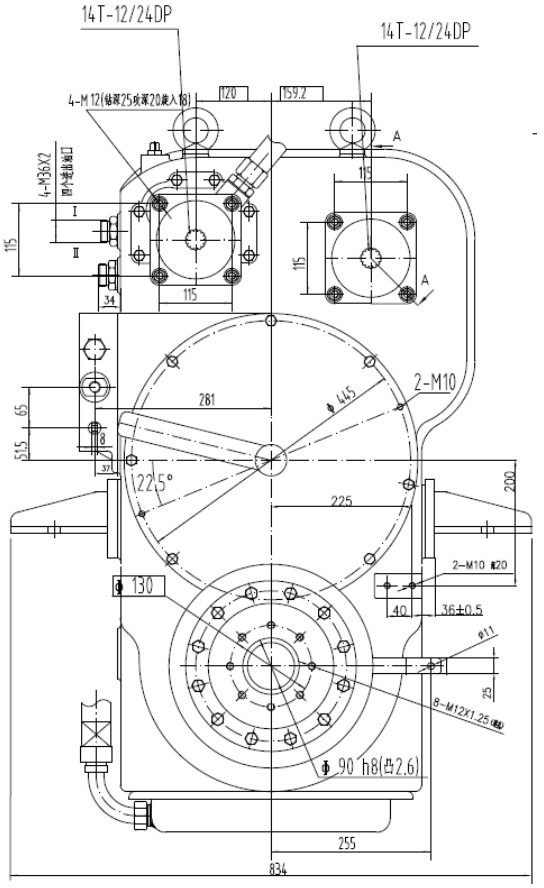
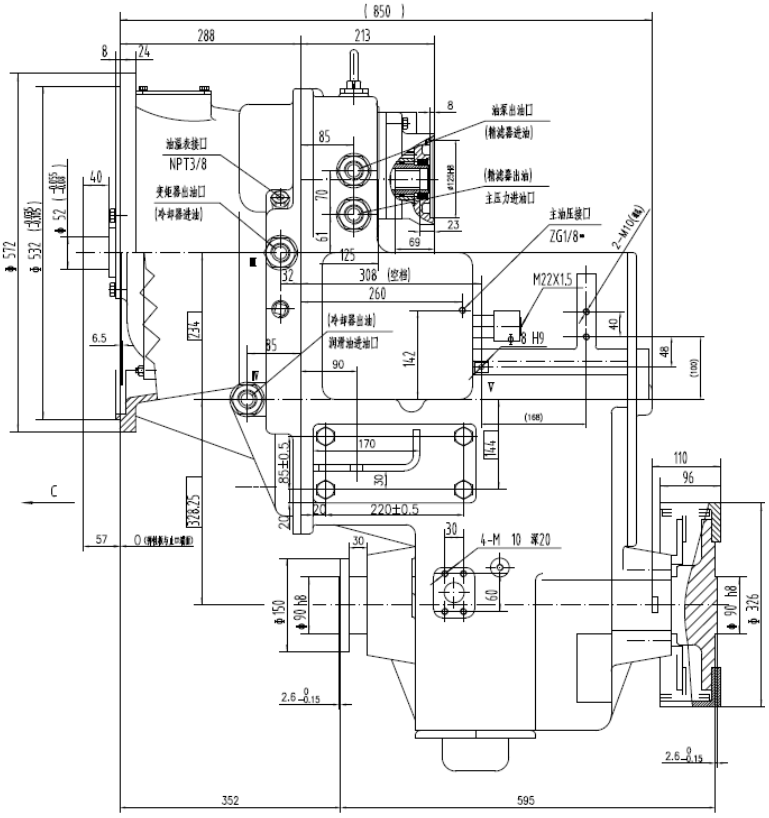
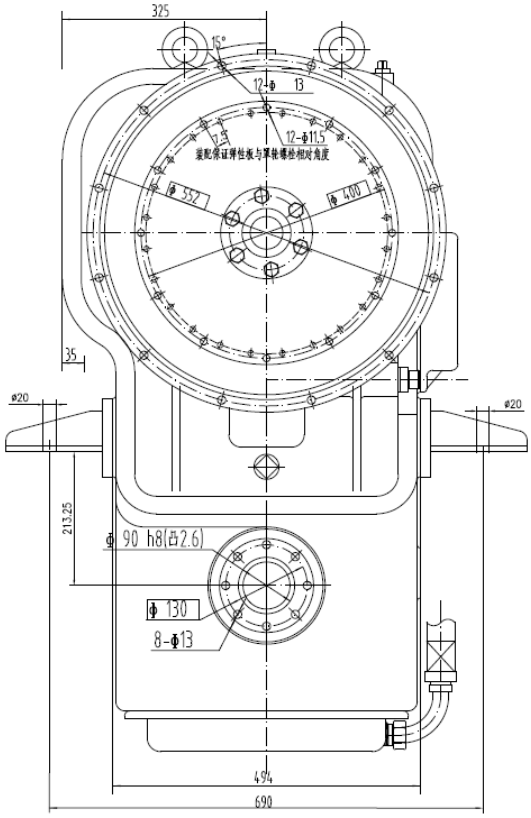
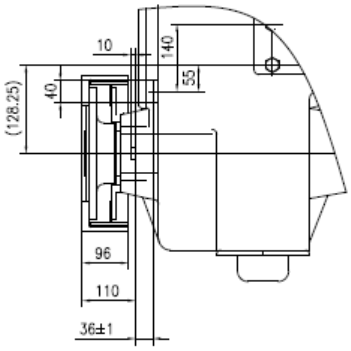
# GROUP 2 TRANSMISSION

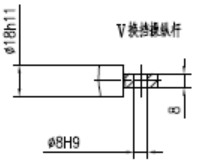
## 1. OUTSIDE VIEW



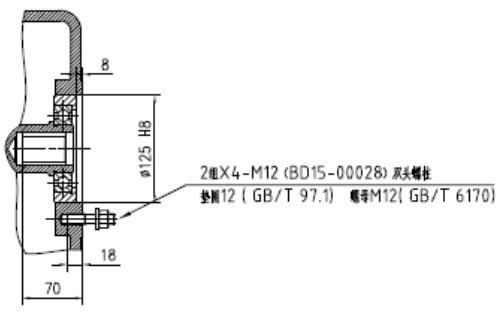



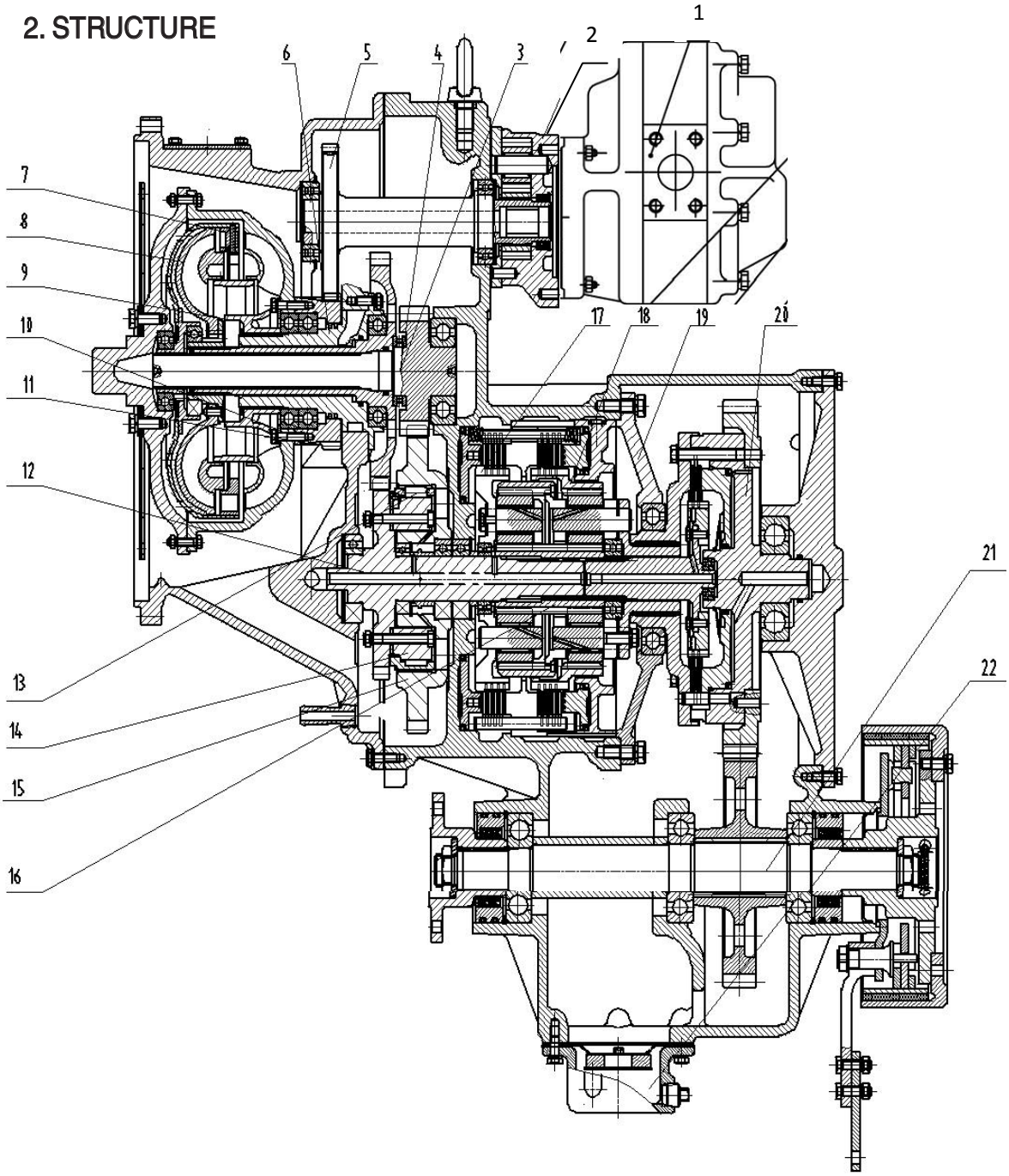




A-A



## 2. STRUCTURE




1 Working pump
2 Variable speed pump
3 First-stage input gear
4 Input second-stage gear
5 Shaft gear
6 Guide pulley seat
7 Second-stage turbine
8 First-stage turbine
9 Guide pulley
10 Pump pulley
11 Transfer gear
12 Intermediate input shaft
13 Large overrunning clutch roller
14 Large overrunning clutch cam
15 Outer-ring gear, large over-running clutch
16 Sun gear
17 Recerse gear planet shelf assembly
18 A block planet shelf assembly
19 Cover
20 Three shaft assembly
21 Four shaft assembly
22 Oil pan

## 3. TECHNICAL DATA

| | |
|---|---|
| Rated input power | 162 kW |
| Rated input speed | 2000 rpm |
| Torque converter type | Single-stage, two-phase, four-element |
| Torque converter model | YJSW315-8A |
| Torque ratio when zero speed | 4±0.20 |
| Transmission Type | Two forward and one reverse gears, hydraulic shift, planetary structure |
| Mechanical Gear Ratio; Gear I | 2.155 |
| Gear II | 0.578 |
| Reverse | 1.577 |
| Hydraulic oil pressure | 1.10 ~ 1.40 MPa |
| Inlet oil pressure, torque converter | 0.30 ~ 0.45 MPa |
| Outlet oil pressure, torque converter | 0.20 ~ 0.30 MPa |
| Lubricating oil pressure | 0.10 ~ 0.20 MPa |
| Max. permissible tempeture at outlet of torque converter | 120℃ |

# 4. OPERATION

## 1) HYDRAULIC TORQUE CONVERTER

Torque converter is designed as single-stage, two-phase and four elements. Its construction is as shown in figure 2 (page 2-3).

Torque converter consists mainly of pump pulley (10), first-stage turbine (8), second-stage turbine (7) and guide pulley (9). The pump pulley connects to engine flywheel by a flexible steel board. When the pump pulley turns, oil in torus is driven and has certain kinetic energy. Then the oil drives the first- and second-stage turbines, and drives the transmission running. Since turbines' torque and speed would change by variation of load, the torque converter possesses the functions of automatic torque- and speed-changing. The guide pulley is fixed on housing of torque converter by a guide pulley seat (6).

When hydraulic transmission has a small load or high speed, the second-stage turbine works individually; however, when the load increases and the speed decreases (at the moment the speed of motor is basically unchanged), two turbines automatically work together.

## 2) MECHANICAL TRANSMISSION

Power of the second-stage turbine (7) is transferred to intermediate input shaft (12) via input second-stage gear (4), and that of the first-stage turbine to input first-stage gear (3), then to outer-ring gear of large overrunning clutch (15). When external load is comparatively small, speed of intermediate input shaft (12) is higher than that of outer-ring gear of large overrunning clutch (15), thus making large overrunning clutch roller (13) racing. At this time the second-stage turbine works individually.

When external load is increasing, speed of intermediate input shaft (12) is caused to descend gradually. If speed of the intermediate input shaft (12) is lower than that of outer-ring gear of large overrunning clutch (15), the roller (13) is to be wedged. Power from the first-stage turbine is transferred to large overrunning clutch cam (14) via the roller (13). Since the cam (14) and the intermediate input shaft (12) are connected with bolts, the first- and the second-stage turbines work together at the time. Mechanical transmission has two forward gears and one reverse gear. Transmission route and power flow chart of each gear are as shown in figure 4, 5 and 6.

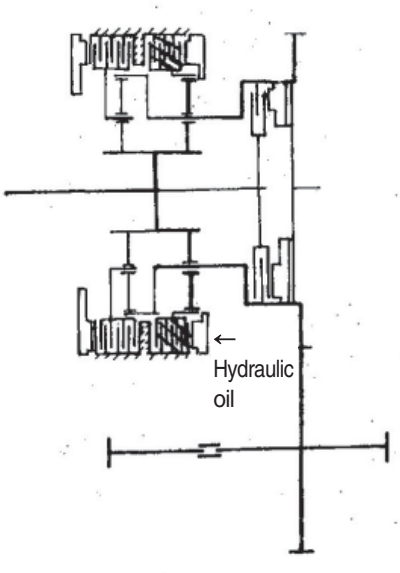



Figure 4 Power flow chart of forward gear I

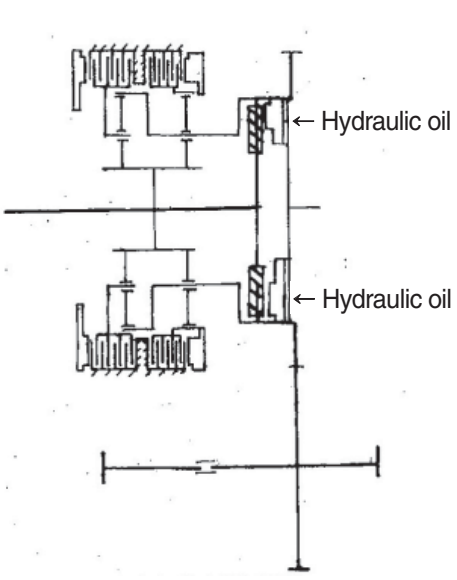



Figure 5 Power flow chart of forward gear II

At the bottom of the transmission, there is a front and rear axle release device (see to figure 2), which can control single- or dual-axle drive. Pull the control rod outward for single-axle drive and push inside for dual-axle drive. Generally, use single-axle drive in long-distance transport with light load to reduce loss from power recycling; and use dual-axle drive when operating under heavy load on slushy roads or crossing bridges.

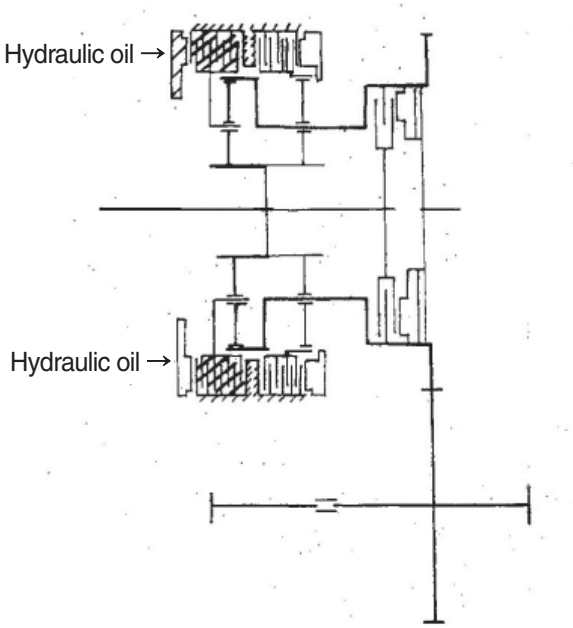



Figure 6 Diagram of reverse gear power flow chart

### 3) HYDRAULIC SYSTEM

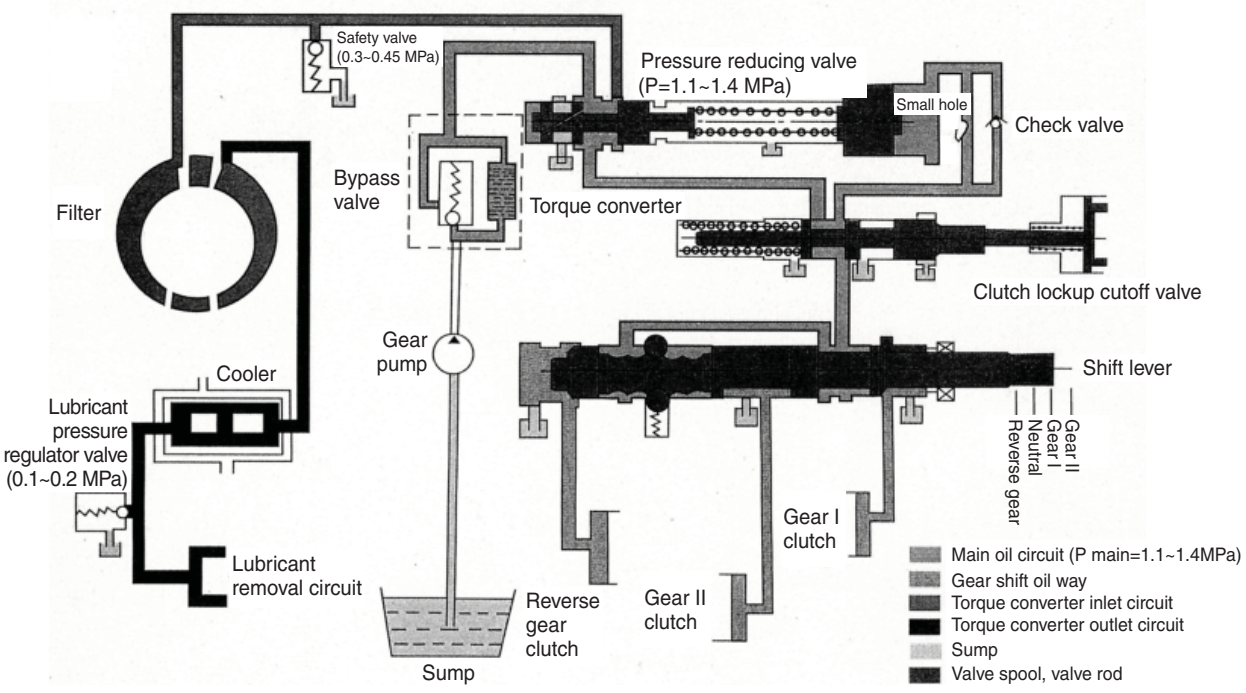



Diagram of hydraulic system of hydraulic transmission 850KPT51

## 5. APPLICATION AND INSTALLATION

### 1) INSTALLATION AND CONNECTION

**(1) Connection to engine**

Surface of torque converter casing is directly connected to that of engine flywheel casing by bolts. Through the connection between flexible steel board of converter and engine flywheel by stud bolts and nuts, power is transferred. Head of centering shaft at front end of pump pulley cover inserts flywheel centering hole as centering.

When installing, screw stud bolts into flywheel, open a chock on torque converter, lift the transmission and make hole on flexible steel board and centering hole lining up, screw end-face bolts and tighten the nuts through square holes at lower side of the chock, at last, cover the chock.

※ Difference between the plane of flywheel casing and that of flywheel ≤0.50 ㎜.

**(2) Connection to oil pump**

Working oil pump and steering oil pump are directly mounted onto PTO1 and PTO2 of transmission. (Shaft head length 60~65 ㎜, key connection useful length ≥40 ㎜).

※ Connection parameter must be correct.

**(3) Installation on vehicle**

Had better apply three- or four-point flexible supporting installation. There is each one V-block at both sides of transmission for installation and it's required to weld corresponding V-blocks on the vehicle body, too. Between two V-blocks insert a rubber plate of 10~12 ㎜ as elastic layer, avoiding stress from vehicle chassis being transmitted to transmission housing directly.

**(4) Selection and assembly of filter**

Select filter meeting parameter as follows : Min. filter flow: 120 ℓ/min

Filter accuracy not less than 150 mesh/inch. Use sintered filter as far as possible.

The installation height of filter and oil pipes must not be higher than that of the oil pipe connector of housing.

**(5) Selection and assembly of cooler**

Calculate cooling capacity required on the basis of an ambient temperature 30, which should be 35~40% of the rated power of engine. Normal flow must be assured.

Cooler for transmission should be located at cool water end of the cooling system.

Diameter of oil pipe and thread connector for cooler and filter should be more than 20, and when oil pipe exceeds 1m in length, the value increases by 20%.

※ The system maker is liable for correct installation.

### 2) APPLICATION REQUIREMENTS

**(1)** After installation of hydraulic transmission, fill in about AFT (DEXRON Ⅲ) from the oil hole. Check the oil level again after 5min running from starting engine, which should reach the height of oil-level plug. During checking, be sure to take safety measures to avoid vehicle moving or rolling.

**(2)** Oil level should be checked before each shift operating.

**(3)** When the transmission works, the hydraulic oil pressure should be kept within 1.1~1.4 MPa. In case of the value is lower than 1 MPa or higher than 1.6 MPa, stop and check to avoid damaging the parts inside.

(4) The oil temperature should be lower than 120˚C. When it exceeds, keep the engine speed within 1200~1500 rpm and make the transmission at neutral, then the oil temperature should decrease to a normal value in 2~3 min. If not, it shows there are problems in the system, which must be resolved before operation.

(5) Reduce machine speed before transmission changing down. And stop before reversing.

(6) The shifting lever should be at neutral position when starting the engine.

(7) Stop when control by using the axle releasing device.

After installation of a new T/M, keep running in for twelve hours under a load less than 70%, four hours for each of three gears. Check the oil temperature, oil pressure and the tightness of bolts. After running in, clean the sump strainer of transmission and then renew oil.

### 3) MAINTENANCE

Maintenance is carried out after running for 50, 250, 1000 and 2000 hours.

(1) 50 hours maintenance : ① check oil level ② Inspect the control system.

(2) 250 hours maintenance : Clean filter and clean sump.

(3) 500 hours maintenance : Change oil.

(4) 1000 hours maintenance : Replace filter.

(5) 2000 hours maintenance : Dismantle and inspect the transmission and the torque converter, replace easily-worn parts, regulate or replace parts when necessary.

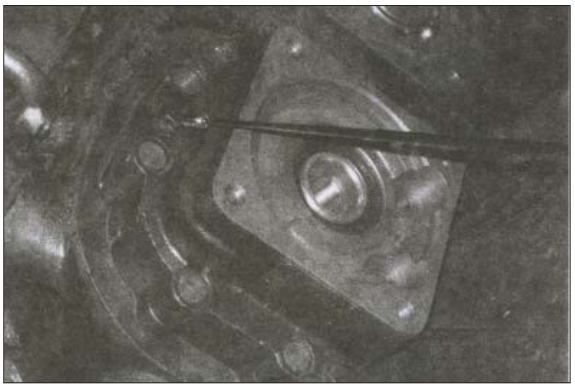
## 6. MAIN FAILURES AND REMEDIES

| Main Failures | Remedies |
|---|---|
| The engine rotating, but machine can not run | |
| 1. Did not in any gears<br>2. Hydraulic oil level too low<br>3. Brake rod of shift valve can not return<br>4. Insufficient oil supply due to shifting oil pump damaged or oil seals broken | 1. Put into gear or check if it correct<br>2. Add oil<br>3. Dismantle and check the brake rod<br>4. Replace oil pump or oil seals |
| Insufficient driving force | |
| 1. Low oil pressure at inlet of torque converter<br>2. Clutch sliding<br>3. Insufficient engine speed | 1. Check oil level; clean sump strainer and filter; check the pressure regulating valve of torque converter<br>2. Inspect clutch oil pressure and piston oil seal<br>3. Inspect the engine |
| Variable speed oil pressure too low | |
| 1. Misalignment of reducing valve<br>2. Obstructed oil filter<br>3. Damaged oil pump<br>4. Serious oil leakage in clutch oil seal | 1. Realignment<br>2. Clean oil filter<br>3. Replace oil pump<br>4. Replace oil seals |
| Oil temperature in torque converter too high | |
| 1. Oil level in transmission too low or too high<br>2. Clutch sliding<br>3. Long-time, heavy load operation | 1. Fill oil acc. to specified<br>2. Check oil pressure of clutch<br>3. Stop to cool |
| Can not put into gear after emergent braking | |
| 1. Misalignment limit screws of air brake valve pedal<br>2. Choked piston of air brake valve. Return is unavailable after release of brake.<br>3. Choked brake valve rod | 1. Realign the limit screws of pedal so that air brake valve can return completely.<br>2. Clean and repair the piston<br>3. Dismantle and check brake valve rod |

## 7. DISASSEMBLY AND ASSEMBLY

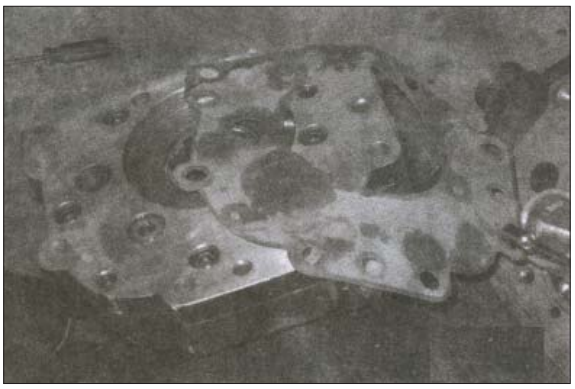
### 1) DISASSEMBLY

(1) Use a M16 socket wrench to unscrew 6-M10×60 bolts on the interface between oil pump and casing. Use a copper bar to lightly knock on the outside of oil pump and remove the oil pump.

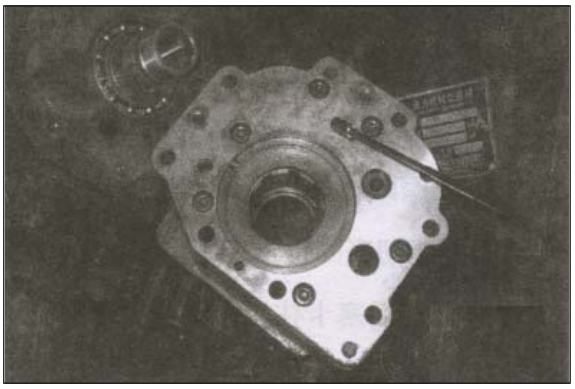


850KTM01

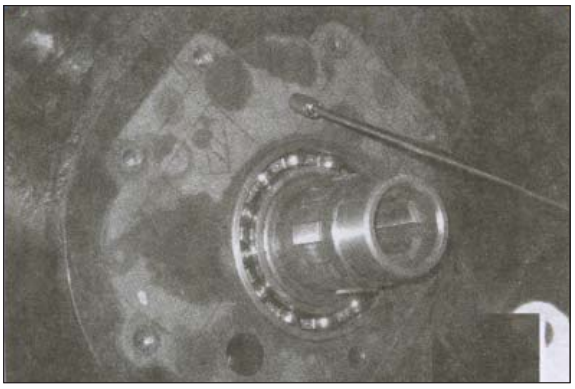
(2) When assebmling, set a paper washer on the surface of oil pump with grease, set 6-M10×60 bolts and fasten up one by one.



850KTM02

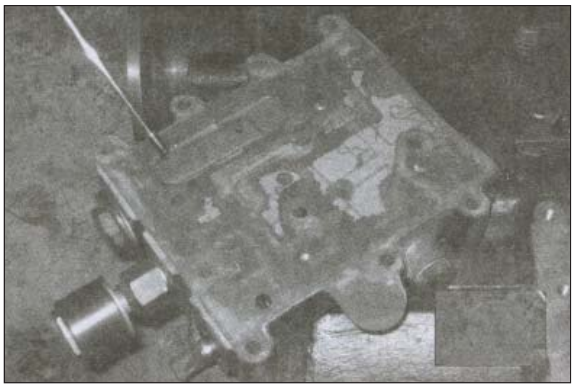


850KTM03



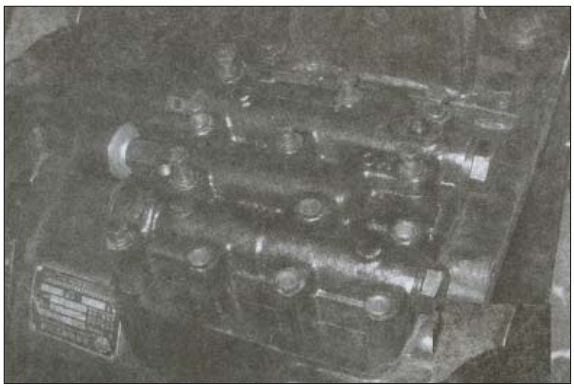
850KTM04

(3) Use a M16 socket wrench to fasten up 10-M10×70 and 1-M10×65 bolts on the control valve.



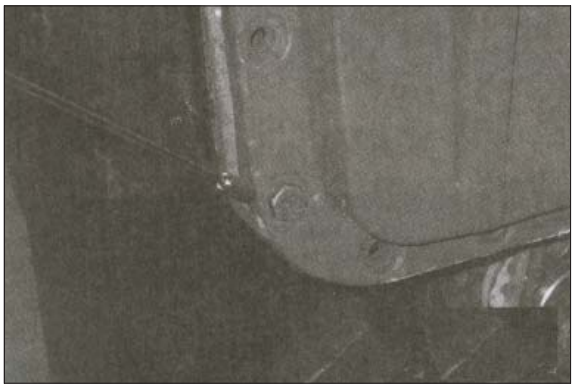
850KTM05

(4) When assembling, set a paper washer on the surface of casing with grease and mount the control valve. First set a bolt, then insert 10-M10×70 and 1-M10×65 bolts in sequence and fasten up. Be sure that the bolts are fastened from inside to outside not to have the water paper broken.

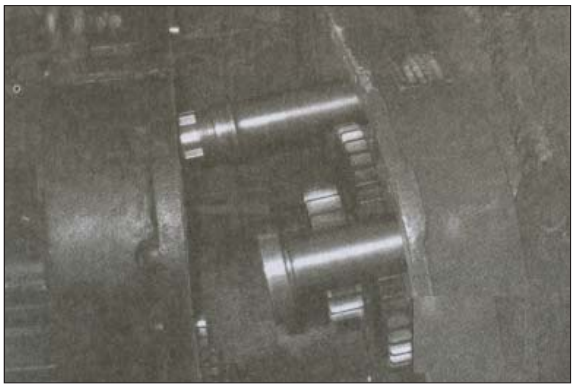


850KTM06

(5) Use a M16 socket wrench to unscrew 26-M10×30 and 5-M10×70 jointing the torque converter and transmission. Use 3-M10×70 art bolts to disassemble the torque from the casing.



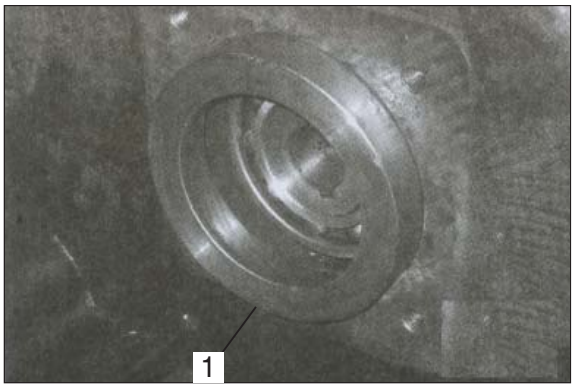
850KTM07



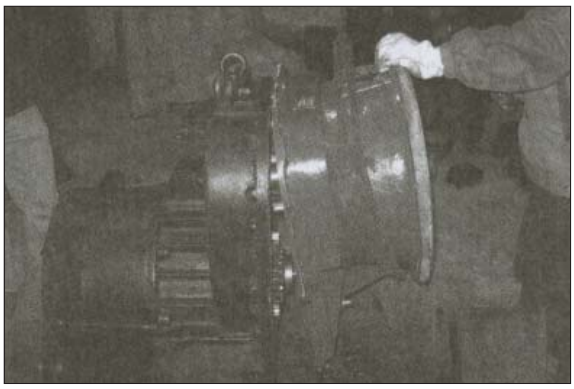
850KTM08

(6) Dismount the bearing seat and torque converter respectively.

1 Bearing seat



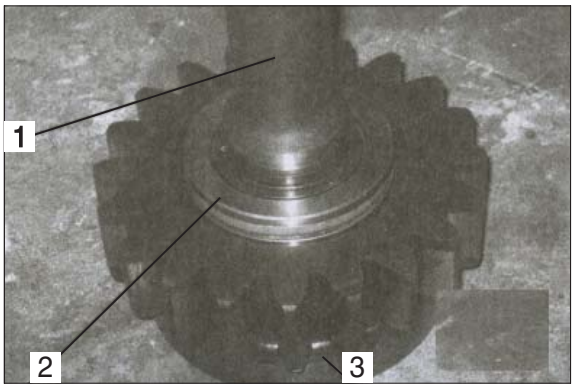

850KTM09



850KTM10

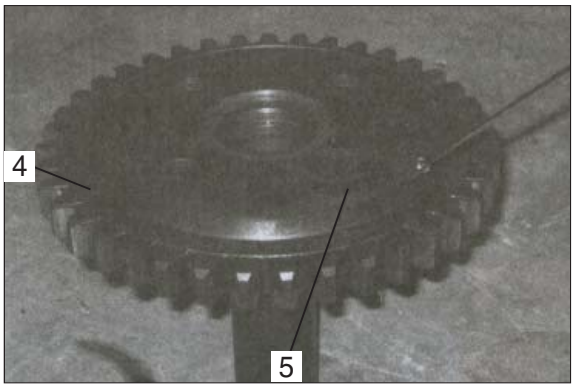
(7) Disassemble the input first and second gears from the torque converter respectively.

1 Input first gear
2 Ball thrust bearing
3 Ball bearing (55×120×29)




850KTM11

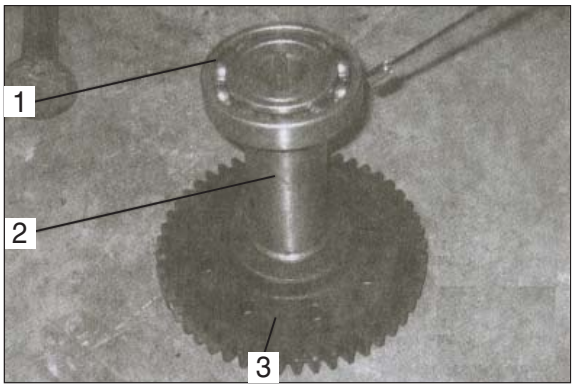
4 Input second gear
5 Oil seal (45×53×5)




850KTM12

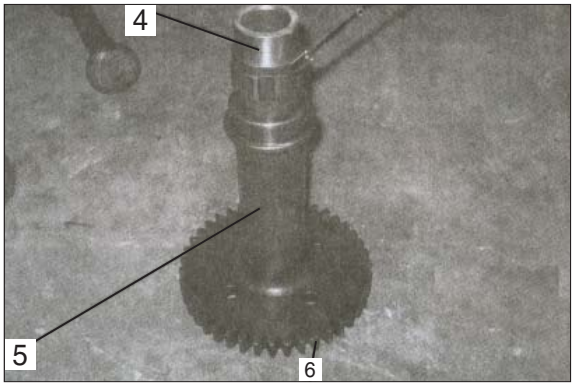
(8) Use a M16 socket wrench to unscrew 26-M10×30 and 5-M10×70 jointing the torque converter and transmission. Use 3-M10×70 art bolts to disassemble the torque from the casing.

1 Ball bearing (55×100×21)
2 Steering oil pump driving shaft
3 Steering oil pump drive gear
Flat key (14×35)
Ball bearing (50×90×20)



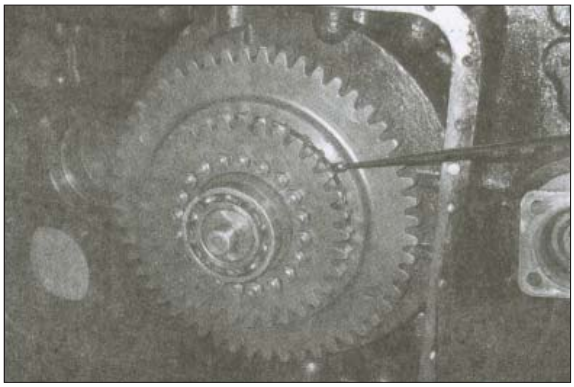
850KTM13

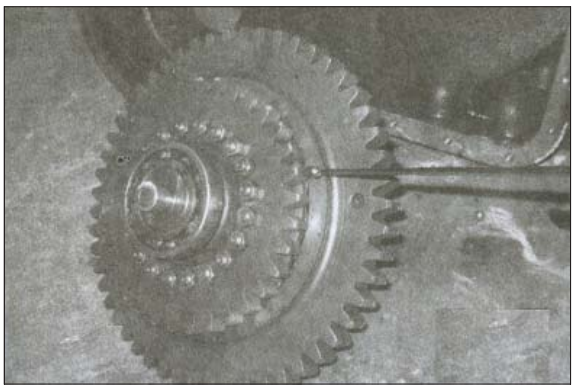
4 Ball bearing (60×95×18)
5 Gear shaft
6 Ball bearing (50×90×20)



850KTM14

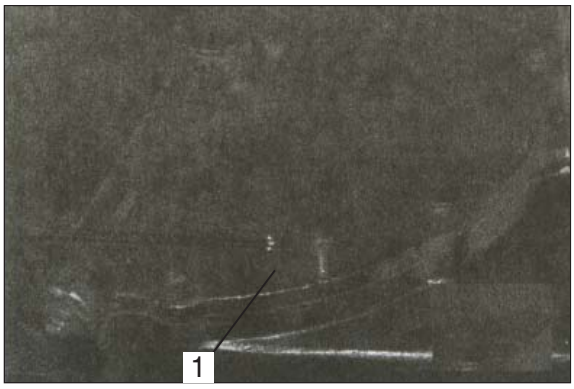
(9) Disasemble biaxial assy.


850KTM15


850KTM16

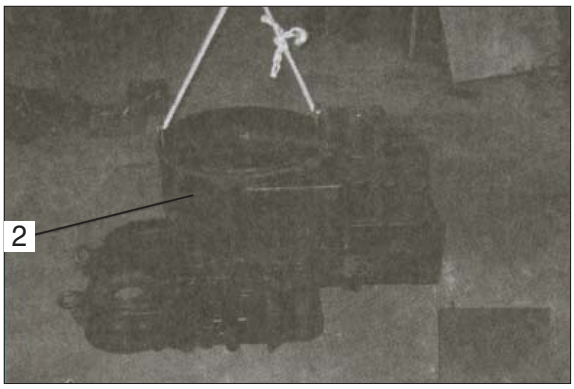
(10) Put the transmission in level position and use a M16 wrench to unscrew 8-M10×30 bolts of end cover. Set two eye bolts into screw hole and remove the end cover.

1 End cover



850KTM17

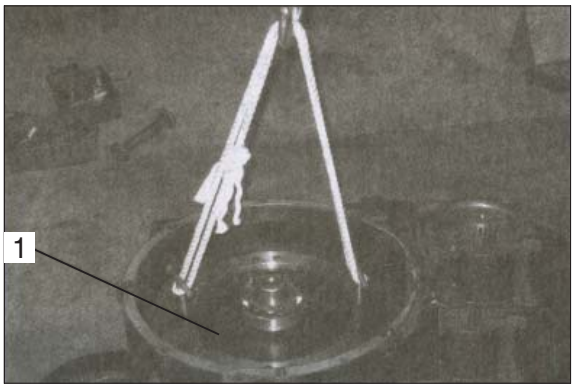
2 Casing



850KTM18

(11) Use two M12 eye bolts to sling the direct gear assy out.

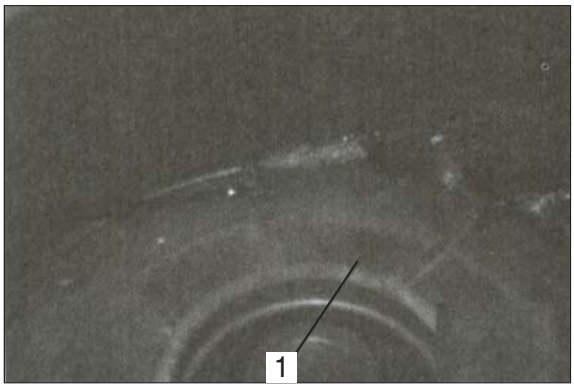
1 Direct gear assy



850KTM19

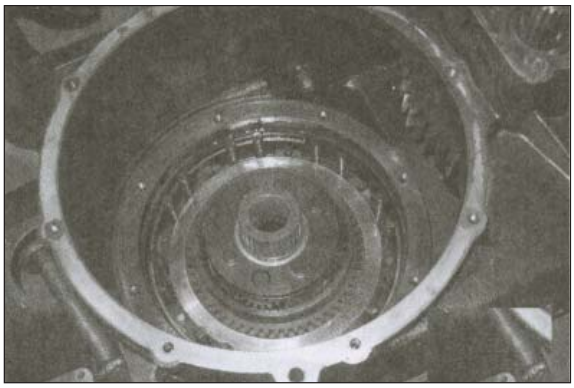
(12) Use a M22 socket wrench to unscrew 8-M14×40 bolts on the mid-cover to remove it.

1 Mid-cover

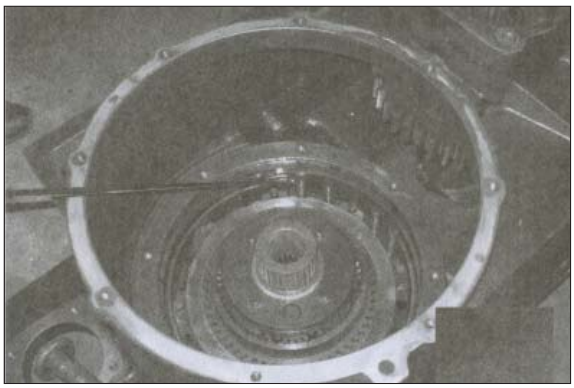


850KTM20

(13) Remove the parts of the planetary gear sets inside transmission, gear I cylinder assy, 15 spring pins, springs, friction discs (4 sets), gear I planet carrier, isolator assy, friction discs (4 sets), reverse gear planet carrier assy and reverse gear piston in sequence.



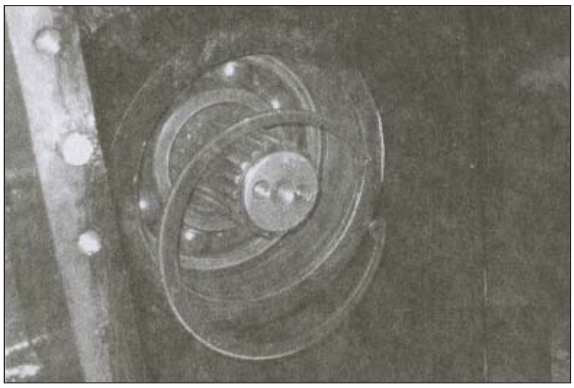
850KTM21



850KTM22

(14) Remove 2 rings 130 at two sides of the casing and knock out the output shaft forward from the rear side.

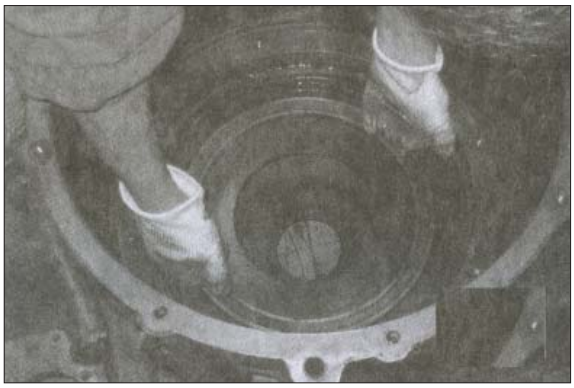
850KTM23



850KTM24

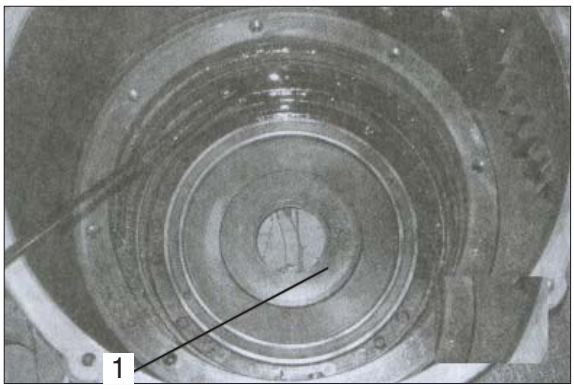
## 2) ASSEMBLY

(1) Clean the transmission case, put it in level position, and assemble the reverse gear piston.



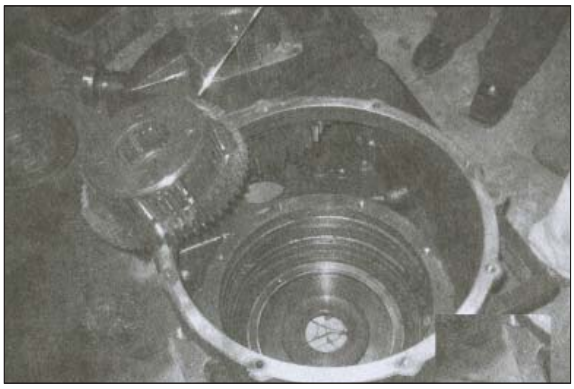
850KTM25

1 Reverse gear piston




850KTM26

(2) Assemble reverse planetary gear.

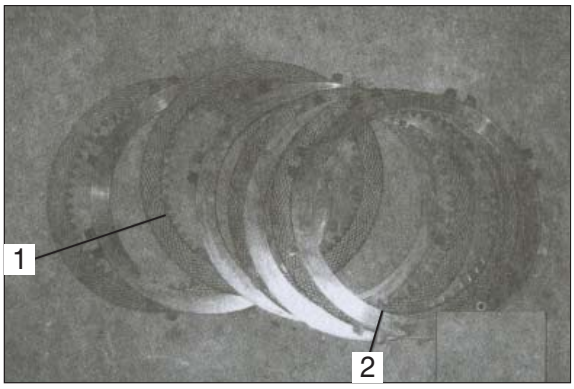


850KTM27

850KTM28

(3) Assemble 4 sets of reverse driven disc and driving disc in sequence.

1 Reverse driving disc
2 Reverse driven disc

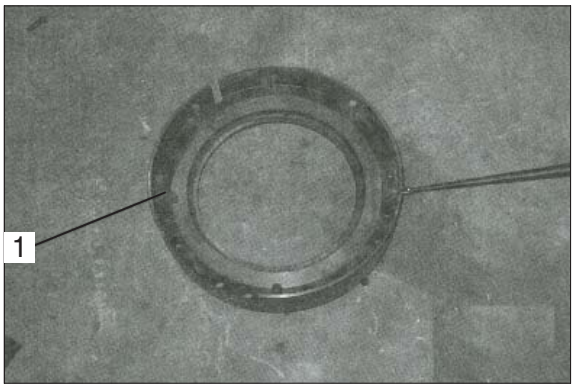


850KTM29

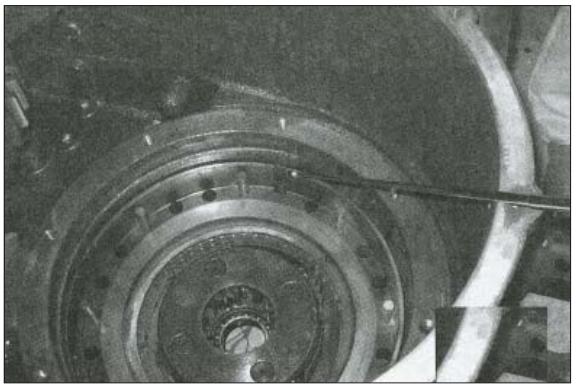

850KTM30

(4) Assemble friction disc isolator assy.

1 Friction disc isolator assy

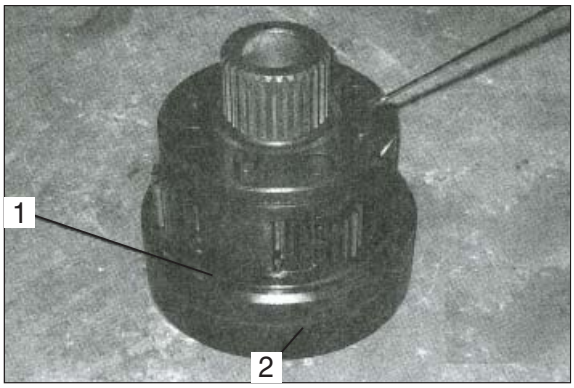


850KTM31

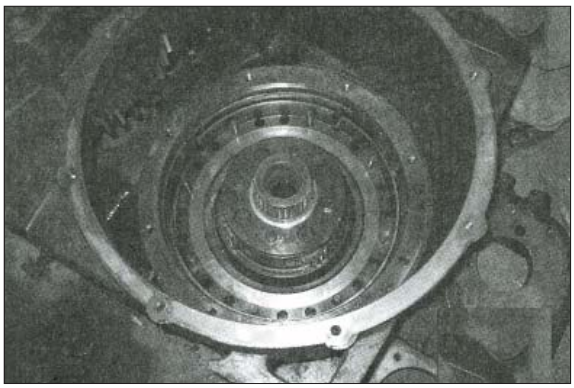

850KTM32

(5) Assemble gear I planet gear carrier assy.

1 Pinion carrier
2 Reverse ring gear

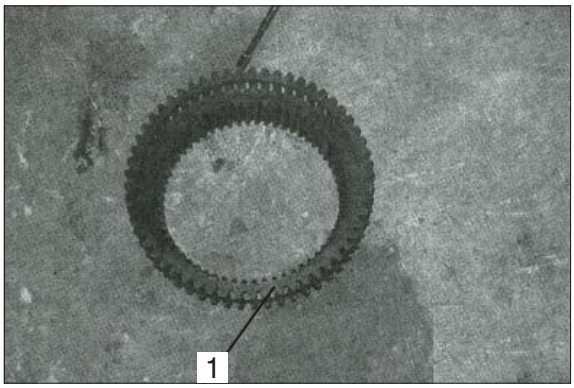


850KTM33


850KTM34

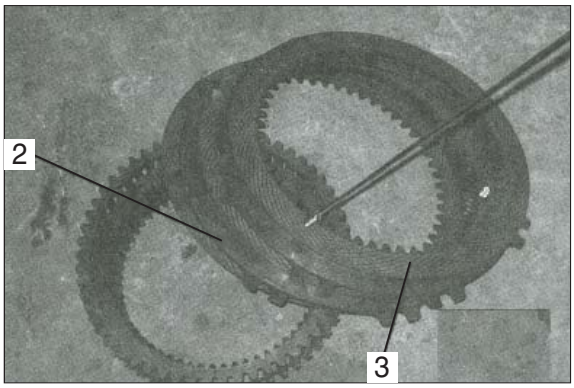
(6) Assemble gear I ring gear and 4 sets of driving disc and driven disc.

1 Gear I ring gear



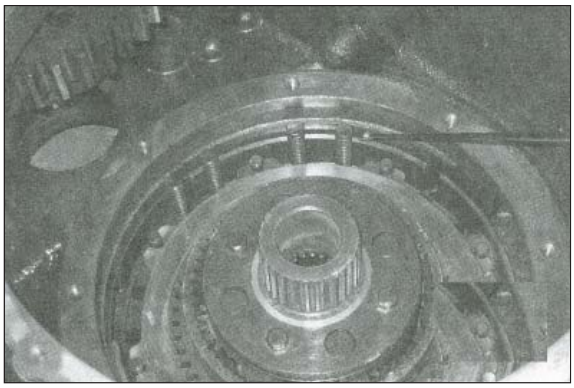
850KTM35

2 Driven disc
3 Driving disc



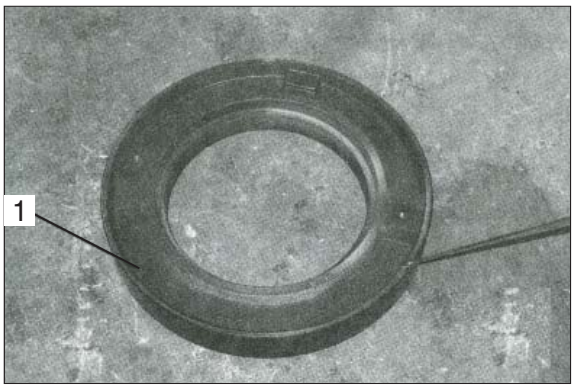
850KTM36

(7) Insert 15 springs and spring pins, and put the gear I cylinder body assy.



850KTM37

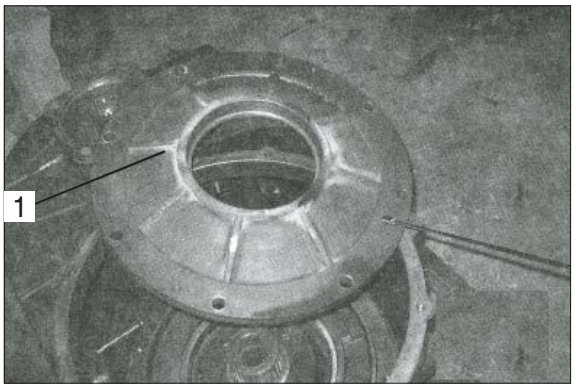
1 Gear I cylinder body



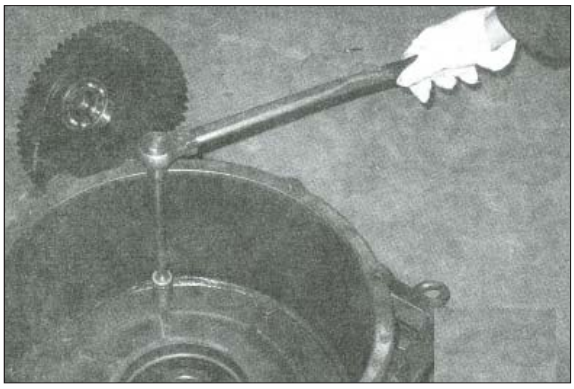

850KTM38

(8) Put the mid-cover and use a M22 socket wrench to fasten up 8-M14M0 bolts on the mid-cover.

1 Mid-cover



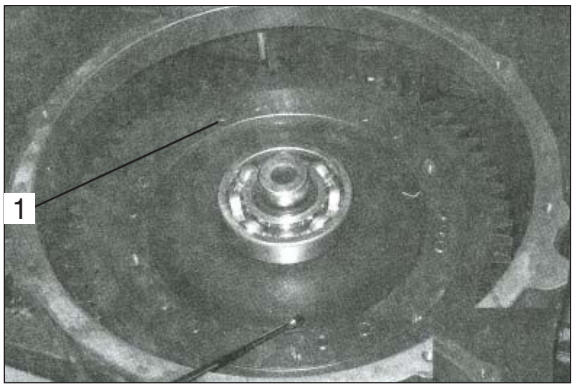

850KTM39



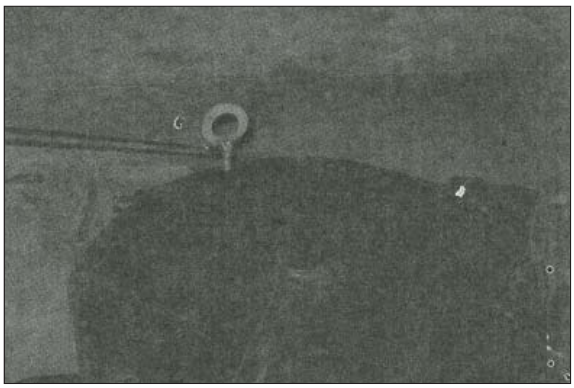
850KTM40

(9) Assemble direct gear assy, end cover, and use a M16 wrench to fasten up 8-M 10×30 bolts.

1 Direct gear assy

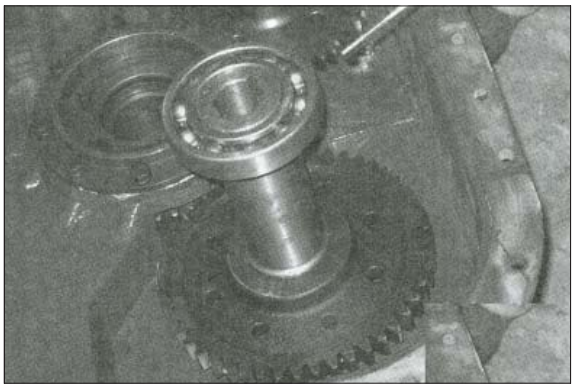



850KTM41



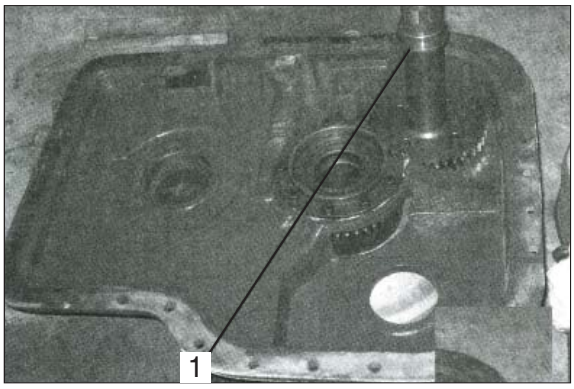
850KTM42

(10) Assemble steering oil pump driving shaft and gear shaft assy into the torque converter.



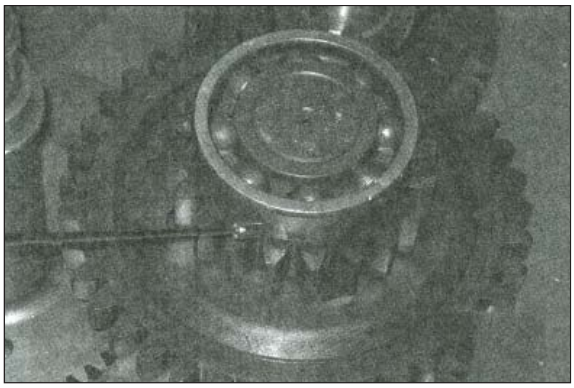
850KTM43

1 Gear shaft




850KTM44

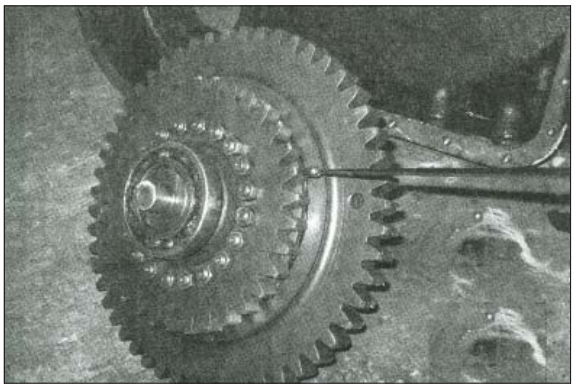
(11) Assemble the 1st/2nd stage gear input and bearings into torque converter.



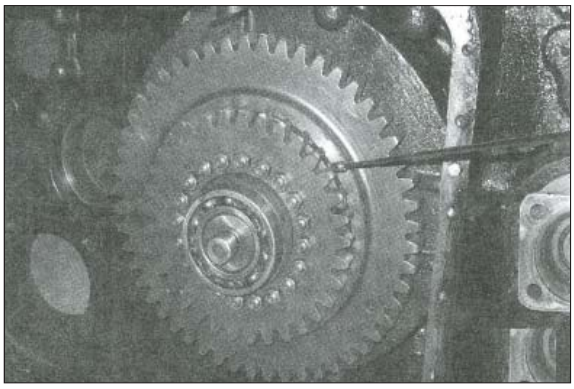
850KTM45

850KTM46

(12) Assemble the biaxial assy into the transmission box.

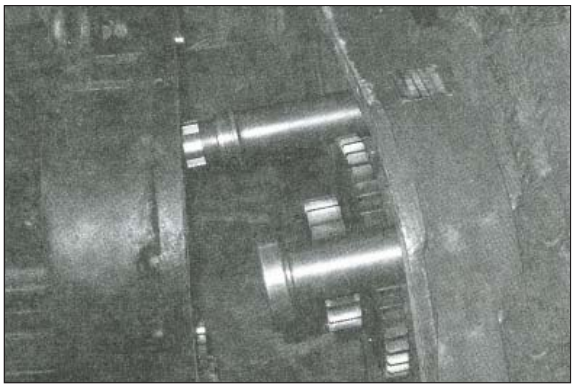


850KTM47

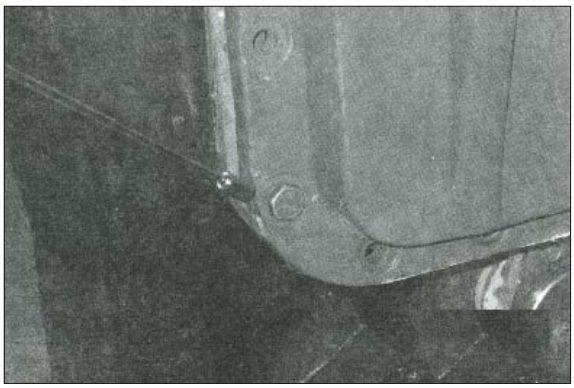


850KTM48

(13) Joint the torque converter to the transmission and set 2-A10×30 pin and then use a M16 socket wrench to fasten 26-M10×30 and 5-M10×70 to combine the torque converter with transmission box.

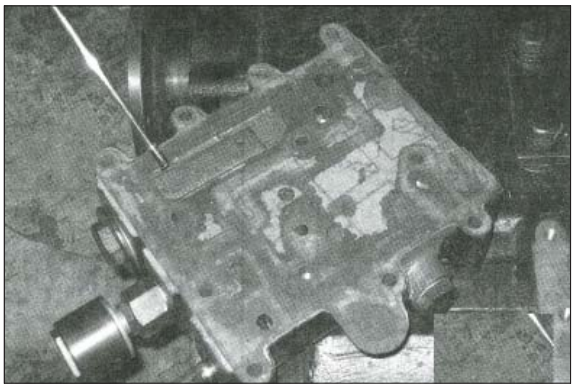


850KTM49

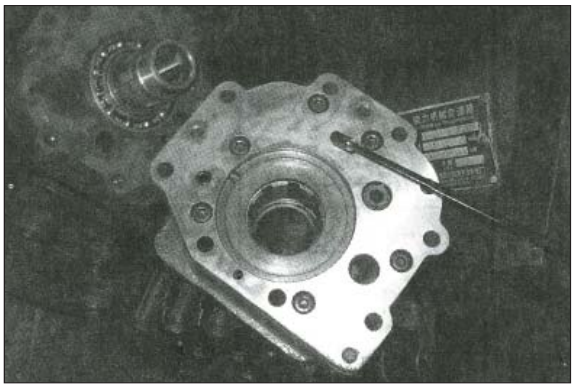


850KTM50

(14) Assemble the control valve and oil pump.



850KTM51



850KTM52