

FORD

SERIES 6000

INDEX (By Starting Paragraph)

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CONDENSED SERVICE DATA

GENERAL

	Series 6000 Commander 6000 Non-Diesel	Series 6000 Commander 6000 Diesel
Torque Recommendations	See End of Shop Manual	
Engine Make	Own	Own
Cylinders, Number of	6	6
Bore—Inches	3.62	3.62
Stroke—Inches	3.60	3.90
Displacement—Cubic Inches	223	242
Compression Ratio	8.40	16.5
Pistons Removed From	Above	Above
Main & Rod Bearings Adjustable?	No	No
Generator & Regulator Make	Own	Own
Starter Make	Own	Delco-Remy
Carburetor Make	Zenith	None
Distributor Make	Own	None

TUNE-UP

Firing Order	1-5-3-6-2-4	1-5-3-6-2-4
Distributor Poin Gap	0.024-0.026
Valve Tappet Gap—Intake	0.015 Hot	0.015 Hot
Valve Tappet Gap—Exhaust	0.015 Hot	0.015 Hot
Valve Face Angle—Degrees	See. Par. 28	
Vavle Seat Angle—Degrees	See. Par. 28	
Ignition Timing	See Par. 82
Injection timing	See Par. 63
Spark Plug Make	Auto-Lite
Spark Plug Size	18MM
Spark Plug Electrode Gap (Gasoline)	0.028-0.032
(LPG)	0.018-0.022
Engine Low Idle—RPM	650-700	800-850
Engine High Idle—RPM (Series 6000)	2575-2625	2475-2525
(Commander 6000)	2675-2725	2645-2695
Engine Rated Speed—RPM (Series 6000)	2300	2230
(Commander 6000)	2430	2430
Battery Terminal Grounded	Negative	Negative

SIZES—CAPACITIES—CLEARANCES

Crankshaft Journal Diameter	See. Par. 43	
Crankpin Diameter	2.2980-2.2988	2.2980-2.2988
Camshaft Journals Diameter	1.9255-1.9265	1.9255-1.9265
Piston Pin Diameter	0.9120-0.9123	1.1240-1.1243
Valve Stem Diameter, Intake	See. Par. 28	
Valve Stem Diameter, Exhaust	See. Par. 28	
Main Bearings Running Clearance	See Par. 43	0.0019-0.0040
Rod Bearings Running Clearance	0.0006-0.0025	0.0006-0.0025
Piston Skirt Clearance	See. Par. 40	
Crankshaft End Play	0.004-0.008	0.004-0.008
Camshaft Bearing Running Clearance	0.001-0.003	0.001-0.003
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Hydraulic System Reservoir— Quarts	14	14
Steering Gear Housing—Lbs.	1/2	1/2

FRONT SYSTEM

The series 6000 and Commander 6000 tractors are available with any of four front end assemblies; a single wheel tricycle, a dual wheel tricycle, a wide adjustable front axle and an all purpose front axle.

The most obvious difference between the two adjustable front axles is that the all purpose axle (Fig. FO12A) is mounted to the tractor with the stay rod portion of the axle toward the front of the tractor rather than rearward as with the wide adjustable axle. Mounting the axle this way shortens the tractor wheelbase to 85 inches as compared to the 104.24 inch wheelbase when tractor is equipped with the wide adjustable axle. Service procedures will not differ greatly and will be obvious upon examination.

Power steering is standard equipment for all models.

TRICYCLE TYPE

Single Wheel Models

1. The single wheel tricycle wheel spindle is bolted to the power steering motor shaft and is installed so that the arm is on left side as shown in Fig. FO10. When installing wheel spindle, tighten the four retaining cap screws to 150-180 ft.-lbs. torque.

To adjust the wheel bearings, raise front of tractor and remove cap (36). Remove cotter pin from adjusting nut (35) and tighten nut until bearings are fully seated, then back-off nut until bearings have zero end play and wheel rotates with a very slight drag.

Renewal of bearings, cups and retainers is obvious after an examination of the unit and reference to Fig. FO10.

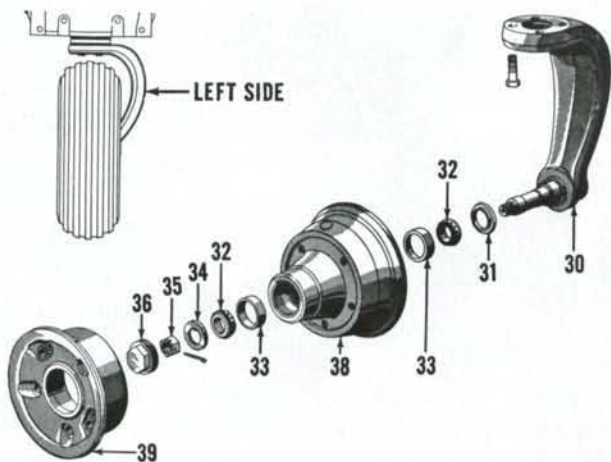
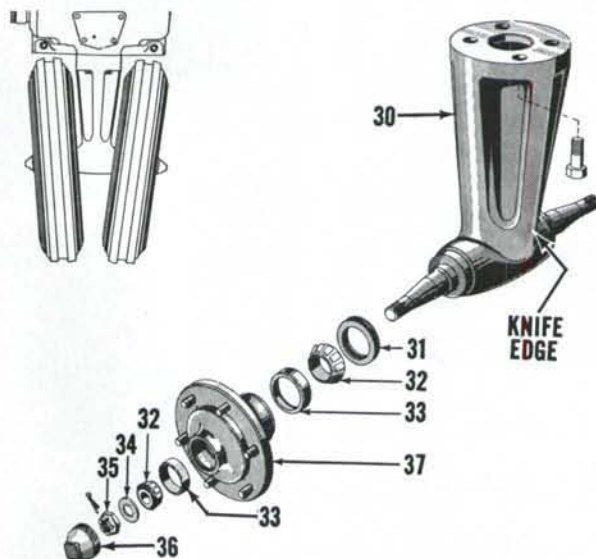


Fig. FO10—Single wheel tricycle spindle and associated parts.

- 30. Spindle
- 31. Retainer
- 32. Bearing cone
- 33. Bearing cup
- 34. Washer
- 35. Nut
- 36. Hub cap
- 38. Wheel disc
- 39. Wheel flange

Fig. FO11 — Dual wheel tricycle spindle and associated parts. Knife edge of spindle faces toward front.



- 30. Spindle
- 31. Retainer
- 32. Bearing cone
- 33. Bearing cup
- 34. Washer
- 35. Nut
- 36. Hub cap
- 37. Wheel hub

Dual Wheel Models

2. The dual wheel spindle assembly attaches to the power steering motor shaft and must be installed with the knife edge toward front as shown in Fig. FO11. When installing the spindle, tighten the four retaining cap screws to 150-180 ft.-lbs. torque.

To adjust the wheel bearings, raise front of tractor and remove cap (36). Remove cotter pin from adjusting nut (35) and tighten nut until bearings are fully seated, then back-off nut until bearings have zero end play and wheels rotate with a very slight drag.

Renewal of bearings, cups and retainers is obvious after an examination of the unit and reference to Fig. FO11.

AXLE TYPE

Adjustable Axle Models

3. **SPINDLE BUSHINGS.** The spindle bushings (17 & 19—Fig. FO12 or FO12A) can be removed with a cape chisel after removing steering arms (3) and withdrawing spindles. (1). Bushings are pre-sized and should be installed flush with outer ends of bore using a suitable piloted driver. Tighten the steering arm retaining cap screws to 40-55 ft.-lbs. torque on tractors prior to serial number 21962 having $\frac{1}{16}$ -inch cap screws, or to 65-90 ft.-lbs. torque on later tractors having $\frac{1}{2}$ -inch cap screws.

4. **TIE-RODS AND TOE-IN.** The tie-rod ends are the non-adjustable type and correction of faulty units is accomplished by renewal of the units.

To adjust the toe-in, turn wheel to the straight ahead position, loosen clamps on both tie-rod tubes and rotate each tube an equal amount to obtain a toe-in of $\frac{1}{4}$ -inch. Tie-rods should be within $\frac{1}{8}$ -inch equal length when adjustment is complete. Tighten clamps securely.

5. **AXLE PIVOT PINS.** The axle pivot pins (9 & 15—Fig. FO12) of wide adjustable front axles have no bushings and are retained in supports (12 and 13) by cap screws.

The stay rod and rear support bracket of the all purpose front axle are equipped with renewable bushings (24 and 25—Fig. FO12A) and the pivot pins are retained in supports (12 and 13) by cap screws. The bushings are presized and should require no final sizing if carefully installed.

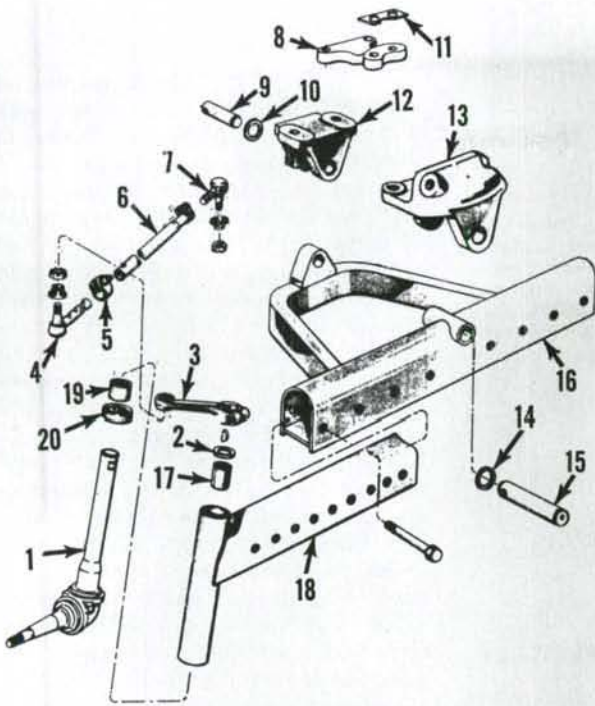


Fig. FO12 — Exploded view of the wide adjustable front axle and associated parts.

1. Spindle
2. Dust seal
3. Steering arm
4. Tie-rod end
5. Clamp
6. Adjusting tube
7. Tie-rod end
8. Center steering arm
9. Pivot pin, rear
10. Spacer
11. Bolt anchor
12. Support, rear
13. Support, front
14. Spacer
15. Pivot pin, front
16. Center main member
17. Bushing
18. Axle extension
19. Bushing
20. Bearing

To renew pivot pins, first disconnect the center steering arm (8) from power steering motor shaft, then remove the retaining cap screws. Raise front of tractor enough to take weight off pins, then using a suitable drift, drive pins forward out of supports. Do not lose spacers as pivot pins are removed.

When reassembling, tighten the center steering arm retaining cap screws to 150-180 ft.-lbs. torque.

6. AXLE MAIN MEMBER. To remove the axle main member, first remove pivot pins as outlined in paragraph 5. Raise front of tractor until supports will clear axle assembly and roll assembly forward. Any further disassembly will be obvious.

NOTE: Depending on the work required, some mechanics prefer to remove the axle extensions and lower the center main member, using a rolling floor jack.

7. AXLE EXTENSIONS. The axle extensions are retained in the center main member by two bolts. To renew an axle extension, first remove the steering arm (3) and withdraw spindles (1) from extensions. Remove the two bolts and pull extension from center main member.

Bushings (17 and 19) are final sized and should be installed flush with outer ends of bore using a suitable piloted driver. Tighten the steering arm retaining cap screws to 40-55 ft.-lbs. torque on tractors prior to serial number 21962 having $\frac{1}{8}$ -inch cap screws, or to 65-90 ft.-lbs. torque on later tractors having $\frac{1}{2}$ -inch cap screws.

FRONT SUPPORT

8. REMOVE AND REINSTALL.

The front support will not normally require any service; however, should it become necessary to remove or renew a front support, proceed as follows: Remove hood front side panels, radiator grilles, top hood and splash pan. Relieve the hydraulic system pressure by cycling the system, then disconnect lines from unload valve and drain hydraulic system. Disconnect all lines from hydraulic reservoir, then unbolt and remove hydraulic reservoir.

Disconnect pressure line from accumulator, disconnect mounting brackets and lift out accumulator assembly.

Remove steering gear and motor assembly as outlined in paragraph 16, disconnect head light wires, then unbolt front hood from hood rails and front support and lift same from tractor with a hoist. On adjustable axle tractors, remove front axle assembly by unbolting front and rear axle supports. Attach hoist to front support, remove retaining cap screws and pull same from side rails.

Upper and lower bearing cups and seals can be driven from front support, if necessary. When renewing the lower shaft seal proceed as follows: Place steering gear and motor assembly in the front support and support unit approximately $\frac{1}{8}$ -inch above its mounting pads. Use a $3\frac{1}{2}$ -inch O. D. seal driver and bump seal into its bore until rubber gasket of seal contacts steering motor base. Weight of steering gear and motor assembly will compress the seal gasket and position seal assembly when installed as outlined in paragraph 16.

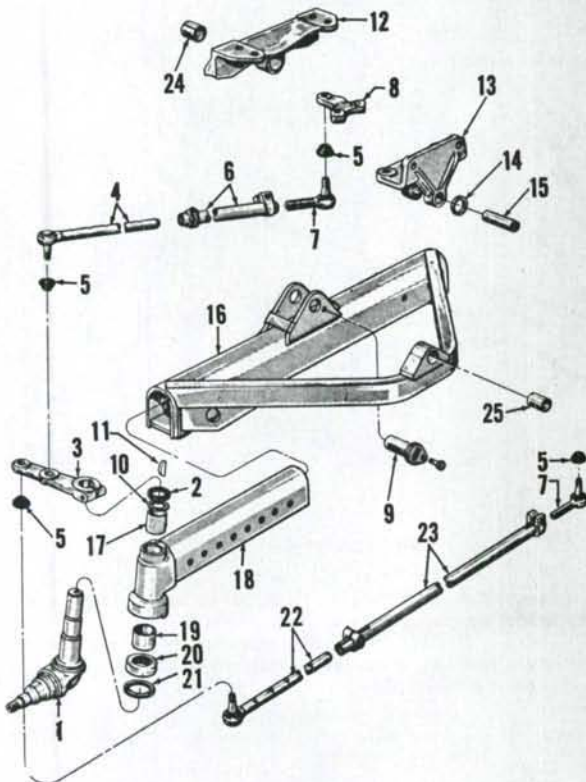


Fig. FO12A — Exploded view of the all purpose frost axle and associated parts.

1. Spindle
2. Dust seal
3. Steering arm, R. H.
4. Steering arm connecting rod
5. Dust covers
6. Sleeve & clamp assy.
7. Rod ends
8. Center steering arm
9. Pivot pin, rear
10. Washer
11. Woodruff key
12. Support, rear
13. Support, front
14. Spacer
15. Pivot pin, front
16. Center main member
17. Bushing
18. Axle extension
19. Bushing
20. Bearing
21. Spacer
22. Connecting rod
23. Sleeve & clamp assy.
24. Bushing
25. Bushing

POWER STEERING

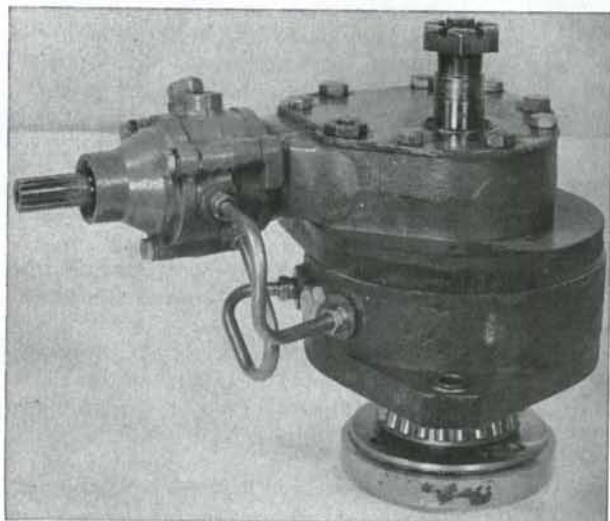


Fig. FO13 — Power steering control valve, steering gear and steering motor unit removed from tractor. Sector shaft is shown inserted for illustrative purposes.

Power steering is standard equipment on all models. The main components of the system are a gear driven roller vane type pump and a unit in which is combined a control valve, a recirculating ball nut type steering gear and a rotary vane type steering motor. Refer to Fig. FO13 for a view of the combined control valve, steering gear and steering motor unit.

SYSTEM OPERATING PRESSURE

10. A pressure test of the power steering circuit will disclose whether the pump or some other unit in the system is malfunctioning.

To make such a test, remove right front grille and side panel and radiator lower baffle, connect a pressure test gage assembly (N1100-PSA,

or equivalent) capable of reading at least 2000 psi pressure in series with the pump pressure line as shown in Fig. FO14. Run engine until oil is warmed to operating temperature. With engine running at approximately 1000 rpm, turn steering wheel to full left or right, hold in this position and observe the gage pressure which should be 1100-1350 psi. Maximum working pressure of power steering pump is 1350 psi and if gage pressure approximates this reading, pump and relief valve can be considered satisfactory. If pressure is not as specified, renew the combined flow control and relief valve (4—Fig. FO15) and retest. If pressure is still considerably lower than 1100 psi, overhaul the pump as outlined in paragraph 12. If pump and relief valve are satisfactory, and the system still does not operate properly, refer to subsequent paragraphs for checking and overhauling the remainder of the system components.

POWER STEERING PUMP

11. REMOVE AND REINSTALL. Relieve all accumulator pressure

LUBRICATION AND BLEEDING

9. The power steering system can be considered self-bleeding; however, whenever service has been performed on any of the component parts, be sure all connections are made and tightened; then fill hydraulic reservoir with 3½ gallons of Ford M-2C-41 oil, or its equivalent. Start engine and cycle system several times to purge any air which may be present. Place hydraulic lift in lowered position, retract remote cylinders and relieve system pressure; then recheck reservoir level and refill as necessary.

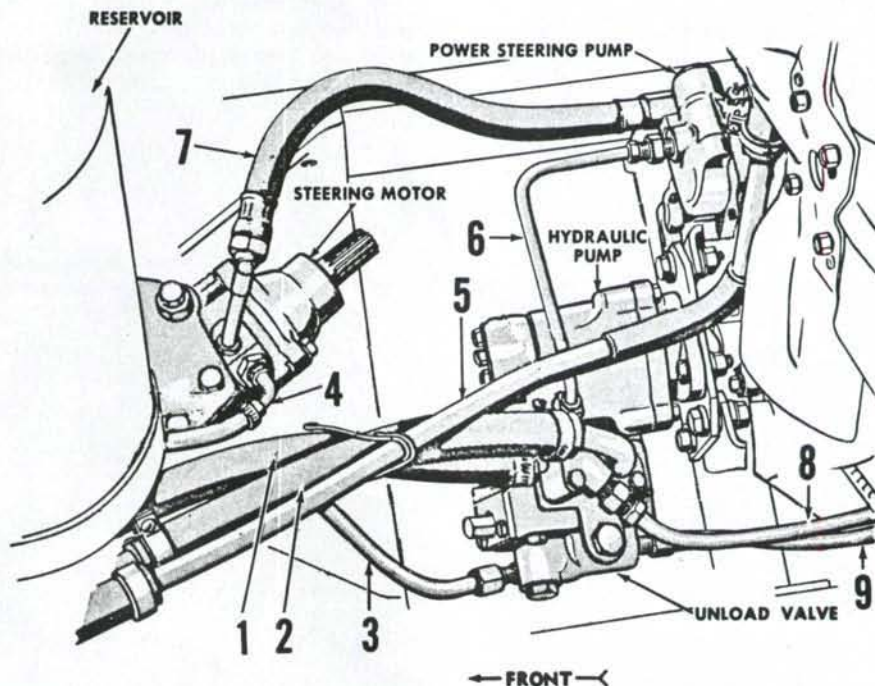


Fig. FO14A — View showing arrangement of hydraulic lines, tubes and related parts located at front of tractor. Early model tractor is shown. Later tractors differ in that the power steering by-pass line (6) is now a flexible line that is attached to a "tee" in the unload valve. The power steering return line (4) is now also attached to the "tee" instead of the reservoir.



Fig. FO14—Method of installing pressure gage in series with the power steering pump pressure line.

- | | | |
|------------------------------|------------------------------------|---------------------------------|
| 1. Supply line | 4. Power steering return line | 7. Power steering pressure line |
| 2. Return line | 5. Power steering pump supply line | 8. Brake return line |
| 3. Accumulator pressure line | 6. By-pass line | 9. Brake pressure line |

1. Plug
2. "O" ring
3. Spring
4. Flow control valve
5. Relief valve
6. Cover
8. Drive pin
9. Shaft
10. "O" ring
11. Rotor
12. Roller
13. Cam ring
14. Dowel pin
15. Inlet hose
16. Housing
17. "O" ring
18. Gasket
19. Oil seal
20. Snap ring
21. Bearing
22. Flange
23. Spacer
24. Driven gear
25. Washer
26. Nut

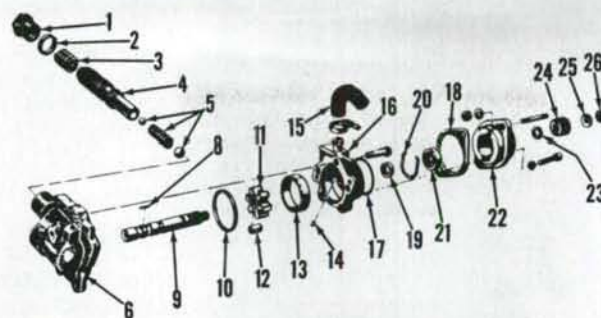


Fig. FO15 — Exploded view of power steering pump. Flow control valve (items 4 and 5) is serviced as a complete unit only.

either by actuating brakes or cycling hydraulic lift. Remove the hood front side panel, grill, baffle and splash pan, then disconnect the pump supply line (5—FO14A) at pump and drain hydraulic reservoir. Disconnect the pump to control valve pressure line (7) at control valve. Remove the by-pass line (6) between pump and unload valve. Unbolt and remove pump from timing gear cover.

Note: Removal of lower inside retaining nut will be simplified if a curved manifold wrench is used.

Reinstall by reversing the removal procedure and fill and bleed system as outlined in paragraph 9.

12. **OVERHAUL.** Disconnect the pump to control valve pressure line from pump, then mount pump in a vise with drive shaft end up. Unstake retaining nut (26—Fig. FO15) and remove nut, lock washer (25), gear (24) and spacer (23). Remove the two Allen screws and separate pump cover flange (22) from pump. Remove gasket (18), "O" ring (17), snap ring (20) and bearing (21) from flange. Remove the cover to housing cap screws and remove pump from vise;

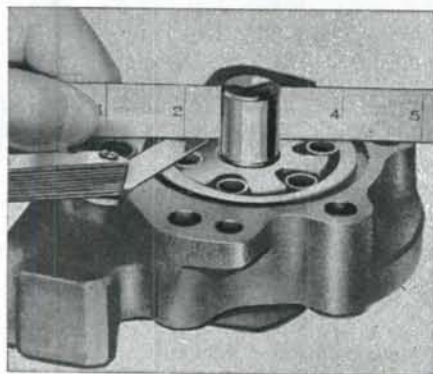


Fig. FO16 — Maximum clearance between rotor and cam ring is 0.0016 when measured as shown.

then, separate pump and remove the two "O" rings. Remove the shaft (9), rotor (11), rollers (12), and cam ring (13), cam locating pin (14) and oil seal (19) from pump housing. Remove plug (1), spring (3) and flow control valve (4) from pump cover.

Note: The combined flow control and relief valve is not a serviceable item and if relief valve (5) or flow control valve is faulty, the complete unit must be renewed.

Wash all parts except the sealed roller bearing (21) in a suitable solvent and inspect as follows: Check bushings in housing and cover and if excessively worn, renew housing and/or cover as bushings are not available separately. Inspect cam ring, rotor and rollers for excessive wear. Renew rollers if they are scored or out-of-round. Check the length of rollers and thickness of rotor and if rollers are more than 0.0008 shorter than rotor thickness, renew rollers. Place cam ring and rotor in pump housing. Place a straight edge across machined surface of housing and use a feeler gage to measure between straight edge and rotor as shown in Fig. FO16. If clearance between cam ring and rotor exceeds 0.0016, renew rotor. A power steering pump repair kit which contains the cam ring, rotor and rollers is available for service.

When reassembling use new "O" rings and coat shaft and double lip of seal with Lubriplate, or its equivalent. Use a seal protector or shim stock when installing shaft in housing to avoid damage to seal. Install rotor so roller slots are positioned, and will travel, as indicated in Fig. FO17. Complete reassembly by reversing disassembly procedure. Flow control valve is installed with extension toward inside. Torque housing to cover cap

screws to 25-30 ft.-lbs., the flow control valve plug to 30-35 ft.-lbs. and the driven gear retaining nut to 40-50 ft.-lbs.

CONTROL VALVE

13. **R&R AND OVERHAUL.** Remove right front side panel, grille, baffle and splash pan. Remove all accumulator pressure either by actuating brakes or cycling hydraulic lift system. Disconnect supply line from power steering pump and drain hydraulic reservoir. Note: Reservoir can also be drained by removing check valve from "T" fitting on right side of hydraulic lift housing and running engine. Stop engine as soon as the oil flow stops. Disconnect steering shaft brackets from side rail and remove center and front steering shafts. Disconnect return line and pressure line from top of control valve. Disconnect steering motor lines from lower right side of control valve, then loosen the connectors at steering motor and rotate lines out of the way. Place a scribe line across control valve assembly to aid in reassembly, then remove the control valve cover. Unstake retaining nut, hold steering shaft from turning, then remove and discard nut. Pull control valve assembly and thrust bearings from steering shaft. See Fig. FO18.

Note that embossed letters "RT" and "PR" are toward aft end of steering shaft. Also note the groove machined in the I. D. of the valve spool prior to removing valve (spool) from control body. Be sure to reinstall valve spool in same position.

Wash all parts in a suitable solvent and inspect bearings and retainers for wear or damage. Inspect valve (spool)

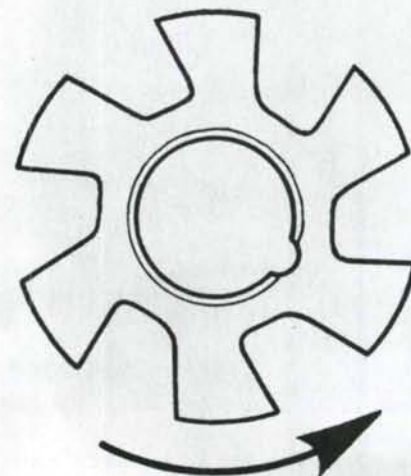


Fig. FO17—Install rotor in pump so it will turn in the direction indicated by arrow.