match marks when reinstalling pitman arm. Refill unit with approximately 0.2 L (⅔ pint) of SAE 90 gear oil.

Reinstall steering unit on tractor and adjust steering wheel free play as previously outlined.

POWER STEERING

Integral Type

13. ADJUSTMENT. Steering wheel free play should be within range of 25-50 mm (13/16 -2 inches) measured at steering wheel rim. To adjust free play, turn adjusting screw (1 – Fig. 26) clockwise to reduce free play or counter-clockwise to increase free play.

To check and adjust relief valve pressure setting, connect a 0-20000 kPa (0-3000 psi) pressure gage at test port (2 – Fig. 27) in steering valve housing. Operate steering until oil is at operating temperature. With engine running at 2600 rpm, turn and hold steering wheel fully in one direction and observe pressure reading when relief valve is actuated. Pressure should be 10000-10700 kPa (1450-1550 psi) on all models. To adjust relief valve pressure setting, turn adjuster (1) to obtain desired opening pressure.

If unable to obtain recommended pressure, check hydraulic pump output as outlined in paragraph 19. If pump output is satisfactory, remove and inspect relief valve poppet and spring (33 – Fig. 28).

14. R&R AND OVERHAUL. To remove steering gear assembly, first remove steering wheel using a suitable puller. Remove instrument panel, cowl and fuel tank. Disconnect drag link from pitman arm using a suitable puller. Disconnect hydraulic oil tubes, remove steering box mounting cap screws and withdraw steering gear assembly.

To disassemble, first place match marks on pitman arm and sector shaft. Use a suitable puller to remove pitman arm. Drain oil from housing. Remove steering column (44 – Fig. 28). Drive out rivet and spring pin (43) and remove steering shaft (45), then unbolt and remove top cover (38). Secure worm shaft (18) and remove locknut (36). Separate valve assembly and thrust bearings from housing. Remove side cover mounting cap screws, then turn adjusting screw (5) clockwise to remove side cover (2). Remove sector shaft through side cover opening. Remove retaining ring (12) and bottom cover (13). Withdraw ball nut assembly (21).

NOTE: Ball nut assembly is available only as a complete unit and disassembly is not recommended.

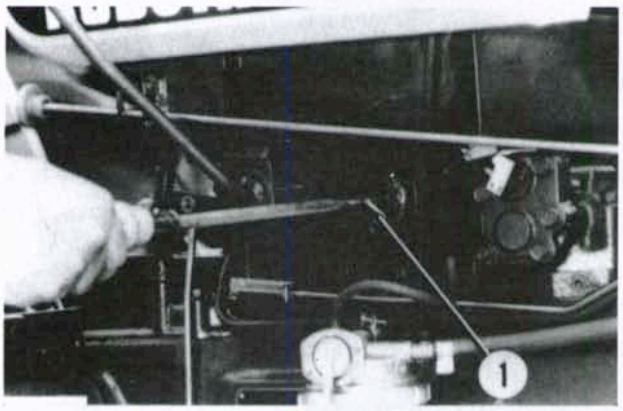


Fig. 26—Turn steering gear adjusting screw (1) to adjust steering wheel free play.

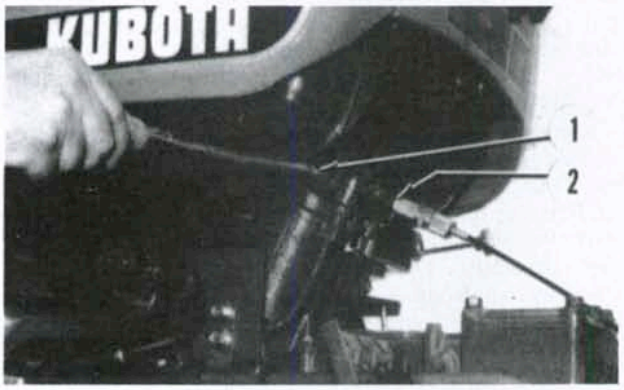
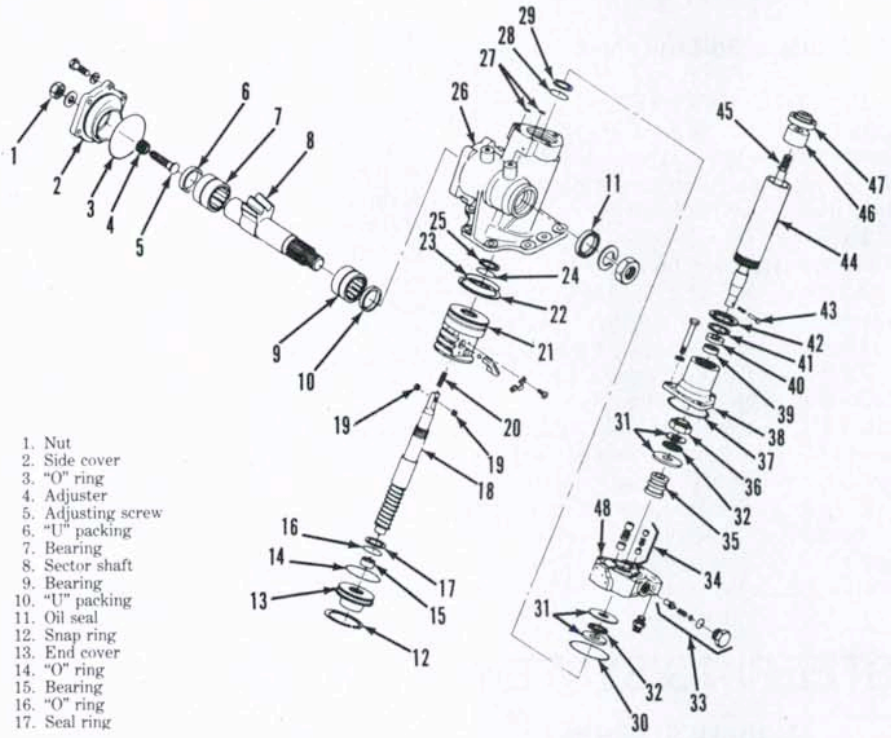


Fig. 27—To check integral type power steering pressure, attach a pressure gage at test port (2). Pressure setting can be adjusted by turning adjuster (1). Refer to text.



1. Nut
2. Side cover
3. "O" ring
4. Adjuster
5. Adjusting screw
6. "U" packing
7. Bearing
8. Sector shaft
9. Bearing
10. "U" packing
11. Oil seal
12. Snap ring
13. End cover
14. "O" ring
15. Bearing
16. "O" ring
17. Seal ring

Fig. 28—Exploded view of integral type power steering used on some models.

18. Worm shaft
19. Seal rings
20. Spring
21. Ball nut
22. Seal ring
23. "O" ring
24. "O" ring
25. Seal ring
26. Housing
27. "O" ring
28. "O" ring
29. Seal ring
30. "O" ring
31. Washers
32. Thrust bearing
33. Relief valve assy.
34. Reaction pistons & spring
35. Valve spool
36. Nut
37. "O" ring
38. Upper cover
39. Bearing
40. Oil seal
41. Snap ring
42. Nut
43. Rivet & pin
44. Column
45. Steering shaft
46. Bushing
47. Seal
48. Valve housing

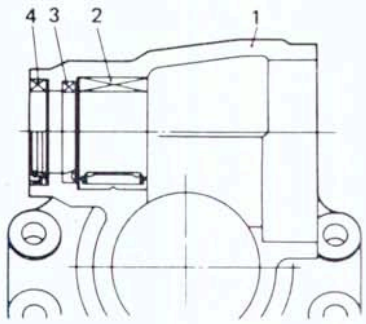


Fig. 29—Open side of sector shaft "U" packing (3) should face inward and open side of seal (4) should face outward.

1. Gear housing
2. Needle bearing
3. "U" packing
4. Seal

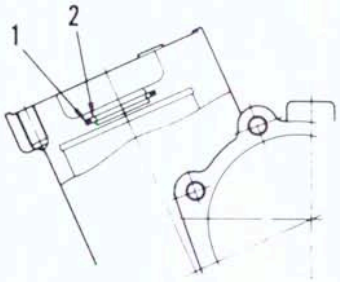


Fig. 30—Be sure "O" ring (1) is installed behind Teflon seal ring (2) when reinstalling worm shaft seals in housing.

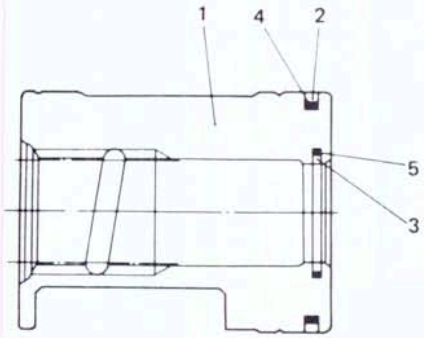


Fig. 31—View of ball nut seals correctly installed. "O" ring must be behind Teflon rings.

1. Ball nut assy.
2. Teflon seal
3. Teflon seal
4. "O" ring
5. "O" ring

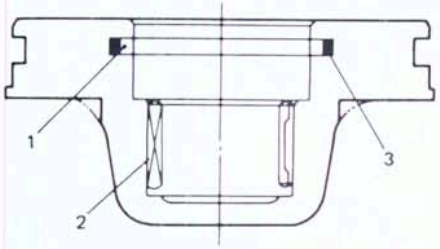


Fig. 32—View of lower cover seal ring and bearing installation.

1. Teflon seal
2. Needle bearing
3. "O" ring

Separate components of valve assembly and inspect for wear, scoring or other damage. Valve spool (35) and valve housing (48) must be renewed as a matched set. Check all components for wear and correct fit and renew any which do not meet the following specifications: Clearance between cylinder and ball nut should be 0.030-0.079 mm (0.0012-0.0031 inch). Worm shaft axial end play in ball nut should be 0.02 mm (0.0008 inch) and maximum allowable end play is 0.12 mm (0.0047 inch). Worm shaft must rotate smoothly in ball nut. Worm shaft lower bearing journal outside diameter should be 28.562-28.575 mm (1.1245-1.1250 inches) with minimum allowable diameter of 28.475 mm (1.1211 inches). Clearance between valve housing and spool should be 0.008-0.015 mm (0.0003-0.0006 inch) and maximum allowable clearance is 0.025 mm (0.001 inch). Be sure that spool and sleeve are free of scratches, nicks or burrs and that spool slides smoothly in sleeve. Sector shaft bearing journal diameter should be 38.059-38.075 mm (1.4984-1.4990 inches). Renew shaft if diameter is less than 38.025 mm (1.4970 inches).

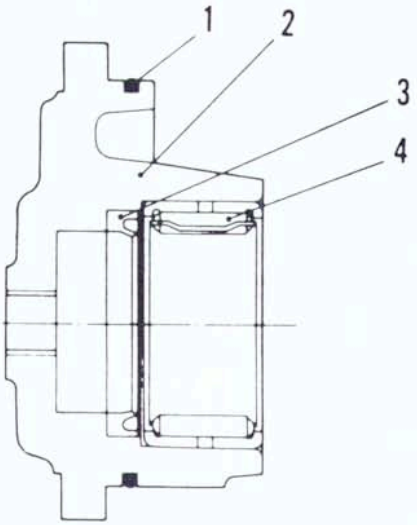


Fig. 33—Side cover seal and bearing installation. Be sure open side of "U" packing faces inward.

1. "O"ring
2. Side cover
3. "U" packing
4. Needle bearing

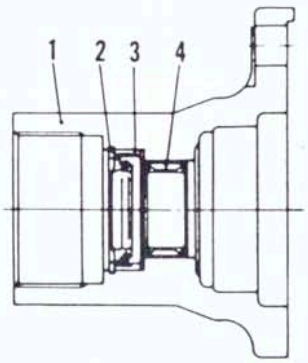


Fig. 34—Upper cover bearing and seal installation. Open side of oil seal (3) should face bearing (4).

1. Upper cover
2. Snap ring
3. "O" ring
4. Bearing

When renewing needle bearings, position bearings in housings so press force is applied against side of bearing with manufacturer's marks. Install new oil seals, "O" rings and Teflon seal rings as shown in Figs. 29 through 34. Lubricate seals and "O" rings prior to reassembly. Apply molybdenum disulfide "Molycoat" to steering column bushing (46 – Fig. 28) and oil seal (47).

Reassemble steering unit by reversing the disassembly procedure. Be sure to align "P" marks on valve spool (5 – Fig. 35) and valve housing (2). Position ball nut and worm shaft assembly, valve housing assembly and thrust bearings into steering gear housing, then install special mounting plate (1 – Fig. 36) to retain components in housing. (Special plate can be fabricated using dimensions shown in Fig. 36A.) Turn worm shaft clockwise, tighten locknut hand tight and stake locknut threads with a pin punch. Install sector shaft and tighten side cover mounting cap screws to 40-55 N·m (30-40 ft.-lbs.) torque. Remove

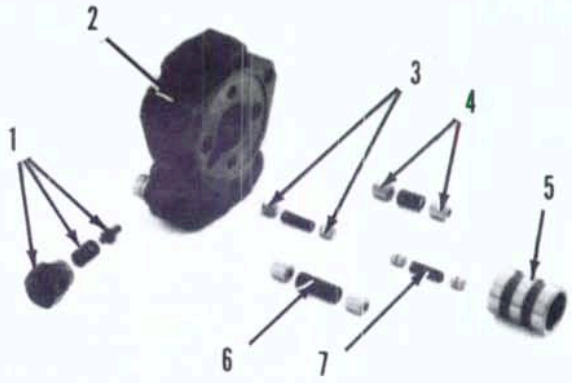


Fig. 35—Be sure to align "P" marks on spool (5) and valve (2) when reassembling.

1. Relief valve assy.
2. Valve housing
3. Pistons
4. Pistons
5. Spool
6. Spring
7. Spring

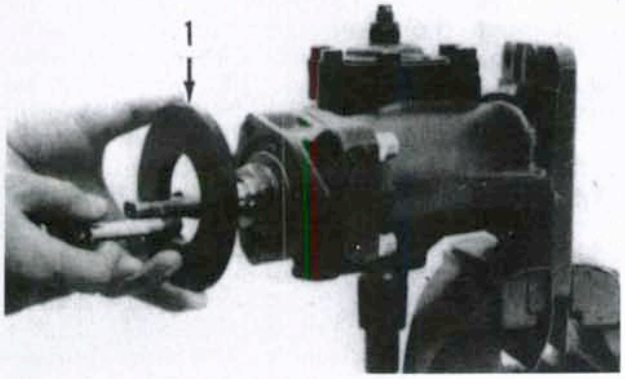


Fig. 36—Install special mounting plate (1) to retain ball nut and thrust bearings while tightening worm shaft locknut. See Fig. 36A.

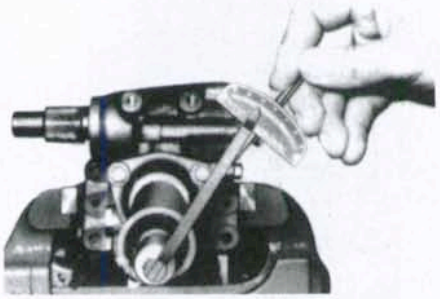


Fig. 38—As a final assembly check, measure torque required to start rotation of worm shaft. Torque should not exceed 1.7 N·m (15 in.-lbs.)

special plate and install top cover. Tighten retaining screws to a torque of 40-55 N·m (30-40 ft.-lbs.). Align match marks and install pitman arm onto sector shaft. Tighten retaining nut to a torque of 120-155 N·m (90-115 ft.-lbs.).

Check backlash between sector gear and ball nut using a dial indicator as shown in Fig. 37. Turn adjusting screw (5–Fig. 28) as required to obtain recommended backlash of 0.1-0.4 mm (0.004-0.016 inch). To check for proper final assembly of steering gear, use a torque wrench as shown in Fig. 38 to measure torque required to start rotation of worm shaft. Torque should be less than 1.7 N·m (15 in.-lbs.). If measured torque exceeds 1.8 N·m (16 in.-lbs.), correct problem before reinstalling unit on tractor. Install steering shaft and column tube and tighten nut to a torque of 98-127 N·m (75-94 ft.-lbs.).

Reinstall steering gear on tractor by reversing removal procedure. On models equipped with separate reservoir tank, refill hydraulic system with approximately 1.5 L (1.6 quarts) of Kubota UDT fluid. Adjust steering pressure relief valve setting as previously outlined.

Booster Type

15. On models equipped with booster type power steering, a manual steering gear assembly is used which is identical to steering gear outlined in paragraphs 11 and 12. The power booster unit is mounted on left side of tractor and transfers hydraulic power assist directly to steering drag link which is attached to booster unit. The booster unit consists of a hydraulic cylinder with a valve housing built into the cylinder. When steering wheel is turned, valve spool shifts and directs hydraulic fluid to one side of power cylinder which actuates cylinder and assists in turning front wheels.

16. ADJUSTMENT. Steering wheel free play is adjusted as outlined in paragraph 11.

To check and adjust booster relief valve pressure setting, proceed as follows: Be sure hydraulic fluid is at normal operating temperature. Remove plug from test port in bottom of valve housing and install a pressure gage as shown in Fig. 39A. Operate engine at rated speed, turn steering wheel in one direction until front wheels stop and observe pressure gage reading. When relief valve opens, pressure should be approximately 6900 kPa (1000 psi). To adjust pressure, turn relief valve adjusting screw (16–Fig. 39), located in valve housing, clockwise to increase pressure or counter-clockwise to reduce pressure.

17. R&R AND OVERHAUL. To remove booster unit, first disconnect hydraulic hoses and drain oil. Disconnect drag link end from booster unit. Disconnect booster unit from front mounting bracket and pitman arm and remove from tractor.

To disassemble unit, first move piston rod in and out of cylinder to drain oil. Remove retainer (1–Fig. 39) and dust

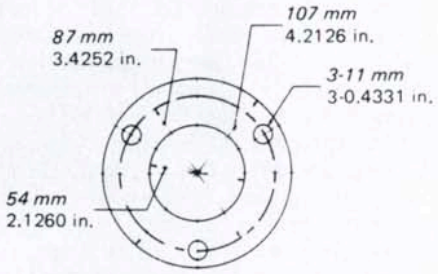


Fig. 36A—Mounting plate can be fabricated using dimensions shown.

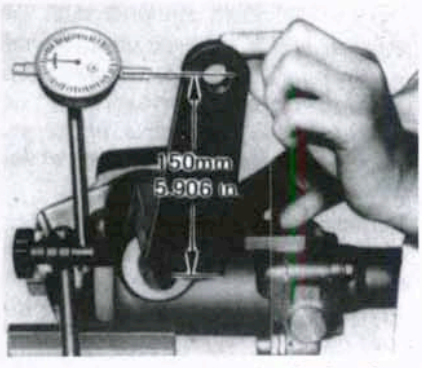


Fig. 37—Check sector gear backlash using a dial indicator.

Fig. 39—Exploded view of power steering booster unit used on some tractors.

1. Retainer
2. Seal
3. Ball stud
4. Housing
5. Stop plate
6. Screw
7. Spring
8. Seats
9. Actuator rod
10. Sleeve
11. Pin
12. Cap
13. Washer
14. Valve spool retainers
15. Centering spring
16. Relief valve assy.
17. "O" rings
18. Valve assy.
19. Nut
20. "O" ring
21. Cylinder
22. Piston ring
23. Piston & rod
24. "O" ring
25. Cylinder end
26. Rod seal assy.