JANIEIRO 1972

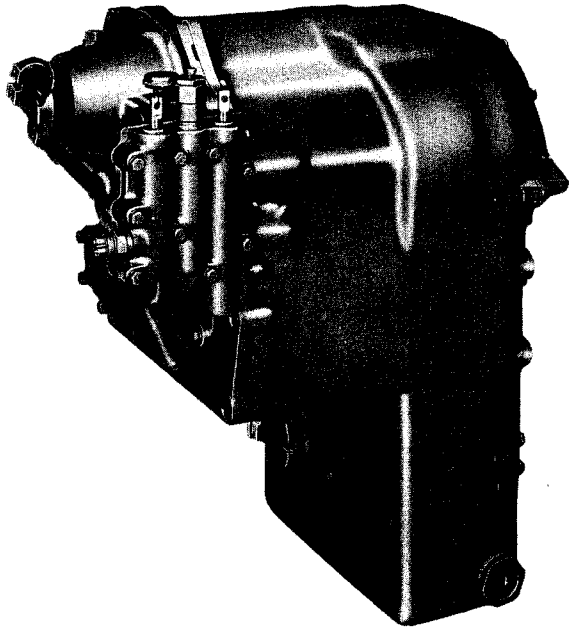
R 28000 SERIES 3 SPEED

CLARK

TRANSMISSION

RUTHZIL TRATOR COMERCIAL DE PEÇAS LTDA 11 97083-6812 ROLANDO

MAINTENANCE & SERVICE MANUAL



S/N 2458

R 28000–SERIES–3 SPEED

CLARK EQUIPMENT COMPANY

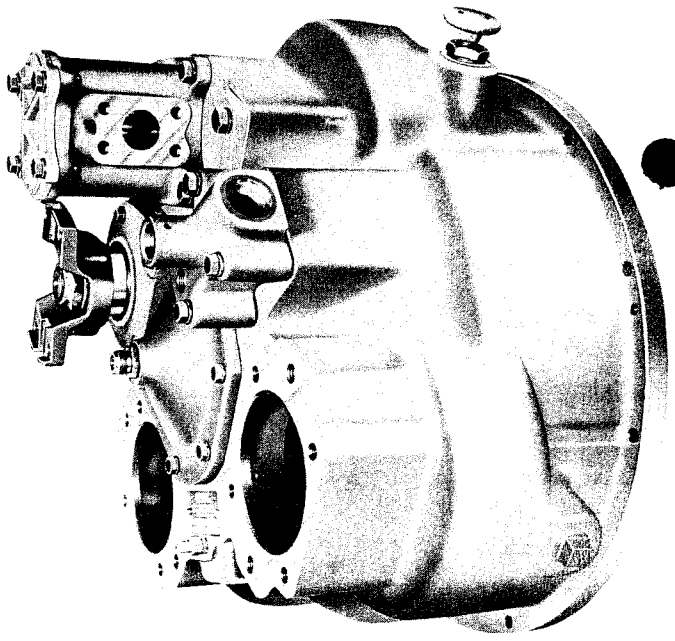
CUSTOMER SERVICE DIVISION

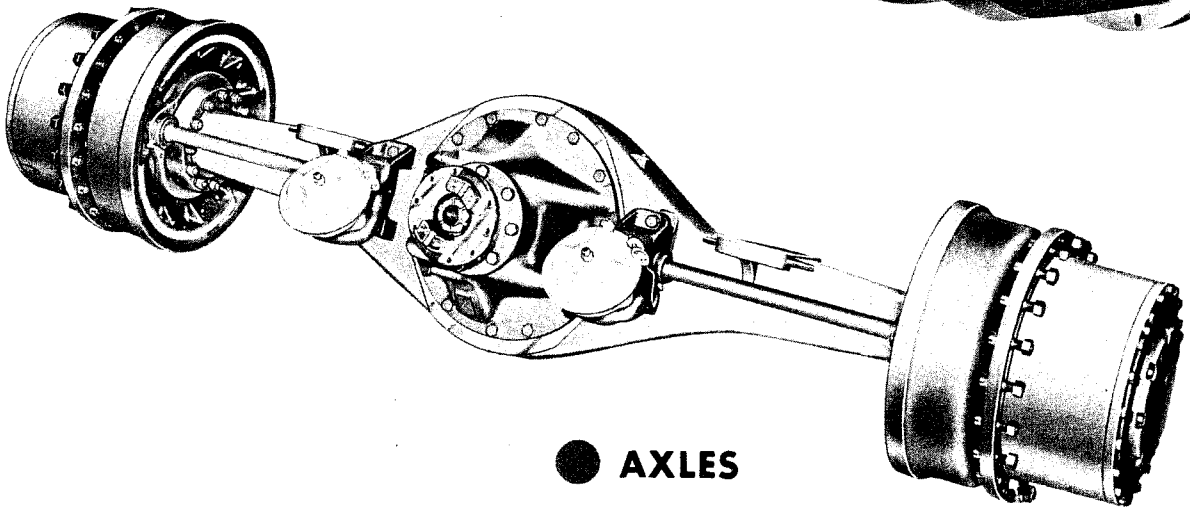
PUBLICATION DEPARTMENT — JACKSON, MICHIGAN

SM R283-1-72

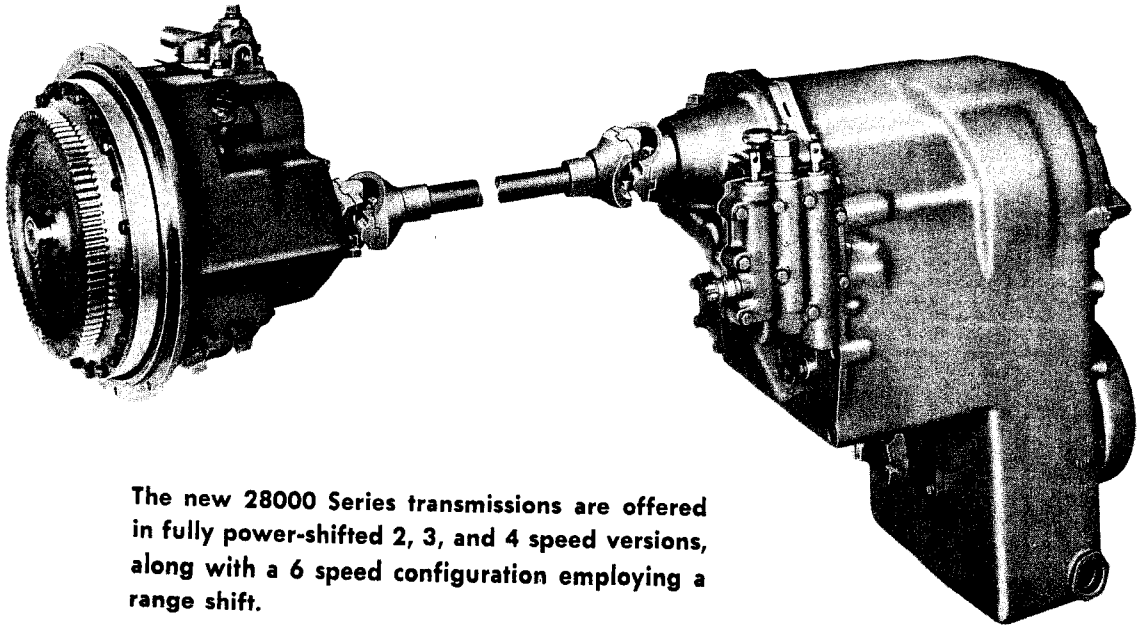
- **TORQUE CONVERTERS UP TO 1000 HORSEPOWER**

- **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.

CLARK EQUIPMENT

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.**

CLARK EQUIPMENT

TABLE OF CONTENTS

HOW THE UNITS OPERATE .....

SECTIONAL VIEWS AND PARTS IDENTIFICATION

- Basic Design Silhouette ..... Fig. A
- Case and Front Cover Group ..... Fig. B
- Three-Speed Case and Clutch Group ..... Fig. C
- Clutch Group ..... Fig. D
- Control Valve Assembly ..... Fig. E
- Mechanical Parking Brake ..... Fig. F
- Axle Disconnect ..... Fig. G
- Assembly Instruction Drawing ..... Fig. H
- Typical Three-Speed Power Flow ..... Fig. I
- External Plumbing Diagram ..... Fig. J
- Clutch and Gear Arrangement ..... Fig. K

DISASSEMBLY OF TRANSMISSION 1

CLEANING AND INSPECTION 10

REASSEMBLY OF TRANSMISSION 11

SERVICING MACHINE AFTER TRANSMISSION OVERHAUL 21

SPECIFICATION AND SERVICE DATA 22

LUBRICATION 22

TROUBLE SHOOTING GUIDE ..... 22 & 23

CLARK EQUIPMENT

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
Case and Front Cover Group	Fig. B
Three-Speed Case and Clutch Group	Fig. C
Clutch Group	Fig. D
Control Valve	Fig. E
Mechanical Parking Brake	Fig. F
Axle Disconnect	Fig. G
Assembly Instruction Drawing	Fig. H
Typical Three-Speed Power Flow	Fig. I
External Plumbing Diagram	Fig. J
Clutch and Gear Arrangement	Fig. K

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.

CLARK
EQUIPMENT

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 fitting on the transmission. Then 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.

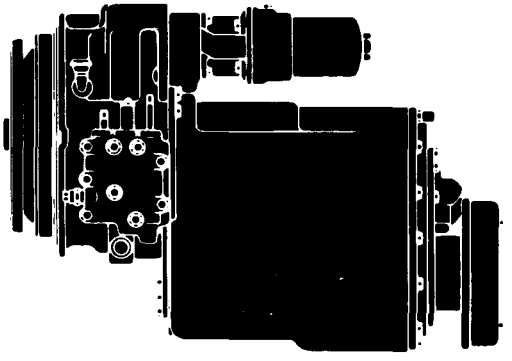
With the engine running and the directional control lever in neutral position, oil pressure from the regulating valve is blocked at the control valve, and the transmission is in neutral. Movement of the forward and reverse spool will direct oil, under pressure to either the forward or reverse direction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

When either directional clutch is selected the opposite clutch is relieved of pressure and vents back through the direction selector spool. The same procedure is used in the speed selector.

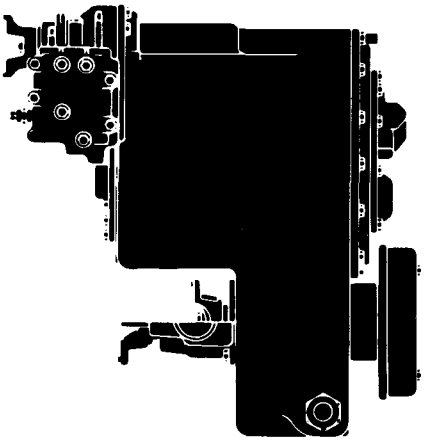
The direction or speed clutch assembly consists of a drum with internal splines and a bore to receive a hydraulically actuated piston. The piston is "oil tight" by the use of sealing rings. A steel disc with external splines is inserted into the drum and rests against the piston. Next, a bronze disc with splines at the inner diameter is inserted. Discs are alternated until the required total is achieved. A heavy back-up plate is then inserted and secured with a snap ring. A hub with O.D. splines is inserted into the splines of discs with teeth on the inner diameter. The discs and hub are free to increase in speed or rotate in the opposite direction as long as no pressure is present in that specific 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 valve, through a tube, to a chosen clutch shaft. This shaft has a drilled passageway for oil under pressure to enter the shaft. Oil pressure sealing rings are located on the clutch shaft. These rings direct oil under pressure to a desired clutch. Pressure of the oil forces the piston and discs against the heavy back-up plate. The discs, with teeth on the outer diameter, clamping against discs with teeth on the inner diameter, enables the hub and clutch shaft to be locked together and allows them to drive as a unit.

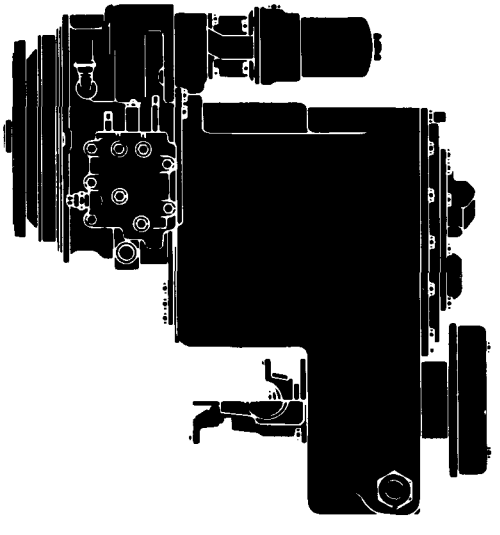
There are bleed balls in the clutch piston which allow quick escape for oil when the pressure to the piston is released.



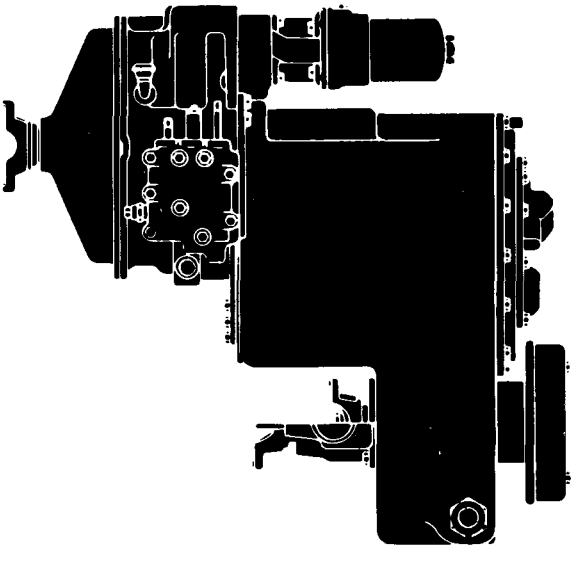
HR 28000
(SHORT DROP)
(OUTPUT)



R 28000



HR 28000



MHR 28000

FIGURE A

CLARK EQUIPMENT

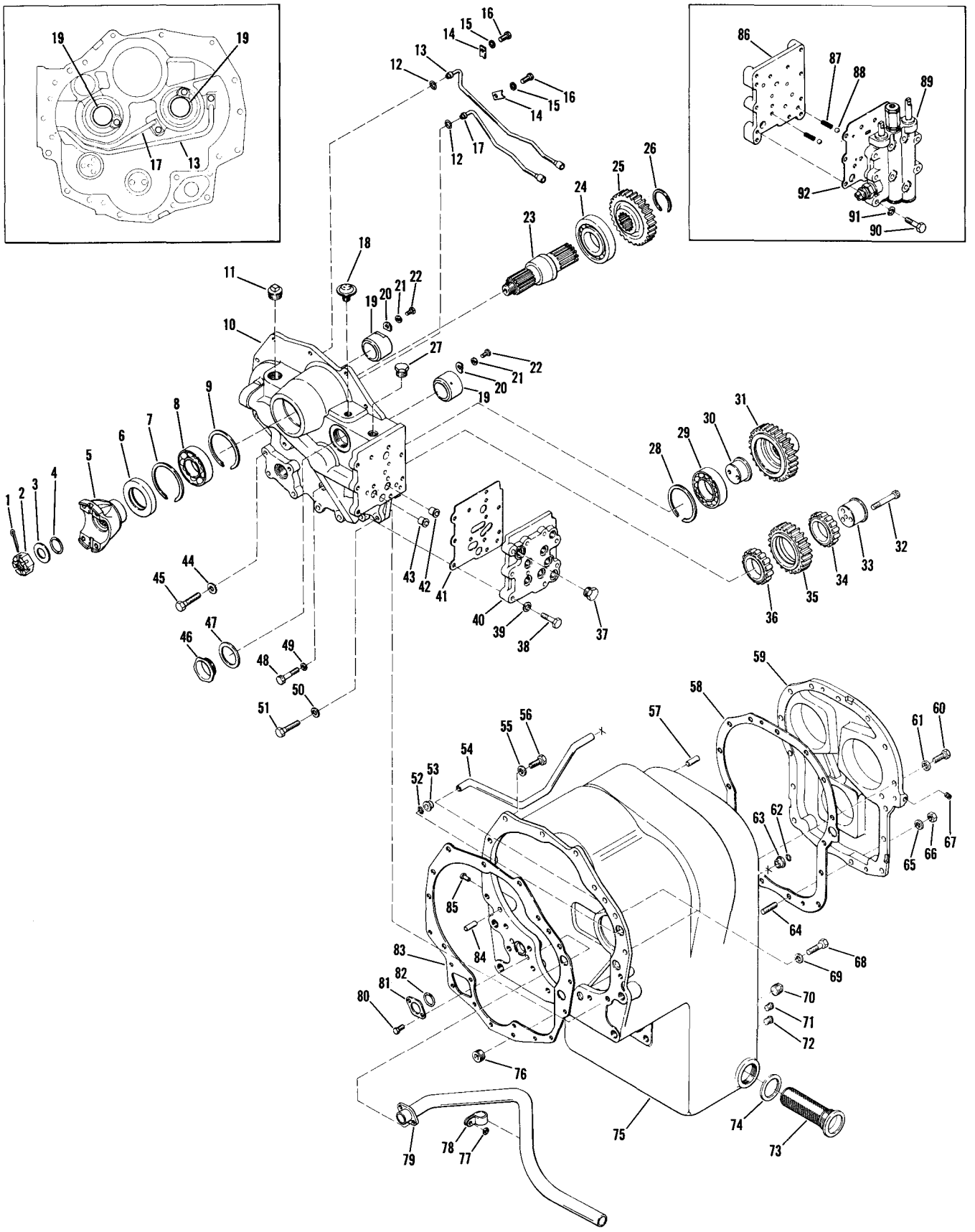


FIGURE B

CLARK EQUIPMENT

R28000 CASE AND FRONT COVER GROUP

Item	Description	Qty.
1	Flange Nut Cotter	1
2	Flange Nut	1
3	Flange Washer	1
4	Flange O-Ring	1
5	Input Flange	1
6	Input Flange Oil Seal	1
7	Input Shaft Front Bearing Retainer Ring	1
8	Input Shaft Front Bearing	1
9	Input Shaft Front Bearing Retainer Ring	1
10	Front Cover & Tube Assembly	1
11	Pipe Plug	1
12	O-Ring	2
13	3rd Speed Tube Assembly	1
14	Tube Clip	2
15	Clip Screw Lockwasher	2
16	Clip Screw	2
17	Reverse Speed Tube Assembly	1
18	Breather	1
19	Front Cover Sleeve	2
20	Front Cover Sleeve Lock	2
21	Sleeve Lock Screw Lockwasher	2
22	Sleeve Lock Screw	2
23	Input Shaft	1
24	Input Shaft Rear Bearing	1
25	Input Shaft Gear	1
26	Gear Snap Ring	1
27	Pipe Plug	1
28	Bearing Retainer Ring	1
29	P.T.O. Output Gear Bearing	1
30	P.T.O. Output Gear Shaft	1
31	P.T.O. Output Gear	1
32	P.T.O. Idler Shaft to Converter Housing Screw	3
33	P.T.O. Idler Shaft	1
34	P.T.O. Idler Shaft Inner Race & Roller Assy	1
35	P.T.O. Idler Gear	1
36	P.T.O. Idler Shaft Inner Race & Roller Assy	1
37	Valve Plate Plug	1
38	Remote Valve Plate Screw	9
39	Remote Valve Plate Screw Lockwasher	9
40	Remote Valve Plate	1
41	Remote Valve Plate Gasket	1
42	Tube Sleeve	1
43	Tube Sleeve	1
44	Lockwasher	4
45	Screw	4
46	Front Cover Plug	1
47	Front Cover Plug Gasket	1
48	P.T.O. Output Gear Shaft Screw	2
49	P.T.O. Output Gear Shaft Screw Lockwasher	2
50	Lockwasher	5
51	Screw	5
52	Clutch Pressure Tube O-Ring	1
53	Tube Sleeve	1
54	Low Speed Clutch Pressure Tube	1
55	Lockwasher	4
56	Screw	4
57	Case to Rear Cover Dowel Pin	2
58	Gasket	1
59	Rear Cover	1
60	Screw	13
61	Lockwasher	13
62	Clutch Pressure Tube O-Ring	1
63	Tube Sleeve	1
64	Stud	2
65	Lockwasher	2
66	Stud Nut	2
67	Pipe Plug	1
68	Screw	5
69	Lockwasher	5
70	Case Plug	1
71	Oil Level Plug	1
72	Oil Level Plug	1
73	Screen Assembly	1
74	Screen Assembly Gasket	1
75	Transmission Case Assembly	1
76	Magnetic Drain Plug	1
77	Washer	1
78	Suction Line Tube Clip	1
79	Suction Tube Assembly	1
80	Retaining Washer Screw	2
81	Suction Line Retaining Washer	1
82	Suction Line Assembly O-Ring	1
83	Front Cover Gasket	1
84	Front Cover Dowel Pin	2
85	Rivet	1
86	Control Valve Remote Mounting Plate	1
87	Detent Spring	2
88	Detent Ball	2
89	Control Valve Assembly	1
90	Valve to Converter Housing Screw	9
91	Valve to Converter Housing Screw Lockwasher	9
92	Control Valve Gasket	1

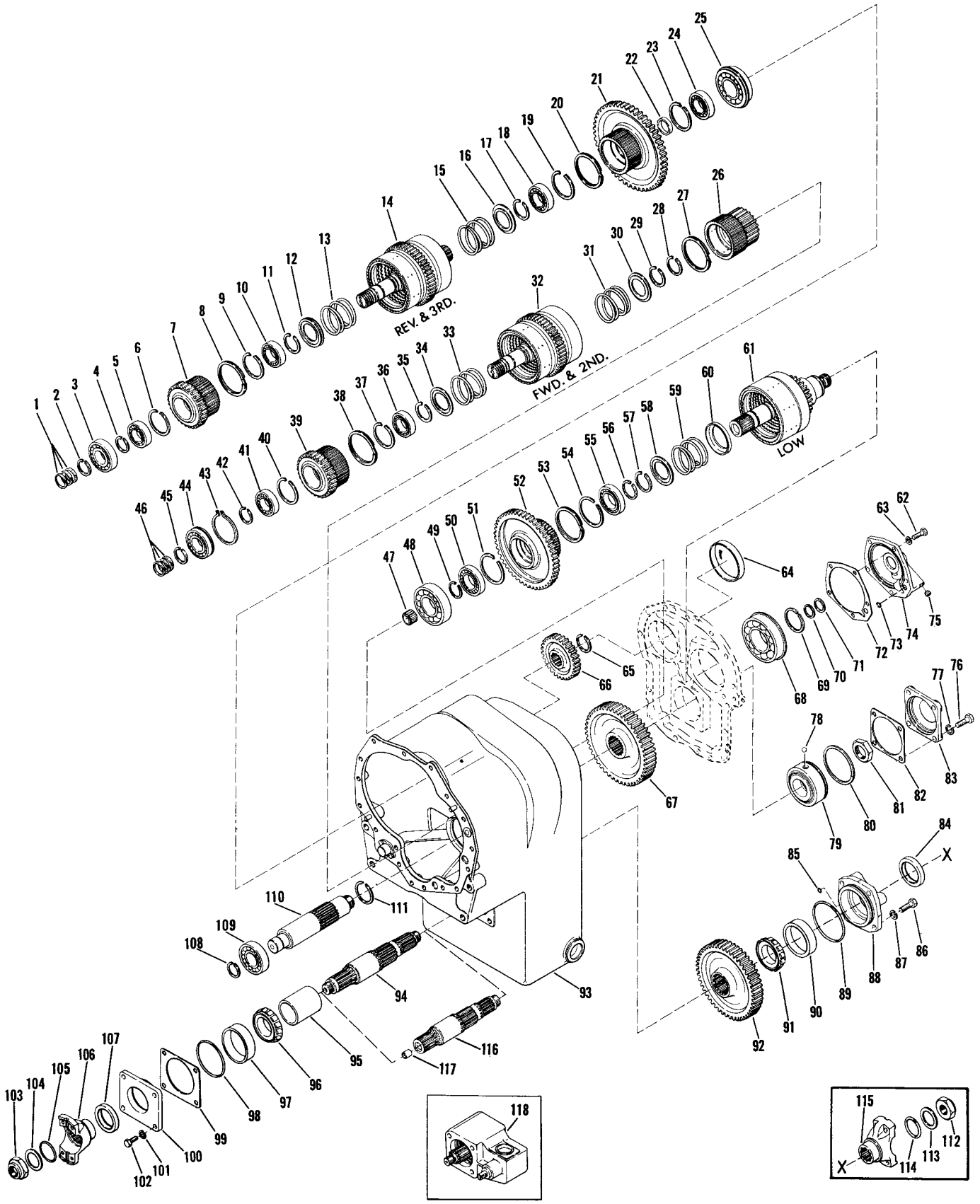
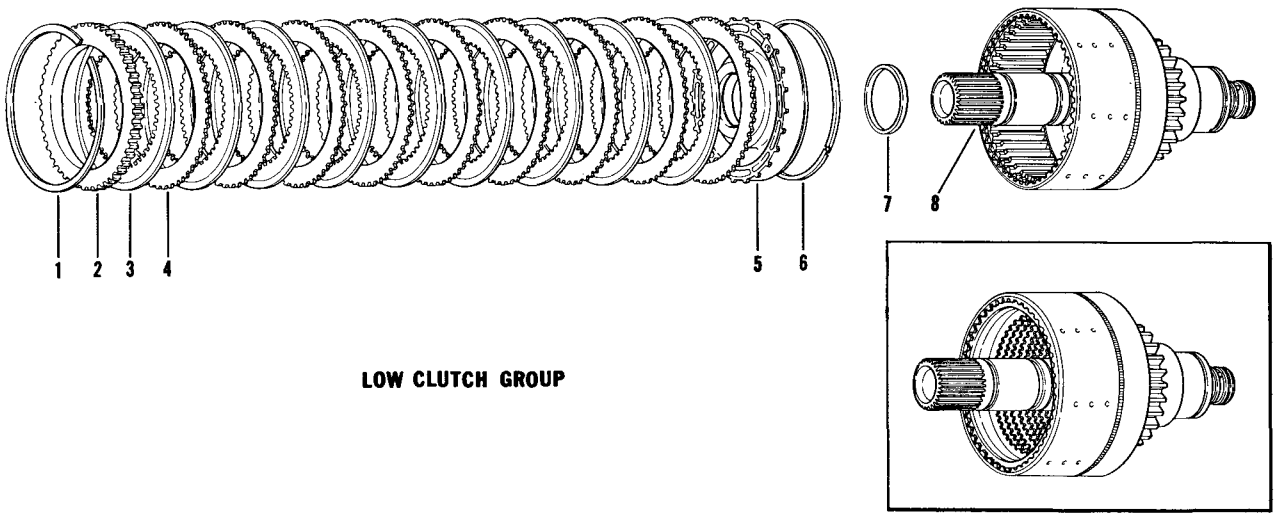


FIGURE C

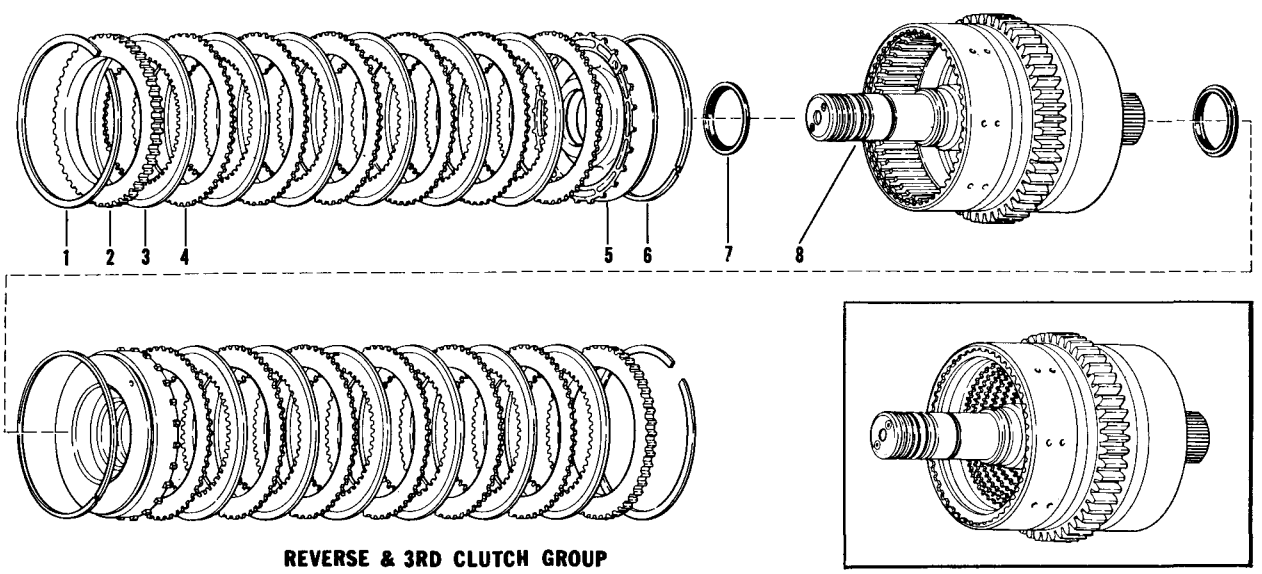
CLARK EQUIPMENT

R28000 THREE SPEED CASE AND CLUTCH GROUP

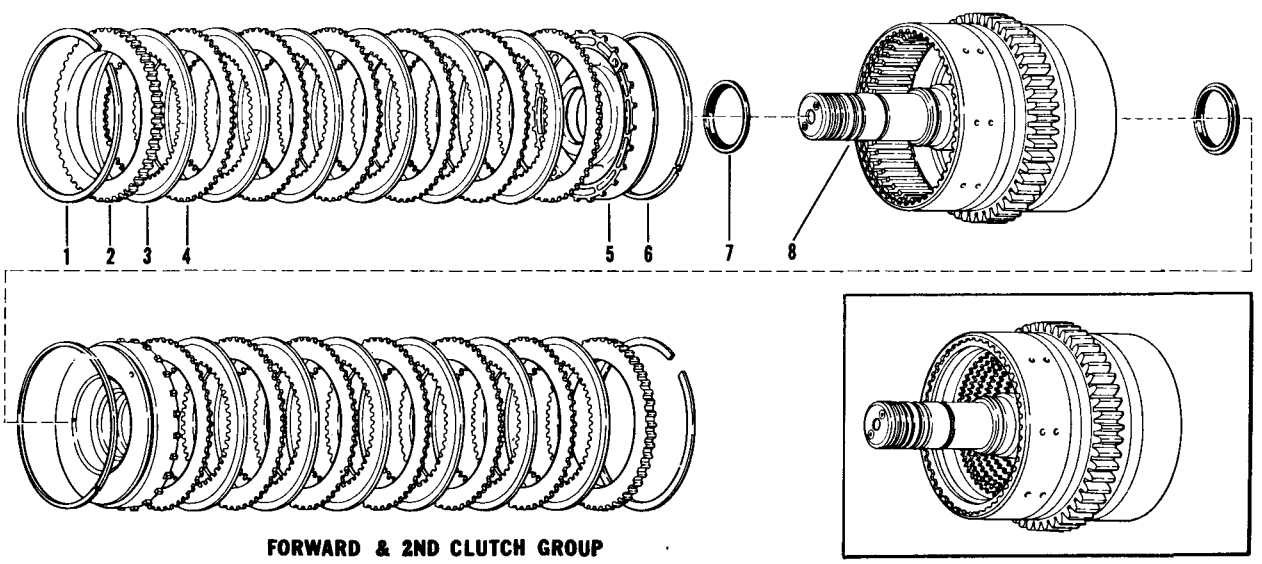
Item	Description	Qty.
1	Reverse & 3rd Clutch Shaft Piston Ring	3
2	Front Bearing Retainer Ring	1
3	Reverse & 3rd Shaft Front Bearing	1
4	Front Bearing Retainer Ring	1
5	Clutch Driven Gear Bearing	1
6	Clutch Driven Gear Bearing Snap Ring	1
7	Clutch Driven Gear	1
8	Clutch Hub Oil Baffle Ring	1
9	Clutch Driven Gear Bearing Snap Ring	1
10	Clutch Driven Gear Bearing	1
11	Return Spring Retainer Snap Ring	1
12	Spring Retainer	1
13	Piston Return Spring	1
14	Reverse & 3rd Clutch Shaft & Drum	1
15	Piston Return Spring	1
16	Spring Retainer	1
17	Return Spring Retainer Snap Ring	1
18	3rd Gear Bearing	1
19	3rd Gear Bearing Snap Ring	1
20	Clutch Hub Oil Baffle Ring	1
21	3rd Gear	1
22	3rd Gear Bearing Spacer	1
23	3rd Gear Bearing Snap Ring	1
24	3rd Gear Bearing	1
25	Reverse & 3rd Shaft Rear Bearing	1
26	2nd Gear	1
27	Clutch Hub Oil Baffle Ring	1
28	2nd Gear Retainer Ring	1
29	Return Spring Retainer Snap Ring	1
30	Spring Retainer	1
31	Piston Return Spring	1
32	Forward & 2nd Clutch Shaft & Drum	1
33	Piston Return Spring	1
34	Spring Retainer	1
35	Return Spring Retainer Snap Ring	1
36	Clutch Driven Gear Bearing	1
37	Clutch Driven Gear Bearing Snap Ring	1
38	Clutch Hub Oil Baffle Ring	1
39	Clutch Driven Gear	1
40	Clutch Driven Gear Bearing Snap Ring	1
41	Clutch Driven Gear Bearing	1
42	Front Bearing Retainer Ring	1
43	Front Bearing Locating Ring	1
44	Forward & 2nd Shaft Front Bearing	1
45	Front Bearing Retainer Ring	1
46	Forward & 2nd Shaft Piston Ring	3
47	Low Speed Clutch Shaft Pilot Bearing	1
48	2nd Gear Bearing	1
49	Low Gear Bearing Retainer Ring	1
50	Low Gear Bearing	1
51	Low Gear Bearing Locating Ring	1
52	Low Gear	1
53	Low Gear Oil Baffle Ring	1
54	Low Gear Bearing Locating Ring	1
55	Low Gear Bearing	1
56	Low Gear Bearing Retaining Ring	1
57	Return Spring Retainer Snap Ring	1
58	Return Spring Retainer	1
59	Return Spring	1
60	Return Spring Retainer	1
61	Low Speed Clutch Shaft & Drum	1
62	Bearing Cap Screw	5
63	Bearing Cap Screw Lockwasher	5
64	Bore Plug	1
65	Drive Gear Retainer Ring	1
66	Low Speed Drive Gear	1
67	Idler Shaft Gear	1
68	Low Shaft Rear Bearing	1
69	Low Shaft Rear Bearing Retainer Ring	1
70	Low Shaft Piston Ring	1
71	Low Shaft Piston Ring	1
72	Rear Bearing Cap Gasket	1
73	Rear Bearing Cap O-Ring	1
74	Low Shaft Rear Bearing Cap	1
75	Low Shaft Rear Bearing Cap Plug	1
76	Idler Shaft Bearing Cap Screw	4
77	Idler Shaft Bearing Cap Screw Lockwasher	4
78	Idler Shaft Rear Bearing Lock Ball	1
79	Idler Shaft Rear Bearing	1
80	Rear Bearing Locating Ring	1
81	Idler Shaft Nut	1
82	Idler Shaft Bearing Cap Gasket	1
83	Idler Shaft Bearing Cap	1
84	Rear Bearing Cap Oil Seal	1
85	Rear Bearing Cap O-Ring	1
86	Rear Bearing Cap Screw	4
87	Rear Bearing Cap Screw Lockwasher	4
88	Output Shaft Rear Bearing Cap	1
89	Bearing Cap O-Ring	1
90	Rear Bearing Cup	1
91	Rear Bearing Cone	1
92	Output Shaft Gear	1
93	Transmission Case & Tube Assy	1
94	Output Shaft (Used When Disconnect is Omitted)	1
95	Output Shaft Gear Spacer	1
96	Output Shaft Bearing Cone	1
97	Output Shaft Bearing Cup	1
98	Disconnect Housing O-Ring	1
99	Disconnect or Bearing Cap Shim	–
100	Front Output Bearing Cap (Not used with Disconnect)	1
101	Bearing Cap Screw Lockwasher	4
102	Bearing Cap Screw	4
103	Flange Nut	1
104	Flange Nut Washer	1
105	Flange Nut O-Ring	1
106	Output Flange	1
107	Front Bearing Cap Oil Seal	1
108	Bearing Retaining Ring	1
109	Idler Shaft Front Bearing	1
110	Idler Shaft	1
111	Idler Shaft Gear Locating Ring	1
112	Flange Nut	1
113	Flange Nut Washer	1
114	Flange Nut O-Ring	1
115	Output Flange	1
116	Output Shaft (Used with Disconnect Only)	1
117	Output Shaft Bushing	1
118	Disconnect Assembly (Optional)	1



LOW CLUTCH GROUP



REVERSE & 3RD CLUTCH GROUP



FORWARD & 2ND CLUTCH GROUP

FIGURE D

LOW CLUTCH GROUP

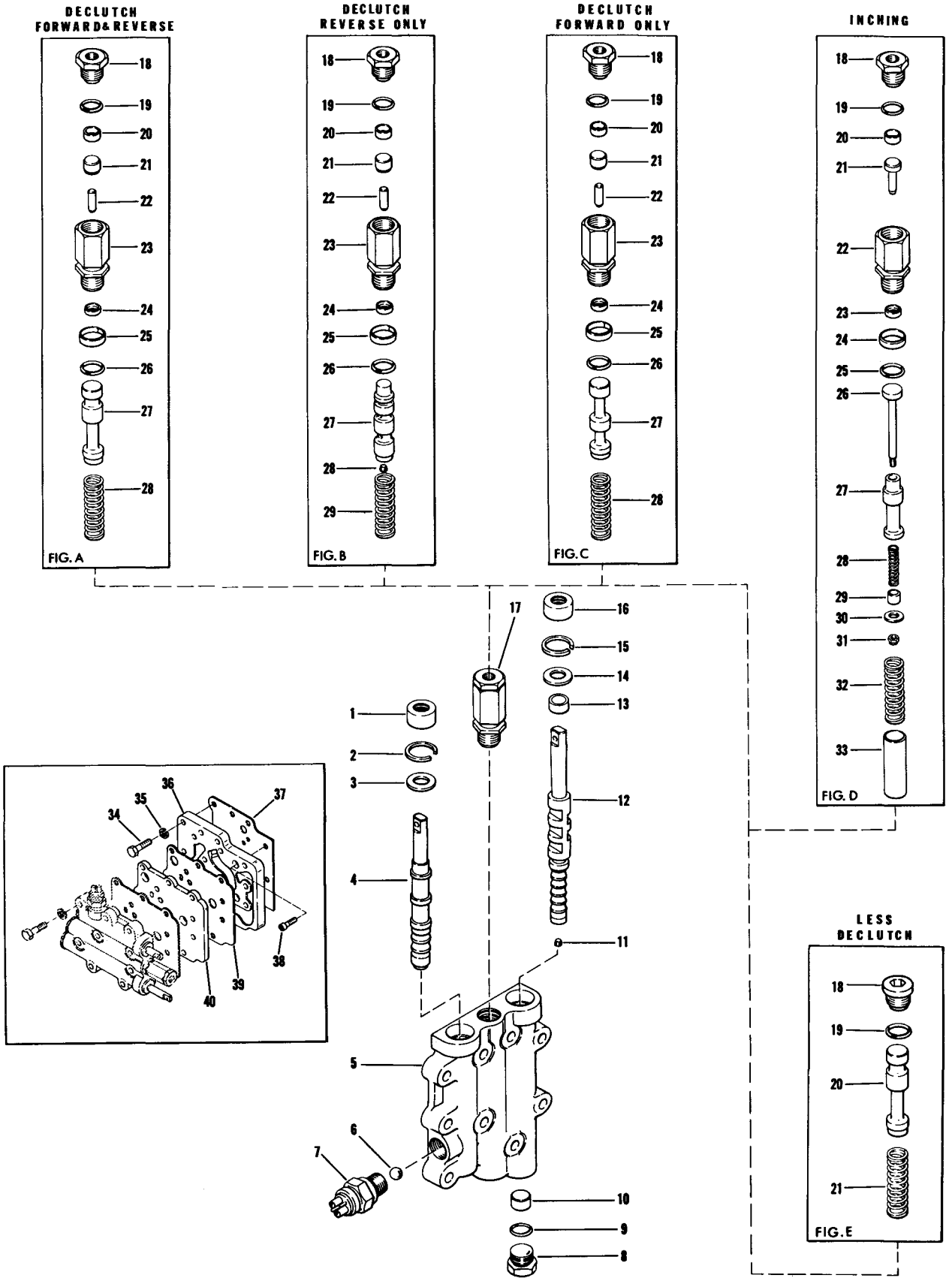
Item	Description	Qty.
1	End Plate Retainer Ring	1
2	End Plate	1
3	Clutch Inner Disc	9
4	Clutch Outer Disc	9
5	Clutch Piston	1
6	Clutch Piston Outer Seal Ring	1
7	Clutch Piston Inner Seal Ring	1
8	Low Speed Clutch Drum and Shaft	1

REVERSE AND 3rd CLUTCH GROUP

Item	Description	Qty.
1	End Plate Retainer Ring	2
2	End Plate	2
3	Clutch Inner Disc	12
4	Clutch Outer Disc	12
5	Clutch Piston	2
6	Clutch Piston Outer Seal Ring	2
7	Clutch Piston Inner Seal Ring	2
8	Reverse and 3rd Clutch Drum and Shaft	1

FORWARD AND 2nd CLUTCH GROUP

Item	Description	Qty.
1	End Plate Retainer Ring	2
2	End Plate	2
3	Clutch Inner Disc	12
4	Clutch Outer Disc	12
5	Clutch Piston	2
6	Clutch Piston Outer Seal Ring	2
7	Clutch Piston Inner Seal Ring	2
8	Forward and 2nd Clutch Drum and Shaft	1



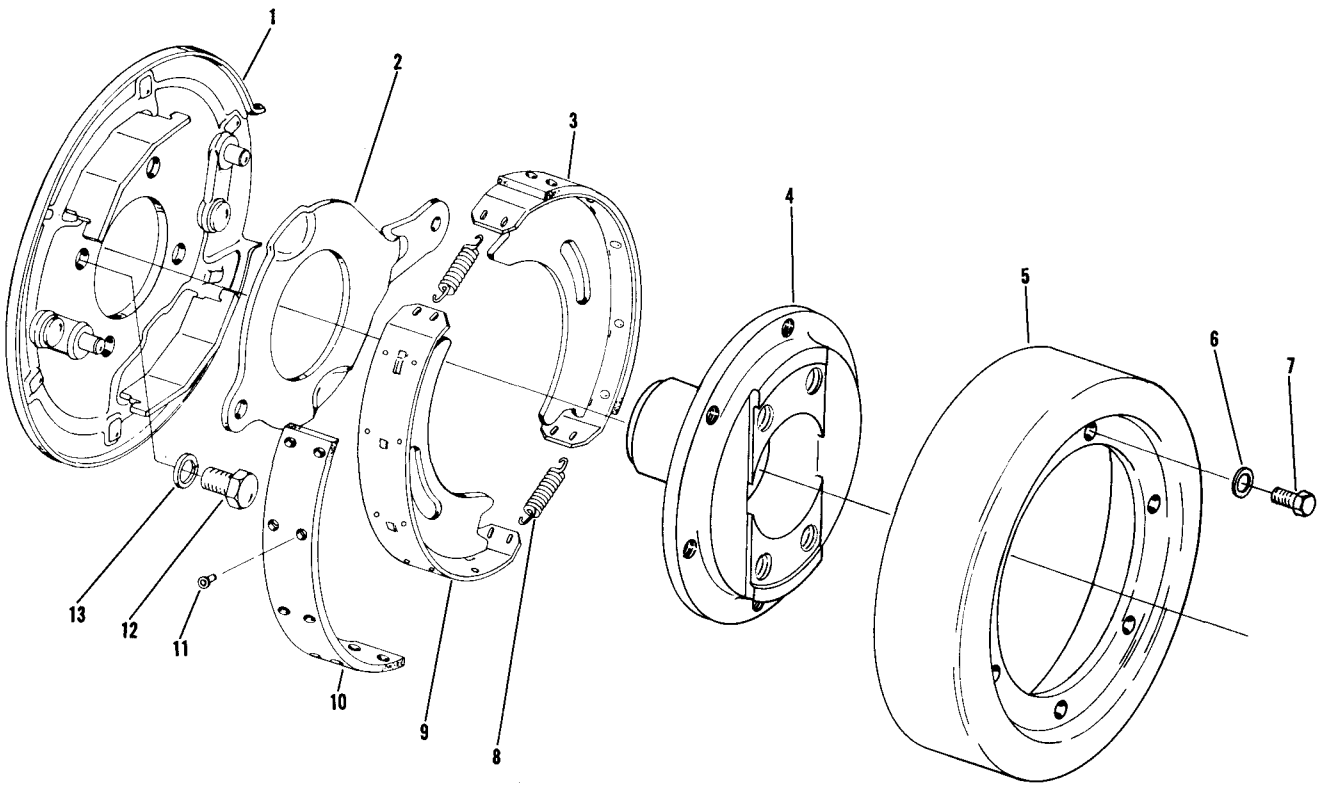
HYDRAULIC CONTROL VALVE

FIGURE E

CLARK EQUIPMENT

CONTROL VALVE ASSEMBLY

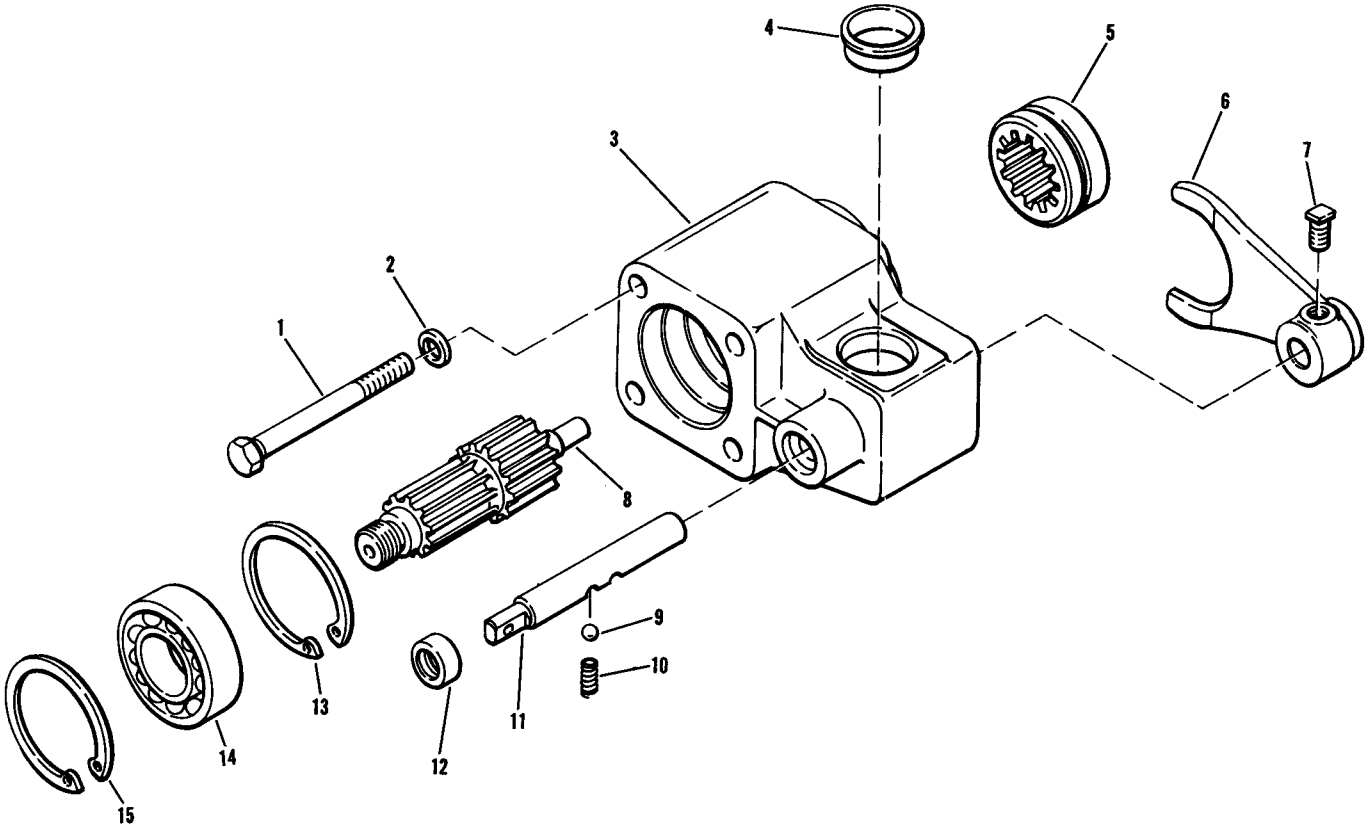
Item	Description	Qty.
1	Valve Spool Oil Seal	1
2	Valve Spool Oil Seal Retainer Ring	1
3	Valve Spool Oil Seal Washer	1
4	Forward & Reverse Valve Spool	1
5	Control Valve Assembly – Inc. items 1 thru 9, 11, 12, 14, 15, and 16	1
6	Neutral Switch Detent Ball	1
7	Neutral Switch	1
8	Valve Housing Plug	1
9	Valve Housing Plug O-Ring	1
10	Overshift Spacer	1
11	Speed Selector Spool Pipe Plug	1
12	Speed Selector Spool	1
13	Overshift Spacer	1
14	Valve Spool Oil Seal Washer	1
15	Valve Spool Oil Seal Retainer Ring	1
16	Valve Spool Oil Seal	1
17	Hydraulic Piston Housing Assembly	1
	NOTE: Items 18 thru 21, 28, 29 or 33 are various declutch options.	
34	Adaptor Housing to Converter Housing Screw	4
35	Screw Lockwasher	4
36	Valve Adaptor Housing	1
37	Converter Housing to Valve Adaptor Housing Gasket	1
38	Adaptor Housing to Converter Housing Screw	5
39	Plate Gasket	1
40	Valve Adaptor Plate	1



MECHANICAL PARKING BRAKE

Item	Description	Qty.
1	Backing Plate Assembly	1
2	Actuating Lever	1
3	Brake Shoe and Lining	2
4	Brake Flange	1
5	Brake Drum	1
6	Brake Drum to Flange Screw Lockwasher	6
7	Brake Drum to Flange Screw	6
8	Return Spring	2
9	Brake Shoe (See item 3)	—
10	Brake Lining	2
11	Rivet	20
12	Backing Plate Screw	4
13	Backing Plate Screw Lockwasher	4

FIGURE F



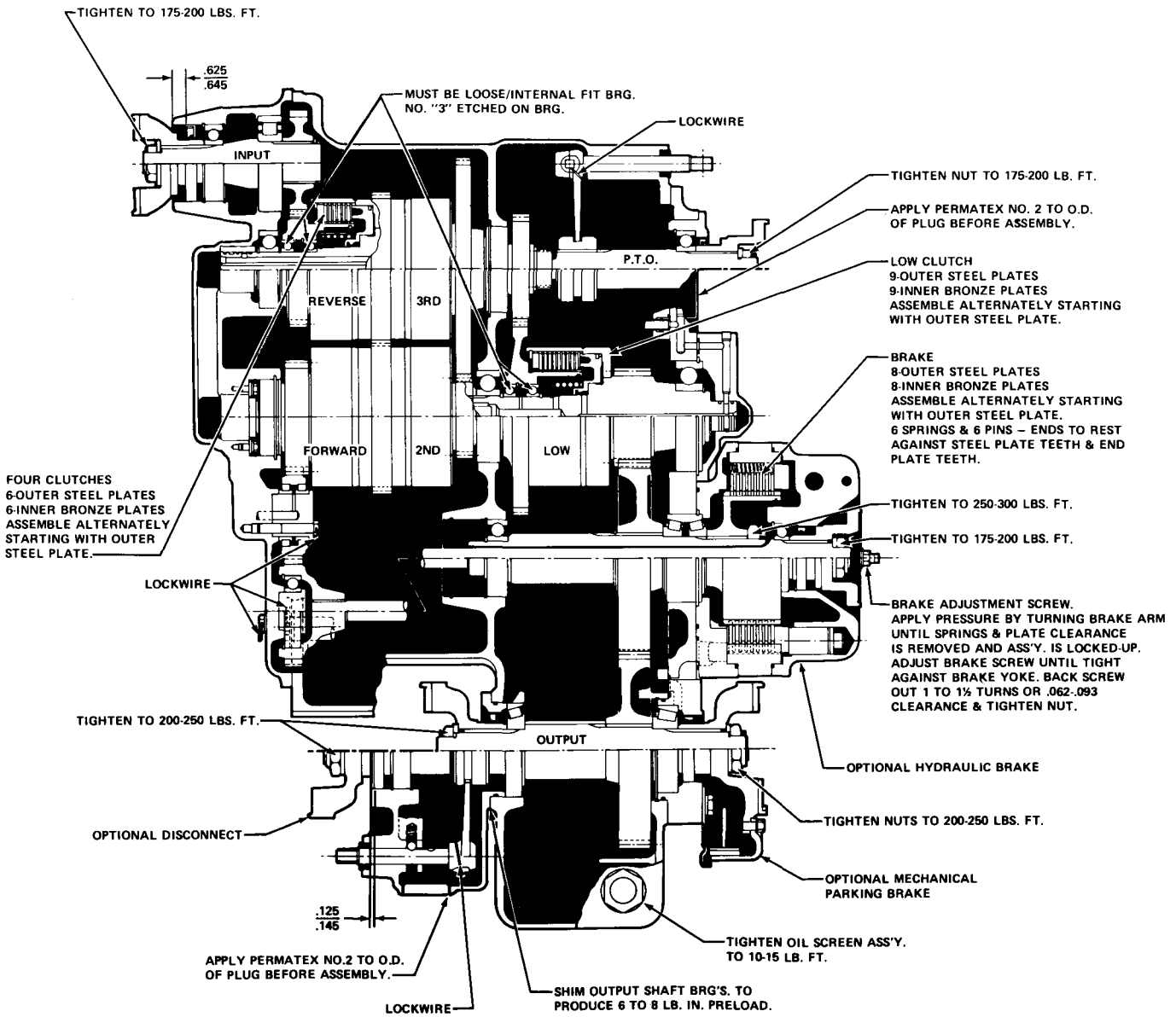
AXLE DISCONNECT

Item	Description	Qty.
1	Disconnect Housing Capscrew	4
2	Disconnect Housing Capscrew Lockwasher	4
3	Disconnect Housing	1
4	Disconnect Housing Plug	1
5	Shift Hub	1
6	Shift Fork	1
7	Shift Fork Lockscrew	1
8	Disconnect Shaft	1
9	Detent Ball	1
10	Detent Spring	1
11	Shift Rail	1
12	Shift Rail Oil Seal	1
13	Bearing Retainer Ring	1
14	Bearing	1
15	Bearing Retainer Ring	1

FIGURE G

CLARK EQUIPMENT

1. USE PERMATEX & CRANE SEALER ONLY WHERE SPECIFIED.
2. ALL LEAD IN CHAMFERS FOR OIL SEALS, PISTON RINGS & "O" RINGS MUST BE SMOOTH & FREE FROM BURRS. INSPECT AT ASSEMBLY.
3. LUBRICATE ALL PISTON RING GROOVES & "O" RINGS WITH OIL BEFORE ASSEMBLY.
4. APPLY VERY LIGHT COAT OF PERMATEX NO.2 TO O.D. OF ALL OIL SEALS BEFORE ASSEMBLY.
5. AFTER ASSEMBLY OF PARTS USING PERMATEX OR CRANE SEALER, THERE MUST NOT BE ANY FREE OR EXCESS MATERIAL THAT COULD ENTER THE OIL CIRCUIT.
6. APPLY LIGHT COAT OF CRANE SEALER TO ALL PIPE PLUGS.
7. APPLY A THIN COATING OF GREASE BETWEEN SEAL LIPS ON LIP TYPE SEALS PRIOR TO ASSEMBLY.



R-28320 SERIES POWER SHIFT TRANSMISSION WITH VARIOUS OPTIONS

FIGURE H

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 specific 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 of dirt and foreign matter entering the mechanism.

DISASSEMBLY

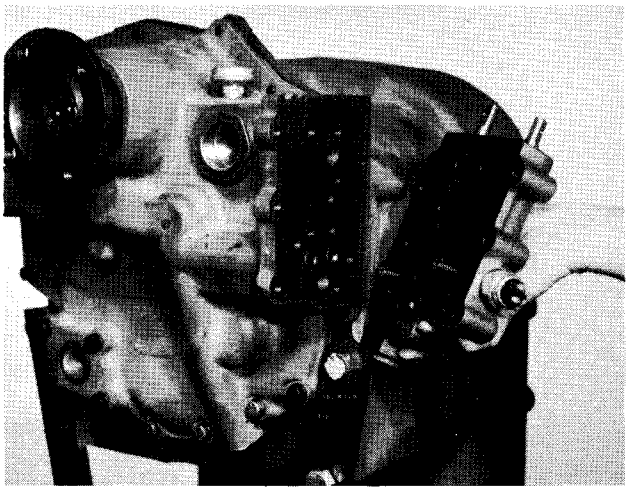


Figure 1
Remove control valve bolts and washers. Remove control valve. Use caution as not to lose detent springs and balls.

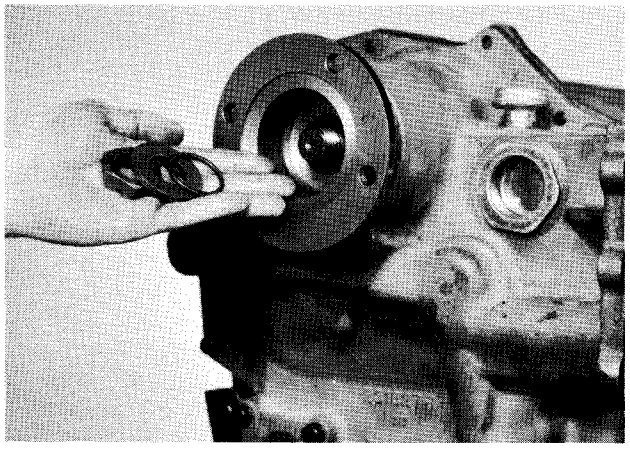


Figure 2
Remove companion flange nut, washer and O-ring.

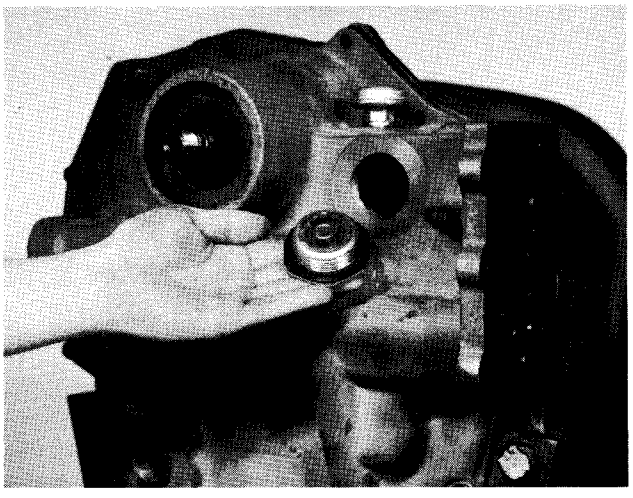


Figure 3
Remove front cover plug.

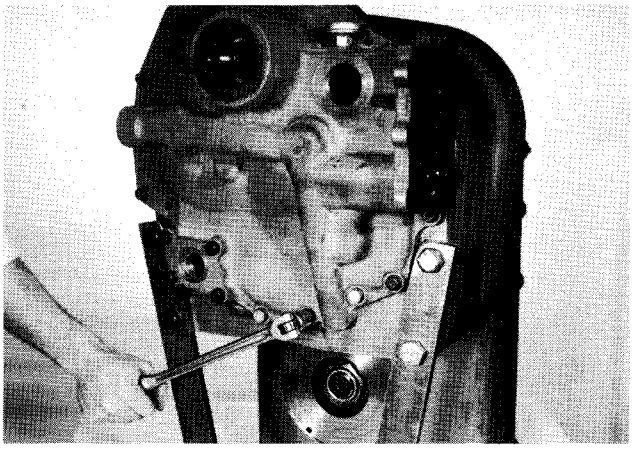


Figure 4
Remove bolts securing front cover to transmission housing.

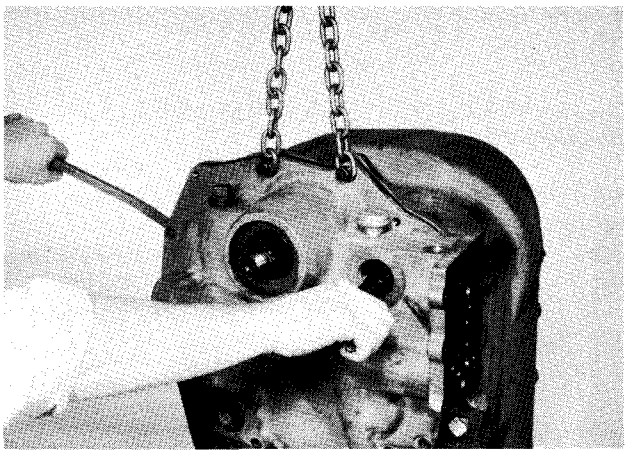


Figure 5
Support front cover with a chain fall. Using spreading type snap ring pliers, spread ears on forward clutch front bearing retaining ring. Holding snap ring open pry front cover from transmission housing.

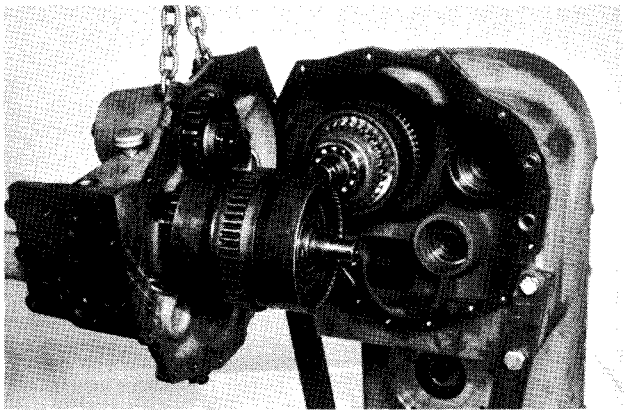


Figure 6
If forward and 2nd clutch comes out with front cover, spread ears on front bearing snap ring and separate clutch from front cover.

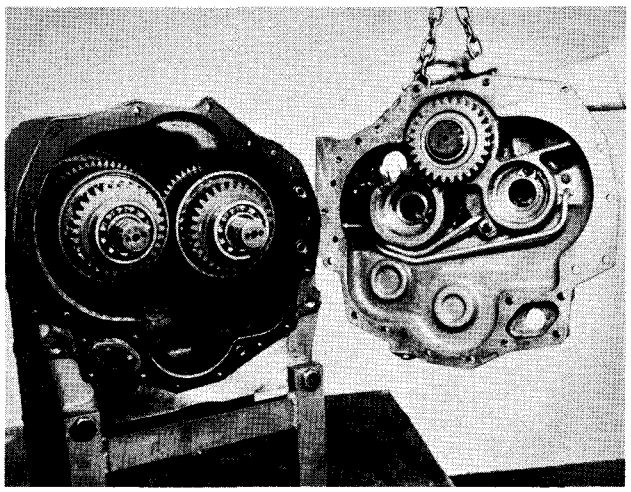


Figure 7
Front cover removed with forward and 2nd and reverse and 3rd clutch in transmission case.

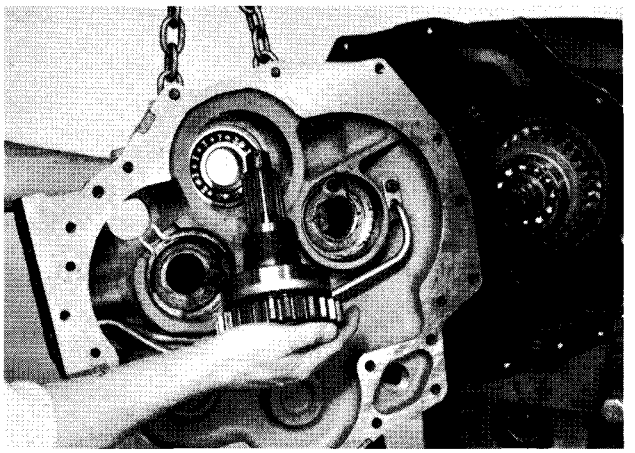


Figure 8
If input shaft is to be removed, tap on threaded end of shaft, remove input shaft, gear and bearing.

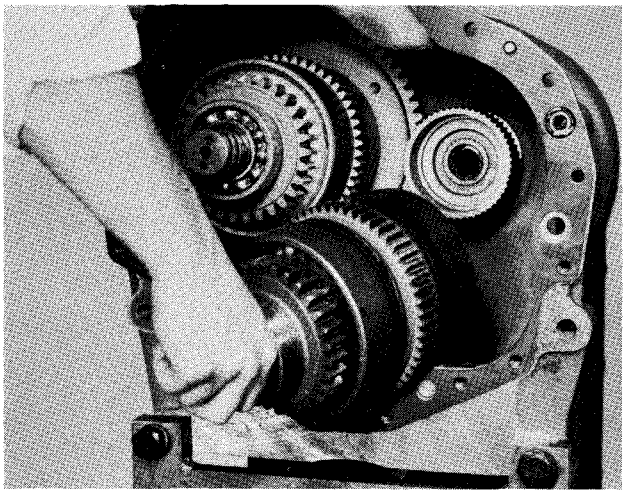


Figure 9
Remove forward and 2nd clutch assembly.

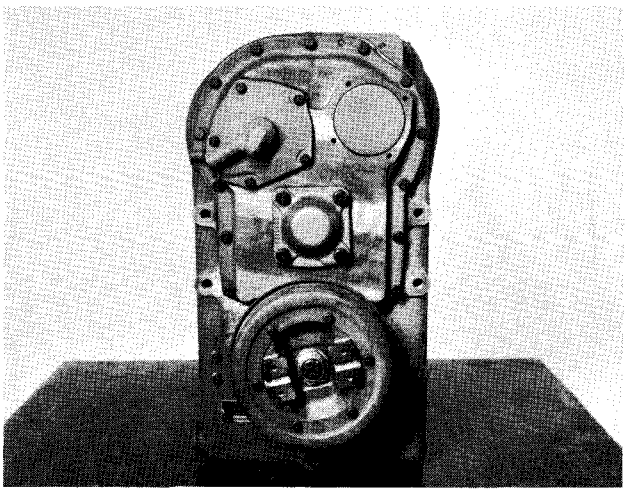


Figure 10
Rear view of transmission utilizing a mechanical parking brake option.

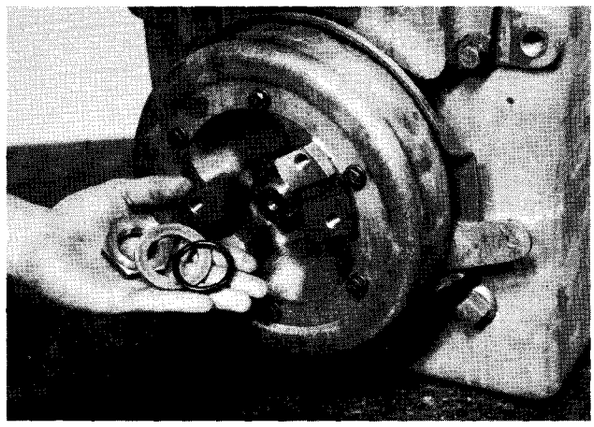


Figure 11
Remove output flange nut, washer and O-ring. If parking brake is not used, remove companion flange and proceed to Figure 17.

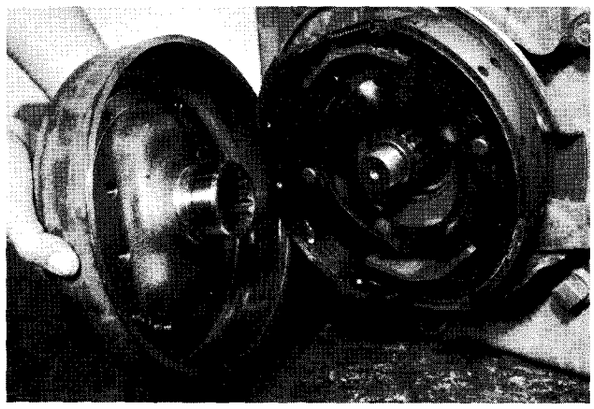


Figure 12
Remove parking brake drum and flange.

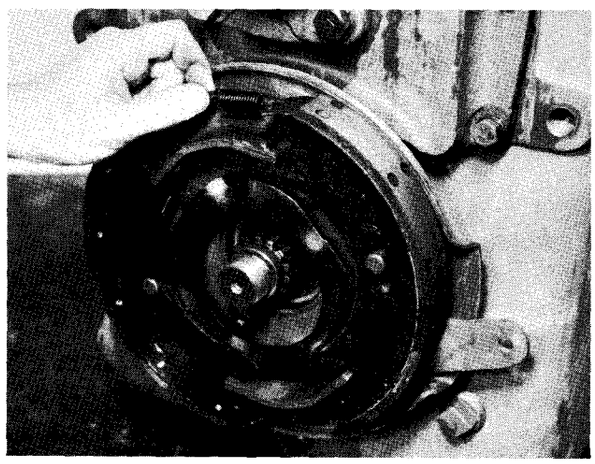


Figure 13
Remove upper and lower brake shoe return springs.

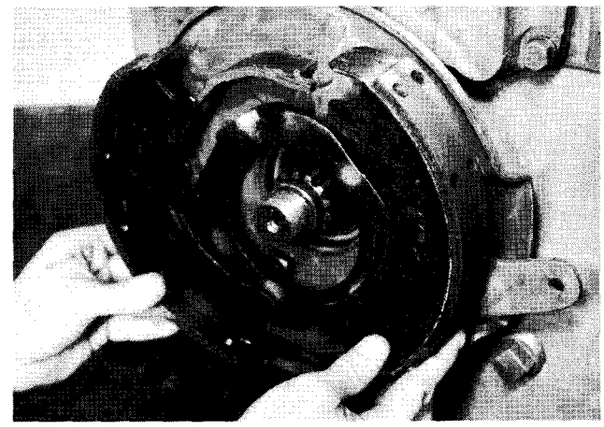


Figure 14
Remove brake shoes.

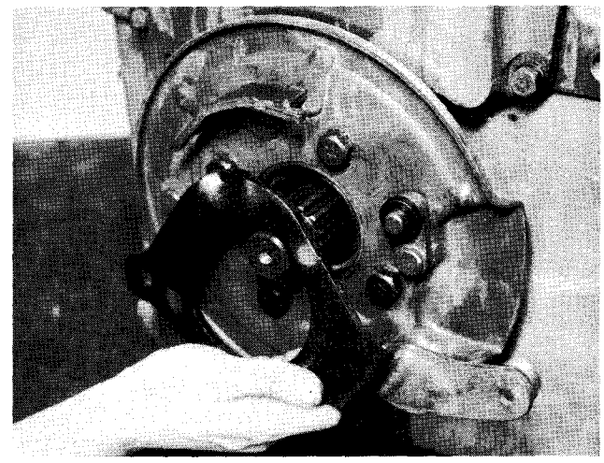


Figure 15
Remove brake actuator arm.

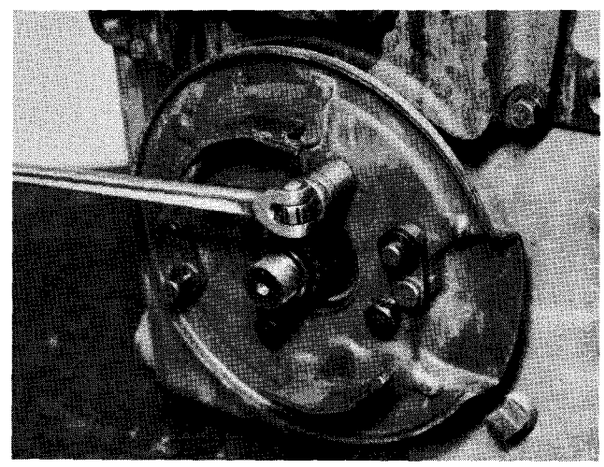


Figure 16
Remove brake backing plate bolts.



Figure 25
Remove low speed drive gear retainer ring and drive gear.

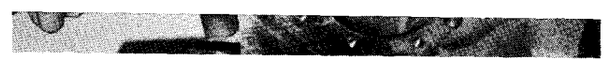


Figure 28
Remove reverse and 3rd clutch assembly.

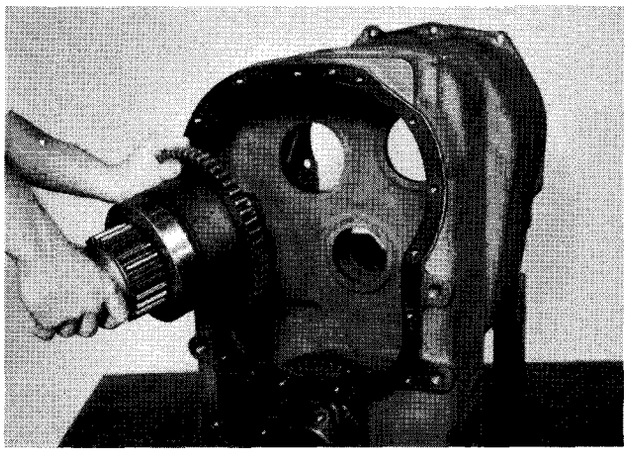


Figure 29
Remove low clutch assembly.

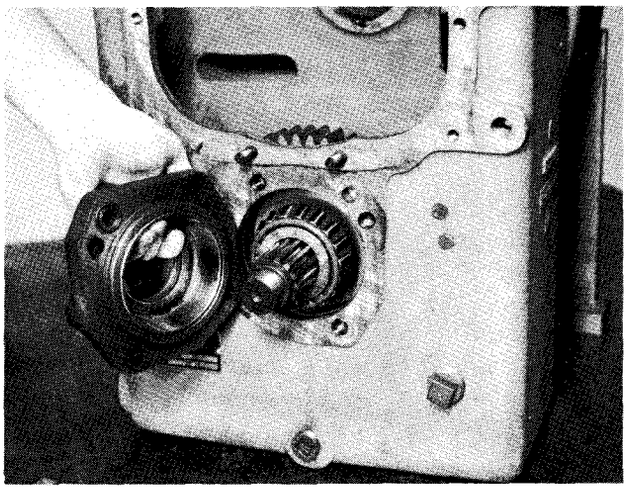


Figure 30
Remove rear output shaft bearing cap bolts and cap.

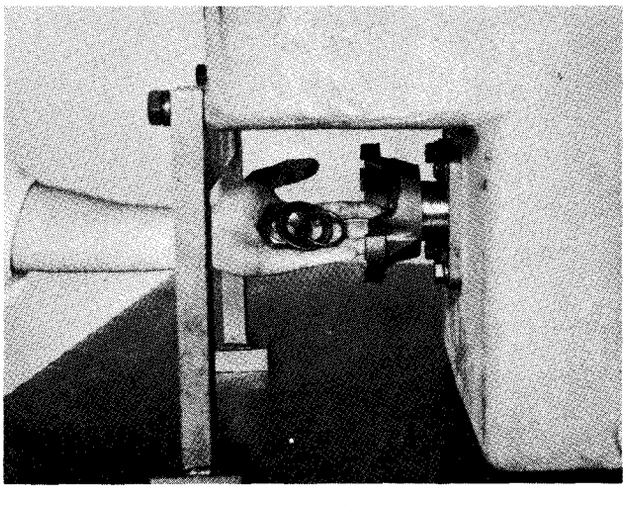


Figure 31
Remove front output flange nut, washer, O-ring and companion flange.

CLUTCH DISASSEMBLY

NOTE: Two clutches are shown being disassembled. The low clutch, and the forward and second. All clutches are disassembled in a similar manner. The quantity of clutch discs will differ between the low clutch and the forward, reverse, second and third. Do not mix the bronze discs in the low clutch with the bronze discs of any of the other clutches. (See note, Figure 68).

LOW CLUTCH DISASSEMBLY

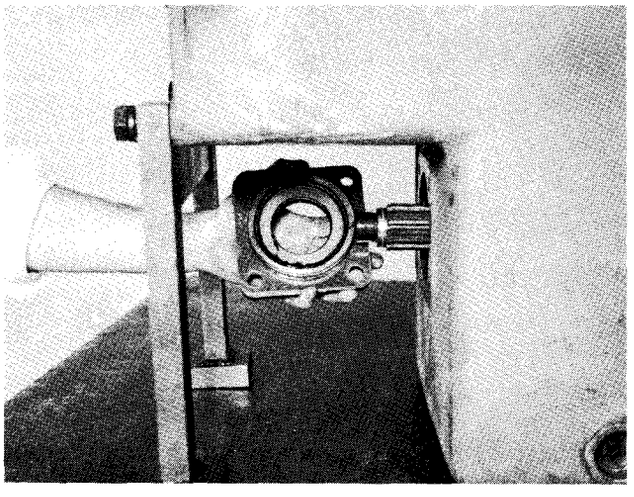


Figure 32
Remove output shaft front bearing cap bolts and cap.

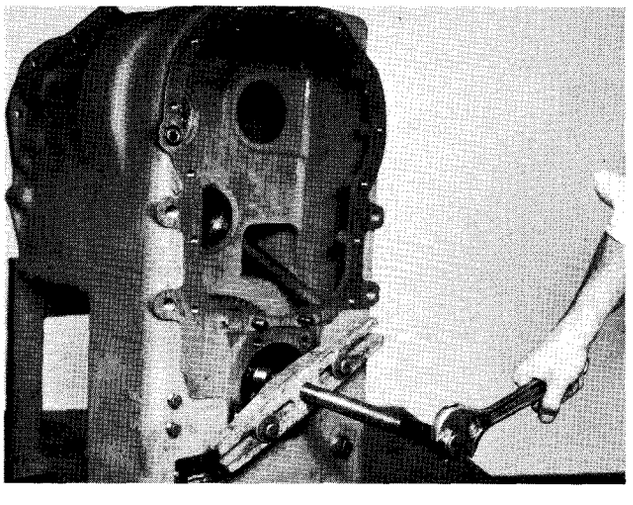


Figure 33
Block output gear. Push output shaft from rear through bearing and gear.

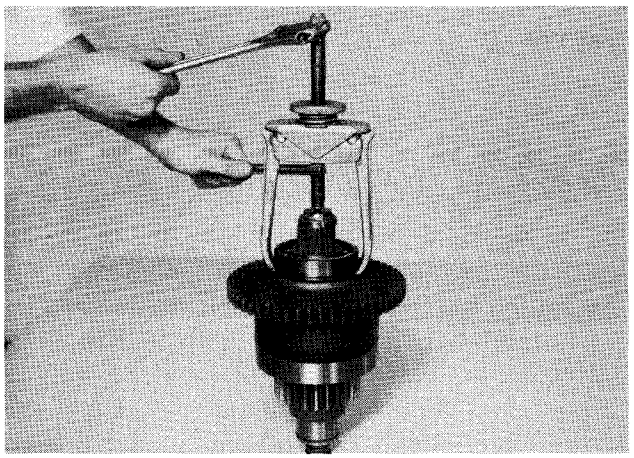


Figure 34
Remove low clutch shaft rear bearing.

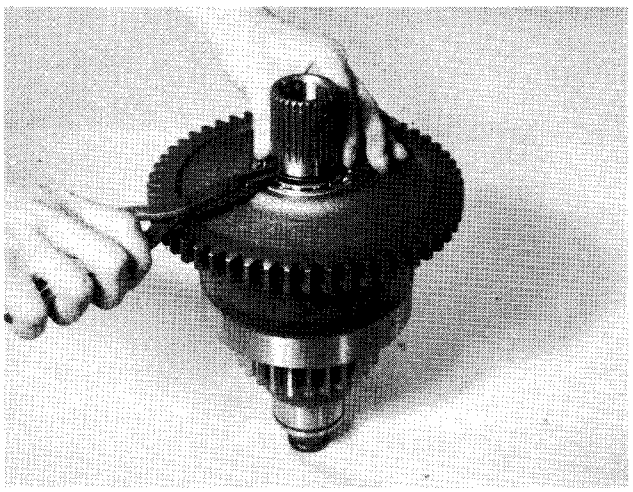


Figure 35
Remove low speed gear retainer ring.

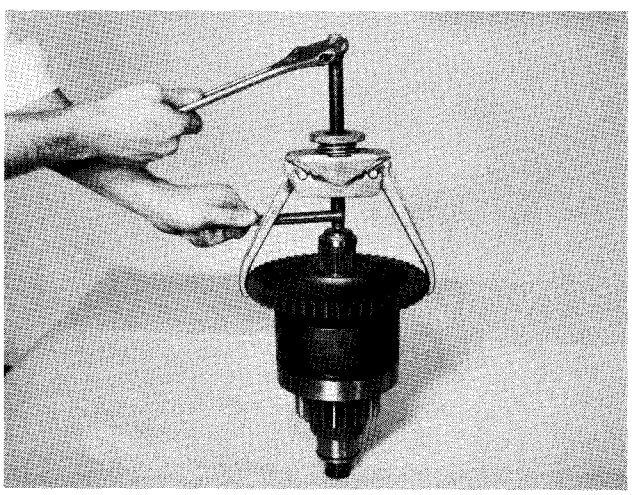


Figure 36
Remove low speed gear and outer bearing.

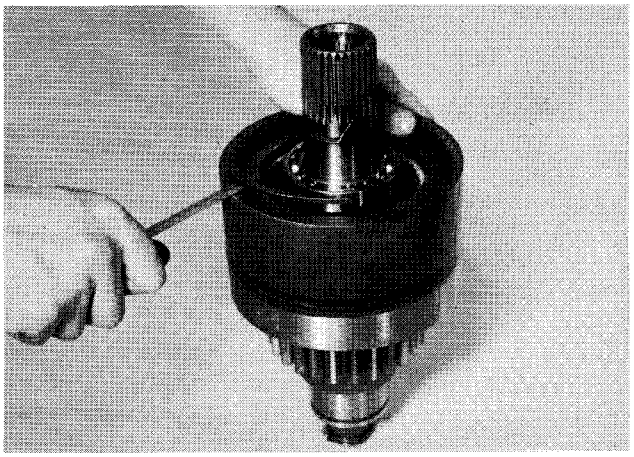


Figure 37
Remove clutch end plate retainer ring.

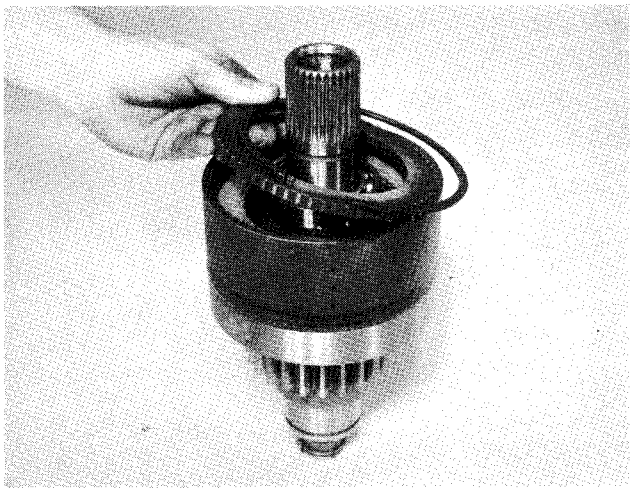


Figure 38
Remove clutch end plate and inner and outer clutch discs.

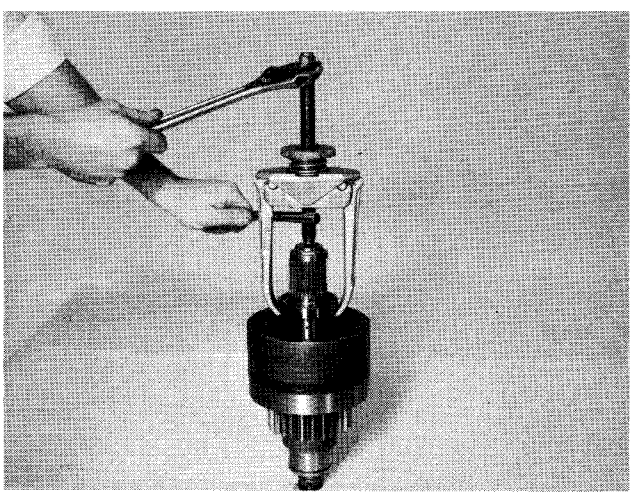


Figure 39
Remove low gear inner bearing.

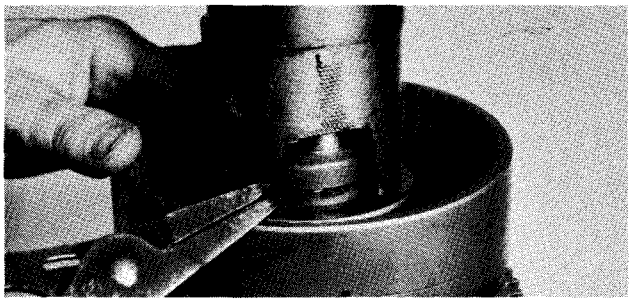


Figure 40

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

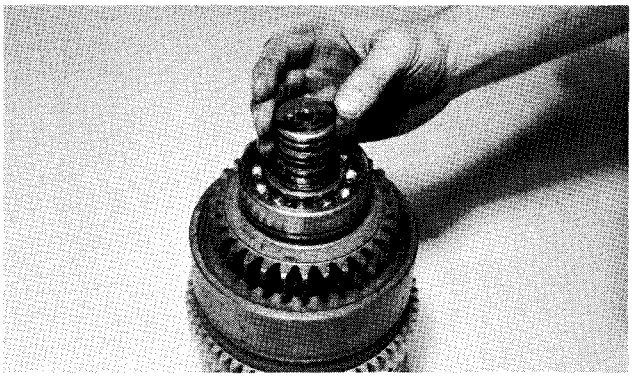


Figure 41

Remove clutch shaft piston rings.

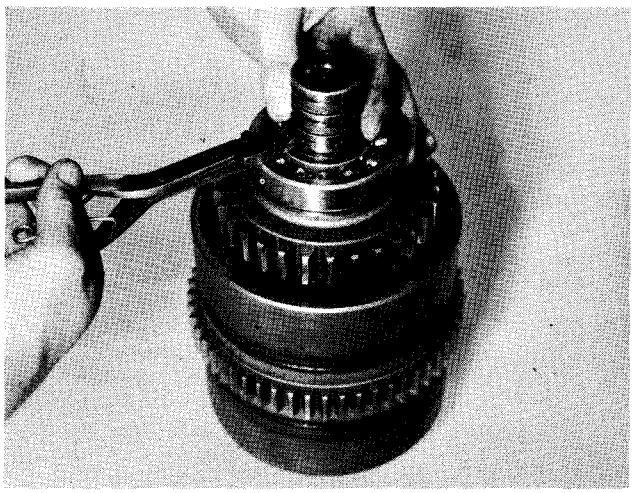


Figure 42

Remove front bearing retainer ring.

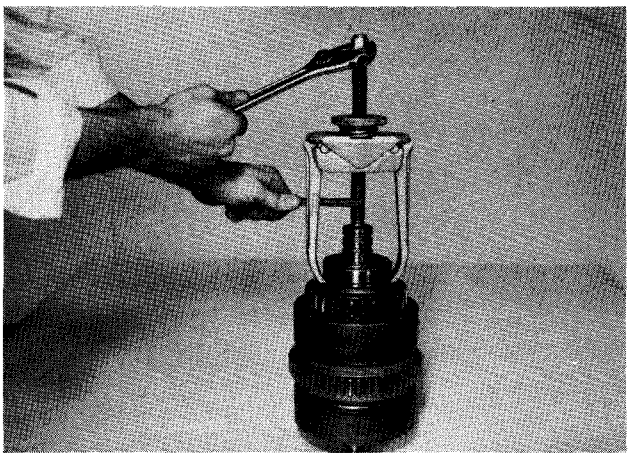


Figure 43

Remove front bearing.

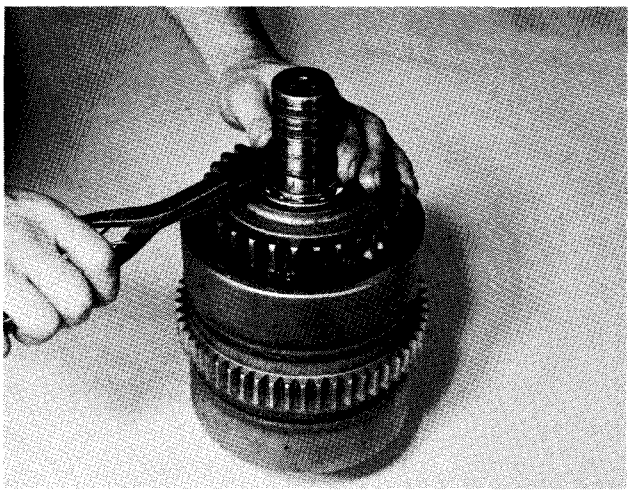


Figure 44

Remove front bearing locating ring.

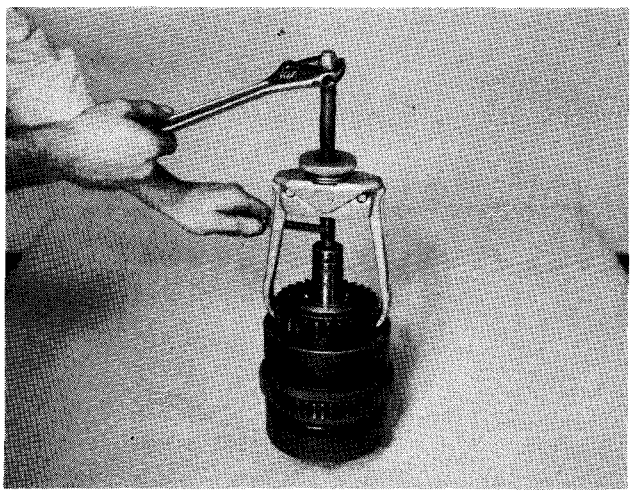


Figure 45

Remove clutch driven gear and outer bearing.

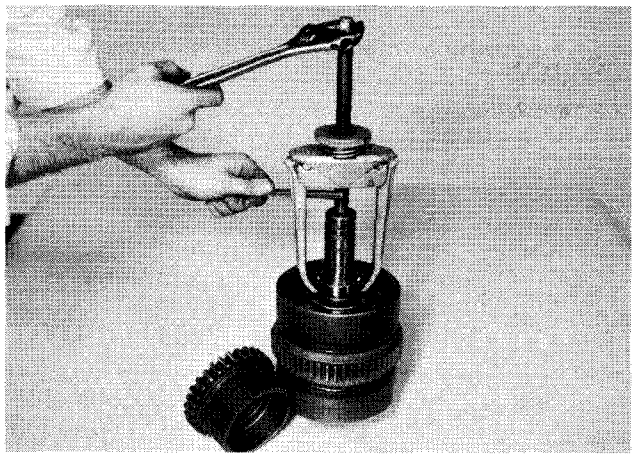


Figure 46

Remove inner bearing.

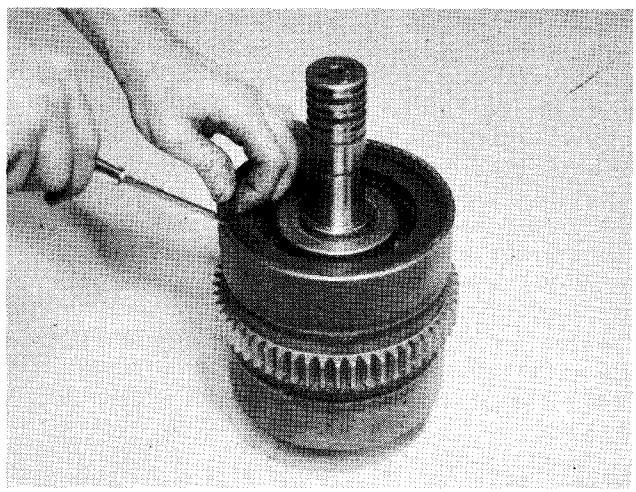


Figure 47

Remove end plate retainer ring.

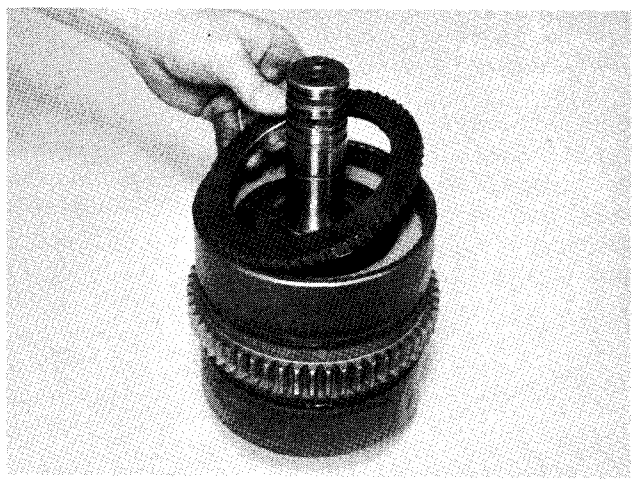


Figure 48

Remove end plate.

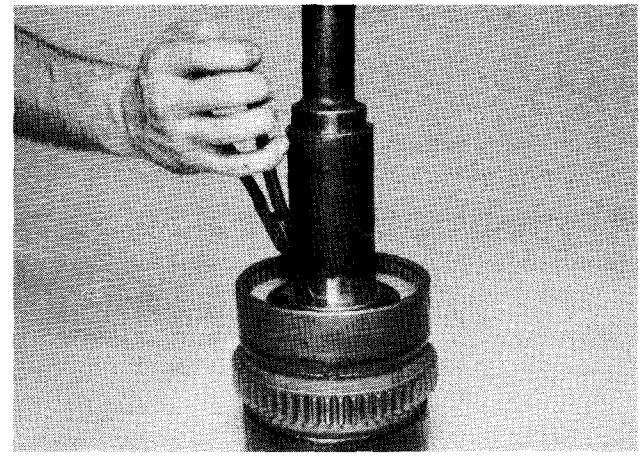


Figure 49

Compress return spring retainer. Remove retainer ring from groove.

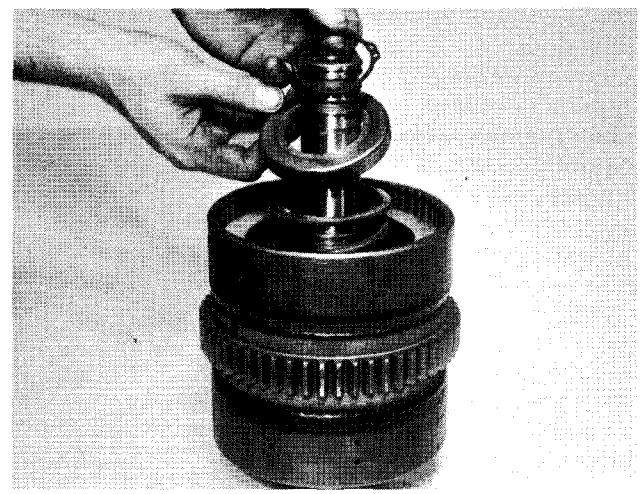


Figure 50

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

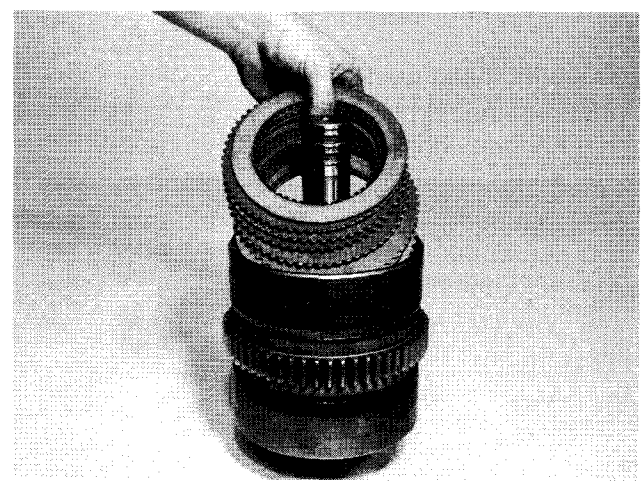


Figure 51

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

CLARK EQUIPMENT

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 inhalation of vapors and skin rashes when using alkali 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.

Suction Screen:
Remove suction screen located at the lower left hand side of the transmission housing. Clean screen thoroughly or replace if necessary. AFTER housing is cleaned, reinstall screen and gasket.

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 recommended type 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 & 2ND CLUTCH REASSEMBLY

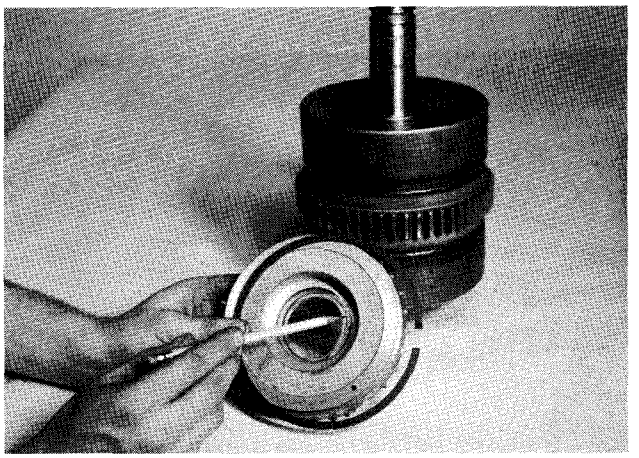


Figure 52

Install new clutch piston inner and outer sealing rings.

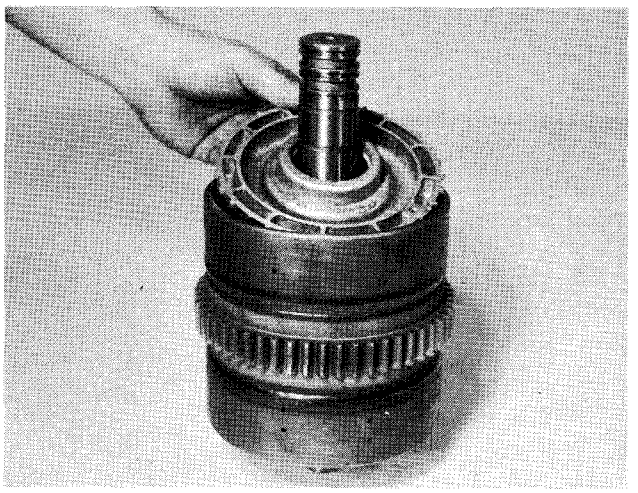


Figure 53

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

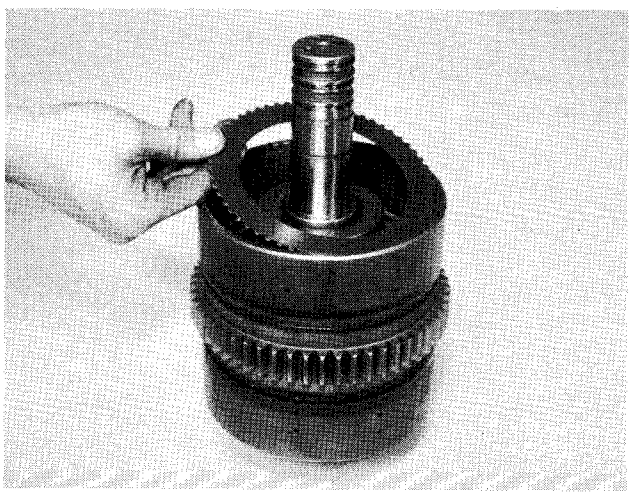


Figure 54

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

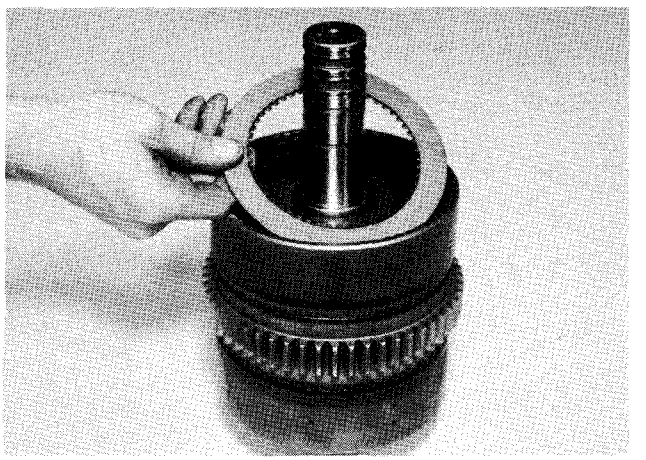


Figure 55

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.

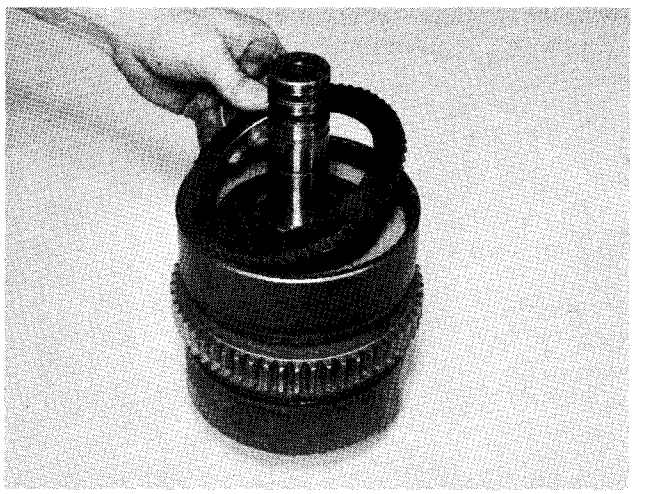


Figure 56

Install end plate.

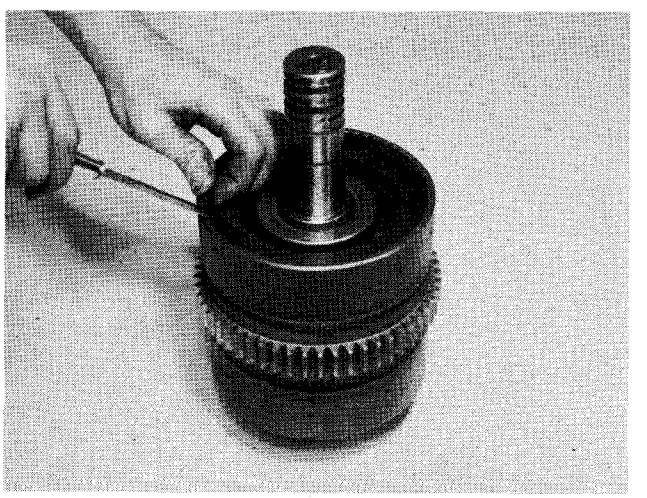


Figure 57

Install end plate retainer ring.

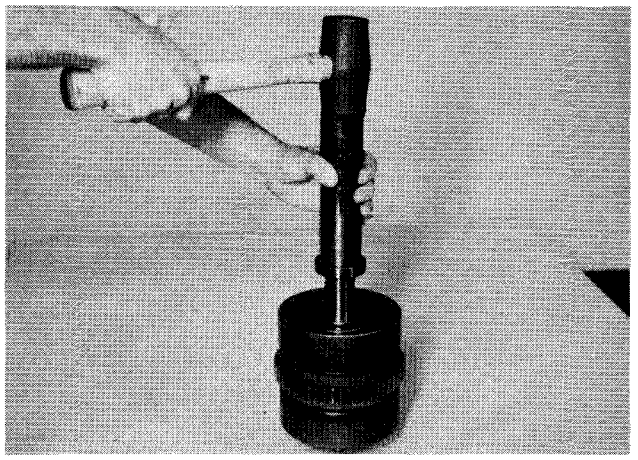


Figure 58
Install clutch driven gear inner bearing.

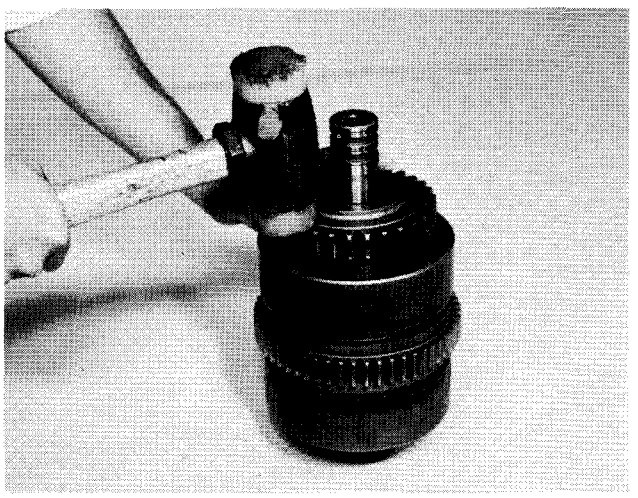


Figure 59
Install clutch driven gear into clutch drum. Align splines on clutch gear with internal teeth of bronze discs. Tap gear into position. Do not force this operation. Gear splines must be in full position with internal teeth of all bronze discs.

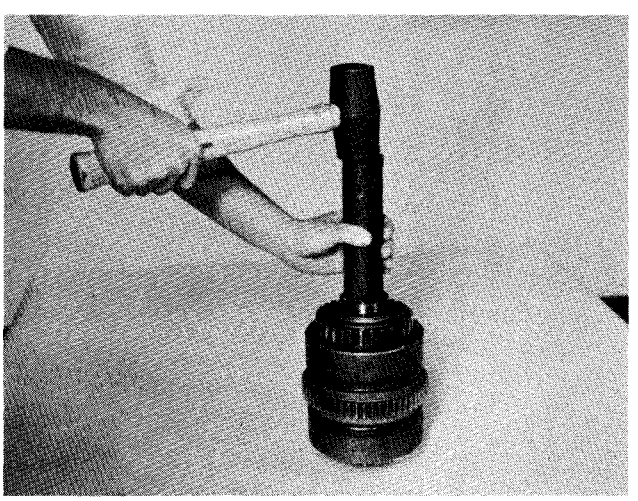


Figure 60
Install driven gear outer bearing.

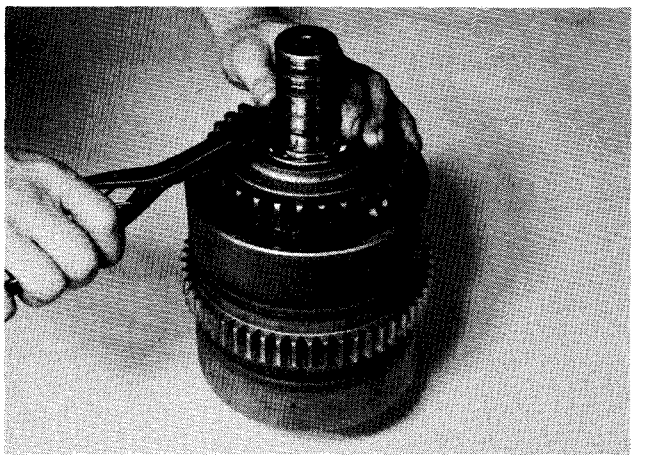


Figure 61
Install front bearing locating ring.

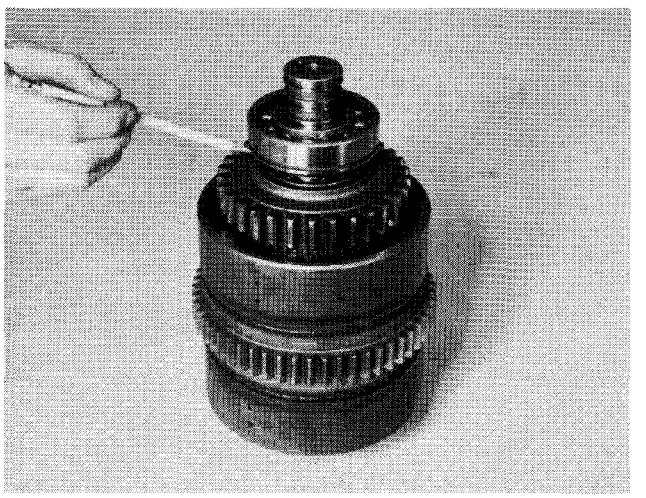


Figure 62
Install front bearing. *NOTE: Snap ring groove in front bearing must be down.*

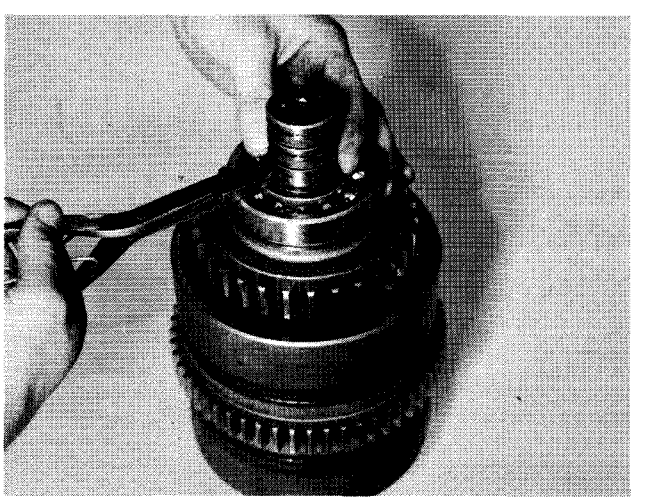


Figure 63
Install front bearing retaining ring.

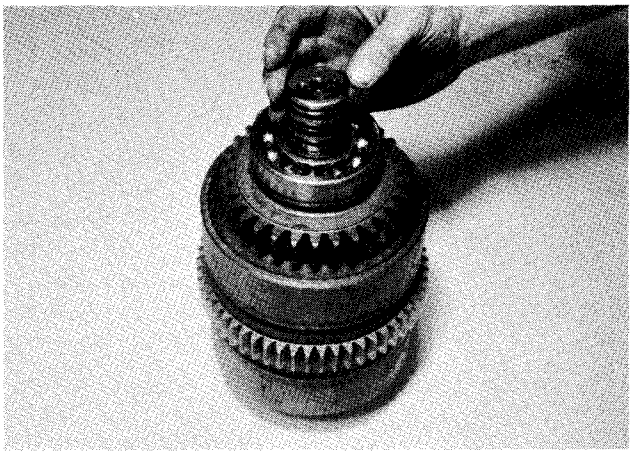


Figure 64

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

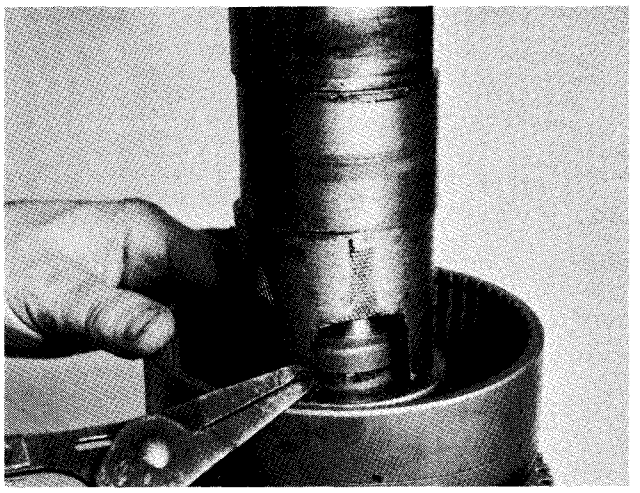


Figure 65

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.

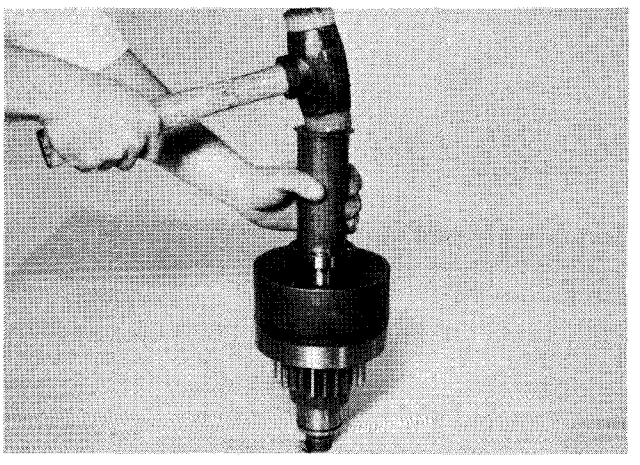


Figure 66

Install low gear inner bearing.

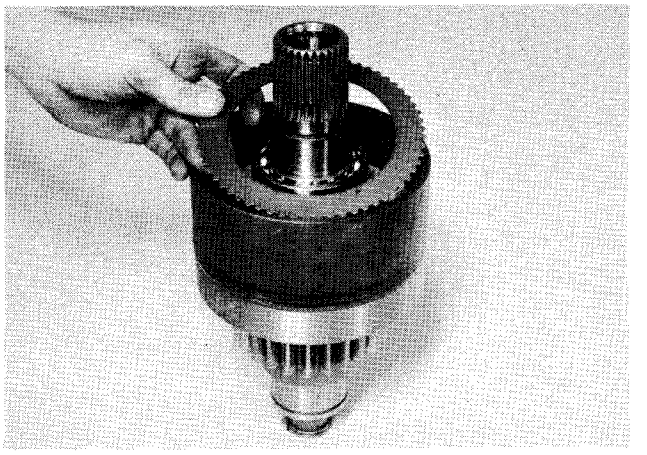


Figure 67

Install one steel disc.

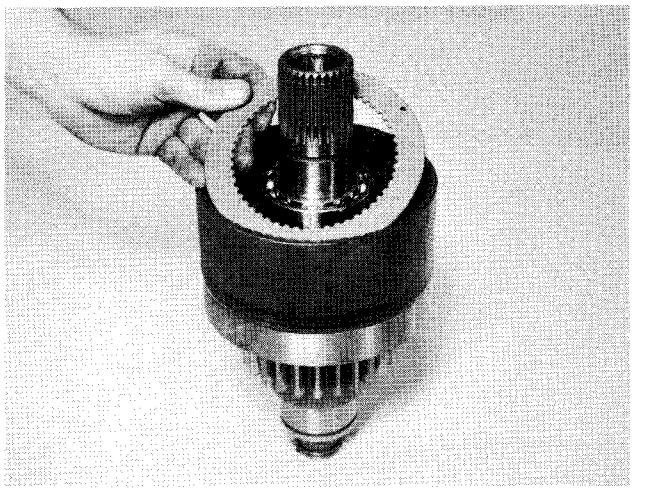


Figure 68

Install one bronze disc. *NOTE: The bronze discs in the low clutch have 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.*

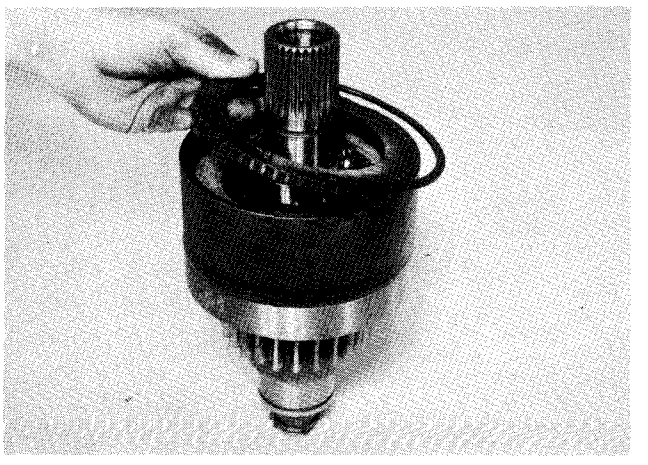


Figure 69

Install end plate and retainer ring.

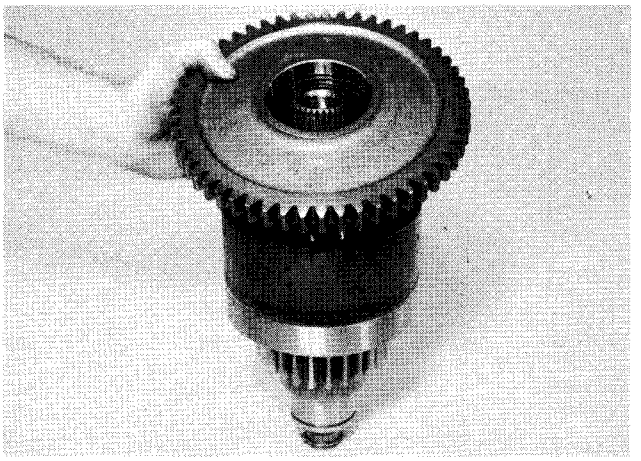


Figure 70

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.

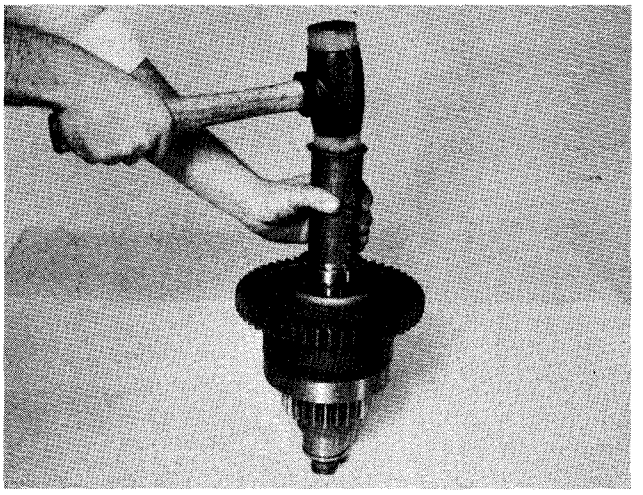


Figure 71

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

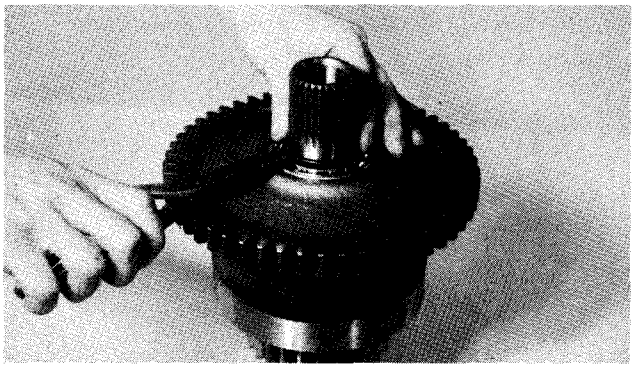


Figure 72

Install low gear retainer ring.

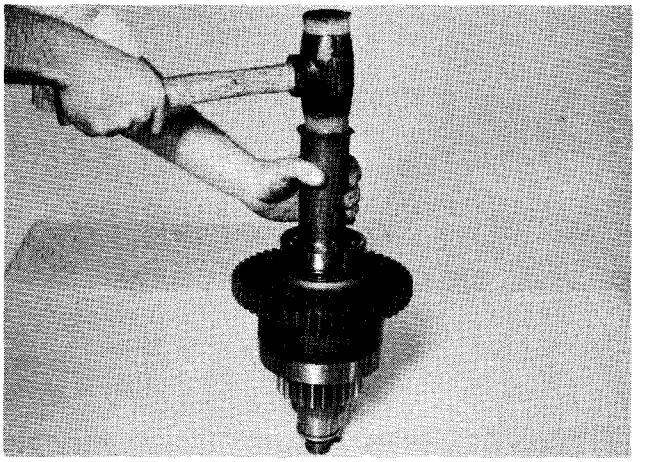


Figure 73

Install low clutch shaft rear bearing.

REASSEMBLY OF OUTPUT SHAFT

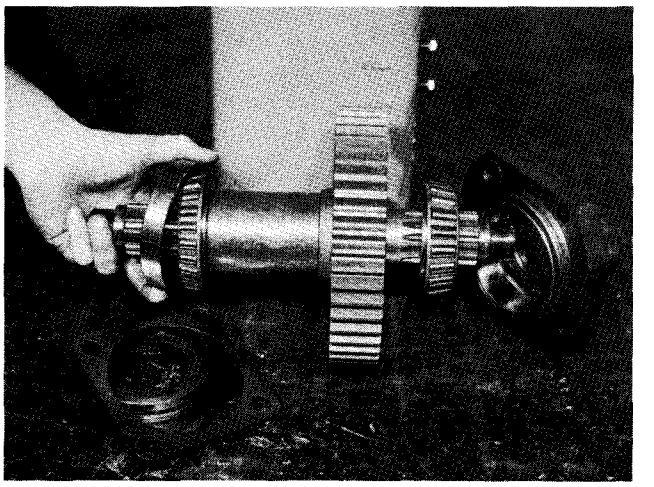


Figure 74

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.

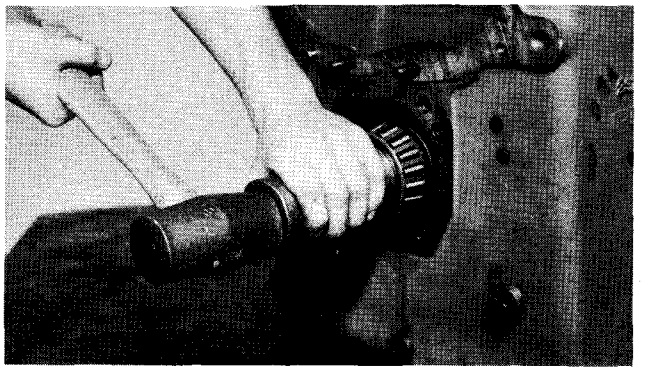


Figure 75

Position output gear in transmission case with protruding hub toward front of case. See Fig. 74. 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.

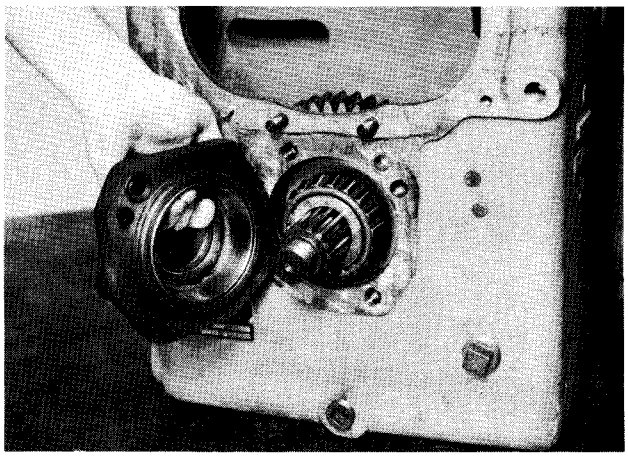


Figure 76

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).

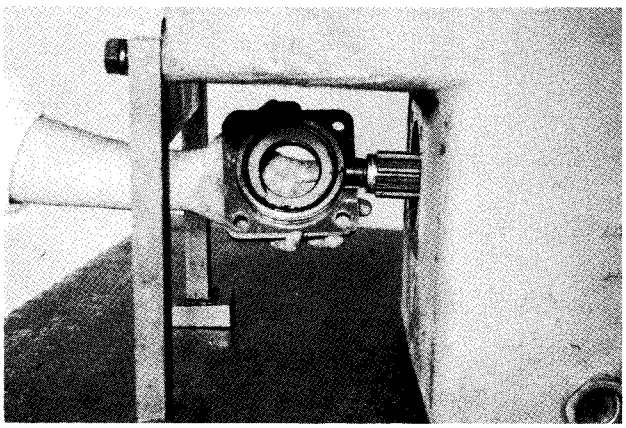


Figure 77

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.

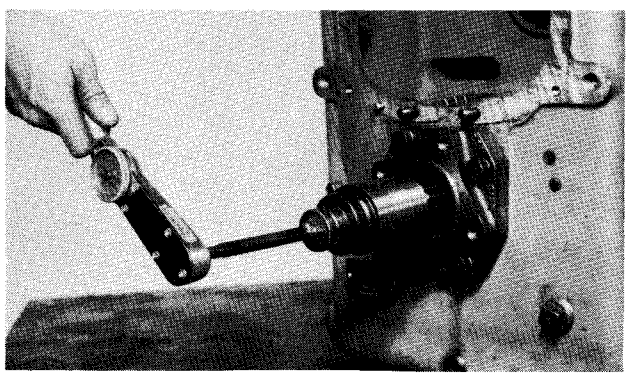


Figure 78

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.

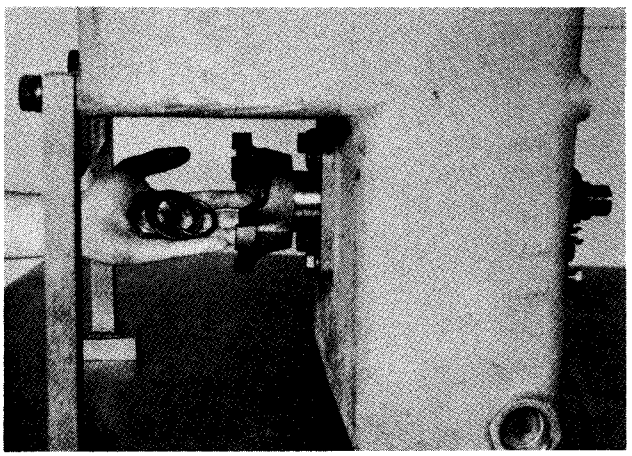


Figure 79

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

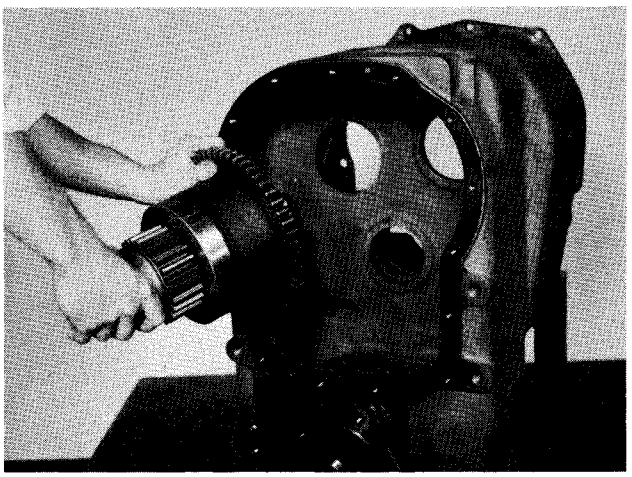


Figure 80

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

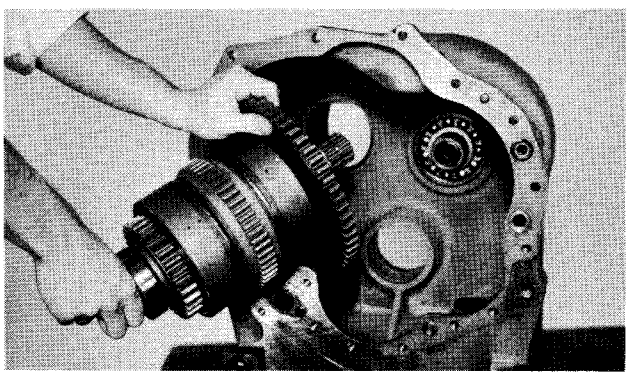


Figure 81

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

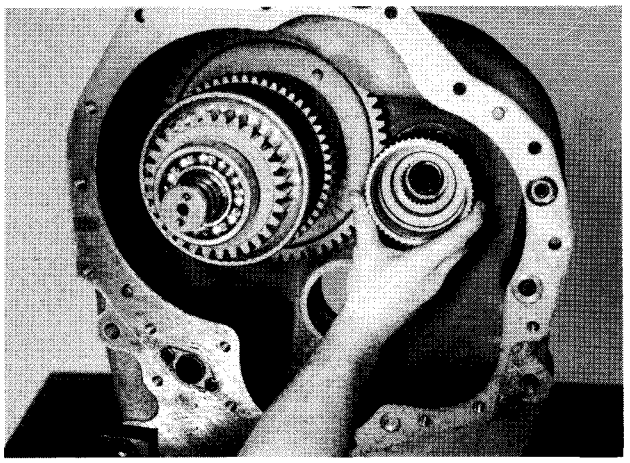


Figure 82
Install 2nd speed gear on low clutch shaft.

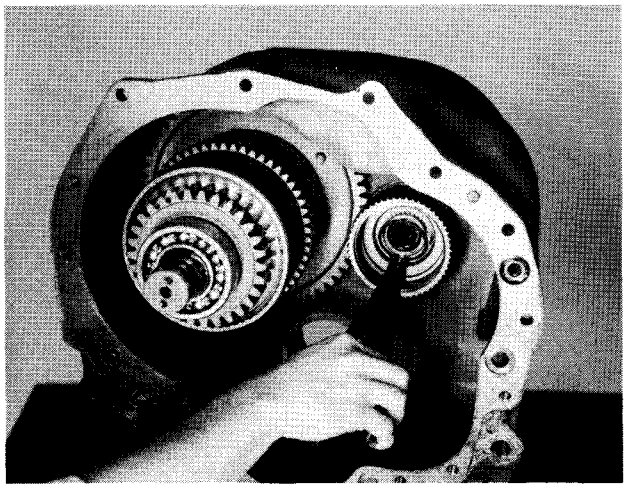


Figure 83
Install 2nd speed gear retainer ring.

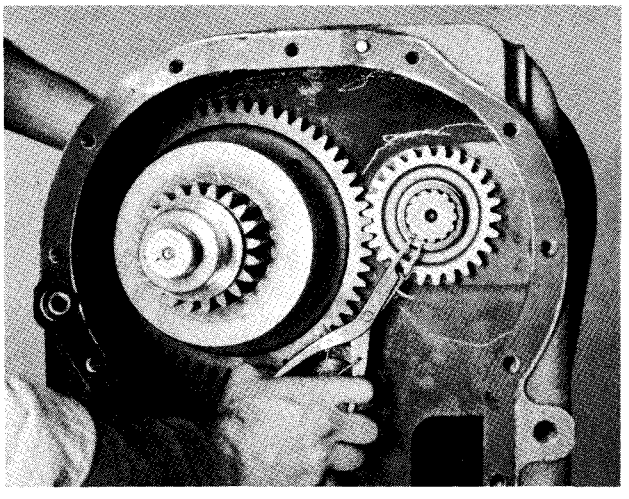


Figure 84
Install low speed drive gear and retainer ring.

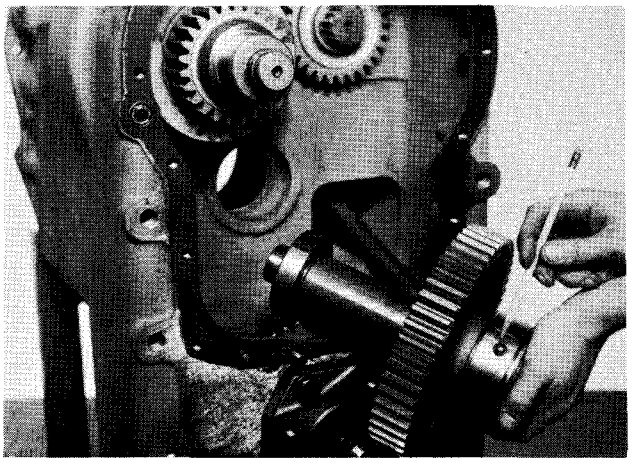


Figure 85
Install idler shaft and bearing assembly.

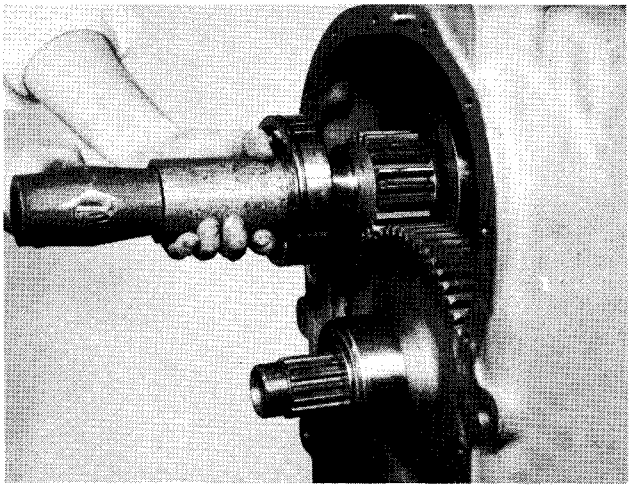


Figure 86
Install low clutch rear bearing with bearing ring groove to the rear.

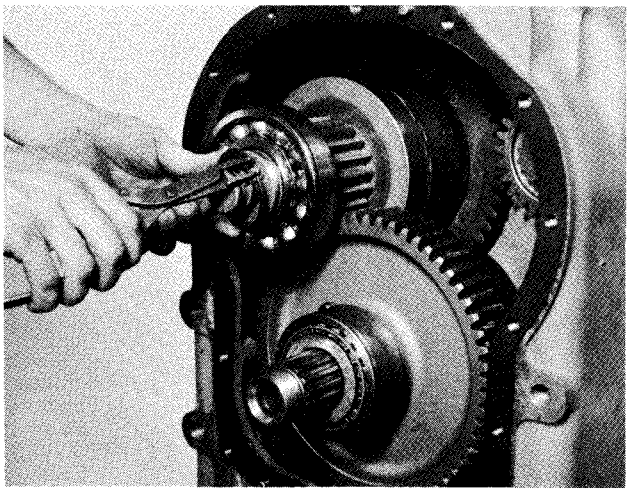


Figure 87
Install low clutch rear bearing retainer ring.

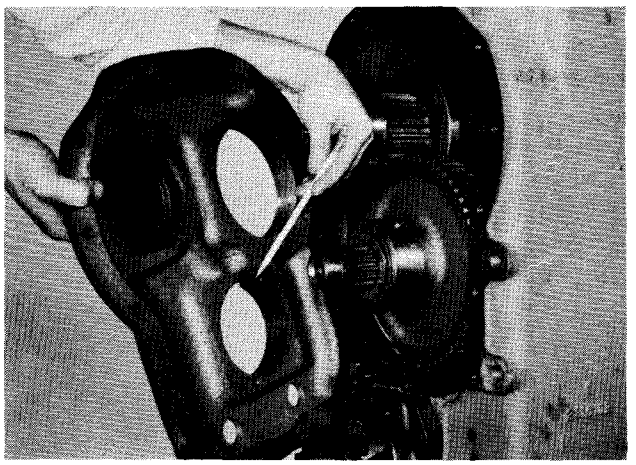


Figure 88
Position a new gasket on rear transmission case. Align lock ball in idler shaft rear bearing with notch in rear transmission cover. Tap cover in place and secure with bolts and lockwashers.

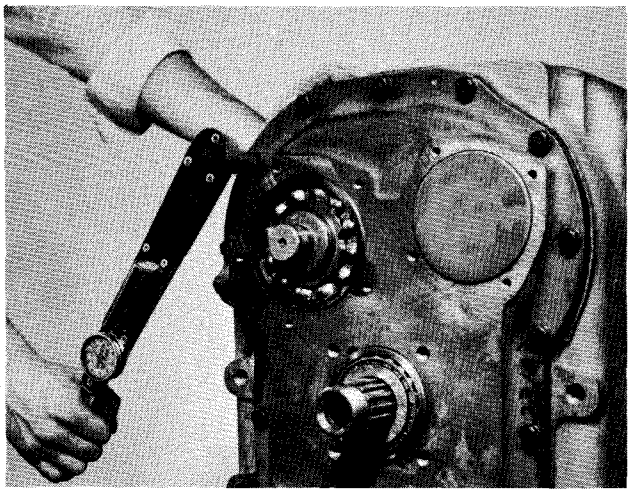


Figure 89
Torque rear cover bolts to specified torque.

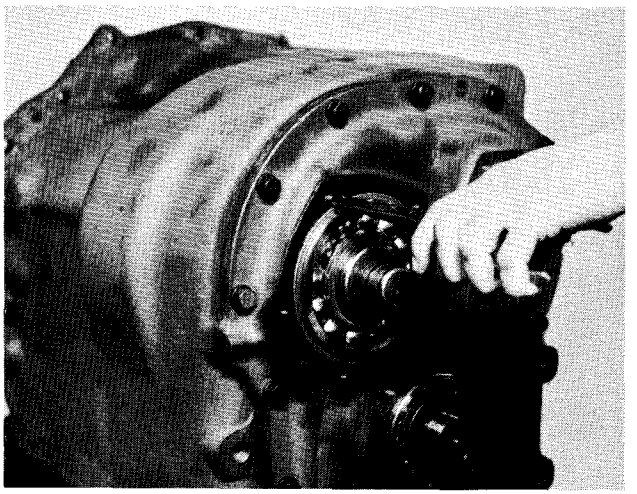


Figure 90
From front of transmission case, tap low clutch and idler shaft to rear. This will allow clearance to install rear bearing snap ring.

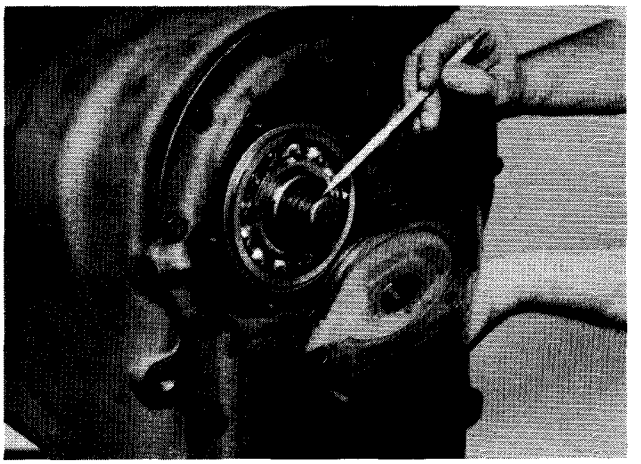


Figure 91
Install low clutch shaft piston rings. Install new gasket and O-Ring on low shaft bearing cap.

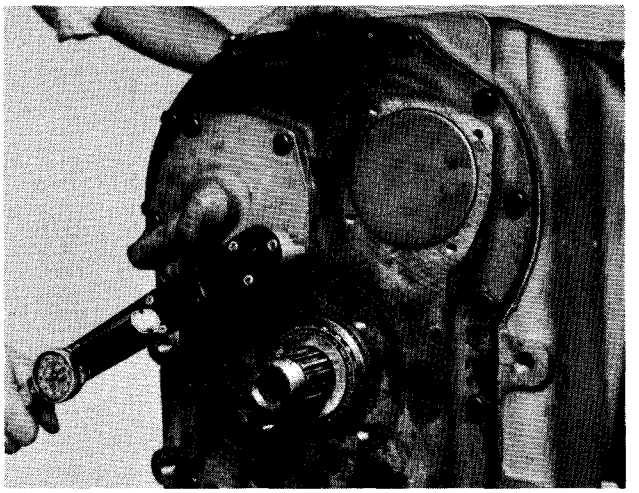


Figure 92
Install bearing cap and secure with lockwashers and bolts. Tighten to specified torque.

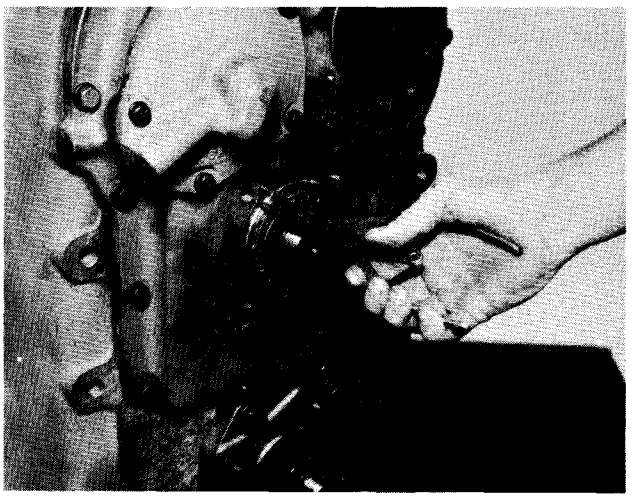


Figure 93
Install idler shaft rear bearing locating ring.

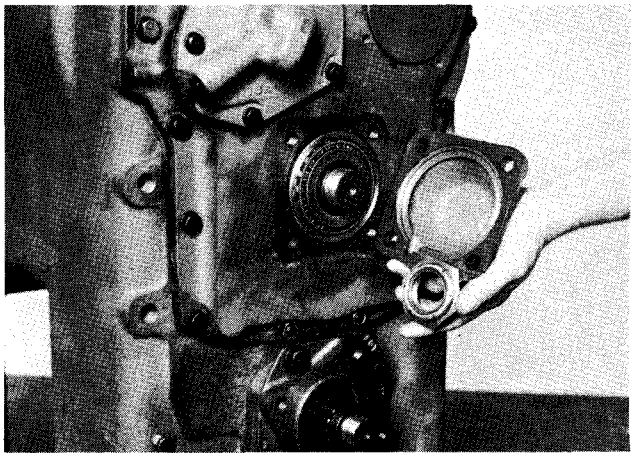


Figure 94

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 Fig. 100.

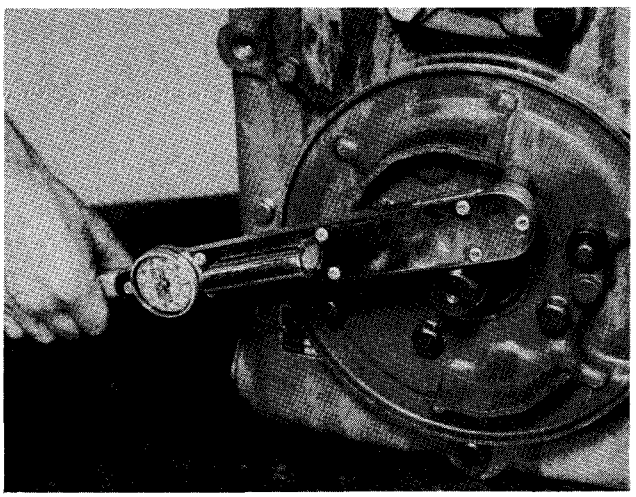


Figure 95

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

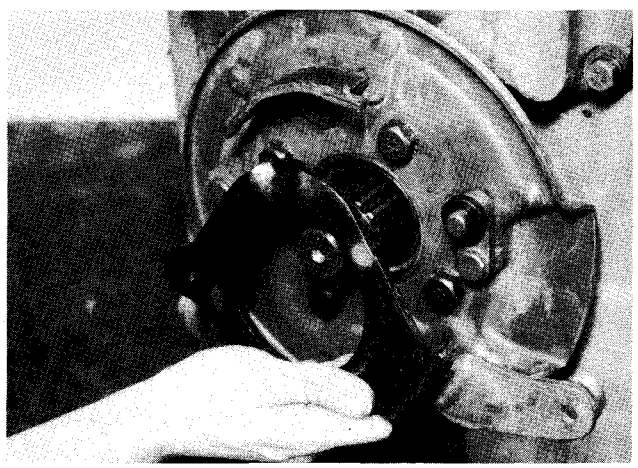


Figure 96

Position brake actuating arm.

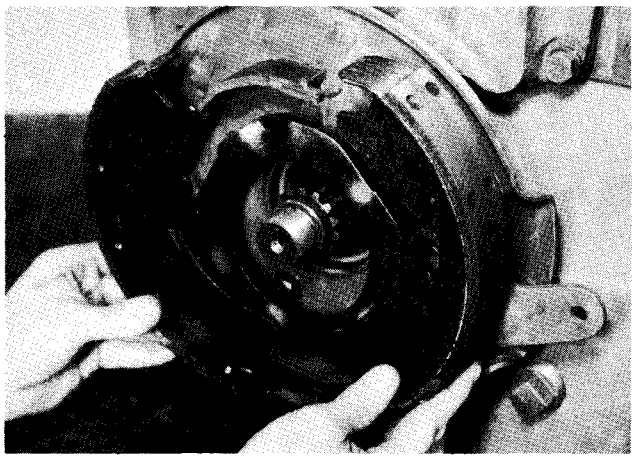


Figure 97

Locate brake shoes.

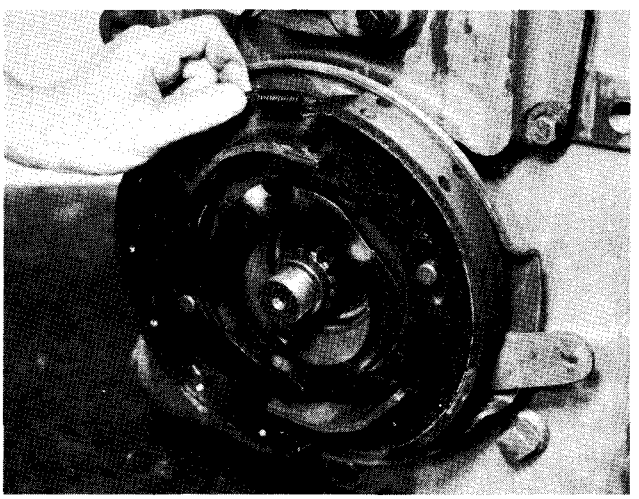


Figure 98

Install upper and lower brake shoe return springs.

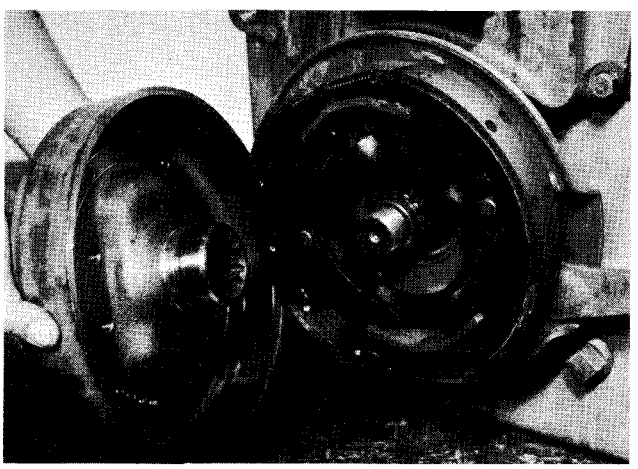


Figure 99

Install brake drum and flange assembly.

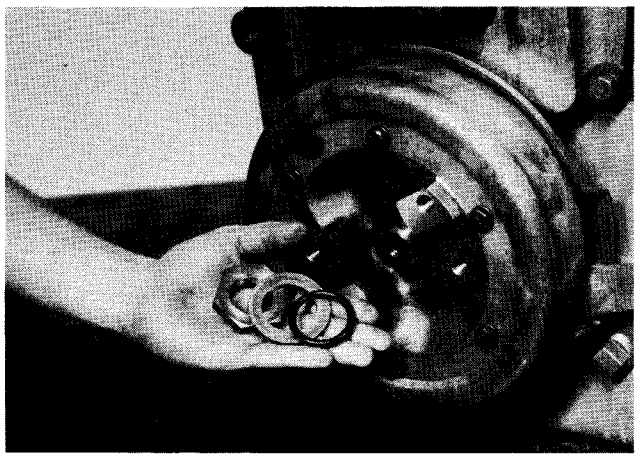


Figure 100
Secure flange with a new O-Ring, washer and flange nut. Block output shaft and tighten nut 200 to 250 ft. lbs. torque.

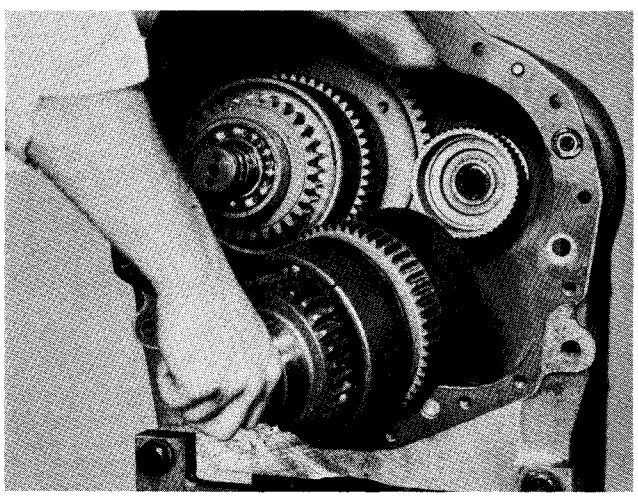


Figure 101
From the front of the transmission case, install the forward and 2nd clutch assembly.

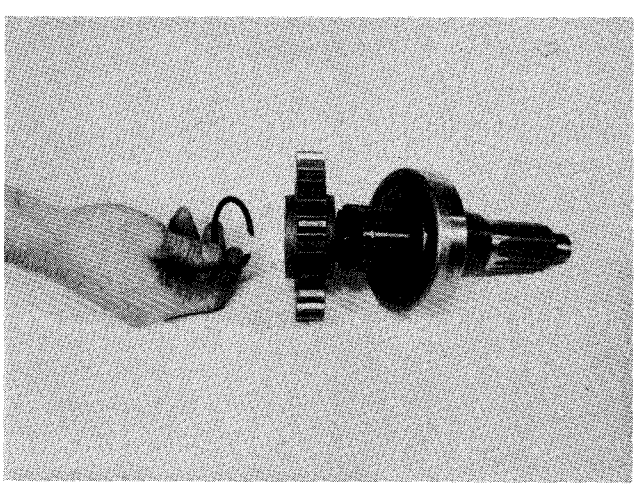


Figure 102
Input shaft, rear bearing, drive gear and snap ring.

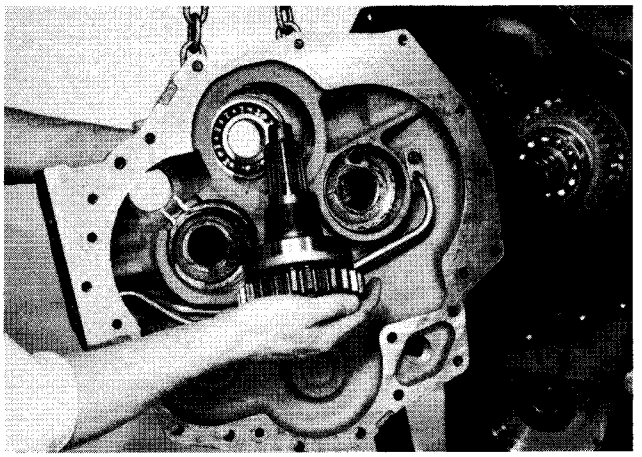


Figure 103
Install input shaft into front bearing.

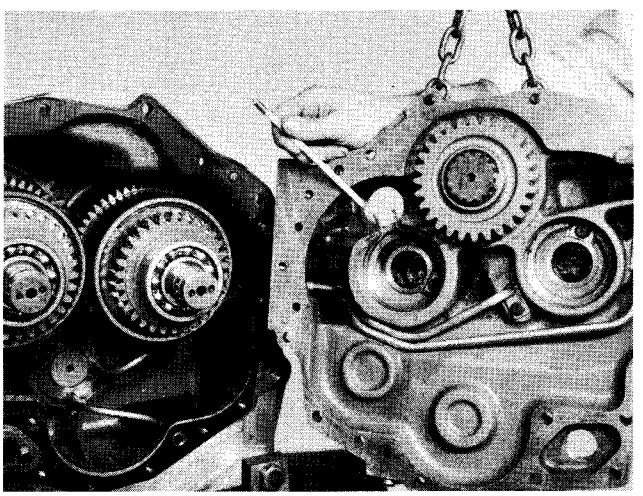


Figure 104
Forward clutch front bearing locating ring.

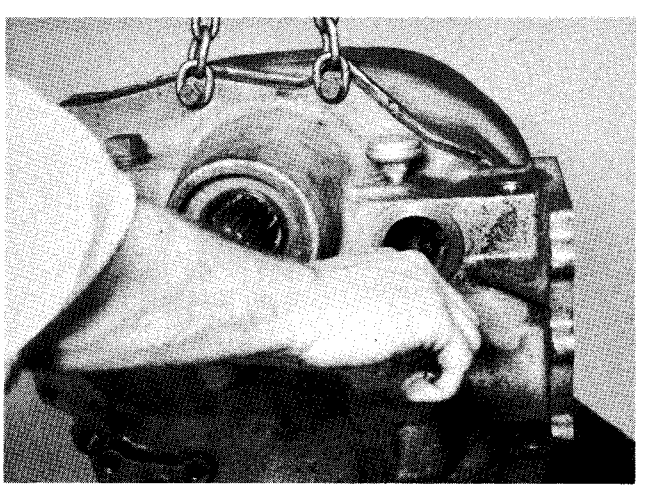


Figure 105
Support front cover with a chain fall. Spread forward clutch front bearing retainer ring. Position front cover to transmission case. Tap cover into place using caution as not to damage any of the clutch shaft piston rings.

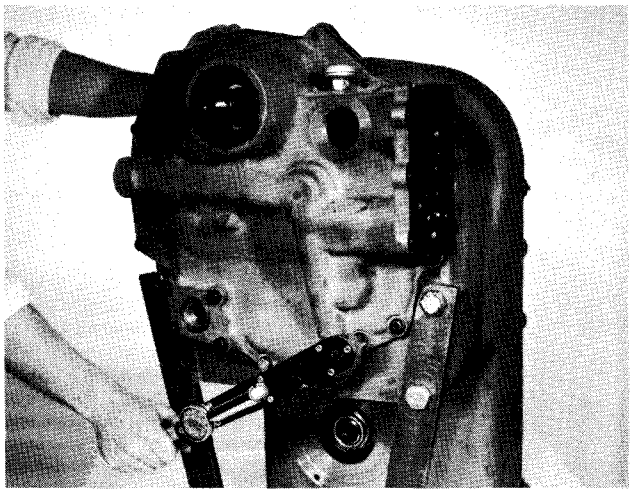


Figure 106
Install cover to case bolts. Tighten to specified torque.

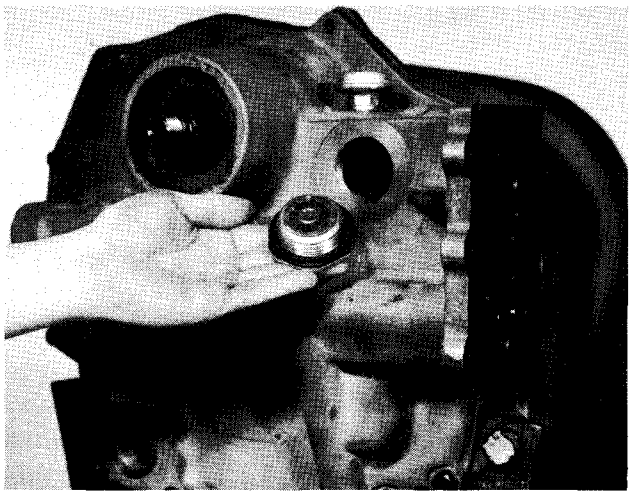


Figure 107
Install front cover plug.

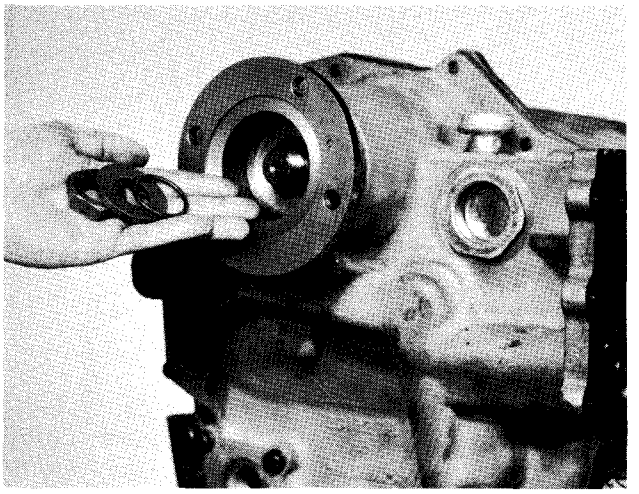


Figure 108
Install companion flange, flange O-Ring, washer and nut. Tighten nut 175 to 200 ft. lbs. torque.

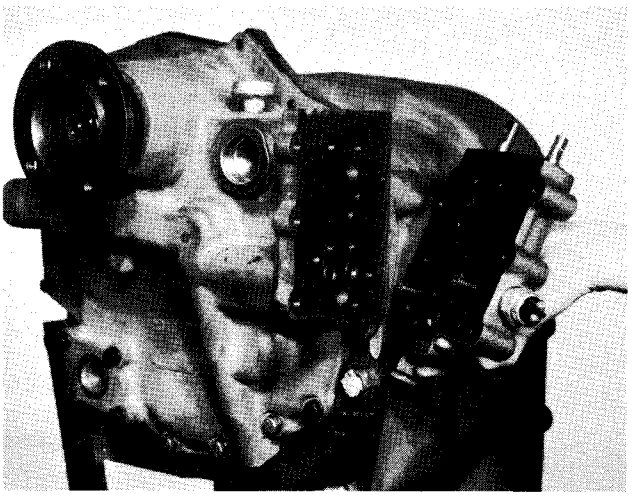


Figure 109
Locate detent balls and springs in control valve. Position new gasket. Secure valve with bolts and washers. Tighten to specified torque.

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.

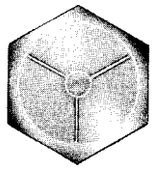
After the overhauled or repaired transmission has been installed in the machine, the oil cooler, and connecting hydraulic system must be thoroughly cleaned. This can be accomplished in several manners and a degree of judgment must be exercised as to the method employed.

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

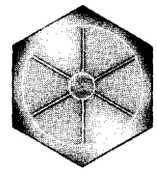
Grade 5 Identification, 3 Radial Dashes 120° Apart on Head of Bolt



Grade 5

LUBRICATED OR PLATED

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



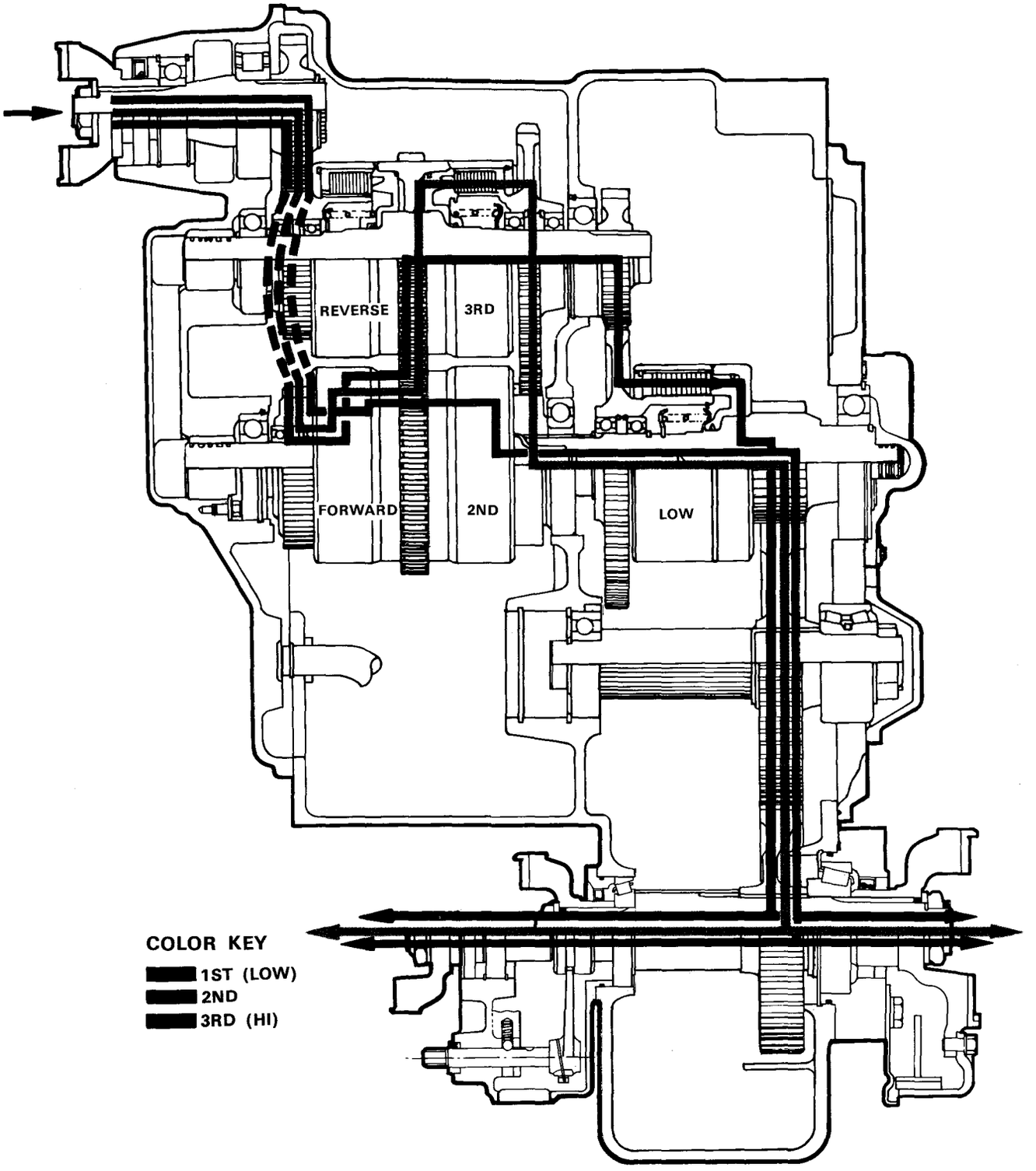
Grade 8

NOMINAL THREAD SIZE	FINE THREADS	COARSE THREADS	FINE THREADS	COARSE THREADS
3/8	26 — 29	23 — 25	37 — 41	33 — 36
7/16	41 — 45	37 — 41	58 — 64	52 — 57
1/2	64 — 70	57 — 63	90 — 99	80 — 88
9/16	91 — 100	82 — 90	128 — 141	115 — 127

LACK OF POWER

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

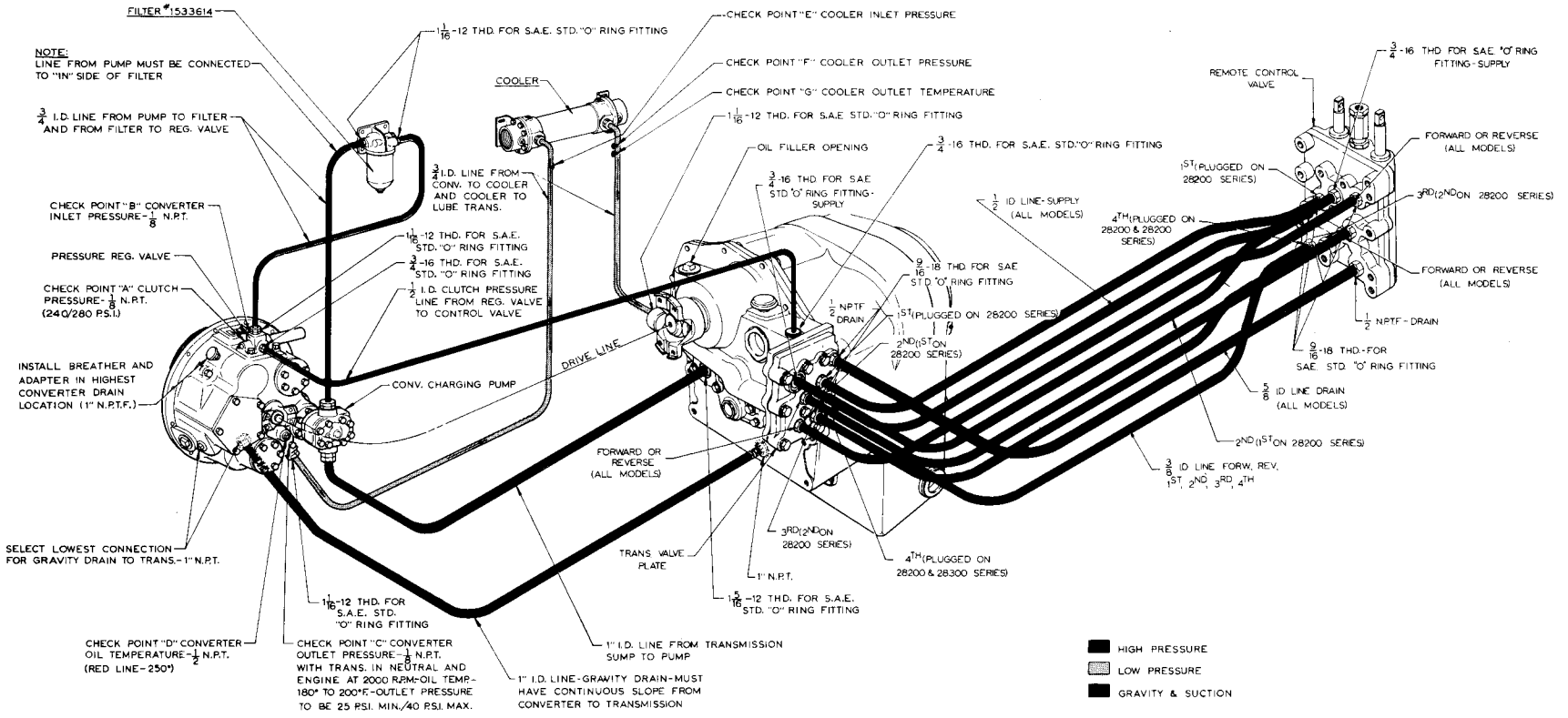
1. Tune engine check governor.
2. Make corrections as explained in "Over-Heating."



R MODEL 3 SPEED TRANSMISSION

FIGURE I

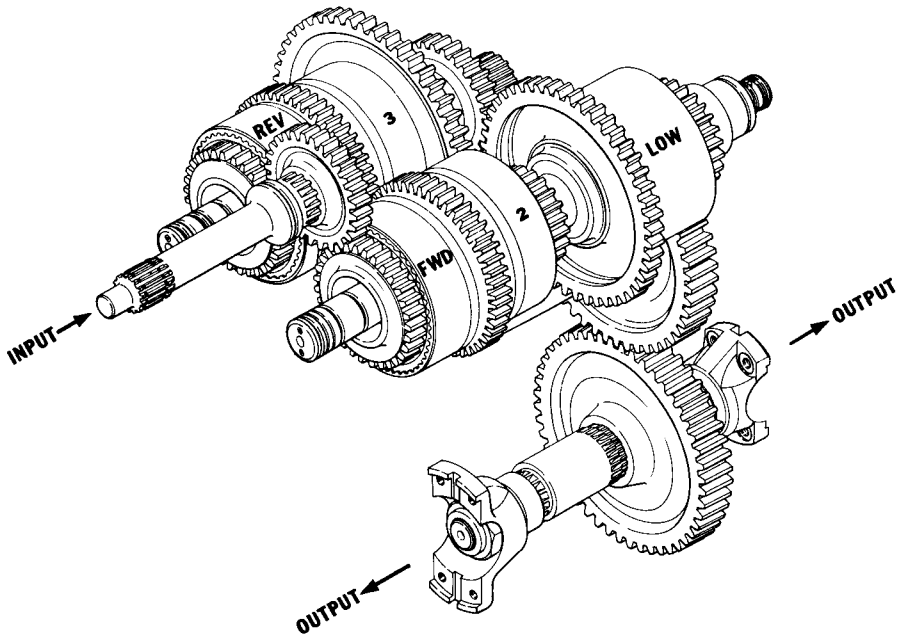
FIGURE J



GENERAL - HOSE LINE OPERATING REQUIREMENTS

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.

CLARK EQUIPMENT



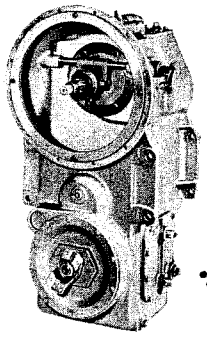
28000 SERIES - 3 SPEED
CLUTCH & GEAR ARRANGEMENT

FIGURE K

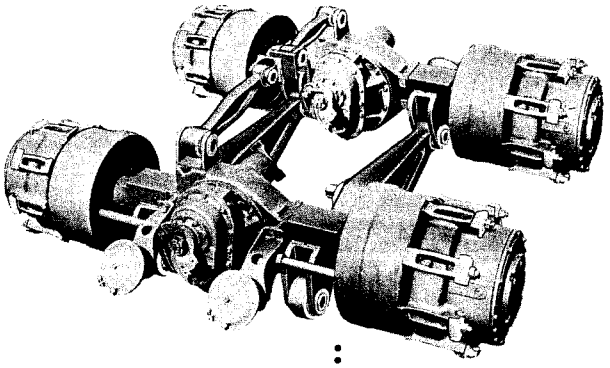
NOTES

CLARK EQUIPMENT

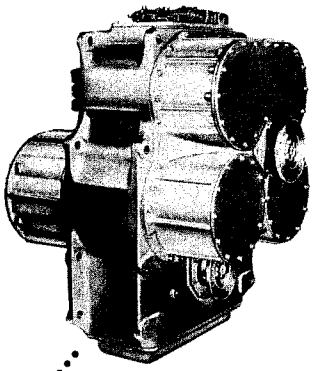
NOTES



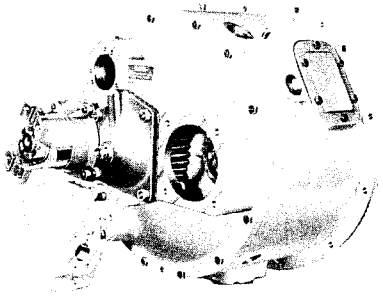
AGRICULTURAL TRANSMISSIONS



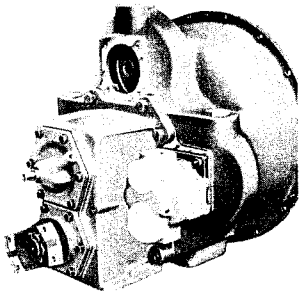
BOGIE DRIVES



POWER SHIFT TRANSMISSIONS



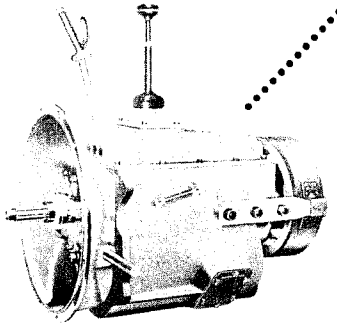
8000 SERIES CONVERTERS
14"-15" AND 16" DIAMETERS



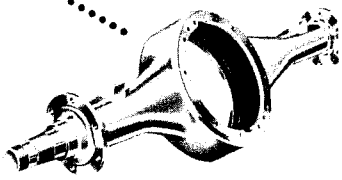
16000 SERIES CONVERTERS
16"-17"-18" AND 19" DIAMETERS

ONE SOURCE

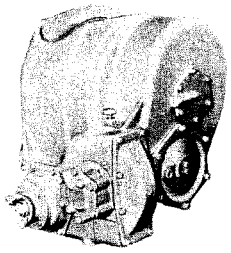
CLARK OF COURSE



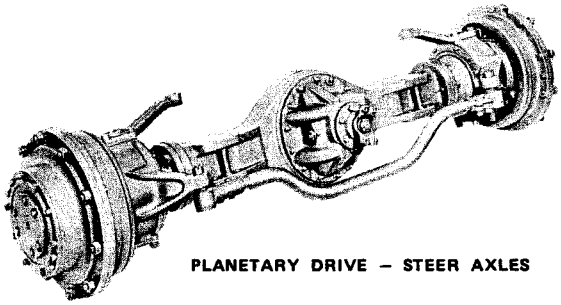
TRUCK TRANSMISSIONS



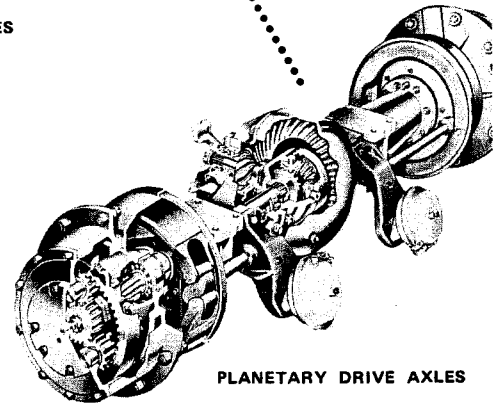
ONE PIECE FORGED AXLE HOUSINGS



300 AND 400 SERIES WINCHES



PLANETARY DRIVE – STEER AXLES



PLANETARY DRIVE AXLES

CLARK EQUIPMENT

CLARK EQUIPMENT COMPANY
AUTOMOTIVE DIVISION
BUCHANAN
—MICHIGAN
JACKSON


ONE SOURCE
CLARK OF COURSE