

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 I 3.82 II 2.08 III 1.09 IV 0.59 Backward I 3.05 II 0.87
Fluid	AFT (DEXRON III)
Pump	CB32 (Not accompanying with transmission)
Operating pressure	1.2~1.5 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.

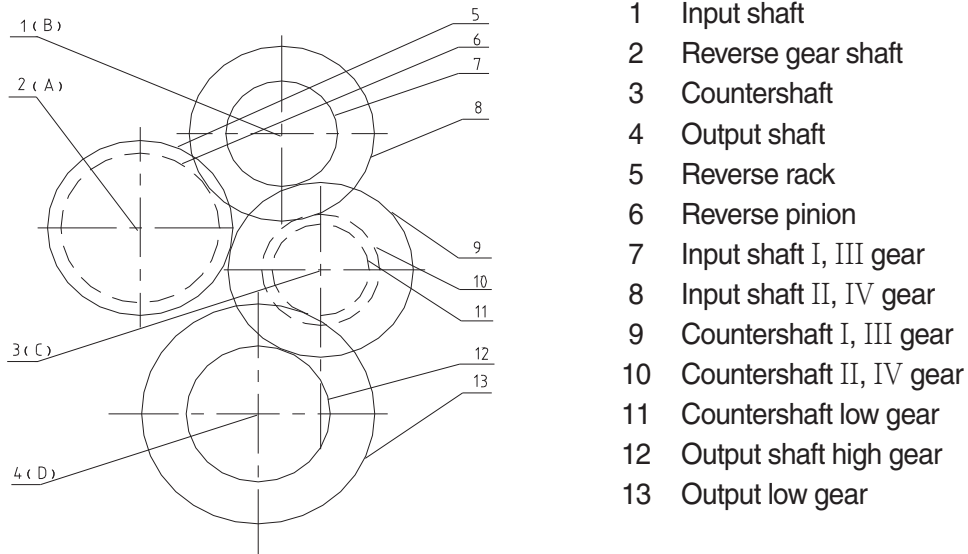


Figure 1

Transmission system diagram

Gear	Clutch	Gear				
		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

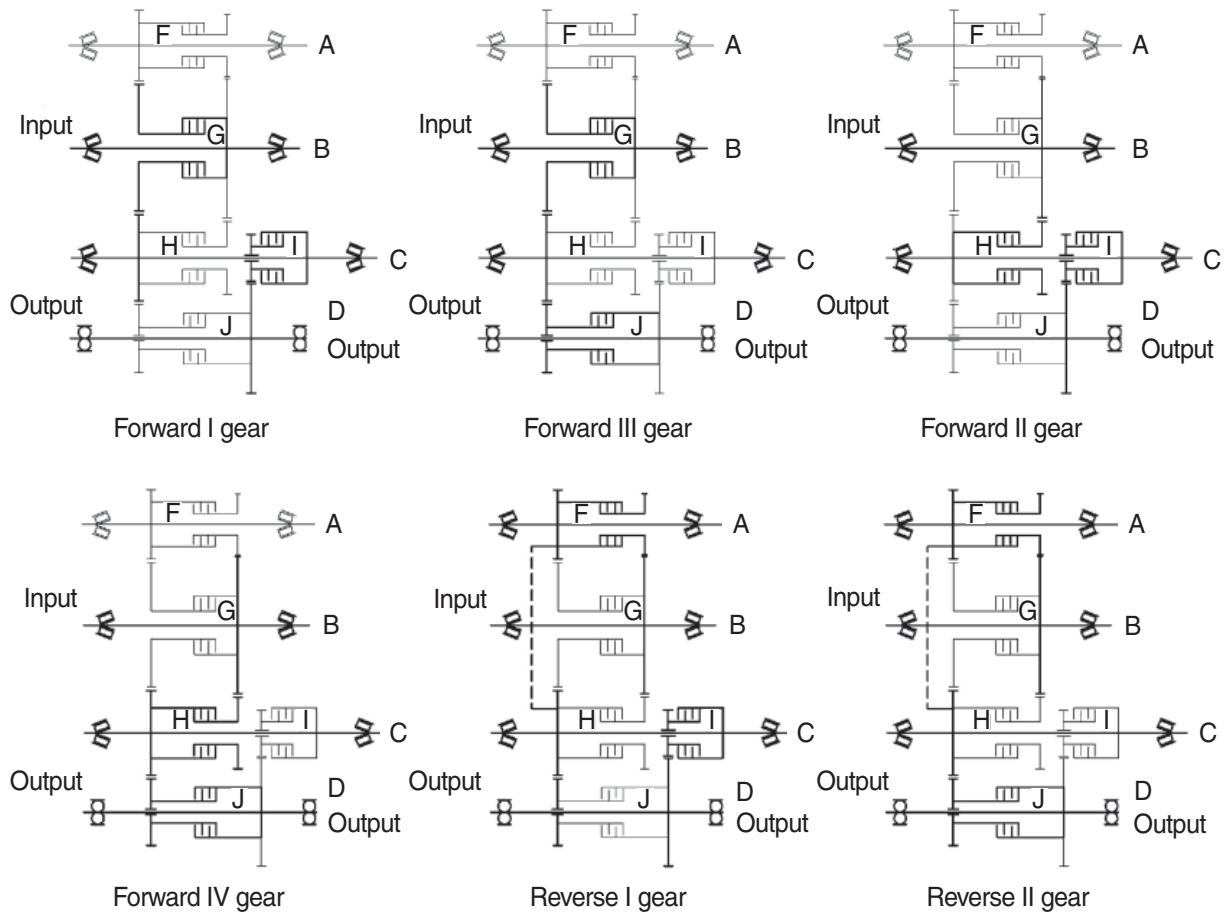


Figure 2 Transmission diagram (The illustration is a view from input side)

F Reverse clutch IV
 G I, III clutch I
 H II, IV clutch II

I Low gear clutch
 J High gear clutch

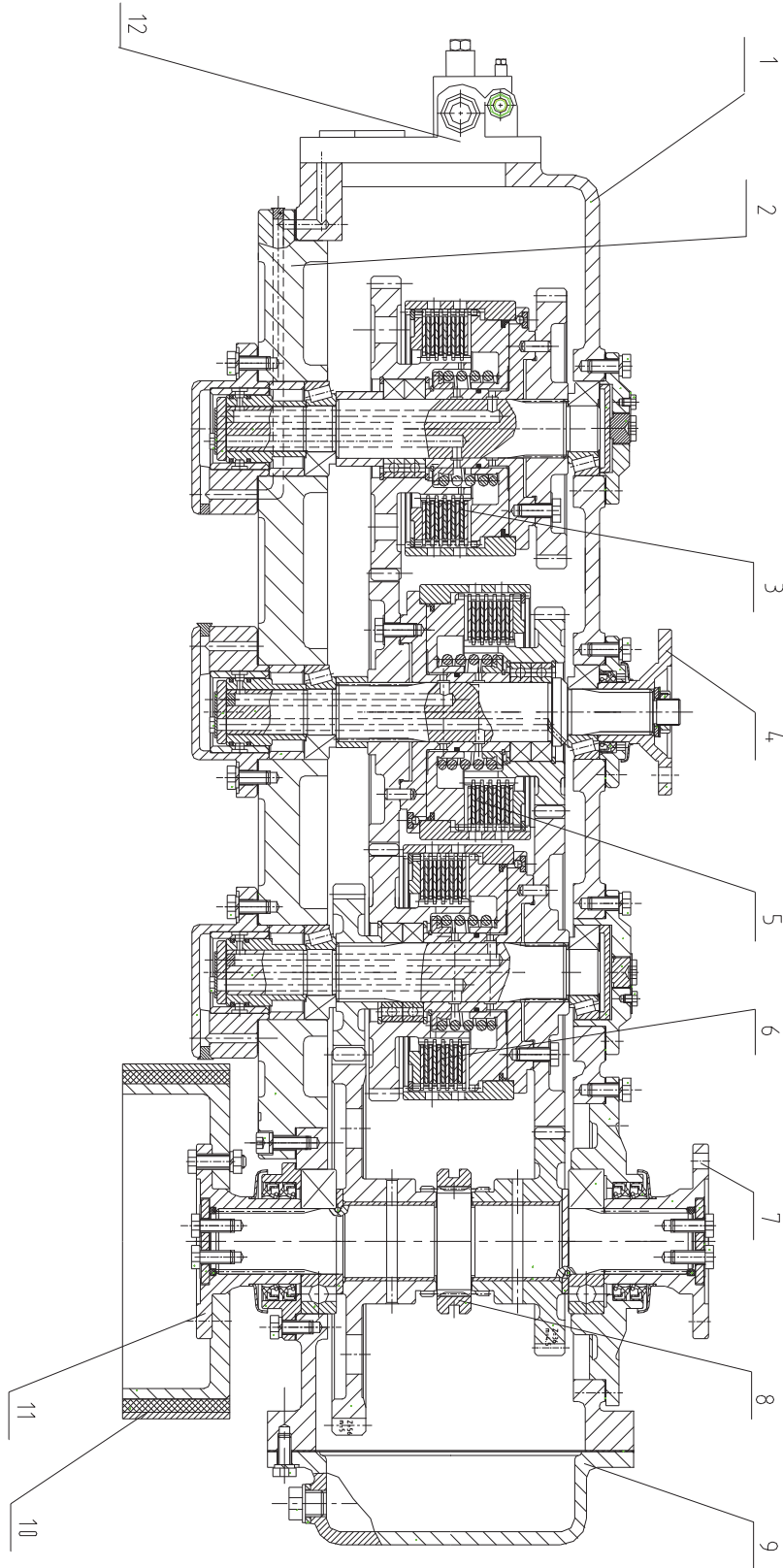


Figure 3 Structure of transmission

- | | | | | | |
|---|-----------------------|---|----------------------------|----|---------------|
| 1 | Casing | 5 | Input shaft | 9 | Oil pan |
| 2 | Reverse clutch pack | 6 | Intermediate shaft | 10 | Parking brake |
| 3 | Reverse shaft | 7 | Flange | 11 | Flangel |
| 4 | Flange of input shaft | 8 | High low sliding tooth set | 12 | Control valve |

(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.

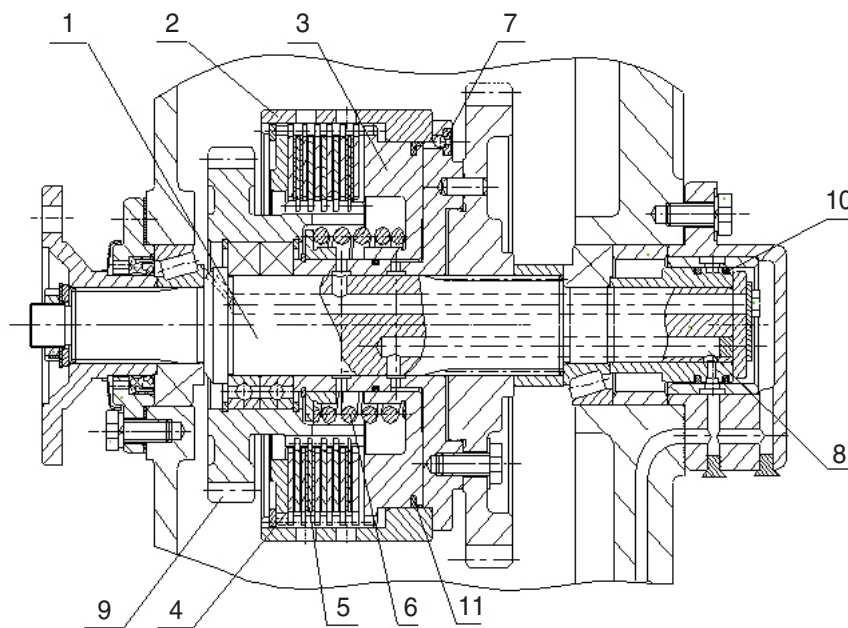


Figure 4 Diagram of hydraulic clutch

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.

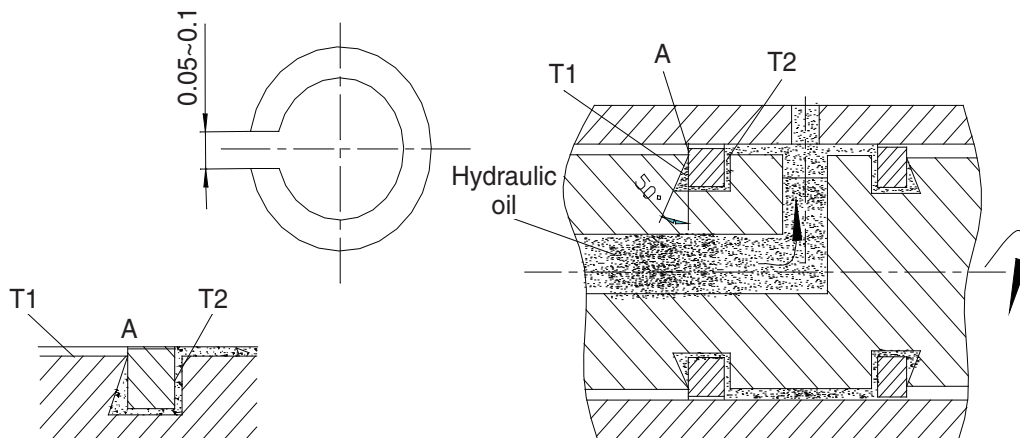


Figure 5 Piston sealing diagram

(2) High low sliding sleeve

When the high low sliding sleeve is down in figure 3, it's low gear I , II and reverse I gear. It is high gear III, IV and reverse II gear. There is no output in intermediate position.

Its control lever is as shown in figure 1. There are three places for staying, high, empty and low.

The shift of high low sliding sleeve must be taken in neutral case and after the parking of machine.

Otherwise the impact will occur.

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)

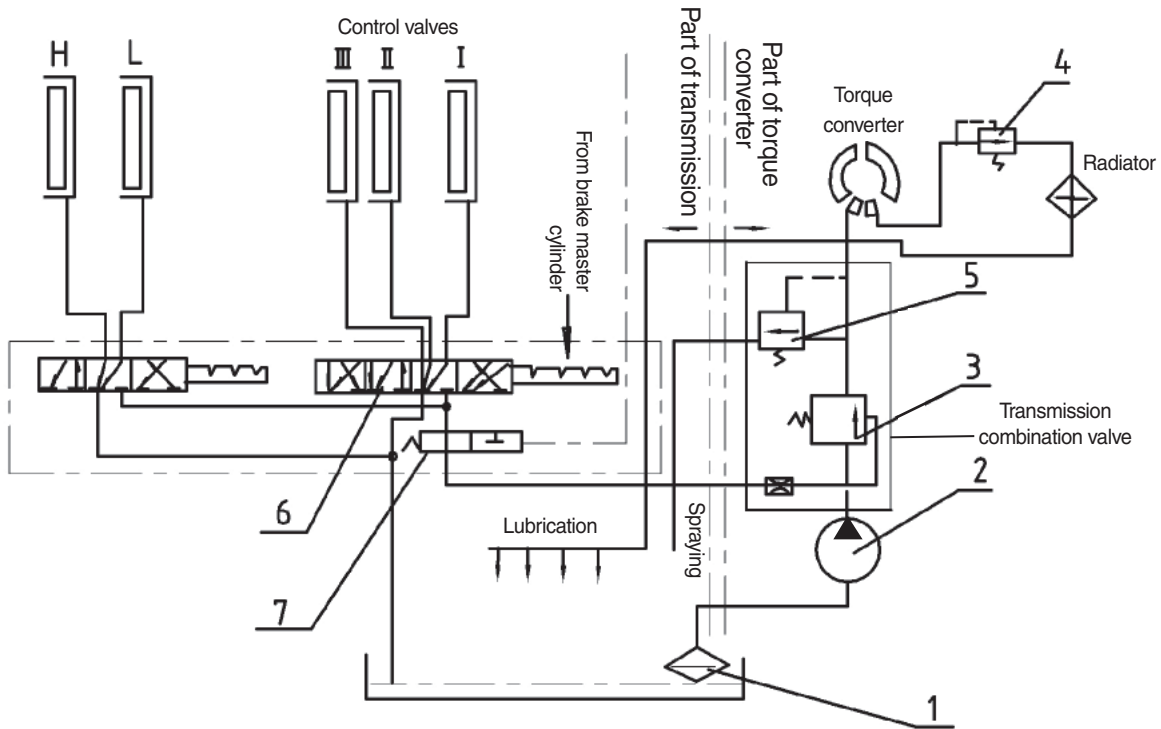


Figure 6 Oil way system schematic diagram

- | | | |
|------------------------|----------------------------|----------------------|
| 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

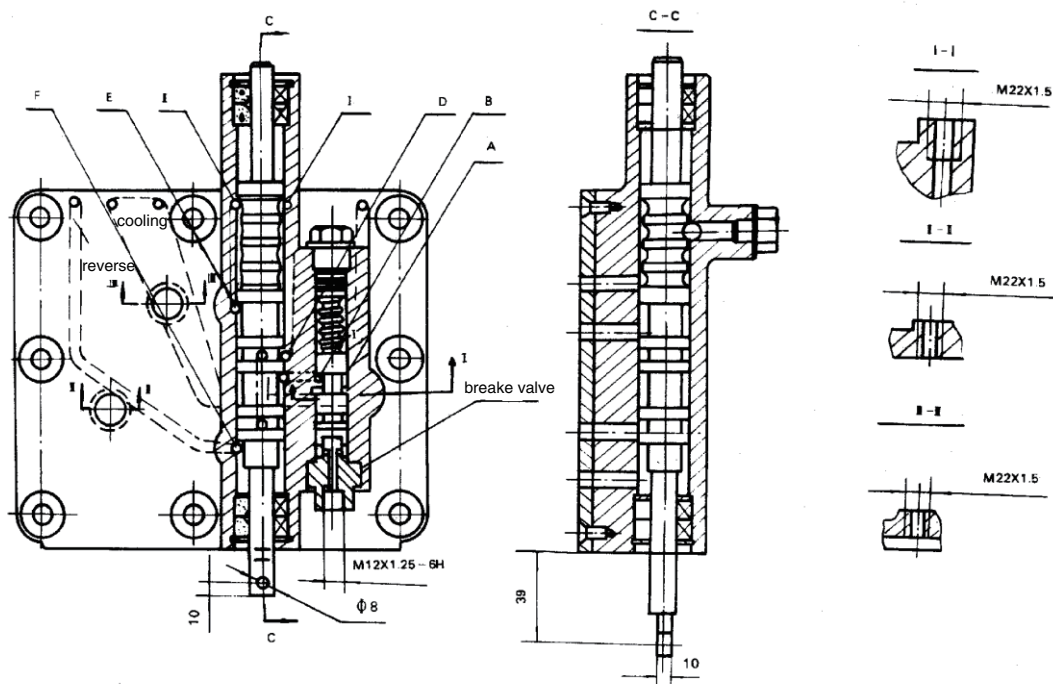


Figure 7 Control valve body

Control valve includes brake relief valve and shift valve. Orifice A 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 D, E or F, 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.

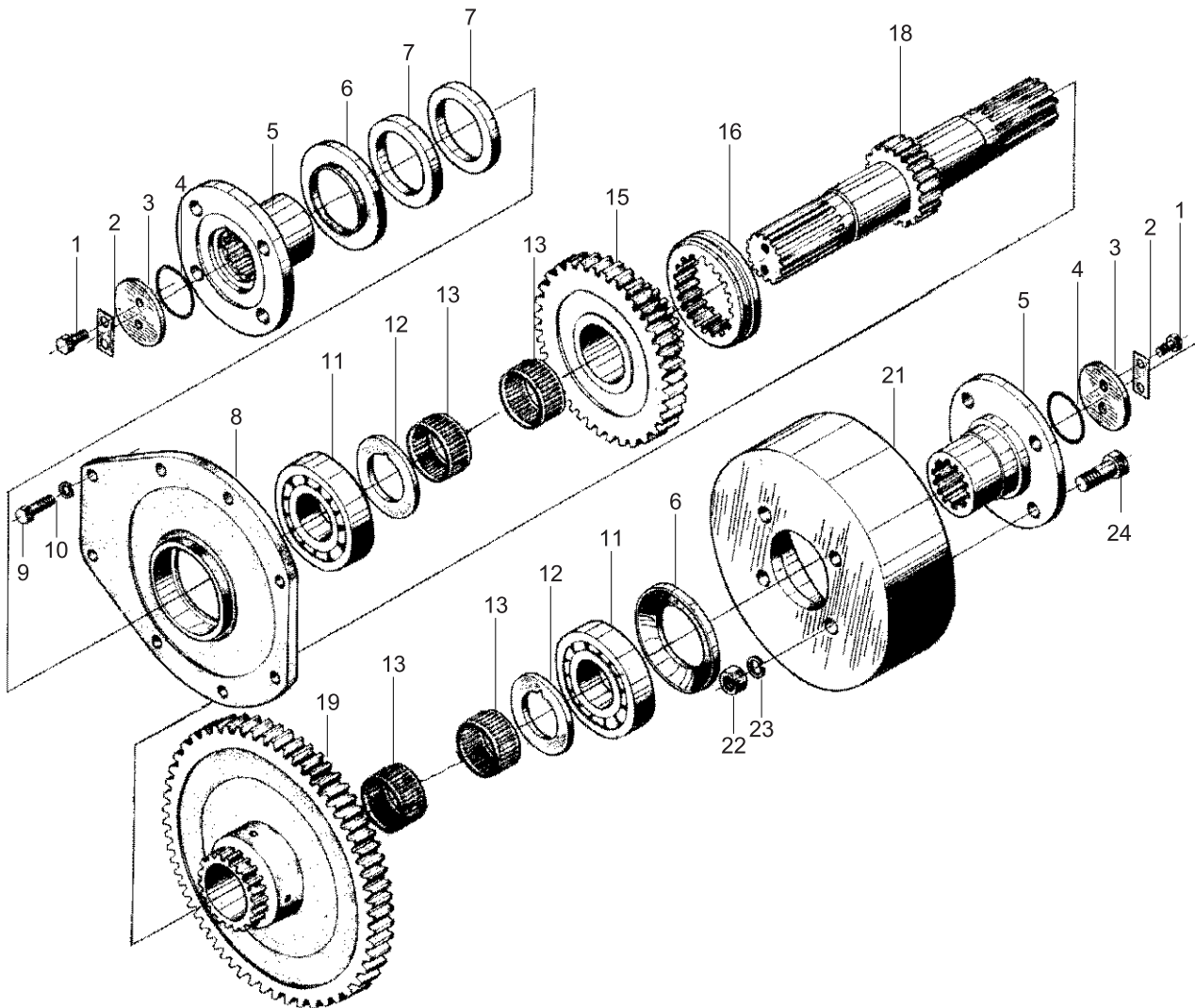
- Daily Service : Check oil level in transmission, operation of clutches, noise of gear, bolt-nut fastening.
- Weekly service : Check oil level and control unit of transmission.
- Monthly service : Check operation of transmission and noise, clean strainer.
- Quarterly service : Change oil, replace strainer.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

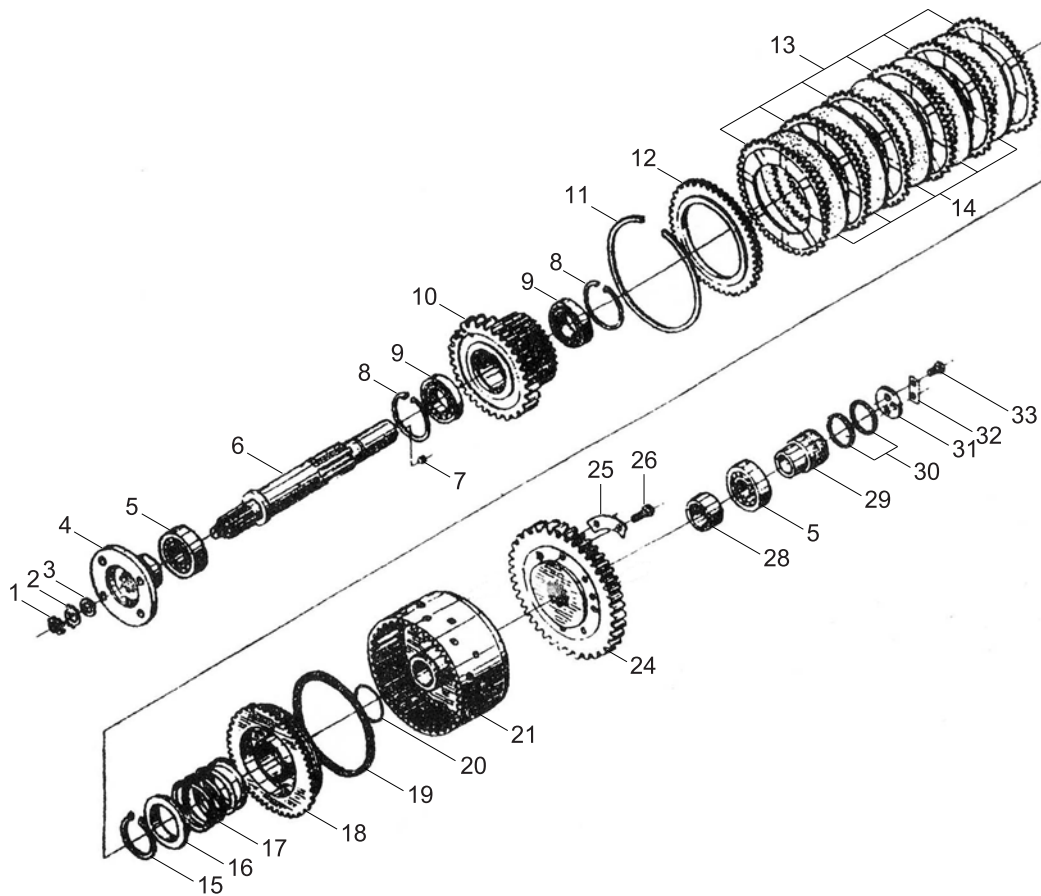
4. STRUCTURE

1) OUTPUT SHAFT ASSEMBLY



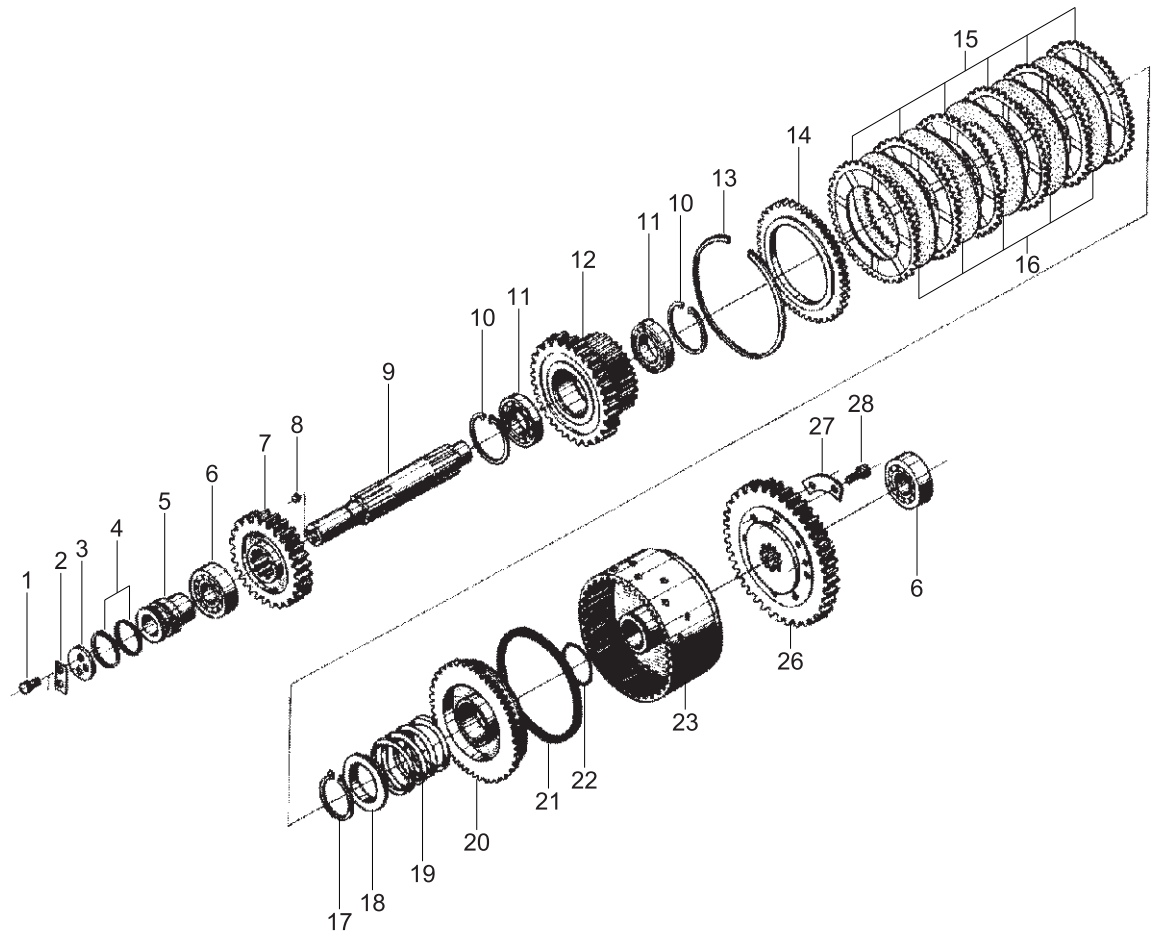
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|-----------------|---------------------------|-------------------|
| 1 Bolt | 9 Bolt | 19 Gear |
| 2 Lock washer | 10 washer | 21 Hand brake hub |
| 3 Press plate | 11 Bearing | 22 Nut |
| 4 O-ring | 12 Thrust ring | 23 Spring washer |
| 5 Output flange | 13 Bush | 24 Bolt |
| 6 Output flange | 15 Gear | |
| 7 Oil seal | 16 High sliding gear sets | |
| 8 Back cover | 18 Output shaft | |

2) INPUT SHAFT ASSEMBLY



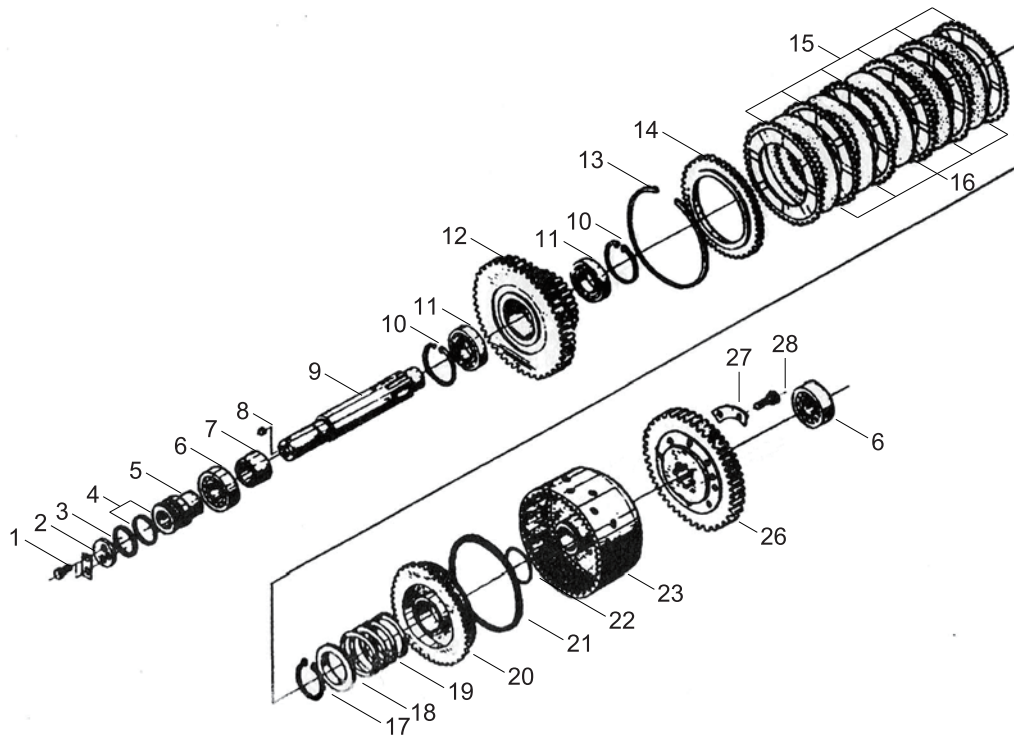
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|----|--------------|----|-----------------------|----|----------------|
| 1 | Nut | 12 | Outside cover | 25 | Lock washer |
| 2 | Washer | 13 | Friction disc | 26 | Bolt |
| 3 | Washer | 14 | Friction disc | 28 | Shaft sleeve |
| 4 | Input flange | 15 | Snap ring | 29 | Inner cover |
| 5 | Bearing | 16 | Spring retainer | 30 | Piston ring |
| 6 | Input shaft | 17 | Spring | 31 | Retaining part |
| 7 | Plug | 18 | Piston | 32 | Lock washer |
| 8 | Snap ring | 19 | Spacer ring | 33 | Bolt |
| 9 | Bearing | 20 | O-ring | | |
| 10 | Gear | 21 | Clutch shell assembly | | |
| 11 | Snap ring | 24 | Gear | | |

3) INTERMEDIATE SHAFT ASSEMBLY



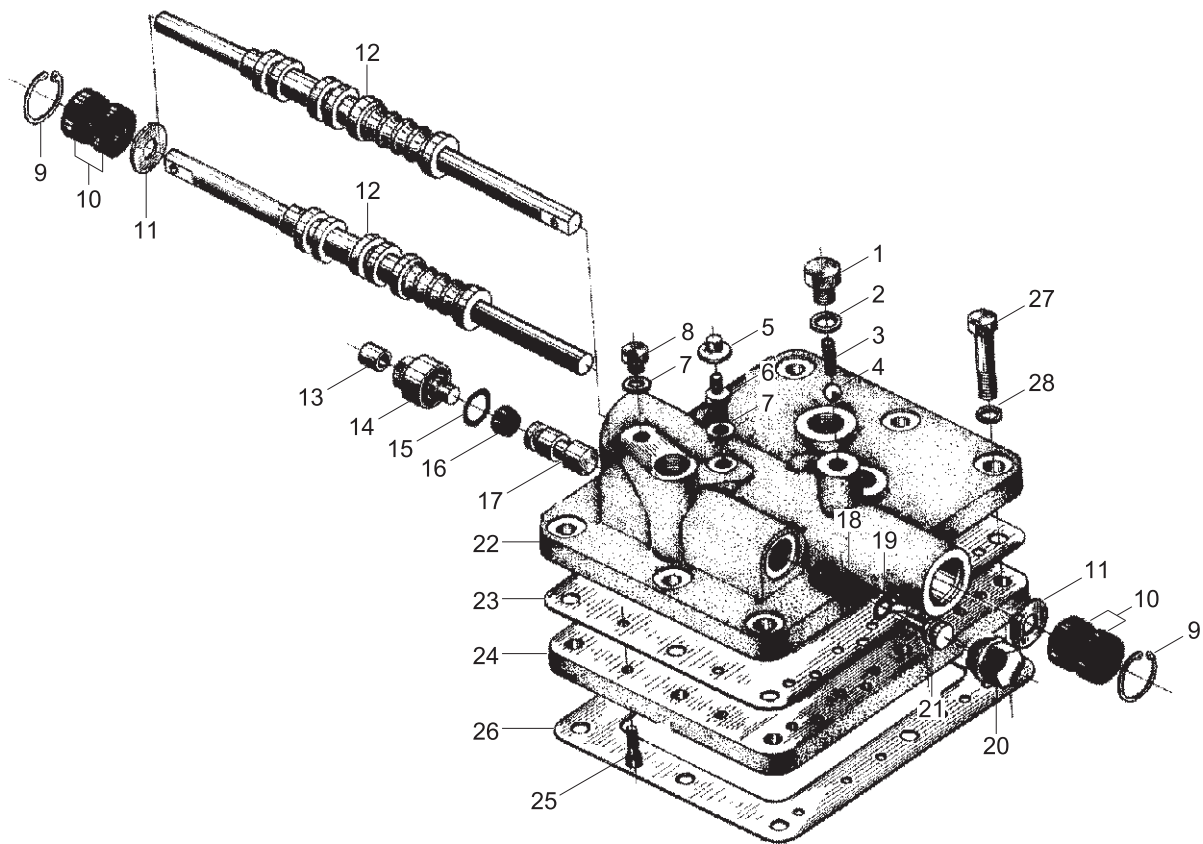
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|----------------------|--------------------|--------------------------|
| 1 Bolt | 11 Bearing | 21 Spacer ring |
| 2 Lock washer | 12 Gear | 22 O-ring |
| 3 Retaining part | 13 Snap ring | 23 Clutch shell assembly |
| 4 Piston ring | 14 Outside cover | 26 Gear |
| 5 Inner cover | 15 Friction disc | 27 Lock washer |
| 6 Bearing | 16 Friction disc | 28 Bolt |
| 7 Gear | 17 Snap ring | |
| 8 Plug | 18 Spring retainer | |
| 9 Intermediate shaft | 19 Spring | |
| 10 Snap ring | 20 Piston | |

4) REVERSE SHAFT ASSEMBLY



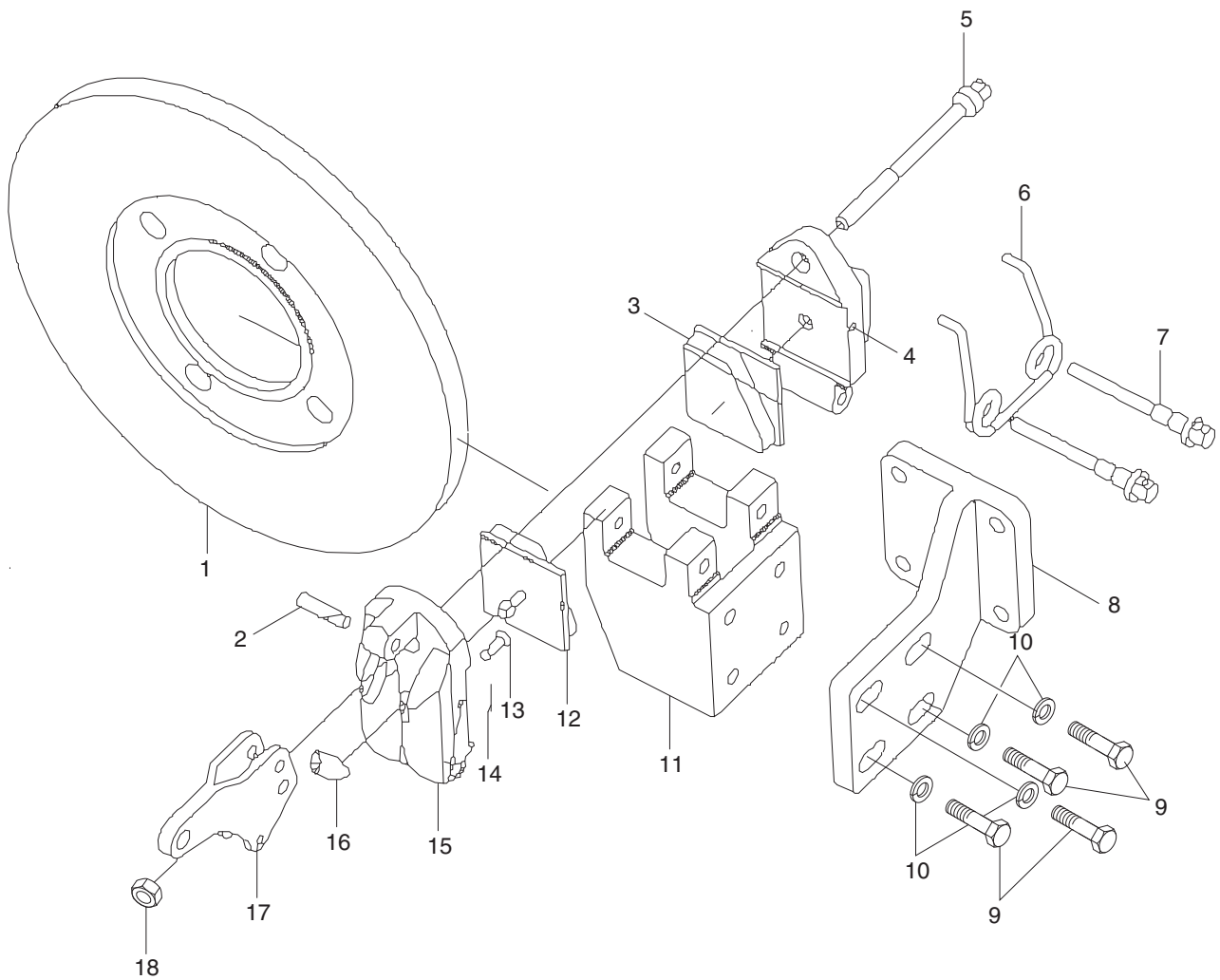
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|------------------|--------------------|--------------------------|
| 1 Bolt | 11 Bearing | 21 Spacer ring |
| 2 Lock washer | 12 Gear | 22 O-ring |
| 3 Retaining part | 13 Snap ring | 23 Clutch shell assembly |
| 4 Piston ring | 14 Outside cover | 26 Gear |
| 5 Spacer ring | 15 Friction disc | 27 Lock washer |
| 6 Bearing | 16 Friction disc | 28 Bolt |
| 7 Shaft sleeve | 17 Snap ring | |
| 8 Plug | 18 Spring retainer | |
| 9 Shaft | 19 Spring | |
| 10 Snap ring | 20 Piston | |

5) CONTROL VALVE ASSEMBLY



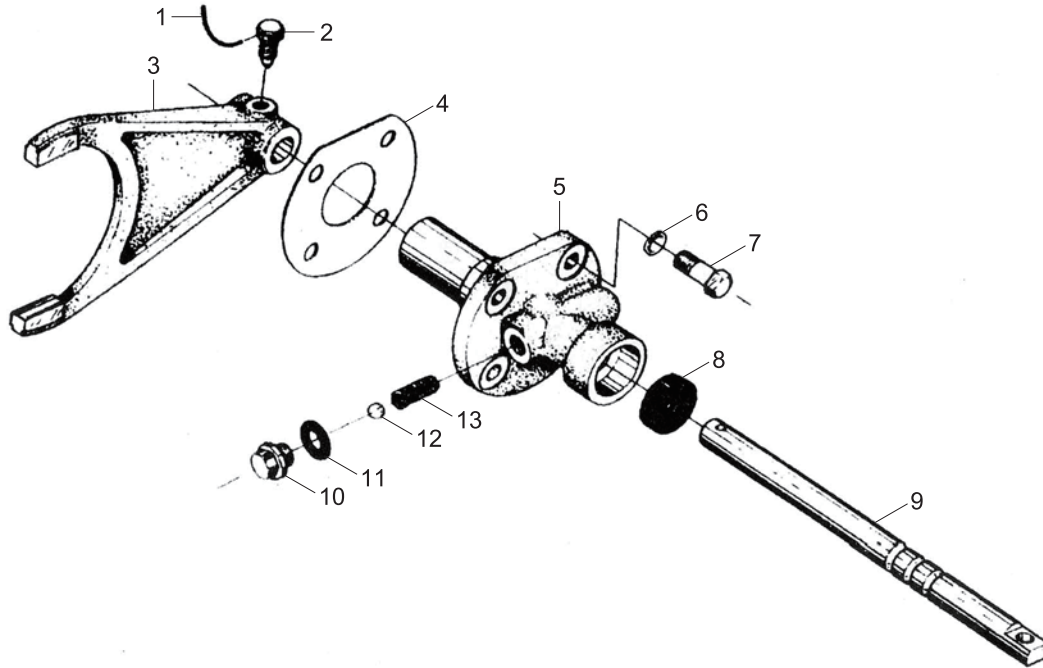
1	Screw	11	Adjust washer	21	Plug
2	Washer	12	Control slide valve	22	Valve body
3	Spring	13	Dust cover	23	Gasket
4	Steel ball	14	Plug	24	Bottom plate
5	Dust cover	15	O-ring	25	Socket bolt
6	Test connector	16	Cup	26	Gasket
7	Washer	17	Break slide valve	27	Bolt
8	Plug	18	Spring	28	Washer
9	Snap ring	19	O-ring		
10	Oil seal	20	Spring seat		

6) PARKING BRAKE



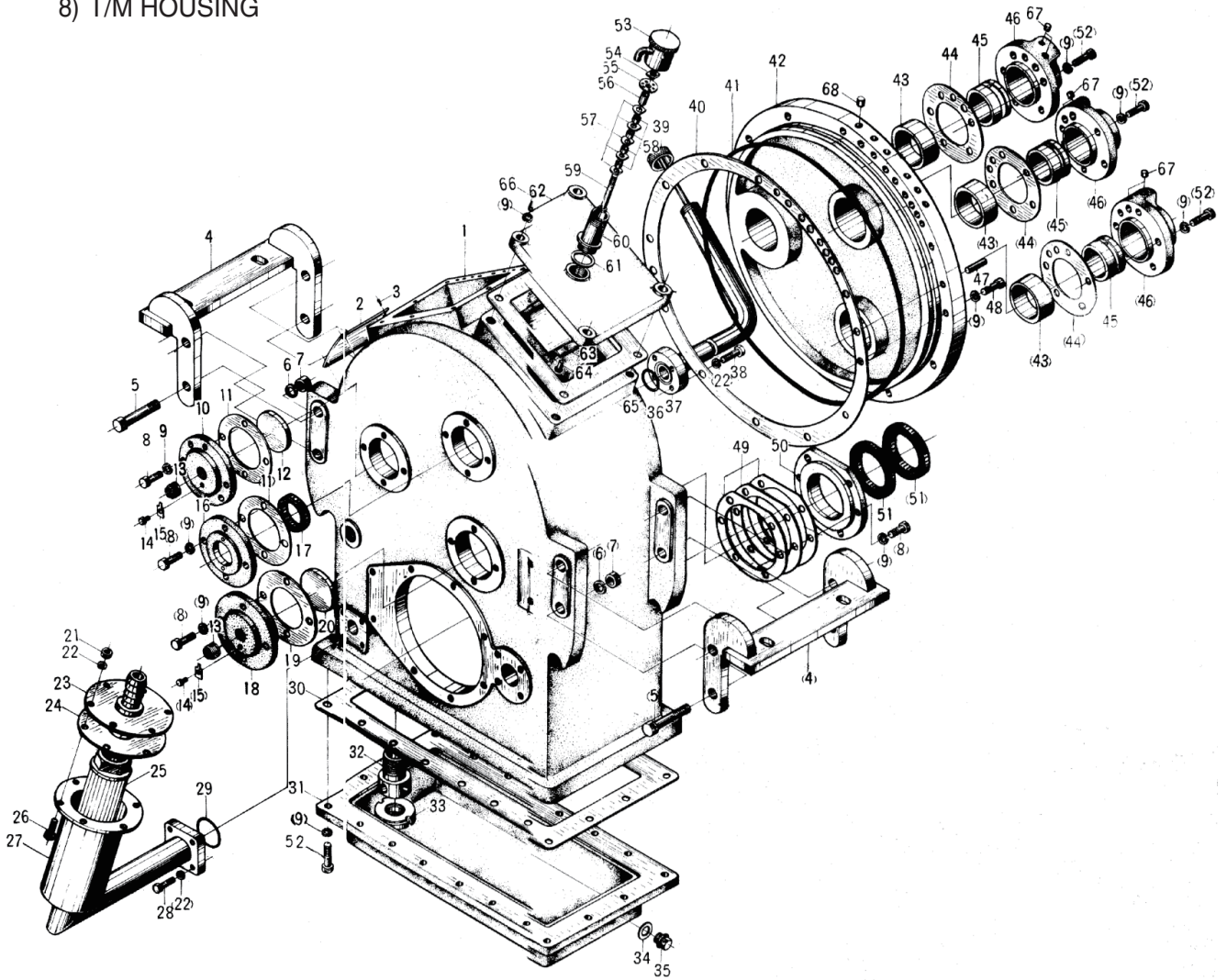
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|---|---------------|----|-------------|----|------------|
| 1 | Brake disc | 7 | Fixed shaft | 13 | Pull shaft |
| 2 | Pin | 8 | Bracket | 14 | Pin-split |
| 3 | Brake pad | 9 | Bolt | 15 | Bracket |
| 4 | Bracket | 10 | Washer | 16 | Spring |
| 5 | Adjust bolt | 11 | Support | 17 | Pulling |
| 6 | Return spring | 12 | Brake pad | 18 | Nut |

7) HIGH-LOW SPEED SHIFT FORK



- | | | | | | |
|---|---------------------------|----|------------|----|------------|
| 1 | Iron wire | 6 | Washer | 11 | Washer |
| 2 | Screw | 7 | Bolt | 12 | Steel ball |
| 3 | High-low speed shift fork | 8 | Oil seal | 13 | spring |
| 4 | Gasket | 9 | Fork shaft | | |
| 5 | Fork bracket | 10 | Plug | | |

8) T/M HOUSING



1 Housing	18 Cover	35 Plug	53 Ventilation cover
2 Mark	19 Gasket	36 O-ring	54 Nut
3 Rivet	20 Gesr oil cap adjust ring	37 Tube assembly	55 Ventilation tablet
4 Bracket	21 Nut	38 Bolt	56 Copper cover
5 Bolt	22 Washer	39 Pipe cover assembly	57 Maze tablet
6 Spring washer	23 Connector	40 Gasket	58 copper spacer
7 NUT	24 Gasket	42 Cover	59 Long screw
8 Bolt	25 Fillter	43 Bush	60 Housing
9 Wsher	26 Bolt	44 GASKET	61 Gasket
10 Cover	27 Flange connector	45 Outer oil seal cap	62 Cover
11 Gasket	28 Bolt	46 Cover	63 Gear oil cap
12 Adjustment ring	29 O-ring	47 Pin	64 Rivet
13 Adjustment screw	30 Gasket	48 Socket bolt	65 Gasket
14 Bolt	31 Oil pan	49 Front output shaft shims	66 Bolt
15 Stopper pad	32 Suction pipe	50 Fr output shaft seal oil cap	67 Plug
16 Input shaft cover	33 Permanent magent	51 Oil seal	68 Plug
17 Oil seal	34 O-ring	52 Bolt	