

**ASSEMBLY  
AND  
DISASSEMBLY**

**FUNK**

**4000 SERIES  
SHIFT-O-MATIC<sup>®</sup>  
TRANSMISSION**

**LONG DROP**



# 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.

**Funk**

**SHIFT-MATIC**

MODEL

SPEC

SERIAL

MANUFACTURED BY  
**FUNK MANUFACTURING CO.**  
COFFEYVILLE, KANSAS U.S.A.

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<sup>TM</sup> DRIVE

### DESCRIPTION

The Series 4000 Shift-O-Matic<sup>TM</sup> 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<sup>TM</sup> 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 transmits 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<sup>TM</sup> 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<sup>TM</sup> in neutral. Make sure the area around oil level check plug is clean before removing plug.
2. The Shift-O-Matic<sup>TM</sup> 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° to 190°.



## SERIES 4000 SHIFT SHIFT-O-MATIC<sup>TM</sup> DRIVE

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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<sup>TM</sup> in neutral. Make sure the area around oil level check plug is clean before removing plug.
2. The Shift-O-Matic<sup>TM</sup> 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° to 190°.



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 L 2104 B1D*
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<sup>TM</sup> 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 head H.T.)

8 each 4012121 Washer, half round (11/16" dia. x 1/4" thick)

#### CONVERTER INSTALLATION INSTRUCTIONS

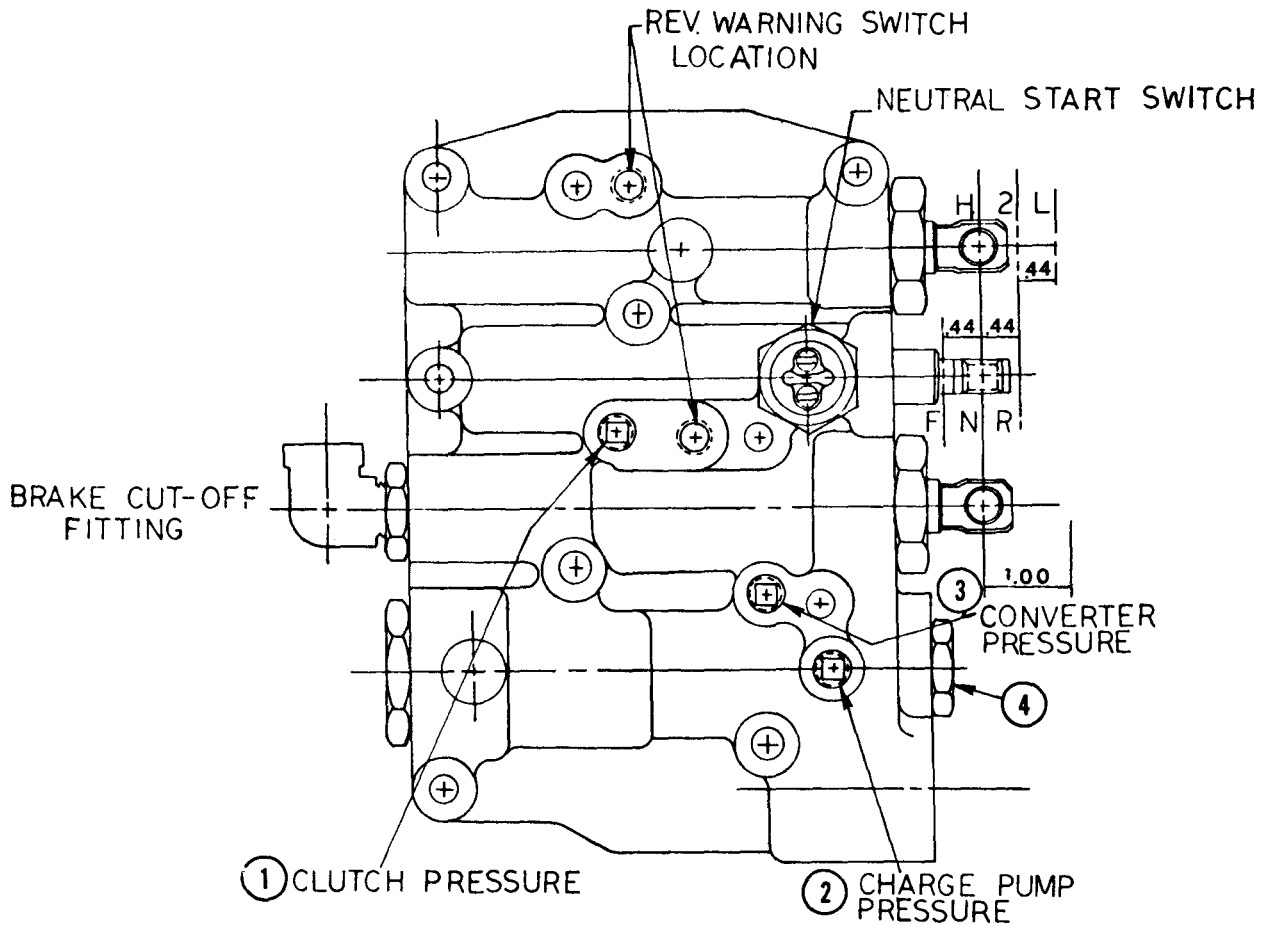
1. Remove drive plate assembly and converter from unit by pulling straight out.
2. Attach drive plate assembly to the engine flywheel using capscrew and lockwashers provided in parts bag. Refer to No. 1.
3. Attach converter to the drive plate assembly using the socket head capscrews and the half round 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<sup>TM</sup>  
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**

- Install a 300 p.s.i. gauge in Port #1.
- Run engine at approximately 2000 r.p.m.
- 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)*
- If all clutches have low pressure, the pressure regulator valve should be checked, and adjusted if necessary.
  - Remove cap Ref. #4 and remove the pressure regulator valve, dowel pin and spring.
  - Check valve to be sure it works freely in the valve body.
  - 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**

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

**STEP III. - FEATHERING VALVE (IF USED).**

- Install a 300 p.s.i. gauge in Port #1
- Run engine at approximately 2000 r.p.m.
- 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).**

- Install a 300 p.s.i. gauge in Port #1.
- Run engine at approximately 2000 r.p.m.
- 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

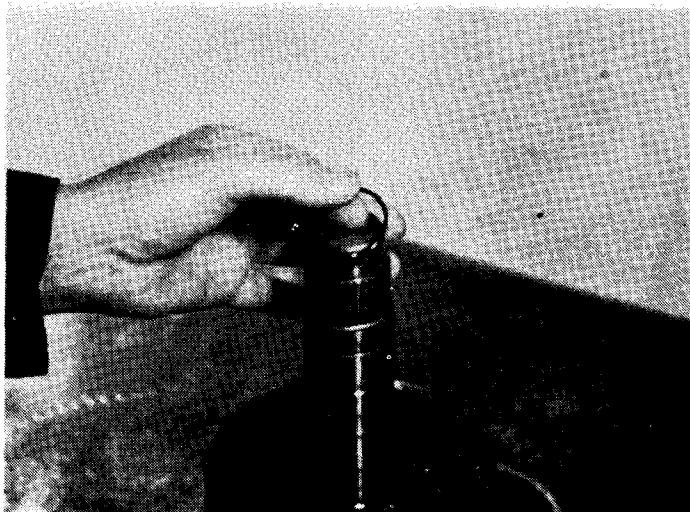
FOR THE

4000 SERIES TRANSMISSION



## ASSEMBLY INSTRUCTIONS

4000 Series



Thoroughly clean all parts prior to assembling the transmission.

Fig. 1

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

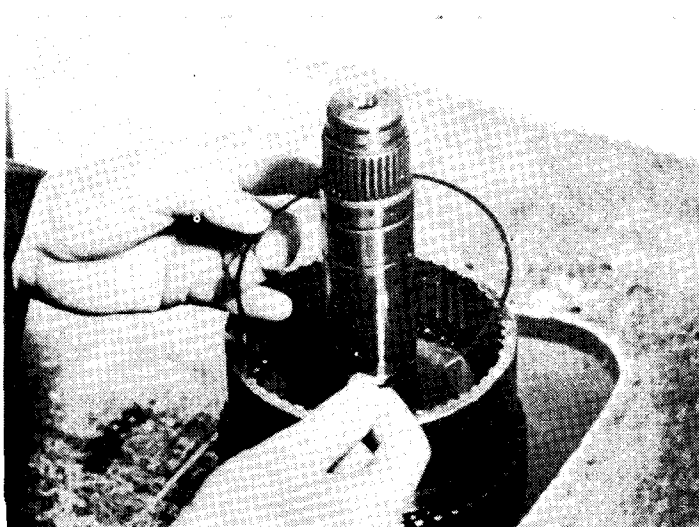


Fig. 2

Install the bottom retaining ring for the outer piston seal.

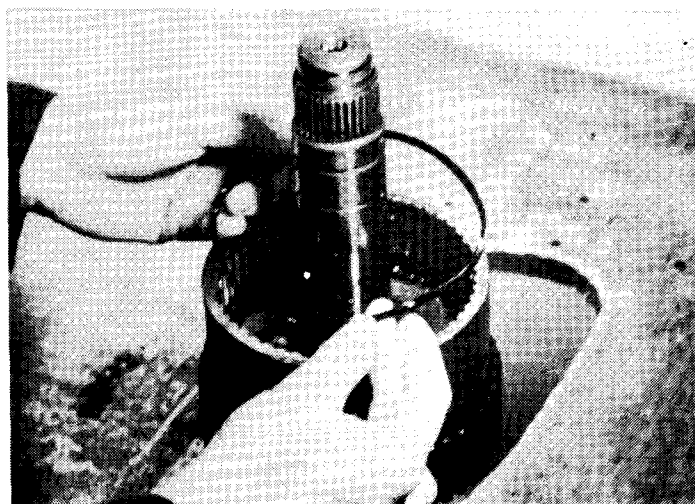


Fig. 3

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

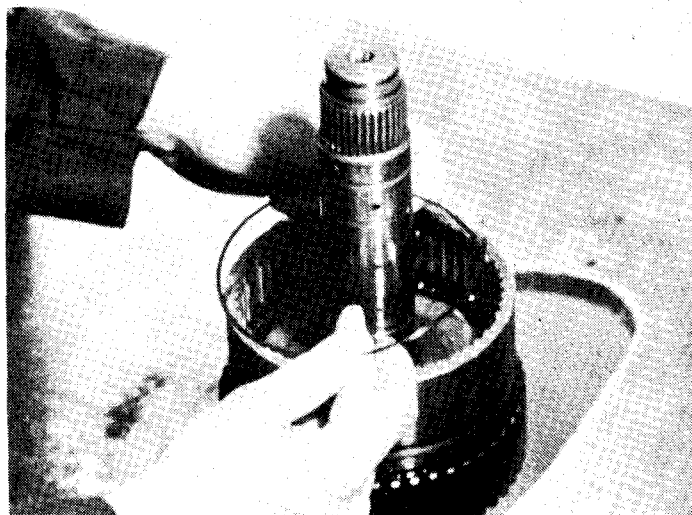


Fig. 4

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

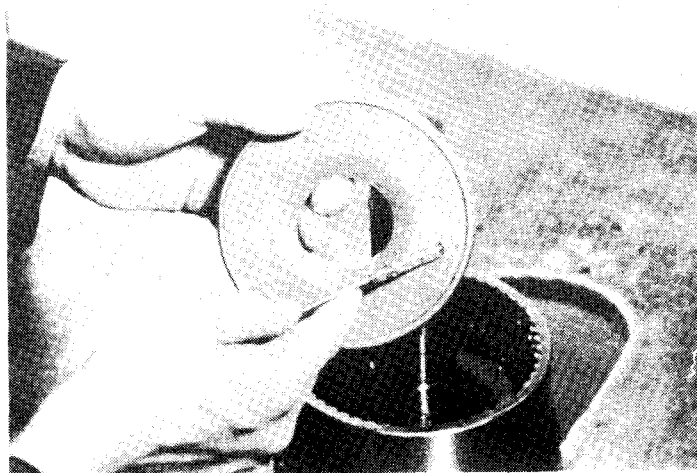


Fig. 5

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

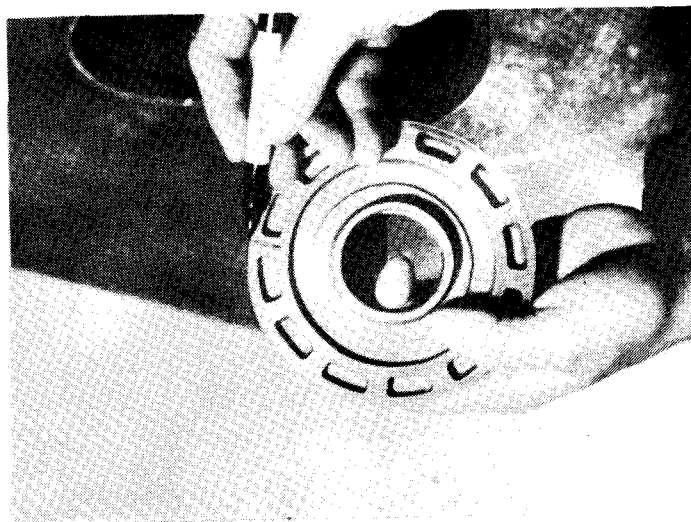


Fig. 6

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

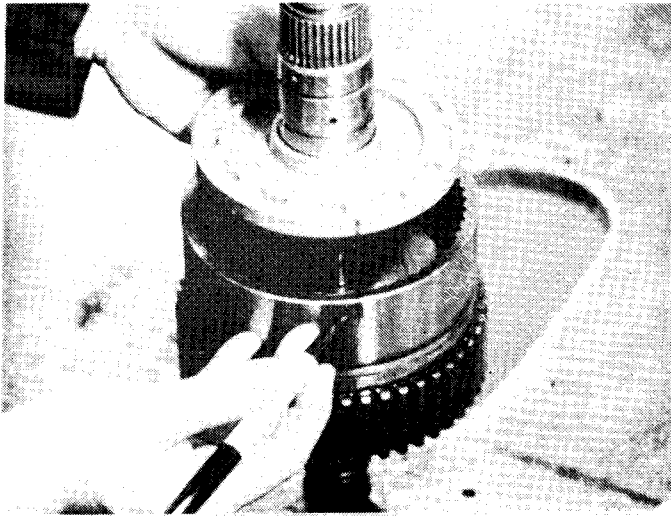


Fig. 7

Mark the cylinder in line with the dowel pin.

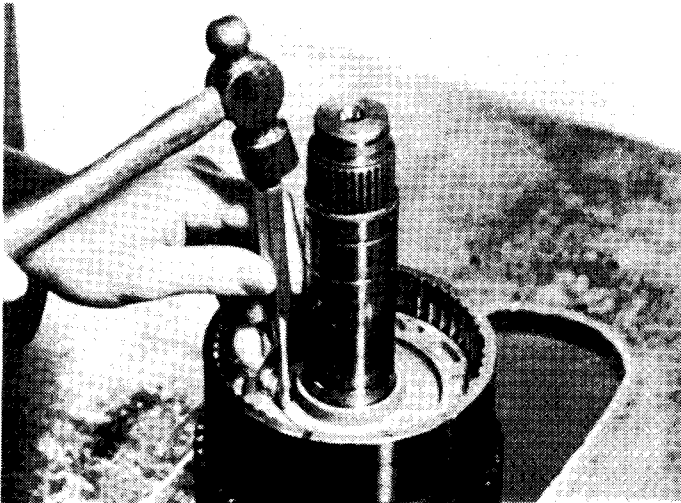


Fig. 8

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.

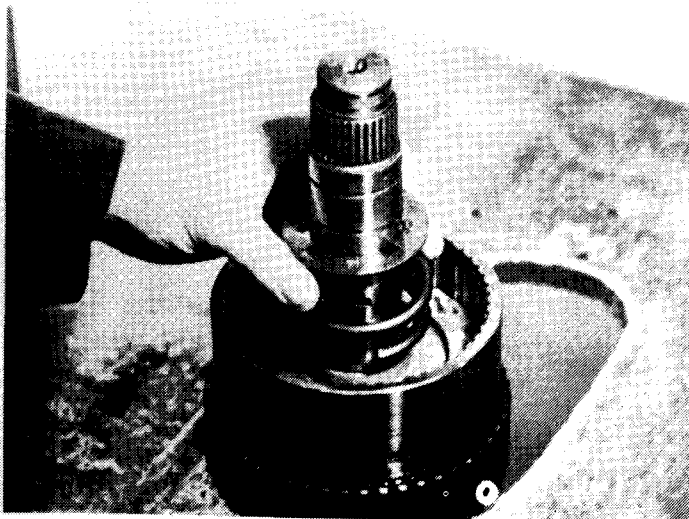


Fig. 9

Install piston spring and spring retainer.

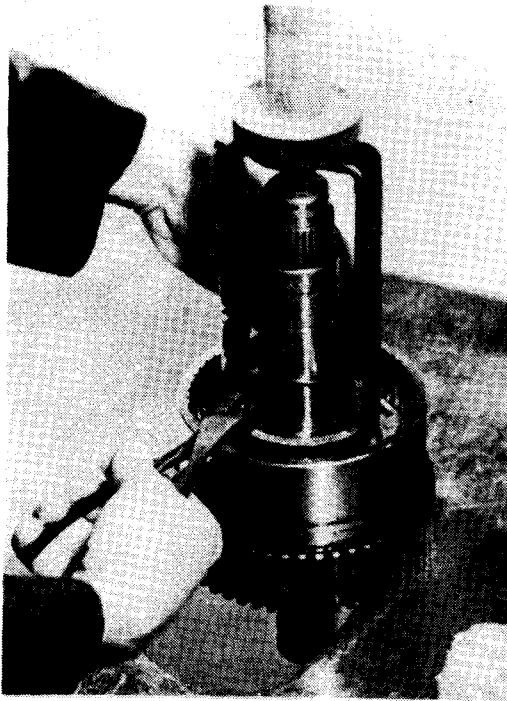


Fig. 10

Compress spring retainer and install snap ring.

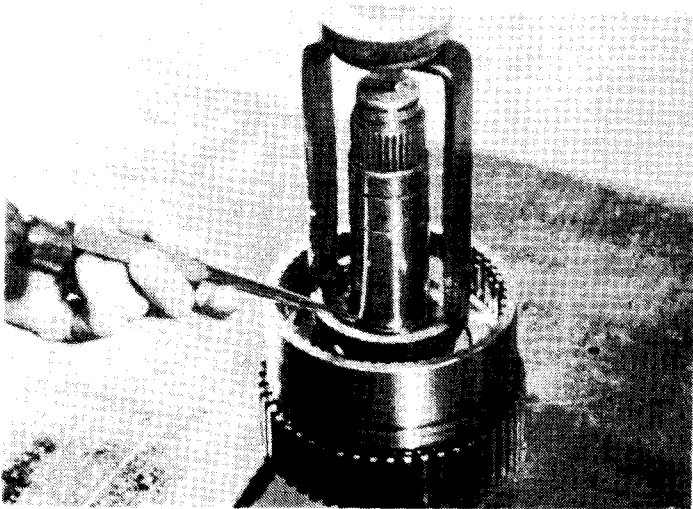


Fig. 11

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

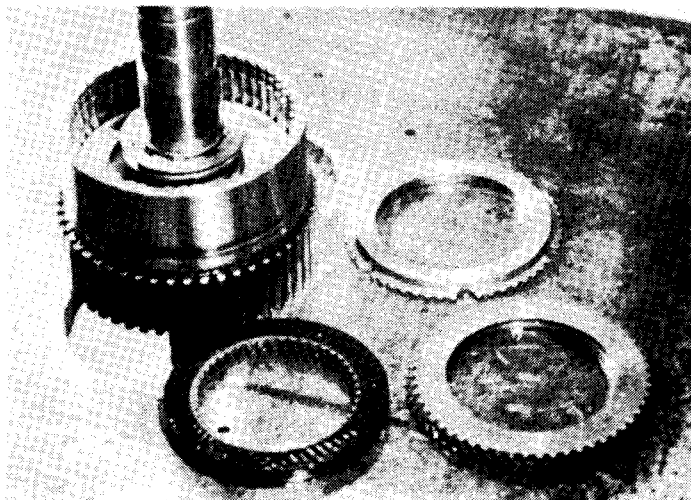


Fig. 12

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



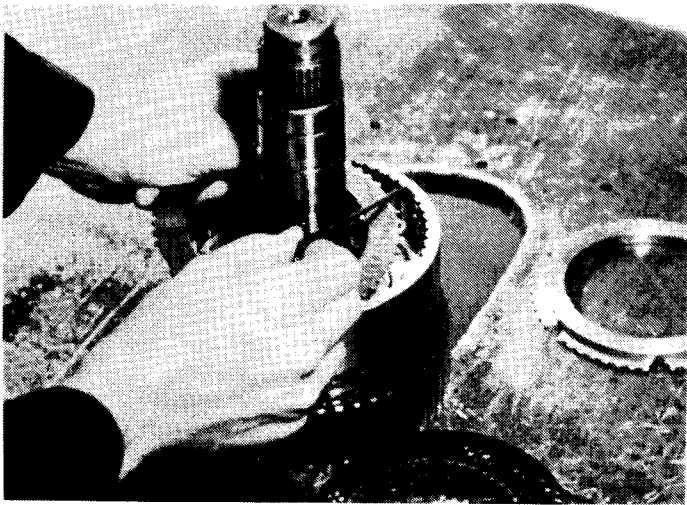


Fig. 13

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

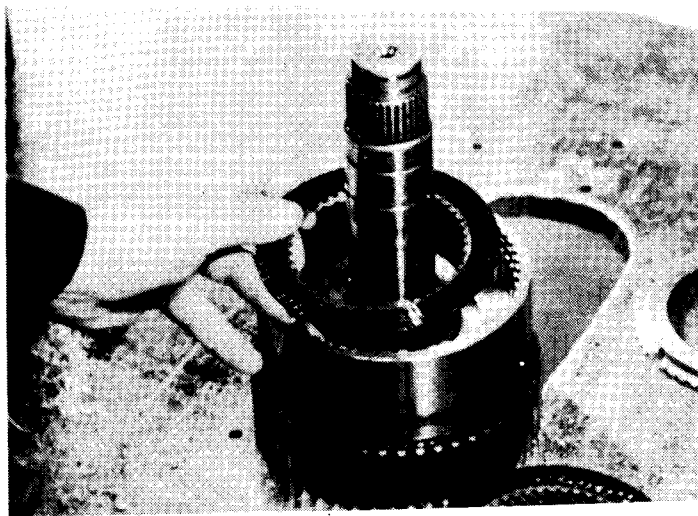


Fig. 14

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

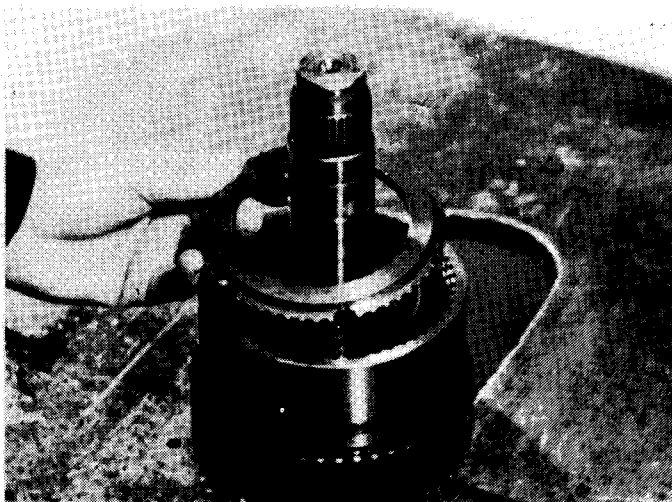


Fig. 15

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

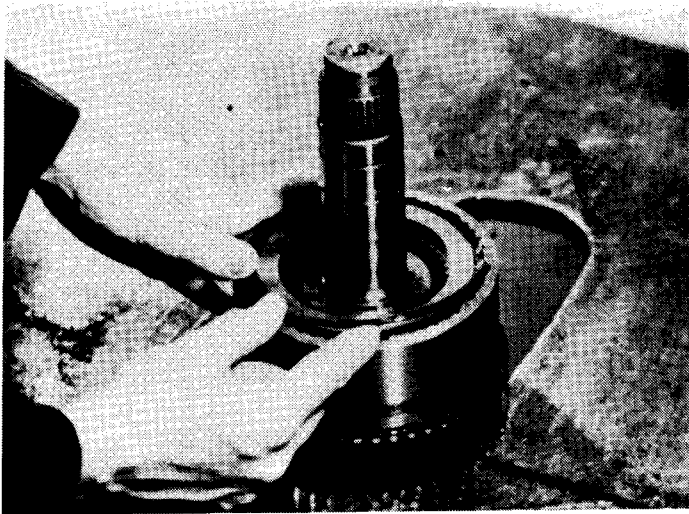


Fig. 16

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

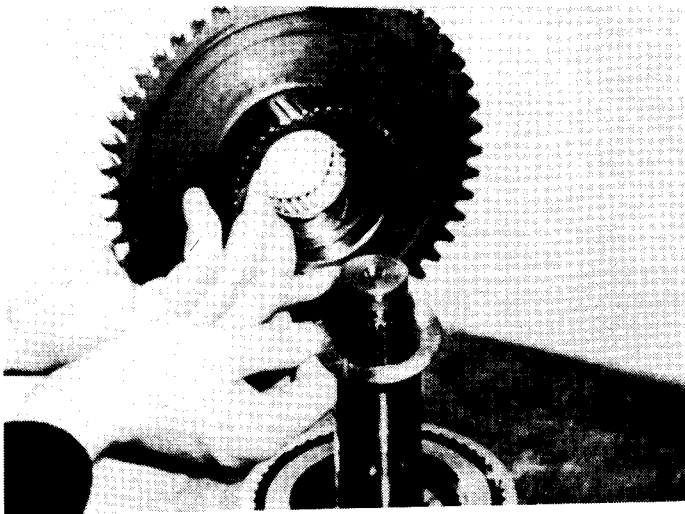


Fig. 17

Install the thrust washer and then the hub.



Fig. 18

Place another thrust washer on top of the hub.

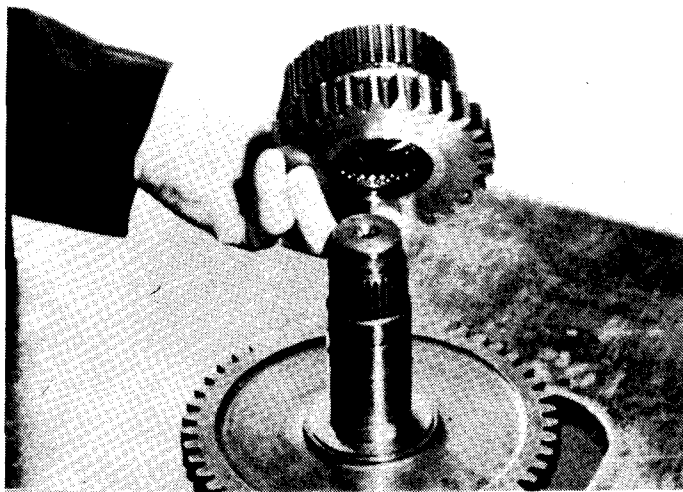


Fig. 19

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

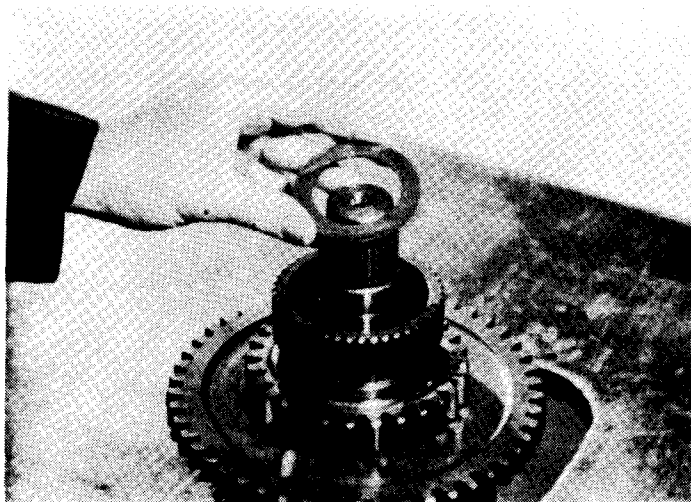


Fig. 20

Install another thrust washer.



Fig. 21

Install snap ring.

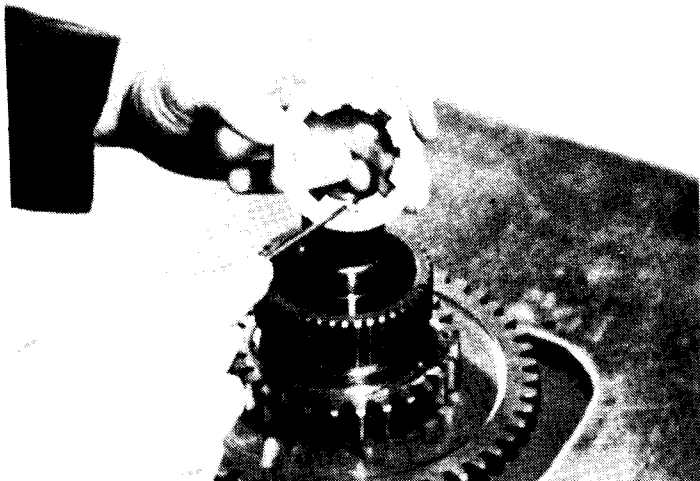


Fig. 22

Place spring retainer on top of snap ring.

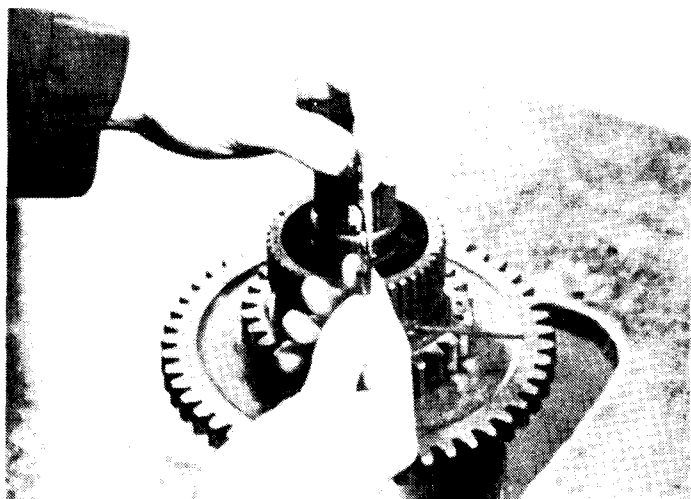


Fig. 23

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

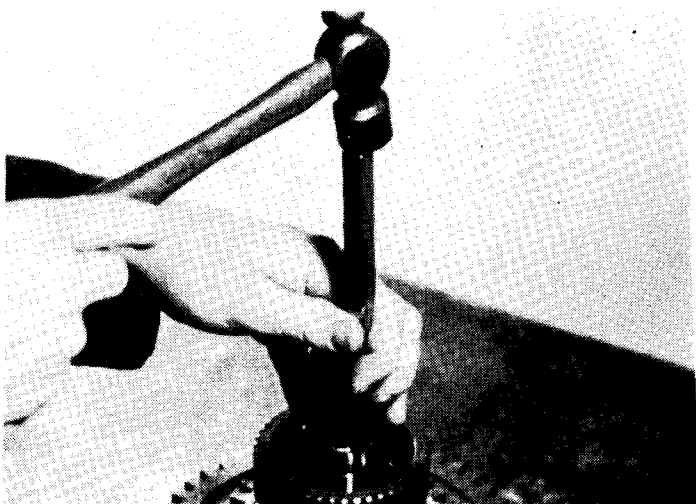


Fig. 24

Tap retainer washer in place.

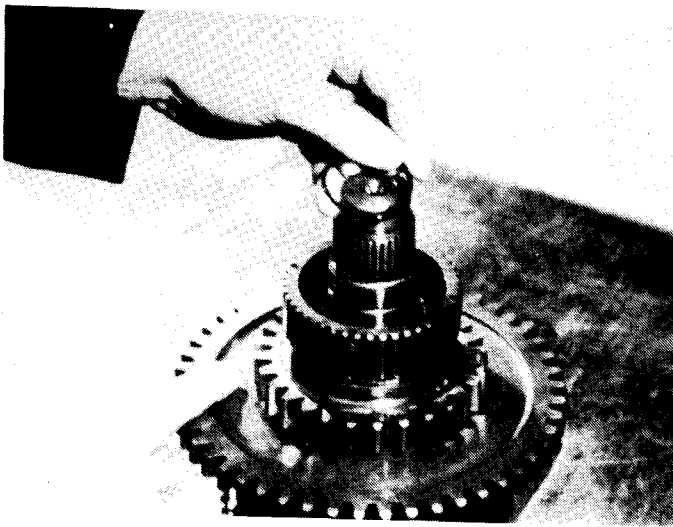


Fig. 25

Install inner piston seal on shaft.

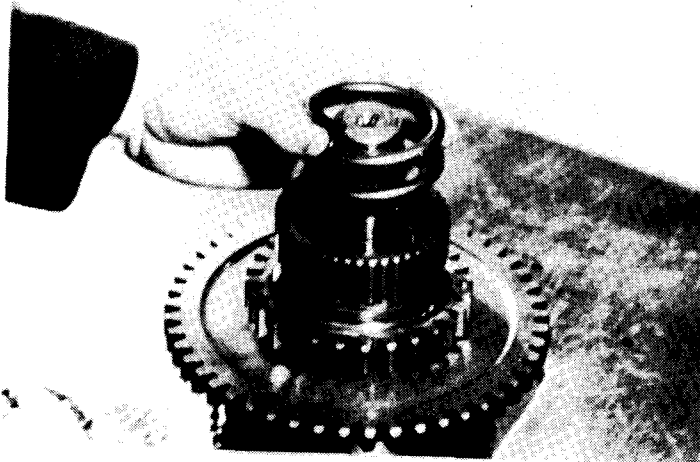


Fig. 26

Install clutch spring.

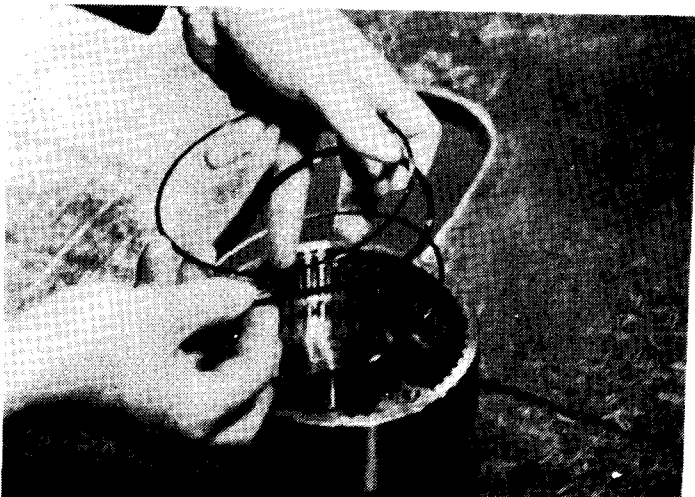


Fig. 27

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

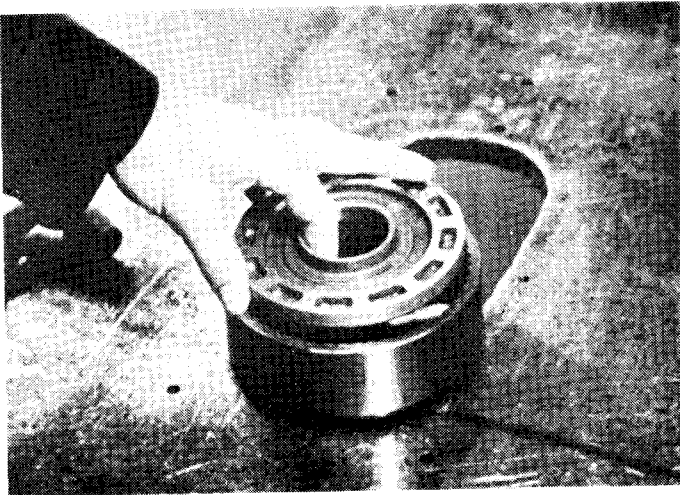


Fig. 28

Install piston.

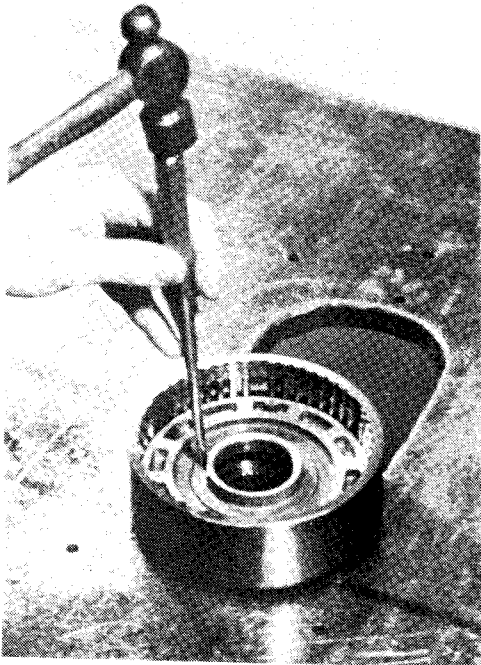


Fig. 29

Tap piston in place with flat punch.

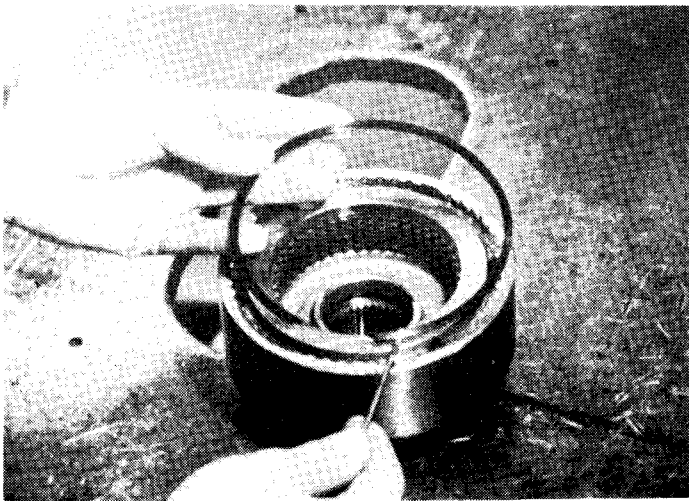


Fig. 30

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

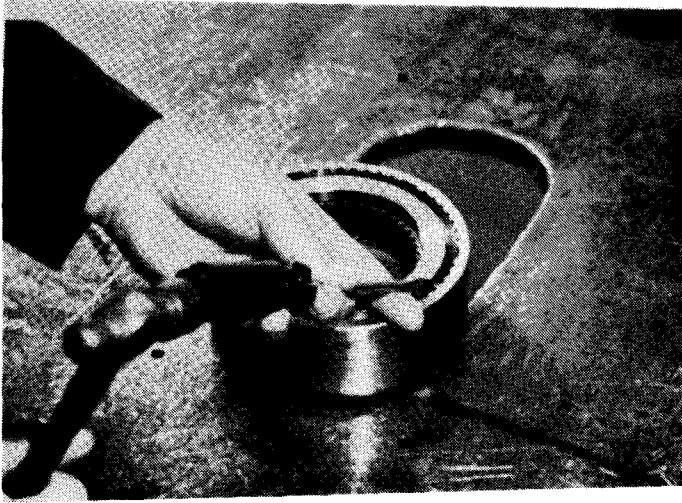


Fig. 31

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

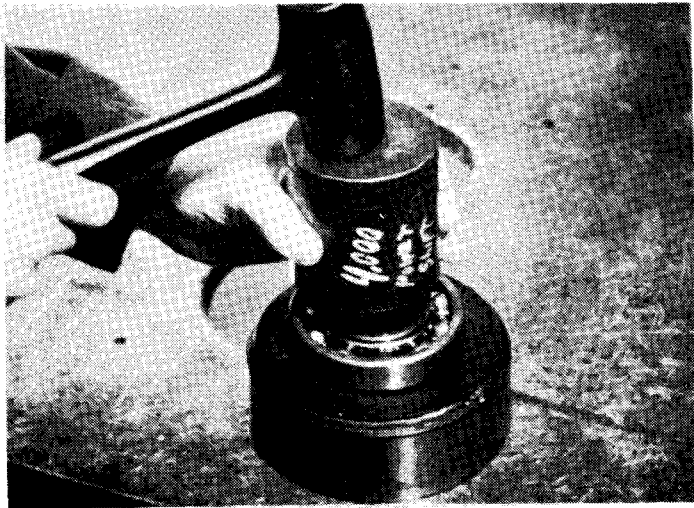


Fig. 32

Install bearing on the back side of low gear clutch.

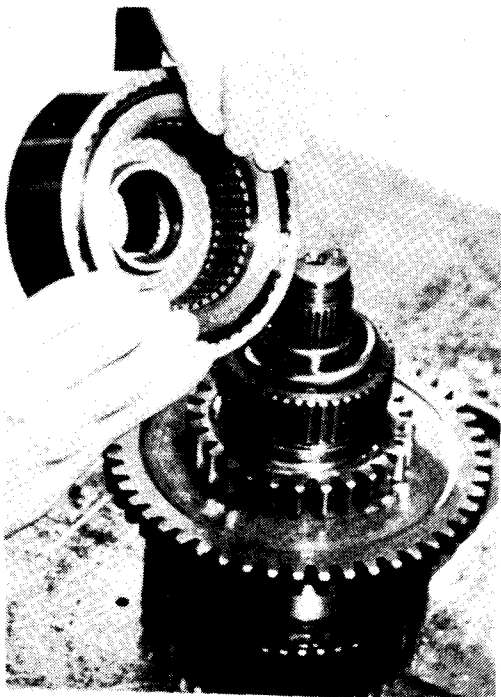


Fig. 33

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



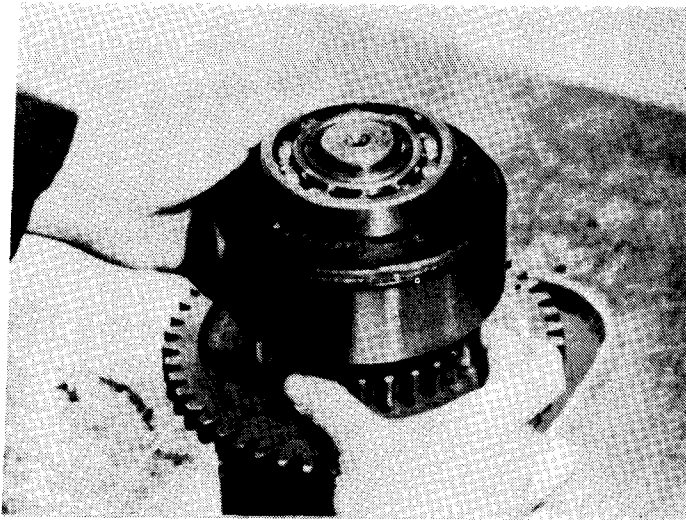


Fig. 34

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

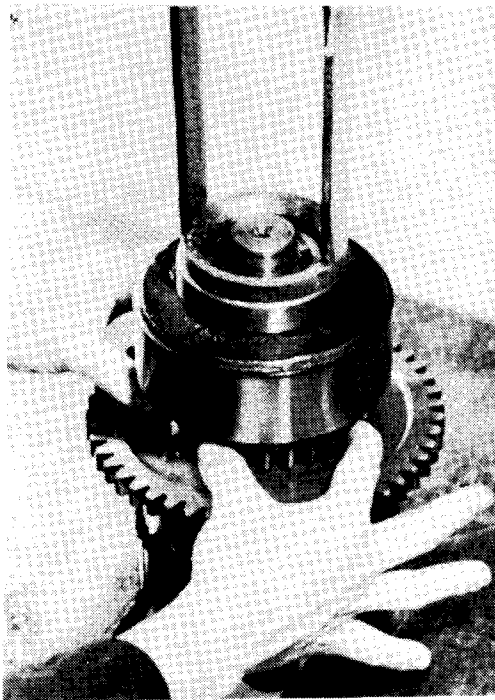


Fig. 35

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

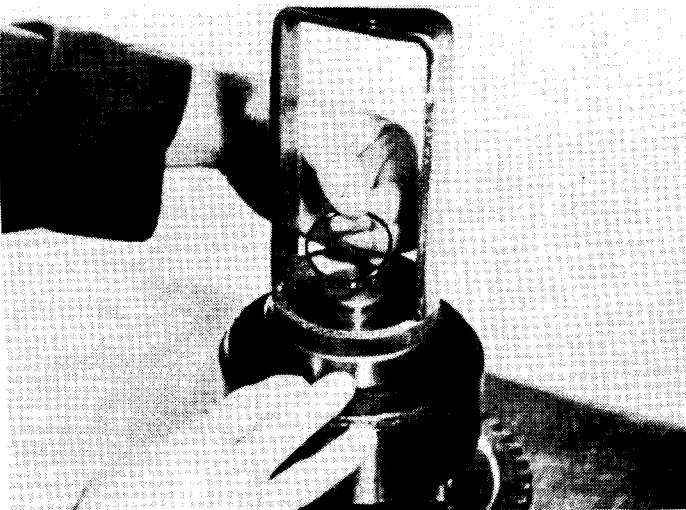


Fig. 36

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



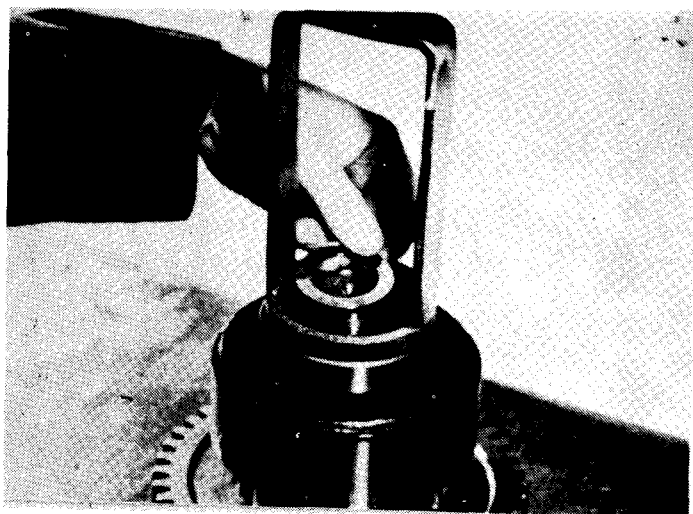


Fig. 37

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

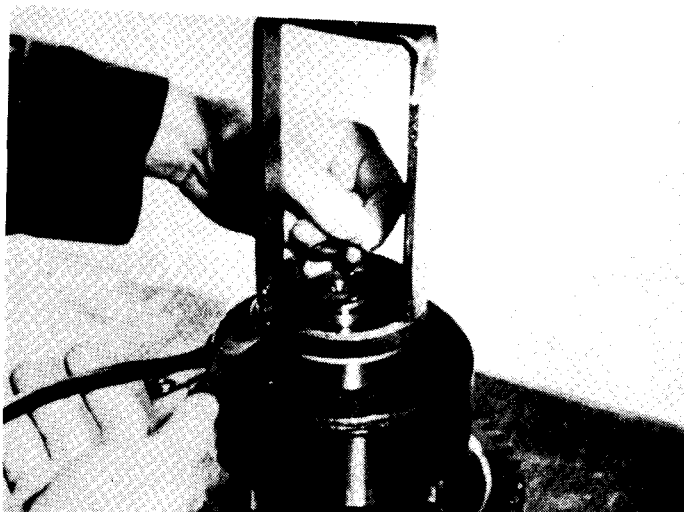


Fig. 38

Install snap ring on top of the retaining washer.

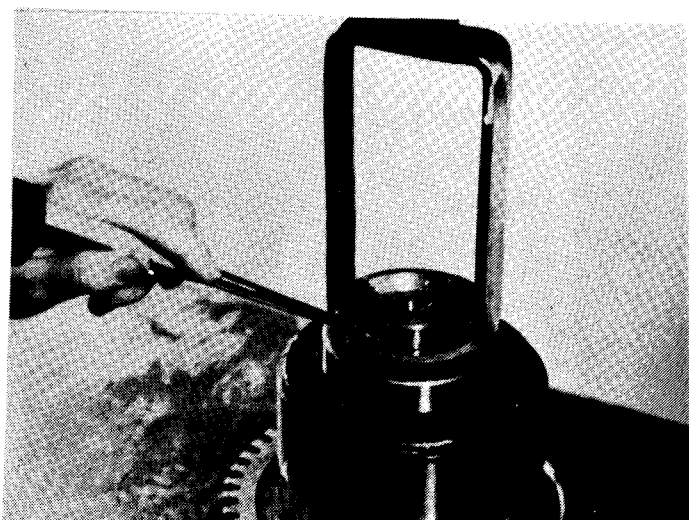


Fig. 39

Make sure snap ring is seated.

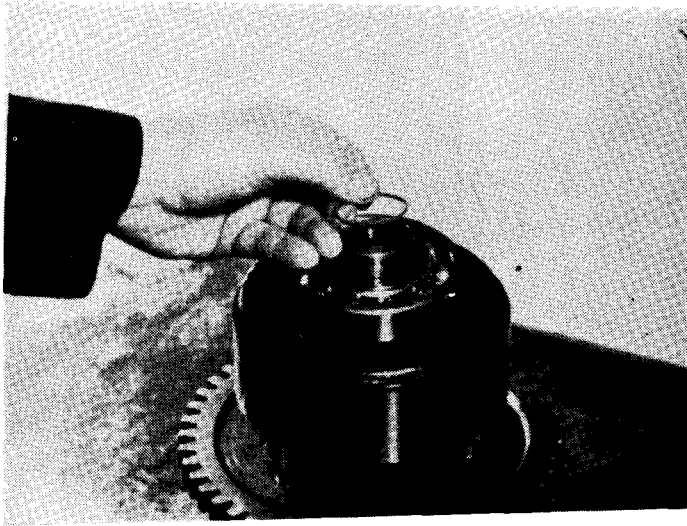


Fig. 40

Install a teflon seal ring on the clutch stack.

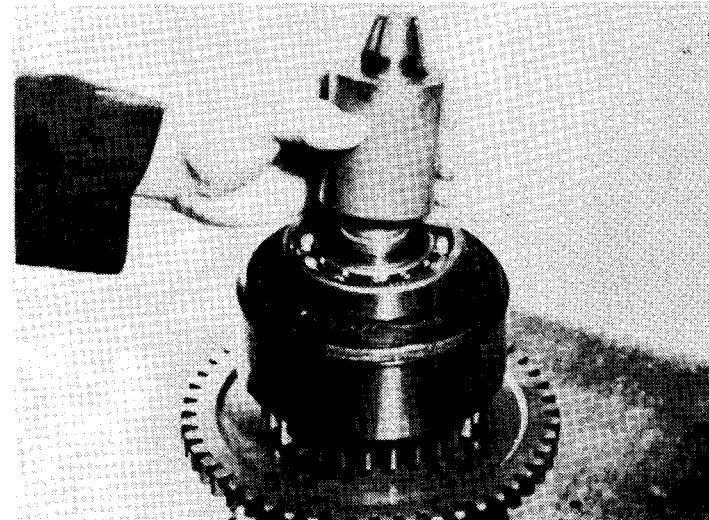


Fig. 41

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

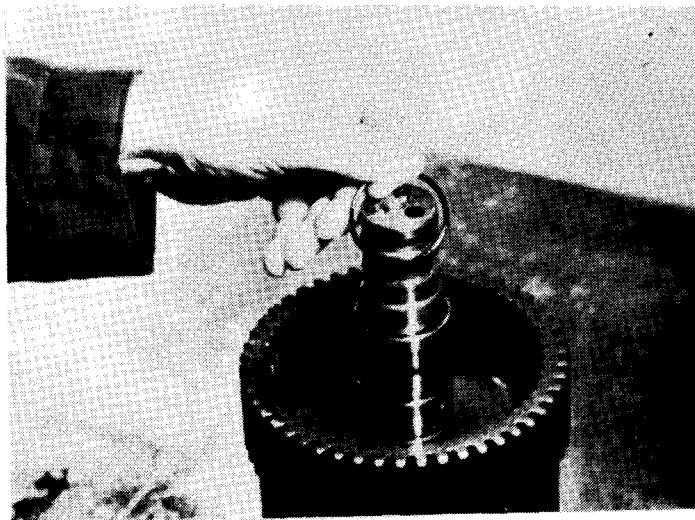


Fig. 42

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

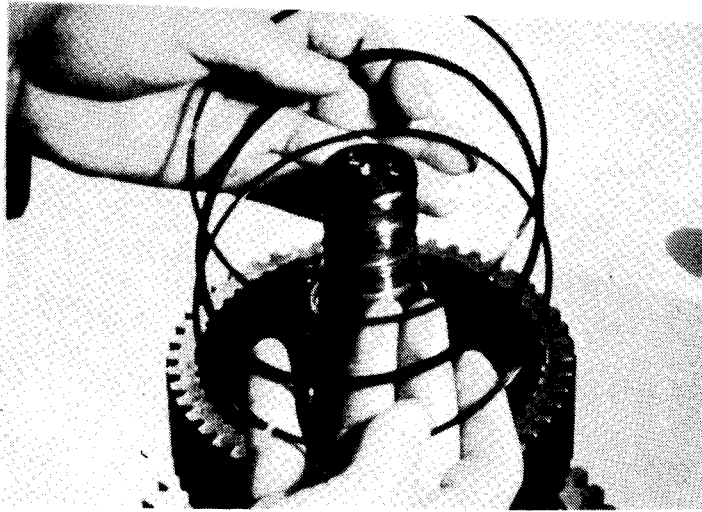


Fig. 43

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

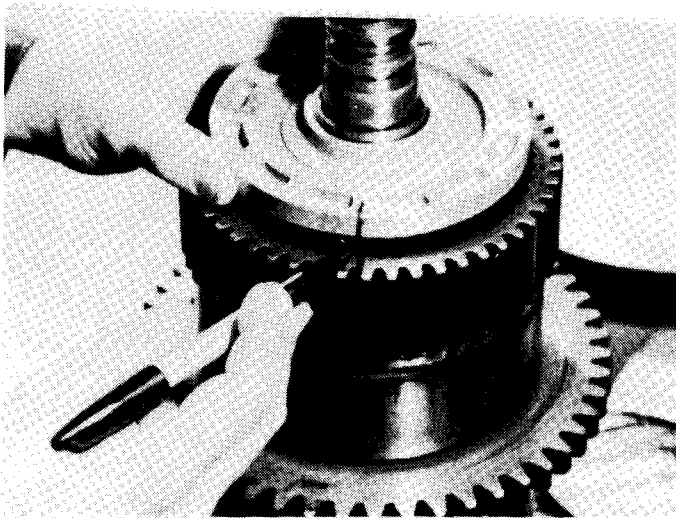


Fig. 44

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

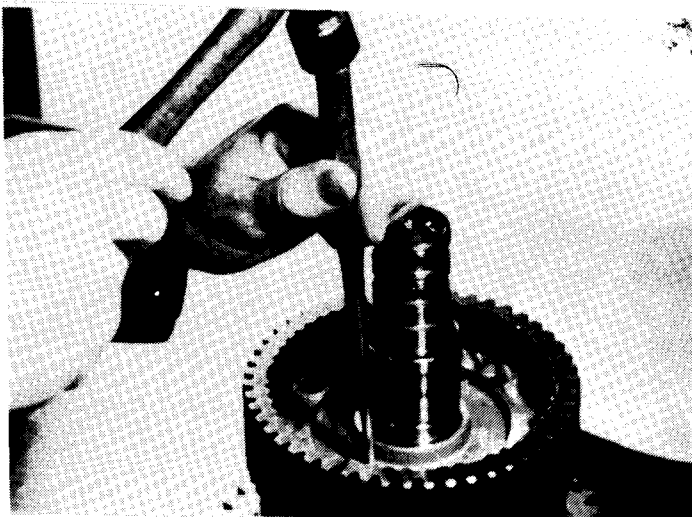


Fig. 45

Tap piston in place with a flat punch.

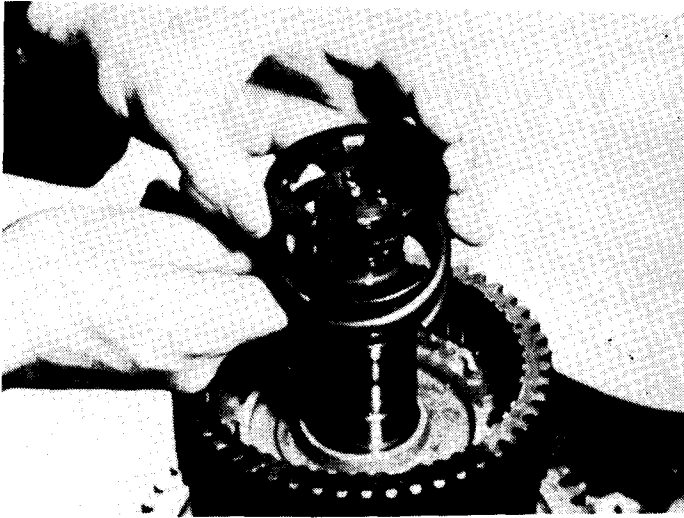


Fig. 46

Install piston spring and spring re-  
tainer.

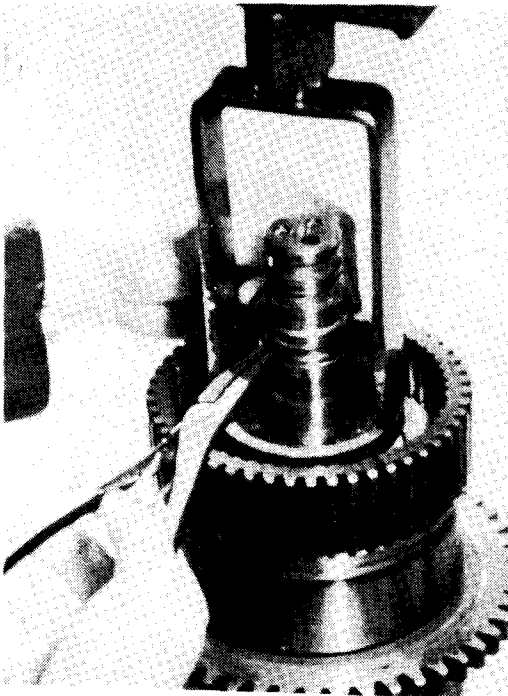


Fig. 47

Compress spring and install snap  
ring.

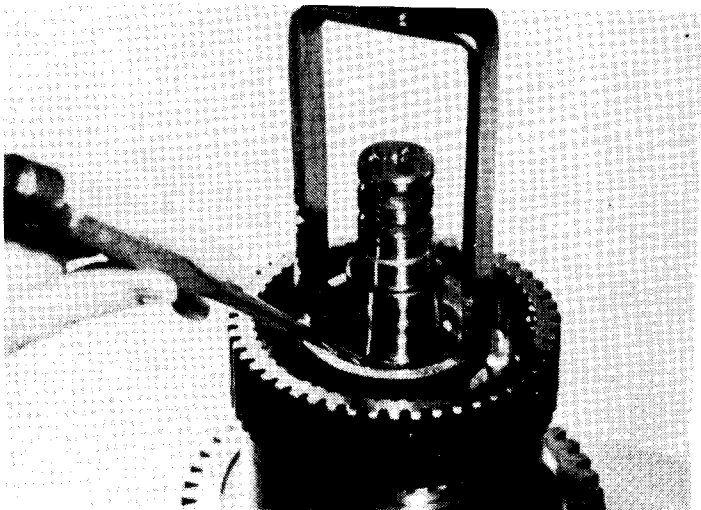


Fig. 48

Seat the snap ring with a punch.

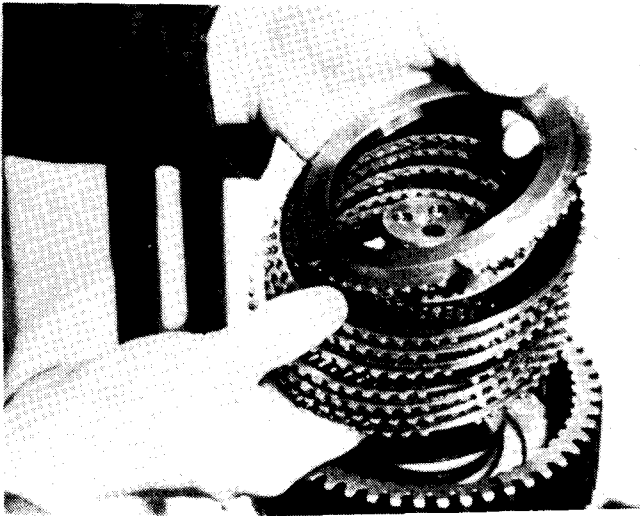


Fig. 49

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

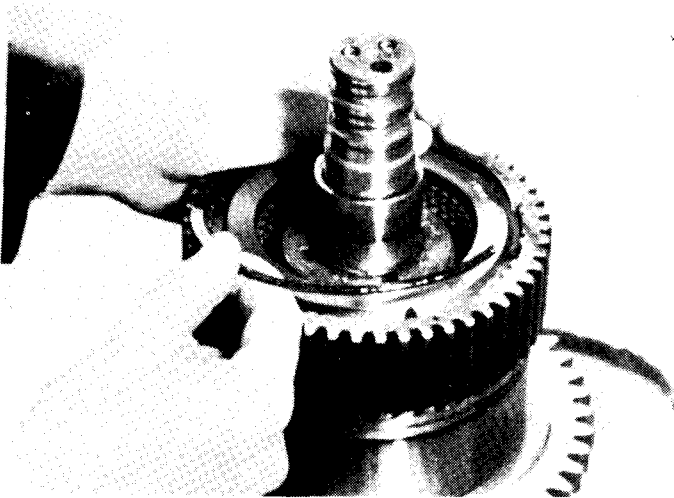


Fig. 50

Install snap ring over back-up plate.



Fig. 51

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

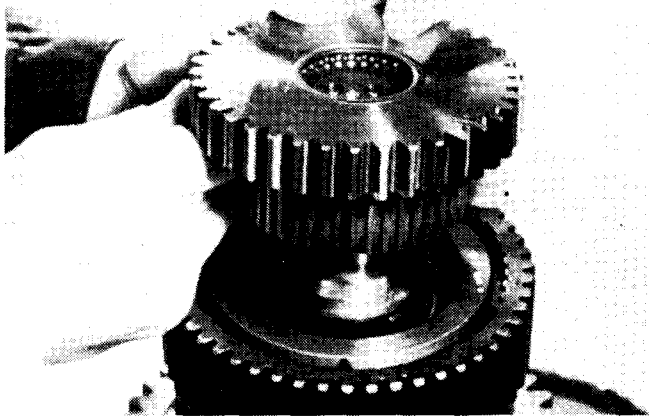


Fig. 52

Install forward hub.



Fig. 53

Install thrust washer on top of hub  
and then bearing.

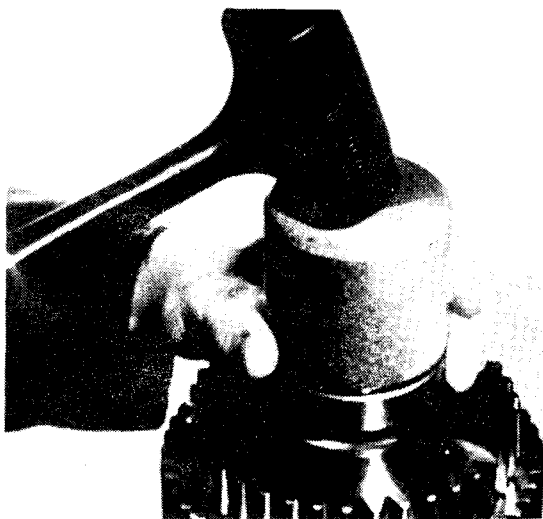


Fig. 54

Drive bearing on the shaft.

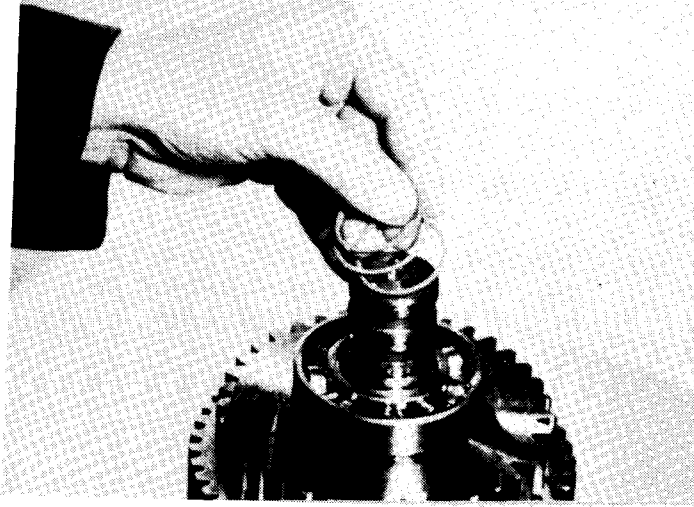


Fig. 55

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

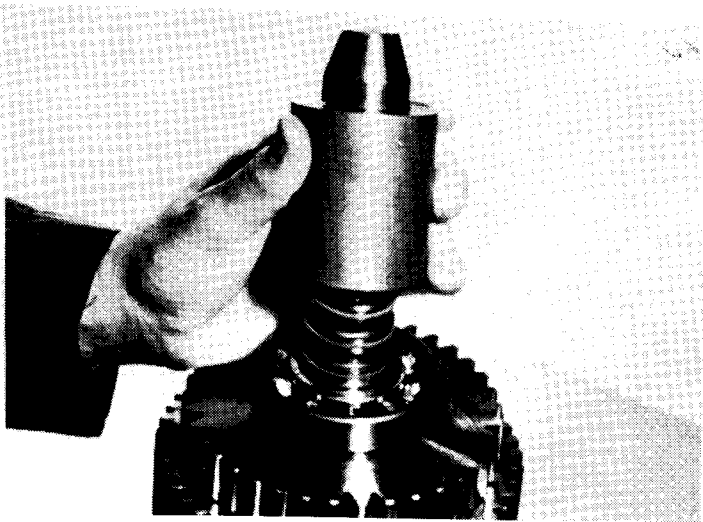


Fig. 56

Resize the seal rings.

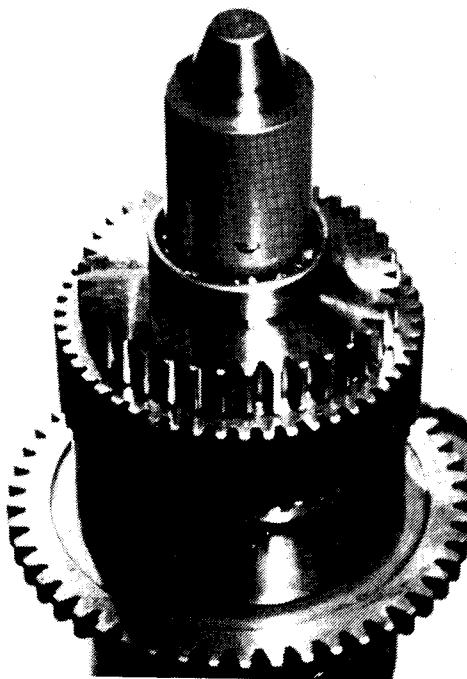


Fig. 57

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

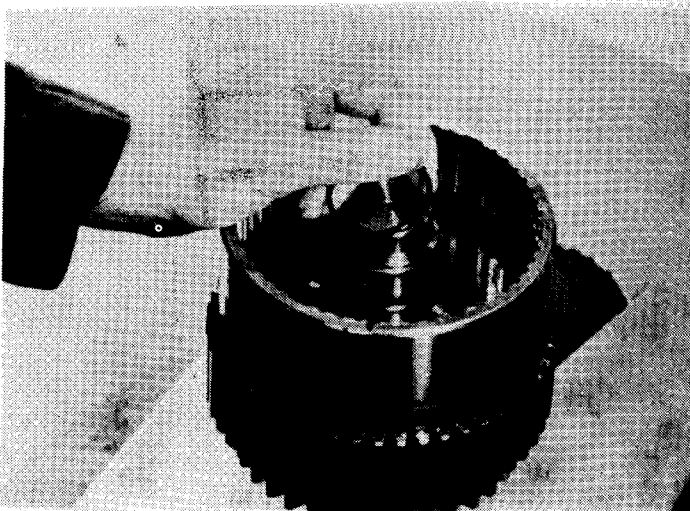


Fig. 58

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

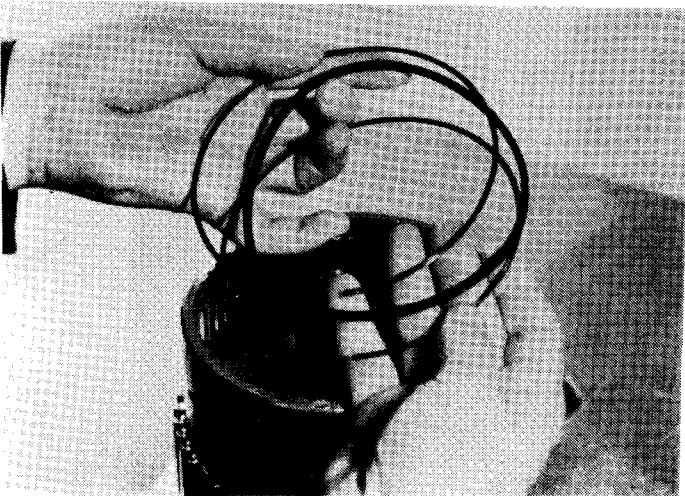


Fig. 59

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

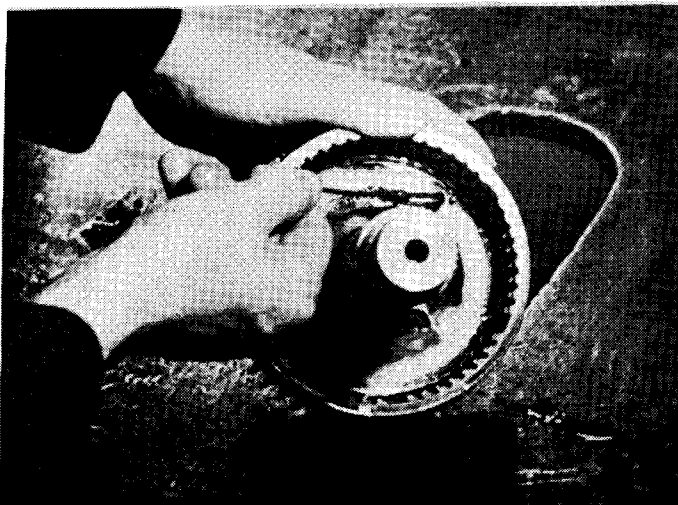


Fig. 60

Mark the cylinder in line with the stud.



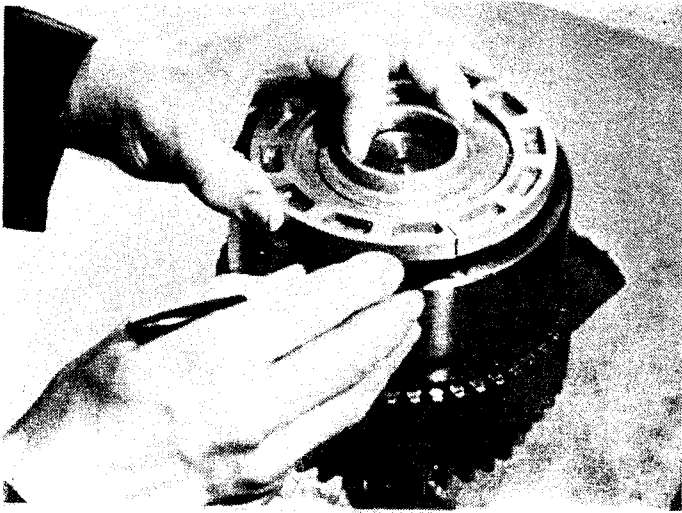


Fig. 61

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

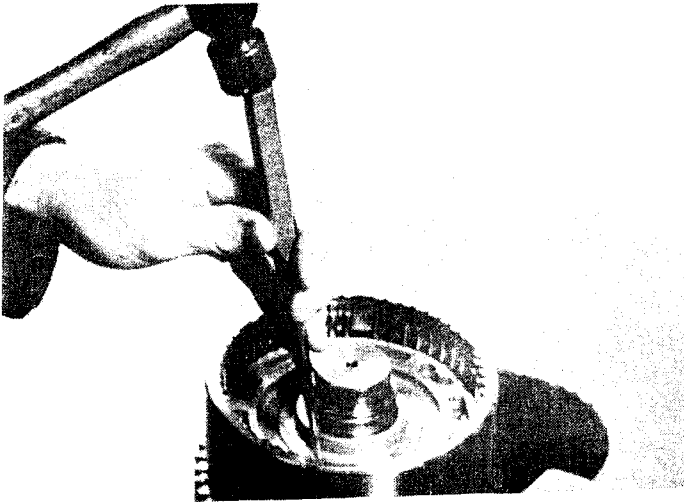


Fig. 62

Install piston by tapping it with a flat punch.

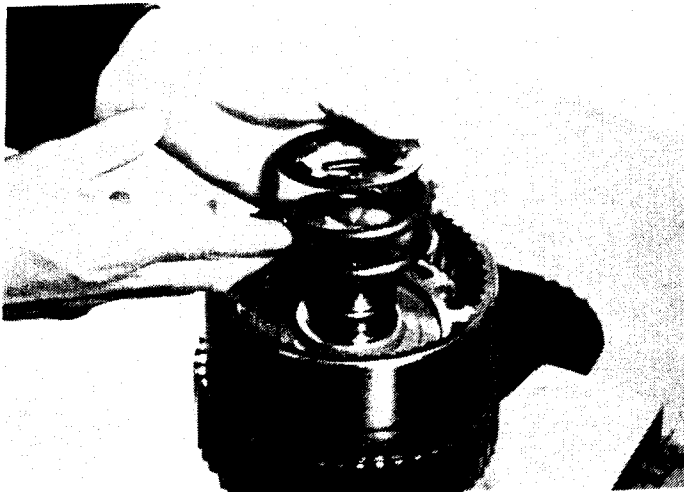


Fig. 63

Install piston spring and spring retainer.

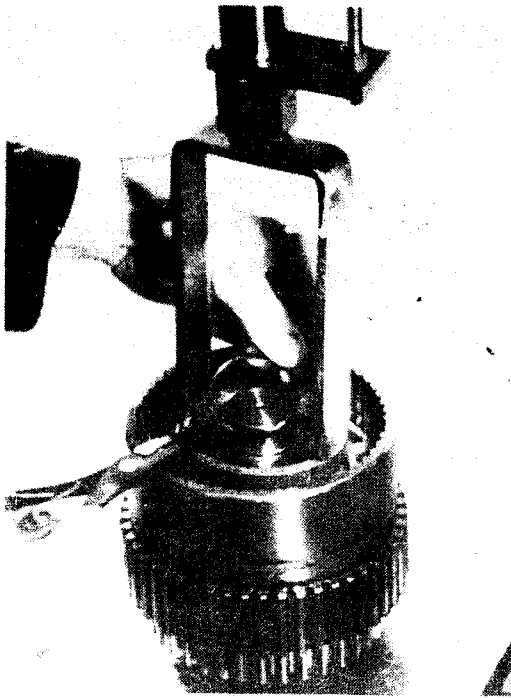


Fig. 64

Compress the spring and install the snap ring.

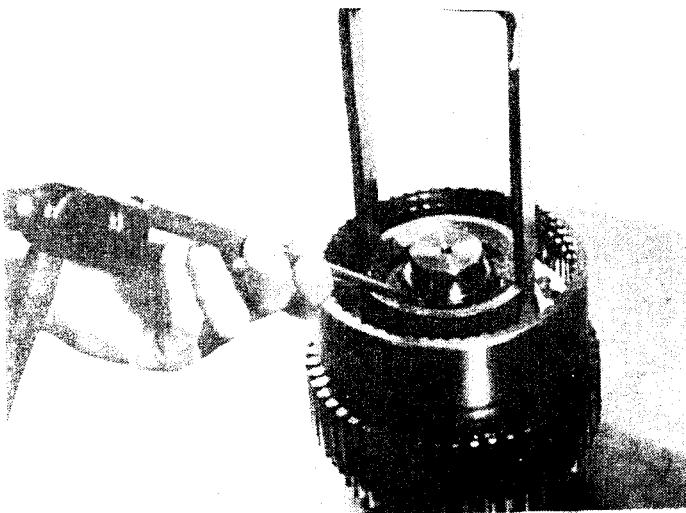


Fig. 65

Make sure snap ring is seated.



Fig. 66

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

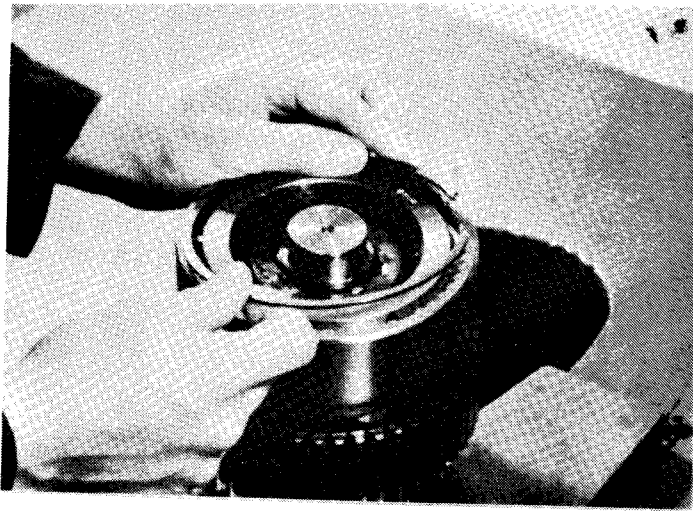


Fig. 67

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

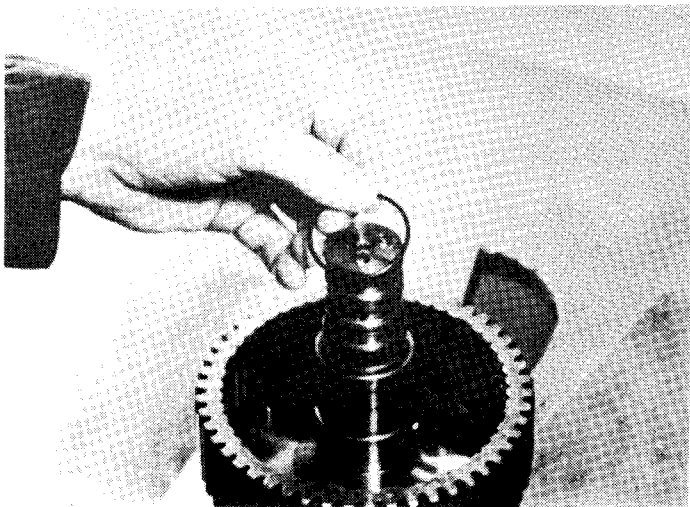


Fig. 68

Turn clutch stack over and install the inner piston seal.

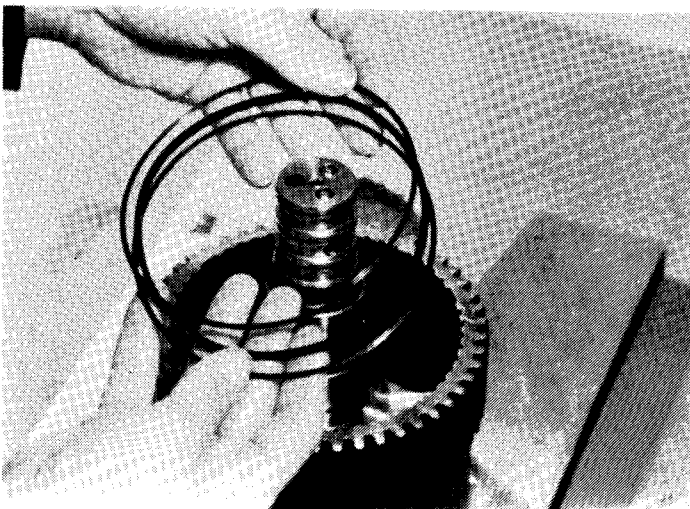


Fig. 69

Install outer piston seal and both retaining rings.

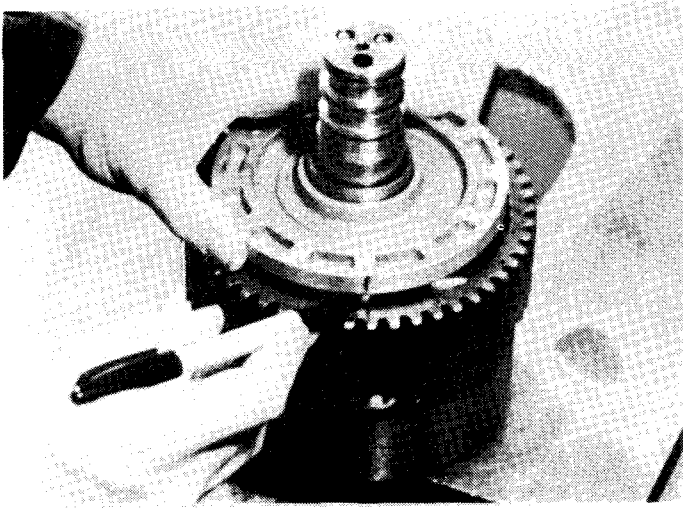


Fig. 70

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

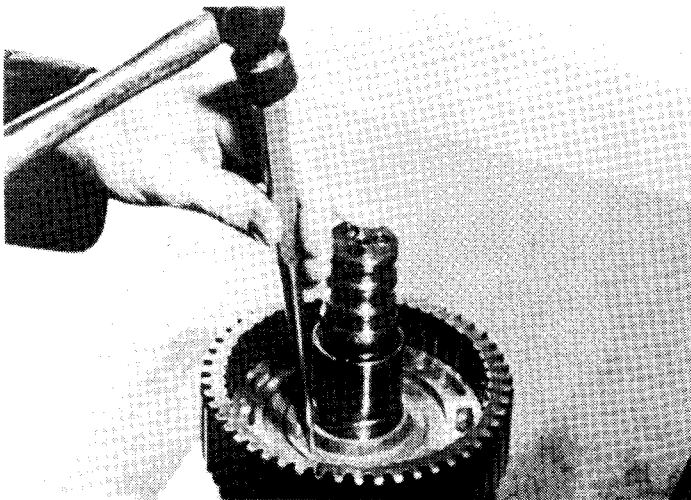


Fig. 71

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

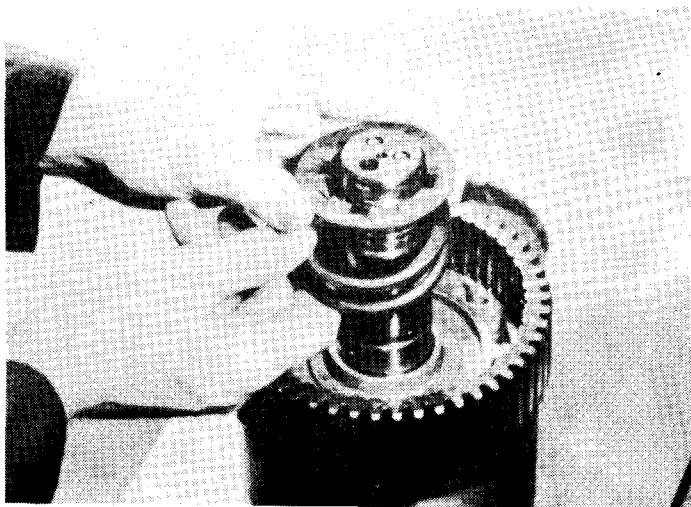


Fig. 72

Install piston spring and spring retainer.

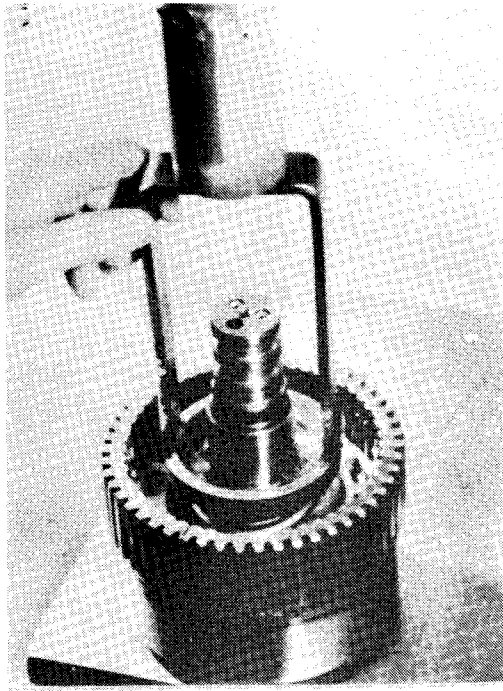


Fig. 73

Compress the spring.

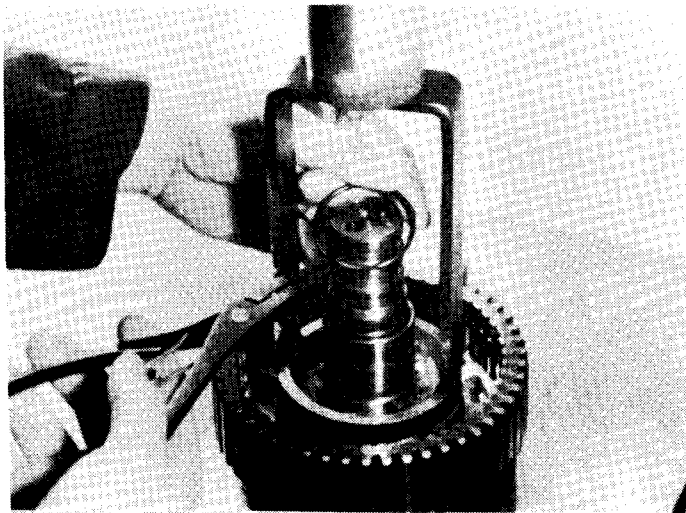


Fig. 74

Install snap ring.

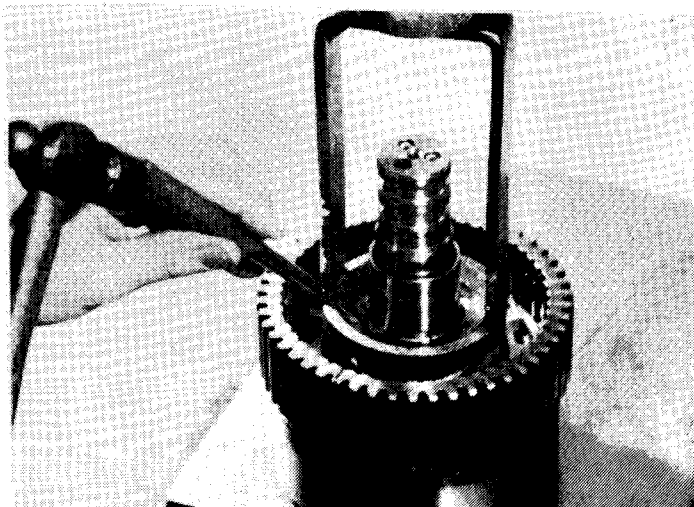


Fig. 75

Make sure snap ring is seated properly.

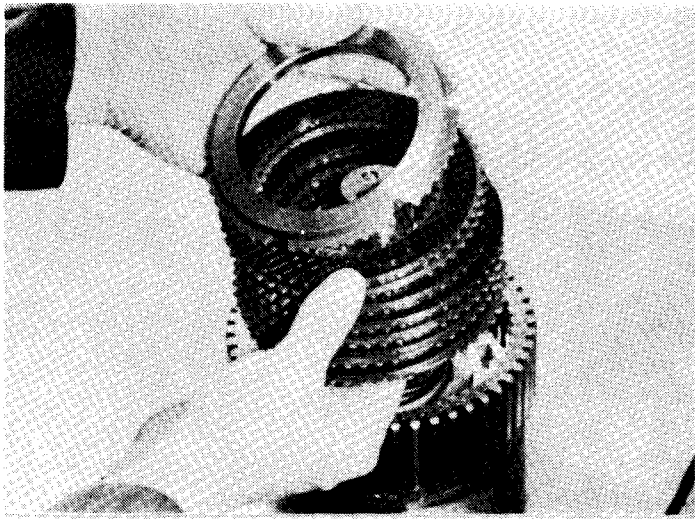


Fig. 76

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

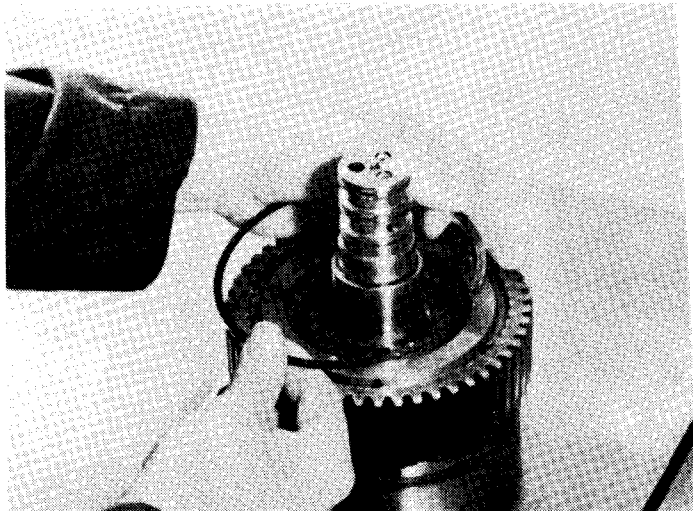


Fig. 77

Install snap ring over back-up plate.



Fig. 78

Install spacer ring and thrust washer.

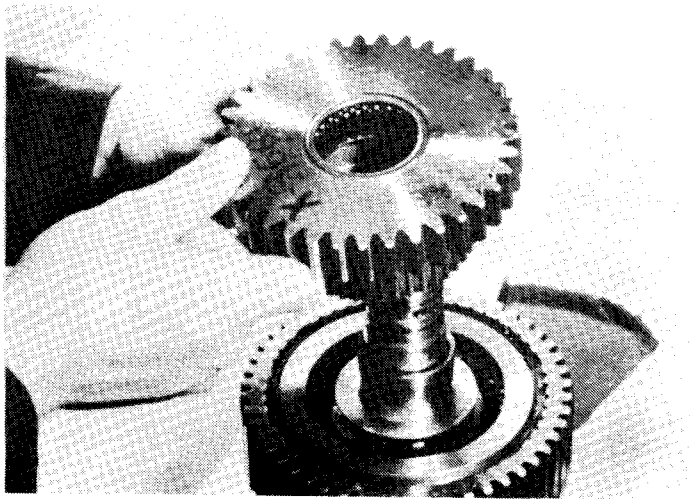


Fig. 79

Install forward hub.

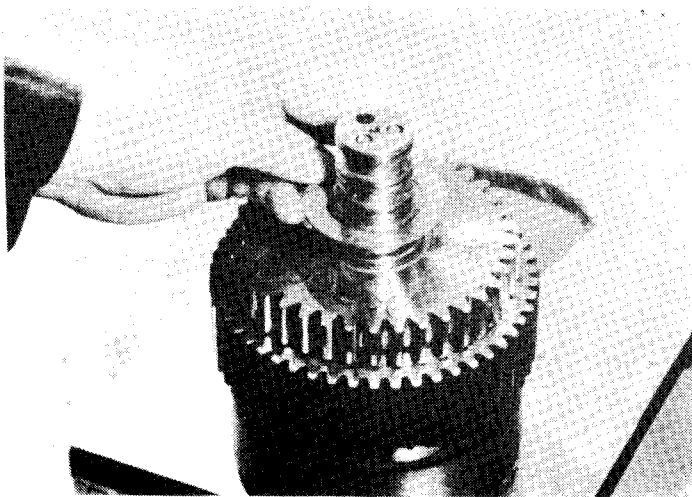


Fig. 80

Install thrust washer.

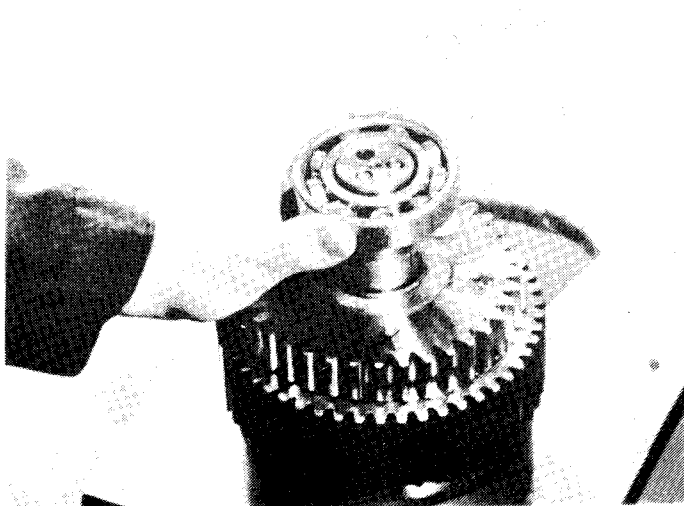


Fig. 81

Install front bearing on shaft.

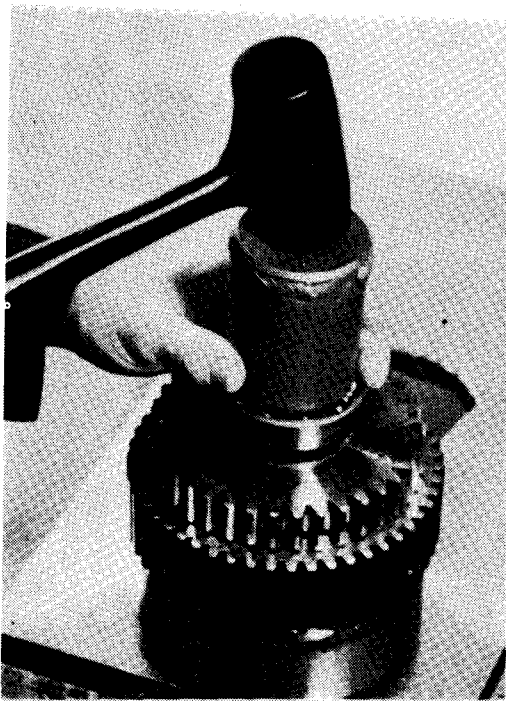


Fig. 82

Drive or press bearing on the shaft.



Fig. 83

Install the three teflon seal rings.

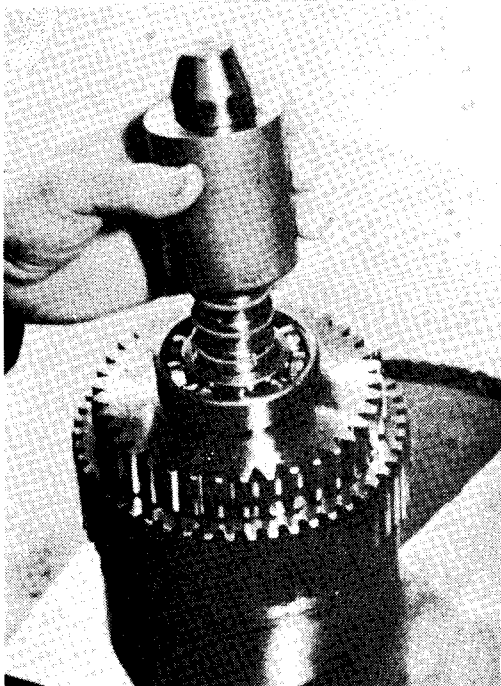


Fig. 84

Place the resizing tool over the seal rings.



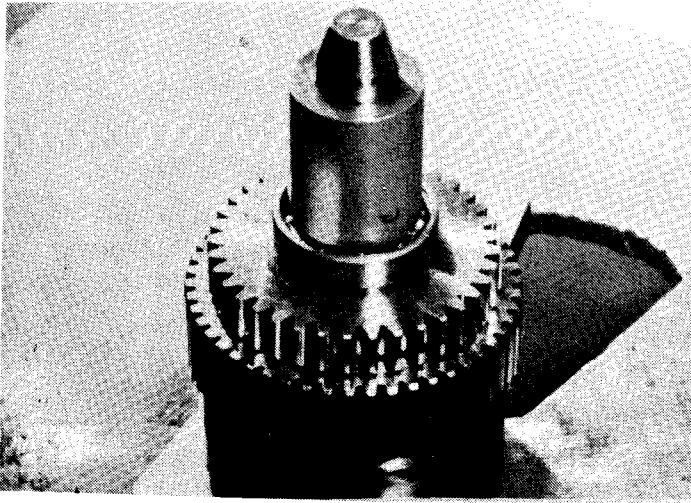


Fig. 85

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

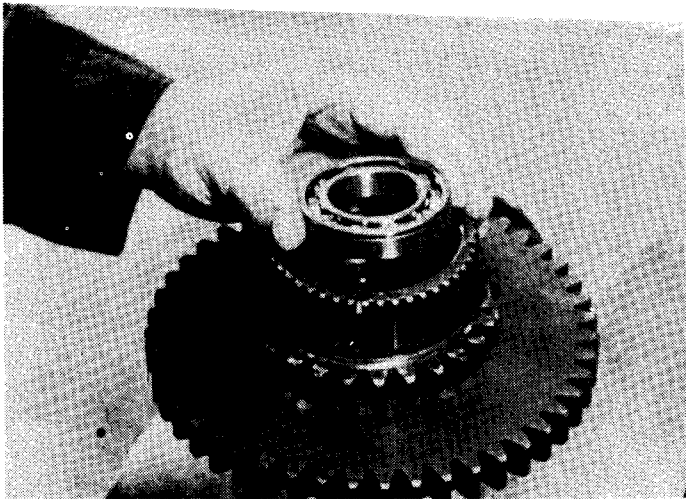


Fig. 86

Place bearing in second gear clutch hub.

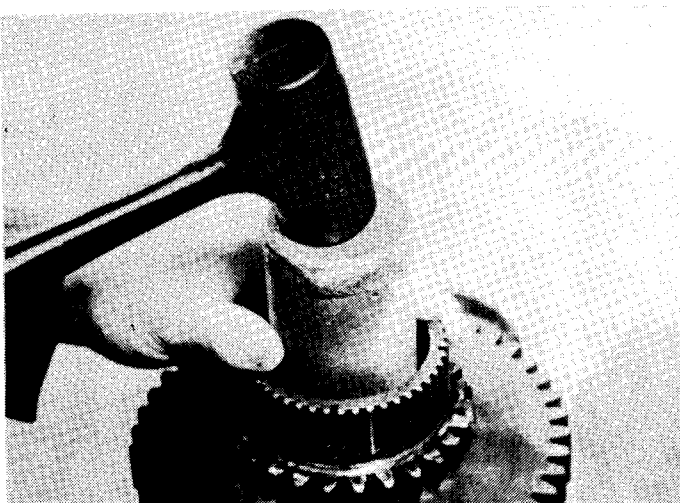


Fig. 87

Drive bearing in place.



Fig. 88

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

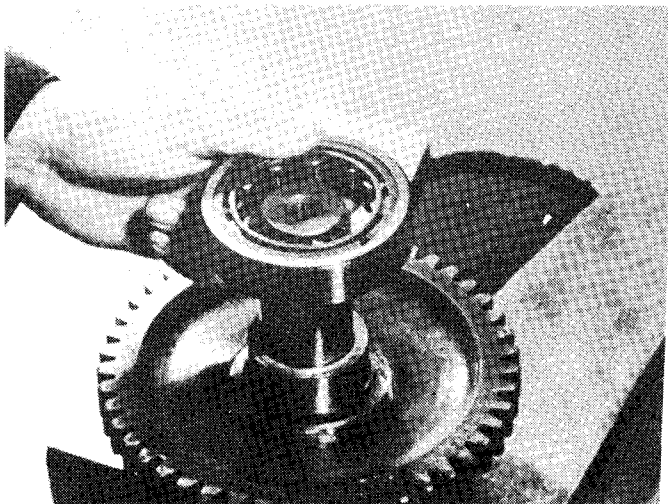


Fig. 89

Place the roller bearing over the inner race.

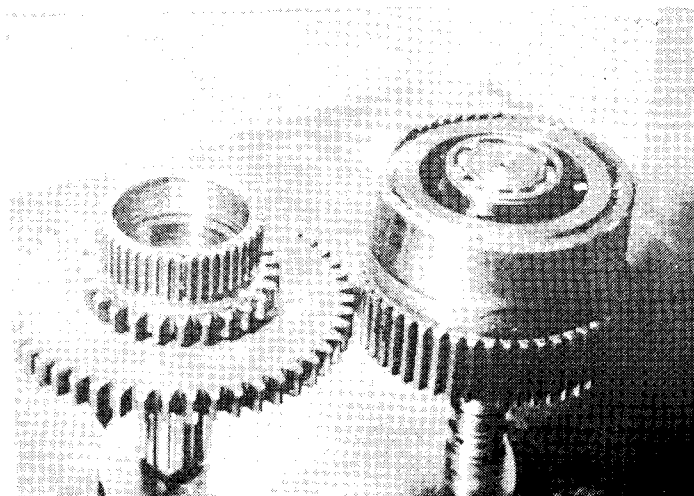


Fig. 93

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

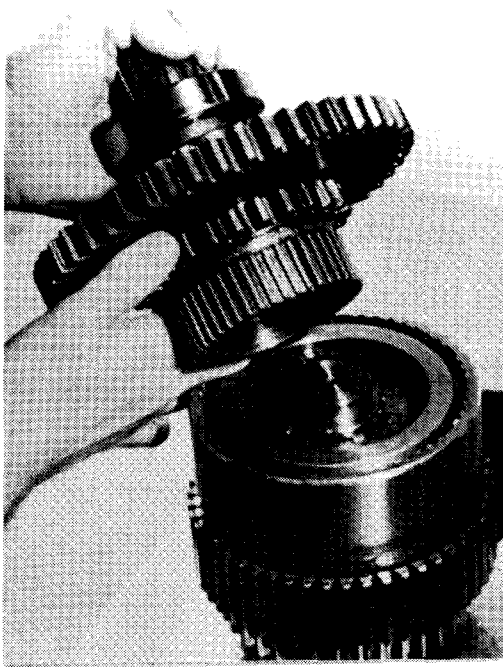


Fig. 94

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

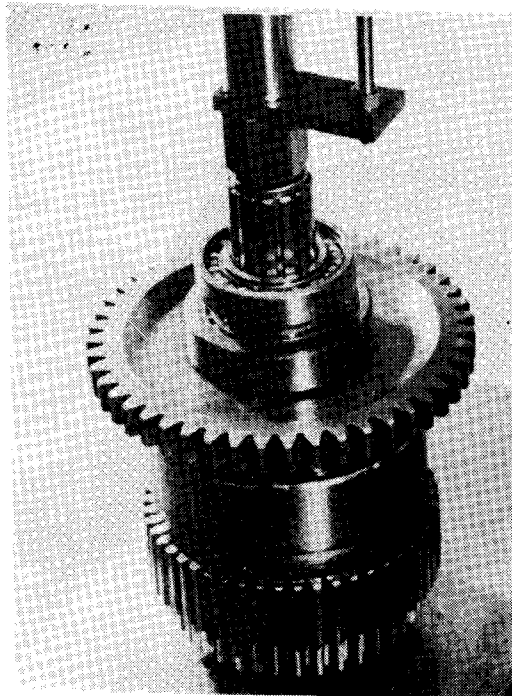


Fig. 95

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.

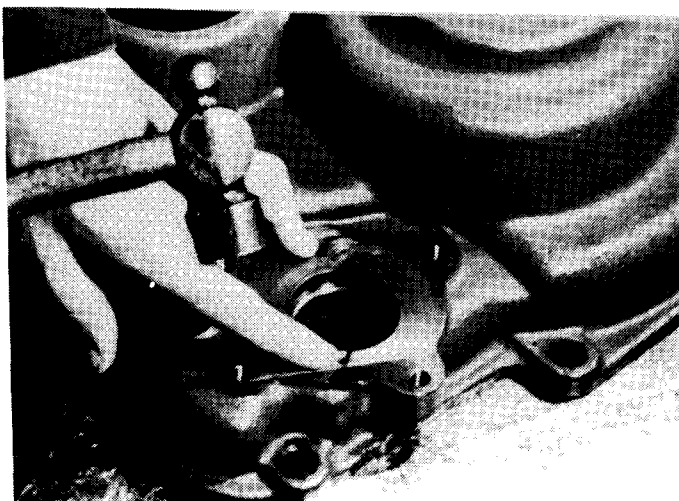


Fig. 96

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

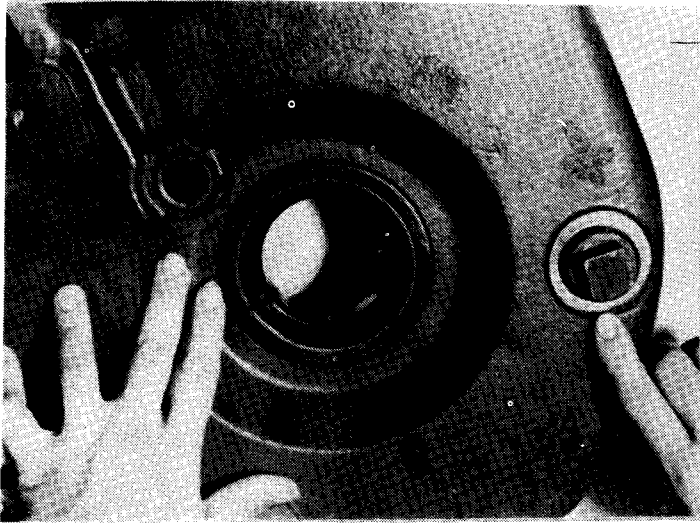


Fig. 97

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.

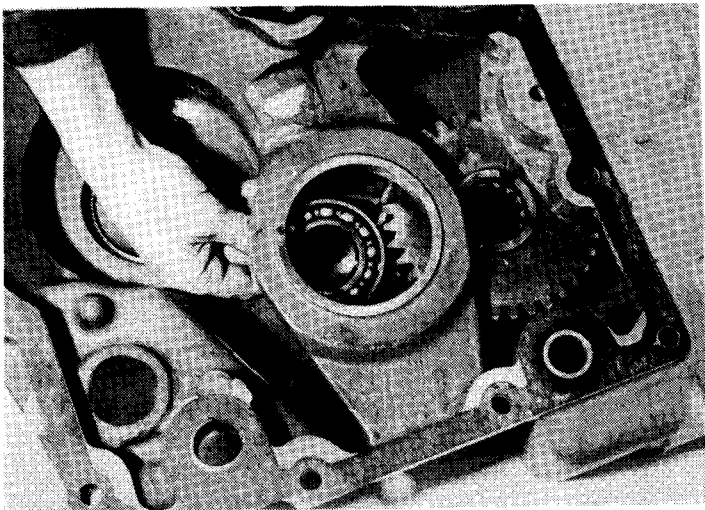


Fig. 98

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.

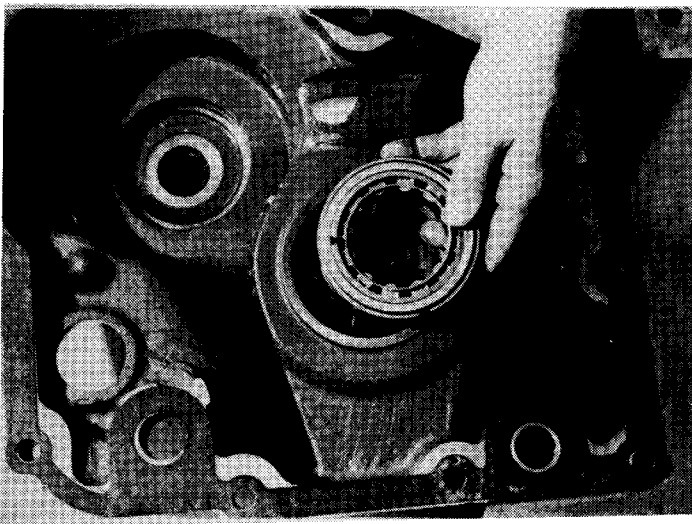


Fig. 99

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

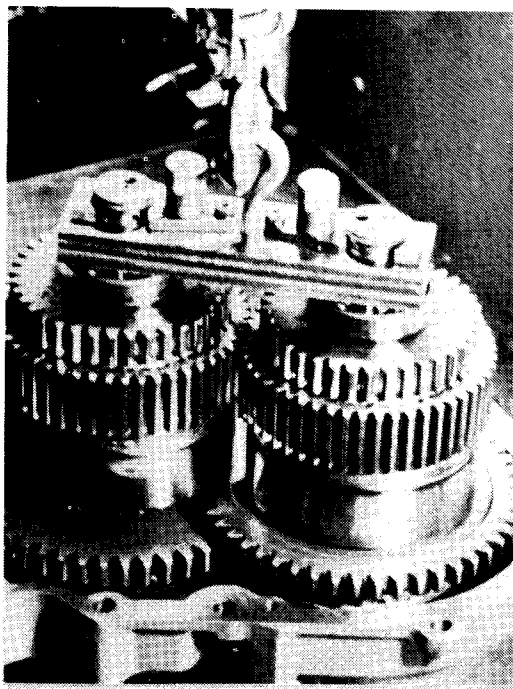


Fig. 100

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

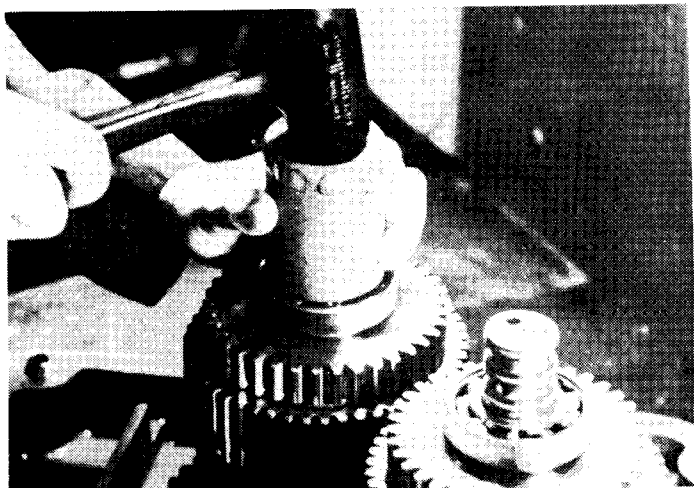


Fig. 101

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

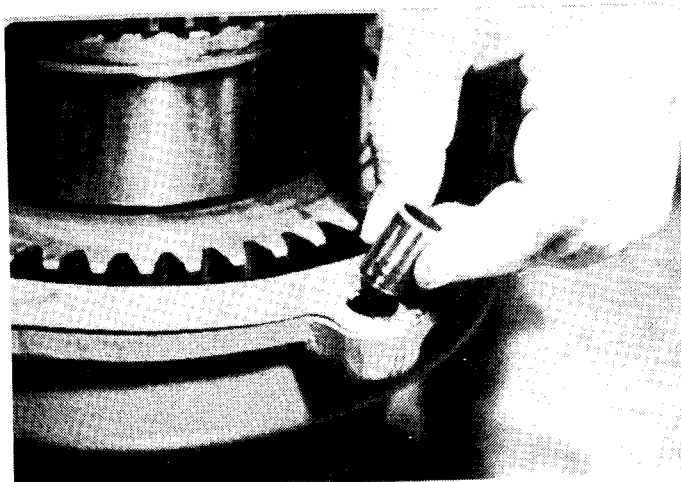


Fig. 102

Install the two hollow dowel pins in the output housing.

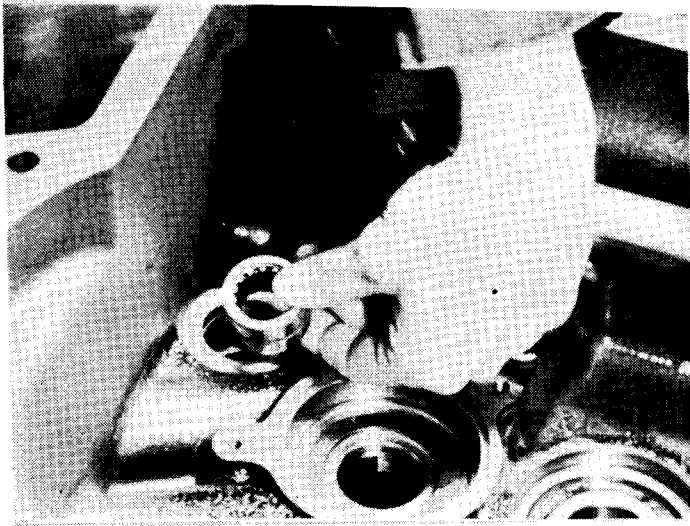


Fig. 103

Place pump shaft bearing in the input housing.

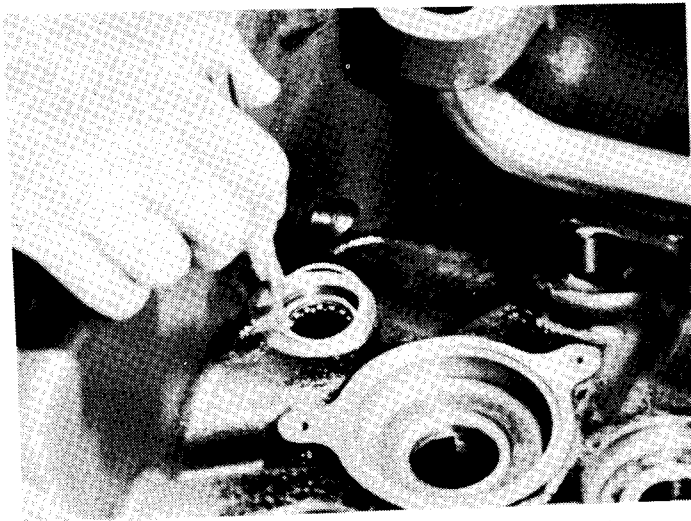


Fig. 104

Install snap ring over the bearing.

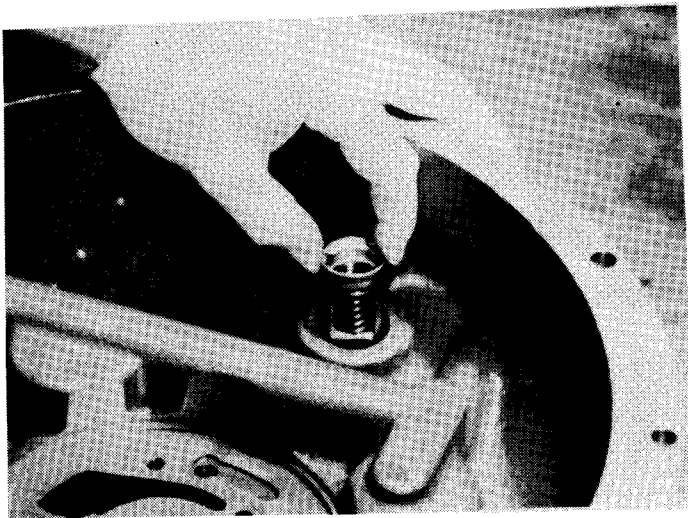


Fig. 105

Install converter by-pass valve in the input housing.

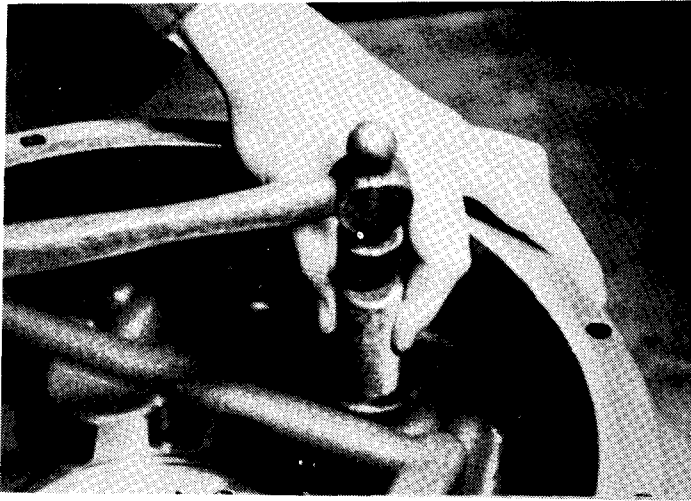


Fig. 106

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

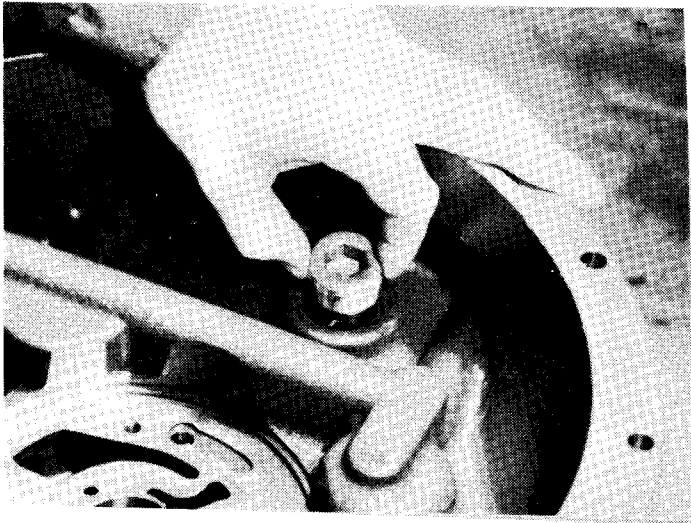


Fig. 107

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

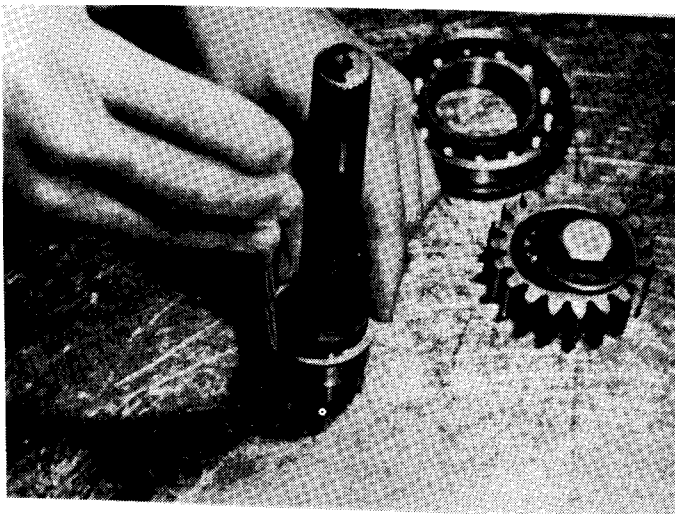


Fig. 108

Install snap ring on the input shaft.



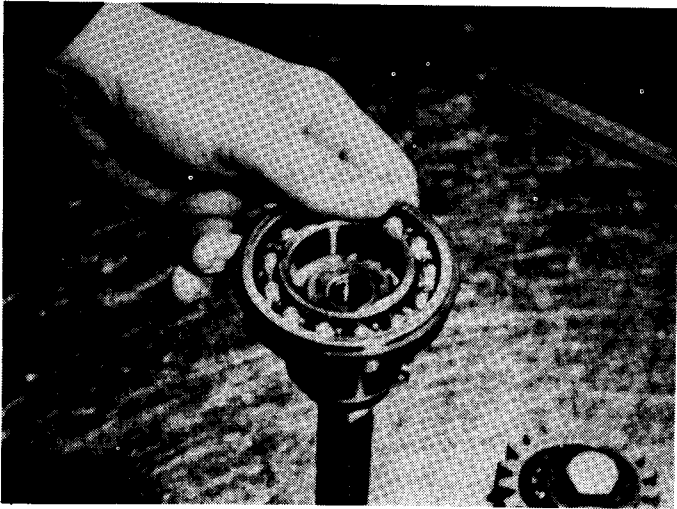


Fig. 109

Press input pilot bearing on the shaft.

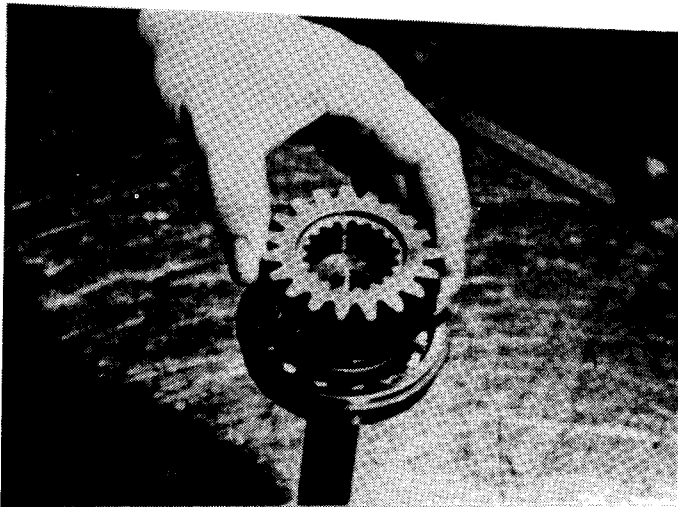


Fig. 110

Install gear on shaft.

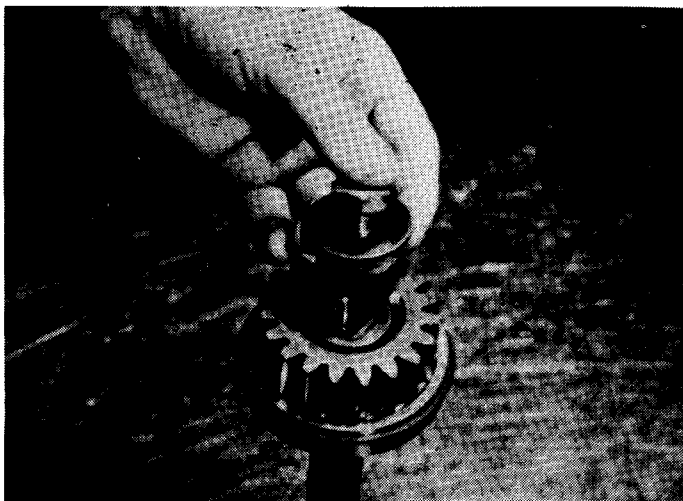


Fig. 111

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



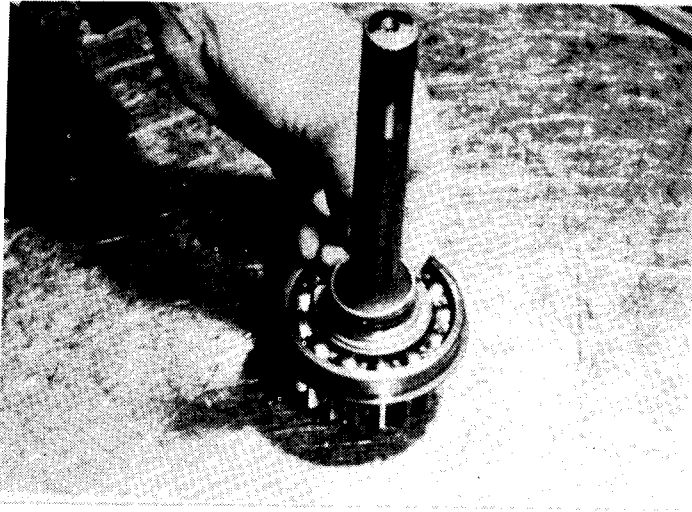


Fig. 112

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

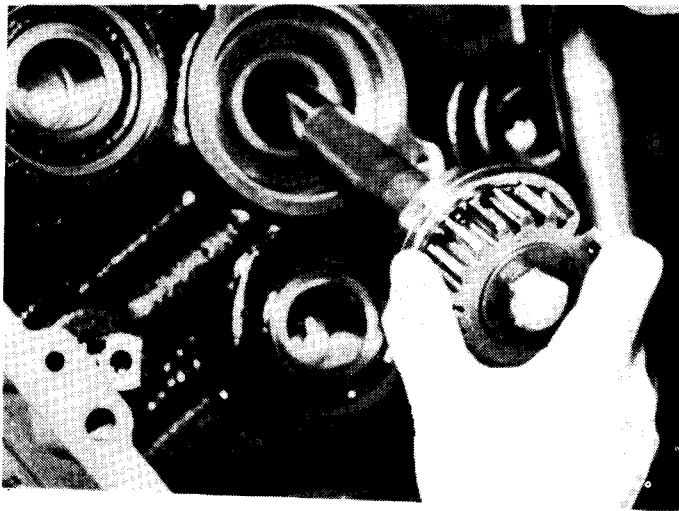


Fig. 113

Install input shaft into the input housing.

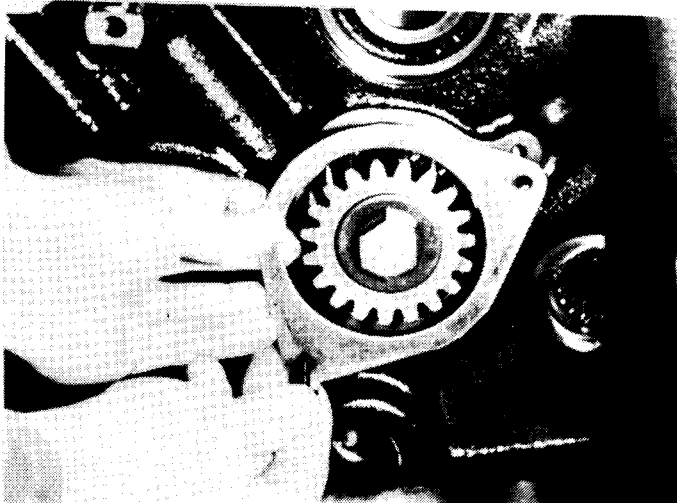


Fig. 114

Install retaining plate over the input shaft bearing.

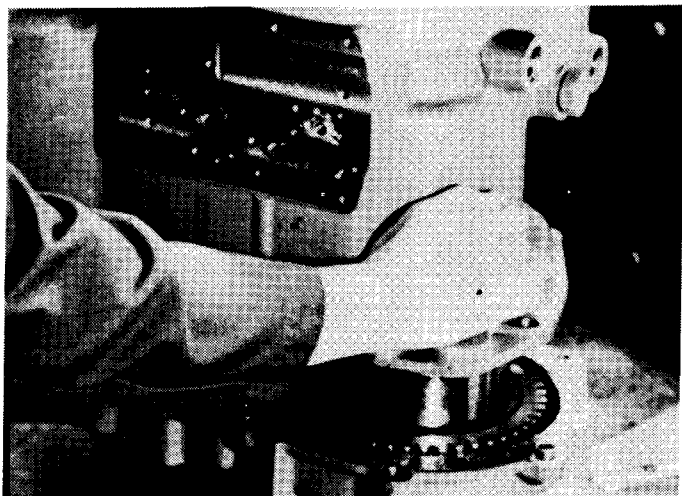


Fig. 115

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.

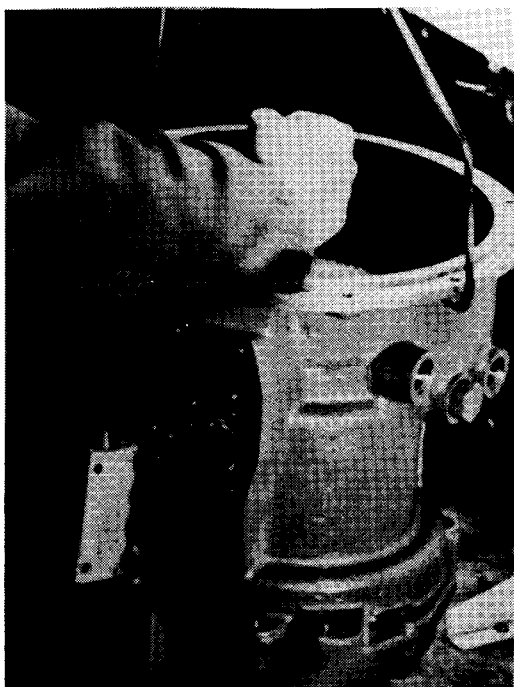


Fig. 117

Do not force the housing.