

VOLVO AQUAMATIC 100

OUTDRIVE SERVICE

SHIFTING MECHANISM

Two shifting mechanism variations have been used in Aquamatic 100 stern drives. Early units using a dog type clutch are identified by the parallel shifting arms on the starboard side of the drive unit. Later units use a tapered friction clutch and can be identified by crossed shifting arms. Refer to Figs. 2-1 and 2-2.

Check reverse lock by measuring distance between reverse pin and reverse latch with drive unit in neutral. Distance should be 0.020 in. (0.5 mm) and is adjusted by loosening clamp screw and moving pin. Refer to Figs. 2-1 and 2-2.

LUBRICATION

The Aquamatic 100 has two lubricating systems. The lower gear housing is lubricated in an oil bath while the upper portion of the outdrive is pressure fed by an oil pump suspended in the lower gear housing. On earlier models the oil pump draws oil from an oil chamber separate from the oil bath for the lower gears. Two drain plugs are located in the lower unit for draining the two oil chambers. On later models, one oil chamber is used and only one drain plug is provided. Both models have a capacity of 2 quarts of SAE Hypoid 90 oil which should be changed every 100 hours or once a season.

OUTDRIVE OVERHAUL

PROPELLER SHAFT

R&R AND OVERHAUL. Drain lower gear housing of lubricant. Remove propeller (30-Fig. 2-3) Later models use a drive pin (25) to transmit power to propeller while earlier models use a splined propeller shaft. Earlier

model propellers are held by a threaded propeller nut (32) and tab washer.

Remove bearing housing (28) and propeller shaft assembly from lower gear housing (8) by pulling at end of propeller shaft. Remove lock screw found on gear side of bearing housing (28). Unscrew large hex nut (20) and press propeller shaft and gear from

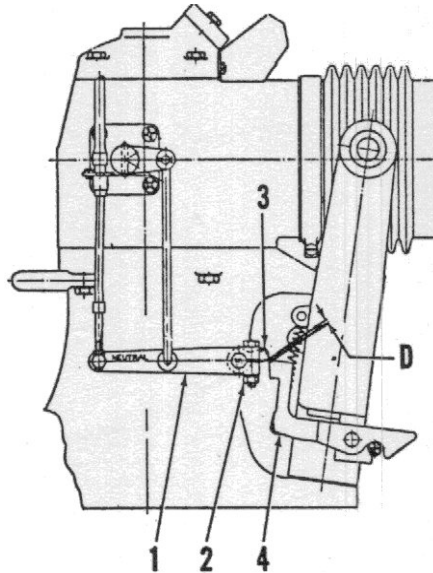


Fig. 2-1-Aquamatic 100 units with parallel shift arms use a dog type clutch for shifting gears. With shift lever (1) in neutral distance between pin (3) and reverse latch (4) should be 0.020 in. (0.5 mm). Loosen clamp screw (2) to adjust.

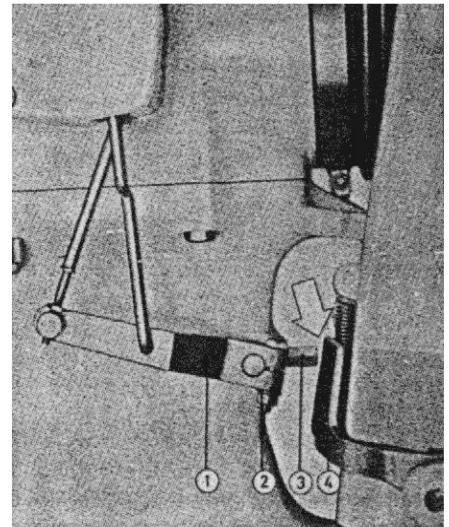


Fig. 2-2-Aquamatic 100 units with a tapered friction clutch can be identified by crossed shift arms as shown. Adjust reverse pin gap as outlined in Fig. 2-1.

bearing housing. Remove oil seals (26) from bearing housing. Unlock tab washer (18), unscrew nut (17) and press gear (19) from propeller shaft (23). Watch for shims (21) and retain in original order for reinstallation. Press bearing (22) from propeller shaft. Inner race of bearing (16) is pressed on end of propeller shaft (23) and must be split for removal, after removing snap ring (15). On earlier models, a snap ring was not used. Pull race and rollers of bearing (16) from gear housing.

To reassemble, reverse disassembly procedure. If gear housing, bearing housing, propeller shaft, gears or bearings were renewed, refer to LOWER UNIT GEARS section for backlash adjustment procedure. If none of the above components are renewed, re-install shims (21). Gears must be renewed as a matched set. Install seals (26) so that lips face away from each other. Press bearing (22) on propeller shaft so that recess is towards gear.

VERTICAL DRIVE SHAFT

R&R AND OVERHAUL Drain lubricant from lower gear housing. Unscrew bolts holding lower gear housing to intermediate housing (8-Fig. 2-4). Separate housings being careful not to hit oil pick-up (42). Remove propeller shaft assembly as outlined in PROPELLER SHAFT section.

Unlock tab washer (13-Fig. 2-3)

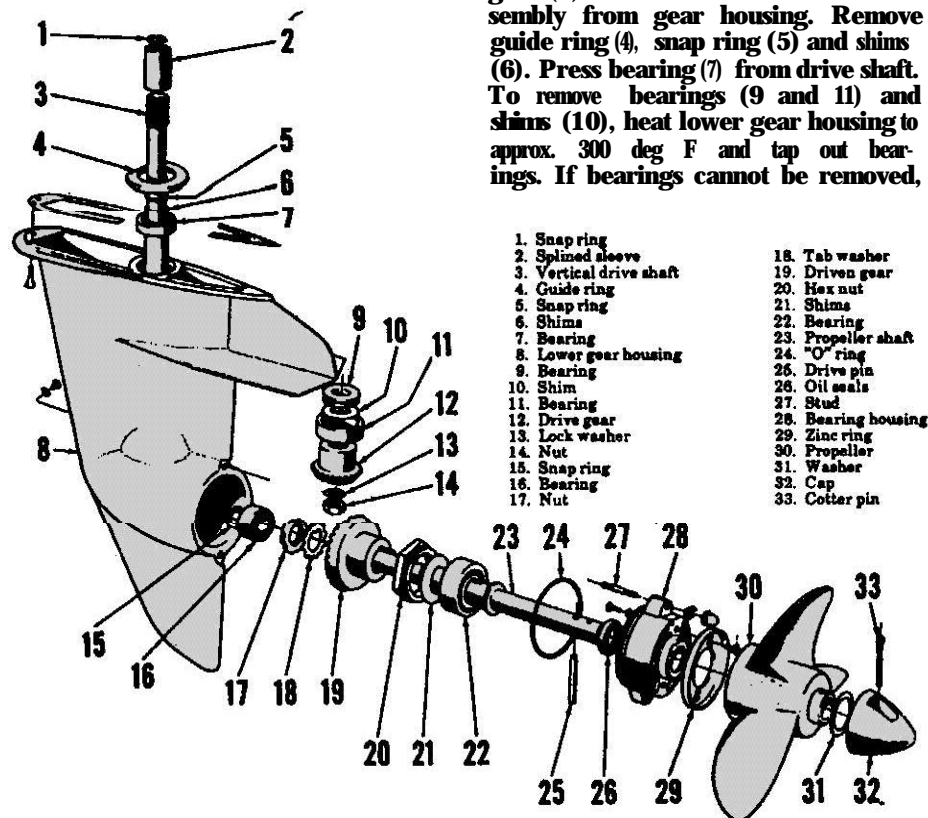
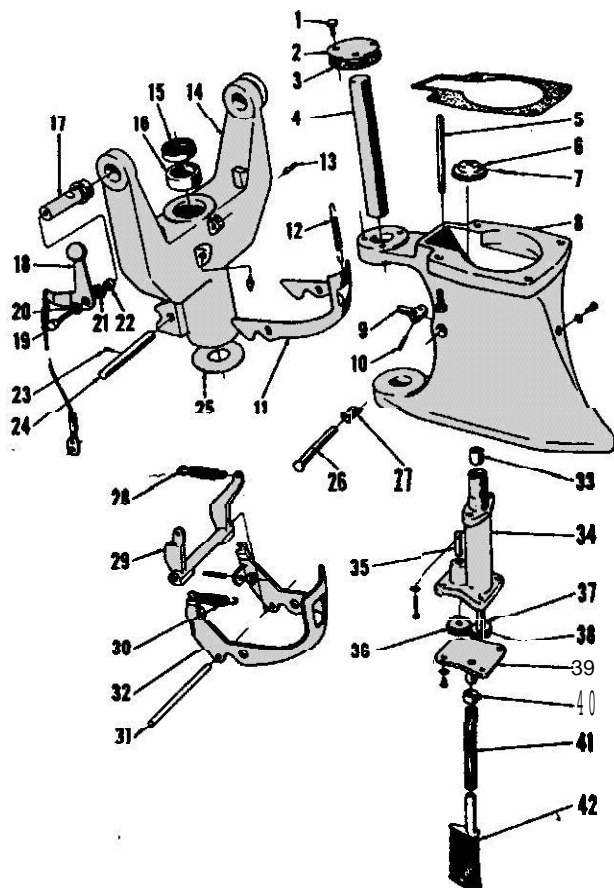


Fig. 2-4-Exploded view of steering yoke and intermediate housing assemblies.

1. Screw
2. Cover
3. Gasket
4. Steering shaft
5. Oil tube
6. Gear
7. Pin
8. Intermediate housing
9. Reverse pin
10. Pin
11. Reverse latch
12. Spring
13. Pin
14. Steering yoke
15. Oil seal
16. Bearing
17. Swivel pin
18. Lever
19. Screw
20. Washer
21. Spring washer
22. Spacer
23. Lock screw
24. Tilt pin
25. Washer
26. Shaft
27. Bushing
28. Spring
29. Lever
30. Spring
31. Shaft
32. Reverse latch
33. Bushing
34. Oil pump
35. Pin
36. Gear
37. Gear
38. Pin
39. Cover
40. Clamp
41. Oil pickup tube
42. Oil screen



and unscrew nut (14). Remove drive gear (12). Pull vertical drive shaft assembly from gear housing. Remove guide ring (4), snap ring (5) and shims (6). Press bearing (7) from drive shaft. To remove bearings (9 and 11) and shims (10), heat lower gear housing to approx. 300 deg F and tap out bearings. If bearings cannot be removed,

split race of bearing (11), remove rollers and using Volvo Tool No. 884140, drive out bearing. Retain shims (10) in their original order for reinstallation.

NOTE: On earlier models there is a seal between bearing (7) and housing which must be pulled from housing before heating housing for bearing removal.

To reassemble, reverse disassembly procedure. Gears must be renewed as part of a matched set. On later models, spline sleeve (2) is marked "Top". Install guide ring (4) so that cut away section is nearest oil pump pick-up. If drive shaft, gear housing, gears or bearings were renewed, refer to LOWER UNIT GEARS section for adjusting gear backlash. If none of the above components was renewed, re-install shims (10). Shims (6) control drive shaft end play and a sufficient number should be installed between bearing (7) and snap ring (5) to remove all end play in drive shaft.

LOWER UNIT GEARS

Gears must be renewed as a matched set. Two types of gears have been used. Correct wear pattern is shown in Fig. 2-5 for straight tooth bevel gears and in Fig. 2-6 for spiral tooth bevel gears. To

adjust gears for correct mesh position and gear backlash, proceed as follows:

Paint gears with machinist's blueing and assemble components (3 thru 28—Fig. 2-3) using original shims removed during disassembly. Rotate drive shaft to produce mesh pattern and measure gear backlash at splined end of drive shaft. Backlash measured against splines should be 0.04-0.08 mm (0.0016-0.0032 in.) which gives a backlash of 0.10-0.20 mm (0.004-0.008 in.) on gears. Disassemble and change number or size of shims (10) to adjust mesh position of drive gear, and change number or size of shims (21) to adjust backlash. Install as many shims (6) as necessary to obtain zero end play in drive shaft. Always check end play after adjusting mesh position of drive gear (12).

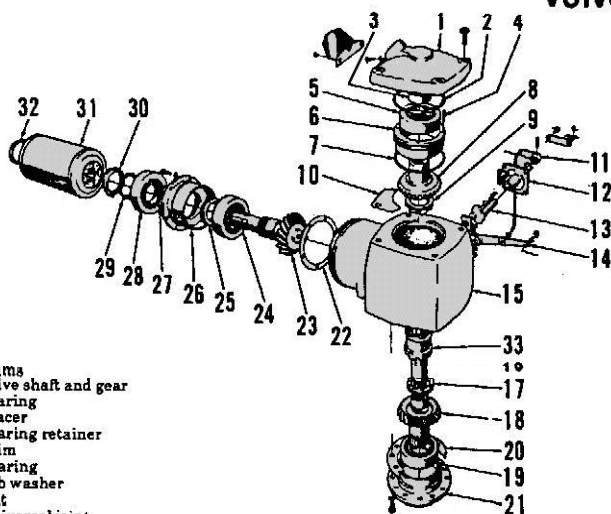
UPPER GEAR HOUSING

Models Without Silent Shift

R&R AND OVERHAUL. Disconnect shift linkage between boat and upper gear housing (15—Fig. 2-7) and between upper gear housing and intermediate housing (8—Fig. 2-4). Detach universal joint bellows. Separate upper gear housing and intermediate housing by removing two bolts at forward part of unit and two bolts at handle. Be careful not to damage oil tube (5—Fig.

Fig. 2-7—Exploded view of Aquamatic 100 upper gear housing using dog type clutch.

- | | |
|------------------------|--------------------------|
| 1. Top cover | 22. Shims |
| 2. "O" ring | 23. Drive shaft and gear |
| 3. Bearing | 24. Bearing |
| 4. Lock pin | 25. Spacer |
| 5. Bearing | 26. Bearing retainer |
| 6. Bearing housing | 27. Shim |
| 7. "O" ring | 28. Bearing |
| 8. Reverse gear | 29. Tab washer |
| 9. Dog | 30. Nut |
| 10. Shift arm | 31. Universal joint |
| 11. Shift cover | 32. Snap ring |
| 12. Shift shaft | |
| 13. Shift lever | |
| 14. Shift lever | |
| 15. Upper gear housing | |
| 16. Drive shaft | |
| 17. Dog | |
| 18. Forward gear | |
| 19. Bearing | |
| 20. Shims | |
| 21. Bearing housing | |



2-4) when lifting off housing.

Remove snap ring (32—Fig. 2-7) and pull universal joint off drive shaft and gear (23). Remove shift control mechanism on side of upper gear housing. Unscrew bearing retainer (26) screws and pull components (23 thru 30) from gear housing. Remove shims (22). Unlock tab washer (29) and screw off nut (30). Press drive shaft and gear (23), bearing (24) and spacer (25) from bearing retainer (26). Press bearing (24) off drive shaft and gear (23) and press bearing (28) out of bearing retainer (26).

Remove top cover (1) and withdraw reverse gear (8) assembly. Left hand thread dog (9) may be removed using Volvo Tool No. 884158. Press gear (8) from bearing (5) and hearing from bearing housing (6). Needle bearing (3) may be removed by heating top cover (1) to approximately 300° F and pulling bearing.

Unscrew lower bearing housing (21) bolts and withdraw forward gear (18)

and clutch (33) assembly. Left hand thread dog (17) may be removed using Volvo Tool No. 884158. Press gear (18) and bearing (19) from bearing housing (21) and gear (18) from bearing (19).

To reassemble, reverse disassembly procedure. Gears must be renewed as a matched set. To adjust bearings for preload and gears for mesh position and backlash, proceed as follows:

To determine size of spacer (25), place spacer on flat surface and lay either bearing (24 or 28) on spacer with wide side of bearing inner ring contacting spacer. Zero a dial indicator on bearing outer ring then read difference in height of bearing inner ring. Repeat procedure with other bearing. Measure distance between bearing shoulders (A—Fig. 2-8). Add plus or minus bearing heights and add or subtract result from hearing shoulder dimension (A). This will give size of spacer needed. Shims (27) may be used if exact size of spacer is unobtainable. Assemble components 123 thru 30—Fig. 2-7) and wrap a cord with 2½-3¼ lbs. of weight attached to end, around bearing housing. Be sure to install bearings so that thin sides of inner races face each

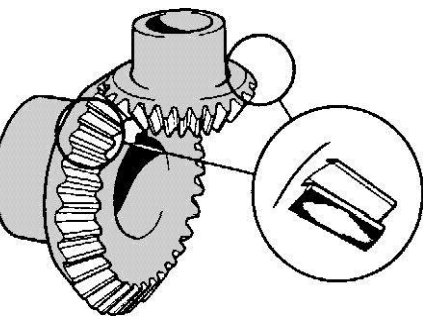


Fig. 2-5—Shown above is normal mesh pattern for lower units using straight tooth gears.

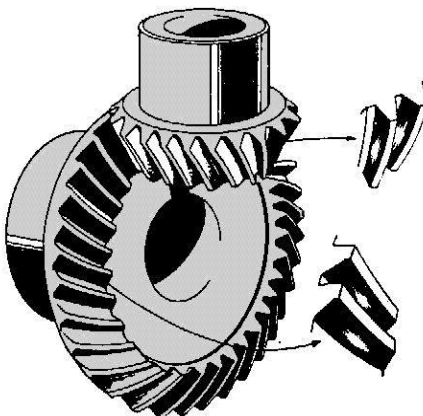


Fig. 2-6—For units using spiral tooth bevel gears in lower unit, mesh pattern should be as shown above.

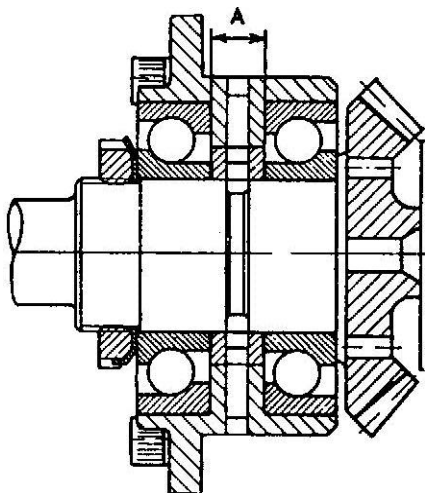


Fig. 2-8—To determine spacer size in forward bearing box, measure shoulder of bearing box (A) and proceed as outlined in text.

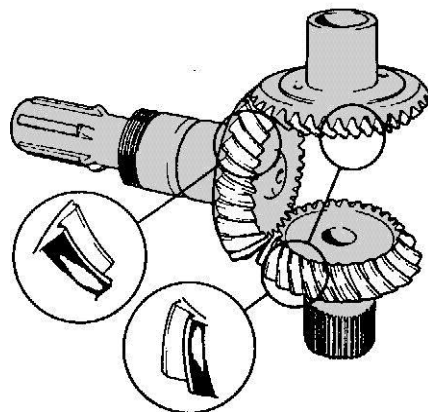


Fig. 2-9—Normal mesh pattern for drive, forward and reverse gears of Aquamatic 100 units.

other. Hold end of drive shaft. Weight should just rotate bearing housing. Change size of spacer or add shims if necessary.

Paint gears with machinist's blueing and check mesh position which should be as shown in Fig. 2-9. Mesh position is adjusted by changing number or size of shims (22-Fig. 2-7).

To check forward gear backlash, insert drive shaft and gear (23) assembly consisting of components (22 thru 30) in gear housing. Install forward gear assembly (18 thru 21) in gear housing and measure gear backlash. Correct backlash is 0.004-0.008 in. Change number or size of shims (20) to obtain correct forward gear backlash.

To check gear backlash for reverse gear, follow instructions in preceding paragraph, but install reverse gear assembly (1 thru 8). Change number or size of shims (10) to obtain correct backlash of 0.004-0.008 in.

Models With Silent Shift

R&R AND OVERHAUL. Disconnect shift linkage between boat and upper gear housing (47-Fig. 2-10) and between upper gear housing and intermediate housing 8--Fig. 2-4). Detach universal joint bellows. Separate upper gear housing and intermediate housing by removing two bolts at forward part of unit and two bolts at handle. Be careful not to damage oil tube (5) when lifting off housing.

Remove snap ring (67--Fig. 2-10) and pull universal joint off drive shaft and gear (45). Hold input shaft, engage a gear and unscrew oil pump drive pinion (62). Remove shift mechanism on side of upper gear housing. Unscrew bearing retainer screws (39) and pull components (36 thru 45) from housing. Remove shims (46). Unlock tab washer (37) and screw off round nut (36). Press drive shaft and gear (45), bearing (43) and spacer (42) from bearing retainer (41). Watch for shims (44). Press bearing (43) off drive shaft and gear (45) and press bearing (38) out of bearing retainer (41).

Remove top cover (1), snap ring (3) and spacer (4). Lift out upper gear assembly consisting of components (6 thru 15). Press gear (11) from bearing (6) & bearing from bearing housing (8)

To remove lower gear assembly, unscrew lower bearing housing (59) bolts. Vertical drive shaft and clutch assembly will also be removed. Remove snap ring (61) and spacer (60). Press lower gear (56) and bearing (57) from bearing housing (69) and pull bearing (57) from gear (56). Retain shims (58) for reinstallation. Drive out pins (17 and 64) to remove needle bearings and

spacers from vertical drive shaft (63).

To reassemble, reverse disassembly procedure. Gears and clutch cones must be renewed as a matched set. Recesses in bearings (6 and 57) should face away from gear. To adjust bearings for pre-load and gears for mesh position and backlash, proceed as follows:

To determine size of spacer (42), place spacer on flat surface and lay either bearing (38 or 43) on spacer with side of bearing inner ring contacting

spacer. Zero a dial indicator on bearing outer ring then read difference in height of bearing inner ring. Repeat procedure with other bearing. Measure distance between bearing shoulders (A-Fig. 2-8). Add plus or minus bearing heights and add or subtract result from bearing shoulder dimension (A). This will give size of spacer needed. Assemble components (36 thru 45-Fig. 2-10) and wrap a cord with 2½-3¼ lbs of weight attached to end, around bearing housing. Be sure to in-

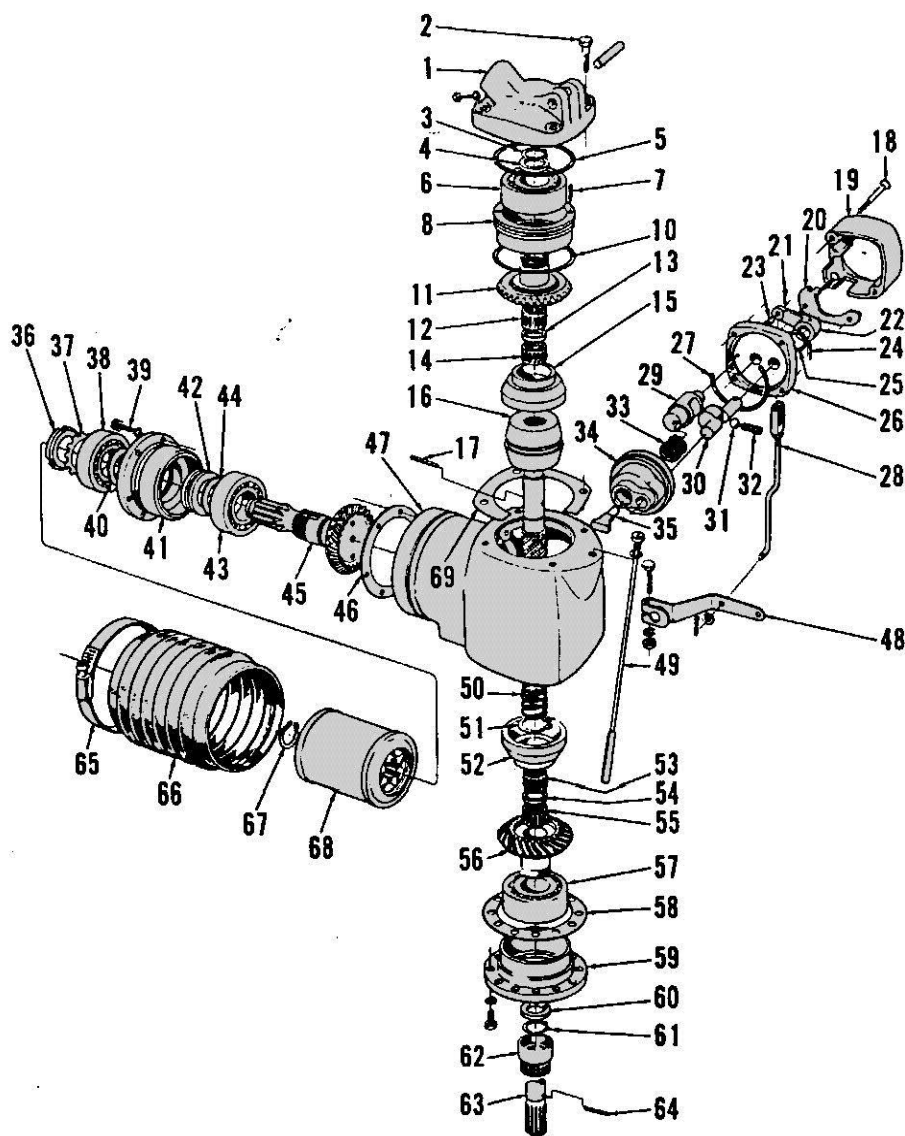


Fig. 2-10—Exploded view of upper gear housing with tapered friction type clutch.

- | | | | |
|--------------------|----------------------|--------------------------------|-------------------------|
| 1. Top cover | 19. Cover | 36. Nut | 53. Bearing |
| 2. Screw | 20. Cable holder | 37. Tab washer | 54. Spacer |
| 3. Snap ring | 21. Cotter pin | 38. Bearing | 55. Bearing |
| 4. Spacer | 22. Shift arm | 39. Screw | 56. Lower gear |
| 5. "O" ring | 23. Bolt | 40. Shim | 57. Bearing |
| 6. Bearing | 24. Pin | 41. Bearing housing | 58. Shims |
| 7. Lock pin | 25. Seal | 42. Spacer | 59. Bearing housing |
| 8. Bearing housing | 26. Cover | 43. Bearing | 60. Spacer |
| 10. "O" ring | 27. "O" ring | 44. Shim | 61. Snap ring |
| 11. Upper gear | 28. Shift arm | 45. Drive gear and drive shaft | 62. Oil pump drive gear |
| 12. Bearing | 29. Eccentric piston | 46. Shims | 63. Drive shaft |
| 13. Spacer | 30. Eccentric shaft | 47. Upper gear housing | 64. Pin |
| 14. Bearing | 31. Ball | 48. Shift lever | 65. Clamp |
| 15. Clutch cone | 32. Spring | 49. Oil dipstick | 66. Bellows |
| 16. Clutch | 33. Bearing | 50. Spring | 67. Snap ring |
| 17. Pin | 34. Bearing housing | 51. Snap ring | 68. Universal joint |
| 18. Bolt | 35. Sliding pin | 52. Clutch cone | |

stall bearings so that thin sides of inner races face each other. Hold end of drive shaft. Weight should just rotate bearing housing. Change size of spacer or add shims (40 and 44) if necessary.

Paint gears with machinist's blueing and check mesh position which should be as shown in Fig. 2-S. Mesh position is adjusted by changing number or size of shims (46).

To check lower gear backlash, insert drive shaft and gear (45) assembly consisting of components (36 thru 46) in gear housing. Install lower gear assembly (56 thru 69) in gear housing and measure gear backlash. Correct backlash is 0.004-0.008 in. Change number or size of shims (58) to obtain correct lower gear backlash.

To check upper gear backlash, follow instructions in preceding paragraph, but install upper gear assembly consisting of components 1, 69 and 5 thru 11) in place of forward gear assembly. Change number or size of shims (69) to obtain correct backlash of 0.004-0.008 in.

STEERING SHAFT

To remove steering shaft (4-Fig. 2-4), first drain lubricant from drive unit. Disconnect shift control rod to upper gear housing and remove upper gear housing as outlined in UPPER GEAR HOUSING section. Separate lower gear housing from intermediate housing as outlined in VERTICAL DRIVE SHAFT section. Remove swivel pins (17) and separate intermediate

housing (8) and yoke (14) from transom. Remove cover plate (2) and drive out steering shaft (4). Pull seals (15) and needle bearing (16) from yoke.

OIL PUMP

To remove oil pump (34-Fig. 2-4), drain lubricant from drive unit. Disconnect shift control rod to upper gear housing and remove upper gear housing as outlined in UPPER GEAR HOUSING section. Separate lower gear housing from intermediate housing as outlined in VERTICAL DRIVE SHAFT section. Unscrew two bolts retaining oil pump in housing and remove oil pump. Remove cover (39) and clean and inspect for worn or broken parts. Test run to make sure pump is delivering oil.