GROUP 2 TRANSMISSION

1. FEATURES AND USE

This transmission features simple structure, stable operation, easy operation and high efficiency.

This transmission is used for transmission of four-wheel drive type wheel loaders which need frequent change of load and speed after mounting a hydraulic torque converter.

2. TECHNICAL DATA

Maximum input	2500 rpm
Maximum input torque	950 N.m
Maximum input power	74 kW
Torque ratio of torque converter	3.0~3.6
Type	Countershaft, constant mesh, power shifting transmission
Ratio	Forward Ⅰ3.82 Ⅱ2.08 Ⅲ1.09 Ⅳ 0.59 Backward Ⅰ3.05 Ⅱ0.87
Fluid	AFT (DEXRON Ⅲ)
Pump	CB32 (Not accompanying with transmission)
Operating pressure	1.1~1.5 Mpa
Allowable pan oil temperature	100˚C
Brake relief valve operating pressure	>0.55 Mpa

1) WORKING PRINCIPLE OF TRANSMISSION SYSTEM

The transmission has four shafts and five shifting clutches, which transmission principle is illustrated in figure 2, see page 2-4.

When first hydraulic clutch is engaged with low clutch, the power from torque converter is transmitted in following course: 1-7-9-3-11-13-4, which is first gear.

When second hydraulic clutch is engaged with low clutch, the power is transmitted in following course: 1-8-10-3-11-13-4, and second gear is gained.

Other shifting gears can be obtained by analogy referencing table as below.

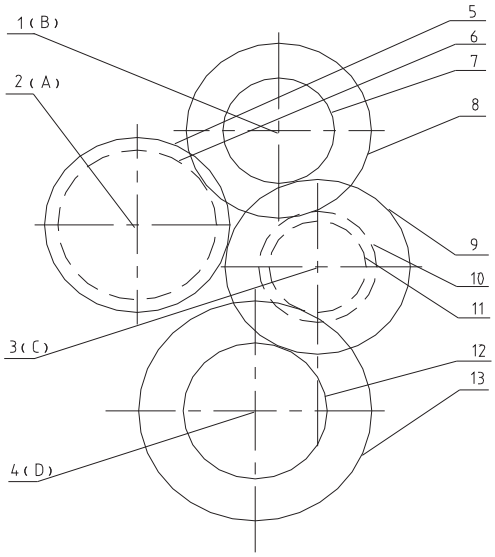


Figure 1

1 Input shaft
2 Reverse gear shaft
3 Countershaft
4 Output shaft
5 Reverse rack
6 Reverse pinion
7 Input shaft I, III gear
8 Input shaft II, IV gear
9 Countershaft I, III gear
10 Countershaft II, IV gear
11 Countershaft low gear
12 Output shaft high gear
13 Output low gear

Transmission system diagram

Gear \ Clutch		I	II	Backward	Low gear	High gear
Forward	I	✓			✓	
	II		✓		✓	
	III	✓				✓
	IV		✓			✓
Reverse	I			✓	✓	
	II			✓		✓

Remarks : Each gear needs two clutches engaged, separating either of which will be neutral gear. Low and high gear can't be engaged simultaneously while they can be separated simultaneously.

TRANSMISSION DIAGRAM

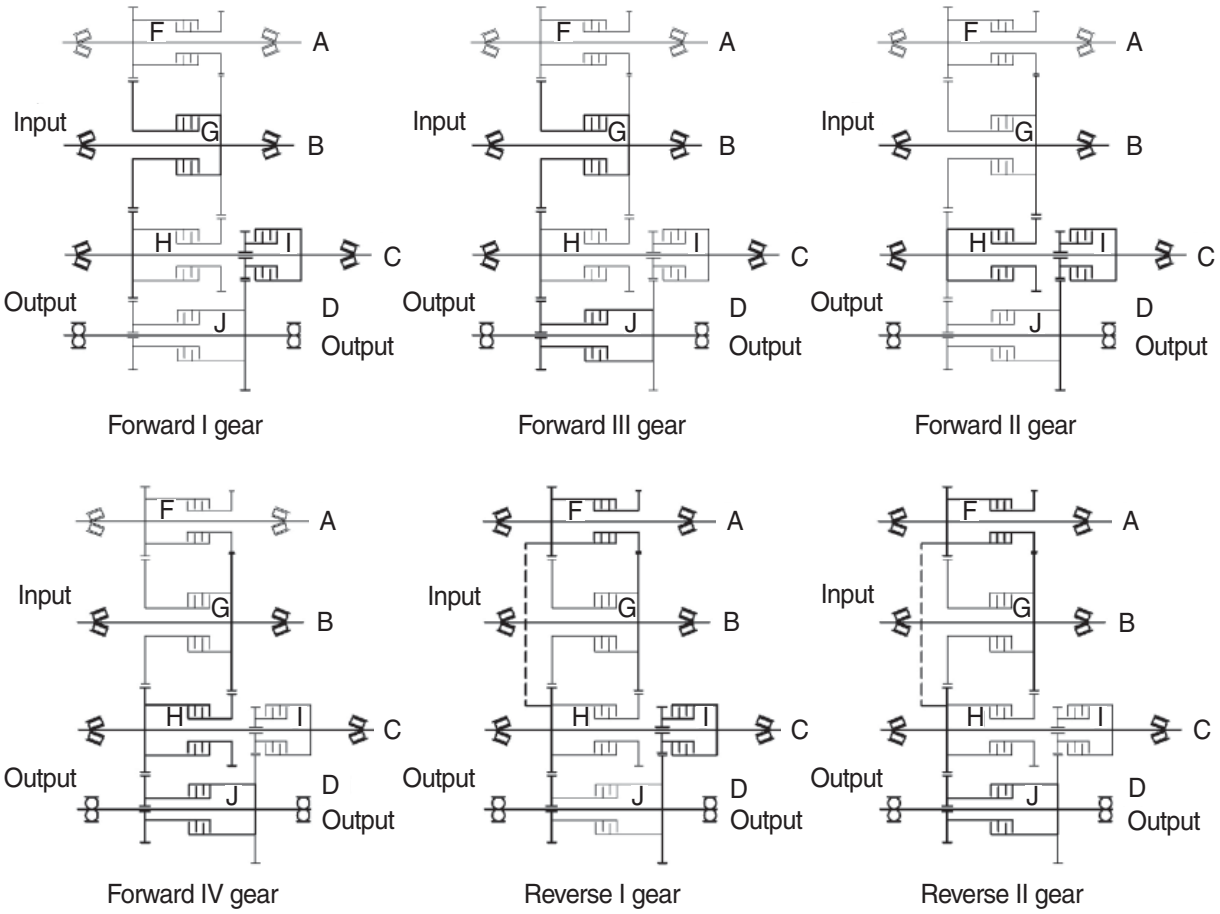


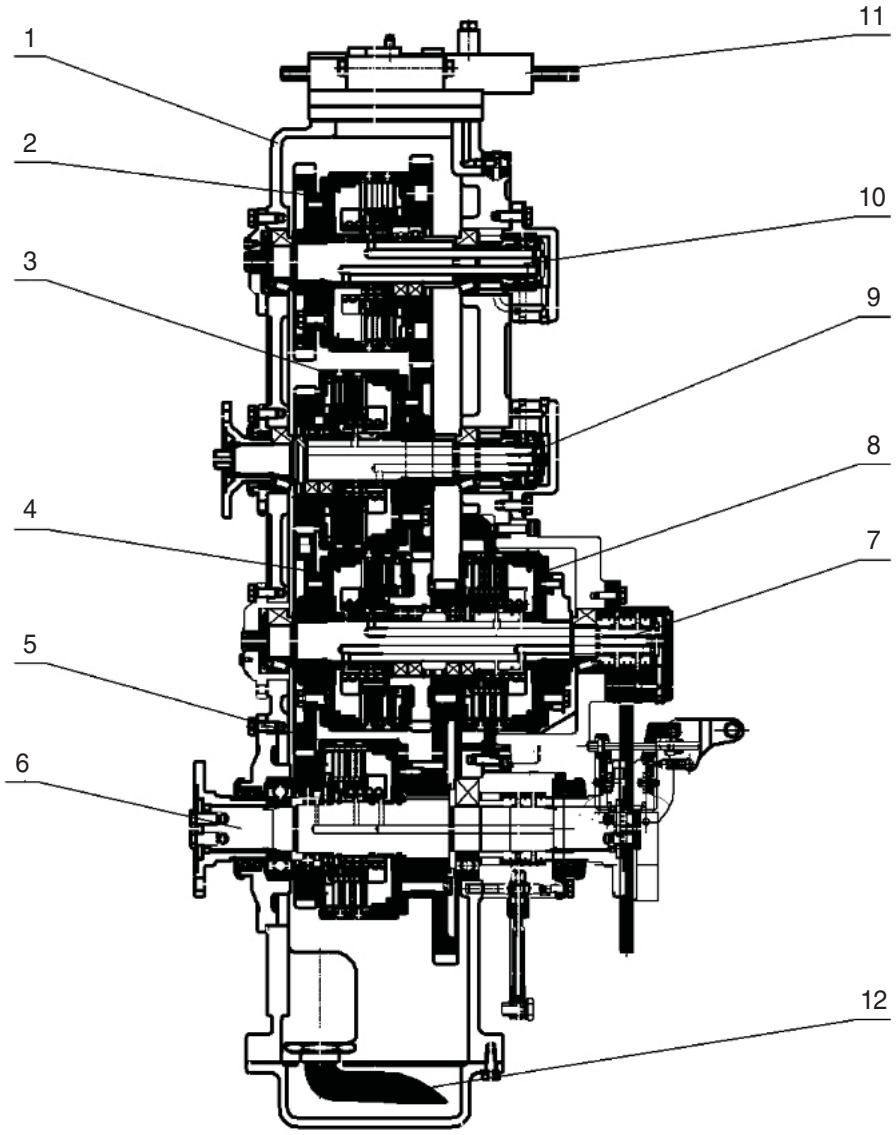
Figure 2 Transmission diagram (The illustration is a view from input side)

F Reverse clutch Ⅳ
G Ⅰ, Ⅲ clutch Ⅰ
H Ⅱ, Ⅳ clutch Ⅱ
I Low gear clutch
J High gear clutch

2) IDENTIFICATION OF TRANSMISSION

Transmission incorporates input shaft assembly, countershaft assembly and rear transmission shaft assembly and operating assembly consists of control valves.

In addition, in front of transmission's output shaft, there is a caliper disc brake installed for parking brake use.



SL7352TR01

1	Casing	5	High gear pack reverse gear	9	Input shaft
2	Reverse clutch pack	6	Output shaft	10	Reverse shaft
3	I, III clutch pack	7	Countershaft	11	Control valve
4	II, IV clutch pack	8	Low clutch pack	12	Suction hose

(1) Hydraulic clutch

Transmission's input shaft assembly, countershaft assembly and reverse shaft assembly have similar construction, each of which has a key unit, hydraulic clutch, with the same construction.
Figure 4 is a diagram of hydraulic clutch. This unit consists of drive shaft (1), clutch case (2), piston (3), powder metallurgy friction plate (4), friction plate (5), return spring (6), drain valve (7).
Hydraulic oil from transmission's control valve is directed to the tube inside the case and large end cover, then into the way (8) of drive shaft (1), then piston cavity, pushing the piston forward to press the active and passive plate (4) and (5). Therefore, drive shaft (1) rotates along with gear (9), hydraulic oil is cut off, drain valve opens, the piston quickly returns by the force of spring (6), active and passive plate part, and gear (9) idles.

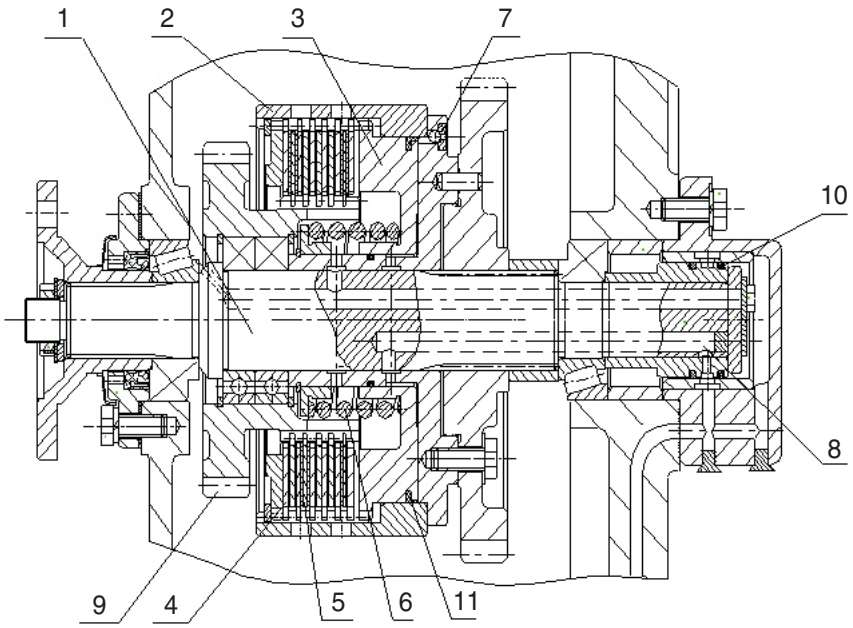


Figure 4 Diagram of hydraulic clutch

Active plate is made of copper-based metal powder, total 6 pcs. Passive plate is made of 65Mn, total 5 pcs. Concavity is 0.5 mm, convexity should face piston side as assembling. After assembly, turn the friction plate with hand to check and, if you feel tight, the spacing is too small and you need to change with a thinner one.
Poor installation of piston ring (10) and (11) and wear appeared in use adversely affects sealing condition and further operation of clutch. Therefore, it's required to pay attention in installation of packing ring.

When the compression ring of compressor is used in the clutch, a 50 degree bevel is on the outer side of the groove on the shaft (figure 5). That would result in pressure difference between T1 and T2 of two sides of the ring, by which a small ring near point A is pressed tightly to to achieve oil sealing, and relative rotation and friction near point A occurs. The outer annulus of piston ring receives tension force from piston ring to apply pressure on the inside surface of ring.

Before setting the piston ring, be sure to grind its opening making the width of opening being within 0.05~0.1 mm. Piston ring with too small opening is vulnerable and may be broken as fitting while the too large allows too much oil leakage to result in low pressure.

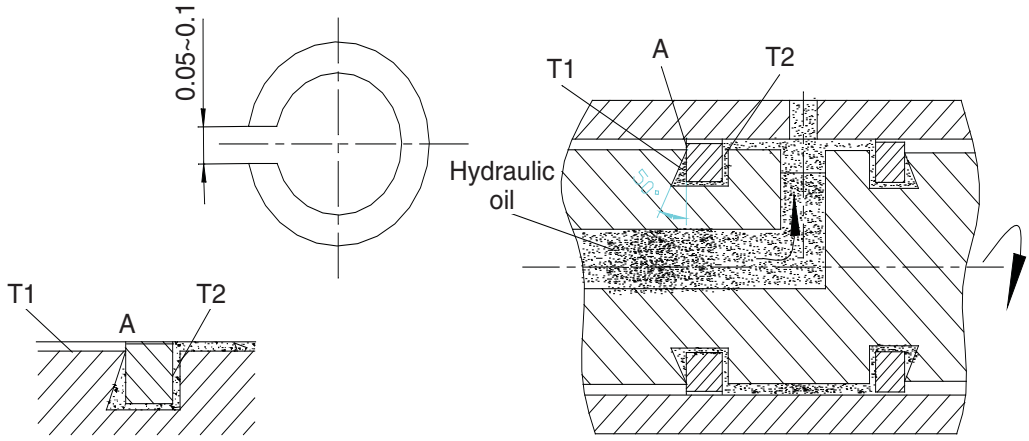


Figure 5 Piston sealing diagram

3) WORKING PRINCIPLE AND CONSTRUCTION OF CONTROL SYSTEM

Working principle of control system for hydraulic transmission is illustrated in figure 6. The components on the right to the double dot dash line in the figure are configured with torque converter. The left part consists of transmission control valves, cylinder (clutch), strainer and oil tank (consists of pan and case)

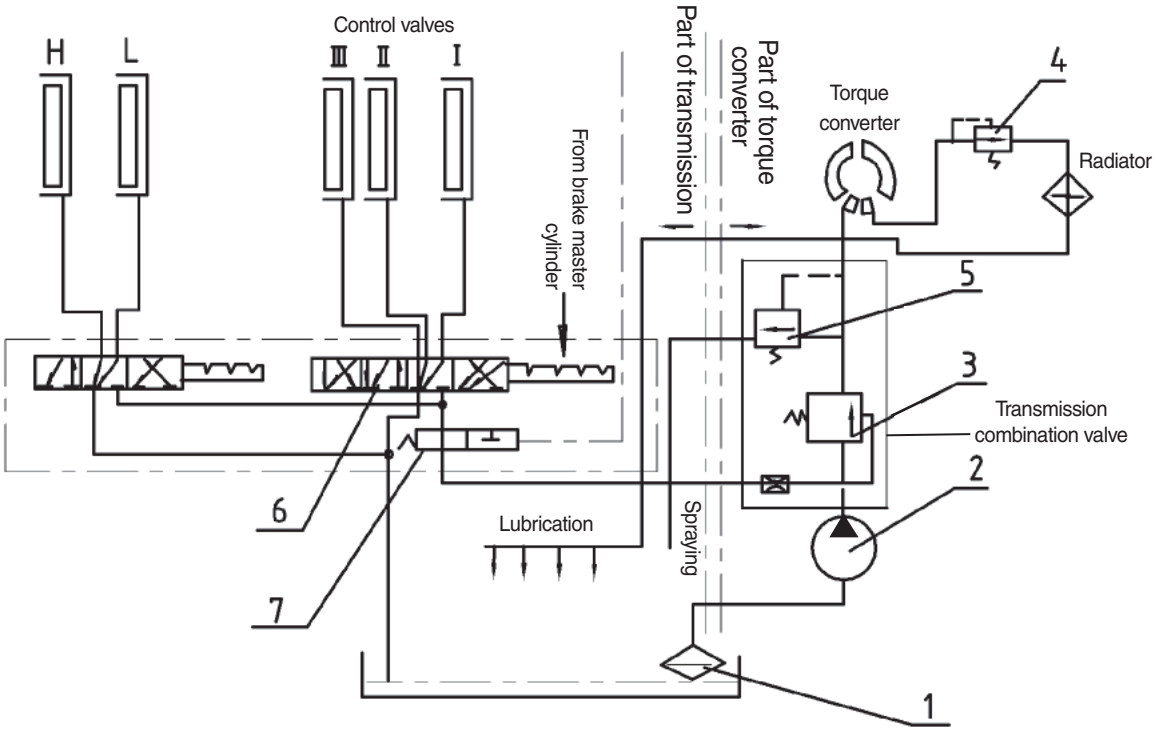


Figure 6 Oil way system schematic diagram

1	Oil suction filter	4	Outlet pressure valve	7	Brake relief valve
2	Main oil pump	5	Oil inlet pressure valve		
3	Shift pressure valve	6	Shift valve		

When torque impeller runs, the drive gear drives oil pump (2) to operate, sucking in hydraulic fluid, which is then directed to torque converter's combination valve. Torque converter's combination valve consists of pressure control valve (3), input pressure valve (5) and baffle. Transmission pressure valve (3) assures supply of hydraulic fluid in combination valve for control use in priority, which then is directed to torque converter via transmission pressure valve (3). Control pressure and torque converter inlet pressure of fluid is controlled by transmission pressure valve (3) and inlet pressure valve (5). The pressure is 1.1~1.5 Mpa and 0.3~0.6 Mpa, respectively (torque converter inlet pressure is 0.1~0.2 Mpa as shifting). When torque converter's inlet pressure exceeds the set value of inlet pressure valve (5), the valve opens and fluid flows out to be supplied to transmission and torque converter. Torque converter's outlet pressure valve (4) controls its outlet pressure to be 0.05~0.15 Mpa. The fluid leaving outlet pressure valve (4) runs through radiator and then is directed to transmission lubricating system.

4) CONTROL VALVES

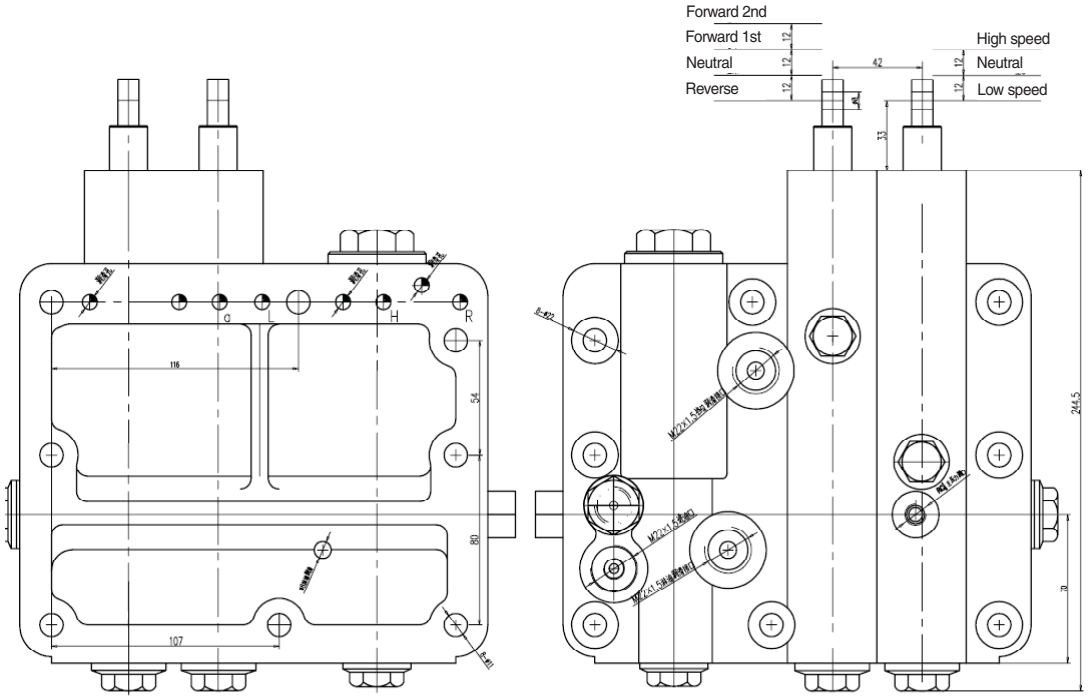


Figure 7 Control valve body

Control valve includes brake relief valve and shift valve. Orifice on the valve body is connected to combination valve of transmission. When the shift spool of moved, the fluid from torque converter is directed to orifice, respectively to allow shifting of transmission forward or backward.

When brake pedal is pressed, a part of fluid from brake master cylinder is directed to brake spool pushing the spool stem to cut off oil way to make transmission in idle to ensure reliable braking.

3. MAINTENANCE AND REPAIR

1) MAINTENANCE

Five levels of maintenance service including daily service (approx. 8h), weekly service (approx. 50h), month service (approx. 200h), quarterly service (approx. 500h), yearly service (approx. 2400h) should be performed.

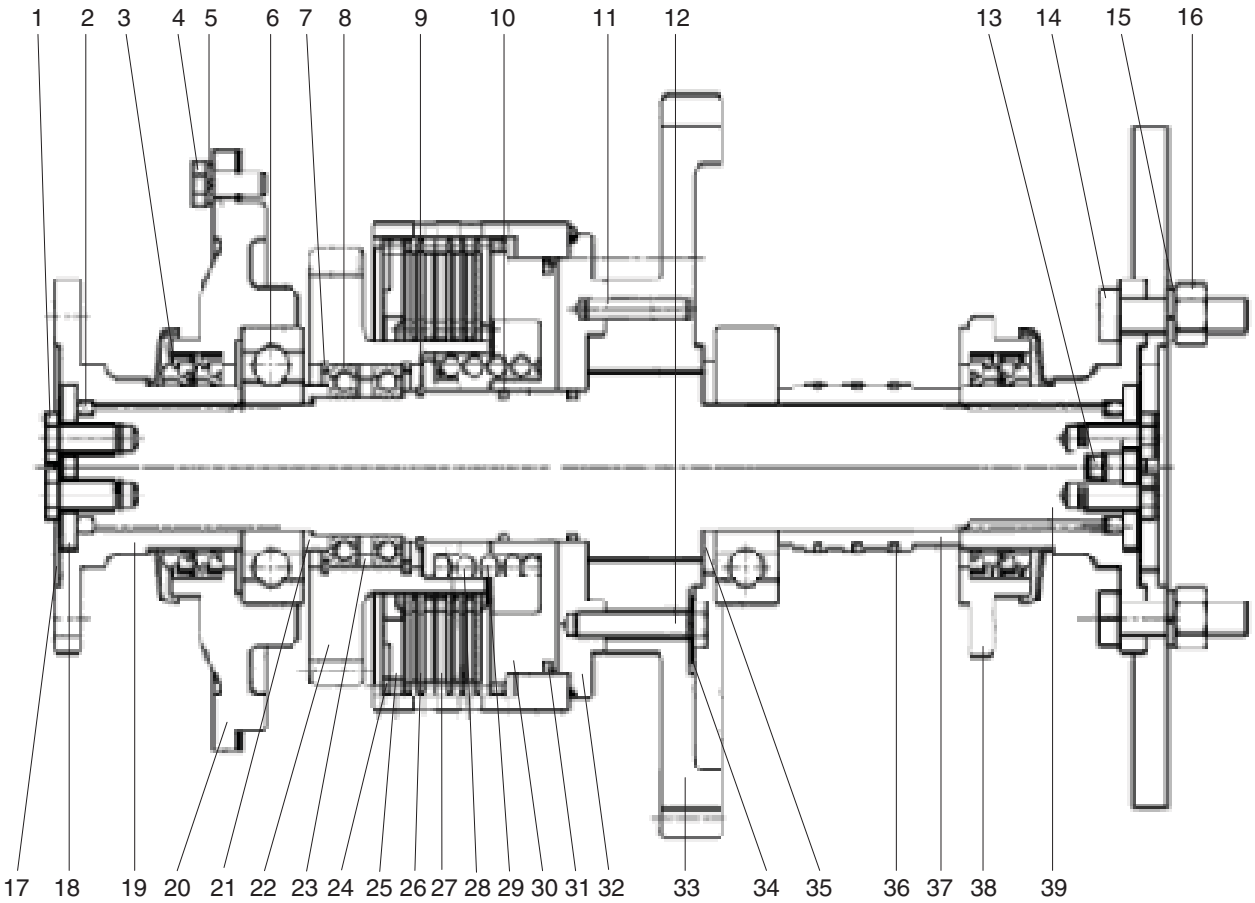
- Daily Service : Check oil level in transmission, operation of clutches, noise of gear, bolt-nut fastening.
- Weekly service : Check oil level and control unit of transmission.
- Monthly service : Check operation of transmission and noise, clean strainer.
- Quarterly service : Change oil, replace strainer.
- Yearly service : Check operation, input power, noise, oil temp and oil leaks, clean vent cap, and fasten up each screw and tube joints.

2) REPAIR

Problem	Cause	Remedy
Too low oil pressure or zero	Insufficient oil, air entered	Replenish
	Clogged strainer	Clean, replace
	Failed gear pump	Replace
	Failed shift pressure valve of bypass valve	Repair
	Stuck control valve spool	Check, repair
	Broken oil seals of transmission or piston of oil inlet has caused oil leaks	Replace
	Clutch drain valve steel ball is missing	Repair
Too high oil pressure	Oil distributor failure	Repair
	Impurities in oil way, blocked oil way	Clean
	Incorrect oil is used	Change oil
Too high oil temperature	Oil cooler is blocked	Clean
	Water entered into oil way	Change oil
	Insufficient oil in transmission	Replenish oil
	Inappropriate gear selection	Select low gear
	Handbrake can't be released well	Adjust
	Scuffing friction plate of clutch or incomplete oil separation	Replace
Engine runs but vehicle will not travel	Too low oil pressure	See "Too low oil pressure"
	Gear is not engaged in place	Re-engage
	Brake valve spool has not returned	Check brake valve spool
	Scuffing friction plate	Replace
	Control valve failure	Repair
Weak traction force	Too low oil pressure	See "Too low oil pressure"
	Transmission clutch does not disengage completely	Repair
	Lacking oil	Replenish oil

5. STRUCTURE

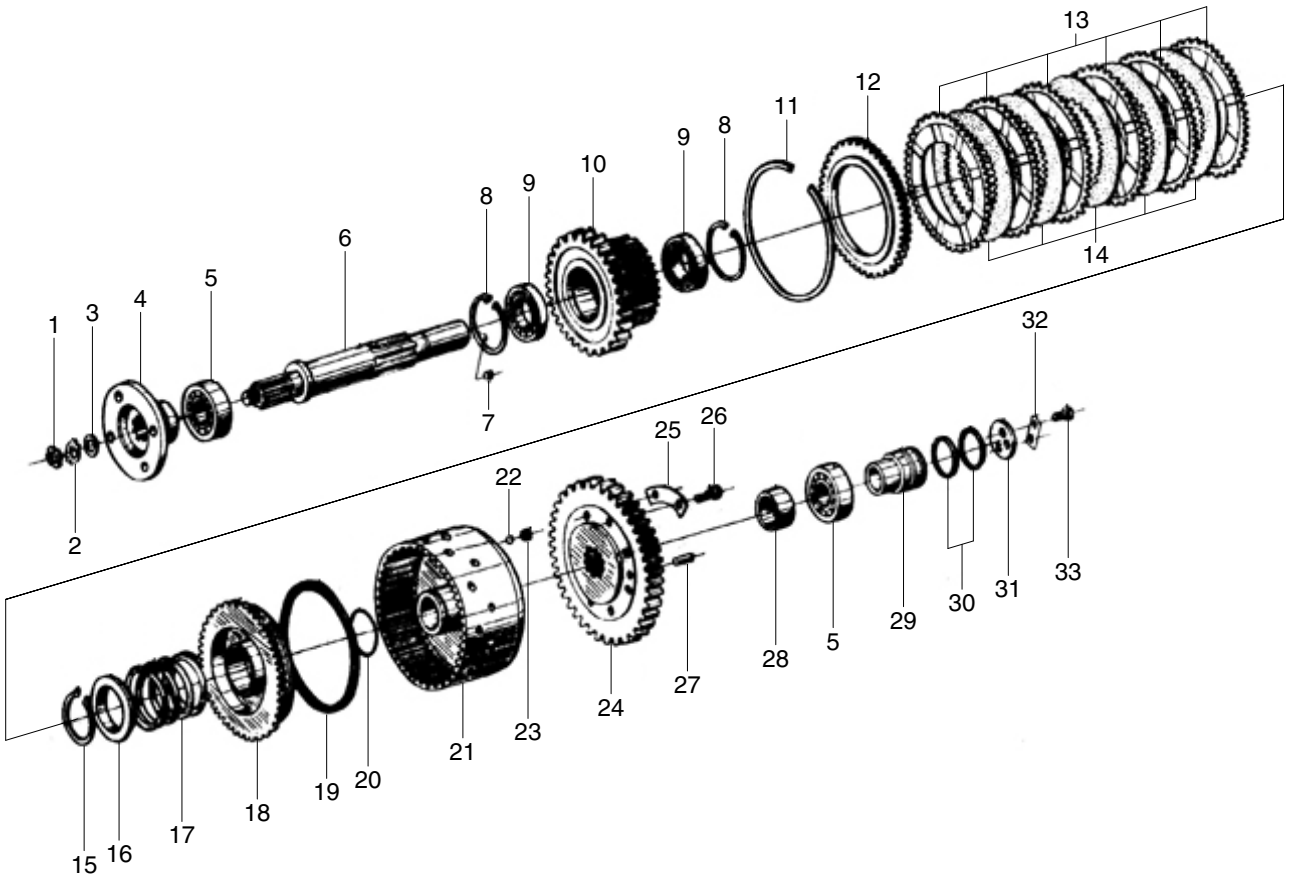
1) OUTPUT SHAFT ASSEMBLY



HL831KTM09

1	Bolt	14	Bolt	27	Steel plate
2	O-ring	15	Elastic washer	28	Spring retainer
3	Oil seal	16	Nut	29	Spring
4	Bolt	17	Lock washer	30	Piston
5	Washer	18	Binder plate	31	Oil seal
6	Bearing	19	Output flange	32	Clutch housing
7	Snap ring	20	Output shaft rear housing	33	Gear
8	Bearing	21	Spacer ring 1	34	Lock washer
9	Snap ring	22	Gear	35	Backing ring
10	O-ring	23	Backing ring	36	Wiper seal
11	Round pin	24	Bead flange	37	Spacer ring
12	Bolt	25	Bearing end-shield	38	Bearing end-shield
13	Drain plug	26	Friction disk	39	Output shaft

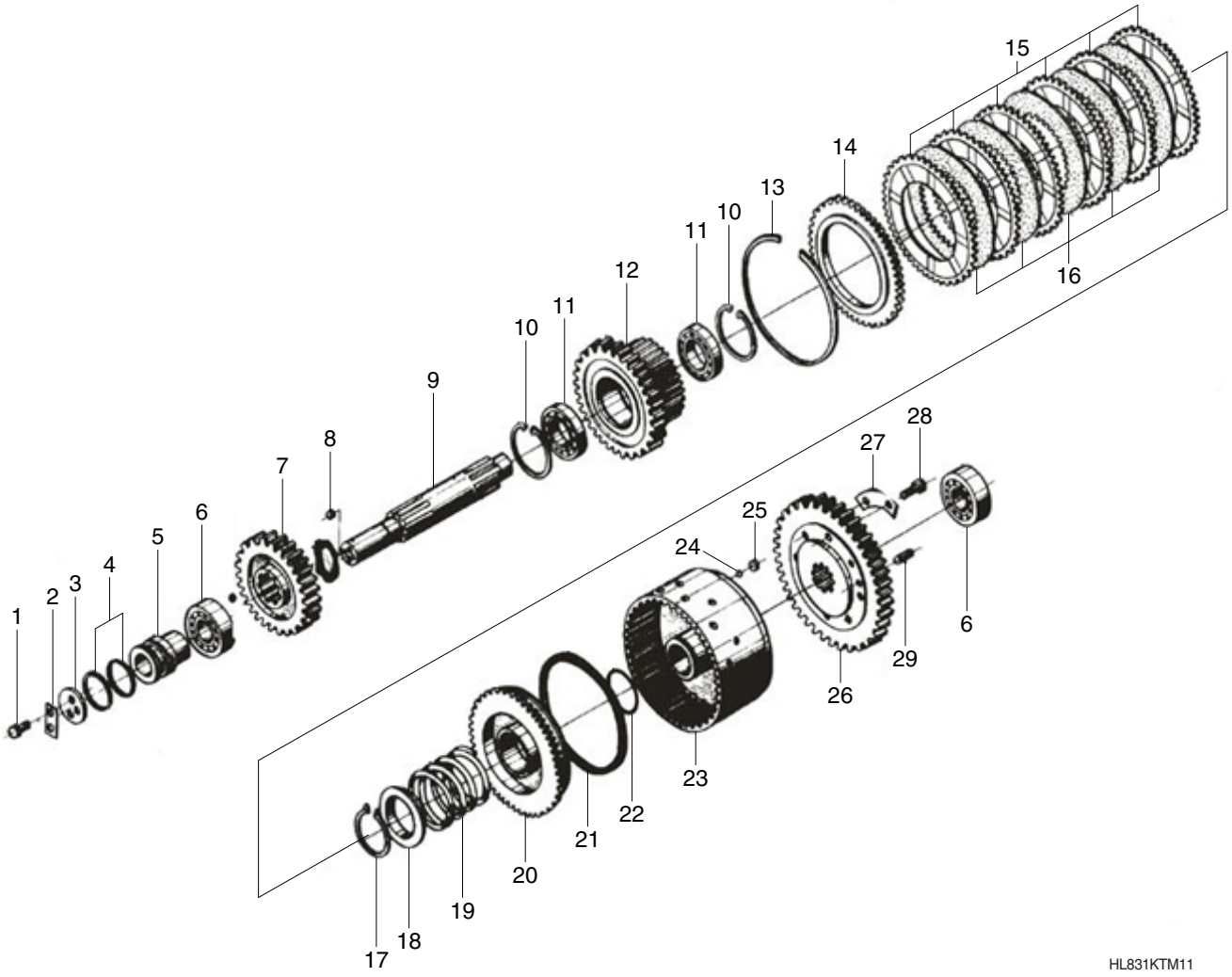
2) INPUT SHAFT ASSEMBLY



HL831KTM10

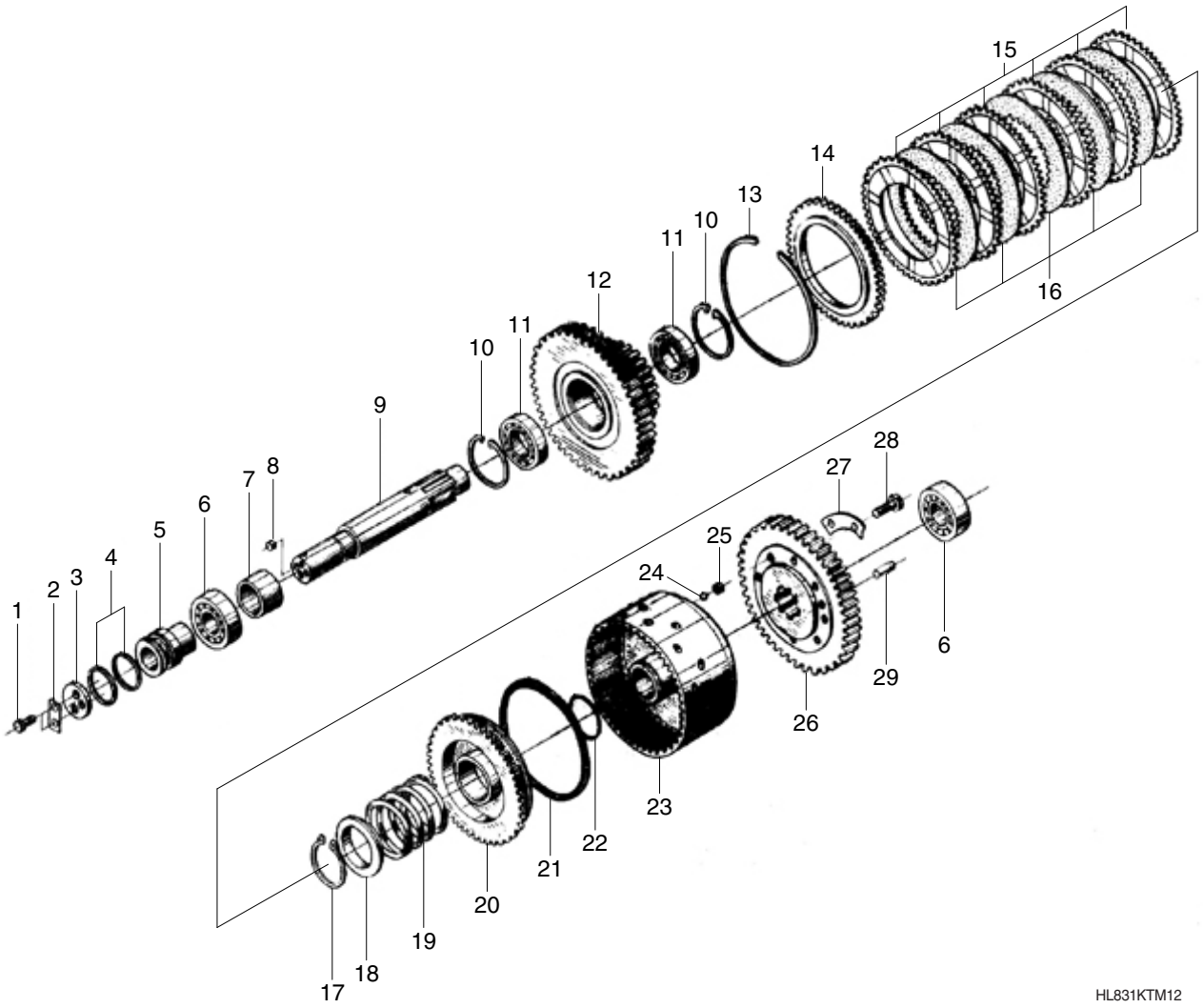
1	Nut	12	Bearing end-shield	23	Valve base
2	Pressure plate	13	Friction disc	24	Gear
3	Plate	14	Friction disc	25	Lock washer
4	Input flange	15	Snap ring	26	Bolt
5	Bearing	16	Spring retainer	27	Round pin
6	Input shaft	17	Spring	28	Shaft sleeve
7	Plug	18	Piston	29	Inner cover
8	Snap ring	19	Spacer ring	30	Piston ring
9	Bearing	20	O-ring	31	Retaining part
10	Gear	21	Clutch shell assembly	32	Lock washer
11	Snap ring	22	Steel ball	33	Bolt

3) INTERMEDIATE SHAFT ASSEMBLY



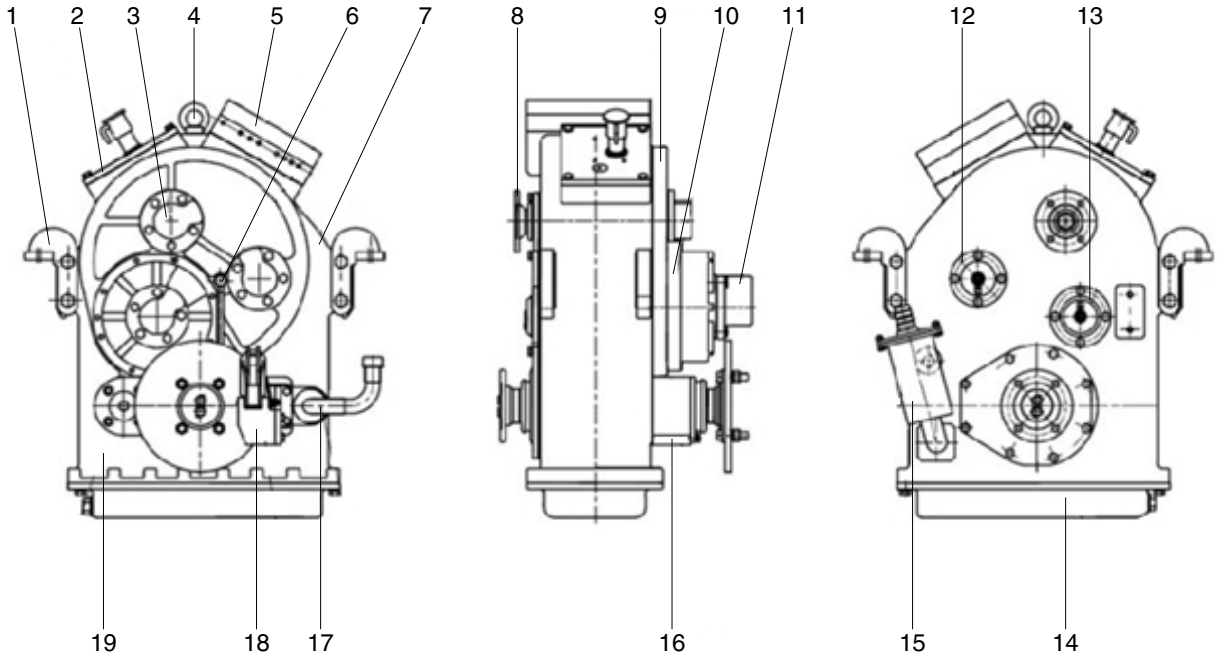
1	Bolt	11	Bearing	21	Spacer ring
2	Lock washer	12	Gear	22	O-ring
3	Retaining part	13	Snap ring	23	Clutch shell assembly
4	Piston ring	14	Bearing end-shield	24	Steel ball
5	Inner cover	15	Friction disc	25	Valve base
6	Bearing	16	Friction disc	26	Gear
7	Gear	17	Snap ring	27	Lock washer
8	Plug	18	Spring retainer	28	Bolt
9	Intermediate shaft	19	Spring	29	Round pin
10	Snap ring	20	Piston		

4) REVERSE SHAFT ASSEMBLY



1	Bolt	11	Bearing	21	Spacer ring
2	Lock washer	12	Gear	22	O-ring
3	Retaining part	13	Snap ring	23	Clutch shell assembly
4	Piston ring	14	Bearing end-shield	24	Steel ball
5	Spacer ring	15	Friction disc	25	Valve base
6	Bearing	16	Friction disc	26	Gear
7	Shaft sleeve	17	Snap ring	27	Lock washer
8	Plug	18	Spring retainer	28	Bolt
9	Shaft	19	Spring	29	Round pin
10	Snap ring	20	Piston		

5) BODY PARTS AND PIECES OF SUBSIDIARY



HL831KTM13

1	Bracket	8	Input bearing end-shield	15	Filter assembly
2	Cover plate	9	Bearing end-shield	16	Sleeve
3	Fuel inlet bearing end-shield	10	Bearing support	17	Filler pipe assembly
4	Eye bolt	11	Fuel inlet bearing end-shield	18	Brake
5	Control valve	12	Bearing end-shield	19	Gear box casing
6	Hose tube assembly	13	Intermediate shaft		
7	Name plate	14	Oil sump		