4000 SERIES

FUNK

SHIFT-O-MATIC

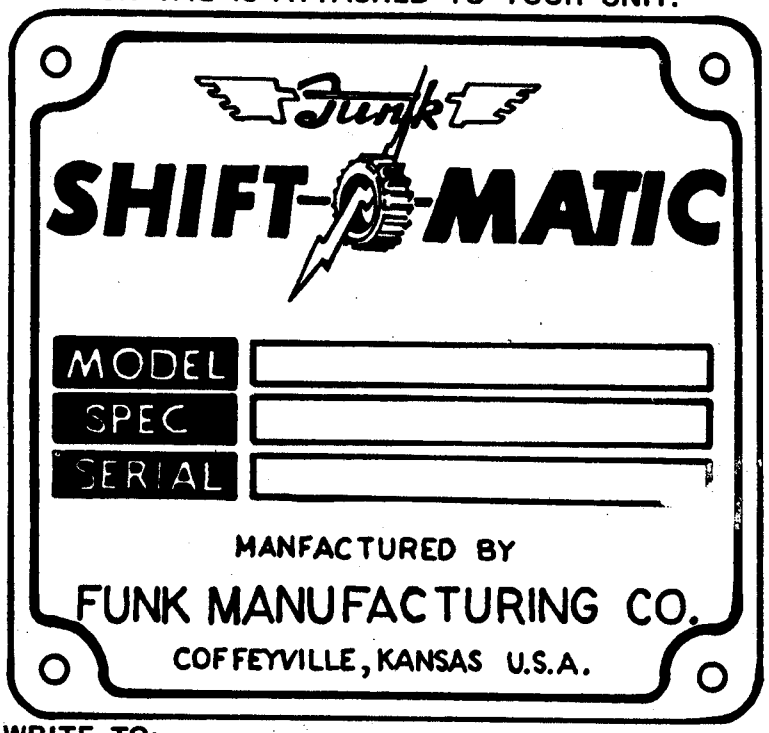
LONG DROP TRANSMISSION

ASSEMBLY AND DISASSEMBLY

PARTS ORDERING INSTRUCTIONS

SHOULD REPAIR PARTS BE REQUIRED, PLEASE SPECIFY THE MODEL, SPECIFICATION, AND SERIAL NUMBERS OF YOUR UNIT AS WELL AS THE NAME AND NUMBER OF THE PARTS ACCOMPANYING YOUR PURCHASE ORDER.

THIS INFORMATION TAG IS ATTACHED TO YOUR UNIT.



YOU MAY WRITE TO:

FUNK MANUFACTURING CO.
ATTN. PARTS DEPARTMENT PLANT #2
1211 W. 12th STREET
COFFEYVILLE, KANSAS 67337

OR TELEPHONE

AREA CODE (316) 251-3400
ASK FOR PARTS DEPARTMENT.

OR TWX 910-740-1908

THANK YOU
THE FUNK MFG. CO.

SERIES 4000 SHIFT SHIFT-O-MATIC™ DRIVE

DESCRIPTION

The Series 4000 Shift-O-Matic™ Drive is a forward and reverse transmission, with three speeds in either direction. Forward motion, reverse motion, and the three speeds are obtained through the use of hydraulically actuated multiple disc clutches. These clutches are power absorbing members that can be engaged at full engine power. Shifting under full engine power makes this model a full power shift for the forward and reverse motion in all three speeds.

The clutches in this unit are hydraulically applied and spring released. Because the clutches are hydraulically controlled, there is automatic compensation for normal wear which eliminates the need for adjustment. Each clutch uses seven graphitic friction plates, and seven polished steel reaction plates.

The power from the engine is transmitted to the Shift-O-Matic™ through a torque converter. The use of the torque converter has two distinct advantages, one is the converter is essentially a fluid drive, there being no direct mechanical connection through it. This feature creates a very smooth and shock free drive eliminating engine stalling and lugging. A second advantage is that the converter multiplies torque during heavy pull down loads. When loads are light the converter transmitts the engine power directly at almost engine speed, and there is no torque multiplication. The net result is an action like a transmission, with infinitely variable and automatic speed ratios. The need for shifting gears, although present, is greatly reduced.

OPERATION

Like all mechanical equipment, the Shift-O-Matic™ Drive will need attention and servicing. Routine checks will help prevent down time. The operator can aid in preventative maintenance by reporting weak or borderline malfunctions.

Because the unit operates "in" oil and "by" oil, most of the maintenance is concerned with oil replenishment and oil cleanliness. The type of service and operating conditions shall determine the maintenance interval. However, as previously stated, it is especially important that the oil be kept clean.

RULES OF OPERATION

1. Check oil level daily, with engine at idle speed and Shift-O-Matic™ in neutral. Make sure the area around oil level check plug is clean before removing plug.

2. The Shift-O-Matic™ should always be in the neutral position before starting engine, or when the vehicle is parked and the engine is running.

3. If the vehicle is to be towed, it will be necessary to run the engine at idle speed to lubricate the clutches.

4. Normal operating oil temperature is 160^{o} to 190^{o}.

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RULES OF OPERATION

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2. The Shift-O-Matic™ should always be in the neutral position before starting engine, or when the vehicle is parked and the engine is running.

3. If the vehicle is to be towed, it will be necessary to run the engine at idle speed to lubricate the clutches.

4. Normal operating oil temperature is 160^{o} to 190^{o}.

5. If the oil temperature gauge, which is the converter oil out temperature, rises above 250° or the warning light comes on, stop the vehicle immediately.

   Shift to neutral and run the engine at 1000-1200 r.p.m. The temperature should drop rapidly to the engine water temperature. If the temperature does not drop, trouble is indicated. The trouble should be determined before the vehicle is operated again. Overheating generally occurs due to working in too high of a gear ratio. Shifting to a lower gear will help eliminate overheating.

6. Do not shut off engine when unit is overheating.

7. Pressure checks at control valve are made at approximately 180° oil temperature.

8. Normal clutch pressure is 240 p.s.i.to 250 p.s.i. at 2000 r.p.m.

9. Pump pressure is 245 p.s.i. to 255 p.s.i. at 2000 r.p.m.

10. The converter by-pass pressure is 30 p.s.i. to 40 p.s.i. at 2000 r.p.m.

11. The transmission oil flow from the transmission to the heat exchanger is approximately 8 to 10 g.p.m. at 2000 r.p.m.

SERVICE

1. Funk Manufacturing Company recommends the use of oil which conforms to spec ~~C-3~~ Automatic Transmission Fluid. or MIL 2104 b or 10

2. When servicing the unit for the first time after vehicle installation and/or after repair, the unit is filled as follows:

   A. Fill the unit with 4 gallons of the recommended lubricant.
   B. Start engine and run at idle speed (approximately 500-700 r.p.m.) for one minute to let the hydraulic system charge.
   C. With engine at idle speed, finish filling unit to the full level. This will take between 3 and 4 quarts.

   The oil level is always checked with the engine running at idle speed and the Shift-O-Matic™ in neutral.

SERVICE PROCEDURES AND RECOMMENDATIONS

1. It is recommended the oil and oil filter be changed after the first 40 hour of operation and/or after repair.

2. Thereafter and under normal operating conditions, it is recommended the oil and oil filter be changed whenever the oil shows traces of contamination, or the effects of high operating temperature evidenced by discoloration or strong odor.

   If the oil in the system has become contaminated with metal particles, all of the components of the system (oil lines, oil pump, oil filter, control valve, clutches, converter, heat exchanger) must be thoroughly cleaned. Generally this means a tear down of the unit. The metal particles in the oil is evidence of failure of some part.

3. When changing the oil, the dirty oil should be drained while the unit is warm, examining for contamination as described above.

4. Keep all controls properly lubricated.

5. If the radiator on the vehicle is drained for winter storage, the heat exchanger for the Shift-O-Matic™ must also be drained.

CONVERTER INSTALLATION FOR ALL SERIES 4000 SHIFT-O-MATICS

All 4000 series are shipped with a small parts bag attached to the unit with a copy of this memo and the following parts included.

1. The following parts are for attaching the drive plate assembly to the engine flywheel.

   8 - each F10030-12 Capscrew (3/8 x 3/4" hex. head H.T.)

2. The following group is for attaching the converter to the drive plate assembly.

   Group - #40121191 - Supplied with the 11-3/4"
   8 each F11004-20NY Capscrew (5/16 N.F. x 1-1/4" socket heat H.T.)
   8 each 4012121 Washer, half round (11/16" dia. x 1/4" thick)

CONVERTER INSTALLATION INSTRUCTIONS

1. Remove drive plate assembly and converter from unit by pulling straight out.

2. Attach drive plate assembly to the engine flywheel using capscrew and lockwashers provided in parts bag. Refer to No. 1.

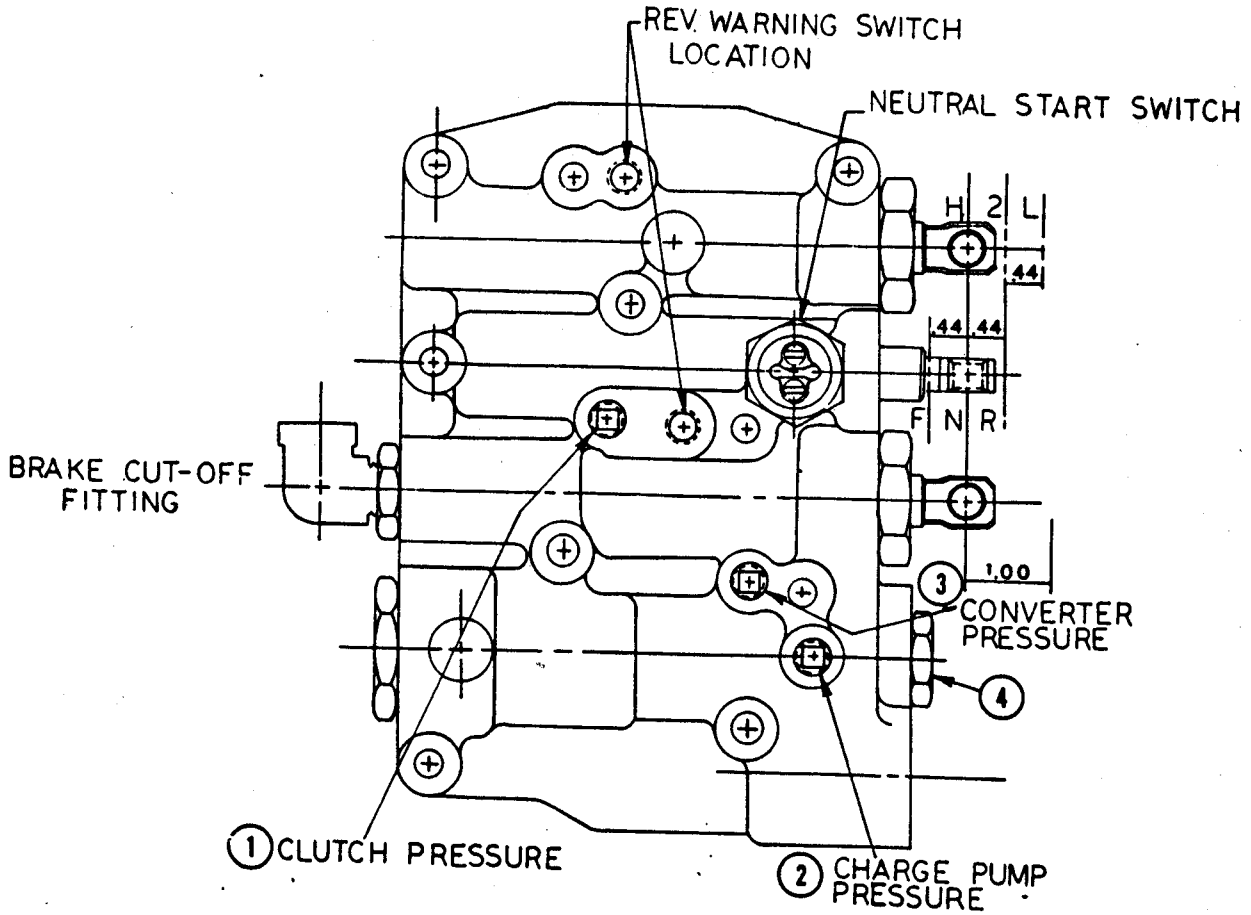
3. Attach converter to the drive plate assembly using the socket head capscrews and the half round washers provided in the parts bag. Refer to No. 2. The half round washer is used under the head of the socket head capscrew.

4. Center the converter hub gear seal ring in it's groove, grease will help hold ring in position.

5. Align unit with converter and mate together.

   NOTE: To aid in installation, the stator support tube spline, the input shaft spline, and converter hub gear seal ring should be lightly greased.

4000 SERIES SHIFT-O-MATIC™
CONTROL VALVE, FUNCTION AND PRESSURE CHECK



THE PRESSURE CHECKS ARE TO BE MADE WITH THE TRANSMISSION OIL TEMP. AT 170° to 185°.

STEP I. - CLUTCH PRESSURE

A. Install a 300 p.s.i. gauge in Port #1.
B. Run engine at approximately 2000 r.p.m.
C. Engage each speed clutch forward and reverse, the clutch pressure should be within the span of 240 to 255 p.s.i. for all clutches. (200-215 PETTIBONE)
D. If all clutches have low pressure, the pressure regulator valve should be checked, and adjusted if necessary.
   1. Remove cap Ref. #4 and remove the pressure regulator valve, dowel pin and spring.
   2. Check valve to be sure it works freely in the valve body.
   3. The pressure can be raised by adding the #4004245 spacer ring, as required, on the end of the valve next to the spring.

STEP II. - CONVERTER CHARGE PRESSURE

A. Install a 100 p.s.i. gauge in Port #3.
B. Run engine at approximately 2000 r.p.m.
C. The pressure should be within the span of 30 to 30 p.s.i.

STEP III.- FEATHERING VALVE (IF USED).

A. Install a 300 p.s.i. gauge in Port #1
B. Run engine at approximately 2000 r.p.m.
C. Pull stem to full out position (1"), clutch pressure should be between 5 to 7-1/2 p.s.i.

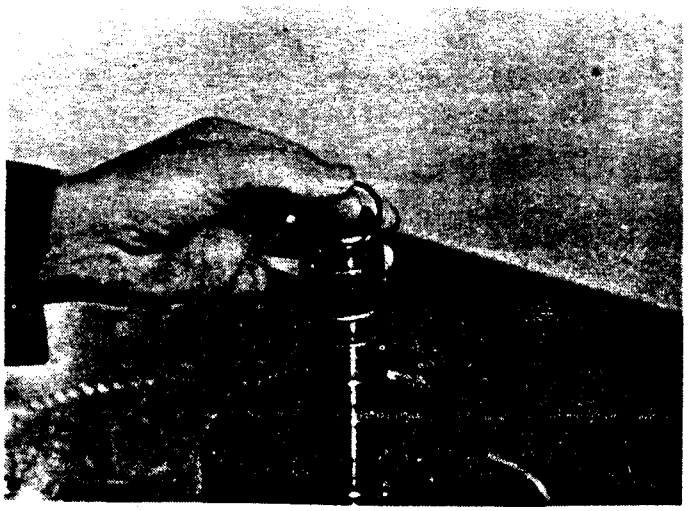
STEP IV. _ BRAKE CUTOFF VALVE (IF USED).

A. Install a 300 p.s.i. gauge in Port #1.
B. Run engine at approximately 2000 r.p.m.
C. Apply 325-375 p.s.i. to cut off valve, clutch pressure should be between 5 to 7-1/2 p.s.i.

ASSEMBLY INSTRUCTIONS

FOR THE

4000 SERIES TRANSMISSION



Thoroughly clean all parts prior to assemblying the transmission.

Fig. 1

Install the inner piston seal on the clutch stack assembly for high gear clutch.

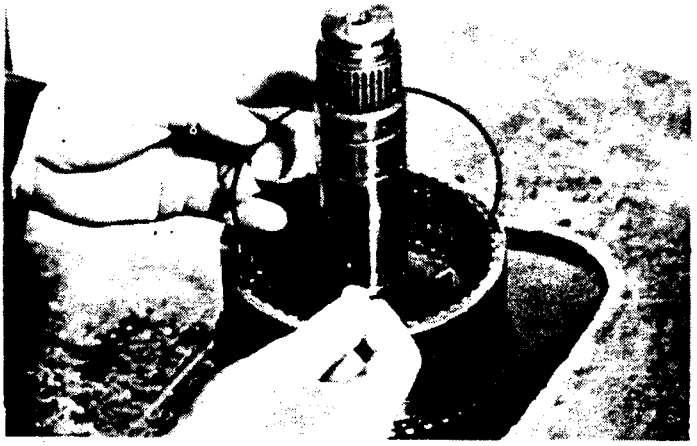


Fig. 2

Install the bottom retaining ring for the outer piston seal.

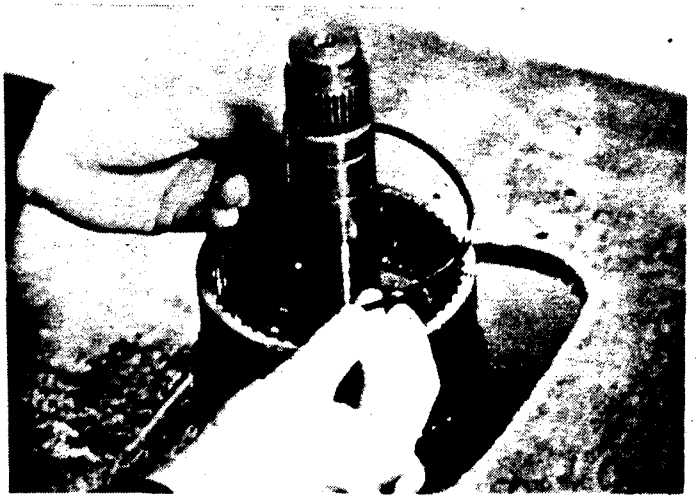


Fig. 3

Install the outer piston seal in the groove on top of the retaining ring.

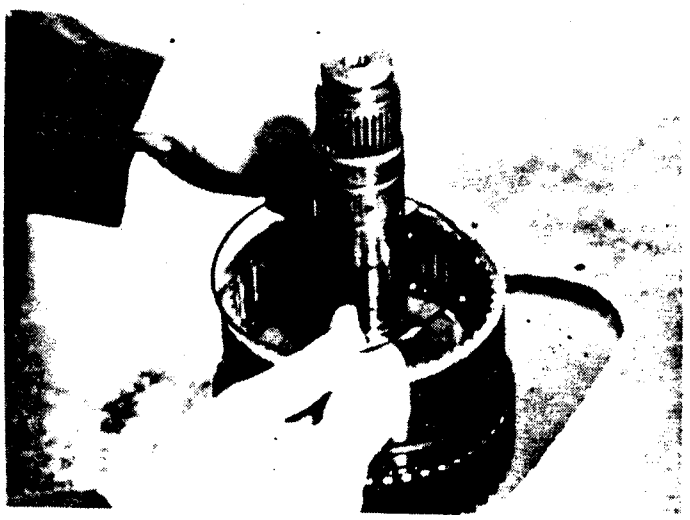


Fig. 4

Install the top retaining ring on top of the piston seal.

Fig. 5

The piston has a counter bored hole in it which fits over a dowel pin in the bottom of the cylinder.

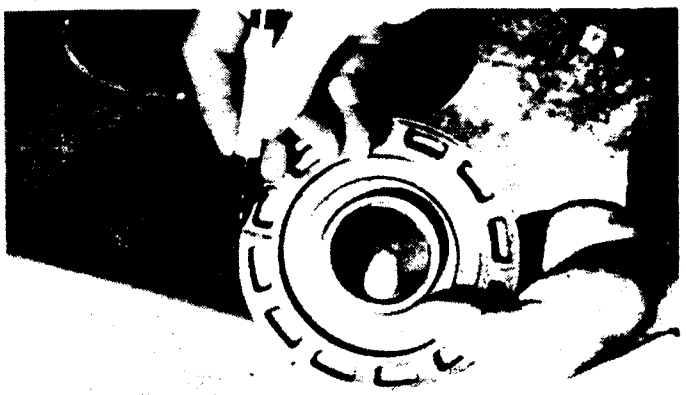


Fig. 6

Take a marking pencil and mark the location on top of the piston directly above the counter bored hole.

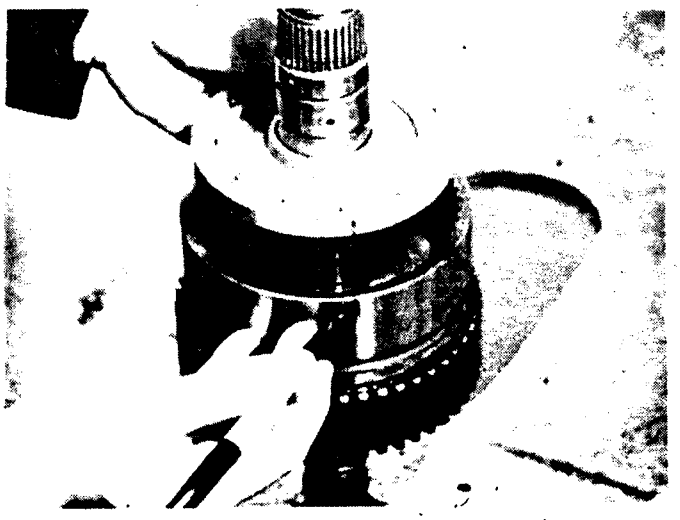


Fig. 7

Mark the cylinder in line with the dowel pin.

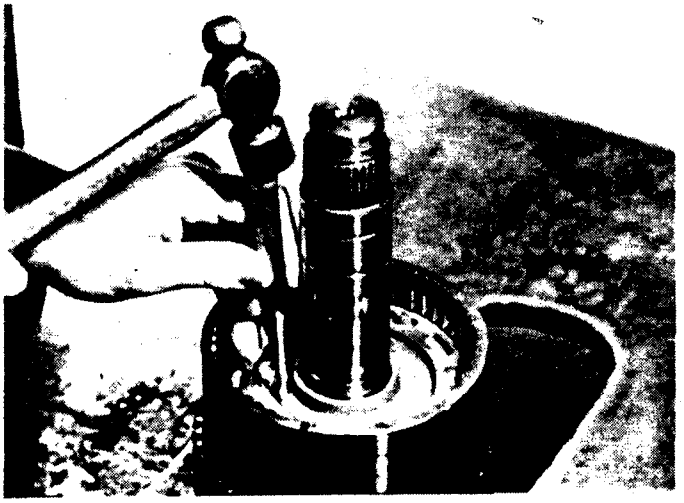


Fig. 8

Install the piston by tapping with a flat punch around the inside circle of the piston, making sure that your marks are lined up so the dowel pin will go in the counter bored hole of the piston.

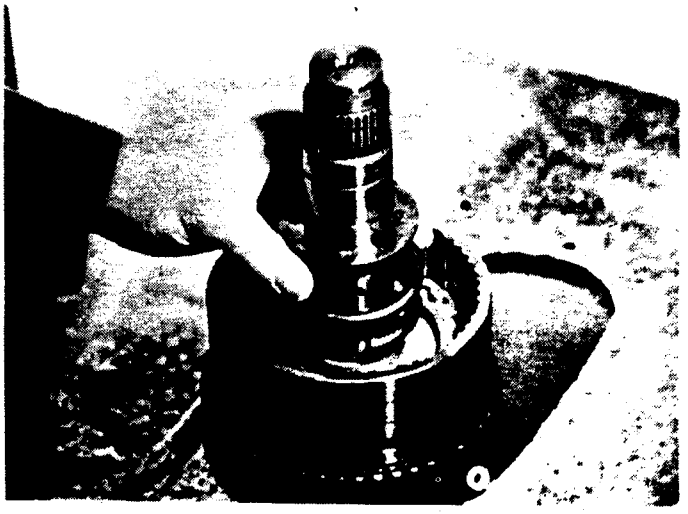


Fig. 9

Install piston spring and spring retainer.

Fig. 10

Compress spring retainer and install snap ring.

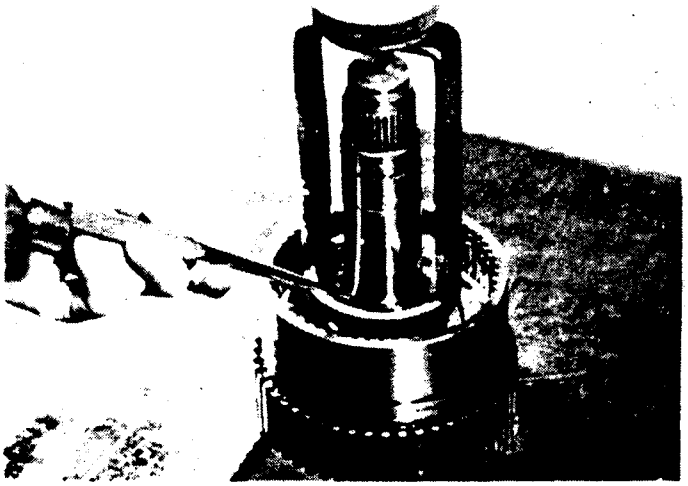


Fig. 11

After snap ring is installed, mak sure it is seated and that the retaining washer clips go on the outside of the snap ring.

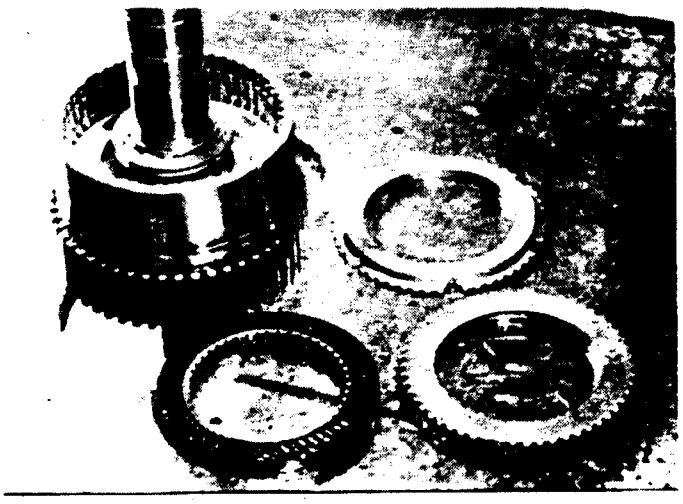


Fig. 12

Lay out seven clutch plates, seven separator plates, and the back-up plate.

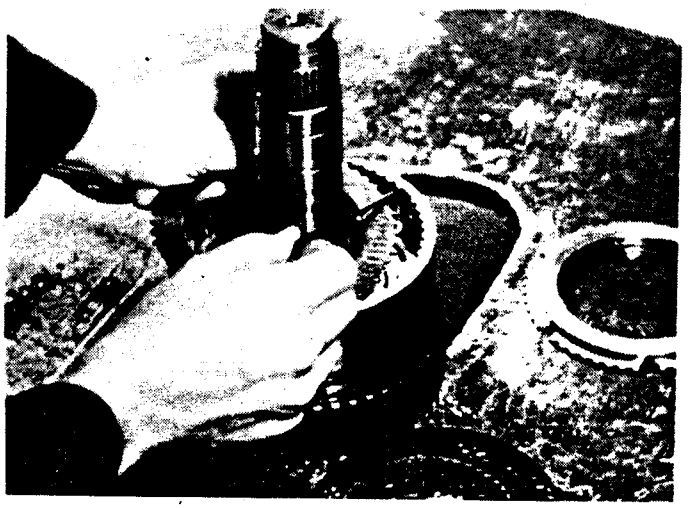


Fig. 13

Start with the separator plate and line up the flat groove between the splines with the flat groove in the cylinder.

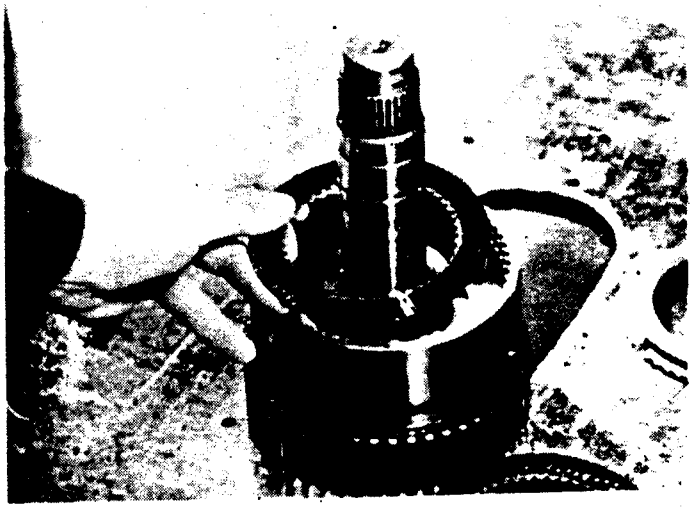


Fig. 14

Install a clutch plate. Continue this sequence until seven of each are installed in the cylinder.

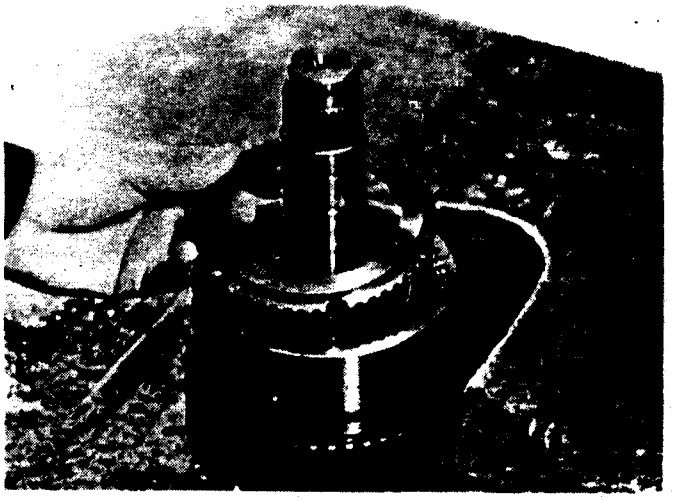


Fig. 15

Install the back-up plate on top of the last clutch plate.

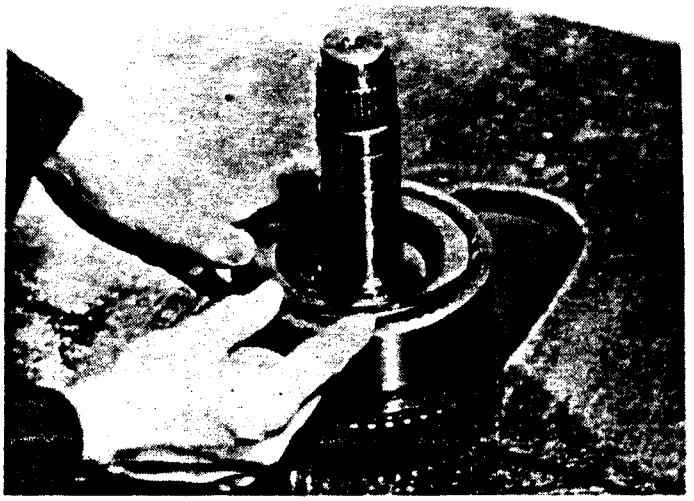


Fig. 16

Install the snap ring on top of the back-up plate.

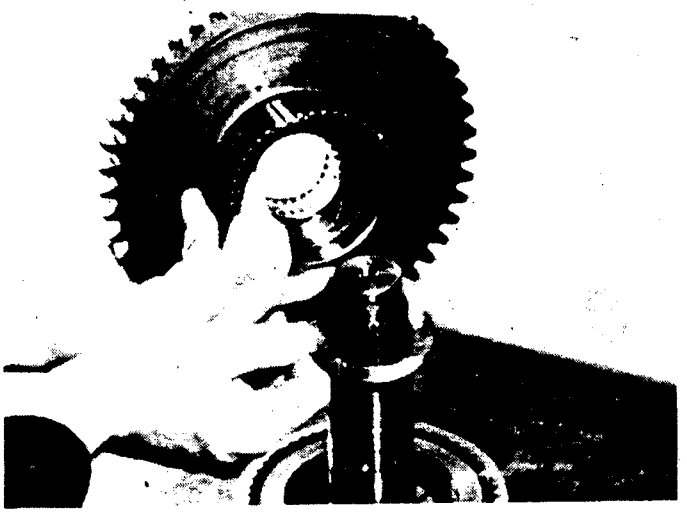


Fig. 17

Install the thrust washer and ther the hub.

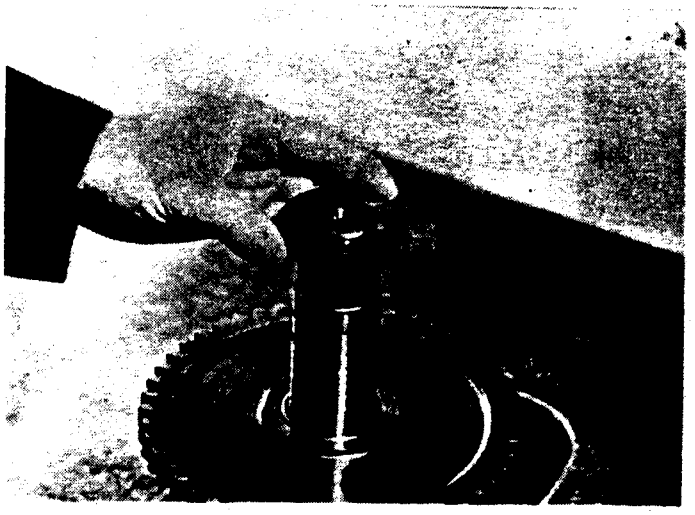


Fig. 18

Place another thrust washer on top of the hub.

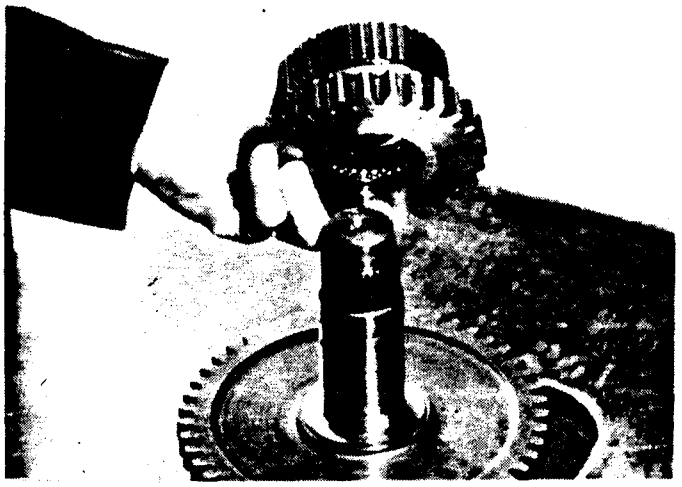


Fig. 19

Install low gear hub on top of the last thrust washer.

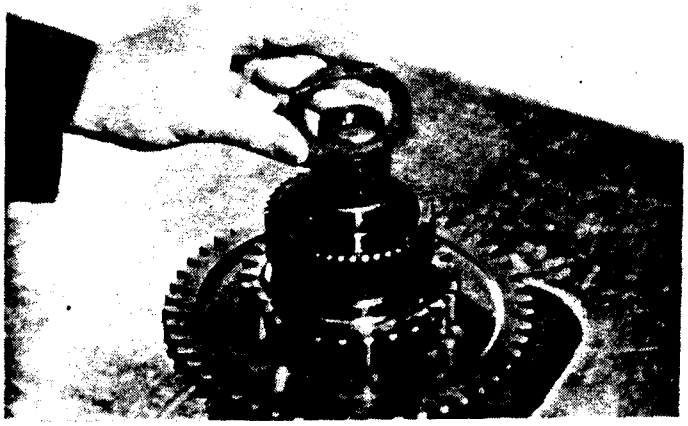


Fig. 20

Install another thrust washer.

Fig. 21

Install snap ring.

Fig. 22

Place spring retainer on top of snap ring.

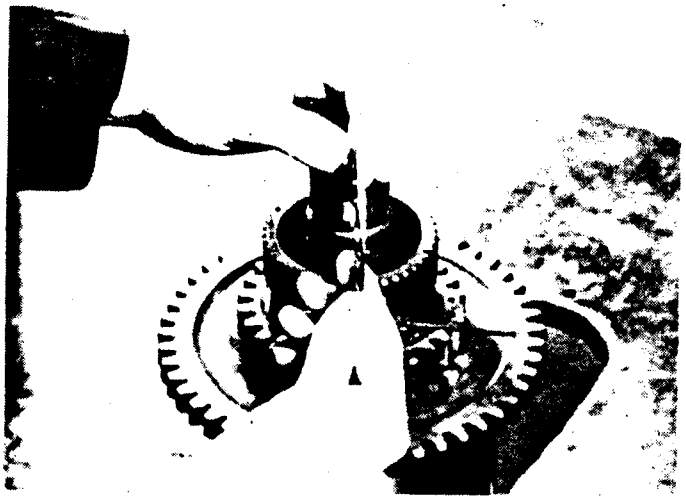


Fig. 23

Make sure that the snap ring retaining tangs go over the snap ring.

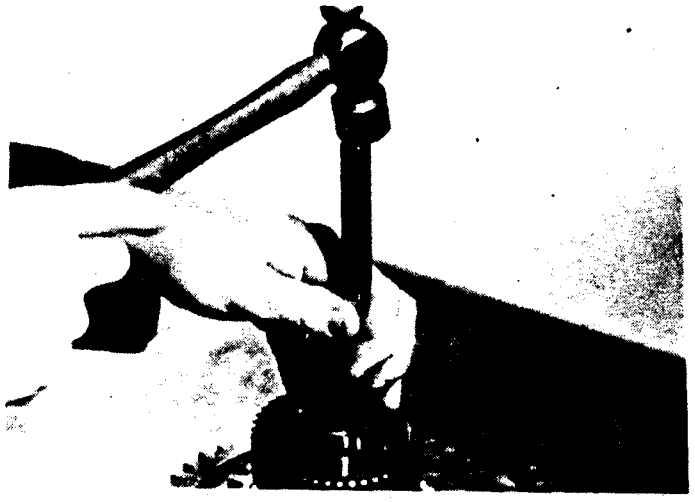


Fig. 24

Tap retainer washer in place.

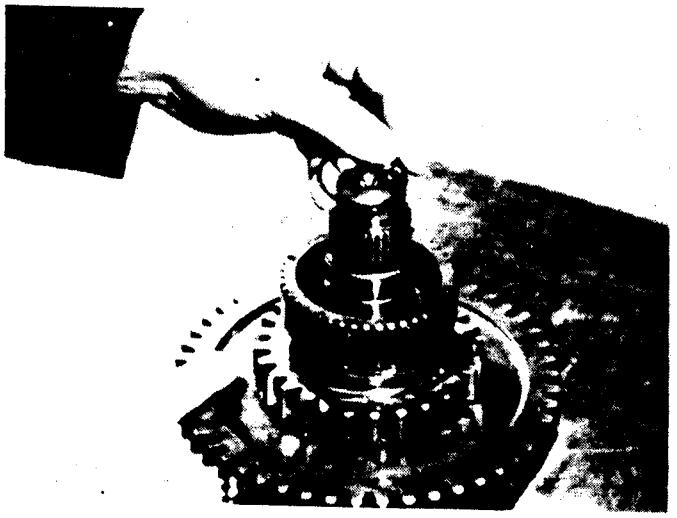


Fig. 25

Install inner piston seal on shaft.

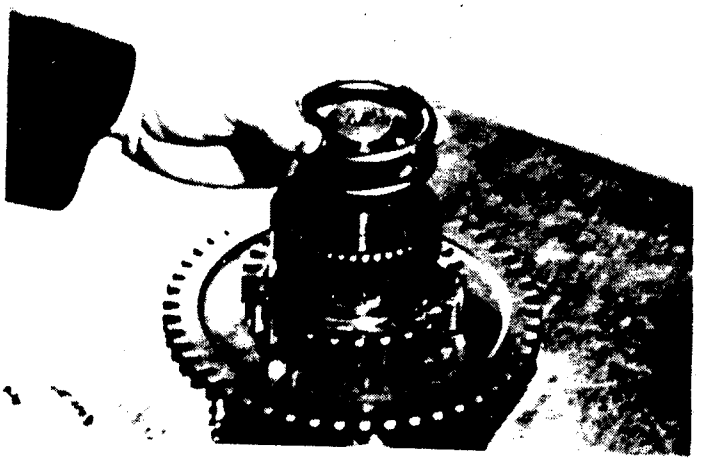


Fig. 26

Install clutch spring.

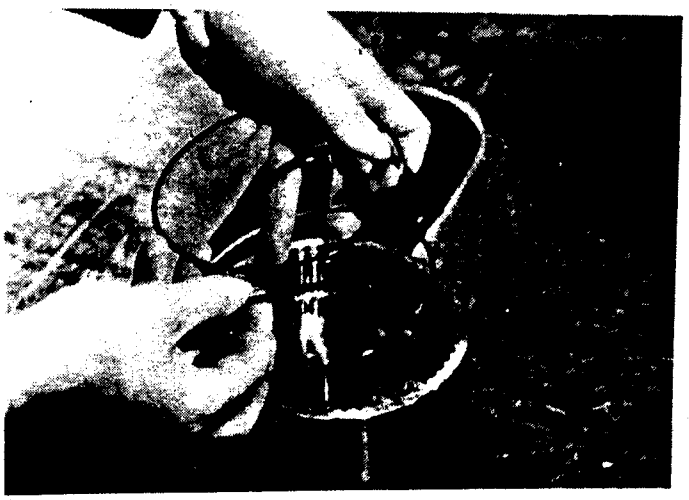


Fig. 27

Install the outer piston seal and retainer rings in low gear clutch.

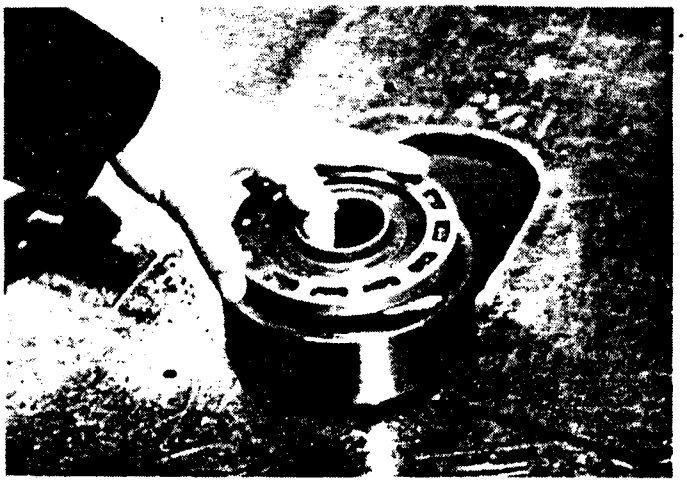


Fig. 28

Install piston.

Fig. 29

Tap piston in place with flat punch.

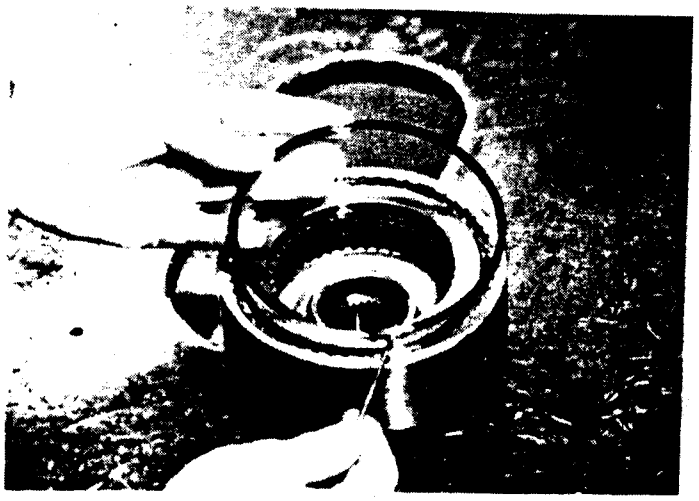


Fig. 30

Load the clutch with seven clutch plates, seven separator plates and the back-up plate.

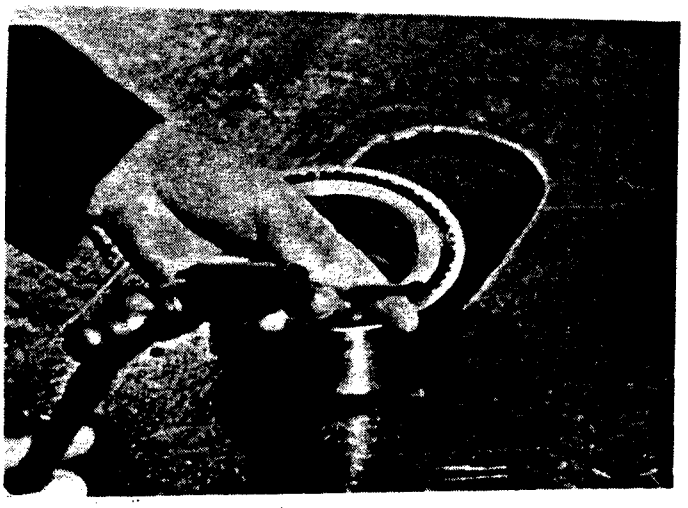


Fig. 31

Install snap ring and make sure that it is in the groove.

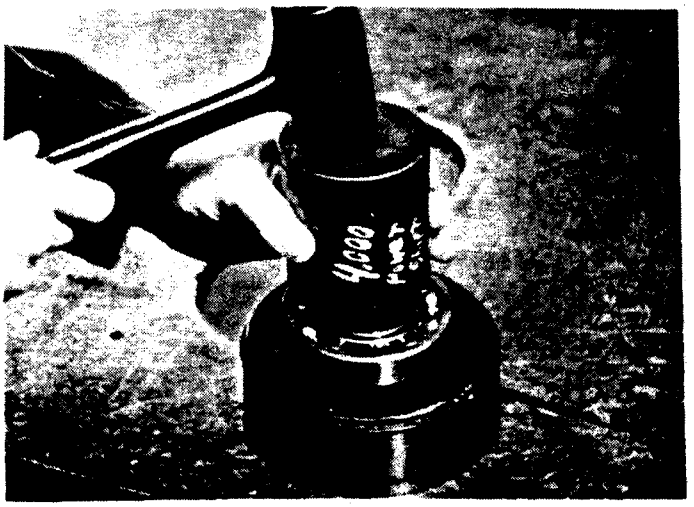


Fig. 32

Install bearing on the back side of low gear clutch.

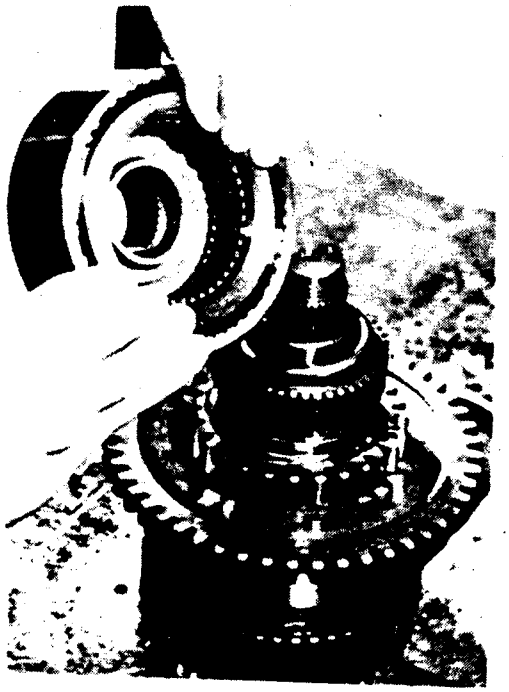


Fig. 33

With the clutch and separator plate splines lined up, squeeze the back-up plate against them as you install it over low gear hub.

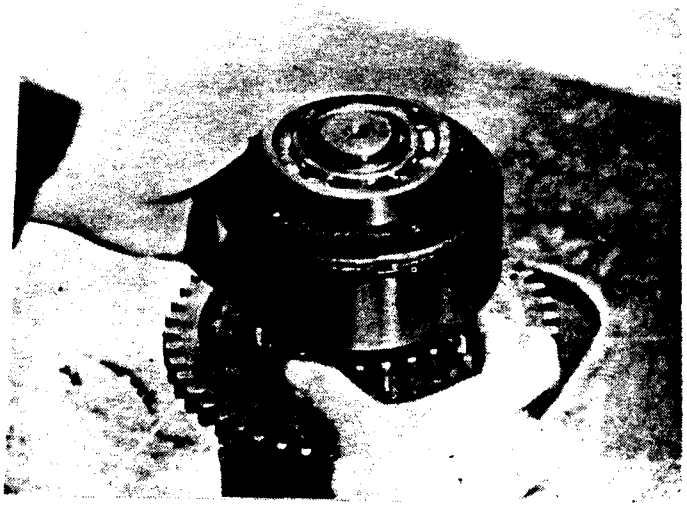


Fig. 34

As the cylinder is being installed, you can move low gear hub back and forth a little to further line up the splines.

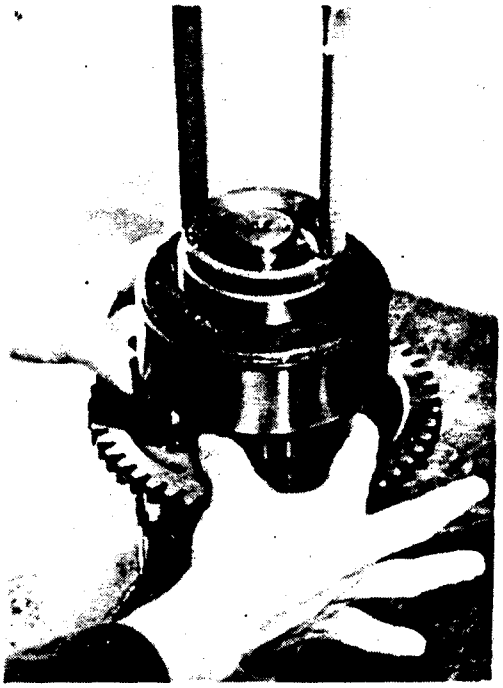


Fig. 35

After splines are lined up, compress the spring by pressing the cylinder down on the clutch stack.

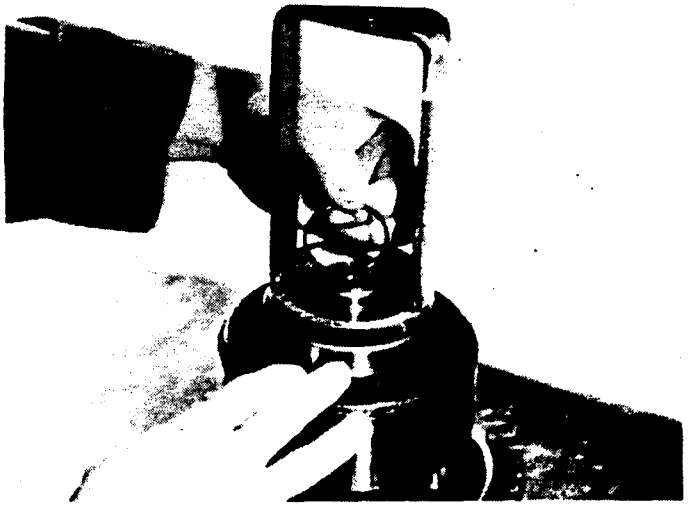


Fig. 36

Install the "O" ring between the cylinder and the shaft.

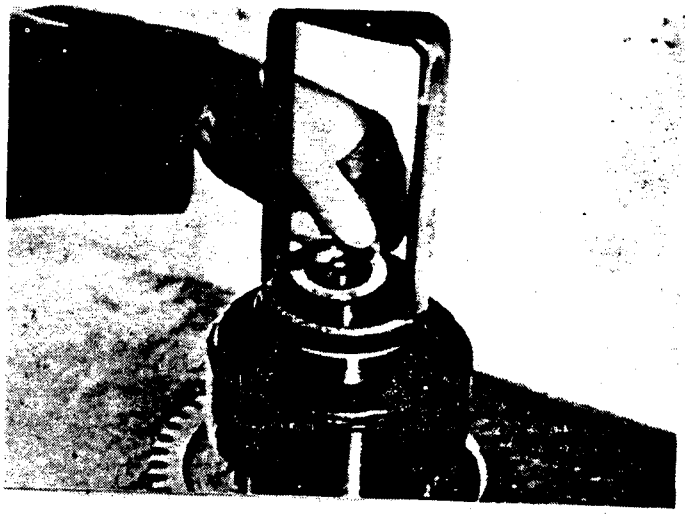


Fig. 37

Place a retaining washer on top of the "O" ring.

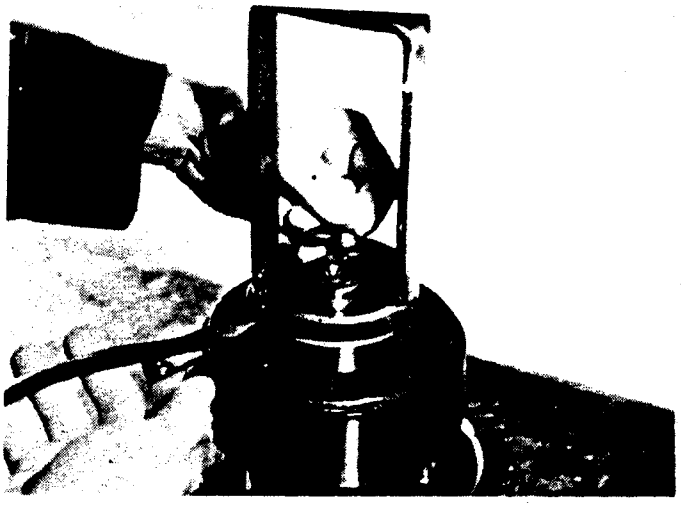


Fig. 38

Install snap ring on top of the retaining washer.

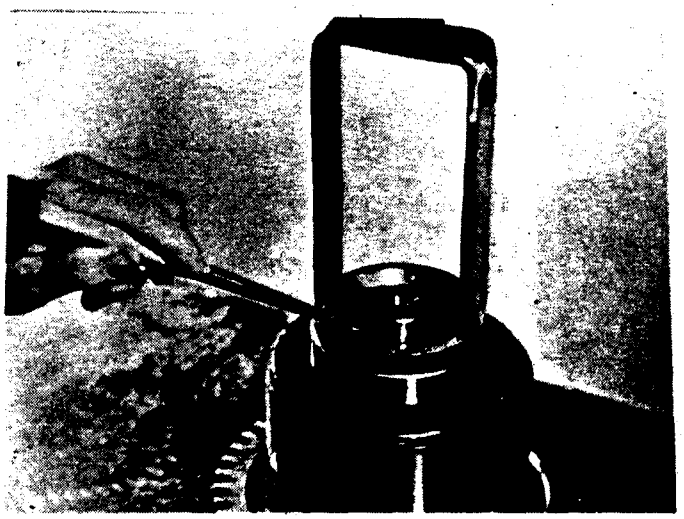


Fig. 39

Make sure snap ring is seated.

Fig. 40

Install a teflon seal ring on the clutch stack.

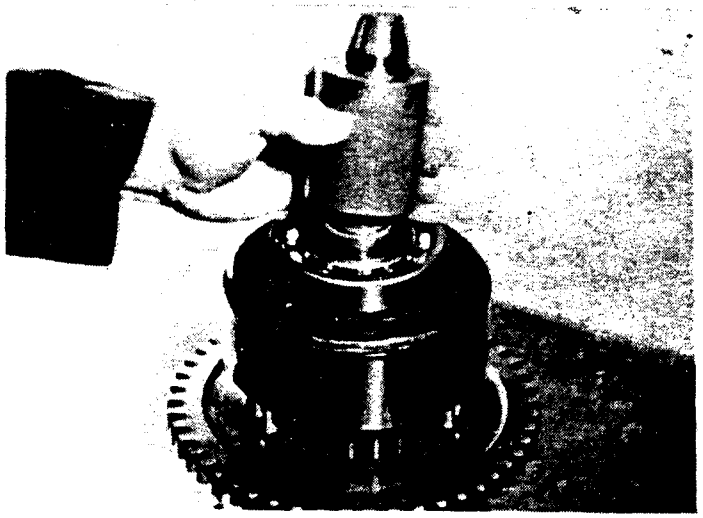


Fig. 41

The seal ring must then be resized with either a resizing tool or something similar.

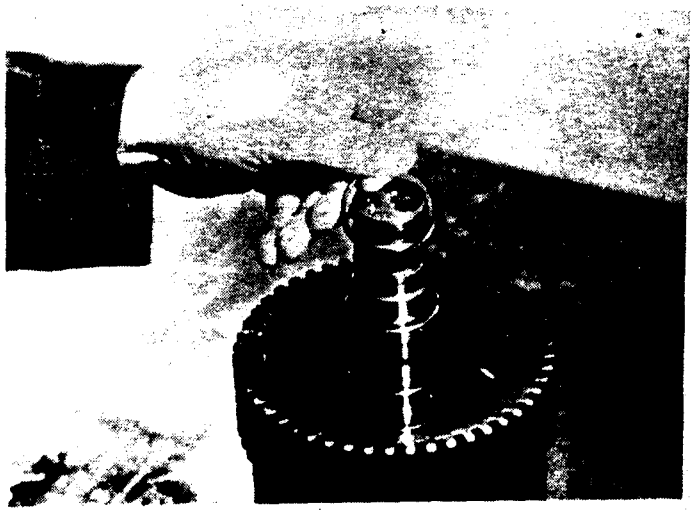


Fig. 42

Turn the clutch stack over and install the inner piston seal for forward clutch.

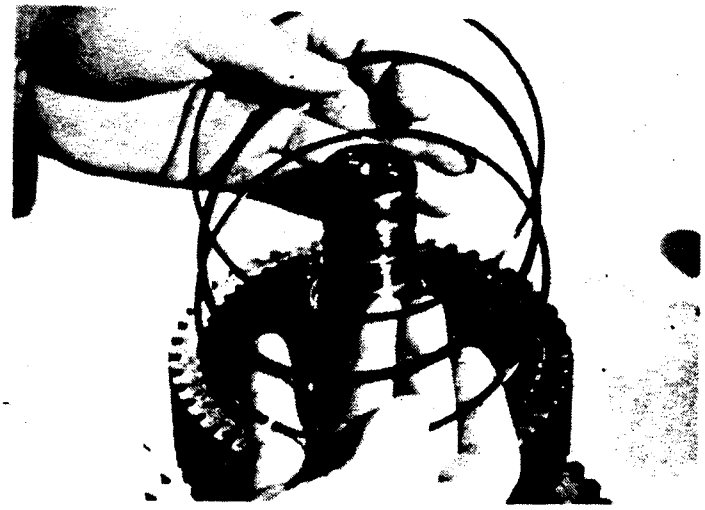


Fig. 43

Install the outer piston seal and retaining rings in forward clutch.

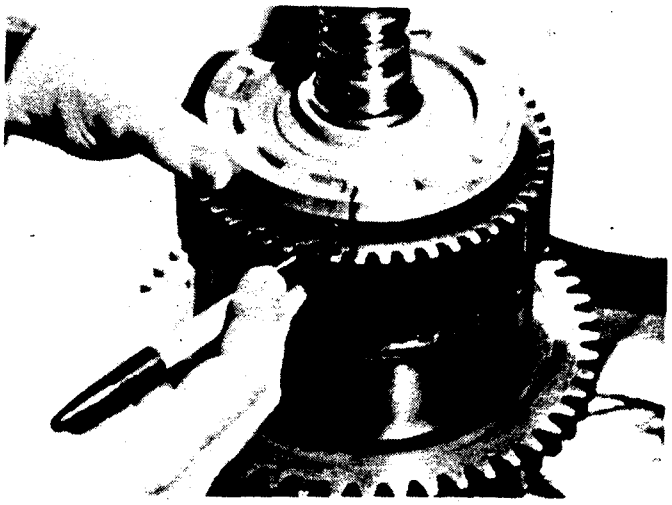


Fig. 44

Mark the piston and cylinder to line up the stud and the counter bored hole in the piston.

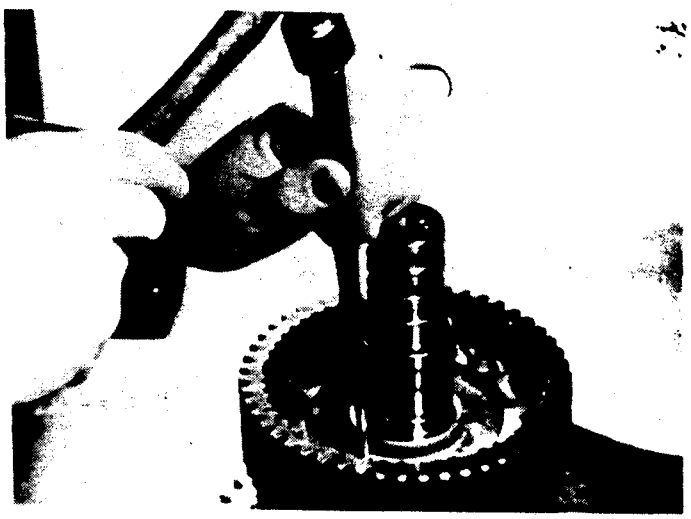


Fig. 45

Tap piston in place with a flat punch.

Fig. 46

Install piston spring and spring retainer.

Fig. 47

Compress spring and install snap ring.

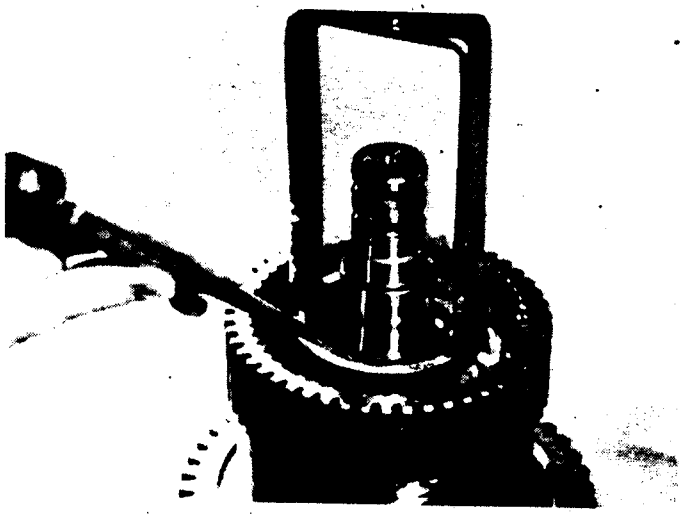


Fig. 48

Seat the snap ring with a punch.

Fig. 49

Load the seven clutch plates, seven separator plates and back-up plate in the cylinder.

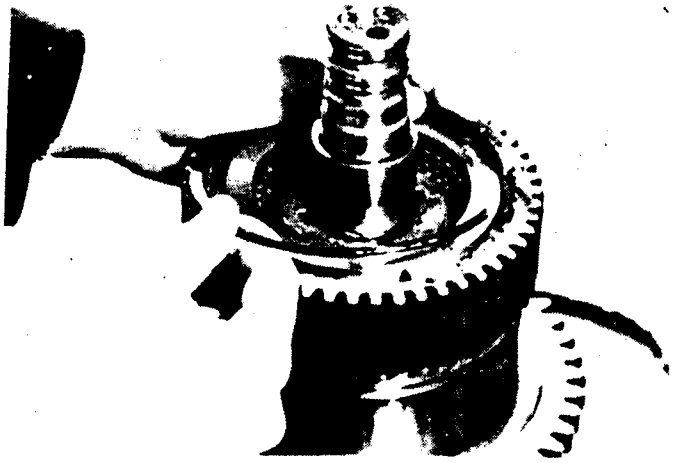


Fig. 50

Install snap ring over back-up plate.

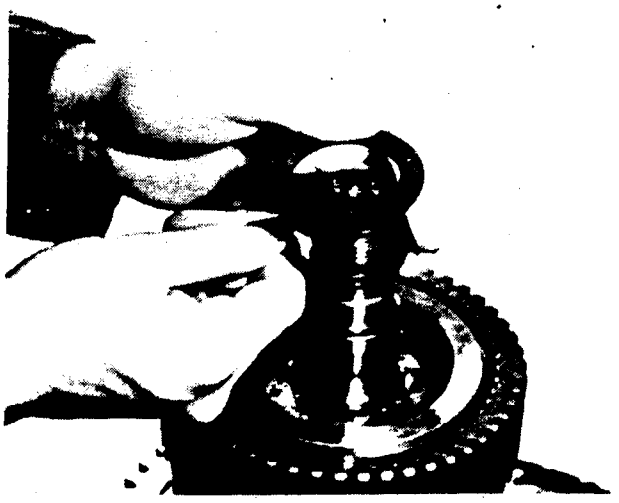


Fig. 51

Install spacer ring and thrust washer on top of snap ring.

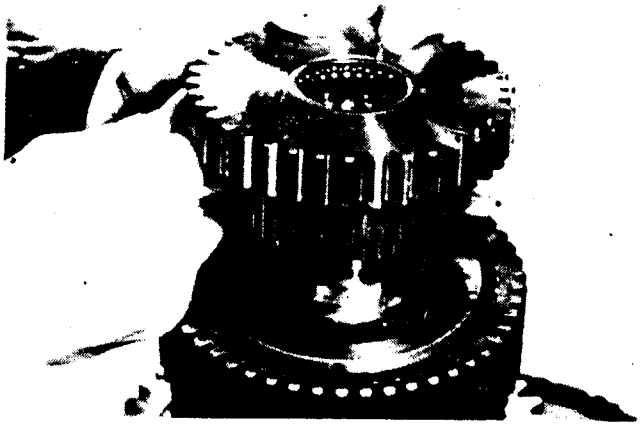


Fig. 52

Install forward hub.

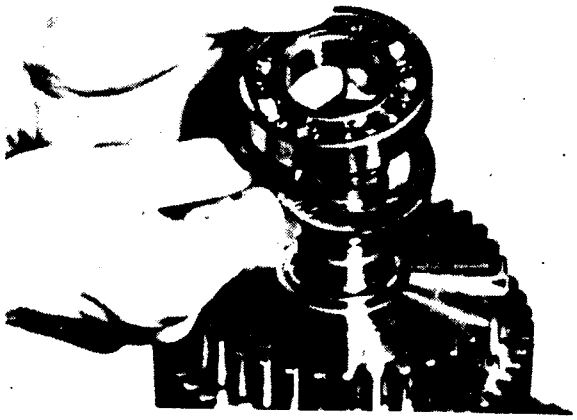


Fig. 53

Install thrust washer on top of hub and then bearing.

Fig. 54

Drive bearing on the shaft.

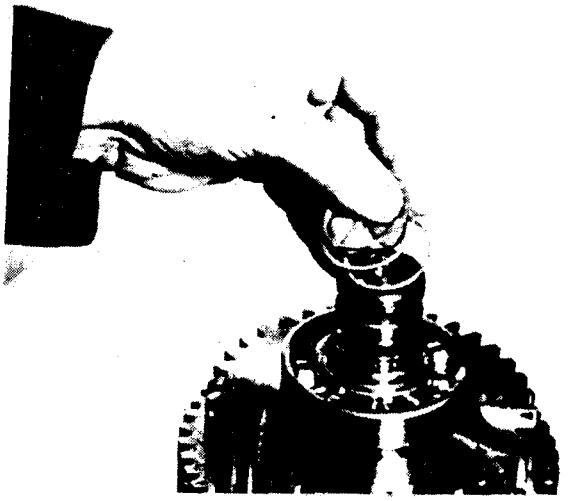


Fig. 55

Install the three teflon seal rings on front end of clutch stack.

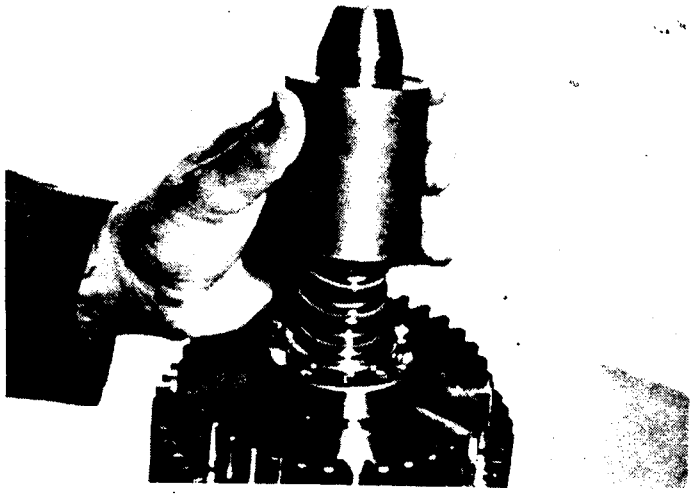


Fig. 56

Resize the seal rings.

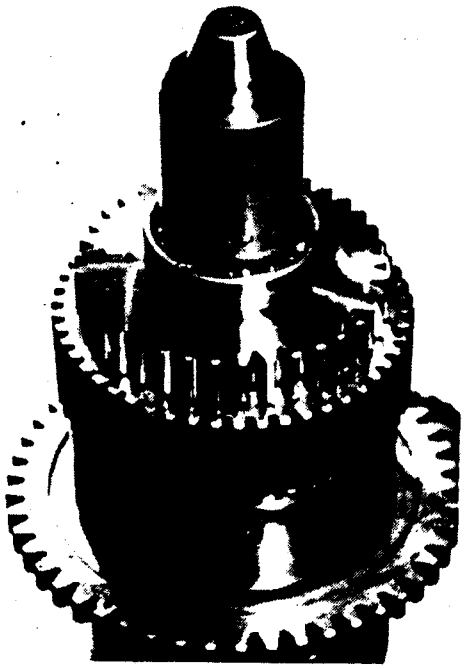


Fig. 57

Leave the resizer on the seal rings for a few minutes so they will shrink properly.

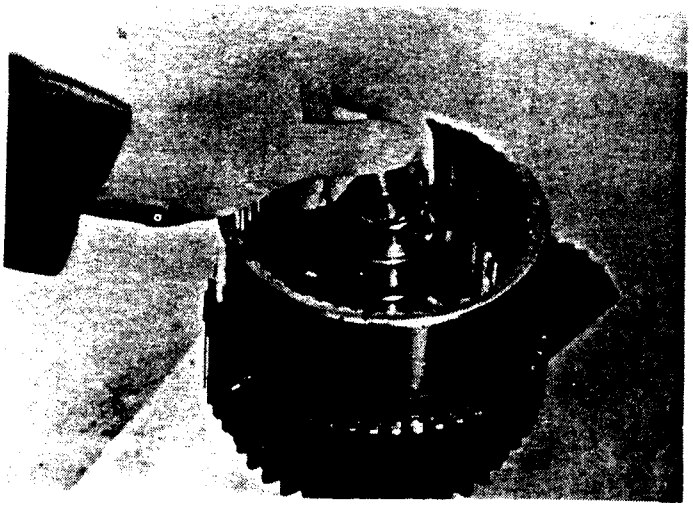


Fig. 58

Take the other clutch stack assembly and install the inner piston seal in the second gear cylinder.

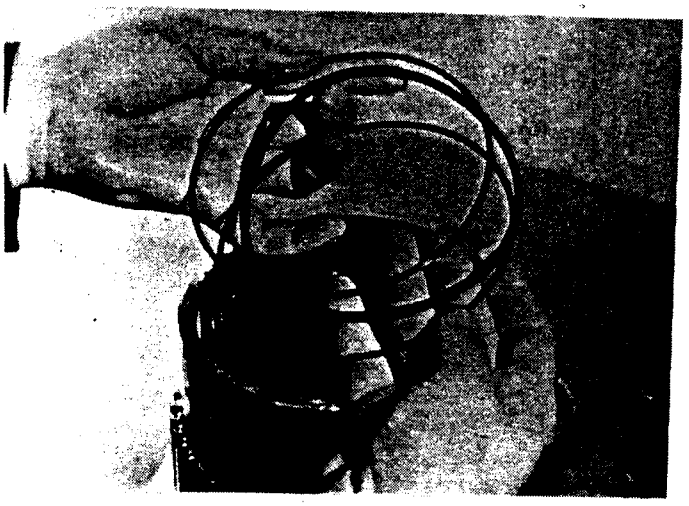


Fig. 59

Install the outer piston seal and retaining rings in the cylinder.

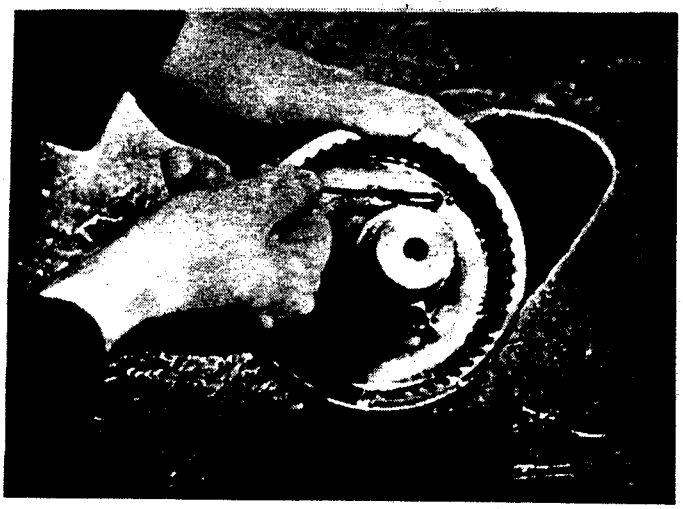


Fig. 60

Mark the cylinder in line with the stud.

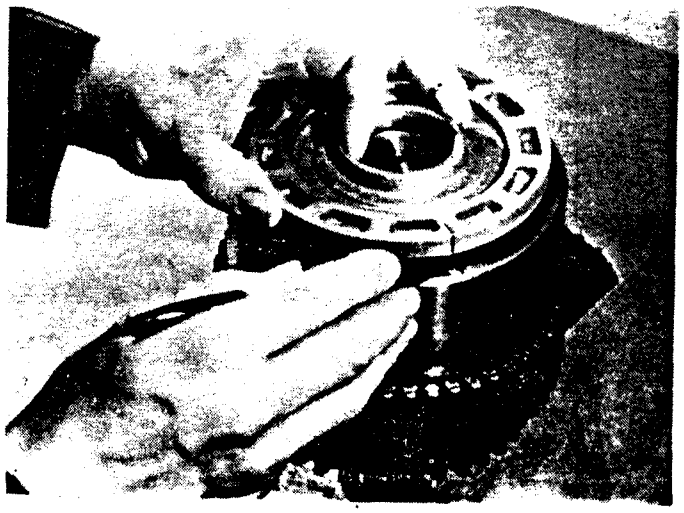


Fig. 61

Mark the piston in line with the counter bored hole in the bottom of it.

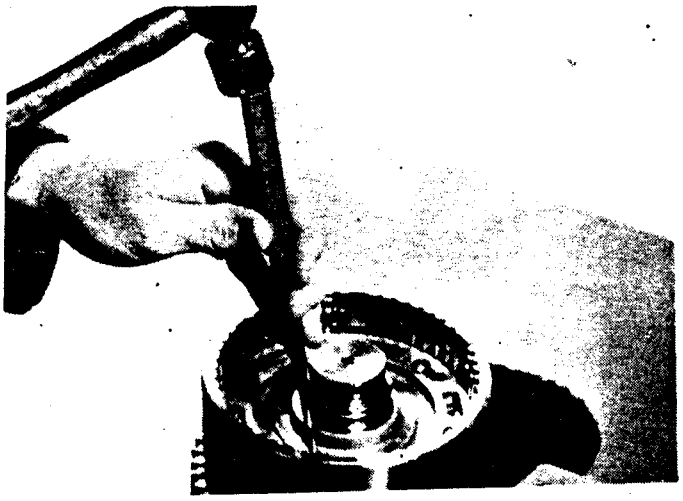


Fig. 62

Install piston by tapping it with a flat punch.

Fig. 63

Install piston spring and spring retainer.

Fig. 64

Compress the spring and install the snap ring.

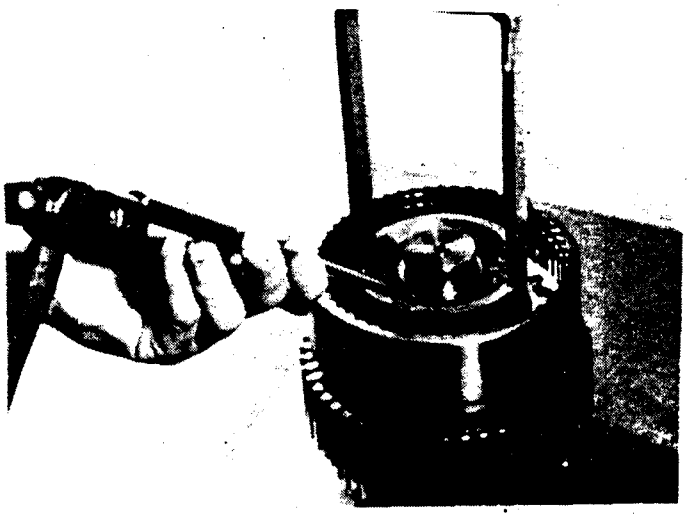


Fig. 65

Make sure snap ring is seated.

Fig. 66

Load seven clutch plates, seven separator plates, and the back-up plate in the cylinder.

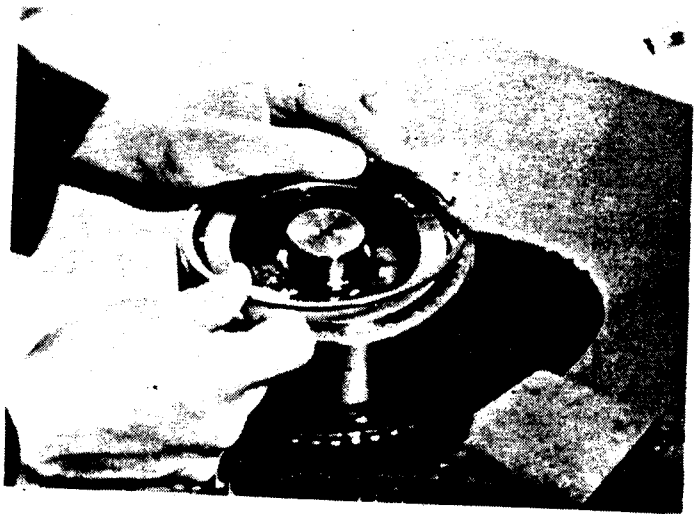


Fig. 67

Install snap ring on top of the back-up plate.

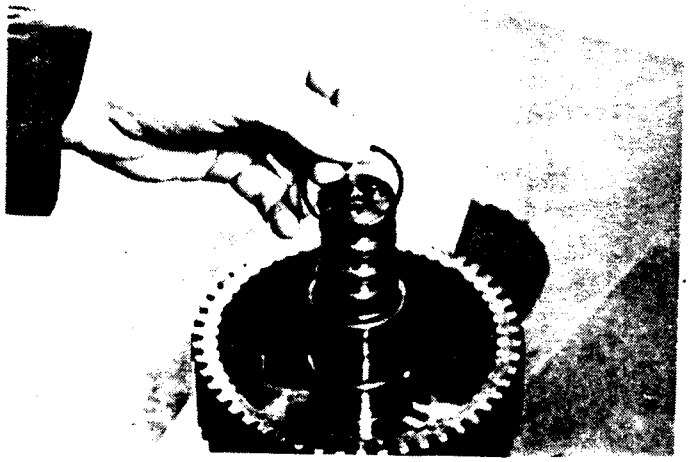


Fig. 68

Turn clutch stack over and install the inner piston seal.

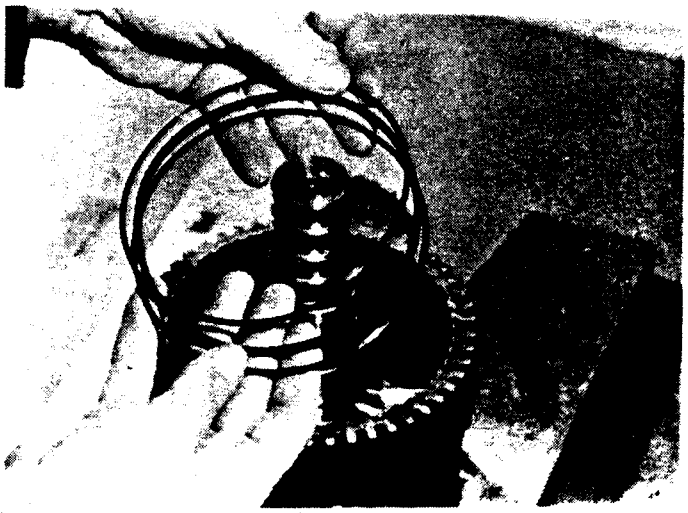


Fig. 69

Install outer piston seal and both retaining rings.

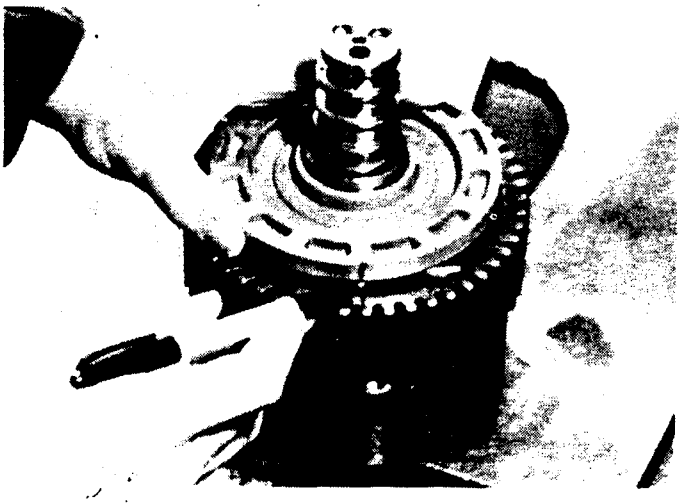


Fig. 70

Mark piston and cylinder to line up stud and the counter bored hole in the piston.

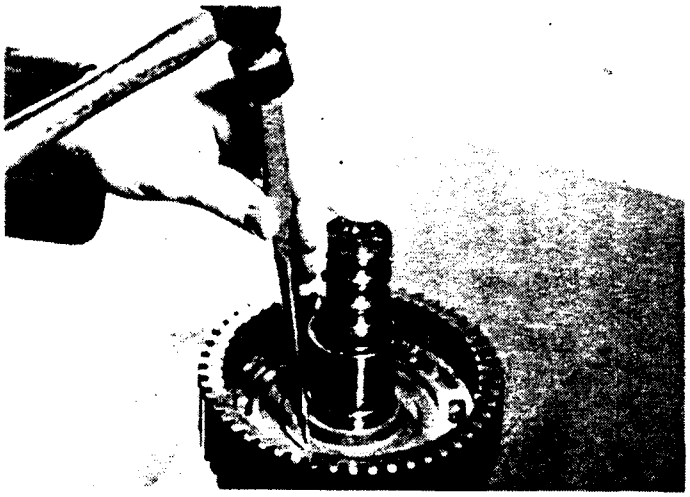


Fig. 71

Install piston by tapping it in place with a flat punch.

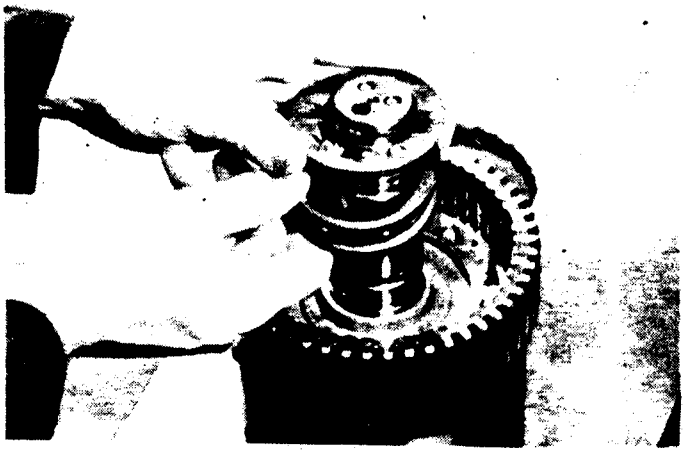


Fig. 72

Install piston spring and spring retainer.

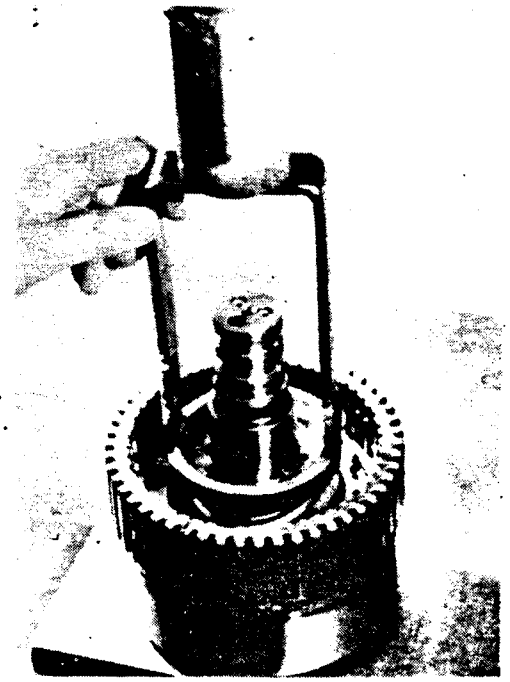


Fig. 73

Compress the spring.

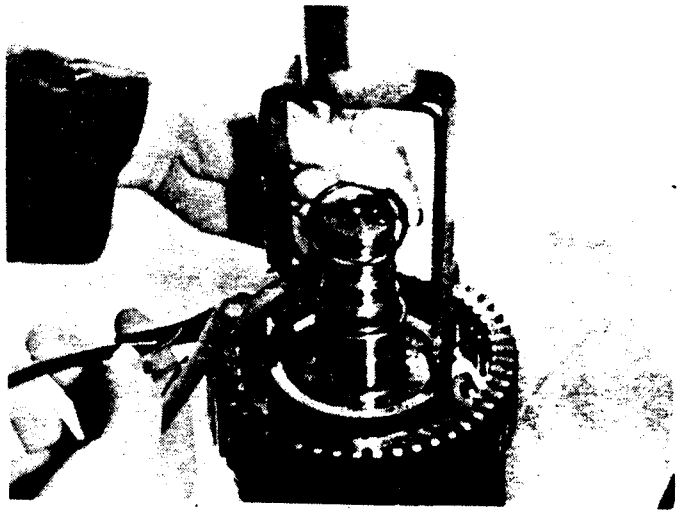


Fig. 74

Install snap ring.

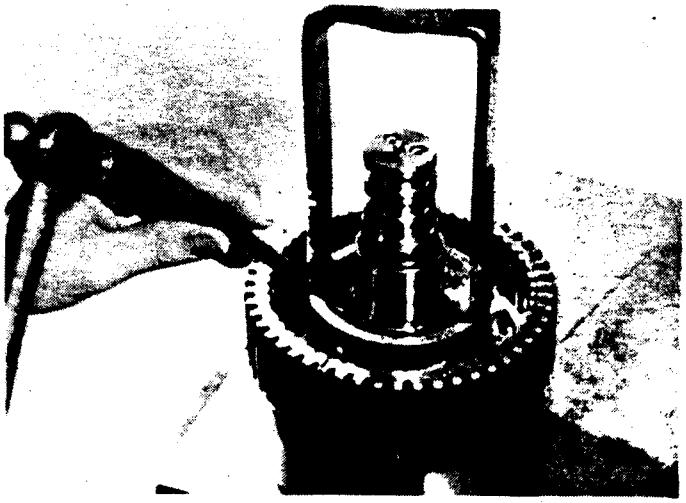


Fig. 75

Make sure snap ring is seated properly.

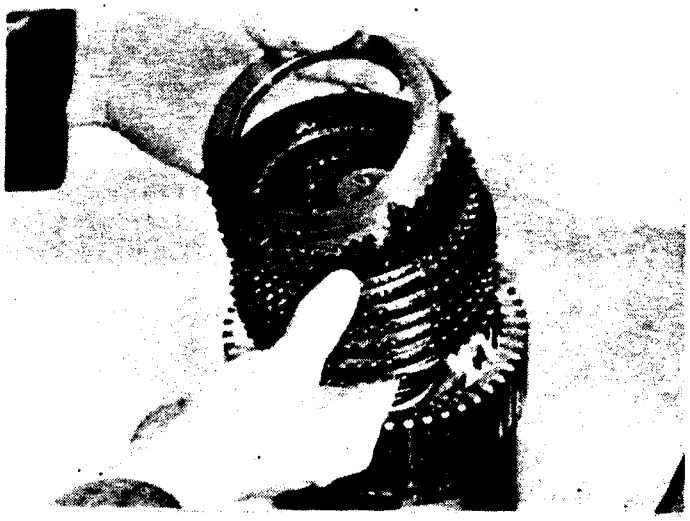


Fig. 76

Install seven separator plates and seven clutch plates and the back-up plate in forward clutch.

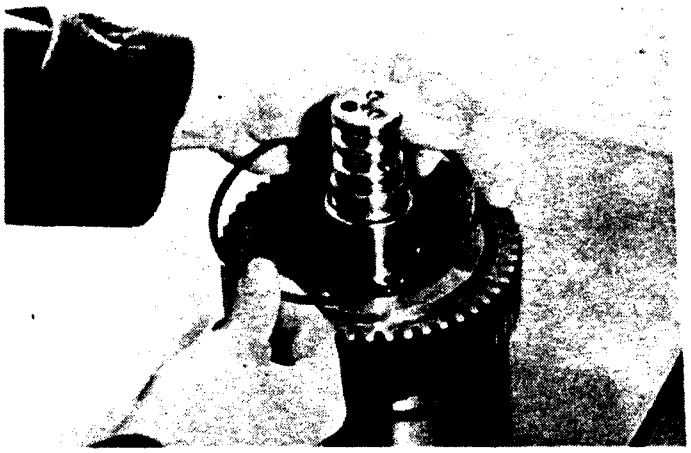


Fig. 77

Install snap ring over back-up plate.

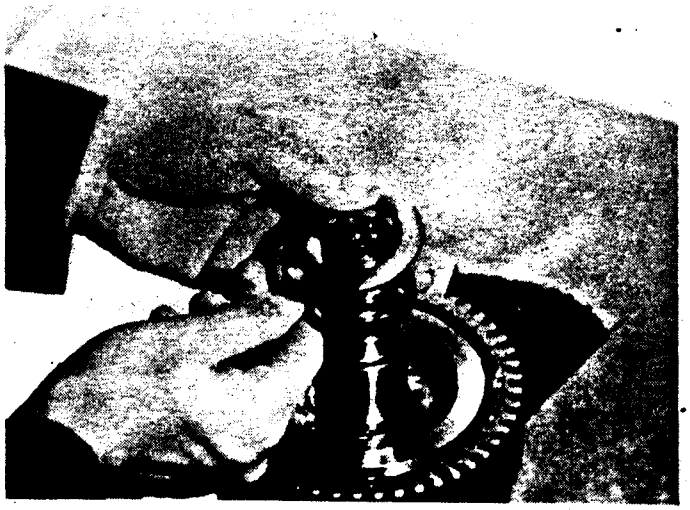


Fig. 78

Install spacer ring and thrust washer.

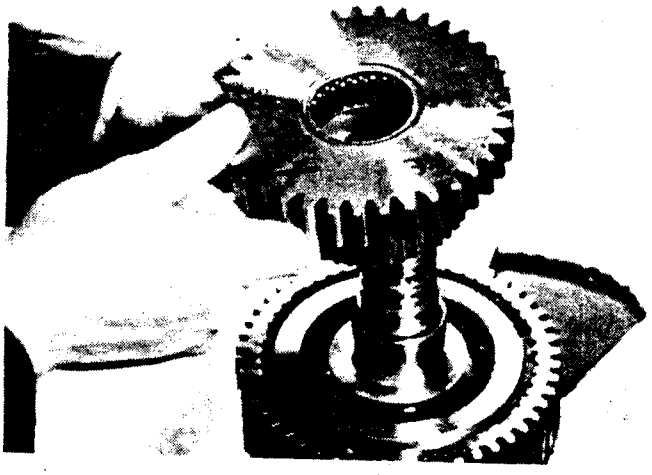


Fig. 79

Install forward hub.

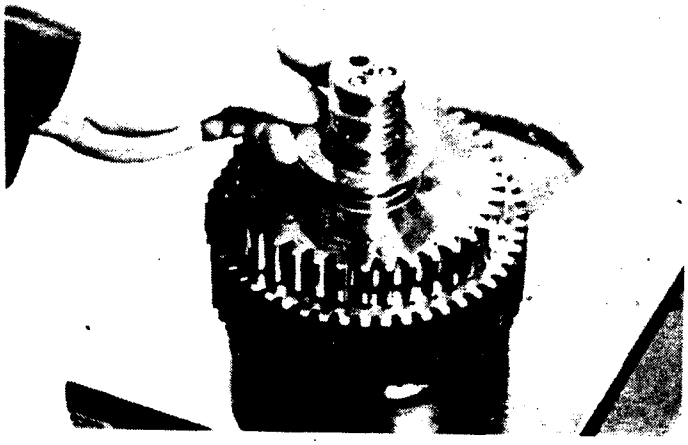


Fig. 80

Install thrust washer.

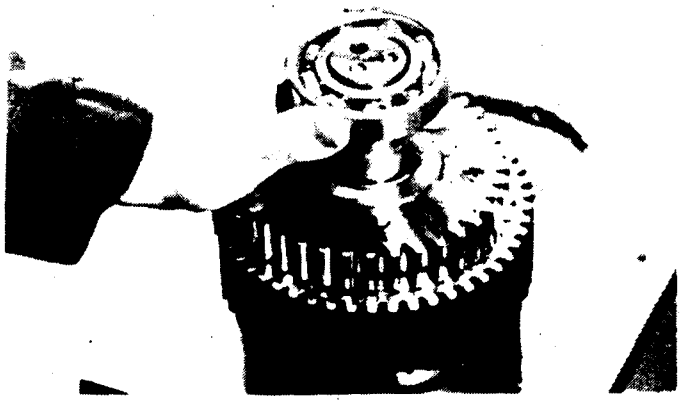


Fig. 81

Install front bearing on shaft.

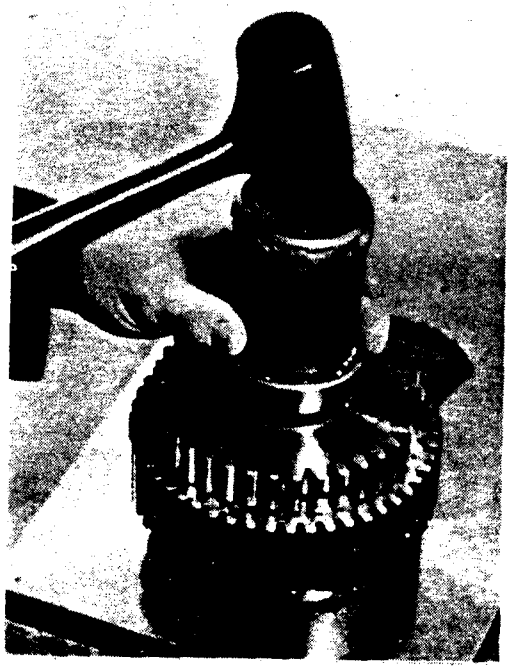


Fig. 82

Drive or press bearing on the shaft.

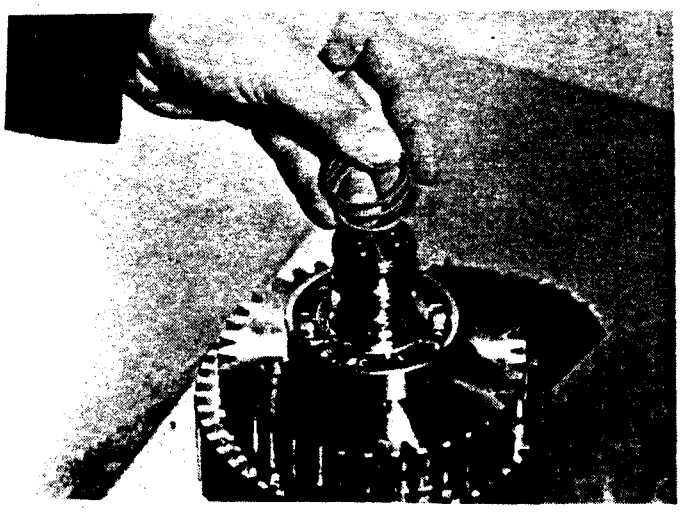


Fig. 83

Install the three teflon seal rings.

Fig. 84

Place the resizing tool over the seal rings.

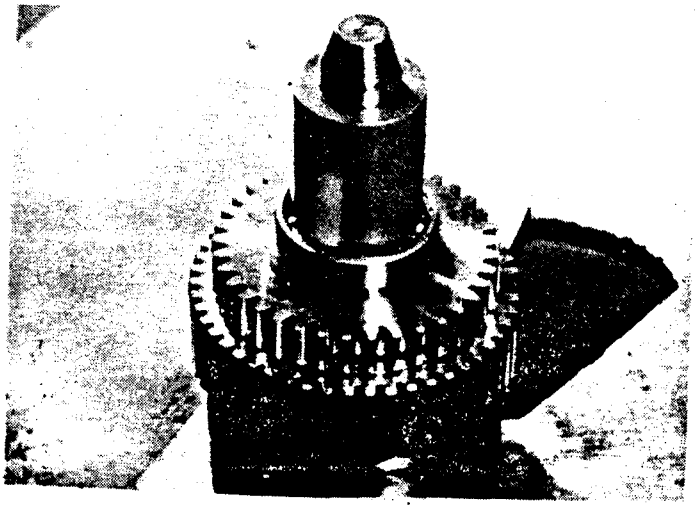


Fig. 85

Leave the resizer on the seal rings for a few minutes.

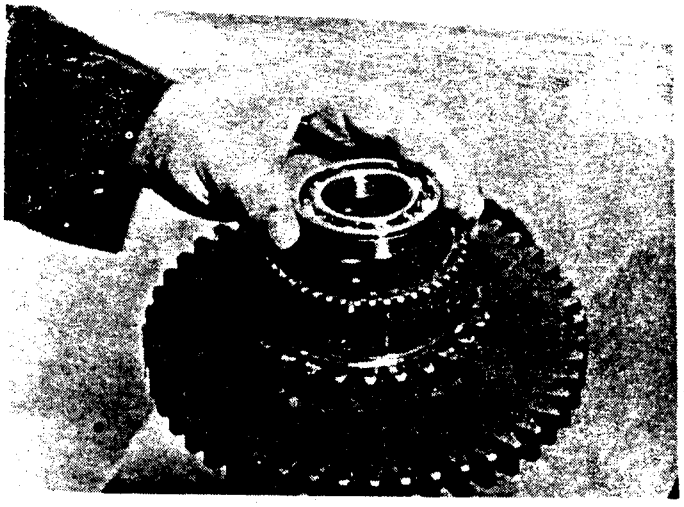


Fig. 86

Place bearing in second gear clutch hub.

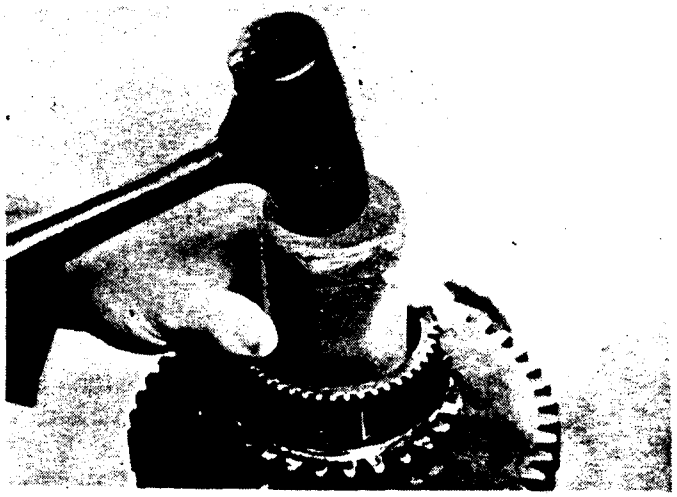


Fig. 87

Drive bearing in place.

Fig. 88

Turn second gear clutch hub over and install the inner bearing race on the output shaft.

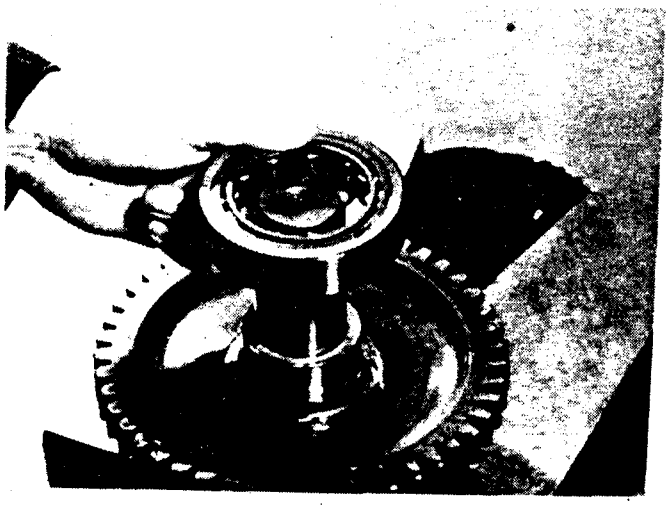


Fig. 89

Place the roller bearing over the inner race.

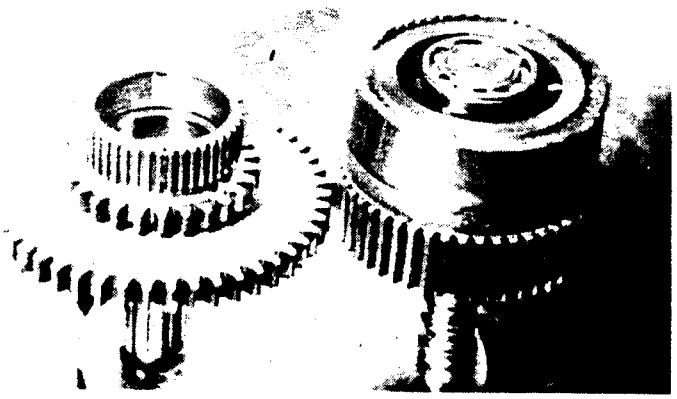


Fig. 93

The two halves of the clutch stack are now ready to be assembled together.

Fig. 94

Line up the splines of the second gear hub with the clutch and separator plate.

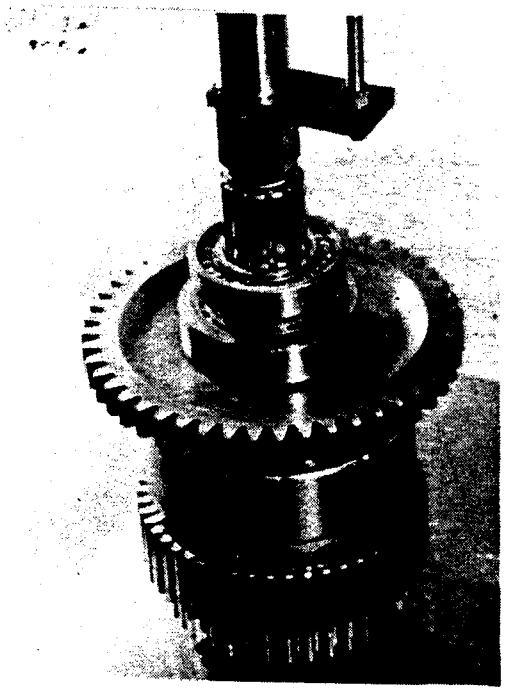


Fig. 95

Press the output shaft which will seat the second gear clutch hub bearing over the shaft. Make sure the clutch plates do not bind on the hub spline as you are pressing the two halves together.

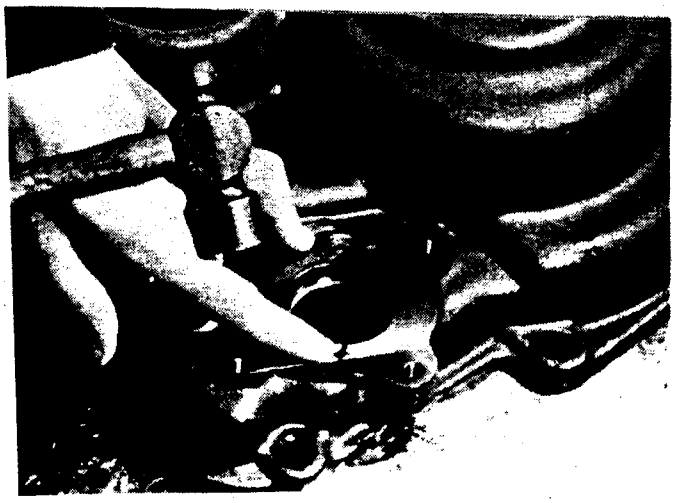


Fig. 96

Drive the two roll pins for the pump in the output housing.

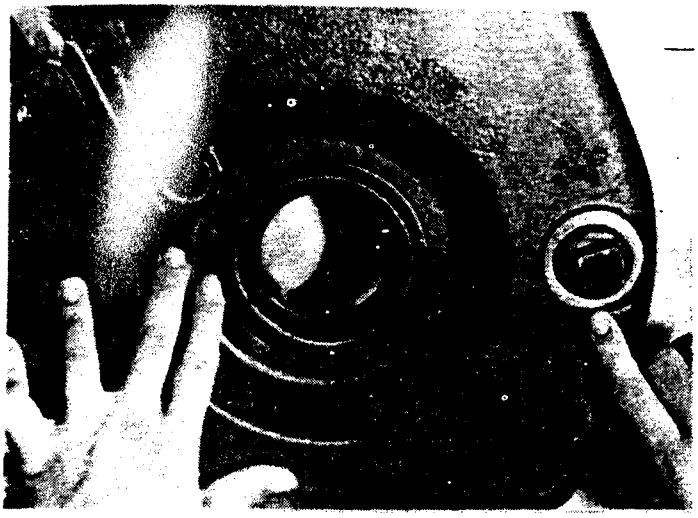


Fig. 97

Install the output bearing and oil seal in the output housing. Install the oil seal for the disconnect shaft and drain plugs in the housing.

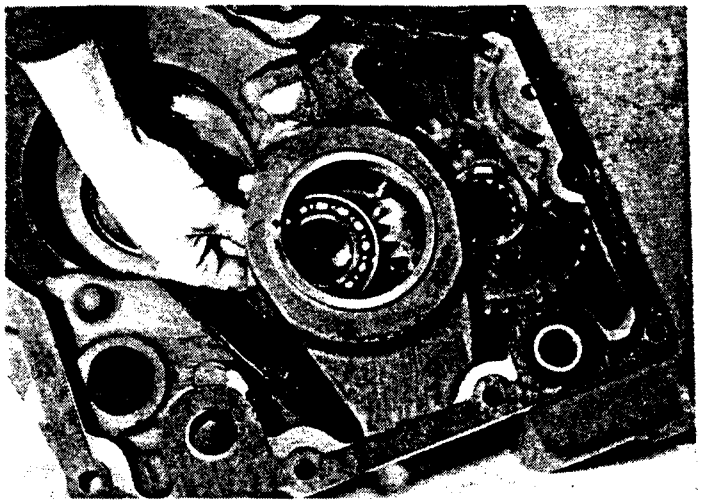


Fig. 98

Lay the output housing on the back side and install the bearing and drive gear in the bore. Place the output gasket on the case.

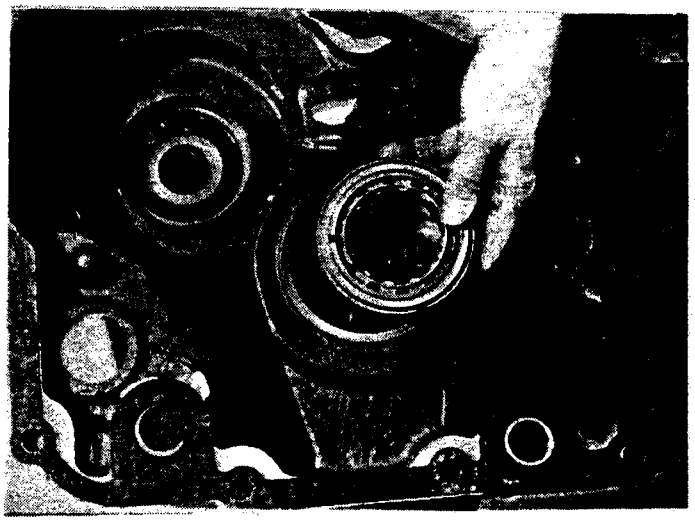


Fig. 99

Place the clutch stack bearing in the bore on top of the drive gear.

Fig. 100

Lift both clutch stacks together and place them in the output housing.

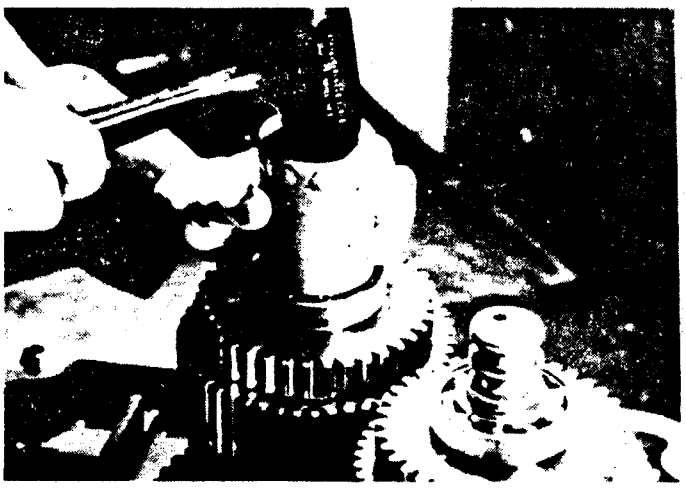


Fig. 101

The clutch stack shaft must be stabbed into the driven gear and driven into the bottom bearing.

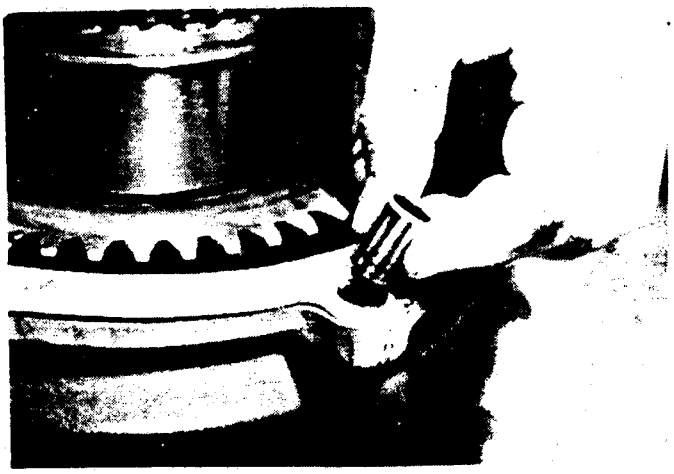


Fig. 102

Install the two hollow dowel pins in the output housing.

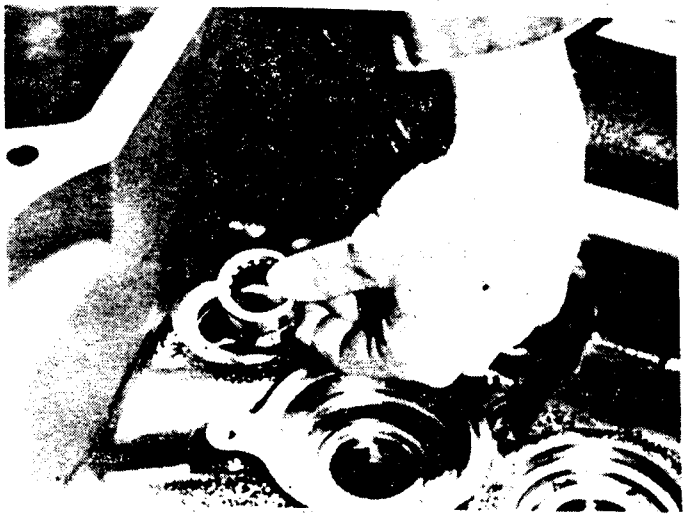


Fig. 103

Place pump shaft bearing in the input housing.

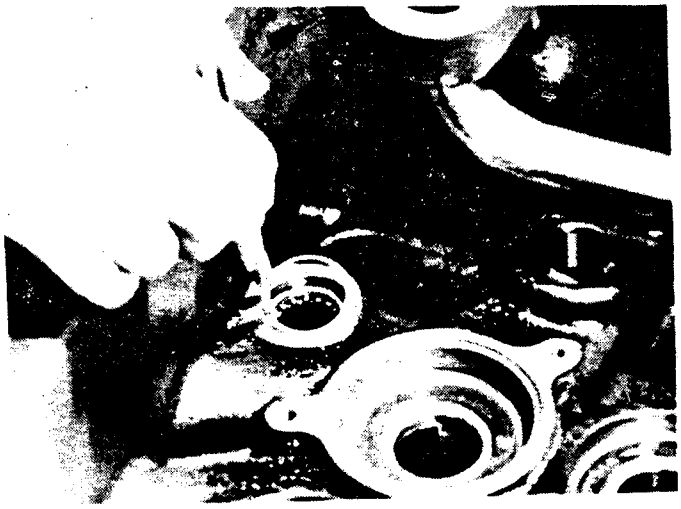


Fig. 104

Install snap ring over the bearing.

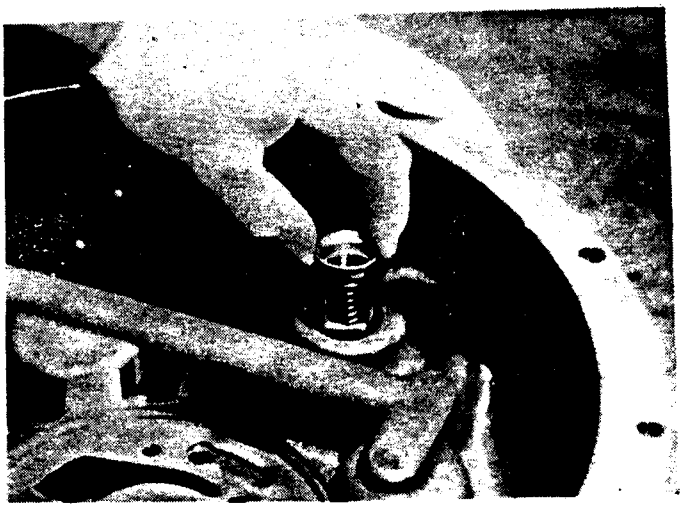


Fig. 105

Install converter by-pass valve in the input housing.

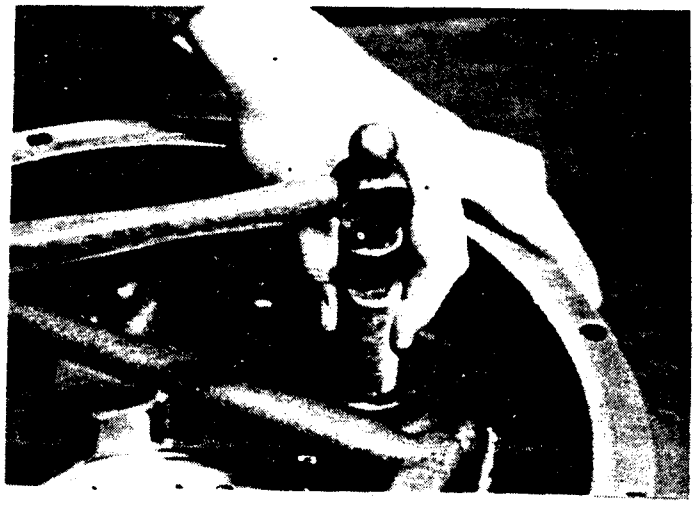


Fig. 106

The by-pass valve must be seated in the housing.

Fig. 107

Install a 1" Allan head pipe plug in the housing.

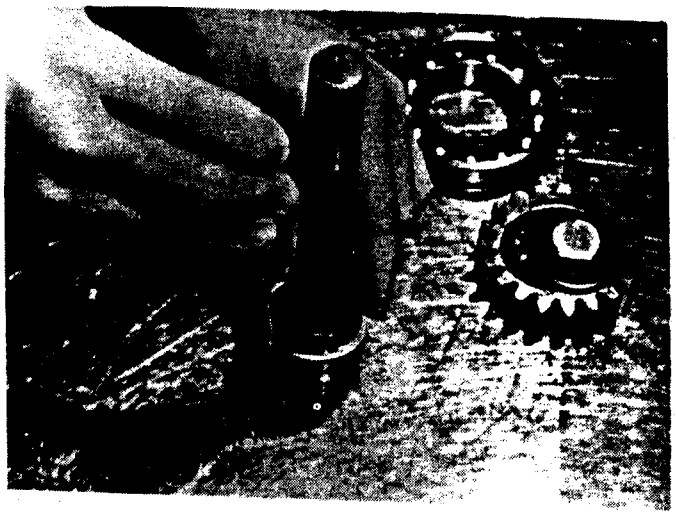


Fig. 108

Install snap ring on the input shaft.

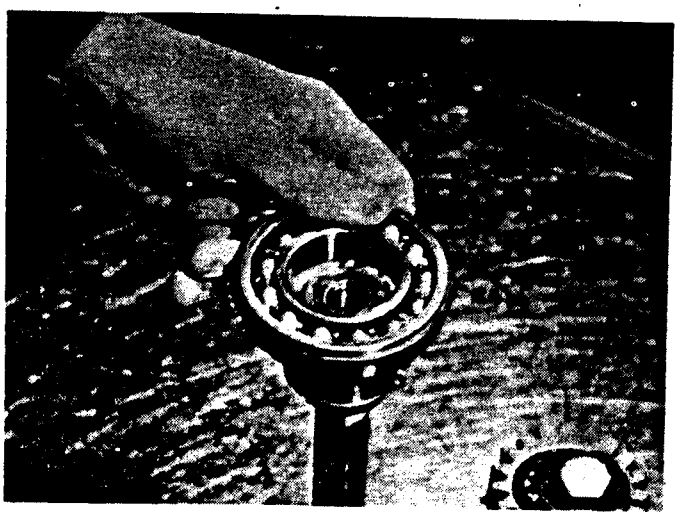


Fig. 109

Press input pilot bearing on the shaft.

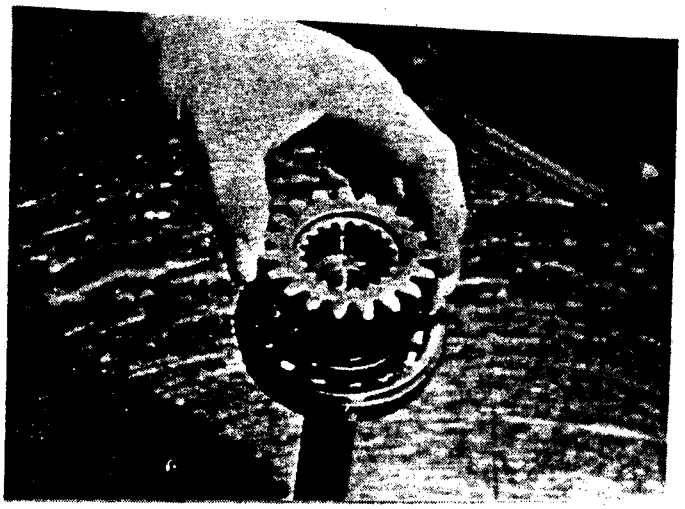


Fig. 110

Install gear on shaft.

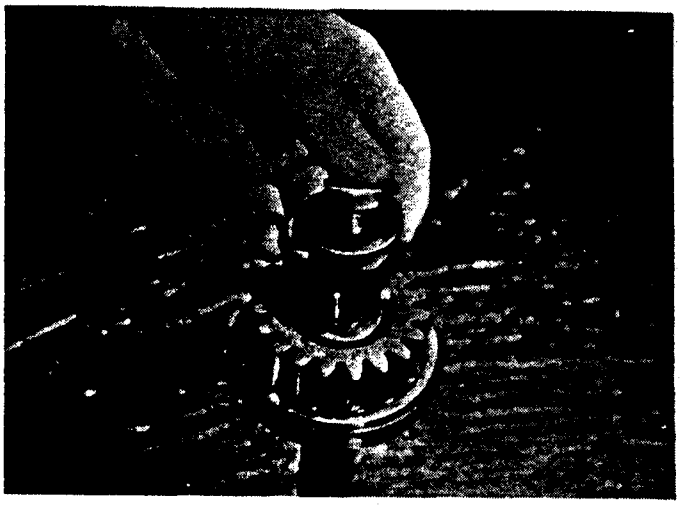


Fig. 111

Install the shim, retaining washer and place bolt on shaft.

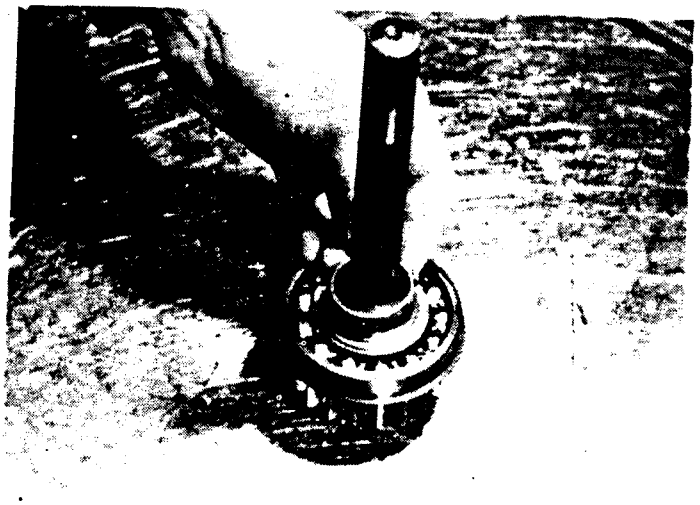


Fig. 112

Install a teflon seal ring on the input shaft and resize it.

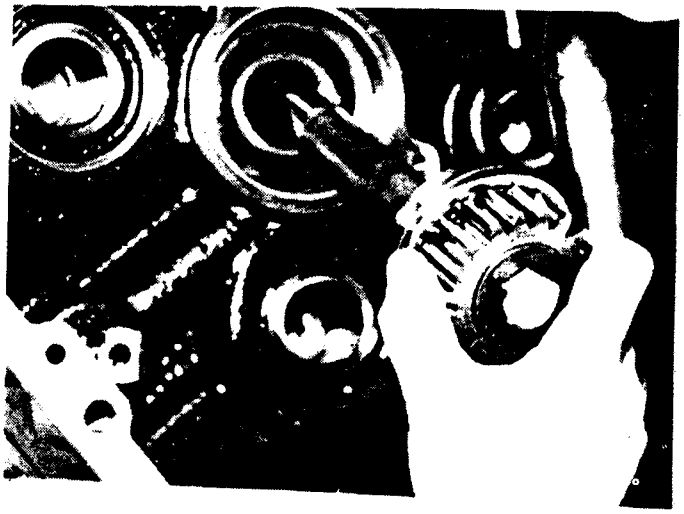


Fig. 113

Install input shaft into the input housing.

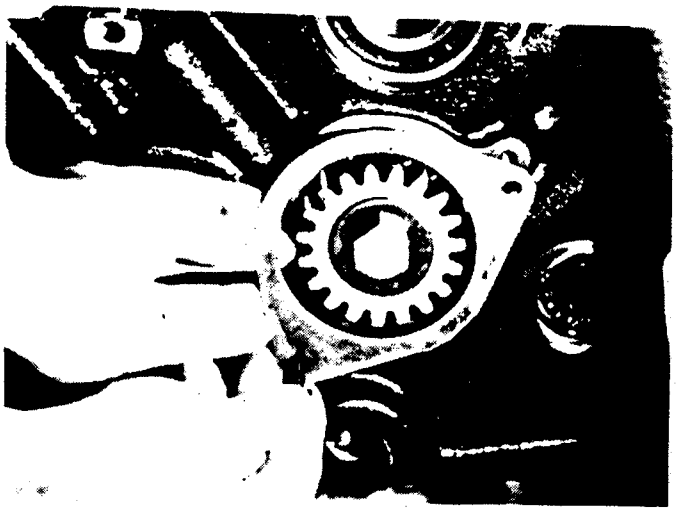


Fig. 114

Install retaining plate over the input shaft bearing.

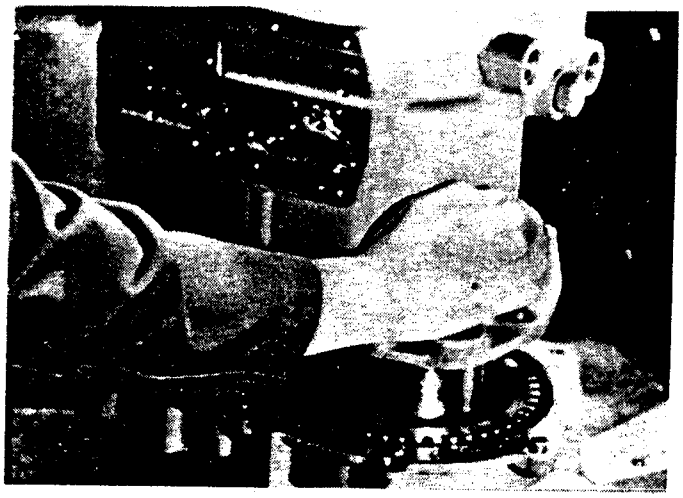


Fig. 115

Lift input housing and set it over the clutch stacks and onto the output housing.

Fig. 116

Turn the input shaft as you are letting the input housing down over the clutch stacks.

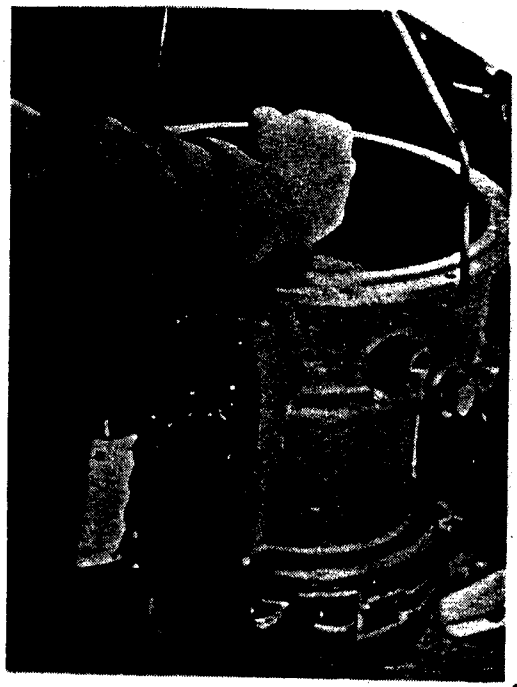


Fig. 117

Do not force the housing.

Fig. 118

Install bolts fastening the input and output housings together.

Fig. 119

The pump has a thrust washer between the driven gear and the housing.

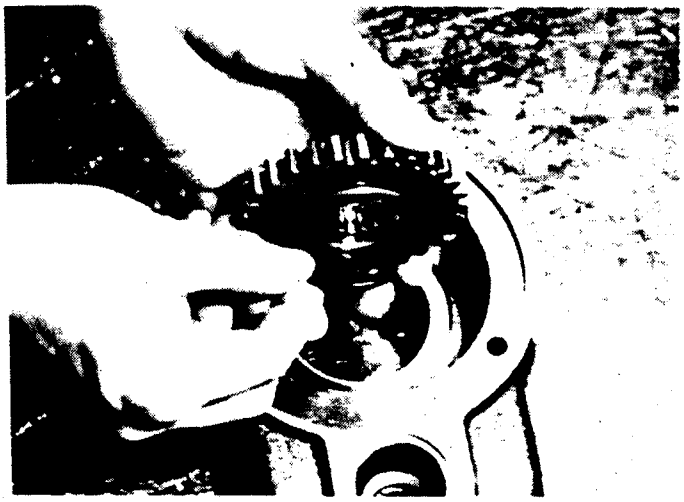


Fig. 120

Place the pump drive gear and the thrust washer in housing.

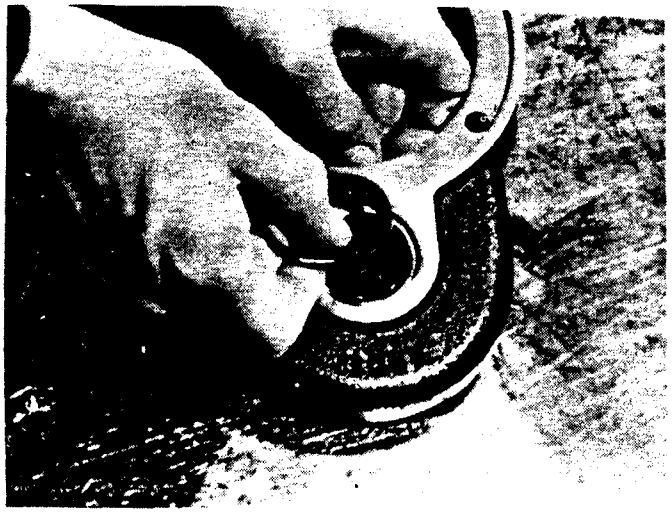


Fig. 121

Install spacer, and "0" ring in the housing.

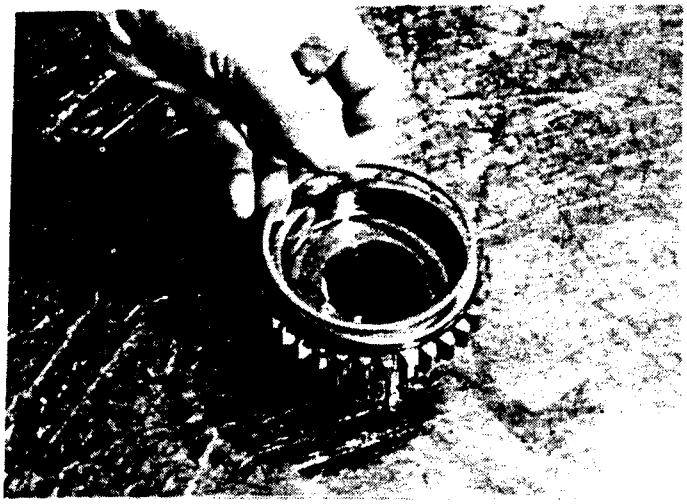


Fig. 122

Install the teflon seal ring on the pump gear.

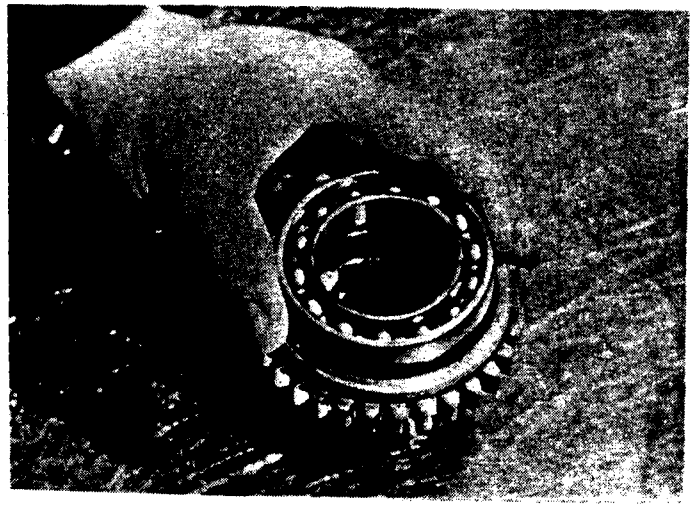


Fig. 123

Press the bearing into the gear.

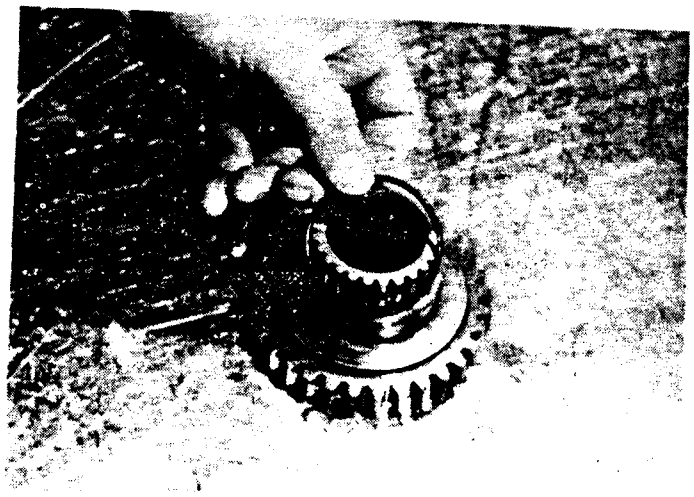


Fig. 124

Install the "O" ring on the pump drive gear.

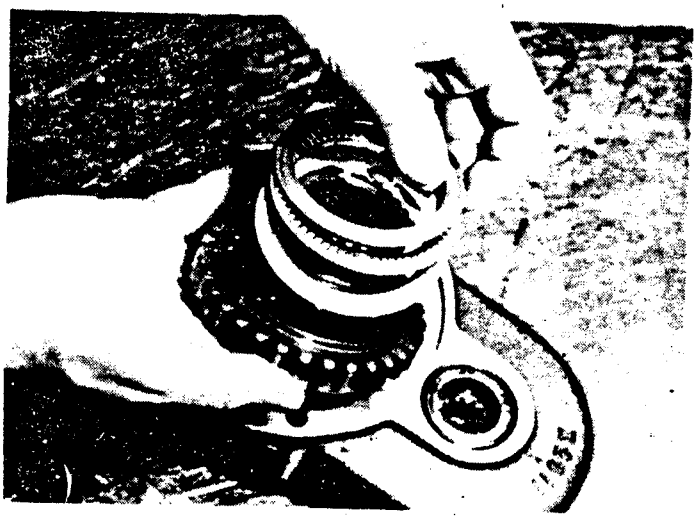


Fig. 125

Install the thrust bearing and bearing races over the gear.

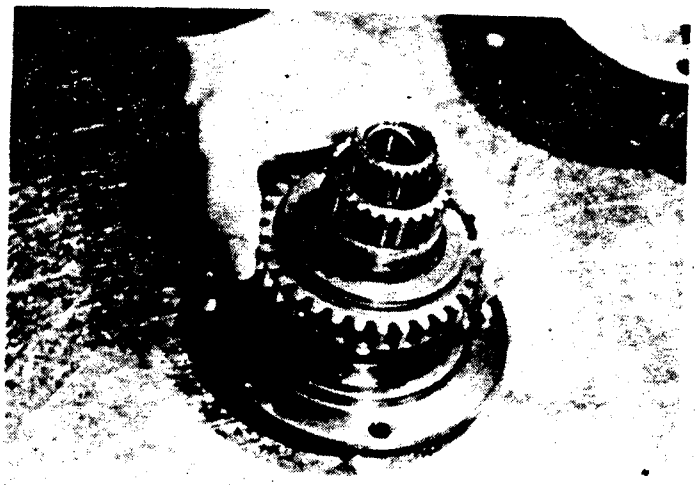


Fig. 126

Place the gear over the stator tube.

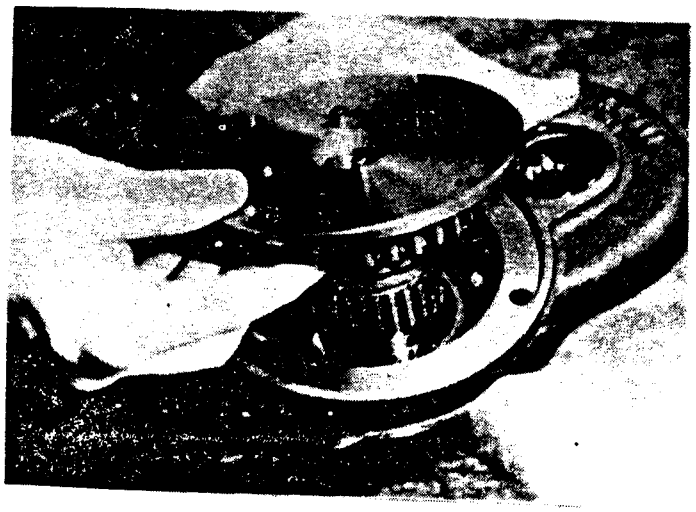


Fig. 127

The stator tube and gear are then placed in the housing.

Fig. 128

Install the square sealing ring in the pump bore of the input housing.

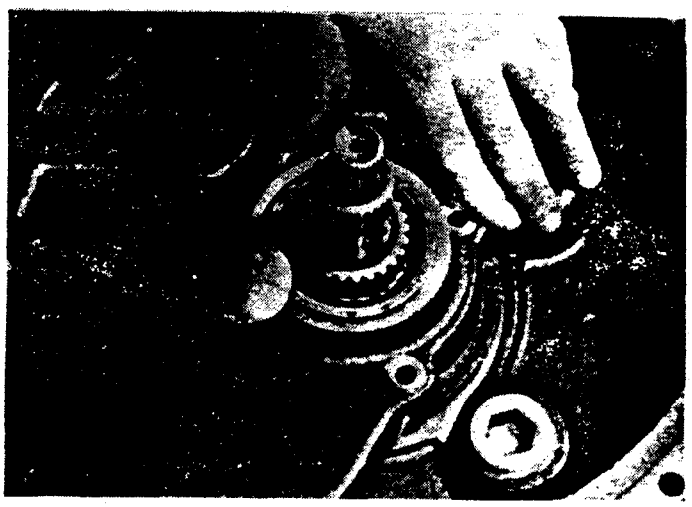


Fig. 129

Place the pump drive assembly over the input shaft.

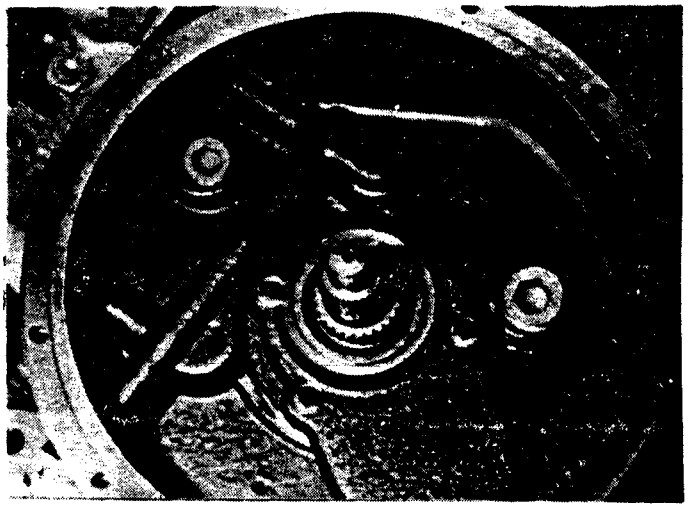


Fig. 130

Bolt the housing in place.

Fig. 131

Install the pump housing over the pump drive shaft.

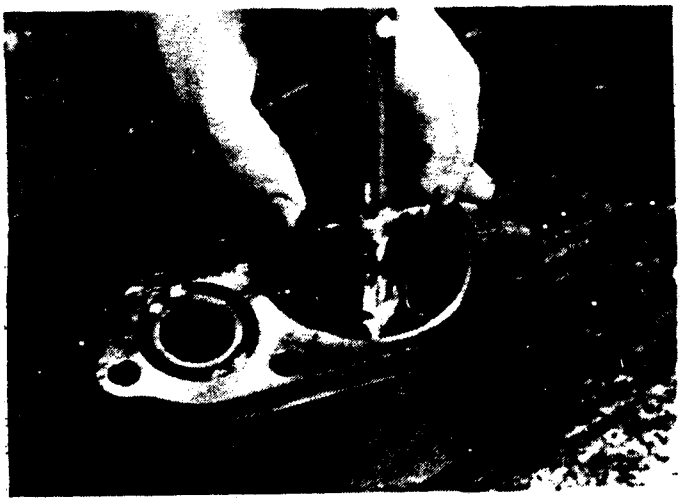


Fig. 132

Place the key in the shaft and slip the gerotor gear down the shaft over the key.

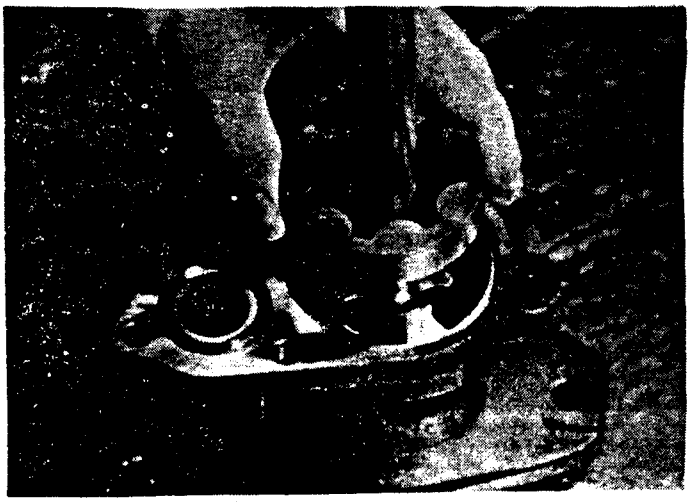


Fig. 133

Install the outer gerotor gear in the pump.

Fig. 134

Install the back-up plate over the pump gears.

Fig. 135

Place thrust washer over the shaft.

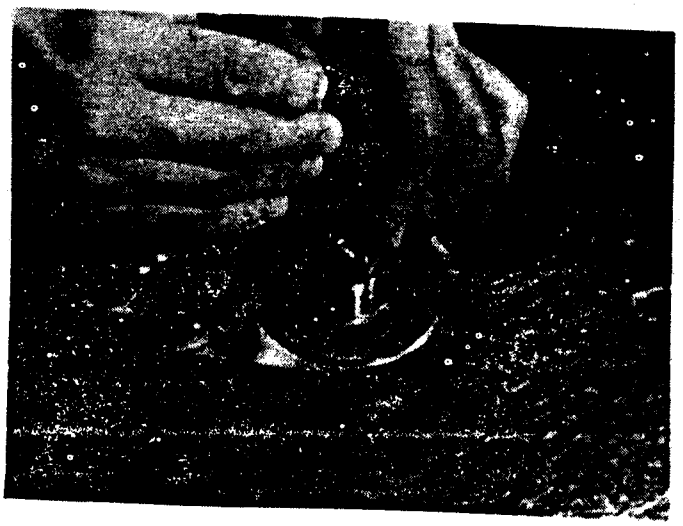
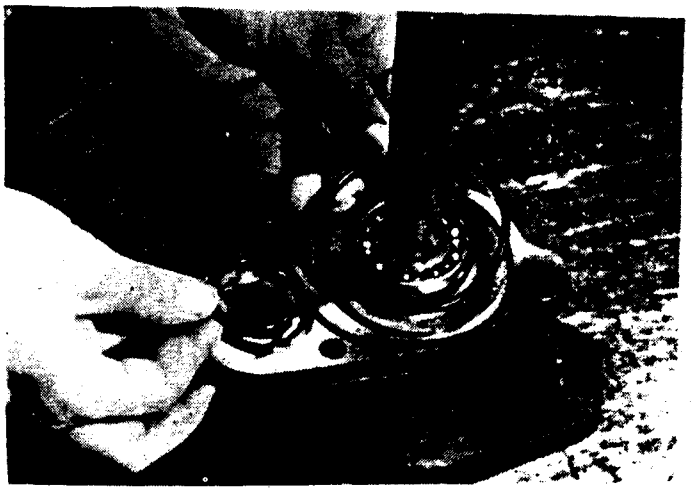


Fig. 136

Install snap rings in the groove.

Fig. 137

Install bearing on the pump shaft.



Fig, 138

Install the two "O" rings in the pump housing.

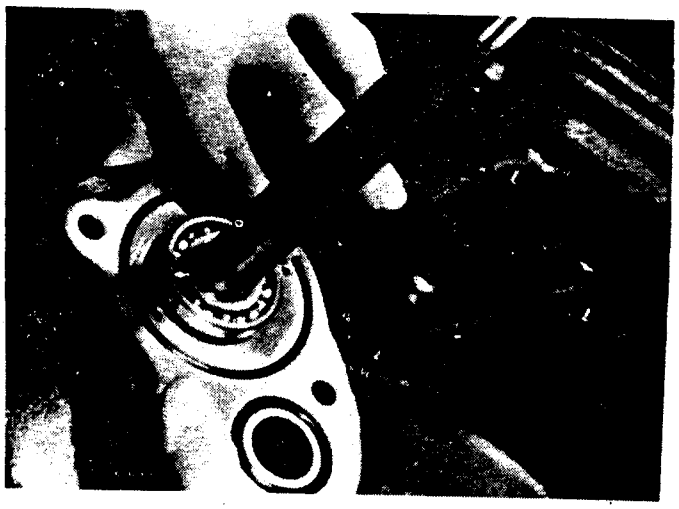


Fig. 139

Line up the two holes in the pump back-up plate with the two roll pins in the output housing.

Fig. 140

Bolt the pump assembly onto the case.

Fig. 141

Tighten all the pump bolts evenly.

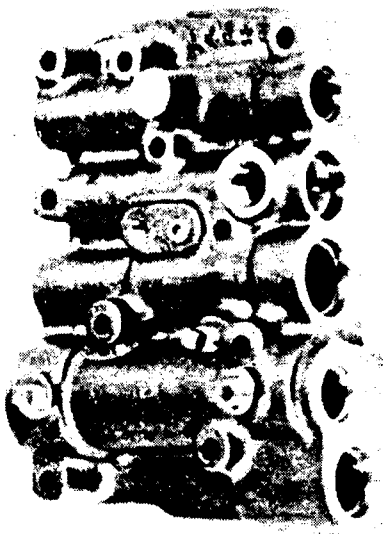


Fig. 146

This is the valve body housing.

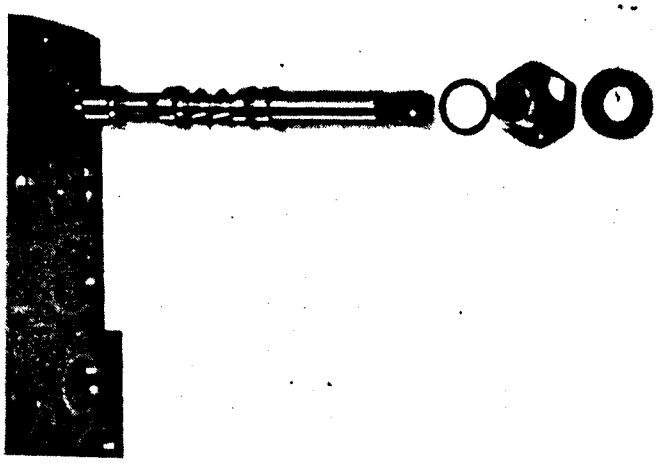


Fig. 147

Place the valve spool for the speed clutches in the top right hand port of the valve body. The retaining cap has an oil seal in the outer portion of it and an "O" ring on the threaded end.

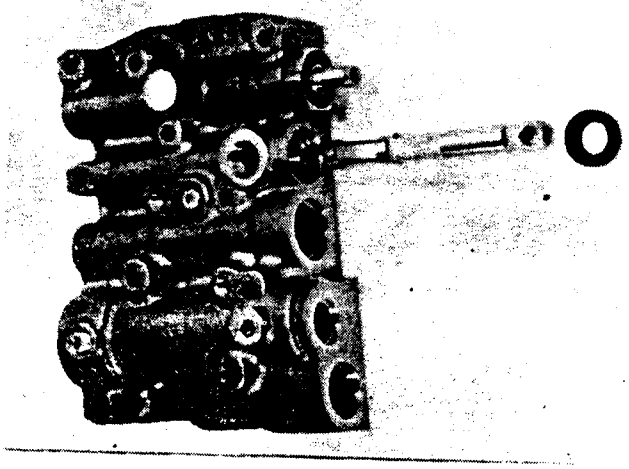


Fig. 148

The second valve spool is for the directional clutches. This slips in the housing and the oil seal is then pressed into the housing bore.

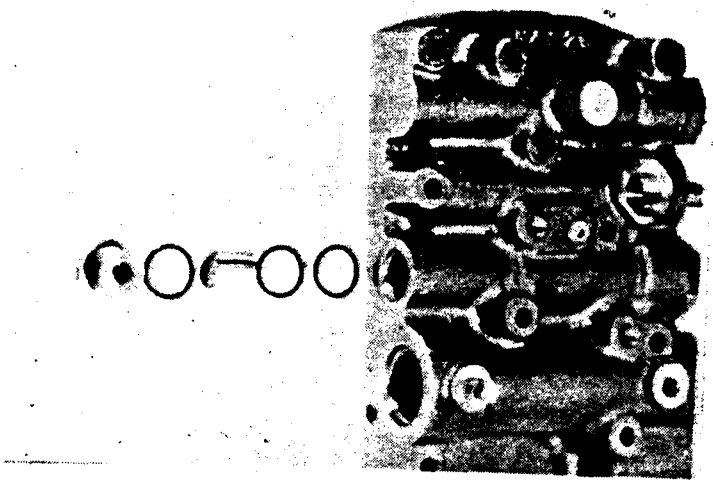


Fig. 149

On the upper left hand port instal two "0" rings in the grooves which are inside the bore then place the piston in the bore and install the retaining cap with an "0" ring on it.

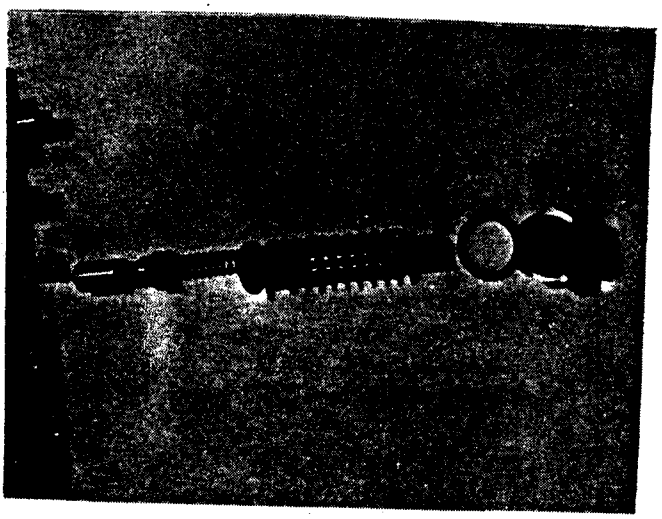


Fig. 150

In the same port on the right hand side the parts are installed as they are layed out in the picture. The stud goes in the feathering valve. The feathering valve spring goes inside the shifting spool and the return spring goes over the shifting spool. The retainer cap has an oil seal and an "0" ring on it.

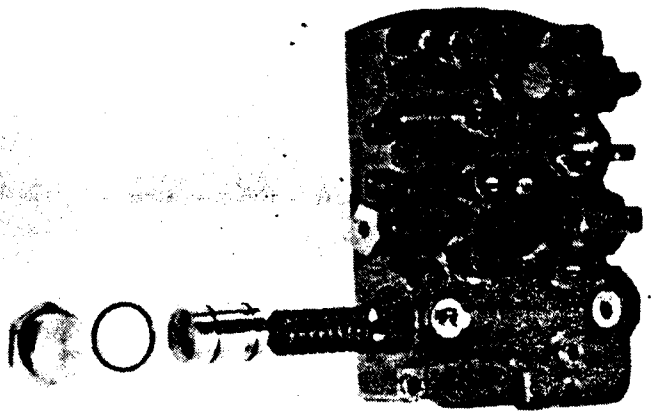


Fig. 151

In the bottom left hand port you have your accumulator spring, accumulator valve and the "0" ring which goes over the cap.

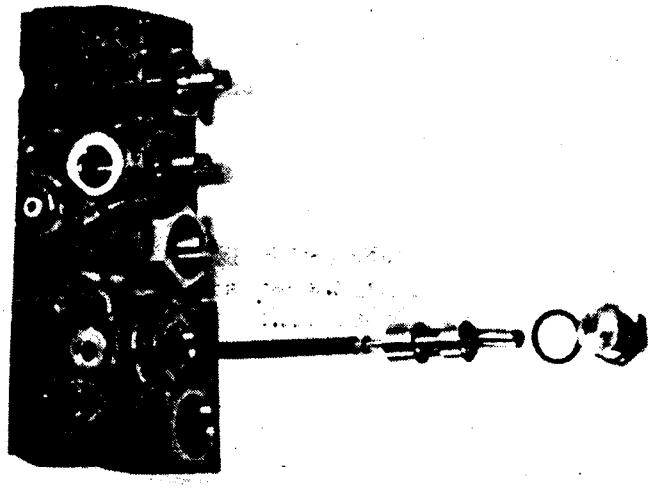


Fig. 152

The same port on the right hand side you have your main pressure spring, a shim, main pressure valve, and the stud which goes in the valve, then your "0" ring and the cap.

Fig. 153

Install the clip to the brake cutoff and the dowel pin for the directional spool.

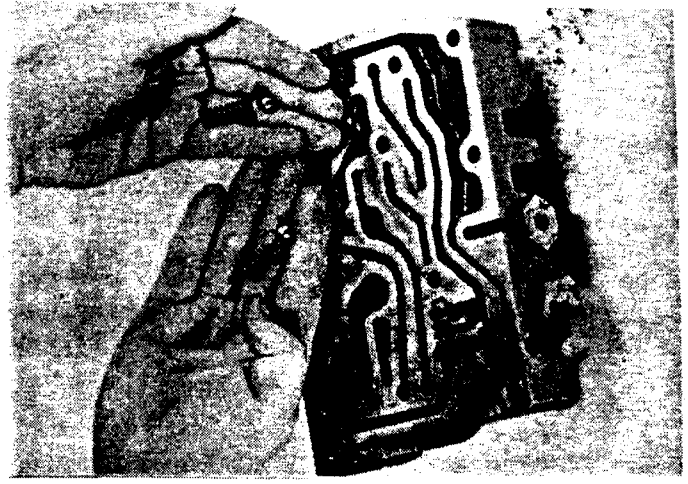


Fig. 154

Install two detent balls and springs.

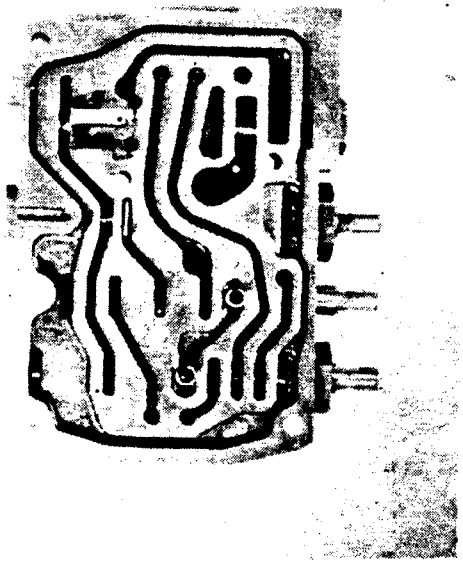


Fig. 155

This is the bottom side of the valve body showing the detent springs, the clip and the dowel pin.

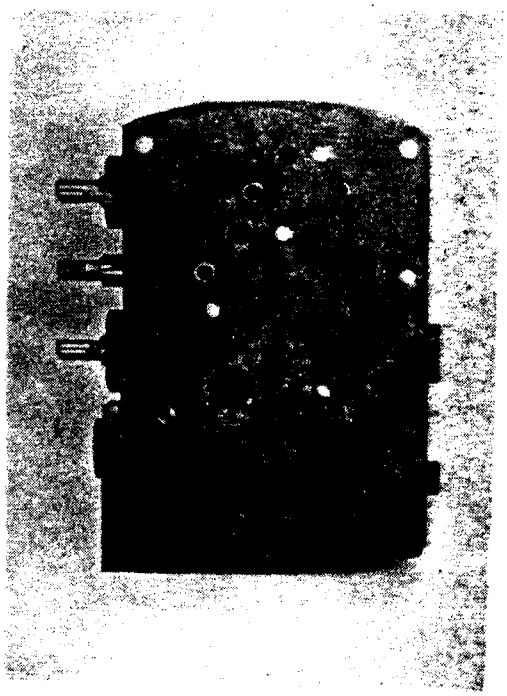


Fig. 156

The bottom side of the valve body with gasket installed.

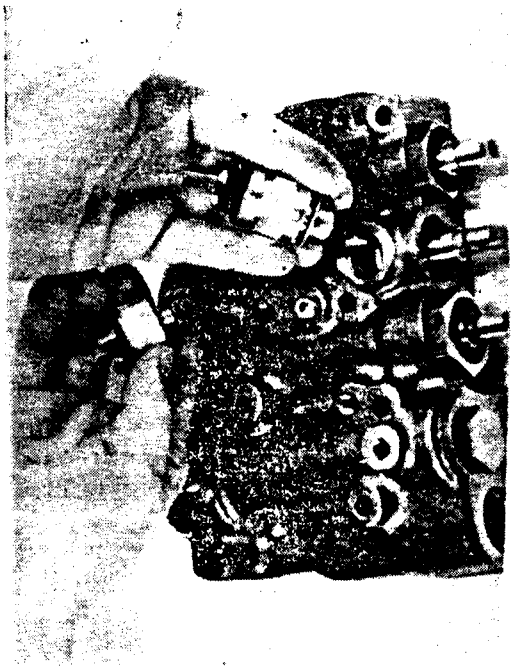


Fig. 157

Install reverse warning switch and the neutral start switch in the ports as shown.

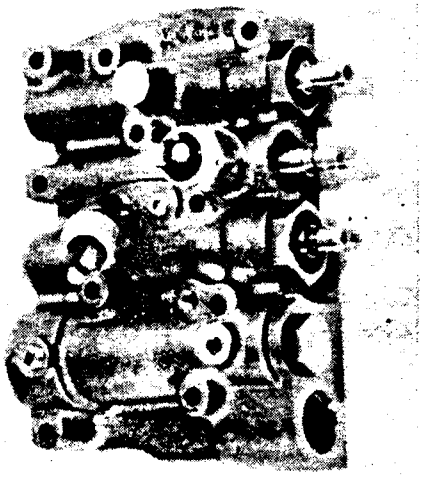


Fig. 158

This is the valve body with the reverse warning switch and neutral start switch installed.

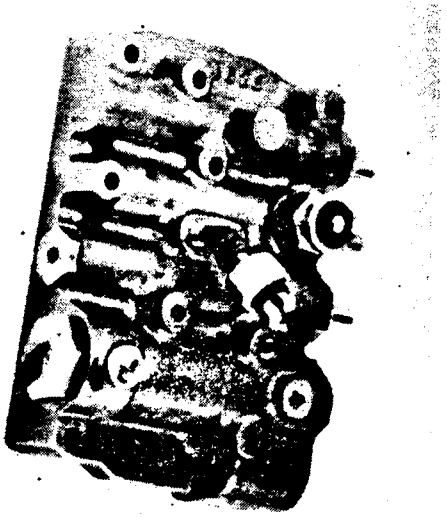


Fig. 159

A different view of the same valve body.

Fig. 160

Install valve body as shown starting with the bottom edge against the housing and then raising the top part of the valve into place. This way you do not lose the detent balls and springs.

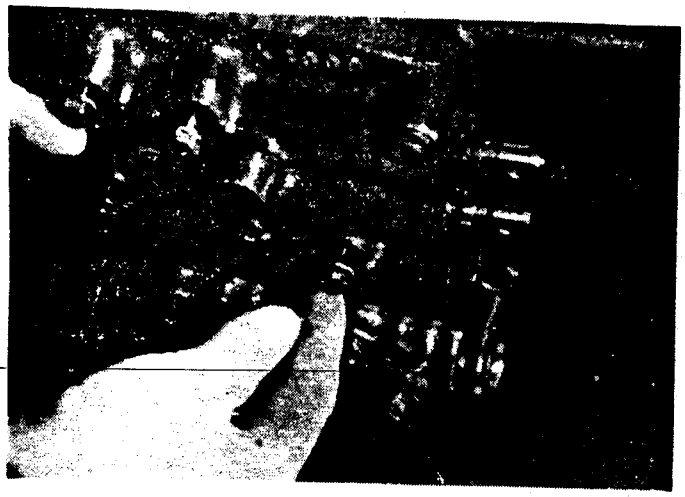


Fig. 161

Tighten all bolts on the valve body evenly.

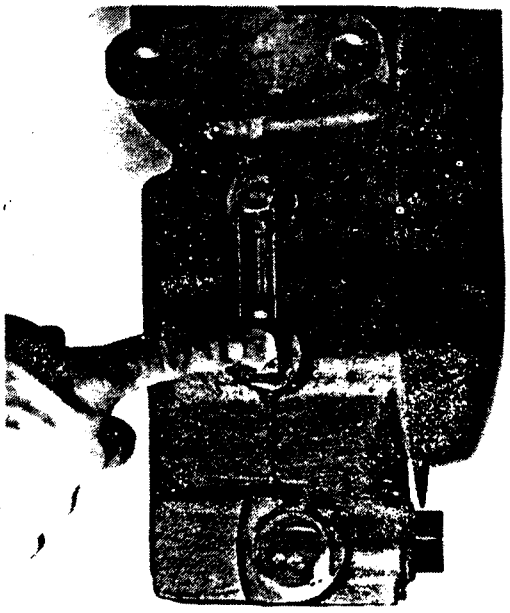


Fig. 162

Install the oil level sight gauge in the output housing.

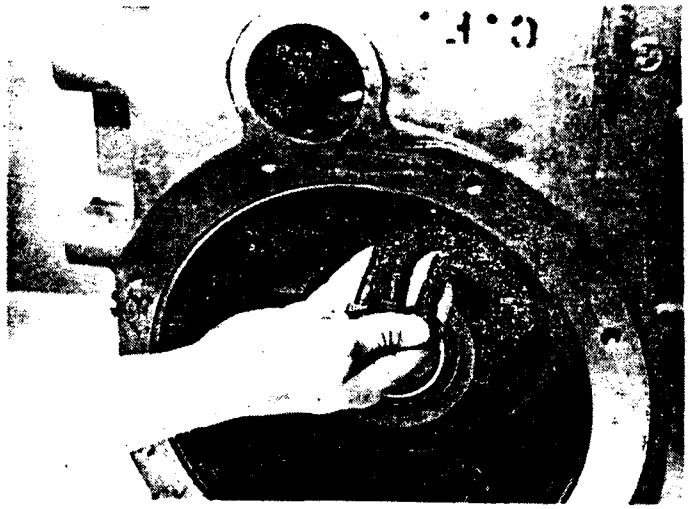


Fig. 163

Install the three capscrews inside the output housing which bolts the output and input housings together.

Fig. 164

Press the bearing cups in the idler gear and place the bearing cones and spacer in the gear.

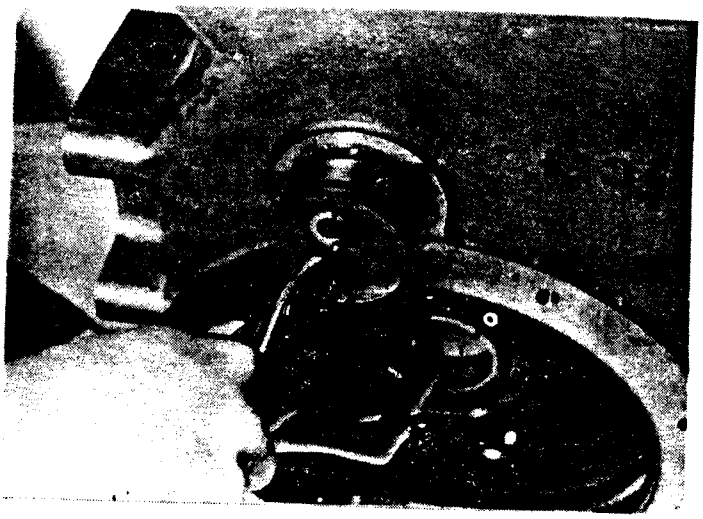


Fig. 165

Place the idler gear in the housing and install the idler shaft with the "O" ring on it into the case.

Fig. 166

Install the capscrew with dyna-seal washer through the idler shaft.

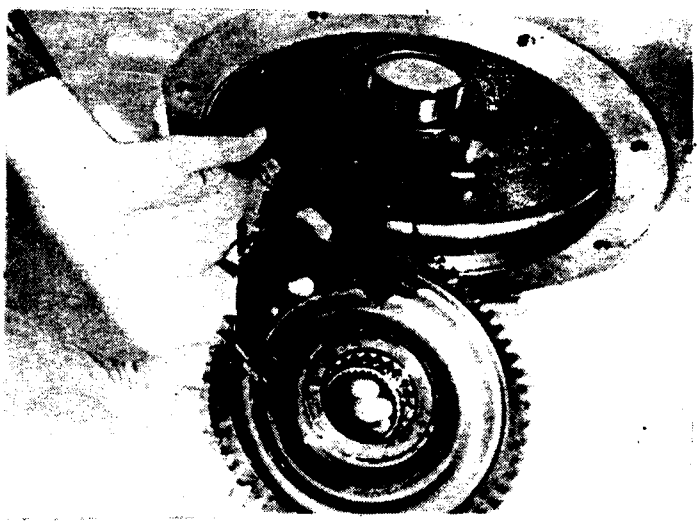


Fig. 167

Install the bearing in the bore of the output gear. Place the two nylon clips on the shifter fork. Place the fork in the shift groove of the gear and install them together in the case. The shifter shaft will extend through the front of the case.

Fig. 168

Place the rubber seal on the output shaft.

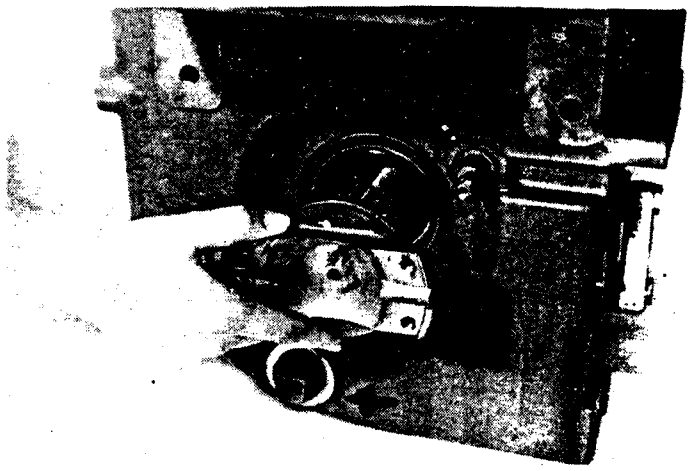


Fig. 169

Install output shaft through the housing and output gear.

Fig. 170

Install the bearing and oil seal in the output retainer.

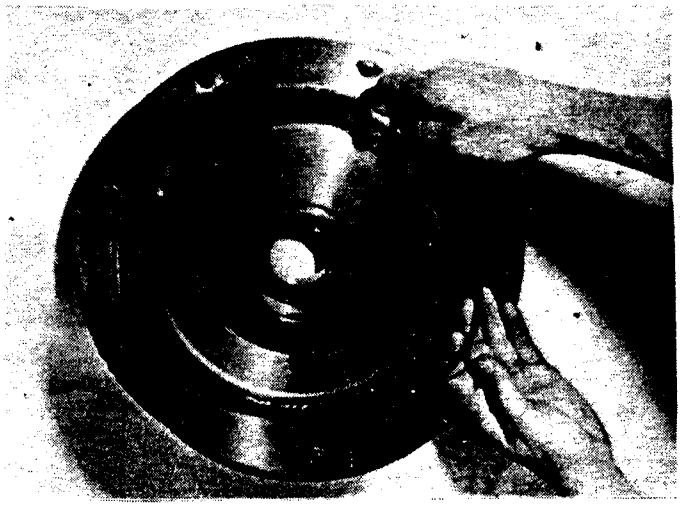


Fig. 171

Install "0" ring on the output retainer.

Fig. 172

Install the output retainer and install the capscrews

Fig. 173

Install the detent ball, plunger, spring and allen head plugs in the side of the case. This is the detent for the disconnect shaft.

Fig. 174

Install the brake mounting bracket.

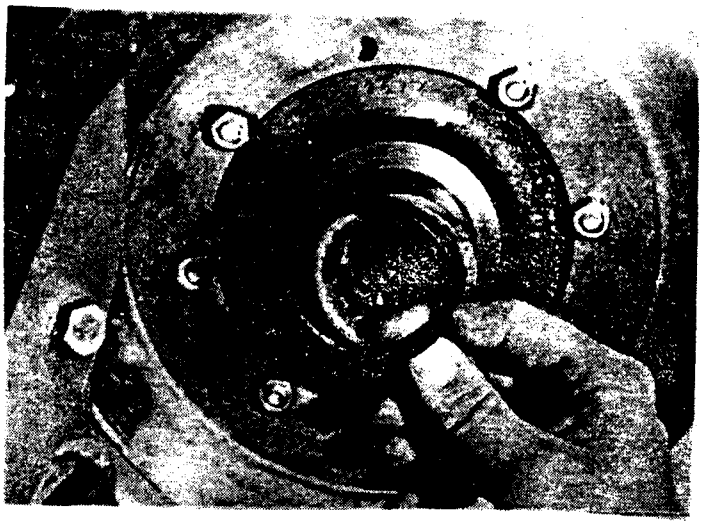


Fig. 175

Install the rubber seal on the disk flange.

Fig. 176

Place the disk on the shaft and install the "O" ring, shims, retainer washer and place bolt.

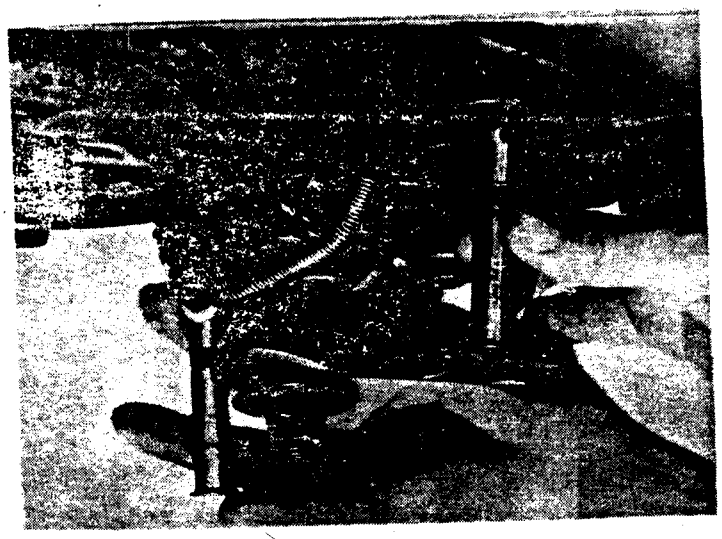


Fig. 177

Place the disk caliper assembly on the bracket and install the two pins.

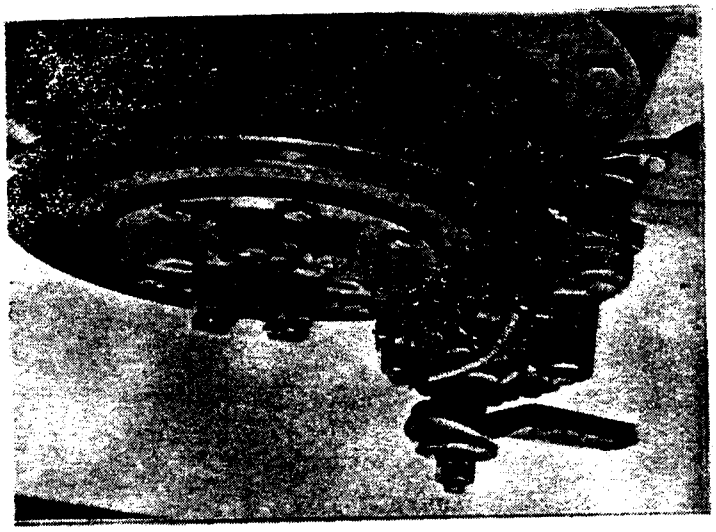


Fig. 178

The pins are retained with cotter keys.

DISASSEMBLY INSTRUCTIONS

FOR THE

4000 SERIES TRANSMISSION

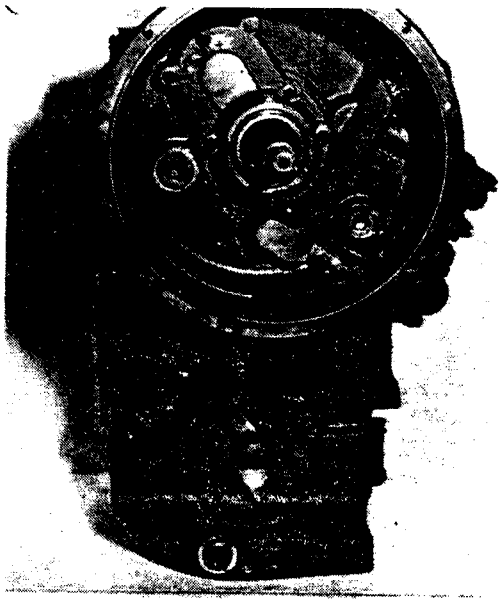


Figure 1

Front view of transmission.
(Input side)

Figure 2

Rear view of transmission.

(Output side)

Figure 3

Right side of transmission.

Figure 4

Left side of transmission.

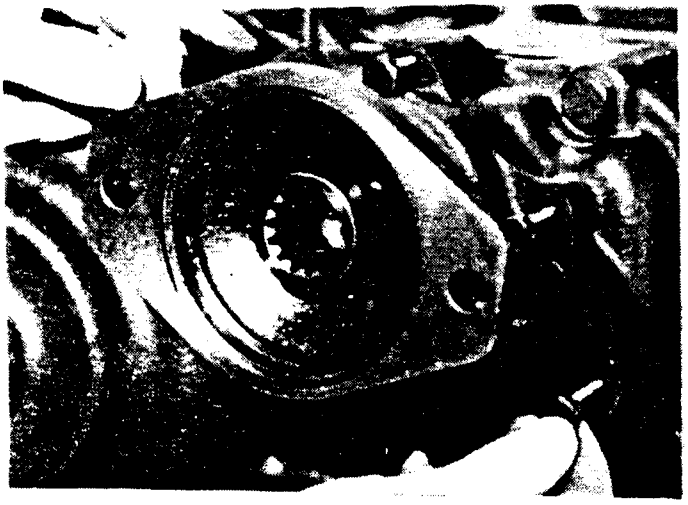


Figure 5

Remove cap screws from charge pump. This charge pump assembly is also an auxiliary pump drive.

Figure 6

Remove the charge pump assembly by pulling it straight out.

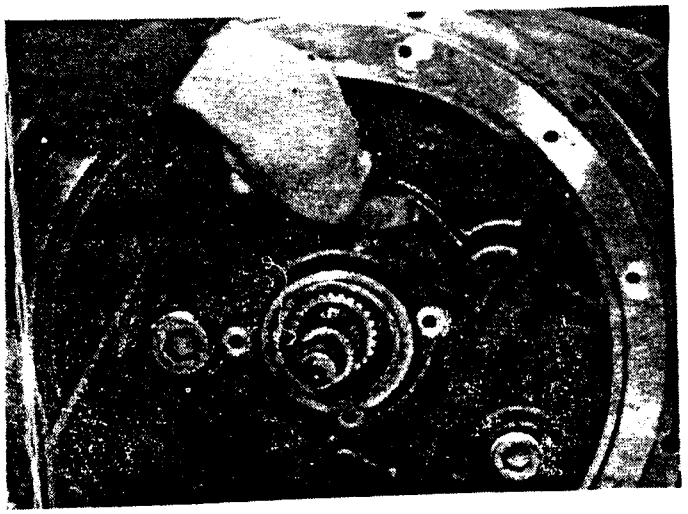


Figure 7

The drive gear for the pump shaft is on the input side of the transmission. Remove the capscrews and pry the housing away from the case.

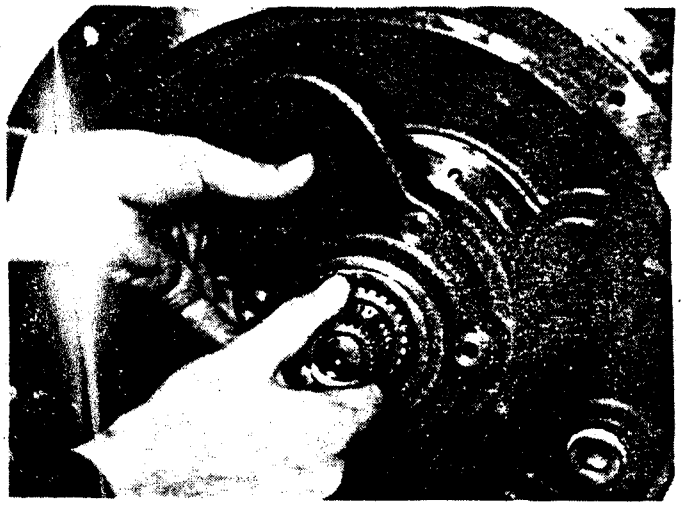


Figure 8

The stator tube and pump drive gear can be removed together.

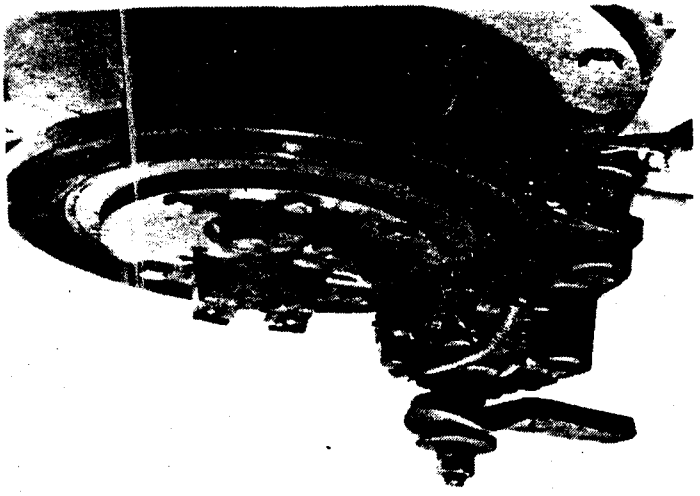


Figure 9

Remove the cotter pins from the caliper assembly.

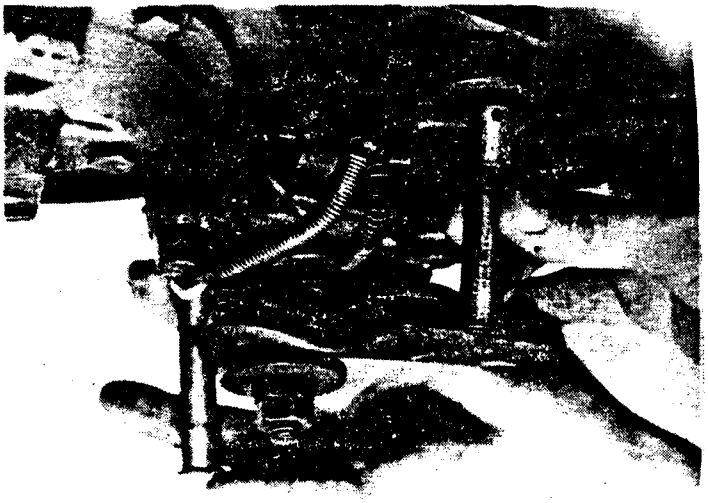


Figure 10

Remove the two pins and the caliper assembly will slip out.

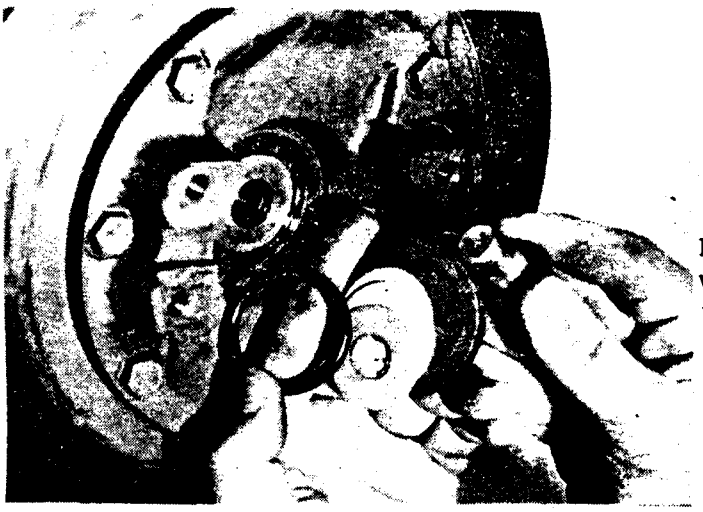


Figure 11

Remove the place bolt, reta[illegible]r washer shims and "0" ring f[illegible] the output disc.

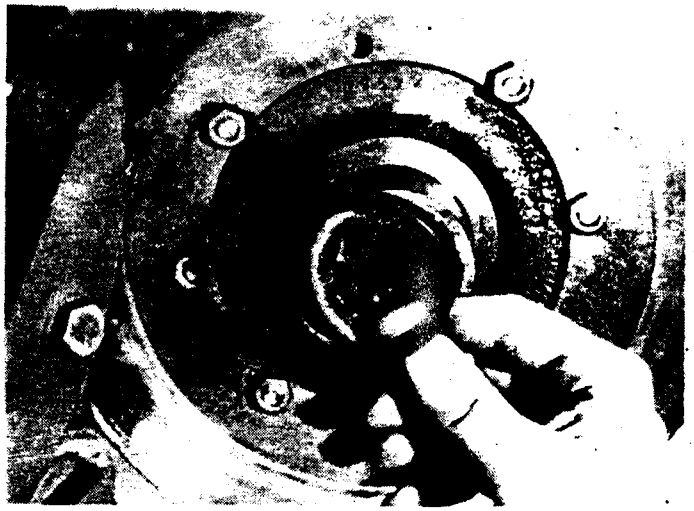


Figure 12

The output flange and disk will pull straight out and them remove the rubber seal from [illegible]e flange.

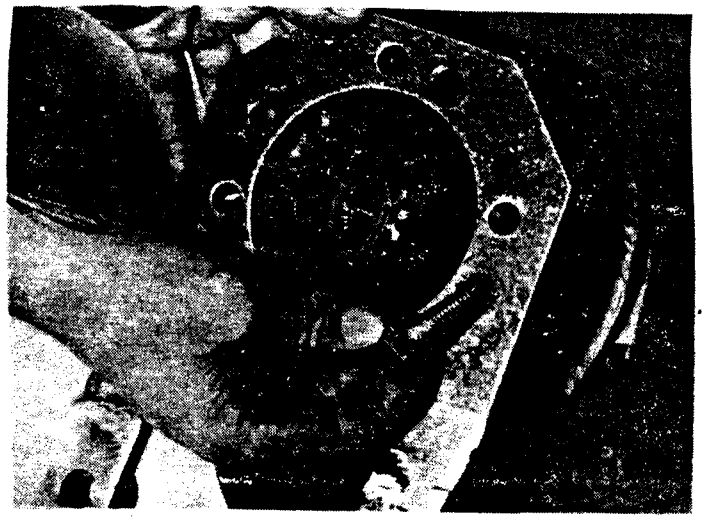


Figure 13

Remove the brake bracket.

Figure 14

Remove the output retainer.

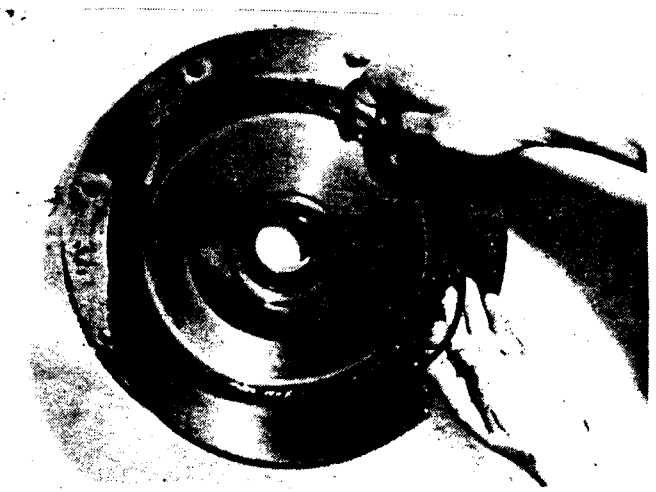


Figure 15

Remove the "O" ring.

Figure 16

Remove the oil seal and bearing from the retainer.

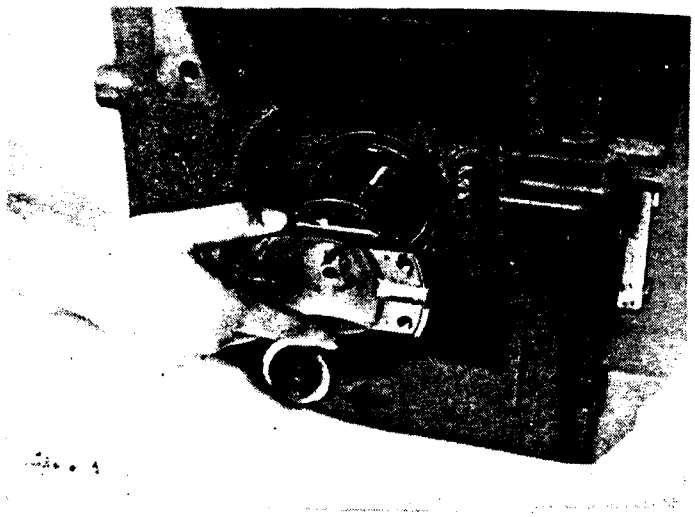


Figure 17

The output shaft is removed from the front side of the case.

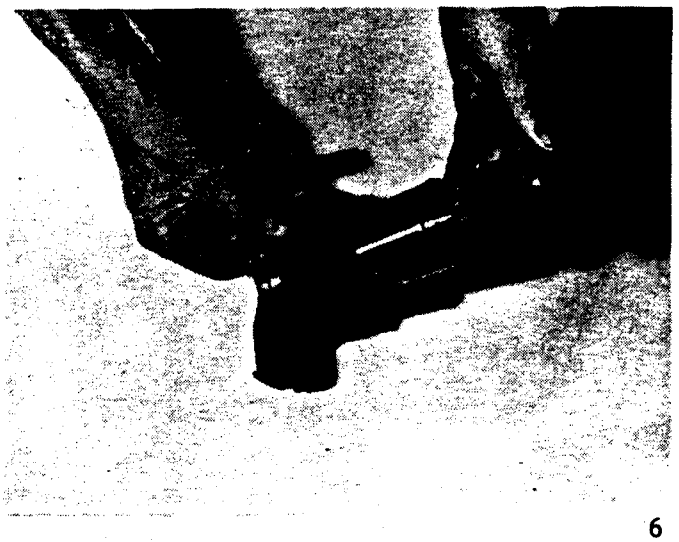


Figure 18

Remove the rubber seal from output shaft.

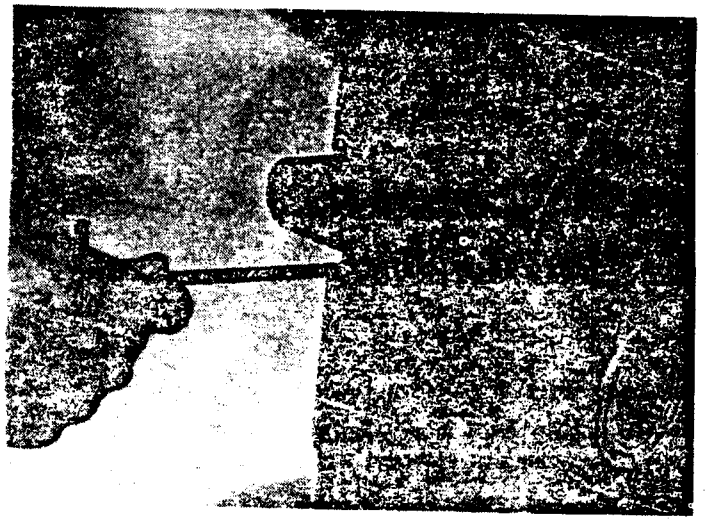


Figure 19

Remove the allen head screw from the left side of case. This is the detent assembly.

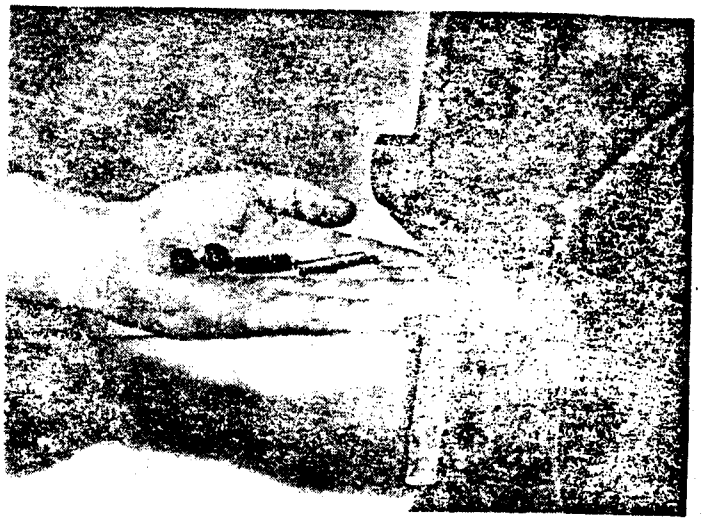


Figure 20

The detent ball, plunger, spring and allen head screws.

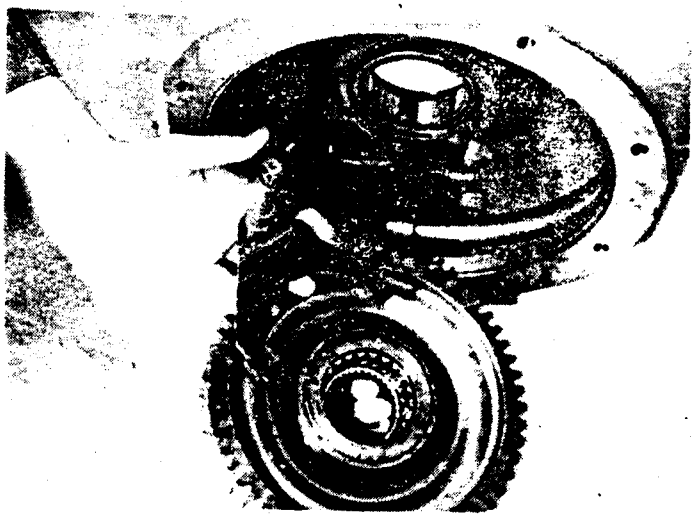


Figure 21

The output gear and shifter fork must be removed together.

Figure 22

Remove the capscrew and dynaseal washer from the idler shaft.

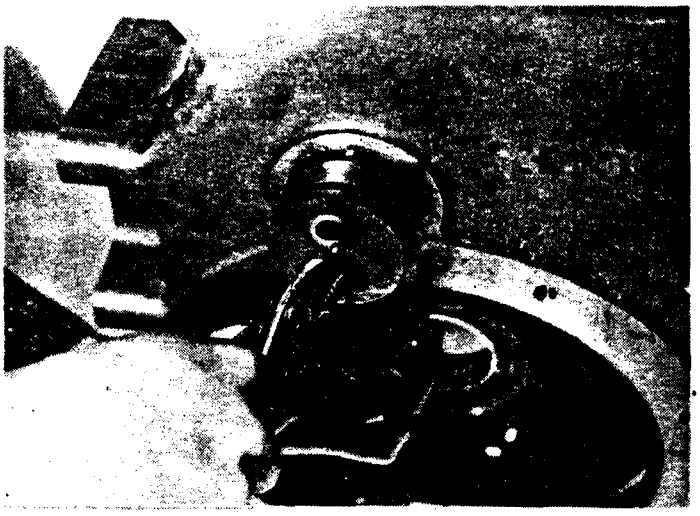


Figure 23

Pull the idler shaft and "O" ring out of case while holding up on the idler gear.

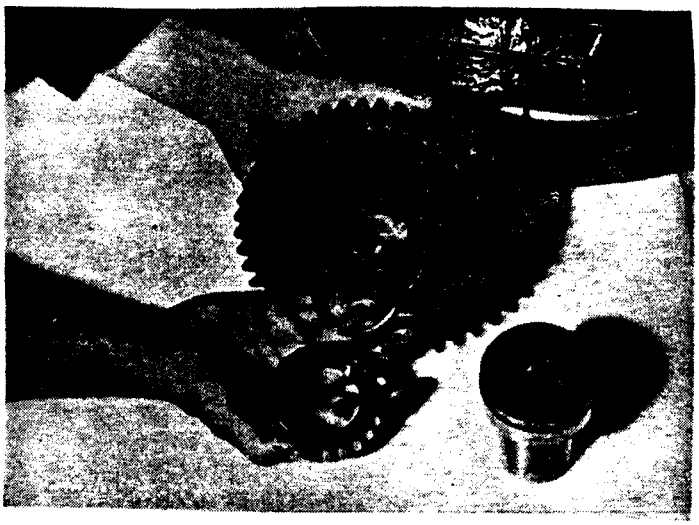


Figure 24

The idler gear bearings and spacer removed from the case.

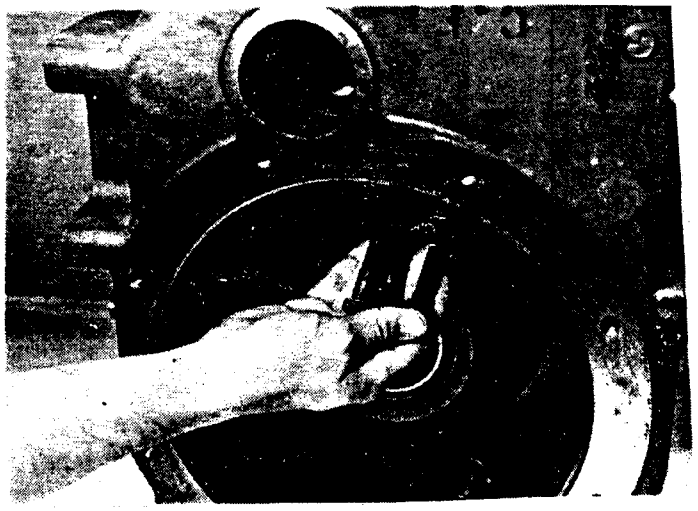


Figure 25

Remove the three capscrews from inside the housing. These hold the bottom of the input housing to the output housing.

Figure 26

Remove the oil level assembly and drain plugs.

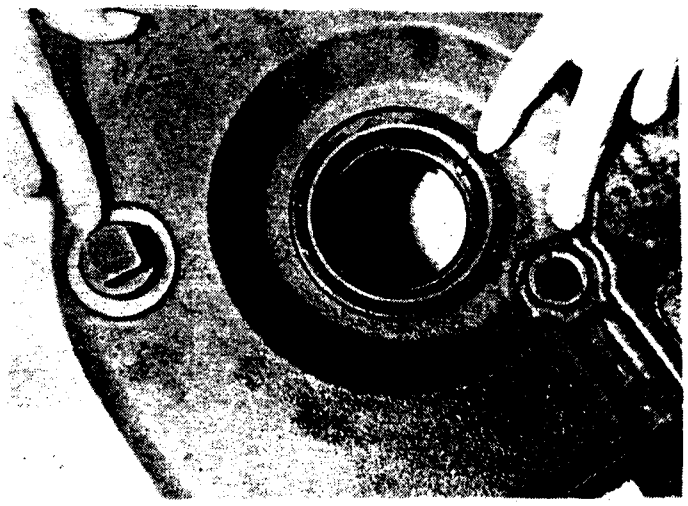


Figure 27

Remove the output seal, bearing, and the disconnect seal.

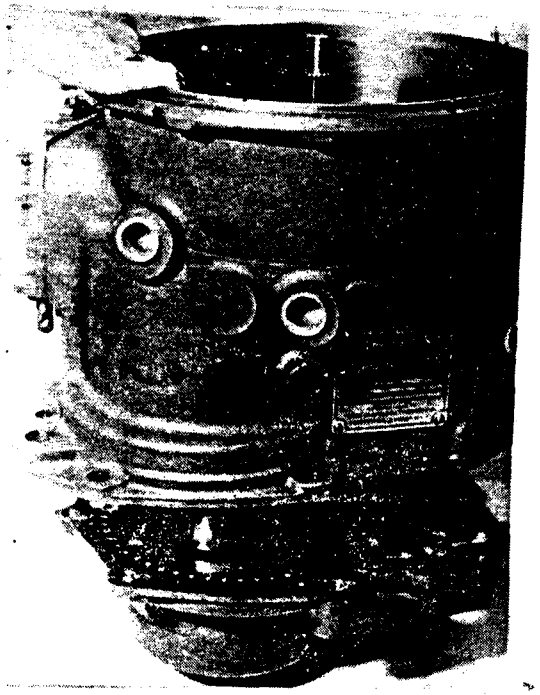


Figure 28

Lay the transmission on its back with the converter housing pointing up. Remove the remaining capscrews which bolt the two housings together. Lift the input housing straight up. The clutch stacks will remain in the output housing.

Figure 29

Remove the two hollow studs from the housings.

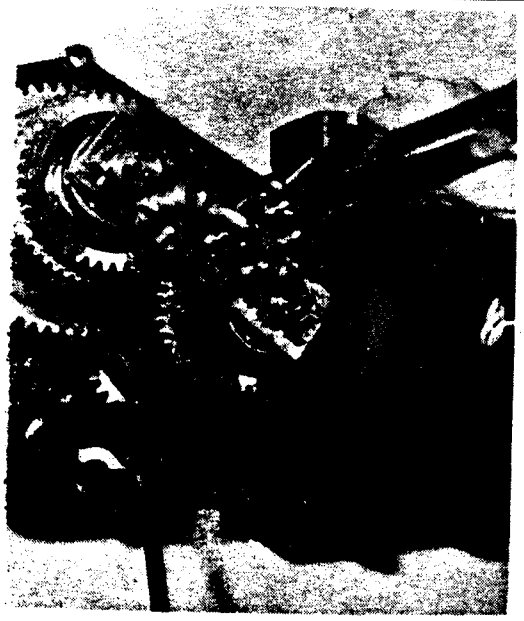


Figure 30

Both clutch stacks must be removed together. The lower clutch stack has a press fit bearing in the bottom of the housing and must be pryed up while removing the clutch stack assembly.

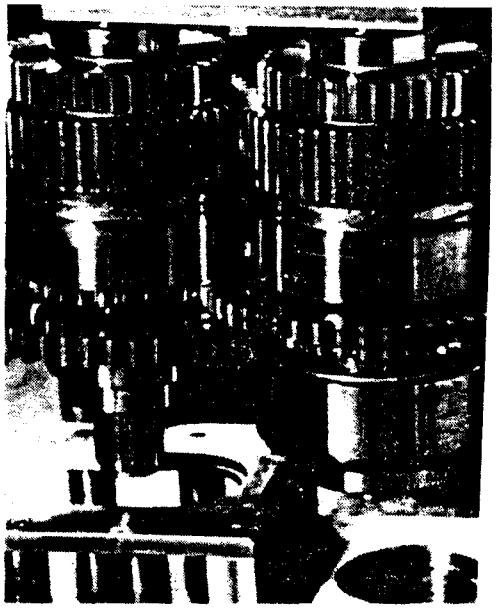


Figure 31

The clutch stacks are different lengths so you must block up under the shortest one to remove the lift bracket.

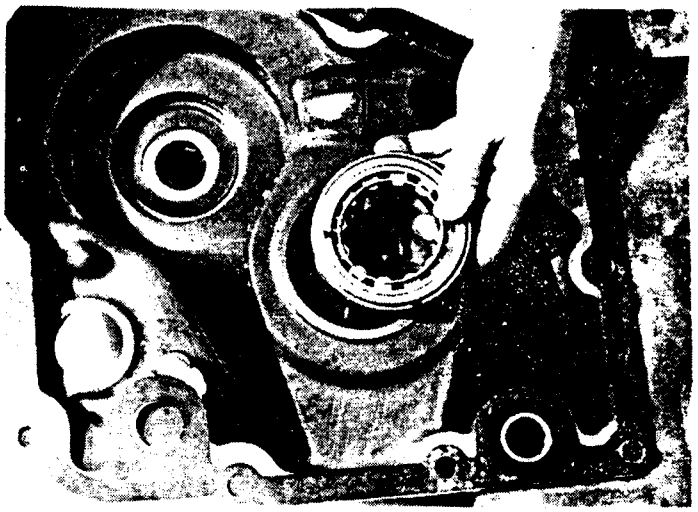


Figure 32

Remove the roller bearing from the case bore. The inner race for this bearing is pressed on the lower clutch shaft.

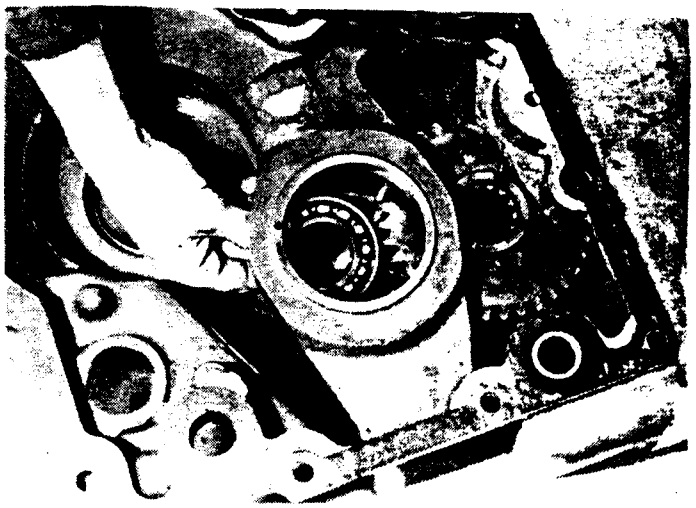


Figure 33

Remove the drive gear and lower bearing from the case.

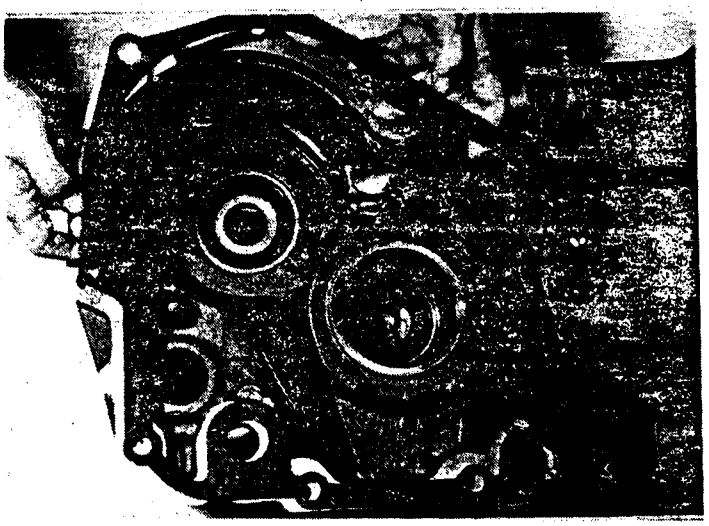


Figure 34

Remove the housing gasket.

Figure 35

Remove the cap screws holding the valve body on the input housing.

Figure 36

To remove the valve body, hold the bottom part of the valve against the case and pull the top of the valve body out and down. This way you do not lose the two detent balls and springs.

Figure 37

The valve body pad on the input housing.

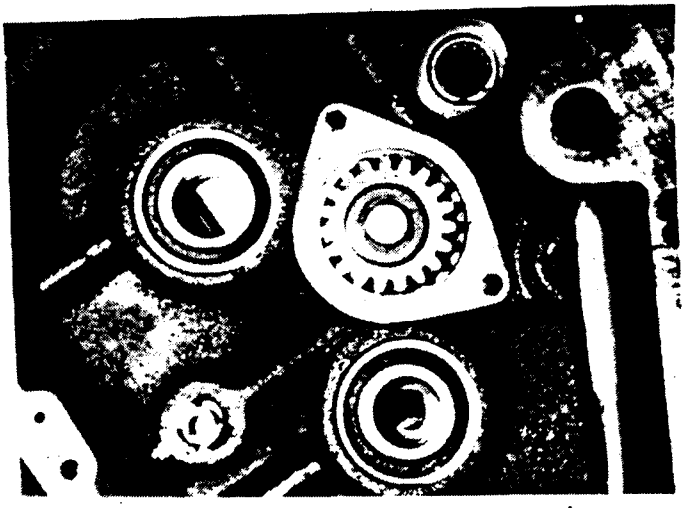


Figure 38

Internal view of the input housing.

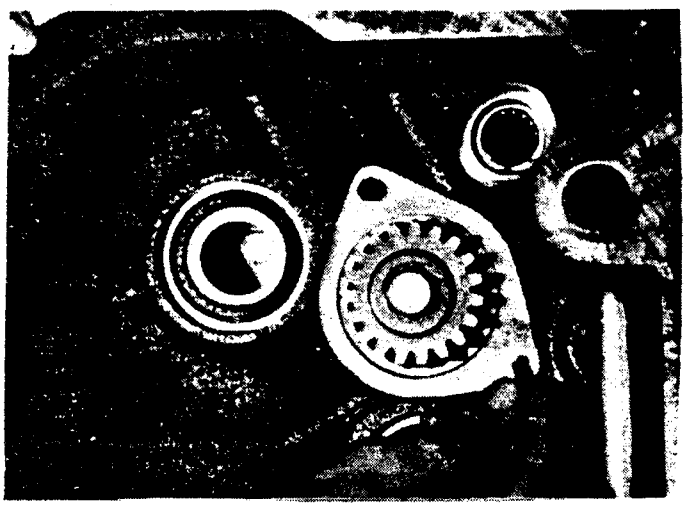


Figure 39

To remove the input shaft, remove the two capscrews from the retainer.

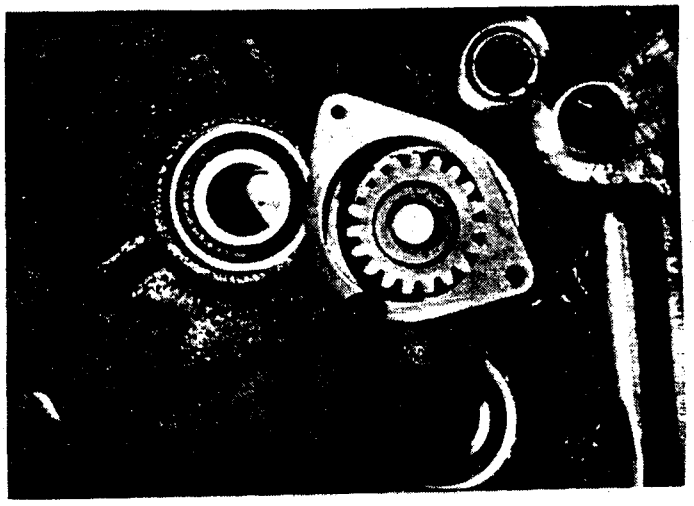


Figure 40

Lift the retainer off of the input gear.

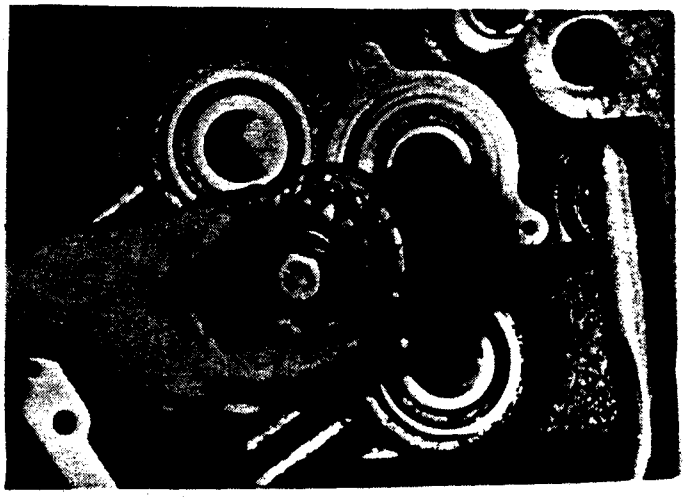


Figure 41

Pull the input shaft out of the input housing.

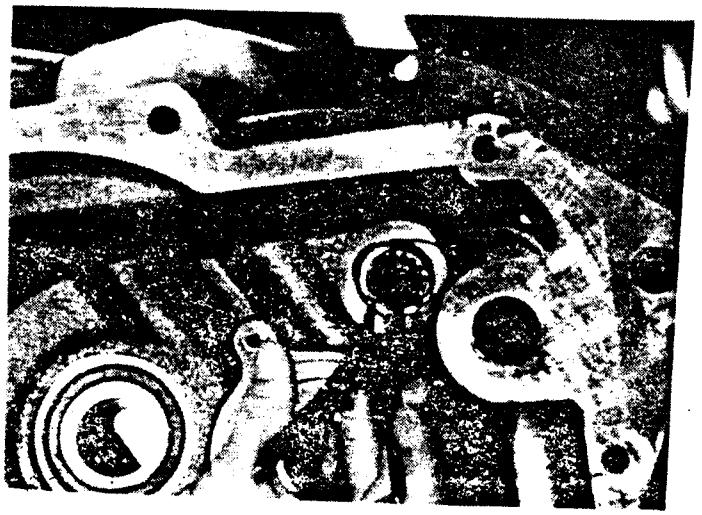


Figure 42

Remove the snap ring from the pump shaft support bearing.

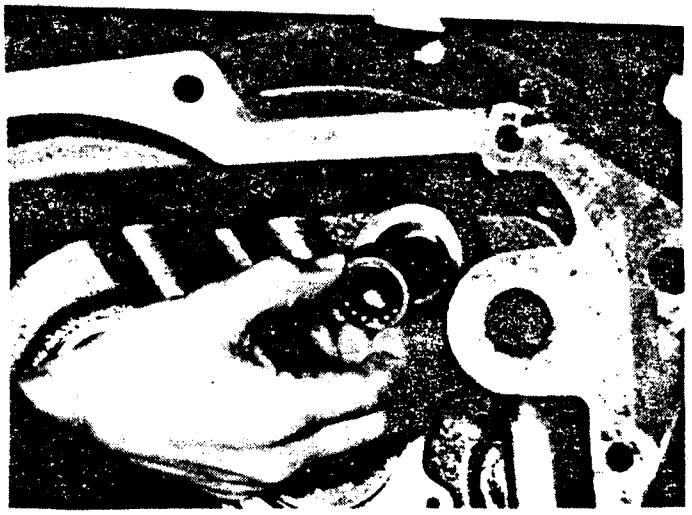


Figure 43

The bearing is a slip fit in the bore and can be slipped out with your fingers.

Figure 44

The upper suction tube is swaged into the housing and is not to be removed.

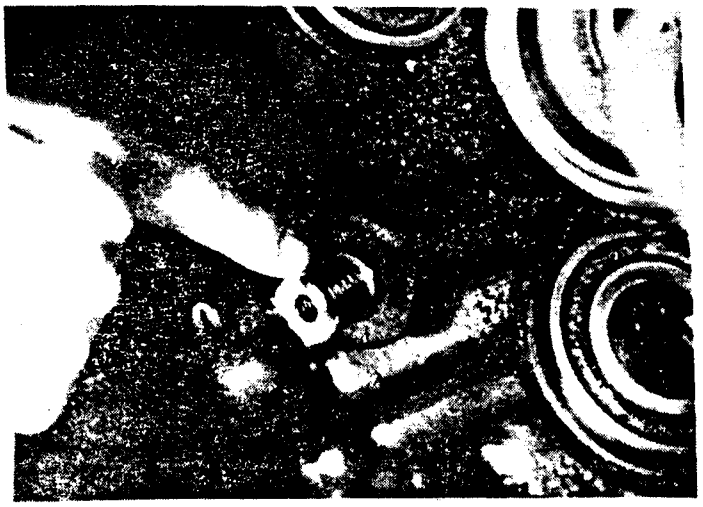


Figure 45

The converter bypass valve is located in the input housing.

Figure 46

Remove the one inch allen head pipe plug from the front side of the input housing.

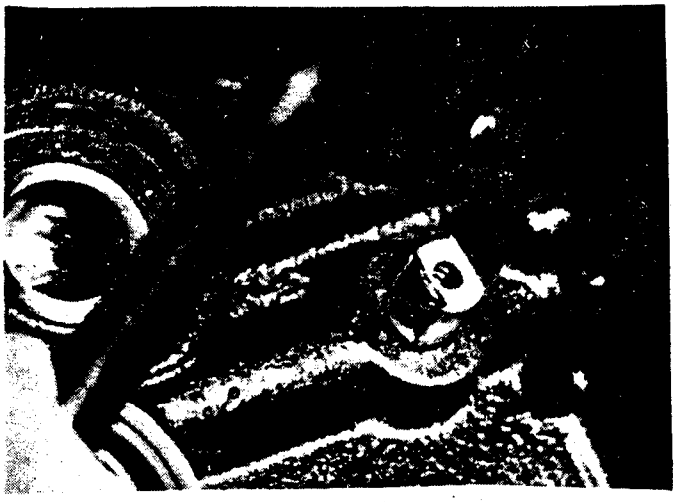


Figure 47

With the pipe plug removed, lightly tap the converter bypass valve on the back side until it is loose.

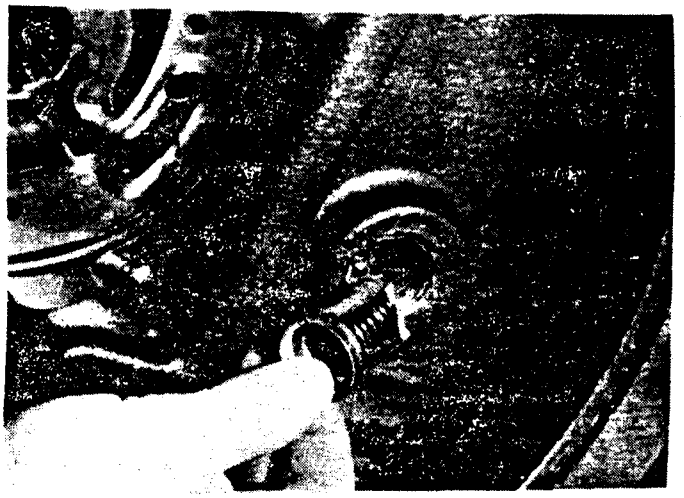


Figure 48

Remove the converter bypass valve from the front side of the input housing.

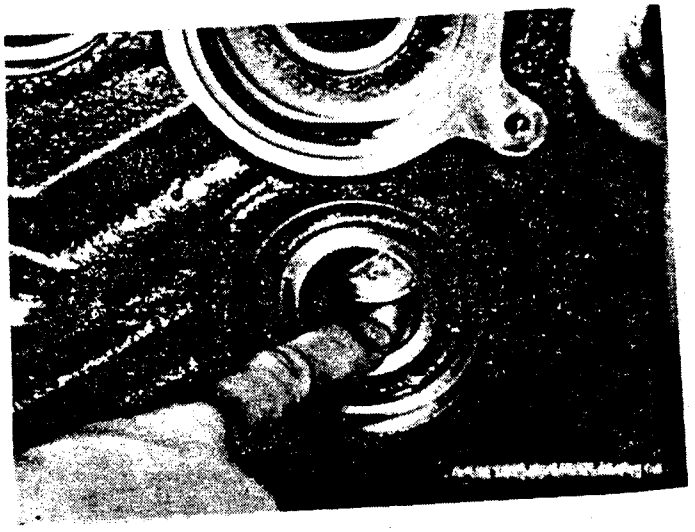


Figure 49

Check the seal ring bores for wear and scratches.

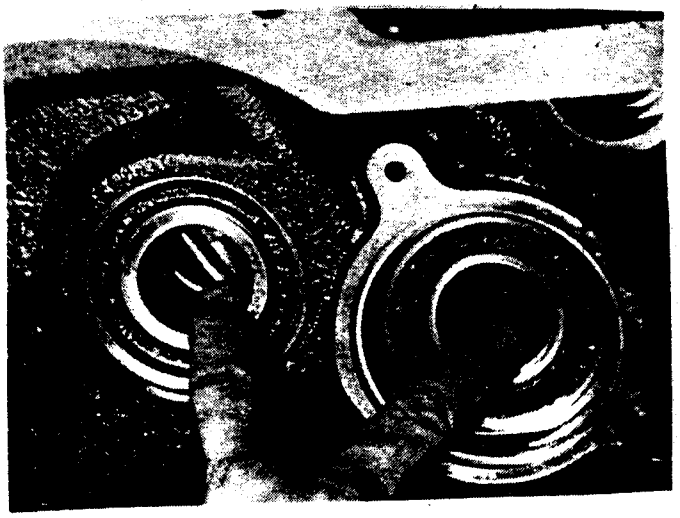


Figure 50

Check the seal ring bores for seal and scratches.

Figure 51

Remove the place bolt, retaining washer, and shim from the input shaft.

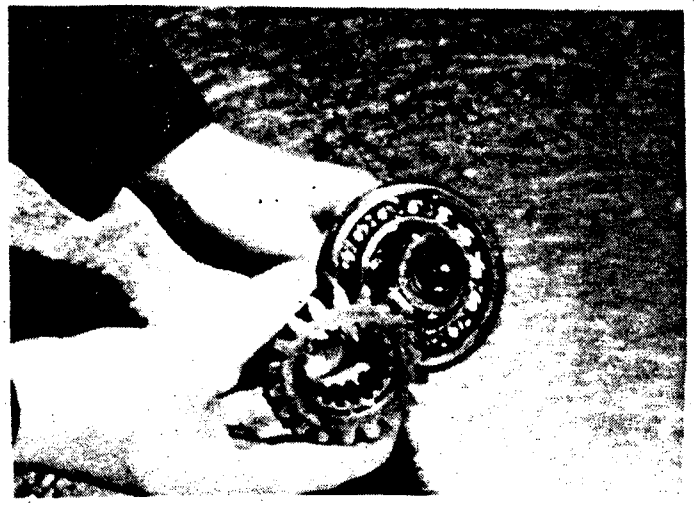


Figure 52

Slip the input gear off of the input shaft.

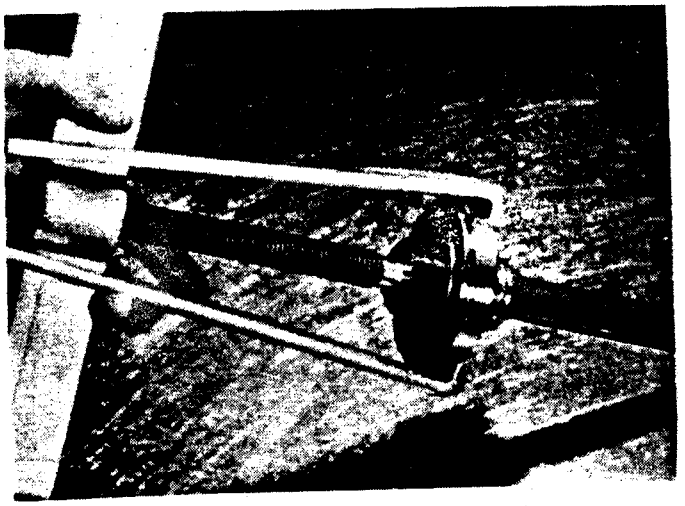


Figure 53

Use gear pullers or a press to remove the bearing from the input shaft.

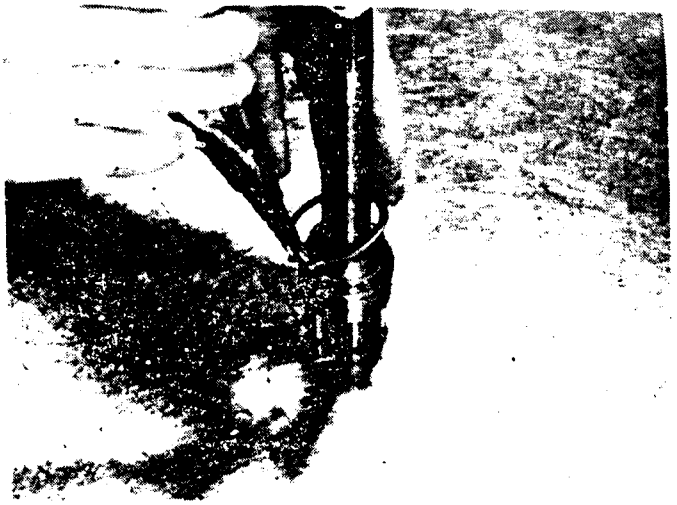


Figure 54

Remove the snap ring from shaft.

Figure 55

Remove seal ring from shaft.

Figure 56

Remove "O" ring and spacer from the pump shaft drive housing.

Figure 57

Remove "0" ring, stator tube, and drive gear from housing.

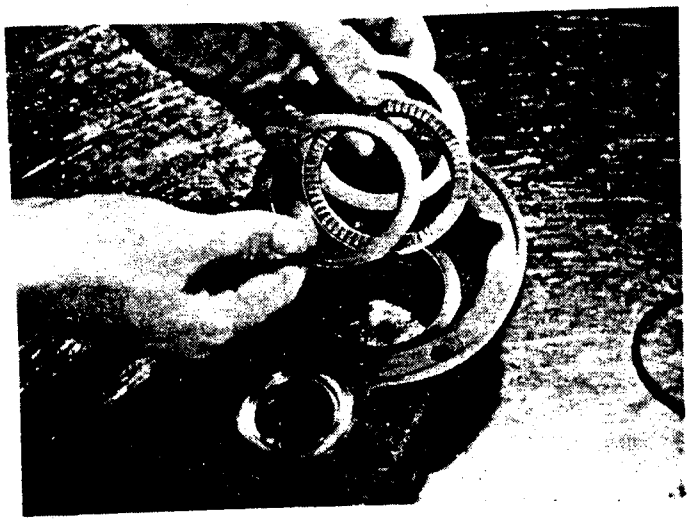


Figure 58

Remove the thrust bearing and both spacers from the housing.

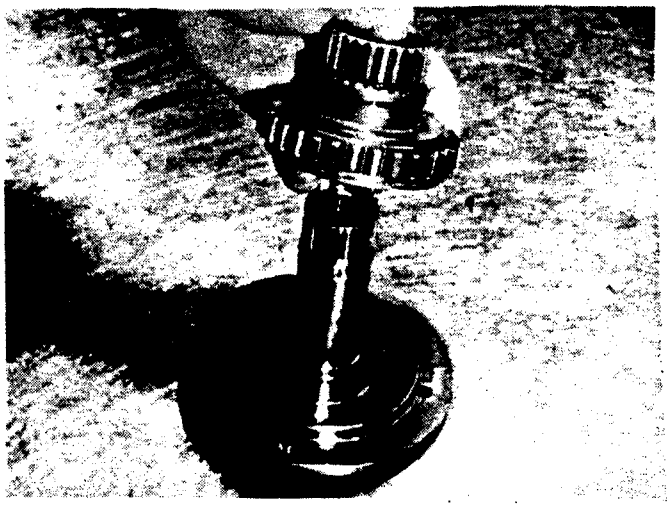


Figure 59

Lift drive gear off of the stator tube.

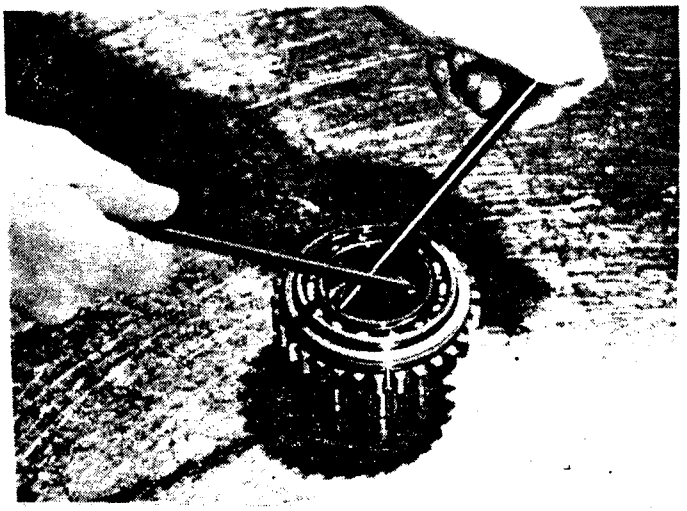


Figure 60

Remove pilot bearing from the drive gear.

Figure 61

Remove seal ring from drive gear.

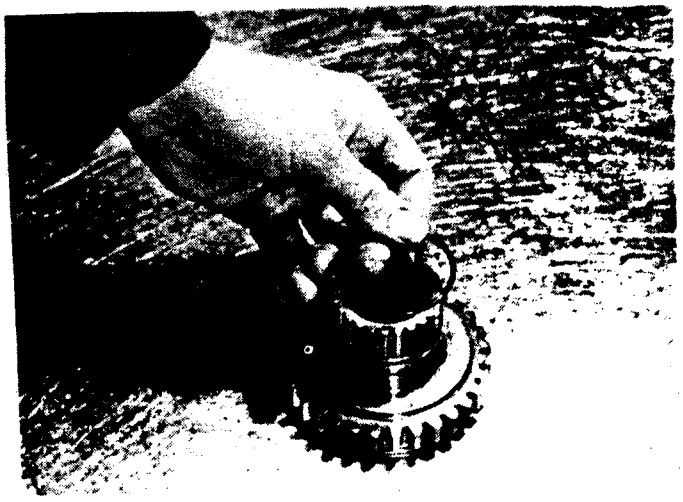


Figure 62

Remove "O" ring from drive gear.

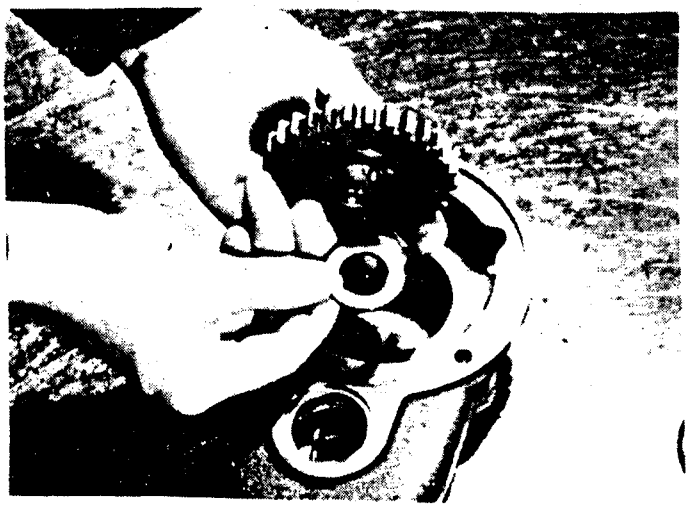


Figure 63

Remove the driven gear and the spacer from the housing.

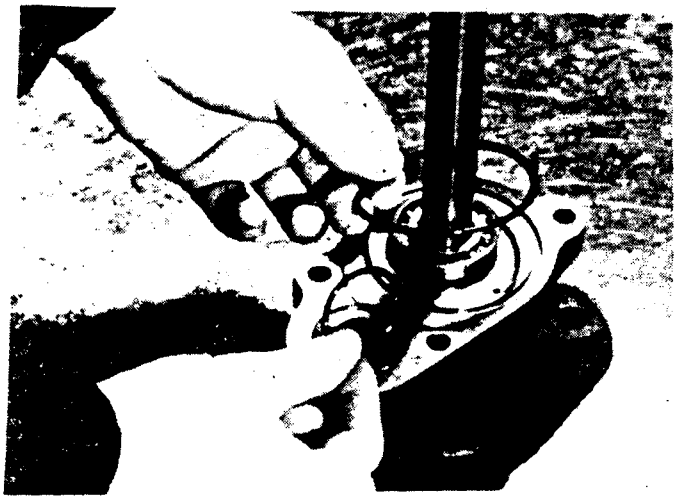


Figure 64

Remove both "O" rings from the charge pump housing.

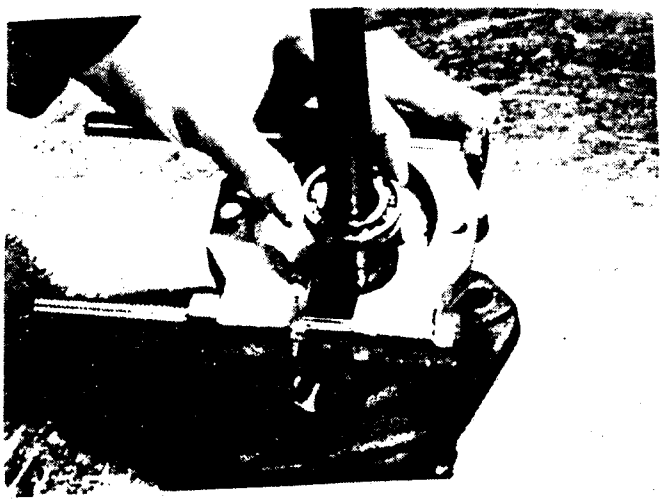


Figure 65

Use a bearing puller to remove the bearing from the pump drive shaft.

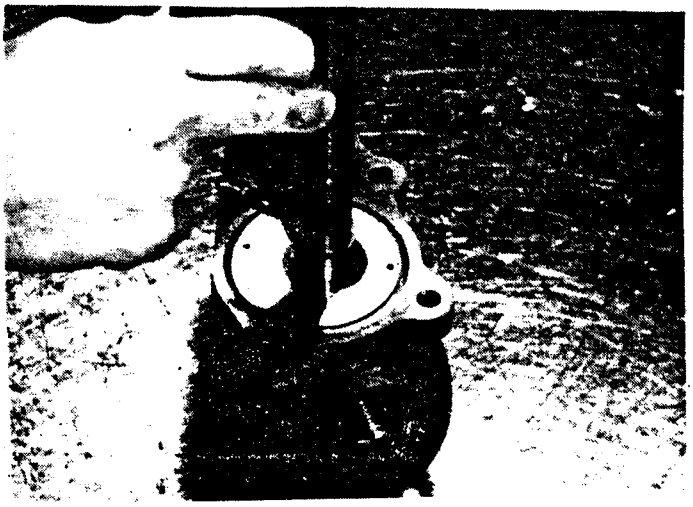


Figure 66

Remove the snap ring from the shaft.

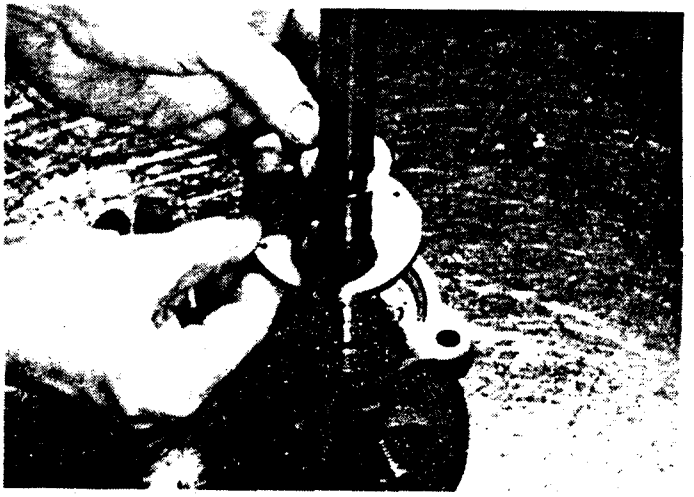


Figure 67

Remove the spacer washer and back-up plate from the pump.

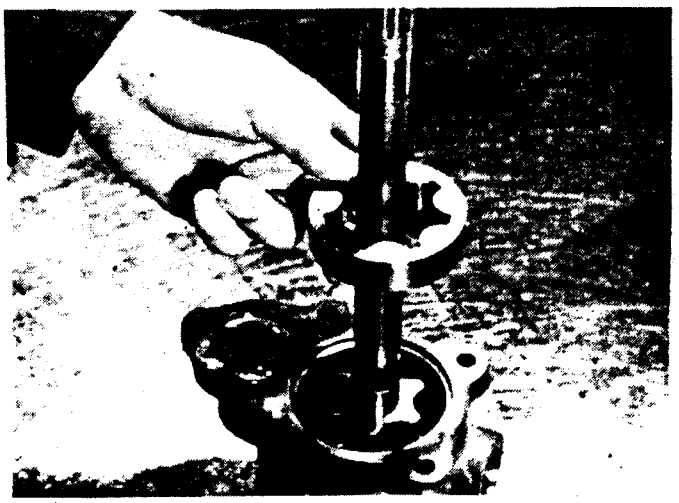


Figure 68

The outer gerotor gear will lift out of the pump housing.

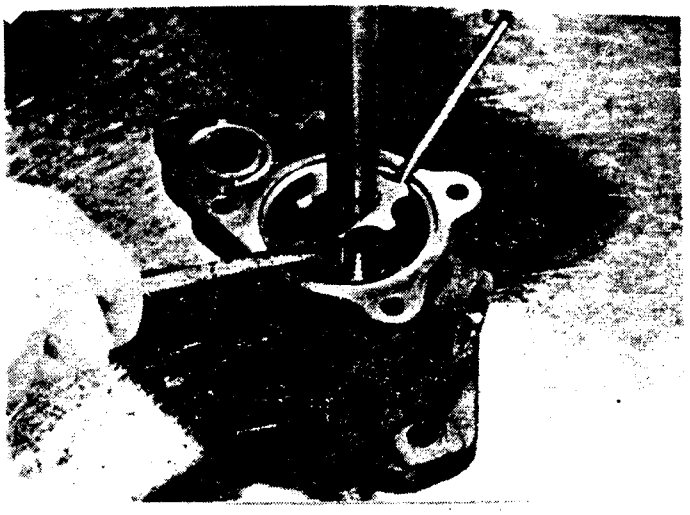


Figure 69

The inner gerotor gear may need to be pryed up for removal. Be careful not to damage housing or gear when removing.

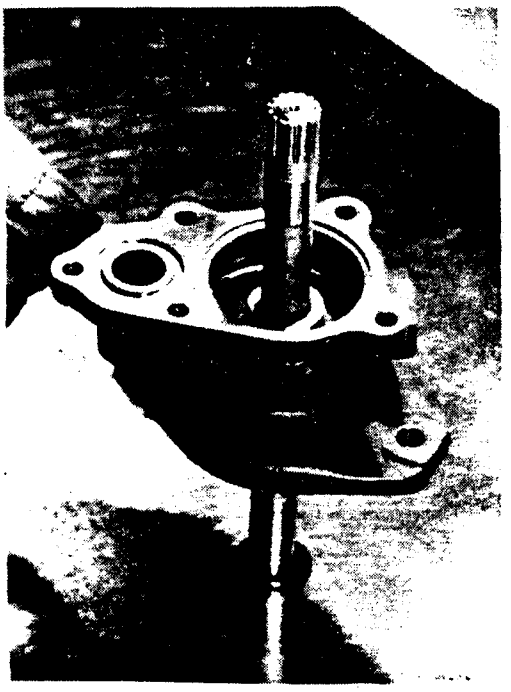


Figure 70

After removing the key from the pump shaft the housing will lift off of the pump shaft.

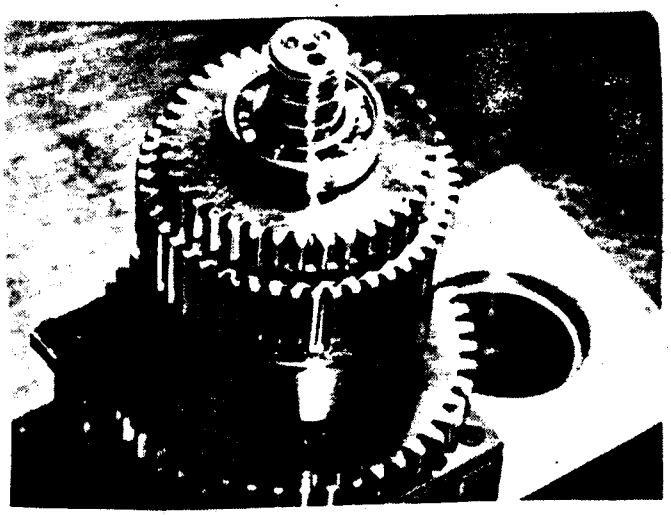


Figure 71

The top part of this clutch stack assembly is reverse and the bottom part is second gear.

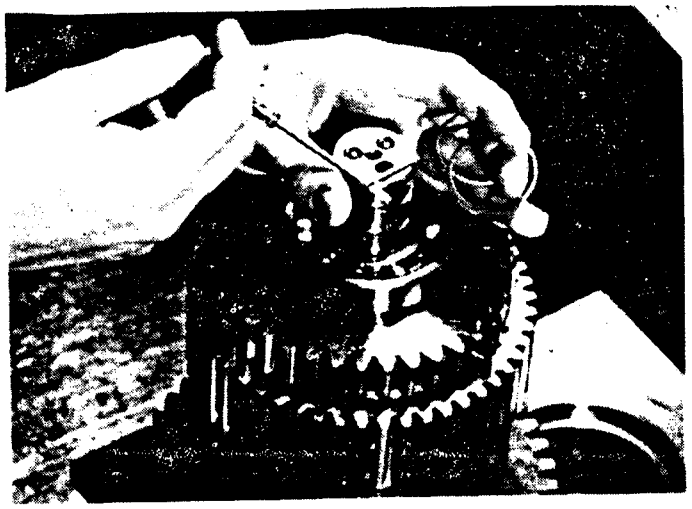


Figure 72

Start the disassembly by removing the three seal rings.

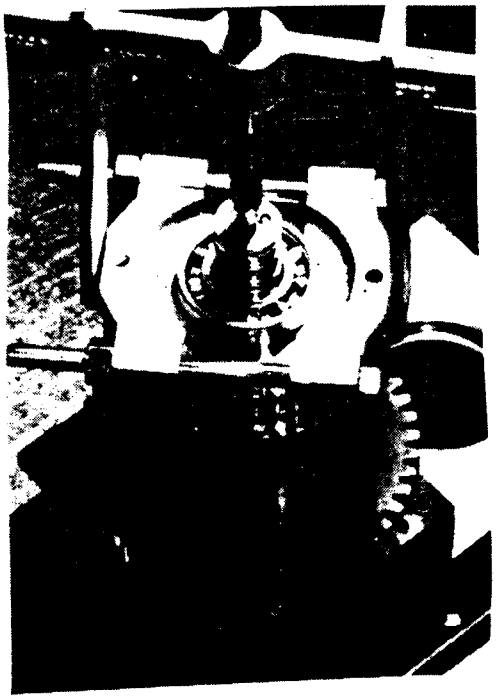


Figure 73

Use a bearing puller to remove the pilot bearing.

Figure 74

Remove the bearing and thrust washer.

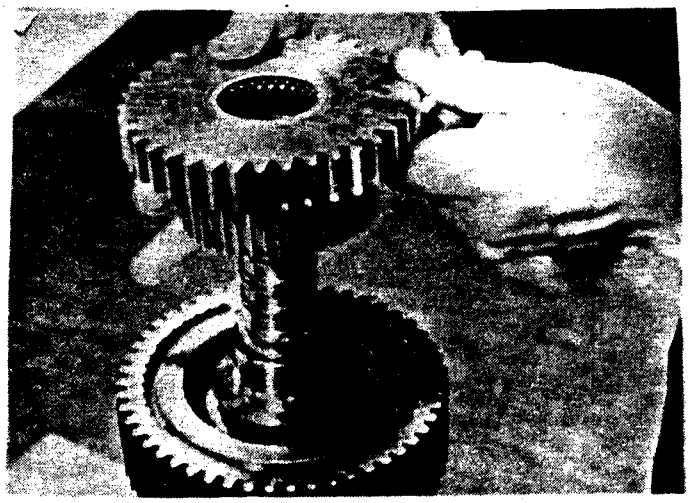


Figure 75

Lift the clutch hub off. The hub bearing can be pressed out of the hub.

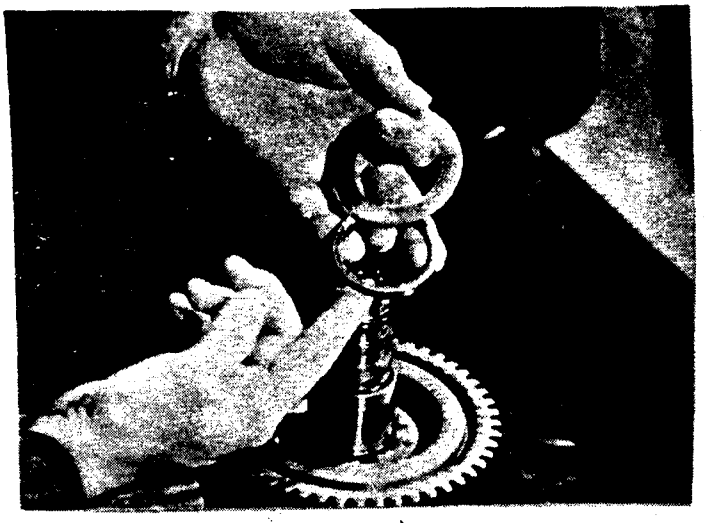


Figure 76

Remove the thrust washer and spacer ring.

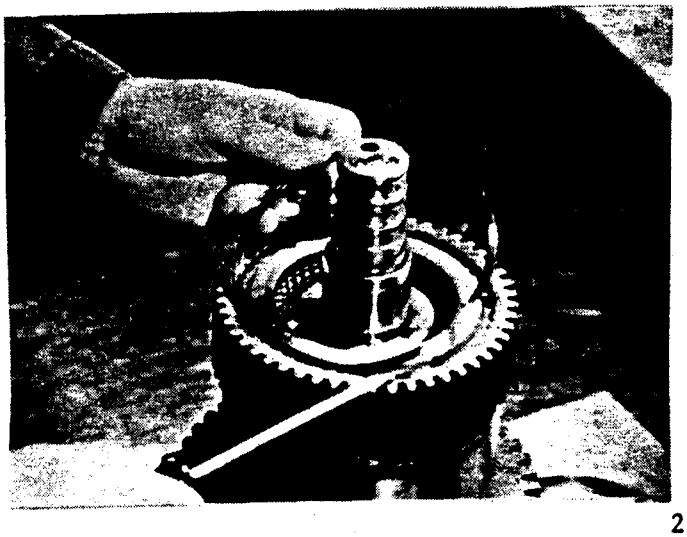


Figure 77

Remove the large internal snap ring.

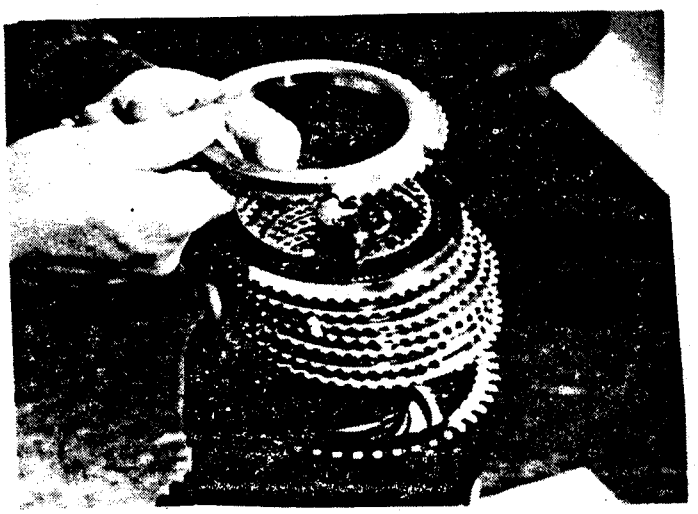


Figure 78

Remove the retainer plate, clutch plates, and separator plates.

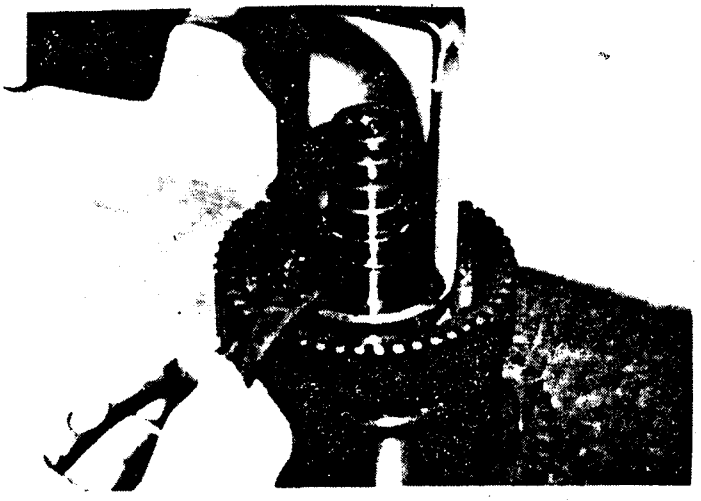


Figure 79

Use a press and spring compressor tool to hold the spring retainer down while removing the snap ring.

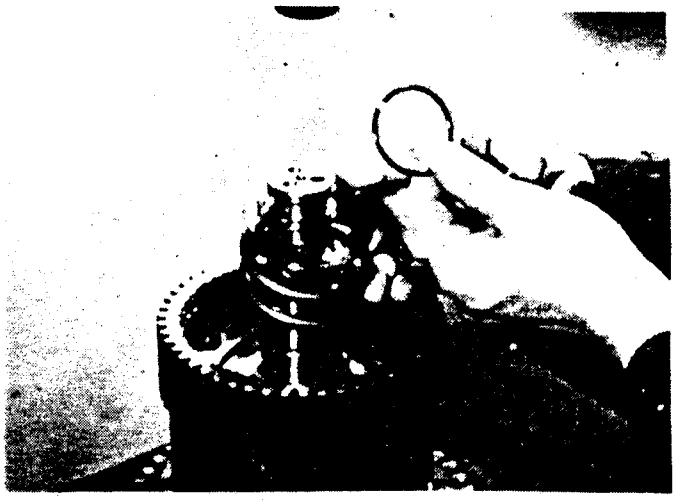


Figure 80

Let the tension off of the spring and remove it and the spring retainer.

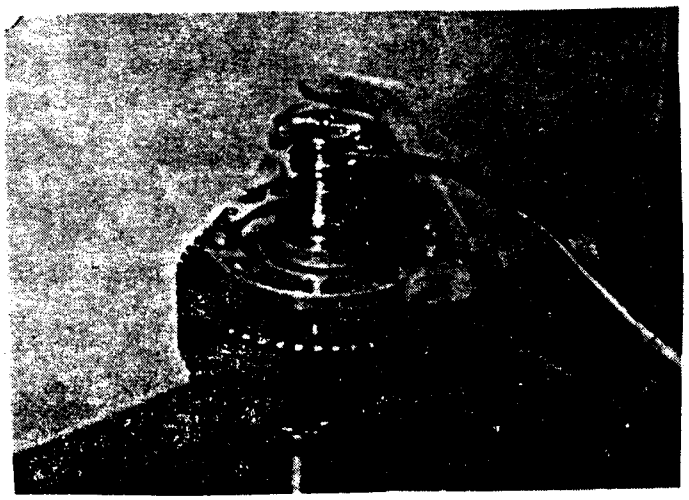


Figure 81

Use air to pop the piston up by blowing in the pressure port of the clutch stack assembly.

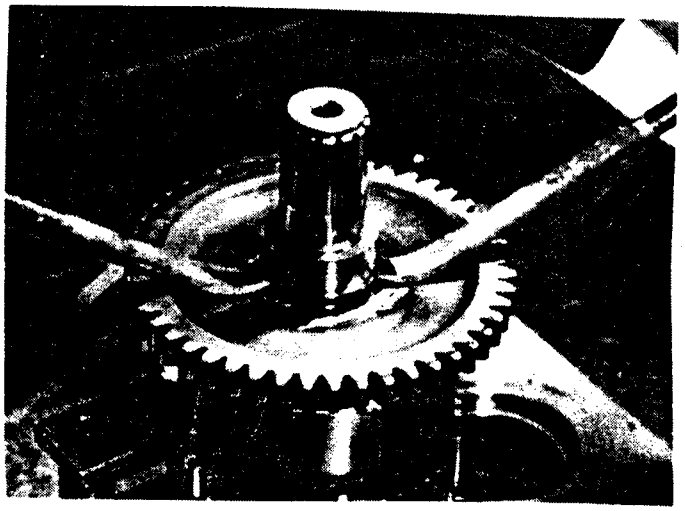


Figure 82

Pry the inner bearing race off of the output shaft.

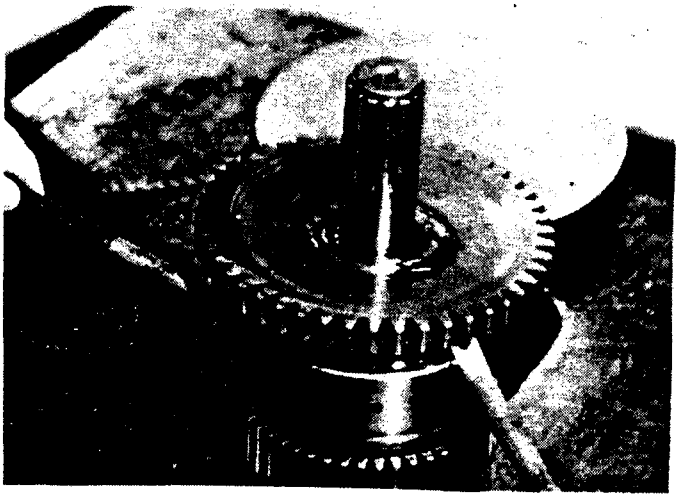


Figure 83

The output shaft and second gear hub is one solid piece and must be pryed off from second gear clutch assembly.

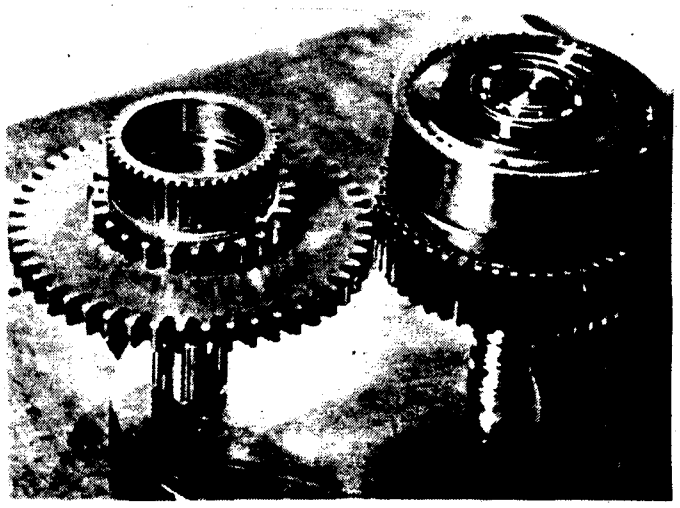


Figure 84

The clutch stack assembly will then be in two pieces as shown.

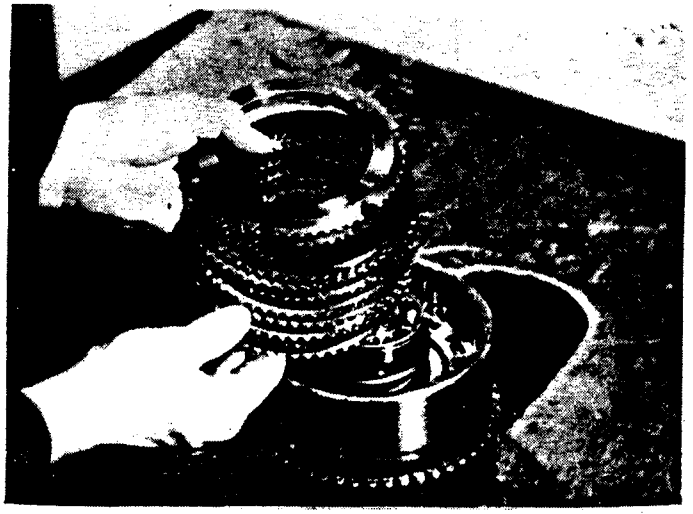


Figure 85

Remove the internal snap ring and lift the retainer plate, clutch plates, and separator plates out of the cylinder.

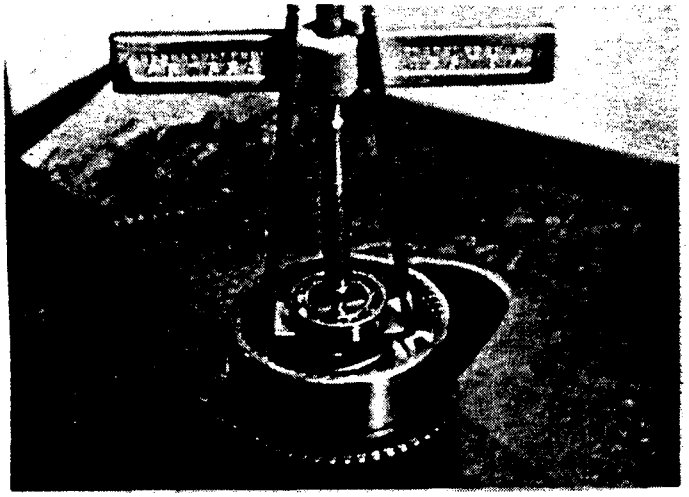


Figure 86

Use a bearing puller to remove the bearing from the shaft.

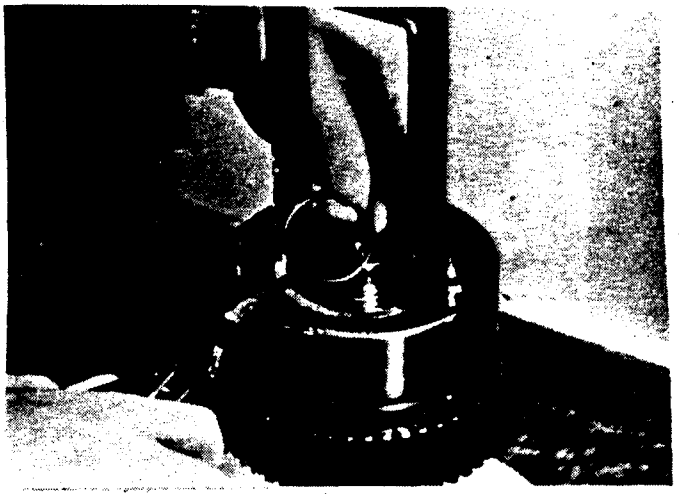


Figure 87

Compress the spring retainer and remove the snap ring.

Figure 88

Remove the retainer and clutch spring.

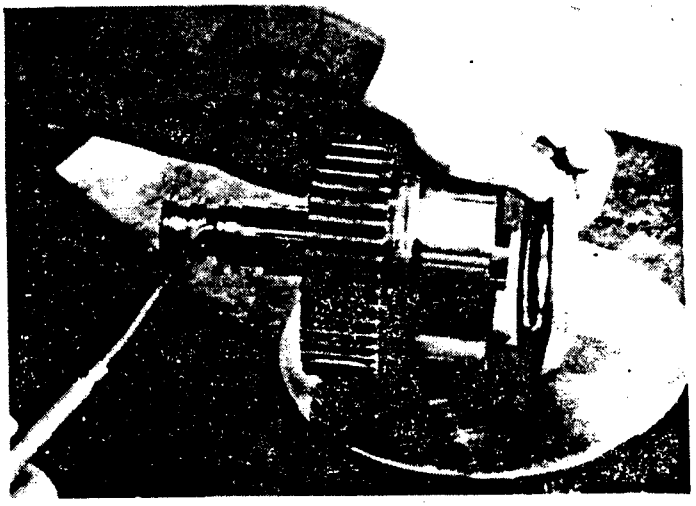


Figure 89

Use air in the pressure port to remove the piston.

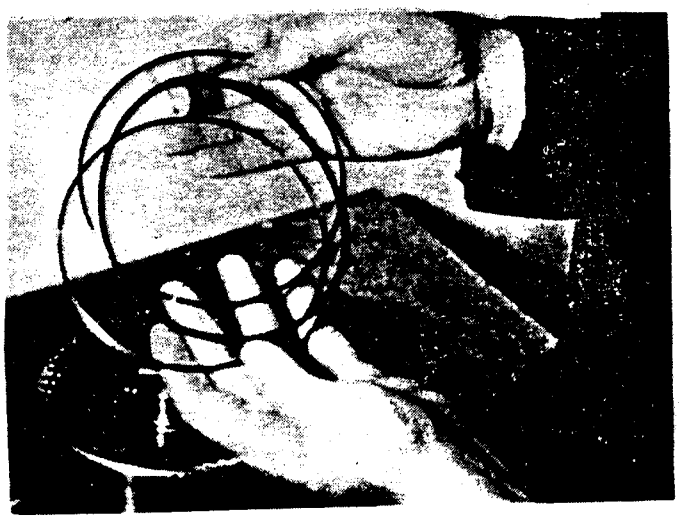


Figure 90

Remove the inner piston seal and the outer piston seal. The outer seal has a retaining ring on each side of it.

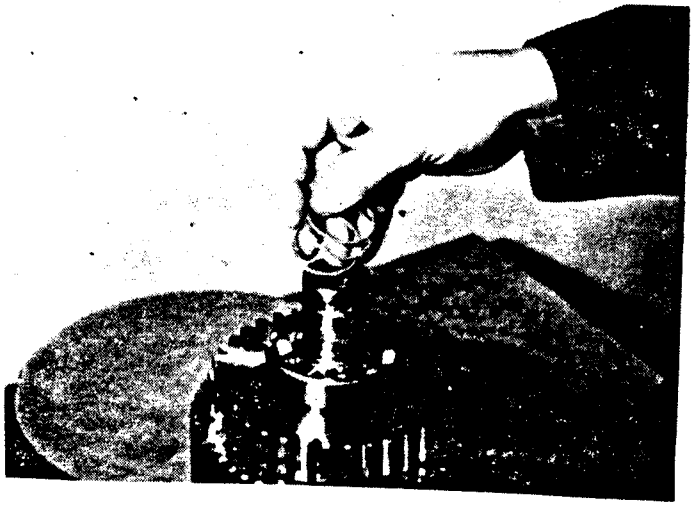


Figure 91

Remove the three seal rings from the top of the other clutch stack assembly.

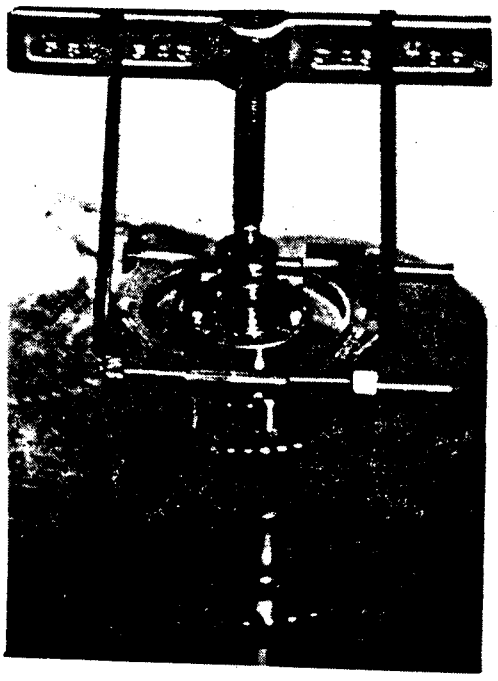


Figure 92

Pull the pilot bearing off.

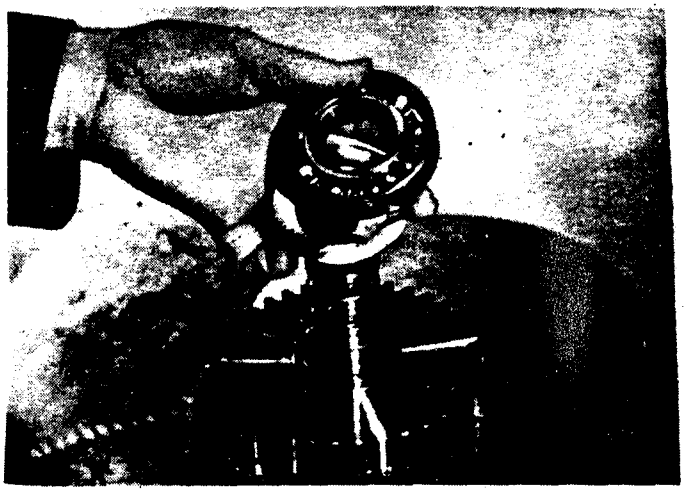


Figure 93

Remove the thrust washer which is below the bearing.

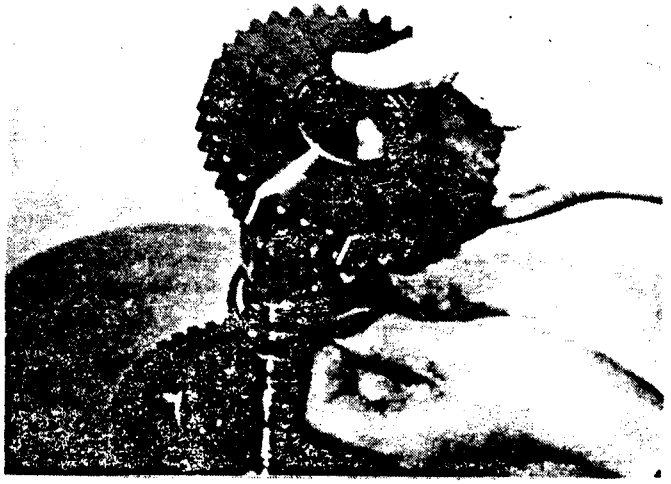


Figure 94

Remove the forward hub, thrust washer, and spacer ring.

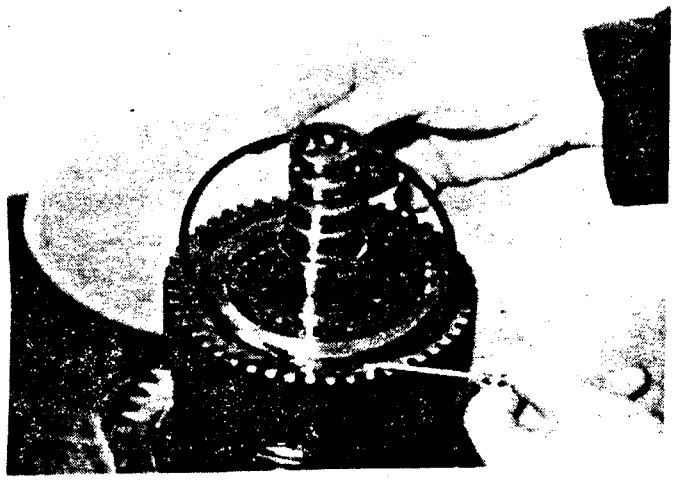


Figure 95

Remove the internal snap ring.

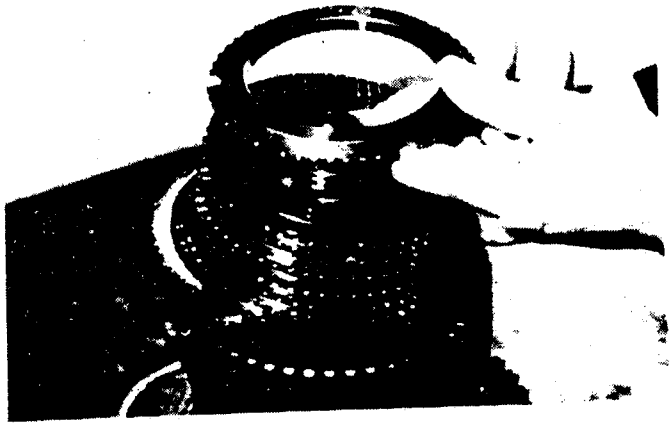


Figure 96

Remove the retainer plate, clutch plates, and separator plates.

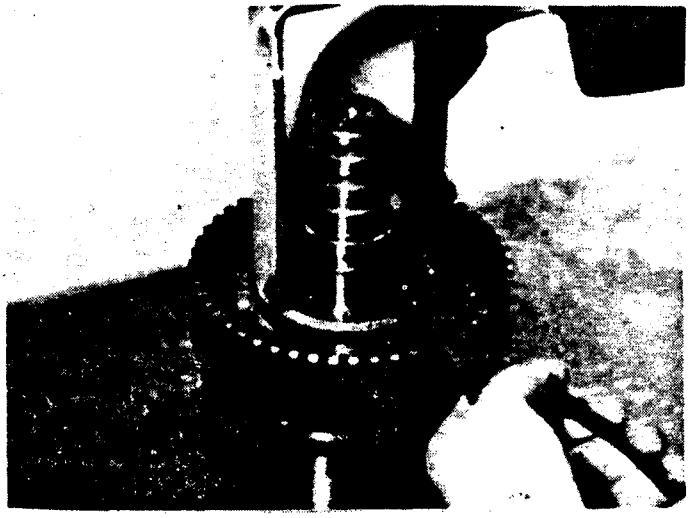


Figure 97

Compress the spring retainer and remove the snap ring.

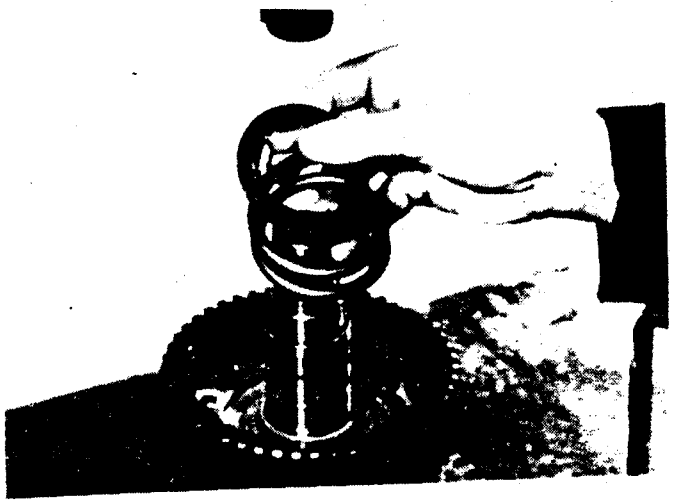


Figure 98

Remove the spring retainer and piston spring.

Figure 99

Turn the clutch stack assembly over and remove the seal ring.

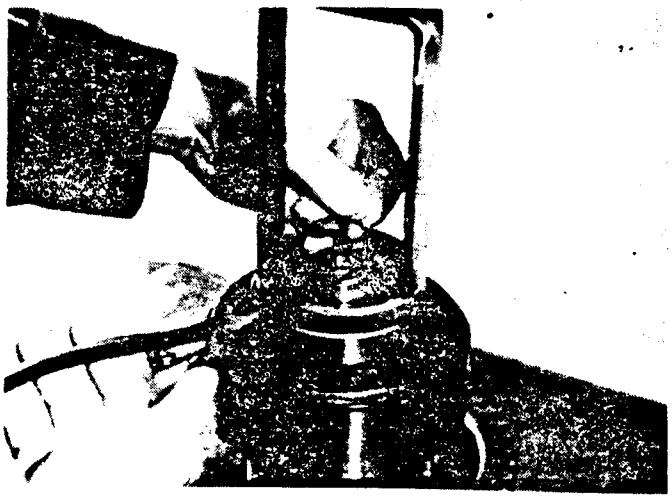


Figure 100

Compress the cylinder while supporting the clutch stack assembly and remove the snap ring.

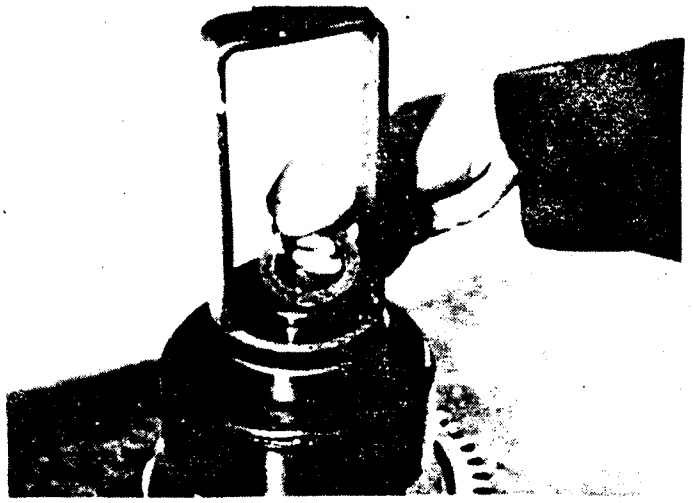


Figure 101

Remove the retainer washer.

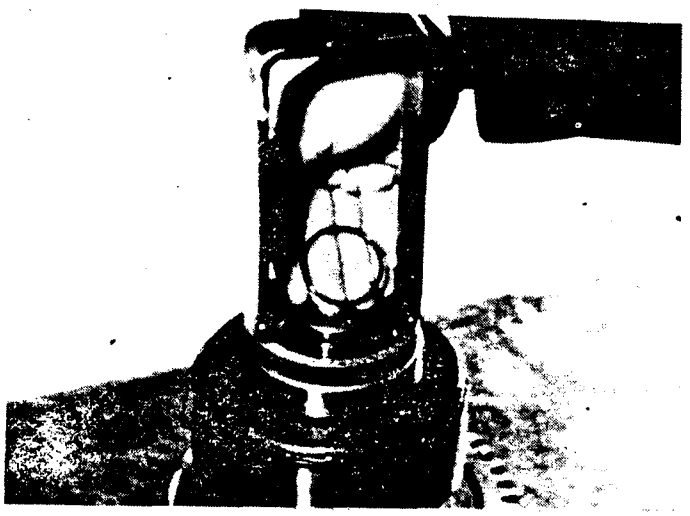


Figure 102

Remove the "0" ring which is sealing around the shaft and cylinder bore.

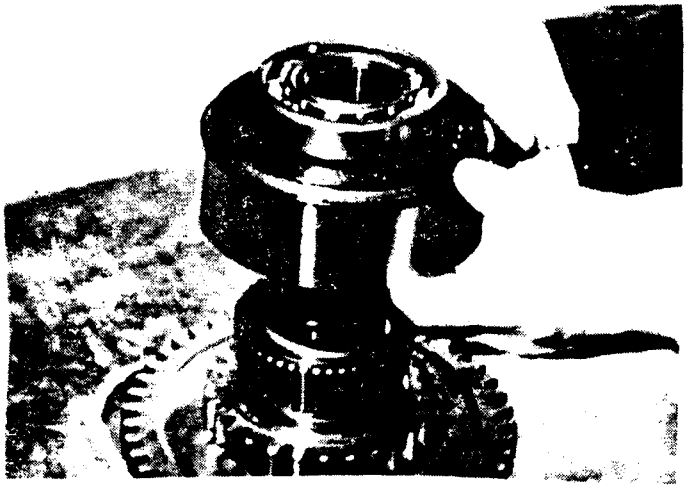


Figure 103

Release the tension on the cylinder and remove the cylinder and bearing together.

Figure 104

Remove piston spring, "0" ring, and spring retainer.

Figure 105

Remove snap ring.

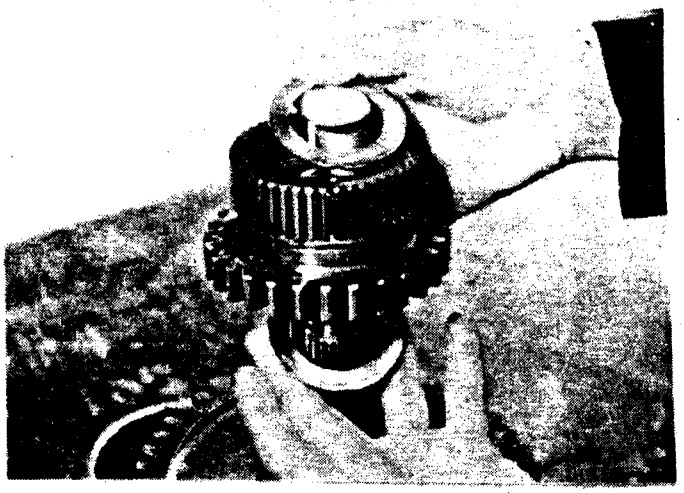


Figure 106

Lift the low gear hub and both thrust washers off of the shaft.

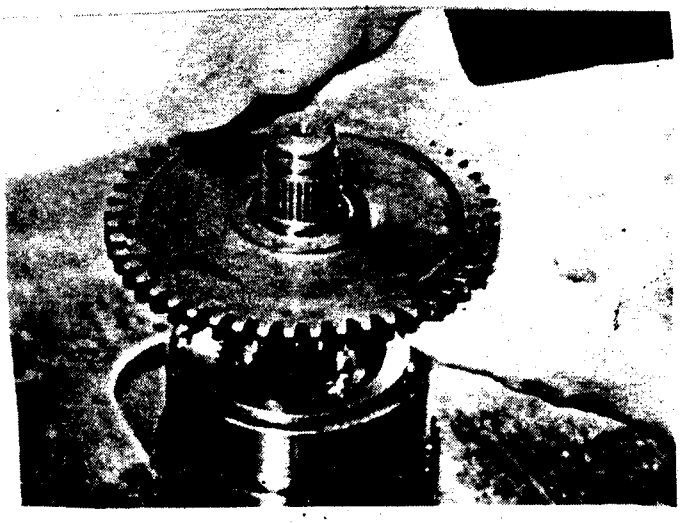


Figure 107

Lift hi gear and hub assembly off of shaft.

Figure 108

Remove the bottom thrust washer.

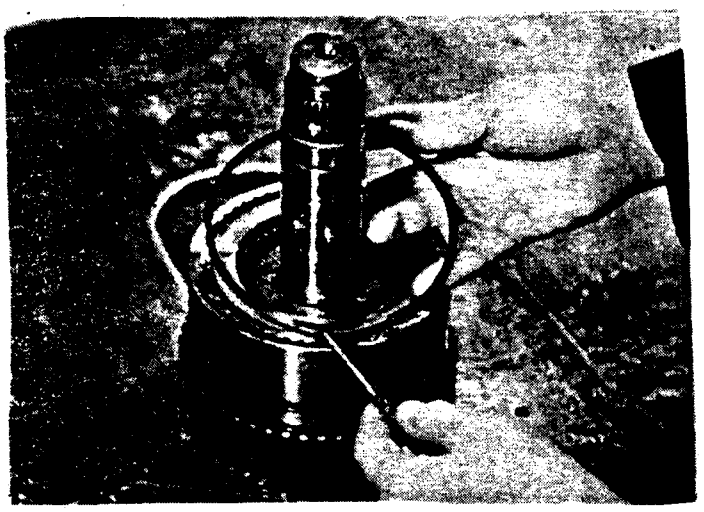


Figure 109

Remove the internal snap ring.

Figure 110

Remove retainer plate, clutch plates, and separator plates.

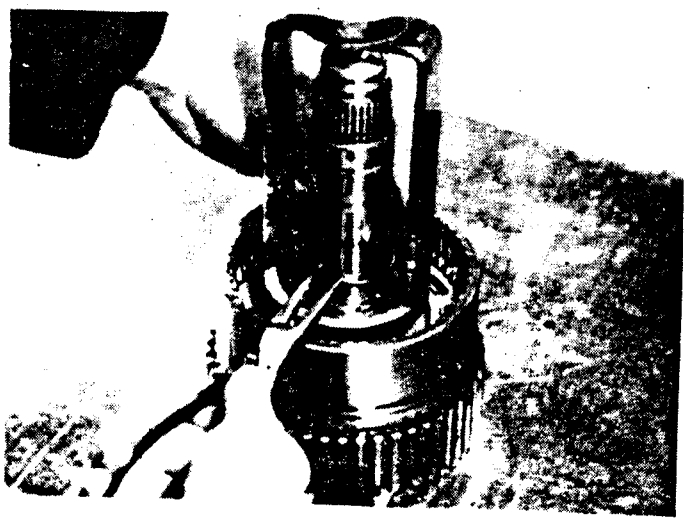


Figure 111

Compress spring and remove snap ring.

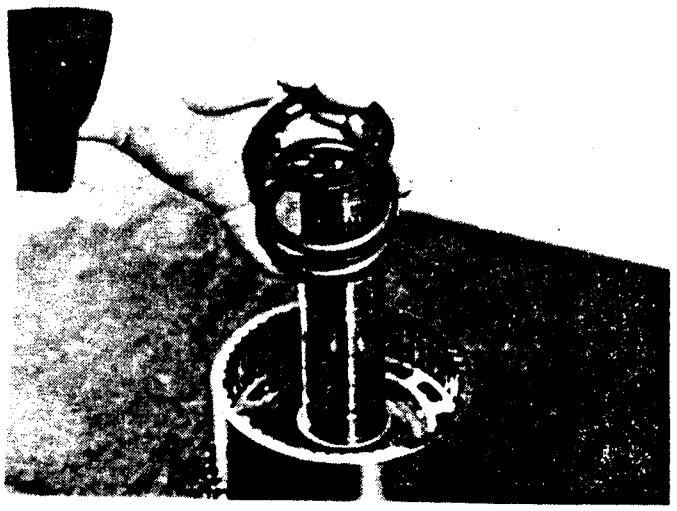


Figure 112

Remove spring retainer and piston spring.

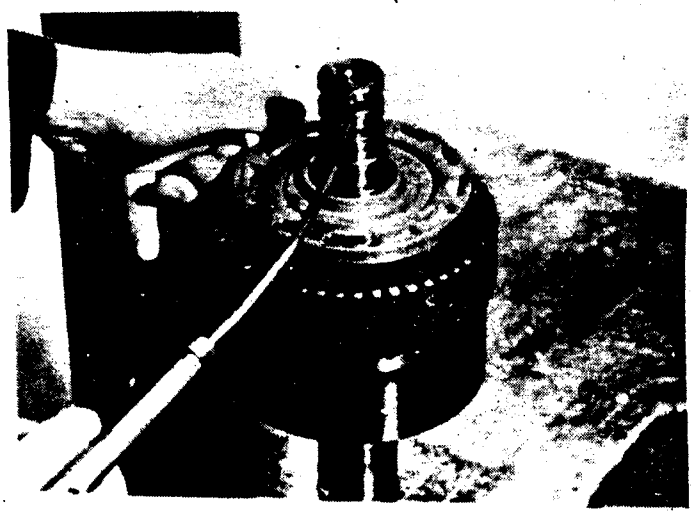


Figure 113

Use air in the pressure ports to remove pistons.

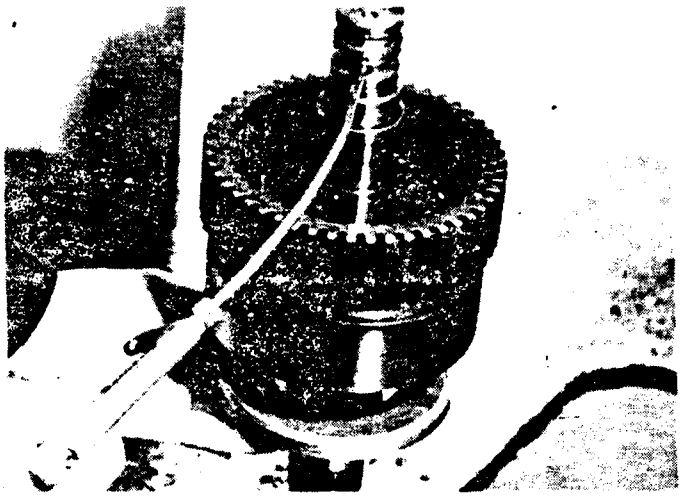


Figure 114

Use air in the press parts to remove pistons.

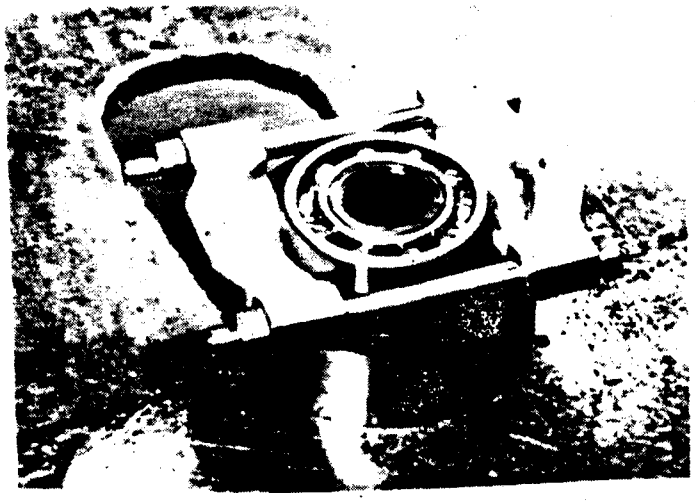


Figure 115

Remove bearing from the low clutch cylinder.

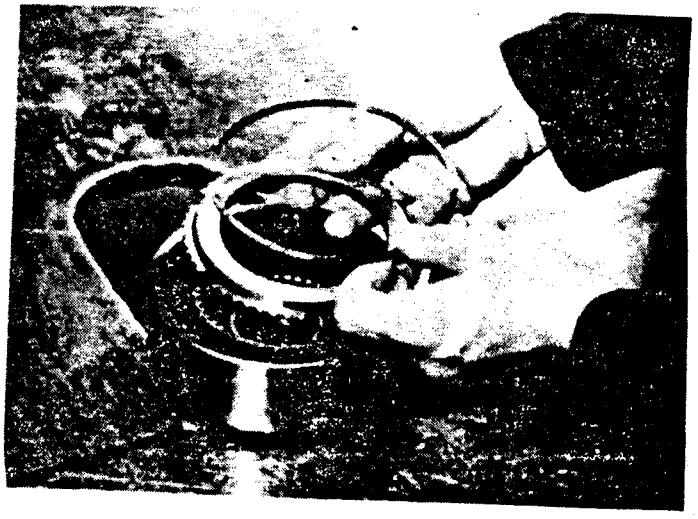


Figure 116

Turn the cylinder over and remove the internal snap ring.

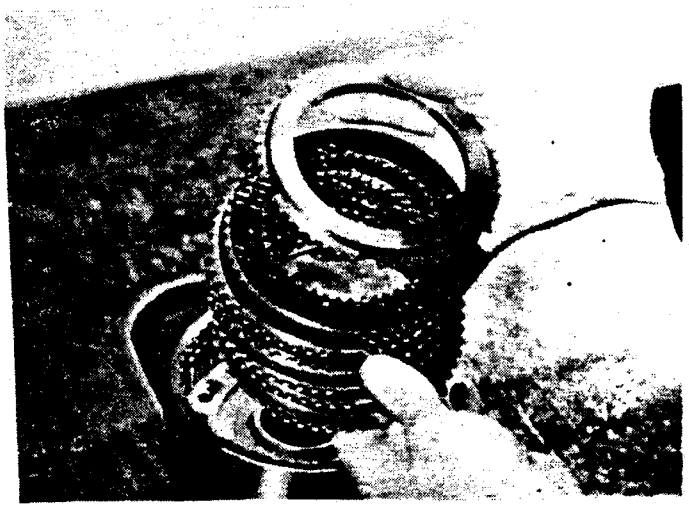


Figure 117

Remove retainer plate, clutch plates, and separator plates.

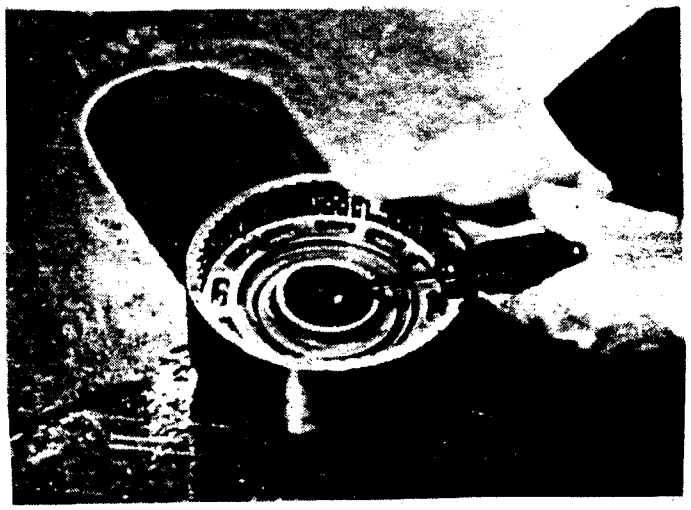


Figure 118

The piston must be pryed out of the cylinder. Be careful not to score the piston seal surfaces.

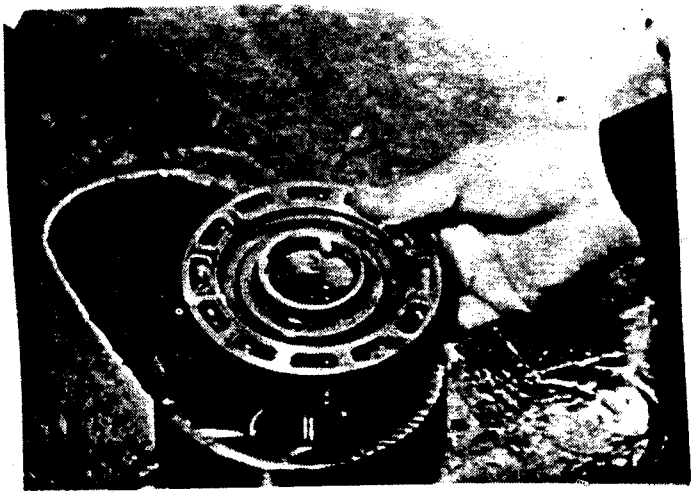


Figure 119

Remove the piston and check the inside bore and outer seal surface for damage.

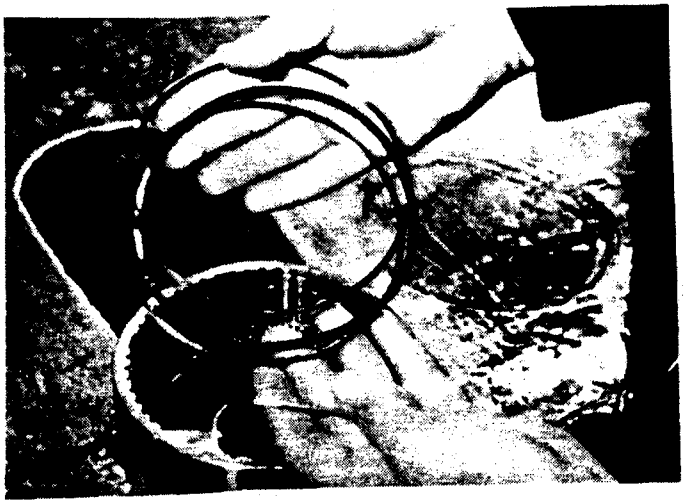


Figure 120

Remove the piston seal and both retaining rings from the cylinder.

Figure 126

Remove the two detent balls and springs.

Figure 127

Remove the dowel pin which is the stop for the directional valve stem and remove the fork stop for the brake cutoff and inching valve.

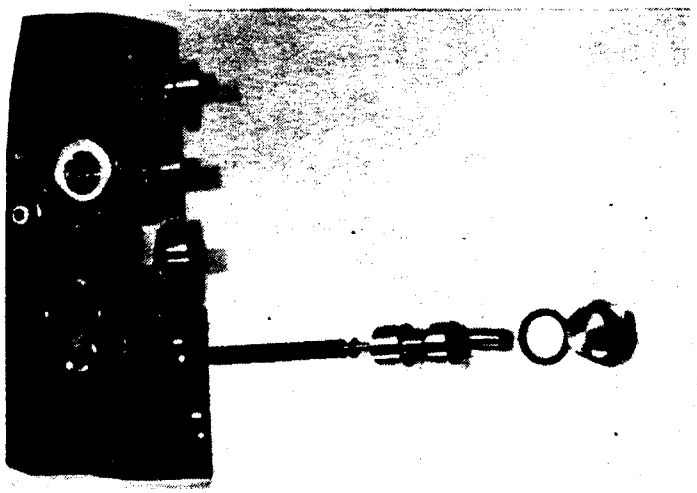


Figure 128

Remove the bottom valve cap on the right-hand side. Then remove the main pressure valve and spring.

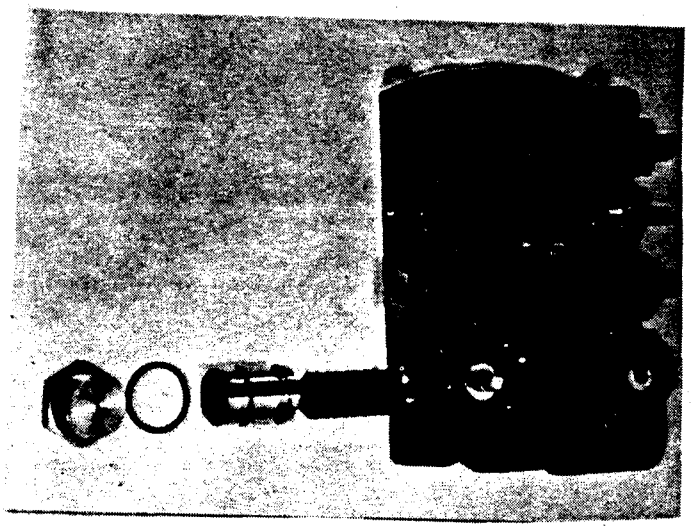


Figure 129

Remove the bottom valve cap on the left-hand side to remove the accumulator valve and spring.

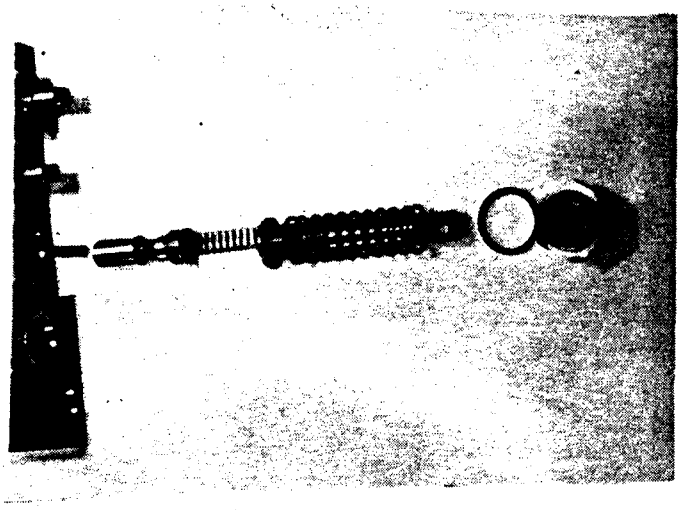


Figure 130

The bottom shifting spool is the inching valve control. Remove the cap and take out the return spring, the valve stem, the inching valve spring, and the inching valve and stud.

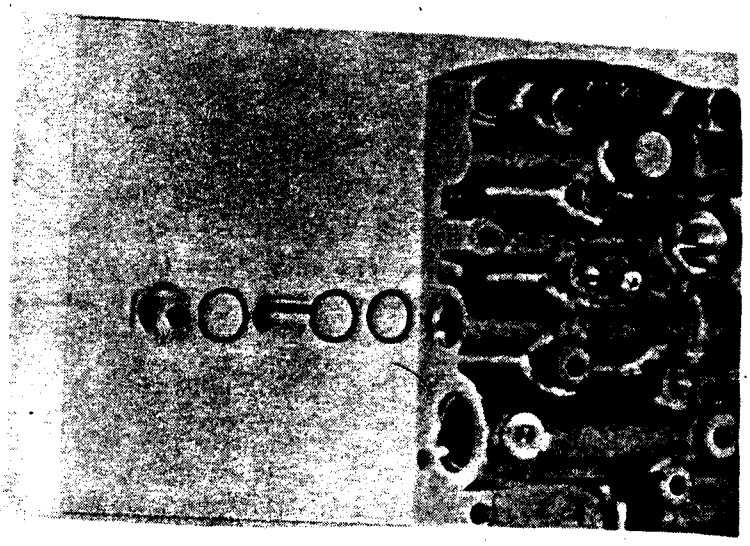


Figure 131

On the top left-hand side is the brake cut-off port. Remove this cap and take the brake cut-off piston and the two "0" rings out.

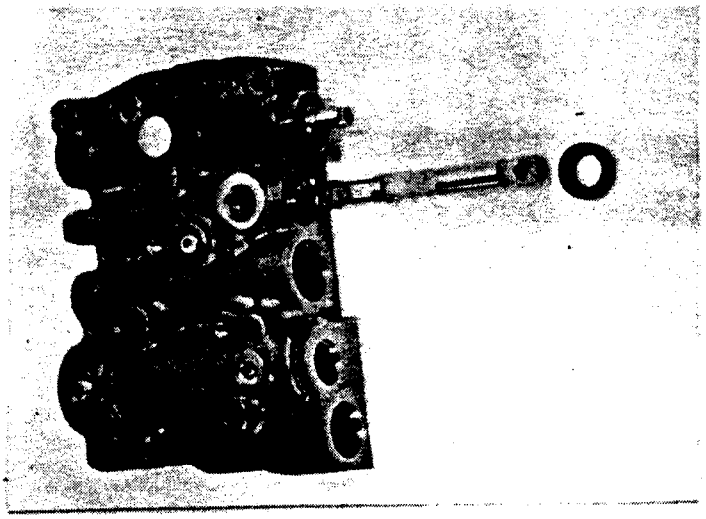


Figure 132

The second shift spool from the top is the directional valve stem. This will pull out after removing the oil seal and the dowel pin which was shown in picture 116.

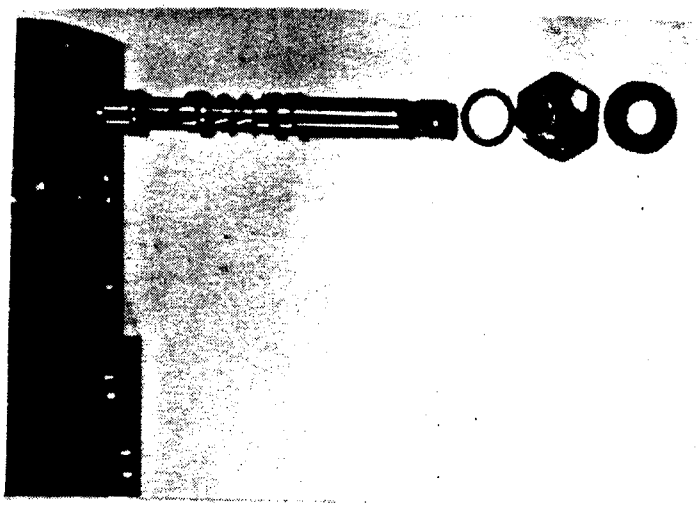


Figure 133

The top shift spool is the speed valve stem. Remove the valve cap and it will pull straight out.

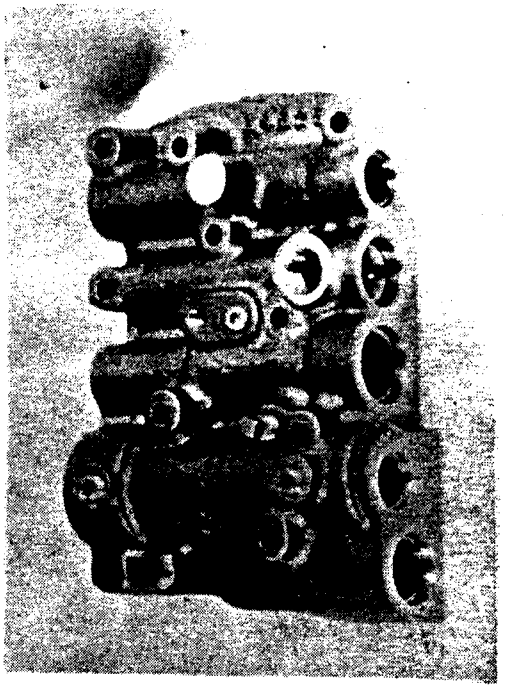


Figure 134

This is the valve body casting.