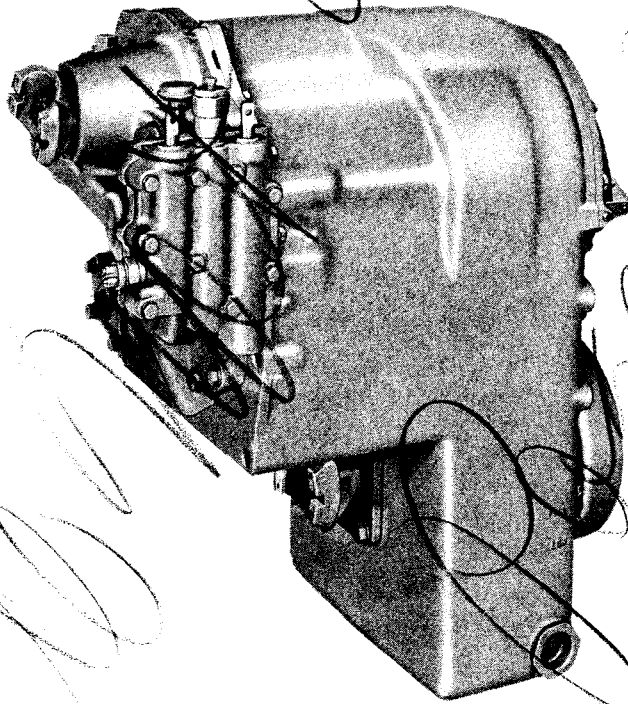


CLARK[®]

TRANSMISSION

MAINTENANCE & SERVICE MANUAL



R 28000 — SERIES — 4 SPEED

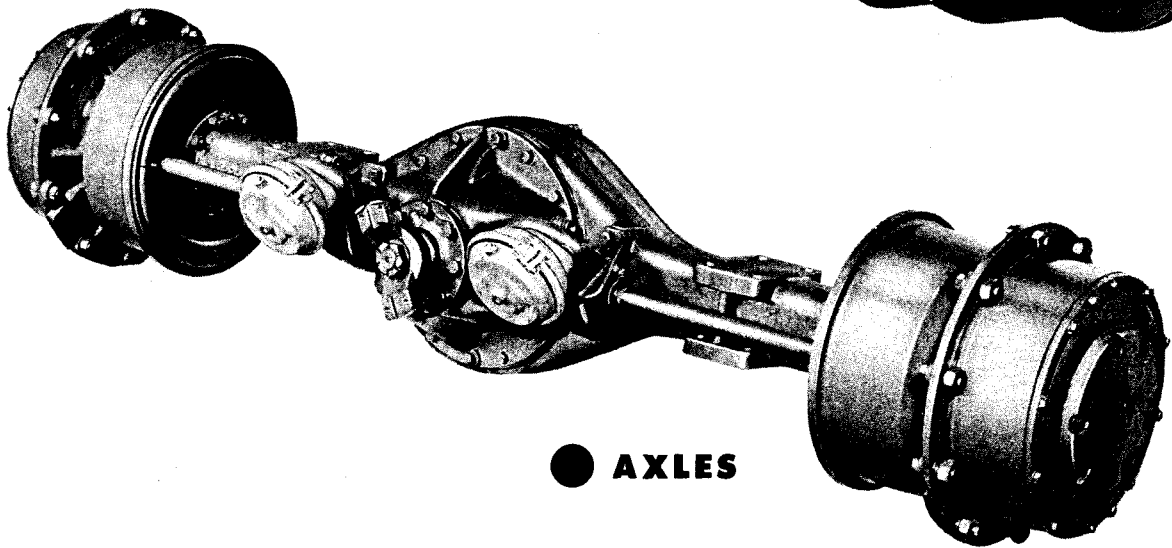
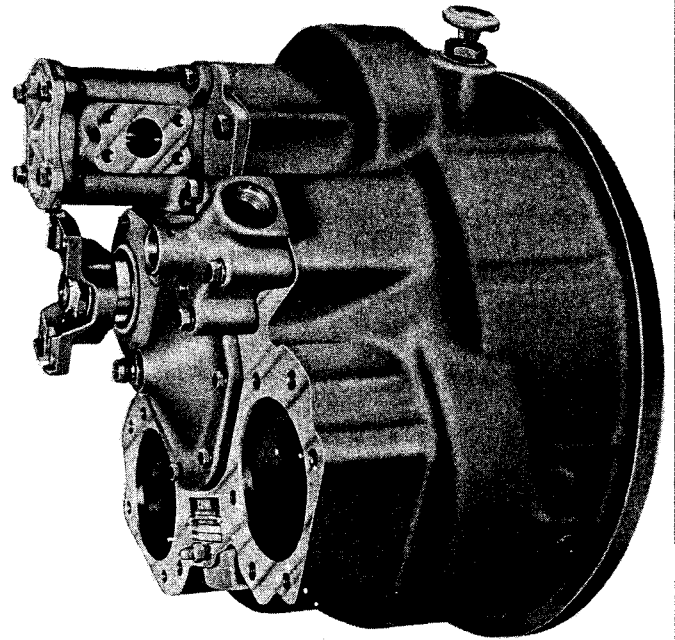
CLARK EQUIPMENT COMPANY

CUSTOMER SERVICE DIVISION

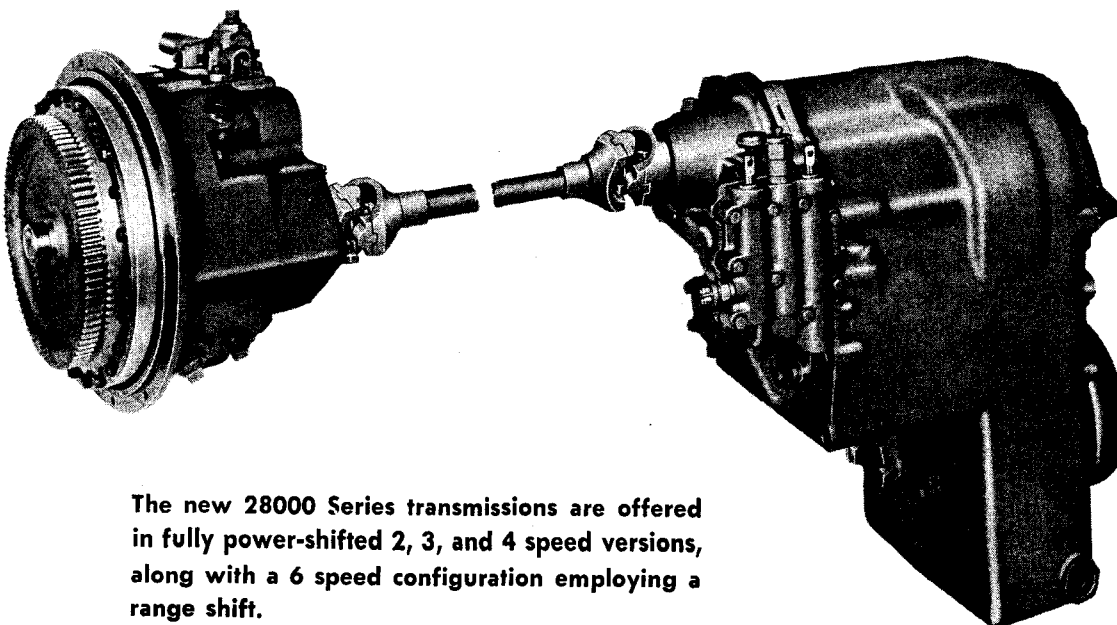
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● **TORQUE CONVERTERS
UP TO 1000 HORSEPOWER**

● **TRANSMISSIONS
UP TO 1000 HORSEPOWER**



● **AXLES**



The new 28000 Series transmissions are offered in fully power-shifted 2, 3, and 4 speed versions, along with a 6 speed configuration employing a range shift.

FOREWORD



This manual has been prepared to provide the customer and the maintenance personnel with information and instructions on the maintenance and repair of the **CLARK** Power Shift Transmission.

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, inspection 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 become familiar with the various parts of the transmission, 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.

Whenever repair or replacement of component parts is required, only Clark-approved parts as listed in the applicable parts manual should be used. Use of "will-fit" or non-approved parts may endanger proper operation and performance of the equipment. The Clark Equipment Company does not warrant repair or replacement parts, nor failures resulting from the use thereof, which are not supplied by or approved by the Clark Equipment Company. **IMPORTANT: Always furnish the Distributor with the transmission serial and model number when ordering parts.**

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TRANSMISSION ASSEMBLY

The transmission and hydraulic torque portion of the power train enacts an important role in transmitting engine power to the driving wheels. In order to properly maintain and service these units it is important to first understand their function and how they operate.

The transmission and torque converter function together and operate through a common hydraulic system. It is necessary to consider both units in the study of their function and operation.

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

Basic Design Silhouette.....	Fig. A
R-28000 Case and Front Cover Group.....	Fig. B
Four Speed Case and Clutch Group.....	Fig. C
Clutch Group.....	Fig. D
Control Valve.....	Fig. E
Axle Disconnect and Mechanical Parking Brake.....	Fig. F
Typical 28000 Cross Section.....	Fig. G
External Plumbing Diagram.....	Fig. H
Typical Four Speed Power Flow.....	Fig. I

The R, HR, and MHR Model Transmissions are of three basic designs.

The R Model consists of a separate torque converter, mounted to the engine with the powershift transmission remotely mounted and connected to the torque converter with a drive shaft.

The HR Model consists of a torque converter and powershifted transmission in one package mounted directly to the engine.

The MHR version is a mid-mount torque converter and transmission assembly connected to the engine by means of a drive shaft. (See Fig. A for basic design silhouette.)

The shift control valve assembly may be mounted directly on the side of the converter housing or front transmission cover, or remote mounted and connected to the transmission by means of flexible hoses. The function of the control valve assembly is to direct oil under pressure to the desired directional and speed clutch. A provision is made on certain models to neutralize the transmission when the brakes are applied. This is accomplished through use of a brake actuated shutoff valve. The speed and direction clutch assemblies are mounted inside the transmission case and are connected to the output shaft of the converter either by direct gearing or drive shaft. The purpose of the speed or directional clutches is to direct the power flow through the gear train to provide the desired speed range and direction.

An axle disconnect is optional and is located on the output shaft. The drive to the front or rear axle can be disconnected or connected by manual shifting.

HOW THE UNITS OPERATE

With the engine running, the converter charging pump draws oil from the transmission sump through the removable oil suction screen and directs it through the pressure regulating valve and oil filter.

The pressure regulating valve maintains pressure to the transmission control cover for actuating the direction and speed clutches. This requires a small portion of the total volume of oil used in the system. The remaining volume of oil is directed through the torque converter circuit to the oil cooler and returns to the transmission for positive lubrication. This regulator valve consists of a hardened valve spool operating in a closely fitted bore. The valve spool is spring loaded to hold the valve in a closed position. When a specific pressure is achieved, the valve spool works against the spring until a port is exposed along the side of the bore. This sequence of events provides the proper system pressure.

After entering the converter housing the oil is directed through the stator support to the converter blade cavity and exits in the passage between the turbine shaft and converter support. The oil then flows out of the converter to the oil cooler. After leaving the cooler, the oil is directed to a lubricating fitting on the transmission and through a series of tubes and passages lubricates the transmission bearings and clutches. The oil then gravity drains to the transmission sump.

The hydraulic torque converter consists basically of three elements and their related parts to multiply engine torque. The engine power is transmitted from the engine flywheel to the impeller element through the impeller cover. This element is the pump portion of the hydraulic torque converter and is the primary component which starts the oil flowing to the other components which results in torque multiplication. This element can be compared to a centrifugal pump in that it picks up fluid at its center and discharges at its outer diameter.

The torque converter turbine is mounted opposite the impeller and is connected to the output shaft of the torque converter. This element receives fluid at its outer diameter and discharges at its center. Fluid directed by the impeller out into the particular design of blading in the turbine and reaction member is the means by which the hydraulic torque converter multiplies torque.

The reaction member of the torque converter is located between and at the center or inner diameters of the impeller and turbine elements. Its function is to take the fluid which is exhausting from the inner portion of the turbine and change its direction to allow correct entry for recirculation into the impeller element.

The torque converter will multiply engine torque to its designed maximum multiplication ratio when the output shaft is at zero RPM. Therefore, we can say that as the output shaft is decreasing in speed the torque multiplication is increasing.

The shift control valve assembly consists of a valve body with selector valve spools. A detent ball and spring in the selector spool provides 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.

With the engine running and the directional control lever in neutral position, oil pressure from the regulating valve 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.

MAINTENANCE AND SERVICE

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. It must also be understood that this is a basic 28000 transmission with many options. Companion flanges and output shafts with and without disconnect assemblies may vary on spe-

cific models. The units are very similar to trouble shoot, disassemble, repair, and reassemble.

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

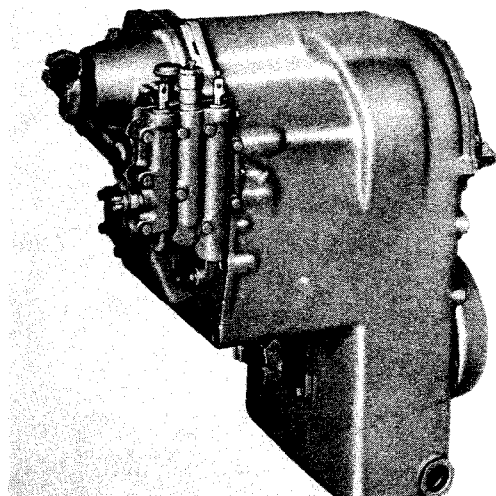


Figure 1
Side view of R 28000.

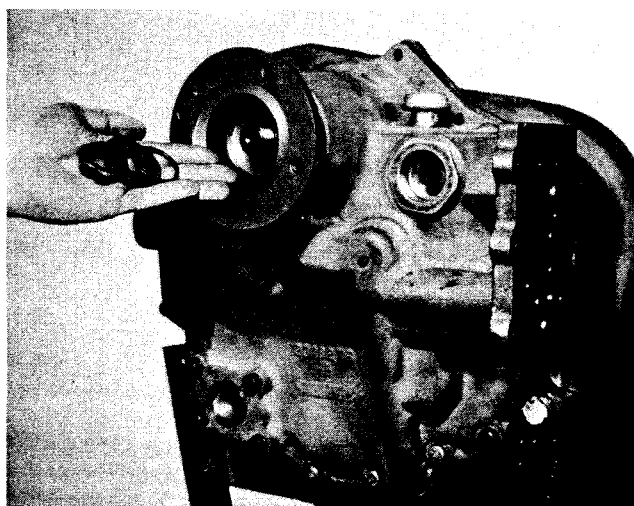


Figure 3
Remove companion flange nut, washer and "O" Ring.

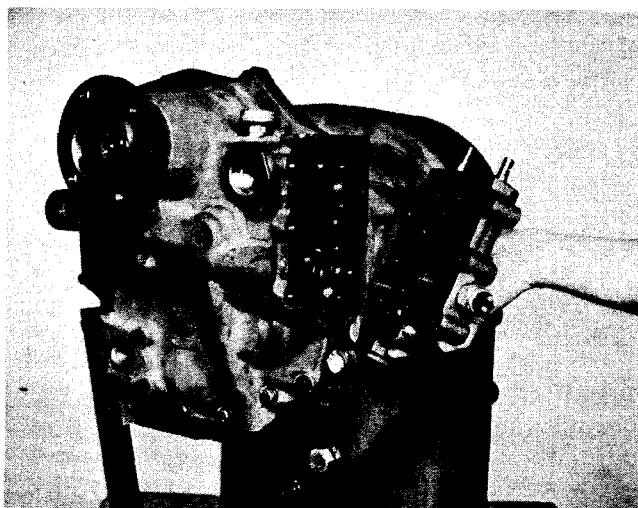


Figure 2
Remove control valve bolts and washers. Remove control valve. Use caution as not to lose detent springs and balls.

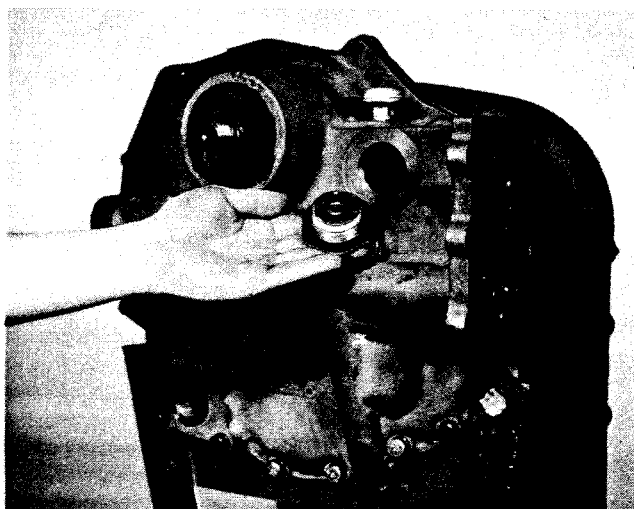


Figure 4
Remove front cover plug.

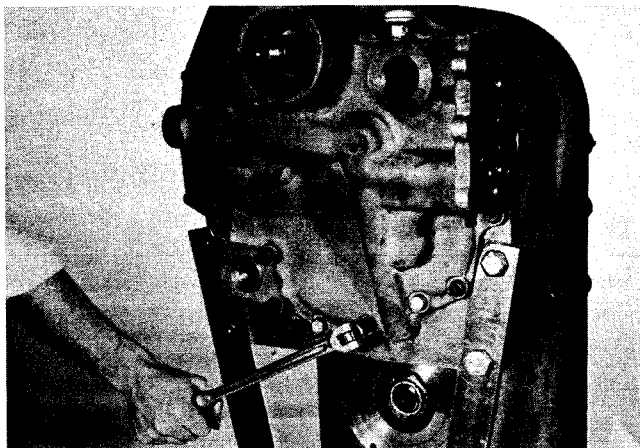


Figure 5

Remove bolts securing front cover to transmission housing.

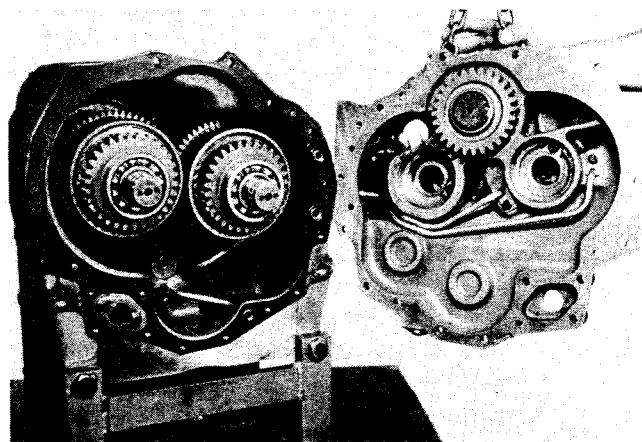


Figure 8

Front cover removed with forward and 2nd and reverse and 3rd clutch in transmission case.

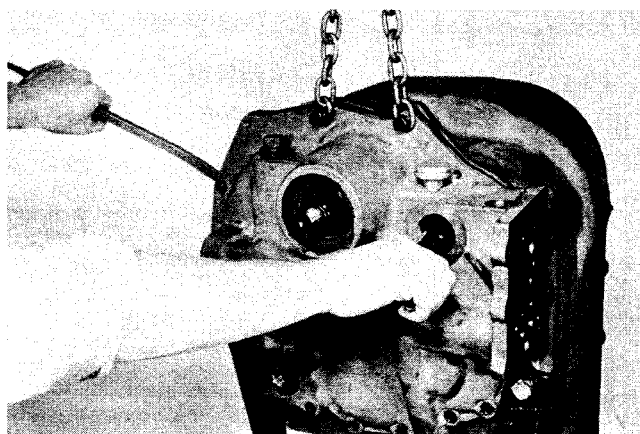


Figure 6

Support front cover with a chain fall. Using spreading type snap ring pliers, spread ears on forward clutch front bearing retaining ring. Holding snap ring open pry front cover from transmission housing.

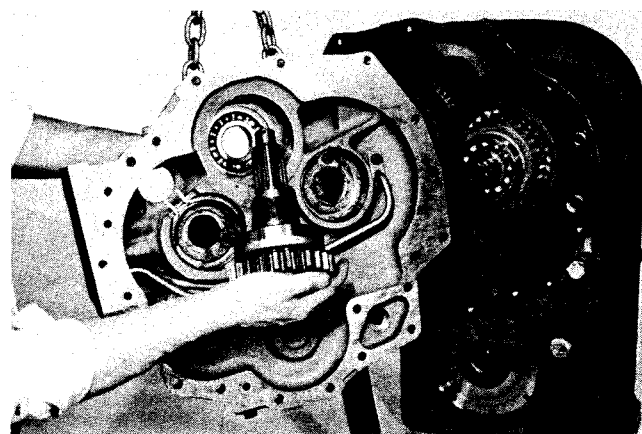


Figure 9

If input shaft is to be removed, tap on threaded end of shaft, remove input shaft, gear and bearing.

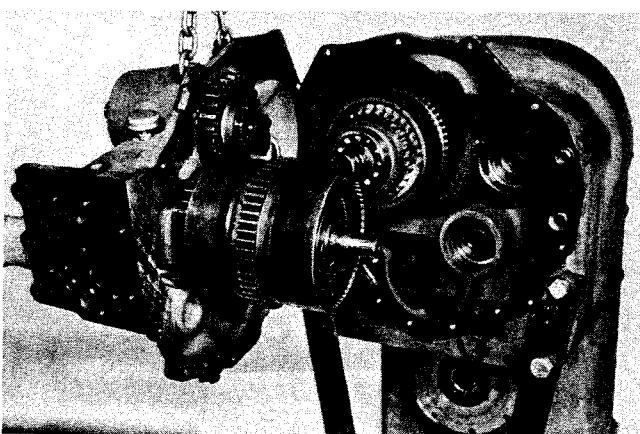


Figure 7

If forward and 2nd clutch comes out with front cover, spread ears on front bearing snap ring and separate clutch from front cover.

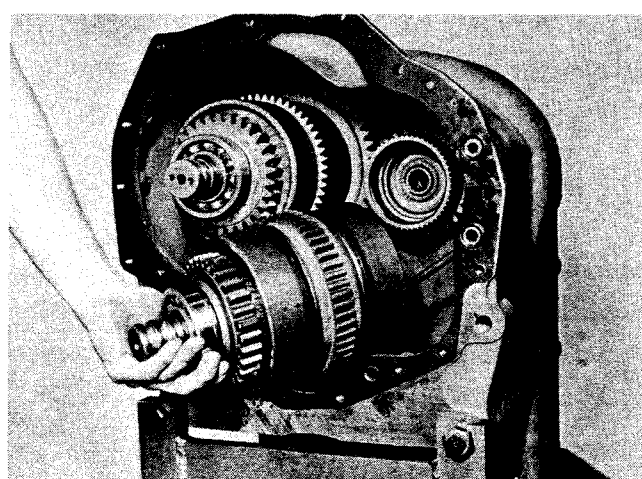


Figure 10

Remove forward and 2nd clutch assembly.

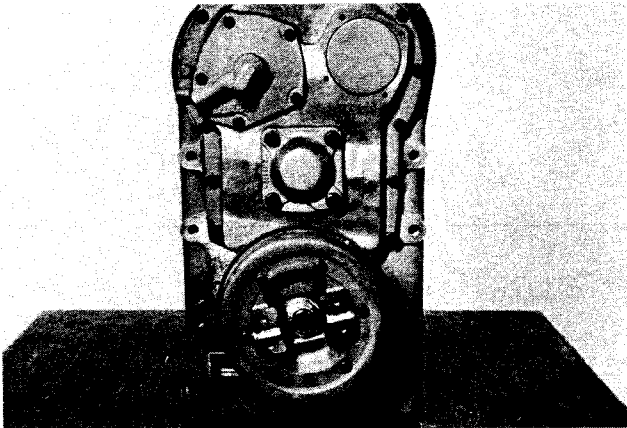


Figure 11

Rear view of transmission utilizing a mechanical parking brake option.

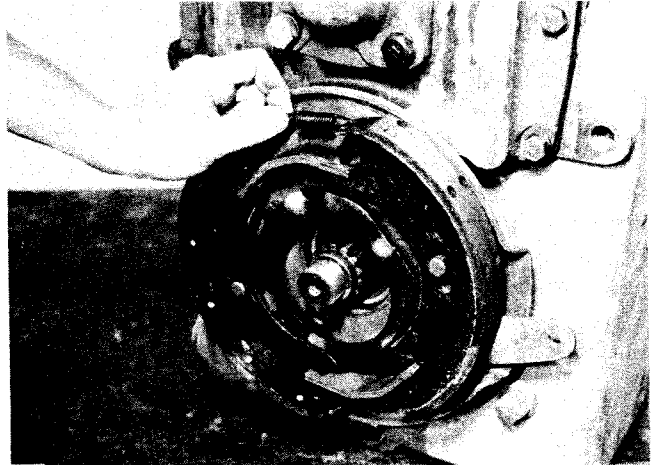


Figure 14

Remove upper and lower brake shoe return springs.

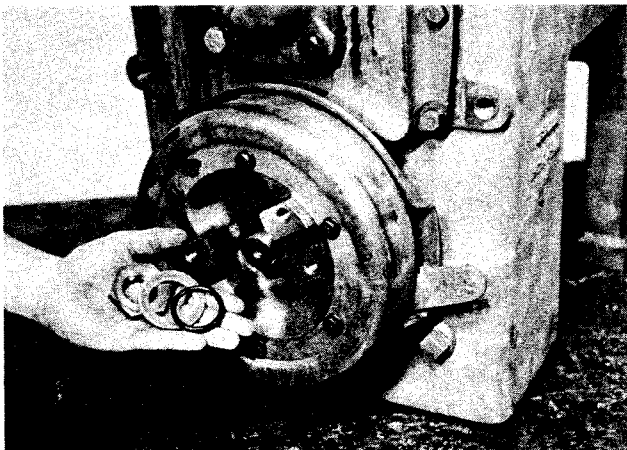


Figure 12

Remove output flange nut, washer and "O" ring. If parking brake is not used, remove companion flange and proceed to Figure 18.

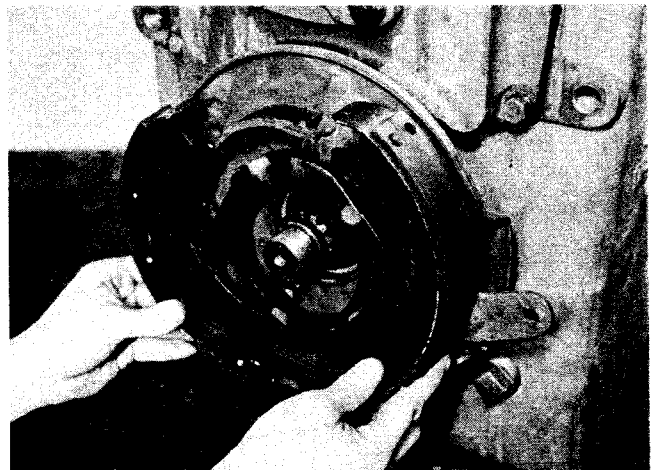


Figure 15

Remove brake shoes.

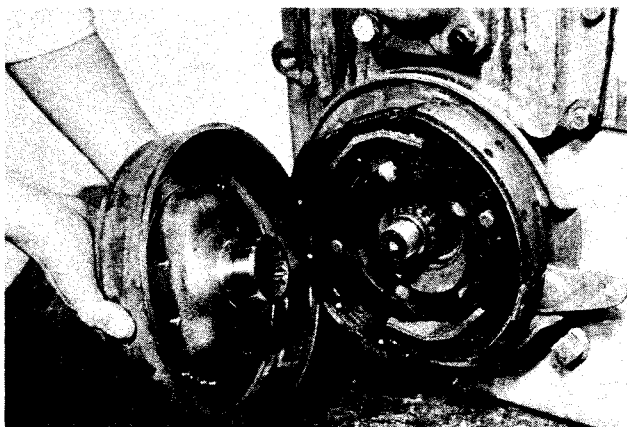


Figure 13

Remove parking brake drum and flange.

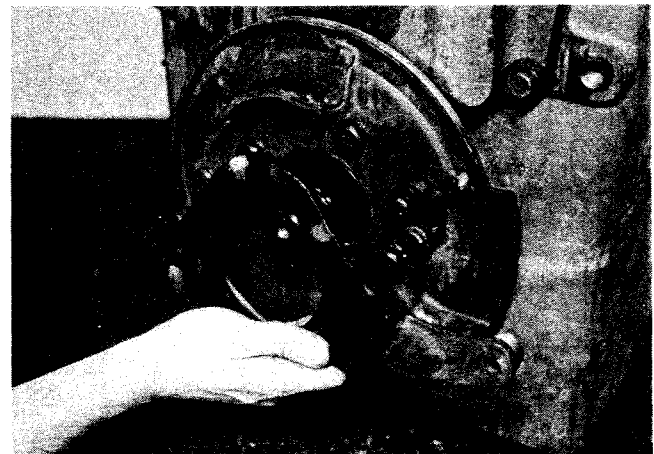


Figure 16

Remove brake actuator arm.

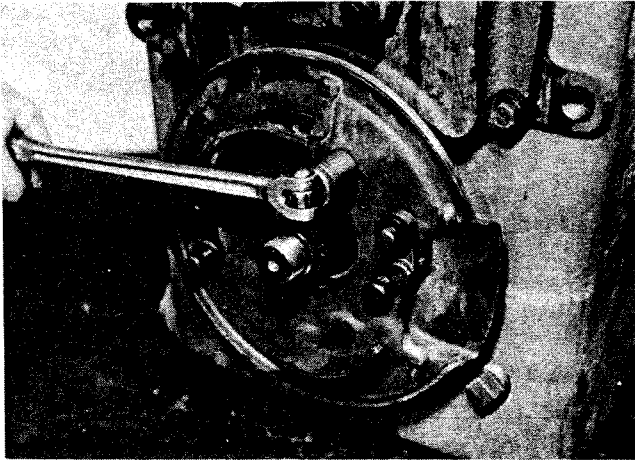


Figure 17
Remove brake backing plate bolts.

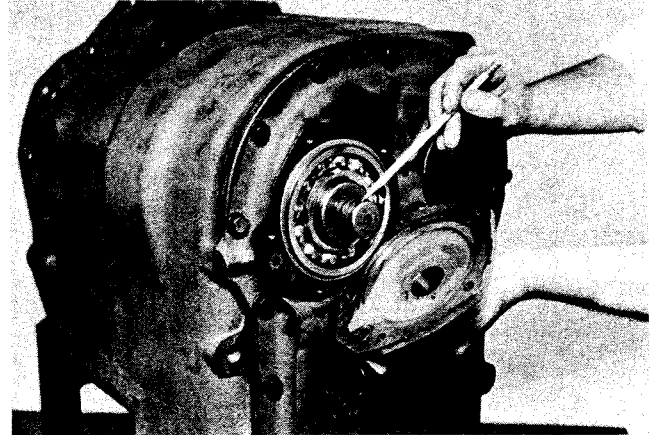


Figure 20
Remove low clutch rear bearing cap.

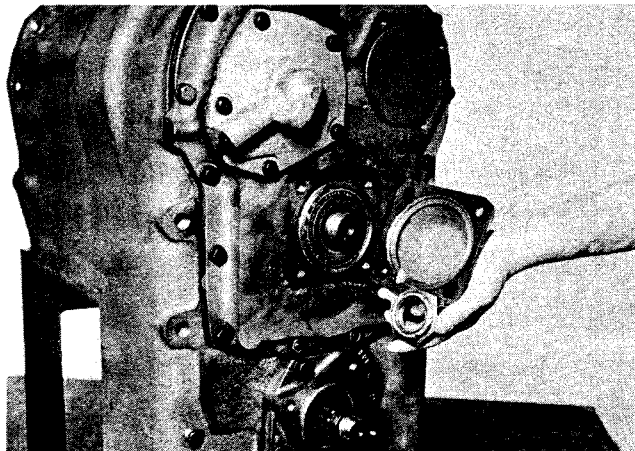


Figure 18
Remove idler shaft bearing cap bolts, bearing cap and idler shaft nut.

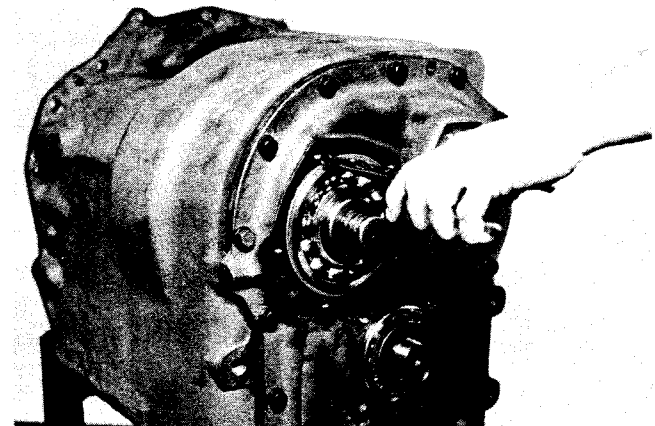


Figure 21
Remove low clutch rear bearing locating ring.

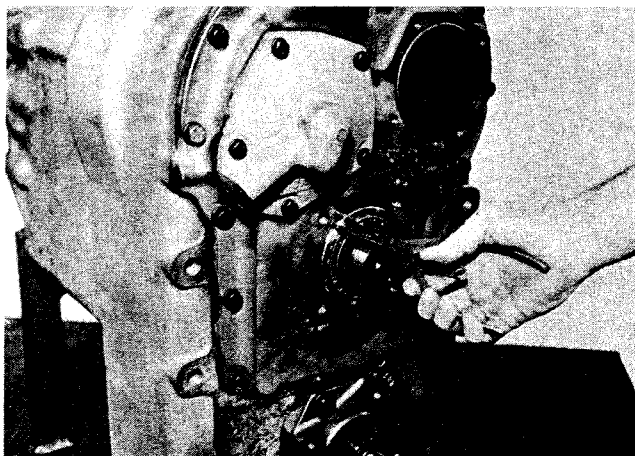


Figure 19
Remove idler shaft rear bearing locating ring.

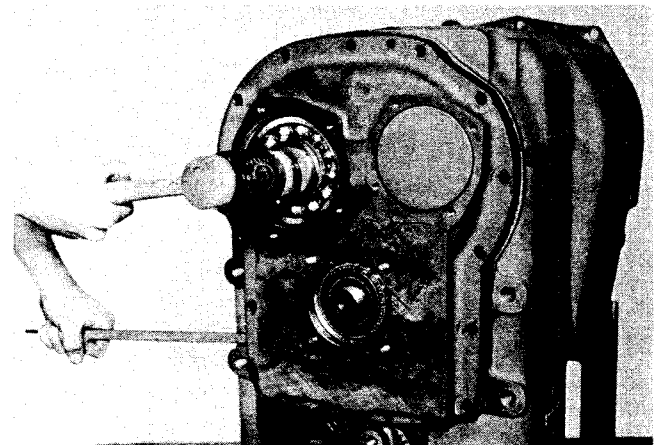


Figure 22
Remove rear cover bolts. Using pry slots provided, pry cover from transmission housing tapping on low clutch and idler shaft to allow cover to be removed without shaft binding.

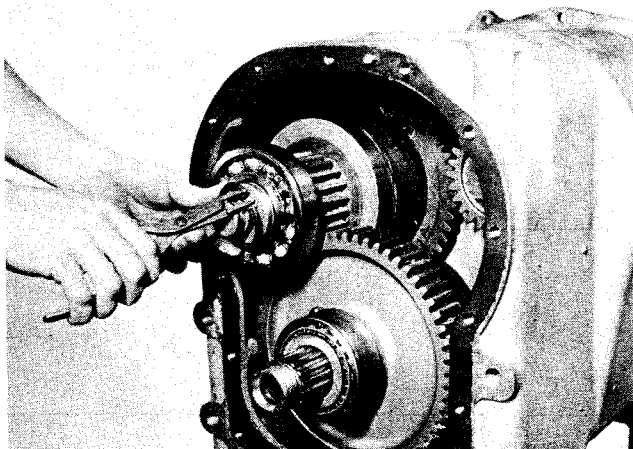


Figure 23

Remove low clutch rear bearing retaining ring.

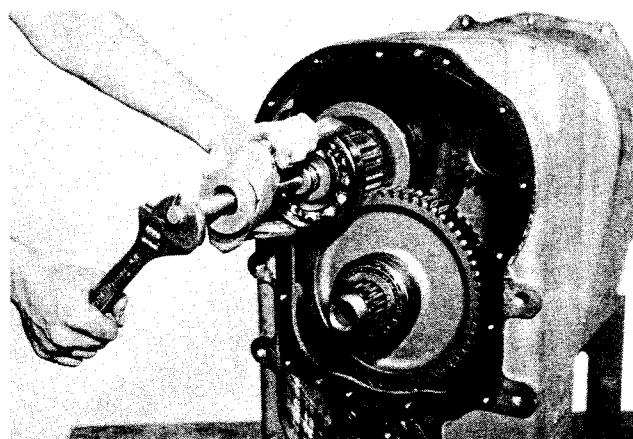


Figure 24

Remove low clutch rear bearing.

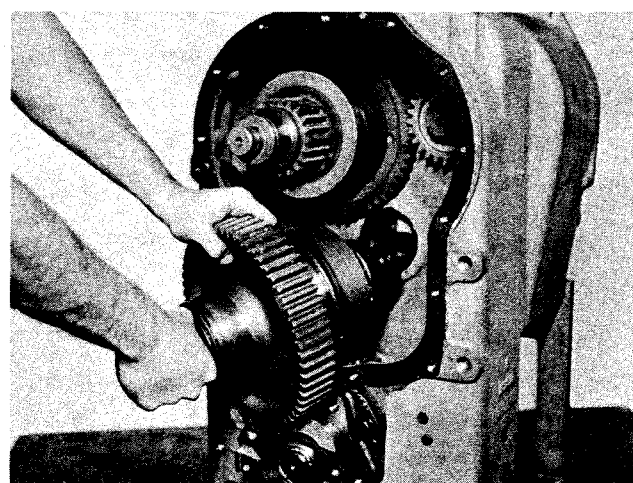


Figure 25

Remove idler shaft and 4th speed clutch from housing.
NOTE: Do not lose rear bearing lock ball.

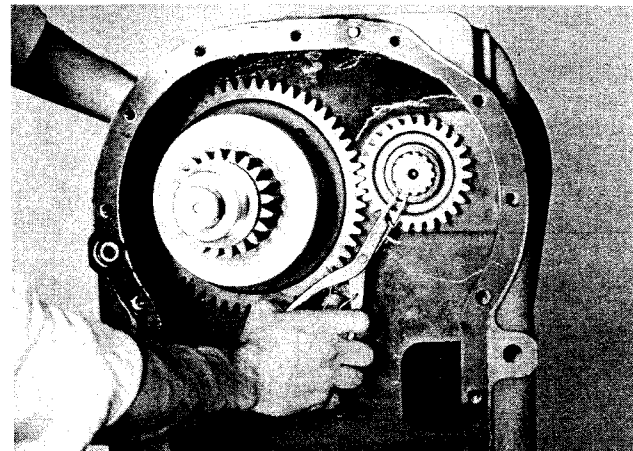


Figure 26

Remove low speed drive gear retainer ring and drive gear.

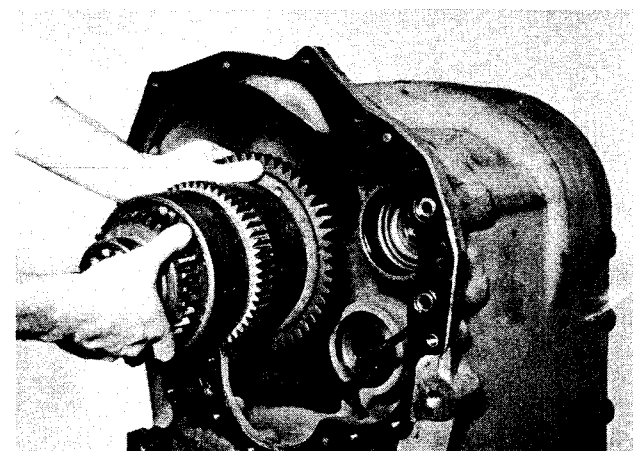


Figure 27

Remove reverse and 3rd clutch assembly.

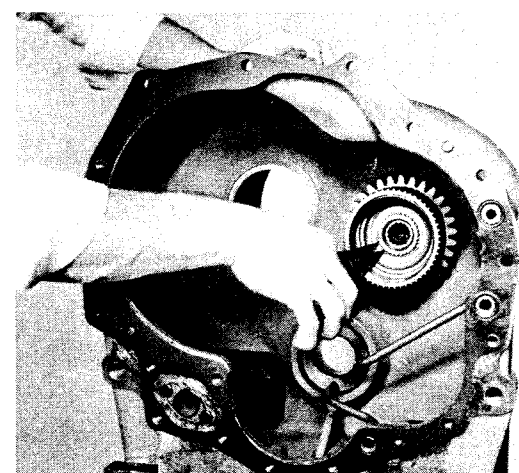


Figure 28

Remove 2nd gear retaining ring.

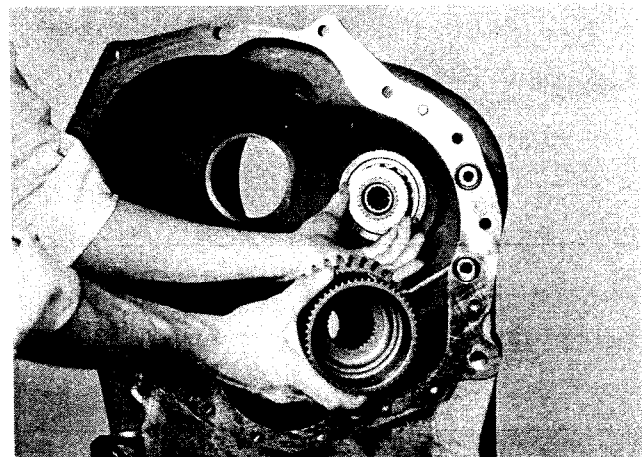


Figure 29
Remove 2nd gear and 2nd gear bearing end plate.

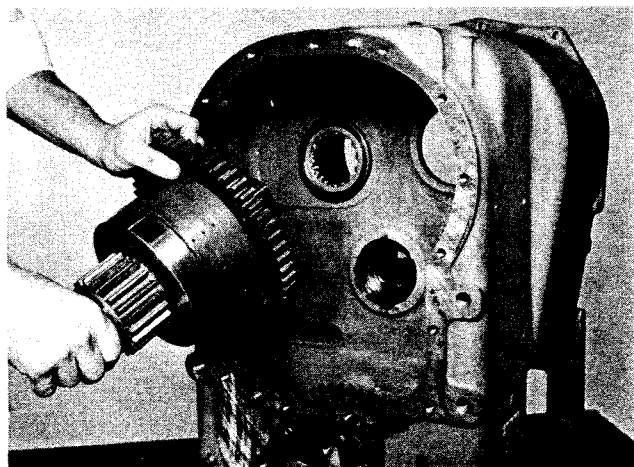


Figure 30
Remove low clutch assembly.

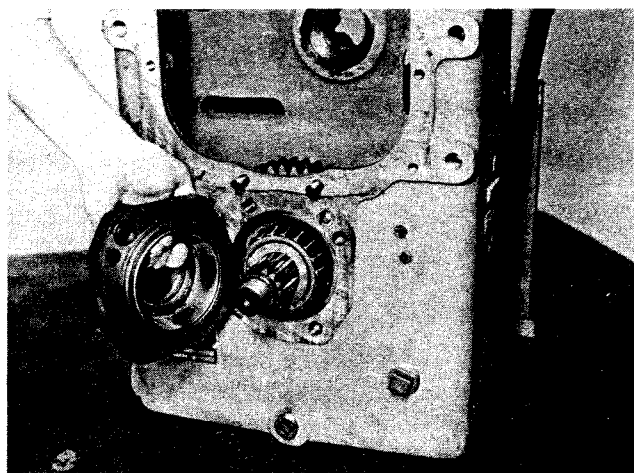


Figure 31
Remove rear output shaft bearing cap bolts and cap.

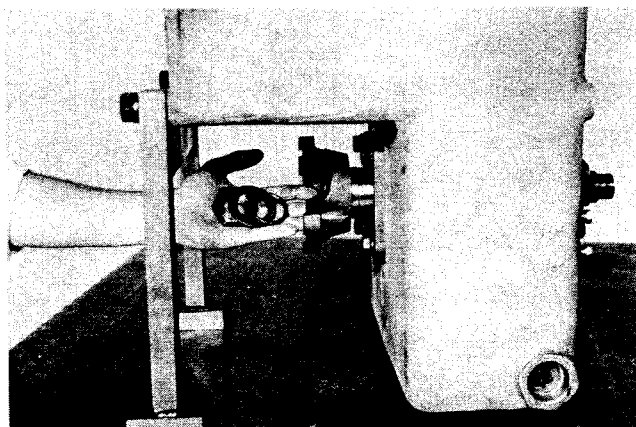


Figure 32
Remove front output flange nut, washer, "O" ring and companion flange.

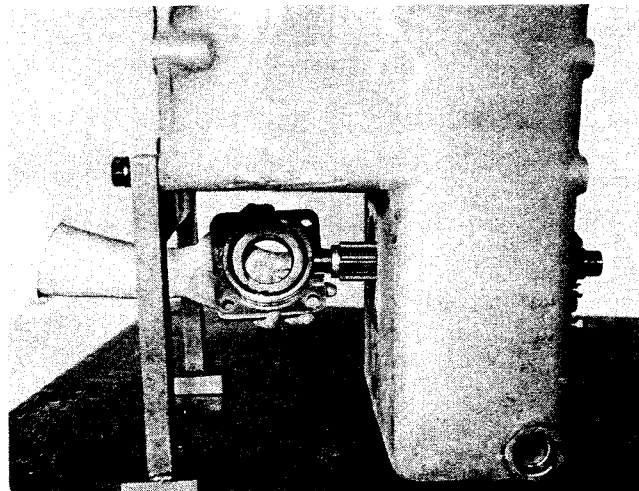


Figure 33
Remove output shaft front bearing cap bolts and cap.

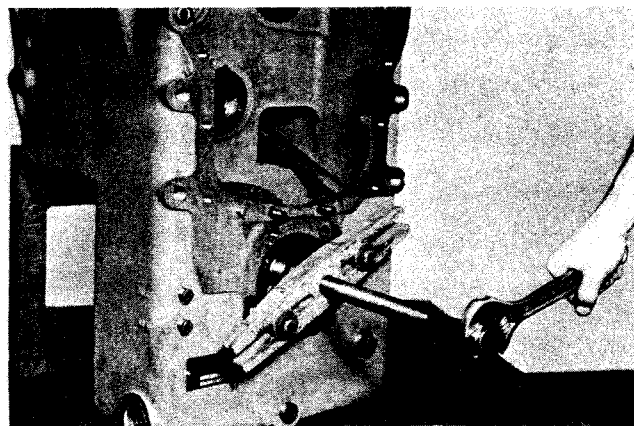


Figure 34
Block output gear. Push output shaft from rear through bearing and gear.

CLUTCH DISASSEMBLY

NOTE: DO NOT MIX THE BRONZE DISCS IN THE LOW CLUTCH WITH THE BRONZE DISCS OF ANY OF THE OTHER CLUTCHES. (SEE NOTE FOLLOWING FIGURE 71).

LOW CLUTCH DISASSEMBLY

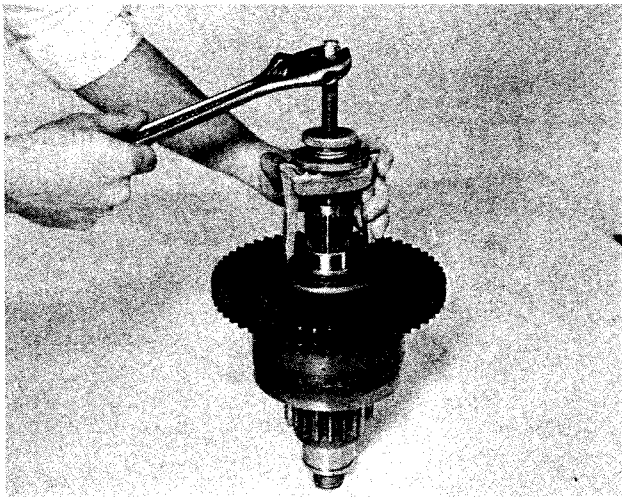


Figure 35

Remove low clutch shaft front bearing inner race.

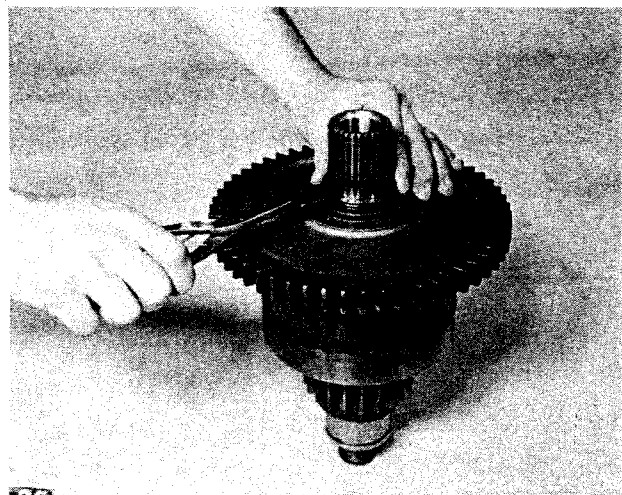


Figure 36

Remove low speed gear taper bearing retainer ring.

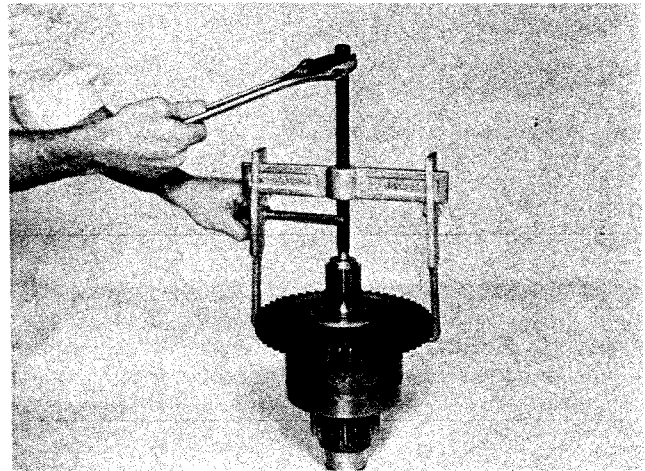


Figure 37

Remove low speed gear and outer taper bearing.

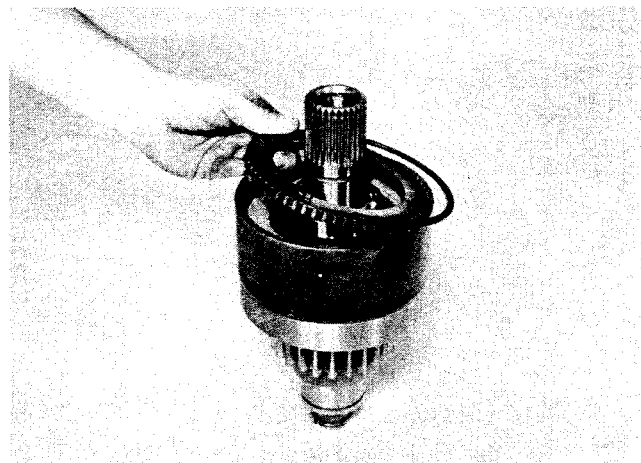


Figure 38

Remove clutch end plate retainer ring.
Remove clutch end plate and inner and outer clutch discs.

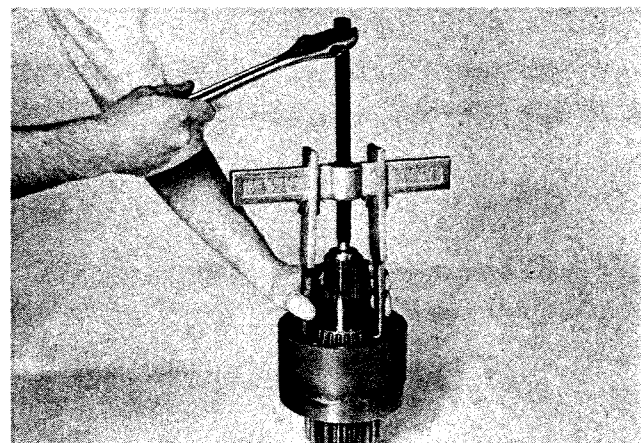


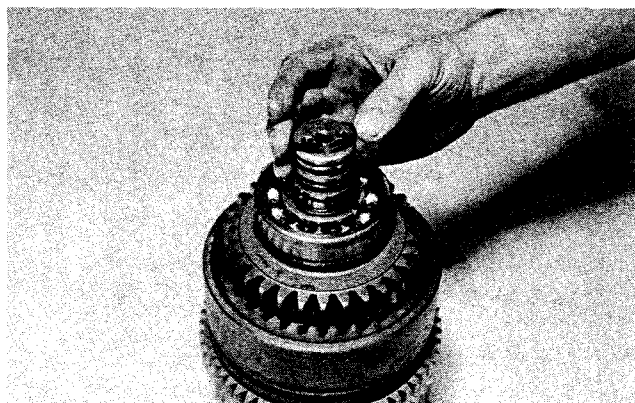
Figure 39

Remove low gear inner taper bearing.

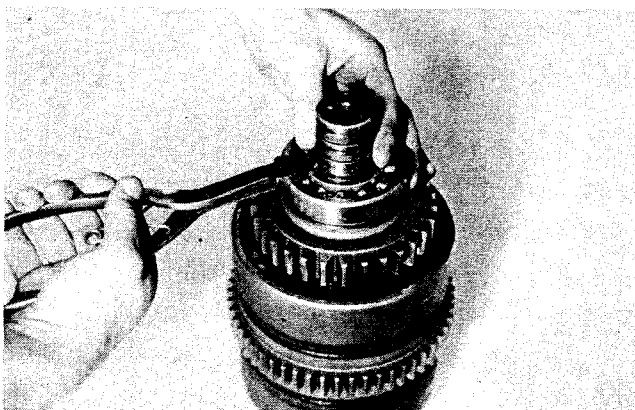

Figure 40

Remove clutch piston return spring. A sleeve with a portion removed is recommended for removing the clutch piston return spring, washer, and retainer ring. Sleeve shown is a common pipe, with a 1-1/2" wide x 1" high opening. The pipe is 6" long 3-1/4 O.D. 2-3/4 I.D. Compress spring retainer washer. Through opening remove spring retainer snap ring. Release tension on spring retainer. Remove spring retainer and spring. Turn clutch over and tap clutch shaft on a block of wood to remove clutch piston.

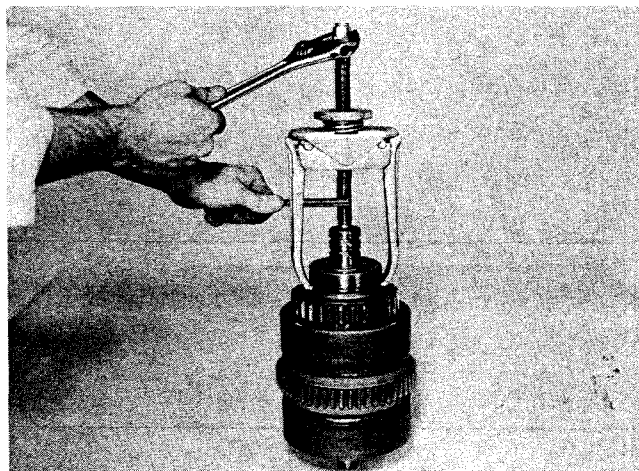
Forward and 2nd Clutch Disassembly


Figure 41

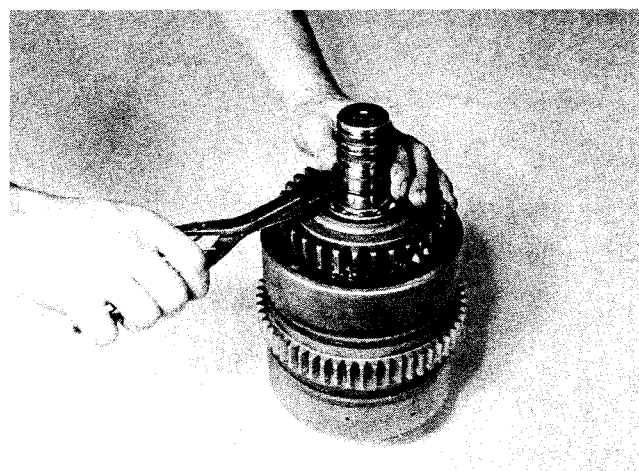
Remove clutch shaft piston rings.


Figure 42

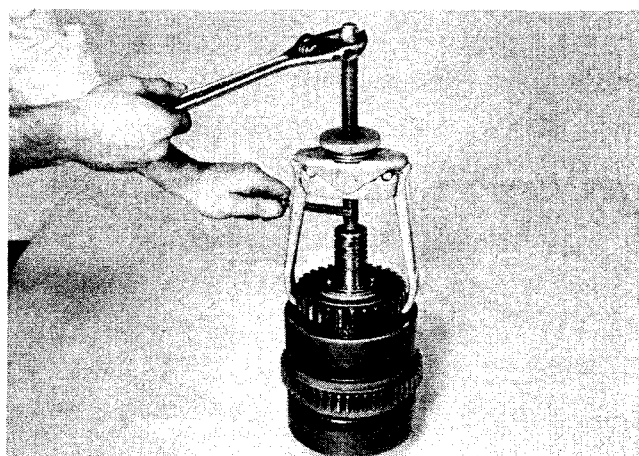
Remove front bearing retainer ring


Figure 43

Remove front bearing.


Figure 44

Remove front bearing locating ring.


Figure 45

Remove clutch driven gear and outer bearing.

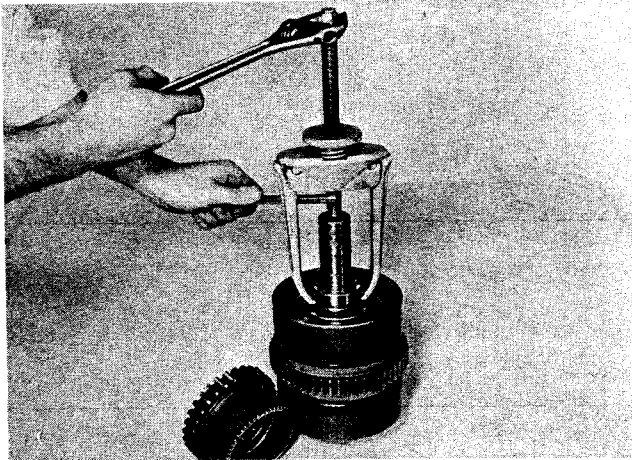


Figure 46
Remove inner bearing.

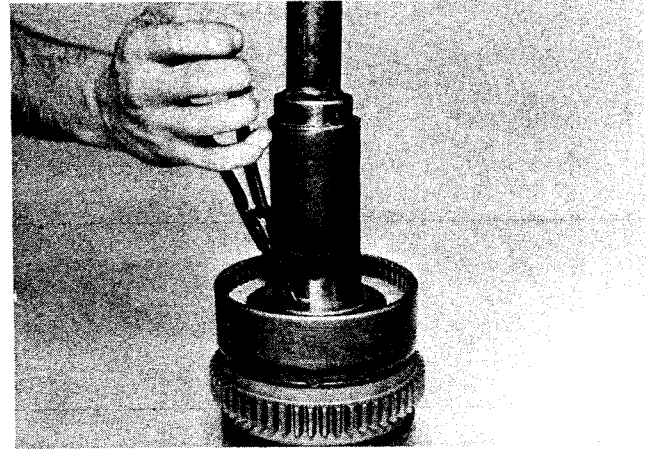


Figure 49
Compress return spring retainer. Remove retainer ring from groove.

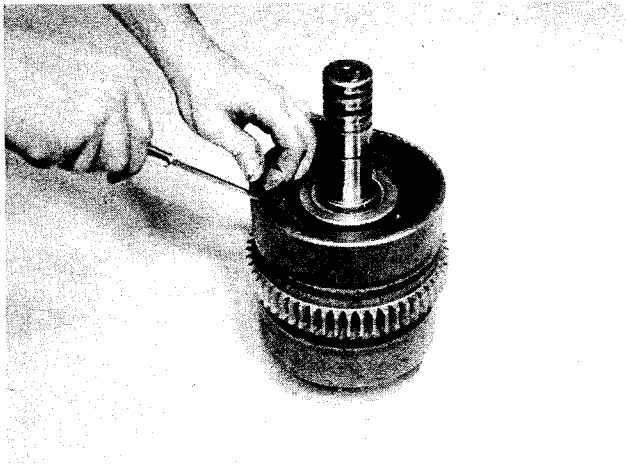


Figure 47
Remove end plate retainer ring.

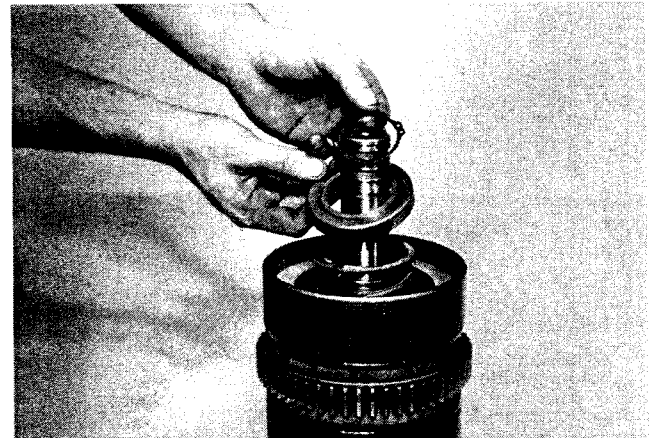


Figure 50
Relieve spring compression. Remove retainer ring, retainer and spring.

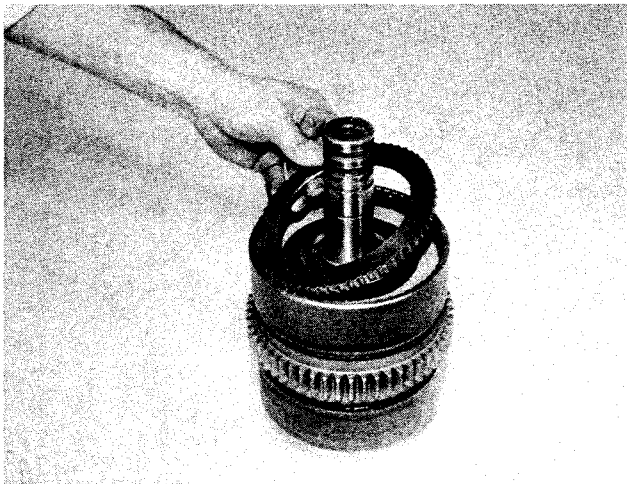


Figure 48
Remove end plate.

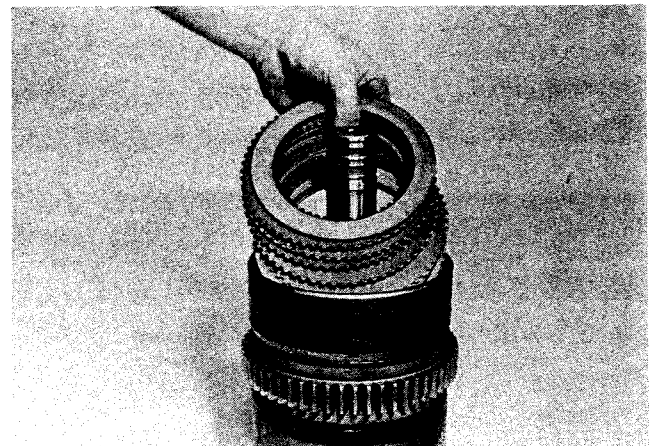


Figure 51 .
Remove inner and outer clutch discs. Turn clutch over and tap clutch shaft on a block of wood to remove clutch piston.

4th Clutch Disassembly

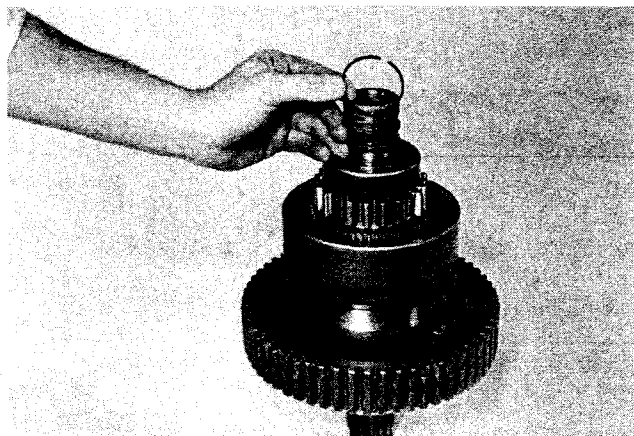


Figure 52
Remove clutch shaft piston rings.

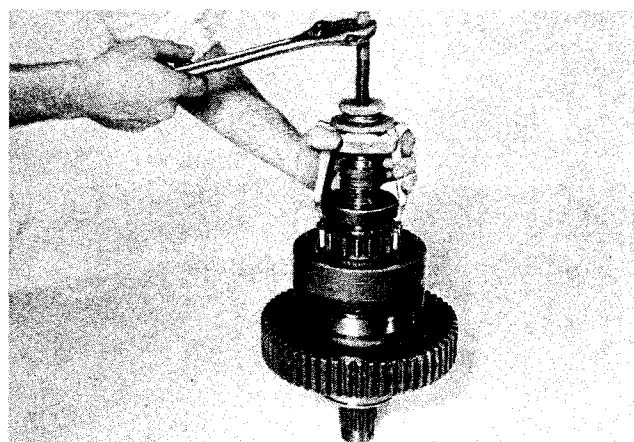


Figure 53
Remove front bearing retainer ring and front bearing.

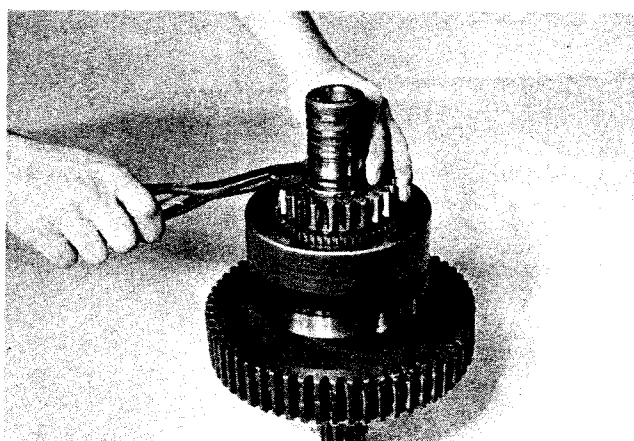


Figure 54
Remove front bearing locating ring.

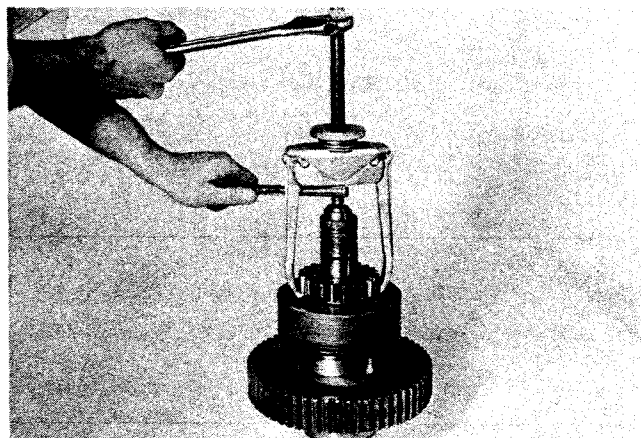


Figure 55
Remove 4th gear from clutch drum.

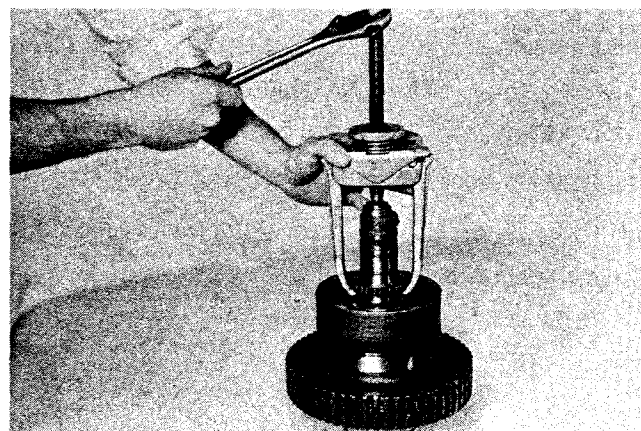


Figure 56
Remove inner bearing spacer and inner bearing. Disassemble clutch discs and piston as explained in Figure 47 through Figure 51.

CLEANING AND INSPECTION

CLEANING

Clean all parts thoroughly using solvent type cleaning fluid. It is recommended that parts be immersed in cleaning fluid and moved 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 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. Apply a thin coat of Permatex No. 2 on the outer diameter of the oil seal to assure an oil tight fit into the retainer. 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 recommended type 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

Forward and 2nd Clutch Reassembly

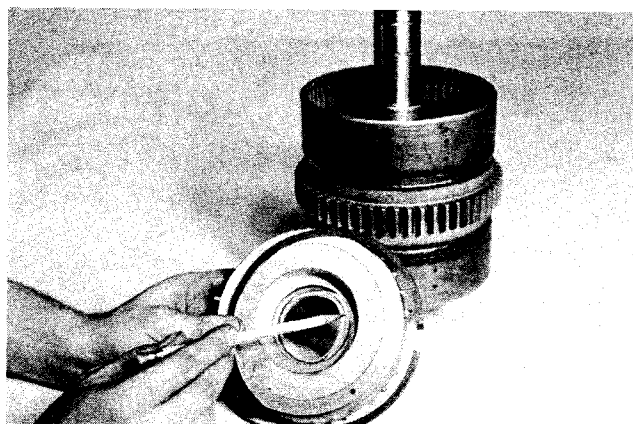


Figure 57

Install new clutch piston inner and outer sealing rings.

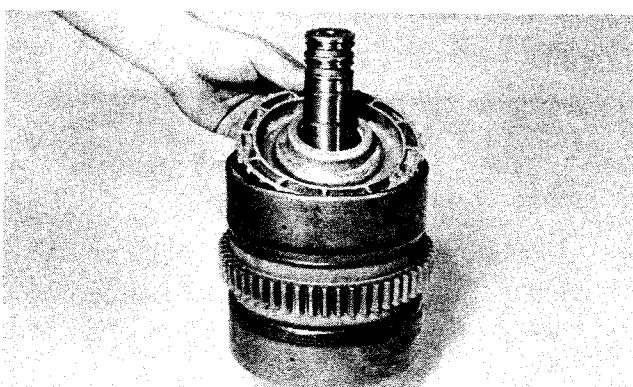


Figure 58

Insert clutch piston in clutch drum. Use caution as not to damage sealing rings.

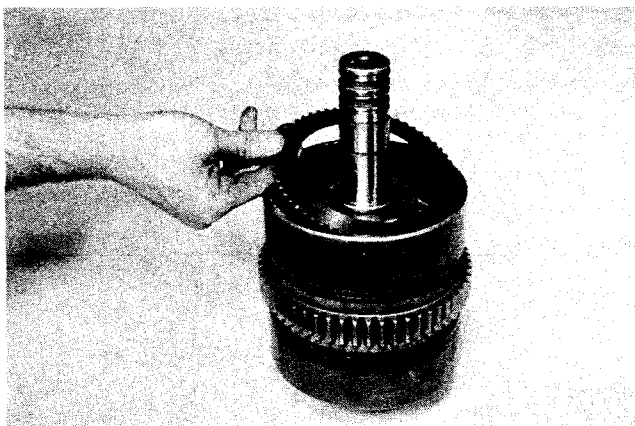


Figure 59

Install clutch piston return spring, spring retainer and retainer snap ring. Insert one steel disc.

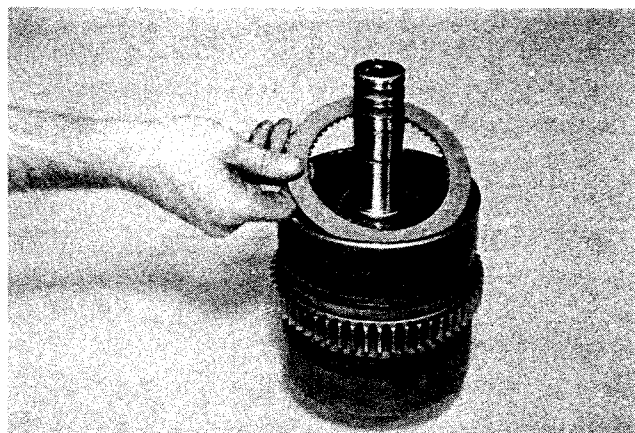


Figure 60

Install one bronze disc. Alternate steel and bronze discs until the proper amount of discs are installed. First disc next to the piston is steel, last disc installed is bronze.

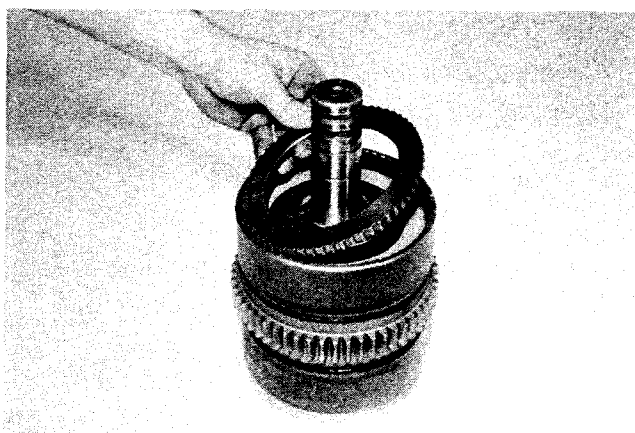


Figure 61
Install end plate.

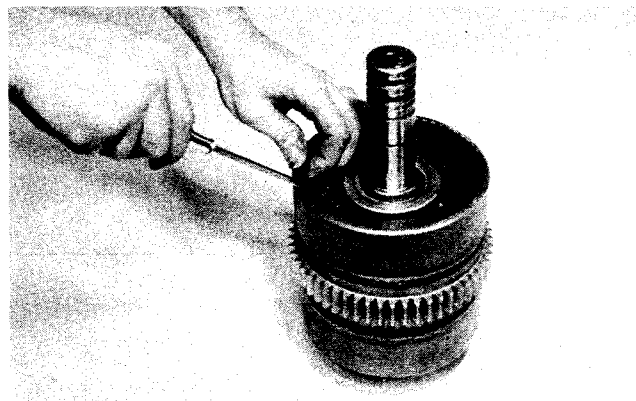


Figure 62
Install end plate retainer ring.

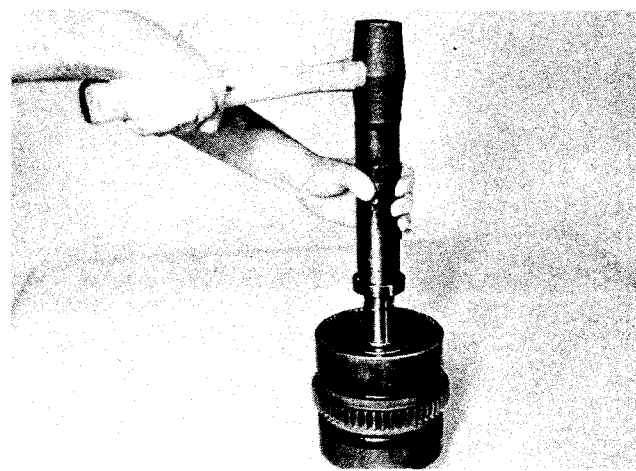


Figure 63
Install clutch driven gear inner bearing.

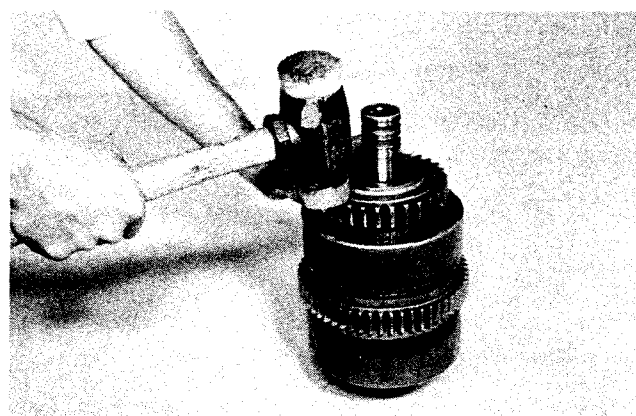


Figure 64
Install clutch driven gear into clutch drum. Align splines on clutch gear with internal teeth of bronze discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all bronze discs.

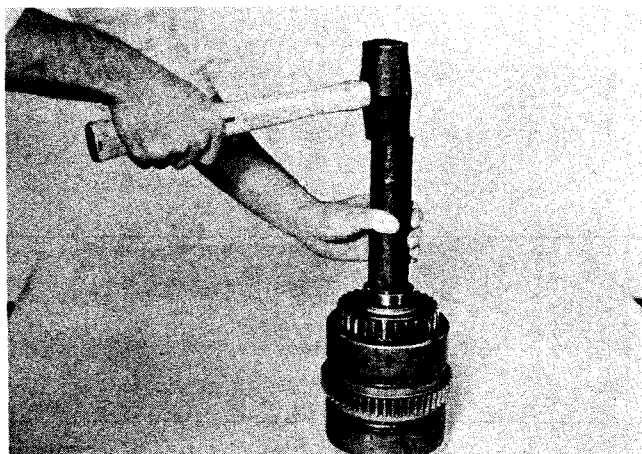


Figure 65
Install driven gear outer bearing.

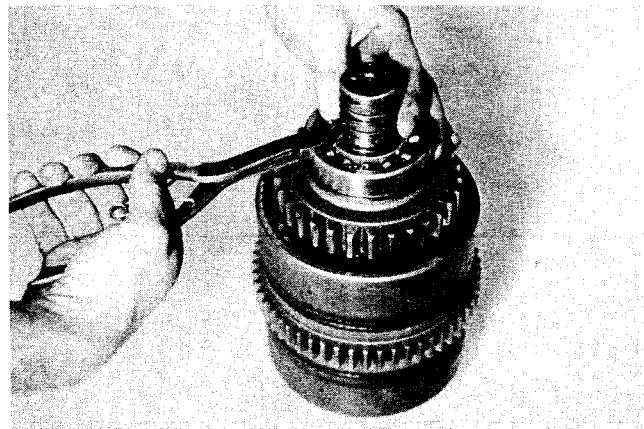


Figure 68
Install front bearing retaining ring.

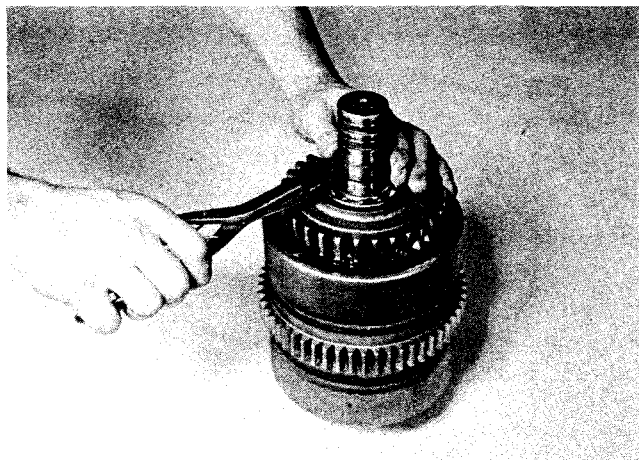


Figure 66
Install front bearing locating ring.

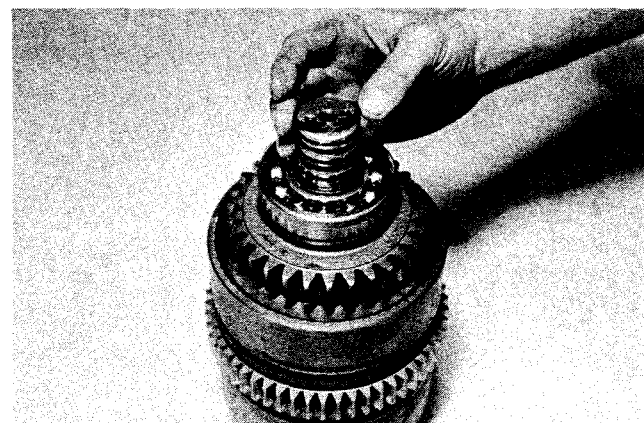


Figure 69
Install clutch shaft oil sealing rings. Grease rings to facilitate reassembly into front housings.

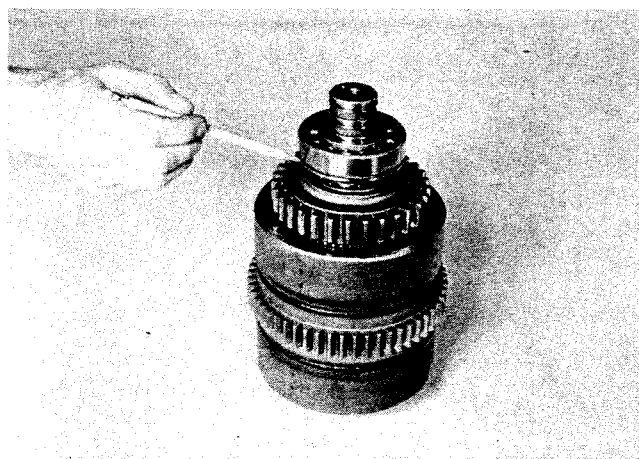


Figure 67
Install front bearing. **NOTE:** Snap ring groove in front bearing must be down.

LOW CLUTCH REASSEMBLY



Figure 70
Install new clutch piston inner and outer sealing ring. Insert piston into clutch drum using caution as not to damage seals. Position piston return spring, spring retainer and retainer snap ring. Compress spring and retainer and install snap ring.

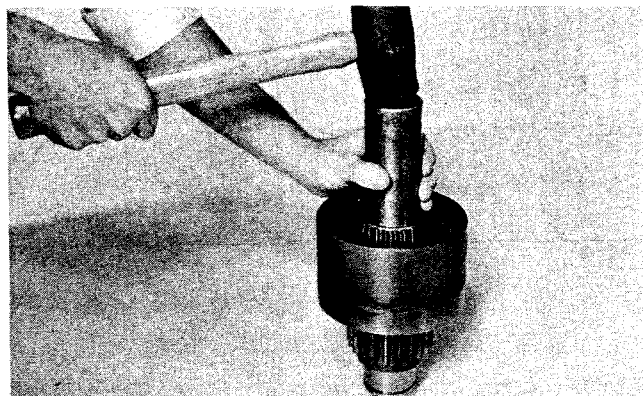


Figure 71

Install low gear inner taper bearing.

Install one steel disc.

Install one bronze disc. **NOTE:** The bronze discs in the low clutch has a higher co-efficient rating than the bronze discs in the other clutches, therefore the discs must not be mixed. Alternate steel and bronze discs until the proper amount of discs are installed. First disc next to the piston is steel, last disc installed is bronze.

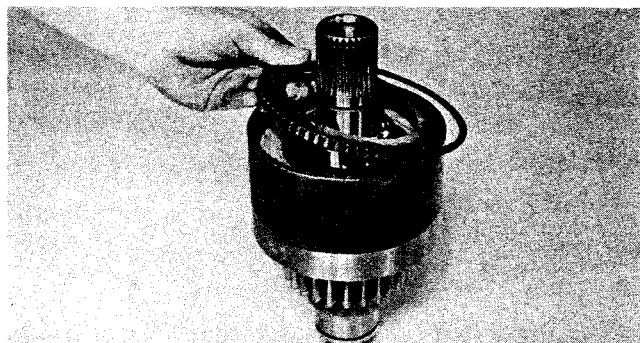


Figure 72

Install end plate and retainer ring.

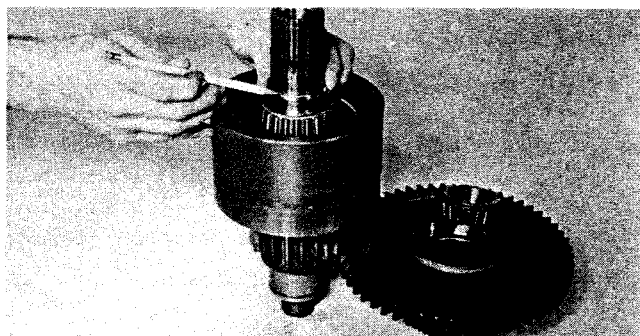


Figure 73

Install low clutch taper bearing spacer. **NOTE:** When installing the 3rd gear in the 3rd speed clutch a bearing spacer is used between the inner and outer 3rd gear bearing also.

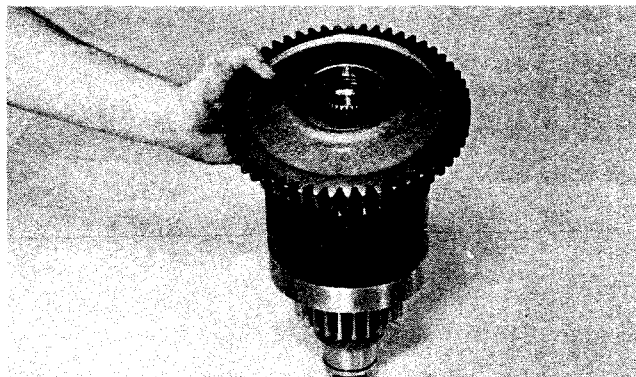


Figure 74

Install low gear into clutch drum. Align splines on low gear with internal teeth of bronze discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all bronze discs.

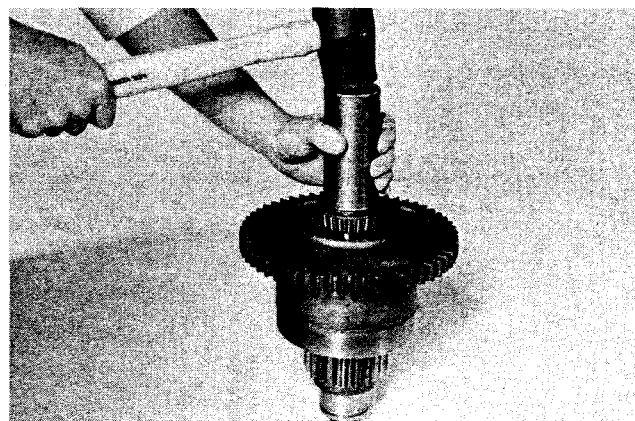


Figure 75

Install low gear outer taper bearing

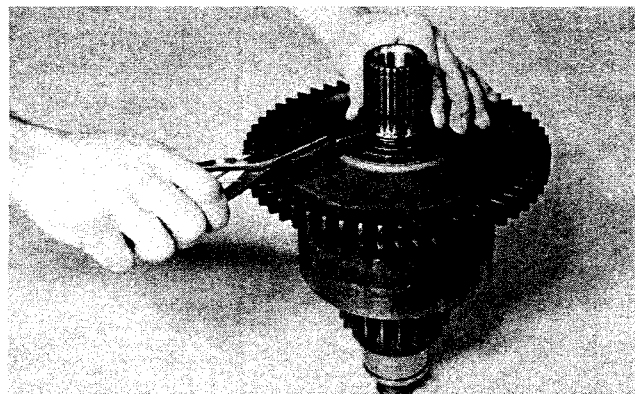


Figure 76

Install low clutch taper bearing retainer ring. **NOTE:** Retainer ring is selected at assembly for proper thickness. Variable thickness rings are used in snap ring grooves to assure proper taper bearing tightness.

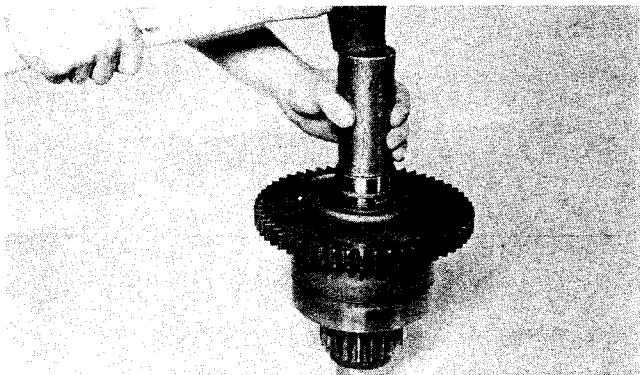


Figure 77

Install low clutch shaft front bearing inner race with large diameter of race down.

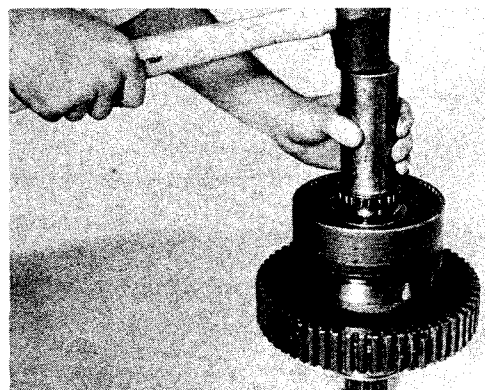


Figure 78

Install piston, piston return spring and inner and outer discs as explained in Fig. 57 through Fig. 62
Install 4th speed gear inner bearing.

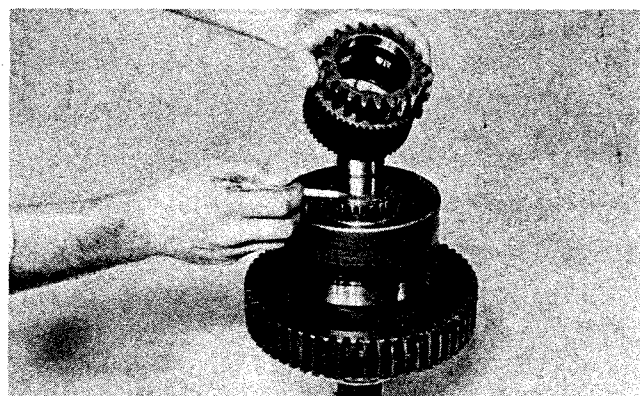


Figure 79

Install bearing spacer between inner and outer 4th speed gear bearings.

Install 4th speed gear into clutch drum. Align splines on clutch gear with internal teeth of bronze discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all bronze discs.

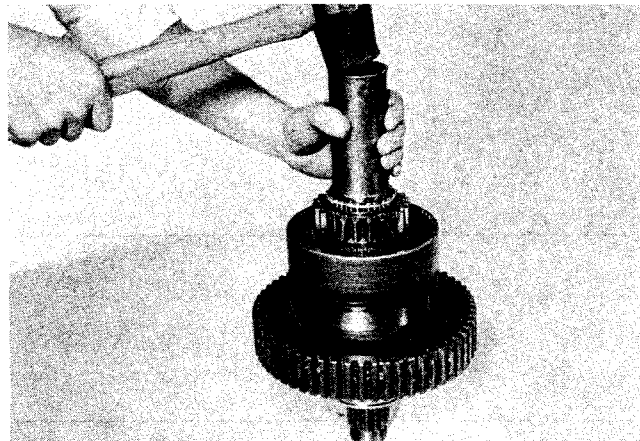


Figure 80

Install 4th speed gear outer bearing. It is recommended a rubber band be used to hold outer bearing rollers in position when installing bearing.

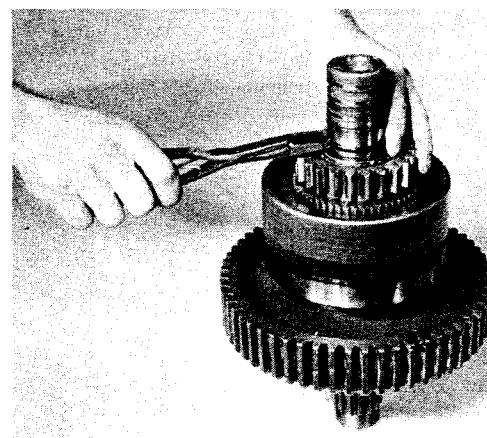


Figure 81

Install front bearing locating ring.

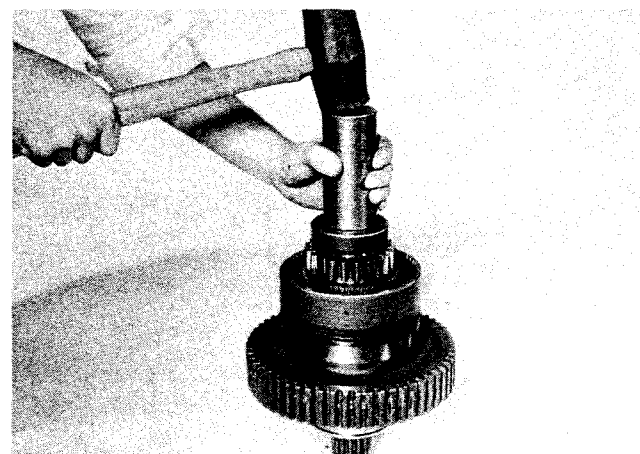


Figure 82

Install front bearing and bearing retainer ring.

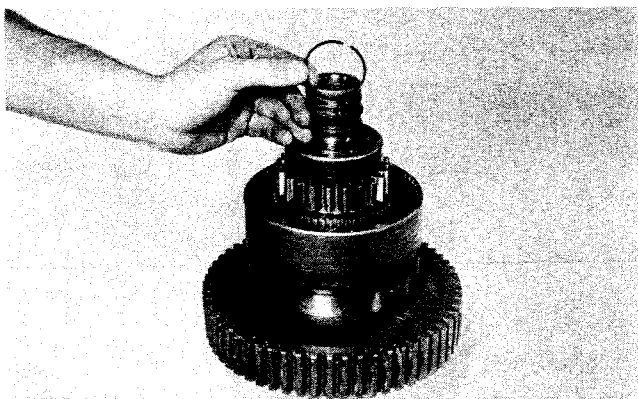


Figure 83
Install clutch shaft piston rings.

REASSEMBLY OF THE OUTPUT SHAFT

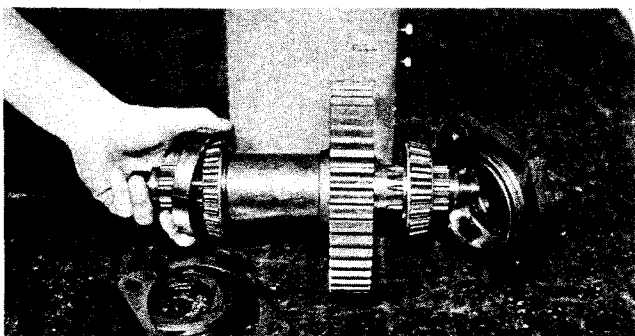


Figure 84
View of output shaft as it would be positioned in transmission case. Note front cone bearing shouldered on shaft with large diameter of bearing in.

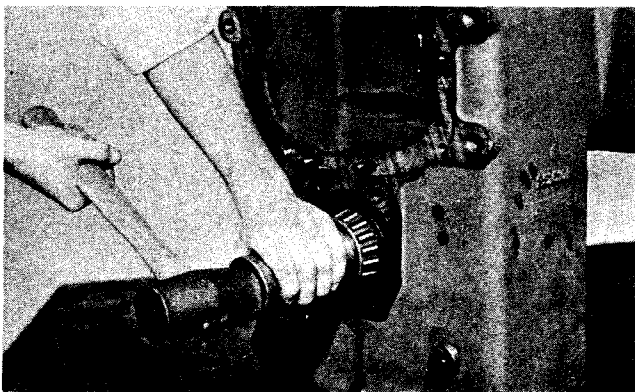


Figure 85
Position output gear in transmission case with protruding hub toward front of case. See Fig. 84. Insert output shaft, gear spacer and taper bearing from front of case and through output gear. Install front taper bearing cup. Block output shaft and install rear taper bearing with large diameter in.

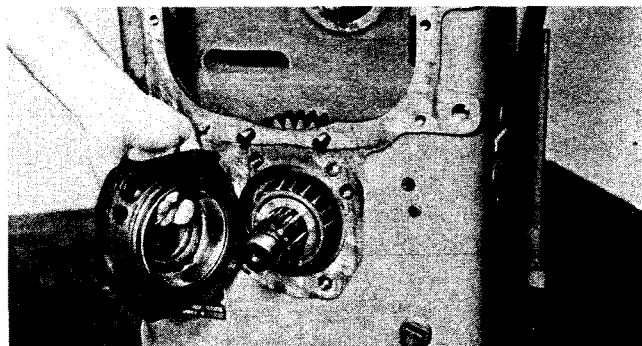


Figure 86
Using new "O" rings install rear output bearing cap and taper bearing cup on transmission case. Lube opening in bearing cap must be aligned with lube opening in case. Tighten bearing cap bolts to specified torque. (See torque chart.)



Figure 87
Install front bearing cap and shims. Tighten bolts to specified torque. Tap output shaft front and rear to seat taper bearings. Loosen front bearing cap bolts.

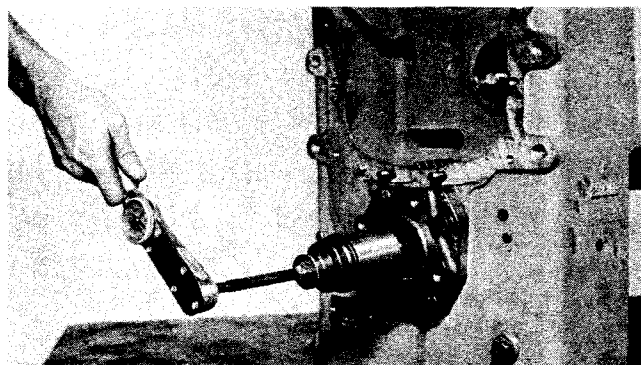


Figure 88
Using an inch lb. torque wrench, determine the rolling torque of the output shaft and record. Tighten front bearing cap bolts to specified torque. Check rolling torque with bolts tight. Torque must be 6 to 8 inch lbs. more than when bearing cap bolts were loose. Add or omit shims on the front bearing cap to achieve the proper preload.

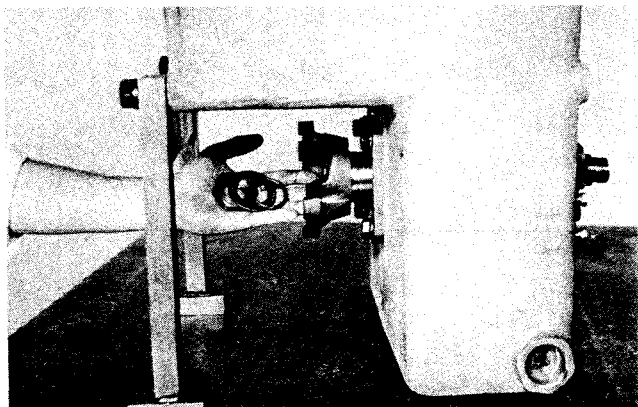


Figure 89

Install output shaft front companion flange, flange "O" ring, washer and flange nut. Block output gear. Tighten nut 200 to 250 ft. lbs. torque.

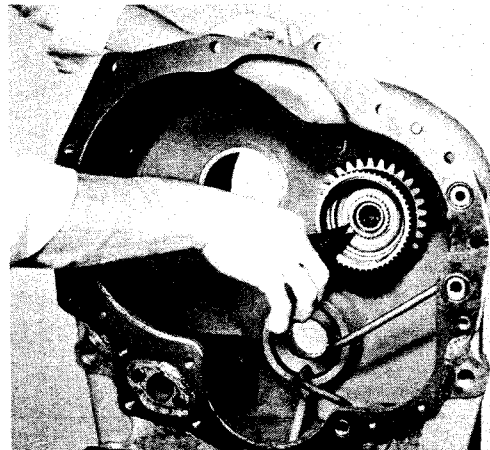


Figure 92

Install 2nd speed gear retainer ring.

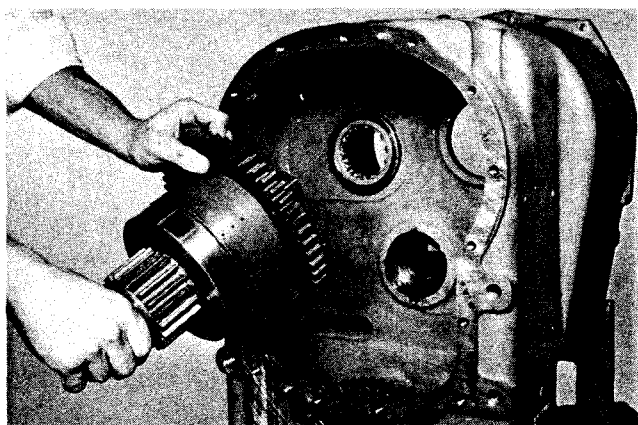


Figure 90

From the rear of the transmission case install the low clutch assembly.

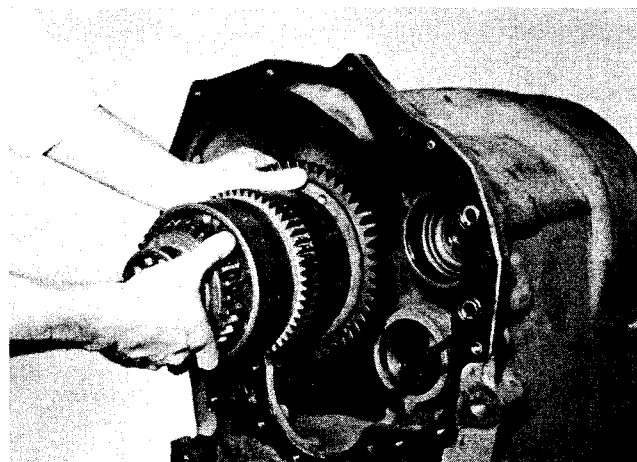


Figure 93

From the front of the transmission case install the reverse and 3rd clutch assembly.

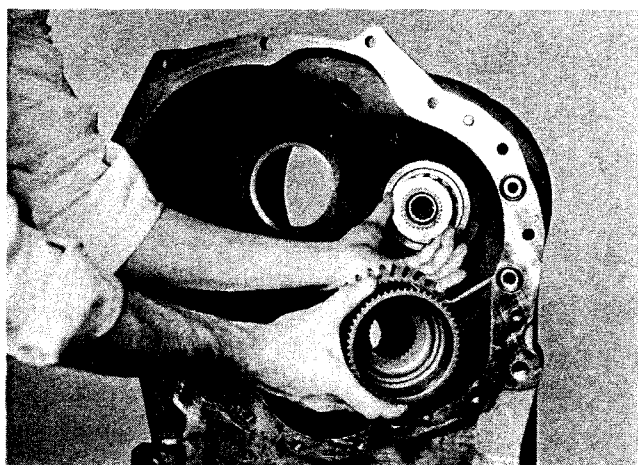


Figure 91

Install 2nd speed bearing end plate and 2nd speed gear on low clutch shaft.

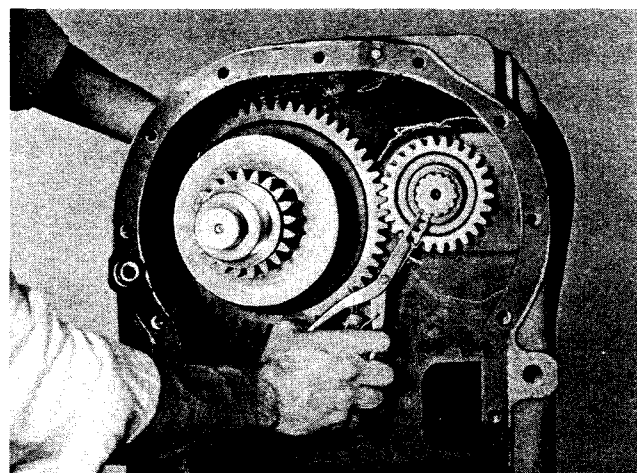


Figure 94

Install low speed drive gear and retainer ring.

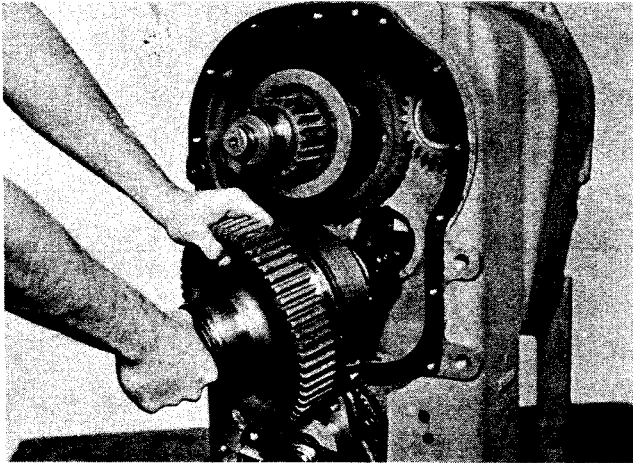


Figure 95

Install idler shaft and 4th speed clutch assembly.

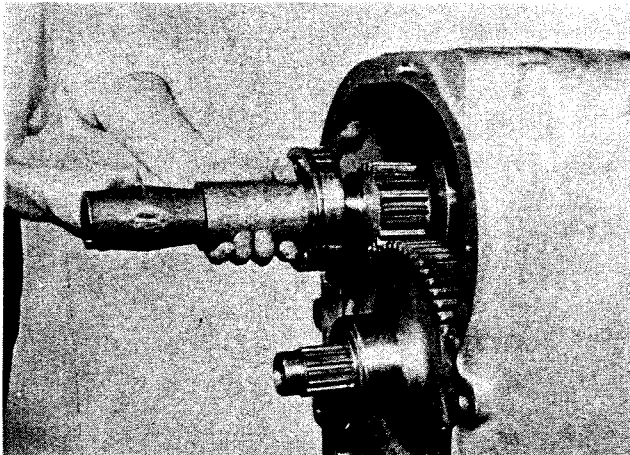


Figure 96

Install low clutch rear bearing with bearing ring groove to the rear.

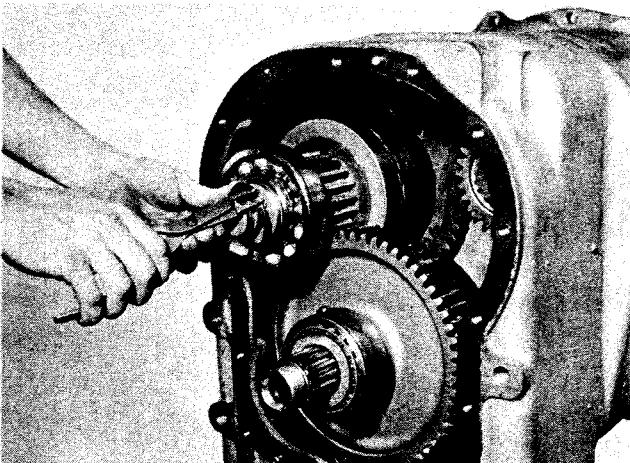


Figure 97

Install low clutch rear bearing retainer ring.

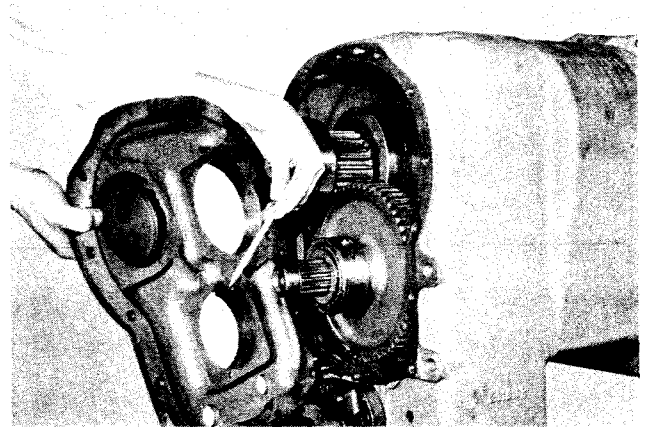


Figure 98

Position a new gasket on rear transmission case. Align lock ball in idler shaft rear bearing with notch in rear transmission cover. Tap cover in place and secure with bolts and lockwashers.

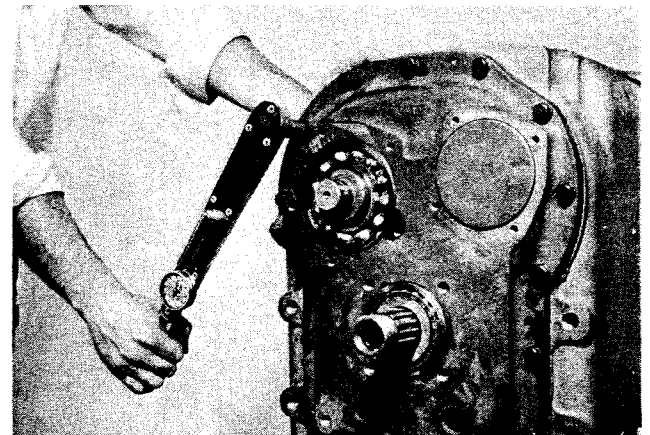


Figure 99

Torque rear cover bolts to specified torque.

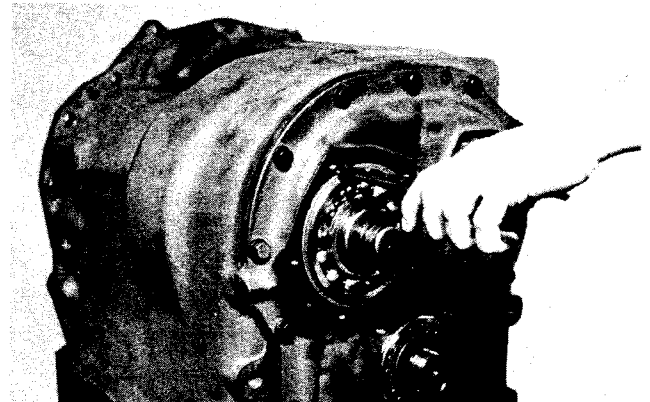


Figure 100

From front of transmission case tap low clutch and idler shaft to rear. This will allow clearance to install rear bearing snap ring.

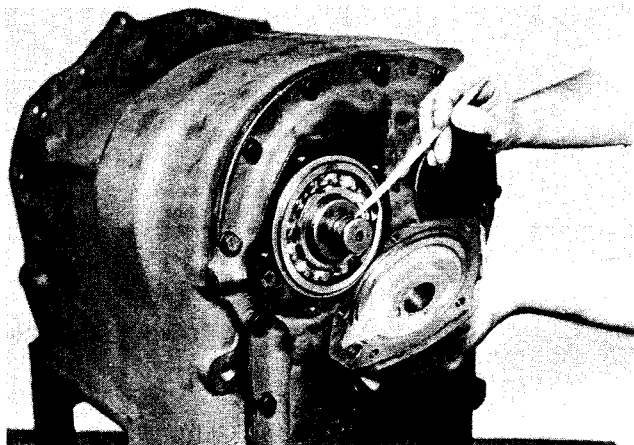


Figure 101

Install low clutch shaft piston rings. Install new gasket and "O" ring on low shaft bearing cap.

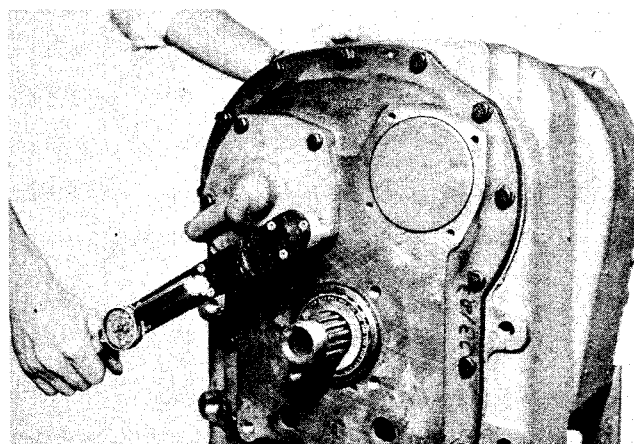


Figure 102

Install bearing cap and secure with lockwashers and bolts. Tighten to specified torque.

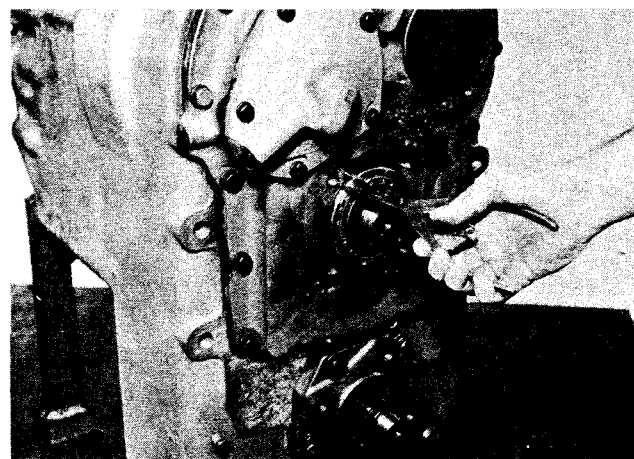


Figure 103

Install idler shaft rear bearing locating ring.

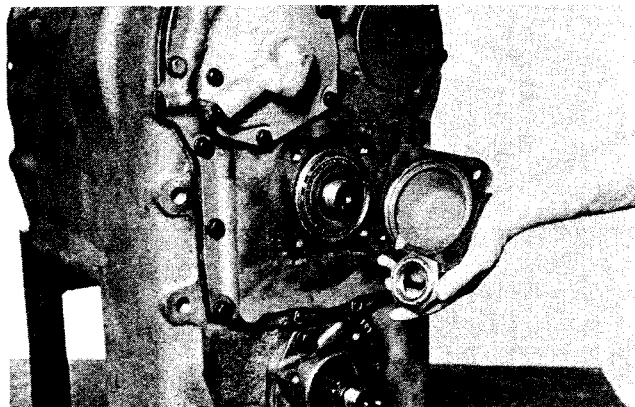


Figure 104

Install idler shaft nut. Block idler gear, tighten nut 250 to 300 ft. lbs. torque. With a new gasket in position install idler shaft bearing cap. Tighten bolts to specified torque.

If a mechanical parking brake is not used proceed to Figure 110.

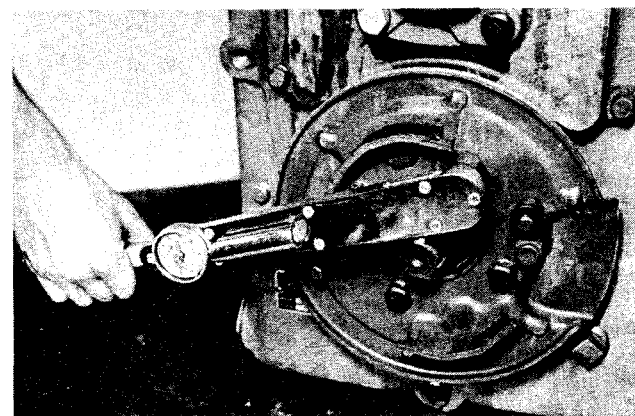


Figure 105

Install brake backing plate assembly. Tighten bolts to specified torque.

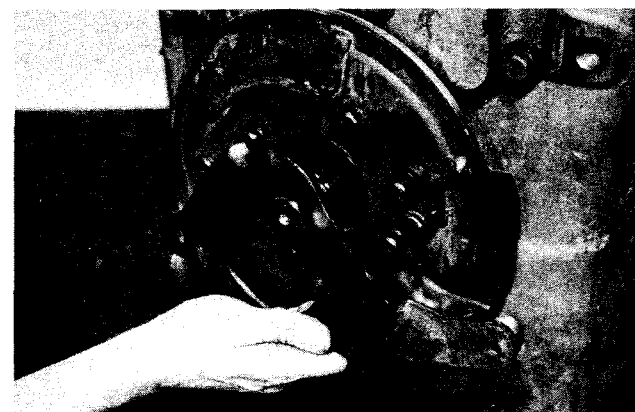


Figure 106

Position brake actuating arm.

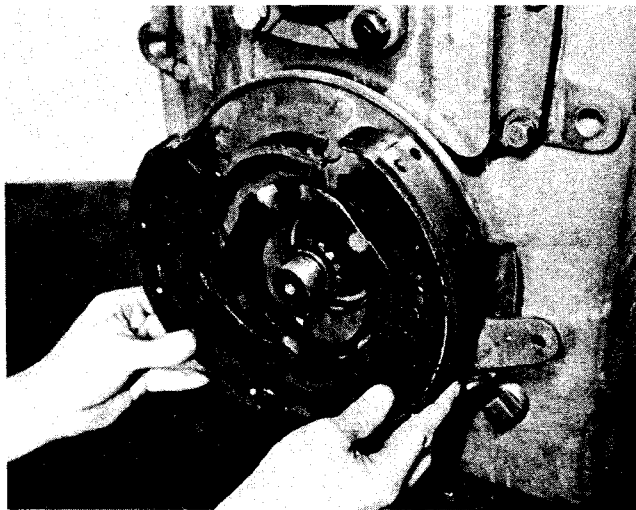


Figure 107
Locate brake shoes.

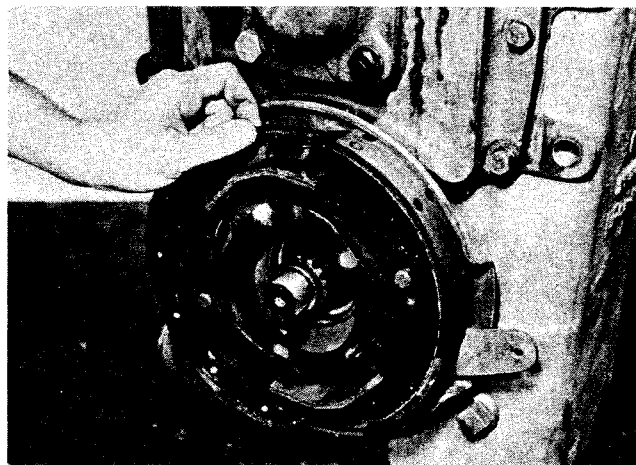


Figure 108
Install upper and lower brake shoe return springs.

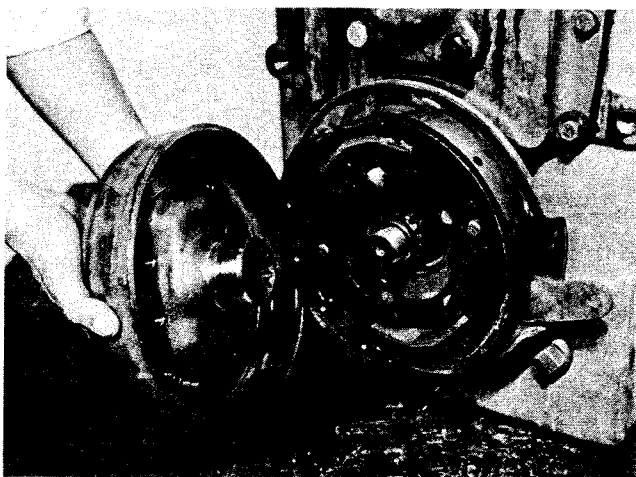


Figure 109
Install brake drum and flange assembly.

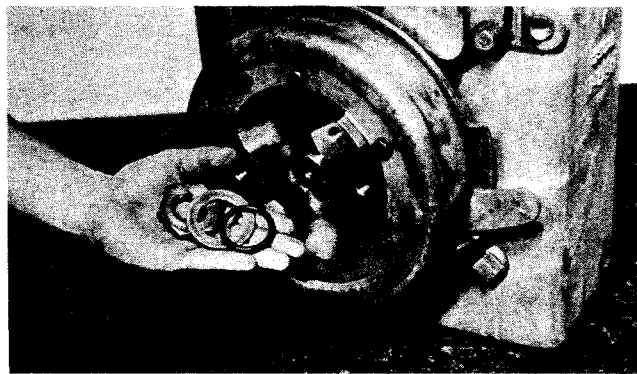


Figure 110
Secure flange with a new "O" ring, washer and flange nut. Block output shaft and tighten nut 200 to 250 ft. lbs. torque.

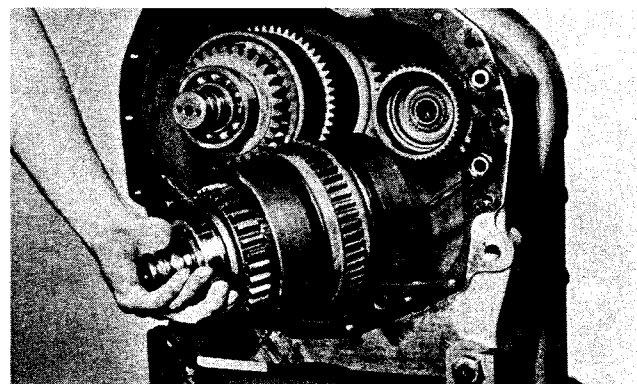


Figure 111
From the front of the transmission case install the forward and 2nd clutch assembly.

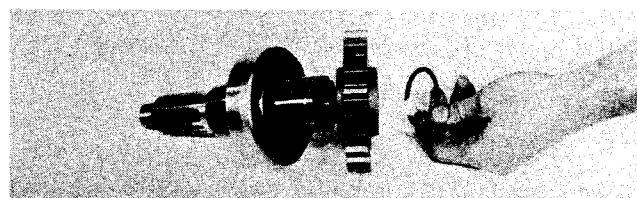


Figure 112
Input shaft, rear bearing, drive gear and snap ring.

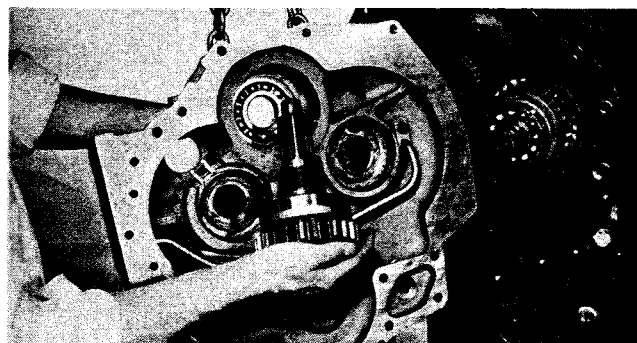


Figure 113
Install input shaft into front bearing.

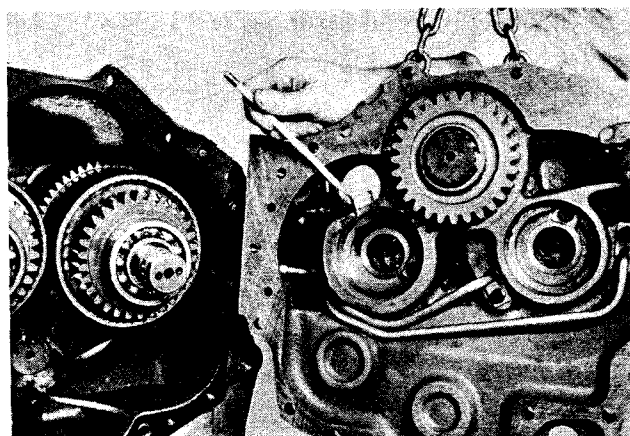


Figure 114

Forward clutch front bearing locating ring.

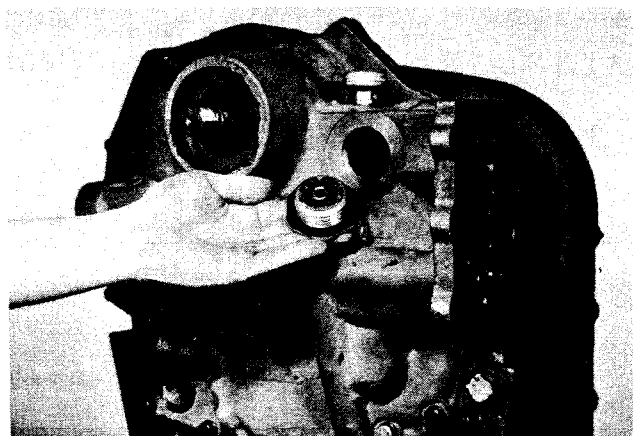


Figure 117

Install front cover plug.

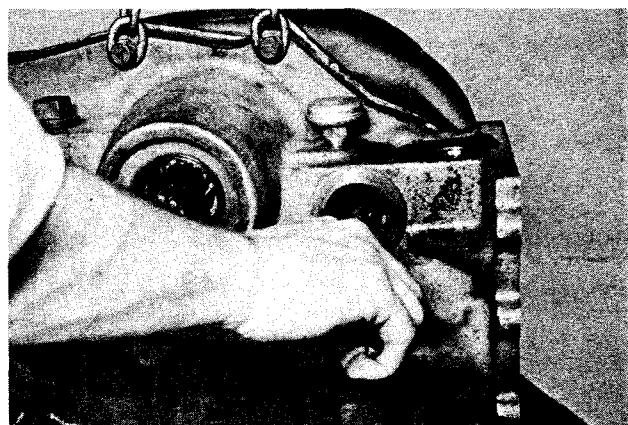


Figure 115

Support front cover with a chain fall. Spread forward clutch front bearing retainer ring. Position front cover to transmission case. Tap cover into place using caution as not to damage any of the clutch shaft piston rings.

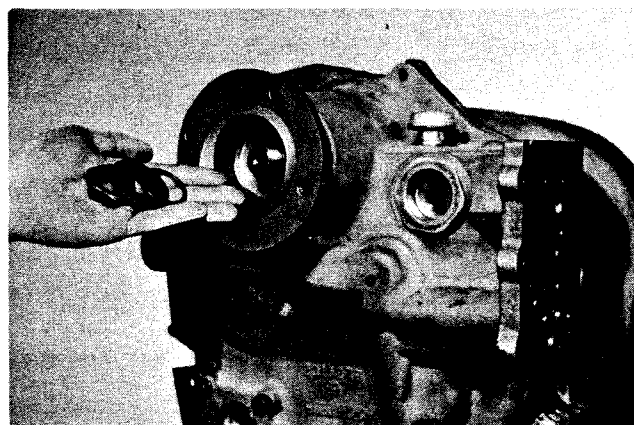


Figure 118

Install companion flange, flange "O" Ring, washer and nut. Tighten nut 175 to 200 ft. lbs. torque.

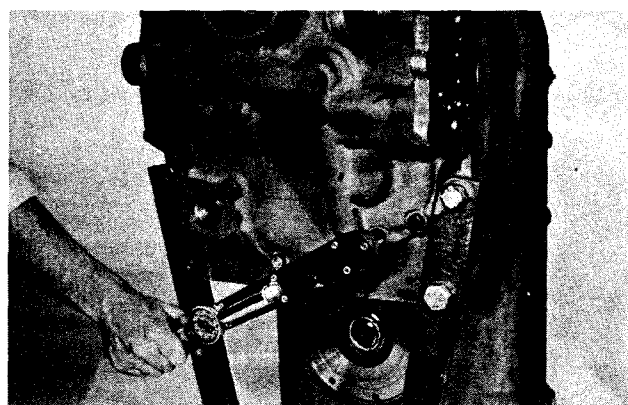


Figure 116

Install cover to case bolts. Tighten to specified torque.

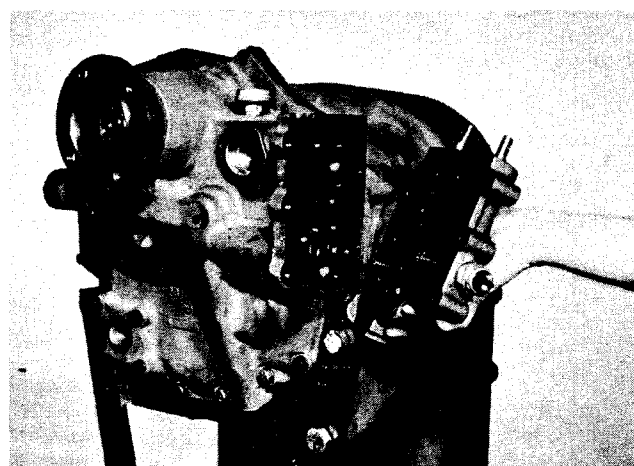


Figure 119

Locate detent balls and springs in control valve. Position new gasket. Secure valve with bolts and washers. Tighten to specified 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 the 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.

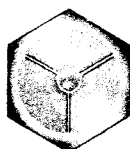
After the overhauled or repaired transmission has been installed in the machine, the oil cooler, and connecting hydraulic system must be thoroughly cleaned. This can be accomplished in several manners and a degree of judgment must be exercised as to the method employed.

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 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, 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. On remote mounted torque converters remove drain 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 is a minor cost compared to cost of difficulties which can result from presence of such foreign material in the system.
6. Reassemble all components and use only type oil recommended in lubrication section. Fill until fluid overflows from upper drain cock at lower end of transmission. Close drain cock 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. Recheck with hot oil (180 to 200 degrees).
7. Recheck all drain plugs, lines, connections, etc., for leaks and tighten where necessary.

TORQUE IN (LBS. — FT.) BOLTS, CAPSCREWS, STUDS AND NUTS

Grade 5 Identification, 3 Radial
Dashes 120° Apart on Head of Bolt



Grade 5

COARSE THREADS

3/8 — 16
7/16 — 14
1/2 — 13
9/16 — 12
5/8 — 11

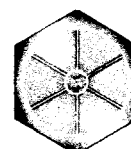
Dry

31 — 34
49 — 54
75 — 83
109 — 120
150 — 165

Lubricated or Plated

23 — 25
37 — 41
57 — 63
82 — 90
113 — 124

Grade 8 Identification, 6 Radial
Dashes 60° Apart on Head of Bolt



Grade 8

Dry

44 — 48
70 — 77
106 — 117
153 — 168
212 — 233

Lubricated or Plated

33 — 36
52 — 57
80 — 88
115 — 127
159 — 175

SPECIFICATIONS AND SERVICE DATA—POWER SHIFT TRANSMISSION AND TORQUE CONVERTER

CONTROLS	Forward and Reverse — Manual Speed and Range Selection — Manual	GEAR TYPE	Spur
CLUTCH TYPE	Multiple discs, hydraulically actuated, spring released, automatic wear compensation and no adjustment. All clutches oil-cooled and lubricated.	CONVERTER OUT PRESSURE	25 - 40
CLUTCH INNER DISC	Sintered Bronze	CLUTCH PRESSURE	240 - 280 — All clutch pressure must be equal within 5 psi. If clutch pressure varies in any one clutch more than 5 psi., repair clutch.
CLUTCH OUTER DISC	Steel	OIL FILTRATION	Full flow oil filter safety by-pass, also strainer screen in sump at bottom of transmission case.

LUBRICATION

TYPE OF OIL	See Lube Chart below.	(a)	Drain transmission and remove sump screen. Clean screen thoroughly and replace using new gaskets.
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.	(b)	Drain oil filters, remove and discard filter elements. Clean filter shells and install new elements.
CHECK PERIOD	Check oil level DAILY with engine running at 500-600 RPM and oil at 180 degrees F. to 200 degrees F. Maintain oil level to FULL mark.	(c)	Refill transmission to FULL mark.
DRAIN PERIOD	HR 28000 Series Converters having an integral oil filter. Change oil filter element every 200 hours. Drain and refill system every 400 hours. Transmission and Converters with remote filter. Change oil filter element every 250 hours. Drain and refill system every 500 hours.	(d)	Run engine at 500-600 RPM to prime converter and lines.
		(e)	Recheck level with engine running at 500-600 RPM and add oil to bring level to FULL mark. When oil temperature is hot (180 degrees to 200 degrees) make final oil level check.

RECOMMENDED OILS FOR CLARK POWER SHIFT TRANSMISSIONS AND CONVERTERS HAVING COMMON OIL SYSTEM		
Prevailing Ambient Temp.	SAE Spec.	Type
INITIAL FILL		
Above 0° F	Type "A" Suffix "A" or Dexron * Type C-2	Automatic Transmission Fluid Hydraulic Fluid
Below 0° F	Type "A" Suffix "A" or Dexron *	Automatic Transmission Fluid
SUBSEQUENT FILL OR REFILLS		
Above 0° F	Type "A" Suffix "A" or Dexron * Type C-2 SAE 10 Mil. 2104B	Automatic Transmission Fluid Hydraulic Fluid MS-DG Grade 10
Below 0° F	Type "A" Suffix "A" or Dexron *	Automatic Transmission Fluid

* DEXRON is a Registered Trademark of General Motors Corporation

TROUBLE SHOOTING GUIDE For The R and HR Model, 28000 Transmission

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 lines as a complete system when running down the source of trouble since the proper operation of any unit there-in 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 control valve, 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 oil temperatures of 180 to 200 degrees 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:

Engage shift levers in forward and high speed and apply brakes. Accelerate engine half to three-quarter throttle.

Hold stall until desired converter outlet temperature is reached. **CAUTION: FULL THROTTLE STALL SPEEDS FOR AN EXCESSIVE LENGTH OF TIME WILL OVERHEAT THE CONVERTER.**

LOW CLUTCH PRESSURE

Cause

1. Low oil level.
2. Clutch pressure regulating valve spool stuck open.
3. Faulty charging pump.
4. Broken or worn clutch shaft or piston sealing rings.
5. Clutch piston bleed valve stuck open.

Remedy

1. Fill to proper level.
2. Clean valve spool and housing.
3. Replace pump.
4. Replace sealing rings.
5. Clean bleed valves thoroughly.

LOW CONVERTER CHARGING PUMP OUTPUT

1. Low oil level.
2. Suction screen plugged.
3. Air leaks at pump intake hose and connections or collapsed hose. (R-28000 only)
4. Defective oil pump.

1. Fill to proper level.
2. Clean suction screen.
3. Tighten all connections or replace hose if necessary.
4. Replace pump.

OVERHEATING

1. Worn oil sealing rings.
2. Worn oil pump.
3. Low oil level.
4. Pump suction line taking air. (R-28000 only)

1. Remove, disassemble, and rebuild converter assembly.
2. Replace.
3. Fill to proper level.
4. Check oil line connections and tighten securely.

NOISY CONVERTER

1. Worn coupling gears.
2. Worn oil pump.
3. Worn or damaged bearings.

1. Replace.
2. Replace.
3. A complete disassembly will be necessary to determine what bearing is faulty.

LACK OF POWER

1. Low engine RPM at converter stall.
2. See "Overheating" and make same checks.

1. Tune engine check governor.
2. Make corrections as explained in "Over-Heating."

1. 250° F. TEMP. RANGE FOR CONTINUOUS OPERATING WITH 300° INTERMITTENT RANGE
2. 300 P.S.I. CONTINUOUS OPERATION WITH 600 P.S.I. SURGE PRESSURE
3. SUCTION LINE (SUMP TO PUMP) TO BE PROTECTED FROM COLLAPSE BY INTERWOVEN SPIRAL STEEL WIRE
4. TYPE "A" SUFFIX "A", ETC., OIL PER CLARK RECOMMENDATIONS

28000 SERIES

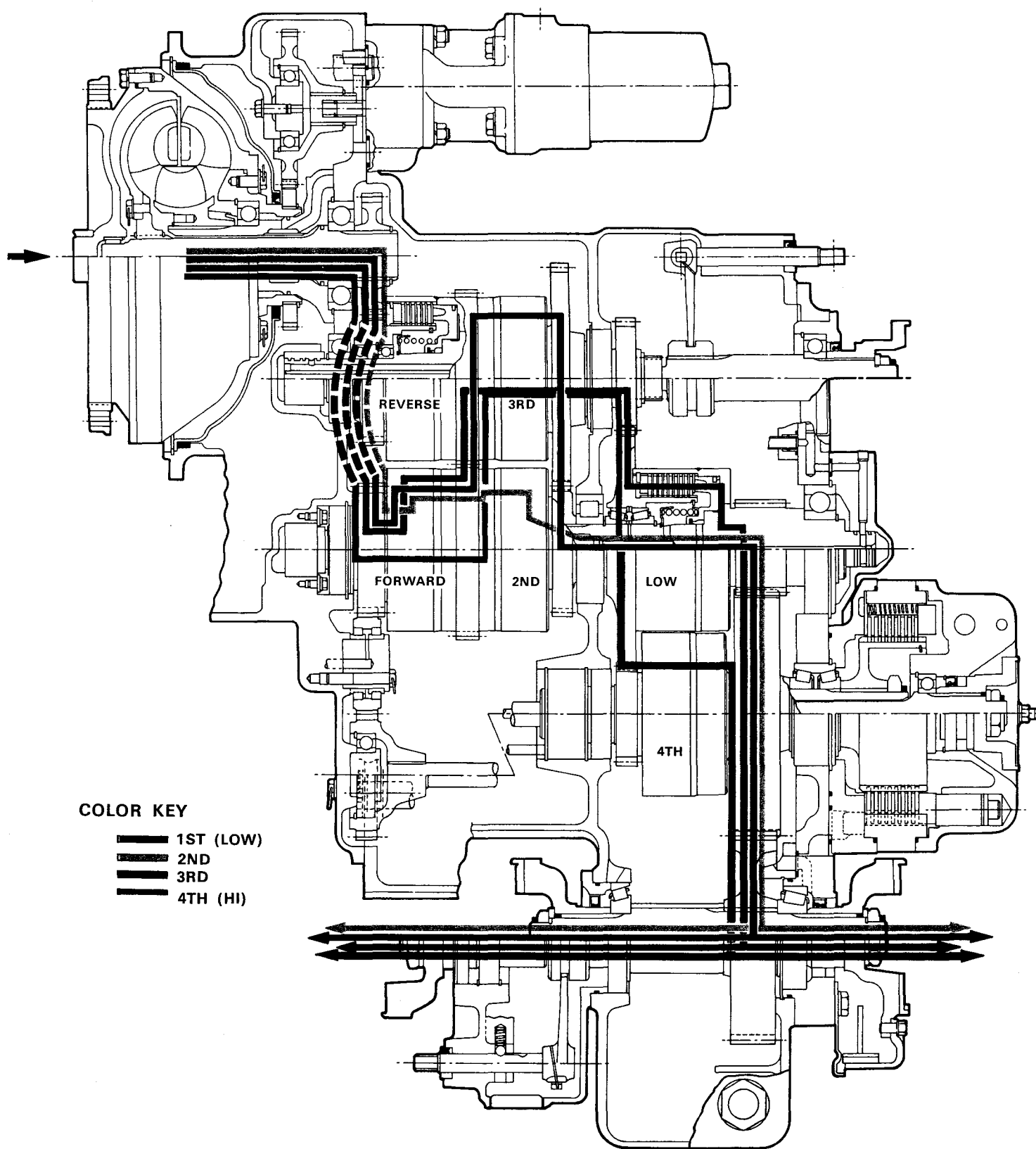
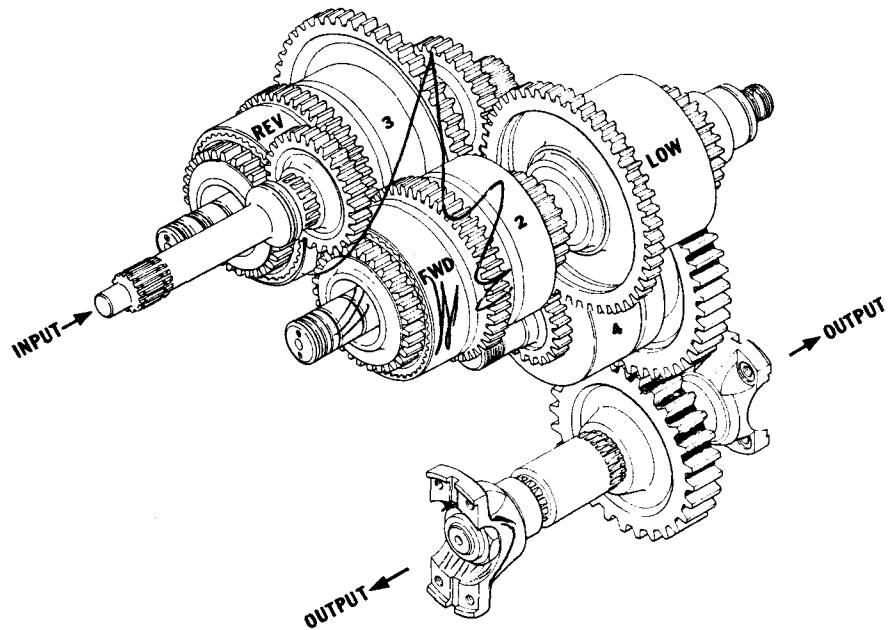


FIG. 1

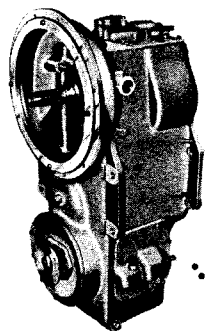
4 SPEED TRANSMISSION

28000 SERIES - 4 SPEED CLUTCH & GEAR ARRANGEMENT

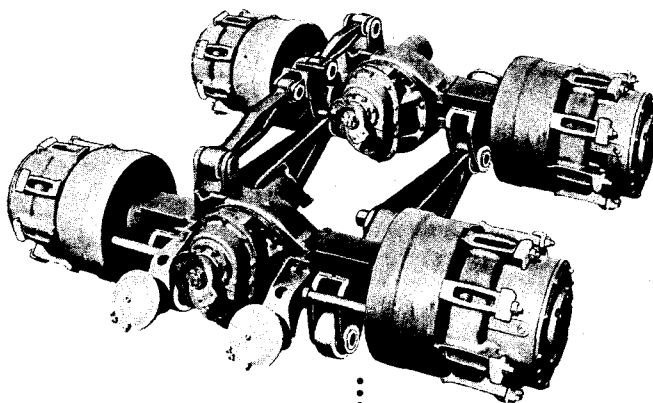


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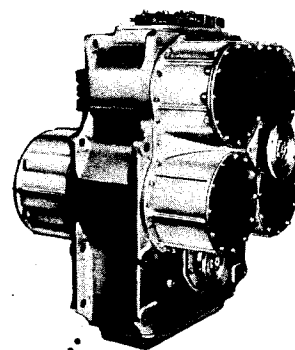
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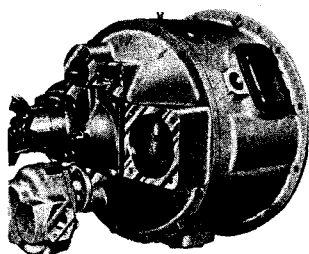
INDUSTRIAL TRANSMISSIONS



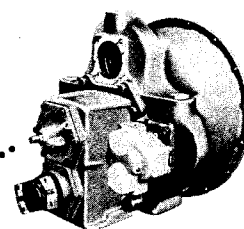
BOGIE DRIVES



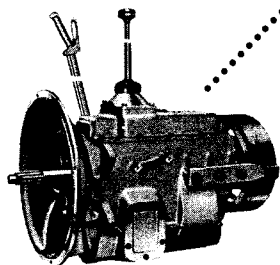
POWER SHIFT
TRANSMISSIONS



8000 SERIES CONVERTERS
14"-15" AND 16" DIAMETERS



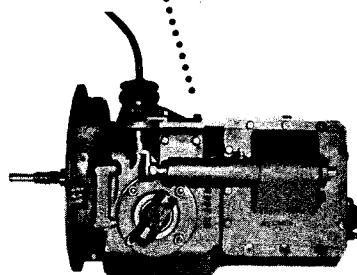
16000 SERIES CONVERTERS
16"-17"-18" AND 19" DIAMETERS



TRUCK TRANSMISSIONS



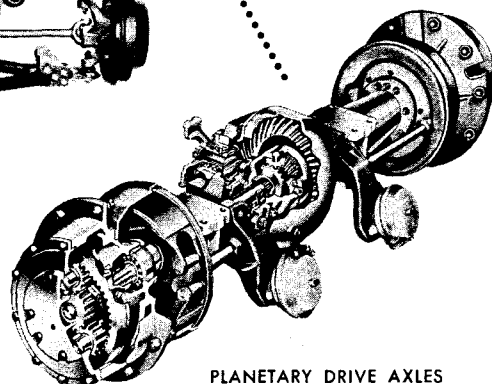
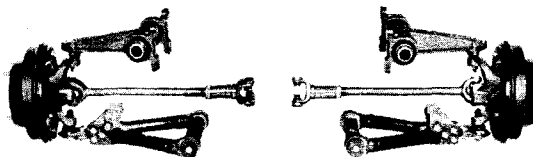
ONE-PIECE FORGED
AXLE HOUSINGS



TRANS-AXLE UNITS



PLANETARY DRIVE—STEER AXLES



PLANETARY DRIVE AXLES



CLARK EQUIPMENT COMPANY
AUTOMOTIVE DIVISION
BUCHANAN
— MICHIGAN
JACKSON