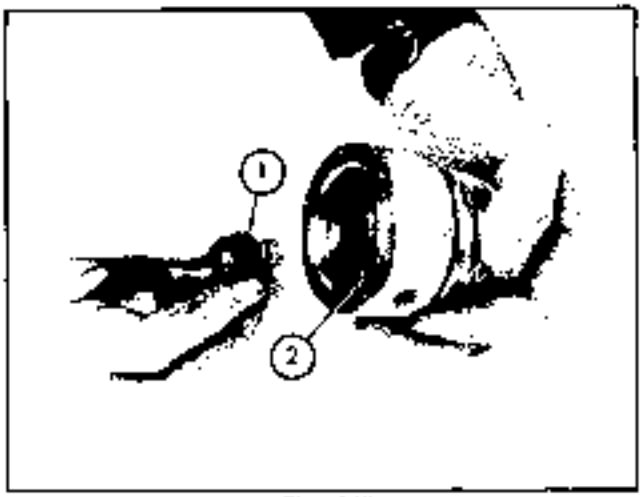


Fig. 142

1. Piston seat retainer
2. Pin hole vent

f. Place vaporizer in a vise and, using a 1-1/4 inch socket, remove large plug. Remove bellows and "O" ring. Discard the "O" ring.

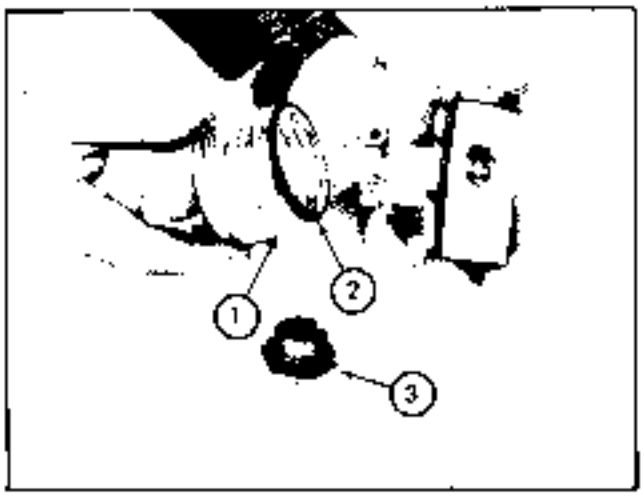


Fig. 143

1. Bellows
2. "O" ring
3. Plug

4-185. REPAIR.

a. Clean all parts to be reused and dry with compressed air.

b. A repair kit (35P1390) is available and should be installed to assure satisfactory performance after vaporizer is reassembled and adjusted.

4-186. REASSEMBLY.

a. Fig. 144 illustrates components in vaporizer. Refer to illustration when reassembling.

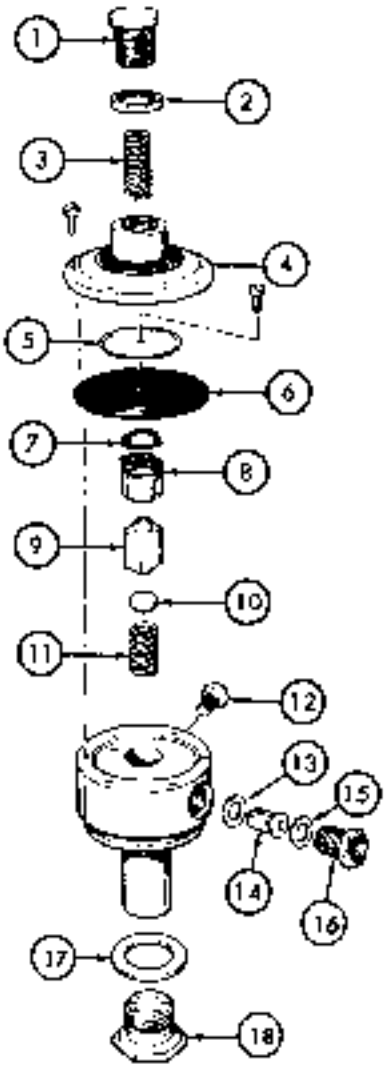


Fig. 144

1. Adjusting bonnet
2. Lock nut
3. Spring
4. Cover
5. Retainer
6. Diaphragm
7. "O" ring
8. Piston
9. Seat retainer
10. Button
11. Spring
12. 1/4" plug
13. Fibre gasket
14. Inlet orifice
15. Aluminum washer
16. Inlet bushing
17. Fibre gasket
18. Plug

b. Install new "O" ring (found in kit) on bellows, see Fig. 143. Apply Lubriplate to "O" ring, and assemble bellows to body. Coat fibre gasket for large plug with oil and install plug, tightening it to 50 ft. lbs. torque.

c. Assemble new diaphragm to new piston with "O" ring, leaving center screw loose. Flange on diaphragm retainer must be away from diaphragm.

d. Temporarily install inlet orifice, using a 1/4"-20 bolt, being sure keyway in orifice is lined up with dowel pin in body. Apply a coat of oil to piston and "O" ring, then install piston in housing so it straddles inlet orifice Fig. 145. Turn diaphragm as necessary to align holes near edge with six holes in body. Tighten center screw and remove diaphragm and piston assembly and inlet orifice.

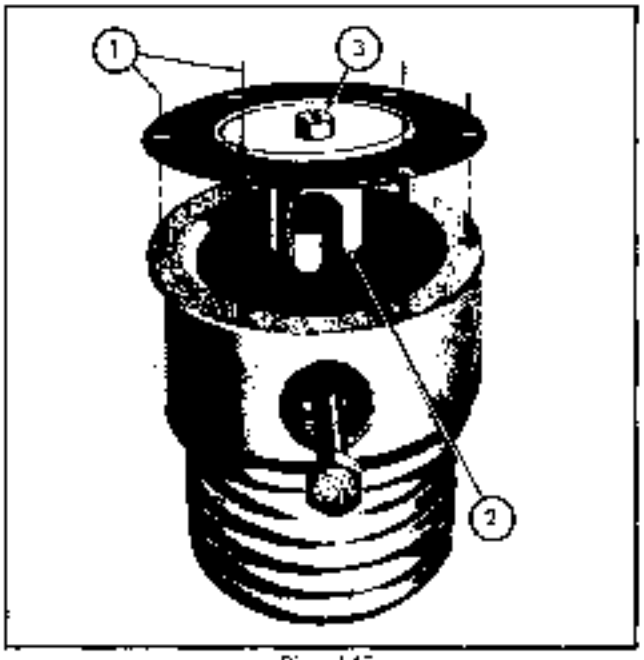


Fig. 145

1. Align screw holes
2. Piston straddles orifice
3. Diaphragm center screw

e. Place spring button on small spring and install these parts in square piston. Install assembly in body. See Fig. 142.

f. Reinstall diaphragm and piston assembly as described in paragraph "d". Be sure piston straddles inlet opening as indicated in Fig. 145. Install diaphragm cover, aligning marks made at disassembly. Reinstall diaphragm spring and adjusting bonnet.

g. Turn adjusting bonnet all the way in and install inlet orifice, using a 1/4"-20 bolt as before. Tap bolt LIGHTLY with a hammer, if necessary.

h. Remove 1/4" bolt and install aluminum washer and inlet bushing. Tighten inlet bushing to 45 ft. lbs. Screw out adjusting bonnet several turns.

CAUTION: EXCESSIVE TORQUE ON THE INLET BUSHING CAN SHEAR DOWEL PIN, ALLOWING INLET ORIFICE TO ROTATE AND SEAT IMPROPERLY.

i. Install a new "O" ring (water seal) on body and install body in thermostat housing, aligning marks made at disassembly. Install tie bolt and tighten securely.

j. The vaporizer pressure must be readjusted after servicing. See "ADJUSTING VAPORIZER".

4-187. ADJUSTING VAPORIZER.

a. Install a pressure gage that will give accurate low pressure readings, in vaporizer OUTLET port. Remove 1/8" pipe plug from side of vaporizer body.

b. Connect an air hose, that will apply 60 to 75 psi, to INLET PORT. The pressure applied to vaporizer INLET must not fall below 60 psi.

c. Place thumb over 1/8" plug hole and apply air pressure to unit. Set pressure adjusting bonnet to obtain a reading of 10 psi with no flow. Remove thumb from port. The reading on gage should now be 6 to 7 psi with full flow.

d. Check the pressure several times by covering and uncovering port. The pressure should return to 10 psi, plus or minus 1 psi, each time port is covered, and drop to 6 - 7 psi when port is uncovered.

NOTE: TO OBTAIN AN ACCURATE GAGE READING, IT MAY BE NECESSARY TO UNSCREW GAGE TO BLEED OFF SOME OF THE AIR.

e. A steady reading on gage in both full flow and no flow ranges indicates that vaporizer valve is operating satisfactorily. If the pressure reading tends to creep up, it indicates that valve is leaking. Low pressure during the flow test means that valve is failing to open properly.

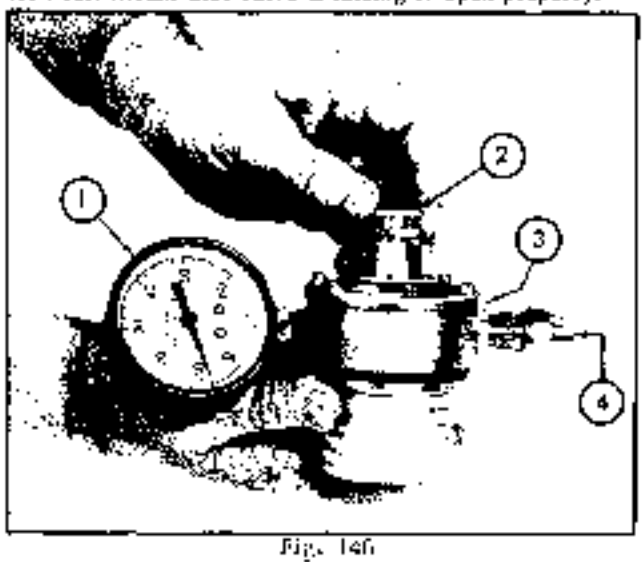


Fig. 146

1. Low pressure gage
2. Adjusting bonnet
3. Plug removed from back side
4. Apply air at 60 - 75 psi here

4-188. ADJUSTING REGULATOR.

a. With vaporizer adjustments completed, and correct outlet pressure obtained, as described previously, connect INLET port of regulator to vaporizer OUTLET port, Fig. 147.

b. Connect an air hose, capable of applying 60 - 75 pis. to vaporizer INLET port. Place a soap film over fuel OUTLET port in regulator as indicated in Fig. 147.

c. Turn in the pressure adjusting screw for regulator to just seat it. Apply air pressure to vaporizer and slowly back out regulator pressure adjusting screw until soap bubble shows a slight air flow. (Flow will be indicated by slowly expanding bubble.) At this point, turn in adjusting screw 3/4 to 1 turn.

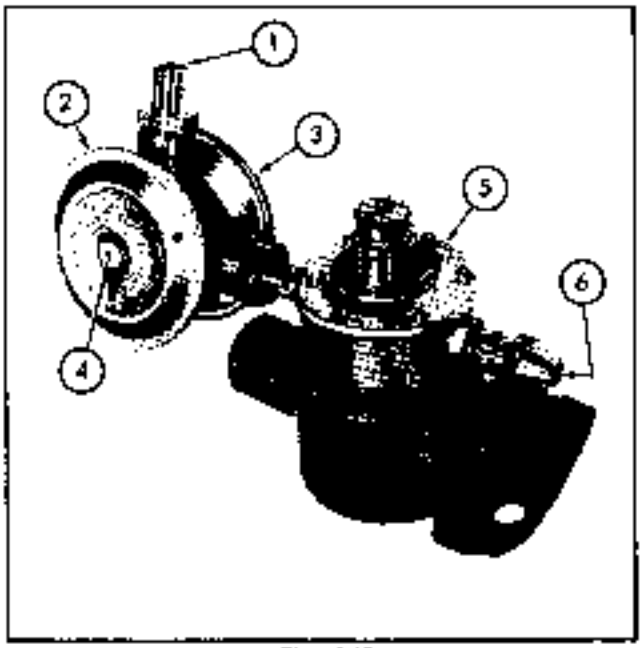


Fig. 147

1. Soap bubble here
2. Pressure regulator screw this end
3. Regulator
4. Puff here to open valve
5. Vaporizer
6. Apply air at 60 - 75 psi here

d. A slight suction applied to regulator outlet, or a light puff applied to diaphragm should cause air to flow through outlet a moment, then shut off tight again.

4-189. SERVICING LP-GAS CARBURETOR.

4-190. REMOVAL.

a. Disconnect fuel line, choke wire, throttle control rods, and air cleaner hose. Remove carburetor and gasket.

4-191. DISASSEMBLY. (See Fig. 2-14A.)

a. Mark throttle plate (3) and choke plate (14) in relation to main body so plates can be reinstalled in their original position. Remove screws (4 and 15) and plates.

b. Remove throttle shaft and lever assembly (2). Remove retainers (6) and seals (5) from both sides of body.

c. Remove choke return spring (23) and remove choke shaft (13) and lever assembly (20). Remove plug (16) and gasket (17).

NOTE: UNLESS CHOKE AND THROTTLE SHAFTS, OR LEVERS, REQUIRE REPLACEMENT, DO NOT DISTURB LEVER POSITION ON SHAFT. MARK LEVER POSITION IF ANY ARE REMOVED FROM SHAFTS.

d. Mark position of choke cable bracket (18) and remove nut (19) and bracket.

e. Remove venturi retaining screw (12) and withdraw venturi from body.

f. Remove idle adjusting needle (7) and spring (8). Loosen nut (22) and remove main load adjusting screw (21) and nut.

4-192. REPAIR.

a. Thoroughly clean all parts in carburetor cleaning solution. Rinse parts in clean solvent and blow dry with compressed air. Blow out all internal passages with compressed air. DO NOT USE WIRE OR A DRILL TO CLEAN THE JETS.

b. Carefully inspect throttle and choke shafts for wear or damage. Replace shafts if worn excessively. Replace needle valve if grooved, scratched, or otherwise damaged.

4-193. REASSEMBLY. (See Fig. 2-14A.)

a. Attach choke cable bracket (18) to body in original position as marked, using nut (19). Tighten the nut securely.

b. Reinstall choke shaft (13), gasket (17) and plug (16). Reinstall choke plate (14) in original position as marked at disassembly. Leave screws (15) loose and close the choke. Tighten the screws with the plate in the best closing position.

c. Reinstall main load adjusting screw (21) and nut (22) in body. Turn screw in all the way against seat, then back out two turns.

d. Reinstall venturi (11) in carburetor throttle bore with side hole in line with hole in main body. Install screw (12) to secure venturi.

e. Install throttle shaft seals (5) and retainer (4) in body. Install throttle shaft assembly (2) through seals and reinstall throttle plate (3) in original position as marked at disassembly. Leave screws (4) loose, close throttle and align plate for best closing position, then tighten screws.

NOTE: THROTTLE STOP SCREW MUST CONTACT STOP PIN WITH THROTTLE PLATE IN CLOSED POSITION.

f. Reinstall the carburetor on the engine, using a new gasket between carburetor and manifold. Reconnect the fuel line, choke wire, throttle control rods, and air cleaner hose. Adjust the carburetor as explained in paragraph 3-17.

4-194. BULKHEAD FILTER ELEMENT. Close valve on fuel tank and run engine until it stops. This will relieve pressure in fuel line.

a. Disconnect fuel line from elbow in filter and remove elbow. Remove filter element and spring. Wash element in solvent and blow dry.

b. Reassemble components in reverse order of disassembly. Retighten fuel lines securely.

4-195. POSITIVE CRANKCASE VENTILATION.

a. Remove necessary engine components to facilitate removal of valve chamber cover. Remove valve chamber cover.

b. Install new valve chamber cover with port for vent valve toward rear of engine (port away from fan end of engine). Reinstall engine components removed.

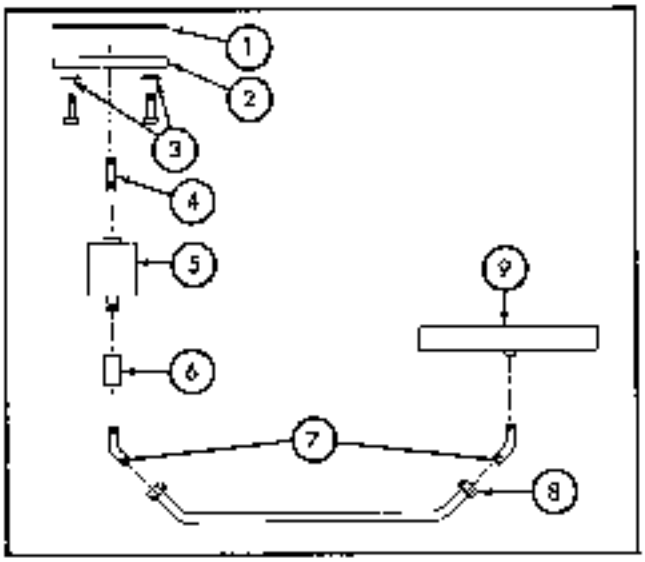


Fig. 148. Positive crankcase ventilation

1. Gasket
2. Valve cover
3. Gaskets
4. Nipple
5. Valve
6. Coupling
7. Elbows
8. Tube
9. Intake manifold

c. Remove pipe plug (upper) from intake manifold and install elbow.

d. Install 1" nipple in valve chamber cover and install valve on nipple. Install pipe coupling and elbow on valve. Install tube between elbows.

e. Remove breather cap from oil fillet tube and install new breather cap furnished.

IMPORTANT: REMOVE, DISASSEMBLE, AND THOROUGHLY CLEAN THE VALVE IN SOLVENT EACH 400 HOURS OF ENGINE OPERATION.

4-196. AUXILIARY VALVE AND HOSE REELS.

a. Use extreme care when installing hydraulic equipment to avoid getting any foreign material into system.

b. Remove left hand knock-out plugs in cowl when installing a single spool valve and left hand hose reel (Fig. 150). Remove all four plugs when installing a double spool valve and two reels.

c. Three new 13/32 inch holes must be drilled in cowl for mounting auxiliary valve. Fig. 149 shows dimensions for locating the mounting holes for single and double spool valves.

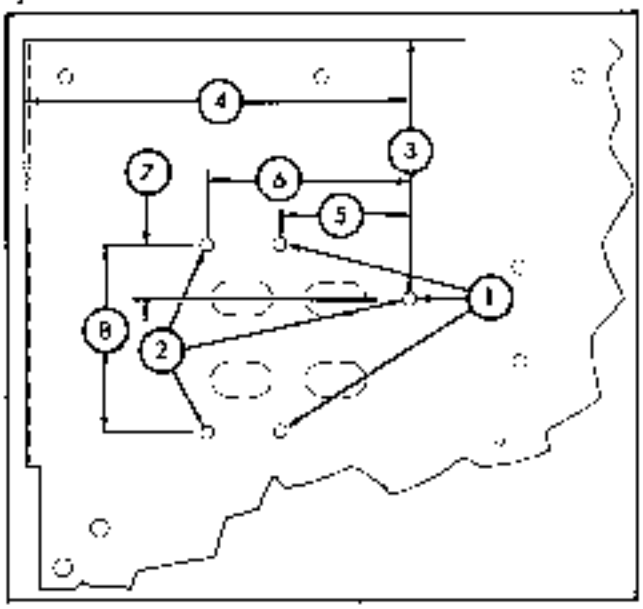


Fig. 149. Valve mounting holes

1. Valve mounting holes - single spool
2. Valve mounting holes - double spool
3. 8-3/16" from top
4. 11-35/16" from edge
5. 4-1/8" (single spool valve)
6. 8-3/8" (double spool valve)
7. 1-11/16"
8. 5-3/4"

d. Install control levers on valve and install elbows. Figs. 152 and 153 show the correct elbow positions.

e. Install valve, using pipe spacers between valve and cowl as shown in Figs. 152 and 153.

f. Remove floor plate. Cut a notch in plate as shown in Fig. 150 to allow clearance for new hydraulic tubes for auxiliary valve.

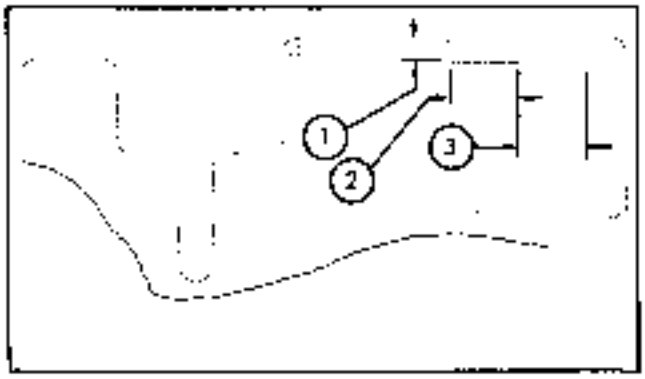


Fig. 150. Floor plate

1. 7/8 inch
2. 2-3/4 inches
3. 2-7/8 inches

g. Remove large plug from side of main hydraulic control valve and pipe plug from return line extension in reservoir. Install a straight connector in return line extension and a elbow in valve port.

h. Slip the hydraulic pressure and return lines into place. Tighten line connections securely. Reinstall floor plate.

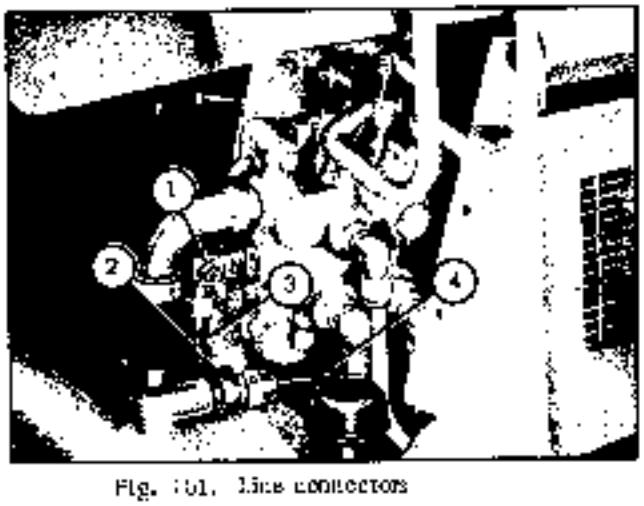


Fig. 151. Line connectors

1. Elbow in valve port
2. Straight connector
3. Pressure line
4. Return line

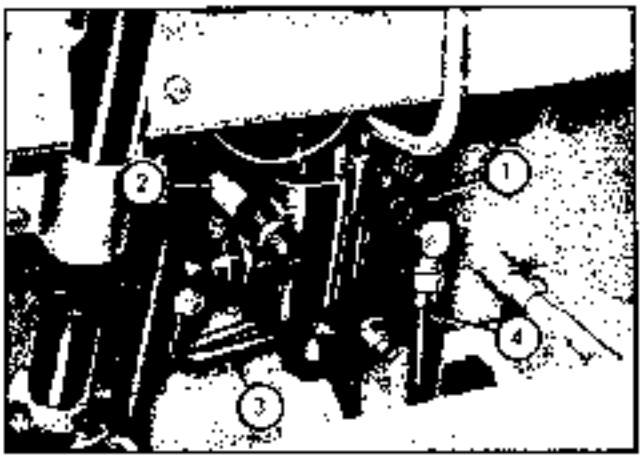


Fig. 152. Single spool valve

1. Single spool valve
2. Pipe spacers (3)
3. Pressure line
4. Return line

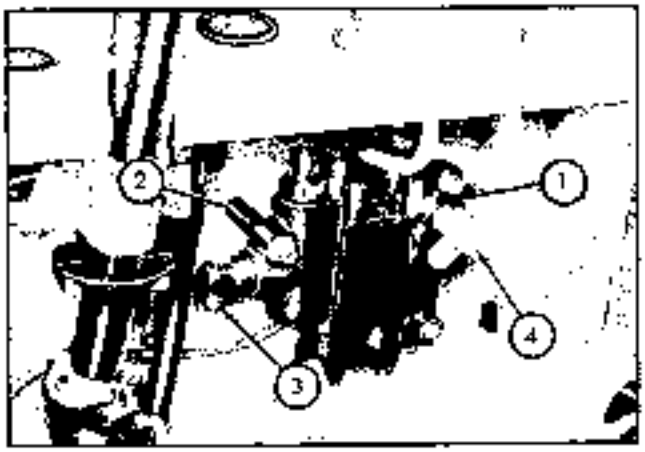


Fig. 153. Double spool valve

1. Double spool valve
2. Pipe spacers (3)
3. Pressure line elbow
4. Return line elbow

i. Drill two 17/32 inch holes in cowl, as shown in Fig. 154, for mounting hose reel. Drill holes in both sides of cowl if two hose reels are to be installed.

j. A new hole must be drilled and tapped in backside of upper carriage bar for mounting junction block. Drill a 5/20" hole, 5/4" deep, in back of bar, at location shown in Fig. 154, depending on height of upright on lift truck. Tap hole to 3/8"-16 N.C. thread, 5/8" deep.

NOTE: DRILL AND TAP ONLY THE MOUNTING HOLE APPLICABLE TO THE HEIGHT OF UPRIGHT ON THE LIFT TRUCK.

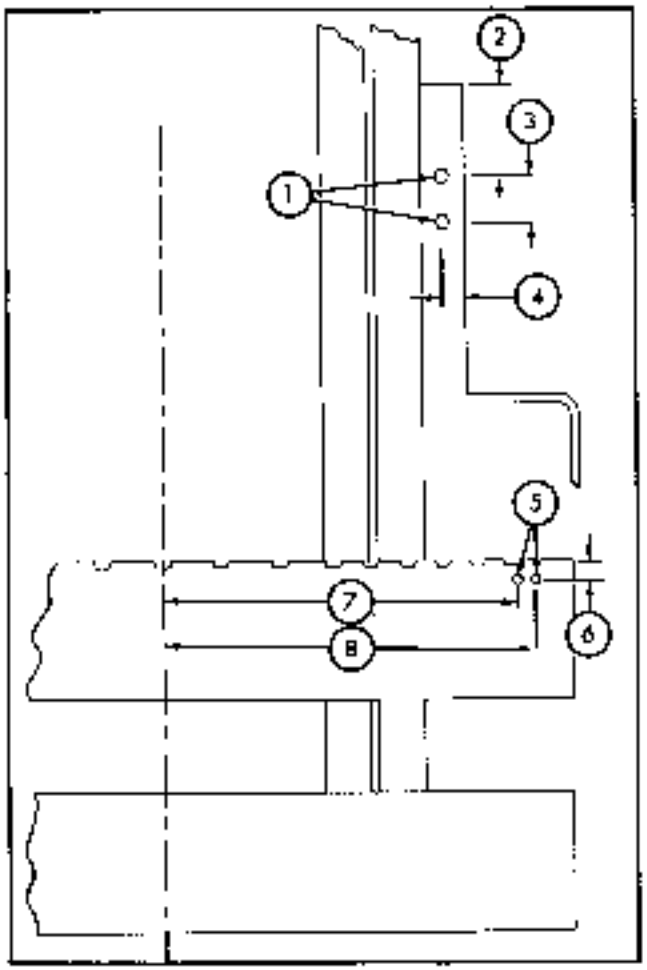


Fig. 154. Reel and block mounting holes

1. Reel mounting holes - 17/32"
2. 4 inches
3. 2 inches
4. 15/16 inch
5. 3/8"-16 NC tapped hole (backside of bar)
6. 7/8" from top of bar
7. 15-5/8" from center - 91 to 145" MFH
8. 16-7/16" from center - 148 to 178" MFH

k. If the lift truck has an overhead guard, it will be necessary to modify the front supports for the guard before the reels are installed. Cut off the mounting plates on the front legs. Weld new mounting plates to legs, using dimensions shown in Fig. 155 to locate. Bend legs back at point shown so bolt holes in plates line up with holes in frame. (See Fig. 157.)

l. Attach the reel to the cowl and install the hydraulic tubes between valve and reel as shown in Fig. 156. Tighten line connections securely.

m. Install the junction block as shown in Fig. 157.

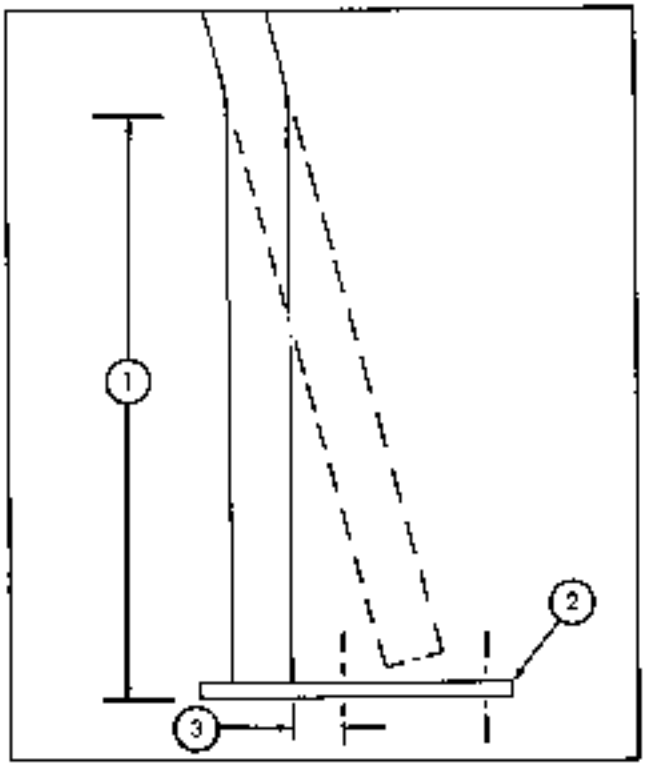


Fig. 155. Overhead guard support

1. 12-5/16 inches
2. New mounting plate
3. 1-1/4 inches

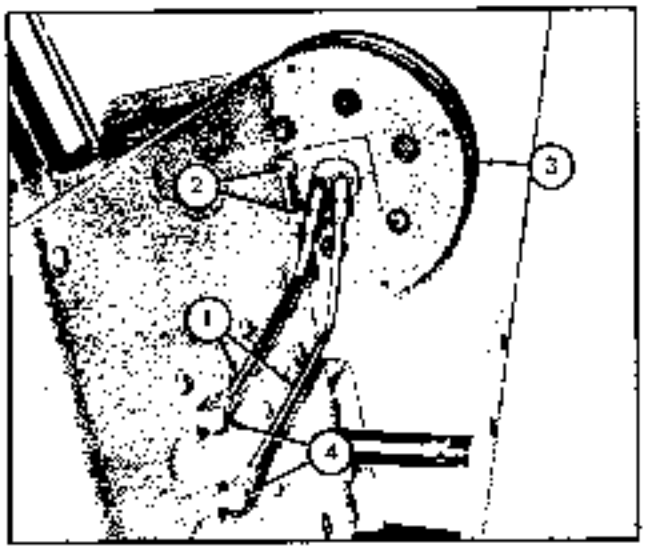


Fig. 156. L.H. hose reel

1. Hydraulic tubes
2. Reel mounting bolts
3. L.H. hose reel
4. Elbows in valve

n. Assemble the hose couplings to the hoses. Attach the hoses to the connections on the reel. Pre-load

spring in hose reel by turning reel against spring tension three turns. Attach hoses to junction block, being sure all twist is removed from hoses.

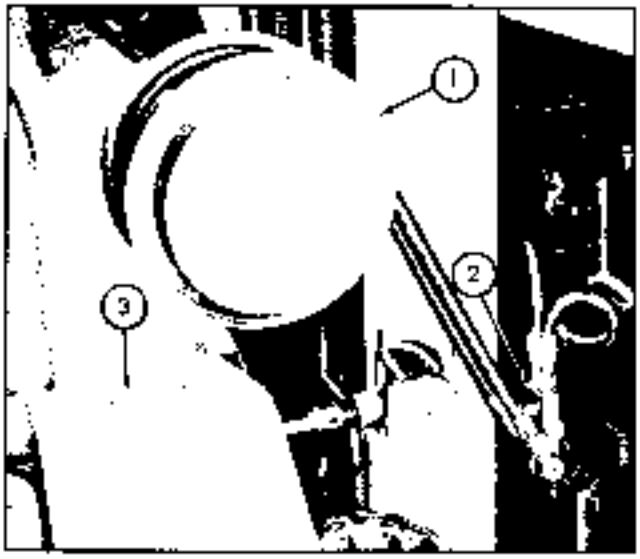


Fig. 157. R.H. reel and junction block

1. R.H. hose reel
2. Junction block
3. Overhead guard mtg. plate

c. Install the necessary hydraulic hoses between the junction block and hydraulic equipment to complete the installation. Relief valve pressure of auxiliary valve is 1700 PSI.

4-197. HEAD LIGHT.

a. Measure up 58 inches from bottom of outer right hand rail and weld light bracket to back side of rail. See figure 158.

b. Drill a 7/16" hole in instrument panel, in the position shown in Fig. 158, for the light switch. Install switch.

c. Assemble light, together with 8" wire, to handle. Install handle and bearing assembly on bracket, securing other end of 8" wire to bracket with bearing attaching screw.

d. Connect 6" wire between "hot" terminal on ignition switch and terminal on light switch. Attach 36" wire with fuse to other terminal on light switch.

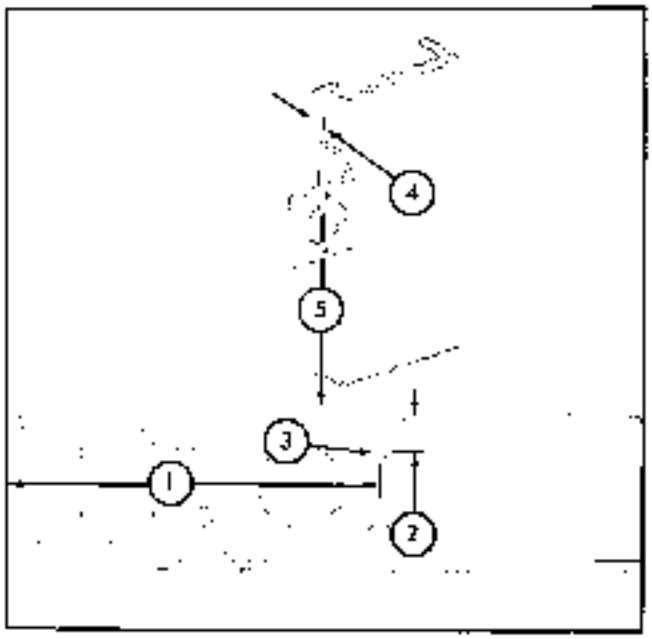


Fig. 158. Light mounting bracket

1. 15-7/16 inches
5. 1-5/8 inches
3. 7/16" hole for switch
4. 3/4" from inner edge
5. 58" from bottom of channel

e. Connect 72" wire to terminal on head light. Secure 72" wire to mast with clips and connect to 36" wire from light switch.

4-198. STOP LIGHT.

a. Remove 1/8" pipe plug from top front of brake master cylinder and install stop light switch.

b. Install light and bracket assembly. If lift truck has an overhead guard, remove nut from left hand rear leg and install light assembly. Use bolt provided for attaching light if truck does not have an overhead guard.

c. Connect 80" wire between wire on stop light and terminal on stop light switch. Connect 30" wire to other stop light switch terminal.

d. Connect 36" wire with fuse to positive terminal on ammeter and connect to 30" wire from stop light switch.

4-199. LOAD SAFETY RACK.

a. Weld safety rack brackets to backside of top carriage bar, using dimensions shown in Fig. 159 to locate.

b. Attach safety rack to brackets with bolts provided.

4-200. OVERHEAD GUARD.

a. Set overhead guard in place on truck, and secure front plates to frame. Secure rear guard support legs to counterweight.

b. If lift truck has hose reels installed, it will be necessary to modify front support legs to obtain necessary clearance. See Fig. 160.

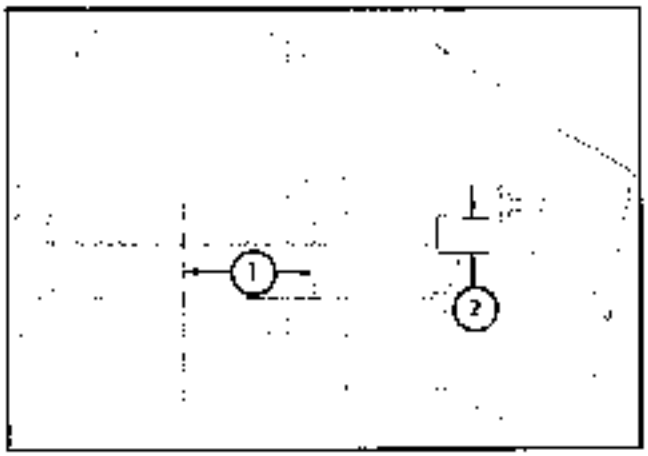


Fig. 159. Rack mounting brackets

1. 24-3/8 inches
2. 9-9/16 inches

CHAPTER 2

FUNCTIONAL PARTS LIST

MOBILIFT

MINNEAPOLIS-MOLINE, INC.

F O R E W O R D

This catalog contains a complete list of parts for the MA Series Fork Lift Trucks. To assist in determining the part numbers and descriptions, the parts in this catalog are grouped according to their location on the Lift Truck. Reference numbers only are shown in each illustration. These numbers correspond to those in the reference number column in the list of parts which precedes each "exploded view".

TYPICAL PARTS ARE SHOWN, AND MAY NOT ALWAYS BE IDENTICAL WITH CURRENT PARTS. REFER TO THE TEXT.

To further assist in locating repair parts, the part numbers are arranged in numerical sequence and indexed on pages 2-127 thru 2-137.

Component parts of assemblies are listed following the assembly itself and are identified as being part of the assembly by this notation following the description:

Consists of the following .....part:

or

Includes the following .....parts:

Part numbers only make up an assembly. Hardware items are not to be included.

Parts such as standard bolts, nuts, screws, washers, etc., are indented and listed under the respective individual parts with which they are used.

"Right or Left" is determined by facing the mast from the Mobilift seat.

When in need of repair parts always order the parts from your Mobilift dealer nearest you. All parts orders should plainly specify your name, post office address and whether shipment is to go by parcel post, express, or freight.

Before returning repair parts it is necessary to secure written permission from the company authorizing the return of such parts. In the returning of repair parts be sure the package is tagged with your name and address. Prepay transportation charges.

Claims of shortage or breakage should be made to the transportation company on receipt of goods.

It is the policy of Minneapolis-Moline, Inc. to improve its products whenever it is possible and practical to do so. We reserve the right to make changes or add improvements in the design or construction of parts at any time without incurring the obligation to install such changes on products previously delivered.

PARTS GROUP INDEX

Ref. No	Part No.		DESCRIPTION	No. Pcs.
		Continental Motors	CRANKCASE ASSEMBLY, CYLINDER HEAD AND GAS MANIFOLD	
			GROUP 1 - FOR MODEL F162 ENGINES	
			Used on MA 30 Lift Trucks to No. 28000125 Inc.	
			Used on MA 40 Lift Trucks to No. 28100643 Inc.	
			Used on MA 50 Lift Trucks to No. 28200185 Inc.	
12	35P776	F401A-302	Head - cylinder	1
		X-1014-S	GM100874 - Plug, pipe, cyl. hd., 1/2"	1
16	35P368	20CL-2020	*Cap - oil filler tube	1
16	10A10431	---------	**Cap - oil filler tube	1
17	35P362	20CL-2010	*Tube - oil filler	1
17	35P811	F162L-250	**Tube - oil filler	1
18	91186	X-1013	Valve - drain, cylinder block	1
19	35P779	F400A-330	Gasket - cylinder head	1
20	35P760	F600L-2090	Dipstick (oil gauge)	1
21	90978	X404L-210	Bolt - dipstick	1
22	35P731	Y400L-266	Support - dipstick	1
23	35P1022	F400A-48712-A	Cylinder and Crankcase - with bearings, bushings, guides, inserts, plugs and pins	1
	92838	X-2286	Plug - expansion, camshaft bushing, rear, 1-1/2"	1
		X-2287	GM172548 - Plug, expansion, 1-1/8"	1
		X-2202	GM172570 - Plug, expansion, 1-3/8"	2
		X-101	GM103868 - Plug, pipe, (drain) 1/4"	2
			*NOTE: Used on motors to No. 287584 Inc.	
			**NOTE: Used on motor No. 287585 and after.	
24	91478	STC-230	Ring - dowel, gear cover to crankcase	1
25	35P763	F400B-225	Gasket - end plate to cylinder	1
28	35P784	F400B-966	Plate - end, crankcase	1
28	35P765	F400B-333	Gasket - gear cover to end plate	1
32	35P736	F400B-5221	Cover - gear, with oil seal	1
33	15P562	X-1535	Seal - oil, gear cover	1
34	91135	X-4200	Stud - gear cover to cylinder, 3/8"-16 x 1-11/16"	1
36	91436	X-1802-C	Nut - gear cover stud, 3/8"-16	2
	35P1759	X-4228	Stud - gear cover to cylinder, 3/8"-16 x 1-7/8"	1
40		X-3285	GM179840 - Bolt, hex., 3/8"-16 x 1-1/2"	2
		X-226	GM114606 - Washer, lock, external, 3/8"	2
		X-1803-H	GM271500 - Nut, hex., 7/16"-14	1
41	91435	X-14134	Washer - stopper, cover screw, 3/8" I.D., 5/8" O.D.	2
48	91115	D600B-208	Ring - dowel, end plate to crankcase	1
55	35P767	F400B-442	Gasket - oil pan	2
57	90948	D600B-340	Block - filler, front	1
60		X-3924	GM179817 - Bolt, filler block, 5/16"-18 x 7/8"	2
		X-297A	GM115548 - Washer, int. lock, 5/16"	2
70	15P510A	D400B-255	Gasket - front and rear filler blocks	2
71	35P769	F400B-4460	Pan - oil	1
72	91585	W40-108	Gasket - drain plug	1
73	15P282	22RB-221	Plug - drain oil pan (Magnetic)	1
74	35P978	X-3896	Screw - oil pan to crankcase	14
76		X-2953	GM179829 - Bolt, hex., filler block, 5/16"-18 x 2-5/8"	2
78	90856	D600B-406	Block - filler, rear	1
79	35P789	T427B-201	Seal - rear filler block	1
80	90875	D600B-305	Guard - oil	1
	15P467	F400B-251	Felt - rear bearing oil guard	-
81	91778	15SL-211	Valve - relief, oil pressure	1
82	91798	X-14324	Washer - relief valve	1
83	91785	F400L-223	Spring - relief valve	1
84	91818	X-866	Gasket - relief valve	1
85	91805	41AX-200	Plug - relief valve	1
	35P1786	F600A-8990	Baffle - tappet drain	2
86	35P912	X-4008	Stud - cover	2

Ref. No.	Part No.	Continental Motors	DESCRIPTION	No. Per
			CRANKCASE ASSEMBLY, CYLINDER HEAD AND GAS MANIFOLD (Cont'd)	
87	91025	X-334	Gasket - cover stud	2
88	35P919	X-18327	Nut - cover stud	2
89	35P799	F124A-201	Gasket - valve chamber cover	1
90	35P881	F400A-3360	Cover - valve chamber	1
93	91135	X-4200	Stud - manifold, 3/8"-16 x 1-11/16"	6
94	35P920	X-14323	Washer - manifold stud, 13/32" I.D., 3/4" O.D.	4
94	35P921	X-14141	Washer - manifold stud, 13/32" I.D., 7/8" O.D.	3
95		X-18278	GM271535 - Nut, manifold stud (brass)	7
96	35P913	X-4266	Stud - manifold, 3/8"-16 x 2-5/8"	1
98		X-100	30A034 - Plug, pipe, 3/8"	1
		X-101	GM133860 - Plug, pipe, 1/4"	1
99	35P793	F400E-303	Gasket - manifold	1
100	35P794	F162E-415	Manifold - intake and exhaust	1
124	35P909	X-4725	Stud - cylinder head, 7/16"-20 x 5-1/2"	13
124	35P910	X-4726	Stud - cylinder head, 7/16"-14 x 4-1/4" (Nylok)	2
125	35P911	3X-X-1436	Washer - cylinder head stud, 7/16"	15
126		3X-X-1908-E	GM451404 - Nut, cylinder head stud, 7/16"-20	15
130	35P852	F6000-415	Housing - flywheel	1
		X-5738	GM170795 - Bolt, hex., 1/4"-20 x 5/8"	2
	35P880	X-5601	Lifting Eye - motor	1
	35R40	F162D-220	Gasket Set - engine overhaul	-
	35R41	F162D-109	Gasket Set - valve grinding	-

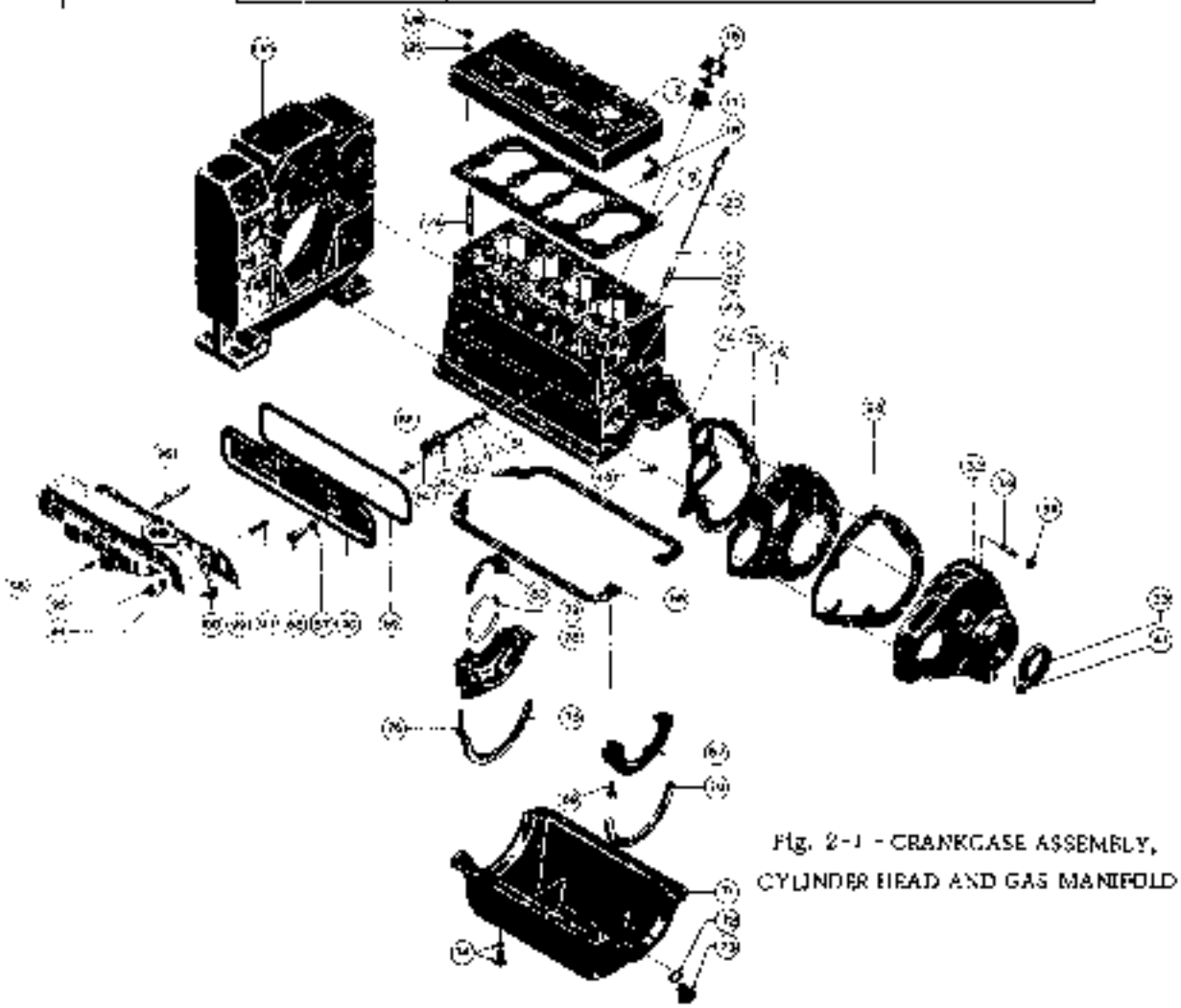


Fig. 2-1 - CRANKCASE ASSEMBLY, CYLINDER HEAD AND GAS MANIFOLD

Ref. No	Part No		DESCRIPTION	No. Per
		Continental Motors	CRANKCASE ASSEMBLY, CYLINDER HEAD AND GAS MANIFOLD GROUP II - FOR MODEL F163 ENGINES Used on MA 30 Lift Trucks No. 26000126 and after. Used on MA 40 Lift Trucks No. 26100544 and after. Used on MA 50 Lift Trucks No. 26200166 and after.	
12	30F1938	F401A-600	Head - cylinder	1
		X-101-6	GM108874 - Plug, pipe, cyl. hd., 1/2"	1
16	10A10401	-------	Cap - oil filler tube	1
17	35P913	F162L-350	Tube - oil filler	1
18	91165	X-1015	Valve - drain, cylinder block	1
19	35P778	F400A-330	Gasket - cylinder head	1
20	35P760	F400L-5060	Dipstick (oil gauge)	1
21	80978	K404L-210	Felt - dipstick	1
22	35P791	Y400L-206	Support - dipstick	1
23	35P1972	F163A-40010-A	Cylinder and Crankcase - with bearings, bushings, guides, inserts, plugs, and pins	1
	99838	X-2208	Plug - expansion, camshaft bushing, rear, 1-1/2"	1
		X-2207	GM172548 - Plug, expansion, 1-1/8"	1
		X-2202	GM172670 - Plug, expansion, 1-3/8"	2
		X-101	GM103866 - Plug, pipe, (drain) 1/4"	2
24	91478	STC-200	Ring - dowel, gear cover to crankcase	1
25	10P468	P2446-201	Gasket - end plate to cylinder	1
26	35P1953	F400B-331	Plate - end, crankcase	1
28	30P749	F400B-353	Gasket - gear cover to end plate	1
32	35P781	F400B-3221	Cover - gear, with oil seal	1
33	10P662	X-1555	Seal - oil, gear cover	1
34	91135	X-4230	Stud - gear cover to cylinder, 3/8"-16 x 1-21/16"	1
36	91483	X-1302-G	Nut - gear cover stud, 3/8"-16	2
	35P1758	X-4228	Stud - gear cover to cylinder, 3/8"-16 x 1-7/8"	1
40		X-9295	GM173840 - Bolt, hex., 3/8"-16 x 1-1/2"	2
		X-220	GM114606 - Washer, lock, external, 3/8"	2
		X-1303-H	GM171530 - Nut, hex., 7/16"-14	1
41	91488	X-14134	Washer - copper, cover screw, 3/8" I.D., 5/8" O.D.	2
45	35P1934	TTC-216	Ring - dowel, end plate to crankcase	1
46	35P787	F400B-442	Gasket - oil pan	2
47	30e45	D400B-340	Block - filler, front	1
50		X-9304	GM179517 - Bolt, filler block, 5/16"-18 x 7/8"	2
		X-297A	GM110048 - Washer, int. lock, 5/16"	2
70	10P010A	F400B-956	Gasket - front and rear filler blocks	2
71	35P783	F400B-4460	Pan - oil	1
72	91868	W48-128	Gasket - drain plug	1
73	10P262	2818-221	Plug - drain oil pan (Magnetic)	1
74	35P016	X-9806	Screw - oil pan to crankcase	14
75		X-2458	GM179628 - Bolt, hex., filler block, 5/16"-18 x 2-5/8"	2
78	35P1931	D400B-432	Block - filler, rear	1
79	35P769	T457B-201	Seal - rear filler block	1
80	35P1932	F400B-399	Guard - oil	1
	10P467	F400B-251	Felt - rear bearing oil guard	1
81	91775	165L-211	Valve - relief, oil pressure	1
82	91796	X-14324	Washer - relief valve	1
83	91768	F400L-223	Spring - relief valve	1
84	91919	X-985	Gasket - relief valve	1
85	91808	41AX-200	Plug - relief valve	1
	30F1796	F600A-3990	Baffle - tappet drain	2
86	35P912	X-4086	Stud - cover	2
87	91025	X-334	Gasket - cover stud	2
88	35P913	X-15227	Nut - cover stud	2
89	35P780	F134A-201	Gasket - valve chamber cover	1

Ref. No.	Part No.	Continental Motors	DESCRIPTION	No. Per
			CRANKCASE ASSEMBLY, CYLINDER HEAD AND GAS MANIFOLD (Cont'd)	
90	35P982	F430A-3960	Cover - valve chamber	1
93	91135	X-4200	Stud - manifold, 3/8"-16 x 1-11/15"	6
94	35P920	X-24025	Washer - manifold stud, 13/32" I.D., 6/4" O.D.	4
94	35P921	X-2414L	Washer - manifold stud, 13/32" I.D., 7/5" O.D.	3
95		X-15276	GM271580 - Nut, manifold stud (Brass)	7
9E	35P913	X-4256	Stud - manifold, 3/8"-16 x 3-3/5"	1
96		X-200	50A354 - Plug, pipe, 1/8"	1
		X-131	GM109866 - Plug, pipe, 1/4"	1
99	65F795	F400E-303	Gasket - manifold	1
100	35P791	F162E-415	Manifold - intake and exhaust	1
124	35P1934	X-6899	Stud - cylinder head, 7/16"-14 x 2-7/8"	11
124	35P1935	X-6884	Stud - cylinder head, 7/16"-14	4
125	35P911	3X-X-1402	Washer - cylinder head stud, 7/16"	15
126		3X-X-1803-E	GM451464 - Nut, cylinder head stud, 7/16"-20	15
180	35P552	F600B-412	Housing - flywheel	1
		X-5799	GM179793 - Bolt, hex., 1/4"-28 x 5/8"	2
	35P980	X-5641	Lifting Eye - motor	1
	35P1928	F103U-124	Gasket Set - engine overhaul	*
	30R41	F162U-209	Gasket Set - valve grinding	*

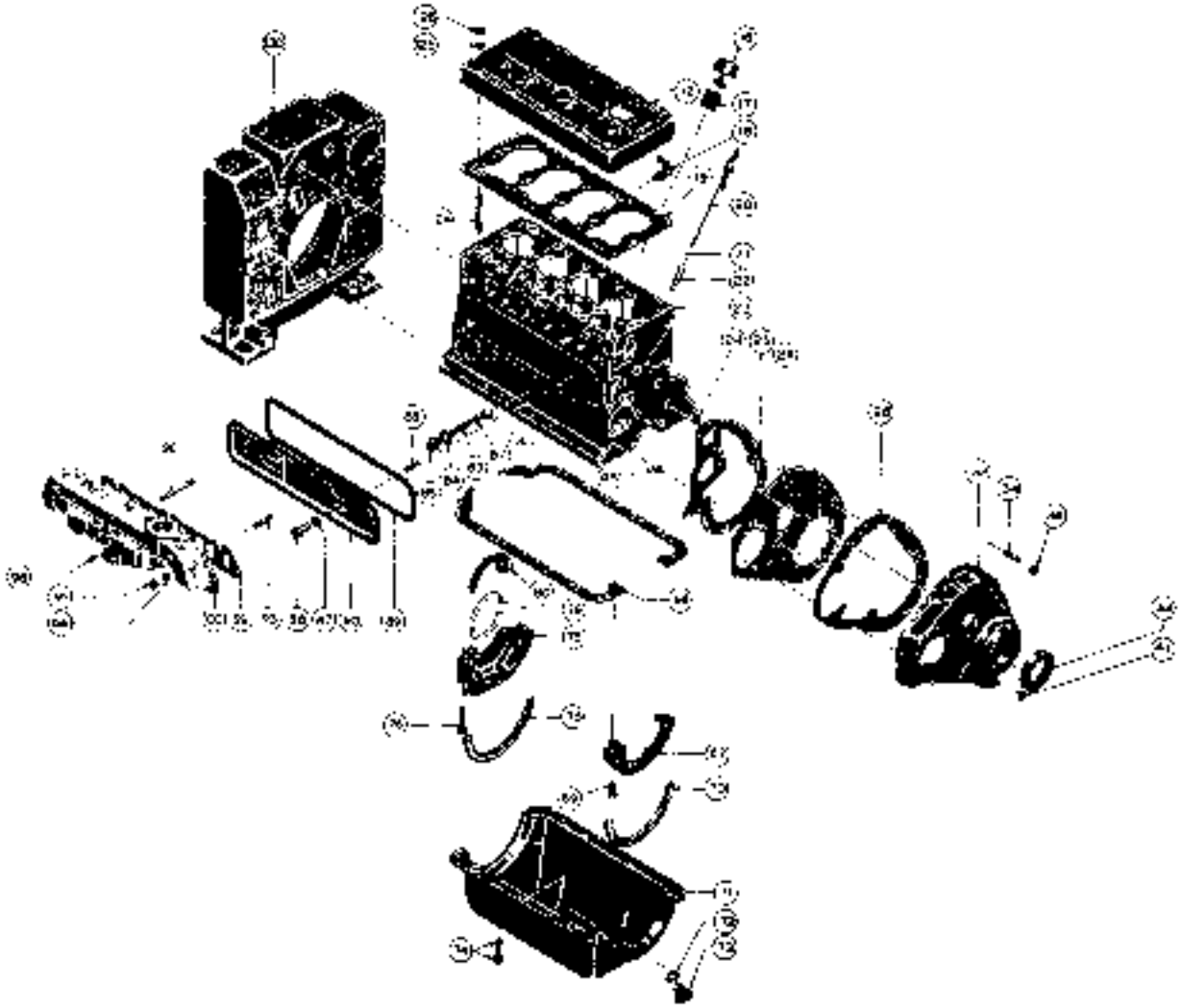


Fig. 2-1 - CRANKCASE ASSEMBLY, CYLINDER HEAD AND GAS MANIFOLD

Ref. No	Part No	Continental Motors	DESCRIPTION	No. Pcs.
			CAMSHAFT, VALVES, OIL PUMP AND OIL FILTER	
1	35P818	F4001-422	Camshaft	1
2		X-2293	GM179814 - Screw, thrust plate, 5/16"-18 x 5/8"	2
		X-297-A	GM115546 - Washer, lock, 5/16"	2
3	35P456	Y400I-208	Plate - thrust, camshaft	1
4	35P815	F400H-406	Gear - timing camshaft	1
5		X-500	GM106750 - Key, Woodruff, No. 6	1
6		X-12486	GM219197 - Nut, gear to camshaft, 3/4"-16	1
7	35P812	F400-G222	Bushing - camshaft, front	1
8	909193	X400G-231	Bushing - camshaft, center	1
9	909252	X400G-232	Bushing - camshaft, rear	1
10	35P549	F600I-2520	Tappet - (valve lifter)	8
11	15P402	F400H-202	+Retainer - valve spring, intake valve	4
11	35P1947	F600I-200	++Retainer - valve spring, intake valve	4
12	15P461	Y400I-215	Spring - valve, intake and exhaust	8
13	35P815	F400I-233	Guide - valve stem	8
14	35P979	P140A-218	Insert - exhaust valve, .010 O.S.	4
15	15P463	Y400I-205	+Lock - retainer, valve spring	8
15	35P1953	CVT-3234	++Lock - retainer, valve spring	8
16	35P979	F400I-235	+Valve - exhaust, 45° seat, positive rotc	4
16	35P1936	F600I-353	++Valve - exhaust, 45° seat, positive rotc	4
18	95315	F600I-228	+Valve - intake	4
16	35P1956	F600I-302	++Valve - intake	4
	15P464	Z120I-3000	+Rotc Cap - assembly, exhaust valve	4
	35P1959	F600I-301	++Rotc Cap - assembly, exhaust valve	4
			+Used on MA Series Trucks with F162 Continental Engine. MA 30 Lift Trucks to No. 28000125 Inc. MA 40 Lift Trucks to No. 26100543 Inc. MA 50 Lift Trucks to No. 26200135 Inc. ++Used on MA Series Trucks with F369 Continental Engine. MA 30 Lift Trucks No. 28000126 and after. MA 40 Lift Trucks No. 26100544 and after. MA 50 Lift Trucks No. 26200136 and after.	
	15P465	Z120I-335	Lock - valve spring seat	8
17	35P817	F600L-4131	Oil pump - assembly, includes parts identified with an asterisk (*)	1
	15P290	Z-14264	Washer - oil pump mounting lug, 3/8"	1
18	90958	F400L-210	Bushing - oil pump shaft, in crankcase	1
19	352653	F600A-205	*Pinion - drive shaft, upper end	1
20	35P917	X-17095	*Pin - gear to shaft	1
21	91635	D600G-274	*Bushing - oil pump, in housing	1
22	91625	F21E1-204	*Shaft - oil pump	1
23		X-584	*GM106749 - Key, Woodruff, No. 3	1
24	15P46	F600H-217	*Gear - driver, oil pump	1
25	15P47	F600H-218	*Gear - idler	1
26	91695	30L-212	*Stud - idler gear	1
27	91635	D600L-204	*Ring - snap, drive gear	1
28	91715	C400L-231	*Gasket - oil pump cover	1
29	15P48	F400L-280	*Cover - oil pump	1
30	91735	J7EL-204	*Gasket - cover to frame	1
31	91725	17EL-300	*Frame - oil pump strainer	1
		X-5798	*GM179798 - Bolt, hex., 1/4"-20 x 5/8"	6
32	91745	C400L-229	*Spacer - frame to screen	1
33	91755	D600L-2120	*Screen - assembly, oil pump	1
34	15P280	Z-20040	Stud - oil pump body to bearing cap	1
35	91435	X-1902G	Nut - oil pump stud	1
36	35A0593	-------	Filter - oil, spin on	1

Ref. No.	Part No.		DESCRIPTION	No. Req.
		Continental Motors	CAMSHAFT, VALVES, OIL PUMP AND OIL FILTER (Cont'd)	
37	35A6158	-------	Base - filter	1
		-------	GM180122 - Bolt, hex., 3/8"-16 x 1"	2
		-------	GM120976 - Nut, hex., 3/8"-16	2
38	30A6264	-------	Hose - with couplings, filter to engine, 21" long	2
39		-------	GM454145 - Tee, pipe, 1/4", 3 way	1
39	30A8214	-------	Tee - pipe, 1/4", 4 way	1
40		-------	30A4399 - Elbow, 1/4"-18 NPT to 1/2"-20 NF	2
41		-------	GM119922 - Bushing, reducer, 1/4" to 1/8"	1
42	35A8321	-------	Connector - orifice, tee to crankcase	1

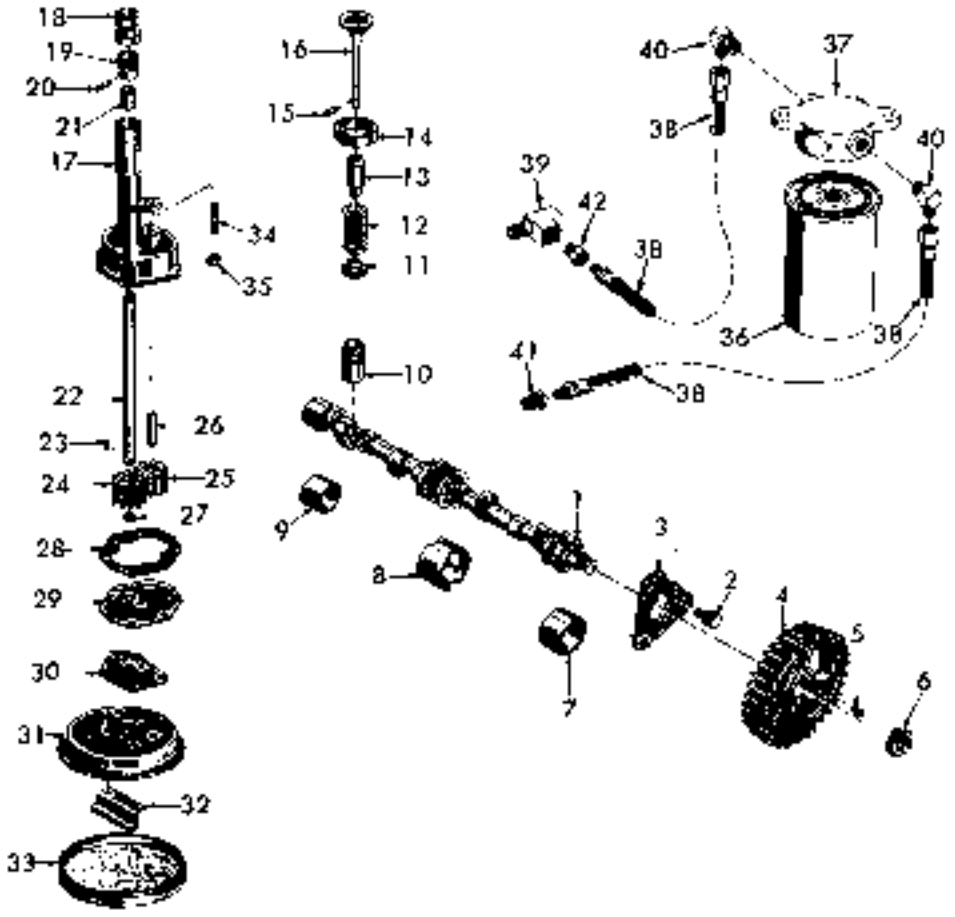


Fig. 2-2 - CAMSHAFT, VALVES AND OIL PUMP

Ref. No.	Part No.	Continental Motors	DESCRIPTION	No. Per
			CRANKSHAFT, FLYWHEEL, CONN. RODS AND PISTONS GROUP 1 • FOR MODEL F162 ENGINES Used on Continental Motors to No. 30,239 Inc.	
1	35P795	F400C-5000	Crankshaft - with bushing	1
2	91215	1ELG-202	Bushing - crankshaft	1
3	35P790	D600C-204	Washer - thrust crankshaft	1
4	13P276	6TG-101	Pin - thrust washer, 5/32" x 1/2"	3
5	91205	1UEC-204	Shim - thrust, crankshaft, .002	A.R.
6	91275	1UEC-205	Shim - thrust, crankshaft, .009	A.R.
7	35P797	F600C-205	Plate - thrust, crankshaft	1
8	35P814	F600H-317	Gear - timing	1
9	13P58	X-534	Key - timing gear and fan pulley	2
10	91238	A600C-204	Thrower - oil	1
12	35P959	P102K-386	Pulley - fan drive	1
13	91245	C400K-217	Plug - keyway, fan pulley	1
14	35P758	8UC-202	Washer - jaw to crankshaft	1
15	91208	D600-0-201	Jaw-starting	1
16	35P799	P400B-348	Cap - bearing, front	1
17	35P800	F600G-3491	Bearing - crankshaft, front, (pair) standard	1
18	35P883	F600G-3491-.020	Bearing - crankshaft, front, (pair) .020 undersize	1
19	35P884	F600G-3491-.040	Bearing - crankshaft, front, (pair) .040 undersize	1
20	35P801	P400B-350	Cap - bearing, center	1
21	35P802	F400G-3111	Bearing - crankshaft, center, (pair) standard	1
21	35P885	F400G-3111-.020	Bearing - crankshaft, center, (pair) .020 undersize	1
21	35P886	F400G-3111-.040	Bearing - crankshaft, center, (pair) .040 undersize	1
22	35P803	P400B-349	Cap - bearing, rear	1
23	35P804	F600G-3471	Bearing - crankshaft, rear, (pair) standard	1
23	35P887	F600G-3471-.020	Bearing - crankshaft, rear, (pair) .020 undersize	1
23	35P888	F600G-3471-.040	Bearing - crankshaft, rear, (pair) .040 undersize	1
24	35P815	X-14465	Washer - bearing cap screws	6
26	13P277	X-2086	Screw - front and rear bearing cap, 1/2"-13 x 2-5/8"	4
27	80818	X-3511	Screw - center bearing cap, 1/2"-13 x 3-1/4"	2
29	35P805	P400D-3021	Rod - connecting, with bearings, No. 1 and 6 pistons	2
29	35P806	P400D-3031	Rod - connecting, with bearings, No. 2 and 4 pistons	2
30	35P807	F600G-341	Bearing - connecting rod, (half) 1 and 6 cyl., standard	4
30	35P889	F600G-341-.020	Bearing - connecting rod, (half) 1 and 3 cyl., .020 undersize	4
30	35P890	F600G-341-.040	Bearing - connecting rod, (half) 1 and 3 cyl., .040 undersize	4
30	35P808	F600G-342	Bearing - connecting rod, (half) 2 and 4 cyl., standard	4
30	35P891	F600G-342-.020	Bearing - connecting rod, (half) 2 and 4 cyl., .020 undersize	4
30	35P892	F600G-342-.040	Bearing - connecting rod, (half) 2 and 4 cyl., .040 undersize	4
31	91:962	P400G-211	Bushing - piston pin	4
32	80385	C600D-200	Bolt - connecting rod	8
33	80388	X-18:98	Nut - connecting rod bolt	8
34		X-501	GM103370 - Cotter, 3/32" x 3/4"	8
35	13P279	X-7011	Ring - piston pin retainer	8
36	13P451	1EA-200	Pin - piston, standard	4
36	35P893	1EA-200-.003	Pin - piston, .003 oversize	4
36	35P895	1EA-200-.005	Pin - piston, .005 oversize	4
37	35P809	P162A-2461-S	Piston - with pin and retainers, standard	4
37	35P896	P162A-2461-S-.020	Piston - with pin and retainers, .020 oversize	4
37	35P894	P162A-2461-S-.040	Piston - with pin and retainers, .040 oversize	4
38	35P1064	P162T-208	Rings - piston, complete re-ring set, standard	1
38	35P1065	P162T-208-.020	Rings - piston, complete re-ring set, .020 oversize	1
38	35P1066	P162T-208-.040	Rings - piston, complete re-ring set, .040 oversize	1

Ref. No	Part No		DESCRIPTION	No Pcs.
		Continental Motors	CRANKSHAFT, FLYWHEEL, CONNECTING RODS AND PISTONS (Cont'd)	
40	35P914	X-5822	Bolt - flywheel to crankshaft	6
41		X-207	GM115548 - Washer, int. lock, 3/8"	6
42	91908	X-18237	Nut - flywheel bolt	6
43	35P850	F600C-4500	Flywheel - with ring gear	1
44	35P851	F400C-377	Ring Gear - flywheel	1
	91945	X-3043-A	Screw - drive, flywheel pointer	1

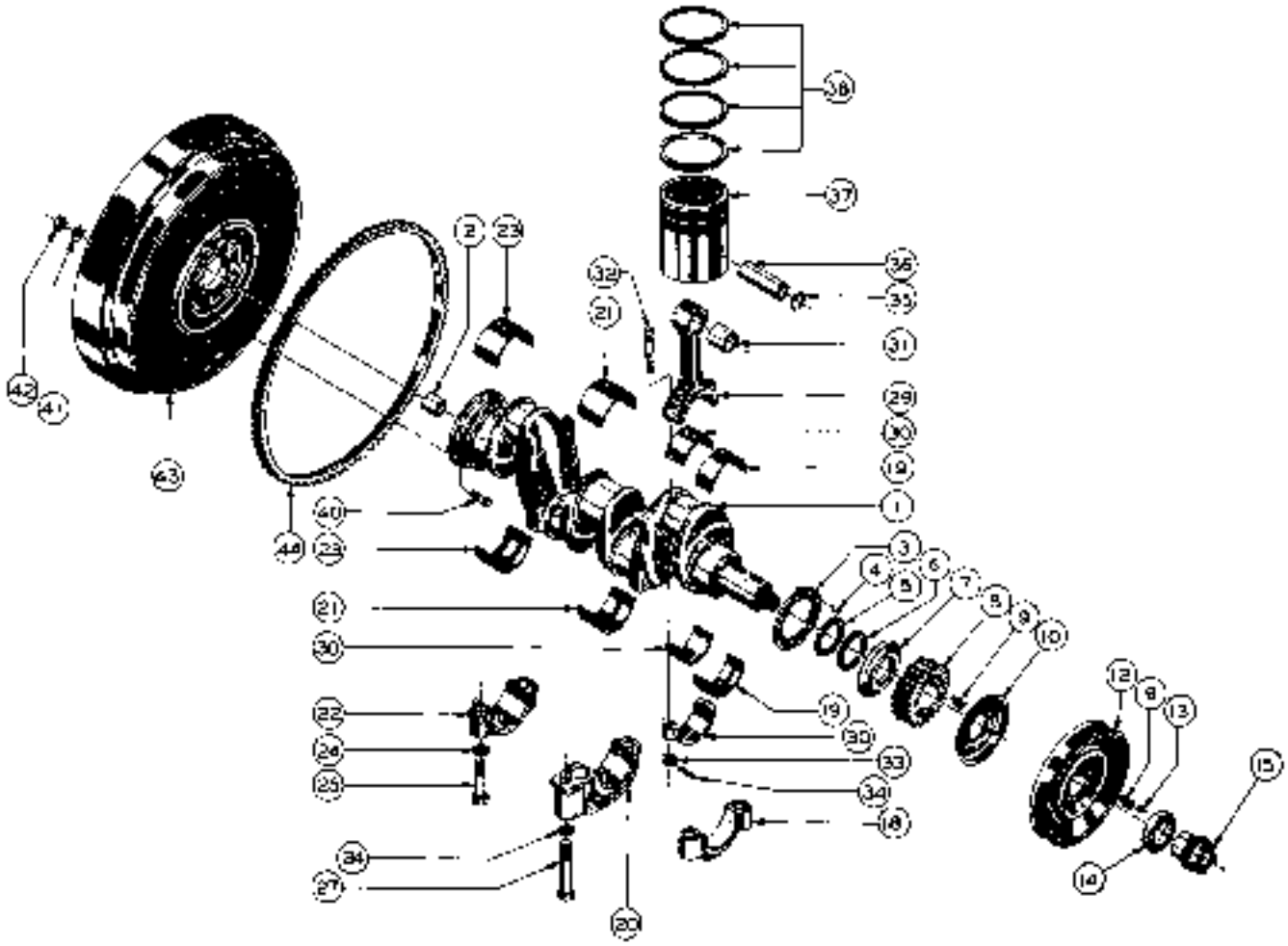


Fig. 2-3 - CRANKSHAFT, FLYWHEEL, CONN. RODS AND PISTONS

Ref. No	Part No	Continental Motors	DESCRIPTION	No Req.
			CRANKSHAFT, FLYWHEEL, CONN. RODS AND PISTONS GROUP II - FOR MODEL F162 ENGINES Used on Continental Motors No. 361235 and after.	
1	35P795	F400C-5000	Crankshaft - with bushing	1
2	91215	10LG-202	Bushing - crankshaft	1
3	35P790	D6BBC-204	Washer - thrust crankshaft	1
4	15P276	6TG-101	Pin - thrust washer, 5/32" x 1/2"	3
5	91263	10EC-204	Shim - thrust, crankshaft, .002	A.R.
6	91275	10EC-205	Shim - thrust, crankshaft, .005	A.R.
7	35P797	E600C-205	Plate - thrust, crankshaft	1
8	35P814	F600H-317	Gear - timing	1
9	15P58	X-394	Key - timing gear and fan pulley	2
10	91285	A600C-204	Thrower - oil	1
12	35P856	F162K-386	Pulley - fan drive	1
13	91346	C400K-217	Plug - keyway, fan pulley	1
14	35P793	6LC-202	Washer - jaw to crankshaft	1
15	91305	D600-0-201	Jaw - starting	1
16	35P799	F4000-048	Cap - bearing, front	1
19	35P1740	F400G-3421	Bearing - crankshaft, front, (pair) standard	1
19	35P1741	F400G-3421-.020	Bearing - crankshaft, front, (pair) .020 undersize	1
19	35P1742	F400G-3421-.040	Bearing - crankshaft, front, (pair) .040 undersize	1
20	35P801	F4000-250	Cap - bearing, center	1
21	35P1743	F400G-3441	Bearing - crankshaft, center, (pair) standard	1
21	35P895	F400G-3441-.020	Bearing - crankshaft, center, (pair) .020 undersize	1
21	35P896	F400G-3441-.040	Bearing - crankshaft, center, (pair) .040 undersize	1
22	35P803	F4000-249	Cap - bearing, rear	1
23	35P1745	F400G-3461	Bearing - crankshaft, rear, (pair) standard	1
23	35P1747	F400G-3461-.020	Bearing - crankshaft, rear, (pair) .020 undersize	1
23	35P1748	F400G-3461-.040	Bearing - crankshaft, rear, (pair) .040 undersize	1
24	35P015	X-14466	Washer - bearing cap screws	6
25	15P277	X-2986	Screw - front and rear bearing cap, 1/2"-13 x 2-5/8"	4
27	90825	X-3021	Screw - center bearing cap, 1/2"-13 x 2-1/4"	2
29	35P1757	F400D-5023	Rod - connecting, with bushing, No. 1 and 3 pistons	2
29	35P1758	F400D-3033	Rod - connecting, with bushing, No. 2 and 4 pistons	2
			Includes the following 3 parts:	
31	911982	F400C-211	Bushing - piston pin	4
32	90396	C600D-206	Bolt - connecting rod	8
33	00385	X-12162	Nut - connecting rod bolt	8
34		X-601	GM100370 - Cotter, 3/32" x 3/4"	8
30	35P1749	F400G-340	Bearing - connecting rod, (half) 1 and 3 cyl. standard	4
30	35P1750	F400G-340-.020	Bearing - connecting rod, (half) 1 and 3 cyl. .020 undersize	4
30	35P1751	F400G-340-.040	Bearing - connecting rod, (half) 1 and 3 cyl. .040 undersize	4
30	35P1752	F400G-341	Bearing - connecting rod, (half) 2 and 4 cyl. standard	4
30	35P1753	F400G-341-.020	Bearing - connecting rod, (half) 2 and 4 cyl. .020 undersize	4
30	35P1754	F400G-341-.040	Bearing - connecting rod, (half) 2 and 4 cyl. .040 undersize	4
35	15P279	X-7911	Ring - piston pin retainer	8
36	15P451	11EA-200	Pin - piston, standard	4
36	35P905	11EA-200-.002	Pin - piston, .002 oversize	4
36	35P906	11EA-200-.005	Pin - piston, .005 oversize	4
37	35P809	F162A-2461-E	Piston - with pin and retainers, standard	4
37	35P905	F162A-2461-E-.020	Piston - with pin and retainers, .020 oversize	4
37	35P904	F162A-2461-E-.040	Piston - with pin and retainers, .040 oversize	4
38	35P1064	F162T-208	Rings - piston, complete re-ring set, standard	1
38	35P1065	F162T-208-.020	Rings - piston, complete re-ring set, .020 oversize	1
38	35P1066	F162T-209-.040	Rings - piston, complete re-ring set, .040 oversize	1

Ref. No	Part No.	DESCRIPTION		No. Per
		Continental Motors	CRANKSHAFT, FLYWHEEL, CONNECTING RODS AND PISTONS (Cont'd)	
	35P970	F162A-247	Spacer - ring, piston top groove	4
40	35P914	C400C-206	Bolt - flywheel to crankshaft	5
41		X-297	GM125549 - Washer, int. lock, 3/8"	5
42	31905	X-23237	Nut - flywheel bolt	6
43	35P550	P600C-4500	Flywheel - with ring gear	1
44	35P951	P400C-377	Ring Gear - flywheel	1
	31948	X-3043-A	Screw - drive, flywheel pointer	1

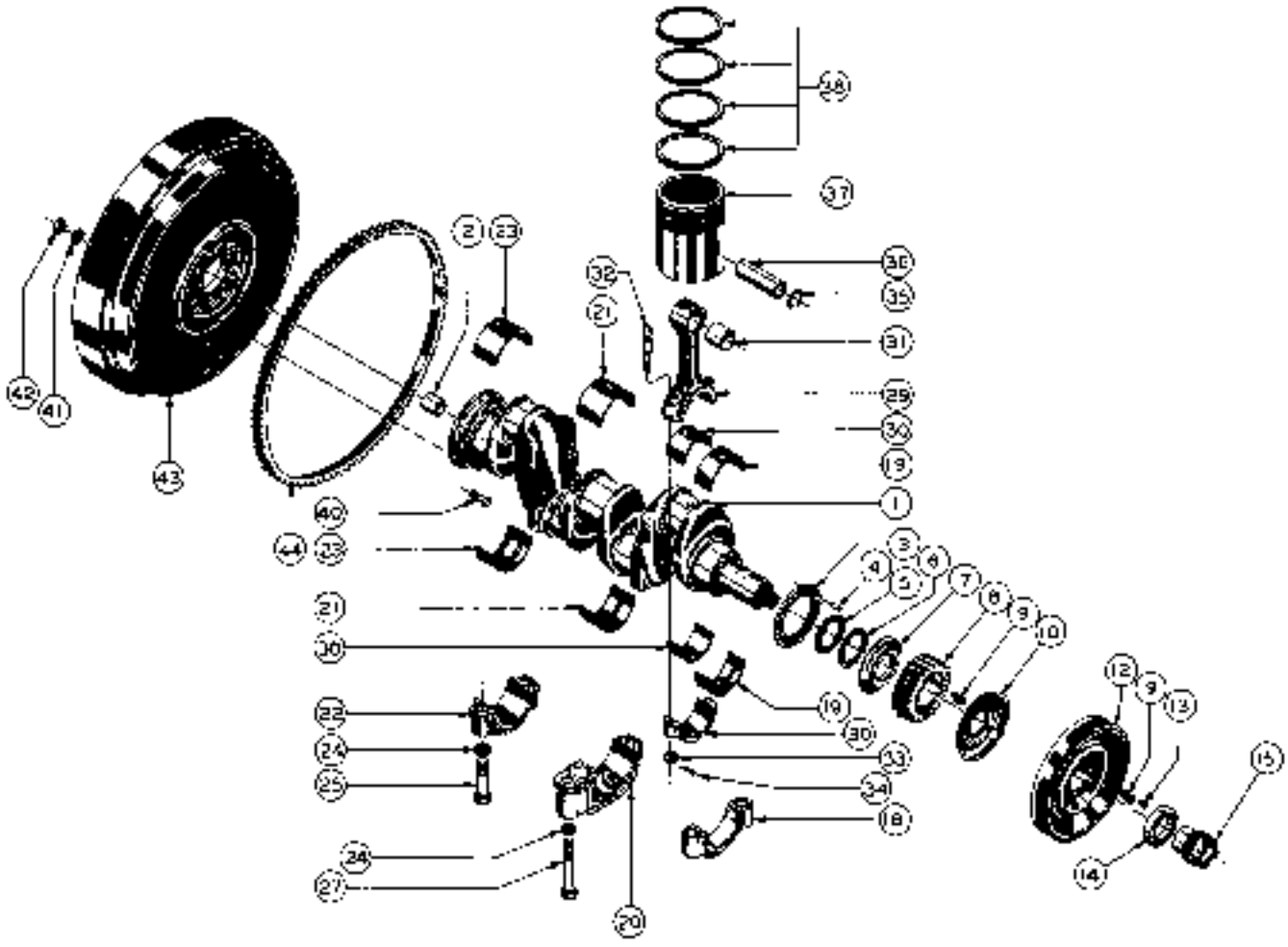


Fig. 2-3 - CRANKSHAFT, FLYWHEEL, CONN. RODS AND PISTONS

Ref No	Part No		DESCRIPTION	No Req
		Continental Motors	CRANKSHAFT, FLYWHEEL, CONN. RODS AND PISTONS GROUP III - FOR MODEL F163 ENGINES Used on MA 30 Lift Trucks No. 28000186 and after. Used on MA 40 Lift Trucks No. 28100544 and after. Used on MA 50 Lift Trucks No. 28500186 and after.	
1	35P1937	F400C-6031	Crankshaft	1
2	35P814	F600H-317	Gear - timing	1
3	35P1936	X-675	Key - timing gear	1
4	91265	A600C-204	Thrower - oil	1
5	35P856	F1E2K-566	Pulley - fan drive	1
6	91346	C400K-217	Plug - keyway, fan pulley	1
7	35P1975	X-14295	Washer - pulley to crankshaft	1
8	35P1970	X-6500	Screw - crankcase, pulley retaining	1
9	35P1925	F600B-470	Cap - bearing, front	1
10	13P469	F600G-3911	Bearing - crankshaft, front (pair), standard	1
10	15P683	F600G-3911-.020	Bearing - crankshaft, front (pair), .020 undersize	1
10	15P684	F600G-3911-.040	Bearing - crankshaft, front (pair), .040 undersize	1
11	35P1926	F400B-359	Cap - bearing, center	1
12	35P1940	F400G-3281	Bearing - crankshaft, center (pair), standard	1
12	35P1941	F400G-3281-.020	Bearing - crankshaft, center (pair), .020 undersize	1
12	35P1942	F400G-3281-.040	Bearing - crankshaft, center (pair), .040 undersize	1
13	35P1927	F4013-301	Cap - bearing, rear	1
14	35P1943	F400G-3351	Bearing - crankshaft, rear (pair), standard	1
14	35P1944	F400G-3351-.020	Bearing - crankshaft, rear (pair), .020 undersize	1
14	35P1945	F400G-3351-.040	Bearing - crankshaft, rear (pair), .040 undersize	1
15	88135	F600B-248	Dowel - bearing, cap, front	2
16	15P53	F600B-247	Dowel - bearing, cap, center and rear	4
17	35P1929	X-6503	Bolt - place, bearing cap, front and rear, 1/2"-13 x 2-1/2" long	4
18	35P1930	X-6920	Bolt - place, bearing cap, center, 1/2"-13 x 3-1/4"	2
19	35P1938	F226D-4002	Rod - connecting, with bushing, No. 1 and 3 pistons	2
19	35P1939	F226D-3002	Rod - connecting, with bushing, No. 2 and 4 pistons Each includes the following 3 parts:	2
20	911852	F400G-211	Bushing - piston pin	4
21	90395	C600D-206	Bolt - connecting rod	8
22	80388	X-15138	Nut - connecting rod bolt	8
23		X-601	CM100378 - Cotter, 3/32" x 3/4"	8
24	13P472	F600G-389	Bearing - connecting rod (half), 1 and 3 cyl. standard	4
24	35P1946	F600G-389-.020	Bearing - connecting rod (half), 1 and 3 cyl., .020 undersize	4
24	35P1947	F600G-389-.040	Bearing - connecting rod (half), 1 and 3 cyl., .040 undersize	4
25	15P473	F600G-390	Bearing - connecting rod (half), 2 and 4 cyl., standard	4
25	35P1948	F600G-390-.020	Bearing - connecting rod (half), 2 and 4 cyl., .020 undersize	4
25	35P1949	F600G-390-.040	Bearing - connecting rod (half), 2 and 4 cyl., .040 undersize	4
26	35P1950	F244A-401-E	Piston - with pin and retainers, standard	4
26	35P1951	F244A-401-E-.020	Piston - with pin and retainers, .020 oversize	4
26	35P1952	F244A-401-E-.040	Piston - with pin and retainers, .040 oversize	4
27	35P1969	X-7109	Ring - piston pin retainer	8
28	35P1966	F600A-214	Pin - piston, standard	4
28	35P1967	F600A-214-.003	Pin - piston, .003 oversize	4
28	35P1968	F600A-214-.005	Pin - piston, .005 oversize	4
29	35P1971	F244A-333	Spacer - ring, piston top groove	4
30	35P1964	F162T-206	Rings - piston, complete set-ring set, standard	1
30	35P1965	F162T-206-.020	Rings - piston, complete set-ring set, .020 oversize	1
30	35P1966	F162T-206-.040	Rings - piston, complete set-ring set, .040 oversize	1

Ref. No	Part No.	DESCRIPTION		No Per
		Continental Motors	CRANKSHAFT, FLYWHEEL, CONN. RODS AND PISTONS (Cont'd)	
31	35F914	C400C-206	Bolt - flywheel to crankshaft	6
32		X-297	GM115549 - Washer, int. lock, 3/8"	6
33	91805	X-18237	Nut - flywheel bolt	6
34	35F850	F600C-4500	Flywheel - with ring gear	1
35	35F851	F400C-377	Ring Gear - flywheel	1
	91945	X-3048-A	Screw - drive, flywheel pointer	1

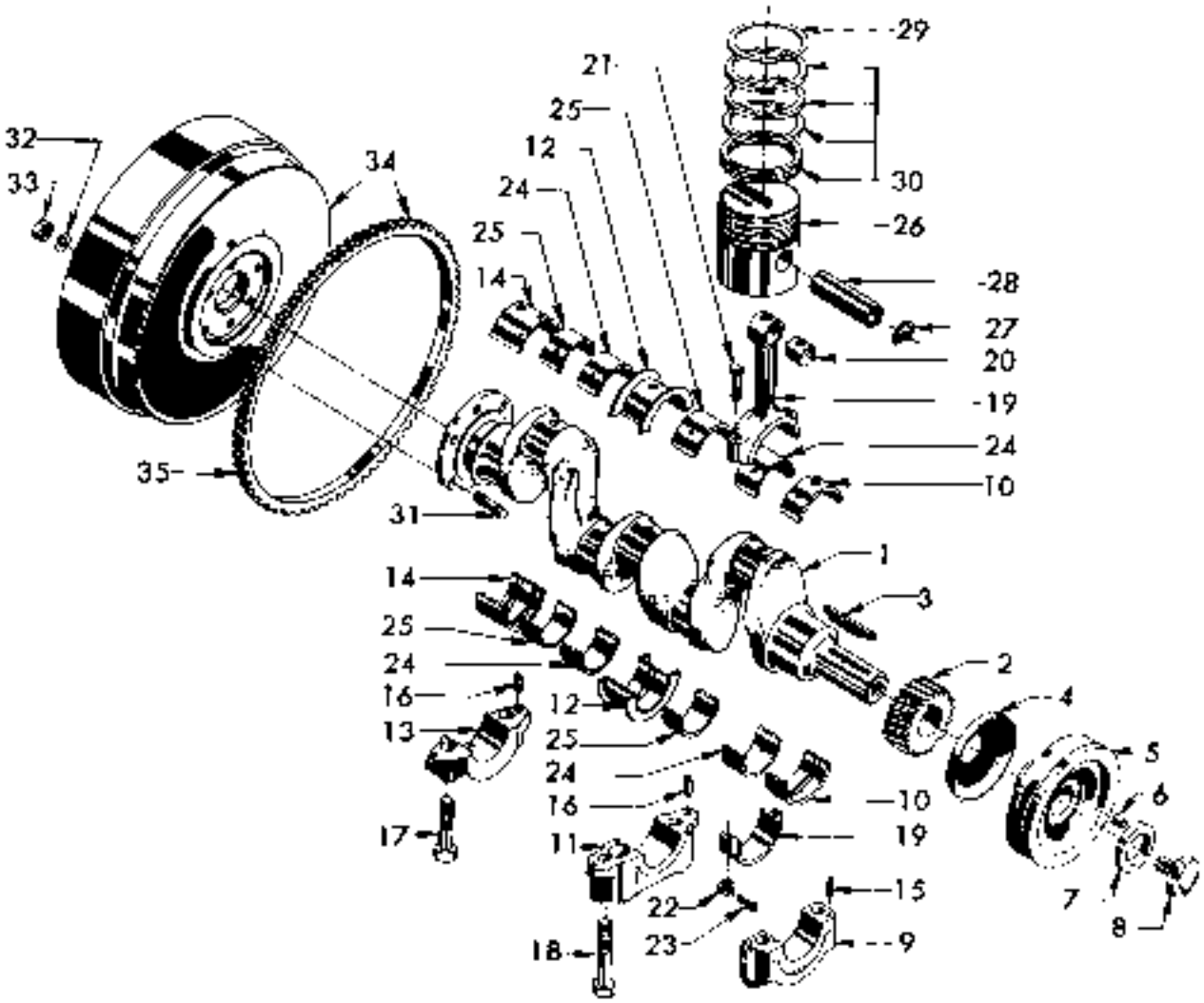


FIG. 2-3A - CRANKSHAFT, FLYWHEEL, CONN. RODS AND PISTONS

Ref. No	Part No.	DESCRIPTION	No. Per
		MUFFLER	
1	86A6296	Muffler	1
2	86A6586	Clamp - muffler to frame (90A6335)	1
		50A3666 - Bolt, hex., 3/8"-16 x 1"	2
3	85A6306	Pipe - exhaust	1
4		50A1746 - Clamp, 1-7/8" Dia.	2
5	35A5286	Elbow - on exhaust manifold	1
6	10A3072	Stud - elbow, in manifold, 3/8" x 1-3/8"	2
		50A1000 - Nut, hex., seez-proof, 3/8"-16	2
		50A4225 - Washer, lock, 3/8"	2
7	10A3616	Gasket - elbow to manifold	1
	35A3135	*Muffler	1
		*50A4190 - Screw, No. 6 x 3/8"	1
		*NOTE: Used on trucks G5 or LP5 equipped.	

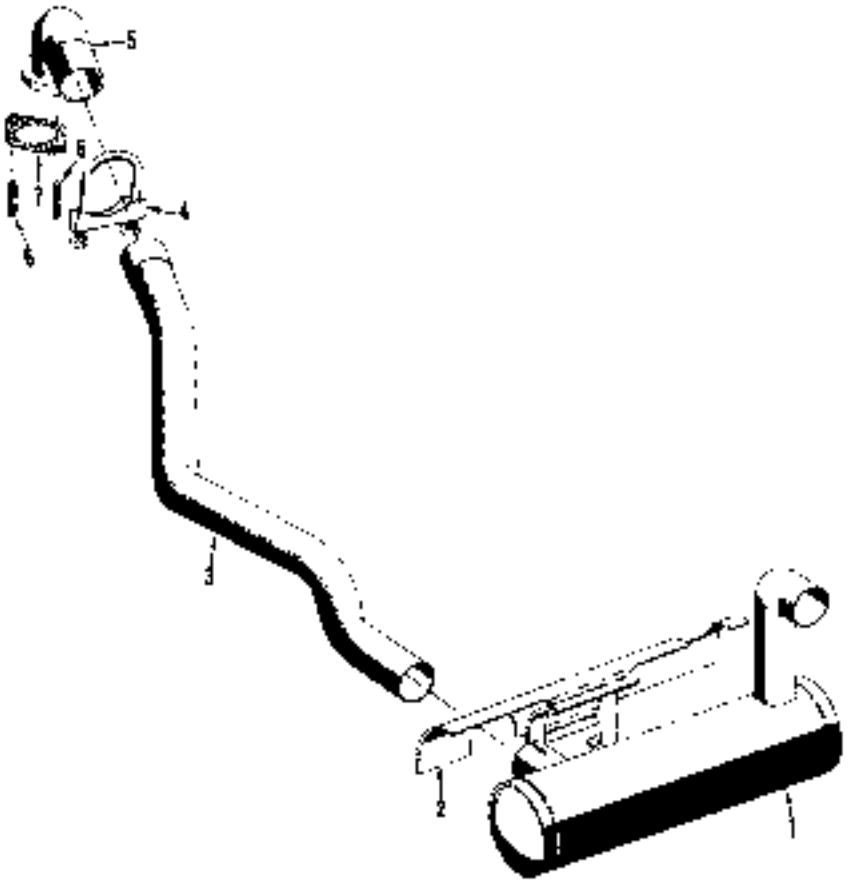


Fig. 2-4 - MUFFLER

Ref. No	Part No.	DESCRIPTION	No. Per
		AIR CLEANER Group E Used on Trucks with Wet Type Air Cleaner.	
1	85A5870	Air Cleaner Consists of the following 4 parts:	1
2	35P866	Cleaner - upper half	1
3	35P867	Oil Cup	1
4	35P868	Gasket - oil cup to upper half	1
5	35P869	Gasket - oil cup to support	1
6	85A5927	Elbow - support, air cleaner	1
	GM180124	- Bolt, hex., cad., 3/8"-16 x 1-1/4"	1
	GM120377	- Nut, hex., cad., 3/8"-16	1
7	85A5829	Stud - air cleaner to support	1
	GM126177	- Nut, wing, 1/4"-20	1
8	92955	Washer - copper, air cleaner stud, 5/16", Continental Motors No. X-14182	1
9	35A5294	Hose - air cleaner to carburetor	1
10	35A5896	Tube - connecting hoses	1
11	35A5295	Hose - elbow to tube	1
	GM105483	- Clamp, hose, 2-3/8"	1
	GM105479	- Clamp, hose, 1-7/8"	3

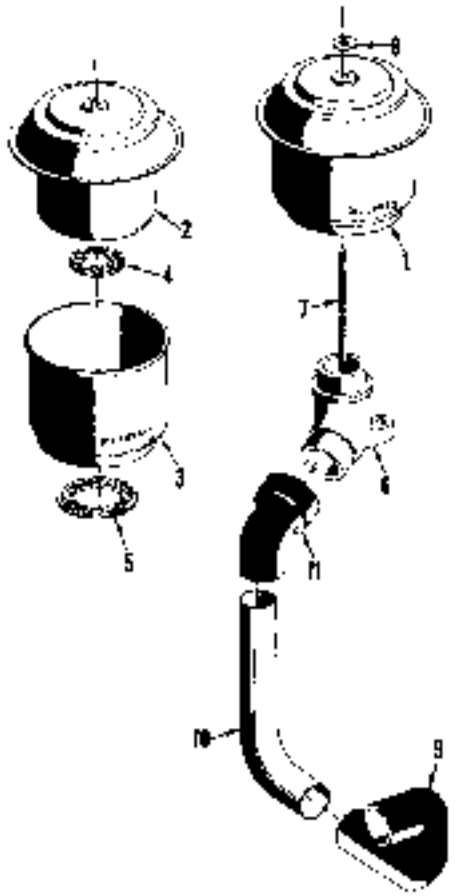


Fig. 2-5 AIR CLEANER - WET TYPE

Ref No.	Part No.	DESCRIPTION	No. Pcs.
		AIR CLEANERS - DRY TYPE	
		Group II Used on Trucks with Dry Type Air Cleaner.	
1	10A16004	Air Cleaner - regular	1
		Consists of the following 8 parts:	
2	10P1672	Base - assembly	1
3	10P1673	Filter - air cleaner	1
4	10P1674	Cover - air cleaner	1
5		GM120240 - Nut, wing, 10-32 N.F.	1
6	35A8109	Bracket - air cleaner, L-shaped	1
		50A3666 - Bolt, hex., 3/8"-16 x 1"	2
		50A1900 - Nut, hex., 3/8"-16	2
7	35A8108	U-Bolt - bracket, 5/16"-18	1
		50A3730 - Nut, hex., 5/16"-18	2
8	35A9101	Hose - reducer, air cleaner to elbow, 1-7/8" to 1-1/2" x 3-3/8" long	1
		50A4289 - Clamp, hose, top, 2-1/4"	1
		50A4288 - Clamp, hose, bottom, 1-7/8"	1
9	35A8294	Hose - air cleaner to carburetor, U-shaped, 1-1/2" I.D.	1
10	35A8296	Tube - connecting hoses, L-shaped, 1-1/2" O.D.	1
		50A4282 - Clamp, hose, 7/8"	2
11	35A8197	Air Cleaner - complete, 5-1/4" O.D. (Special)	1
		Includes the following 5 parts:	
12	35P1601	Filter - element	1
13	10P2580	Nut - wing, with gasket	1
14	10P30	Clamp - assembly, cup	1
15	35P1608	Baffle - air cleaner	1
16	35P1604	Cup - air cleaner	1
	10P2704	Cleaning Compound - filter element, 4 pound box	1
17	35A8806	Bracket - air cleaner	1
		50A8687 - Bolt, hex., 5/16"-18 x 1-1/4"	4
		50A3730 - Nut, hex., 5/16"-18	4
18	35A8115	Band - air cleaner	2
19	35A8285	Hose - reducer, air cleaner to elbow, 45°, 2" I.D. to 1-1/2" I.D.	1
		50A4290 - Clamp, hose, 2-3/8"	1

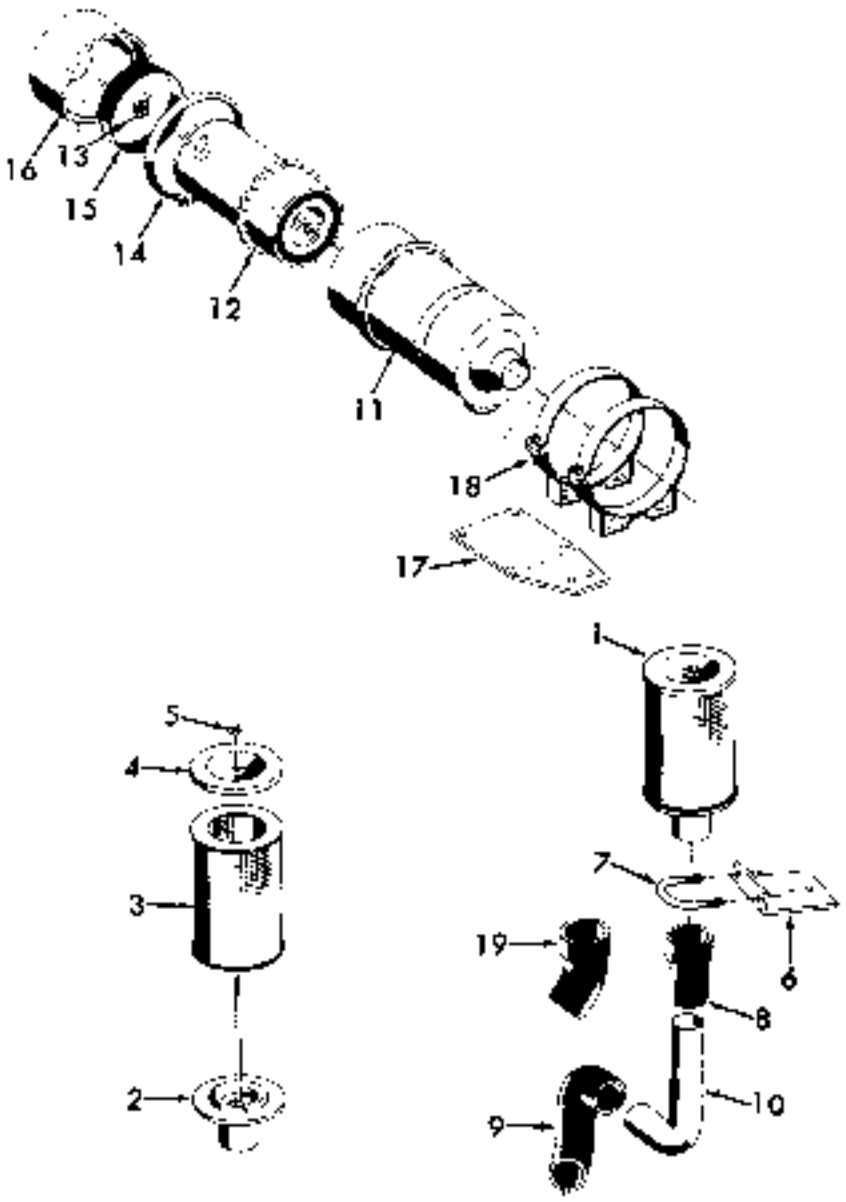


Fig. 2-5A AIR CLEANERS - DRY TYPE

Ref. No.	Part No	DESCRIPTION	No. Per
		FUEL PUMP, FUEL LINES AND FILLER - GASOLINE	
1	35P1039	Pump - fuel	1
		Includes the following 16 parts:	
		GM103865 - Plug, pipe, 1/8"	1
2	35P870	Diaphragm and pull rod	1
3	35P877	Spring - diaphragm	1
4	35P871	Body - fuel pump	1
5	35P872	Cover and plug assembly - top	1
6	35P873	Rocker Arm	1
7	35P870	Pin - rocker arm	1
8	35P879	Washer - rocker arm pin	1
9	35P878	Spring - rocker arm	1
10	35P874	Bowl - brass	1
11	15P25	Gasket - bowl	1
12	15P24	Screen - bowl	1
13	30P347	Bail - assembly, fuel bowl	1
14	10P1869	Valve and cage	2
15	10P1862	Gasket - valve and cage	2
16	10P1866	Retainer - valve and cage	1
17	35P875	Link - connecting	1
18	91085	Gasket - fuel pump to crankcase, Continental Motors No. 16EV-201	1
19	91075	Stud - fuel pump, 5/16"-18 x 1-3/8", Continental Motors No. X-1954-B	2
		GM120376 - Nut, hex., 5/16"-18, Continental Motors No. X-180-B	2
	91083	Cover - fuel pump opening (for LP-Gas units only)	1
	35A5321	Tube - fuel pump to carburetor	1
		50A4398 - Elbow, fuel tube, 5/16"-90°	2
20	35A179	Hose - fuel pump to fuel tank, 10-1/2" long	1
21		50A190 - Valve, shut-off, 1/8" NPT, to fuel tank	1
22	35A5387	Unit - tank, fuel gauge	1
		50A5033 - Screw, round head, cad., No. 10-32 x 7/16"	6
23	10A6918	Gasket - tank unit	1
	35A178	Filler - fuel tank, assembly	1
		Includes the following 9 parts:	
24	35P56	Cap - filler	1
25	35P466	Pin - filler cap	1
26	35P56	Arm - filler cap	1
27	35P467	Pin - arm to cap	1
28	35P57	Spring - arm	1
29	35P58	Catch - arm	1
30	35P469	Pin - catch	1
31	35P59	Flange - screen	1
32	35P60	Screen - assembly	1
	35A5039	*Shield - gas tank filler	1
	35A7596	*Seal - gas tank filler	1
		*GM2994038 - Boot, gas tank sending unit	1
		*NOTE: Used on trucks G5 or LP5 equipped.	

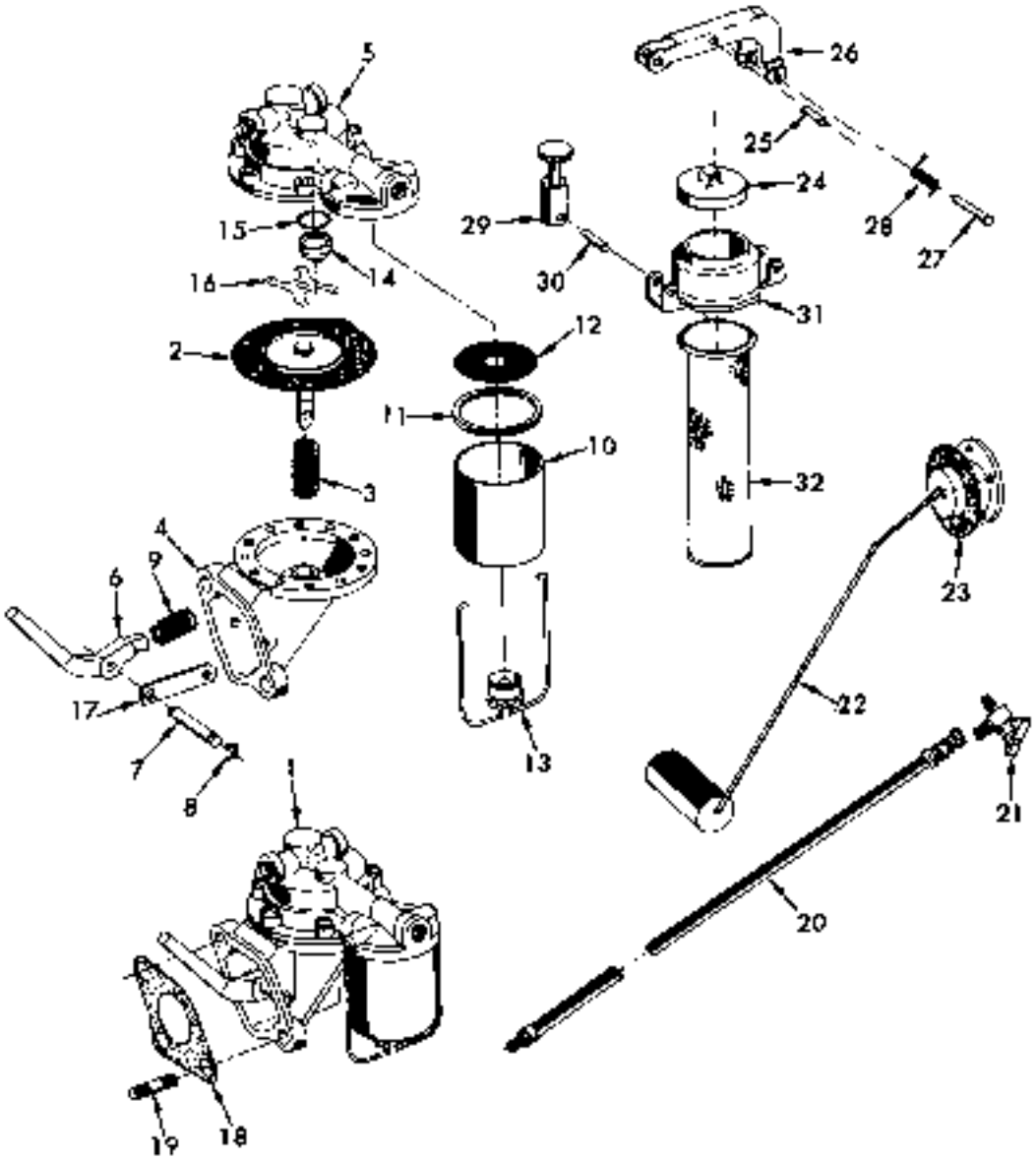


Fig. 2-6 - FUEL PUMP AND FUEL FILLER

Ref. No.	Part No	DESCRIPTION	No. Pcs.
		CARBURETOR - GASOLINE	
	86A6135	Carburetor - (Schebler Model TSX982).....	1
		Consists of the following 42 parts:	
1	35P775	Body - throttle, upper half.....	1
2	35P761	Lever - throttle.....	1
	85P960	Lever - governor.....	1
3	35P762	**Shaft - throttle.....	1
4	EE9534	Disc - throttle.....	1
5		**GM135506 - Screw, binding head, No. 4-40 x 1/4".....	2
6	10P750	Spring - throttle stop screw.....	1
7		GM100714 - Screw, fillister head, No. 6-32 x 5/8".....	1
8	10P940	**Packing - throttle shaft.....	1
9	10P927	**Retainer - throttle shaft packing.....	1
10	10P778	**Cup - throttle shaft.....	1
11	10P929	Pin - throttle stop.....	1
12	35P765	Spring - governor lever.....	1
13	35P772	Clevis - assembly, inner.....	1
14	35P773	Clevis - assembly, outer.....	1
15		GM110480 - Screw, fillister head, No. 10-24 x 7/8".....	2
16		GM120361 - Nut, clevis screw, 10-24.....	2
17	35P767	Washer - clevis assembly.....	1
18	35P760	Bowl - fuel, lower half.....	1
19		GM109674 - Screw, fillister head, No. 12-24 x 5/8".....	1
20	10P912	*‡Gasket - fuel bowl to body.....	1
21	10P920	Float and Lever - assembly.....	1
22	10P921	**Shaft - float lever.....	1
23	35P957	**Valve - float, with seat and gasket (matched).....	1
24	10P747	*‡Gasket - float seat.....	1
25	10P841	Venturi - 25/32" dia. throat.....	1
26	35P769	**Needle - idle adjusting.....	1
	10P751	Spring - idle adjusting needle.....	1
	35P966	Jet - idle restriction.....	1
27	35P770	Nozzle - main assembly.....	1
28	EE9538	*‡Gasket - main nozzle.....	1
29	35P771	**Jet - power.....	1
30	10P947	Plug - nozzle opening.....	1
31	35P766	Shaft - choke assembly.....	1
32	10P923	** Packing - choke shaft.....	1
33	10P926	**Retainer - choke shaft packing.....	1
	85P986	Plug - choke shaft opening.....	1
34	10P75	Disc - choke.....	1
		**GM126606 - Screw, binding head, No. 4-40 x 1/4".....	2
35	EE9520	Spring - choke disc.....	1
36	35P768	Bracket - choke, assembly.....	1
37		GM113983 - Screw, fillister head, No. 6-32 x 3/8".....	1
38	10P756	Clip - choke bracket.....	1
39		GM112625 - Screw, fillister head, No. 6-32 x 5/16".....	1
40	10P755	Swivel - choke lever.....	1
41		GM113625 - Screw, fillister head, No. 6-32 x 5/16".....	1
42	10P774	Cotter - choke swivel.....	1
43	35P764	**Spring - choke return.....	1
44	10P919	Plug - bowl drain.....	1
45	35P774	Plug - throttle body.....	1
46	10P948	Plug - idle drill.....	1
	85P768	*Gasket Set - carburetor (includes parts with a single asterisk *).....	1
	35P776	**Repair Kit - carburetor (includes parts with a double asterisk **).....	1
	10A7213	Gasket - carburetor to manifold.....	1
	JE130	Stud - carburetor to manifold, 5/16"-18 x 1-1/4".....	2
		50A3730 - Nut, hex., 5/16"-18.....	2
		50A4202 - Washer, plain, 11/32" I.D., 11/16" O.D.....	1
		50A1797 - Clevis, clip, on carburetor end.....	1

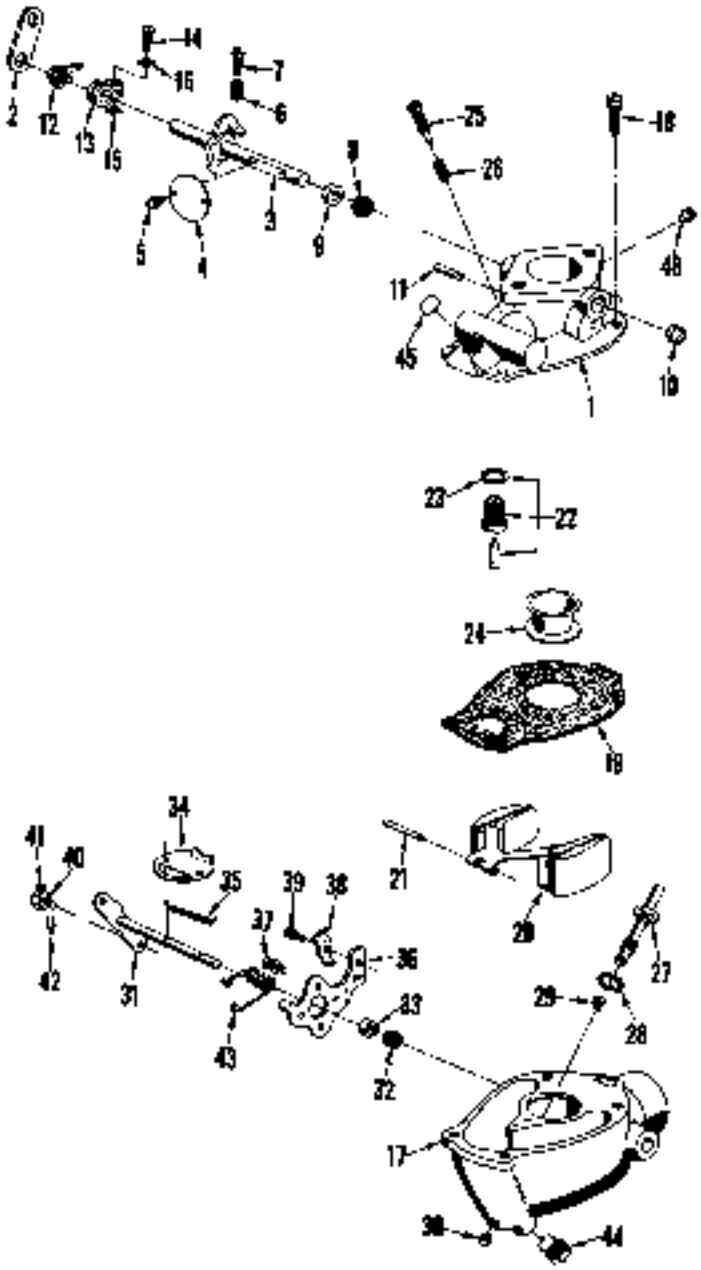


Fig. 8-7 - CARBURETOR

Ref. No.	Part No.	DESCRIPTION	No. Per
		Kovi Governor No. GOVERNOR	
	35P957	60340A Governor - complete	2
		Includes the following 22 parts:	
		------ 50A4210 - Washer, plain, 13/32" I.D., 13/16" O.D.	1
1	35P881	51875-AB1 Body - assembly, with bushings, bearing and seal	1
2	92185	50031 Bearing - needle, lever shaft	1
3	15P77	51209-11 Bushing - lever shaft	1
4	92196	50027 Bushing - drive shaft	1
5	92205	52041 Washer - thrust, drive shaft	2
6	92175	50032-18 Seal - oil, lever shaft	2
7	35P882	55839-A Lever - governing, with shaft	1
8	35P885	56988 Fork - lever shaft	1
9	35P884	52306-1 Spring - bumper, lever shaft	2
10	92295	51842 Screw - bumper screw adjusting	2
11		50131-2 GM103024 - Nut, hex., 1/4"-28	1
12	35P886	51184-B Base - with bushing	1
	35P967	50315-1 Bushing - base	1
13	35P885	52095-C Shaft - drive, assembly	1
14		50042-12 GM145651 - Ball, steel, 3/4"	4
15	35P887	59794-B Race - lower	1
16	35P866	52466 Washer - thrust	1
17	35P869	59129A Plate - drive, assembly	1
18	15P100	50021 Bearing - thrust	1
19	15P101	50022 Base - lever fork	1
20	35P890	57029-3 Ring - snap	1
21	35P891	56998 Washer - retainer	1
22	15P103	50026-32 Washer - ball stop	A.R.
23	35P892	55260-A Race - upper	1
	35A5294	------ Rod - carburetor to governor, 1/4" x 6-1/8"	1
		------ 50A4201 - Washer, plain, 9/32" I.D., 5/8" O.D.	1
		------ 50A3829 - Pin, cotter, 3/32" x 5/8"	1
		Continental Motors No.	
	35P858	F140V-200 Spacer - governor to gear cover	1
		X-5821 GM179847 - Screw, governor, 5/8"-16 x 2"	1
		X-0951 GM450517 - Screw, governor, 5/8"-16 x 4-3/4"	1
		X-13262 50A1045 - Nut, elastic stop, 5/8"-16	2
	91498	X14154 Washer - copper, governor screw	1
	15P97	F140M-232 Gasket - spacer and governor	2
	92826	M600S-306 Lever - governor speed change	1
		X-608 GM107761 - Pin, cotter, 1/16" x 5/8"	1
	92885	X-19944 Stud - speed change lever, 5/16"-18 x 1-7/8"	1
		X-16210 GM102644 - Nut, hex., 5/16"-24	1
	92225	F400S-201 Plate - governor attaching	1
	92255	F400S-202 Gasket - governor plate	1
	92945	X-3665 Screw - speed adjusting	2
		X-16137 GM114492 - Nut, hex., 1/4"-28	2
	35P960	F1625-203 Deflector - oil	1
	35P1018	B435S-201 Spring - governor	1
	92315	Y400S-227 Screw - governor adjusting	1
		X-16137 GM114492 - Nut, hex., 1/4"-28	2

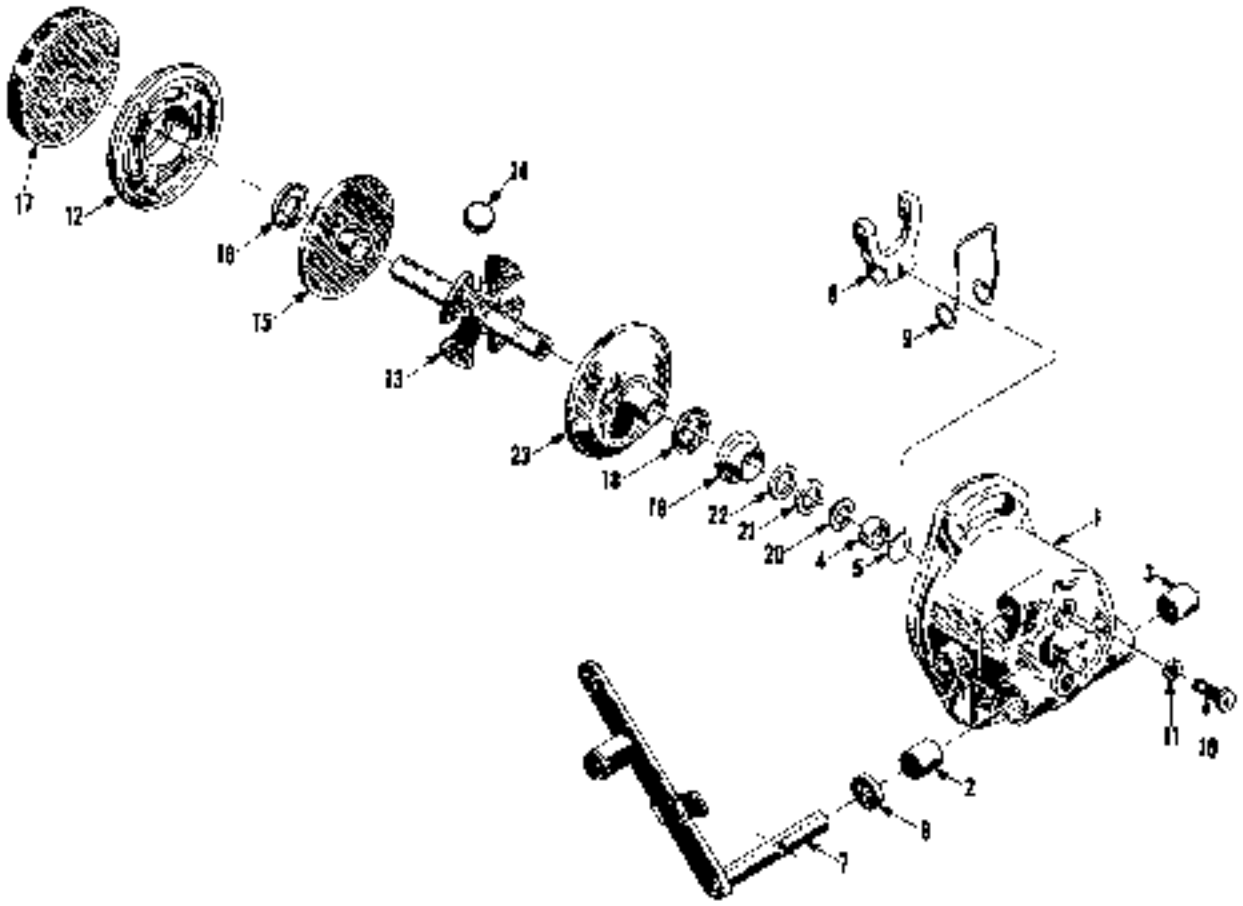


Fig. 2-8 - GOVERNOR

Ref. No	Part No	Continental Motors	DESCRIPTION	No. Per
			COOLING SYSTEM	
	35P984	F226K-3722	Pump - water, complete	1
			Consists of the following 14 parts:	
	9241S	X-102	Pipe Plug - 3/8"	1
1	15P175	X-3784	Screw - cover to body	4
2	15P174	F400K-892	Cover - water pump	1
3	15P173	F400K-891	*Gasket - water pump cover	1
4	35P1960	F401K-317	Impeller - with insert (15P168)	1
5	35P1961	OA200K-3040	*Seal - water pump (15P163)	1
	35P955	K600K-220	Gasket - water pump seal	1
6	15P172	F400K-291	*Shedder - water	1
7	15P171	X-7022	*Ring - seal bearing	1
8	35P1324	F226K-372	Body - water pump	1
9	10P170	X-12517	Nipple - hose, 3/5" pipe, gasoline engine	2
10	15P167	F226K-2230	*Shaft - water pump	1
11	35P1962	X-7096	*Retainer - seal (15P170)	1
12	35P258	F140K-369	Hub - fan	1
	35P1968	F400T-820	*Kit - water pump repair, includes items with an asterisk*	1
13		X-3838	GM179846 - Bolt, hex., 3/8"-16 x 2-3/4"	2
14	9146	X-14134	Washer - copper, water pump to cylinder	1
15	92405	F400K-340	Gasket - water pump to cylinder	1
16	15P178	X-2441	Hose - water pump, gasoline engine (for F162 engine)	1
16	15P602	X-2443	Hose - water pump, gasoline engine (for F163 engine)	1
17		X-2378	GM13383 - Clamp, hose, 1"	2
		X-12564	50A8874 - Nipple, pipe, 3/8" x 1-1/4", gas engine	1
		X-5062	GM114128 - Elbow, pipe, 3/8"-90°, gasoline engine	1
18	35A5889		Radiator - with pressure cap	1
			Includes the following 2 parts:	
			50A4430 - Valve, drain, 1/4" N.P.T.	1
	35P1765		Oil Cooler - radiator	1
19	35P280		Cap - pressure, 7#	1
20	35A5844		Hose - radiator, inlet	1
21	35A5845		Hose - radiator, outlet	1
			50A4238 - Clamp, hose, 2-1/8" dia.	1
			50A4236 - Clamp, hose, 1-7/8" dia.	8
22	35A5898		Fan	1
			50A3656 - Bolt, hex., 5/16"-18 x 1"	4
			50A422E - Washer, lock, 5/16"	4
23	35A6148		Belt - fan	1
24	35P1067	GD157K-204	Thermostat - 180°	1
25	92758	F218K-202	Adapter - thermostat	1
26	35P777	F400K-429	Housing - thermostat, gasoline engine	1
27		X-12191	GM111318 - Elbow, street, 3/8", gasoline engine	1
			GM109866 - Plug, hex., 1/4"	1
28	92765	C400K-215	Gasket - housing to cylinder head, gasoline engine	1
29	15P304	X-18837	Stud - thermostat housing, 5/16"-18 x 2"	2
		X-1801E	GM102834 - Nut, hex., 5/16"-18	2
30	35A5837		Cushion - radiator, 5/16" I.D., 1-3/8" O.D., 3/8" thick	4
31	35A5838		Bolt - attaching radiator, 5/16"-18 x 1"	4
			50A4202 - Washer, plain, 11/32" I.D., 11/16" O.D.	4

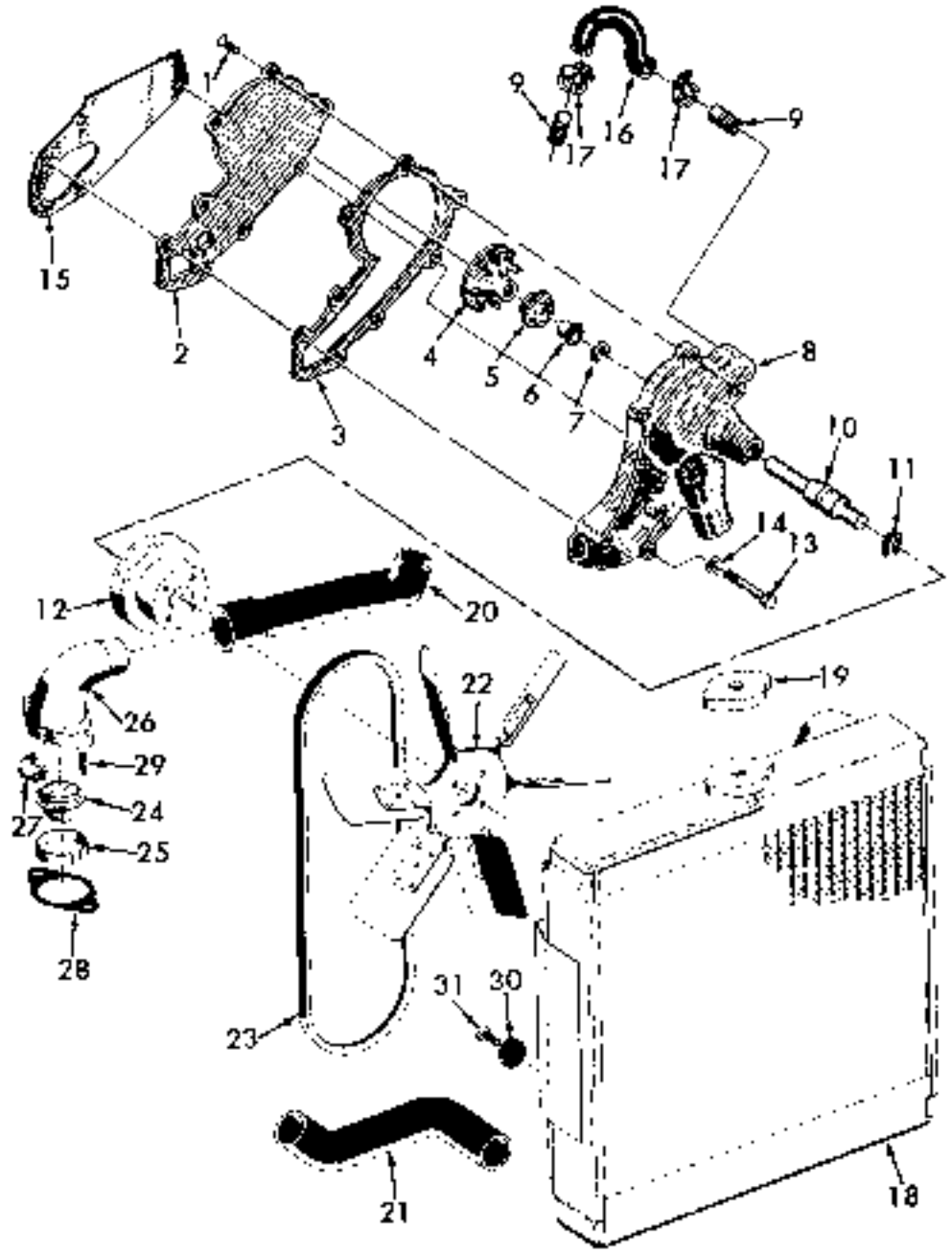


Fig. 2-9 - COOLING SYSTEM

Ref. No.	Part No.	DESCRIPTION	No. Pcs.
		FOOT ACCELERATOR	
1	35A5899	Pedal - accelerator	1
		50A4972 - Nut, hex., 1/4"-28	1
2	35A7142	Bracket - foot pad to mount bracket	1
3	35A6486	Pin - bracket, 3/8" x 1-18/16"	1
4		50A1813 - Ring, snap, 3/8"	2
5	35A5896	Bracket - on floor plate	1
6	35A5890	Eyebolt - bracket on spring (on early models)	1
		50A1900 - Nut, hex., 3/8"-16	2
		50A3664 - Bolt, hex., 3/8"-16 x 3/4"	1
7	35A6389	Spring - eyebolt to rod (on early models)	1
7A	10A307	Spring - rod to hood support (on late models)	1
8	35A7075	Rod - throttle, pedal to carburetor	1
		50A5001 - Nut, hex., No. 10-32	1
9		50A4276 - Clevis, adjusting, No. 10-32	1
10		50A3965 - Pin, clevis, 5/16"	1
		50A3818 - Pin, cotter, 1/16" x 1/2"	1
11		50A1797 - Clip, bracket	1

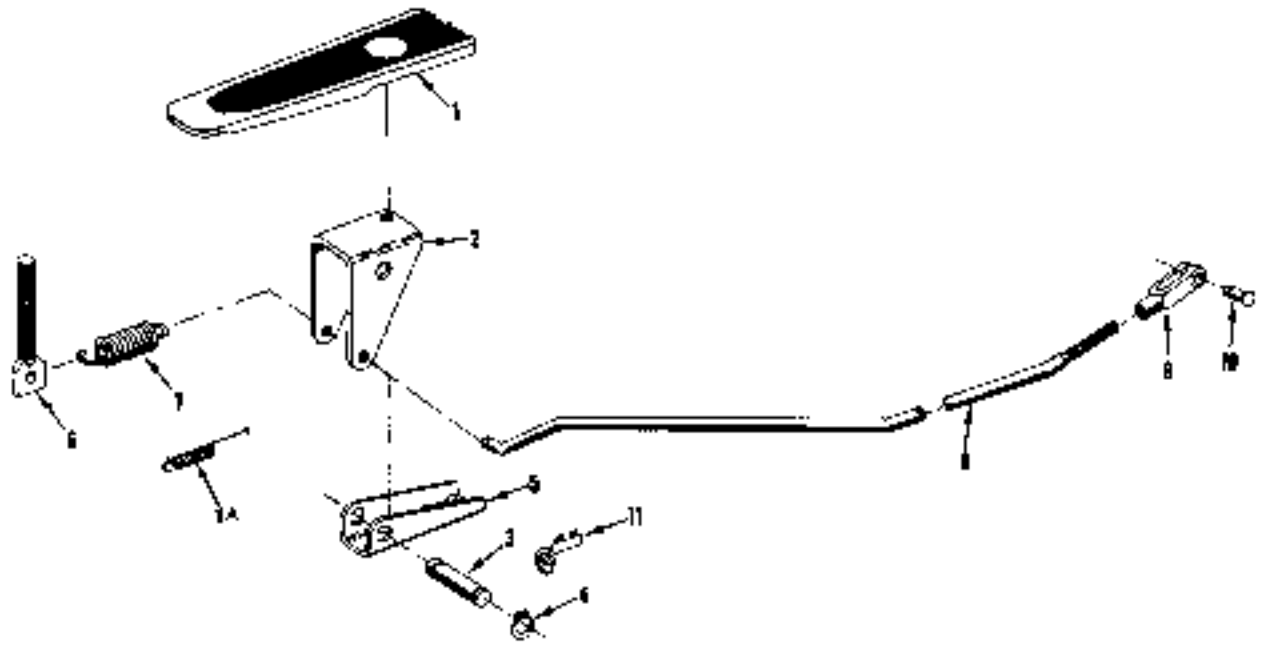


Fig. 2-10 - FOOT ACCELERATOR

Ref No.	Part No.	DESCRIPTION	No Pcs.
		ALTERNATOR - 12 Volt, 32 Amp.	
1	35A8253	Alternator - less fan and pulley (Delco Remy No. 1100729)	1
2	36A8272	Bracket - alternator	1
		50A1926 - Bolt, hex., 3/8"-16 x 3-1/4"	1
3	35A8559	Bracket - coil	1
		50A3643 - Bolt, hex., 1/4"-20 x 1"	1
		50A1699 - Nut, hex., 1/4"-20	1
		GM2977484 - Terminal	1
		GM2964093 - Boot	1
		GM120614 - Nut, hex., No. 10-32	1
		50A8753 - Nut, hex., No. 12-24	1
4	35A8802	Strap - alternator adjusting	1
5	35A8252	Harness - alternator	1
6	35A8249	Fan - alternator, 5-1/4" O.D.	1
7	35A8254	Pulley - alternator, 3-1/64" O.D.	1
8	85A9786	Belt - alternator	1
9	35A8248	Regulator - for alternator (Delco-Remy No. 1119507)	1

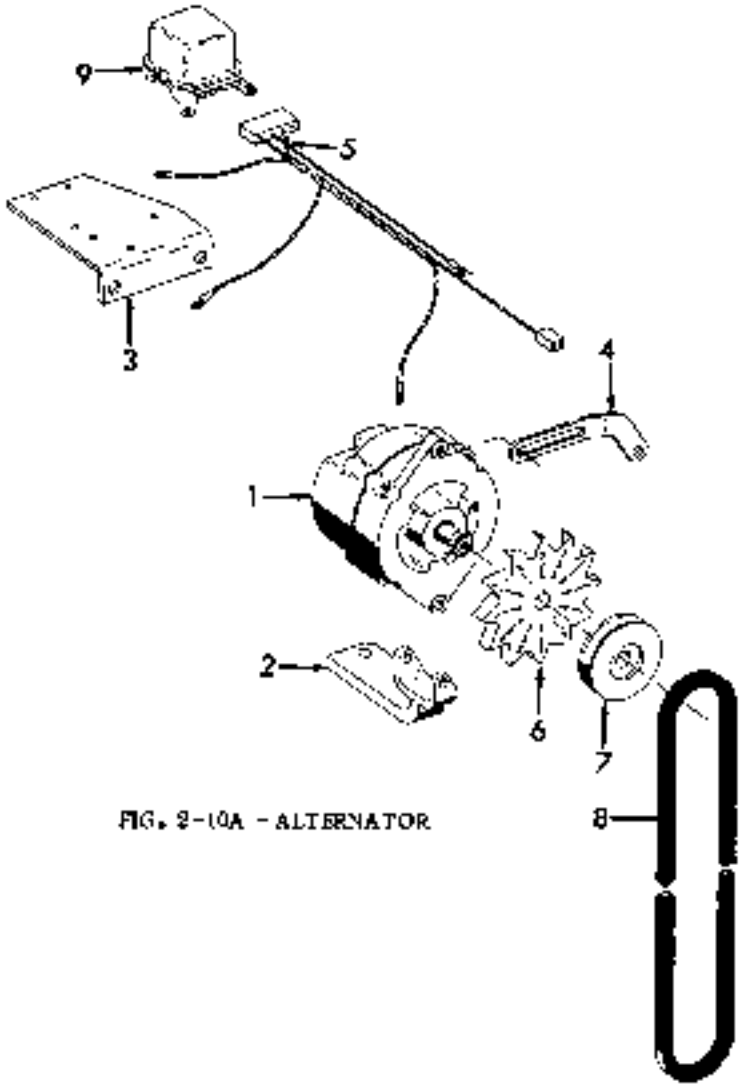


FIG. 2-10A - ALTERNATOR

Ref No.	Part No	DESCRIPTION	No Req
		VOLTAGE REGULATOR, GENERATOR, STARTING MOTOR AND DISTRIBUTOR	
1	35A6137	Regulator - voltage (Delco-Remy No. 1119600), regular	1
	35A7733	Regulator - voltage (Delco-Remy No. 1119165), GS or LPS equipped	1
		GM56697 - Boot, regulator, 2" long, GS or LPS equipped	3
		GM180020 - Bolt, hex., 1/4"-28 x 3/4"	3
2	10A21399	Generator - less fan and pulley (Delco-Remy No. 1100420), regular	1
	35A6957	Generator - less fan and pulley (Delco-Remy No. 1102340), GS or LPS	1
		GM29648S3 - Boot, generator, GS or LPS equipped	3
		GM124645 - Key, Woodruff, No. 9, alloy	1
	35A5134	Pulley and Fan - assembly, generator drive	1
3	35A5173	Bracket - generator support, regular	1
	35A6206	Bracket - generator support, GS or LPG equipped	1
		50A3664 - Bolt, hex., 5/8"-16 x 3/4"	2
		50A3680 - Bolt, hex., 5/16"-18 x 1"	1
		50A3659 - Bolt, hex., 5/16"-18 x 1-3/4"	1
		50A3739 - Nut, hex., 5/16"-18	2
4	35A5171	Bar - generator adjusting	1
		50A3664 - Bolt, hex., 5/8"-16 x 3/4"	1
		50A3655 - Bolt, hex., 5/16"-18 x 3/4"	1
5	35A6087	Motor - starting (Delco-Remy No. 1107884)	1
		50A3671 - Bolt, hex., 3/8"-16 x 2-1/4"	3
		50A1900 - Nut, hex., 3/8"-16	3
		50A3755 - Nut, machine, No. 8-32	2
		GM2566977 - Boot, starter wire, GS or LPS equipped	2
6	35A5841	Adapter - starting motor	1
7	35A5230	Distributor - assembly (Autolite Co. No. 1BT-4702)	1
		Includes the following 3 parts:	
	35P1449	Point Set - distributor (Autolite Co. No. 1-47)	1
	35P1450	Condenser - distributor (Autolite Co. No. 2-38)	1
	35P1772	Rotor - distributor (Autolite Co. No. 4-23)	1
8	35P202	Shaft - distributor drive (Continental Motors No. F400M-279)	1
	35P203	Clamp - distributor hold down (for F162 engine Cont. Mtrs. No. F400M-278)	2
	02465	Stud - clamp (for F162 engine Cont. Mtrs. No. X-19096), 5/8"-16 x 1"	2
	35P1965	Clamp - distributor hold down (for F163 engine Cont. Mtrs. No. F400M-258)	1
	35P1984	Stud - clamp (for F163 engine Cont. Mtrs. No. X-19102) 5/8"-16 x 1-3/8"	1
		50A1033 - Nut, hex., (Gripco) Cont. Mtrs. No. X-18337, 5/8"-16	2-1
	35P203	Clamp - distributor hold-down (Continental Motors No. F400M-278)	2
	02465	Stud - clamp, 5/8" x 1" (Continental Motors No. X-19099)	2
		50A1033 - Nut, hex., (Gripco), 5/8"-16 (Continental Motors No. X-18337)	2
	35P820	Washer - plain, 12/32" I.D. (Continental Motors No. X-14323)	3
9	35A5275	Cable - distributor to spark plug	4
10	10A385	Spark Plug - No. 8 Coman., Champion D-16 or AC-TC36	4
11	10A16817	Coil - ignition, with clamp	1
		50A3648 - Bolt, hex., 1/4"-20 x 1"	4
		50A1899 - Nut, hex., 1/4"-20	4
		GM2884033 - Boot, coil, GS and LPS equipped	2
12	35A6501	Bracket - coil	1
		50A4086 - Nut, hex., 7/16"-20	2
		50A4201 - Washer, plain, 9/32" I.D., 5/8" O.D.	2
13	35A5290	Cable - coil to distributor, 5" long	1

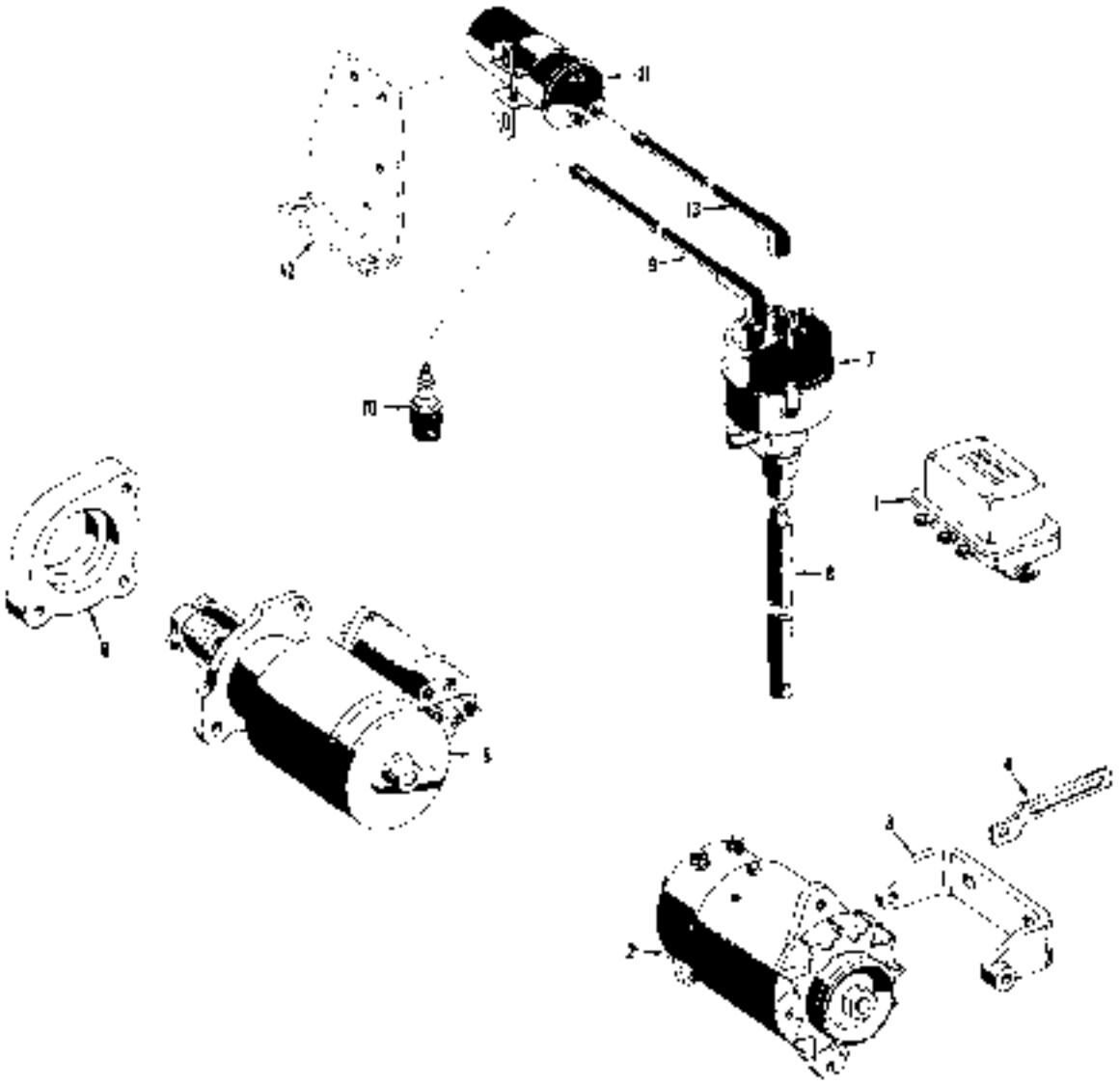


Fig. 2-11 - VOLTAGE REGULATOR, GENERATOR, STARTING MOTOR AND DISTRIBUTOR

Ref. No	Part No.	DESCRIPTION	No. Prs
		BATTERY, BATTERY BOX, CABLES AND WIRING HARNESS	
		Group 1	
		Used on MA 30 Lift Trucks to No. 25000125, Inc. Used on MA 40 Lift Trucks to No. 26100848, Inc. Used on MA 60 Lift Trucks to No. 26200185, Inc.	
	10P2347	Battery - dry, 12 volt, 50 amp. hr., heavy duty, type 25M	1
	10P2367	Electrolyte - 3 - 2 qt. package	-
	10P2368	Electrolyte - 5 gallon container	-
	10P2369	Hose - electrolyte dispenser, for 5 gallon container	-
		GM5297609 - Boot, battery, pos. terminal (GS and LPS equipped)	1
1	35A6281	Case - battery	1
2	35A6263	Hold-Down - battery, front	1
3	10A9838	Stud - front, hold down	1
		50A4210 - Washer, plain, 13/32" I.D., 13/16" O.D.	1
		50A3761 - Nut, wing, 3/8"-16	1
4	35A6282	Hold-Down - battery, rear	1
		50A3602 - Bolt, hex., 3/8"-16 x 1/2"	1
		50A3664 - Bolt, hex., 3/8"-16 x 3/4"	1
5	35A6171	Cable - ground, frame to battery	1
6	35A6170	Cable - starting motor to battery	1
	35A9124	Cable - starting motor to disconnect switch, 21-1/2" long (GS and LPS)	1
	35A2684	Harness - wiring, upper	1
	35A6483	Harness - wiring, lower	1
	35A3109	Harness - generator to regulator	1
7	10A6424	Clip - harness	3
8	10A12478	Clip - harness	2
9	13P659	Clip - harness	2
		GM120392 - Washer, plain, 9/32" I.D., 5/8" O.D.	6
	35A1006	Wire - light switch, temperature gauge and fuel gauge, 14 Ga., 6" long	2
	35A1067	Wire - ammeter and starter switch, 14 Ga., 13" long	2
	35A7720	Wire - horn relay to horn, 16 Ga., 18" long (P158)	1
	35A1103	Wire - harness to coil, 14 Ga., 8" long	1
	35A4239	Wire - meter to ground, 14 Ga., 12" long	1
	35A6146	Wire - harness to hour meter, 14 Ga., 4" long	1
10	35A7396	Hose - wiring harness cover, 7/8" O.D. x 15" long	1
		POSITIVE CRANKCASE VENTILATION	
	35A6468	Cover - valve tappet	1
	35A6643	Gasket - valve cover	1
	35A6461	Tube - breather to elbow	1
		GM9402625 - Elbow, 45°	2
		GM144068 - Pipe, coupling, 1/4"	1
	10A18718	Valve - ventilation	1
		GM122051 - Nipple, pipe, 1/4" x 1"	1
	35A6644	Gasket - cylinder stud	2
	10A19321	Breather - filter	1

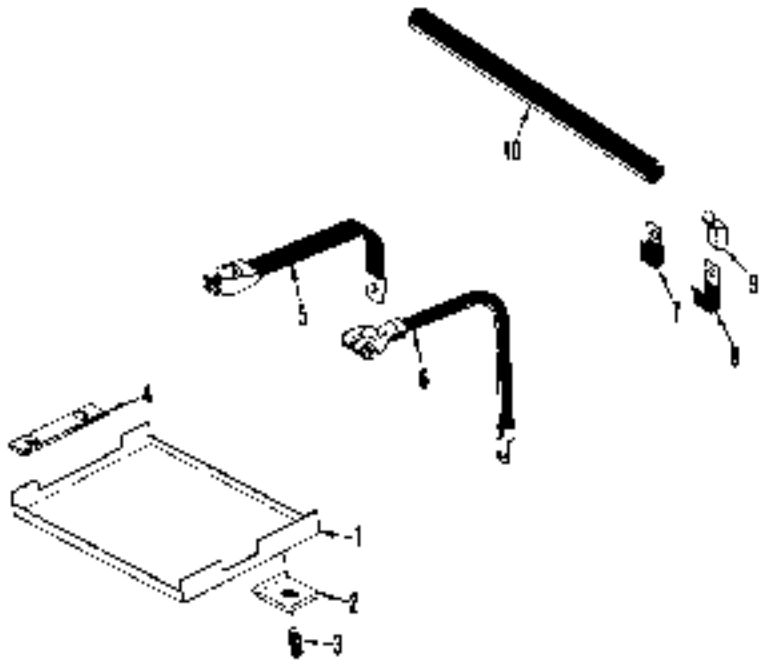


Fig. 2-12 - BATTERY BOX AND CABLES

Ref. No	Part No.	DESCRIPTION	No. Pcs
		BATTERY, BATTERY BOX, CABLES AND WIRING HARNESS	
		Group 11	
		Used on MA 30 Lift Trucks No. 28300128 and after. Used on MA 40 Lift Trucks No. 26100644 and after. Used on MA 50 Lift Trucks No. 26200186 and after.	
	10P2347	Battery - dry, 12 volt, 68 amp. hr., heavy duty, type 2 SM	-
	10P2867	Electrolyte - 3 - 2qt. package	-
	10P2869	Electrolyte - 5 gallon container	-
	10P8368	Hose - electrolyte dispenser, for 5 gallon container	-
		GM3287803 - Boot, battery, post. terminal (UL approved)	1
1	35A6281	Case - battery	1
2	35A6283	Hold-Down - battery, front	1
3	10A9938	Stud - front, hold-down	1
		50A4210 - Washer, plain, 13/32" I.D., 19/16" O.D.	1
		50A3701 - Nut, wing, 3/8"-16	1
4	35A6282	Hold-Down - battery, rear	1
		50A8662 - Bolt, hex., 3/8"-16 x 1/2"	1
		50A3664 - Bolt, hex., 3/8"-16 x 3/4"	1
5	35A6171	Cable - ground, frame to battery	1
6	35A6170	Cable - starting motor to battery	1
	35A8193	Harness - wiring, upper	1
	35A8192	Harness - wiring, lower	1
	35A8196	Harness - generator to regulator	1
	35A8207	Harness - horn to horn button	1
		50A4693 - Clip, upper harness to cowl, 9/16"	1
		50A4862 - Clip, harness, on diff. case and trans. valve, 1/4"	2
		50A4666 - Clip, harness, on valve and bell housing, 1/2"	2
	35A1065	Wire - temperature gauge to fuel and oil gauges, 14 Ga. x 6" long	2
	35A1067	Wire - ammeter and starter switch, 14 Ga. x 13" long	1
		HEAD LAMP AND REAR TAIL LAMP	
11	10A18240	Lamp - spot light (35A5018)	1
		Includes the following 2 parts:	
12	10P1701	Unit - sealed, lamp element	1
13	10P1702	Retainer - rubber, sealed unit	1
15	35A8598	Handle - spot light control (35A5011)	1
		50A2824 - Pin, roll, 3/16" x 1-1/2"	1
		50A1911 - Nut, hex., 1/2"-13	1
16	35A4119	Knob - light control (used with 35A5011 lever)	-
17	35A6354	Label - knob, Mobilift (used on 35A4119 knob)	1
	35A8295	Knob - light control (used on 35A8598 lever)	1
		50A4697 - Ring, knob (used with 35A8295 knob)	1
18	35A7578	Bearing - with flange	1
		50A2646 - Bolt, hex., 1/4"-20 x 5/8"	2
		GM120352 - Washer, plain, 9/32" I.D., 5/8" O.D.	6
		50A4204 - Washer, plain, 5/16" I.D., 3/4" O.D.	2
19	35A8591	Bracket - upright, light mount (35A7572)	1
20	35A2102	Clip - wire, spot light	4
	15A15557	Clip - wire	1
	35A1068	Wire - ignition switch to light switch, 12 ga., 5" long	1
	35A3004	Wire - with fuse, spot light and taillight, 36" long	2
	35A3009	Wire - connector to light, 14 ga., 7" long	1
	35A6725	Wire - light to ground	1
21	35A8787	Switch - light (35A406)	1
22	35A2467	Clip - wire, on lower radiator bolt	1
	35A6471	Wire - junction to switch, 14 Ga., 30" long	1
	35A6470	Wire - switch to light, 14 Ga., 80" long	1

Ref. No.	Part No.	DESCRIPTION	No. Per
		HEAD LAMP AND REAR TAIL LAMP (Cont'd)	
23	33A3091	Lamp - tail and stop	1
		Includes the following 4 parts:	
24	35P365	Lens - tail lamp	1
25	35P366	Retainer - lens	1
26	35P364	Gasket - retainer	1
27	35P603	Connector - with nuts and washers	2
28	35A5285	Bracket - tail light	1
		GM126957 - Bolt, rd. hd., 5/8"-11 x 4-1/2"	1
		GM102639 - Nut, hex., 5/8"-11	1
		GM446247 - Washer, plain, 11/16" I.D., 1-1/2" O.D.	1

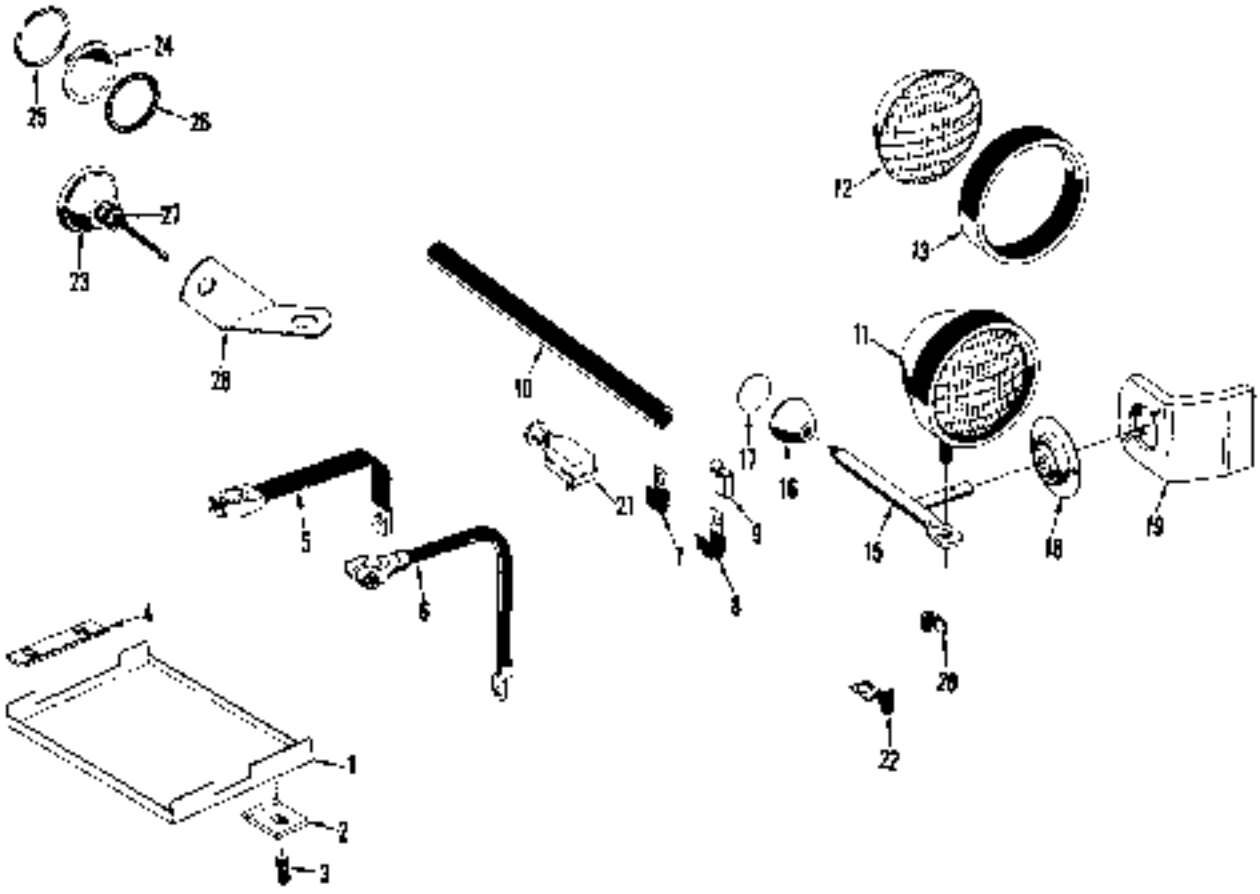


Fig. 2-12A - BATTERY BOX, CABLES AND LIGHTS

Ref No.	Part No.	DESCRIPTION	No Req.
		INSTRUMENT PANEL AND INSTRUMENTS	
1	35A6588	*Panel - instrument, 8-3/4" x 26-3/8" long	1
		*GM180077 - Bolt, hex., 5/16"-18 x 3/4"	3
		*50A1764 - Nut, speed, type 1, 5/16"	8
	35A7586	**Panel - instrument, 5-5/8" wide x 26-3/8" long	1
2	35A513	Gauge - ammeter	1
3	35A512	Gauge - engine temperature	1
4	35A519	Unit - temperature sending	1
5	35A511	Gauge - oil pressure	1
6	35A520	Unit - oil pressure sending	1
7	35A514	Gauge - fuel, gasoline engine	1
8	35A408	Switch - light (special)	1
9	35A9040	Switch - ignition and starting meter Includes the following part:	1
	35P1559	Key - switch	1
	35A8055	Washer - switch	2
10	35A4277	*Hour Meter (35A 6059)	1
10	35A8590	**Hour Meter	1
11	10A3486	*Dampener - vibration, hour meter	1
		*GM100737 - Screw, rd. hd., No. 6-32 x 3/8"	3
12	10A2296	*Switch - pressure, hour meter, gasoline engine	1
12	35A8116	**Switch - pressure, hour meter, gasoline engine	1
13	35A7076	*Bracket - pressure switch and sending unit	1
14	30A2912	*Hose - bracket to crankcase, 11" long, gasoline engine	1
		*GM119922 - Bushing, reducer, 1/4" x 1/8"	1
15	35A210	*Light - warning	1
16	35A309	*Unit - transmission warning light	1
17	35A7702	Horn (10A10699)	1
		GM120613 - Nut, gripco, 1/4"-25 (for 10A10699)	2
	35A7761	Nut - horn to bracket, 7/8"-20 (for 35A7762 horn)	1
18	35A7763	Bracket - horn (10A10700)	1
		GM180075 - Bolt, hex., 5/16"-18 x 5/8"	2
19	35A516	*Relay - horn	1
19	35A8198	**Relay - horn	1
		*Used on MA 30 Trucks to No. 28000125, Inc.	
		*Used on MA 40 Trucks to No. 26100543, Inc.	
		*Used on MA 50 Trucks to No. 26200185, Inc.	
		**Used on MA 30 Trucks No. 28000126 and after.	
		**Used on MA 40 Trucks No. 26100544 and after.	
		**Used on MA 50 Trucks No. 26200186 and after.	
		50A3648 - Bolt, hex., 1/4"-20 x 1/2"	2
		50A1683 - Nut, hex., 1/4"-20	2
20	35A6901	Rod - choke, with knob, 16" long	1
		50A4939 - Nut, hex., 3/8"-24	1
21	35A56	Plate - warning, parking brake	1
	35A8194	#Switch - electrical cut-off	1
		#GM2966921 - Boot, disconnect switch	2
	35A8342	#Decal - switch	1
	35A8227	#Cover - instrument	1
		#50A4617 - Grommet, instrument panel	1
		#GM5297603 - Boot, oil pressure switch	1
		#GM2964033 - Boot, water temperature and oil pressure sending unit	2
		#NOTE: Used on trucks GS or LPS equipped.	

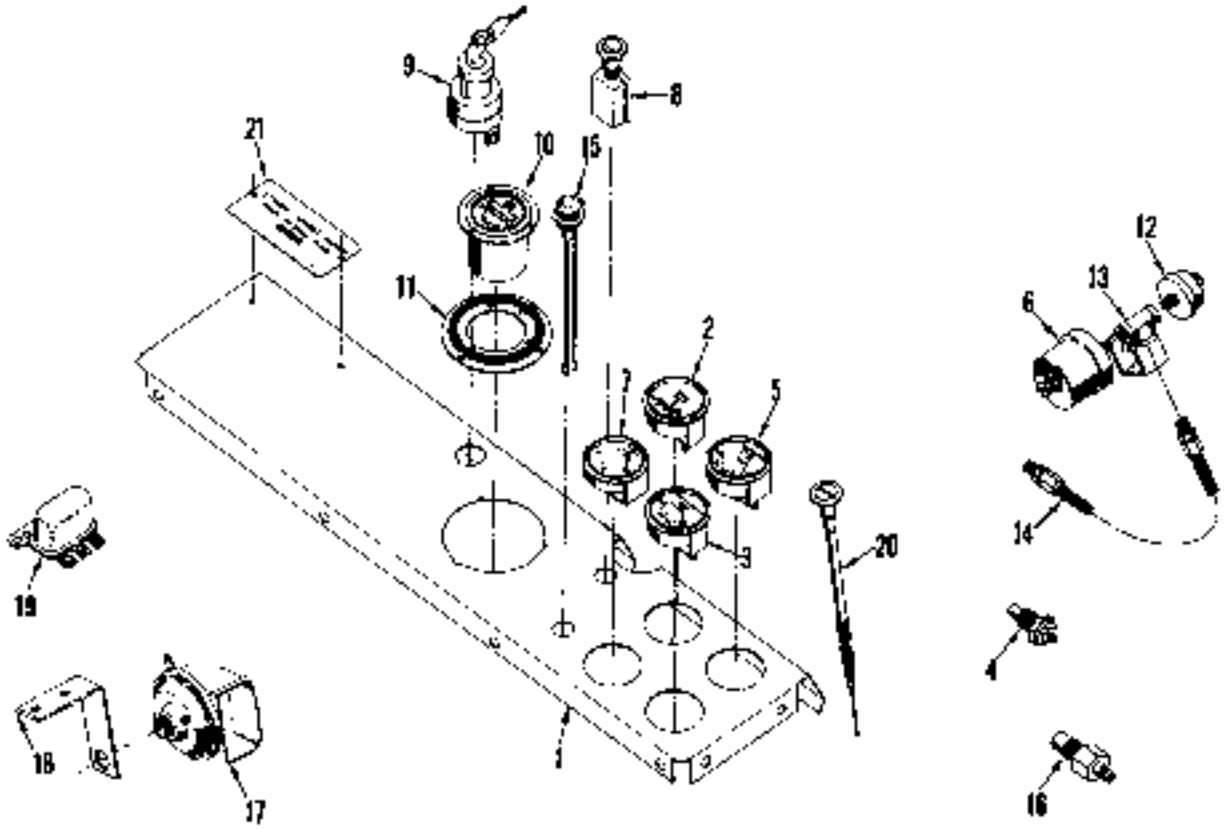


Fig. 2-13 - INSTRUMENT PANEL AND INSTRUMENTS

Ref. No	Part No	DESCRIPTION	No. Per
		LP GAS EQUIPMENT	
1	D1186	Tank - fuel, with fittings	1
		GM120377 - Nut, hex., 3/8"-16	4
		GM120394 - Washer, plain, 13/32" I.D., 13/16" O.D.	4
	30A7139	Plate - tank mounting, with studs (MA80)	1
	36A7070	Plate - tank mounting, with studs (MA40-50)	1
		GM121386 - Bolt, rd. hd., 5/8"-11 x 3"	2
		GM102659 - Nut, hex., 5/8"-11	2
		GM44247 - Washer, plain, 11/16" I.D., 1-1/2" O.D.	4
2	35P516	Strap - mounting, fuel tank, R.H.	1
2	35P508	Strap - mounting, fuel tank, L.H.	1
	35A7156	Grommet - hood	3
3	35P1088	Vaporizer - assembly, includes thermostat housing	1
	35P1085	Repair Kit - vaporizer (includes diaphragm, seal, seals and washers)	1
4	35P1064	Solenoid - 12 volt	1
5	35P1095	Regulator - Zenith Model C	1
		Includes the following 3 parts:	
6		GM115056 - Nipple, pipe, 1/4" N.P.T.	2
7		30A972 - Elbow, street, 1/4"	1
		GM144515 - Adapter, tube, 1/4" N.P.T. x 3/8"	1
	35P1672	Valve - block and spring assembly	1
	35P1673	Screw - adjusting, fuel pressure	1
	35P1385	Orifice - fuel inlet	1
	35P1096	Repair Kit - regulator (includes diaphragms, gaskets and seals)	1
		GM219197 - Nut, hex., 3/4"-16	1
8	35P1086	Carburetor - LP gas (see breakdown on page 8-36)	1
	35P1067	Gasket - carburetor	1
9	35P509	Elbow - carburetor, 3/8" N.P.T. x 3/8" tube	1
10	35P514	Bulkhead - filter	1
		Includes the following 2 parts:	
11		GM144355 - Elbow, adapter, 1/4" N.P.T. x 3/8" tube, 90°	2
	35P1605	Element - filter	1
	35P1608	Spring - filter	2
		GM125700 - Washer, internal lock, 7/8"	1
12	35P515	Relief Valve	1
	10A5097	Plate - fuel pump cover	1
	10A6849	Gasket - plate	1
	35P530	Dash - plug, instrument gauge	1
		GM178433 - Pipe, cap, gasoline tank	1
13	35P509	Elbow - adapter, 3/8" N.P.T. x 3/8" tube, x 90°	1
	35P1088	Bracket - hose, and clamp	1
14	35P1089	Hose - water bypass	1
15	35P1090	Hose - carburetor to regulator, 25" long (35P1090)	1
16	35P1091	Hose - filter to solenoid	1
17	35P1092	Hose - filter to tank	1
18	35P519	Coupling - hose to tank, female	1
19	D1178	Coupling - hose to tank, male	1
		Includes the following 2 parts:	
	30A1701	"O"-Ring - coupling	1
	35P1769	Gasket - coupling	1
20	35P525	Switch - vacuum	1
		GM181383 - Bolt, hex., 7/16"-20 x 3/4"	4
		GM271506 - Nut, hex., 7/16"-20	4
21	35P1093	Wire - solenoid to pressure switch, 24" long	1
22	35P1094	Wire - pressure switch to starter, 36" long	1
	35P1610	Gasket - thermostat housing	1

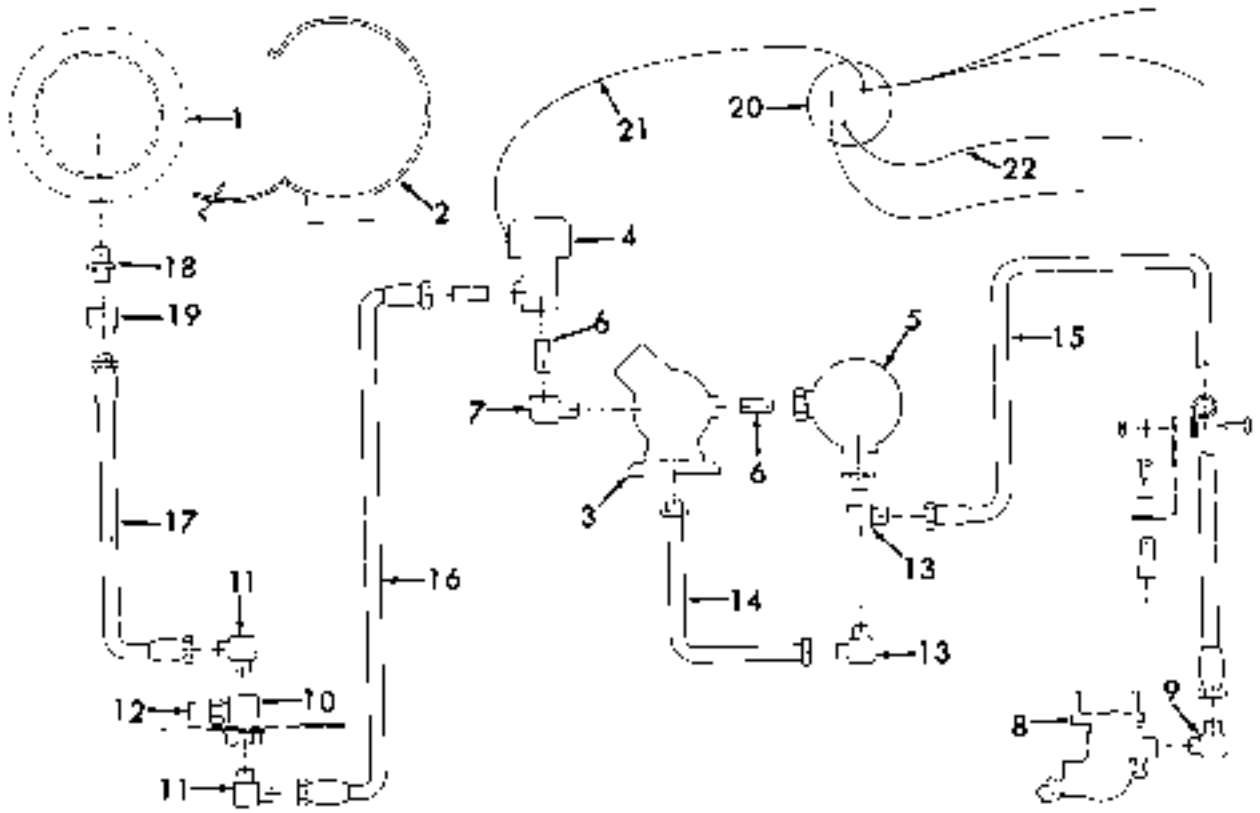


Fig. 2-14 - LP GAS EQUIPMENT

Ref No	Part No	DESCRIPTION	No Per
		LP GAS CARBURETOR	
	35P1088	Carburetor - LP gas	1
		Includes the following 23 parts:	
1	-------	Body - carburetor, order 35P1386 assembly	1
2	35P1779	Shaft - assembly, throttle and idle stop	1
3	35P1413	Plate - throttle shaft	1
4		GM135506 - Screw, binding head, No. 4-40 x 1/4"	2
5	35P1415	Seal - throttle shaft	2
6	35P1780	Retainer - seal	2
7	35P1779	Screw - idle adjusting	1
8	CE7117	Spring - idle adjusting screw	1
9		GM22n544 - Screw, adjusting, idle stop	1
10	10F750	Spring - screw, throttle stop	1
11	35P1777	Venturi	1
12	9546R	Screw - venturi retaining	1
13	35P1761	Shaft - choke	1
14	9465K	Plate - choke shaft	1
15		GM135508 - Screw, binding head, No. 4-40 x 1/4"	2
16	35P1762	Plug - choke shaft	1
17	35P1787	Gasket - plug	1
18	35P1783	Bracket - choke cable	1
19	9411K	Bushing - choke shaft	1
20	9042R	Clamp - choke cable	1
21	35P1736	Screw - main load adjusting, 5/16"-24 x 1-1/4"	1
22		30A3002 - Nut, hex., 5/16"-24	1
23	35P1784	Lever - assembly, choke shaft	1
24		GM113625 - Screw, fillister head, No. 8-32 x 5/16"	1
25	35P1785	Spring - choke return	1
26	35P761	Lever - throttle	1
	35P885	Lever - governor	1
27	35P765	Spring - governor lever	1
28	35P772	Clevis - assembly, inner and outer	2
		Includes the following part:	
29		GM110480 - Screw, fillister head, No. 10-24 x 7/8"	2
30		GM120861 - Nut, clevis, screw, No. 10-24	2
31	35P767	Washer - clevis	2
32	35P1087	Gasket - carburetor	1
33	JE130	Stud - carburetor to manifold, 5/16"-18 x 1-3/4"	2

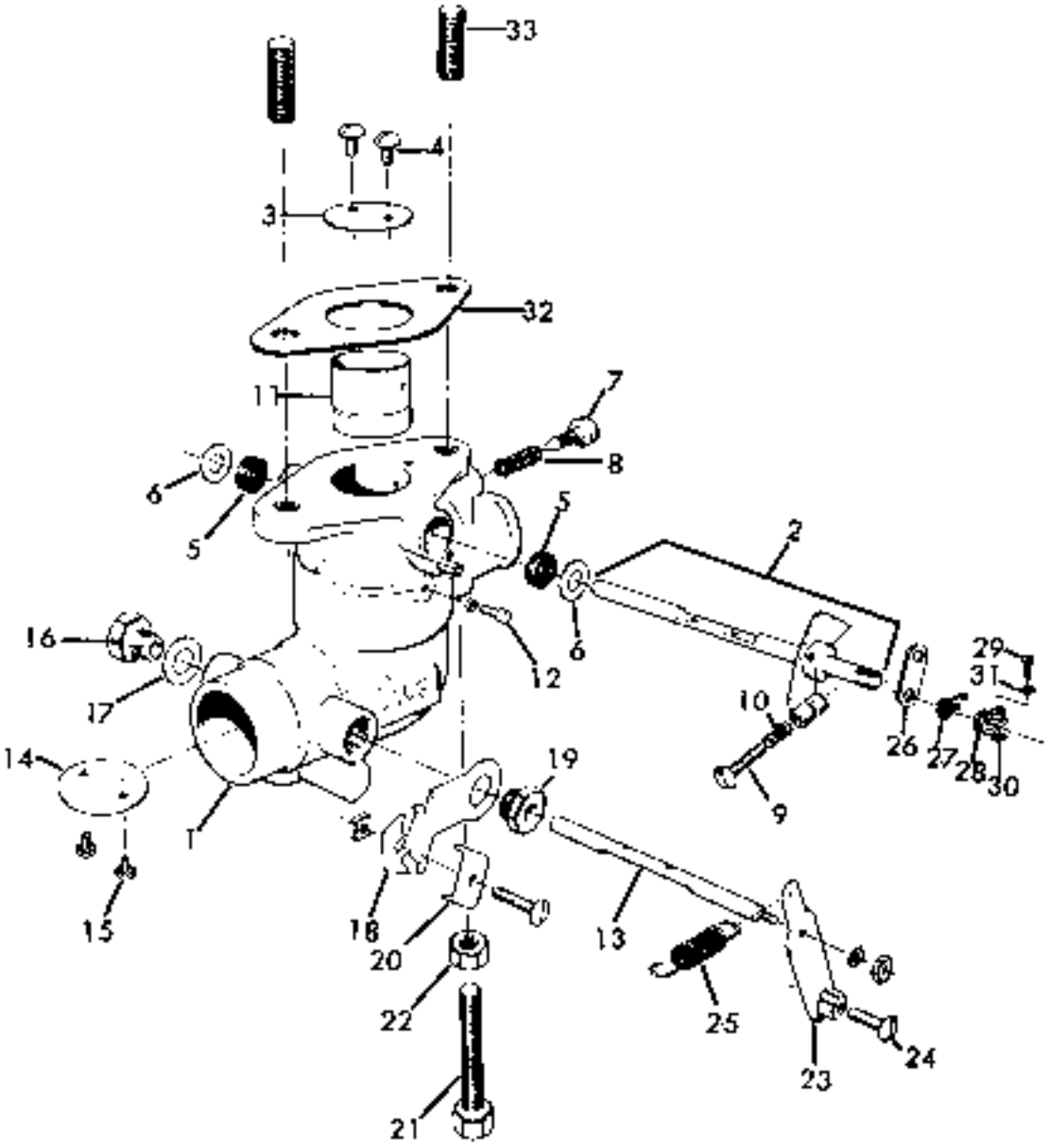


Fig. 2-14A - LP Gas Carburetor

Ref. No	Part No	DESCRIPTION	No. Per
		TRANSMISSION CASE, CONVERTER AND PUMP	
1	35A5167	+Case - transmission	1
1	35A7789	++Case - transmission	1
		+NOTE: Used on MA 30 Lift Trucks to No. 26000145, Inc.	
		+NOTE: Used on MA 40 Lift Trucks to No. 26100628, Inc.	
		+NOTE: Used on MA 50 Lift Trucks to No. 26230205, Inc.	
		++NOTE: Used on MA 30 II Lift Trucks No. 26000146 and after.	
		++NOTE: Used on MA 40 II Lift Trucks No. 26100629 and after.	
		++NOTE: Used on MA 50 II Lift Trucks No. 26230206 and after.	
		50A3867 - Bolt, hex., 3/8"-16 x 1-1/4"	20
		50A3869 - Bolt, hex., 3/8"-16 x 1-3/4"	1
		50A3870 - Bolt, hex., 3/8"-16 x 2"	2
		50A1925 - Bolt, hex., 3/8"-16 x 2-1/2"	7
		50A1441 - Screw, cap, 3/8"-16 x 1-1/4"	1
2	35A3260	Plug - magnetic, in case	1
3	10A21543	Pin - dowel, case to housing, 3/8" x 3/4"	2
4	35A5104	Manifold - with steel balls	1
5	35A5438	*Shim - manifold	1
		GM145041 - Ball, steel, 5/16" dia.	3
		50A3856 - Bolt, hex., 5/16"-18 x 1"	5
6	35A5306	Dip Stick	1
7	35A5306	Tube - filler, also dip stick support, 29/32" I.D., x 11-5/16" long	1
8		*50A1762 - "O" ring, filler tube	1
	35A8059	Sump Filter - assembly	1
		Includes the following 6 parts:	
		50A1658 - Bolt, hex., 5/16"-18 x 1"	3
9	35P1494	Flange - filter mounting (35A8267)	1
		Includes the following parts:	
10	35P1502	Pin - flange	1
11	35P1501	Bolt - hex., 1/4"-20 x 4-1/2"	1
12	35P1496	Tube - suction (35A819)	1
13	35P1497	Element - filter (35A818)	1
14	35P1498	Gasket - filter element	1
15	35A317	*Gasket - filter flange	1
16	35A5103	Bell Housing - with steel balls	1
		GM146657 - Ball, steel, 1/2"	3
		50A855 - Plug, pipe, socket head, 1/2"-14	1
17	35A5132	*Gasket - housing to transmission case	1
18	35A5111	Cap - bearing	1
		50A3858 - Bolt, hex., 5/16"-18 x 1-1/2"	1
19		*50A961 - "O" ring, cap	1
20	35A311	Pump - converter	1
		Includes the following 3 parts:	
		50A5032 - Bolt, hex., 5/16"-18 x 1-1/8"	7
21	10A27	"O" Ring - converter pump, 1/2" I.D., 11/16" O.D.	1
22	M536	"O" Ring - converter pump, 5-1/2" I.D., 5-3/4" O.D.	1
23	35P613	*Seal - oil, converter pump	1
24	10A3287	*Washer - copper, pump bolts	7
25	35A5731	*Gasket - pump to housing	1
		*NOTE: Parts with single Asterisk (*) are part of 35R83.	
	35R83	Gasket Set - transmission overhaul	1
26	35A5730	Converter (Long Model F40-281)	1
27	35A822	Kit - drive plate, converter to flywheel, with bolts and washers	1
		Includes the following parts:	
28		50A1977 - Bolt, hex., place bolt, plate to flywheel, 5/16"-18 x 5/8"	6
29	35P1506	Washer - drive plate bolt, 5/16" I.D., 13/16" O.D.	6
30		GM9409125 - Bolt, hex., place bolt, plate to converter, 3/8"-24 x 1/2"	6

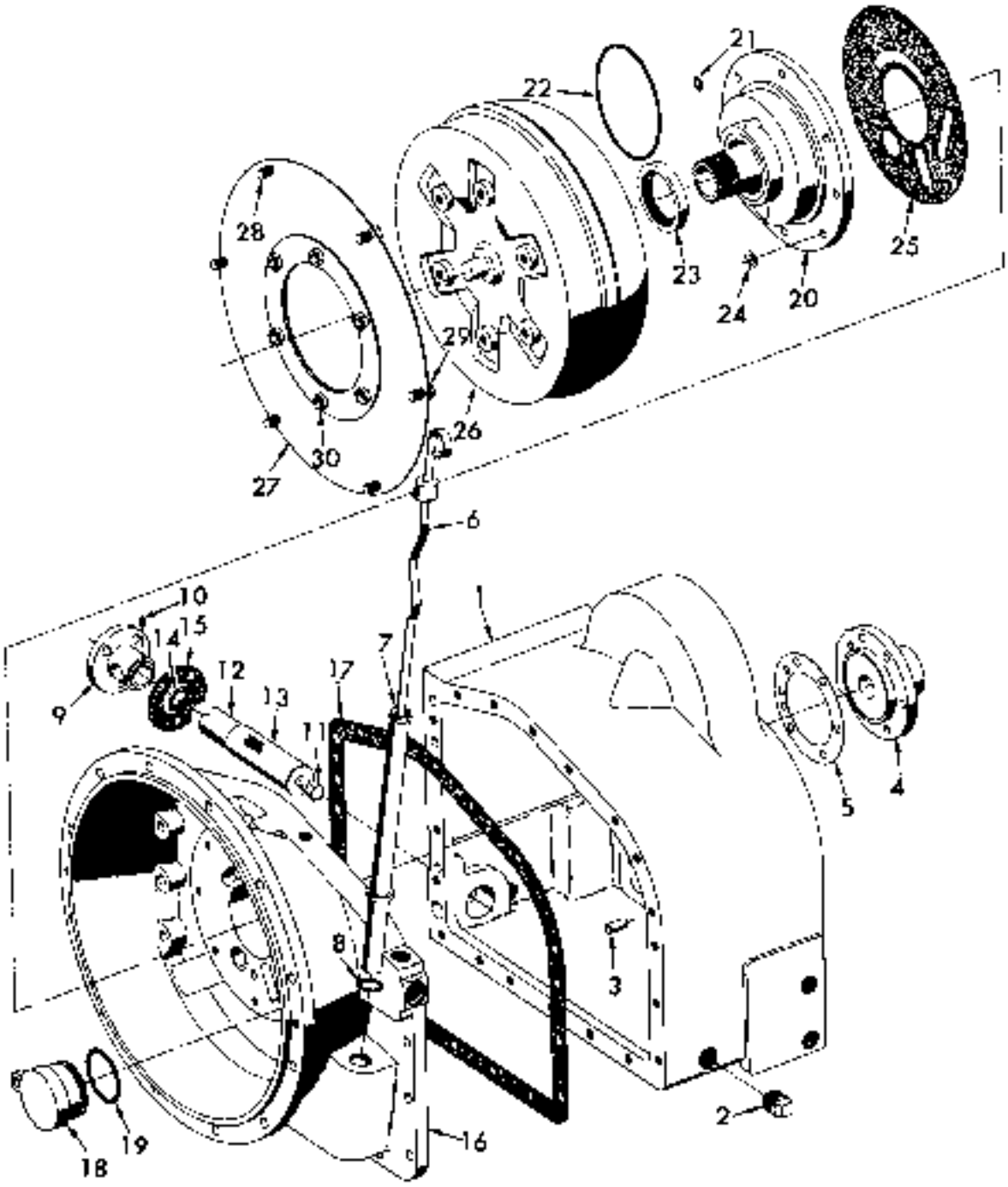


Fig. 2-15 - TRANSMISSION CASE, CONVERTER AND PUMP

Ref. No	Part No	DESCRIPTION	No. Req.
		TRANSMISSION	
	35R42	Housing - assembly, input shaft	1
		Consists of the following 11 parts:	
1	35A2133	Housing	1
2	35A330	Piston	2
3	35A333	Plate - friction	8
4	35A334	Plate - backing	4
5	10A18453	Ring - back-up	2
6	10A15839	Ring - piston	2
7	35A336	Ring - retainer, back-up ring	2
8	35A365	Ring - oil seal	2
9	35A331	Spring - tension	2
10	35A332	Retainer - spring	2
11	35A349	Ring - snap, spring retainer	2
12	30A328	Shaft - input, 15-5/8" long	1
		GM145641 - Ball, steel, 5/16"	2
13	35A341	*Ring - oil seal, 1-1/4" O.D.	3
14		*50A700 - Ring, quad., input shaft	3
15	36A5081	Gear - forward, with bushing	1
16	36A5083	Gear - reverse, with bushing	1
17	35A339	Bushing - gear	2
18	35A337	Washer - thrust, gear to spring retainer	2
19	35A369	Washer - thrust, gear to bearing	2
20	35A342	Bearing - ball, input shaft	2
21	35A991	Ring - collector, ball bearing	1
22		*50A767 - "O" Ring, collector ring	1
23	35A993	*Ring - piston	1
24	35A990	Retainer - piston ring	1
25		*50A768 - Ring, retainer	1
26	3686400	+Shaft - output, with ring gear, matched	1
		+GM104115 - Rivet, button head, 3/8" x 1-1/4"	8
26	3557908	++Shaft - output, with ring gear, matched, less ball pinion	1
	35A7618	++Shaft - ball pinion, see page 68 for illustration	1
	35A8490	++Bolt - 12 pt., 7/16"-14 x 3/4"	12
		+NOTE: Used on MA 30 Lift Trucks to No. 28000145, Inc.	
		+NOTE: Used on MA 40 Lift Trucks to No. 26100628, Inc.	
		+NOTE: Used on MA 50 Lift Trucks to No. 26200605, Inc.	
		++NOTE: Used on MA 30 II Lift Trucks No. 28000146 and after.	
		++NOTE: Used on MA 40 II Lift Trucks No. 26100629 and after.	
		++NOTE: Used on MA 50 II Lift Trucks No. 26200206 and after.	
27	35A5082	Gear - forward, output shaft, 21 teeth	1
28	36A5084	Gear - reverse, output shaft, 49 teeth	1
29		50A578 - Ring, snap, gear retainer	3
30	35A5116	Cone - bearing, converter end	1
31	35A5114	Cup - bearing, converter end	1
32	35A5119	Cone - bearing, trans. end case	1
33	35A5112	Cup - bearing, trans. case end	1
34	35A5314	Nut - lock, bearing to shaft	2
35		*50A1745 - Washer, locknut	1
		*NOTE: Parts with single asterisk are part of 35R83.	
36	36A5085	Gear - reverse idler, with bearings, 51 teeth	1
37	35A353	Bearing - needle, reverse gear	2
38	36A5304	Shaft - with roll pin, idler gear	1
		50A2345 - Pin, roll, 3/16" x 3/4"	1
39	35A5313	Washer - thrust, idler gear	2

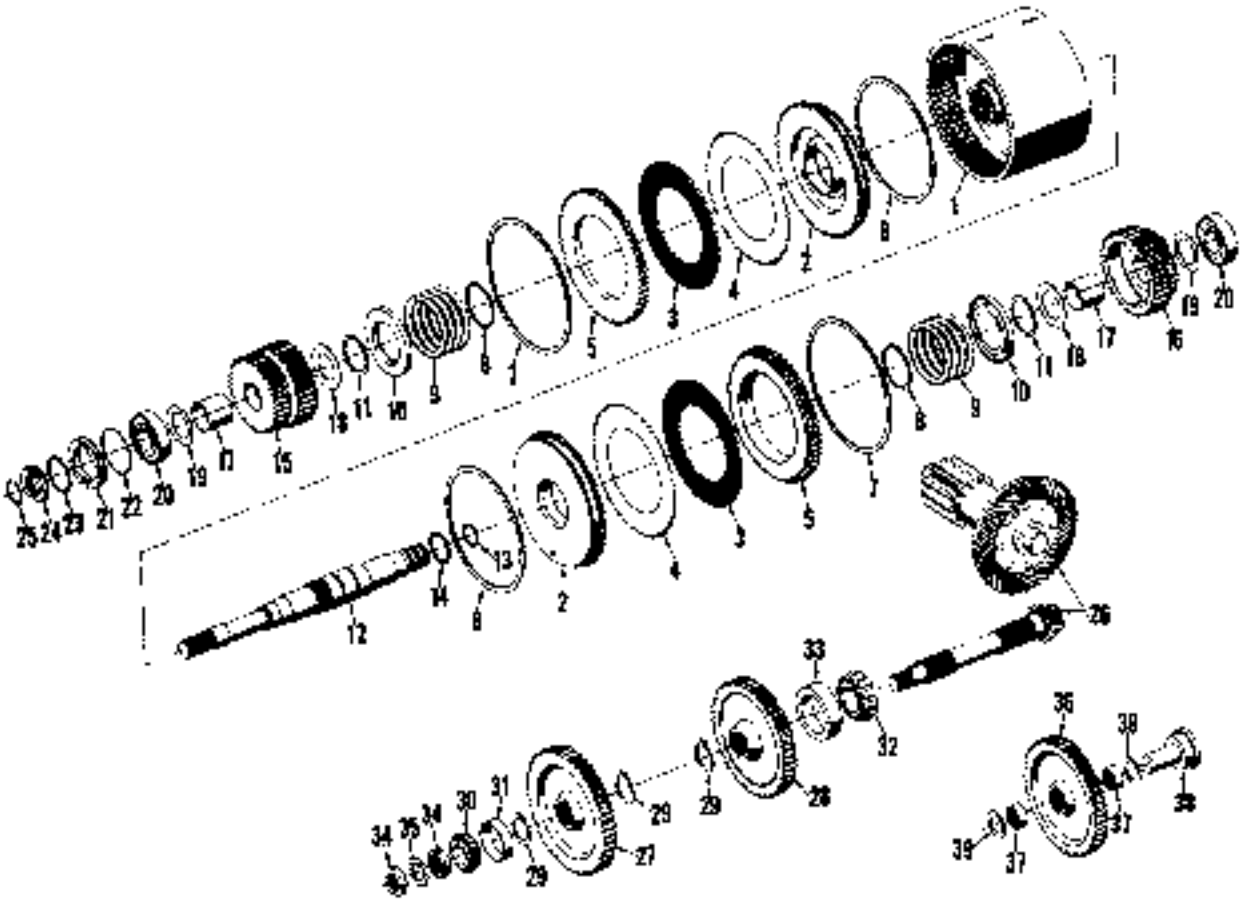
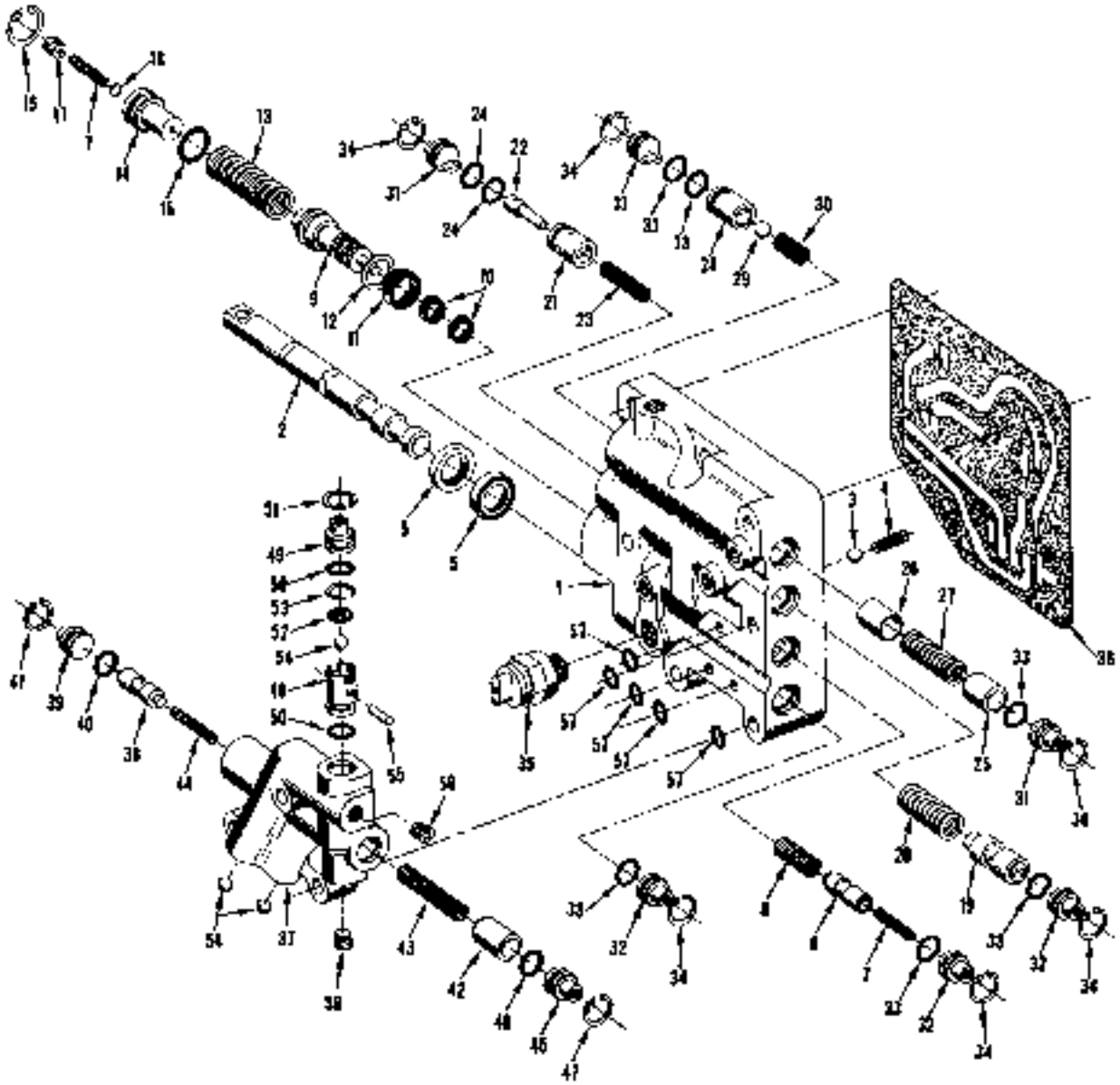


Fig. 2-16 - TRANSMISSION

Ref. No.	Part No.	DESCRIPTION	No. Prs
		TRANSMISSION CONTROL VALVE AND REGULATOR	
		Group I. Used on Lift Trucks with Hydraulic Inching.	
	36R65	Valve - control, complete	1
		Consists of the following 48 parts:	
		50A3662 - Bolt, hex., cad., 3/8"-16 x 1-5/8"	2
		50A3672 - Bolt, hex., cad., 3/8"-16 x 2-3/4"	2
		*50A1829 - Star-o-seal, bolts, 3/8"	6
1	35A7338	Body - valve	1
2	35A5848	Spool - directional, 4-7/32" long	1
3		50A4265 - Ball, steel, 5/16"	1
		50A4445 - Plug, pipe, hex. socket, 1/8"-27	9
4	35A6069	Spring - spool ball, 23/32" long	1
5	10A10829	Seal - oil, lever spool	2
6	35A680	Spool - inching	1
7	35A689	Spring - centering inching spool, 3/4" long	2
8	35A7766	Spring - inching spool	1
9	35AE368	Piston - inching	1
10		50A3675 - Ring, quad	2
11	35AE95	Seal - piston	1
12	35A689	Washer - piston seal	1
13	35A696	Spring - inching piston, 2-1/2" long	1
14	35A5184	Plug - inching spring	1
15		50A196 - Snap ring	1
16	10A136	"O" long - inching plug, 13/16" I.D.	1
17	35A5185	Plug - vent, inching plug	1
18	35A5210	Disc - filter, inching plug	1
19	35A375	Spool - pressure reducer, 3/4" O.D.	1
20	35A374	Spring - pressure spool, 1-3/4" long	1
21	35A1250	Valve - relief	1
22	35A1249	Piston - relief valve	1
23	35A1248	Spring - relief valve	1
24	10A6829	"O" Ring - relief valve	2
25	35A392	Spool - priority valve, 15/16" long	1
26	35A391	Guide - priority valve	1
27	35A390	Spring - priority valve	1
28	35A377	Valve - lube relief	1
29		50A4266 - Ball, steel, 3/8"	1
30	10A13106	Spring - lube relief ball, 1" long	1
31	35A5175	Block - valve, 15/16" long	3
32	35A5187	Block - valve, 5/8" long	3
33	10A6329	"O" Ring - valve blocks, 9/16" I.D.	6
34	10A6330	Ring - snap, valve blocks	6
35	35A5233	Switch - neutral starting	1
36	36A7304	Gasket - body to transmission case	1
37	35A7282	Body - pressure regulator valve	1
		50A1927 - Bolt, hex., cad., 3/8"-16 x 3-1/2"	2
		50A2249 - Bolt, hex., cad., 3/8"-16 x 4-3/8"	1
		*50A1829 - Star-o-seal, bolts, 3/8"	3
		*NOTE: Parts with single asterisk are part of 36L93.	
38	35AE90	Spool - pressure regulator	1
39	35A5187	Block - spool, 5/8" long	1
40	10A6329	"O" Ring - block	1
41	10A6330	Snap Ring - spool	1
42	35A7323	Piston - regulator valve	1
43	35A7364	Spring - piston, regulator valve, outer	1
44	35A7365	Spring - piston to spool, inner	1
45	35A5177	Block - piston, 15/16" long	1
46	10A6329	"O" Ring - piston, block	1
47	10A6330	Snap Ring - piston block	1
48	35A7306	Orifice - regulator valve	1
49	35A5187	Block - orifice, 5/8" long	1

Ref. No	Part No	DESCRIPTION	No. Pcs.
		TRANSMISSION CONTROL VALVE AND REGULATOR (Cont'd)	
50	10A6328	"O" Ring - orifice and block	2
51	10A6330	Snap Ring - block	1
52	35A7367	Screen - orifice	1
53		50A2870 - Snap ring, orifice	1
54		GM145841 - ball, steel, 5/16"	3
55		GM141132 - Pin, dowel	1
56		GM444855 - Plug, pipe, esk, 1/8"-27	2
57		50A2878 - "O" Ring, regulator valve	6



Ref. No.	Part No.	DESCRIPTION	No. Per
		TRANSMISSION CONTROL VALVE AND REGULATOR	
		Group II. Used on Lift Trucks with Mechanical Inching with Regulator.	
	39B2645	Valve - control, complete	1
		Includes the following 42 parts:	
1	35A5012	Body - valve	1
		50A3688 - Bolt, hex., 3/8"-16 x 1-1/2"	2
		50A3672 - Bolt, hex., 3/8"-16 x 2-3/4"	2
		*50A1929 - Stat-o-seal, bolts, 3/8"	4
2	35A3648	Spool - directional, 3-7/32" long	1
3		50A4265 - Ball, steel, 5/16"	1
		50A4445 - Plug, pipe, hex. socket, 1/8"-27	3
4	35A6063	Spring - spool ball, 25/32" long	1
5	10A16329	Seal - oil, lever spool, 3/4" I.D., 1/4" wide	2
6	35A690	Spool - inching, 1-5/8" long	1
7	35A639	Spring - centering, inching spool, 5/4" long	1
8	35A8027	Spring - inching spool	1
9	35B6000	Inching Spool - assembly, complete, mechanical inching	1
15		50A196 - Snap Ring, sleeve retainer	1
16	35A3006	Seal - inching spool in valve housing	1
19	35A375	Spool - pressure reducer, 3/4" O.D.	1
20	35A374	Spring - pressure spool, 1-3/4" long	2
21	35A1350	Valve - relief	1
22	35A1249	Piston - relief valve	1
23	35A2246	Spring - relief valve	1
24	10A6029	"O" Ring - relief valve	2
25	35A392	Spool - priority valve, 15/16" long	1
26	35A381	Guide - priority valve	1
27	35A390	Spring - priority valve	1
28	35A377	Valve - lube relief	1
29		50A4266 - Ball, steel, 3/8"	1
30	10A16105	Spring - lube relief ball, 1" long	1
31	35A6177	Block - valve, 15/16" long	3
32	35A5127	Block - valve, 5/8" long	8
33	10A6329	"O" Ring - valve blocks, 9/16" I.D.	6
34	10A6330	Ring - snap, valve blocks	6
35	35A5259	Switch - neutral starting, with screw type terminals	1
36	35A7687	Switch - neutral starting, with slip type terminals	1
38	35A7304	Gasket - body to transmission case	1
37	35A7292	Body - pressure regulator valve	1
		50A1926 - Bolt, hex., 3/8"-16 x 3-1/4"	1
		50A1927 - Bolt, hex., cad., 3/8"-16 x 3-1/2"	1
		50A2849 - Bolt, hex., cad., 3/8"-16 x 4-3/8"	1
		*50A1829 - Stat-o-seal, bolts, 3/8"	3
		*NOTE: Parts with single asterisk are part of 35R80.	
38	35A600	Spool - pressure regulator	1
39	35A5197	Block - spool, 5/8" Long	1
40	10A6328	"O" Ring - block	1
41	10A6380	Snap Ring - spool	1
42	35A7323	Piston - regulator valve	1
43	35A7364	Spring - piston, regulator valve, outer	1
44	35A7365	Spring - piston to spool, inner	1
45	35A5177	Block - piston, 15/16" long	1
46	10A6328	"O" Ring - piston, block	1
47	10A6330	Snap Ring - piston block	1
48	35A7366	Orifice - regulator valve	1
49	35A5187	Block - orifice, 5/8" long	1
50	10A6329	"O" Ring - orifice and block	2
51	10A6330	Snap Ring - block	2
52	35A7367	Screen - orifice	1
53		50A2879 - Snap Ring, orifice	1
54		GM245841 - Ball, steel, 5/16"	3

Ref. No	Part No.	DESCRIPTION	No. Per
		TRANSMISSION CONTROL VALVE AND REGULATOR (Cont'd)	
55		80A5081 - Pin, dowel, 1/8" x 11/16"	1
56		GM444353 - Plug, pipe, disk., 1/8"-27	2
57		80A2976 - "O" Ring, regulator valve	5

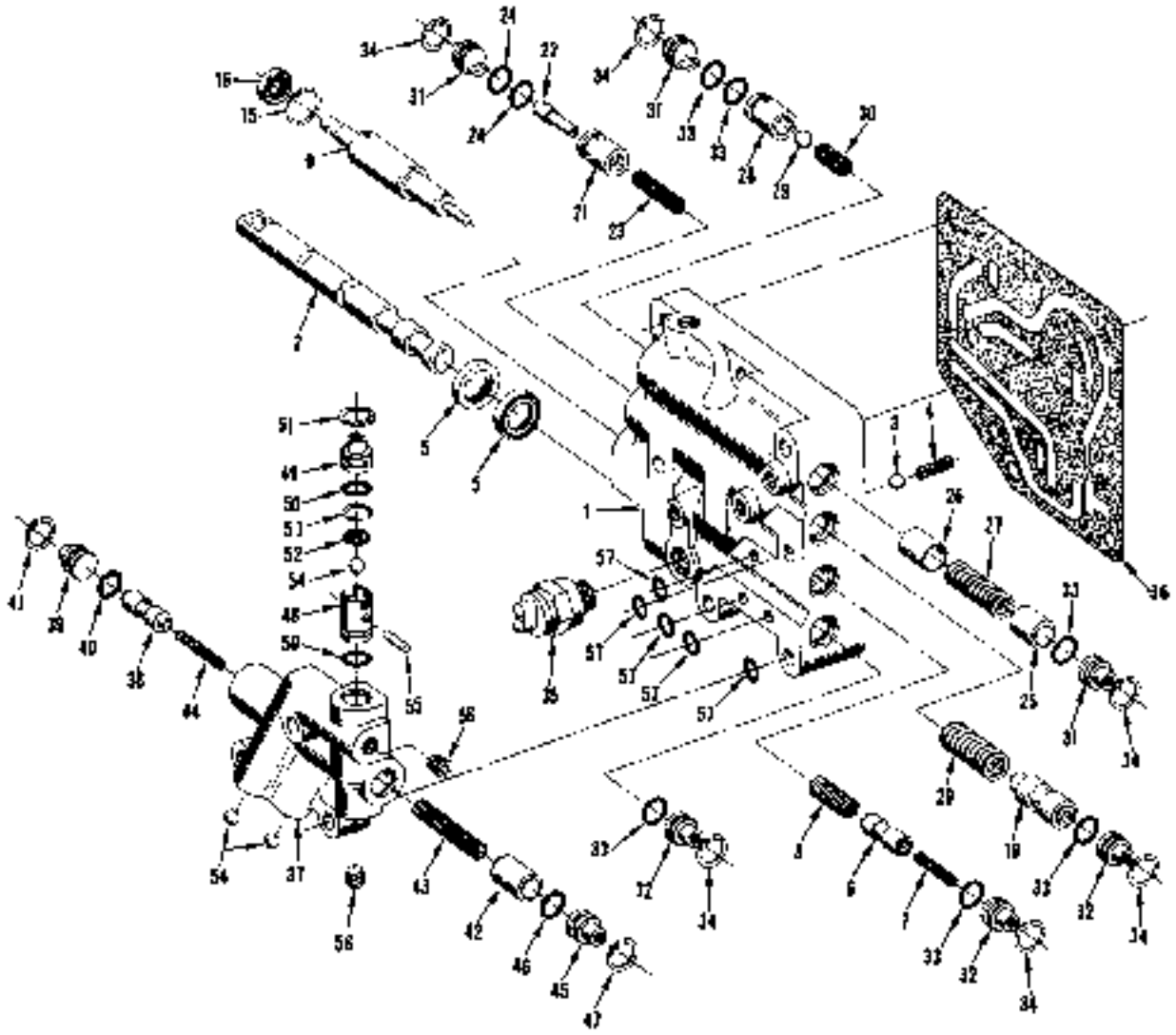


FIG. 2-17A - TRANSMISSION CONTROL VALVE AND REGULATOR

Ref. No	Part No	DESCRIPTION	No. Pcs.
		TRANSMISSION CONTROL VALVE	
		Group III. Used on Lift Trucks With Mechanical Inching less Regulator.	
	39C1545	Valve - control, complete	1
		Includes the following 26 parts:	
1	35A3736	Body - valve	1
		50A3668 - Bolt, hex., 3/8"-16 x 1-1/2"	2
		50A3072 - Bolt, hex., 3/8"-16 x 2-3/4"	5
		* 50A1359 - Stat-o-seal, bolts, 3/8"	7
		*NOTE: Parts with single asterisk are part of 35883.	
2	35A3848	Spool - directional, 6-7/32" long	1
3		50A4265 - Ball, steel, 5/16"	1
		50A4445 - Plug, pipe, hex. socket, 1/8"-27	3
4	35A3098	Spring - spool ball, 23/32" long	1
5	10A16329	Seal - oil, lever spool, 3/4" I.D., 1/4" wide	2
6	35A690	Spool - inching, 1-5/8" long	1
7	35A689	Spring - centering, inching spool, 3/4" long	1
8	35A3027	Spring - inching spool	1
9	35A3000	Inching Spool - assembly, complete, mechanical inching	1
15		50A196 - Snap Ring, sleeve retainer	1
16	35A3008	Seal - inching spool in valve housing	1
19	30A375	Spool - pressure reducer, 3/4" O.D.	1
20	35A374	Spring - pressure spool, 1-3/4" long	1
21	30A1250	Valve - relief	1
22	35A1248	Piston - relief valve	1
23	30A1249	Spring - relief valve	1
24	10A8328	"O" Ring - relief valve	2
25	35A392	Spool - priority valve, 15/16" long	1
26	30A391	Guide - priority valve	1
27	35A390	Spring - priority valve	1
28	35A377	Valve - lube relief	1
29		50A4266 - Ball, steel, 3/8"	1
30	10A12105	Spring - lube relief ball, 1" long	1
31	35A5177	Block - valve, 1-1/16" long	3
32	35A5197	Block - valve, 3/4" long	3
33	10A6329	"O" Ring - valve blocks, 9/16" I.D.	6
34	10A6330	Ring - snap, valve blocks	6
35	35A7627	Switch - neutral starting	1
36	35A5196	Gasket - body to transmission case	1

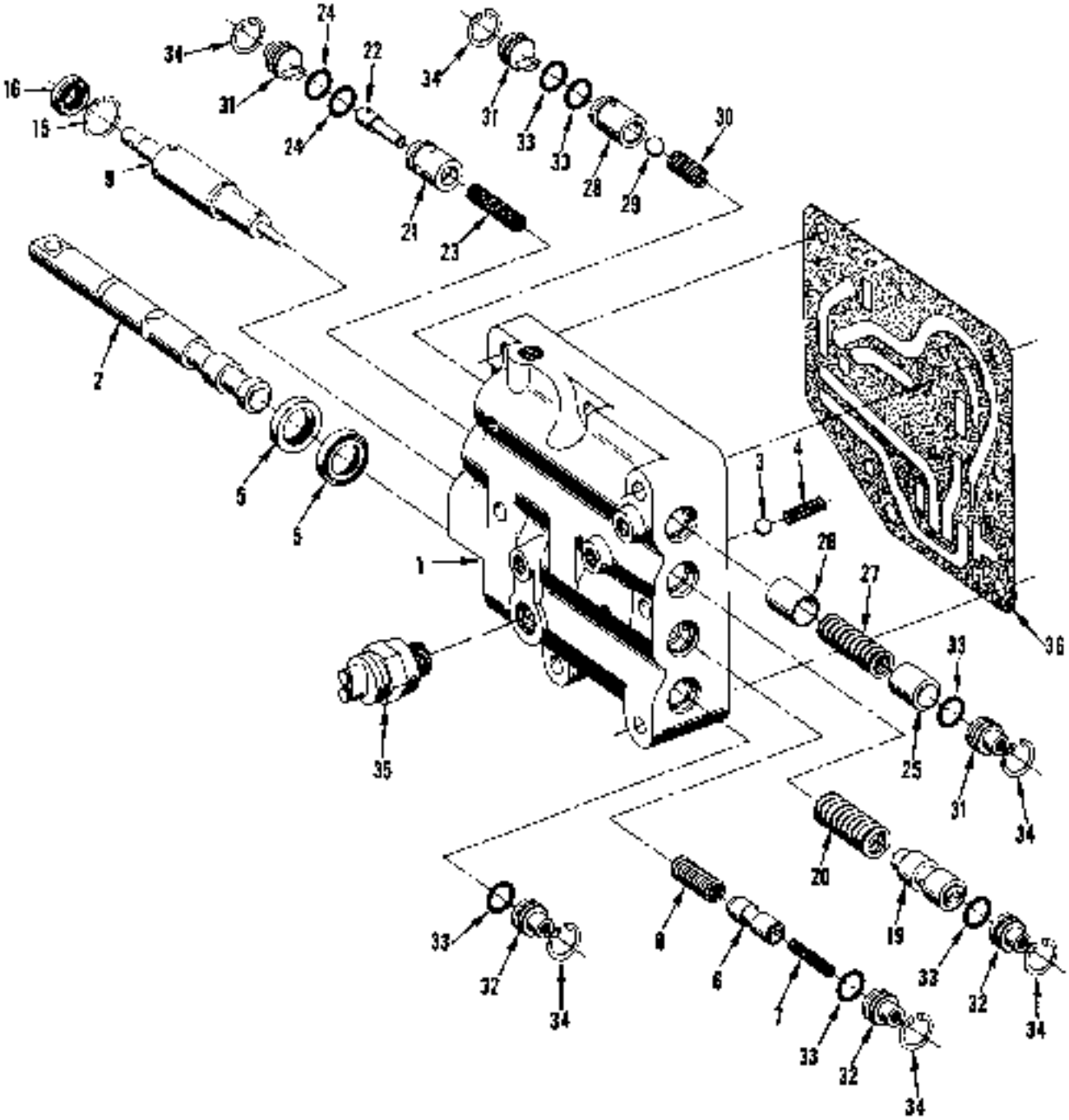


FIG. 2-17B - TRANSMISSION CONTROL VALVE

Ref. No.	Part No.	DESCRIPTION	No. Pcs.
		TRANSMISSION CONTROLS, FILTER AND OIL LINES	
		Group 1 - Used on Lift Trucks with Hydraulic Inching.	
1	35A6174	Lever - hand control	1
2	35A6476	Knob - hand lever	1
3	35A6133	Support - lever, mounts to steering column	2
		GM150077 - Bolt, hex., 5/16"-18 x 3/4"	4
4	35A6129	Arm - control lever	1
		50A2332 - Pin, roll, 3/16" x 1"	2
5	35A6131	Spacer - arm, 1" O.D. x 3/4" long	1
6	35A6147	Cable - push and pull, hand lever to bell crank	1
		GM120613 - Nut, hex. jam, 1/4"-28	2
7		GM192249 - Clevis, cable to lever, 1/4"-28	1
		GM150077 - Pin, clevis, 1/4"	1
		GM137141 - Pin, cotter, 1/16" x 5/8"	1
9	35A6060	"U"-Bolt - cable to bracket, 1/4"-28	1
		GM120367 - Nut, hex., 1/4"-28	2
9	35A6046	Bellcrank	1
10		GM192249 - Clevis, bellcrank, 1/4"-28	1
		GM150077 - Pin, clevis, 1/4"	1
		GM137141 - Pin, cotter, 1/16" x 5/8"	1
11	35A7599	Support - bellcrank	1
		50A4212 - Washer, plain, 17/32" I.D., 1-1/16" O.D.	1
		50A3831 - Pin, cotter, 3/32" x 1"	1
		GM192688 - Set Screw, socket head, 3/8"-16 x 1"	1
		GM124828 - Nut, hex., jam, 3/8"-16	1
12	35A6062	Link - bellcrank to valve, 3/4" x 2-3/4"	2
13		50A3862 - Pin, link, 3/8"	2
		50A3823 - Pin, cotter, 3/32" x 3/4"	2
14	35A6633	Filter - spin-on	1
15	35A6159	Base - spin-on filter	1
16		50A2284 - Elbow, 90°, 3/8" N.P.T. to 3/4"-16 J.I.C.	2
		GM180122 - Bolt, hex., 3/8"-16 x 1"	2
17	35A6223	Tube - filter to transmission case	1
18		50A4424 - Elbow, 3/4"-16 U.N.F., 90°	1
19	10A12012	"O" Ring - elbow to case	1
20	35A1458	Hose - filter to cooler inlet	1
21	35A6145	Tube - hose to cooler	1
22	35A6297	Tube - control valve to cooler outlet	1
23	35A882	Hose - tube to cooler outlet	1
		50A4996 - Elbow, 90°, 3/8" N.P.T. to 3/4"-16	1
		50A4411 - Elbow, 45°, 3/8" N.P.T. to 3/4"-16 J.I.C.	1
24	35A6373	Elbow - tube to control valve, 3/16"-18 to 3/4"-16	1
25	10A16405	"O" Ring - elbow to control valve	1

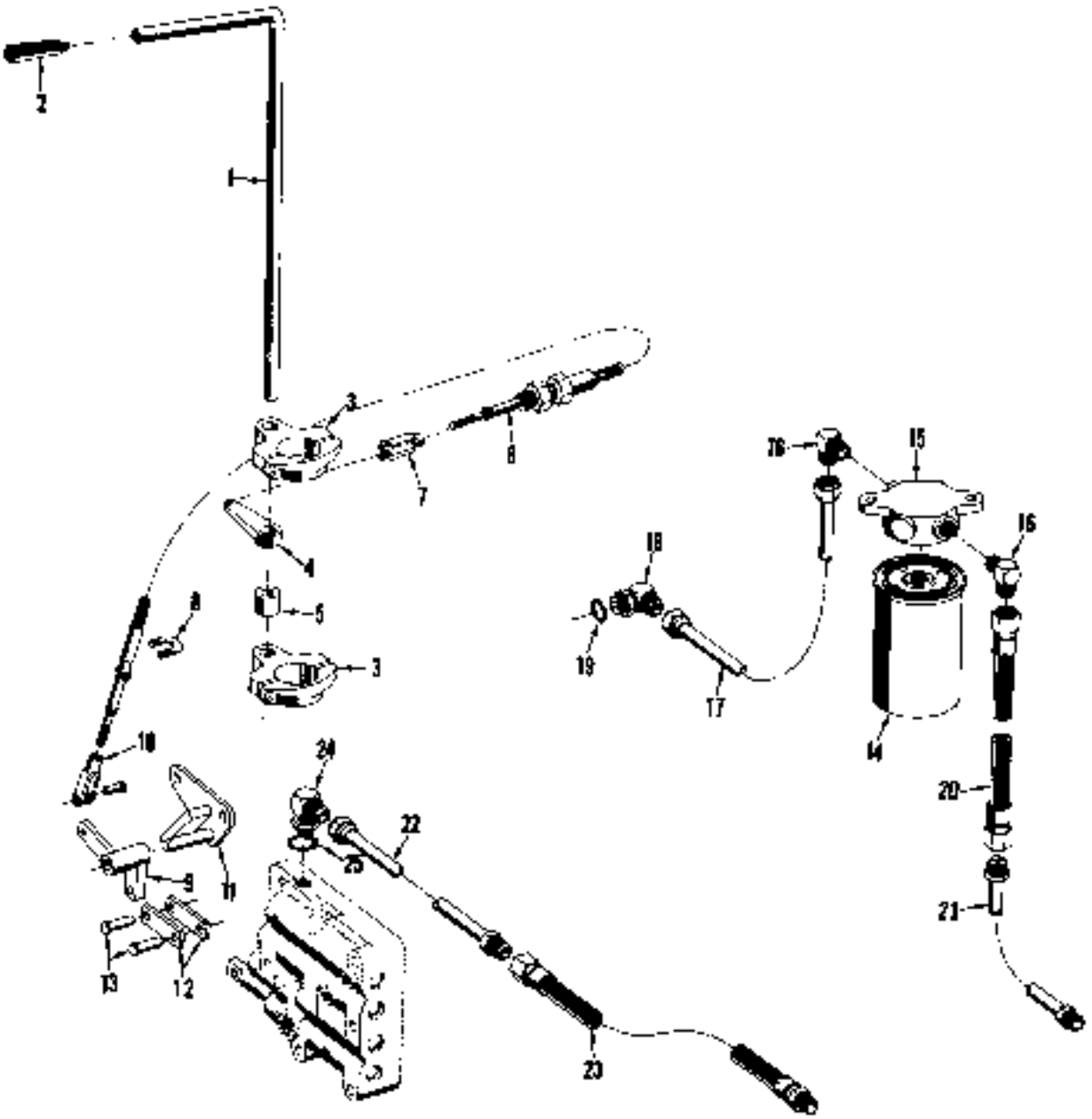


Fig. 2-18 - TRANSMISSION CONTROLS, FILTER AND OIL LINES

Ref. No	Part No.	DESCRIPTION	No. Pcs.
		TRANSMISSION CONTROLS, FILTER AND OIL LINES	
		Group II - Used on Lift Trucks with Mechanical Inching.	
		Used on MA 30 Lift Trucks to No. 28000125, Inc. Used on MA 40 Lift Trucks to No. 26100543, Inc. Used on MA 50 Lift Trucks to No. 26200135, Inc.	
1	35A6174	Lever - hand control	1
2	35A6476	Knob - hand lever	1
3	35A6138	Support - lever, mounts to steering column	2
		GM130077 - Bolt, hex., cad., 5/16"-18 x 3/4"	4
4	35A6120	Arm - control lever	1
		50A2822 - Pin, roll, 3/16" x 1"	2
5	35A6131	Spacer - arm, 1" O.D. x 3/4" long	1
6	35A6147	Cable - push and pull, hand lever to bell crank	1
		GM120612 - Nut, hex. jam, 1/4"-28	2
7		GM192243 - Clevis, cable to lever, 1/4"-28	1
		GM138077 - Pin, clevis, 1/4"	1
		GM137141 - Pin, cotter, 1/16" x 5/8"	1
8	35A6060	"U" Bolt - cable to bracket, 1/4"-28	1
		GM120267 - Nut, hex., 1/4"-28	2
9	35A6002	Bellcrank - directional control	1
		Includes the following part:	
10	35A2252	Bushing - bellcrank, 1/2" wide	2
		GM121224 - Pin, cotter, 3/32" x 1"	2
11		GM193249 - Clevis, bellcrank, 1/4"-28	1
12		GM138077 - Pin, clevis, 1/4"	1
		GM137141 - Pin, cotter, 1/16" x 5/8"	1
13	35A7590	Support - bellcrank	1
14		GM102595 - Set Screw, socket head, 3/8"-16 x 1"	1
15		GM124829 - Nut, hex., jam, 3/8"-16	1
		50A4212 - Washer, plain, 17/32" I.D., 1-1/16" O.D.	1
		50A3831 - Pin, cotter, 3/32" x 1"	1
16	35A2007	Link - bellcrank to valve, U-shaped, 4-3/16" long	1
17	35A7994	Bellcrank - mechanical inching	1
		Includes the following part:	
		50A3831 - Pin, cotter, 3/32" x 1"	1
		50A4212 - Washer, plain, 17/32" I.D., 1-1/16" O.D.	1
18	35A7993	Bearing - needle, mechanical inching bellcrank	2
19	15P609	Link - connecting bellcrank to inching spool	1
20	35A3010	Spring - inching spool return	1
21	35A3013	Turnbuckle - bellcrank to pedal	1
22	35A3014	Clevis - turnbuckle to brake pedal, 3/8" x 2-5/2"	1
23		50A3852 - Pin, link, 3/8" x 1-1/32" long	3
		50A3829 - Pin, cotter, 3/32" x 3/4"	3
24	35A7998	Clevis - turnbuckle to bellcrank, 3/8" x 5-1/4"	1
25	35A3015	Pin - clevis, 3/8" x 1-1/32" long	1
26	35A3533	Filter - spin-on	1
27	35A6159	Base - spin-on filter	1
28		50A2284 - Elbow, 90°, 3/8" N.P.T. to 3/4"-16 J.I.C.	2
		50A3666 - Bolt, hex., 3/8"-16 x 1"	2
29	35A6329	Tube - filter to transmission case	1
30		GM4910977 - Elbow, 90°	1
31	10A12012	"O" Ring - elbow to case	1
33	35A6145	Tube - assembly, filter to cooler	1
34	35A8607	Tube - control valve to cooler inlet (35A6287 and 35A862)	1
		50A4995 - Elbow, 90°, 3/8" N.P.T. to 3/4"-16	1
		50A4411 - Elbow, 45°, 3/8" N.P.T. to 3/4"-16 J.I.C.	1
36	35A6373	Elbow - tube to control valve, 9/16"-18 to 3/4"-16	1
37	10A16405	"O" Ring - elbow to control valve	1

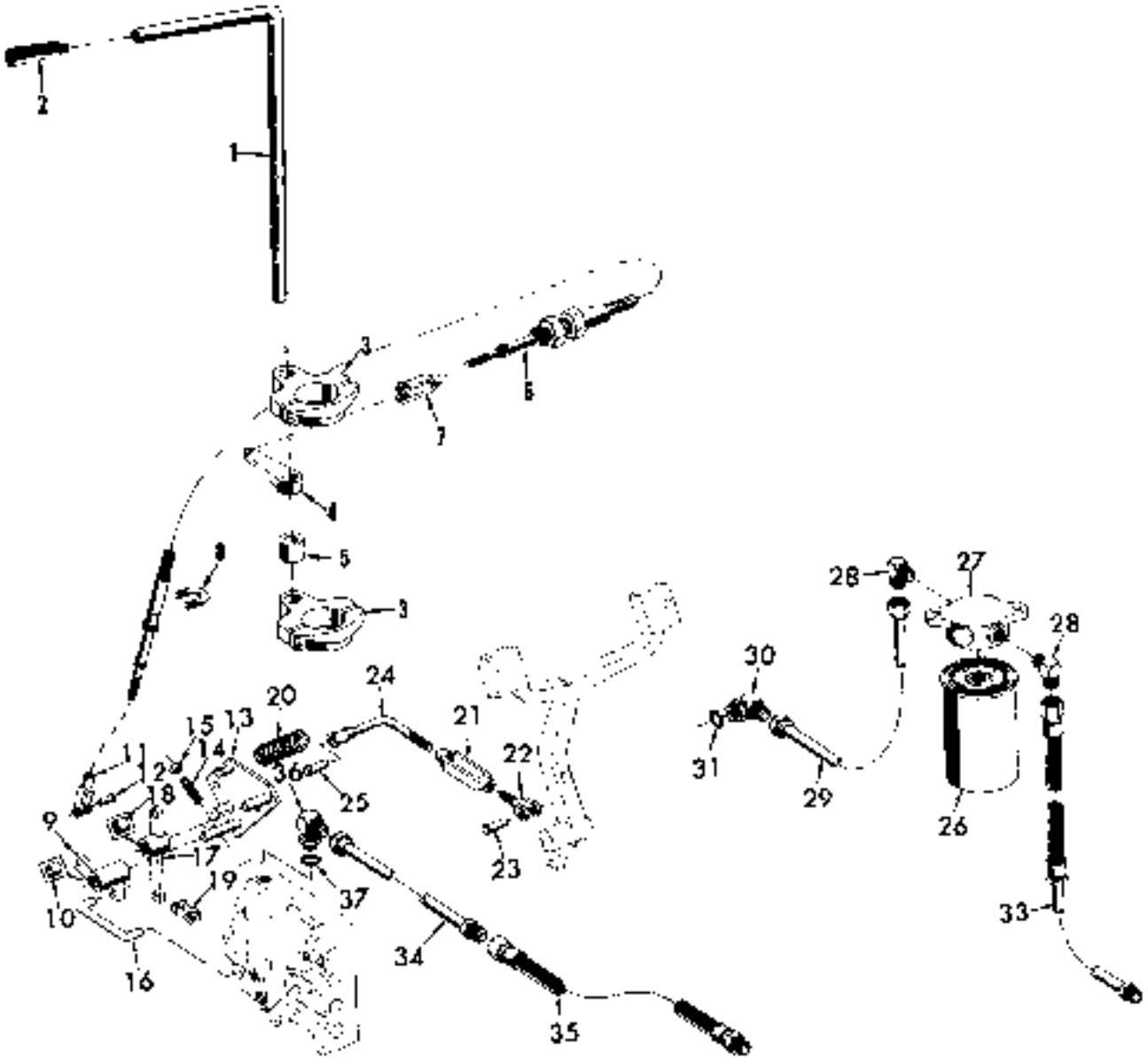


FIG. 2-18A - TRANSMISSION CONTROLS, FILTER AND OIL LINES

Ref. No.	Part No.	DESCRIPTION	No. Per
		TRANSMISSION CONTROLS, FILTER AND OIL LINES	
		Group III	
		Used on MA30-II Lift Trucks No. 2300012E and after.	
		Used on MA40-II Lift Trucks No. 26100628 and after.	
		Used on MA50-II Lift Trucks No. 26200196 and after.	
1	35A8220	Lever - hand control, in instrument panel	1
		50A2324 - Pin, roll, 1/4" x 1"	2
		50A2326 - Pin, roll, 1/4" x 1-1/4"	1
2	35A6476	Knob - hand lever	1
3	35A8226	Hub - lever	1
		50A3685 - Bolt, hex., 5/16"-18 x 3/4"	2
		50A2324 - Pin, roll, 1/4" x 1"	2
4	35A8219	Lever - directional	1
		50A2324 - Pin, roll, 1/4" x 1"	1
5	35A8246	*Ball joint - shift lever	1
		*NOTE: Used on MA30 Lift Trucks to No. 28000145, Inc.	
		Used on MA40 Lift Trucks to No. 26100628, Inc.	
		Used on MA50 Lift Trucks to No. 26200205, Inc.	
6	35A8805	**Ball joint - shift lever	1
		**NOTE: Used on MA30-II Lift Trucks No. 28000146 and after.	
		Used on MA40-II Lift Trucks No. 26100629 and after.	
		Used on MA50-II Lift Trucks No. 26200206 and after.	
		50A3730 - Nut, hex., 5/16"-18	2
7	35A8225	Connector - link, 3/8"-16 x 1-5/8"	1
		50A1930 - Nut, hex., 3/8"-16	2
		50A3829 - Pin, cotter, 5/32" x 3/4"	2
8	35A8231	Link - bellcrank to valve, L-shaped, 3/8" x 1-15/16"	2
9	35A8221	Bellcrank - directional spool	1
		Includes the following part:	
10	35A2252	Bushing - bellcrank, 1/2" wide	2
11	35A8029	Support - bellcrank	1
		50A4212 - Washer, plain, 17/32" I.D., 1-1/16" O.D.	1
		50A3331 - Pin, cotter, 3/32" x 1"	1
12	30A7994	Bellcrank - inching control	1
		Includes the following part:	
		50A4212 - Washer, plain, 17/32" I.D., 1-1/16" O.D.	1
		50A3331 - Pin, cotter, 3/32" x 1"	1
13	35A7609	Bearing - needle, bellcrank	2
14	15P609	Link - connecting, bellcrank to inching spool	1
15	35A8016	Spring - inching spool return	1
16	35A8013	Turnbuckle - bellcrank to pedal	1
17	35A8014	Clevis - turnbuckle to brake pedal, 3/8" x 2-1/2"	1
18		50A3852 - Pin, link, 3/8" x 1-1/2" long	3
		50A3829 - Pin, cotter, 3/32" x 3/4"	3
19	35A7998	Clevis - turnbuckle to bellcrank, 3/8" x 5-1/4"	1
20		GM192420 - Nut, hex. jam, L.H., 3/8"-16	1
21	35A8015	Pin - clevis, 3/8" x 1-1/32" long	1
22	50A5033	Filter - spin-on	1
23	35A6159	Base - spin-on filter	1
24		50A2284 - Elbow, 90°, 3/4" N.P.T. to 3/4"-16 J.I.C.	2
		50A3606 - Bolt, hex., 3/8"-16 x 1"	2
25	30A6829	Tube - filter to transmission case	1
26		GM4910977 - Elbow, 90°	1
27	10A12012	"O" Ring - elbow to case	1
28	30A6145	Tube - assembly, filter to cooler	1
29	35A8607	Tube - control valve to cooler outlet (30A6287 and 30A962)	1
		50A4995 - Elbow, 90°, cooler inlet, 3/8" N.P.T. to 3/4"-16	1
		50A4441 - Elbow, 45°, cooler outlet, 3/8" N.P.T. to 3/4"-16	1
30	30A6873	Elbow - tube to control valve, 3/16"-16 to 3/4"-16	1
31	10A26405	"O" Ring - elbow to control valve	1

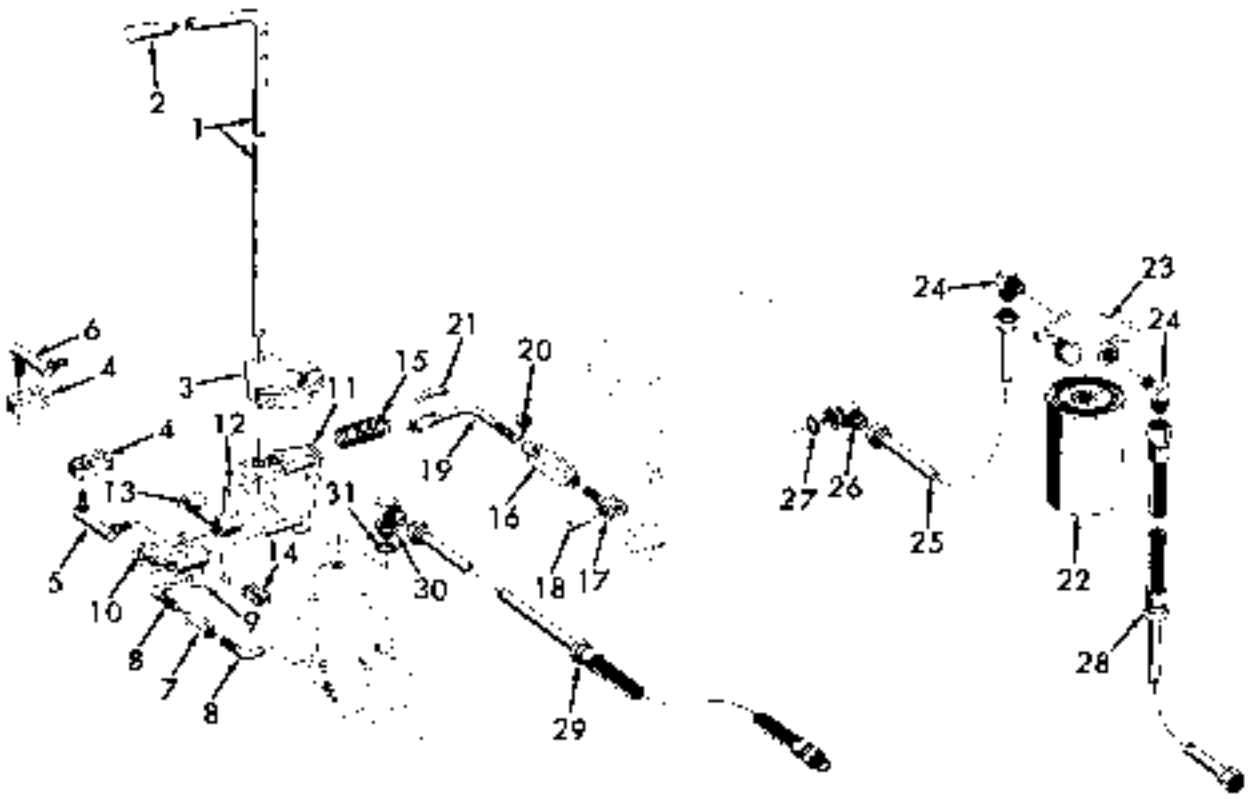


FIG. 2-138 · TRANSMISSION CONTROLS, FILTER AND OIL LINES

Ref. No.	Part No.	DESCRIPTION	No. Req.
		HYDRA-LIZER, STEERING WHEELS AND LINKAGE	
1	36A6394	Fork - steering, right hand (36A5166)	1
2	36A6395	Fork - steering, left hand (36A5527)	1
3		50A1719 - Nut, hex., lock, 1"-14 N.F.	2
		50A2167 - Washer, flat, 1/8" x 1-1/32" I.D., 1-5/8" O.D.	2
		50A4997 - Nut, hex., slotted, 1"-14 N.F.	2
		50A2594 - Washer, flat, 5/16" x 1-1/64" I.D., 1-3/4" O.D.	2
		50A3601 - Pin, cotter, 3/16" x 2-1/4"	2
4	36A7387	Stop - assembly, fork, used only with 36A5166 and 36A5527 forks	2
		GM130176 - Bolt, hex., 1/2"-13 x 1-1/4", for 36A7386 stop	4
		50A2647 - Set Screw, hex. socket, 3/8"-16 x 1"	1
		50A3742 - Nut, hex., jam, 3/8"-16	4
5	36A5102	Wheel - less cushion tire	2
6	35A6356	Tire - cushion, 5" x 10" x 10-1/2"	2
7	35A6274	Seal - oil, 2-11/16" I.D., 3-7/8" O.D.	2
8	32A5248	Cap - hub, 4-1/8" O.D.	2
9	36A4101	Cone - bearing, inner	2
10	10A7292	Cup - bearing, inner	2
11	10A7061	Cone - bearing, outer	2
12	10A7062	Cup - bearing, outer	2
13	36A6136	Cylinder - right hand	1
14	36A5167	Cylinder - left hand	1
		50A3085 - Bolt, hex., 3/4"-16 x 1-3/8"	8
		50A955 - Plug, pipe, 1/2" N.P.T.	2
15	35A6403	Bushing - inside cylinder, 4-1/2" I.D., 5" O.D.	2
16	32A6401	Retainer - bushing	2
17	35A6707	Ring - lock, retainer	2
18	32A6404	Seal - oil, in cylinder	2
19	36A6038	Piston - with bushing (36A5163)	2
20	32A6402	Bushing - piston, outer, 4-3/4" I.D., 5" O.D.	2
21		50A1731 - Ring, quad., piston	4
22	10A7330	Cone - bearing, piston, upper	2
23	10A7331	Cup - bearing, piston, upper	2
24	35A4161	Cone - bearing, piston, lower	2
25	10A7292	Cup - bearing, piston, lower	2
26	35A6174	Seal - oil, piston bearing, 2-13/16" I.D., 3-7/8" O.D.	2
27	36A6184	Head - piston, with threaded holes, 5/8"-16	2
27	35A6605	Head - piston, with drilled holes, 11/32"	2
		50A1376 - Bolt, lock, 5/16"-18 x 3/4", for 35A6605 head	8
28		50A1760 - "O" Ring, piston head	2
29	36A5161	Tube - with nuts, connecting cylinder	1
		50A2251 - Connector, 3/8" P.T. to 1/2" tube	2
30	36A6196	Socket - tie rod, 9" long, R.H. thread	2
31	35A564	Socket - tie rod, 8-3/4" long, L.H. thread	2
		GM102647 - Nut, hex., slotted, 1/2"-20	4
		GM108896 - Cotter, 1/8" x 1"	4
		GM271291 - Fitting, grease, 1/4"-28	4
32	10P1331	Cover - dust, tie rod socket, rubber	4
33	36A696	Sleeve - adjusting, tie rod, 7/8" O.D. x 8-5/8" long	2
34	35A537	Clamp - adjusting sleeve	4
		50A3608 - Bolt, hex., 3/8"-16 x 1-3/2"	1
		50A1800 - Nut, hex., 3/8"-16	4
35	36A6194	Housing - steering	1
36		50A5000 - Nut, hex., slotted, 5/8"-18	1
		50A3768 - Pin, cotter, 1/8" x 1"	1
		50A4203 - Washer, plain, 21/32" I.D., 1-5/16" O.D.	1
37	10A7338	Cone - bearing, steering housing, lower	1
38	10A7339	Cup - bearing, steering housing, lower	1
39	35A5383	Cone - bearing, with seal, steering housing, upper	1
40	10A14362	Cup - bearing, steering housing, upper	1
41	20H3664	Cap - bearing, steering housing, lower	1

Ref. No.	Part No.	DESCRIPTION	No. Per.
		HYDRA-LIZER, STEERING WHEELS AND LINKAGE (Cont'd)	
42	80A5350	Drag Link - less socket, 48" long	1
		Includes the following 4 parts:	
		80A4629 - Fitting, grease, 1/8"-27 straight	1
43	35P241	Bearing - ball socket	2
44	35P238	Spring - socket	1
45	35P239	Bumper - spring	1
46	35P242	Plug - socket	1
47	35A5331	Socket - drag link, with dust seal	1
		GM102648 - Nut, hex., slotted, 9/16"-18	1
48	19P1531	Seal - dust, rubber, drag link socket	1
49	80A5336	Clamp - drag link to socket	1
		80A4899 - Bolt, hex., cad., 7/16"-20 x 1-3/4"	2

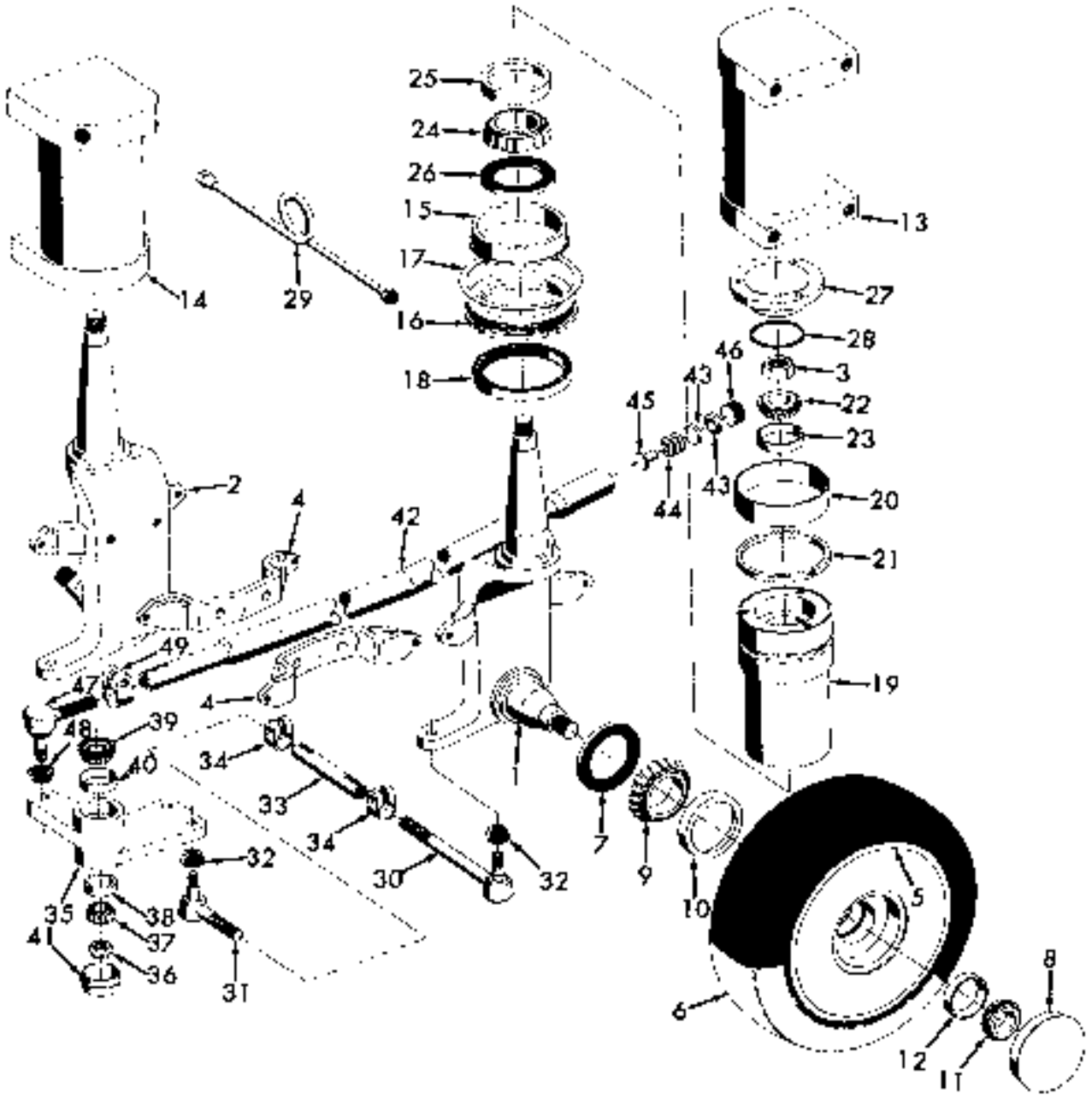


Fig. 2-19 - HYDRA-LIZER, STEERING WHEEL AND LINKAGE

Ref. No.	Part No.	DESCRIPTION	No. Pcs.
		STEERING LINKAGE ASSEMBLIES Group 9 MA 80 Less Power Steering	
	35A6580	Gear - steering, assembly, less arm Includes the following 34 parts.	1
		GM108568 - Plug, pipe, sq. hd., 1/2"	1
1	35P1057	Housing - with bushing	1
2	85P984	Bushing - steering arm	1
3	35P1055	Jacket - steering column	1
		GM187540 - Grommet, rubber	1
4	35P1059	Shaft - steering, with worm	1
5	85P952	Bearing - steering shaft, upper	1
6	35P956	Spring - upper, bearing	1
7	35P955	Seat - upper bearing spring	1
8	10P2280	Cone - bearing, steering worm	2
9	10P2281	Cup - bearing, steering worm	2
10	10P2282	Retainer - bearing	1
11	35P951	Ball - steel, steering worm	60
12	85P1061	Guide - ball return	4
13	35P1060	Clamp - ball guide	1
14	35P1062	Block - ball, steering worm	1
15	10P2278	Adjuster - worm thrust bearing	1
16	10P2291	Nut - lock, bearing adjuster	1
17	10P2290	Shaft - cross, with gear	1
18	10P2142	Packing - steering arm	1
19	10P2292	Nut - steering arm	1
20	10P2283	Cover - side, with bushing	1
21	10P2240	Gasket - side cover	1
	35P546	Shim Kit - lash adjuster, side cover	1
22	85P569	Screw - lash adjusting, side cover	1
23	35P567	Nut - lash adjusting screw	1
24	35A6581	Arm - steering	1
25	35A6138	Steering Wheel	1
26		GM114496 - Nut, steering wheel, jam, 1/2"-20	1
27	35A6142	Button - horn	1
28	35A6141	Cover - horn button	1
29	35A6444	Plate - base	1
30	35A6443	Cup - contact	1
		GM140722 - Screw, rd. hd., No. 10-12 x 5/8"	3
31	35A6441	Spring - contact cup	1
32	35A6445	Cap - contact	1
33	35A6442	Brush - contact in sleeve	2
34	35A6439	Sleeve - contact brush	1
35	35A6440	Spring - brush, in sleeve	1

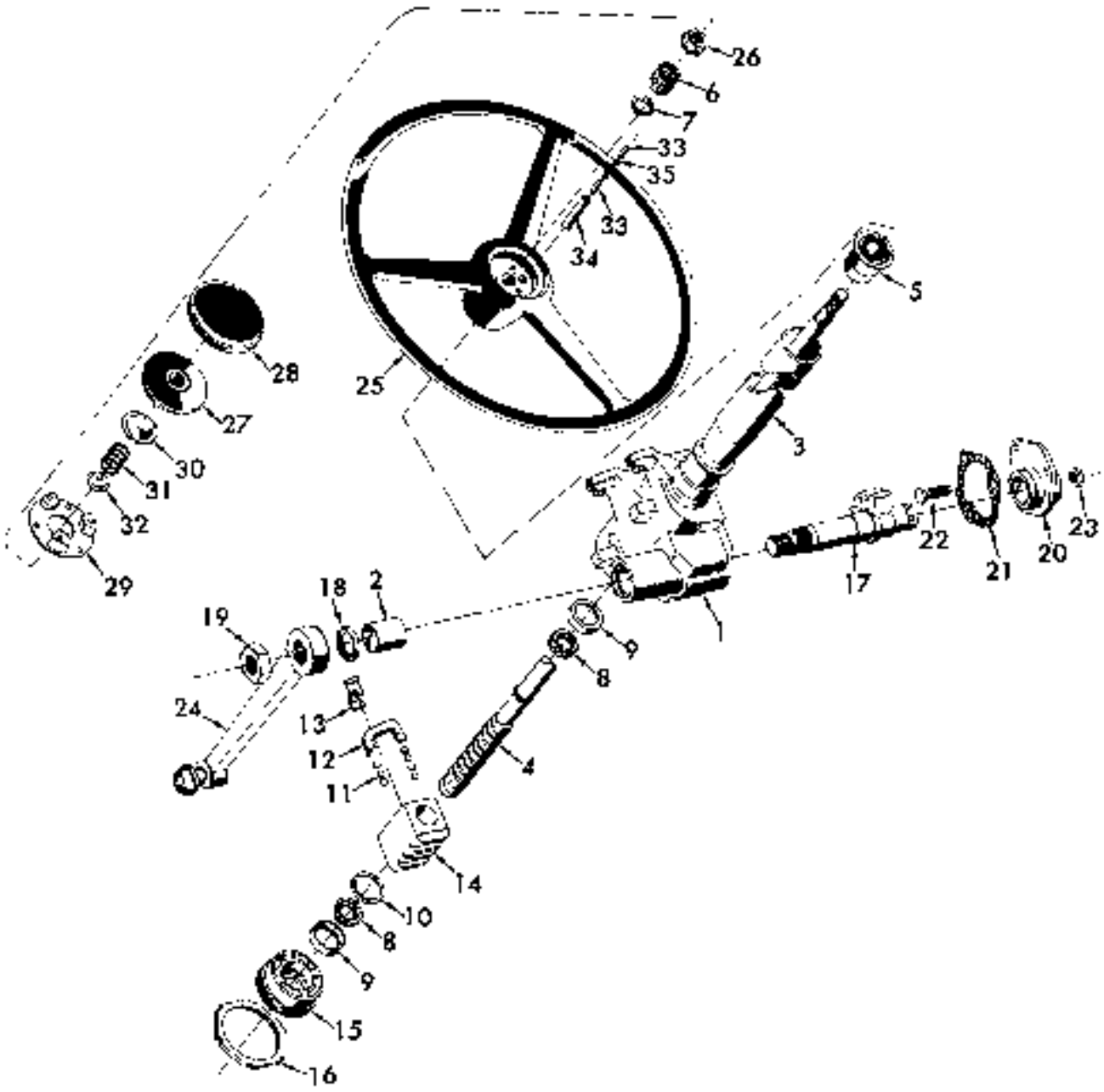


Fig. 2-20 - STEERING GEAR, MA80 LESS POWER STEERING

Ref. No.	Part No.	DESCRIPTION	No. Per
		STEERING GEAR Group II Used on MA 30 with Power Steering and MA 40 and MA 50.	
1	35A8797	Gear - steering, assembly, less jacket and shaft (35A8295)	1
		Includes the following 2 parts:	
		50A3675 - Bolt, hex., 7/16"-14 x 2-1/4"	1
		50A1993 - Bolt, hex., 7/16"-14 x 2"	2
		50A1894 - Bolt, hex., 7/16"-14 x 2-1/2"	1
2	35P932	Housing - with bearing and connector	1
3	35P944	Bearing - pitman shaft	1
4	35P934	Gear - assembly	1
5	35P938	Rack - piston nut assembly, with worm	1
6	35P949	Ring - piston	1
7	35P948	Guide - ball return	1
7A	35P1787	Kit - recirculating balls	1
8	35P947	Clamp - return guide	1
9	35P940	Plug - piston rack	1
10	35P935	Valve - assembly	1
11	35P936	Spring - valve spool	1
12	35P937	Bearing - thrust, valve assembly, lower	1
13	35P950	Bearing - thrust, valve assembly, upper	1
14	35P927	Plug - adjuster, assembly	1
15	35P952	Bearing - needle, adjuster plug	1
16	35P942	Nut - lock, adjuster plug	1
	35P939	Kit - seal, adjuster plug	1
17	35P929	Cover - side, with bushing	1
18	35P943	Nut - lash adjuster screw	1
19	35P960	Plug - housing end	1
20	35P941	Kit - service, consists of seals, rings and washers	1
20A	35A8796	Steering Shaft and Column Assembly	1
		Includes the following 8 parts:	
21	35P1880	Shaft - steering, with flange assembly (35P926)	1
22	35P1881	Jacket - with bearings, bushing and seal (35P950)	1
		Includes the following 4 parts:	
23	35P1882	Bushing - jacket, lower (for 35A8796 steering shaft)	1
24	35P952	Bearing - assembly, upper	1
25		GM18T049 - Grommet, rubber, 1/4" I.D.	1
26	35P954	Seal - oil, lower bearing	1
27	35P928	Retainer - lower bearing seal	1
28	35P955	Seat - spring, upper bearing	1
29	35P956	Spring - upper bearing	1
30	35P931	Flange - assembly, lower (for 35A8295 steering gear)	1
33	35A8712	Bushing - steering shaft, lower (for 35A8295 steering gear) (35P951)	1
	35A8799	Bolt - 12 P., flange mounting, 3/8"-24 x 1-1/4"	1
31	35A8300	Arm - steering	1
32	35P963	Nut - shaft to steering arm	1
33	35A6136	Wheel - steering	1
34		GM114496 - Nut, steering wheel, 1/2"-20	1
		50A4212 - Washer, wheel nut, 17/32" I.D., 1-1/16" O.D.	1
35	35A6142	Button - horn	1
36	35A6141	Cover - horn button	1
37	35A6444	Plate - base	1
38		50A5034 - Screw, rd. hd., No. 10 x 1/2"	3
39	35A6443	Cup - contact	1
40	35A6441	Spring - contact cup	1
41	35A6445	Cap - contact	1
42	35A6442	Brush - contact in sleeve	2
43	35A6139	Sleeve - contact brush	1
44	35A6440	Spring - brush, in sleeve	1

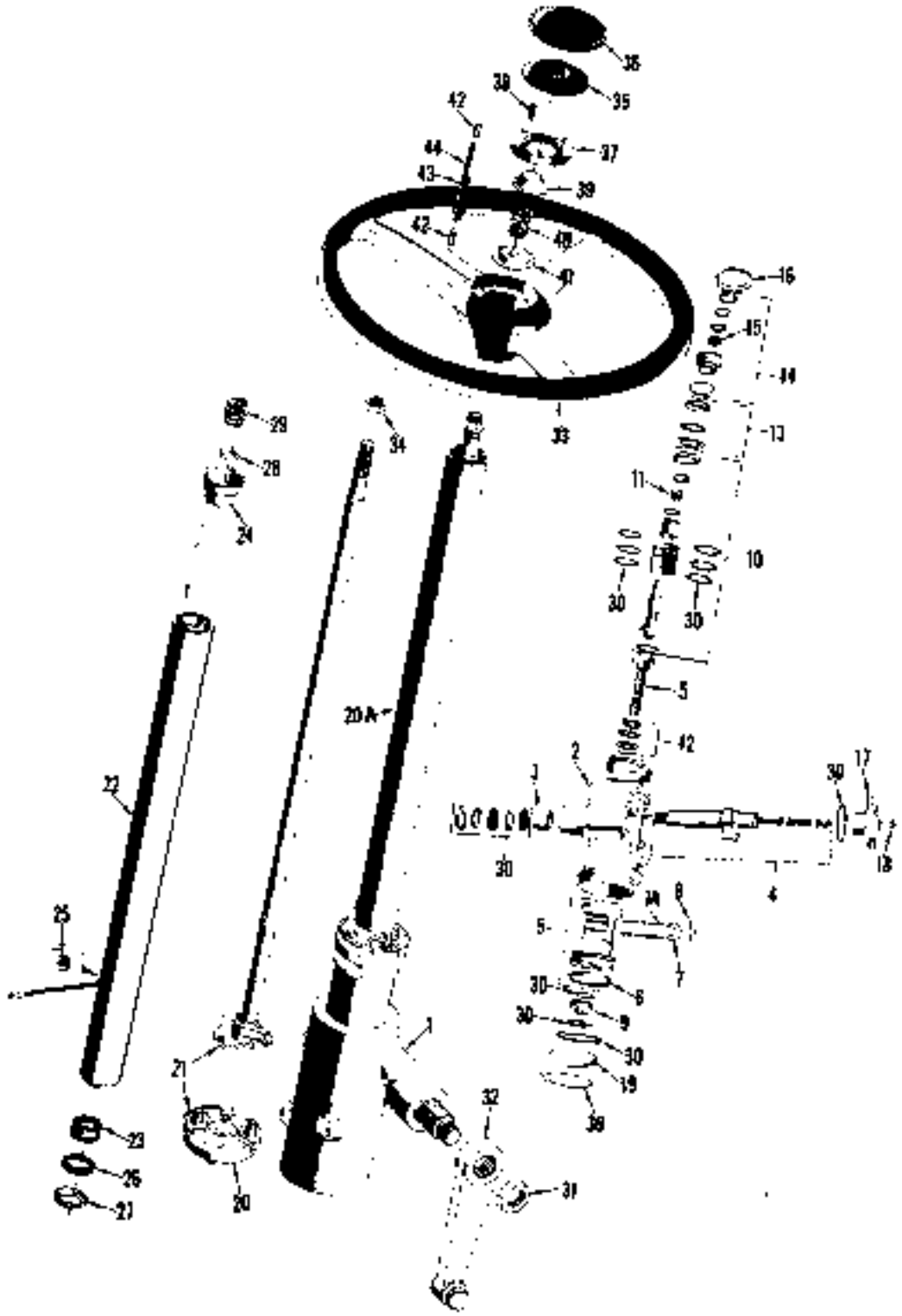


Fig. 2-21 – STEERING GEAR, MA30 w/POWER STEERING AND MA40 AND 50

Ref. No.	Part No.	DESCRIPTION	No. Req.
		DIFFERENTIAL AND AXLE	
		Group 2	
		Used on MA 30 Lift Trucks to No. 28000145, Inc.	
		Used on MA 40 Lift Trucks to No. 26100825, Inc.	
		Used on MA 50 Lift Trucks to No. 26300205, Inc.	
1	35A5280	Case - differential	1
		50A3667 - Bolt, hex., 3/8"-16 x 1-1/4"	11
2	10A11543	Pin - dowel, 3/8"x 3/4"	2
	35A5453	Stud - diff. case to trans. case, 3/8"-16 x 1-3/8"	9
		GM120377 - Nut, hex., 3/8"-16	9
3	35A8843	*Shim - diff. case to trans. case, .002 thick (35A6880)	A.R.
4	35A8844	*Shim - diff. case to trans. case, .003 thick (35A6881)	A.R.
5	35A8845	*Shim - diff. case to trans. case, .005 thick (35A6887)	A.R.
		*NOTE: Parts with single asterisk (*) are part of 35R83.	
6	3686460	Ring Gear - with bull pinion and output shaft, 14 teeth	1
7	10A7059	Cone - bearing, pinion shaft, left hand	1
8	10A7060	Cup - bearing, pinion shaft, left hand	1
9	10A7051	Cone - bearing, pinion shaft, right hand	1
10	10A7052	Cup - bearing, pinion shaft, right hand	2
11	35A5150	Cap - bearing, pinion shaft, right hand	2
		50A1743 - "O" Ring	1
12	35A5442	Shim - right hand bearing cap, .002	A.R.
13	35A5441	Shim - right hand bearing cap, .003	A.R.
14	35A5440	Shim - right hand bearing cap, .005	A.R.
15	35A5287	Cap - bearing, pinion shaft, left hand	2
16		50A1744 - "O" Ring	2
17	35A5445	Shim - left hand bearing cap, .002	A.R.
18	35A5444	Shim - left hand bearing cap, .003	A.R.
19	35A5443	Shim - left hand bearing cap, .005	A.R.
	38A2240	Cage - differential assembly, 4 pinion, with bull gear, 29 T., (38A0087)	1
		Includes the following, 1 - 36A8852 cage, 2 - 35A5130 gear, A.R. - 35A7282, 35A7288, 35A7284, 35A5553 washer, 1 - 35A7809 shaft, 4 - 35A5131 pinion, 4 - 35A7813 washer, 1 - 35A5351 cover, 8 - 35A8491 bolt.	
20	36A8852	++Cage - differential, with bull gear and bushing, 29 teeth	1
21	10A8225	Cone - bearing, differential cage, left hand	2
22	10A8227	Cup - bearing, differential cage, left hand	1
23	35A5291	+Cage - differential, right hand	1
		+50A2804 - Pin, roll, 3/16" x 1-1/2"	1
23	35A8851	++Cage - cover, differential, right hand	1
	35A8491	++Bolt - cage cover, 12 pt., 3/8"-16 x 3/4"	8
24	9027H	Cone - bearing, right hand cage	1
25	10A6335	Cup - bearing, right hand cage	1
26	35A5132	++Pinion - differential cage	2-4
27	35A5129	+Shaft - differential pinion, 3/4" x 5"	1
	35A7809	++Shaft - differential pinion	1
28	35A5127	+Washer - thrust, pinion to cage, beveled, 49/64" I.D., 1-21/32" O.D.	2
	35A7813	++Washer - thrust, pinion to cage, beveled with lock, 49/64" I.D., 1-21/32" O.D.	4
		+NOTE: Used on lift trucks with 2 pinion differential.	
		++NOTE: Used on lift trucks with 4 pinion differential as listed for serial numbers in heading.	
29	35A5303	Shaft - axle, with flange, 27-3/16" long	2
30	35A5130	Gear - bevel, on axle	2
31	35A7282	Washer - thrust, bevel gear, 1-3/4" I.D., 2-13/16" O.D. x .030	A.R.
32	35A7283	Washer - thrust, 1-3/4" I.D., 2-13/16" O.D. x .032	A.R.
31	35A7284	Washer - thrust, 1-3/4" I.D., 2-13/16" O.D. x .035	A.R.
31	35A8553	Washer - thrust, 1-3/4" I.D., 2-13/16" O.D. x .036	A.R.
32	35A5305	Housing - axle, left hand	1
		GM180175 - Bolt, hex., 1/2"-13 x 1-1/4"	12
33	10A7846	"O" Ring - housing to case, 4-1/8" dia.	1

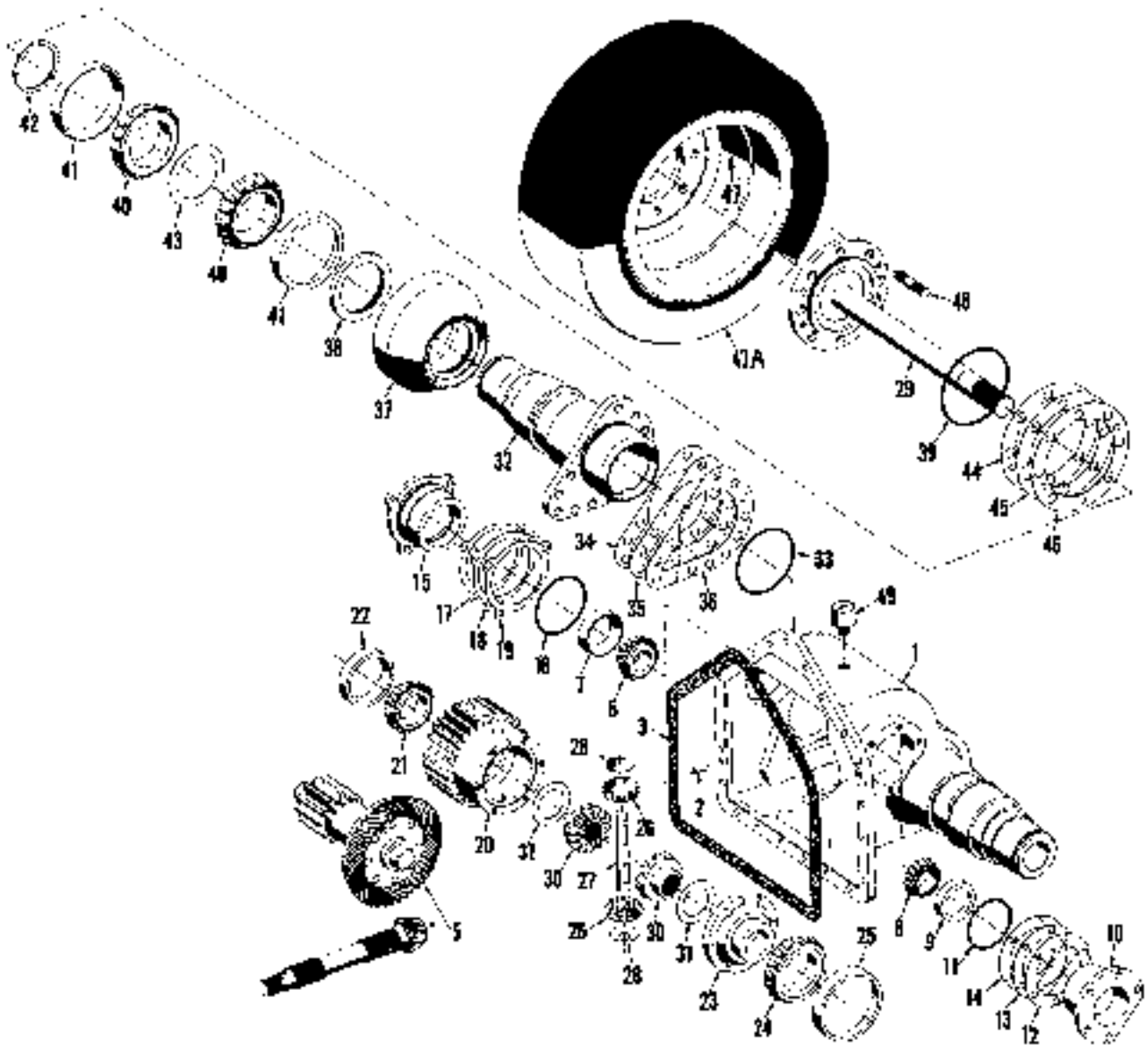


FIG. 2-22 - DIFFERENTIAL AND AXLE

Ref. No	Part No	DESCRIPTION	No. Per
		DIFFERENTIAL AND AXLE (Cont'd)	
		Group 1 (Cont'd)	
		Used on MA 30 Lift Trucks to No. 29000145, Inc.	
		Used on MA 40 Lift Trucks to No. 26100628, Inc.	
		Used on MA 50 Lift Trucks to No. 26200205, Inc.	
34	35A5448	Shim - housing to case, .002	A.R.
35	35A5447	Shim - housing to case, .009	A.R.
36	35A5446	Shim - housing to case, .005	A.R.
37	36A6828	Housing - bearing, with oil seal and steel balls	2
		GM145637 - Ball, steel, 3/16" dia.	16
38	10A19176	Seal - oil, bearing housing	2
39	10A10135	"O" Ring - axle flange to housing, 4-7/8" O.D.	2
40	35A7702	Cone - bearing, axle to housing (10A6440)	4
41	10A6441	Cup - bearing, axle to housing	4
42		50A1740 - Ring, bearing retainer	2
43	35A7275	Shim - bearing, .020	A.R.
43	35A7276	Shim - bearing, .022	A.R.
43	35A7277	Shim - bearing, .025	A.R.
43	35A7278	Shim - bearing, .028	A.R.
43	35A7279	Shim - bearing, .030	A.R.
43	35A7280	Shim - bearing, .032	A.R.
43	35A7281	Shim - bearing, .035	A.R.
44	35A5436	Shim - bearing housing, .002	A.R.
45	35A5435	Shim - bearing housing, .003	A.R.
46	35A5434	Shim - bearing housing, .020	A.R.
47	35A6591	Wheel - drive, less cushion tire, MA 30	2
47A	35A6590	Tire - cushion, 8" x 12-1/8" x 16", MA 30	2
47	35A5282	Wheel - drive, less cushion tire, MA 40	2
47A	35A6357	Tire - cushion, 7" x 12-1/8" x 16", MA 40	2
47	35A6397	Wheel - drive, less cushion tire, MA 50	2
47A	35A6359	Tire - cushion, 9" x 12-1/8" x 16", MA 50	2
48	35A6582	Stud - drive wheel to housing, 9/16"-12	16
		50A1096 - Nut, 9/16"-12	16
49	35A5691	Breather - differential case, 1/4" N.P.T.	1

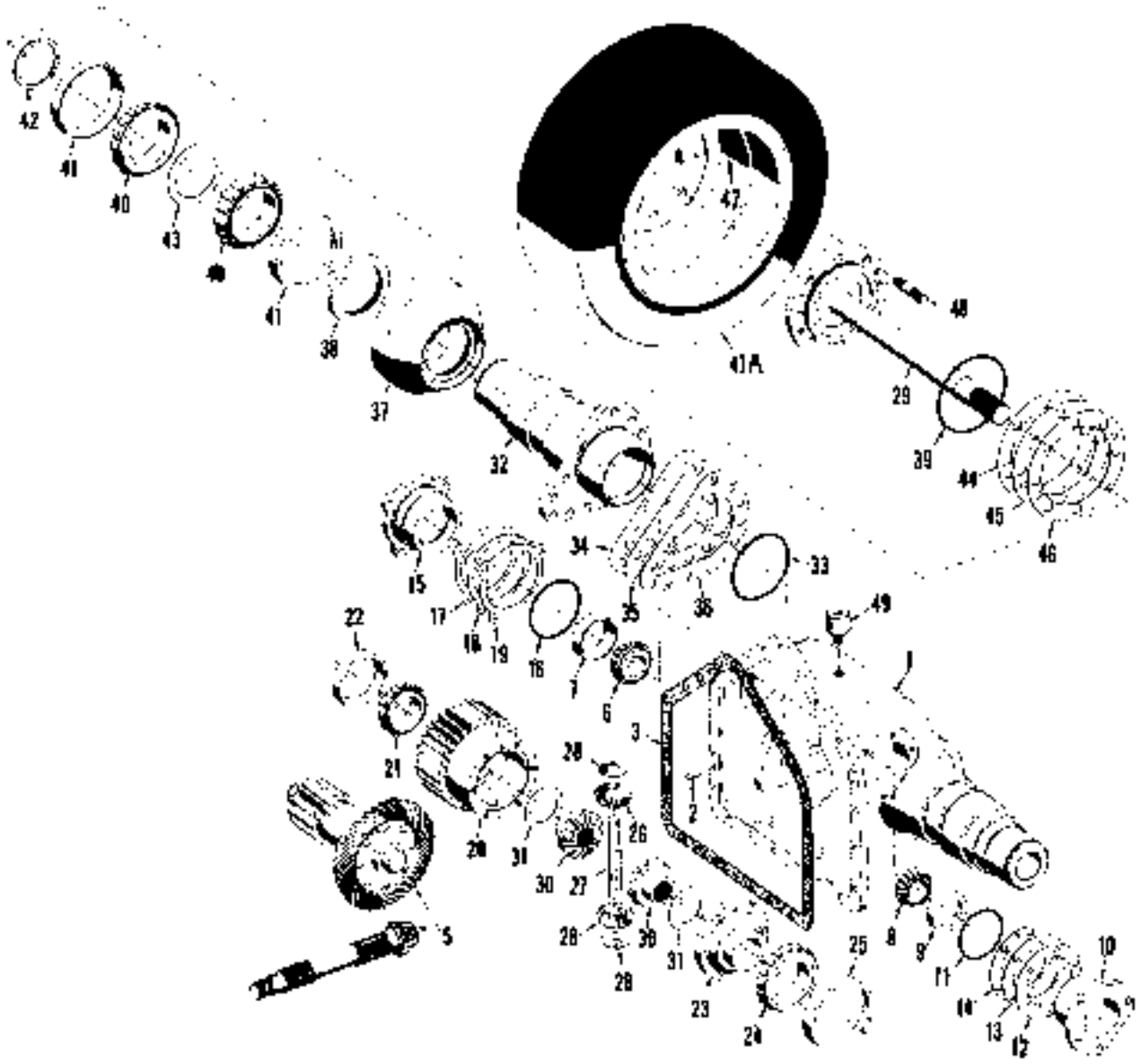


FIG. 2-22 - DIFFERENTIAL AND AXLE

Ref. No	Part No.	DESCRIPTION	No. Pcs.
		DIFFERENTIAL AND AXLE **Group 11**	
		Used on MA 30 H Lift Trucks No. 29000146 and after. Used on MA 40 H Lift Trucks No. 28100629 and after. Used on MA 50 H Lift Trucks No. 26200206 and after.	
1	35A7815	Case - differential	1
2	35A8753	Washer - studs and bolts, 5/8" O.D.	10
		50A1441 - Bolt, 12 pt., 3/8"-16 x 1-1/4"	3
		50A5036 - Stud, case, 3/8"-16 x 1-3/4"	7
		50A1900 - Nut, hex., 3/8"-16	7
3	10A11543	Pin - dowel, 3/8" x 3/4"	2
4	35A8843	*Shim - differential case to transmission case, .002 thick	A.R.
4	35A8844	*Shim - differential case to transmission case, .003 thick	A.R.
4	35A8845	*Shim - differential case to transmission case, .005 thick	A.R.
5	35A7818	Shaft - bull pinion, 12 teeth	1
6	35B7803	Ring Gear and Pinion - matched set	1
7	35A8400	Bolt - ring gear, drilled, 12 pt., 7/16"-14 x 3/4"	12
8	10A7058	Cone - bearing, pinion shaft, left hand	1
9	10A7060	Cup - bearing, pinion shaft, left hand	1
10	10A7051	Cone - bearing, pinion shaft, right hand	1
11	10A7052	Cup - bearing, pinion shaft, right hand	1
12	35A8244	Cap - bearing, pinion shaft, right hand	1
13		50A1748 - "O" Ring, cap, 8-5/16" O.D.	1
		50A2704 - Screw, cap, 3/8"-16 x 1"	5
14	35A5442	Shim - right hand bearing cap, .002	A.R.
14	35A5441	Shim - right hand bearing cap, .003	A.R.
14	35A5440	Shim - right hand bearing cap, .005	A.R.
15	35A7817	Cap - bearing, pinion shaft, left hand	1
16		50A1744 - "O" Ring, bearing cap, 8-7/16" O.D.	1
		50A2704 - Screw, cap, 3/8"-16 x 1"	2
		50A2705 - Screw, cap, 3/8"-16 x 1-1/4"	2
17	35A8241	Shim - left hand bearing cap, .002	A.R.
17	35A8242	Shim - left hand bearing cap, .003	A.R.
17	35A8243	Shim - left hand bearing cap, .005	A.R.
18	35A7806	Cage - differential, with bushing and bull gear, 31 teeth Includes the following parts:	1
19	35A8492	Bushing - cage (ream to fit)	1
20	35A9237	Cone - bearing, differential cage, left hand	1
21	35A8236	Cup - bearing, differential cage, left hand	1
22	35A7807	Cover - differential cage, with bushing, right hand Includes the following parts:	1
23	35A8492	Bushing - cover, (ream to fit)	1
24	35A8491	Bolt - cover, 12 pt., 3/8"-16 x 3/4"	8
25	35A8235	Cone - bearing, right hand cage cover	1
26	35A8236	Cup - bearing, right hand cage cover	1
27	35A8234	Pinion - differential cage	4
28	35A7809	Shaft - differential pinions	1
29	35A7812	Washer - thrust, pinion to cage	4
		*NOTE: Parts with single asterisk are part of 35R83.	

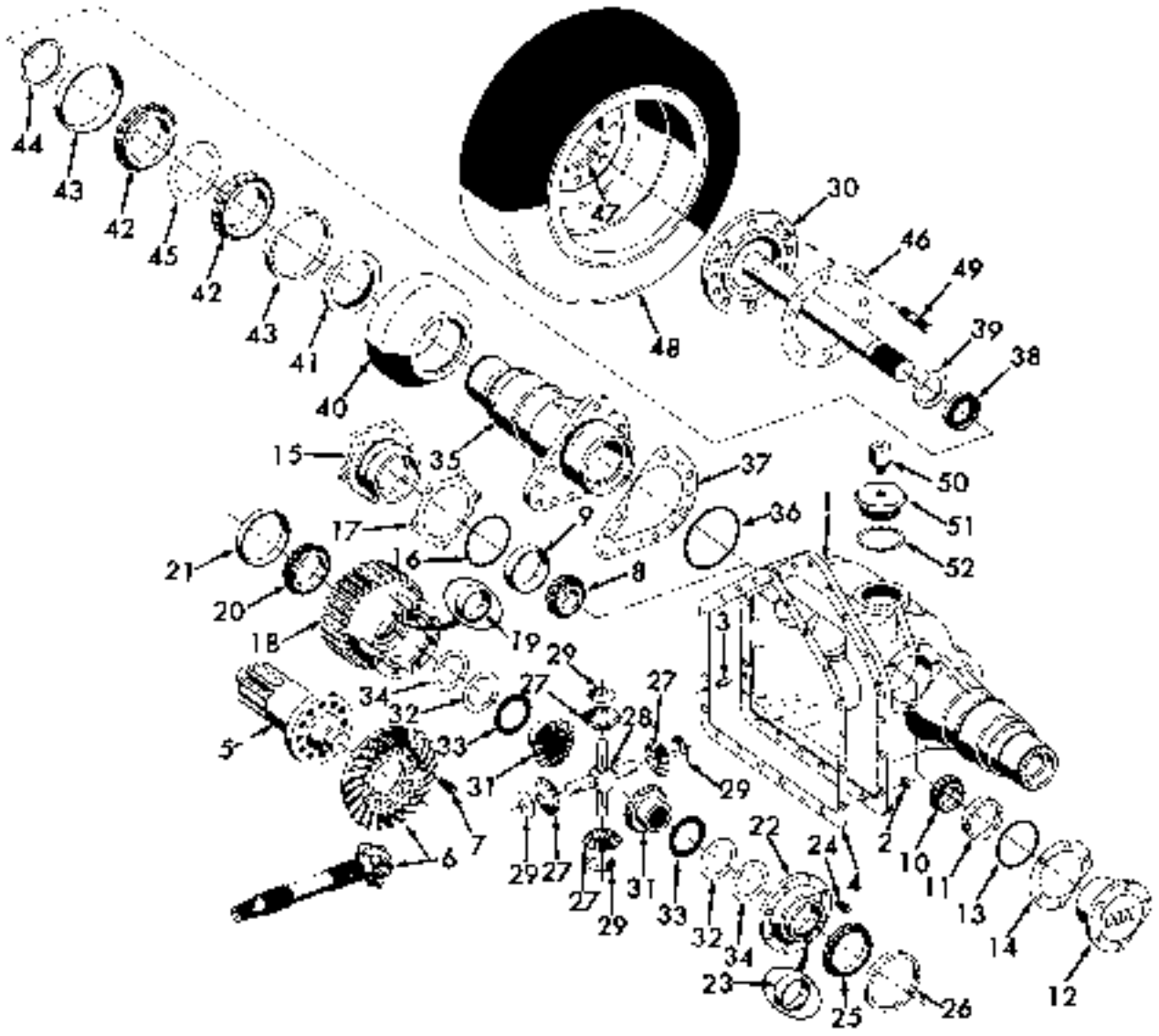


FIG. 2-22A - DIFFERENTIAL AND AXLE

Ref. No.	Part No	DESCRIPTION	No. Per
		DIFFERENTIAL AND AXLE (Cont'd) Group II (Cont'd)	
		Used on MA 30 H Lift Trucks No. 28000146 and after. Used on MA 40 H Lift Trucks No. 26100629 and after. Used on MA 50 H Lift Trucks No. 26200206 and after.	
30	35A6245	Shaft - axle, with flange, 17-3/16" long	2
31	35A7808	Gear - bevel, on axle, 18 teeth	2
32	35A7814	Race - bearing, bevel gear, 1/16" x 2" I.D. x 2-23/32" O.D.	2
33	35A7815	Bearing - thrust, bevel gear	2
34	35A7812	Shim - thrust bearing, .002 x 2" I.D., 2-23/32" O.D.	A.R.
34	35A7810	Shim - thrust bearing, .003 x 2" I.D., 2-23/32" O.D.	A.R.
34	35A7811	Shim - thrust bearing, .005 x 2" I.D., 2-23/32" O.D.	A.R.
35	35A6264	Housing - axle, left hand	1
		50A3860 - Bolt, hex., 1/2"-13 x 1-1/4"	11
36	M333	"O" Ring - housing to case, 4-1/4" O.D.	1
37	35A6446	Shim - housing to case, .002	A.R.
37	35A6447	Shim - housing to case, .003	A.R.
37	35A6446	Shim - housing to case, .005	A.R.
37	35A6711	Shim - housing to case, .010	A.R.
38	35A6028	Seal - axle housing and differential case, outer ends	2
39	35A6493	Collar - housing, seal retainer	2
40	35A6360	Housing - bearing	2
		50A2746 - Screw, flat head, 3/8"-16 x 1"	4
41	35A6629	Seal - oil, bearing housing	2
42	35A7752	Cone - bearing, axle to housing	4
43	10A8441	Cup - bearing, axle to housing	4
44		50A1740 - Ring, bearing retainer	2
46	35A7275	Shim - bearings, .020	A.R.
45	35A7270	Shim - bearings, .022	A.R.
45	35A7277	Shim - bearings, .025	A.R.
45	35A7273	Shim - bearings, .028	A.R.
45	35A7279	Shim - bearings, .030	A.R.
45	35A7280	Shim - bearings, .032	A.R.
45	35A7281	Shim - bearings, .035	A.R.
46	35A5436	Shim - bearing housing, .002	A.R.
46	35A5435	Shim - bearing housing, .003	A.R.
46	35A5434	Shim - bearing housing, .020	A.R.
47	35A6581	Wheel - drive, less cushion tire, MA 30	2
48	35A6580	Tire - cushion, 6" x 12-1/6" x 18", MA 30	2
47	35A6582	Wheel - drive, less cushion tire, MA 40	2
48	35A6587	Tire - cushion, 7" x 12-1/6" x 18", MA 40	2
47	35A6587	Wheel - drive, less cushion tire, MA 50	2
48	35A6588	Tire - cushion, 8" x 12-1/6" x 18", MA 50	2
49		50A3084 - Stud, drive wheel to housing, 9/16"-12 x 2-7/16"	16
		50A1036 - Nut, hex., 9/16"-12	16
50	35A3491	Breather - differential case, 1/4" N.P.T.	1
51	35A6251	Plug - inspection, hex head, 2-1/2"-16	1
52	35A6250	Washer - plug, (copper), 2-7/8" O.D.	1

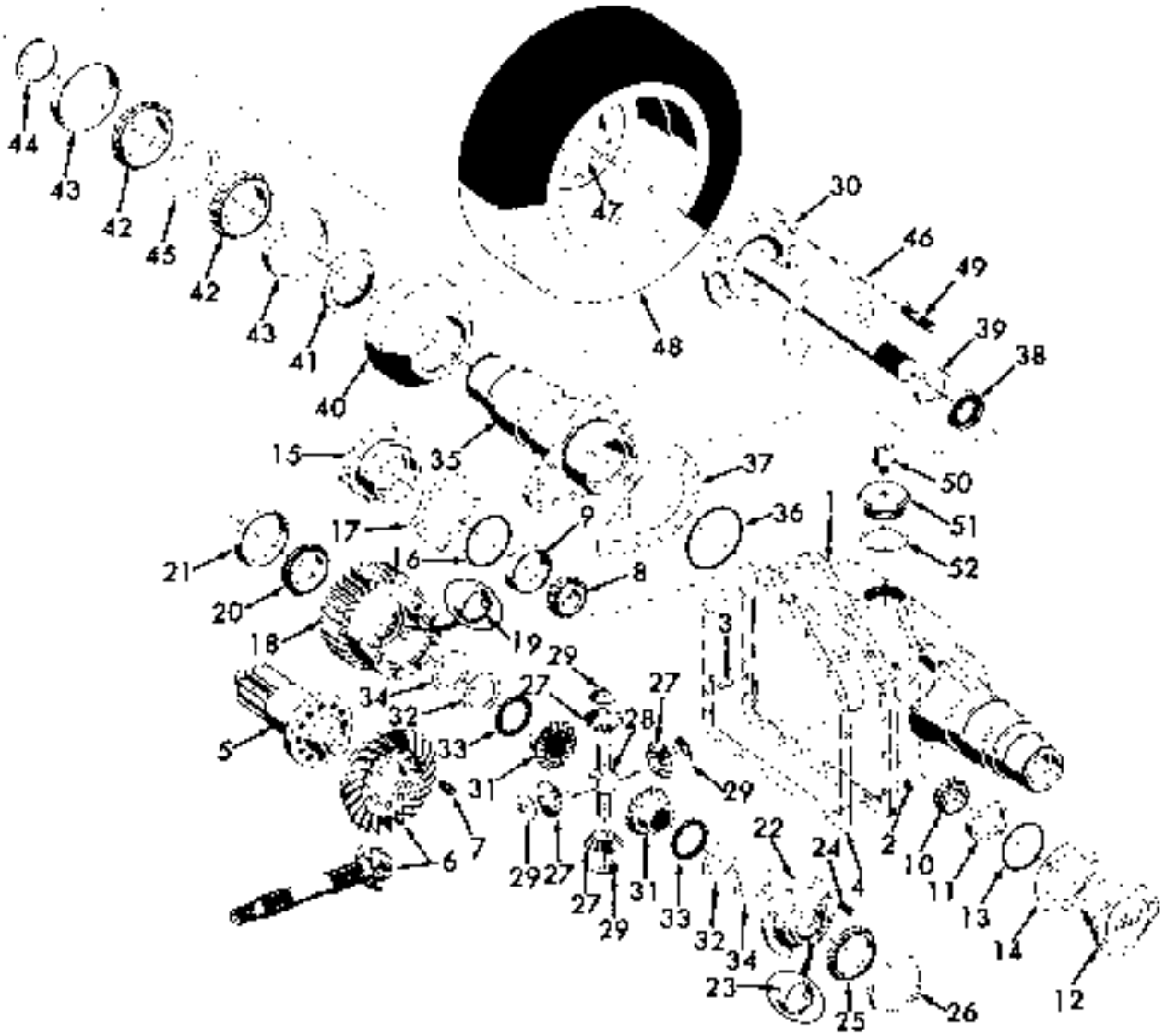


FIG. 2-22A - DIFFERENTIAL AND AXLE

Ref. No.	Part No.	DESCRIPTION	No. Req.
		BRAKES	
1	35A5774	Brake - complete, right hand	1
1	35A5775	Brake - complete, left hand	1
		50A1279 - Screw, cap, 5/8"-18 x 1"	12
2	35P1562	Plate - backing, right and left hand brake (35P964)	2
3	35P966	Shoe - brake, with lining, bonded	4
5	35P970	Link - lever, assembly, right hand brake	1
6	35P974	Link - lever, assembly, left hand brake	1
7	35P969	Pin - hold-down, brake shoe	4
8	35P104	Spring - hold-down pin	4
9	35P105	Retainer - hold-down pin	8
10	35P968	Spring - brake shoe return	2
11	35P99	Spring - brake shoe retainer	2
13	35P972	Push Rod - cylinder	4
14	35P967	Cylinder - wheel	2
		50A1405 - Bolt, hex., 1/2 pc. socket, 5/16" x 18 x 1/2"	4
15	35P64E	*Spring - wheel cylinder	2
16	M572	*Cup - spring	4
17	35P977	Piston - cylinder	4
18	35P976	*Boot - cylinder	4
	35R49	*Kit - wheel cylinder	1
		*NOTE: Kit includes parts identified with a single asterisk.	
19	35P975	Screw - bleeder, wheel cylinder	2

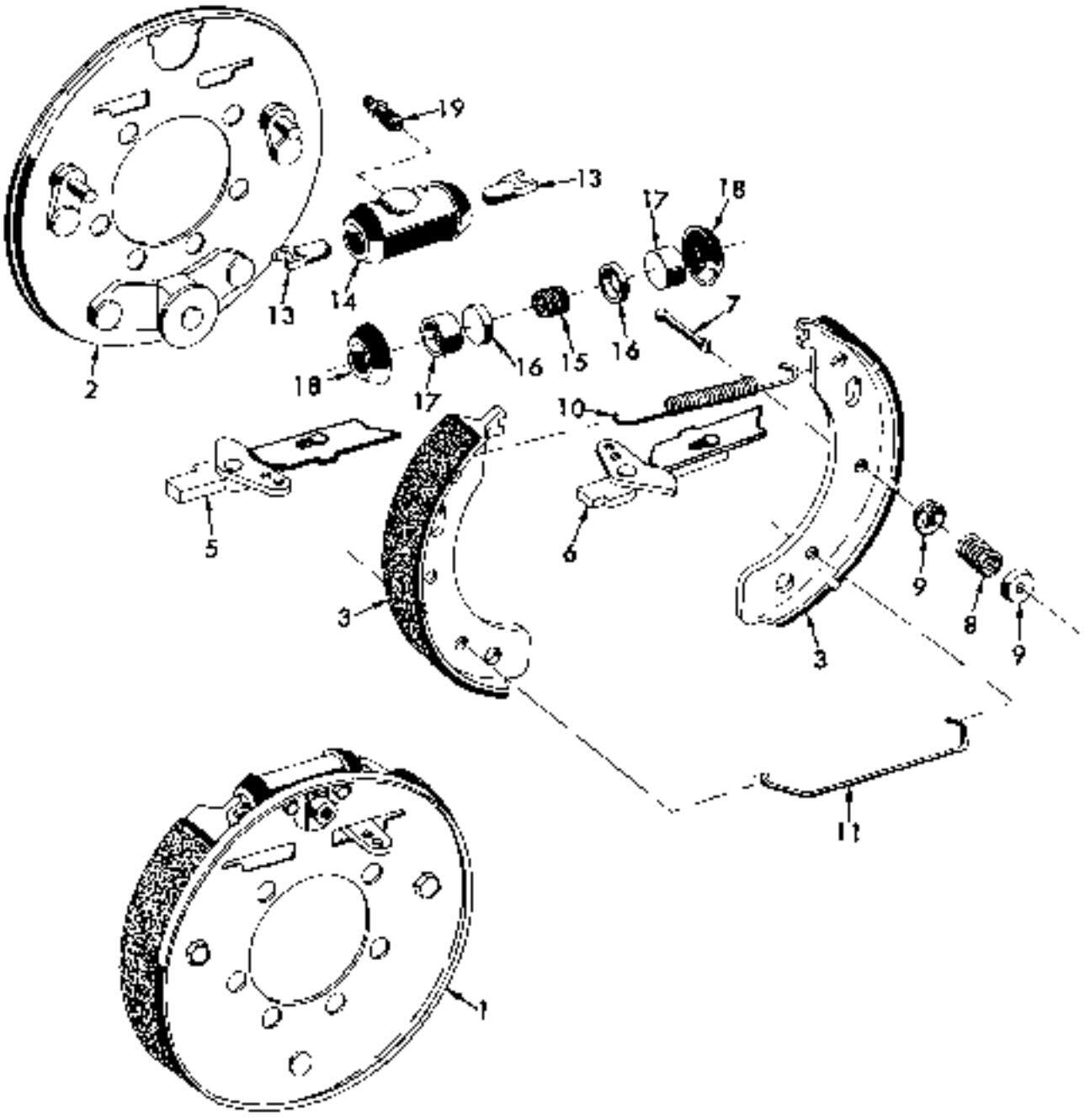


Fig. 2-23 - BRAKES

Ref. No	Part No	DESCRIPTION	No. Per
		BRAKE LINKAGE AND MASTER CYLINDER	
1	35A3571	Pedal - brake and inching	1
2	35A7591	Support - with bearing, brake pedal	1
		50A3861 - Bolt, hex., 1/2"-20 x 2-1/2"	3
3	35A7592	Bearing - support, 3/4" I.D., 1" O.D.	4
4	30A7589	Shaft - brake pedal, 3/4" x 4-1/4"	1
5	35A3574	Bellcrank - pedal to master cylinder	2
6	35A7590	Shaft - bellcrank to support, 3/4" x 3-1/4"	1
7	35A3570	Rod - with clevis, cylinder to bell crank, used with 50A3877 cylinder	1
		50A2826 - Pin, cotter, 1/4" x 1-1/4"	3
8	35A2250	Clevis - bell crank and cylinder rod	1-2
9		50A4284 - Clevis, brake pedal, 7/16"	1
10		50A3856 - Pin, clevis, 7/16"	3
		50A3829 - Pin, cotter, 3/32" x 3/4"	3
11	35A200	Pad - brake pedal	2
		50A4038 - Nut, hex., 3/8"-24	2
12	35A3579	*Spring - pedal return	1
12	35A8010	**Spring - pedal return	1
13	35A3855	Lever - hand brake	1
		50A3073 - Bolt, hex., 3/8"-16 x 5"	2
		50A1345 - Nut, hex., 3/8"-16	2
14	35A3859	Cable - lever to right hand brake, 22" long	1
15	35A3860	Cable - lever to left hand brake, 60-3/4" long	1
		50A602 - Clip, brake cable	1
		GM190016 - Bolt, hex., 1/4"-20 x 1/2"	1
		GM120375 - Nut, hex., 1/4"-20	1
16	35A189	Pin - cable to lever, 5/16" x 13/16"	2
		50A3829 - Pin, cotter, 3/32" x 3/4"	2
17	35A190	Clamp - cable	4
		50A3055 - Bolt, hex., 5/16"-18 x 3/4"	2
		50A3659 - Bolt, hex., 5/16"-18 x 1-3/4"	1
		50A3730 - Nut, hex., 5/16"-18	1
18	35A191	Spacer - between clamps, 1/2" x 1/2"	1
19	35A3601	Pin - clevis, 1/4" x 5/8"	2
		50A3516 - Pin, cotter, 1/16" x 5/8"	2
20	35A3377	Cylinder - master, 1", see page 2-76 for breakdown	1
	35A3956	Cylinder - master, 7/8", see page 2-76 for breakdown	1
		50A4910 - Bolt, hex., 3/8"-16 x 1-1/8"	2
		50A954 - Plug, sq. hd., 1/8"	1
21	35A3834	*Cross - in master cylinder, 4 way, 3/8"-24 to 1/8"-27 N.P.T.	1
		**50A4754 - Tee, cylinder, 3 way, 3/8"-24 to 1/8"-27 N.P.T.	1
		**50A964 - Plug, sq. hd., 1/8"-27 N.P.T.	1
22	35A3832	Tube - cross to right hand brake	1
23	35A3830	Tube - cross to left hand brake	1
24		50A1761 - Connector, tube to brake	2
25		50A940 - Bolt, connector	2
26		50A941 - Gasket, bolt to connector	2
27		50A937 - Gasket, connector to brake	2
28	35A3828	*Tube - cross to inching valve	1
		*GM137420 - Elbow, valve, 3/8"-24 to 1/8"-27 N.P.T.	1
		*Note: Used on trucks with hydraulic inching.	
		**Note: Used on trucks with mechanical inching.	
29	30A6424	Clip - brake tubes	2
30	35A387	Switch - stop light	1

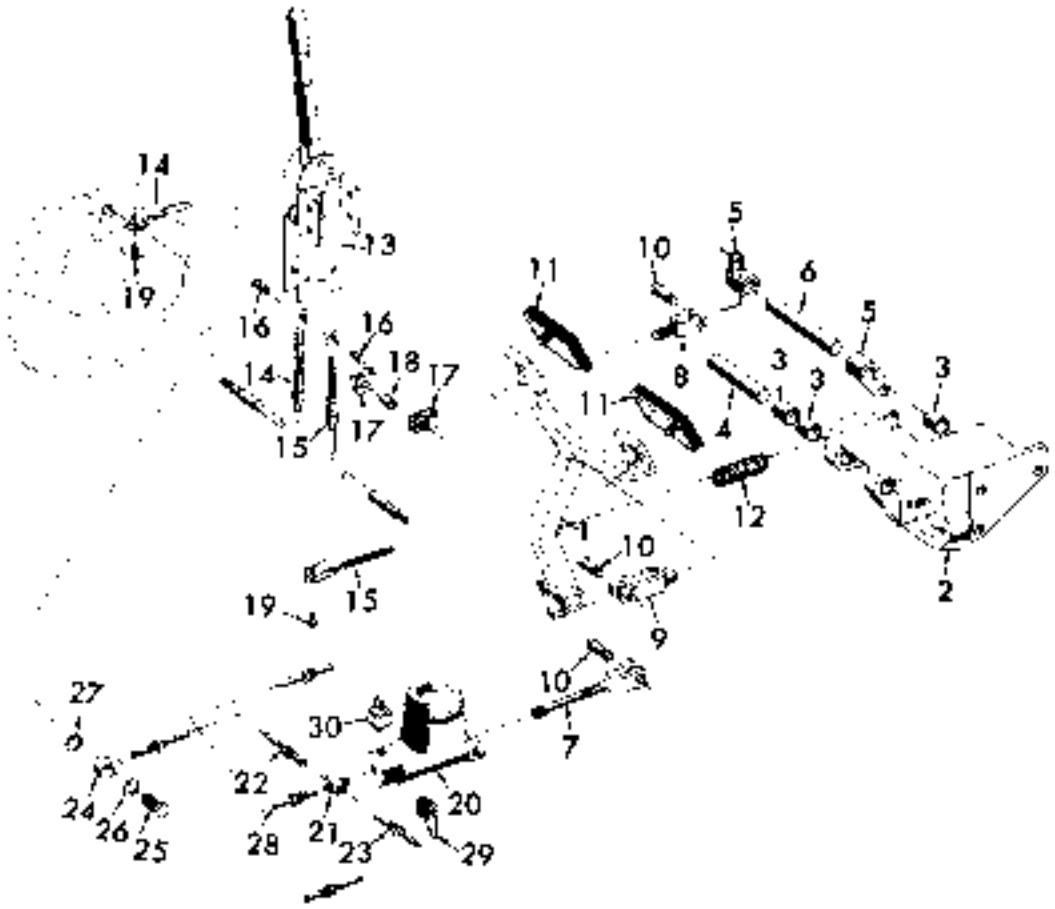


Fig. 2-24 - BRAKE LINKAGE AND MASTER CYLINDER

Ref. No.	Part No.	DESCRIPTION	No. Per
		MASTER CYLINDER - 1"	
		Group I	
1	35A5377	Cylinder - master, 1" (Order 35A8058)	1
		Includes the following 8 parts:	
2	35P961	*Valve - check	1
3	35P923	Spring - check valve	1
4	10P208	*Cup - check valve spring	1
5	35P962	*Piston	1
6	35P963	*Lockring	1
7	35P231	*Boot - rubber	1
8	35P925	Cap - filler	1
9	35P924	Gasket - filler cap	1
	35P922	*Repair Kit - for 1" cylinder	*
		*NOTE: Repair Kit consists of parts identified with an asterisk (*).	
10	30A5376	Rod - with clevis, cylinder to bell crank	1
		MASTER CYLINDER - 7/8"	
		Group II	
11	35A8058	Cylinder - master, 7/8"	1
		Includes the following 10 parts:	
12	35P380	Rod - cylinder, less clevis	1
13	35P1040	**Valve - check, assembly	1
14	35P1041	Spring - check valve	1
15	35P1042	**Cup - check valve spring	1
16	35P1043	** Piston - cylinder (includes "O" ring)	1
17	35P1044	**"O" Ring - piston	1
18	35P1045	** Lockring - piston	1
19	35P381	**Boot - cylinder (rubber)	1
8	35P925	Cap - filler	1
9	35P924	Gasket - filler cap	1
	35P1597	**Repair Kit - for 7/8" cylinder	1
		**NOTE: Repair Kit consists of parts identified with a double asterisk (**).	
22	35A2253	Clevis - cylinder rod, 7/16"-20	1
23		30A1740 - Nut, hex. jam, 7/16"-20	1

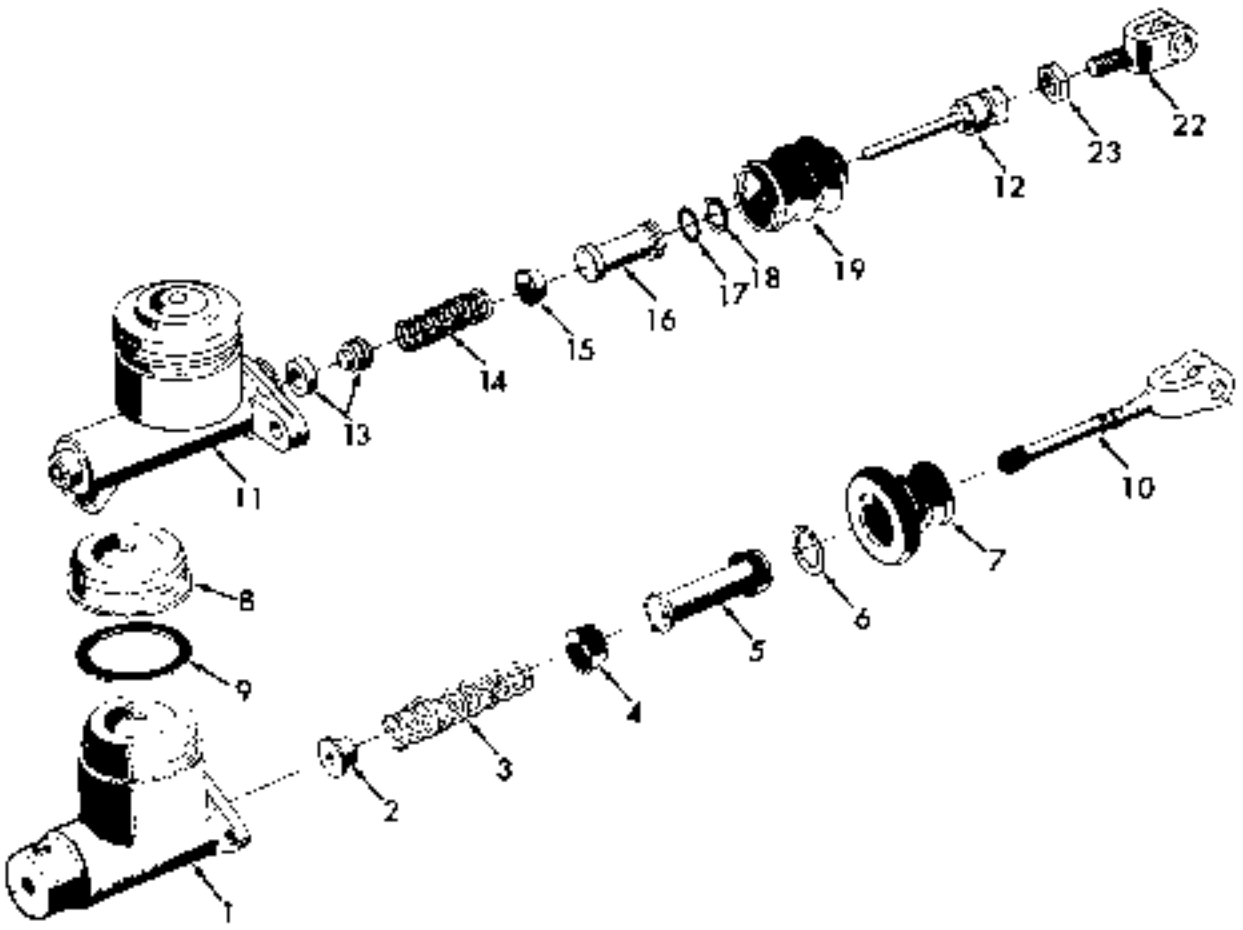


FIG. 2-24A - MASTER CYLINDERS

Ref. No.	Part No.	DESCRIPTION	No. Per
		HOOD, PANELS AND SEAT	
1	36A6165	Hood - assembly	1
2	35A6268	Shaft - hood to support, 1/2" x 18-3/4"	1
		50A1627 - Ring, snap, 1/2"	2
3	35A8067	Grommet - rubber bumper, 3/16" dia., gasoline engine	4
4	36A6400	Support - hood, front, with grille	1
		50A3866 - Bolt, hex., 3/8"-16 x 1"	4
		50A1900 - Nut, hex., 3/8"-16	4
5	35A6495	Shield - gas cap, regular	1
	36A8099	Shield - filler, gas tank (for GS or LPS equipped)	1
	35A7595	Seal - shield, (for GS or LPS equipped)	1
6	35A5424	Closure - hydraulic, oil tank	1
		50A3855 - Bolt, hex., 5/16"-18 x 3/4"	6
		50A9750 - Nut, hex., 5/16"-18	6
		50A4281 - Washer, plain, 3/8" I.D., 7/8" O.D.	3
7	35A5346	Hood - extension, rear, gasoline engine	1
		50A3854 - Bolt, hex., 5/16"-18 x 5/8"	3
		50A9750 - Nut, hex., 5/16"-18	3
8	35A6068	Link - side, on front support	2
9	35A6069	Spacer - inside support	1
10	D6814	Pin - link to support, 3/4" x 1-5/8"	1
		50A4210 - Washer, plain, 13/32" I.D., 18/16" O.D.	2
		50A3529 - Pin, cotter, 3/32" x 3/4"	2
11	35A5402	Link - with pin, hood, 3/4" x 5-1/4"	1
12	10A15973	Pin - link to hood, 3/8" x 1-1/8"	1
		50A3762 - Pin, cotter, 1/8" x 3/4"	1
13	35A6072	Spring - hood latch	1
14	35A6070	Anchor - hood spring	2
15	35A6071	Pin - hood anchor, 5/16" x 1-1/4"	1
		50A3529 - Pin, cotter, 3/32" x 3/4"	2
		50A4282 - Washer, plain, 11/32" I.D., 11/16" O.D.	2
16	36A5412	Panel - side, right hand	1
17	36A5413	Panel - side, left hand	1
		50A8668 - Bolt, hex., 3/8"-16 x 1-1/2"	4
		50A2028 - Washer, plain, 13/32" I.D., 1" O.D.	4
18	36A4960	Emblem - hood, 1-7/16" x9-29/32"	2
		GM131014 - Washer, plain, 5/32" I.D., 3/8" O.D.	8
		50A3755 - Nut, hex., No. 6-32	6
19	36A6148	*Cowl - assembly	1
19	35A8216	**Cowl - assembly	1
		*GM180175 - Bolt, hex., 1/2"-13 x 1-1/4"	3
		**50A3881 - Bolt, hex., 1/2"-13 x 1-1/2"	2
		*GM180178 - Bolt, hex., 1/2"-13 x 1-3/8"	1
		50A8682 - Bolt, hex., 1/2"-13 x 1-3/4"	6
		*GM180180 - Bolt, hex., 1/2"-13 x 1-7/8"	1
		*GM180120 - Bolt, hex., 3/8"-16 x 3/4"	2
		GM180123 - Bolt, hex., 3/8"-16 x 1-1/2"	4
		**50A4910 - Bolt, hex., 3/8"-16 x 1-1/8"	4
		*GM131579 - Nut, lock., 3/8"-16	8
		**50A4008 - Nut, acorn, 3/8"-16	4
20	35A8359	*Panel - instrument	1
		*GM180077 - Bolt, hex., 5/16"-18 x 3/4"	8
		*50A1764 - Nut, speed, type I, 5/16"	8
		*GM120893 - Washer, plain, 11/32" I.D., 11/16" O.D.	8
21	35A6135	*Support - steering column, upper	1
		*GM180122 - Bolt, hex., 3/8"-16 x 1"	4
		*GM120877 - Nut, hex., 3/8"-16	4
22	35A5408	*Clamp - steering column	1
		*GM180124 - Bolt, hex., 3/8"-16 x 1-1/4"	4
		*GM120894 - Washer, plain, 13/32" I.D., 13/16" O.D.	5

Ref. No	Part No.	DESCRIPTION	No. Req
		HOOD, PANELS, AND SEAT (Cont'd)	
29	35A6130	Bracket - steering column to cowl, lower section	2
	35A7696	** Panel - instrument	1
	35A3109	** U-Bolt - steering column	2
		** 50A5730 - Nut, hex., 5/16"-18	7
		** 50A1421 - Washer, plain, 11/32" I.D., 11/16" O.D.	8
		* NOTE: Used on MA 30 Trucks to No. 26000125, Inc.	
		* NOTE: Used on MA 40 Trucks to No. 26100043, Inc.	
		* NOTE: Used on MA 50 Trucks to No. 26200165, Inc.	
		** NOTE: Used on MA 30 Trucks No. 26000126 and after.	
		** NOTE: Used on MA 40 Trucks No. 26100044 and after.	
		** NOTE: Used on MA 50 Trucks No. 26200166 and after.	
24	35A6385	Seat - assembly, bucket type	1
		50A5002 - Nut, hex., 5/16"-24 U.N.F.	4
		50A4202 - Washer, plain, 11/32" I.D., 11/16" O.D.	4
		Includes the following 6 parts:	
	35P1316	Seat - shell, with foam rubber, 3" (35P1313)	1
	35P1314	Cover - seat, for 2" foam rubber	1
	35P1317	Cover - seat, for 3" foam rubber	1
	35P496	Slide - seat, left hand	1
	35P496	Slide - seat, with adjusting arm	1
	35P1315	Spring - adjusting arm	1

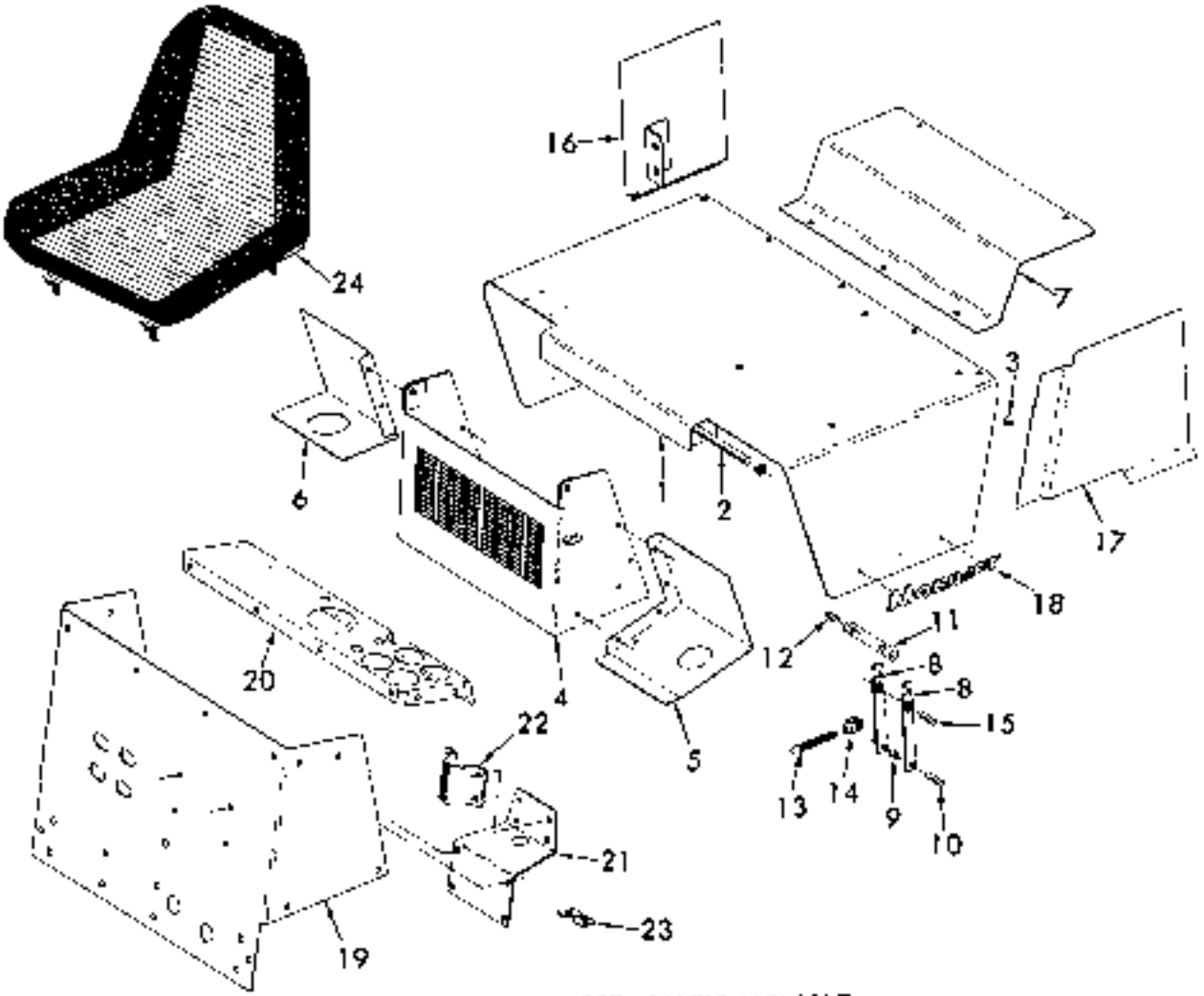


Fig. 2-25 - HOOD, PANELS AND SEAT

Ref. No.	Part No.	DESCRIPTION	No. Per
		FRAME, OVERHEAD GUARD AND COUNTERWEIGHT	
1	--------	Frame - main, assembly	1
		Includes the following part:	
		50A4445 - Plug, hex., socket, 3/8" N.P.T.	2
		50A4439 - Plug, pipe, 1/4" N.P.T.	1
		50A4441 - Plug, pipe, 1/2"	1
	35A6222	Pin - pivot, steering housing	1
2	--------	Guard - overhead, order from Mobilift Sales Department	1
		GM180122 - Bolt, hex., 3/8"-16 x 1"	6
		50A1985 - Nut, hex., lock, 3/8"-16	4
		GM426767 - Nut, hex., 7/8"-14	2
		GM446266 - Washer, plain, 15/16"	2
3	35A6736	Counterweight - MA 30	1
		50A8711 - Bolt, hex., 3/4"-10 x 3-1/2", MA 30	1
3	35A6225	Counterweight - MA 40	1
		50A1068 - Bolt, hex., 3/4"-10 x 6", MA 40	1
3	35A6132	Counterweight - MA 50	1
		50A1073 - Bolt, hex., 3/4"-10 x 8-1/2", MA 50	1
		50A4214 - Washer, plain, 5/32" thick	1
		50A3751 - Nut, hex., 3/4"10	1
4	35A6826	Pin - hitch, 1" x 6-3/8"	1
		50A2232 - Pin, roll, 5/16" x 2-1/4"	1
5	35A3429	Bracket - engine mount	1
		50A3691 - Bolt, hex., 5/8"-11 x 1-1/4"	2
6	35A3430	Mounting - center bonded	2
		50A3667 - Bolt, hex., 1/2"-13 x 8"	2
		50A4087 - Washer, plain, cad., 7/64" x 9/16" I.D., 7/8" O.D.	4
		50A2530 - Washer, plain, 1/4" x 17/32" I.D., 2" O.D.	2
		50A1799 - Nut, elastic stop, cad., 1/2"-13	2
7	36A6128	Breather - filler cap, with dip stick, used with duplex mast	1
7	35A7185	Breather - filler cap, with dip stick, used with high free and low free masts	1
8	36A5389	*Support - steering gear and cowl	1
	36A5390	**Support - steering gear	1
		GM271547 - Bolt, hex., 5/8"-11 x 1-1/2"	3
		GM180178 - Bolt, hex., 1/2"-13 x 1-3/4"	10
		GM120378 - Nut, hex., 1/2"-13	10
9	35A5342	Support - axle housing, right hand	1
10	35A5343	Support - axle housing, left hand	1
		50A3708 - Bolt, hex., 3/4"-10 x 2-1/2"	4
		*50A3709 - Bolt, hex., cad., 3/4"-10 x 2-3/4"	8
11	35A5220	*Bracket - tilt cylinder mount, U-shaped	2
	35A6823	**Bracket - tilt cylinder mount, U-shaped	1
		*GM271771 - Bolt, hex., cad., 3/4"-10 x 2"	4
		*50A1135 - Nut, grip lock, 3/4"-10	4
		*GM181017 - Washer, flat, 1/8" x 23/16" I.D., 1-1/2" O.D.	4
12	36A7145	*Plate - floor	1
	36A6290	**Plate - floor	1
		50A3684 - Bolt, hex., 3/8"-16 x 3/4"	2
	35A7769	Bumper - floor plate (sponge rubber)	2
13	36A7143	*Clip - support, floor plate, front	2
	35A8217	**Clip - floor plate, front	1
14	36A6200	*Support - engine mounting, left hand	1
15	35A6201	*Support - engine mounting, right hand	1
16	36A6202	*Support - hood, front, left hand	1
	35A8229	**Support - hood, front, left hand	1
17	35A6203	*Support - hood, front, right hand	1
	35A8230	**Support - hood, front, right hand	1
		50A3667 - Bolt, hex., 3/8"-16 x 1-1/4"	8
		50A4205 - Washer, plain, 13/32" I.D., 13/16" O.D.	8
18	35A6204	*Support - flywheel housing, left hand	1

Ref. No	Part No.	DESCRIPTION	No. Per
		FRAME, OVERHEAD GUARD AND COUNTERWEIGHT (Cont'd)	
19	30A6206	*Support - flywheel housing, right hand	1
		*30A3686 - Bolt, hex., 3/8"-16 x 1"	8
		*GM160207 - Bolt, hex., 9/16"-12 x 1-1/2"	6
		*GM124683 - Nut, hex., 9/16"-12	6
		*GM191458 - Washer, plain, 29/32" I.D., 1-3/16" O.D.	6
		*30A4210 - Washer, plain, 18/32" I.D., 13/16" O.D.	8
	35A6250	**Safety Walk - floor plate, 7" x 21-1/2"	1
	35A6255	**Safety Walk - frame, L.H. side, 5-1/4" x 7"	1
		*NOTE: Used on MA 30 Lift Trucks to No. 28000185, Inc.	
		*NOTE: Used on MA 40 Lift Trucks to No. 26100543, Inc.	
		*NOTE: Used on MA 50 Lift Trucks to No. 26200185, Inc.	
		**NOTE: Used on MA 30 Lift Trucks No. 28000126 and after.	
		**NOTE: Used on MA 40 Lift Trucks No. 26100544 and after.	
		**NOTE: Used on MA 50 Lift Trucks No. 26200186 and after.	

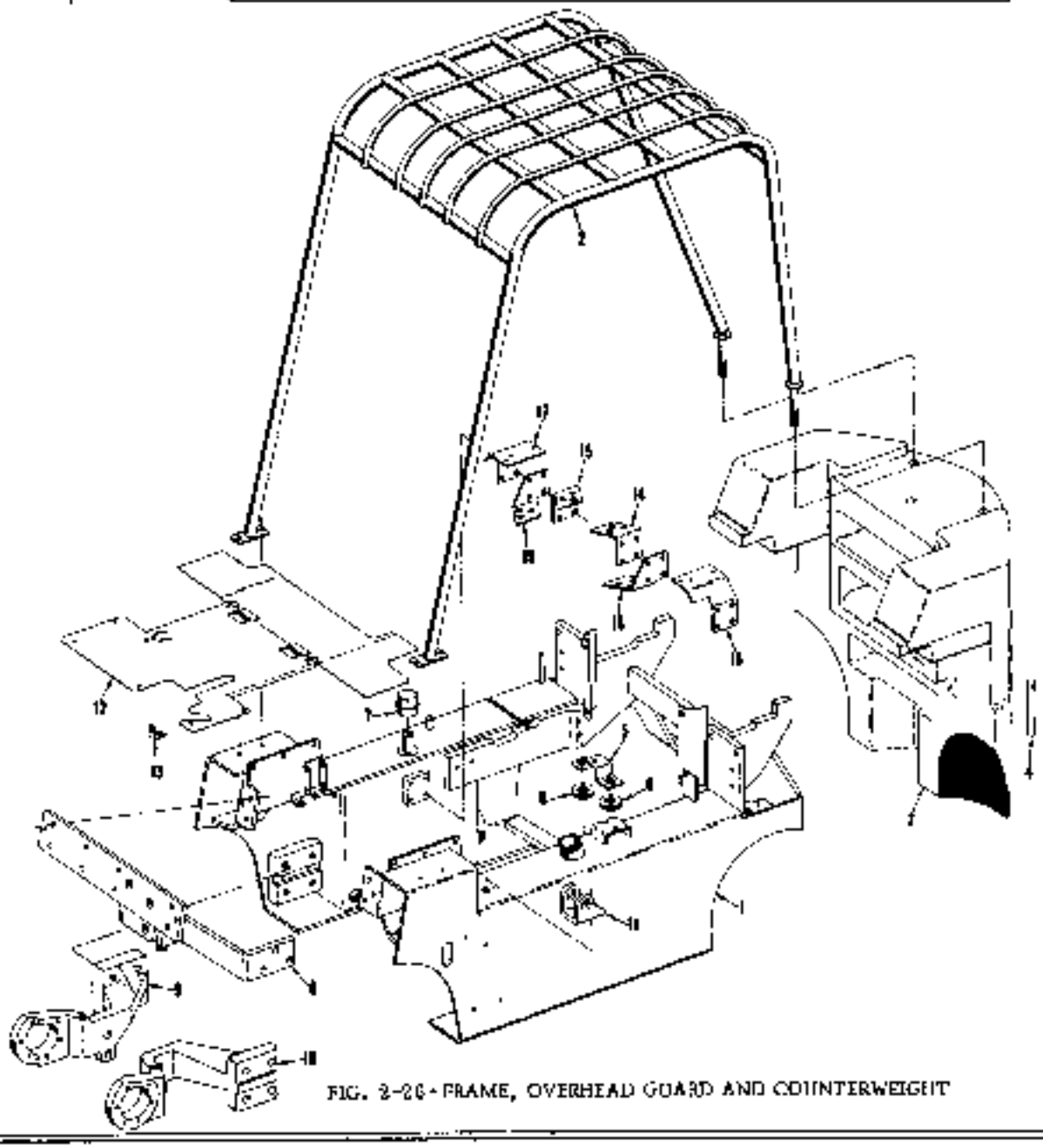


FIG. 2-26 - FRAME, OVERHEAD GUARD AND COUNTERWEIGHT

Ref. No.	Part No.	DESCRIPTION	No. Req'd
		HYDRAULIC PUMP	
1	35A7410	Pump - 16.5 G.P.M., MA 30 less P.S., Wooster No. P3-13BH5-1-R-01	1
1	35A7580	Pump - 16.5 G.P.M., MA 30 with P.S., Wooster No. PVP3-13EH5-1-R-02	1
1	35A5846	Pump - 21 G.P.M., MA 40 and MA 50, Wooster No. PVP3-19EH-5-1-R-02	1
		50A1750 - Bolt, hex., 3/8"-16 x 6-1/4"	1
		50A1751 - Bolt, hex., 3/8"-16 x 5-1/4"	1
		50A1629 - Star-o-seal, pump bolts	2
		50A1045 - Nut, hex., (Extra) 3/8"-16	1
		50A1732 - Nut, elastic stop, pump shaft, 5/8"-18	1
2	35P1111	Body - pump, for 35A7410 and 35A7580 pumps	1
2	35P999	Body - pump, for 35A5846 pump	1
3	35P981	Cover - body, rear, for 35A7580 and 35A5846 pumps	1
3A	35P1112	Cover - body, rear, for 35A7410 pump	1
4		GM433114 - Bolt, hex., 3/8"-16 x 4-1/4" for 35A7410 and 35A7580 pumps	4 or 6
5		GM450517 - Bolt, hex., 3/8"-16 x 4-3/4" for 35A7580 pump	2
4		GM18E225 - Bolt, hex., 3/8"-16 x 4-1/8" for 35A5846 pump	4
5		GM18E299 - Bolt, hex., 3/8"-16 x 5" for 35A5846 pump	2
6	35P1116	Washer - cover bolts, for 35A7410 and 35A7580 pumps	6
6	35P988	Washer - cover bolts	6
7	35P990	Cover - body, front	1
8	35P997	Seal - oil, front cover to shaft	1
9	35P998	Seal - front cover to body on 35A5846 and 35A7580 front and rear on 35A7410 pumps	2
10	35P996	Gasket - seal, front cover to body	1
11	35P995	Spacer - front cover to body	1
12	35P1000	Gasket - seal, rear cover to body, for 35A7580 and 35A5846 pumps	1
13	35P1118	Gear - drive, for 35A7410 and 35A7580 pump	1
13	35P982	Gear - drive, for 35A5846 pump	1
14	35P1114	Gear - driven, for 35A7410 and 35A7580 pumps	1
14	35P983	Gear - driven	1
15	35P994	Bearing - drive and driven gears	4
15A	35P1117	Plug - rear plate, 1-5/16"-12, for 35A7410 pump	1
15B	10A12027	"O" Ring - plug, 1-3/16" I.D., 1-7/16" O.D., for 35A7410 pump	1
16	35P1600	Valve - flow divider, for 35A5846 pump and 35A7580 pump (35P1001) Includes the following 9 parts:	1
17	-------	Cartridge - assembly, includes seat (Order 35P1600)	1
18	-------	Piston - cartridge for 35A5846 and 35A7580 pumps (Order 35P1600)	1
19	35P1104	Spring - piston, outer	1
20	35P1105	Spring - piston, inner	1
22	10A6830	Snap Ring - cartridge	1
23	35P1101	Ball Guide - assembly	1
24	35P1102	Screw - adjusting	1
25	35P1105	Spring - pressure, inner, ball guide	1
26	35P1106	Spring - pressure, outer, ball guide	1
27	35P1103	Plug - cartridge	1
28	35P1107	Gasket - plug	1
29	10P1784	"O" Ring - flow divider, inner	1
30	10A75	"O" Ring - flow divider, intermediate	2
31	10A80	"O" Ring - flow divider, upper	1
32	35P511	Gear - hydraulic pump, Continental No. P400H-036	1
33		GM106751 - Key, Woodruff, No. 9, for 35A7410 and 35A5846 pumps	1
		GM106736 - Key, Woodruff, No. 5/32" x 5/8", for 35A7580 pump	1
34	35A705	Gasket - hydraulic pump	1

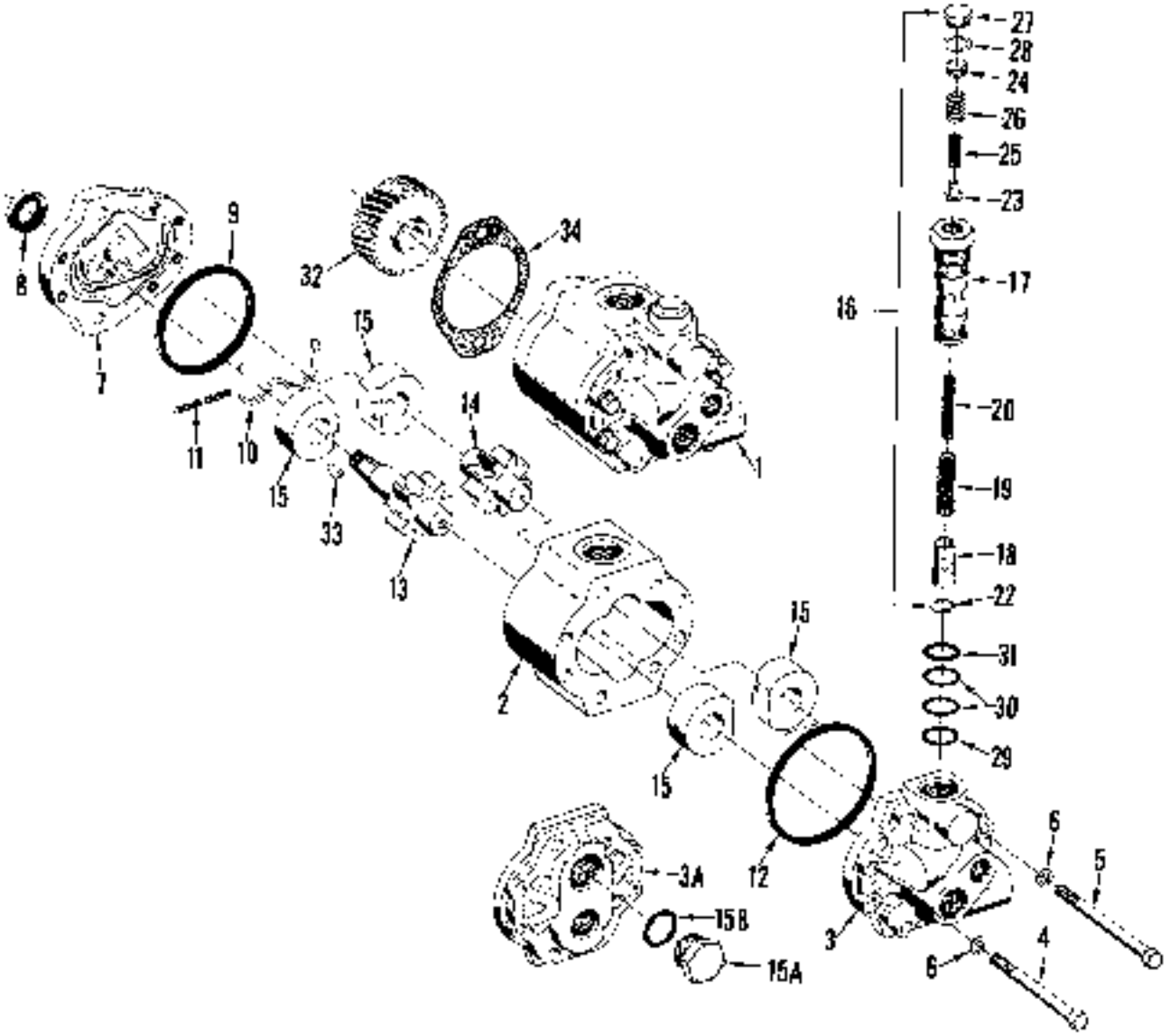


Fig. 2-27 - HYDRAULIC PUMP

Ref. No.	Part No.	DESCRIPTION	No. Pcs.
		MAST CONTROL VALVE	
1	35A7411	Valve - control, complete, MA 30	1
1	35A6478	Valve - control, complete, MA 40 and MA 50	1
		Each includes the following 25 parts:	
		50A1825 - Bolt, hex., 3/8"-16 x 2-1/2"	3
		50A1900 - Nut, hex., 3/8"-16	3
2	15P660	Seal - spool	4
3	15P656	Spring - spool centering	2
4	10P1652	Washer - stop, centering spring	2
5	15P654	Collar - stop, centering spring	2
6	15P652	Bolt - stop collar	2
7	10P1600	Washer - lock, stop collar bolt	2
8	15P655	Disc - stop collar	2
9	15P657	Ring - snap, stop disc	2
10	15P663	Bonnet - rubber, spool opening	2
11	35P210	Plug - ball check	1
12	10A6329	"O" ring - ball check plug	1
13	35P218	Plunger - check and relief valve	2
	20P2777	Spring - plunger, check valve (D5 and after)	1
14	35P216	Seat - relief valve	1
15	10A12012	"O" Ring - relief valve seat	1
16	35P227	Spring - relief	1
17	35P222	Guide - relief valve	1
18	35P213	Ball - relief guide	1
19	10A16499	Washer - spacer, relief spring	1
20	10A16496	Shim - relief spring	1
21	10A16497	Gasket - relief spring cap	1
22	35P220	Cap - relief spring	1
23	35P217	Plug - port	1
24	35P225	"O" Ring - port plug	1
25	35P1034	Plug - conversion, special	1
26	15P747	Gasket - conversion plug	1
27	36A6500	Plate - support, valve and handles	1
		50A3669 - Bolt, hex., 3/8"-16 x 1"	2
28	36A3599	Handle - control, raise and lower (36A5396)	1
29	36A8600	Handle - control, tilt (36A5397)	1
		50A4210 - Washer, plain, 13/32" I.D., 13/16" O.D.	3
	35A7797	Washer - handles (Belleville)	2
30	35A5394	Pin - handle to support, 3/8" x 4-3/8"	1
		50A2939 - Pin, roll, 1/8" x 1"	2
31	35A6439	Link - handle to valve spool, 5/8" x 2-1/4"	4
32	35A4119	*Knob - control handle (threaded)	2
33	35A6356	*Label - lift control	1
34	35A6355	*Label - tilting lever	1
32	35A3293	**Knob - tilt cylinder (not threaded)	1
32	35A3294	**Knob - tilt cylinder (not threaded)	1
		**50A4857 - Ring, knob to handle	2
		*NOTE: Used on trucks with 2 piece knobs.	
		**NOTE: Used on trucks with solid knobs.	

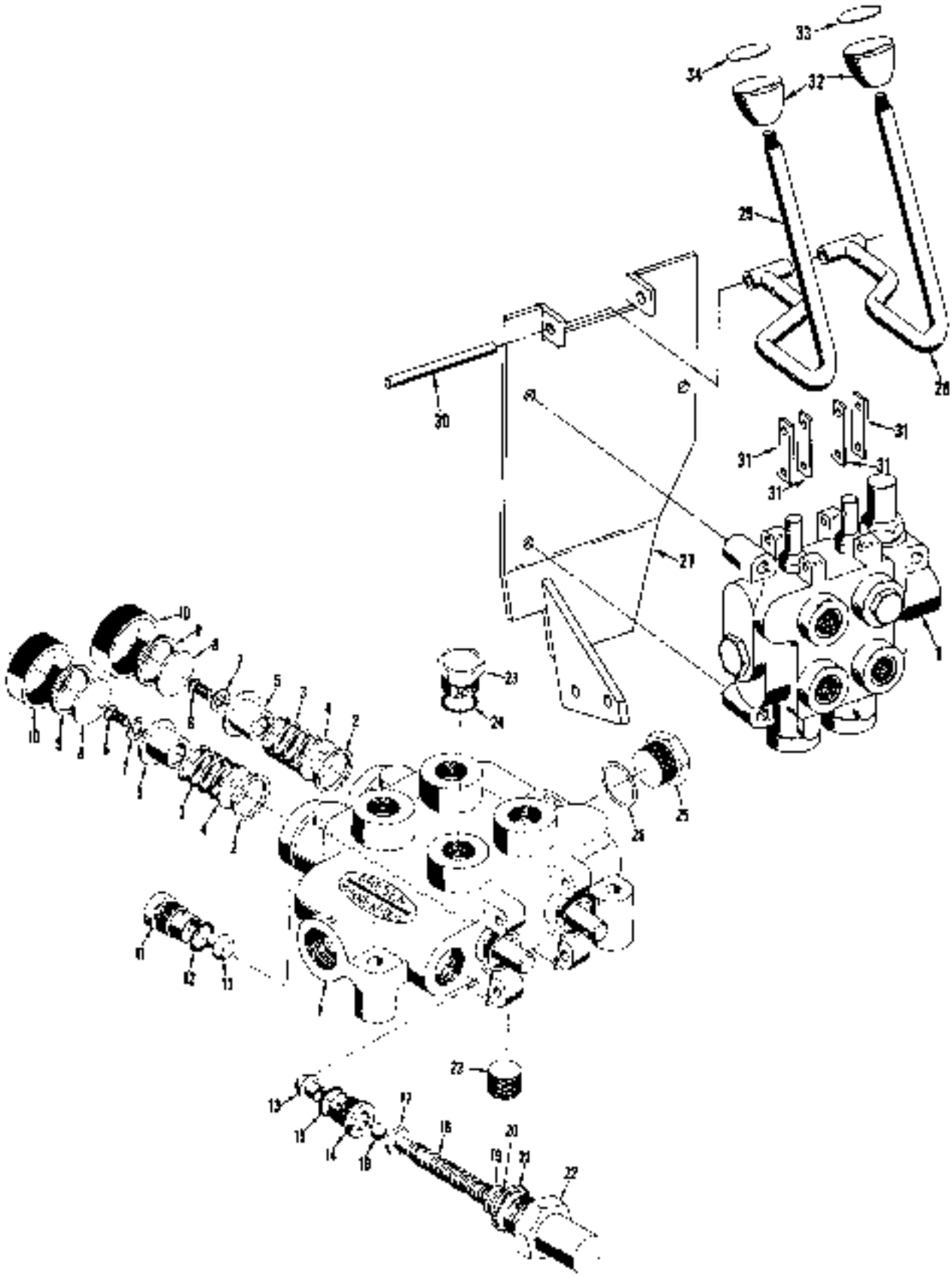


Fig. 2-28 - MAST CONTROL VALVE

Ref. No.	Part No.	DESCRIPTION	No. Per
		HYDRAULIC OIL LINES AND FITTINGS	
1	35A686	Strainer - on oil tank	1
2	36A6205	+Flange - strainer	1
2	36A8331	-+Flange - strainer	1
		50A6666 - Bolt, hex., 3/8"-16 x 7/8"	6
3	35A3295	Gasket - flange to tank	1
4	35A6336	+Tube - pump to strainer	1
4	35A6337	++Tube - pump to strainer	1
5		+50A2415 - Elbow, 1" x 3/4"	1
5	10A14720	++Elbow - flange (rubber)	1
6		50A4805 - Elbow, 1-5/16" x 12, 30°	1
7	10A12027	"O" Ring - elbow to pump	1
8	10A67	+Hose - connecting, tube to elbow	1
		50A4285 - Clamp, hose, 1-3/8"	2
8		+50A2460 - Nipple, pipe, 3/4"	1
		+NOTE: Used on MA 30 Trucks to No. 29000125, Inc.	
		+NOTE: Used on MA 40 Trucks to No. 26100543, Inc.	
		+NOTE: Used on MA 50 Trucks to No. 26200165, Inc.	
		++NOTE: Used on MA 30 Trucks No. 29000126 and after.	
		++NOTE: Used on MA 40 Trucks No. 26100544 and after.	
		++NOTE: Used on MA 50 Trucks No. 26200166 and after.	
10	35A6286	*Tube and Hose - assembly, pump to steering gear, 46-3/4"	1
10A	35A6306	*Hose - tube, 3/8" I.D., x 2" long	1
11	35A6173	*Adapter - pump to tube, 9/16"-18 J.I.C.	1
12	10A12012	*"O" Ring - connector to pump	1
13	35A3503	*Tube - steering gear to hyd. tank (35A6305)	1
14		50A4413 - Elbow, 1/4" P.T., 9/16", 90°	1
14A		50A4084 Clip - steering gear tube, (10A12478)	1
		GM190116 - Bolt, hex., 3/8"-16 x 3/4"	1
		*NOTE: Used on Lift Trucks with power steering.	
15	35A6881	Tube - pump to control valve	1
16		50A4383 - Elbow, 90°	1
17	10A14630	"O" Ring - elbow to pump	1
18	35A1326	Hose - tube to control valve	1
19		50A4425 - Elbow, 90°, 7/8"-14 O.N.F.	2
	10A16235	"O" Ring - valve inlet	2
20	35A6382	Tube - valve to tank sump	1
21	35A6502	Hose - tube to tank sump, 13/16" I.D. x 3-1/2" long (35A3038)	1
		50A4285 - Clamp, hose, 1-3/8"	2
22	35A6732	Tube - valve to tilt cylinder tee, forward tilt	1
23	35A6739	Tube - valve to tilt cylinder tee, back tilt	1
24	35A1297	Tee - tubes	2
25		50A4445 - Plug, pipe, hex. socket, 1/8"-27	2
26		50A4424 - Elbow, tube to valve, 3/4"-16, 90°	2
	10A12012	"O" Ring - elbow to valve	2
27	10A16296	"O" Ring - elbow to valve	2
28	35A6139	Hose - tee to tilt cylinder, short, 3/8" x 15"	2
29	35A6140	Hose - tee to tilt cylinder, long, 3/8" x 19"	2
30		50A4423 - Elbow, 90°, 3/16"-18 N.F.	4
31	10A16496	"O" Ring - elbow to cylinder	4
32	35A7860	Tube - manual valve to tilt cylinder (35A6134)	1
34	35A4567	Hose - tilt cylinder to tube, 1/2" I.D. x 29-1/2" (35A1269)	1
35		50A4428 - Connector, hose, 7/8"-14 N.F.	1
	10A16255	"O" Ring - connector	1
		50A609 - Clip, lift cylinder, hose	1
36	35A4041	Hose - tilt cylinder to tank sump, 5/8" O.D. x 24"	1
		50A4305 - Clamp, hose, 5/8"	2
37		50A2384 - Nipple, pipe, 1/8" x 1-1/2"	1
38	35A7215	** Cover - filter	1
39	35A6206	**Gasket - filter cover	1
		**NOTE: Used on Triplex Masts 190" and up.	

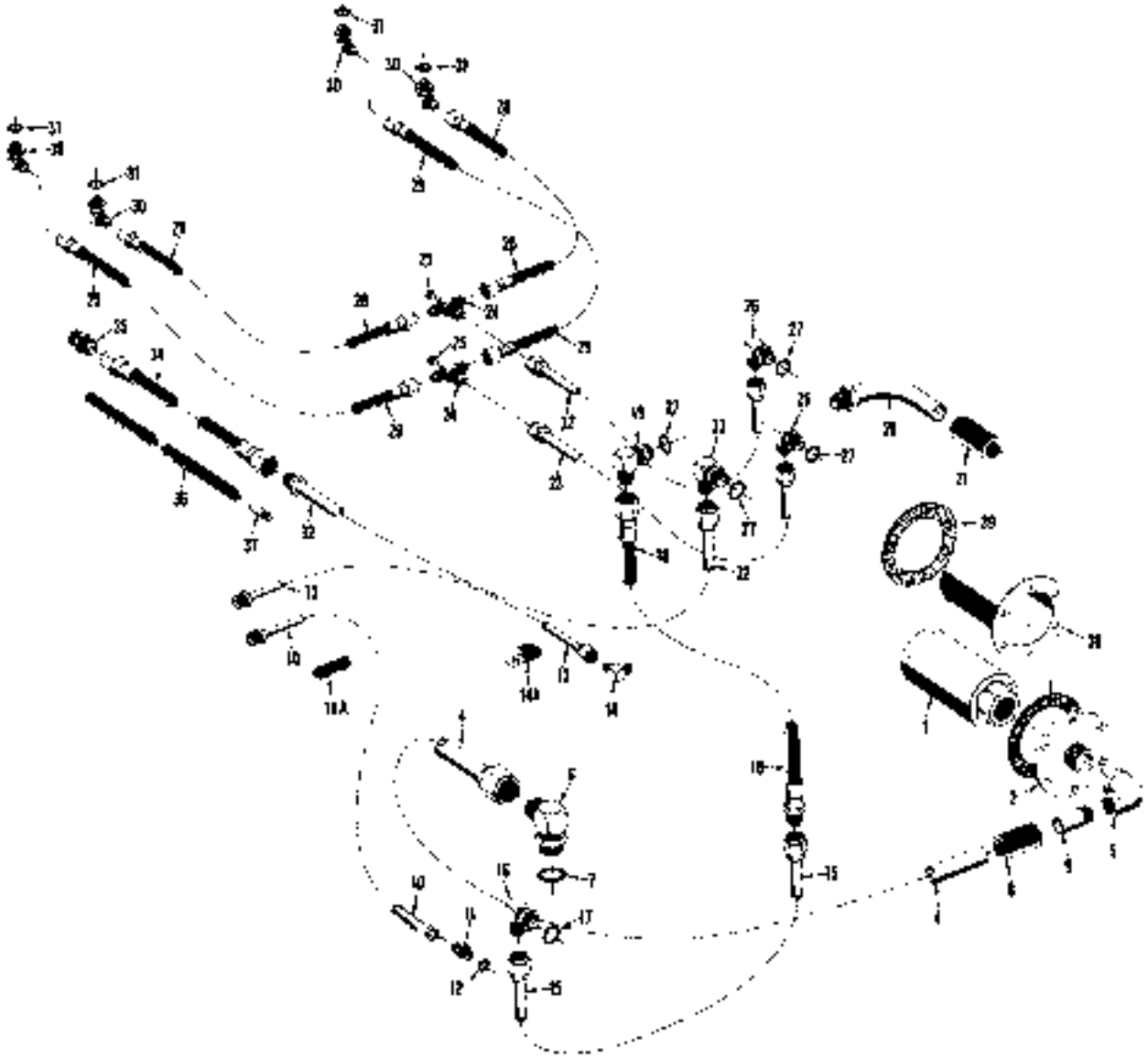


Fig. 2-29 - HYDRAULIC OIL LINES AND FITTINGS

Ref No	Part No	DESCRIPTION	No. Pcs.
		TILT CYLINDER	
1	35A6080	+Cylinder - assembly	2
2	35A8338	++Cylinder - assembly Each includes the following 18 parts:	2
3	35P1033	+Shell - assembly	2
4	35P1923	++Shell - assembly	2
5	35P3DE	Piston - half	2
6	35P241	Piston - half	2
7	35P310	*"O" Ring - piston to rod	2
8	35P307	*Rider - nylon, piston	4
9	35P308	Packing - assembly	2
10	35P948	+Rod - piston, 11-1/2" long, for 35A6080 cylinder	2
10	35P1924	++Rod - piston, 11" long, for 35A8338 cylinder	1
11		50A1140 - Nut, piston rod, 1-1/8"-12	2
12	35P208	Retainer - piston rod seal	2
13	35P814	Bushing - piston rod retainer	2
14	M1065	*"O" Ring - retainer to bushing	2
15	35P204	*Packing - assembly	2
16	35P309	*"O" Ring - retainer to outer shell	2
17	10A7845	*Ring - back-up, retainer "O" ring	2
18	35P210	Washer - threaded with nylon pellet	2
19	35P135	Pellet - nylon, threaded washer	2
20	35P209	*Ring - wiper, piston rod	2
	35R82	*Repair Kit - cylinders *NOTE: Repair Kit consists of the above parts identified by an asterisk (*).	1
21	35B6826	End - piston rod Includes the following part:	2
22	19A13163	+‡Bushing - piston rod end and head end	4-2
		GM151643 - Bolt, hex., 3/8"-24 x 1-1/2"	2
		GM120369 - Nut, hex., 3/8"-24	2
23	35A7236	++Bearing - head end, on 35A8338 cylinder	2
24	35A6301	‡‡Pin - cylinder, upright end, 1-1/4" x 3-1/4"	4-2
		50A1771 - Pin, roll, upright end, 1/4" x 3"	2
25	35A8588	++Pin - cylinder, head end, rear, 1" O.D. x 2-5/16" long	2
		50A4187 - Set Screw, dog point, frame end, 3/8"-16 x 5/8"	2
		+NOTE: Used on MA 30 Trucks to No. 25000125, Inc.	
		+NOTE: Used on MA 40 Trucks to No. 26100543, Inc.	
		+NOTE: Used on MA 50 Trucks to No. 26200185, Inc.	
		++NOTE: Used on MA 30 Trucks No. 28000120 and after.	
		++NOTE: Used on MA 40 Trucks No. 26100544 and after.	
		++NOTE: Used on MA 50 Trucks No. 26200186 and after.	

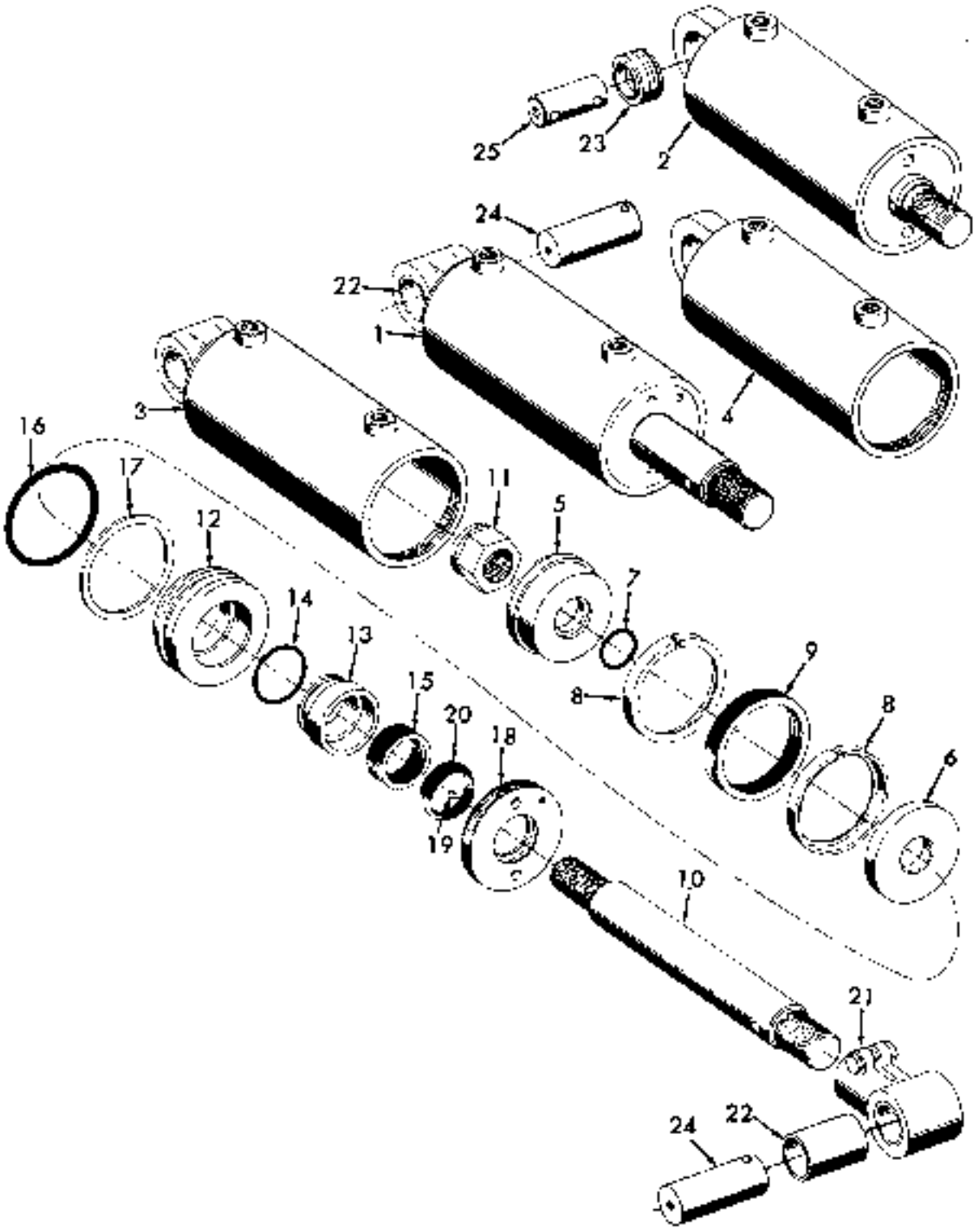


FIG. 2-30 - TILT CYLINDER

Ref. No.	Part No.	DESCRIPTION	No. Per
		DUPLEX MAST	
1	-------	Rail - outer assembly, see chart on page 118	1
		Includes the following 2 parts:	
2	35A5654	Cap - bearing, outer rail pivot	2
	35A5366	Screw - bearing cap, 5/8"-11 x 2-3/4"	4
		GM191758 - Fitting, grease, 1/8" straight	4
3	35A5727	Bushing - bearing cap	2
4	-------	Rail - inner assembly, see chart on page 118	1
5	35A5535	Shoe - mast	8
		50A1676 - Screw, hex. socket, 3/8"-16 x 5/8"	12
6	35A5536	Shim - mast shoe	A/R
7	35A706	Roller - mast	10
8	D317	Bearing - mast roller	10
9		50A671 - Ring, snap, mast bearing, 2-5/32" I.D.	10
10		50A578 - Ring, snap, mast bearing, 1-3/8" I.D.	10
11	-------	Carriage - assembly, order from Mobilift Sales Department	1
12	35A5017	Bearing - thrust, carriage	4
13	35A5766	Pin - thrust bearing	4
		GM102534 - Set Screw, cup point, 3/8"-16 x 3/4"	2
14	-------	Rack - load safety, order from Mobilift Sales Department	-
		GM271722 - Bolt, hex., 5/8"-11 x 2"	6
	35A5871	Bracket - mounting, load rack to carriage	2
16	-------	Chain - 2 x 4 lacing, see chart on page 119 for length of chain	2
17	35A5042	Link - connecting, 2 links with 2 pins	-
18	35A5362	Anchor - chain, 2-1/2" long	2
19	35A5760	Pin - chain anchor, 3/4" x 2-1/8" long	2
		50A1752 - Ring, retainer, anchor pin	2
20	35A5683	Anchor - chain, 4-1/2" long	2
21	35A557	Pin - chain anchor, 5/16" x 1-1/8"	4
		GM108672 - Pin, cotter, 3/32" x 1/2"	4
22	-------	Rod - chain anchor, see chart on page 118	2
		GM213758 - Nut, hex., jam, 3/4"-16	8
		50A197 - Nut, spherical, 3/4"-16	2
23	-------	Cylinder - lift, see chart on page 118	1
		GM180158 - Bolt, hex., 3/8"-16 x 2"	1
		GM124629 - Nut, hex. jam, 3/8"-16	1
24	35A5286	Head - piston, with return line to front of cylinder	1
	35A7912	Head - piston, with return line to rear of cylinder	1
		GM102592 - Set Screw, cup point, 3/8"-16 x 1/2"	1
25	35A980	Guide - piston head	2
		GM180179 - Bolt, hex., 1/2"-13 x 1-3/4"	4
		GM126378 - Nut, hex., jam, 1/2"-13	4
26	35A5520	Block - stop, outer rail, 1/2" thick x 2" x 2-7/8"	2
		GM271716 - Bolt, hex., 5/8"-11 x 1"	4
26	35A5907	Block - stop, outer rail, 1/2" thick x 1-1/2" x 2-1/4"	2
		50A1025 - Bolt, hex., 3/8"-16 x 2-1/2"	4
	35A5393	Block - stop, outer rail, 5/8" thick x 1-1/2" x 2-3/8"	2
	35A5238	Shim - stop block, .0299 x 1-1/2" x 1-6/4"	8
27	35A5749	Sheave - chain, 3-1/8" dia.	1
28	35A5750	Sheave - chain, 5-1/4" dia.	2
29	35A5316	Bearing - sheave	6
30	35A5760	Pin - sheave bearing, head and lower holes in rail, 1" x 2-3/4"	4
30	35A5362	Pin - sheave bearing, upper holes in rail, 1" x 3-1/8"	2
		50A2846 - Pin, roll, 5/32" x 3/4"	0
31	-------	Fork - lifting, order from Mobilift Sales Department	2
32	35A668	Pin - fork stop, 2-1/16" long	2
33	35A669	Lever - stop pin	2
34	35A667	Spring - stop pin	2
		50A2932 - Pin, roll, 3/16" x 1"	2

Ref. No.	Part No.	DESCRIPTION	No. Req'd
		DUPLEX MAST (Cont'd)	
	35A4097	Washer - fork lock, 1/16" x 21/32" I.D., 7/8" O.D.	8
35	35A3797	Latch - includes bushing	1
36	10A13925	Bushing - latch, 5/8" I.D., 5/8" long	1
37	35A4084	Pin - latch, 5/8" x 1-7/8"	1
		60A3843 - Pin, roll, 3/16" x 1-1/4"	1
38	35A3636	Cap - latch dog	1
39	35A2037	Plunger - latch dog	1
40	35A3606	Spring - latch dog	1
41	35A7365	Tube - vent, 1/4" and 5/8" O.D., J-shaped (35A7310)	1
42	35P1776	Hose - vent tube, 1 foot, see chart on page 1-9 for length needed	1
	15P909	Strap - hose	2
		60A3078 - Clamp, hose, 5/16"	2
43	35A7307	Elbow - vent hose, 90°, 1/4"-18 N.P.T.	1
44	35A7070	Strap - vent hose	2
		GM132073 - Screw, rd. hd., 1/4"-20 x 2-1/2"	2
45	35A1464	Spacer - vent hose	2

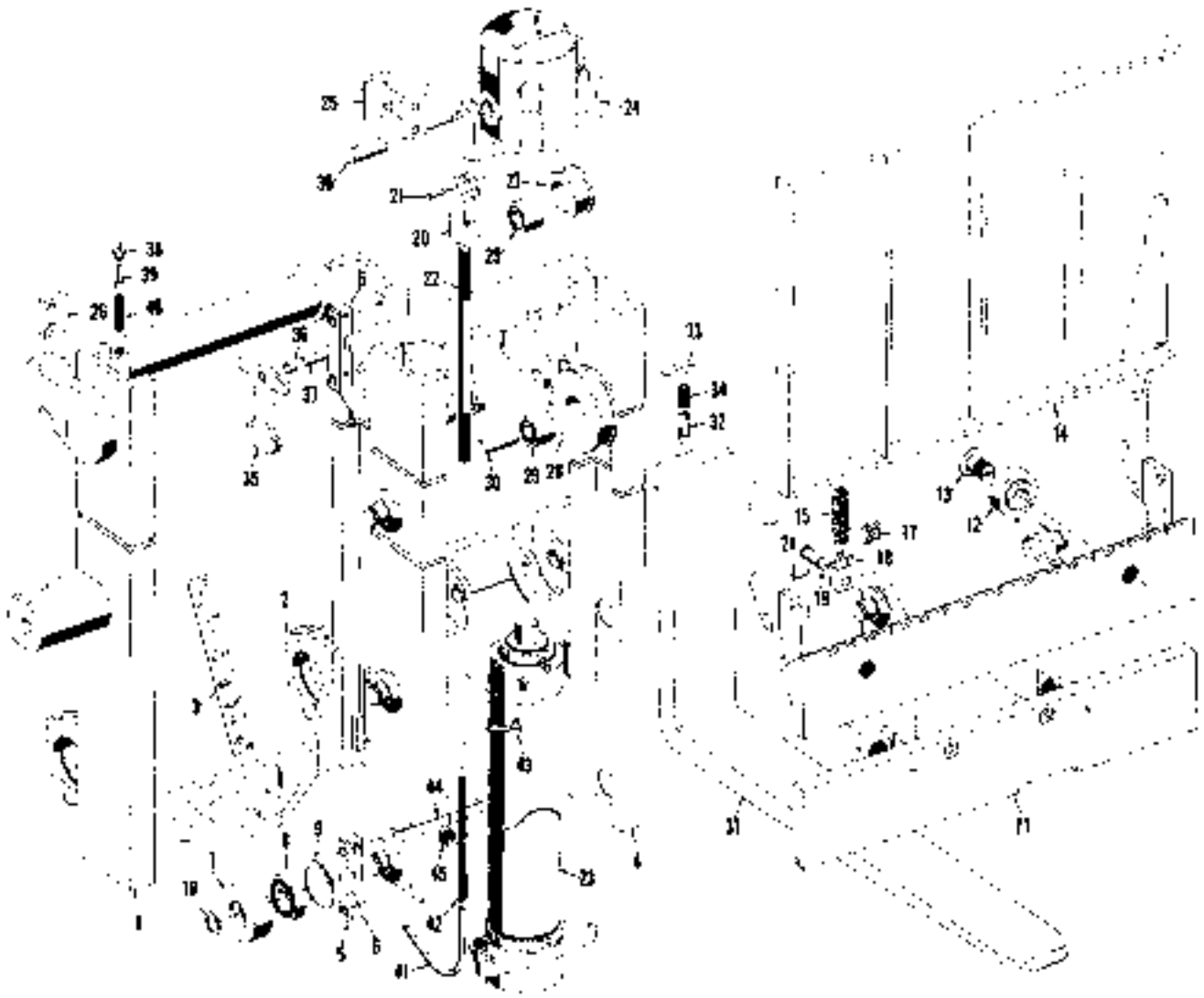


FIG. 2-31 - DUPLEX MAST

Ref No.	Part No	DESCRIPTION	No. Pcs.
		DUPLEX LIFT CYLINDER (Cascade) Group I 4" Diameter, for MA 30	
1	35A7907	Cylinder - lift, complete, 35-1/2" long (35A0745)	1
1	35A7905	Cylinder - lift, complete, 40-1/2" long (35A6753)	1
1	35A7970	Cylinder - lift, complete, 44" long (35A0759) Each includes the following 34 parts:	1
2	35P119E	Shell - for 35-1/2" cylinder, with 1/2" lock nut, Ref. No. 30	1
2	35P1455	Shell - for 35-1/2" cylinder, with 3/4" lock nut, Ref. No. 30	1
2	35P1197	Shell - for 40-1/2" cylinder, with 1/2" lock nut, Ref. No. 30	1
2	35P1456	Shell - for 40-1/2" cylinder, with 3/4" lock nut, Ref. No. 30	1
2	35P1198	Shell - for 44" cylinder, with 1/2" lock nut, ref. No. 30	1
2	35P1457	Shell - for 44" cylinder, with 3/4" lock nut, ref. No. 30	1
3	35P833	Screw - button head, cylinder shell	1
4	35P832	*Seal - button head screw	1
5	35P1199	Tube - intermediate, for 35-1/2" cylinder	1
5	35P1200	Tube - intermediate, for 40-1/2" cylinder	1
5	35P1201	Tube - intermediate, for 44" cylinder	1
6	35P1202	Plunger - for 35-1/2" cylinder	1
6	35P1203	Plunger - for 40-1/2" cylinder	1
6	35P1204	Plunger - for 44" cylinder	1
7	35P183	*Ring - wiper, intermediate tube (35P1205 Interm.)	1
8	35P182	*Spring - garter, wiper ring	1
9	35P1207	Retainer - wiper ring	1
10	10A784E	*"O" Ring - retainer, size 3-3/4" I.D., 4" O.D. (35P817 Interm.)	1
11	35P1208	Bushing - intermediate tube	1
12	35P1209	*"O" Ring - intermediate tube bushing, size 3-3/8" I.D., 3-5/8" O.D.	1
13	35P1210	*Ring - back-up, "O" ring	1
14	35P1211	*Pickling - tube bushing	1
15	35P1212	*Ring - wiper, plunger	1
16	35P1206	*Spring - garter, wiper ring	1
17	35P1213	Retainer - plunger wiper ring	1
18	35P174	*"O" Ring - wiper retainer, size 2-1/2" I.D., 2-3/4" O.D.	1
19	35P1214	Piston	1
20	35P1215	*Packing - piston	1
21	10A785E	*"O" Ring - piston, inner, size 1-1/2" I.D., 1-3/4" O.D.	1
22	35P1216	*Ring - back-up, "O" ring	1
23	35P1217	Ring - snap, piston retainer	1
24	35P1218	Bearing - intermediate tube	1
25	35P1219	Ring - bearing retainer	1
26	35P1220	Ring - snap, bearing	1
27	35P1221	Head - cylinder, used on cylinders with 1/2" lock nut, Ref. No. 30	1
27	35P1498	Head - cylinder, used on cylinders with 3/4" lock nut, Ref. No. 30	1
28	35P1222	*"O" Ring - cylinder head, size 3-7/8" I.D., 4-1/8" O.D.	1
29	35P1459	*Ring - back-up, head "O" ring	1
29A	35P1460	*Ring - nylon, cylinder head, upper, used with 3/4" lock nut, Ref. No. 30	1
30	35P1224	Nut - lock, cylinder head, 1/2"	1
30	35P1461	Nut - lock, cylinder head, 3/4"	1
31	35A4209	Spacer - intermediate tube, 1/4" x 3-3/8" O.D., for 35-1/2" and 40-1/2" cylinders	1
31	35A3453	Spacer - intermediate tube, 1" x 3-3/8" O.D. for 35-1/2" cylinder	1
32	35A4100	Spacer - plunger, 1/4" x 2-3/8" O.D., for 40-1/2" and 44" cylinders	2
32	35A4099	Spacer - plunger, 1" x 2-3/8" O.D., for 35-1/2" cylinder	2
33	35A7796	Spring - oil restrictor, 5-3/4 coils, 1-7/32" long (35A4992)	1
34	35A7795	Washer - perforated, oil restrictor (35P1225)	1
35	35A7792	Spacer - oil restrictor (35A4991)	1
36	35A7793	Nut - sleeve, oil restrictor	1
	35R70	*Repair Kit - lift cylinder (35R59) *NOTE: Repair Kit consists of the above items identified by an asterisk (*).	-
37	35P1226	Rod - end, cylinder top, 3-1/8" long	1
	35P1227	Lock Washer - rod	1

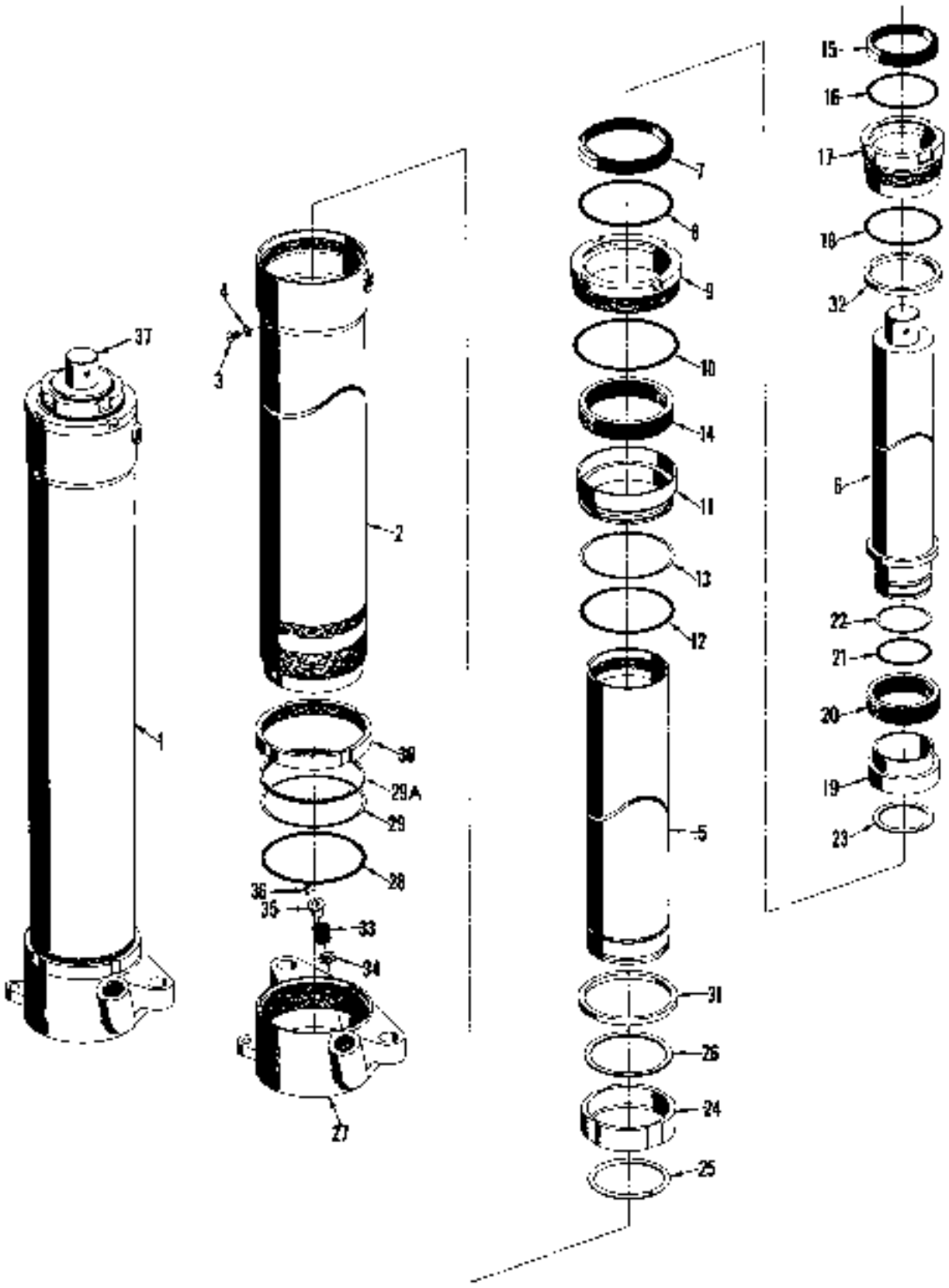


FIG. 2-88 - DUPLEX LIFT CYLINDER, 4" DIAMETER

Ref. No.	Part No.	DESCRIPTION	No. Per
		DUPLEX LIFT CYLINDERS (Cascade) Group II 4-3/4" Diameter, for MA 40 and 50	
1	35A7927	Cylinder - lift, complete, 35-1/2" long (35A5237)	1
1	35A7935	Cylinder - lift, complete, 40-1/2" long (35A5246)	1
1	35A7946	Cylinder - lift, complete, 44" long (35A5250) Each includes the following 34 parts:	1
2	35P 120	Shell - for 35-1/2" cylinder, with 1/2" lock nut, Ref. No. 30	1
2	35P1402	Shell - for 35-1/2" cylinder, with 3/4" lock nut, Ref. No. 30	1
2	35P1121	Shell - for 40-1/2" cylinder, with 1/2" lock nut, Ref. No. 30	1
2	35P1403	Shell - for 40-1/2" cylinder, with 3/4" lock nut, Ref. No. 30	1
2	35P842	Shell - for 44" cylinder, with 1/2" lock nut, Ref. No. 30	1
2	35P1404	Shell - for 44" cylinder, with 3/4" lock nut, Ref. No. 30	1
3	35P833	Screw - button head, cylinder shell	1
4	35P682	*Seal - button head screw	1
5	35P1122	Tube - intermediate, for 35-1/2" cylinder	1
5	35P1123	Tube - intermediate, for 40-1/2" cylinder	1
5	35P844	Tube - intermediate, for 44" cylinder	1
6	35P1124	Plunger - for 35-1/2" cylinder	1
6	35P1125	Plunger - for 40-1/2" cylinder	1
6	35P840	Plunger - for 44" cylinder	1
7	35P822	*Ring - wiper, intermediate tube	1
8	35P839	*Spring - garter, wiper ring	1
9	35P834	Retainer - wiper ring	1
10	10P1241	*"O" Ring - retainer, 4-1/2" I.D., 4-3/4" O.D.	1
11	35P836	Bushing - intermediate tube	1
12	10A10793	*"O" Ring - intermediate tube bushing, 4-1/8" O.D., 4-3/8" O.D.	1
13	35P838	*Ring - back-up, "O" ring	1
14	35P837	*Packing - tube bushing	1
15	35P840	*Ring - wiper, plunger	1
16	35P839	*Spring - garter, wiper ring	1
17	35P835	Retainer - plunger wiper ring	1
18	10A11847	*"O" Ring - wiper retainer, 3-1/4" I.D., 3-1/2" O.D.	1
19	35P830	Piston	1
20	35P824	*Packing - piston	1
21	10A4729	*"O" ring - piston, inner, 2-1/4" I.D., 2-1/2" O.D.	1
22	35P821	*Ring - back-up, "O" ring	1
23	35P823	Ring - snap, piston retainer	1
24	35P826	Bearing - intermediate tube	1
25	35P825	Ring - bearing retainer	1
26	35P827	Ring - snap, bearing	1
27	35P828	Head - cylinder, used on cylinders with 1/2" lock nut, Ref. No. 30	1
27	35P1405	Head - cylinder, used on cylinders with 3/4" lock nut, Ref. No. 30	1
28	10A13135	*"O" Ring - cylinder head, lower, 4-5/8" I.D., 4-7/8" O.D.	1
29	35P1406	*Ring - back-up, head "O" ring	1
29A	35P1407	*Ring - nylon, cylinder head, upper, used with 3/4" lock nut, Ref. No. 30	1
30	35P831	Nut - lock, cylinder head, 1/2"	1
30	35P1408	Nut - lock, cylinder head, 3/4"	1
31	35A5530	Spacer - intermediate tube, 1/4" x 4-5/32" O.D., for 35-1/2" and 40-1/2" cylinders	1
31	35A5529	Spacer - intermediate tube, 1" x 4-5/32", for 35-1/2" cylinder	1
32	35A5532	Spacer - plunger, 1/4" x 3-5/32", for 35-1/2 and 40-1/2" cylinders	1
32	35A5534	Spacer - plunger, 1" x 3-5/32", for 35-1/2" cylinders	1
33	35A7796	Spring - oil restrictor (35P1025 Inlet.)	1
34	35P148	Washer - perforated, oil restrictor	1
35	35P148	Spacer - oil restrictor	1
	35R71	*Repair Kit - lift cylinder (35R57)	1
		*NOTE: Repair Kit consists of the above items identified by an asterisk (*).	

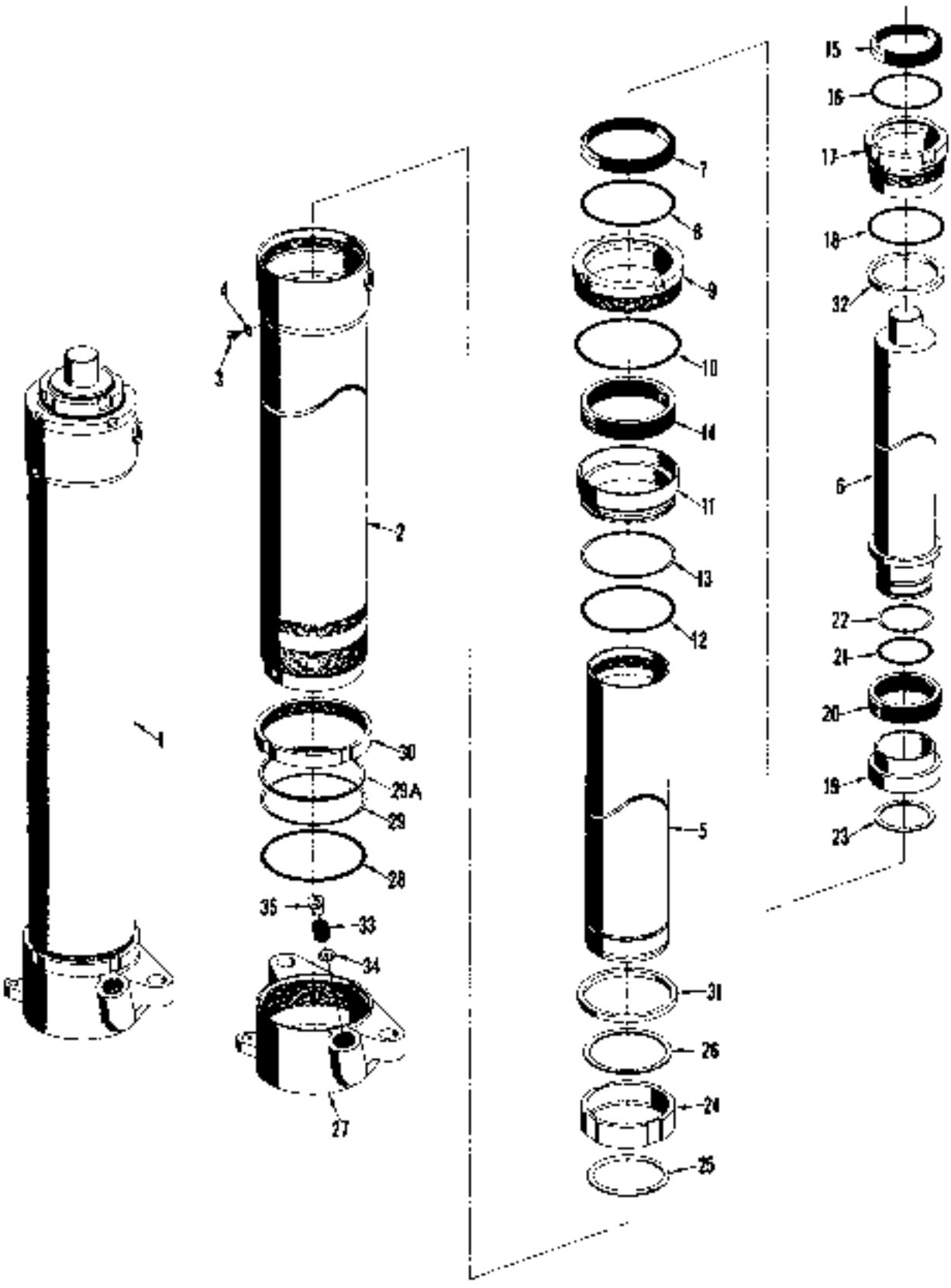


FIG. 2-88 - DUPLEX LIFT CYLINDER, 4-3/4" DIAMETER

Ref. No.	Part No.	DESCRIPTION	No. Req.
		UPRIGHT FOR TRIPLEX TRI-FREE LIFT (Cascade Viewmast) Group I	
1	-------	*Channel - outer assembly	1
2	-------	*Channel - center assembly	1
3	-------	*Channel - inner assembly	1
		*NOTE: Order above parts by M.F.H. and O.A.H.L.	
4	86R1064	Cap - bearing, outer rail pivot	2
		50A1268 - Screw, bearing cap, 5/8"-11 x 2-1/2"	4
5	86P1839	Plug - channel	26
6	86P1839	Shim - bearing	A.R.
7	86P1840	Bearing - channels	8
	-------	Bolt - hex., 3/8"-24 x 1/2"	16
8	86P1841	Trip	1
9	-------	Bolt - hex., 3/8"-24 x 1"	2
10	86P1842	Pad	2
11	-------	Bolt - hex., 1/4"-28 x 3/8"	2
12	86P1843	Rod - lift	2
13	86P1845	Pin - rod and anchor	4
14	86P1844	Retainer - pin	4
15	86P1846	Anchor - chain, outer channel	2
16	86P1847	Ring - retainer, anchor	2
17		GM219752 - Nut, hex, jam, 3/4"-16	2
18	86P1848	Nut - hex., (Nylock), 3/4"-16	2
19	86P1849	Keeper - pins	2
20	-------	Bolt - hex., 3/8"-24 x 1/2"	2
21	86P1842	Pad - center channel	1
22	-------	Bolt - hex., 1/4"-28 x 3/8"	2
23	86P1850	Pin - latch	4
24	-------	Bolt - hex, socket, 5/16"-18 x 1"	1
25	86P1851	Spring - latch	2
26	86P1852	Latch - lift, 2 on center channel, 1 on inner channel	3
27	86P1850	Latch - lift, inner channel	1
28	86P1851	Sheave - chain, lower	2
29	86P1855	Sheave - chain, upper	2
30	-------	Fitting - grease, straight, 1/4"-28	4
31	86P1852	Shaft - sheaves	4
32	-------	Screw - hex. socket, jam., 5/16"-24	4
33	-------	Set Screw - hex. socket, 5/16"-24 x 5/8"	4
34	-------	Chain - lift, see chart below, 3/4" pitch AL644	2

Chain for Lift - 3/4" Pitch AL-644

M.F.H.	O.A.H.L.	Chain Length	M.F.H.	O.A.H.L.	Chain Length
133"	72"	164-1/4"	177"	82"	206-1/4"
137"	70"	164-1/4"	181"	82"	206-1/4"
141"	70"	164-1/4"	185"	82"	212-1/4"
145"	70"	164-1/4"	189"	88"	224-1/4"
149"	70"	170-1/4"	193"	88"	224-1/4"
153"	76"	192-1/4"	197"	88"	230-1/4"
157"	76"	192-1/4"	201"	88"	230-1/4"
161"	76"	192-1/4"	205"	94"	236-1/4"
165"	76"	192-1/4"	209"	94"	248-1/4"
169"	82"	200-1/4"	213"	94"	248-1/4"
173"	82"	206-1/4"	217"	94"	248-1/4"

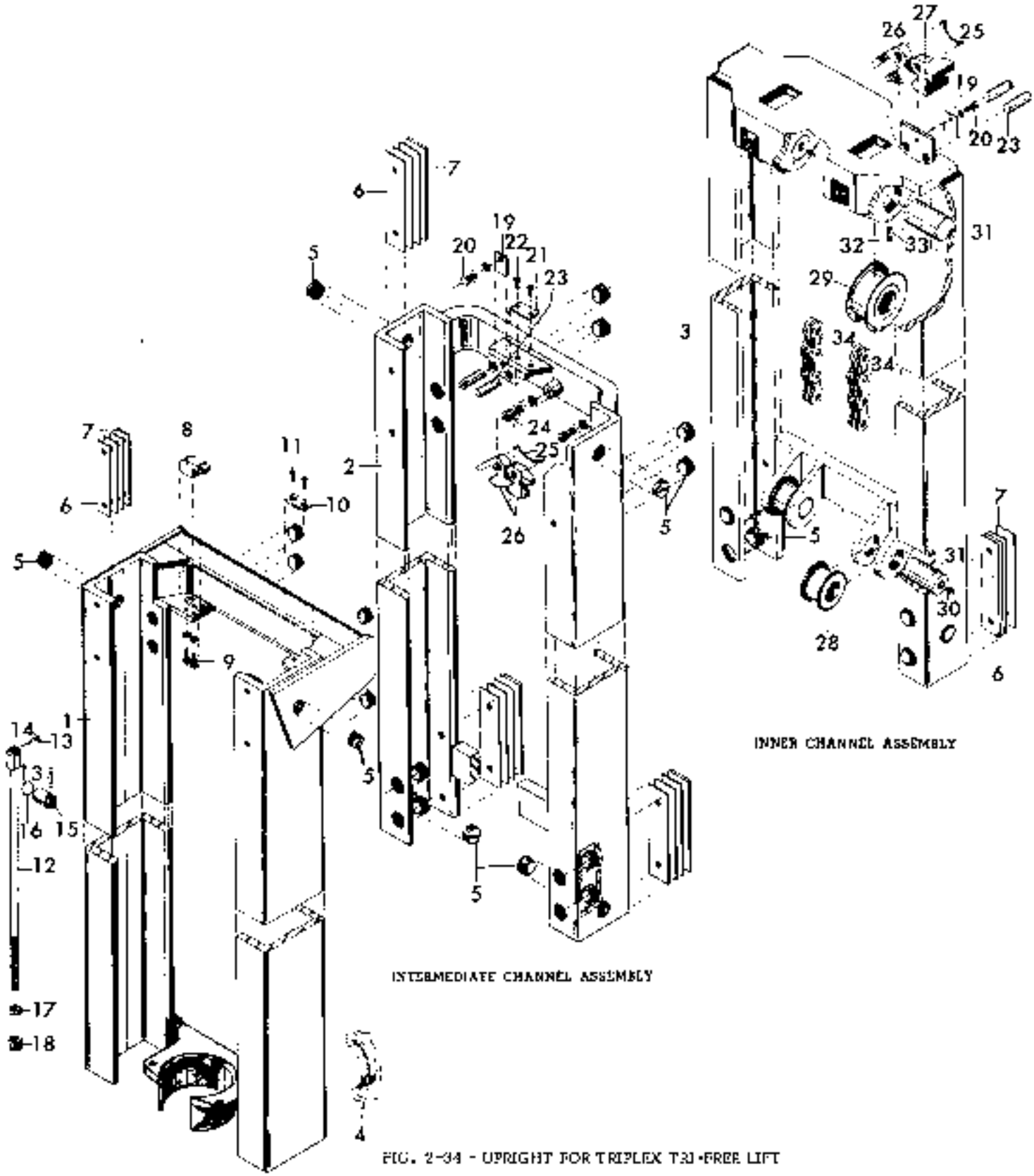


FIG. 2-34 - UPRIGHT FOR TRIPLEX TRI-FREE LIFT

Ref No	Part No	DESCRIPTION	No Req.
		TRIPLEX TRI-FREE LIFT CYLINDER (Cascade Viewmast) Group 11 4-3/4" Diameter, for MA 35 and 40	
1	-------	*Cylinder - assembly, complete *NOTE: Order above part by M.F.H. and O.A.H.L. Each includes the following 43 parts:	1
2	35P1464	Shell - cylinder, outer, for 70" O.A.H.L. mast	1
2	35P1799	Shell - cylinder, outer, for 76" O.A.H.L. mast	1
2	35P1798	Shell - cylinder, outer, for 82" O.A.H.L. mast	1
2	35P1674	Shell - cylinder, outer, for 88" O.A.H.L. mast	1
2	35P1791	Shell - cylinder, outer, for 94" O.A.H.L. mast	1
3	35P838	Screw - button head, cylinder shell	3
4	35P838	**Seal - button head screw	1
5	35P844	Tube - cylinder, intermediate, for 70" O.A.H.L. mast	1
5	35P1792	Tube - cylinder, intermediate, for 76" O.A.H.L. mast	1
5	35P1793	Tube - cylinder, intermediate, for 82" O.A.H.L. mast	1
5	35P1675	Tube - cylinder, intermediate, for 88" O.A.H.L. mast	1
5	35P1794	Tube - cylinder, intermediate, for 94" O.A.H.L. mast	1
6	35P1795	Plunger - cylinder, inner, for 70" O.A.H.L. mast	1
6	35P1796	Plunger - cylinder, inner, for 76" O.A.H.L. mast	1
6	35P1797	Plunger - cylinder, inner, for 82" O.A.H.L. mast	1
6	35P1676	Plunger - cylinder, inner, for 88" O.A.H.L. mast	1
6	35P1795	Plunger - cylinder, inner, for 94" O.A.H.L. mast	1
7	35P982	**Ring - wiper, intermediate tube	1
8	35P838	**Spring - garter, wiper ring	1
9	35P684	Retainer - wiper ring	1
10	10P1241	**"O" Ring - retainer, 4-1/2" I.D., 4-3/4" O.D.	1
11	35P686	Bushing - intermediate tube	1
12	10A13793	**"O" Ring - intermediate tube bushing, 4-1/8" I.D., 4-3/8" O.D.	1
13	35P686	**Ring - back-up, "O" ring	1
14	35P837	**Packing - tube bushing	1
15	35P640	**Ring - wiper, plunger	1
16	35P859	**Spring - garter, wiper ring	1
17	35P658	Retainer - plunger wiper ring	1
18	10A11847	**"O" Ring - wiper retainer, 2-1/2" I.D., 2-3/4" O.D.	1
19	35P820	Piston	1
20	35P824	**Parking - piston	1
21	10A4729	**"O" Ring - piston, inner, 3-1/2" I.D., 3-3/4" O.D.	1
22	35P821	**Ring - back-up, "O" ring	1
23	35P928	Ring - snap, piston retainer	1
24	35P826	Bearing - intermediate tube	1
25	35P925	Ring - bearing retainer	1
26	35P827	Ring - snap, bearing	1
27	35P1768	Head - cylinder	1
28	10A13135	**"O" Ring - cylinder head, lower, 4-5/8" I.D., 4-7/8" O.D.	1
29	35P1466	**Ring - back-up, boac "O" ring	1
30	35P1467	**Ring - cylinder, head, upper	1
	35R71	Repair Kit - for cylinder **NOTE: Repair Kit consists of the above items identified by a double asterisk (**).	1
31	35P1468	Nut - lock, cylinder head	1
32	35P1857	Spacer - plunger, for 133" M.F.H., 2-3/4" I.D., 3-5/32" O.D. x 6" long.	1
32	35P1358	Spacer - plunger, for 137", 175", and 209"M.F.H., 2-3/4" I.D., 3-5/32" O.D., 4" long	1
32	35P1859	Spacer - plunger, for 141", 177", 189" and 213"M.F.H., 2-3/4" I.D., 3-5/32" O.D. x 2" long	1
32	35P1342	Spacer - plunger, for 185" M.F.H., 2-3/4" I.D., 3-5/32" O.D. x 5" long.	1
33	35P1836	Body - restrictor	1
34	10A16295	"O" Ring - body	1
35	35A4982	Spring - oil restricter	1
36	35P1337	Washer - perforated, oil restrictor	1

Ref. No.	Part No.	DESCRIPTION	No. Per
		TRIPLEX TRI-FREE LIFT CYLINDER (Cascade Viewmast) (Cont'd)	
37	35P143	Spacer - oil restrictor	1

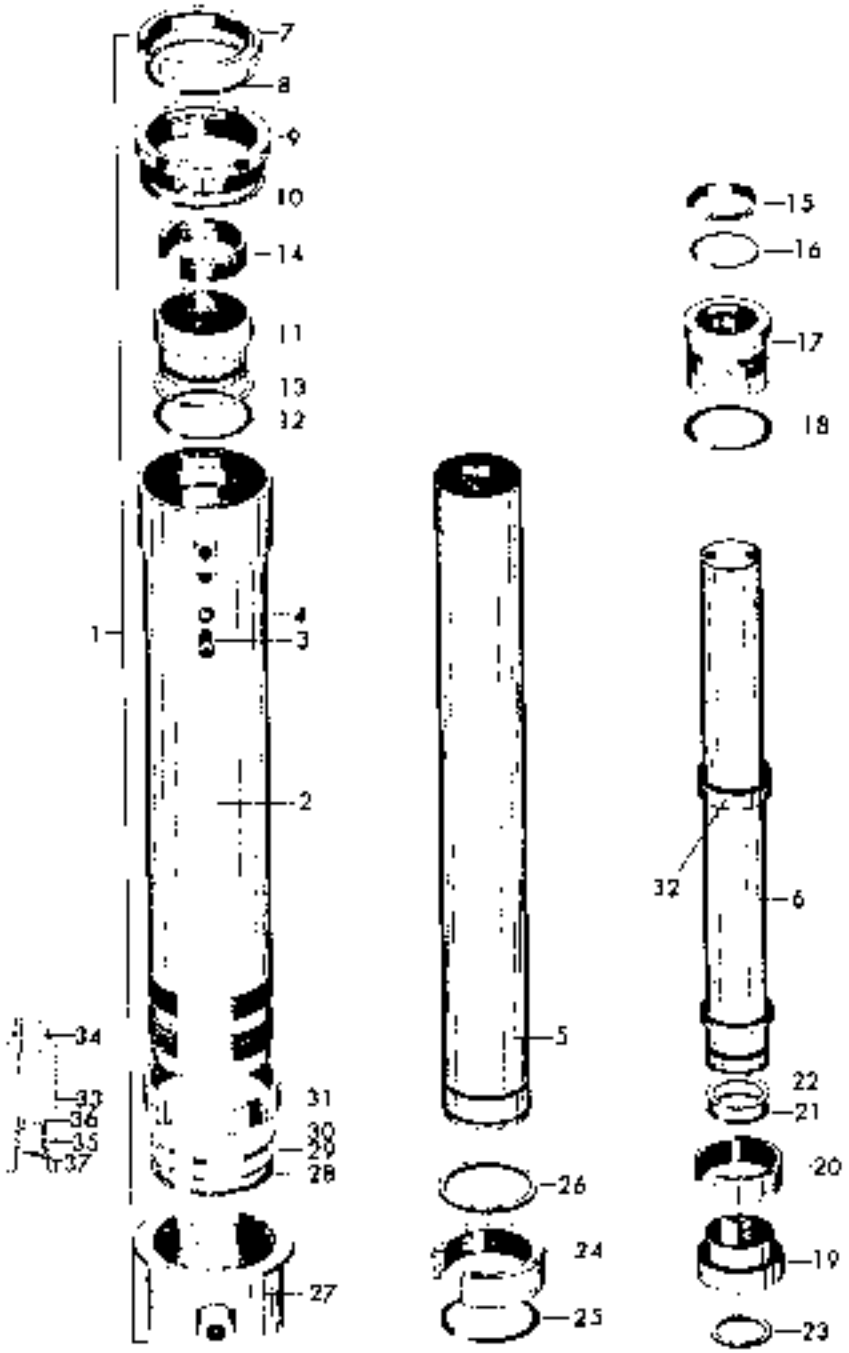


FIG. 8-35 - TRIPLEX TRI-FREE LIFT CYLINDER, 4-3/4" DIAMETER

Ref. No.	Part No.	DESCRIPTION	No. Per
		TRIPLEX TWO-FREE LIFT CYLINDER (Cascade Viewmast) Group 10 5" Diameter, for MA 50	
1	-------	*Cylinder - assembly, complete	1
		*NOTE: Order above part by M.F.H. and O.A.H.L. Each includes the following 43 parts:	
2	35P1504	Shell - cylinder, outer, for 70" O.A.H.L. mast	1
2	35P1505	Shell - cylinder, outer, for 76" O.A.H.L. mast	1
2	35P1506	Shell - cylinder, outer, for 82" O.A.H.L. mast	1
2	35P1507	Shell - cylinder, outer, for 88" O.A.H.L. mast	1
2	35P1508	Shell - cylinder, outer, for 94" O.A.H.L. mast	1
3	35P833	Screw - button head, cylinder shell	1
4	35P832	**Seal - button head screw	1
5	35P1518	Tube - cylinder, intermediate, for 70" O.A.H.L. mast	1
6	35P1519	Tube - cylinder, intermediate, for 76" O.A.H.L. mast	1
6	35P1520	Tube - cylinder, intermediate, for 82" O.A.H.L. mast	1
6	35P1578	Tube - cylinder, intermediate, for 88" O.A.H.L. mast	1
6	35P1521	Tube - cylinder, intermediate, for 94" O.A.H.L. mast	1
6	35P1523	Plunger - cylinder, inner, for 70" O.A.H.L. mast	1
6	35P1524	Plunger - cylinder, inner, for 76" O.A.H.L. mast	1
6	35P1525	Plunger - cylinder, inner, for 82" O.A.H.L. mast	1
6	35P1579	Plunger - cylinder, inner, for 88" O.A.H.L. mast	1
6	35P1526	Plunger - cylinder, inner, for 94" O.A.H.L. mast	1
7	35P1514	**Ring - wiper, intermediate tube	1
8	35P1513	**Spring - garter, wiper ring	1
9	35P1512	Retainer - wiper ring	1
10	35P139	**"O" Ring - retainer, 4-3/4" I.D., 5" O.D.	1
11	35P1510	Bushing - intermediate tube	1
12	35P1508	**"O" Ring - intermediate tube bushing, 4-3/8" I.D., 4-5/8" O.D.	1
13	35P1509	**Ring - back-up, "O" ring	1
14	35P1522	**Packing - tube bushing	1
15	35P1205	**Ring - wiper, plunger	1
16	35P162	**Spring - garter, wiper ring	1
17	35P1527	Retainer - plunger wiper ring	1
18	35P161	**"O" Ring - wiper retainer, 3-1/2" I.D., 3-3/4" O.D.	1
19	35P166	Piston	1
20	35P1511	**Packing - piston	1
21	35P174	**"O" Ring - piston, inner, 2-1/2" I.D., 2-3/4" O.D.	1
22	35P175	**Ring - back-up, "O" Ring	1
23	35P178	Ring - snap, piston retainer	1
24	35P1516	Bearing - intermediate tube	1
25	35P1515	Ring - bearing, retainer	1
26	35P1517	Ring - snap, bearing	1
27	35P1709	Head - cylinder	1
28	35P1808	**"O" Ring - cylinder head, lower, 4-7/8" I.D., 5-1/8" O.D.	1
29	35P1801	**Ring - back-up, head "O" ring	1
30	35P1802	**Ring - nylon, cylinder head, upper	1
	35P1823	**Repair Kit - for cylinder	1
		**NOTE: Repair Kit consists of the above items identified by a double asterisk (**).	
31	35P1803	Nut - lock, cylinder head	1
32	35P1660	Spacer - cylinder, for 133" M.F.H., 3" I.D., 3-3/8" O.D. x 6" long	1
33	35P1653	Spacer - cylinder, for 165" and 185" M.F.H., 3" I.D., 3-3/8" O.D. x 5" long	1
33	35P1661	Spacer - cylinder, for 197", 173" and 209" M.F.H., 3" I.D., 3-3/8" O.D. x 4" long	1
32	35P1662	Spacer - cylinder, for 141", 177", 189" and 213" M.F.H., 3" I.D., 3-3/8" O.D. x 2" long	1
33	35P1936	Body - restrictor	1
34	10A16285	"O" Ring - body	1
35	35A4932	Spring - oil restrictor	1

Ref. No	Part No.	DESCRIPTION	No. Pcs.
		TRIPLEX TRI-FREE LIFT CYLINDER (Cascade Viewmast) (Cont'd)	
36	35P1837	Washer - perforated, oil restrictor	1
37	35P146	Spacer - oil restrictor	1

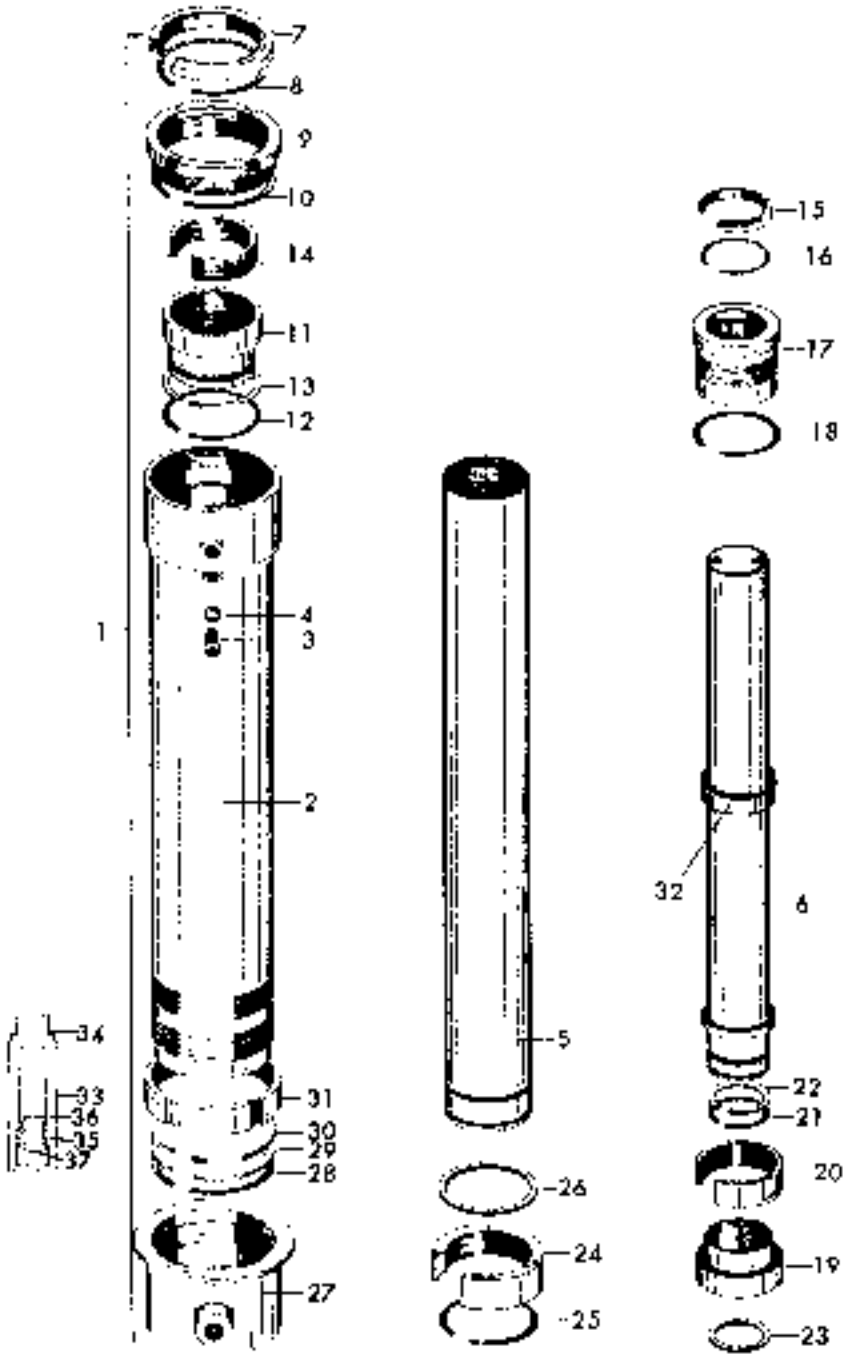


FIG. 2-3E - TRIPLEX TRI-FREE LIFT CYLINDER, 6" DIAMETER

Ref. No.	Part No.	DESCRIPTION	No. Per
		CROSS HEAD FOR UPRIGHT (Cascade Viewmast) Group IV	
1	35P1629	Cross Head - upright	1
2	-------	Bolt - socket head, 1/2"-20 x 1-1/4"	2
3	35P1630	Pad - head	1
4	-------	Bolt - flat head, hex socket, 1/4"-28 x 1/2"	2
5	35P1631	Sheave - cross head	2
6	35P1632	Shaft - sheave	2
7	-------	Socket Jam Screw - 5/16"-24	2
8	-------	Set Screw - cup point, hex. socket, 5/16"-24 x 5/8"	2
9	-------	Fitting - grease, straight, 1/4"-28	2
10	35P1633	Shoe - head	2
11	-------	Bolt - hex., socket	2
12	-------	Bolt - hex., socket, 5/8"-11 x 1"	2
13	35P1634	Shim - shoe	A.R.
14	35P1635	Support - shoe	2
15	-------	Bolt - hex., 3/8"-24 x 1"	2

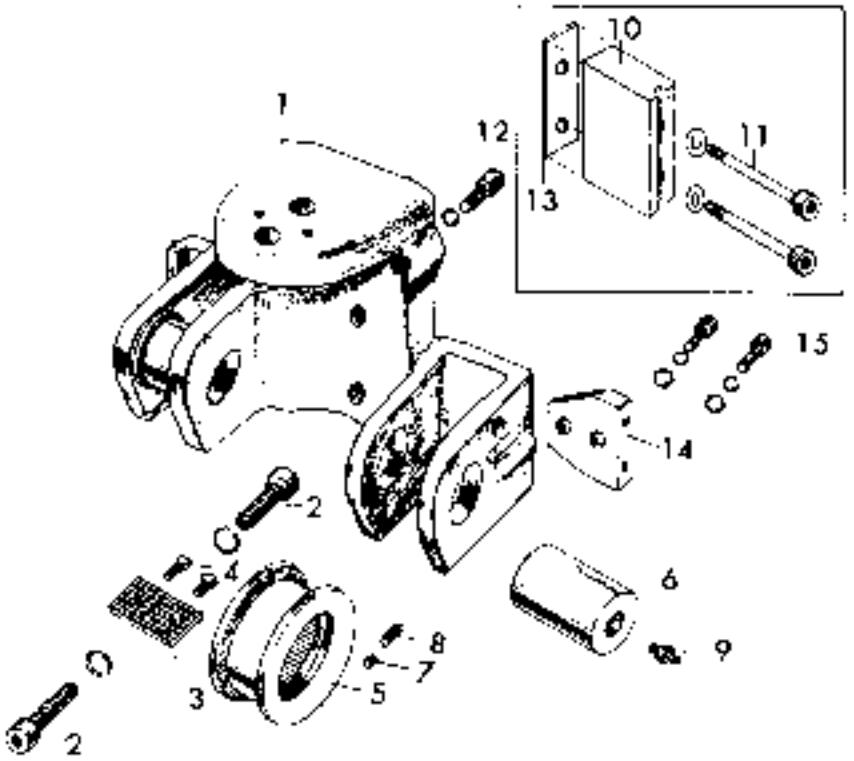


FIG. 2-97 - CROSS HEAD FOR UPRIGHT

		ADAPTING PARTS FOR TRIPLEX TRI-FREE LIFT (Cascade Viewmast)	
	35A5727	Bushing - axle	2
		50A4629 - Fitting, grease	2
	35A8709	Hose - vent, 1/4" I.D. x 105" long	1
	3nA6587	Hose - lift cylinder, 3/8"-14 x 1/2" I.D. x 19-1/2"	1
	35A8203	Hose - protector, 1-1/8" I.D. x 11" long	1
	10A22767	Fitting - vent hose, 1/4" I.D. x 1/8"-27 x 1-1/4" long	1
	35A7507	Elbow - vent hose, 90°, 1/4"-18 N.P.T.	1
		50A3573 - Clamp, hose, 7/16"	2

Ref. No.	Part No.	DESCRIPTION	No. Pcs.
		CARRIAGE FOR TRIPLEX TRI-FREE LIFT (Cascade Viewmast) Group V	
1	-------	Carriage - assembly, order from Mobilift Sales Department Includes the following parts:	1
2	35P1820	Wear Pad - carriage	2
3	-------	Bolt - hex. socket, flat head, 1/4"-28 x 3/8"	4
4	35P1863	Shim - wear pad	A.R.
5	35P1865	Roller - assembly, carriage guides	4
6	-------	Bolt - hex. socket, 1/2"-13 x 2"	4
7	35P1866	Nut - bolt, roller support, 1/2"-13	4
8	35P1870	Screw - adjusting, roller assembly	4
9	35P1868	Roller - carriage	4
10	35P1867	Sleeve - roller	4
11	35P1854	Washer - roller, inner	4
12	-------	Fitting - grease, straight, 1/4"-28	5
13	35P1869	Plug - roller, outer	4
14	35P1864	Screw - hex. socket, 5/16"-18 x 1"	2

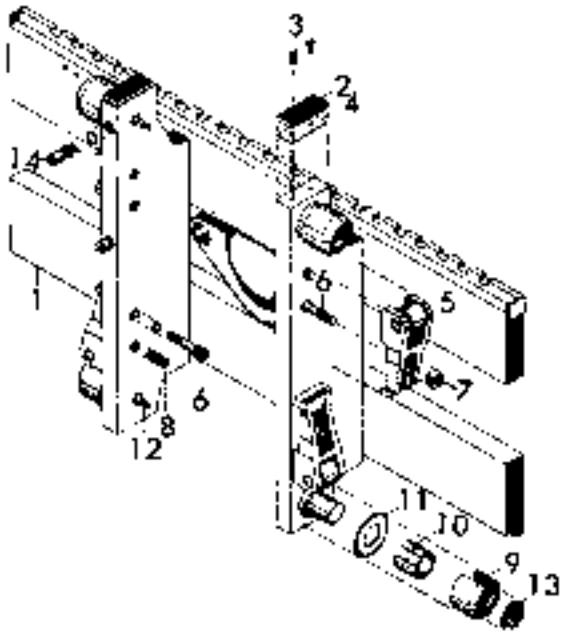


FIG. 2-36 - CARRIAGE FOR TRIPLEX TRI-FREE LIFT

Ref. No.	Part No.	DESCRIPTION	No. Pcs.		
		TRIPLEX MAST - HIGH FREE LIFT (Knickerbocker)			
		Group 1			
		Used on 4000# lift to Mast Serial No. 3FL-[illegible], Inc.			
		Used on 5000# lift to Mast Serial No. 3FL-S-899, Inc.	MA30	MA40	MA50
1	-------	*Rail - outer, assembly	1		1
2	-------	*Rail - inner, assembly	1		1
3	-------	*Rail - center, assembly	1		1
4	35P602	Pad - wear	32		32
5	35P1126	*Cylinder - assembly, see page 108 for breakdown	1		-
5	35P1149	*Cylinder - assembly, see page 109 for breakdown	-		1
6	35P686	Roller - chain	4		4
7	35P691	Race - bearing	4		4
8	35P689	Bearing - roller	4		4
9	35P687	Washer - bearing, inner	4		4
10	35P688	Washer - bearing, outer	4		4
11	35P1127	Pin - dowel	4		4
12	35P733	Screw - roller	4		4
13	-------	*Chain - lifting, 1" pitch, No. AL-844	2		2
14	-------	*Chain - lifting, 3/4" pitch, No. AL-844	2		2
15	35P661	Anchor - chain, 3/4" pitch chain	4		4
16	60P734	Nut - anchor	4		4
17	35P1128	Pin - chain anchor	4		4
18	35P1129	Plate - end, carriage spindle	2		2
19	35P1130	Screw - plate	2		2
20	35P650	Spacer - cylinder to inner channel	1		1
21	35P652	Screw - spacer	1		1
	35P1765	*Hose - assembly, with guard and fittings	1		-
		Consists of the following 4 parts:			
22	35P1131	*Hose - cylinder	1		-
	35P1702	*Guard - hose, spiral	1		-
24	60P696	Adapter - hose to elbow	1		-
26	35P695	Adapter - hose to tube	1		-
	35P1764	*Hose - assembly, with guard and fittings	-		1
		Consists of the following 4 parts:			
22	35P1150	*Hose - cylinder	-		1
	60P1778	*Guard - hose (spiral)	-		1
24	35P696	Adapter - hose to elbow	-		1
26	60P695	Adapter - hose to tube	-		1
		*NOTE: Order parts for lift as to MFH and OAHL plus serial number of mast.			
53	35P1148	Elbow	1		1
26	35P1136	Clamp - elbow	1		1
27	35P699	Elbow - tube to adapter, 90°	1		1
29	35P1138	Tube - cylinder	1		1
29	35P694	Connector - tube to cylinder	1		1
30	35P1135	Anchor - chain, upper, for 1" pitch chain	2		2
31	35P1128	Pin - anchor	2		2
32	60P656	Turnbuckle - anchor rod	2		2
33	35P1136	Anchor - chain, lower, for 1" pitch chain	2		2
34	35P1137	Pin - anchor	2		2
35	35P1106	Peg - roller	4		4
36	35P1139	Ring - bearing retaining, inner	4		4
37	30P1140	Bearing - roller	4		4
38	35P1141	Ring - bearing, retainer, inner	4		4
39	30P1142	Cover - bearing	4		4
40	35P1139	Ring - cover retainer, outer	4		4
41	35P1144	Tire - roller	4		4
42	35P1146	Shaft - roller	4		4
43	35P1145	Support - shaft	8		8
44	35P1134	Screw - shaft support	4		4
	GM215024	- Bolt, hex., 3/8"-24 x 1-3/4"	4		4

Ref. No.	Part No.	DESCRIPTION	No. Pcs MA30 MA40	MA50
		TRIPLEX MAST - HIGH FREE LIFT (Knickerbocker) (Cont'd)		
45	3521147	Roller - shaft	4	4
		GM444563 - Plug, pipe, hydraulic tank, 1/4"-27	1	1

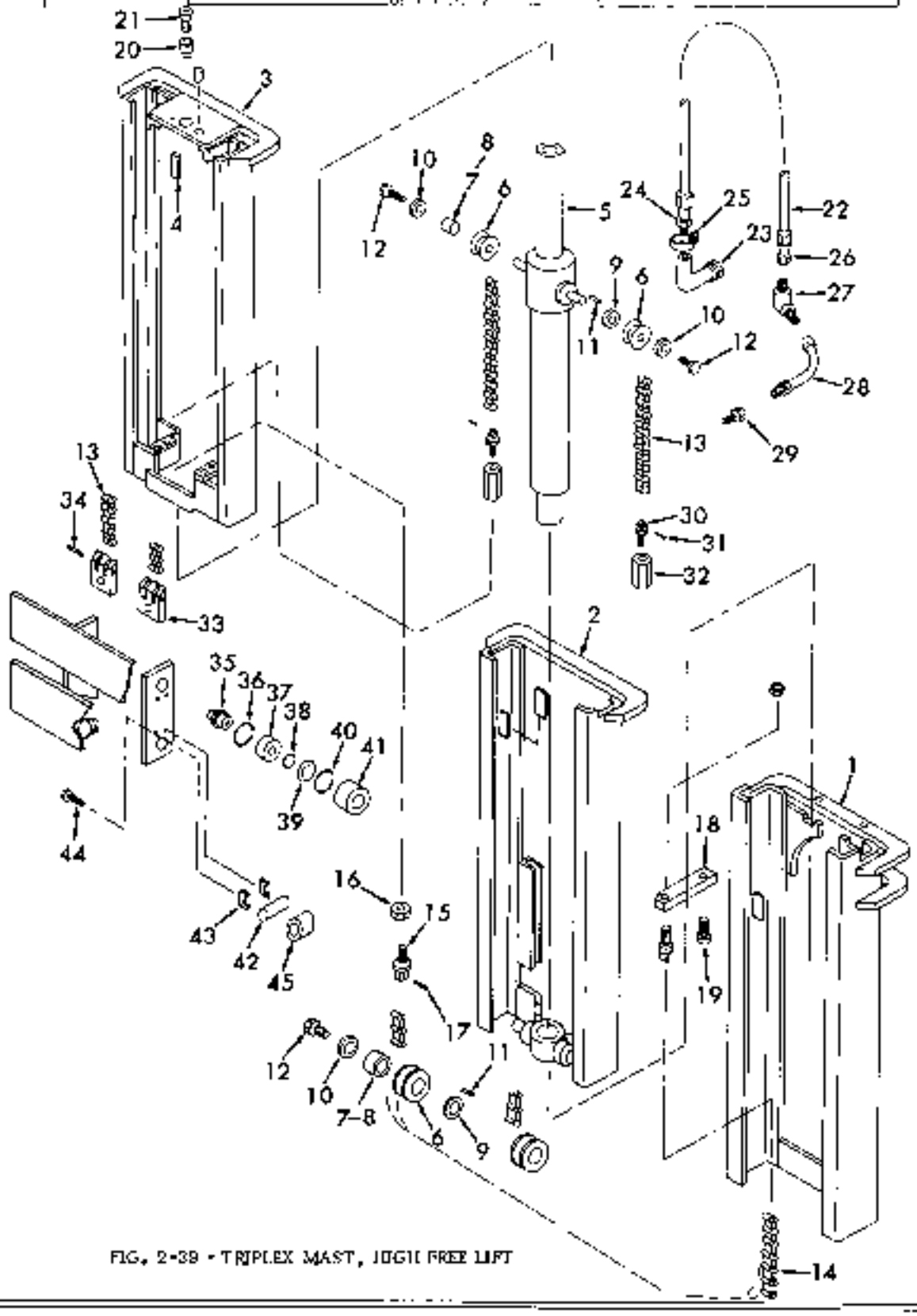


FIG. 2-39 - TRIPLEX MAST, JUGII FREE LIFT

Ref. No	Part No	DESCRIPTION	No. Per MA30 MA40	No. Per MA50
		TRIPLEX MAST - HIGH FREE LIFT (Knickerbocker) Group II Used on 4000 # lift with Mast Serial No. 3PL-4400 and after. Used on 5000 # lift with Mast Serial No. 3PL-5-400 and after.		
1	-------	*Rail - outer, assembly	1	1
2	-------	*Rail - inner, assembly	1	1
3	-------	*Rail - center, assembly	1	1
4	35P692	Pad - wear	32	32
5	-------	*Cylinder - assembly, see breakdown on pages 110 or 112	1	1
6	35P680	Roller - chain	4	4
7	35PE91	Race - bearing	4	4
8	35P689	Bearing - roller	4	4
9	35P687	Washer - bearing, inner	4	4
10	35P688	Washer - bearing, outer	4	4
11	35P1127	Pin - dowel	4	4
12	35P723	Screw - roller	4	4
13	35P693	Washer - lock	2	2
14		GM10354 - Fitting, grease, 1/8"-30°	2	2
15	-------	*Chain - lifting, 1" pitch, No. AL-844	2	2
16	-------	*Chain - lifting, 3/4" pitch, No. AL-844	2	2
17	35P681	Anchor - chain, 3/4" pitch chain	4	4
18	35P754	Nut - anchor	4	4
19	35P1160	Pin - chain anchor	4	4
20	35P1129	Plate - end, carriage spindle	2	2
21	35P633	Screw - plate	2	2
22	35P690	Spacer - cylinder to inner channel	-	1
23	35P692	Screw - spacer	1	1
	35P1763	*Hose - assembly, with guard and fittings	1	-
		Consists of the following 4 parts:		
24	35P1131	*Hose - cylinder	1	-
	35P1762	*Guard - hose (spiral)	1	-
25	35P696	Adapter - hose to elbow	1	-
26	35P695	Adapter - hose to tube	1	-
	35P1764	*Hose - assembly, with guard and fittings	-	1
		Consists of the following 4 parts:		
24	35P1130	*Hose - cylinder	-	1
	35P1778	*Guard - hose (spiral)	-	1
		*NOTE: Order by serial number of lift plus MFH and OAHL.		
25	35P690	Adapter - hose to elbow	-	1
26	35P695	Adapter - hose to tube	-	1
27	35P1675	Clamp - elbow	1	1
28	35P1148	Elbow - hose, 90°	1	1
29	35P699	Elbow - tube to adapter, 90°	1	1
30	35P1672	Tube - cylinder	1	1
31		30A442S - Connector, tube to cylinder, with o-ring	1	1
	10A1E2E5	"O" Ring - connector	1	1
32	35P1135	Anchor - chain, upper, for 1" pitch lift chain	2	2
33	35P1160	Pin - anchor	2	2
34	35P606	Turnbuckle - anchor rod	2	2
35	35P1676	Bolt - turnbuckle, 5/16" x 14 x 4"	2	2
36		GM21753 - Nut, hex., jam, 3/4"-16	4	4
37	35P1136	Anchor - chain, lower, for 1" pitch lift chain	2	2
38	35P1137	Pin - anchor	2	2
39	35P1138	Peg - roller	4	4
40	35P1139	Ring - bearing retainer, outer	4	4
41	35P1140	Bearing - roller	4	4
43	35P1765	Fitting - grease, 1/4" drive x 30°, (Alemite 1668)	4	4
44	35P1141	Ring - bearing, retainer to peg	4	4
45	35P1142	Cover - bearing	4	4
46	35P1144	Tire - roller	4	4
47	35P1673	Shaft - roller	4	4
48	35P1674	Support - shaft	8	8

Ref. No	Part No	DESCRIPTION	No. Per MA30	MA40	MA50
		TRIPLEX MAST - HIGH FREE LIFT (Knickerbocker) (Cont'd)			
49	35P1134	Screw - support, for grease fitting	4	4	
50	------	Fitting - grease (Alemite 1758-13)	4	4	
51		GM215824 - Screw, hex. head, 3/8"-24 x 1-3/4"	4	4	
		GM173123 - Washer, shakeproof, 3/8"	8	8	
52		50A4206 - Washer, plain, 3/8"	8	8	
53	35P1147	Roller - shaft	4	4	
54	35P1069	#Washer - restricter valve	1	1	
55	35P1670	#Spring - restrictor valve	1	1	
56	35P1071	#Spacer - restrictor valve	1	1	
57		#50A4423 - Connector, tube	1	1	
58	10AJ1235	#"O" ring - connector	1	1	
		#NOTE: Used on lifts with restricter valves installed.			

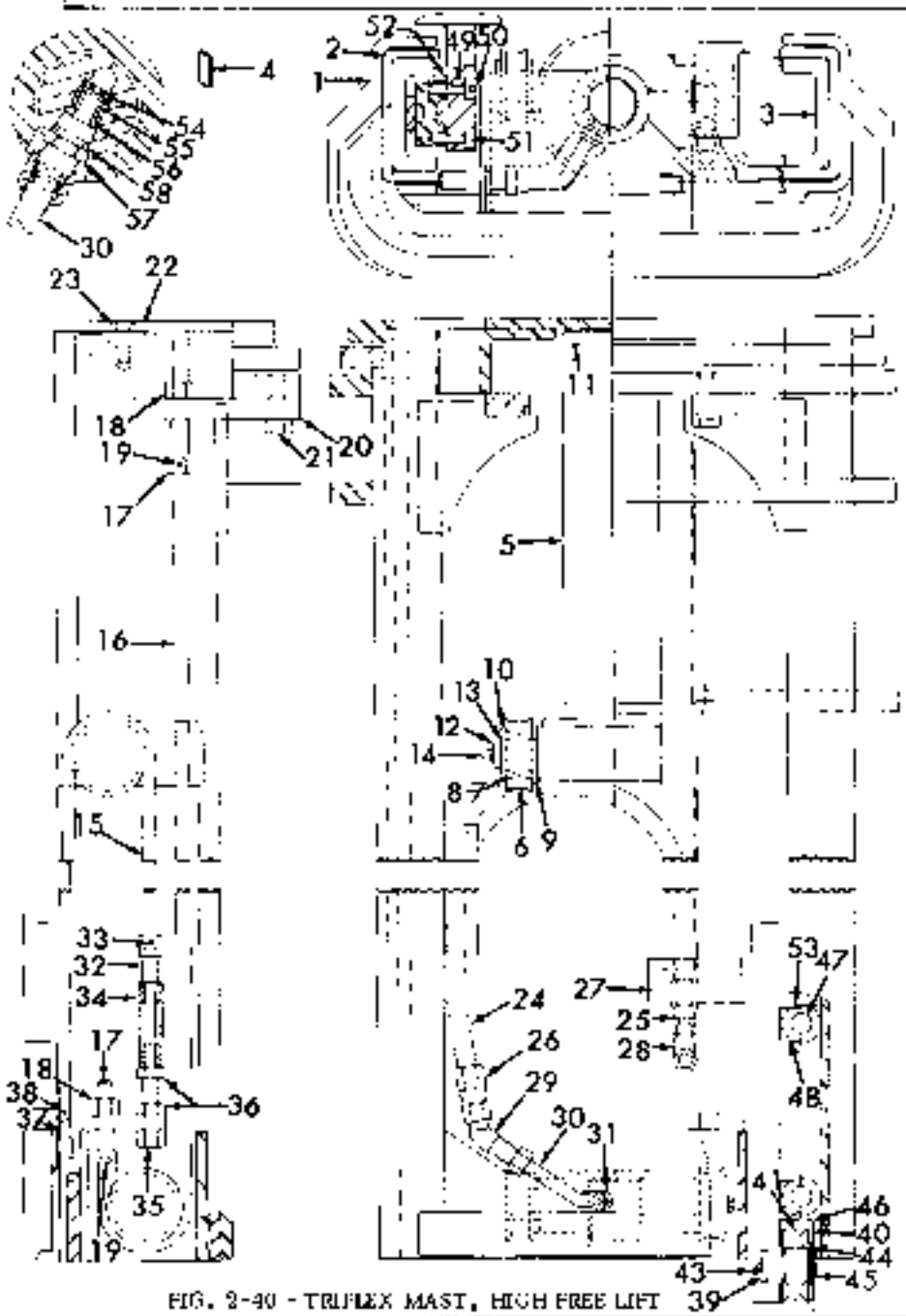


FIG. 2-40 - TRIPLEX MAST, HIGH FREE LIFT

Ref. No.	Part No.	DESCRIPTION	No. Per 4000#	No. Per 5000#
		LIFT CYLINDER - TRIPLEX HIGH FREE LIFT (Knickerbocker)		
		Group III		
		Used on 4000# lift to Mast Serial No. 3FL-398, Inc.		
		Used on 5000# lift to Mast Serial No. 3FL-5-599, Inc.		
1	35P1250	*Cylinder - lift, assembly	1	-
1	35P1149	*Cylinder - lift, assembly	-	1
		Includes the following 24 parts:		
2	35P1259	*Tube - cylinder, outer	1	-
2	35P740	*Tube - cylinder, outer	-	1
3	35P1229	*Tube - interstage	1	-
3	35P741	*Tube - interstage	-	1
4	35P1230	*Tube - plunger, inner	1	-
4	35P742	*Tube - plunger, inner	-	1
5	35P713	Packing Set - outer cylinder, lower section	1	1
6	35P710	Nut - packing, lower section	1	1
7	35P738	Screw - set, packing nut	1	1
8	35P715	Ring - wiper, packing nut	1	1
9	35P712	Ring - wear, outer cylinder	2	2
10	35P719	Ring - stop, outer cylinder, bottom section	1	1
11	35P720	Ring - snap, stop ring	1	1
12	35P701	Packing Set - outer cylinder, top section	1	1
13	35P703	Nut - packing, top section, outer cylinder	1	1
14	35P704	Ring - wiper, upper packing nut	1	1
15	35P252	"O" Ring - upper packing nut, 5-1/4" O.D.	1	1
16	35P717	Packing Set - plunger to interstage	1	1
17	35P705	Gland - plunger packing	1	1
18	35P728	"O" Ring - plunger gland, 4-1/4" O.D.	1	2
19	35P714	Ring - wiper, plunger gland	1	1
20	35P706	Ring - wear, plunger to interstage, upper	1	2
21	35P709	Cap - interstage, upper	1	1
22	10P1364	"O" Ring - interstage cap, 4-2/8" O.D.	1	1
23	35P708	Washer - back-up, interstage cap	1	1
24	35P711	Screw - vent, interstage cap	1	1
25	35P720	Washer - seal, vent screw	2	1
26	35P1247	Spacer - plunger tube	-	1
		*NOTE: Order parts for lift as to MPH and O/AHL.		

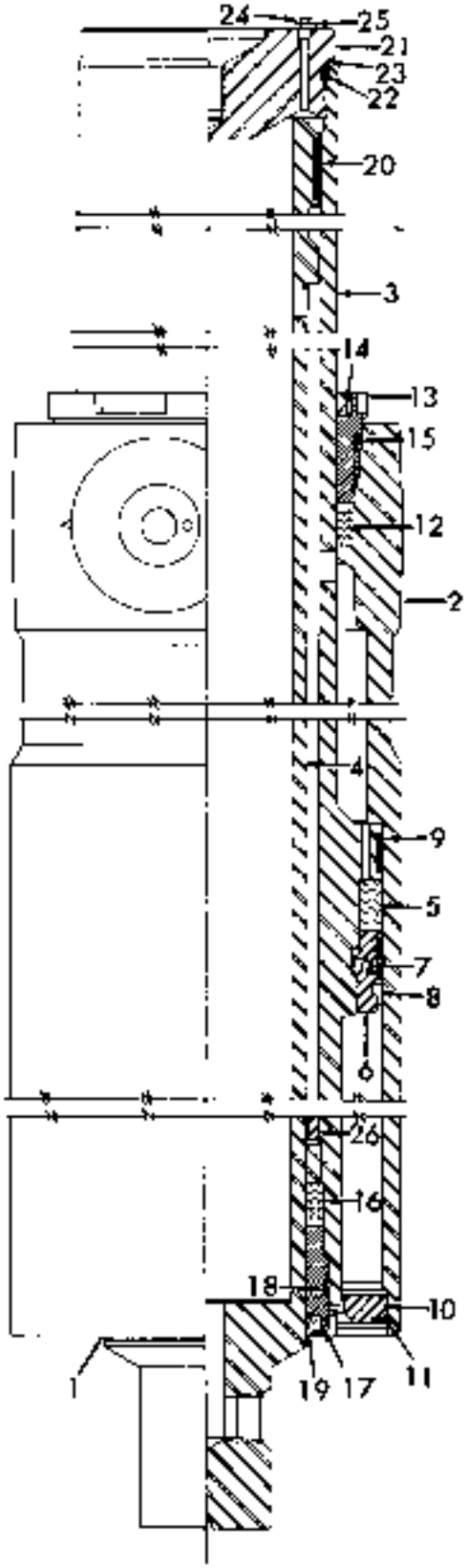


FIG. 2-40 - LIFT CYLINDER - TRIPLEX HIGH FREE LIFT

Ref. No.	Part No.	DESCRIPTION	No. Per. 4000#	No. Per. 5000#
		LIFT CYLINDER - TRIPLEX HIGH FREE LIFT (Knieke bocker)		
		Group IV		
		Used on 4000# Lift Cylinders, Mast Serial No. SFL-400 thru SFL-468, Inc. Used on 5000# Lift Cylinders, Mast Serial No. SFL-5-400 thru SFL-5-402.		
1	-------	*Cylinder - lift, assembly	1	-
1	-------	*Cylinder - lift, assembly Each includes the following 38 parts:	-	1
2	85P1630	*Tube - cylinder, outer	1	-
2	85P1707	*Tube - cylinder, outer	-	1
3	85P1631	*Tube - intermediate	1	-
3	85P1708	*Tube - intermediate	-	1
4	85P1230	*Tube - plunger, inner	1	-
4	85P1710	*Tube - plunger, inner	-	1
5	85P1878	Packing Set - outer cylinder, lower section	1	1
6	85P1858	+Nut - packing, lower section	1	1
6A	85P739	-Set Screw - packing nut	1	1
9	85P1601	--Nut - packing, lower section (replaces Ref. Nos. 6, 6A, 9 and 10)	1	1
8	85P1879	Ring - wiper, packing nut	1	1
9	85P1860	+Ring - wear, outer cylinder, lower	2	2
10	85P1859	-Ring - wear, outer cylinder, upper	1	1
11	85P1692	+Stuffing Box - outer tube, lower end	1	2
11	85P1852	--Stuffing Box - outer tube, lower end *NOTE: Order by serial number of lift plus MPH and OAHL. +NOTE: Used on lifts serial number SFL-400 thru SFL-459 and SFL-5-402. ++NOTE: Used on lifts serial number SFL-460 thru SFL-468.	2	1
12	85P1884	Ring - retaining, stuffing box, outer	1	1
13	85P1860	Ring - retaining, stuffing box, inner	2	1
14	85P1885	Sequence Valve - intermediate tube	1	1
15	85P1687	Piston - cylinder, on intermediate tube	2	1
16	85P701	Packing Set - top section, outer cylinder	1	1
17	85P709	Nut - packing, top section, outer cylinder	1	1
18	85P704	Ring - wiper, upper packing nut	1	1
19	85P702	"O" Ring - upper packing nut, 6-1/4" O.D.	1	1
20	85P717	Packing Set - plunger to intermediate	1	1
21	85P705	Gland - plunger packing	1	1
22	85P713	"O" Ring - plunger gland, 4-1/2" O.D.	1	1
23	85P714	Ring - wiper, plunger gland	1	1
24	85P708	Cap - intermediate, upper	1	1
25	10P1364	"O" Ring - intermediate cap, 4-1/8" O.D.	1	1
26	85U703	Washer - back up, intermediate cap	1	1
27	85P711	Screw - vent, intermediate cap	1	1
28	85P710	Washer - seal, vent screw	1	1
29	85P1247	Spacer - plunger tube, order by MPH and OAHL NOTE: Serial number of lift is stamped on top of outer tube on front side of Ref. No. 2.	-	1

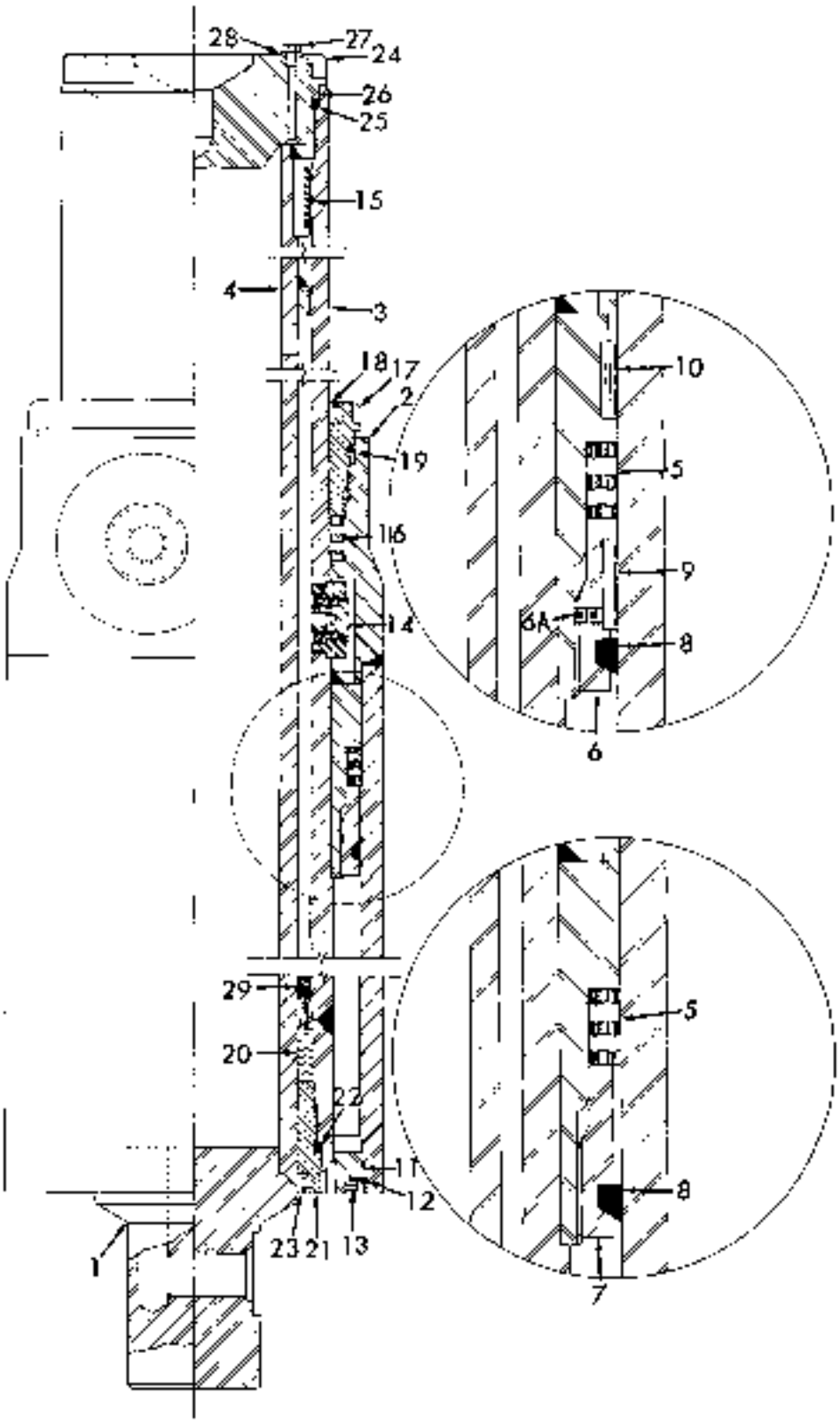


FIG. 2-42 - LIFT CYLINDER - TRIPLEX HIGH FREE LIFT

LIFT CYLINDER - TRIPLEX HIGH FREE LIFT (Kricker/bocker)

Group V

Used on 4000 # lift cylinders, Mast Serial No. 3FL-439 and after.
Used on 5000 # lift cylinders, Mast Serial No. 3FL-5-464 and after.

Ref. No	Part No	DESCRIPTION	No. Per 4000#	No. Per 5000#
1	35P1634	*Cylinder - lift, assembly	1	-
1	35P1706	*Cylinder - lift, assembly	-	1
		Each includes the following 28 parts:		
2	35P1683	*Tube - cylinder, outer	1	-
2	35P1707	*Tube - cylinder, outer	-	1
3	35P1696	*Tube - interstage	1	-
3	35P1709	*Tube - interstage	-	1
4	35P1230	*Tube - plunger, inner	1	-
4	35P1710	*Tube - plunger, inner	-	1
		*NOTE: Order by serial number of lift plus MFD and OAFL.		
5	35P1696	Packing Set - outer cylinder, lower section	1	1
6	35P1686	Adapter - packing, outer cylinder, lower section	1	1
7	35P1687	Nut - packing, lower section	1	1
8	35P1679	Ring - wiper, packing nut	1	1
9	35P1688	Sequence Valve - interstage tube	1	1
10	35P1687	Piston - cylinder, on interstage tube	1	1
11	35P1683	Stuffing Box - outer tube, lower tube	1	1
12	35P1684	Ring - retainer, stuffing box, outer	1	1
13	35P1690	Ring - retaining, stuffing box, inner	1	1
14	35P701	Packing Set - top section, outer cylinder	1	1
15	35P703	Nut - packing, top section, outer cylinder	1	1
16	65P704	Ring - wiper, upper packing nut	1	1
17	35P152	"O" Ring - upper packing nut, 6-1/4" O.D.	1	1
18	35P717	Packing Set - plunger to interstage	1	1
19	35P705	Gland - plunger packing	1	1
20	35P718	"O" Ring - plunger gland, 4-1/4" O.D.	1	1
21	35P714	Ring - wiper, plunger gland	1	1
22	35P702	Cap - interstage, upper	1	1
23	10P1364	"O" Ring - interstage cap, 4-1/8" O.D.	1	1
24	35P708	Washer - back up, interstage cap	1	1
25	35P711	Screw - vent, interstage cap	1	1
26	35P716	Washer - seal, vent screw	1	1
27	35P1247	Spacer - plunger	-	1
		NOTE: Serial numbers of lift is stamped on top, outside of tube, Ref. No. 2.		

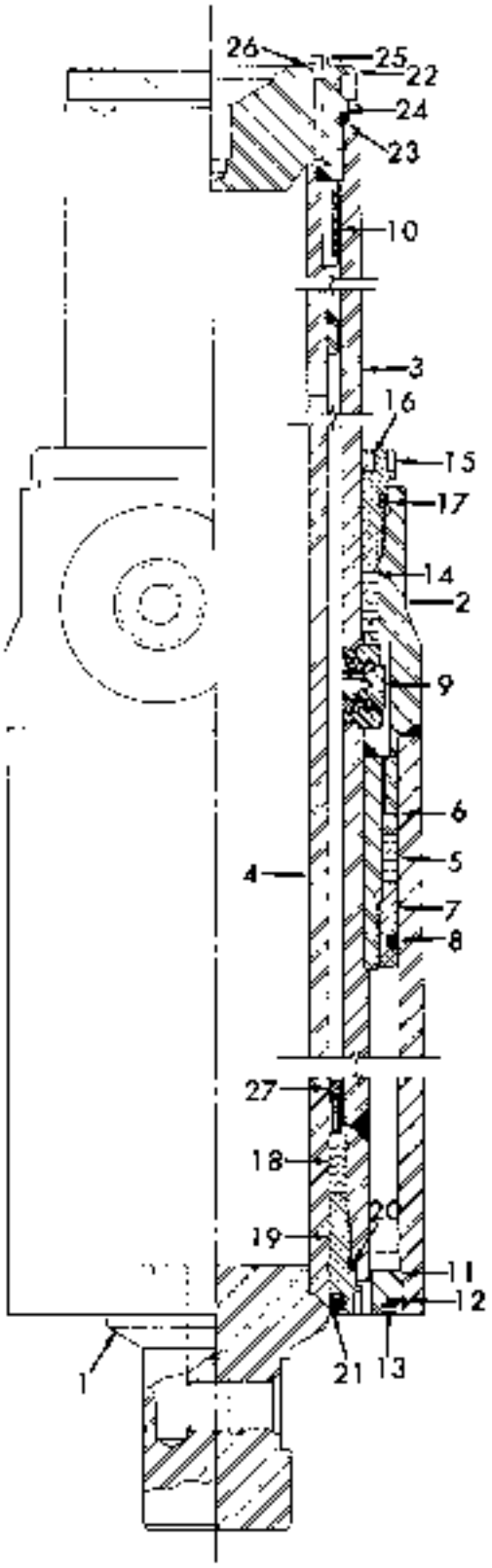


FIG. 2-40 - LIFT CYLINDER - TRIPLEX HIGH FREE LIFT

Ref. No.	Part No.	DESCRIPTION	No. Req'd		
		TRIPLEX MAST - LOW FREE LIFT (Knuckleboom) Group I	MA30	MA40	MA50
1	-------	*Rail - outer assembly	1	1	1
2	-------	*Rail - center assembly	1	1	1
3	-------	*Rail - inner assembly	1	1	1
4	35P695	Pad - wear	32	32	32
5	35P1151	*Cylinder - assembly, see page 116 for breakdown	1	*	*
5	35P1170	*Cylinder - assembly, see page 116 for breakdown	*	1	1
6	35P1152	Head - upright	1	1	1
7	35P1153	Bushing - head	4	4	4
8	35P685	Ring - head retaining	1	1	1
9	35P651	Lock - roller shaft	2	2	2
10	35P665	Shaft - 3" chain roller	2	2	2
11	35P669	Bearing - 3" chain roller	2	2	2
12	35P654	Roller - chain	2	2	2
13	35P1154	Rocker - chain lever	2	2	2
14	35P1155	Lever - rocker	2	2	2
15	35P1156	Shaft - chain roller	2	2	2
16	35P1157	Roller - chain lock	2	2	2
17	35P651	Lock - roller shaft	2	2	2
18	35P691	Bearing - roller, lower	2	2	2
19	35P688	Race - bearing, inner	2	2	2
20	35P696	Roller - chain	2	2	2
21	35P687	Washer - thrust, bearing	4	4	4
22	35P1160	Ring - bearing retainer	2	2	2
23	35P461	Anchor - chain, upper	2	2	2
24	35P1100	Pin - anchor	4	4	4
25	35P724	Lock Nut - anchor	2	2	2
26	35P601	Anchor - chain, lower	2	2	2
27	35P724	Lock Nut - anchor	2	2	2
28	-------	*Chain - Lift, 3/4" pitch, No. A1-844	4	4	4
29	35P1161	Elbow - tube to cylinder, 90°	1	1	1
30	35P461	Anchor - chain	2	2	2
31	35P1100	Pin - anchor	2	2	2
32	35P836	Turnbuckle - anchor chain	2	2	2
33	35P1163	*Rod - lift	2	2	2
34	35P1164	Tube - cylinder	1	1	1
35	35P1165	*Hose - cylinder	1	1	1
36	35P690	Elbow - fuel line to tube	1	1	1
37	35P1166	Elbow - tube to hose	1	1	1
38	35P1167	Adapter - elbow to hose and tube to elbow	2	2	2
39	35P1138	Peg - roller	4	4	4
40	35P1139	Ring - bearing retainer, outer	4	4	4
41	35P1140	Bearing - roller	4	4	4
42	35P1141	Ring - bearing retainer, inner	4	4	4
43	35P1144	Tire - roller	4	4	4
44	35P1142	Cover - bearing	4	4	4
45	35P1139	Ring - cover retaining	4	4	4
46	35P1146	Shaft - roller	4	4	4
47	35P1145	Support - shaft	8	8	8
48	35P1134	Screw - shaft support	4	4	4
		GM915524 - Bolt, hex., 3/8"-24 x 1-3/4"	4	4	4
49	35P1147	Roller - shaft	4	4	4
50	35P1168	Strap - channel	2	2	2
		GM444363 - Plug, pipe, hydraulic tank, 1/8"-27	1	1	1

*NOTE: Order parts for lifts as to MFH and CAPEL.

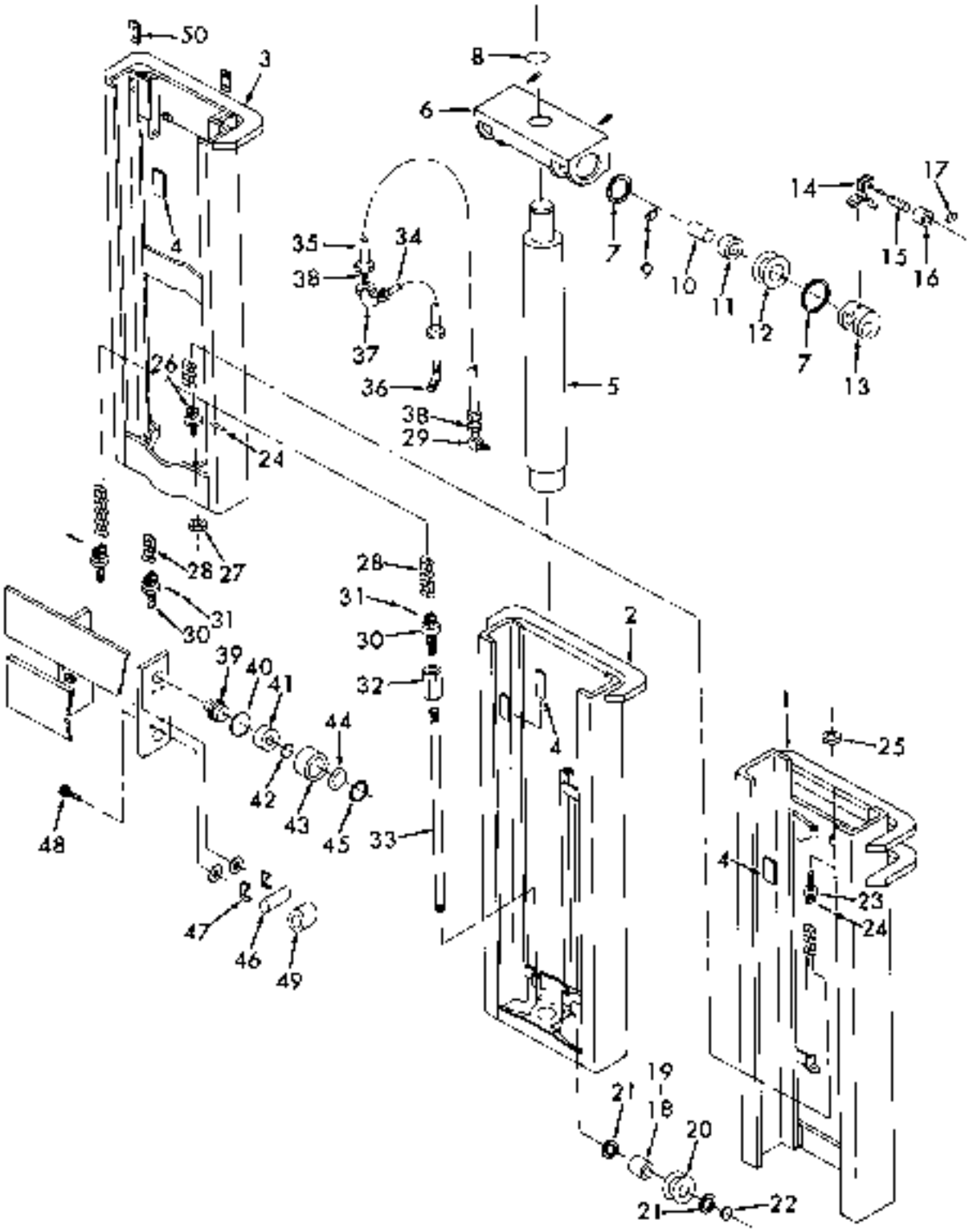


FIG. 2-44 - TRIPLEX MAST - LOW FREE LIFT

Ref. No	Part No	DESCRIPTION	No Per 4000#	No Per 5000#
		LIFT CYLINDER - TRIPLEX LOW FREE LIFT (Knuckelboom) Group II		
1	35P1151	*Cylinder - lift	1	-
1	35P1179	*Cylinder - lift	-	1
		Each includes the following 16 parts:		
2	35P1231	*Cylinder - with base	1	1
3	35P1289	*Rod - piston	1	1
4	35P1264	Nut - piston rod	1	1
5	35P1249	"O" Ring - rod	1	1
6	35P1239	Piston - cylinder	1	1
7	35P1254	Packing - piston	1	1
8	35P1537	Washer - piston rod	1	1
9	35P1255	Spacer - piston rod, 3" long	1	-
9	35P1256	Spacer - piston rod, 2-3/4" long	-	1
10	35P1252	Head - cylinder	1	1
11	35P1242	Bushing - head	1	1
12	35P1241	Ring - retaining, cylinder head	1	1
13	35P1243	Cap - cylinder	1	1
14	35P1544	"O" Ring - cap	1	1
15	35P663	Gasket - cap (35P1245 Liner.)	6	6
16	35P080	Wiper - cap (35P1246 Liner.)	1	1
17	35P635	Retainer - cylinder rod	1	1
	35P1739	Vent - outer cylinder	1	1
		*NOTE: Order parts for lift as to MFH and OAHL.		

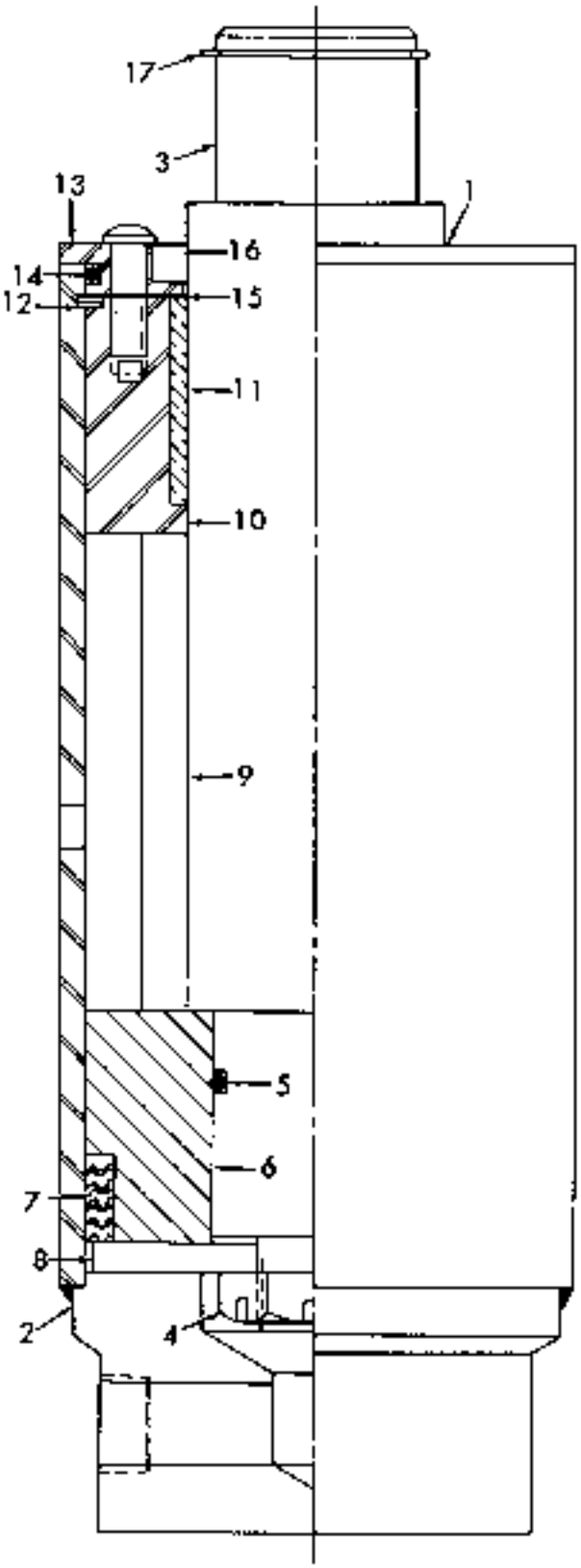


FIG. 2-45 - LIFT CYLINDER - TRIPLEX LOW FREE LIFT

VARIABLE PARTS CHART - For MA 30 - 40 - 50 with Duplex Masts

Duplex Outer Rail	Duplex Inner Rail	MA 30 Cylinder Assy.	MA 40-50 Cylinder Assy.	Chain Assy. Links	Chain Inches	Chain Anchor Rod	Vent Hose	OAH	MPH
36A5696 - 60-1/2"	36A5665 - 60-1/2"	35A5741 - 33"	35A5232 - 33"	35A5794 - 165	126-1/4"	35A5750 - 14"	35A7327 - 10"	63-1/2"	91"
36A5697 - 62"	36A5667 - 62"	35A5741 - 33"	35A5233 - 33"	35A5795 - 171	129-1/4"	35A5750 - 14"	35A7327 - 16"	65"	94"
36A5698 - 63-1/2"	36A5668 - 63-1/2"	35A5742 - 33"	35A5234 - 33"	35A5800 - 175	131-1/4"	35A5750 - 14"	35A7327 - 16"	66-1/2"	97"
36A5699 - 65"	36A5669 - 65"	35A5743 - 33"	35A5235 - 33"	35A5801 - 179	134-1/4"	35A5750 - 14"	35A7327 - 16"	69"	100"
36A5700 - 66-1/2"	36A5670 - 66-1/2"	35A5744 - 33-1/2"	35A5236 - 35-1/2"	35A5802 - 185	138-1/4"	35A5751 - 16-1/2"	35A7328 - 18"	69-1/2"	103"
36A5701 - 68"	36A5671 - 68"	35A5745 - 35-1/2"	35A5237 - 35-1/2"	35A5803 - 189	138-1/4"	35A5751 - 16-1/2"	35A7328 - 18"	71"	106"
36A5702 - 69-1/2"	36A5672 - 69-1/2"	35A5746 - 35-1/2"	35A5238 - 35-1/2"	35A5804 - 193	140-1/4"	35A5751 - 16-1/2"	35A7328 - 18"	72-1/2"	109"
36A5703 - 71"	36A5673 - 71"	35A5747 - 38"	35A5239 - 38"	35A5805 - 199	141-3/4"	35A5752 - 18"	35A7329 - 21-1/2"	74"	112"
36A5704 - 72-1/2"	36A5674 - 72-1/2"	35A5748 - 38"	35A5240 - 38"	35A5806 - 199	144-3/4"	35A5752 - 18"	35A7329 - 21-1/2"	75-1/2"	115"
36A5705 - 74"	36A5675 - 74"	35A5749 - 38"	35A5241 - 38"	35A5807 - 197	143-3/4"	35A5752 - 18"	35A7329 - 21-1/2"	77"	118"
36A5706 - 75-1/2"	36A5676 - 75-1/2"	35A5750 - 38"	35A5242 - 38"	35A5808 - 201	150-3/4"	35A5752 - 18"	35A7329 - 21-1/2"	78-1/2"	121"
36A5707 - 77"	36A5677 - 77"	35A5751 - 41-1/2"	35A5243 - 40-1/2"	35A5809 - 201	150-3/4"	35A5753 - 21"	35A7330 - 24"	80"	124"
36A5708 - 78-1/2"	36A5678 - 78-1/2"	35A5752 - 40-1/2"	35A5244 - 40-1/2"	35A5809 - 205	153-3/4"	35A5753 - 21"	35A7330 - 24"	81-1/2"	127"
36A5709 - 80"	36A5679 - 80"	35A5753 - 40-1/2"	35A5245 - 40-1/2"	35A5810 - 209	156-3/4"	35A5753 - 21"	35A7330 - 24"	83"	130"
36A5710 - 81-1/2"	36A5680 - 81-1/2"	35A5754 - 41"	35A5246 - 42"	35A5810 - 209	156-3/4"	35A5754 - 24"	35A7331 - 26-1/2"	84-1/2"	133"
36A5711 - 83"	36A5681 - 83"	35A5755 - 44"	35A5247 - 44"	35A5811 - 213	159-3/4"	35A5754 - 24"	35A7331 - 26-1/2"	86"	136"
36A5712 - 84-1/2"	36A5682 - 84-1/2"	35A5756 - 44"	35A5248 - 44"	35A5812 - 217	162-3/4"	35A5754 - 24"	35A7331 - 26-1/2"	87-1/2"	139"
36A5713 - 86"	36A5683 - 86"	35A5757 - 44"	35A5249 - 44"	35A5813 - 221	165-3/4"	35A5754 - 24"	35A7331 - 26-1/2"	89"	142"
36A5714 - 87-1/2"	36A5684 - 87-1/2"	35A5758 - 44"	35A5250 - 44"	35A5814 - 225	168-3/4"	35A5754 - 24"	35A7331 - 26-1/2"	90-1/2"	145"
36A5715 - 89-1/2"	36A5685 - 89-1/2"	35A5759 - 47"	35A5251 - 47"	35A5815 - 225	168-3/4"	35A5755 - 28"	35A7332 - 30"	92-1/2"	148"
36A5716 - 91"	36A5686 - 91"	35A5760 - 47"	35A5252 - 47"	35A5816 - 229	171-3/4"	35A5755 - 28"	35A7332 - 30"	94"	151"
36A5717 - 92-1/2"	36A5687 - 92-1/2"	35A5761 - 47"	35A5253 - 47"	35A5816 - 233	174-3/4"	35A5756 - 28"	35A7332 - 30"	95-1/2"	154"
36A5718 - 94"	36A5688 - 94"	35A5762 - 47"	35A5254 - 47"	35A5817 - 237	177-3/4"	35A5756 - 28"	35A7332 - 30"	97"	157"
36A5719 - 96-1/2"	36A5689 - 96-1/2"	35A5763 - 50"	35A5255 - 50"	35A5817 - 237	177-3/4"	35A5756 - 31-1/2"	35A7333 - 33"	98-1/2"	160"
36A5720 - 97-1/2"	36A5690 - 97-1/2"	35A5764 - 50"	35A5256 - 50"	35A5818 - 243	182-1/4"	35A5756 - 31-1/2"	35A7333 - 33"	100-1/2"	163"
36A5721 - 99"	36A5691 - 99"	35A5765 - 50"	35A5257 - 50"	35A5819 - 247	185-1/4"	35A5756 - 31-1/2"	35A7333 - 33"	102"	166"
36A5722 - 100-1/2"	36A5692 - 100-1/2"	35A5766 - 50"	35A5258 - 50"	35A5820 - 251	188-1/4"	35A5756 - 31-1/2"	35A7333 - 33"	103-1/2"	169"
36A5723 - 102"	36A5693 - 102"	35A5767 - 53"	35A5259 - 53"	35A5820 - 251	188-1/4"	35A5757 - 38-1/2"	35A7334 - 36"	105"	172"
36A5724 - 103-1/2"	36A5694 - 103-1/2"	35A5768 - 53"	35A5260 - 53"	35A5821 - 255	191-1/4"	35A5757 - 38-1/2"	35A7334 - 36"	105-1/2"	175"
36A5725 - 105-1/2"	36A5695 - 105-1/2"	35A5769 - 53"	35A5261 - 53"	35A5822 - 261	195-3/4"	35A5757 - 38-1/2"	35A7334 - 36"	105-1/2"	175"

NOTE: For breakdown of Duplex Lift Cylinders see pages 92 and 94.

Ref. No	Part No.	DESCRIPTION	No. Per

VARIABLE PARTS CHART TRIPLEX MAST

Upright Assy. High Free Lift MA 30 - 40	Upright Assy. High Free Lift MA 30	Upright Assy. Low Free Lift MA 30 - 40	Upright Assy. Low Free Lift MA 30	Mast Height
--------	--------	36A6876	36A6971	120"
36A6587	36A6961	36A6877	36A6972	135"
36A6588	36A6962	36A6878	36A6973	144"
36A6589	36A6963	36A6879	36A6974	153"
36A6590	36A6964	36A6880	36A6975	162"
36A6591	36A6965	36A6881	36A6976	171"
36A6592	36A6966	36A6882	36A6977	180"
36A6593	36A6967	36A6883	36A6978	189"
36A6594	36A6968	36A6884	36A6979	198"
36A6595	36A6969	36A6885	36A6980	207"
36A6596	36A6970	36A6886	36A6981	216"

NOTE: Carriage, Forks, Fork Extensions and Load Safety Racks are to be ordered from Mobilift Sales Department.

DECALS, PAINT AND HYDRAULIC FLUID

36A8816	Decal - Mobilift, on upright (30A4683)	2
36A8819	Decal - Mobilift, on hood sides (36A4969)	2
36A8822	Decal - Mobilmatic, on cowl sides	2
36A8821	Decal - High Free Lift, on mast	2
36A6381	Decal - side strip, 1-3/4" x 40-1/2"	2
36A6494	Decal - strip, R.H., 2-1/2" x 10-1/2"	1
36A6495	Decal - strip, L.H., 2-1/2" x 10-1/2"	1
15P1015	Paint - yellow, quart can	-
15P1013	Paint - yellow, gallon can	-
15P1014	Paint - yellow, 16 oz. pressurized can	-
10P706	Fluid - hydraulic (1 quart)	-
10P1027	Fluid - hydraulic (1 gallon)	-
10P705	Fluid - hydraulic (5 gallon)	-
10P707A	Fluid - hydraulic (54 gallon)	-

Ref. No.	Part No.	DESCRIPTION	No. Per Narrow Reel	No. Per Wide Reel
		HOSE REELS		
0	35A1459	Reel - hose, left hand, 91" thru 145"	1	-
1	35A0835	Reel - hose, left hand, 146 thru 216"	-	1
0	35A3244	Reel - hose, right hand, 91" thru 145"	1	-
1	35A0834	Reel - hose, right hand, 146" thru 216"	-	1
		Each include the following 21 parts:		
		GM180479 - Bolt, hex., 1/2"-13 x 1-1/4"	2	2
		GM120378 - Nut, hex., 1/2"-13	2	2
		GM446484 - Washer, plain, 9/16" I.D., 1-7/8" O.D.	2	2
2	35P1175	Shaft - assembly, reel	1	-
2	35P1176	Shaft - assembly, reel	-	1
3	35P1173	Nipple - shaft, 2"	1	1
4	35P1172	Elbow - nipple, female	1	1
5	35P1174	Elbow - shaft, male end	1	1
6	35P1182	Hub - reel	1	-
6	35P1183	Hub - reel	-	1
7	10A7956	"O" Ring - shaft	3	3
8	35P1021	Ring - back-up, "o" ring	4	4
9	35P1184	Snap Ring - hub	1	1
10	35P1009	Elbow - hub, 45°	2	2
11	35P1188	Elbow - hub, 90°	2	2
12	35P1162	Bar - reel	1	-
12	35P1171	Bar - reel	-	1
13	35P1177	Flange - reel, inner	1	1
14	35P1178	Divider - reel, center ring	1	1
15	35P1181	Flange - reel, outer	1	1
		GM120375 - Nut, hex., 1/4"-20	4	4
		GM180735 - Bolt, hex., 5/16"-18 x 3-1/4"	6	-
		GM197963 - Bolt, hex., 5/16"-18 x 4-1/2"	-	6
		GM120376 - Nut, hex., 5/16"-18	6	6
16	35P1179	Spacer - flanges, 1-5/16" long	11	-
16	35P1180	Spacer - flanges, 1-15/16" long	-	11
17	35P1185	Spring - assembly, with cover, R.H.	1	1
17	35P1186	Spring - assembly, with cover, L.H.	1	1
18	35A1482	Block - junction, hydraulic hoses	1	1
		Includes the following 12 parts:		
		GM150126 - Bolt, hex., 3/8"-16 x 1-1/2"	1	1
		30A3420 - Washer, plain, 1-3/8"	1	1
19	35P1190	Body - block	1	1
20	35P1191	Plunger - body	1	1
52	35P1192	Plug - body	2	2
		GM145645 - Ball, steel, 9/16"	2	2
52	35P1193	Spring - ball	2	2
23	35P1194	Spacer - spring and ball	2	2
24	35P1069	Shaft - block	1	1
25	35P1189	"O" Ring - shaft	3	3
26	35P1188	Ring - back-up, "o" ring	2	2
27	35P1187	Snap Ring - shaft	2	2
28	35P1185	Connector - hose to shaft	2	2
29	10A6839	"O" Ring - connector, 5/8" I.D.	2	2
30	10A6025	"O" Ring - plug, body, 13/32" I.D.	2	2
	35A6835	Tube - reel to valve, L.H., 3/8" x 20-9/16" long	1	1
	35A6836	Tube - reel to valve, L.H., 3/8" x 20-3/4" long	1	1
	35A6837	Tube - reel to valve, R.H.	1	1
	35A6838	Tube - reel to valve, R.H., 3/8" x 9-7/8" long	1	1
		GM2410976 - Connector, tubes to valve	2	2
	35P1640	*Hose - reels, 1 foot of hose 3/8" I.D. (Order length as needed for lift)	2	2
		30A2020 - Fitting, hose ends	4	4
		*NOTE: Duplex Masts require 10" more hose and Triplex Masts require 1' more hose than what the MFG is.		

Ref. No.	Part No.	DESCRIPTION	No. Per	
		HOSE REELS (Cont'd)		
	10A16435	"O" Ring - fitting to valve	3	3
	50A7021	Fork - overhead guard, 1/4" x 1-3/4" x 5-1/2"	2	2

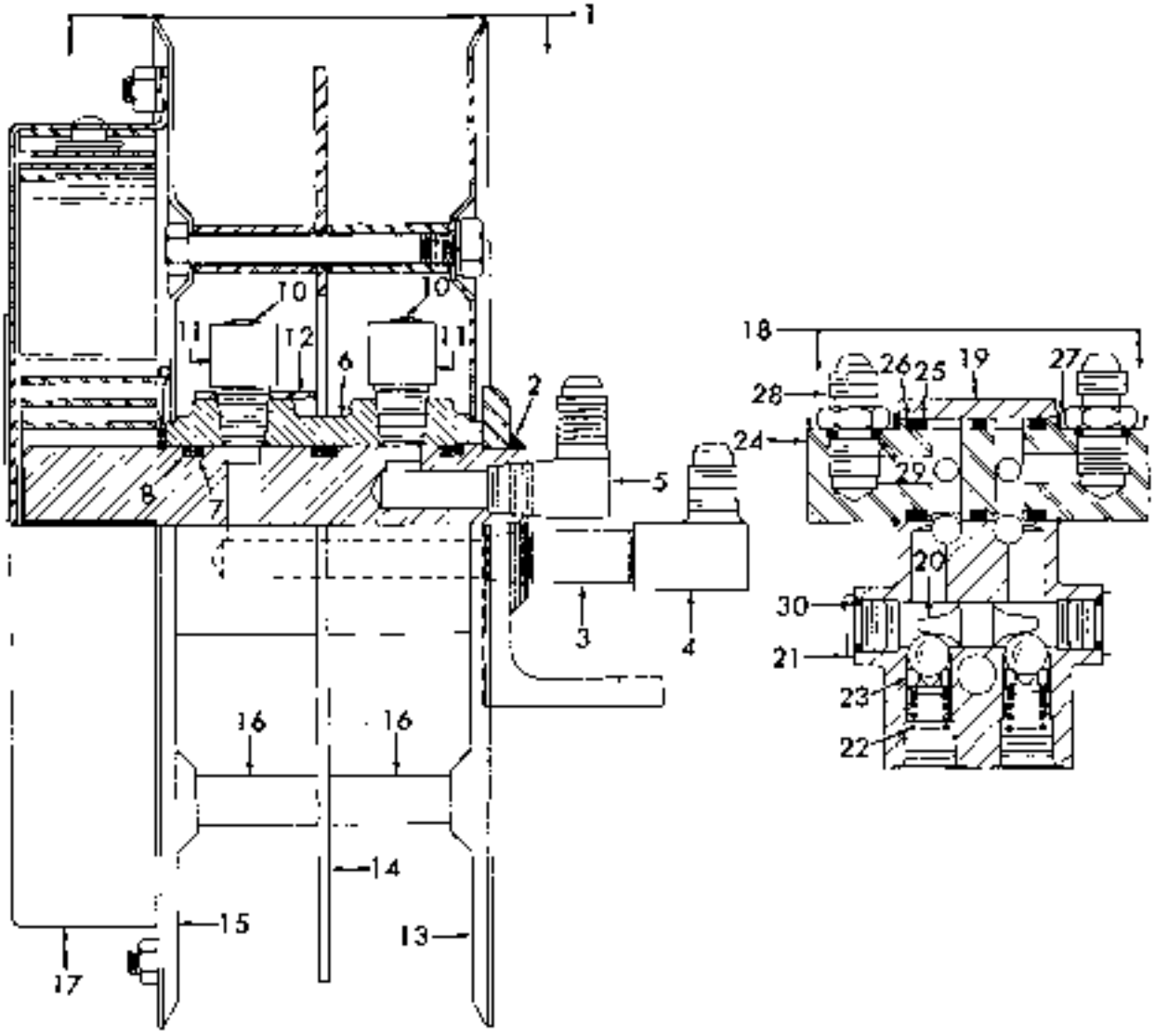


FIG. 2-48 - HOSE REELS

Ref. No	Part No	DESCRIPTION	No. Per	
		AUXILIARY VALVES	Single	Double
1	35A6487	Valve - control, complete	1	-
1	35A6486	Valve - control, complete	-	1
		GM435115 - Bolt, hex., 3/8"-16 x 4-1/4"	3	6
		GM120577 - Nut, hex., 3/8"-16	3	6
		GM120988 - Washer, plain, 7/16" I.D., 1" O.D.	3	6
2	15F690	Seal - spool	2	4
3	15F658	Spring - spool centering	1	2
4	10P1052	Washer - stop, centering spring	1	2
5	15F654	Collar - stop, centering spring	1	2
6	15F652	Bolt - stop collar	1	2
7	10P1650	Washer - lock, stop collar bolt	1	2
8	15F655	Disc - stop collar	1	2
9	15F657	Ring - snap, stop disc	1	2
10	15F653	Bonnet - rubber, spool opening	1	2
11	35P215	Plug - ball check	1	1
12	10A6829	"O" Ring - ball check plug	1	1
13	35P218	Plunger - check and relief valve	2	2
	2004777	Spring - plunger, check valve (D5 and after)	1	1
14	35P210	Seat - relief valve	-	1
15	10A12912	"O" Ring - relief valve seat	1	1
16	35P285	Spring - relief	1	1
17	35P282	Guide - relief spring	1	1
18	35P213	Ball - relief guide	1	1
19	10A16489	Washer - spacer, relief spring	1	1
20	10A16490	Shim - relief spring	1	1
21	10A10487	Gasket - relief spring cap	1	1
22	35P220	Cap - relief spring	1	1
23	35P1095	Plug - pipe	2	1
24	36A6292	Handle - control, auxiliary valve, straight (36A6678)	2	-
25	30A6591	Handle - control, auxiliary valve, offset (36A6677)	-	1
26	35A6579	Pin - handle to support, 1/4" x 1-3/8"	1	2
		50A1910 - "E" Ring, pin, 3/8"	2	4
27	35A7077	Link - handle to valve spool	1	2
28	30A4119	*Knob - control handle (threaded)	1	2
29	35A8556	*Label - knob, Mobilift, 1-1/2" dia. for 35A4119 knob	1	2
	30A5296	**Knob - control lever (not threaded)	1	2
		**50A4987 - Ring, knob to handle	1	2
		*NOTE: Used on trucks with 2 piece knobs.		
		**NOTE: Used on trucks with solid knobs.		
30	35A0507	Spacer - valve and cowl	3	3
31	35A3120	Plug - adapter, 7/16"-14 x 1-3/8"	1	1
32		50A1066 - Quad ring, to control valve	1	1
33	35A6737	Tube - pressure, to valve	1	1
34	85A6172	Elbow - valve, 90°, 3/4" UNF-37° x 7/8"-14 UNS	2	2
35	10A10285	"O" Ring - elbow	2	2
36		50A1992 - Elbow, valve, JIC 90° flared, 5/8" size	1	1
37	35A8736	Tube - valve return	1	1
38		GM9402710 - Connector, tank, 37° connector 5/8"	1	1

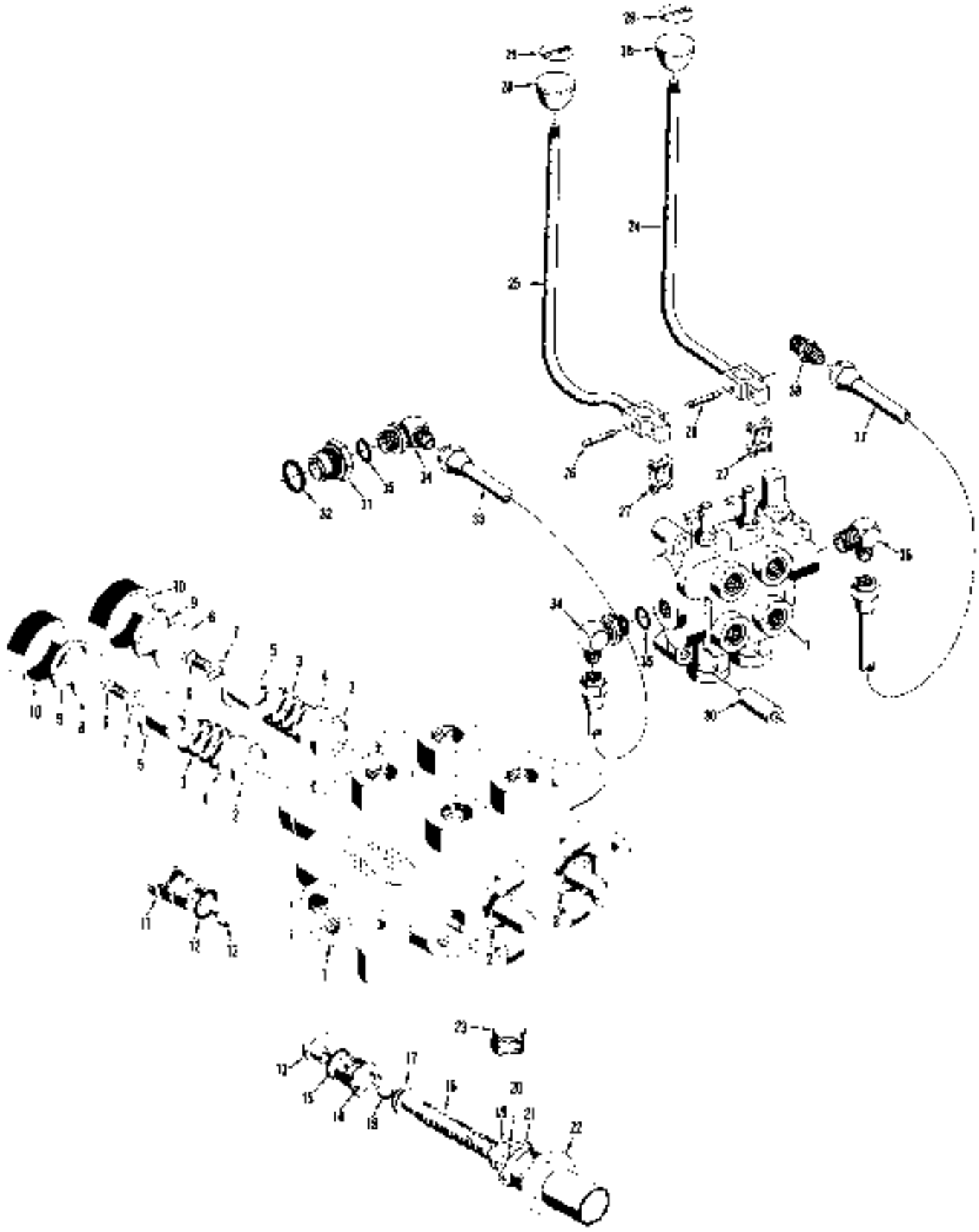


FIG. 3-47 - AUXILIARY VALVES

Ref. No	Part No	DESCRIPTION	No. Pcs	
		SHEAVE TAKE-UP FOR HOSES	Single	Double
1	36A8033	Junction Block - hoses	1	2
2	36A8030	Support - assembly, R.H.	-	1
3	30A8031	Support - assembly, L.H.	1	-
4	36A8033	Bracket - support, R.H.	-	1
5	36A8032	Bracket - support, L.H.	1	-
6	10A11140	Snap Ring - pin	1	2
7	36A8122	Block - guide rod	1	2
8	35A8622	Block - upright, welds to outer channel, 1" x 1-9/16"	2	4
9	35A8121	Spacer - upright, 3/4" x 1-7/16" x 7/64" thick	1	2
10	35A8629	Spacer - upright, 1-7/8" x 2" x 1/8" thick	1	2
11	36B8030	Block - sheave take-up Includes the following part:	1	2
12	30A8095	Pin - sheave, 1" x 3-1/8"	1	2
13	10A11140	Snap Ring - pin	1	2
14	--------	*Hose - junction block to elbow and elbow to aux. valve	4	6
15	--------	*Hose - elbow to aux. valve, R.H. side, long, 3/8" I.D.	-	1
16	--------	*Hose - elbow to aux. valve, R.H. side, short, 3/8" I.D. *Note: See chart on page 126 for length of hoses needed.	-	1
	05P1640	Hose - 1" of 3/8" I.D. single braid hose	-	-
16		30A2620 - Fitting, hose ends	8	16
17		30A4359 - Elbow, hoses, upper ends, 90°	2	4
18		30A4423 - Elbow, hoses to valve, 90°	2	4
19	10A15400	"O" Ring - elbow	2	4
20	35A8622	Clamp - hose, mounts to support, U-shaped	-	2
		30A3646 - Bolt, hex., 1/4"-20 x 3/4"	1	2
		30A3649 - Bolt, hex., 1/4"-20 x 1-1/4"	2	4
		30A1898 - Nut, hex., 1/4"-20	3	6
21	35A8304	Band - hose, 3/4" I.D. x 1" long	30	60
22	--------	Rod - guide, see chart on page 126 for length of rod needed	2	4
23	35B8032	Sheave - block and support, 4-13/16" dia. Includes the following part:	2	4
24	35A8031	Bushing - sheave, 1" I.D., 2" long	2	4

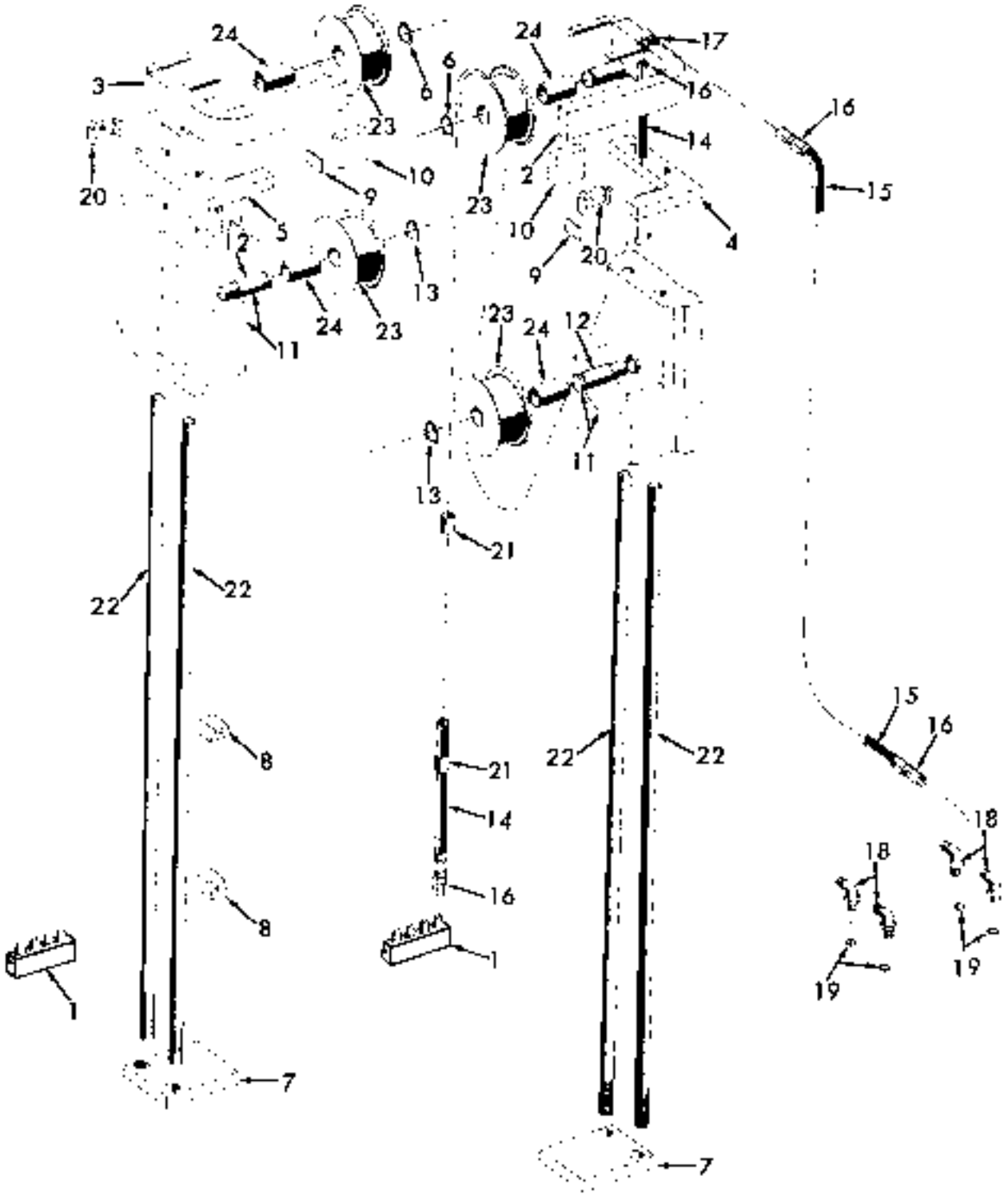


FIG. 2-43 - SHEAVE TAKE-UP FOR HOSES

GUIDE RODS AND HOSES FOR SHEAVE TAKE-UP

MFH	OAHt.	Guide Rod	Length	Hose Block to Elbow and Elbow to Aux. Valve	Hose Elbow to Aux. Valve R.H. Side	Hose Elbow to Aux. Valve R.H. Side
94"	6?"	50A4?65	36-1/2"	73"	71"	68"
97"	66-1/2"	50A4692	37-3/4"	74-1/2"	72-1/2"	67-1/2"
100"	69"	50A4691	38-1/2"	76"	74"	69"
103"	69-1/2"	50A4696	39-1/4"	77-1/2"	75-1/2"	70-1/2"
106"	72"	50A4698	40"	79"	77"	72"
109"	72-1/2"	50A4603	40-3/4"	80-1/2"	78-1/2"	73-1/2"
112"	74"	50A4698	40-3/4"	82"	80"	75"
115"	76-1/2"	50A4609	42-1/4"	83-1/2"	81-1/2"	78-1/2"
118"	77"	50A4697	42-3/4"	85"	83"	78"
121"	78-1/2"	50A4697	43-3/4"	86-1/2"	84-1/2"	79-1/2"
124"	80"	50A4698	44-1/4"	88"	86"	81"
127"	81-1/2"	50A4695	45-1/4"	89-1/2"	87-1/2"	82-1/2"
130"	83"	50A4639	46"	91"	89"	84"
133"	84-1/2"	50A4640	46-3/4"	92-1/2"	90-1/2"	85-1/2"
136"	86"	50A4641	47-1/2"	94"	92"	87"
139"	87-1/2"	50A4642	48-1/4"	95-1/2"	93-1/2"	88-1/2"
142"	89"	50A4643	49"	97"	95"	90"
145"	90-1/2"	50A4644	49-3/4"	98-1/2"	96-1/2"	91-1/2"
148"	92-1/2"	50A4645	51"	100-1/2"	98-1/2"	93-1/2"
151"	94"	50A4647	51-3/4"	102"	100"	95"
154"	95-1/2"	50A4648	52-1/2"	103-1/2"	101-1/2"	96-1/2"
157"	97"	50A4650	53-1/4"	105"	103"	98"
160"	98-1/2"	50A4651	54"	106-1/2"	104-1/2"	99-1/2"
163"	100-1/2"	50A4653	55-1/4"	108-1/2"	106-1/2"	101-1/2"
166"	102"	50A4654	56"	110"	108"	103"
169"	103-1/2"	50A4655	56-3/4"	111-1/2"	106-1/2"	104-1/2"
172"	105"	50A4656	57-1/2"	113"	111"	106"
175"	106-1/2"	50A4657	58-1/4"	114-1/2"	112-1/2"	107-1/2"
178"	108-1/2"	50A4658	60-1/4"	116-1/2"	114-1/2"	109-1/2"

Note: Hose lengths listed are less fittings.

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