

SECTION 6. REPAIR OF EXTERNAL SUBASSEMBLIES

CAUTION:

Avoid contact with rotating output coupling and always shut down engine when doing even minor inspection or repair. Avoid contact with metal surfaces as operating temperature may exceed 200°.

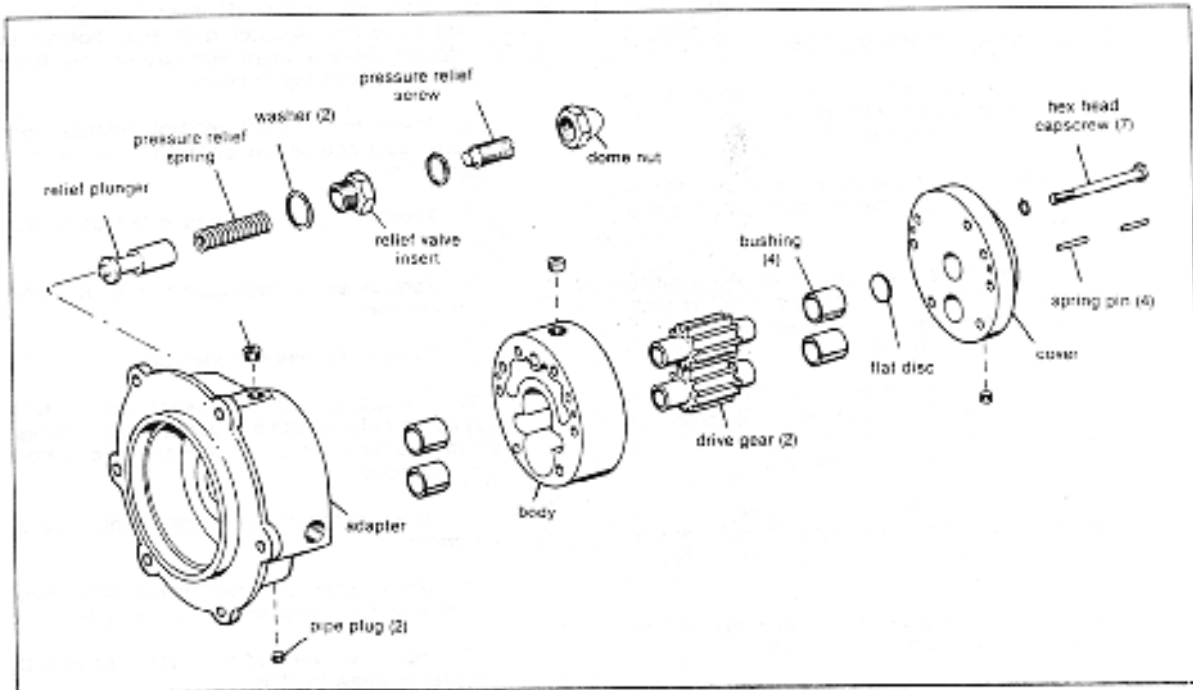


Fig. 15. Oil Pump Assembly

6.1 OIL PUMP

A.PRESSURE RELIEF ASSEMBLY

1. With oil pump in place on marine gear remove dome nut, relief valve insert with screw, spring and accompanying washers. NOTE: UNSCREW INSERT CAREFULLY BECAUSE PRESSURE RELIEF SPRING IS UNDER TENSION.

2. Check relief plunger to see if it is free moving. If not, inspect plunger for burrs, heat scores, or distortions. Burrs may be removed with fine crocus cloth, otherwise plunger should be replaced.

3. Clean all parts with a good grade cleaning solvent or diesel fuel. Blow dry with compressed air.

4. Generously lubricate relief plunger with oil or Vaseline. Insert plunger, cup end last. Check plunger for free movement

5. Insert pressure relief spring into cup of plunger.

1. Screw pressure relief screw into relief valve insert just enough to start threads.
2. Apply washer and install relief valve insert with pressure relief screw. Tighten insert, do not tighten relief screw.
3. Cap and lock pressure relief screw with dome nut and washer

B. OIL PUMP DISASSEMBLY

1. Remove oil pump assembly and filter from main housing cover by removing capscrews and hoses.
2. Remove capscrews and lockwashers securing pump cover, pump body and adapter.
3. Using as soft hammer, separate cover, body and adapter from spring pins. NOTE: FOR REASSEMBLY, PUNCH MARK ALONG SIDE OF COVER, BODY AND ADAPTER.
4. Remove pump gears resting in adapter
5. Remove dome nut and relief valve insert. **NOTE:** PRESSURE RELIEF SPRING IS UNDER TENSION.
6. Unscrew and separate pressure relief screw from relief valve insert. Remove pressure relief spring and plunger.

C. CLEANING AND INSPECTION

1. Remove all permatex and clean all parts with good grade cleaning solvent or diesel fuel. Blow dry with compressed air
2. Inspect gears and oil pump for damage or excess wear. See replacement wear limits chart.
3. Inspect cover and adapter for wear caused by gears. Note: if grooving does not exceed .030, grinding smooth can repair both surfaces. (.030" max cut).

4. Inspect bushings in cover for wear (see wear limits p.23), out of round condition or burrs. If they are worn, damaged or loose, replace and ream to size (see p.23).
5. Inspect bushings (2) in adapter for wear, out-of-round condition burrs. If bushings are damaged, replace as necessary, and ream to size (see p.23).
6. Check relief plunger for free movement in adapter bore. Replace if necessary
7. Inspect all mating surfaces for smoothness
8. Check to see that each oil passage is free from obstruction.

D. ASSEMBLY

1. Generously lubricate pump gears with lubriplate, Vaseline, or engine weight oil and position them in adapter. NOTE: BE SURE SPLINED ENDS (INSIDE DIAMETER OF PUMP GEARS) ARE TOWARD COVER.
2. To both mating surfaces of body, sparingly apply a very thin coat of 'SUPER 300' permatex or equivalent. Too much sealer can prevent pump from functioning.
3. Place body on adapter and cover on body following punch marks. Note: If new body is used make sure sharp inside corners are filed smooth.
4. Secure cover and body to adapter with capscrews and lock-washers, finger tight.
5. Drive spring pins (2) down through cover into body and adapter until they bottom in adapter. Drive 2 more spring pins into body until flush with top of cover.
6. Insert pump shaft through adapter into pump gear and revolve shaft to check ease of operation.
7. Tighten all 6 capscrews to 16 foot-pounds torque.
8. Remove any excess permatex from seams with solvent
9. Recheck for ease of operation

10. Generously lubricate relief plunger with Vaseline or lubriplate and position cup end last in bore of adapter. Check to make sure plunger slides freely.
11. Insert pressure relief spring into cup of plunger.
12. Screw pressure relief screw into relief valve insert just enough to start threads
13. Install washer and relief valve insert with pressure screw in place.
14. Tighten relief valve insert. Do not tighten relief screw
15. Cap and lock pressure relief screw with dome nut and washer
16. Recheck for ease of operation.
3. Apply grease to bearing container and locate new oil pump gasket on container.
4. Install oil pump (and filter) on bearing container. Secure pump with capscrews and lockwashers and torque to 32 lb. ft.
5. Install suction hose to tee and oil pump
6. On units with idler gear, connect hose from oil pump to idler shaft.
7. Be sure to re-adjust oil pressure to correct operating level when engine is started up. See fig.17.

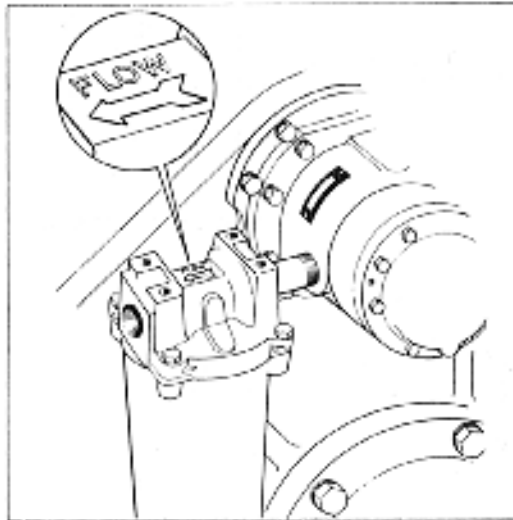


Fig. 16 CAUTION: Flow Arrow on Filter Must Point Away From Oil Pump.

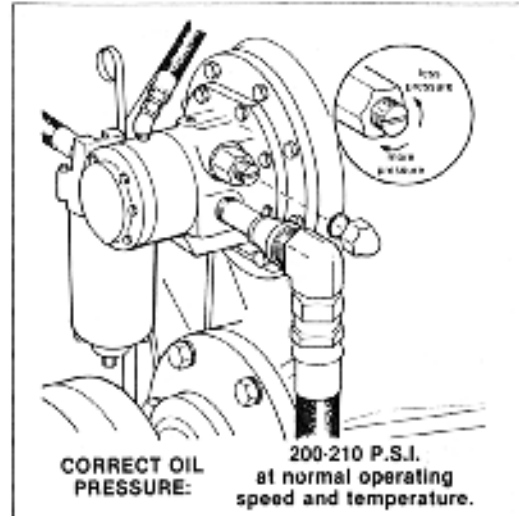


Fig. 17. Correct Operating Oil Pressure Should Be 200-210 P.S.I.

E. RE-INSTALLATION

NOTE: DO NOT use Teflon Tape. It may clog the pump.

1. Flush canister and install new filter element in filter
2. Apply joint compound to threads and install pipe nipples, bushing and oil filter to oil pump.
CAUTION: FLOW ARROW ON FILTER MUST POINT AWAY FROM PUMP. SEE FIG 16.

F. PUMP ROTATION

The direction of pump rotation is the same as engine rotation. If engine rotation is changed the plumbing to the pump must be changed. See cross section assembly drawing for details.

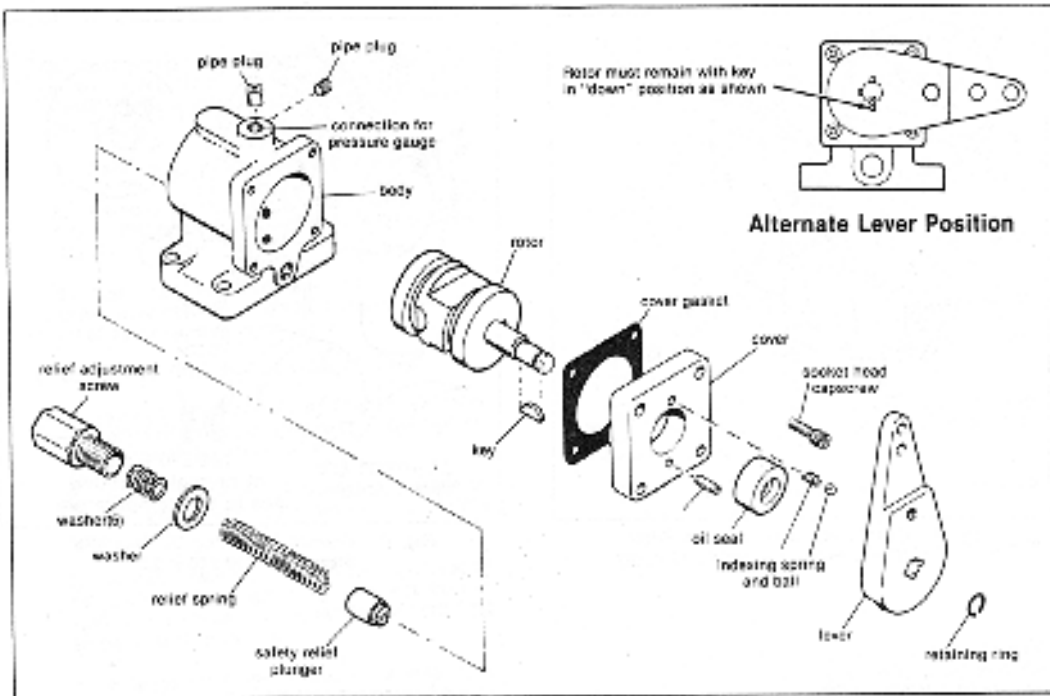


Fig. 18 Selector Valve Assembly

6.2 SELECTOR VALVE AND RELATED PARTS

A. REMOVAL

1. Disconnect hoses and control linkage from lever on selector valve.
2. Remove capscrews and lockwashers and lift off selector valve and baseplate being very careful to keep gaskets in proper configuration for replacement (They may be fixed in position with wire, etc.)

B. DISASSEMBLY

1. Remove retaining ring from rotor and note position of keyways on lever to rotor. (Match mark if desired). Remove lever from rotor being careful not to lose indexing ball and spring.
2. Remove key from rotor shaft

3. Note position of cover). Remove cover, cover gasket, and rotor from block.
4. Remove safety relief adjustment screw, washers, spring and plunger. **NOTE: SPRING IS UNDER TENSION.**

C. CLEANING AND INSPECTION

1. Clean all parts thoroughly with oil and clean all oil ports. Blow dry with compressed air.
2. Inspect rotor and valve block for scoring. Excessive scoring indicates replacement. Valves are not repairable.
3. Inspect oil seal in cover. If it is worn or shows evidence of leaking, replace it.

D. ASSEMBLY

NOTE:

On all fittings use Permatex 'super 300' sealant, graphite paste, or equivalent. **CAUTION:** Do not use No.1 Permatex or Teflon tape.

1. If necessary install new seal in cover. Press seal in until it bottoms in bore (rubber face out). Apply lubricant to seal.
2. Insert rotor shaft through oil seal in cover
3. Set key in rotor shaft and install lever with indexing ball and spring. Make sure that keyway in rotor shaft remains toward bottom of cover.
4. Tap control lever into position with a soft hammer and secure with retaining ring.
5. Position new cover gasket, on pilot face of cover
6. Install rotor with cover into selector valve body. Secure cover with four capscrews. Tighten to 4 pounds-foot torque.
7. Install safety relief adjustment parts in rear of valve body.
8. Check for correct assembly by moving lever back and forth. Selector valve is now ready to be installed on main housing. See fig.19.

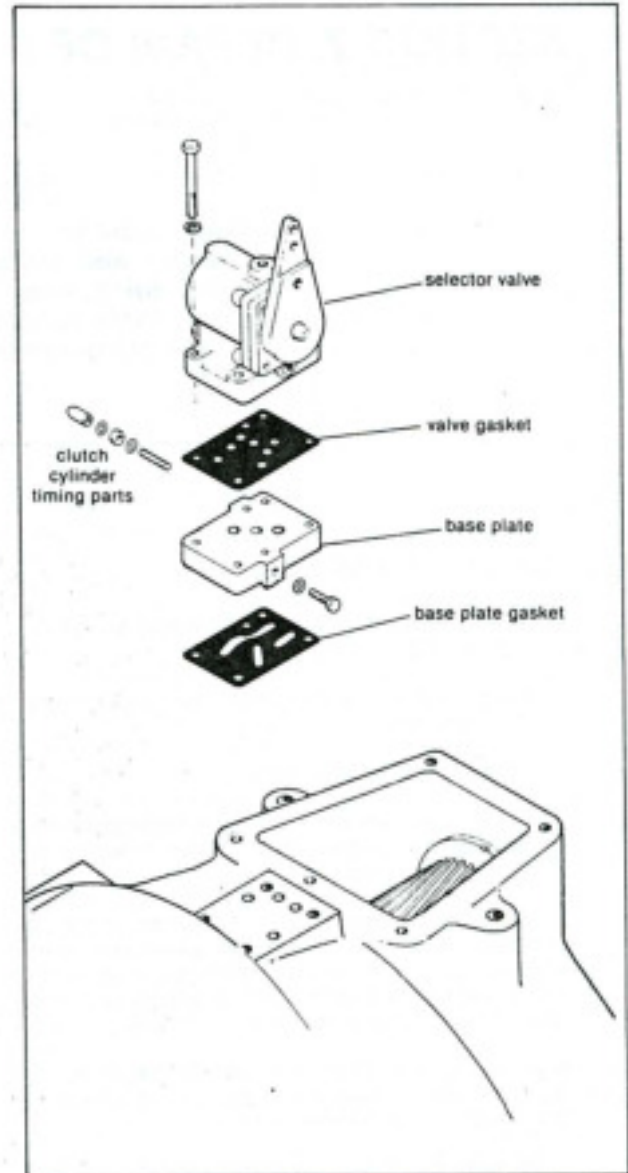


Fig. 19. Exploded View: Selector Valve and Related Parts.

SECTION 7. REPAIR OF INTERNAL SUBASSEMBLIES

CAUTION

Avoid contact with rotating output coupling and always shut down engine when doing even minor inspection or repair. Avoid contact with metal surfaces as operating temperatures may exceed 200°F.

7.1 REMOVAL OF REVERSE GEAR

1. Remove drain plug at rear of housing and drain oil from sump
2. Disconnect all plumbing and wiring and disconnect control linkage.
3. Remove inspection covers
4. Scribe alignment mark across outside diameter of flanges on output coupling for exact refit. Disconnect coupling
5. Remove or push back propeller-coupling member to obtain maximum clearance and remove pilot ring resting between couplings. NOTE: Protect mating faces of couplings and pilot ring to insure proper refit and alignment.
6. Screw two ½"-13 eye bolts into lifting holes on top of housing and connect hoist so it supports the weight of the transmission.
7. Remove capscrews and lockwashers holding housing to oil dam
8. Insert screwdriver or similar object through side inspection hole to hold clutch assembly inside housing. Slowly move housing aft and away from oil dam. See fig.20.

9. Remove clutch from forward driving drum.

Note: See page 38 for adapter group repair.

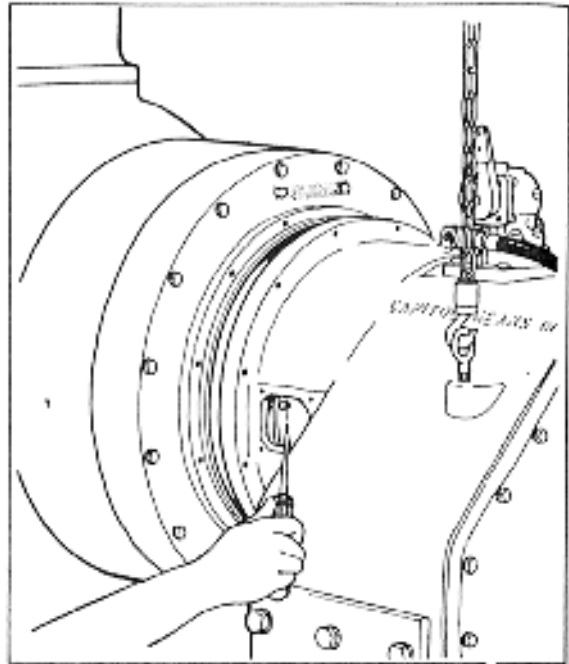


Fig. 20 Maintaining clutch in housing.

CAPITOL GASKET AND SEAL KIT NO.
1-10169-0000 (HY-7700)
1-10168-0000 (HY-6900)

Includes the necessary gaskets, seals and o-rings commonly used for repair.

Clutch quad rings must be purchased separately.

CAUTION

Clutch must be maintained in forward driving drum to prevent falling.

7.2 TABLE: REPLACEMENT WEAR LIMITS

ITEM	NEW DIMENSIONS		REPLACEMENT WEAR LIMIT
	MINIMUM	MAXIMUM	
REDUCTION GEARS- Backlash	.004	.008	.020
PINION SHAFT			
O.D At Forward Commutator	1.7450	1.7455	1.7440
O.D At rear Commutator	2.997	2.998	2.996
O.D At Forward Bearing	3.3380	3.3387	3.3360
O.D At Rear Bearing	1.7721	1.7726	1.7711
FORWARD COMMUTATOR BUSHING			
I.D	1.7495	1.7505	1.7525
REAR COMMUTATOR BUSHING			
I.D	3.001	3.002	3.004
CLUTCH DISC THICKNESS			
Driving (External Teeth)	.150	.160	.140
Driven (Internal Teeth)	.085	.095	.075
Driven, Thick (Internal Teeth)	.160	.175	.150
CLUTCH PACK THICKNESS-Clutch 1-00100-6000			
Forward Pack (Compressed)	1.645	1.785	1.505
Reverse Pack (Compressed)	1.410	1.530	1.290
CLUTCH PACK THICKNESS-Clutch 1-00100-6300			
Forward Pack (Compressed)	1.485	1.620	1.365
Reverse Pack (Compressed)	1.250	1.355	1.150
OIL PUMP			
Ream new bushings to .750"	IF DEEP GROOVES ARE PRESENT, OR MORE THAN .006" CLEARANCE EXISTS BETWEEN PUMP GEARS AND BODY		
SELECTOR VALVE			
	IF DEEP GROOVES ARE PRESENT (.25" DEEP)		
DRIVING DRUM SPLINES			
CLUTCH END FLANGE	IF GROOVES ARE PRESENT VERTICAL TO THE SPLINE		
SPLINES			
ALL SPLINED PARTS			
	REPLACE IF FIT IS NOT SNUG		

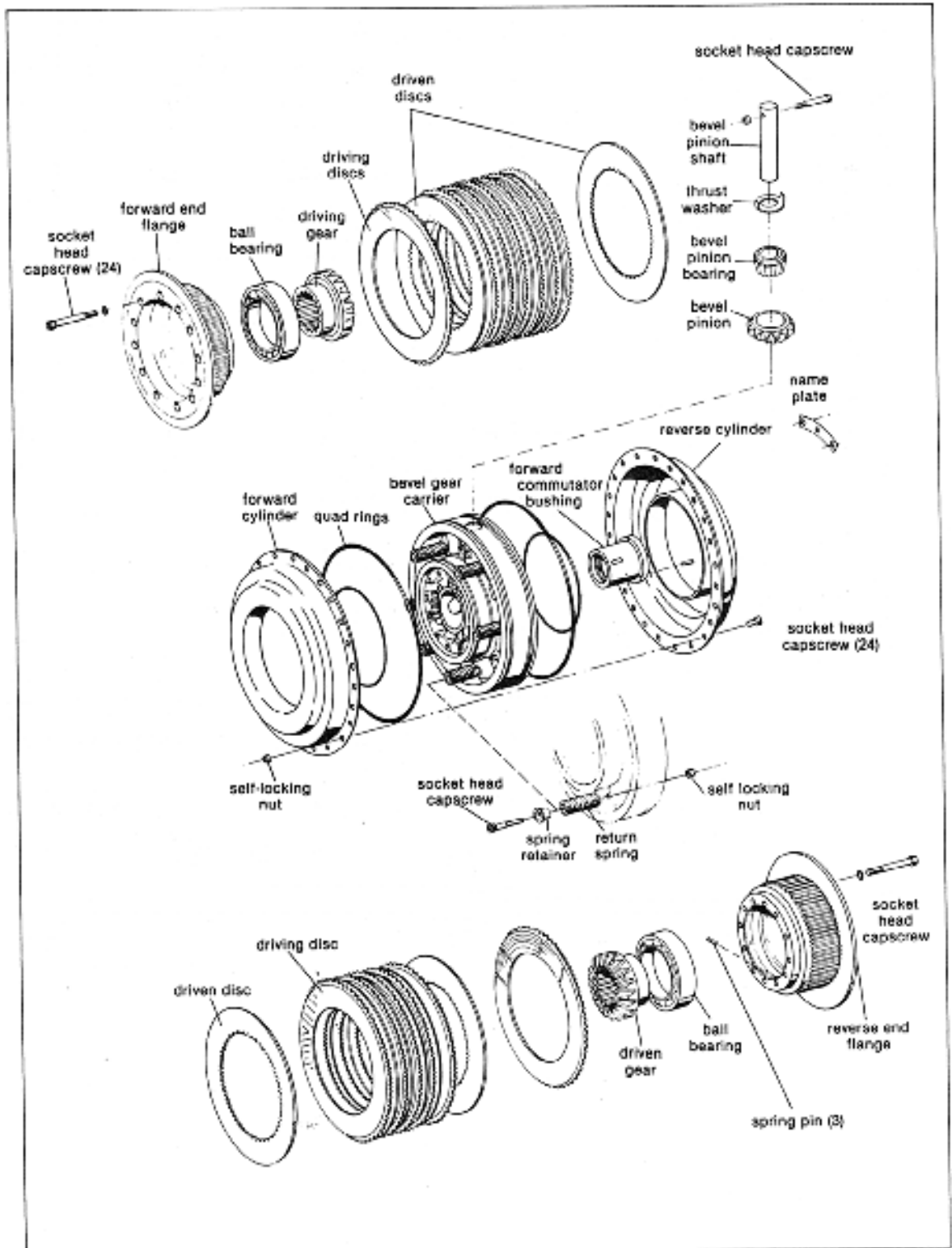


Fig. 21. Clutch and Gear Carrier.

Clutch No. 1-00100-6000 Shown

7.3 CLUTCH

A) DISASSEMBLY

NOTE: FOR REMOVAL
INSTRUCTIONS SEE PAGE 22.

1. Remove socket head, capscrews, lock washers, (and Allen nuts) securing both clutch flanges to bevel gear carrier.
2. Lift off clutch flanges and clutch discs
3. Press and remove bearing and driving gear from both forward and reverse clutch flanges.
4. Remove locknuts, clutch identification tag and capscrews from outer perimeter of cylinders.
5. Separate and remove cylinder
6. Remove and discard quad rings from bevel gear carrier.
7. Remove capscrews and locknuts securing pinion shafts in bevel gear carrier and remove bevel pinion shaft with puller (See special tool No. 1-90008-0000, pinion shaft knockout puller). Refer to fig.22
2. Check all pinion bearings and washers for distortion or rough operation. If one bearing needs replacement we recommend replacing all of them as a set.
3. Clean all parts with a good grade cleaning solvent or diesel fuel. Blow dry with compressed air.
4. Inspect all oil passages in bevel gear carrier to see that they are free from obstruction.
5. Inspect bevel gear carrier for cracks, chips or worn mounting surfaces. Pay special attention to seal ring grooves. Discard carrier if damaged.
6. Inspect forward commutator bushing for chips, heat scores, scratches, distortion or wear (See Wear limits, p. 23). Repair or replace as necessary.
7. Inspect all hardware and springs for wear or distortion. Repair or replace as necessary.

B) CLEANING AND INSPECTION

1. Inspect bevel pinions for wear, chips, and breaks or out of round condition. If there is any damage we recommend replacing all of them as a set.
8. Remove clutch discs from flanges and inspect discs for broken teeth, heat scores or wear (See Wear Limits, page 23). Replace as necessary.
9. Inspect driving gear, and driven gear, for wear, chips or cracks. If either one is damaged we recommend replacing both as a set.

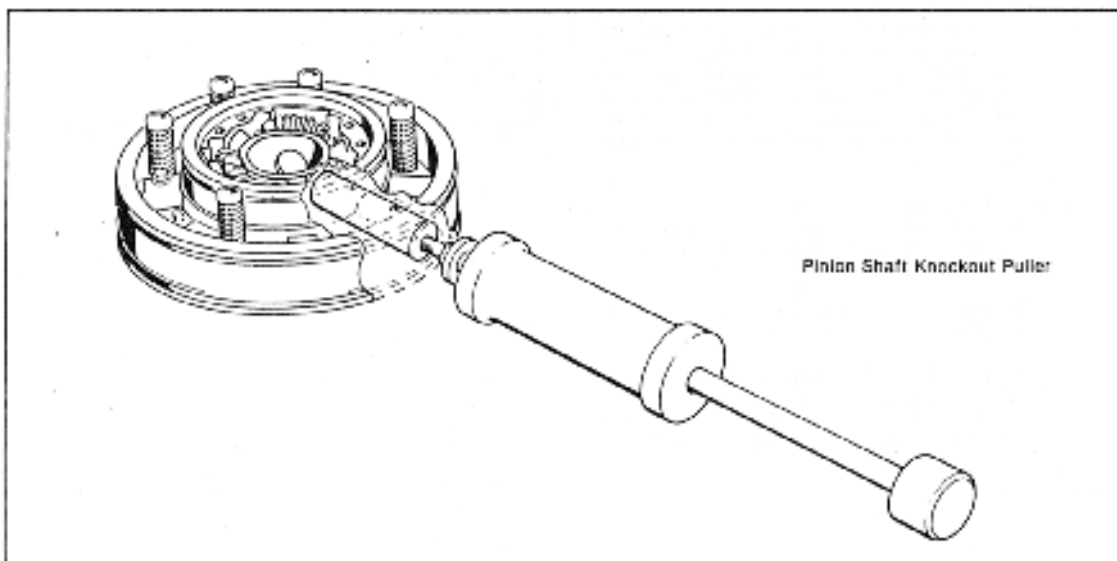


Figure 22. Removal of Pinion Shaft from Gear Carrier.

10. Check both clutch flange ball bearings for wear, distortion, or rough operation. Again we recommend replacement of both bearings if either one shows wear.
11. Inspect forward and reverse clutch end flanges, for wear, cracks or distortion and make certain all oil passages are free from obstruction.
12. Inspect both clutch cylinders for cracks, distortions or scratches. Repair or replace as necessary/

carrier bore making sure holes are in line (See fig.22).

Tap shaft about half way into bore so it protrudes just slightly into recess. Position thrust washer on protruding shaft.

Insert bearing into pinion gear and slip gear (Teeth toward center of carrier) into position.

Tap shaft the remaining distance until holes match up.

d). Repeat steps B and C for the 2 remaining shafts.

e). Secure shafts with capscrews and locknuts.

C) ASSEMBLY

1. Installation of forward commutator:
 - a). Either the bushing should be frozen or the bevel gear carrier heated. This will allow ease of fit and will help prevent scoring of the gear carrier bore. An anti-seize compound should be used on the bushing also.

NOTE:

Bushing may be frozen with a solution of alcohol and water or dry ice. Gear carrier may be heated in hot oil or water (212°F, 100°C max)

- b). Line up holes in flanged end of bushing with roll pins in bevel gear carrier. Press in new bushing on side of carrier stamped 'REV'. Until it seats in bore. The roll pins will lock the bushing in place and insure line-up of oil holes in the bushing and bevel gear carrier.

2. Installation of pinion shaft:
 - a). To prevent damage to gear carrier and bearings, the carrier should again be heated to expand the bore diameter.

- b). Apply lubricant on shafts and bores to ease fit.

C). (Gloves may be required since gear carrier is hot). Insert protective 1/2-20 cap screw in pinion shaft and tap shaft into

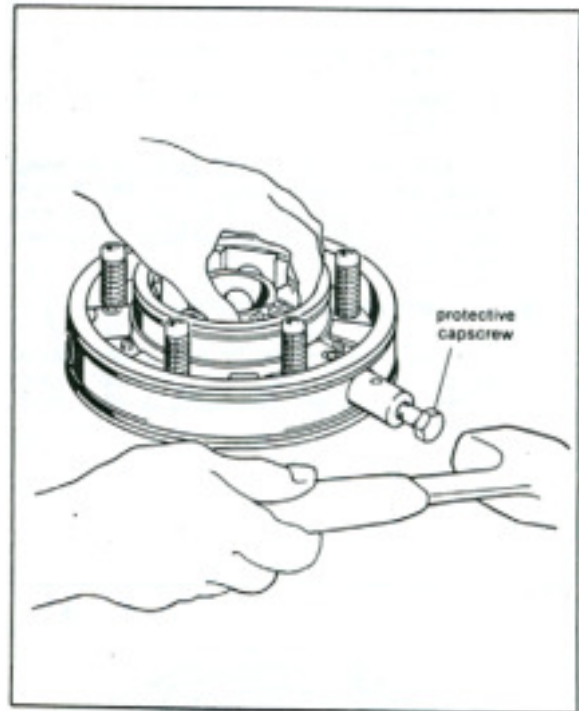


Figure 23. Installing Pinion Shaft in Gear Carrier.

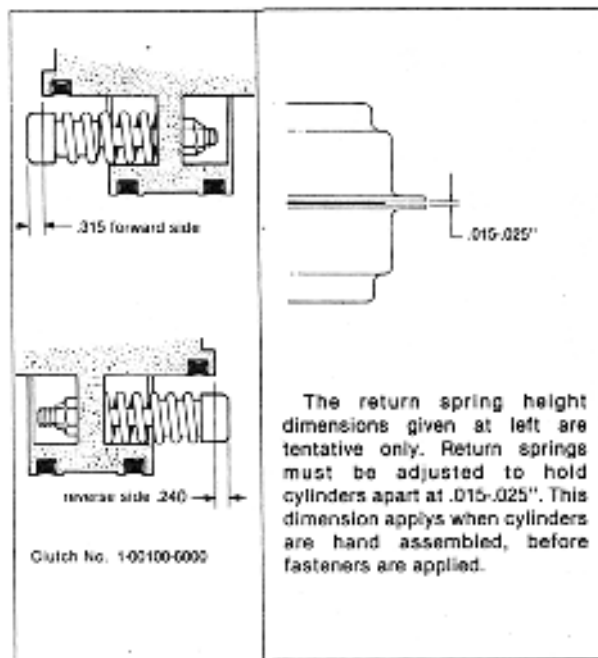


Figure 24. Clutch Return Spring Height Adjustment

3. Replacement of return springs and retainers (If necessary): Insert return spring retainers into return springs and secure in gear carrier using capscrews. Tighten capscrews tentatively until top of spring retainer protrudes the specified distance from the face of the bevel gear carrier hub as shown in figure 24.
4. Without installing quad rings, place cylinders on bevel gear carrier by hand. (See fig.25) above. There must be a uniform gap between cylinders of .015 to .025". Check with a feeler gauge. If necessary, readjust return spring height and install locknuts.
5. Apply lube in seal ring grooves in bevel gear carrier and slip on four new quad rings avoiding twists in the rings.
6. To Install cylinders:
 - A. Apply a light coat of lubricant on inner walls of each clutch cylinder as well as quad rings.
 - B. With forward side of gear carrier up, press cylinder on by hand (See fig. 25).

C. Turn bevel gear carrier over (reverse side up) and press remaining cylinder on, checking to see that cap screw holes in both cylinders are aligned properly.

D. Insert capscrews and locknuts and tighten to 16 pounds-foot torque.

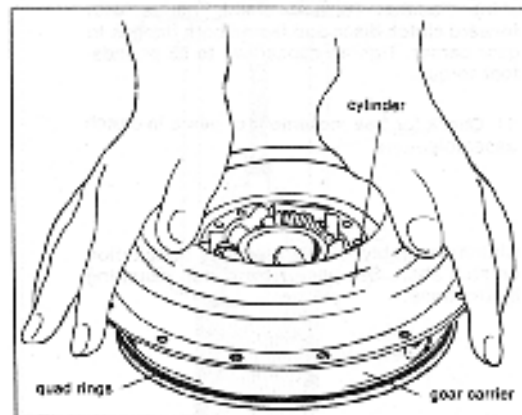


Figure 25. Pressing Cylinder on Bevel Gear Carrier

CAUTION:

To prevent twisting or damaging of seal rings, take care to slip cylinders on evenly and straight down.

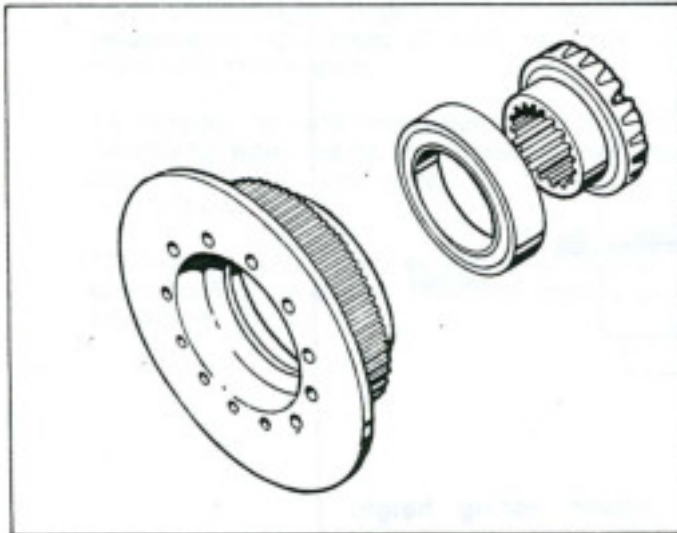


Fig. 26. Clutch end flange, bearing and bevel gear.

7. Press ball bearing into forward clutch flange. Press bevel gear into ball bearing.

8. Likewise press the other ball bearing into reverse clutch flange (fig.26). Then press bevel gear into ball bearing. Check that ball bearings on both flanges are well seated.

9. Arrange the driving friction discs (external tooth) with the steel driven discs (internal tooth) against the forward and reverse clutch flanges. Refer to the appropriate illustration in section 7. parts information.

10. Position reverse clutch flange and reverse clutch discs on reverse side of gear carrier (flange on commutator bushing is on reverse side). Position forward clutch flange with forward clutch discs and fasten both flanges to gear carrier. Tighten capscrews to 25 pounds-foot torque.

11. Check for free movement of gears in clutch assembly.

Clutch assembly is now ready for installation on stub shaft. See page 7 for clutch mounting instructions.

7.4 PINION SHAFT- REMOVAL AND RE-ASSEMBLY

Set transmission housing upright and support if necessary.

1. Disconnect hose from selector valve to oil pump and pump to sump. Disconnect idler hose, if present from pump.
2. Remove selector valve selector valve base plate and gaskets.

A. REMOVAL AND DISASSEMBLY

1. Remove oil filter canister from filter head. Discard element.
2. Remove oil pump mounting bolts. Remove oil pump, discard gasket and remove oil pump drive shaft.
3. Remove bearing retainer from cover (Pinion will accompany it) by tapping on pinion shaft, if necessary from engine side of housing.
4. Release tang of lockwasher and remove locknut and lockwasher from shaft.
5. Using a suitable press, extract pinion shaft from bearing retainer (a protective spacer should be used). Note: Be careful that pinion doesn't fall.
6. Pull remaining bearing cone from pinion shaft if it is damaged or worn.

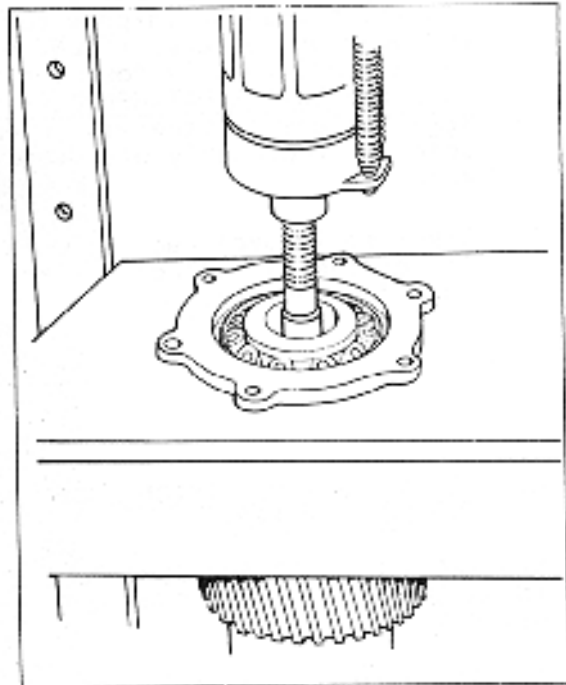


Fig. 27. Extracting Pinion Shaft

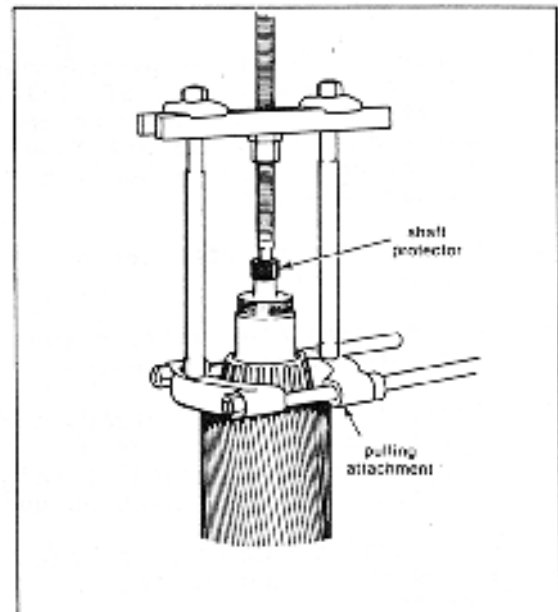


Fig. 28. Pulling Bearing Cone from Pinion Shaft.

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B. CLEANING INSPECTION AND REPAIR

1. Inspect tapered roller bearings for rough rotation. Corrosion, scoring, scratches, burrs, cracks, pitted or chipped races and wear of rollers. If ONE of these conditions is found, discard the ENTIRE MATCHED BEARING SET (5 pieces). Otherwise clean bearings thoroughly with solvent.

2. Likewise inspect bearing cups in retainer- replace entire set if necessary.

C. RE-ASSEMBLY OF PINION SHAFT AND RELATED PARTS.

NEW BEARING CONES AND CUPS COME IN MATCHED PAIRS. BE SURE NOT TO MIX PARTS.

1. Apply lubricant to inside diameter of bearing retainer. Press new bearing cups (if necessary) into bearing retainer snug against spacer.

2. Apply lubricant to bearing surface at threaded end of pinion shaft. Press * new bearing cone onto shaft snug against shoulder of gear. Locate bearing spacer on shaft.

3. Locate bearing retainer on pinion shaft.

4. Press* remaining bearing cone onto shaft. Locate lockwasher.

5. Apply lubricant to threads and install bearing locknut on shaft. Secure by bending tang of lockwasher into slot on nut.

* A protective spacer is recommended to prevent damage to bearing.

3. Inspect pinion teeth, threads and spline for damage. Inspect all bearing surfaces and commutator surfaces for grooved, burred or galled conditions. If damage cannot be repaired with crocus cloth. Discard shaft.

4. Clean pinion thoroughly. Flush oil ports clean with solvent.

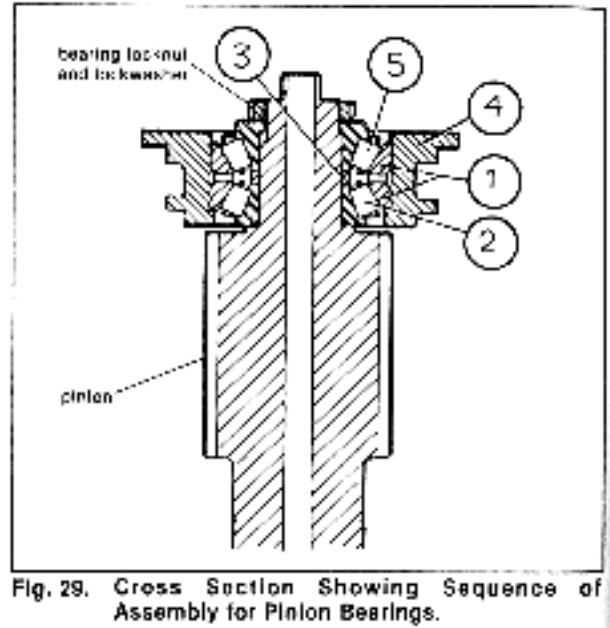


Fig. 29. Cross Section Showing Sequence of Assembly for Pinion Bearings.

Note: Wear to pinion indicates wear to other internal parts. A complete inspection is recommended at this point.

7.5 OUTPUT GEAR AND RELATED PARTS

A. REMOVAL AND DISASSEMBLY

1. Remove cotter pin from output shaft
2. Remove slotted nut and washer
3. With engine end of transmission down, pull output coupling from output shaft using suitable puller.

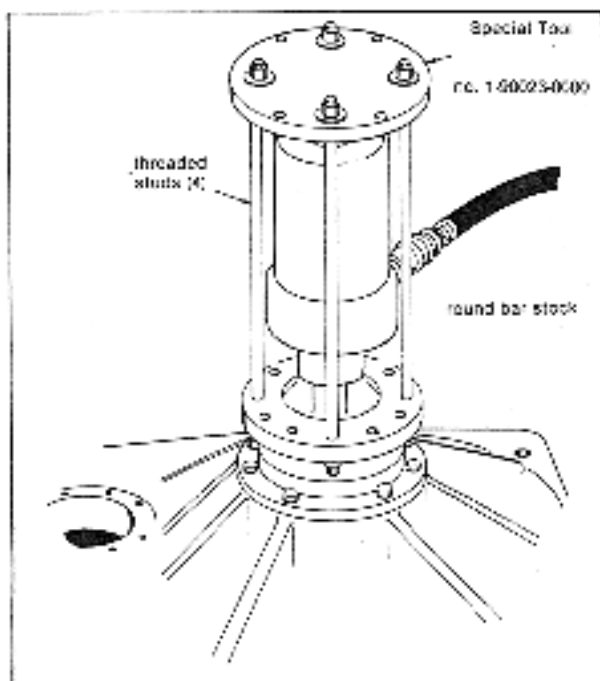


Fig. 30. Removing Output Coupling from Shaft.

4. Remove output bearing cap/oil seal retainer and shims.
5. Press out oil seal from bearing cap/oil seal retainer. Discard oil seal.
6. Remove capscrews and lock washers and remove housing cover. Discard gasket.
7. Using suitable hoist, remove output gear assembly from housing.

8. Remove oil pan
9. Engine Rotation (E.R) Models only: Remove idler gear assembly from housing (or cover). Remove snap rings and bearings. Discard o-ring.
10. Remove snap ring and remove pinion roller bearing mounted in housing.
11. Press out rear commutator bushing. Disassemble commutator by first removing snap ring at rear of assembly.

B. CLEANING, INSPECTING AND REPAIR

1. Inspect disassembled commutator bushing for cracked piston rings, damage or wear- see wear limits chart.
2. Inspect tapered roller bearings on both ends of output shaft for rough rotation, corrosion, scoring, scratches, burrs, cracks, pitted or chipped races and wear. If one of these conditions is found discard bearing(s).
3. Inspect bearing cup in housing bore and cover bore for any sign of damage or wear. Discard if necessary.

NOTE: If bearing cone warrants replacement the bearing cup should be replaced also and visa versa.

4. Inspect output gear for nicks, burrs, scratches, damage or wear of any kind. Teeth may be repaired with a flat file or grinding wheel, otherwise gear must be replaced.

5. E.R. Models only: Inspect idler gear for nicks, burrs, damage or wear. Check bearings for rough rotation or wear. Discard if necessary. Make sure internal oil passage in shaft is clear. Flush idler hose.
6. Inspect output coupling at bearing mating surface for nicks or burrs. File smooth or discard coupling. Inspect oil seal surface for grooves. Discard coupling if it is grooved.
7. Inspect mating surfaces of output coupling and propeller coupling and file smooth if possible. Otherwise replace parts.
8. Inspect housing cover bores and mating surfaces front and back. Repair nicks or burrs with file or crocus cloth. Clean all of the above parts thoroughly with solvent.

2.6 HOUSING PARTS

Set transmission-housing upright.

1. Flush clean and inspect main housing. Inspect front and rear mating surfaces and repair with file or crocus cloth.
2. Inspect reverse clutch drum for deep grooves or wear. Repair or replace as necessary. Clean with solvent.
3. Flush clean oil breather and suction hose (sump to filter).

7.7 RE-ASSEMBLY AND INSTALLATION OF OUTPUT GEAR AND RELATED PARTS

1. Re-assembly rear commutator bushing parts. Be careful not to crack piston rings. Check that inner sleeve 'floats' in commutator shell.

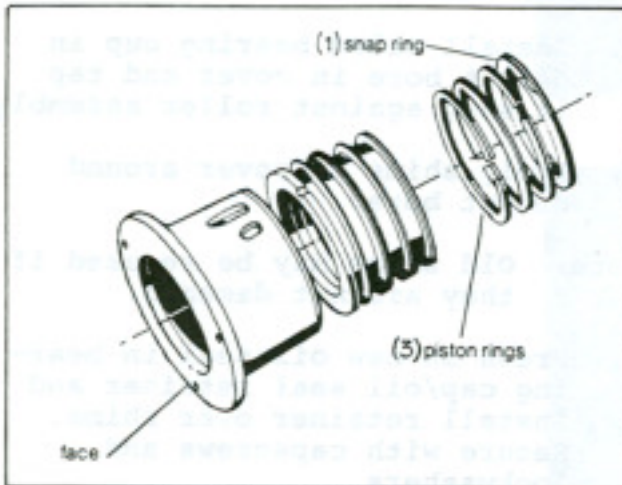


Fig. 31. Rear Commutator Bushing

2. Install rear commutator bushing in housing as follows:

a). Commutator ports MUST GO TOWARD TOP OF TRANSMISSION HOUSING.

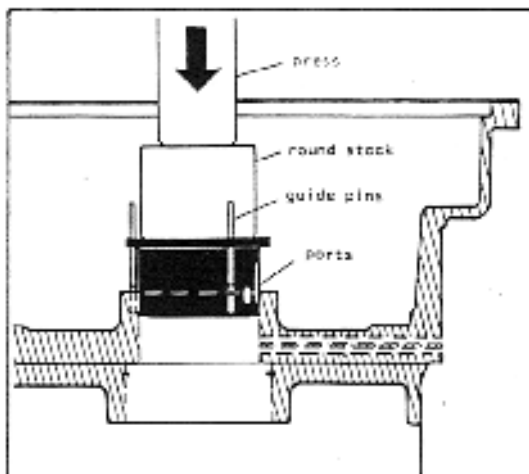


Fig. 32. Installing Rear Commutator in Housing

b). To make sure holes in commutator flange match up with spring pins in housing, three guide pins (3/16" dia.) Should be used.

c). Apply lubricant to commutator and press it into housing bore.

d). Check that commutator sleeve 'floats' in shell.

3. If necessary replace reverse drum and secure with capscrews and lock washers. Turn transmission housing engine end down.

4. Install pinion roller bearing in housing bore. Secure with snap ring.

5. Install new output bearing cup (if necessary) in housing bore. Make sure cup seats firmly.

6. Install oil pan and secure capscrews with locking wire.

7. Install new tapered roller bearings (if necessary) on both ends of output gear shaft. Roller assembly must be heated in oil then pressed onto shaft snug against shoulder of gear. When bearings have cooled, check that they are still snug against shoulder.

8. (HY-7700) Install bearing locknut on forward end of output shaft and secure with screw.

(HY-6900) Install bearing nut and lockwasher on forward end of output shaft and secure by bending lockwasher tang into slot on nut.

9. Using adequate hoist, lower output gear (with roller bearings on shaft) into housing.

10. E.R MODELS ONLY: Assemble and install idler as follows:

a). Press roller bearings on idler shaft snug against snap rings.

b). Install shaft and bearings into idler gear and secure with snap ring.

c). Install idler assembly into housing bore. Tap lightly if necessary so that shaft bottoms in bore.

11. Apply new cover gasket to housing. A small amount of grease may be used to keep gasket in place.

12. Using adequate hoist install the housing cover onto dowel pins in housing *. Tap cover evenly with soft hammer until it is 1/8" from housing. Locate capscrews and lockwashers. Tap cover down firm and tighten capscrews.

13. Install oiled bearing cup in output bore in cover and tap it snug against roller assembly.

14. Apply shims to cover around output bore.

NOTE: Old shims may be re-used if they are not damaged.

15. Press in new oil seal in bearing cap/ oil seal retainer and install retainer over shims. Secure with capscrews and lockwashers.

E.R. MODELS: Be careful not to damage o-ring on idler shaft.

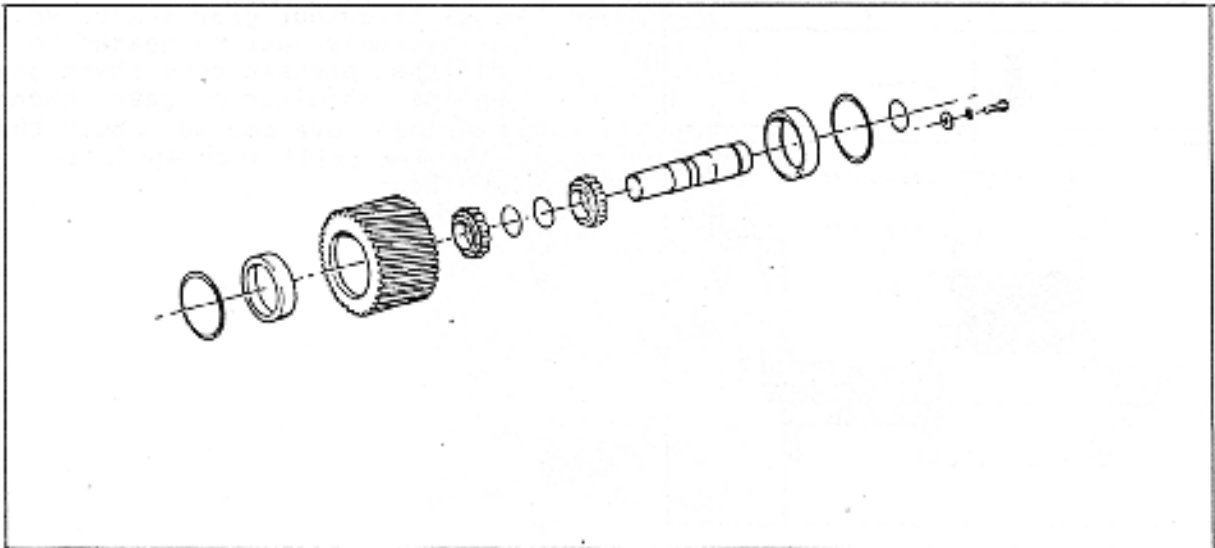


Fig. 33. Exploded View Showing Idler Parts in Sequence of Assembly

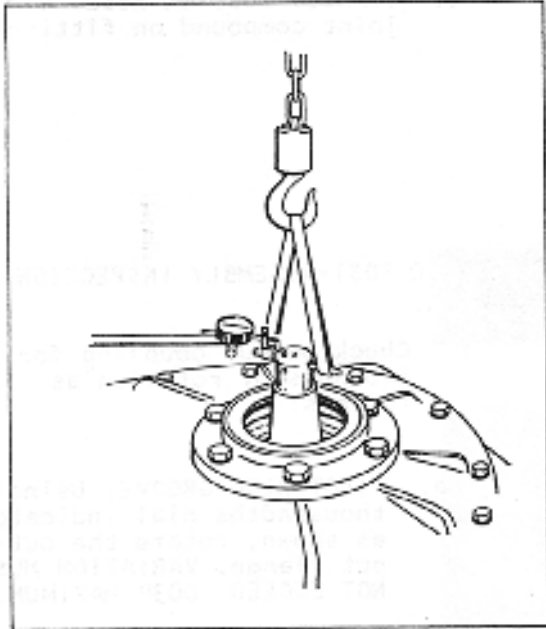


Fig. 34. Checking End Play in Output Shaft.

16. Check endplay in output shaft as follows:

- a). Connect hoist to end of output shaft. Slotted nut may be used for this purpose.
- b). Mount thousandths dial indicator with tip resting on end of shaft.
- c). Raise and lower output shaft with hoist. Twist shaft back and forth several times to seat rollers in bearing.
- d). END PLAY MUST BE BETWEEN .000" and .003". Otherwise remove bearing cap and add or subtract shims as necessary; check endplay again.

7.8 INSTALLATION OF OUTPUT COUPLING

1. If new coupling is used, check clearance between key and keyway in output coupling by locating key and coupling temporarily on shaft. Clearance should be .010" to .015". Otherwise file key as necessary.

2. Heat output coupling in hot oil or water at 180° Fahrenheit (or 82° Celsius) for at least ½ hour before installation.

4. Install hot output coupling on output shaft. Make sure coupling seats firmly against bearing. If it does not, a soft hammer should be used while coupling is hot.

4. Secure coupling with washer, slotted nut and cotter pin.

7.9 INSTALLATION OF PINION SHAFT AND RELATED PARTS

Tip housing upright.

1. If a new pinion or a new rear commutator is being installed, check the clearance between the two parts. It must be .002" or assembly will be very difficult and commutator may freeze on the shaft.

2. E.R. Models only: Mount a thousandths dial indicator on rear cover at pinion bore so that tip is resting on the side of an idler gear tooth. Hold output gear stationary and gently twist idler back and forth. The amount of play or 'backlash' between the teeth must be .004" to .008".

3. Apply lubricant to rear commutator mating surface on pinion shaft.

4. Install pinion assembly (including bearing retainer) into pinion bore in housing cover.

5. Apply oil pump gasket onto pinion bearing retainer with a small amount of grease.

6. Install oil pump. Secure with capscrews and lockwashers. E.R. Models Only: Connect idler hose to pump and idler shaft.

7. Install new oil filter element in canister and install canister on filter head. If head was removed make sure FLOW ARROW POINTS AWAY FROM PUMP when re-installing.

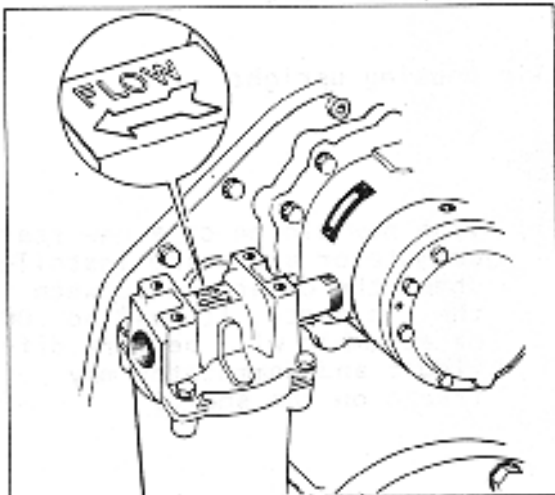


Fig. 35. CAUTION: Flow Arrow on Filter Must Point Away From Oil Pump.

8. Connect suction hose. Use joint compound on fittings.

7.10 POST-ASSEMBLY INSPECTION

1. Check output coupling for trueness of rotation as follows:

a). PILOT RING GROOVE: Using thousandths dial indicator as shown, rotate the output flange. VARIATION MUST NOT EXCEED .003" MAXIMUM.

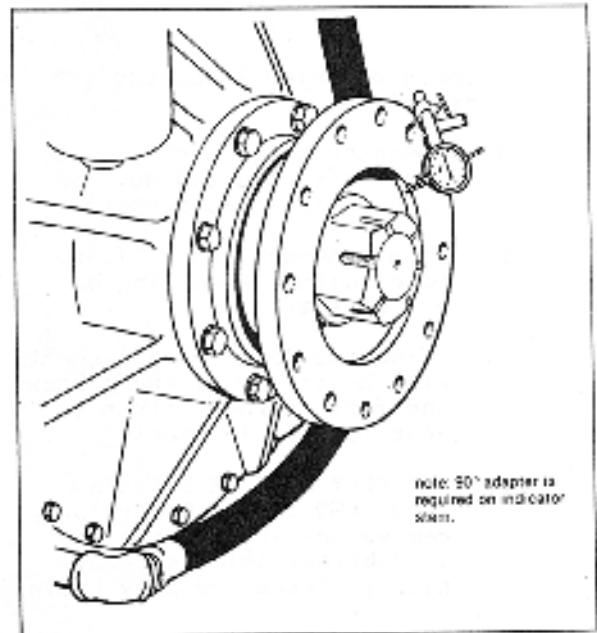


Fig. 36 Dial Indicating Output Flange Pilot Ring Groove

b). MOUNTING FACE: Mount thousandths indicator as shown and rotate coupling. VARIATION MUST NOT EXCEED .003" MAXIMUM.

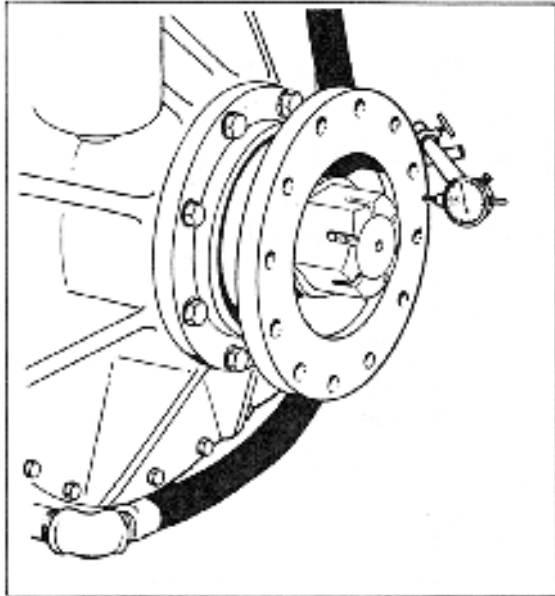


Fig. 37. Dial Indicating Output Flange Mounting Face

2. Check for gear backlash as follows:
A.E.R. MODELS (without idler gear): Mount thousandths dial indicator on top of housing so that arm extends through top inspection hose and tip rests on the side of a pinion tooth. Hold output coupling stationary and gently twist pinion back and forth. The play or 'backlash' must be between .004" and .008".

3. Check for gear tooth contact:

If a NEW pinion and or idler gear are installed check for tooth contact with marking compound. Models without idler gear, apply compound to pinion. Units with idler gear apply compound to idler gear.

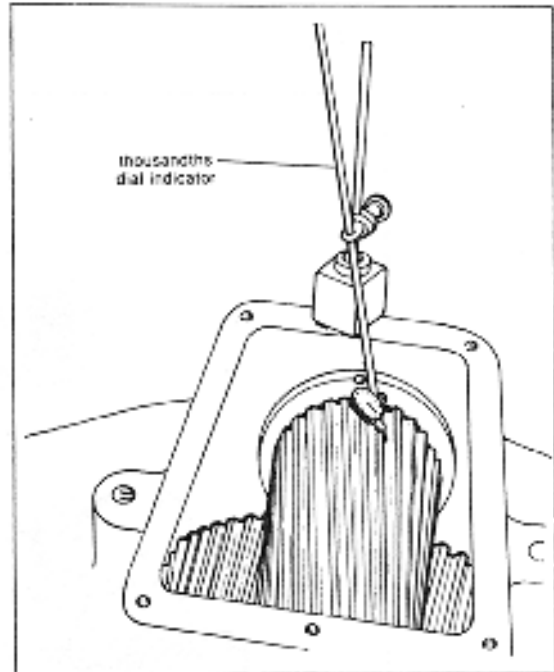


Fig. 38. Checking 'Backlash' with Thousandths Dial Indicator.

7.11 ADDITIONAL ASSEMBLY

1. Install inspection covers and gaskets
2. Install oil breather and dipstick
3. Install oil drain plug
4. Install gasket and baseplate
5. Install gasket and selector valve on baseplate
6. Connect hose from selector valve tee to oil pump.

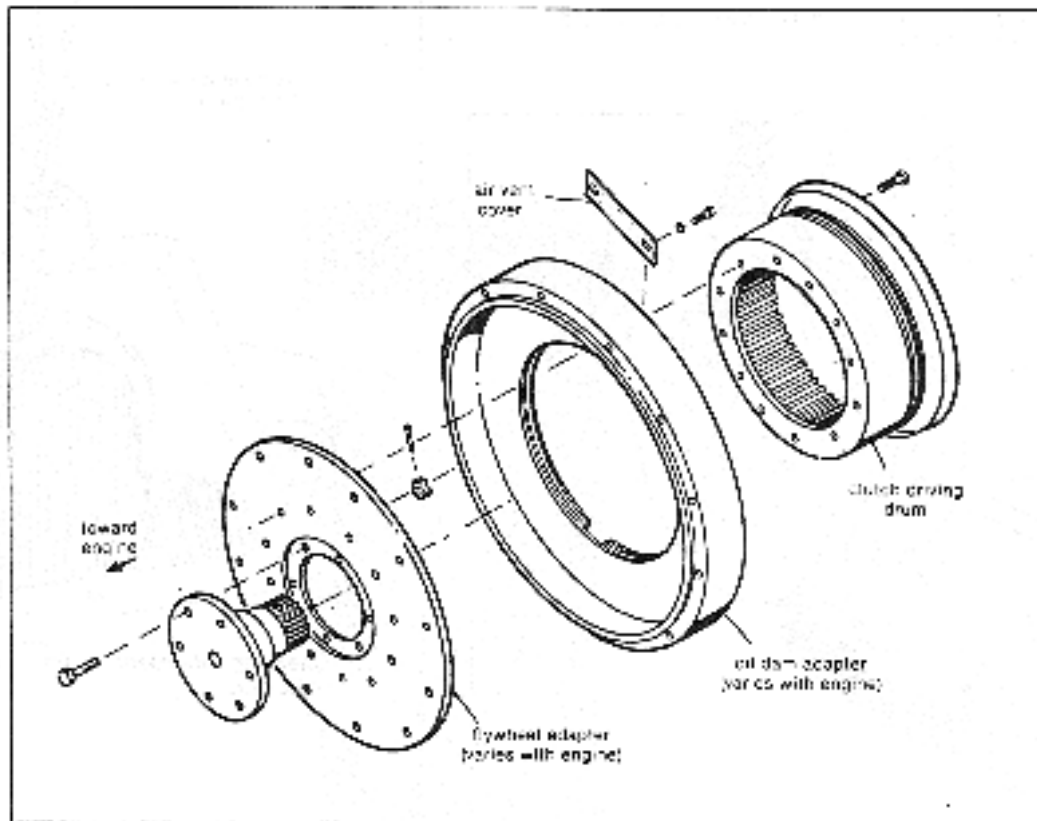


Fig. 38. 'HY' Adapter Group

7.12 ADAPTER PARTS

1. Clean and inspect stub shaft, clutch driving drum. Check splines for chips, deep grooves or wear. Replace parts as necessary.

2. Remove oil dam adapter and inspect labyrinth oil seal on inside diameter. Repair or replace as necessary (wear or damage to seal indicates misalignment-check further!).

3. While oil dam is removed, inspect flywheel adapter and drive flange for distortion or rough mounting surfaces. Repair or replace as necessary.