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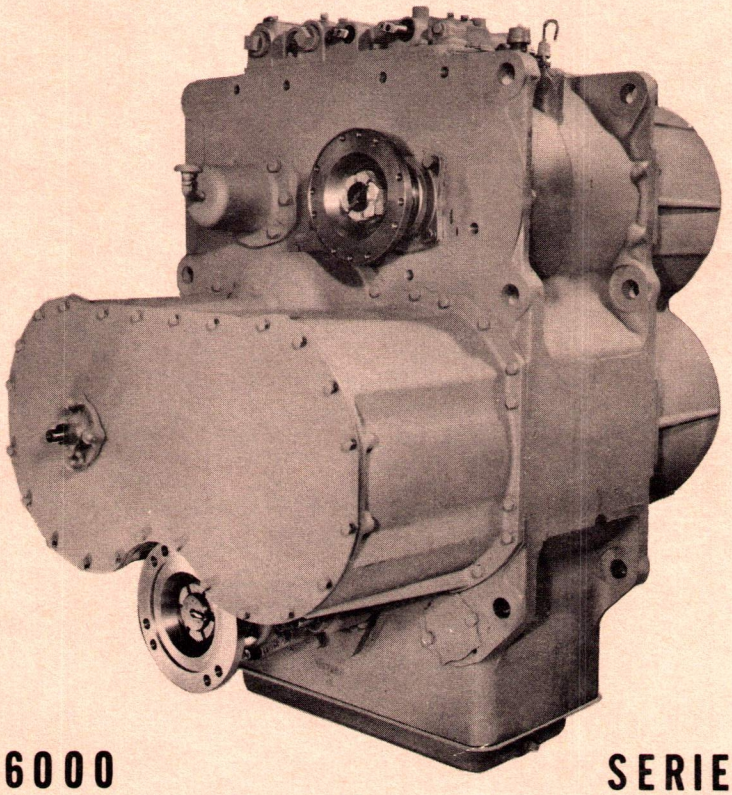
CLARK®

TRANSMISSION

MAINTENANCE & SERVICE MANUAL



16000 SERIES

CLARK EQUIPMENT COMPANY

CUSTOMER SERVICE DIVISION

PUBLICATION DEPT. — JACKSON, MICHIGAN

SM16—4-63

FOREWORD

Φ

This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the 16,000 Series Transmission Assembly.

Extreme care has been exercised in the design, selection of materials and manufacturing of these units. The slight outlay in personal attention and cost required to provide regular and proper lubrication, inspections at stated intervals, and such adjustments as may be indicated will be reimbursed many times in low cost operation and trouble free service.

In order to became familiar with the various parts of the torque converter, its principal of operation, trouble shooting and adjustments, it is urged that the mechanic study the instructions in this manual carefully and use it as a reference when performing maintenance and repair operations.

To assure the best results and to maintain the original quality built into the converter it is important that genuine "Clark" Parts be used when new parts are required: IMPORTANT: **Always furnish the Distributor with the converter serial number when ordering parts.**

NOTES

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16,000 SERIES TRANSMISSION ASSEMBLY

The transmission portion of the power train enacts an important role in delivering engine power to the driving wheels In order to first understand their function and how they operate.

The transmission and torque converter function together and operate through a common hydraulic system. To obtain maximum serviceability they have been designed and built as separate units. It is necessary, however, to consider both units in the study of their funcition and operation.

To supplement the text below, and for references use therewith, the following illustrations are provided:

Fig. A — Front and Rear View, Shaft Identification
Fig. B — Transmission Case and Internal Tubing
Fig. C — Control Cover Assembly
Fig. D — Output Shaft and Declutch Unit Group—"O"
Fig. E — Idler Shaft Group—"I"
Fig. F — Input and Forward Drive Shaft Group—"F"
Fig. G — Reverse Drive Shaft Group—"R"
Fig. H — 2nd and 4th Drive Shaft Group—"A"
Fig. I — 1st and 3rd Drive Shaft Group—"B"
Fig. J — External Oil Flow—Converter and Transmission

HOW THE UNITS OPERATE

With the engine running, the converter charging pump draws oil from the transmission sump and directs it through oil filters to the regulating valve located on top of the transmission. From the regulating valve it is then directed through the control cover on the transmission to the converter and to the transmission clutches.

The pressure regulating valve mounted on the top of the transmission remains closed until required presure is delivered to the transmission for actuating the direction and speed clutches. This regulator valve consists of a hardened valve spool operating in a closely fitted bore. The valve spool is backed up by a spring to hold the valve spool against its seat until the oil pressure builds up to specified pressure. The valve spool then moves toward the spring until a port is exposed along the side of the bore. The oil can then flow through this port into a distributor which directs the oil into the converter inlet port.

After entering the converter, the oil is directed through the stator support to the converter cavity and exits between the turbine shaft and converter support. The oil then passes through an oil distributor which directs the oil out of the converter and into the oil cooler. After leaving the cooler the oil is directed through a hose to the lubricating oil inlet on the transmission, then through a series of tubes to the transmission, bearings, and clutches. The oil then returns to the transmission sump.

A safety valve is built in the transmission control cover and will open to bypass oil only if an excessive pressure is built up due to a blocked passage.

The rear compartment of the converter unit also houses the converter output shaft and oil pump drive gears. A flexible hose provides an overflow to the transmission sump.

The three members of the torque converter are composed of a series of blades. These blades are curved in such a manner as to force the oil to circulate from the impeller to the turbine, through the reaction member again into the impeller. This circulation causes the turbine to turn in the same direction as the impeller. Oil enters the inner side of the impeller and exits from the outer side into the outer side of the turbine. It then exits from the inner side of the turbine and after passing through the reaction member, again enters the inner side of the impeller.

When the torque demand increases, the turbine member turns at a slower speed than the impeller, the oil flows through the reaction member in such a manner as to apply a turning force in a direction opposite to that of the engine. This provides torque multiplication. With further increase in torque demand, the turbine member continues to slow down and eventually stops. At this point the converter is at "stall" and the torque multiplication is at a maximum.

The control valve assembly on the transmission consists of a valve body with selector valve spools connected to the steering column by exterior linkage. A detent ball and spring in the selector spool provides four positions, one position for each speed range. A detent ball and spring in the direction spool provides three positions, one each for forward, neutral and reverse.

On certain models, this valve also contains a shut-off valve spool operated by an air or hydraulic cylinder located on the control cover. This valve is connected to the brake system by a hose line. When the wheel brakes are applied, air or hydraulic fluid enters the valve and overcomes a spring force. This forces the spool to shift over and block pressure from entering the directional clutches. In this manner a "neutral" is established without moving the control levers.

With the engine running and the directional control lever in neutral position, oil pressure from the converter unit is blocked at the control valve, and the transmission is in neutral. Movement of the forward and reverse spool will direct oil, under pressure, to either the forward or reverse direction clutch as desired, and the opposite one is open to relieve pressure.

The direction or speed clutch assembly consists of a drum with internal gear teeth and a bore to receive a hydraulically actuated piston. A piston is inserted into the bore of the drum. The piston is "oil tight" by the use of sealing rings. A disc with external teeth is inserted into the drum teeth and rests against the piston. Next, a disc with splines at the inner diameter is in-

serted. Discs are inserted until the required total is achieved. After inserting the last disc, a series of springs and pins are assembled in such a manner that these springs rest on teeth of the piston. A heavy back-up plate is then inserted and secured by a snap ring. A hub with I.D. and O.D. splines is inserted into the splines of discs with teeth on the inner diameter and a splined shaft extending through the clutch support. This hub is retained by a snap ring. The discs and inner shaft are free to increase in speed or rotated in the opposite direction as long as no pressure is present in the direction or speed clutch.

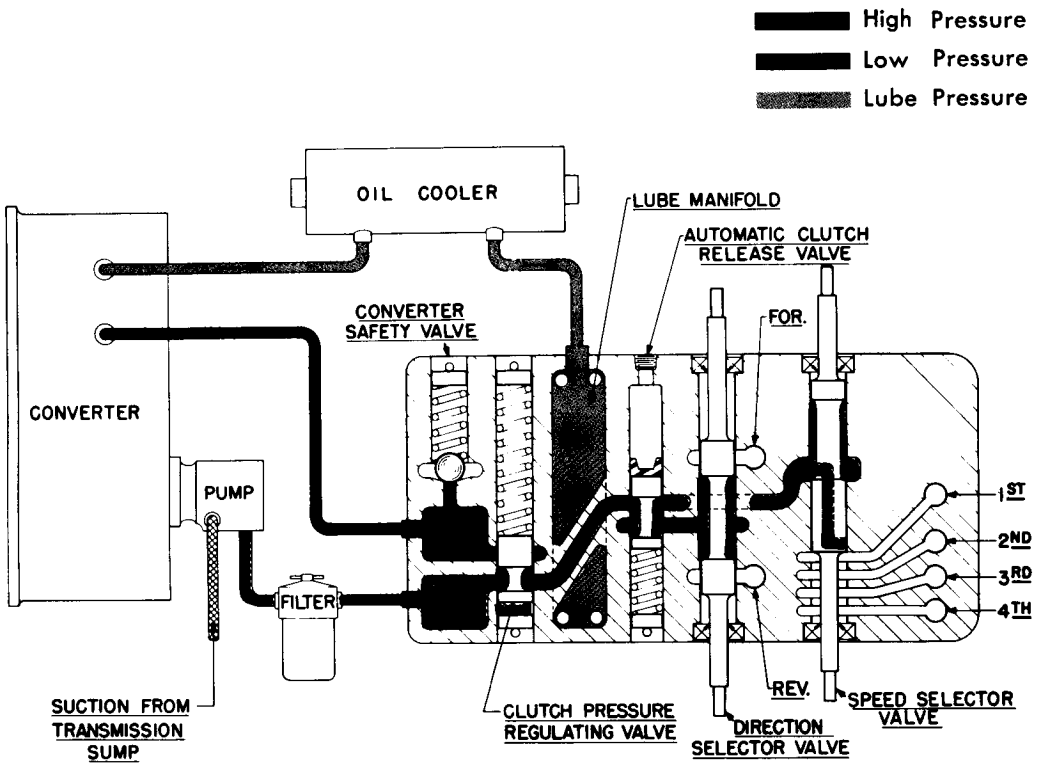
To engage the clutch, as previously stated, the control valve is placed in the desired position. This allows oil under pressure to flow from the control cover valve, through a tube in the transmission case, to a chosen clutch. Once into the drum, oil is directed through a drilled hole into the rear side of the piston bore. Pressure of the oil forces the piston and discs over against the heavy back-up plate. The discs, with teeth on the outer diameter, clamping against discs, with teeth on inner diameter, enables the clutch drum and drive shaft to be locked together and allows them to turn as a unit.

There are bleed balls in the clutch drums which allow quick escape for oil when the pressure to the piston is released.

The transmission gear train consists of six shafts: (1) Input Shaft, (2) Reverse Shaft, (3) Idler Shaft, (4) First and Third Shaft, (5) Second and Fourth Shaft, (6) Output Shaft.

At the bottom of the transmission case a cored passage extends up and into an oil suction flange, which in turn receives the flexible hose connecting to the converter charging pump. A screen mounted in a frame is positioned on the bottom of the case, to screen out any foreign material. This screen is covered by the sump pan. This pan is provided with magnets to catch any metallic particles.

The axle de-clutching unit consists of a split output shaft with a sliding splined sleeve to engage or disengage the axle. This is accomplished by manually shifting a lever in the operator's compartment which is mechanically connected to the shift fork on the clutching unit sliding sleeve. This unit, of course, is only used on the four wheel drive machine. On the front drive only or the rear wheel drive only, the output shaft is of one piece type and an output flange assembled only on the required end.



TRANSMISSION CONTROL COVER INTERNAL OILFLOW

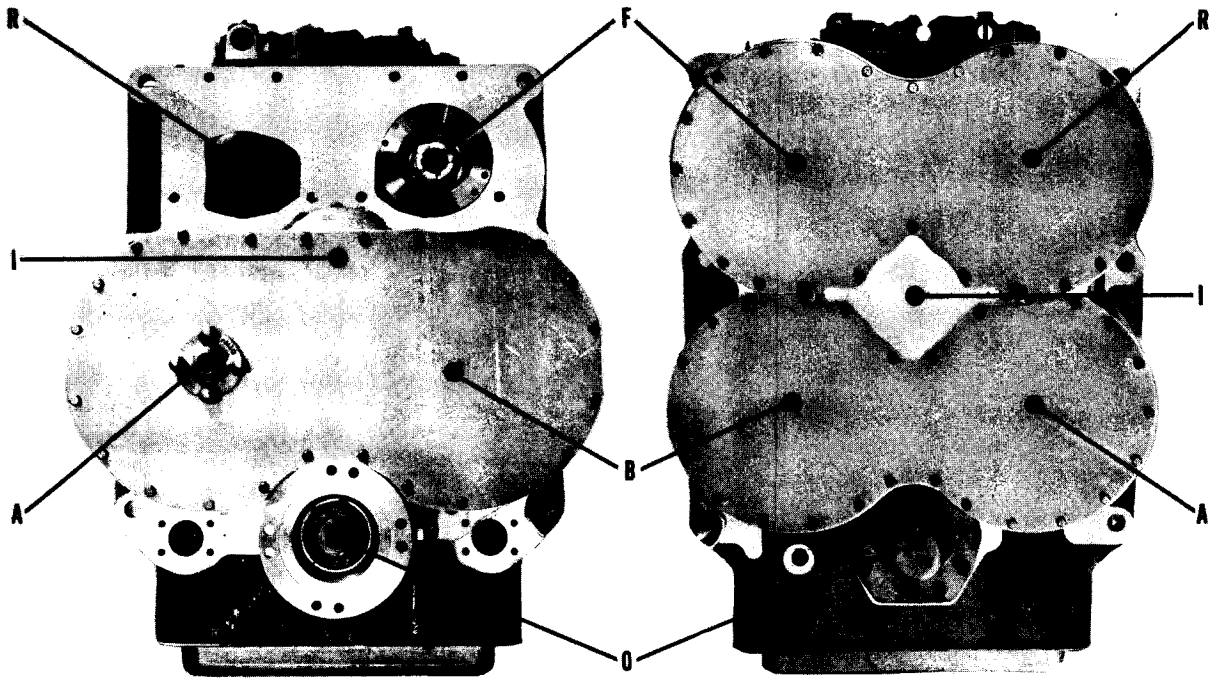


FIG. A—TRANSMISSION ASSEMBLY SHAFT IDENTIFICATION

For purpose of identification, illustration above indicates by alphabetical designation the individual shaft group location in transmisson. Code to alphabetical designation is given below. Alphabetical designation also appears in heading of each shaft group covered in parts listings herein.

A—Second & Fourth Drive Shaft Group

B—First & Third Drive Shaft Group

F—Input Drive Shaft & Forward Clutch Group

I—Idler Shaft Group

O— Output Shaft & Disconnect Assembly Group

R—Reverse Drive Shaft Group

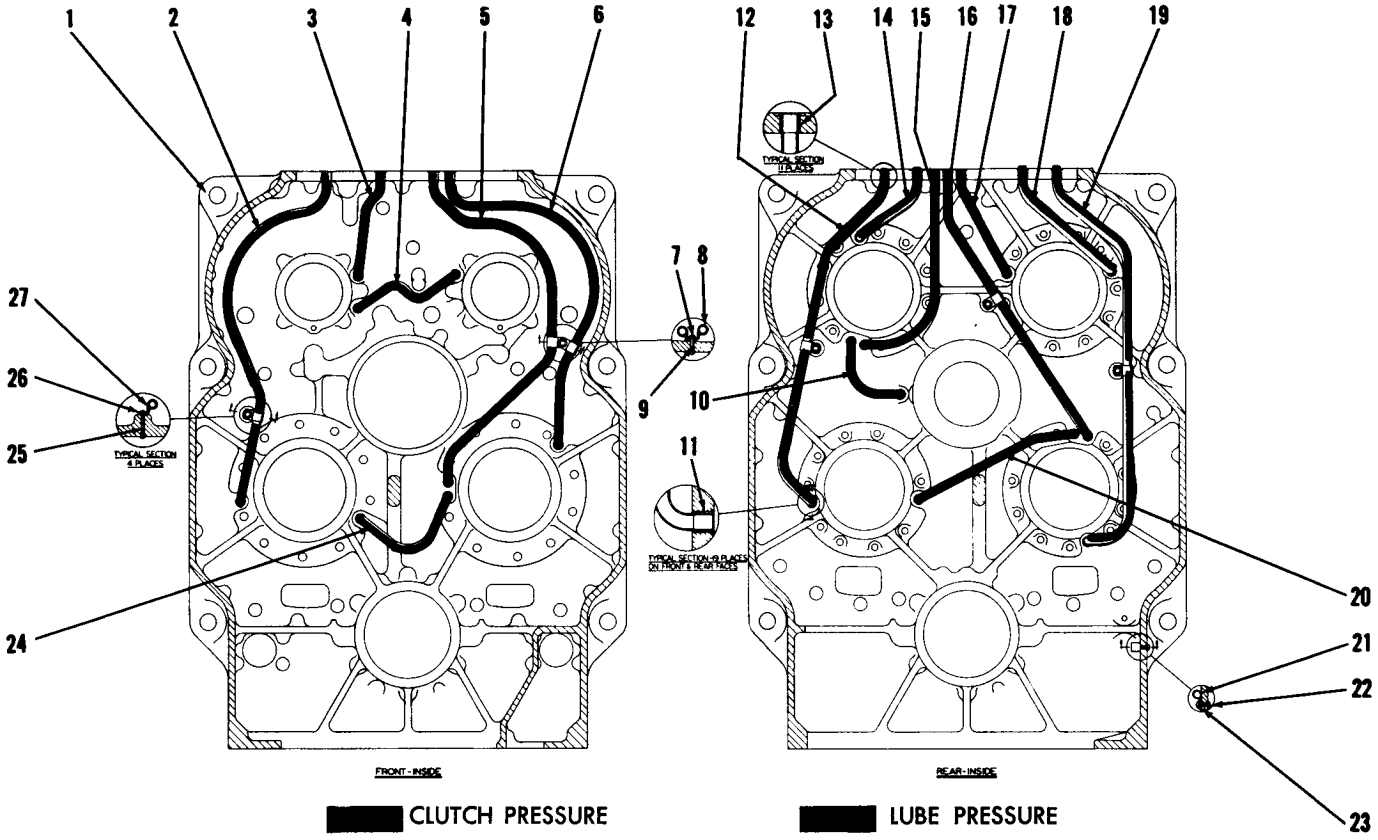


FIG. B 16000 SERIES TRANSMISSION CASE ASSEMBLY

ITEM	DESCRIPTION	QTY.
1	Transmission Case	1
2	1st Clutch Pressure Tube	1
3	Forward Clutch Lube Tube	1
4	Input to Reverse Lube Tube	1
5	2nd Clutch Lube Tube	1
6	2nd Clutch Pressure Tube	1
7	Washer	1
8	Tube Clip	2
9	Rivet	1
10	Reverse to Idler Lube Tube	1
11	Tube Sleeve	18
12	4th Clutch Pressure Tube	1
13	Tube Sleeve	12
14	Reverse Clutch Pressure Tube	1
15	Reverse Clutch Lube Tube	1
16	3rd Clutch Lube Tube	1
17	Forward Clutch Lube Tube	1
18	Forward Clutch Pressure Tube	1
19	3rd Clutch Pressure Tube	1
20	3rd to 4th Lube Tube	1
21	Tube Clip	1
22	Rivet	1
23	Washer	1
24	2nd to 1st Lube Tube	1
25	Rivet	3
26	Washer	3
27	Tube Clip	3

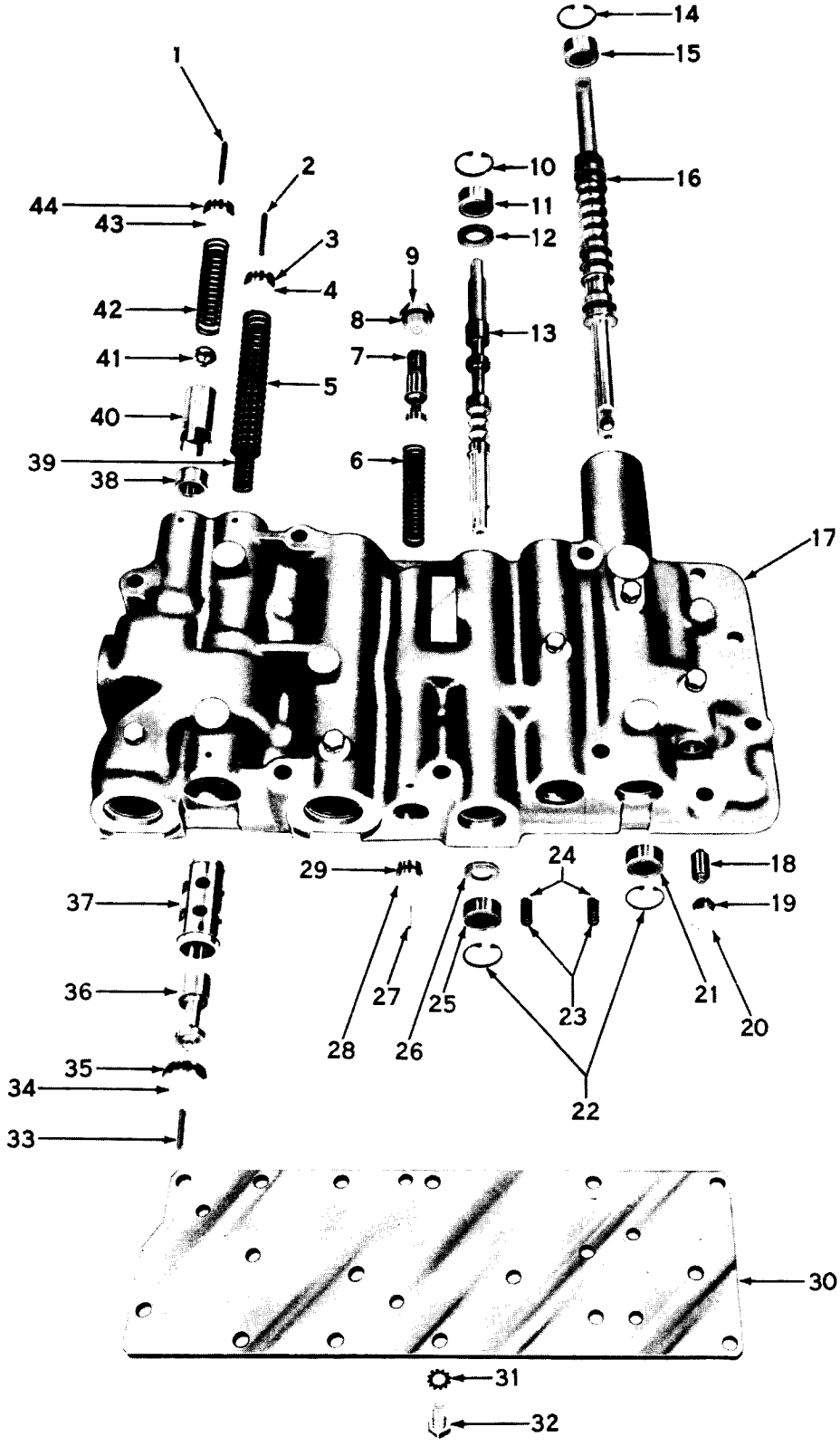

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FIG. C CONTROL COVER GROUP

ITEM	DESCRIPTION	QTY.
1	Spring Stop Roll Pin	1
2	Spring Stop Roll Pin	1
3	Spring Stop	1
4	Spring Stop "O" Ring	1
5	Regulating Valve Spool Spring (Outer)	1
6	Shut-off Valve Spring	1
7	Shut-off Valve Spool	1
8	Shut-off Valve Plug "O" Ring	1
9	Valve Spool Stop Plug	1
10	Valve Oil Seal, Snap Ring	1
11	Valve Oil Seal	1
12	Valve Stop Washer	1
13	Forward-Reverse Selector Valve	1
14	Speed Selector Valve Oil Seal Snap Ring	1
15	Speed Selector Valve Oil Seal	1
16	Speed Selector Valve Assembly	1
17	Control Cover and Valve Housing	1
18	Shuttle Valve	1
19	Pipe Plug "O" Ring	1
20	Pipe Plug	1
21	Speed Selector Valve Oil Seal	1
22	Speed Selector Valve Oil Seal Snap Ring	2
23	Poppet Spring	2
24	Poppet Ball	2
25	Valve Oil Seal	1
26	Valve Stop Washer	1
27	Shut-off Valve Stop Roll Pin	1
28	Pipe Plug	5
29	Shut-off Valve Stop "O" Ring	1
30	Control Cover Plate	1
31	Plate To Cover Screw Lockwasher	16
32	Plate To Cover Screw	16
33	Spring Stop Roll Pin	1
34	Valve Spool Stop	1
35	Stop "O" Ring	1
36	Regulating Valve Spool	1
37	Valve Spool Sleeve	1
38	Safety-Valve Seat	1
39	Regulating Valve Spool Spring (Inner)	1
40	Safety-Valve Spacer	1
41	Safety-Valve Ball	1
42	Safety-Valve Spring	1
43	Spring Stop	2
44	Spring Stop "O" Ring	2

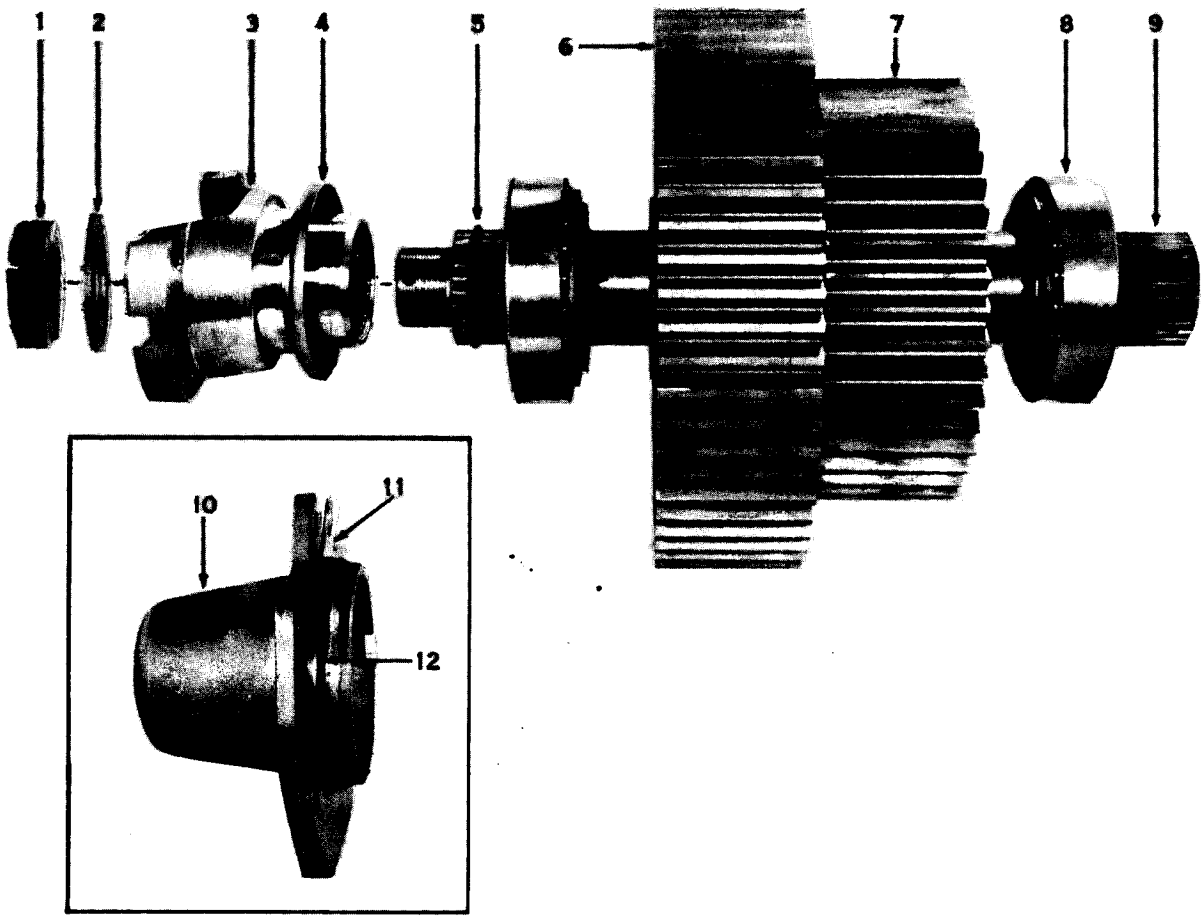


FIG. D OUTPUT SHAFT GROUP "O"

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Flange Nut	1	7	Output Shaft Gear	1
2	Flange Nut Washer	1	8	Output Shaft Taper Bearing	2
3	Companion Flange	1	9	Output Shaft	1
4	Companion Flange Deflector	1	10	Optional Bearing Cap	1
5	Companion Flange "O" Ring	1	11	Bearing Cap Shim	1
6	Output Shaft Gear	1	12	Bearing Cap "O" Ring	1

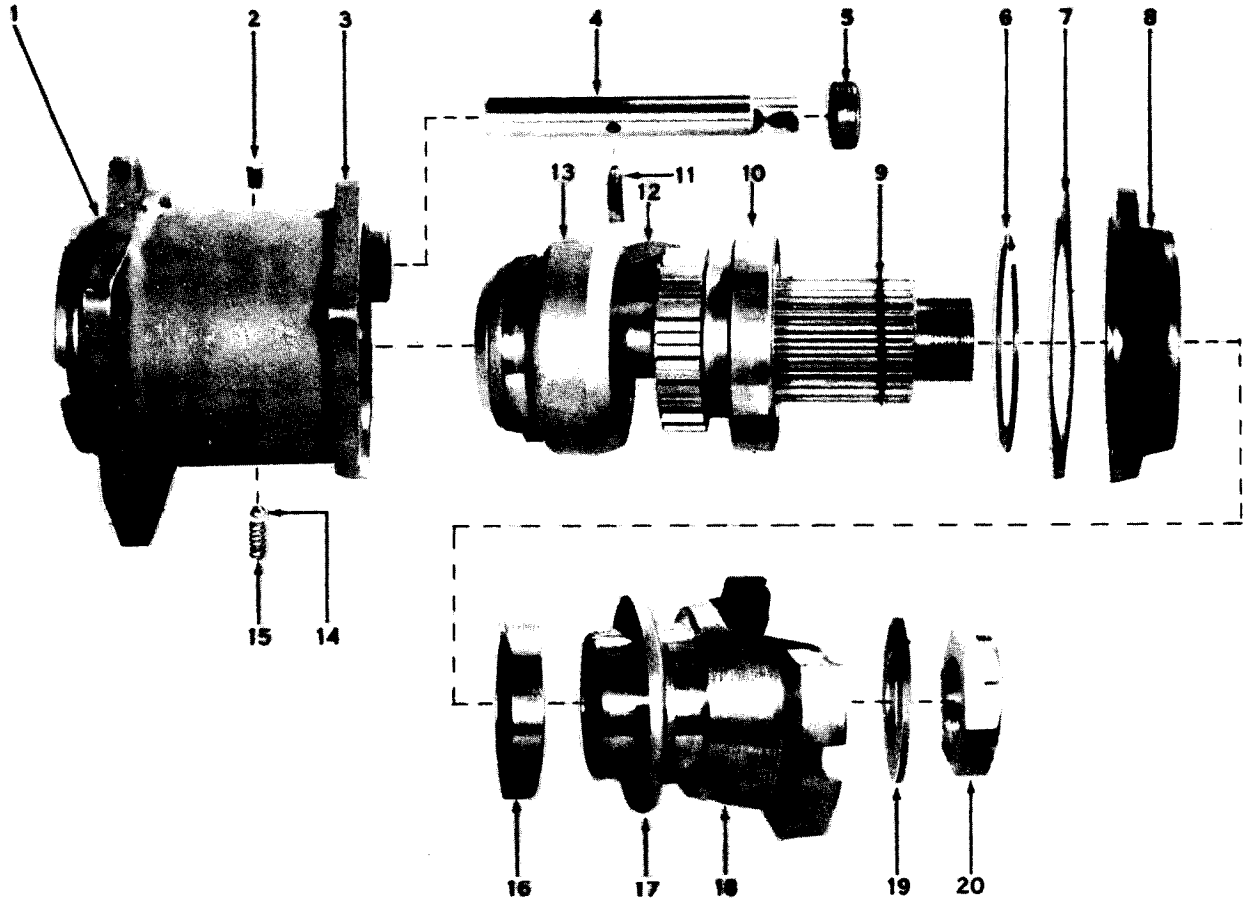
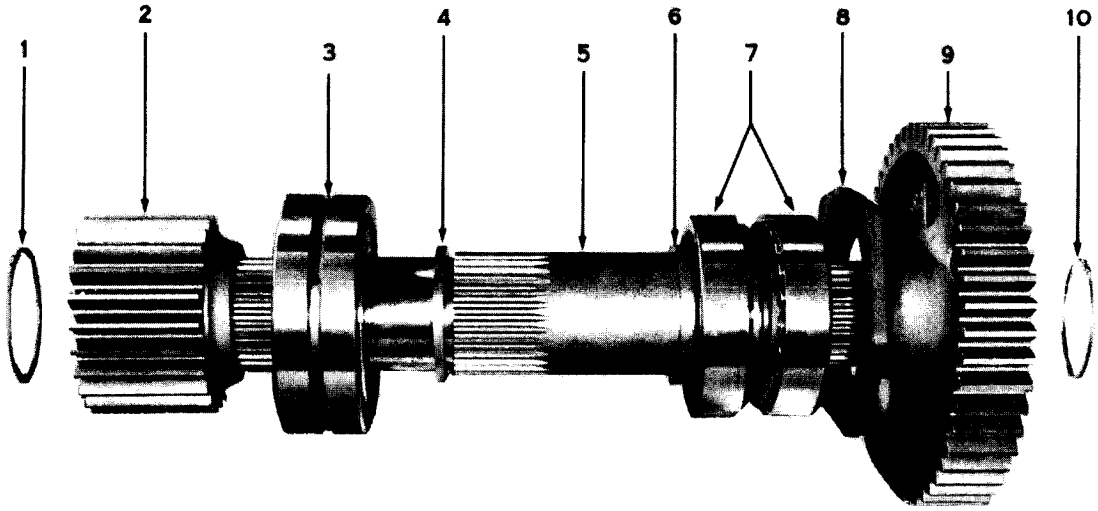


FIG. D DISCONNECT ASSEMBLY "O"

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Disconnect Housing "O" Ring	1	11	Shift Fork Screw	1
2	Poppet Spring Plug	1	12	Shift Fork	1
3	Disconnect Housing	1	13	Disconnect Shift Hub	1
4	Shift Rail	1	14	Detent Ball	1
5	Shift Rail Oil Seal	1	15	Detent Spring	1
6	Bearing Locating Ring	1	16	Companion Flange Oil Seal	1
7	Bearing Cap Gasket	1	17	Companion Flange Deflector	1
8	Bearing Cap	1	18	Companion Flange	1
9	Flange "O" Ring	1	19	Flange Washer	1
10	Disconnect Shaft & Bearing	1	20	Flange Nut	1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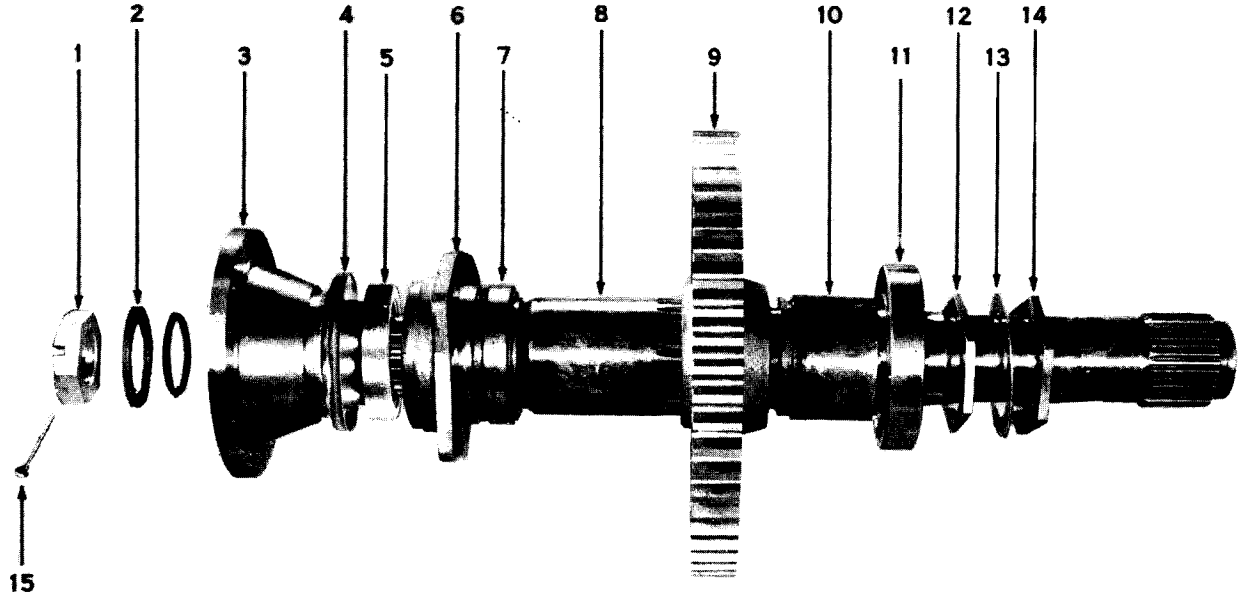
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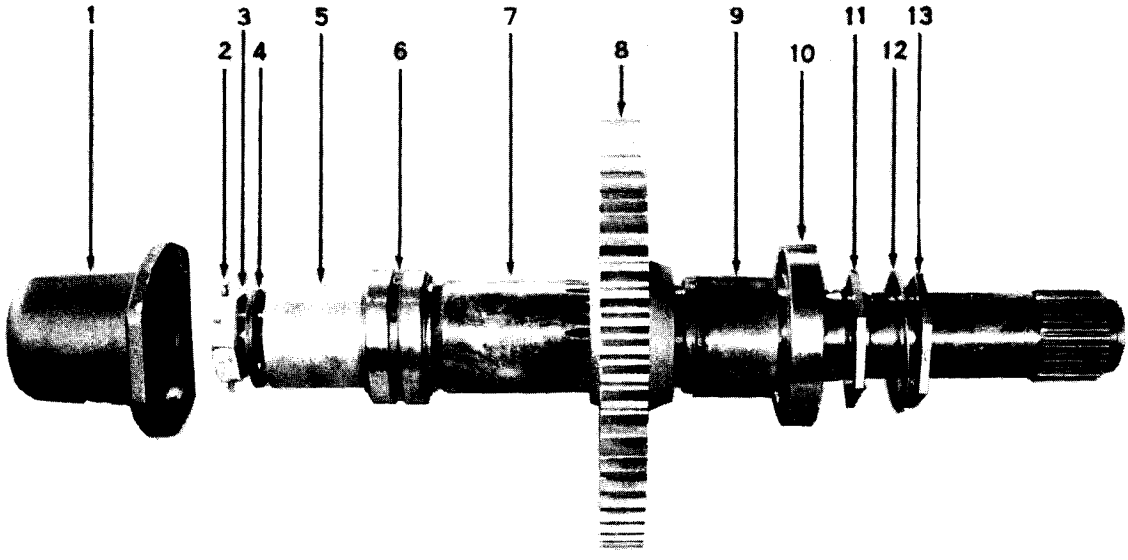
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FIG. E IDLER SHAFT GROUP "I"

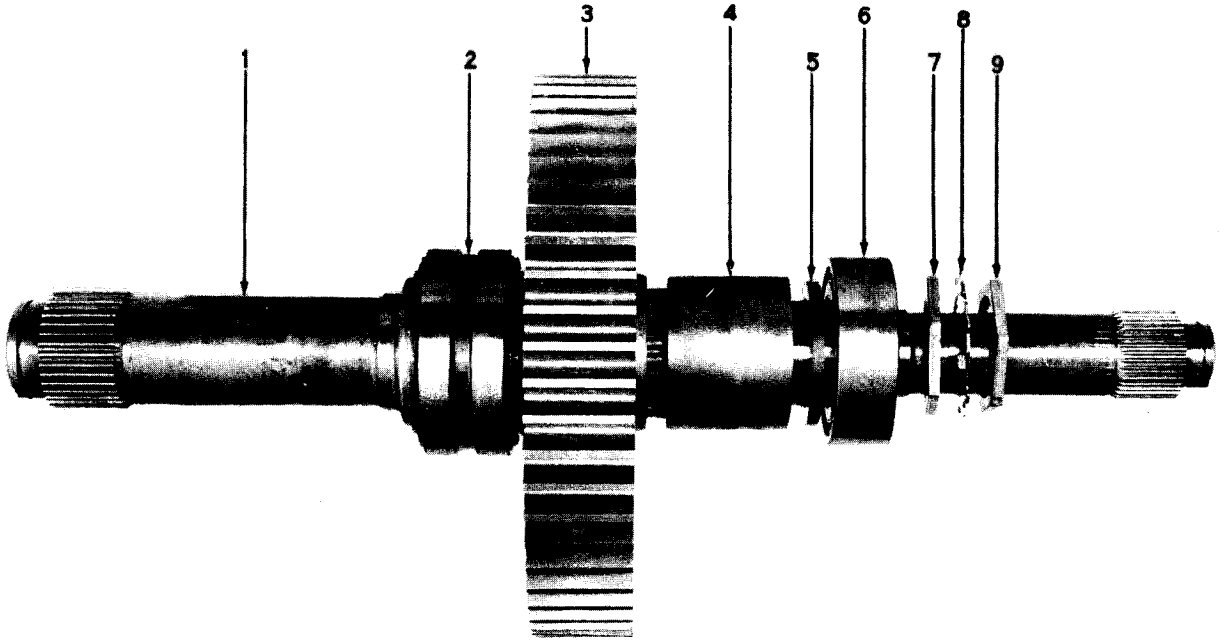
ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Gear Snap Ring	1	6	Tapered Bearing Spacer	1
2	Idler Gear	1	7	Tapered Bearing	2
3	Spherical Roller Bearing	1	8	Idler Shaft Bearing Cap	1
4	Roller Bearing Spacer	1	9	Idler Gear	1
5	Idler Shaft	1	10	Gear Snap Ring	1

FIG F INPUT SHAFT GROUP "F"

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Flange Nut	1	8	Input Shaft	1
2	Flange Nut Washer	1	9	Input Shaft Gear and Locating Ring	1
2A	Flange Nut "O" Ring	1	10	Input Shaft Gear Spacer	1
3	Companion Flange	1	11	Ball Bearing	1
4	Companion Flange DeFlector	1	12	Bearing Lock Nut	1
5	Bearing Cap Oil Seal	1	13	Bearing Nut Lock	1
6	Bearing Cap	1	14	Bearing Lock Nut	1
7	Tapered Bearing Assembly	1	15	Flange Nut Cotter	1

FIG. G REVERSE SHAFT GROUP "R"

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Bearing Cap	1	8	Reverse Shaft Gear & Locating Ring	1
2	Flange Nut Cotter	1	9	Reverse Shaft Gear Spacer	1
3	Flange Nut	1	10	Ball Bearing	1
4	Flange Nut Washer	1	11	Bearing Lock Nut	1
5	Bearing Spacer	1	12	Bearing Nut Lock	1
6	Tapered Bearing Assembly	1	13	Bearing Lock Nut	1
7	Reverse Shaft	1			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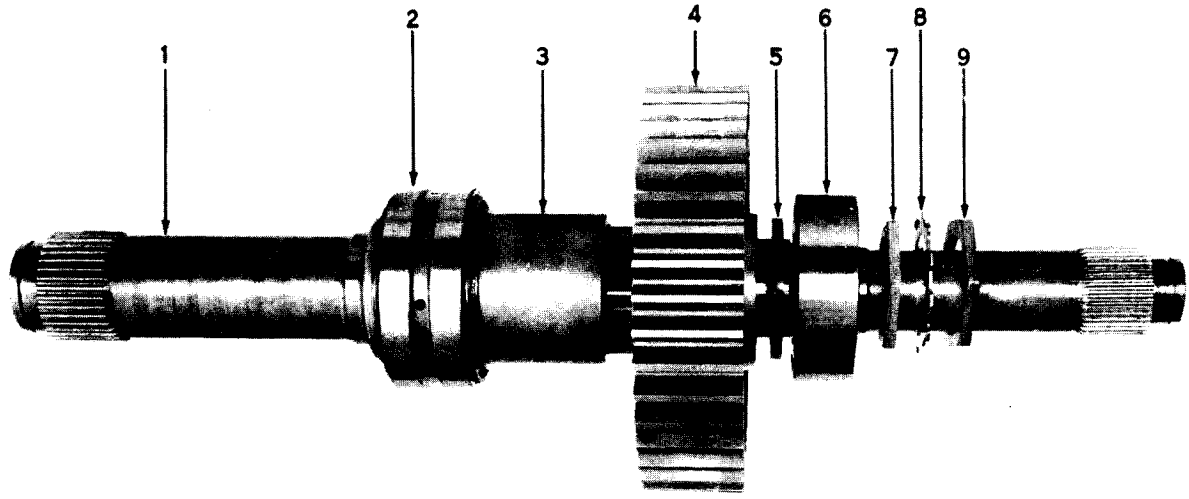
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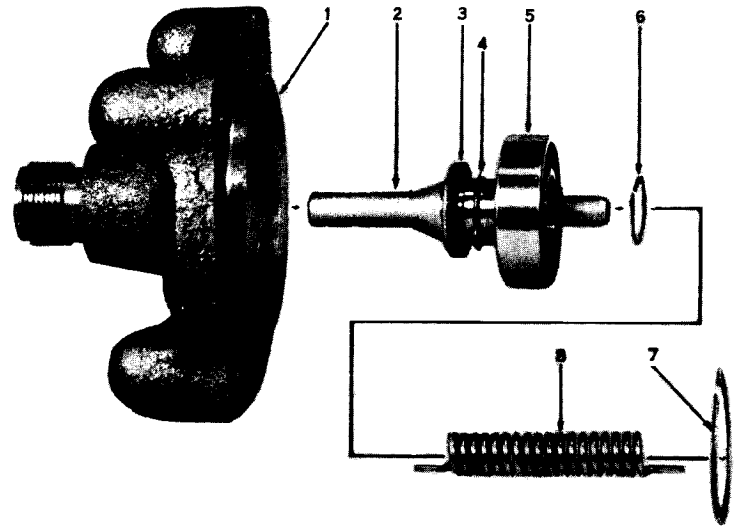
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FIG. H 2nd and 4th SHAFT GROUP "A"

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	2nd and 4th Shaft	1	6	Roller Bearing	1
2	Tapered Bearing Assembly	1	7	Bearing Lock Nut	1
3	2nd and 4th Shaft Gear	1	8	Bearing Nut Lock	1
4	Gear Spacer (Long)	1	9	Bearing Lock Nut	1
5	Gear Spacer (Short)	1			

FIG. I 1st and 3rd SHAFT GROUP "B"

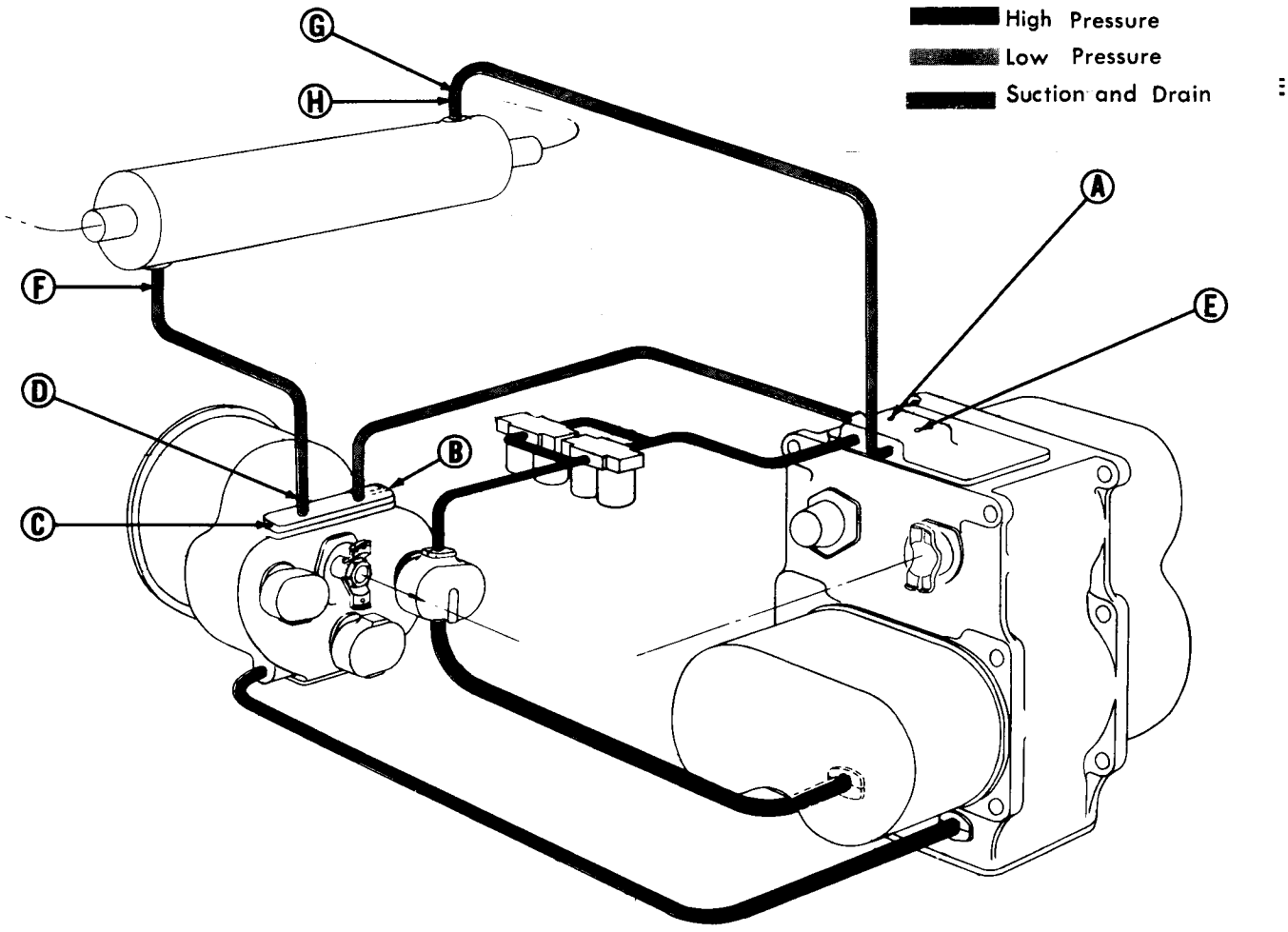
ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	1st and 3rd Shaft	1	6	Roller Bearing	1
2	Tapered Bearing Assembly	1	7	Bearing Lock Nut	1
3	Bearing Spacer	1	8	Bearing Nut Lock	1
4	1st and 3rd Shaft Gear	1	9	Bearing Lock Nut	1
5	Gear Spacer	1			

SPEEDOMETER DRIVE GROUP

ITEM	DESCRIPTION	QTY.	ITEM	DESCRIPTION	QTY.
1	Speedometer Drive Housing	1	5	Speedometer Drive Bearing	1
2	Speedometer Drive Shaft	1	6	Bearing Snap Ring	1
3	Drive Shaft Oil Seal	1	7	Bearing Snap Ring	1
4	Bearing Snap Ring	1	8	Speedometer Drive Spring	1

FIG. J CHECK POINTS

A.	CLUTCH PRESSURE	180-220
B.	CONVERTER INLET	15 MINIMUM-85 MAXIMUM
C.	CONVERTER OUTLET	55 MAXIMUM
D.	CONVERTER TEMPERATURE CONNECTION	———
E.	LUBE PRESSURE	30 MAXIMUM
F.	COOLER INLET PRESSURE	60 MAXIMUM
G.	COOLER OUTLET PRESSURE	35 MAXIMUM
H.	COOLER OUTLET TEMPERATURE	———



16,000 SERIES

EXTERNAL PLUMBING & CHECK POINT DIAGRAM

OVERHAUL OF TRANSMISSION ASSEMBLY

The instructions contained herein cover the disassembly and reassembly of the transmission in a sequence that would normally be followed after the unit has been removed from the machine and is to be completely overhauled.

CAUTION: Cleanliness is of extreme importance and an absolute must in the repair and overhaul of this unit. Before attempting any repairs, the exterior of the unit must be thoroughly cleaned to prevent the possibility of dirt and foreign matter entering the mechanism.

DISASSEMBLY OF THE TRANSMISSION

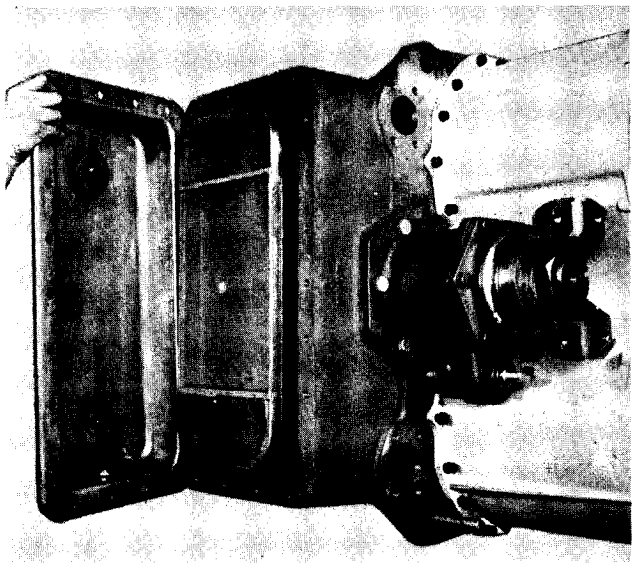


Figure 1
Remove Transmission sump pan bolts and sump pan.

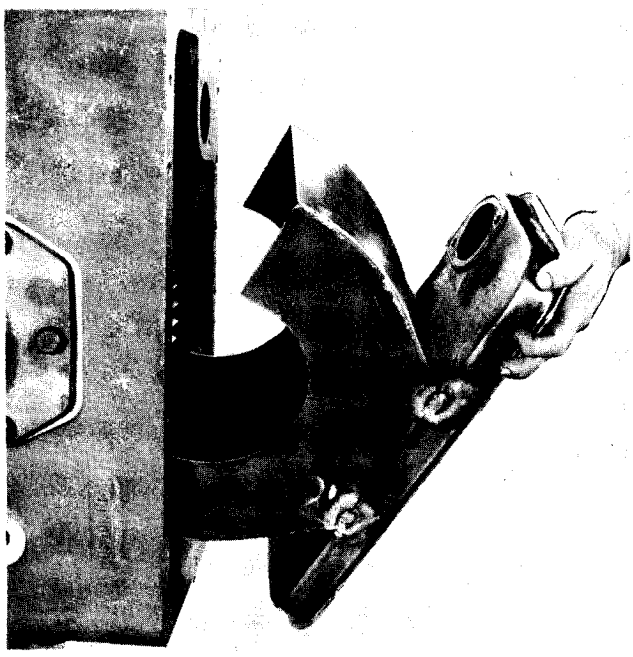


Figure 2
Remove sump screen and baffle assy.

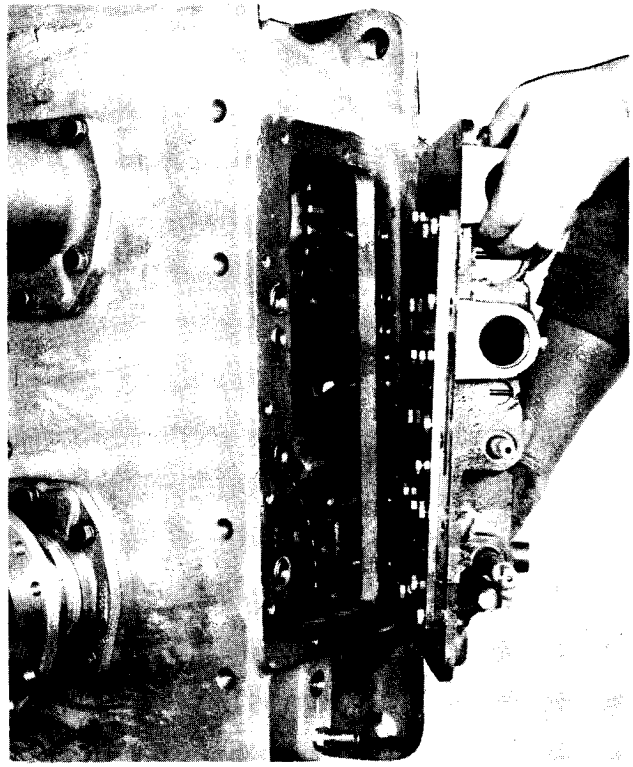


Figure 3
Remove transmission control cover from transmission.

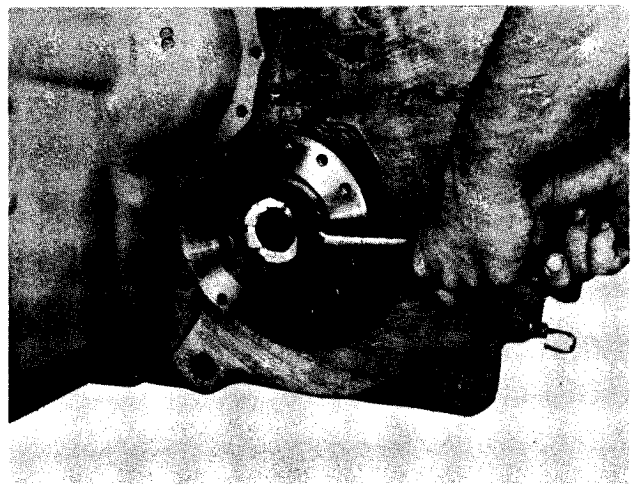


Figure 4
Lock transmission gears with a soft bar and remove input flange nut and flange.

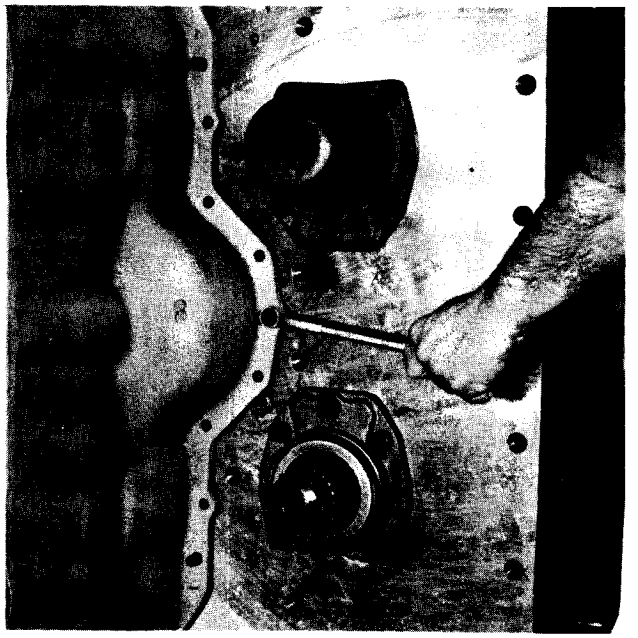


Figure 5
Remove 1st and 2nd clutch cover.

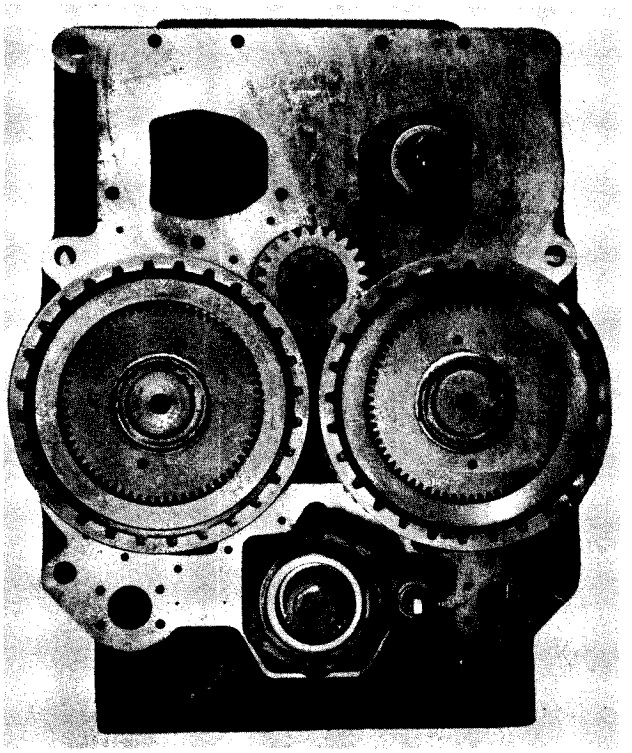


Figure 6
1st and 2nd clutch cover removed. **NOTE:** Clutch covers need not be removed if only the clutch is being repaired. Remove only the clutch cover plate.

NOTE: All clutches are disassembled and assembled in a similar manner, however, the numbers of inner and outer clutch disc, release springs and guide pins differ in the individual clutches. Clutches shown being disassembled are the 1st and 2nd.

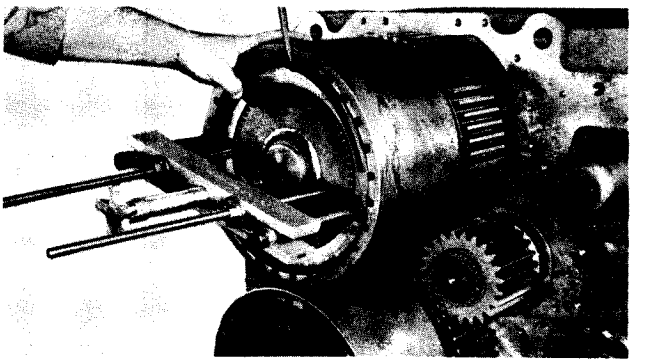


Figure 7
Depress end plate and remove retainer ring. Remove end plate.

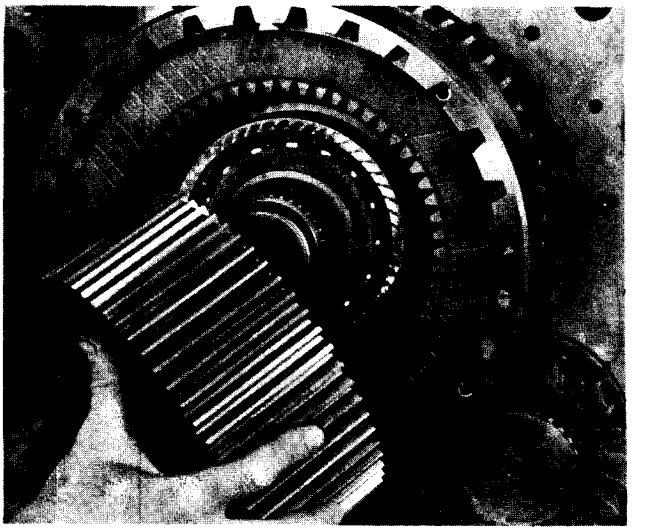


Figure 8
Remove clutch disc hub retainer ring. Remove clutch disc hub. Remove release springs, guide pins and inner and outer clutch discs.

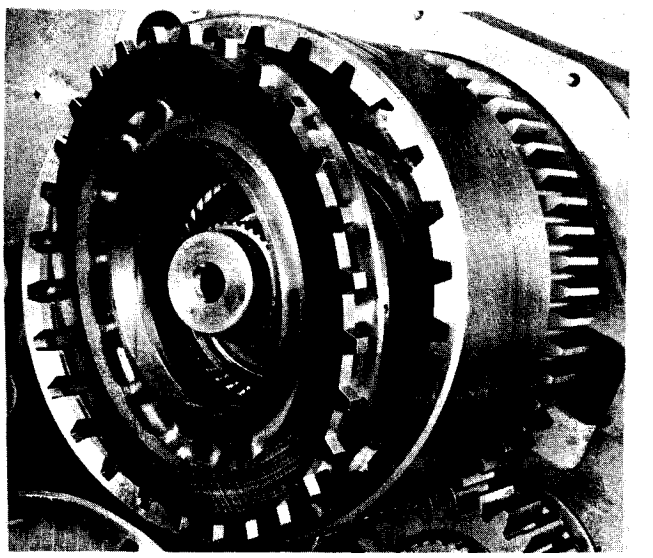


Figure 9
Remove clutch piston.

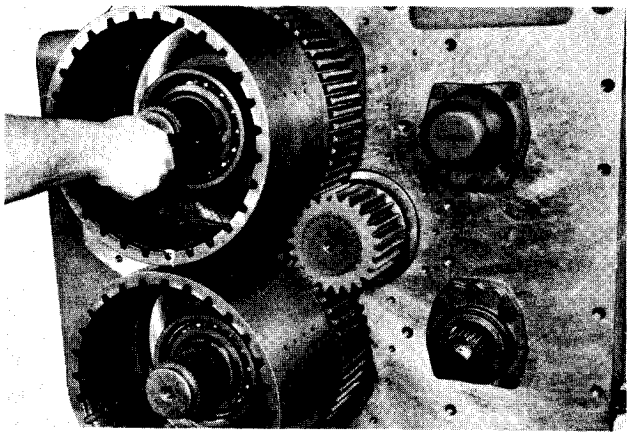


Figure 10
Remove clutch drum retainer ring and retainer washer.

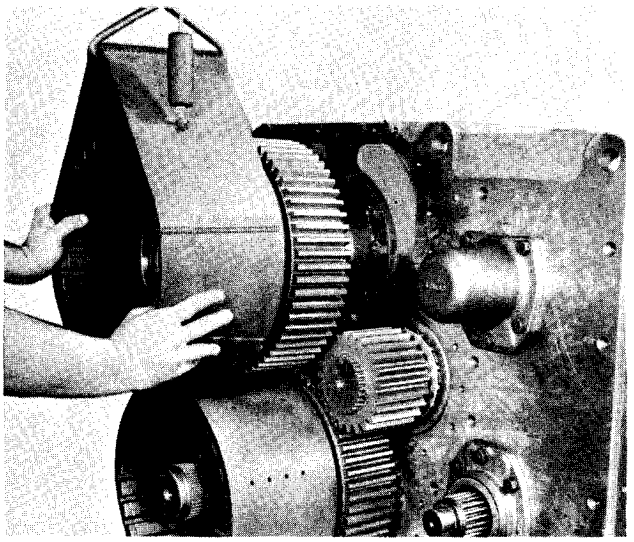


Figure 11
Remove clutch drum assembly from clutch support.
NOTE: If clutch drum hub gear, support bearings, or piston ring outer race are to be replaced, use Fig. 12 thru Fig. 16, if replacement is not necessary, disregard and continue on with Fig. 17.

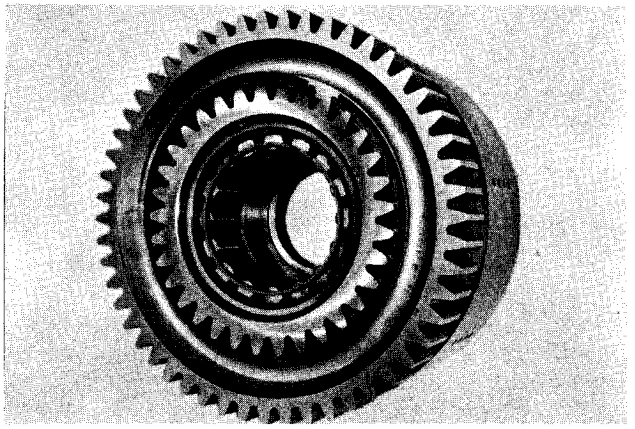


Figure 12
Remove clutch drum hub gear retainer ring.

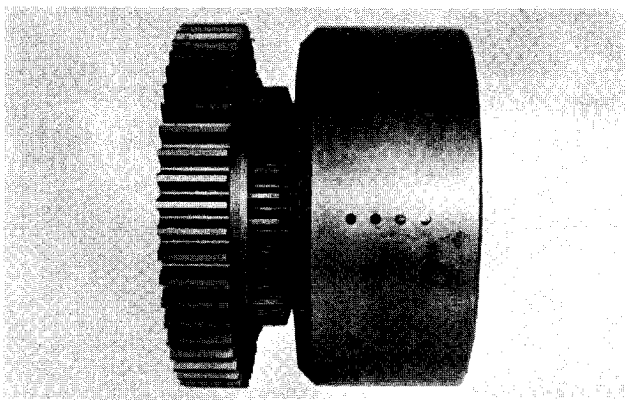


Figure 13
Remove clutch drum hub gear.

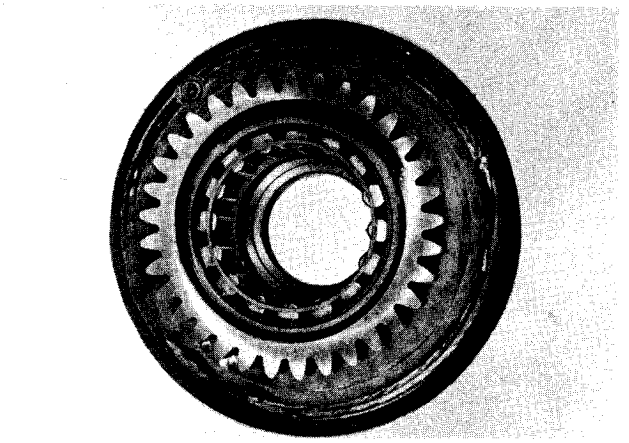


Figure 14
Remove drum support roller bearing retainer ring.

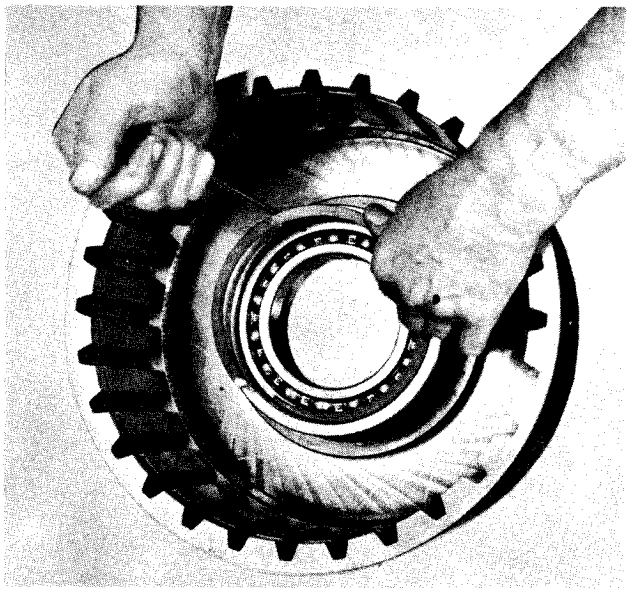


Figure 15
Remove drum support ball bearing retainer ring. Press or drive roller and ball bearing from clutch drum.

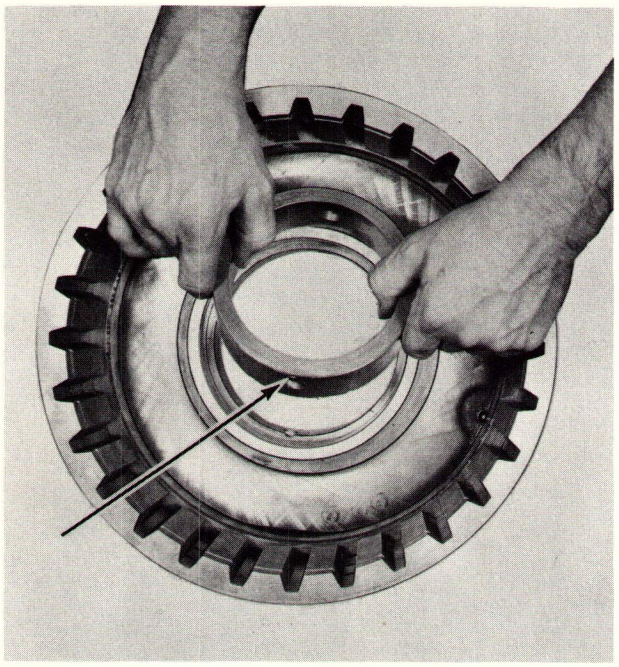


Figure 16
Press piston ring outer race from clutch drum. **CAUTION:** Do not lose ball (see arrow).

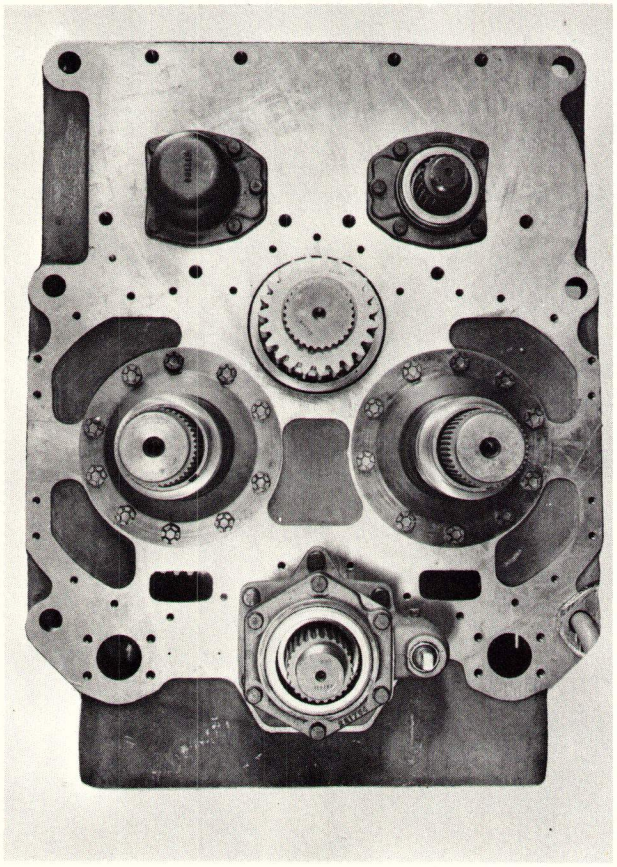


Figure 17
Low clutch side with clutches removed.

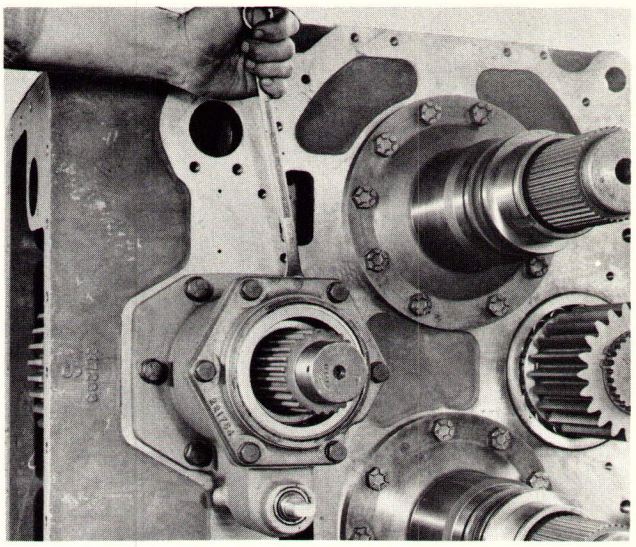


Figure 18
Remove bolts from disconnect housing. Remove disconnect housing.

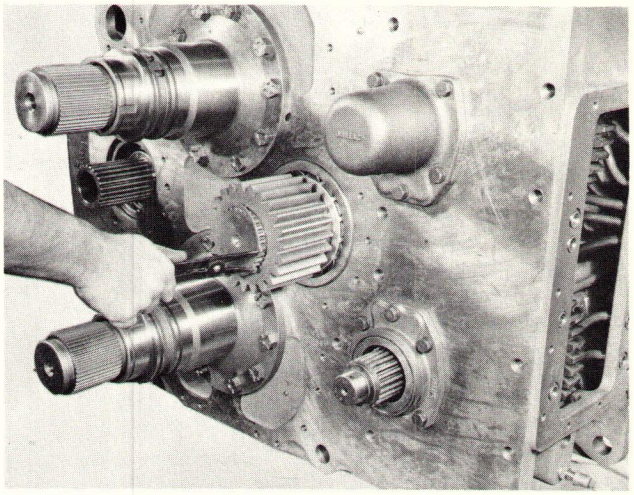


Figure 19
Remove idler gear retainer ring.

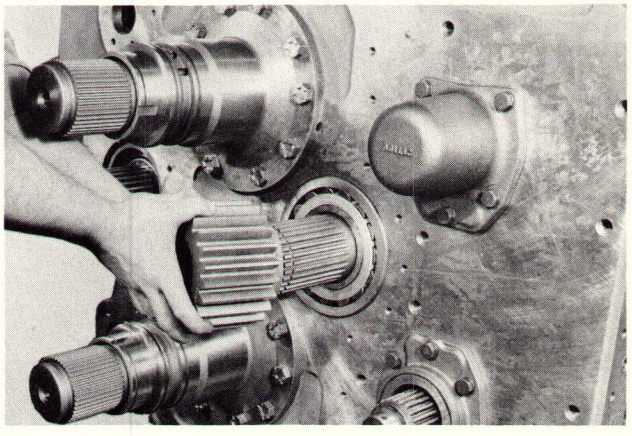


Figure 20
Remove idler gear.

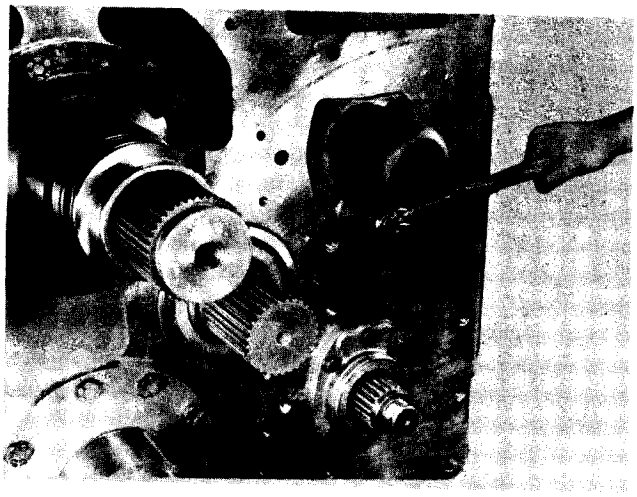


Figure 21
Remove reverse shaft bearing cap.

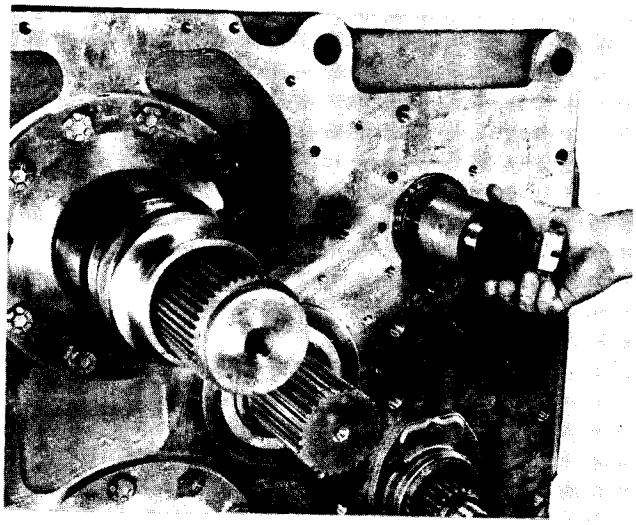


Figure 22
Remove reverse shaft nut cotter, nut, washer and spacer.

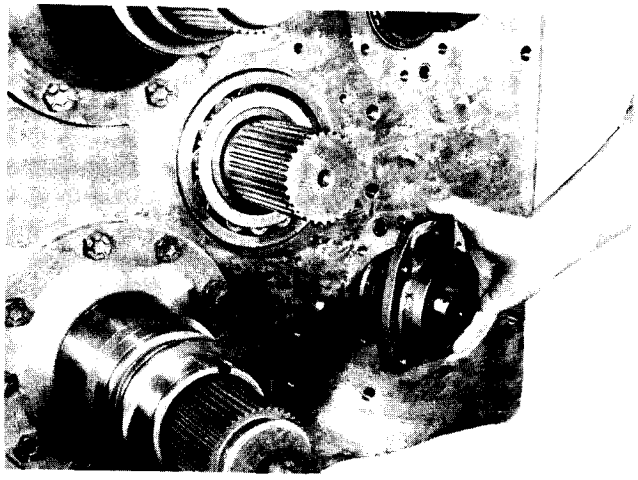


Figure 23
Remove input shaft bearing cap bolts. Remove bearing cap and oil seal assembly.

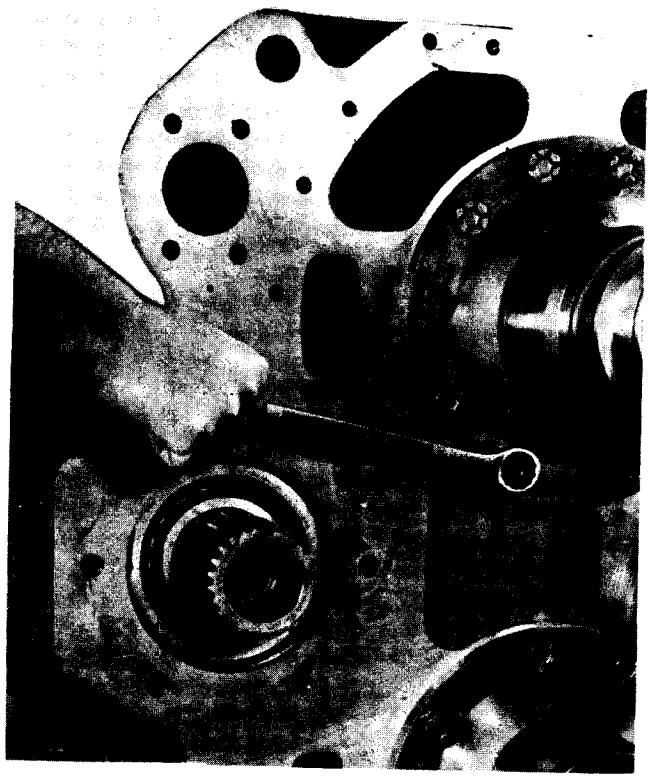


Figure 24
Remove clutch supports.

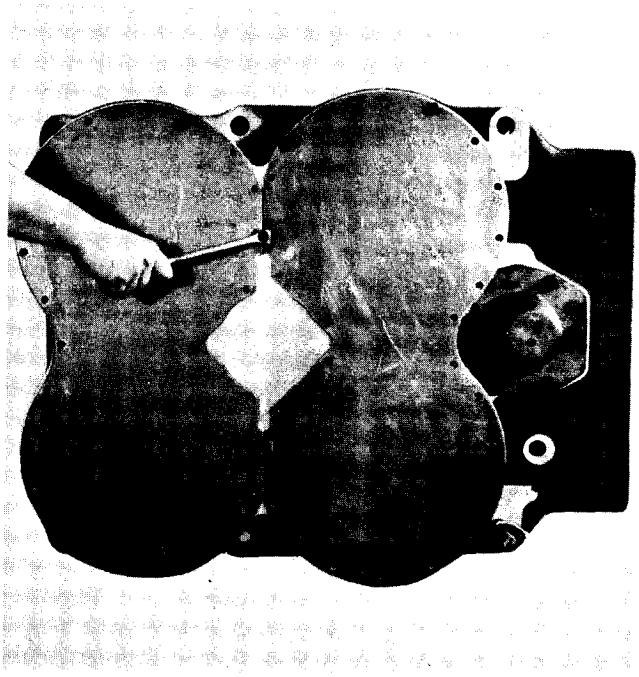


Figure 25
If the input, reverse, 3rd or 4th clutches are to be repaired, remove just the clutch cover plates (fig. 25) and proceed with clutch repair, if a complete tear down is needed proceed as follows.

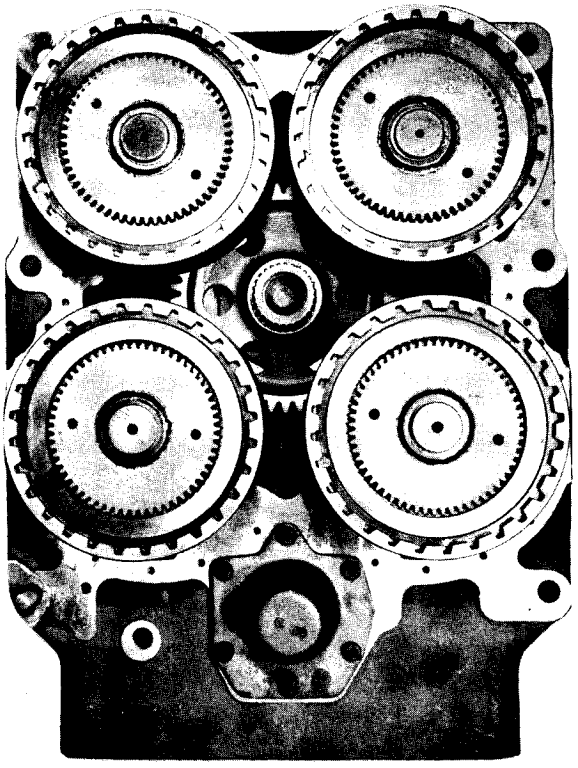


Figure 26
Clutch cover removed. Proceed with clutch disassembly as explained in previous text (fig. 7 thru fig. 16).

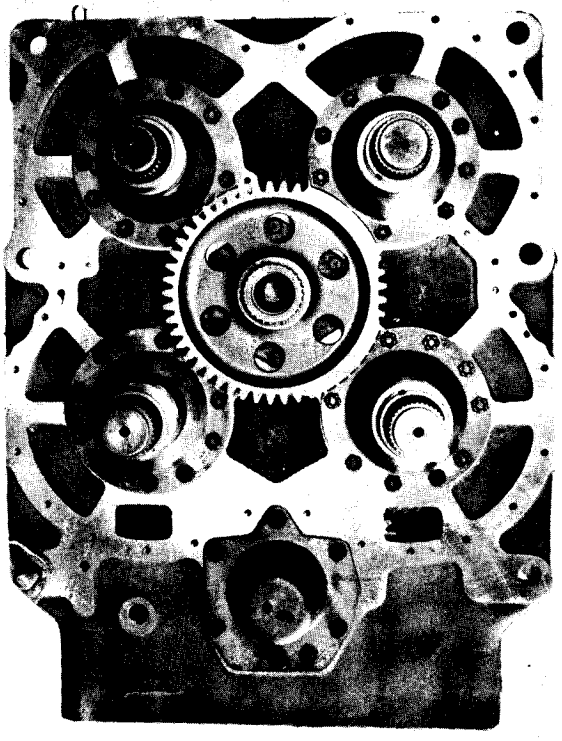


Figure 27
Clutch support and idler gear access.

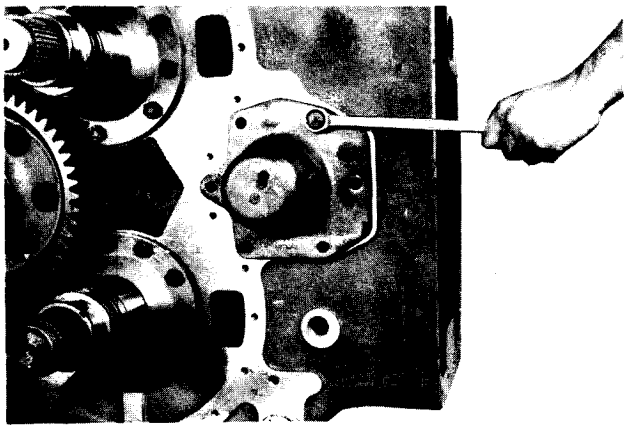


Figure 28
Remove output shaft bearing cap. When a companion flange is used, remove flange nut cotter, flange nut, washer and "O" ring.

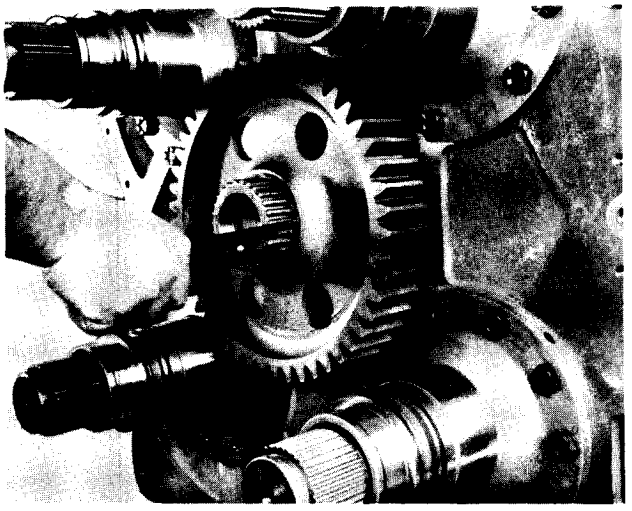


Figure 29
Remove idler gear retainer ring and idler gear.

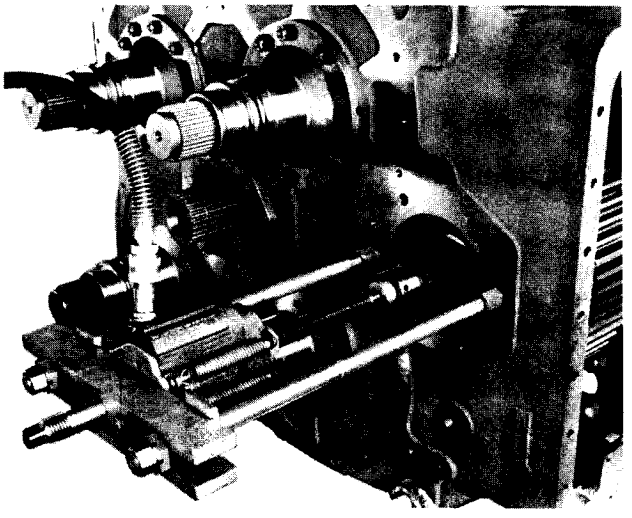


Figure 30
Press output shaft from case. Output shaft may be removed or installed from either side.

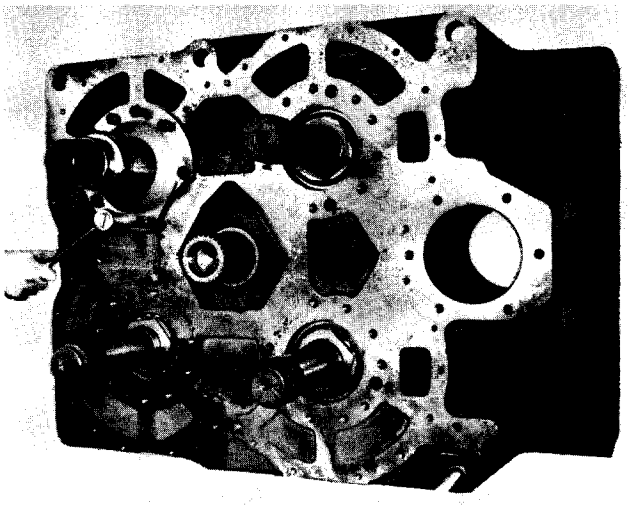


Figure 31
Remove clutch supports.

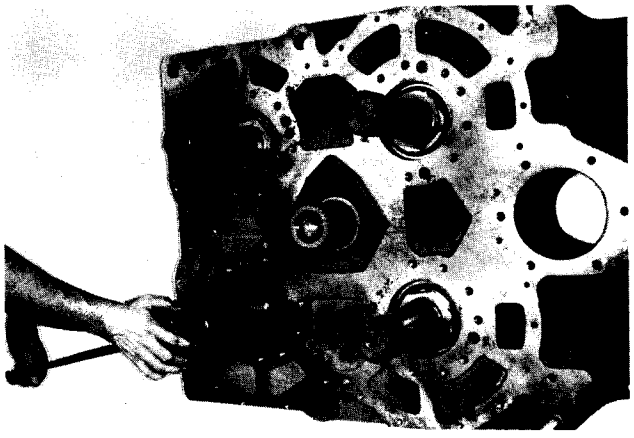


Figure 32
Straighten tangs on shaft nut locks. Lock Gears with a soft bar and remove outer lock nut, nut lock, and inner lock nut.

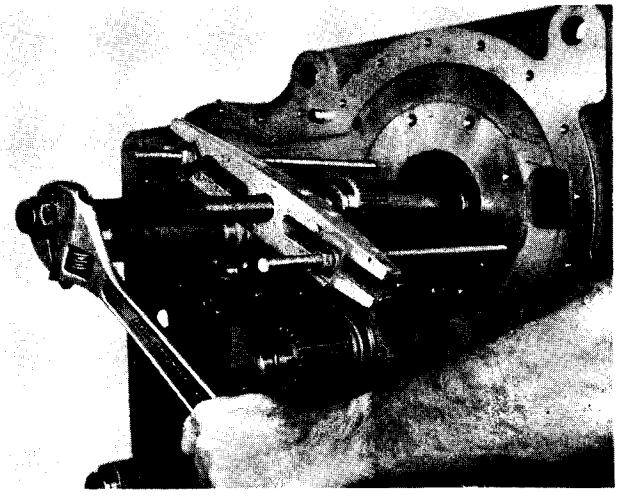


Figure 33
Using a suitable pusher tool, remove 1st and 3rd and 2nd and 4th shaft, pushing from the lock nut side. Remove gears and spacers from inside of case.

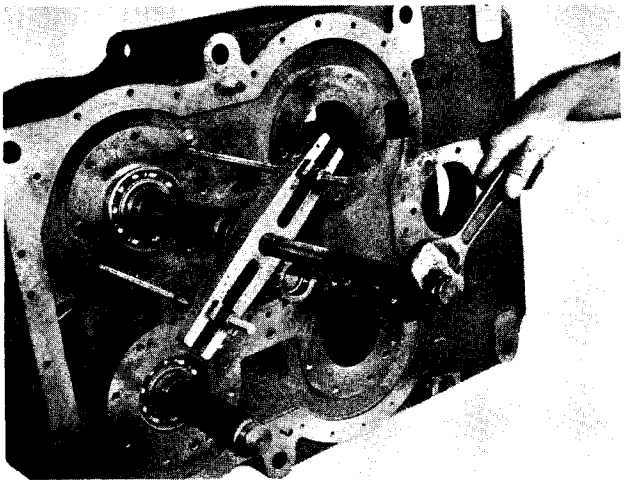


Figure 34
Using a suitable pusher tool, remove input and reverse shaft, pushing from lock nut side. Remove gears and spacers from inside of case.

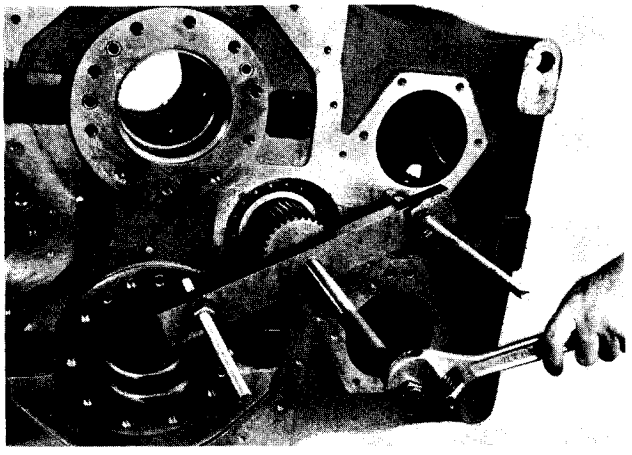


Figure 35
Remove idler shaft by pushing shaft out until double cone bearing and outer bearing race is exposed on opposite side.

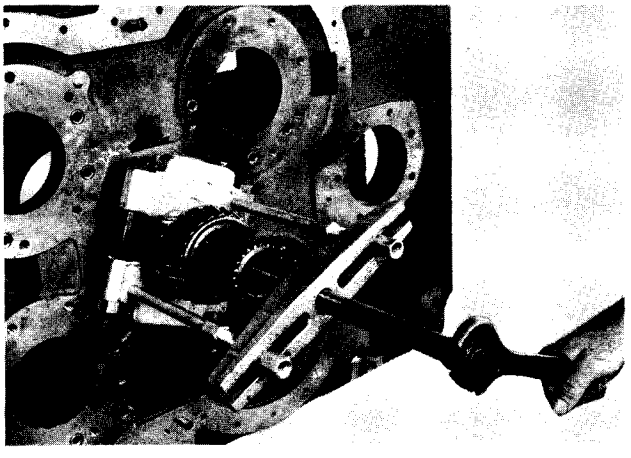


Figure 36
Using a suitable puller remove double cone bearing from idler shaft. From cone bearing side push idler shaft and bearing from case.

DISASSEMBLY OF CONTROL COVER

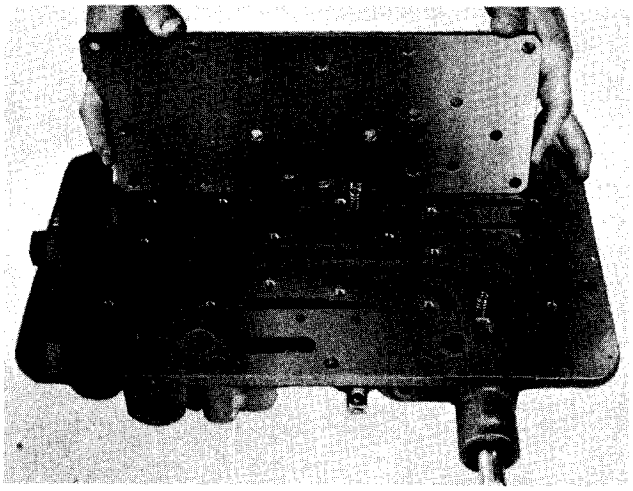


Figure 37
Remove bolts from oil circuit plate. Remove oil circuit plate. **CAUTION:** Do not lose detent springs.

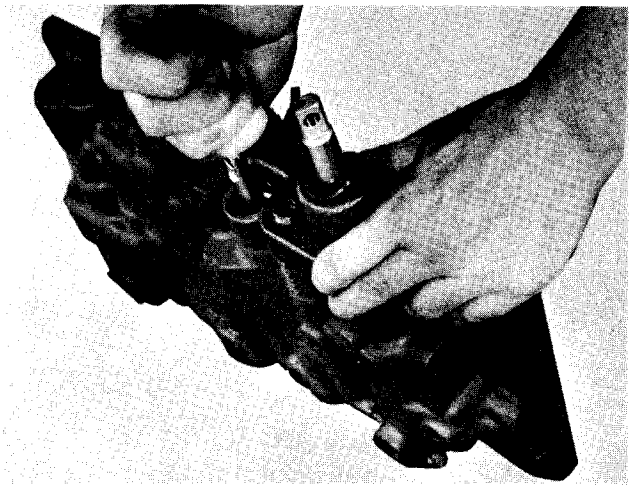


Figure 38
Remove speed selector valve assembly retainer ring.

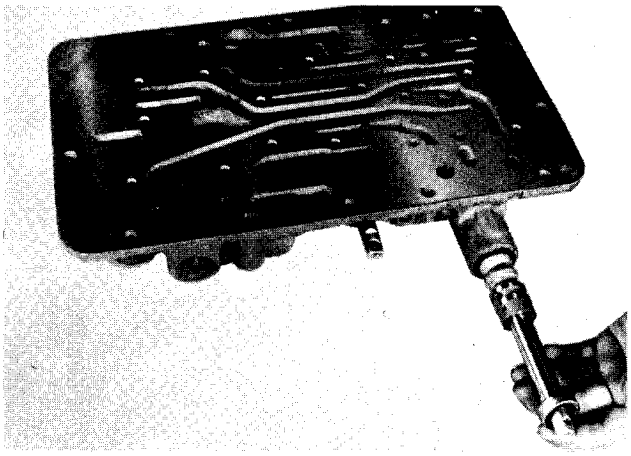


Figure 39
Tap lightly on opposite end of speed selector valve. Valve and valve oil seal will come out together.

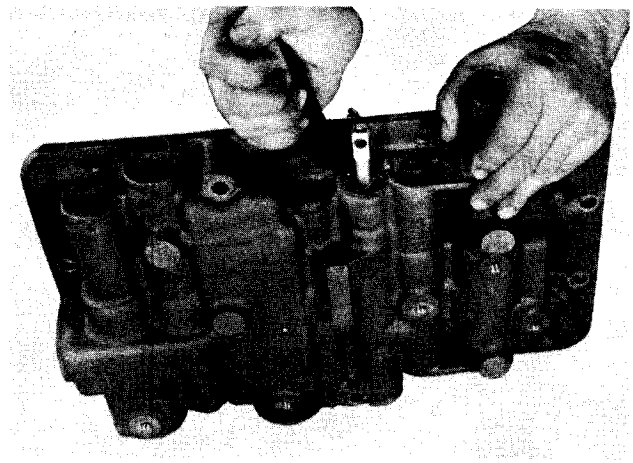


Figure 40
Remove forward and reverse selector valve retainer ring.

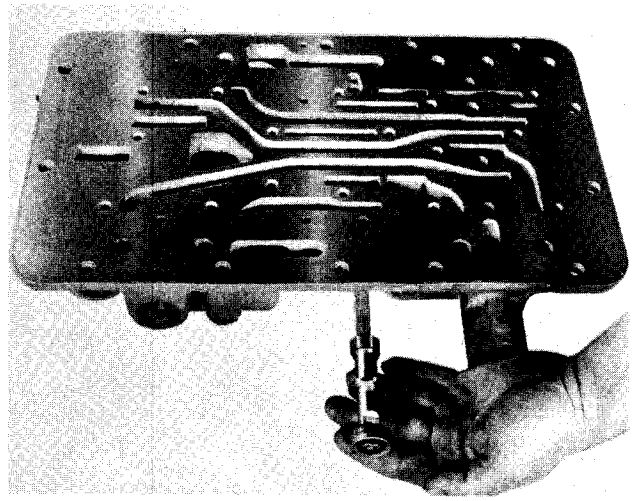


Figure 41
Tap lightly on opposite end of forward and reverse selector valve. Valve and valve oil seal will come out together.

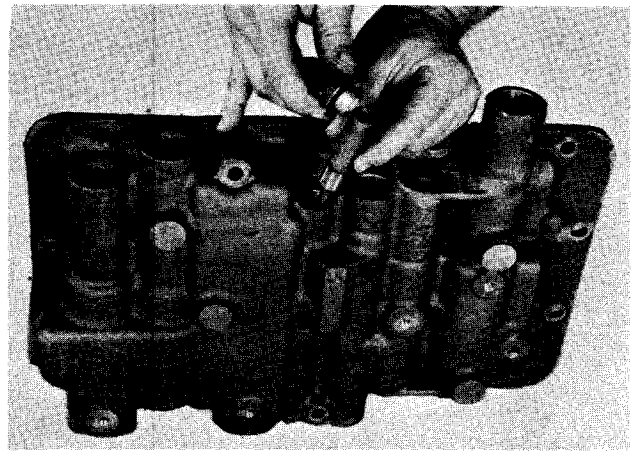


Figure 42
Remove shut-off valve plug and "O" ring. Remove shut-off valve.

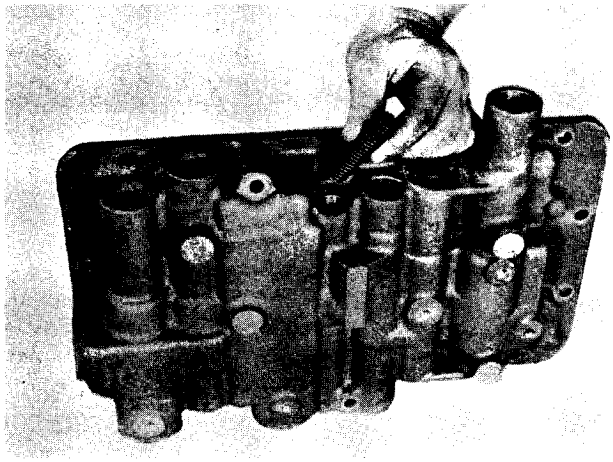


Figure 43
Remove shut-off valve spring.
CAUTION: When removing roll pins, it is recommended a press be used to depress valve stop, valve and spool springs.

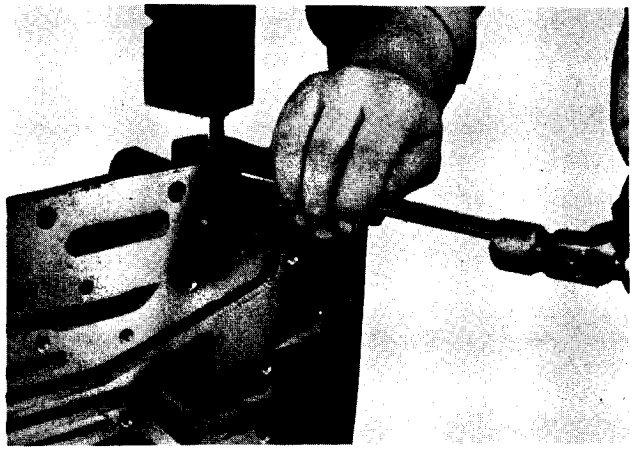


Figure 44
Depress regulating valve spring stop and spring. Remove roll pin.

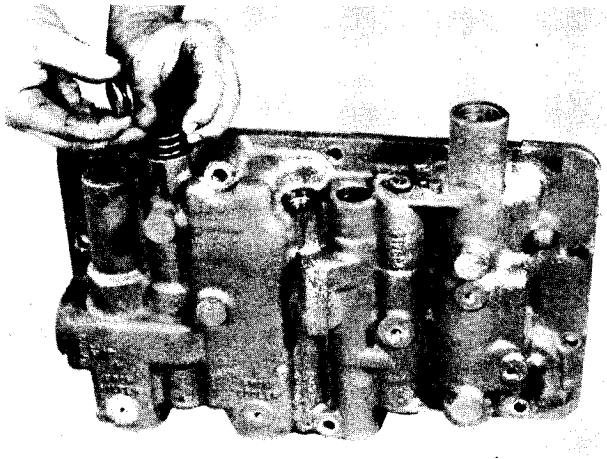


Figure 45
Release press slowly, springs will push spring stop from control housing. Remove spring stop and inner and outer spring.

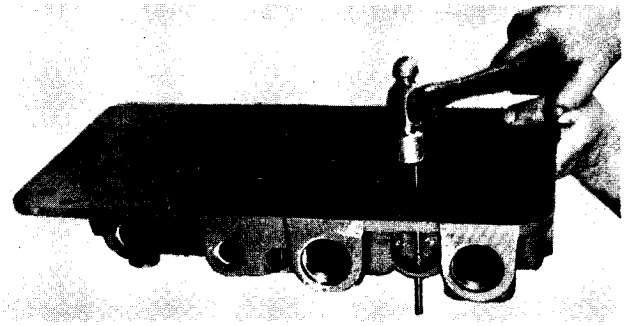


Figure 46
Remove roll pin on opposite end. Depressing valve stop is not necessary as the springs were removed in fig. 45.

Figure 47
Remove regulating valve stop and valve from control housing.

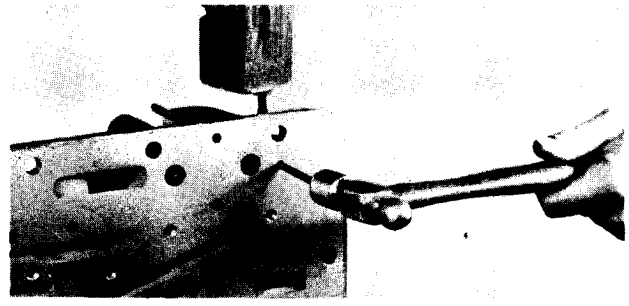


Figure 48
Depress safety valve spring and spring stop.

Figure 49
Remove safety valve spring stop, valve spring, and safety valve ball.

TRANSMISSION INTERNAL TUBING

These tubes are not to be removed unless damaged. They should, however, be cleaned and checked for leaks when transmission is disassembled. The tubes are divided into two groups. The high pressure or clutch pressure lines and the low or lubricating pressure lines.

When necessary to replace any tubes, tool 943629 is required. The procedure for using tool is as follows:

1. Install tubing in housing with end flush with case.
2. Slide collar over end of tube and press into bore of case.

Figure 50

Pull mandrel on tool all the way back and insert tool in tube.

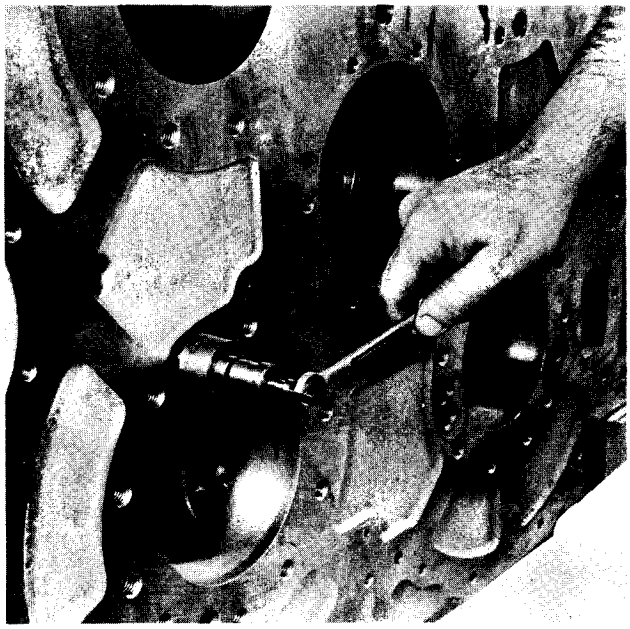


Figure 51

Turn mandrel with hand until tool is firmly seated in tube. Using a ⅜" wrench, turn mandrel as far as possible.

Use this procedure to install all tubes in housing.

Principle of Tool

Tool has roller which expands when mandrel is inserted. As mandrel is turned, the rollers expand against the internal bore of tubing. This forces tube to expand against collar which has a groove on inside diameter: When tube is expanded into this groove it is locked into position.

Cleaning and Repair of Tool

This tool is a precision instrument and must be treated as such. After each use, remove mandrel and rollers and flush tool with cleaning solvent. Inspect rollers and mandrel for chips and flaking. If rollers or mandrel need to be replaced, they may be purchased from the AIR TOOL MANUFACTURING CO., SPRINGFIELD, OHIO.

CLEANING AND INSPECTION

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and slushed up and down slowly until all old lubricant and foreign material is dissolved and parts are thoroughly cleaned.

CAUTION: Care should be exercised to avoid skin rashes, fire hazards and inhalation of vapors when using solvent type cleaners.

Bearings

Remove bearings from cleaning fluid and strike larger side of cone flat against a block of wood to dislodge solidified particles of lubricant. Immerse again in cleaning fluid to flush out particles. Repeat above operation until bearings are thoroughly clean. Dry bearings using moisture-free compressed air. Be careful to direct air stream across bearing to avoid spinning. Do not spin bearings when drying. Bearings may be rotated slowly by hand to facilitate drying process.

Housings

Clean interior and exterior of housings, bearing caps, etc., thoroughly. Cast parts may be cleaned in hot solution tanks with mild alkali solutions providing these parts do not have ground or polished surfaces. Parts should remain in solution long enough to be thoroughly cleaned and heated. This will aid the evaporation of the cleaning solution and rinse water. Parts cleaned in solution tanks must be thoroughly rinsed with clean water to remove all traces of alkali. Cast parts may also be cleaned with steam cleaner.

CAUTION: Care should be exercised to avoid inhalation of vapors and skin rashes when using alkali cleaners.

All parts cleaned must be thoroughly dried immediately by using moisture-free compressed air or soft, lintless absorbent wiping rags free of abrasive materials such as metal filings, contaminated oil or lapping compound.

INSPECTION

The importance of careful and thorough inspection of all parts cannot be overstressed. Replacement of all parts showing indication of wear or stress will eliminate costly and avoidable failures at a later date.

Bearings

Carefully inspect all rollers, cages and cups for wear, chipping or nicks to determine fitness of bearings for further use. Do not replace a bearing cone or cup individually without replacing the mating cup or cone at the same time. After inspection, dip bearings in Type "A" Automatic Transmission Fluid and wrap in clean lintless cloth or paper to protect them until installed.

Oil Seals, Gaskets, Etc.

Replacement of spring load oil seals, "O" rings, metal sealing rings, gaskets and snap rings is more economical when unit is disassembled than premature overhaul to replace these parts at a future time. Further loss of lubricant through a worn seal may result in failure of other more expensive parts of the assembly. Sealing members should be handled carefully, particularly when being installed. Cutting, scratching, or curling under of lip of seal seriously impairs its efficiency. When assembling new metal type sealing rings, same should be lubricated with coat of chassis grease to stabilize rings in their grooves for ease of assembly of mating members. Lubricate all "O" rings and seals with Type "A" Automatic Transmission Fluid before assembly.

Gears and Shafts

If magna-flux process is available, use process to check parts. Examine teeth on all gears carefully for wear, pitting, chipping, nicks, cracks or scores. If gear teeth show spots where case hardening is worn through or cracked, replace with new gear. Small nicks may be removed with suitable hone. Inspect shafts and quills to make certain they are not sprung, bent, or splines twisted, and that shafts are true.

Housing, Covers, etc.

Inspect housings, covers and bearing caps to be certain they are thoroughly cleaned and that mating surfaces, bearing bores, etc., are free from nicks or burrs. Check all parts carefully for evidence of cracks or condition which would cause subsequent oil leaks or failures.

REASSEMBLY OF TRANSMISSION

Instructions given below on reassembly of components of transmission assembly are given in the sequence that must be followed in rebuilding. Principle of operations cited and views shown are similar and parallel on all shafts. The various drive shafts are assembled in the following order:

1. Idler Shaft—"I"
2. First and Third Shaft—"B"
3. Second and Fourth Shaft—"A"
4. Reverse Shaft—"R"
5. Input Shaft—"F"
6. Output Shaft—"O"

REASSEMBLY OF IDLER SHAFT

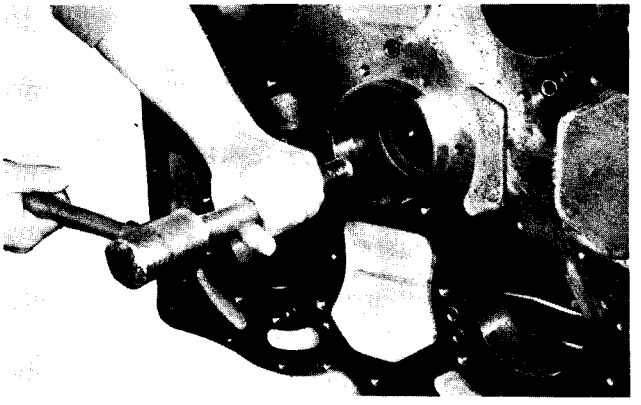


Figure 52
Install idler shaft inner cone bearing cup in transmission case.

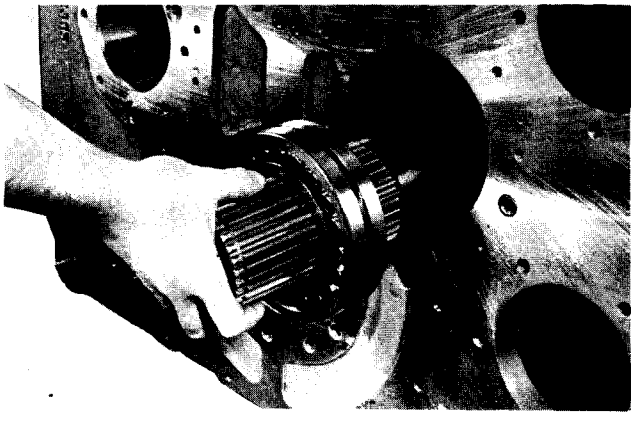


Figure 53
Install spherical bearing spacer on idler shaft. Press large spherical roller bearing on idler shaft. Install bearing and shaft in case. (Opposite side of inner bearing cup.)

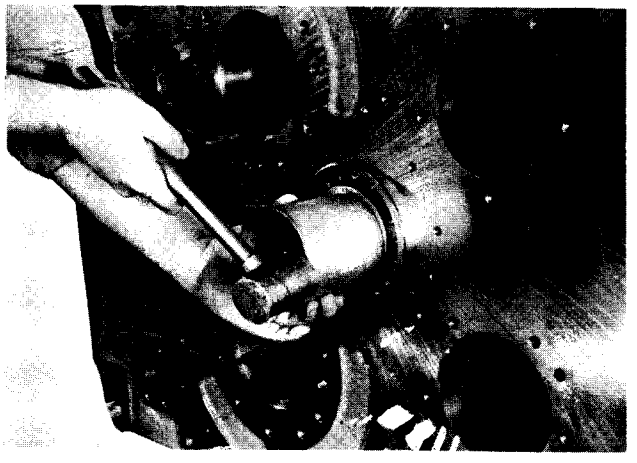


Figure 54
Tap bearing and shaft assembly in case. On taper bearing end of shaft install bearing spacer. **CAUTION:** This spacer has a taper on the outer edge, this taper must go toward taper bearing. If installed wrong the large idler gear snap ring will not seat in ring groove.

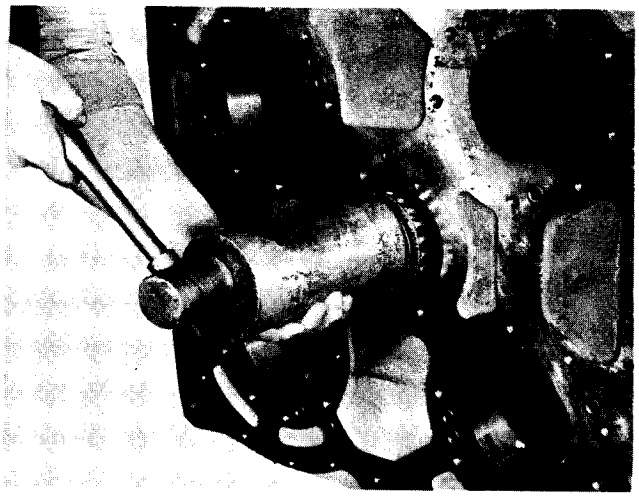


Figure 55
Install inner taper bearing on shaft with large diameter of taper outward.

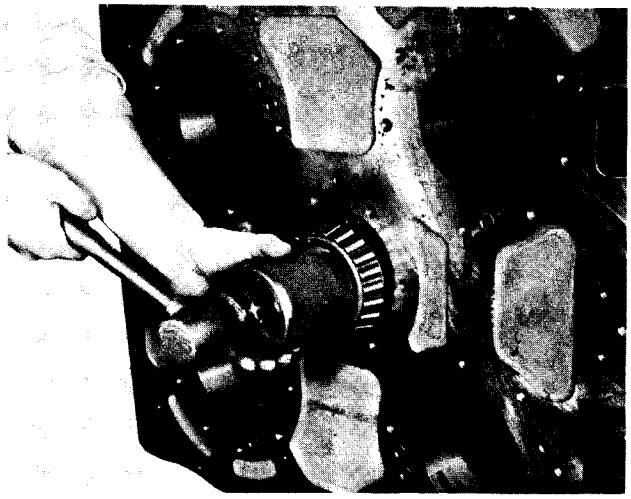


Figure 56
Install outer taper bearing on shaft with large diameter inward.

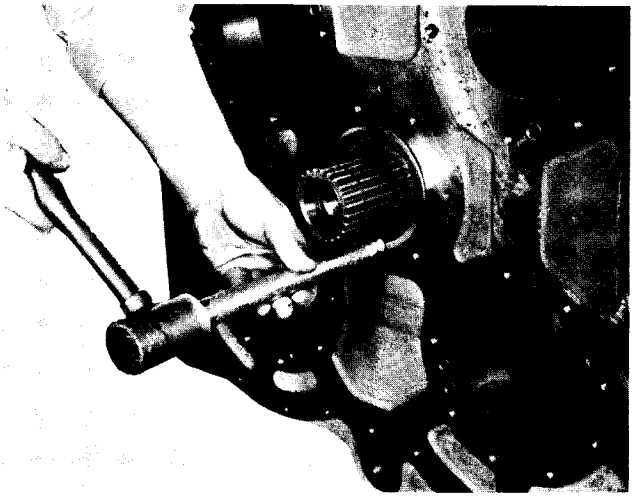


Figure 57
Install outer bearing cup against outer taper bearing.

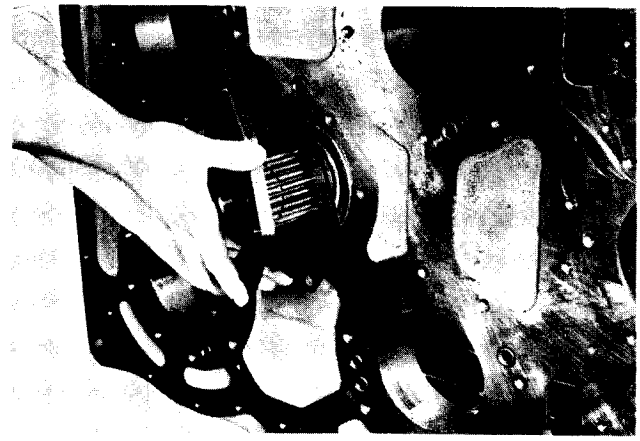


Figure 58
Install idler shaft bearing cap and shims.

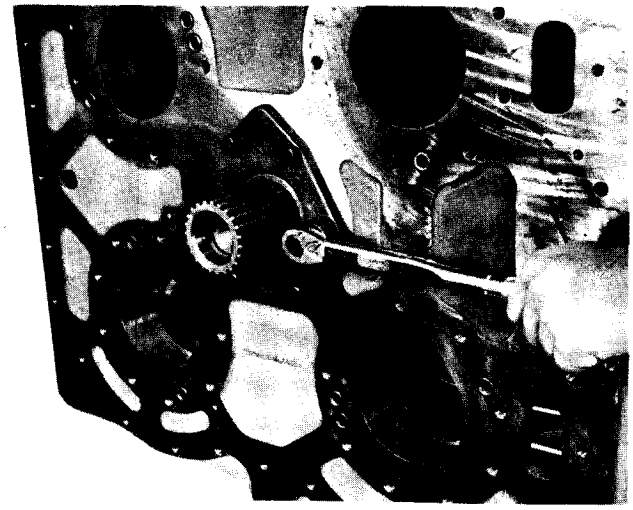


Figure 59
Install bearing cap bolts, torque bolts to 47 to 55 ft. lbs.

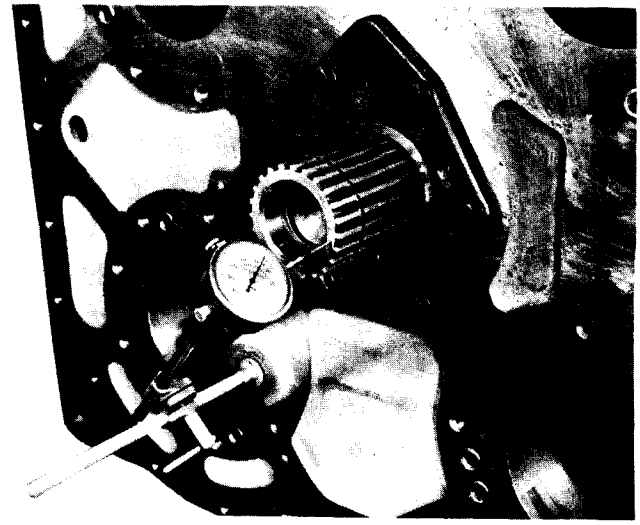


Figure 60
Adjust idler shaft taper bearing by adding or omitting shims. Check adjustment as shown in fig. 60 Adjust taper bearings 0 to .003 end play.

REASSEMBLY OF 1st AND 3rd SHAFT

Press 1st and 3rd double taper bearing assembly on shaft. **CAUTION:** These bearings are in matched sets and under no circumstances can any of the four (4) parts be changed or mixed up with another bearing.

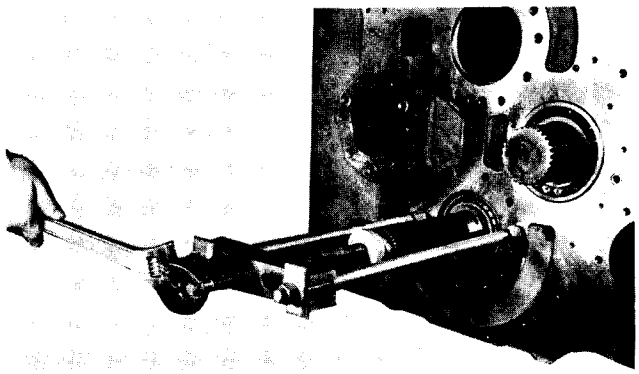


Figure 61

Position 1st and 3rd gear in transmission case. Install long gear spacer on shaft and against taper bearing assembly.

Insert shaft into bore of case and through 1st and 3rd gear. Use shaft pusher as shown in fig. 61. Push shaft assembly in case until taper bearing shoulders in bore of case. Do not remove shaft pusher. On opposite end of shaft install short spacer against 1st and 3rd gear. Install roller bearing as shown in Fig. 63. Remove shaft pusher, this was left on only to hold shaft while installing roller bearings.

REASSEMBLY OF 2nd AND 4th SHAFT

Press 2nd and 4th double taper bearing assembly on shaft. **CAUTION:** These bearings are in matched sets and under no circumstances can any of the four (4) parts be changed or mixed up with another bearing.

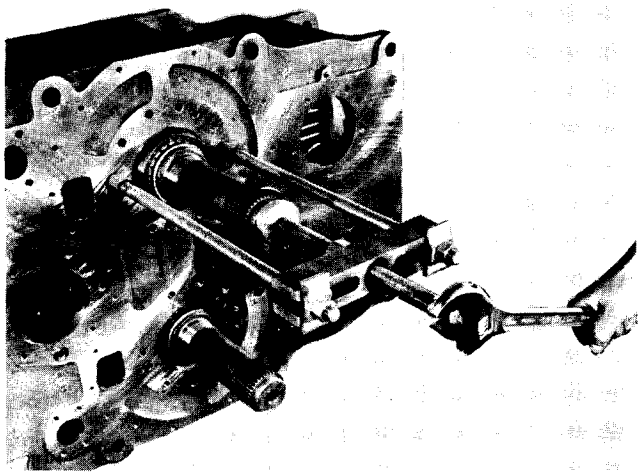


Figure 62

Position 2nd and 4th gear in transmission case, with longer offset of gear hub toward front of case. (Input side) insert shaft into bore of case and through 2nd and 4th gear. Use shaft pusher as shown in fig. 62. Push shaft assembly in case until taper bearing shoulders in bore of case. Do not remove shaft pusher. On opposite end of shaft install long gear spacer on shaft and against the 2nd and 4th gear. Install short spacer on shaft against long spacer. Install roller bearing as shown in fig. 63. Remove shaft pusher, this was left on only to hold shaft while installing roller bearing.

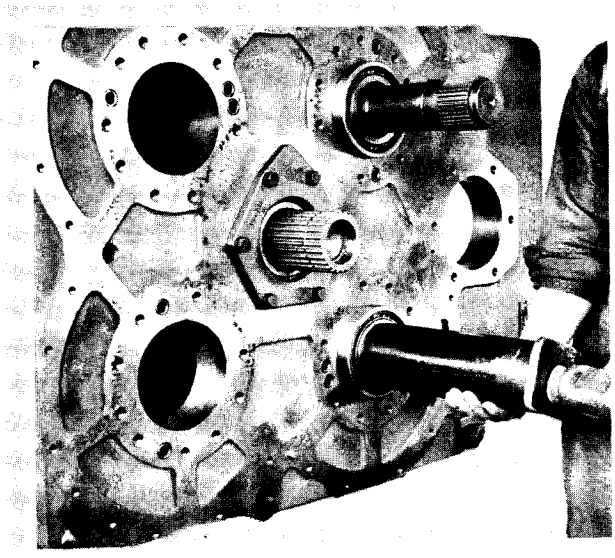


Figure 63

Drive bearings in place. **NOTE:** Bearings must be driven in tight, check long spacer on shaft, when spacer can not be turned by hand, stack up between the front and rear bearing is tight. **DO NOT** attempt to draw bearing up tight with bearing lock nuts.

Reassembly of input and reverse is identical, only one shaft is explained.

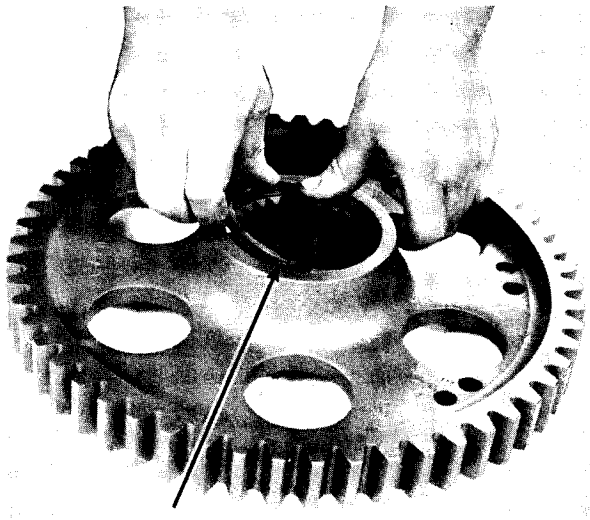


Figure 64

Install snap ring in input and reverse gear.

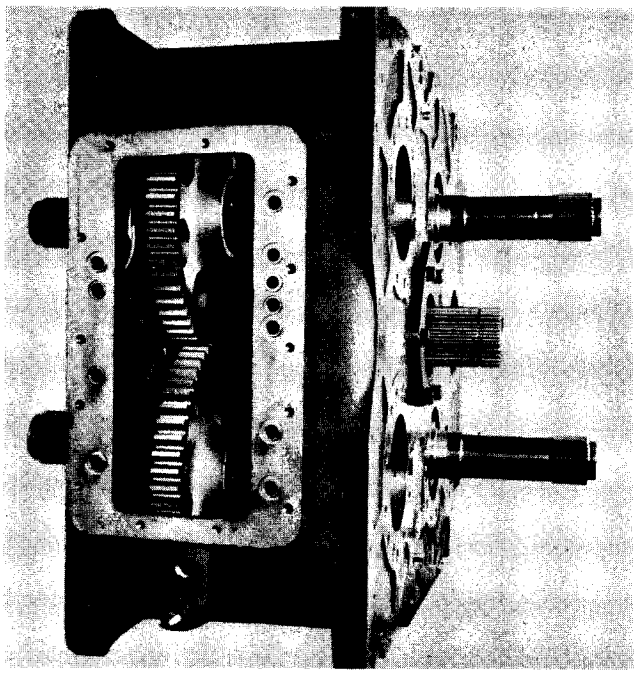


Figure 65

Position input and reverse gears in transmission case (gears may be installed one at a time fig. 65 shows both gears in case).

Press input and reverse shaft double taper bearing assemblies on shafts. **CAUTION:** These bearings are in matched sets and under no circumstances can any of the four (4) parts be changed or mixed up with another bearing. Insert shaft in bottom bore of case and through gear. Use shaft pusher and push shaft assembly in case until taper bearing shoulders in bore of case. Do not remove shaft pusher. On opposite end of shaft install long spacer. **NOTE:** Spacer has a smaller diameter on one end than on the other, this smaller diameter goes against the locating ring in the input and reverse gear.

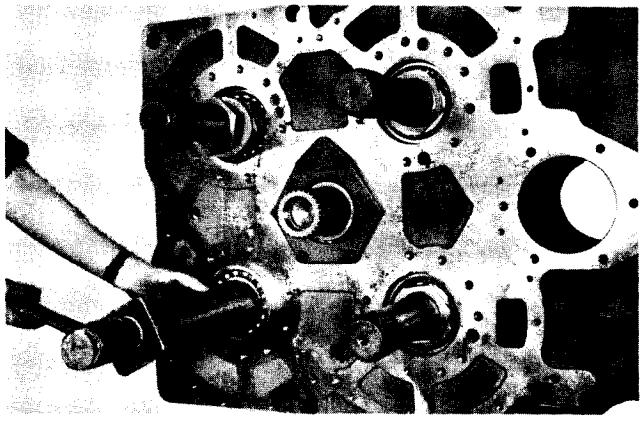


Figure 66

Drive roller bearing in place. **NOTE:** Bearings must be driven in tight, check long spacer on shaft, when spacer can not be turned by hand, stack between the input or reverse gear and the roller bearing is tight. **DO NOT** attempt to draw bearings up tight with bearing lock nuts.

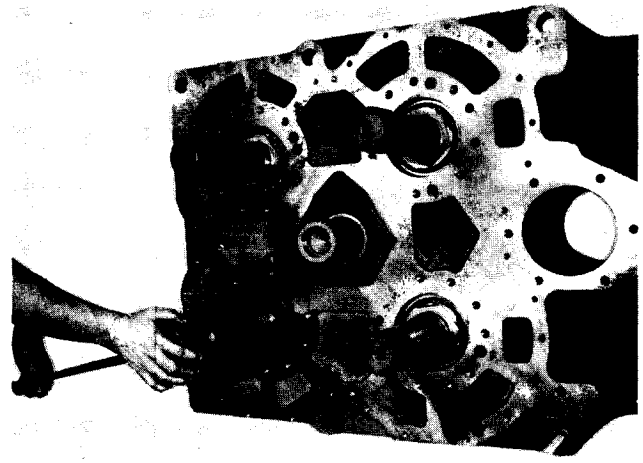


Figure 67

Lock gears using a soft bar, and install bearing inner lock nut (all four shafts) tighten lock nuts 175 to 200 ft lbs. torque. Install nut locks and outer lock nuts. Tighten outer lock nuts 175 to 200 ft lbs. torque. Bend a portion of the nut lock over one flat of the inner lock nut. Bend a portion of the nut lock over one flat of the outer lock nut.

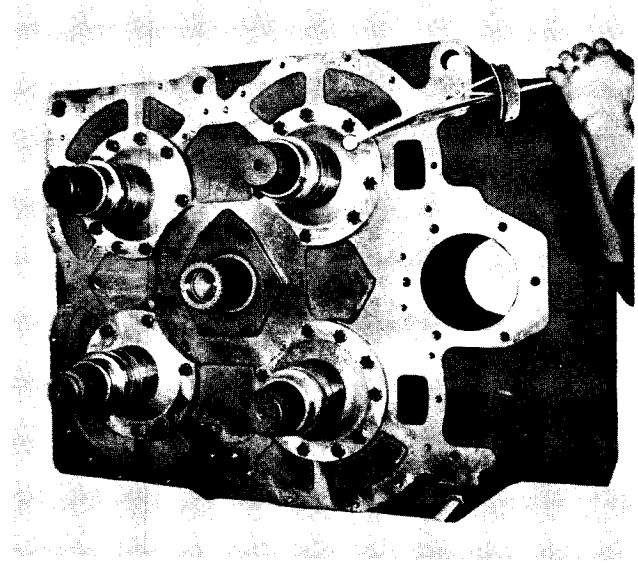


Figure 68

Install clutch supports. Align holes in clutch supports with holes in transmission case and install self locking bolts. Tighten bolts ~~70-85~~ 150-175 ft. lbs. torque.

REASSEMBLY OF OUTPUT SHAFT

Assembly of output shaft is optional. In the following illustrations the threaded end of the output shaft is to the rear and is capped, wih the mechanical disconnect to the front.

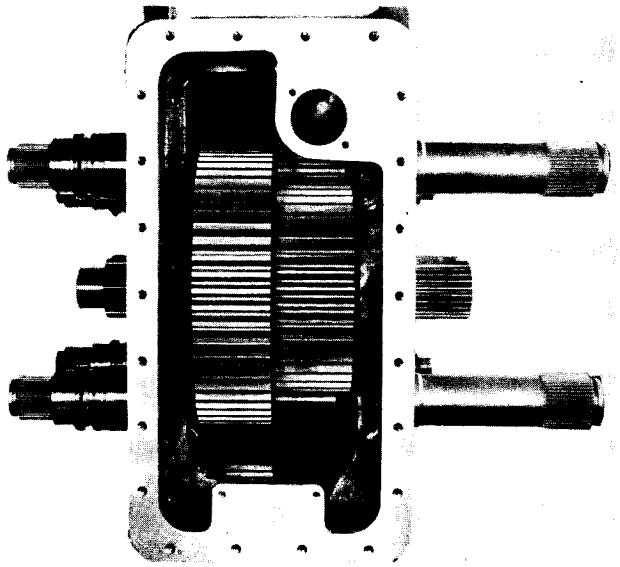


Figure 69

Press taper bearing, (large diameter of taper inward), over threaded end of output shaft against shoulder on shaft. Position small output shaft gear in transmission case to the front. Position large output shaft gear in transmission case to the rear with longer offset of gear hub toward smaller gear. Insert output shaft through rear bore of case and through large and small output gears. Fig. 69 shows proper stack up of gears. Drive front taper bearing, (large diameter of taper inward) on output shaft until bearing shoulders against small gear. Install bearing cups over front and rear bearings.

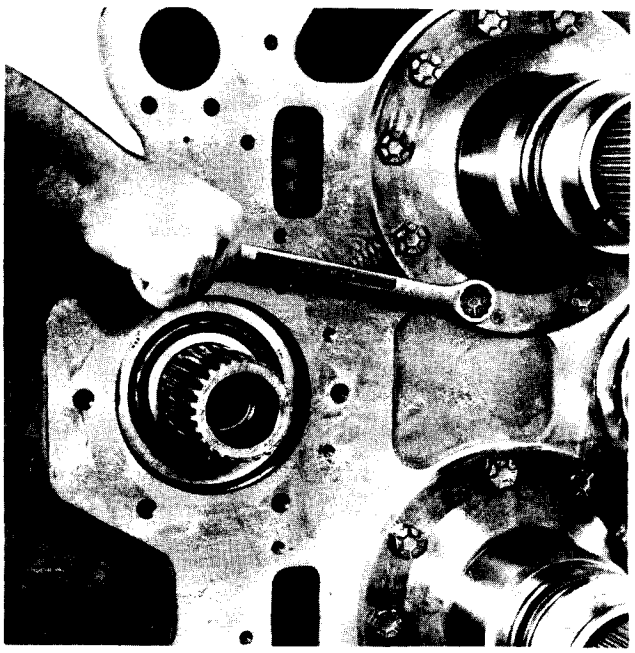


Figure 70

Install 1st and 2nd clutch supports. Align holes in clutch supports with holes in transmission case and install self locking bolts. Tighten bolts ~~70 to 85~~ 260-300 ft. lbs. torque.

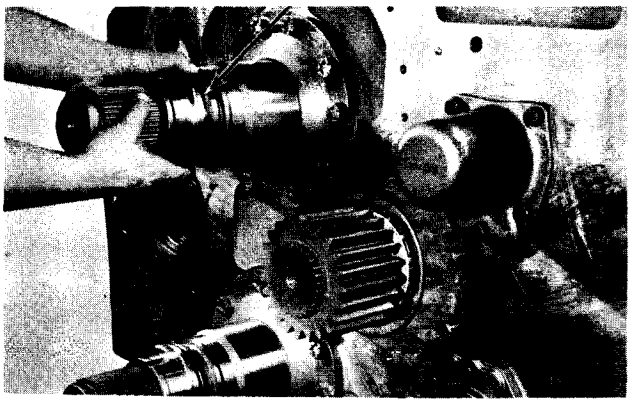


Figure 71

Install new clutch support piston rings. Lock rings in position. Lubricate piston rings with type "A" automatic transmission fluid.

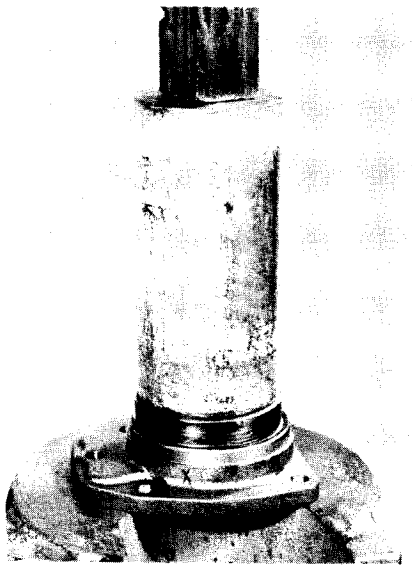


Figure 72

Apply a thin coat of permatex #2 on the outer diameter of the input shaft oil seal. Press oil seal, lip of seal inward, into input shaft bearing cap.

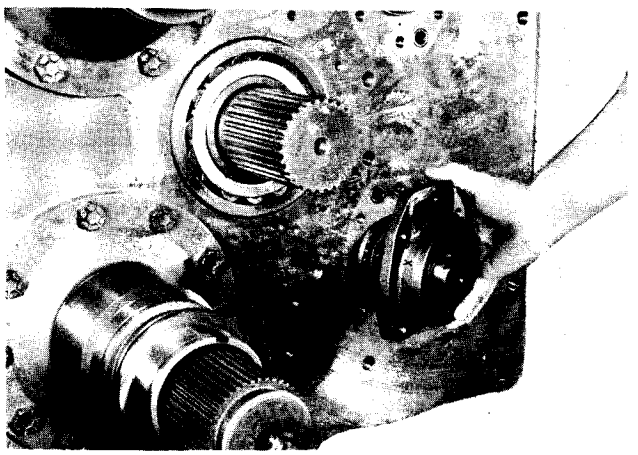


Figure 73

Install bearing cap and seal assembly on input shaft.

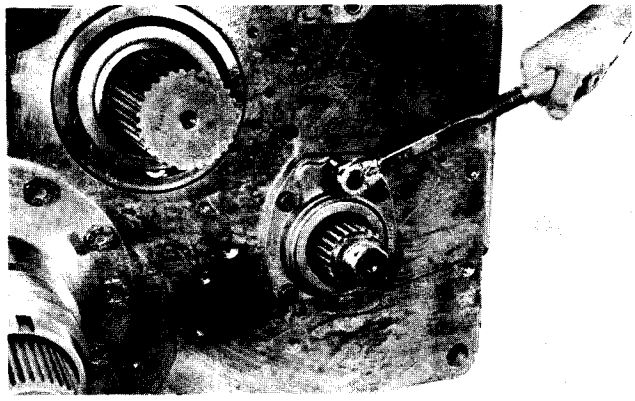


Figure 74
Install bearing cap bolts, four bolts are 1¼" long, one bolt is 1½" long, bolt being torqued in fig. 74 is the 1½" long bolt. Torque all bolts 47 to 55 ft. lbs. torque.

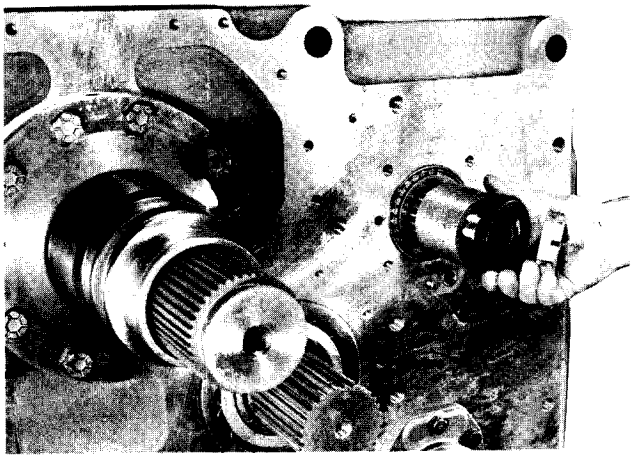


Figure 75
Install reverse shaft bearing spacer, washer and nut. Lock gears with a soft bar and tighten reverse nut 150 to 200 ft lbs. torque—install nut cotter.

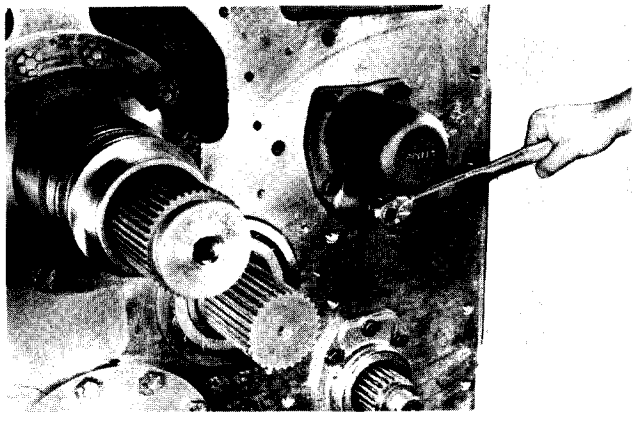


Figure 76
Install a new gasket on reverse shaft bearing cap. Install bearing cap on reverse shaft. Install bearing cap bolts, four bolts are 1¼" long, one bolt is 1½" long, bolt being torqued in fig. 76 is the 1½" long bolt. Torque all bolts 47 to 55 ft. lbs. torque.

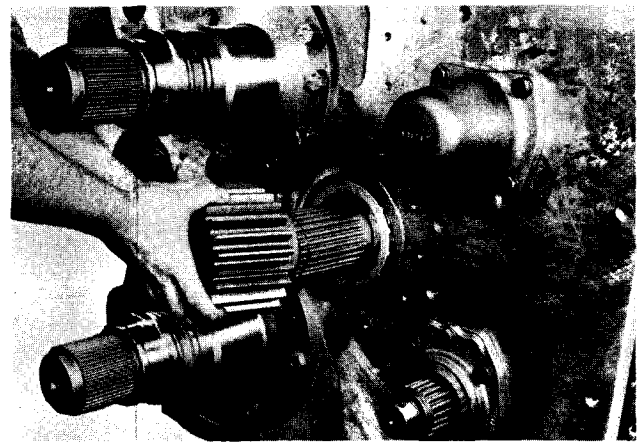


Figure 77
Install small idler gear on idler shaft with longer offset of gear hub inward.

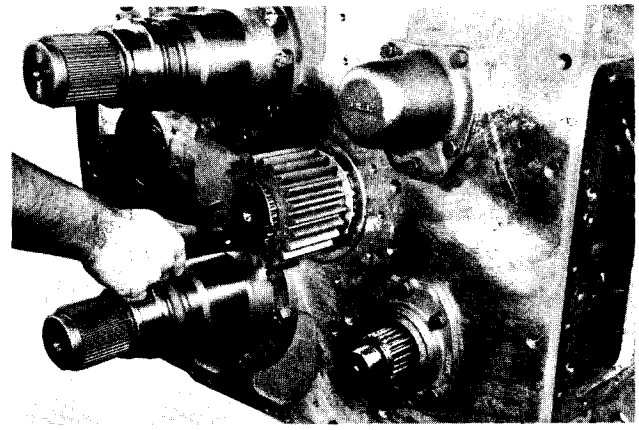


Figure 78
Install idler gear retainer ring. Make certain retainer ring is in full position in ring groove.

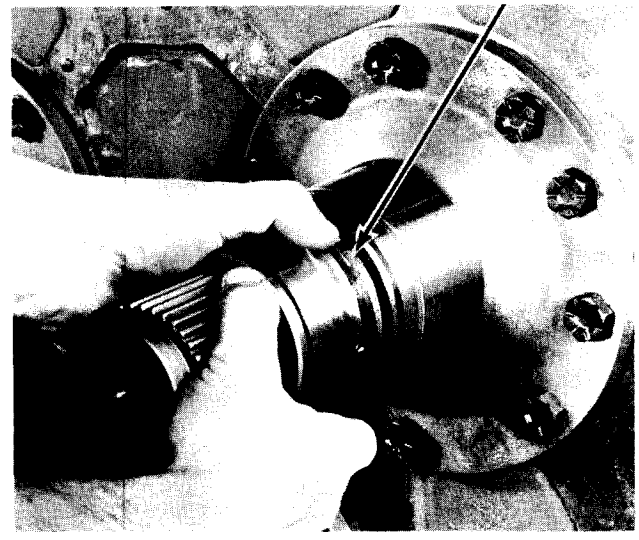


Figure 79
Install new clutch support piston rings. Lock rings in position. Lubricate piston rings with type "A" automatic transmission fluid.

REASSEMBLY OF CLUTCHES

NOTE: All Clutches are assembled in a similar manner, however, the 1st and 2nd speed clutches have a clutch drum hub gear and retainer ring. Also, the number of inner and outer clutch disc, release springs and guide pins will differ.

Clutch being assembled in the following illustrations is the 2nd speed.

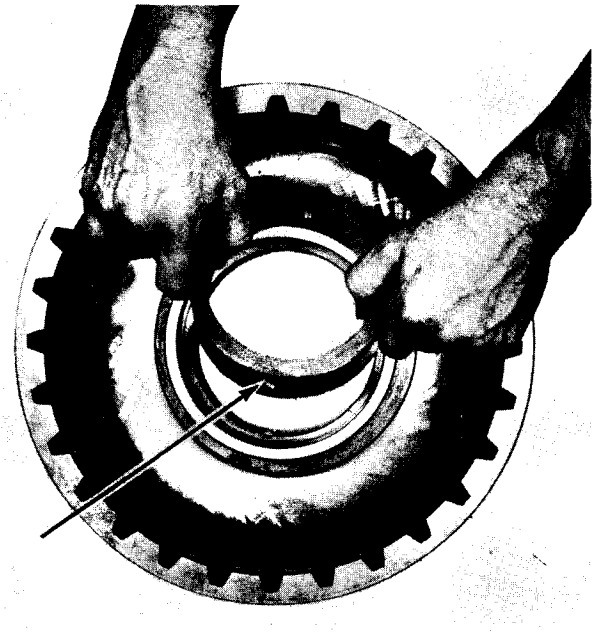


Figure 80
Insert lock ball in clutch piston ring outer race. Press outer race and ball in clutch drum. Outer race must be pressed from flush to 1/64" below shoulder in clutch drum.

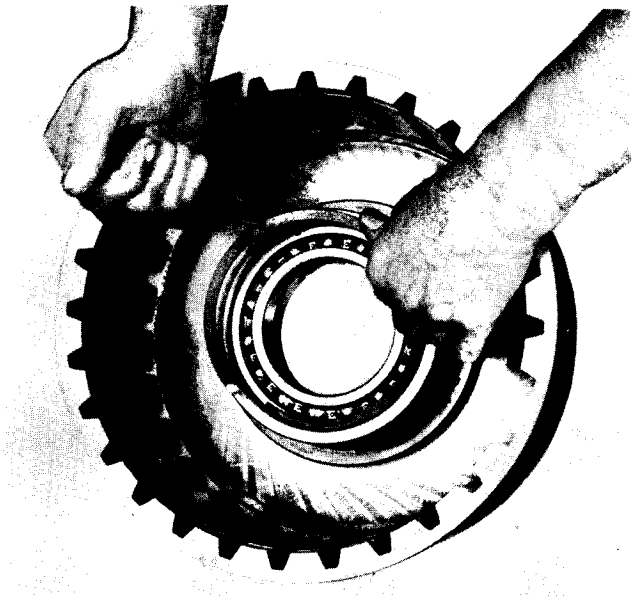


Figure 81
Press support ball bearing in clutch drum, & secure with bearing retainer ring.

Figure 82
From rear end of clutch drum, press support roller bearing in drum secure with retainer ring.

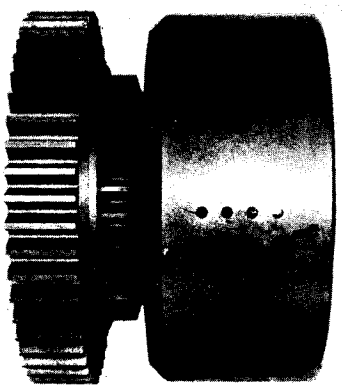


Figure 83
Press clutch drum hub gear on clutch drum with longer offset of gear hub inward. **NOTE:** clutch drum hub gear is used only on the 1st and 2nd clutch.

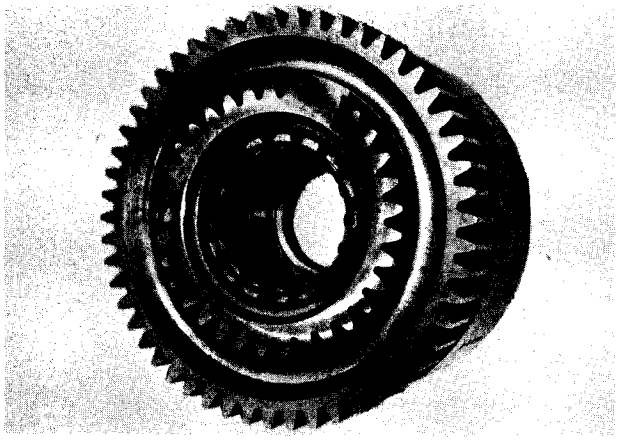


Figure 84
Secure clutch drum hub gear with retainer ring.

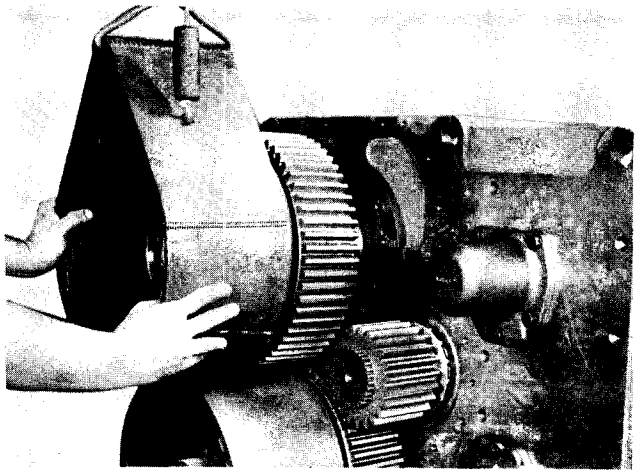


Figure 85
Install clutch drum assembly on clutch support. **CAUTION:** Do not damage clutch support piston rings.

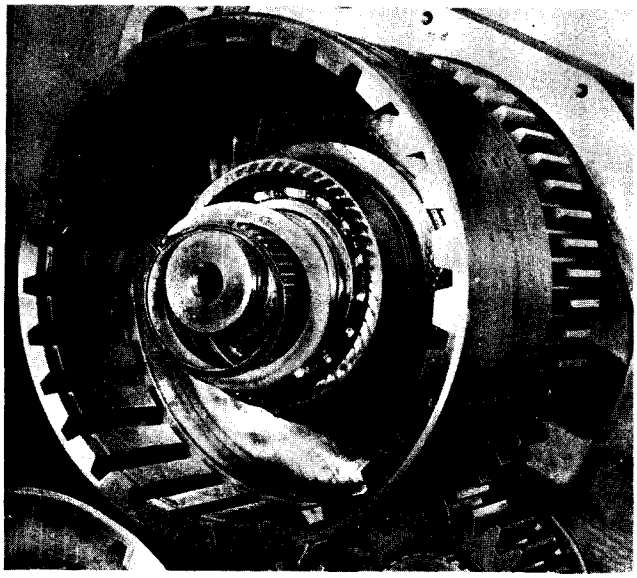


Figure 86
Install clutch drum hub bearing washer.

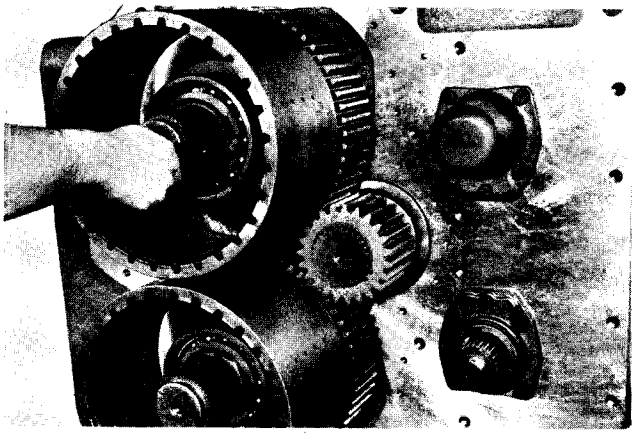


Figure 87
Install drum hub washer retainer ring.

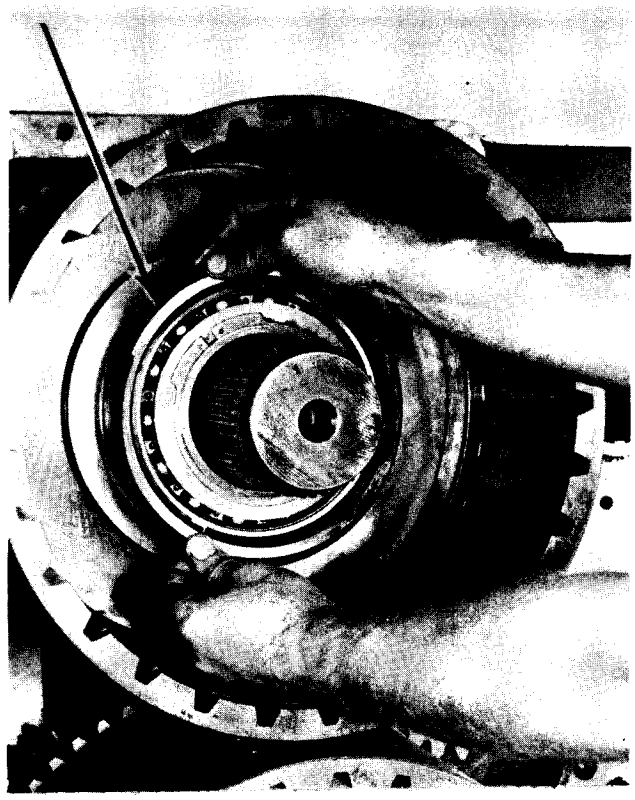


Figure 88
Install clutch piston inner sealing ring. Lubricate piston ring with type "A" automatic transmission fluid.

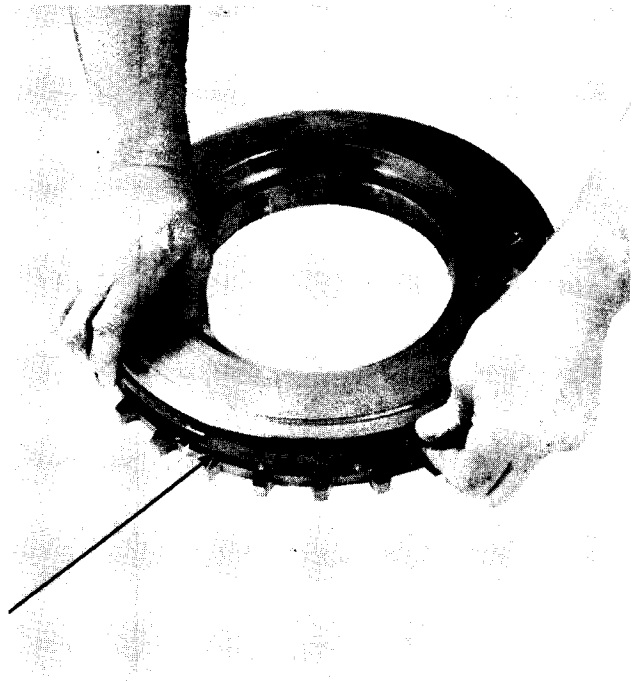


Figure 89
Install clutch piston outer piston ring. Lubricate piston ring with type "A" automatic transmission fluid.

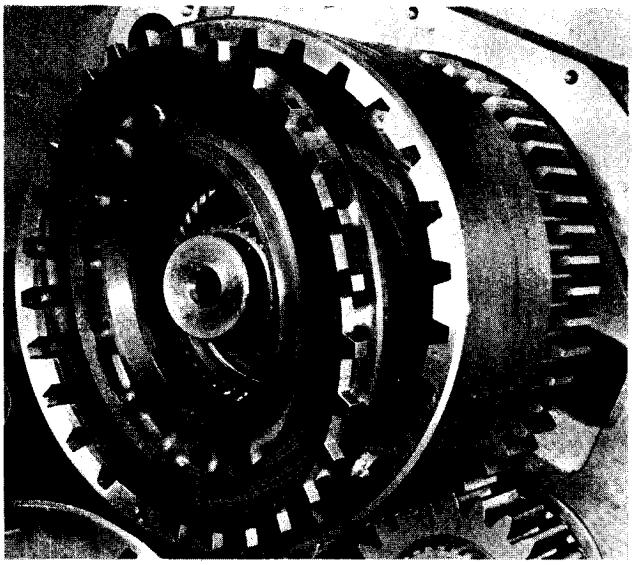


Figure 90
Slide clutch piston into position in clutch drum. **CAUTION:** Do not damage inner and outer piston rings.

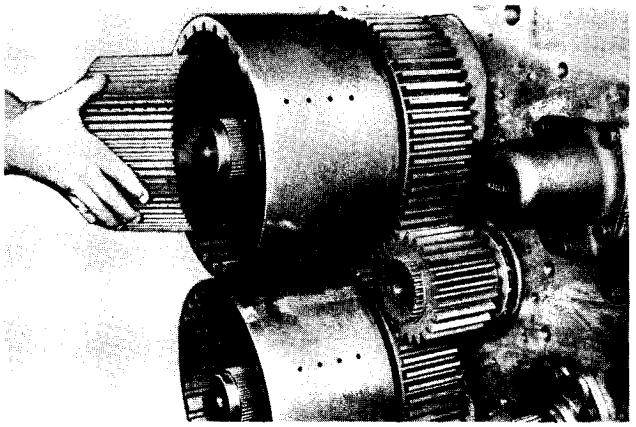


Figure 91
Install clutch disc hub in clutch drum.

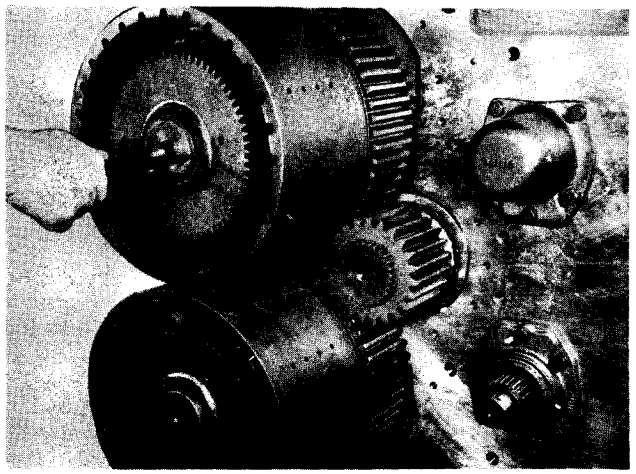


Figure 92
Install disc hub retainer ring.

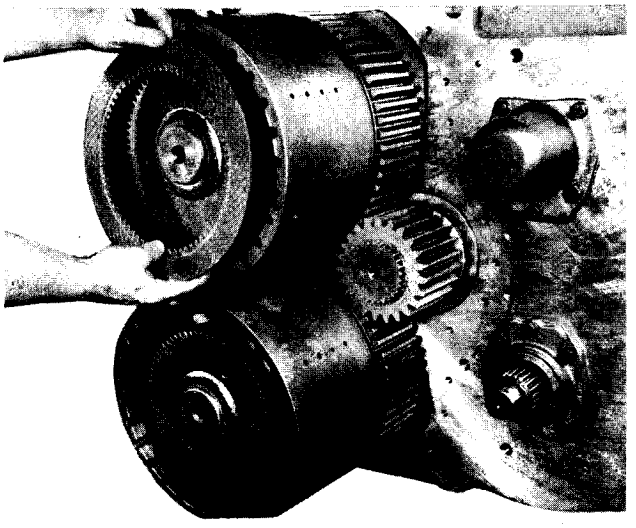


Figure 93
Install one bronze disc on disc hub and against the clutch piston.

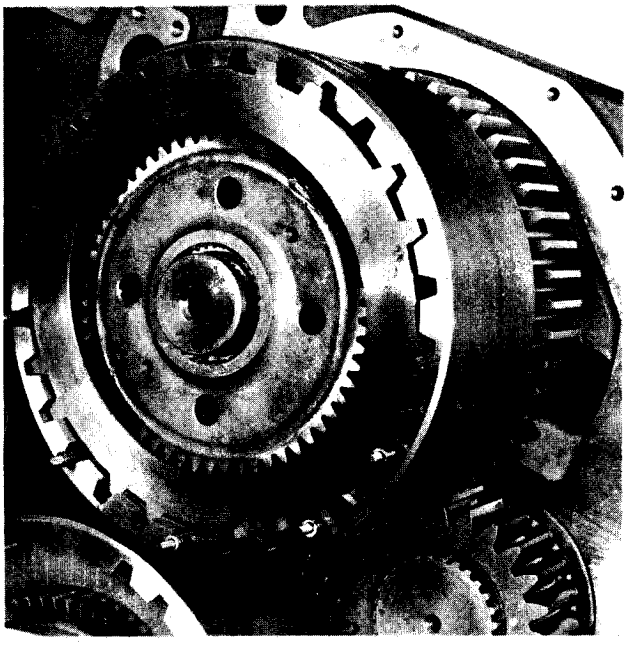


Figure 94
Install one steel disc in clutch drum. **NOTE:** The steel disc has teeth missing on the outer diameter this is to allow passage for the clutch release springs. Insert two or more release springs in drum and against the teeth of the clutch piston. Install next bronzed disc. Alternate clutch discs, steel against bronze and always align the teeth on each steel disc with the teeth on the preceding steel disc. If assembly is correct each release spring is against a tooth on the clutch piston and you start with a bronze disc and end with a bronze disc.
Insert all release springs and guide pins in clutch drum.

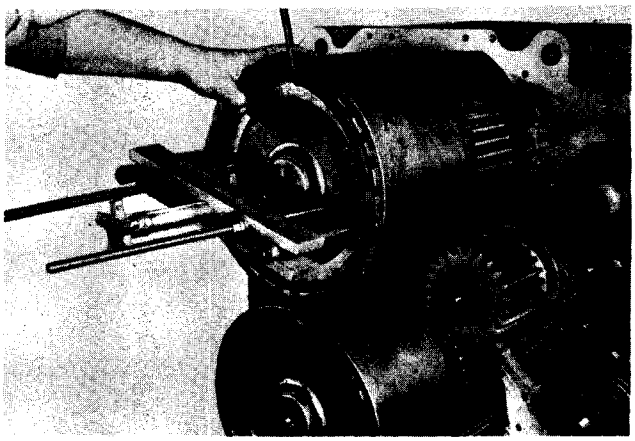


Figure 95
Compress clutch disc end plate and install end plate retainer ring.
Use the same procedure to assemble all the clutches.

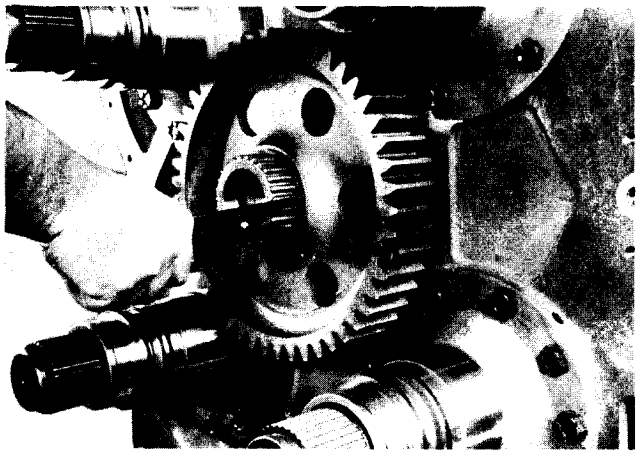


Figure 96
Install large idler gear on idler shaft with longer offset of gear hub inward. Install idler gear retainer ring.

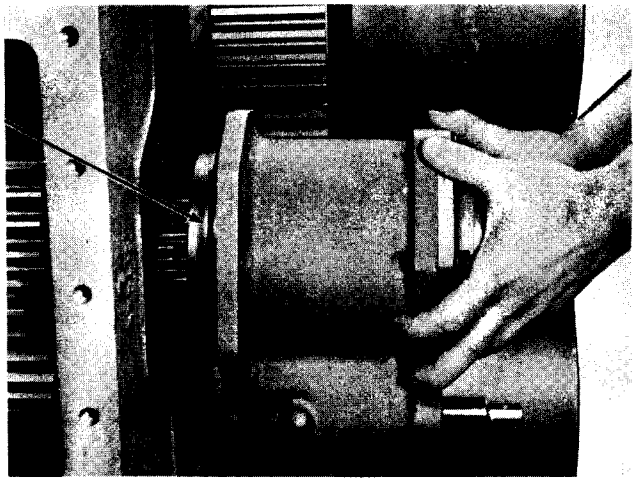


Figure 97
Install new "O" ring on Disconnect housing. Lubricate "O" ring with type "A" automatic transmission fluid. Install disconnect assembly on output shaft.

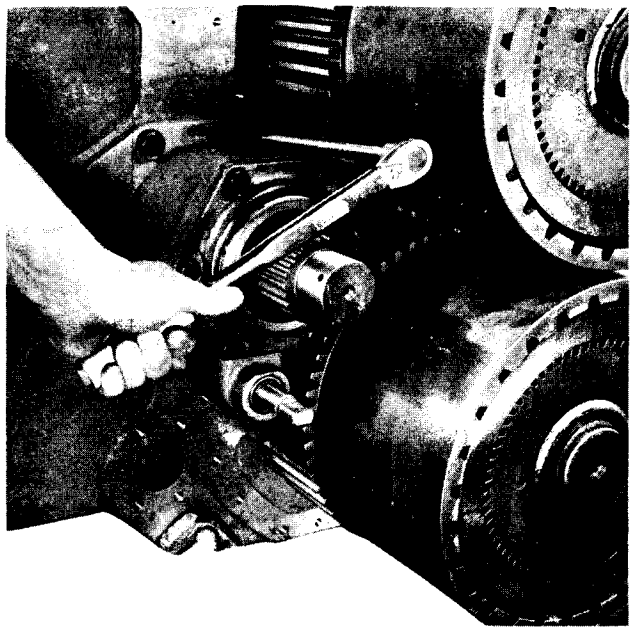


Figure 98
Secure disconnect assembly to transmission case with bolts and lock washers. Tighten bolts 95 to 115 ft lbs. torque.

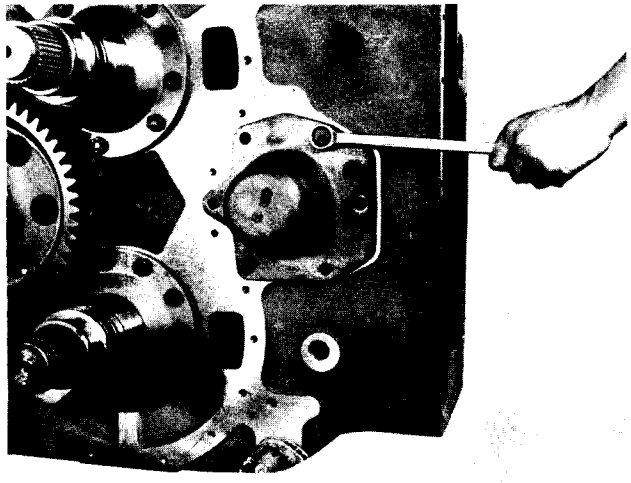


Figure 99
Install a new "O" ring on output shaft bearing cap, lubricate ring with type "A" automatic transmission fluid. Certain units will have an oil seal in this cap, oil seal should be replaced by a new one. Apply a light coat of permatex #2 on the outer diameter of the seal before installing in cap. Install bearing cap and shims, do not tighten bearing cap bolts. Engage disconnect shaft with output shaft using an inch pound torque wrench on the disconnect flange nut, determining the amount of torque required to turn gear train. Add or remove shims from bearing cap to adjust preload. When bearings are adjusted properly, it will take 6 to 8 inch pounds more torque to turn gear train with cap bolts torqued than when bolts were loose. Bearing cap bolts must be tightened 95 to 115 ft lbs. torque.

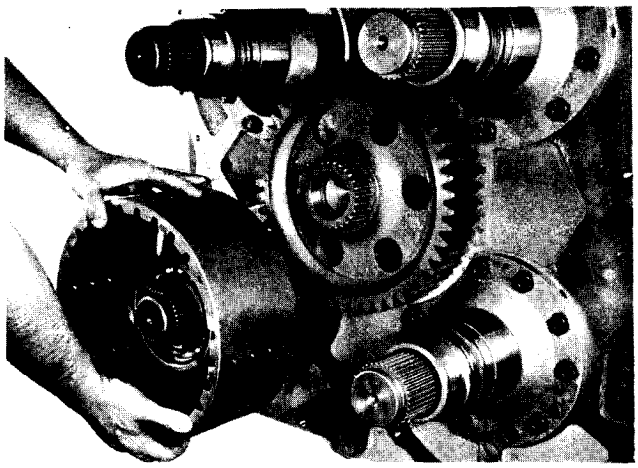


Figure 100
Install input, reverse, 3rd and 4th clutches as explained in figures 80 thru 82 and figures 85 thru 95.

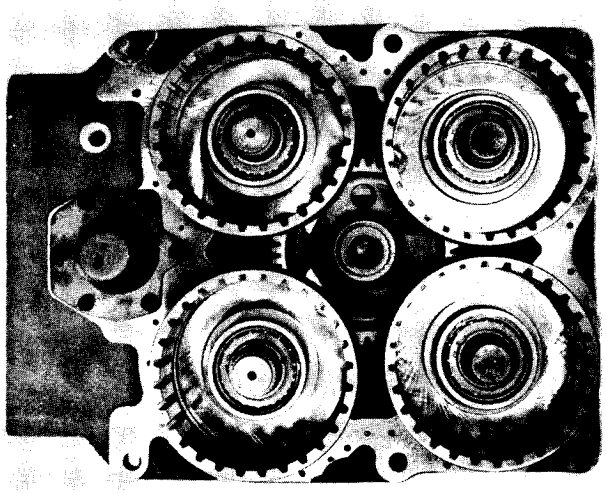


Figure 101
Clutch drum assemblies in position and retained with bearing washer and snap ring.

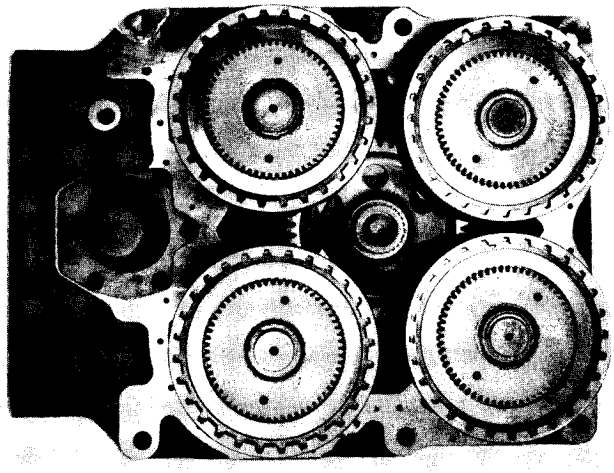
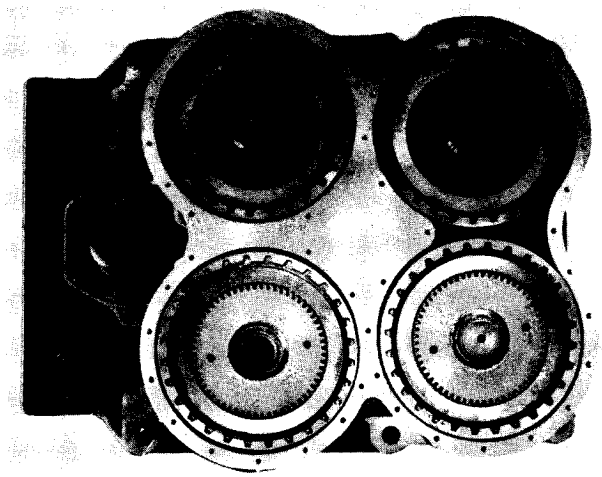


Figure 102
Input, reverse, 3rd and 4th clutches assembled.



Figures 103
Install new gasket on clutch cover. Install clutch cover on transmission case. Secure cover with bolts and lockwashers. Tighten bolts 35 to 45 ft. lbs. torque.

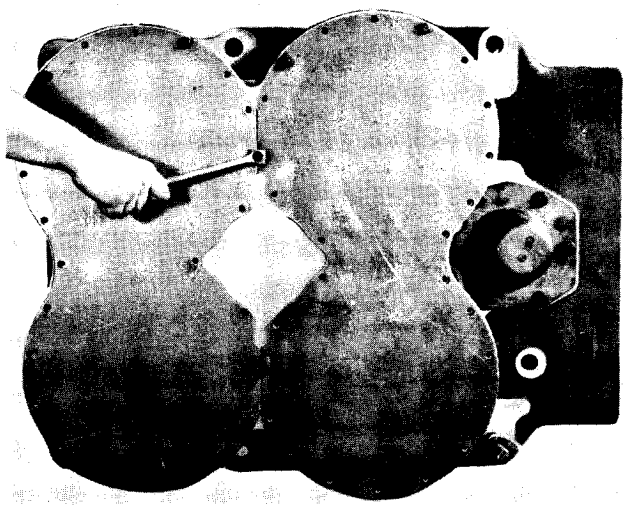


Figure 104
Install new gaskets on clutch cover plates. Install clutch cover plate to clutch cover, secure plates with bolts and lockwashers. Use twenty-two 1" x 3/8-16 bolts for the cover plates. Use two 1¼" x 3/8-16 bolts for the cover plate clip. Tighten all bolts 20 to 25 ft. lbs. torque.

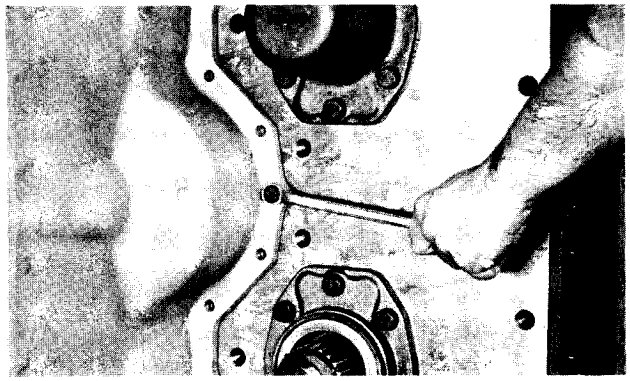


Figure 105

Install new gasket on 1st and 2nd clutch cover. Secure cover to transmission case with bolts and lockwashers. Tighten bolts 35 to 40 ft. lbs. torque.

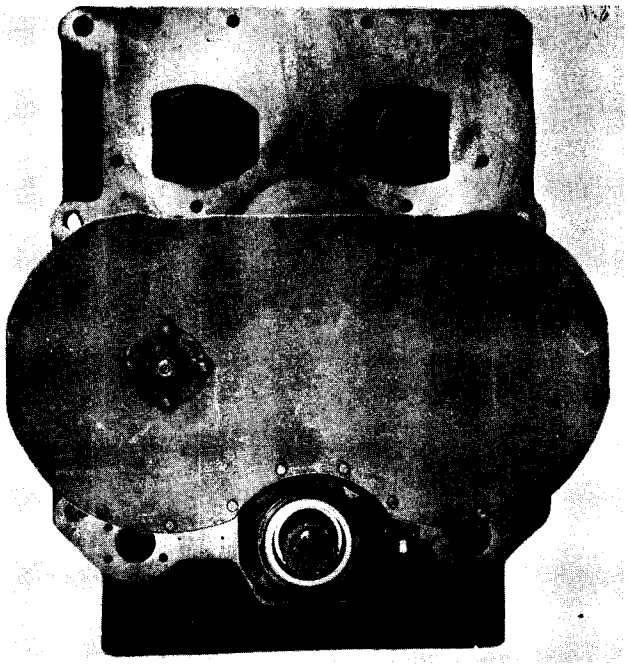


Figure 106

Install speedometer drive assembly to 1st and 2nd clutch cover with button head hex socket bolts, tighten 20 to 25 ft. lbs. torque. insert speedometer drive spring in the end of the 2nd speed clutch shaft. Install new gasket on 1st and 2nd speed clutch cover plate. Align speedometer drive spring with speedometer drive assembly and install cover plate to clutch cover, secure with bolts and lockwishers and tighten 20 to 25 ft. lbs. torque.

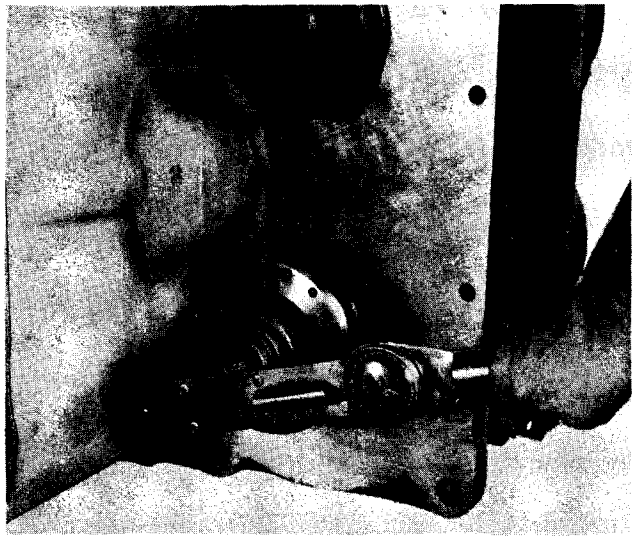


Figure 107

Install input companion flange, "O" ring, washer and nut. Lock gears with a soft bar and tighten flange nut ~~150 to 200~~ 250-300 ft. lbs. torque. Install nut cotter.

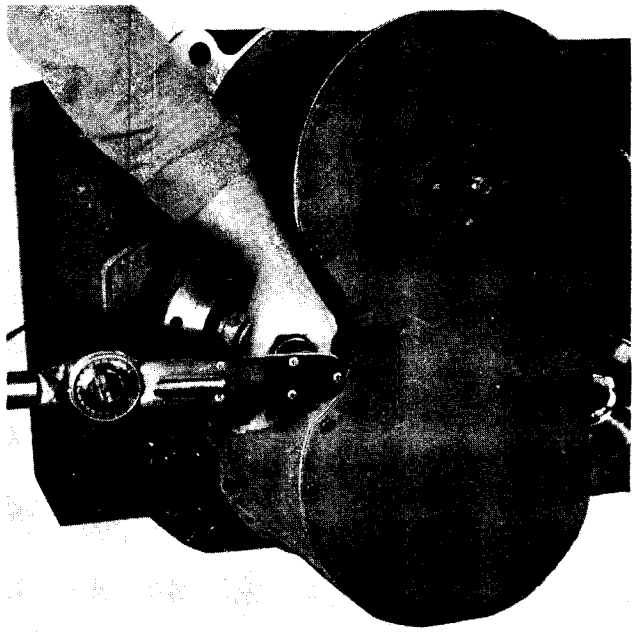


Figure 108

Install disconnect assembly companion flange, "O" ring, washer and nut. Lock gears with a soft bar and tighten nut ~~250 to 300~~ 400-450 ft. lbs. torque.

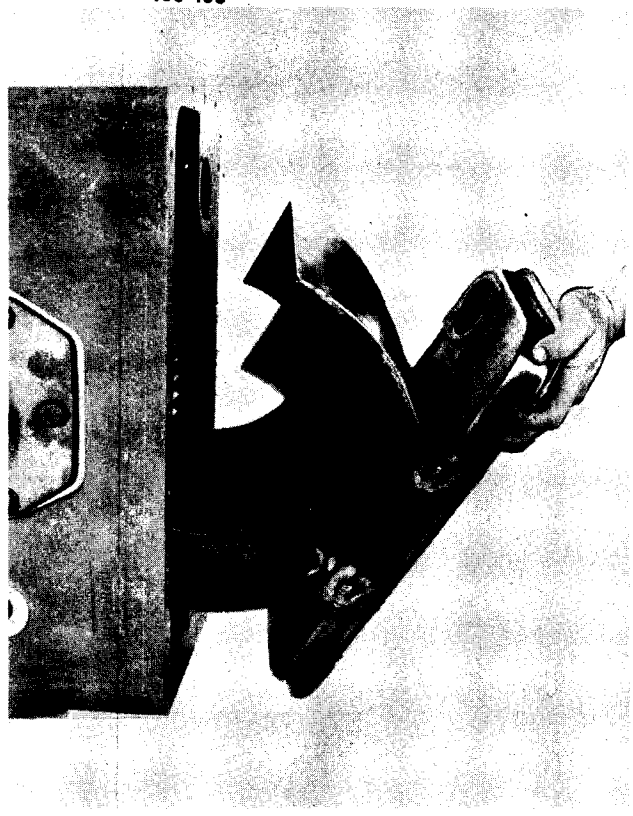


Figure 109

Install sump screen and baffle assembly secure with bolts and lockwashers. Tighten 20 to 25 ft. lbs. torque.

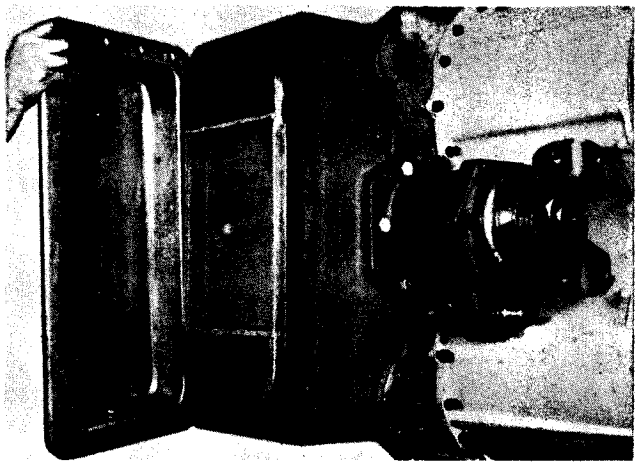


Figure 110
Install new gasket on transmission sump pan. Set pan magnets over welded washers in sump pan. Secure pan with bolts and lockwashers tighten 47 to 55 ft. lbs. torque.

REASSEMBLY OF CONTROL COVER

See figure "C" for sequence of parts and parts identification. **NOTE:** Lubricate all valves, springs, "O" rings, sleeves and oil seals with a light coat of type "A" automatic transmission fluid.

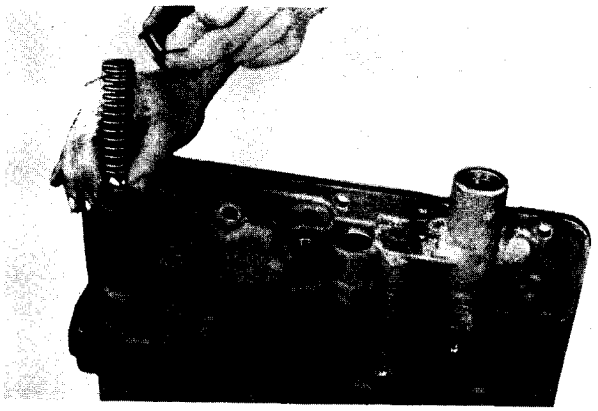


Figure 111
Install safety valve ball and spring in cover. With new "O" ring in position install spring stop on spring.

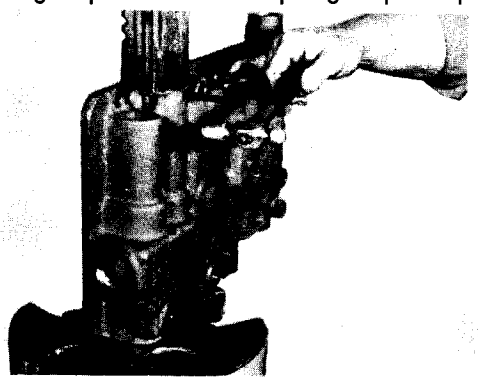


Figure 112
Depress spring stop and spring. Install spring stop roll pin.

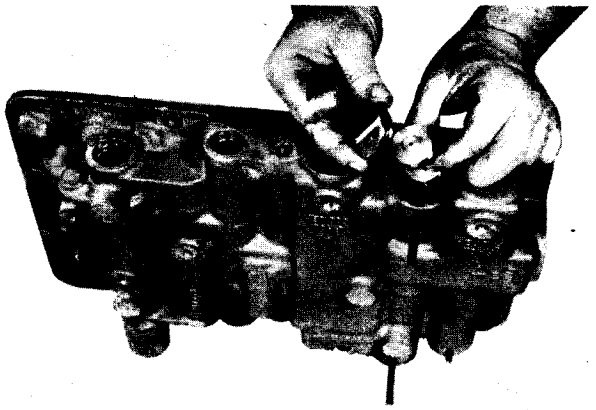


Figure 113
Install regulating valve spool in valve cover. Install new "O" ring on valve stop. Install valve stop in cover and retain with roll pin.

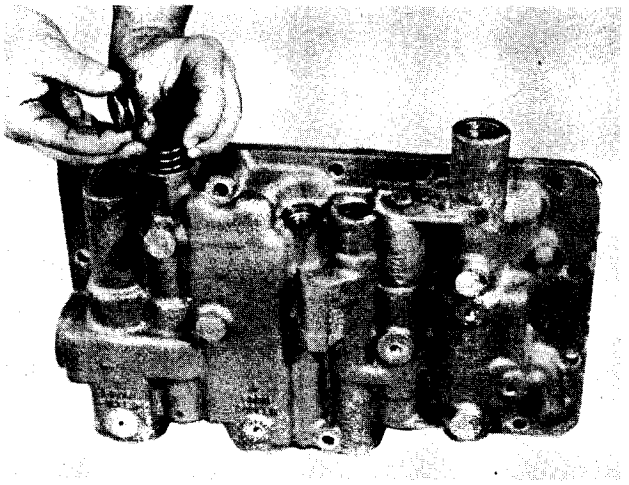


Figure 114
At opposite end of regulating valve install inner and outer valve spring. Install new "O" ring on spring stop. Install spring stop on springs.

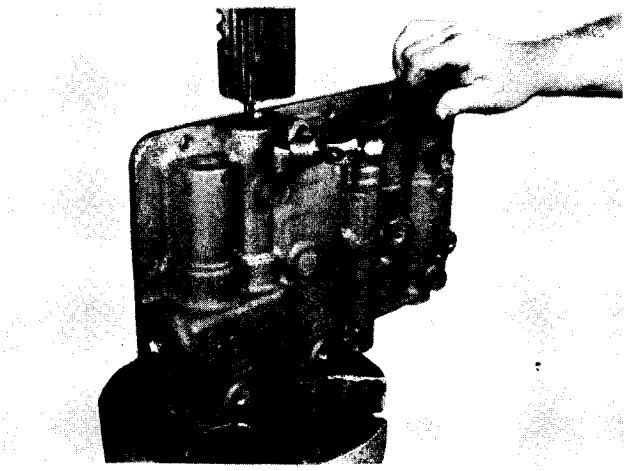


Figure 115
Depress spring stop and spring. Install spring stop roll pin.

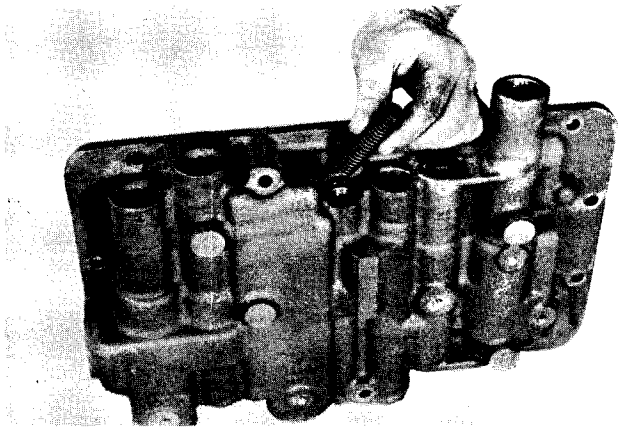


Figure 116
Install shut-off valve spring.

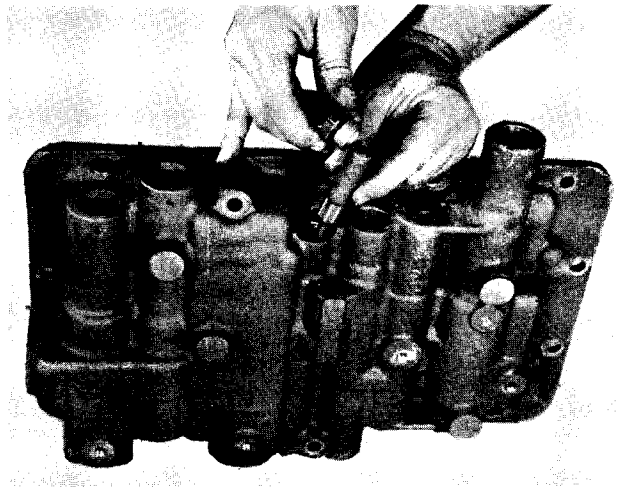


Figure 117
Install shut-off valve in housing. Depress valve and spring with valve plug. Tighten plug securely.

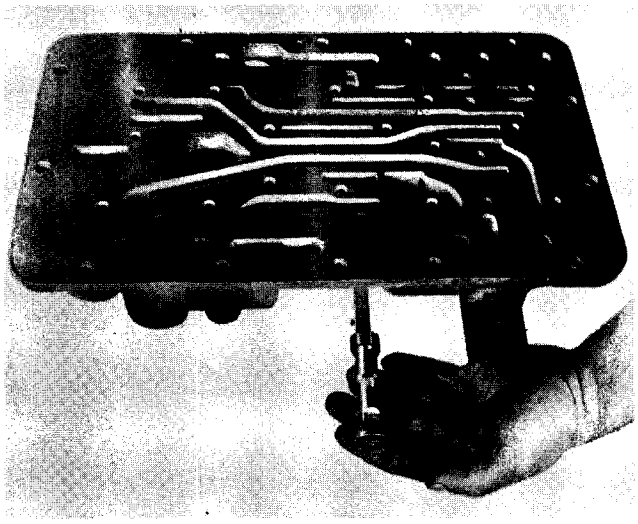


Figure 118
Install forward and reverse selector valve in housing. Install selector valve stop washer on selector valve.

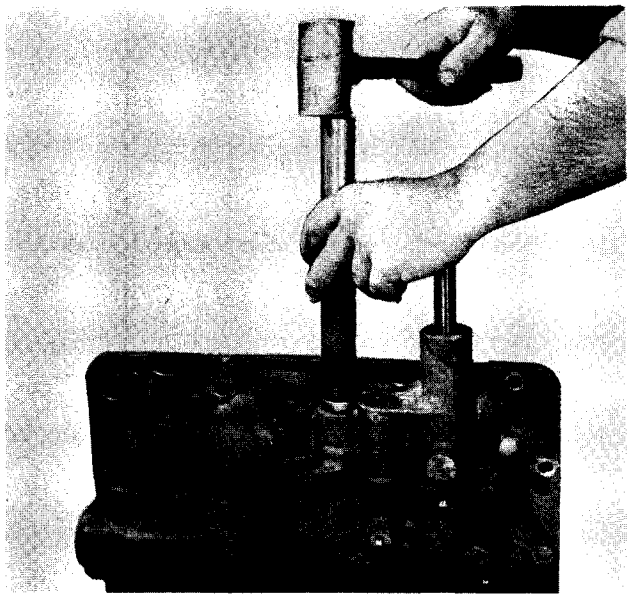


Figure 119
Apply a light coat of permatex #2 on the outer diameter of a new selector valve oil seal. Install oil seal in housing.

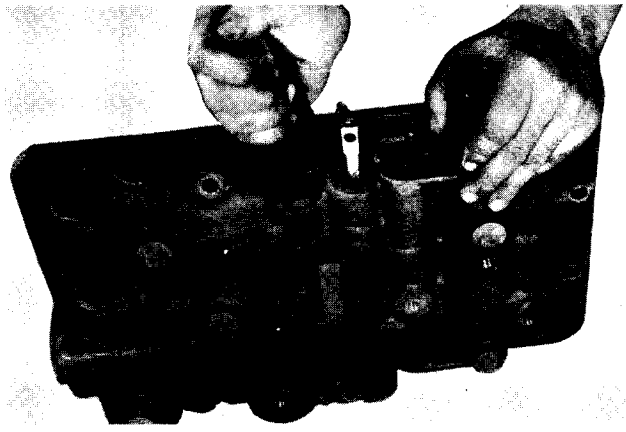


Figure 120
Install oil seal retainer ring.

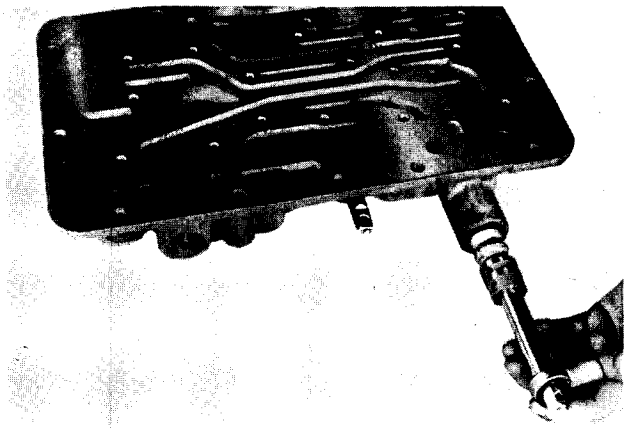


Figure 121
Install speed selector valve assembly in housing.

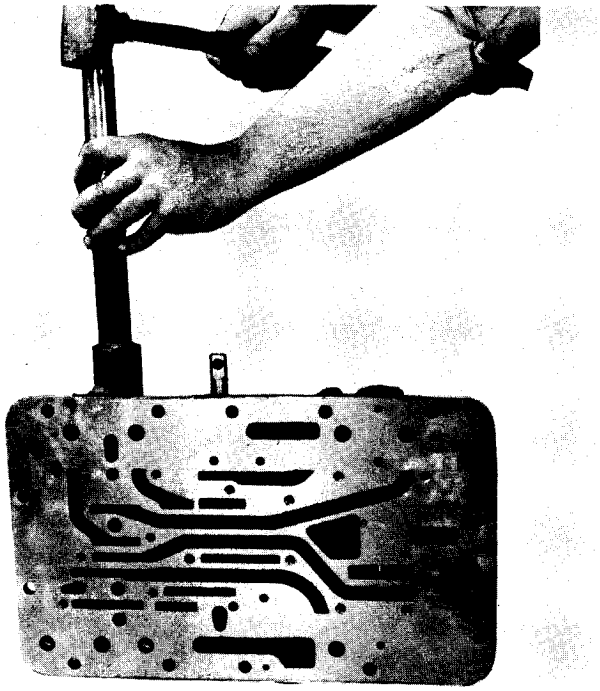


Figure 122
Apply a light coat of permatex #2 on the outer diameter of a new selector valve oil seal. Install oil seal in housing.

Figure 123
Install oil seal retainer ring.

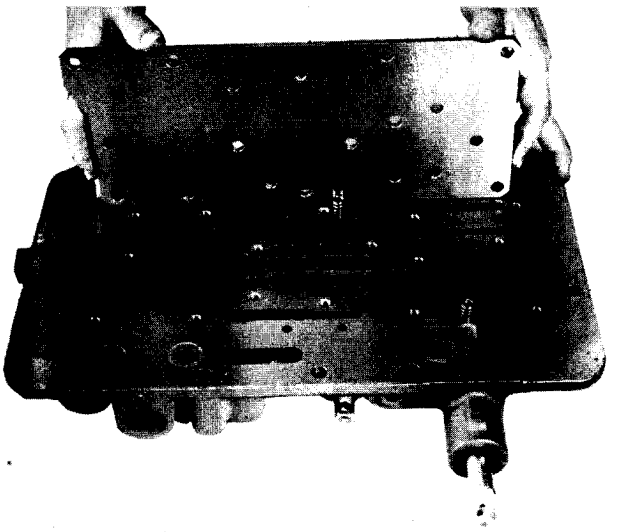


Figure 124
Install poppet balls and poppet springs in drilled ports in control cover. Install control cover plate. Secure with bolts and external shake proof washers. Tighten 20 to 25 ft. lbs. torque.

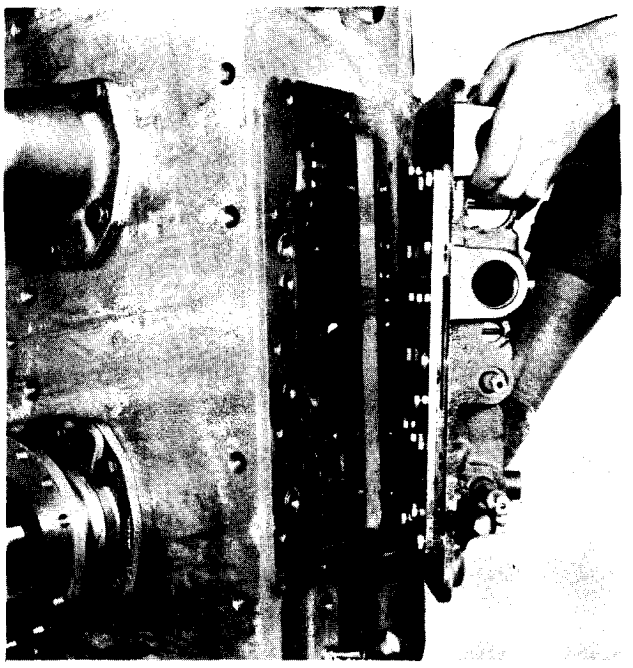


Figure 125
Using new control valve to case "O" rings and new gasket. Install control cover assembly on transmission case. Secure with bolts and lockwashers. Tighten 35 to 45 ft. lbs. torque.

SERVICING MACHINE AFTER TRANSMISSION OVERHAUL

The transmission, torque converter and its allied hydraulic system are important links in the drive line between the engine and wheels. The proper operation of either unit depends greatly on the condition and operation of the other, therefore, whenever repair or overhaul of one unit is performed, the balance of the system must be considered before the job can be considered completed.

After the overhauled or repaired transmission has been installed in the machine, the torque converter, oil cooler, filter and connecting hydraulic system must be thoroughly cleaned. This can be accomplished in several manners and a degree of judgment must be exercised as to the method employed.

The following are considered the minimum steps to be taken:

1. Drain entire system thoroughly.
2. Disconnect and clean all hydraulic lines. Where feasible hydraulic lines should be removed from machine for cleaning.
3. Replace oil filter elements, cleaning out filter cases thoroughly.
4. The oil cooler at bottom of radiator must be thoroughly cleaned. The cooler should be "back flushed" with oil and compressed air until all foreign material has been removed. Flushing in direction of normal oil flow will not adequately clean the cooler. If necessary, radiator and cooler assembly should be removed from machine for cleaning, using oil, compressed air and steam cleaner for that purpose. **DO NOT** use flushing compounds for cleaning purposes.
5. Remove bottom drain cover and plug from torque converter and inspect interior of converter housing, gears, etc. If presence of considerable foreign material is noted, it will be necessary that converter be removed, disassembled and cleaned thoroughly. It is realized this entails extra labor, however, such labor cost is a minor premium compared to cost of difficulties which can result from presence of such foreign material in the system.
6. Reassemble all components and using only Type "A" Automatic Transmission Fluid, fill torque converter and transmission through filler opening until fluid comes up to FULL mark on transmission dipstick. Reinstall fill plug and dipstick and run engine two minutes at 500-600 RPM to prime torque converter and hydraulic lines. Recheck level of fluid in transmission **with engine running** at idle (500-600 RPM) and add quantity necessary to bring level up to FULL mark on dipstick.
7. Recheck all drain plugs, lines, connections, etc., for leaks and tighten where necessary.

SPECIFICATIONS AND SERVICE DATA — 16,000 SERIES TRANSMISSION AND TORQUE CONVERTER

GEAR TYPE	Spur
CONTROLS	Forward and Reverse—Manual Speed Selection—Manual
CLUTCH TYPE	Multiple discs, hydraulicly actuated, spring released, automatic wear compensation and no adjustment. All clutches oil-cooled and lubricated.
CLUTCH INNER DISC	Steel
CLUTCH OUTER DISC	Sintered Bronze
CLUTCH PRESSURE	180-220
OIL FILTRATION	Full flow oil filter safety by-pass, also strainer screen and magnets in sump at bottom of transmission case.

LUBRICATION

TYPE OF OIL	Type "A" Automatic Transmission Fluid
CAPACITY	Consult Operator's Manual on applicable machine model for system capacity. Torque Converter, Transmission and allied hydraulic system must be considered as a whole to determine capacity.
CHECK PERIOD	Check oil level DAILY with engine running at 500–600 RPM and oil at 180° F. to 200° F.

DRAIN PERIOD

Maintain oil level to FULL mark on dipstick. Every 250 hours change oil filter element. Every 500 hours, drain and refill system as follows: Drain with oil at 150° F to 200° F.

(a) Drain converter at bottom rear of converter housing.

(b) Drain transmission and remove sump. Clean pan and screen thoroughly and replace using new gaskets.

(c) Drain oil filters, remove and discard filter elements. Clean filter shells and install new elements.

(d) Refill transmission to FULL mark on dipstick.

(e) Run engine at 500–600 RPM to prime converter and lines.

(f) Recheck level with engine running at 500–600 RPM and add oil to bring level to FULL mark on dipstick.

TABLE OF TORQUE LIMITS

Bolt Size	Torque in Ft. Lbs. Minimum	Maximum	Item
3/8–16	20	25	
7/16–14	35	45	
1/2–13	47	55	
5/8–11	95	115	
	250	300	Input Flange Nut
	400	450	Output Flange Nut

PRESSURE AND OIL FLOW CHECK SPECIFICATIONS
(180° F to 200° F)

A.— Clutch Pressure at Transmission Control Cover	180–220 PSI
B.— Oil Pressure at Converter—Out Port	See Pressure & Oil Flow Checks (Paragraph A)
C.— Oil Pressure at Converter—In Port	See Pressure & Oil Flow Checks (Paragraph B)
D.— Converter Charging Pump Output (Rated)	50 GPM @ 2000 RPM
E.— Oil Leakage through Transmission Clutches (with two clutches engaged)	7 GPM Maximum
F.— Oil Flow into Oil Cooler	40 GPM Minimum @ 2000 RPM
G.— Converter Lube Flow	3 GPM Maximum
H. Lube Pressure	30 PSI Maximum @ 2200 RPM

NOTE: Pump output listed applies to a new pump in each case. A 20% tolerance for wear below this figure is permissible; however, when using check reading in final computation a similar reduction must be taken into consideration when establishing minimum flow permissible on F–Oil Flow into Oil Cooler.

The following chart is presented as an aid to trouble shooting after above mentioned pressure and oil flow checks have been completed and recorded. Chart indicates conditions which will be apparent by analysis of pressure and oil flow check recordings, and listing of possible causes and remedy therefor.

LOW CLUTCH PRESSURE WITH NORMAL CLUTCH LEAKAGE

Cause	Remedy
1. Low Oil Level	1. Check oil level
2. Broken spring in transmission regulator valve	2. Replace Spring
3. Clutch pressure regulator valve spool stuck in open position.	3. Clean valve spool and sleeve

LOW CLUTCH PRESSURE WITH ABNORMAL CLUTCH LEAKAGE

1. Broken or worn clutch piston sealing rings.	1. Replace sealing rings.
2. Clutch drum bleed valve ball stuck in open position.	2. Clean bleed valve thoroughly.
3. Broken or worn sealing rings on clutch support.	3. Replace sealing rings.

LOW CONVERTER CHARGING PUMP OUTPUT

1. Low oil level.	1. Check oil level.
2. Sump screen plugged.	2. Clean screen and sump.
3. Air leaks at pump intake hose and connections or collapsed hose.	3. Tighten all connections or replace hose if necessary.
4. Defective oil pump.	4. Replace pump.

LOW FLOW THROUGH COOLER WITH LOW CONVERTER IN PRESSURE

1. Defective safety by-pass valve spring.	1. Replace spring.
2. Converter by-pass valve partially open.	2. Check for worn by-pass ball seat.
3. Broken or worn sealing rings on converter support and turbine shaft.	3. Remove, disassemble, and rebuild converter assembly, replacing all worn or damaged parts.
4. Broken or worn sealing rings in transmission clutches.	4. See paragraph on Clutch Leakage.

LOW FLOW THROUGH COOLER WITH HIGH CONVERTER OUT PRESSURE

1. Plugged oil cooler.	1. Back flush and clean oil cooler.
2. Restricted cooler return line.	2. Clean out lines.

TROUBLE SHOOTING GUIDE

The following data is presented as an aid to locating the source of difficulty in a malfunctioning unit. It is necessary to consider the torque converter charging pump, transmission, oil cooler and connecting oil lines as a complete system when running down the source of trouble since the proper operation of any unit therein depends greatly on the condition and operations of the others. By studying the principles of operation together with data in this section, it may be possible to correct any malfunction which may occur in the system.

TROUBLE SHOOTING PROCEDURE BASICALLY CONSISTS OF TWO CLASSIFICATIONS: MECHANICAL AND HYDRAULIC,

MECHANICAL CHECKS

Prior to checking any part of the system from a hydraulic standpoint, the following mechanical checks should be made:

1. A check should be made to be sure all control lever linkage is properly connected and adjusted at all connecting points.
2. Check shift levers and rods for binding or restrictions in travel that would prevent full engagement. Shift levers by hand at transmission case, if full engagement cannot be obtained, difficulty may be in control cover and valve assembly.

HYDRAULIC CHECKS

Before checking on the torque converter, transmission, and allied hydraulic system for pressures and rate of oil flow, it is essential that the following preliminary checks be made:

1. Check oil level in transmission. This should be done with engine running at idle (500–600 RPM) and with oil temperature of 180° F to 200° F. DO NOT ATTEMPT THESE CHECKS WITH COLD OIL. To bring the oil temperature to this specification it is necessary to either work the machine or "stall" out the converter. Where the former means is impractical, the latter means should be employed as follows:
   A. Engage shift levers in forward and fourth speed and apply brakes. Accelerate engine half to three-quarter throttle.
   B. Hold stall until desired converter outlet temperature is reached. CAUTION: FULL THROTTLE STALL SPEEDS FOR AN EXCESSIVE TIME WILL OVERHEAT THE CONVERTER.

PRESSURE AND OIL FLOW CHECKS

Whenever improper performance is evident the following basic pressure and oil flow checks should be performed and recorded. It is also recommended that these checks be taken periodically as a preventative maintenance measure. Doing so will permit possible anticipation of difficulties in advance of actual breakdown, thus permitting scheduling of repair operation. Likewise repair of minor difficulties as they occur can be made at considerably less cost and downtime than when delayed until major and complete breakdowns occur.

Analyzing the results of these checks by comparison with specifications and with each other will indicate in most cases the basic item or assembly in the system as the source of difficulty. Further checking of that assembly will permit isolation of the specific cause for trouble.

(SEE PLUMBING AND CHECK POINT DIAGRAM.)

A. OIL PRESSURE AT CONVERTER OUT PORT

Install hydraulic pressure gauge at Converter Out connection on converter. Check and record oil pressure throughout entire working range from stall to maximum speed (engine at full throttle) (see instructions on Stalling Converter previously listed). Pressure must not go above 55 psi.

B. OIL PRESSURE AT CONVERTER IN PORT

Install hydraulic pressure gauge at Converter—In connection. Check and record oil pressure throughout entire working range from stall to maximum speed (engine at full throttle). Pressure must not go below 15psi or above 85 psi.

C. CONVERTER CHARGING PUMP OUTPUT

Install Schroeder Portable Tester in line between converter charging pump and oil filters.

Disconnect hose between pump and filter at filter end and using suitable fittings connect to pressure port of tester. Install hose between filter and tester, connecting same to reservoir port of tester.

DO NOT USE TESTER LOAD VALVE AT ANY TIME DURING TEST. When taking flow readings, all readings should be taken on the first (left) half of flow gauge. Whenever the needle shows on the right half of gauge, correct by switching to higher scale.

Flow check is to be performed with engine at 1200 RPM (NEW PUMP RATED 50 GPM at 2000 RPM or 30 GPM at 1200 RPM).

Pump output listed applies to a new pump in each case. A 20% tolerance for wear below this figure is permissible; However, when using check reading in final computation a similar reduction must be taken into consideration when establishing minimum flow permissible on Oil Flow into Oil Cooler. See pressure and Oil Flow Check Specifications.

D. OIL FLOW INTO COOLER

Install Schroeder Portable Tester in line between converter and Oil Cooler Inlet connection.

Disconnect hose at converter and connect to Reservoir Port of Tester.

Install hose between converter and tester, connecting same to Pressure Port of Tester.

DO NOT USE TESTER LOAD VALVE AT ANY TIME DURING TEST.

When taking flow readings, all readings should be taken on the first (left) half of flow gauge. Use green scale for this check.

CAUTION: Before making the following checks, set the parking brake. Some units may require disconnecting the control linkage from the control cover. This must be done as one shift lever must remain in neutral at all times while shifting the other.

Flow check is to be performed with engine at 1200 RPM. NOTE: Engine speed must not vary more than 25 RPM when taking flow readings.

Shift both levers in neutral, record flow reading, shift into each speed and direction position and record flow at each shift. Record flow in neutral between each shift. DO NOT shift more than one lever at a time. One lever must remain in neutral as explained above.

Oil flow indicated is based on pump output being equal to specifications indicated under "Converter Charging Pump Output." In no case should oil flow into cooler be less than converter pump output minus 6–1/2 GPM with one clutch engaged.

Rated pump capacity, 50 GPM at 2000 RPM or 30 GPM at 1200 RPM. A 20% tolerance for wear below this figure is permissible and must be taken into consideration when establishing oil flow checks.

NOTES

NOTES