TTLA-0517-LX

HITACHI

Training Text

LX300-7

Operational Principle

Hitachi Construction Machinery Co., Ltd.
Technical Training Center

NOTE

1.4 INTAKE AND EXHAUST SYSTEM

Air cleaner	Dry filter paper type (EGB16”) (used with strat precleaner)

1. General description

The intake system of the engine is designed so that the outside open air drawn through the air cleaner is compressed by the turbo charger and sent to the intake manifold.

The exhaust system of the engine is designed so that the exhaust gas is sent from the exhaust manifold to the turbocharger to drive the turbocharger and is discharged through the muffler and tail pipe.

⚠ Be careful not to touch the muffler or exhaust manifold since they are hot when the engine is running and for a while after it is shut off; otherwise, you might burn your hand.

2.1 TORQUE CONVERTER AND TRANSMISSION

Torque converter	
Name	TCA40-1B
Type	3-element, 1-stage, single-phase type
Pressure setting	0.39 • }0.10 MPa {4 • }1 kgf/cm^2} [57 • }15 psi]
Charging pump	
Name	SAR80
Type	Gear type
Transmission	
Name	681-34 (KTM4435W)
Type	Solenoid, full power-shift, planetary gear type, full-modulation
Reduction gear	Spur gear and helical gear
Clutch (for transmission)	
Type	Wet multiple-disk type
Operation	Hydraulic
Pressure setting	2.65 MPa {27 kgf/cm^2} [384 psi]

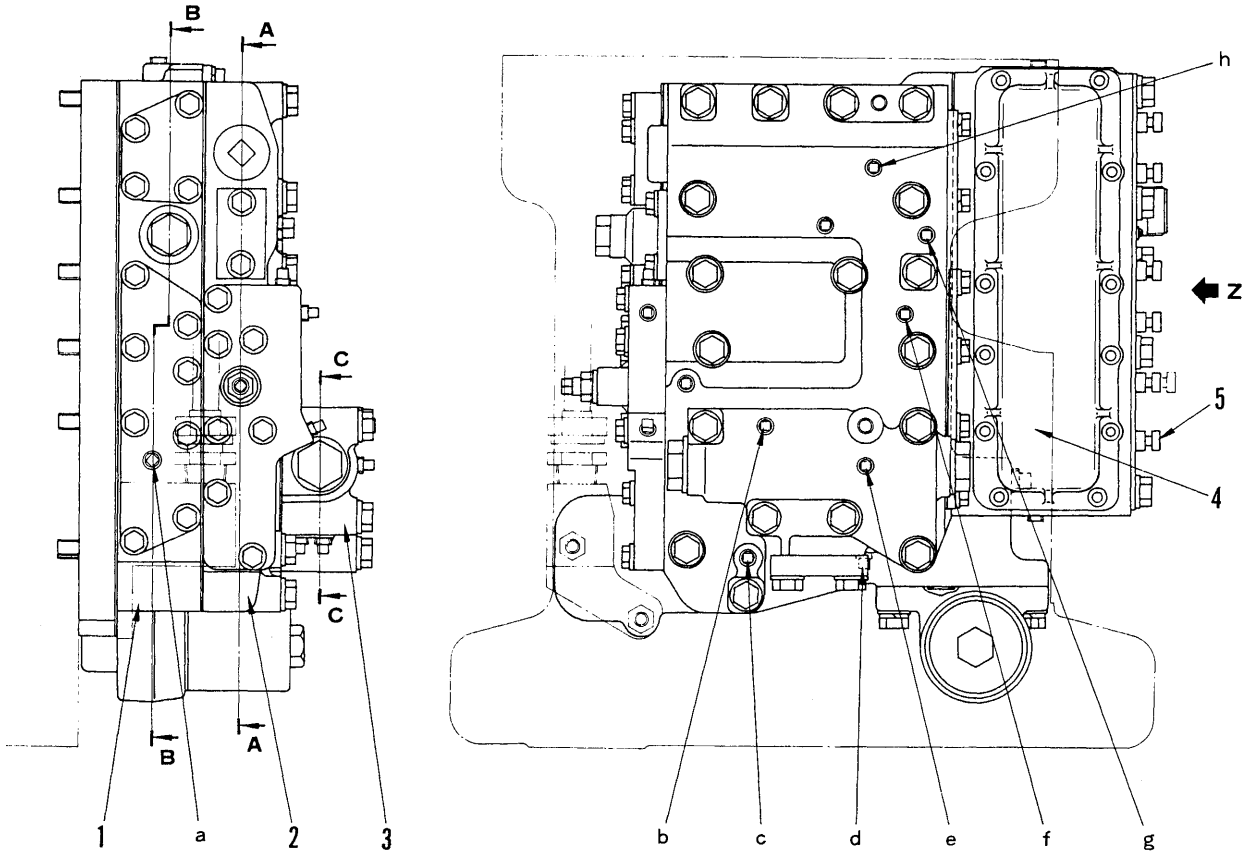
General description

The drive unit is a compact one-piece body consisting of the torque converter, transmission and transfer cases (housings) bolted together.

The drive unit is connected to the engine and is mounted in the rear frame with mounting rubbers.

Power from the engine is transmitted through the engine flywheel and torque converter to the transmission.

2.1.3 TRANSMISSION VALVE



1. LOWER VALVE
2. UPPER VALVE
3. MAIN RELIEF VALVE
4. TRANSMISSION SOLENOID VALVE
5. EMERGENCY MANUAL SPOOL
6. CONNECTOR

a. PILOT REDUCED OIL PRESSURE CHECK PORT
b. TORQUE CONVERTER RELIEF PRESSURE CHECK PORT
c. TRANSMISSION LUBRICATION PRESSURE CHECK PORT
d. PRIORITY PRESSURE CHECK PORT
e. MAIN RELIEF PRESSURE CHECK PORT
f. MODULATION PRESSURE CHECK PORT
g. ACCUMULATOR PRESSURE CHECK PORT
h. REDUCING VALVE PRESSURE CHECK PORT

Fig. 2.13 Transmission Valve Outer View

(3) When the clutch pressure rise is completed (Point C in fig. 2.26)

The oil sent into the port E continues to push the piston (4) to the stroke end. When the piston reaches the stroke end, the pressure rise stops. The pressure at this point is the pressure setting of the modulating valve. The ports F and G are closed by the piston (4).

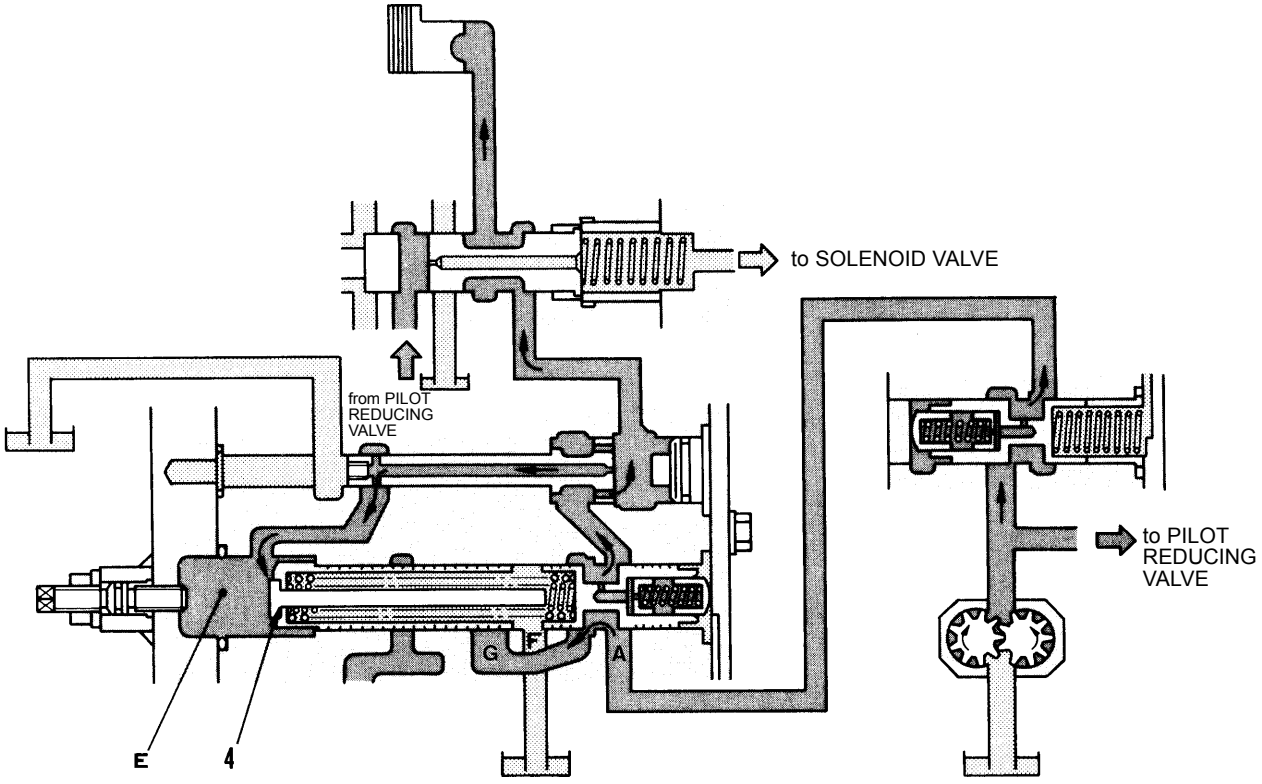
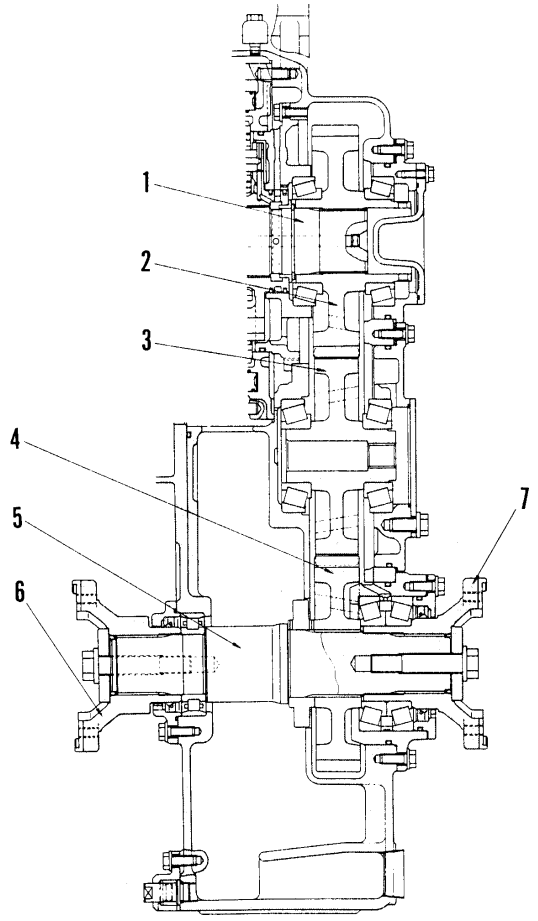


Fig. 2.29 When Clutch Pressure Rise is Completed

2.1.4 TRANSFER



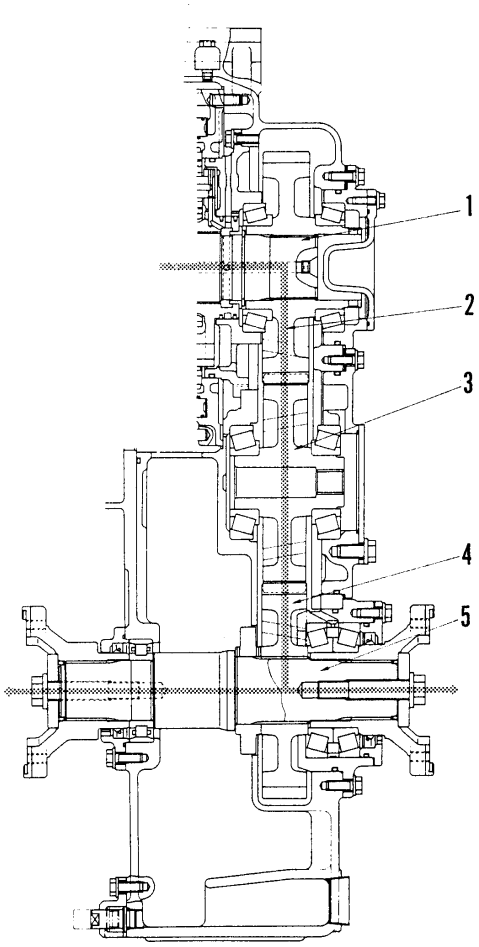
Structure

The transfer is installed on the transmission output side and secured to the transmission case with bolts.

1. TRANSMISSION OUTPUT SHAFT
2. TRANSFER INPUT GEAR
3. TRANSFER IDLER GEAR
4. OUTPUT GEAR
5. OUTPUT SHAFT
6. REAR COUPLING
7. FRONT COUPLING

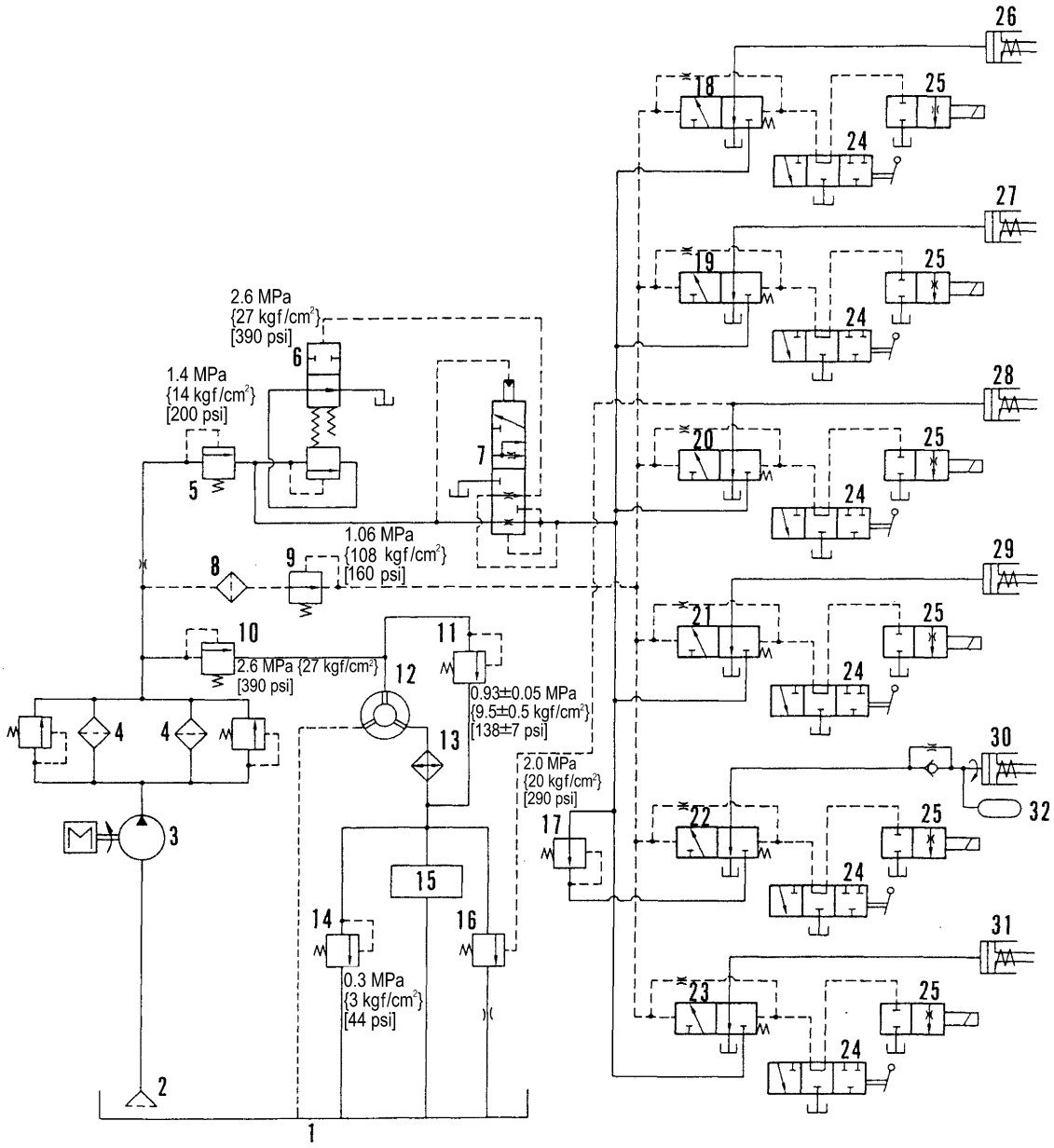
Power flow

1. The transmission output shaft (1) is splined to the transfer input gear (2). The power is transmitted through the idler gear (3) to the output gear (4) and then to the output shaft (5).
2. The power transmitted to the output shaft is divided into two routes. One transmitted through the front propeller shaft to the front axle.
3. The other is is transmitted through the rear propeller shaft to the rear axle.



Power Flow

Fig. 2.44 Transfer



1. TRANSMISSION CASE
2. STRAINER
3. TORQUE CONVERTER CHARGING PUMP
4. OIL FILTER
5. PRIORITY VALVE
6. MODULATING VALVE
7. QUICK RETURN VALVE
8. PILOT OIL FILTER
9. PILOT REDUCING VALVE
10. MAIN RELIEF VALVE
11. TORQUE CONVERTER RELIEF VALVE
12. TORQUE CONVERTER
13. OIL COOLER
14. LUBRICATION RELIEF VALVE
15. TRANSMISSION LUBRICATION
16. LUBRICATION BYPASS VALVE
17. REDUCING VALVE
18. REV SPOOL
19. FWD SPOOL
20. 4TH SPEED SPOOL
21. 3RD SPEED SPOOL
22. 2ND SPEED SPOOL
23. 1ST SPEED SPOOL
24. EMERGENCY MANUAL SPOOL
25. SOLENOID VALVE
26. REV CLUTCH
27. FWD CLUTCH
28. 4TH SPEED CLUTCH
29. 3RD SPEED CLUTCH
30. 2ND SPEED CLUTCH
31. 1ST SPEED CLUTCH
32. ACCUMULATOR VALVE

Fig. 2.50 Hydraulic Circuit Diagram (Engine at rest)

2.5.2 DIFFERENTIAL

The differential is integral with the reduction gear.

The power from the propeller shafts is transmitted through the drive pinion and the ring gear to the differential gear case. It is then sent through the side gears to the right and left axle shafts. The speed reduction of the power is accomplished by the drive pinion and the ring gear.

The differential operates as follows:

(1) Conventional differential

Most wheel loaders use the conventional differential which is the same type used for automobiles.

1. While the loader travels straight forward, the ring gear, differential gear case, and side gears rotate together, with the pinion gears inside the differential gear case not rotating. The power of the same speed is thus transmitted from the right and left side gears through the axle shafts to the wheels.
2. When the loader makes a turn, the right and left wheels rotate at different speeds; the pinion gears in the differential gear case rotate around their own axes according to the difference in speed between the right and let side gears.

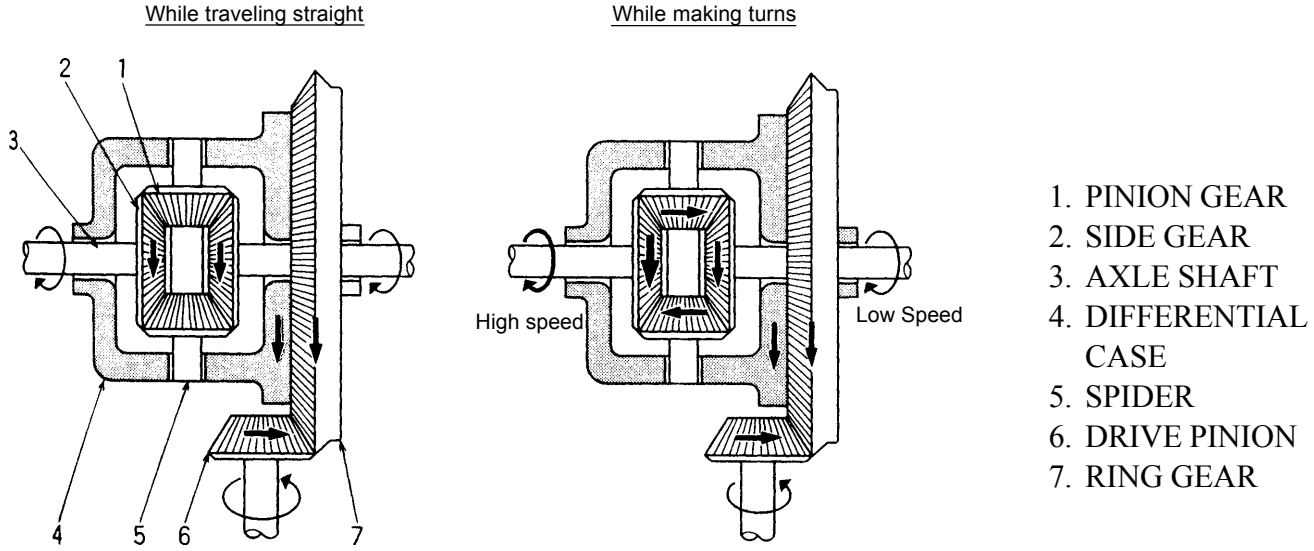
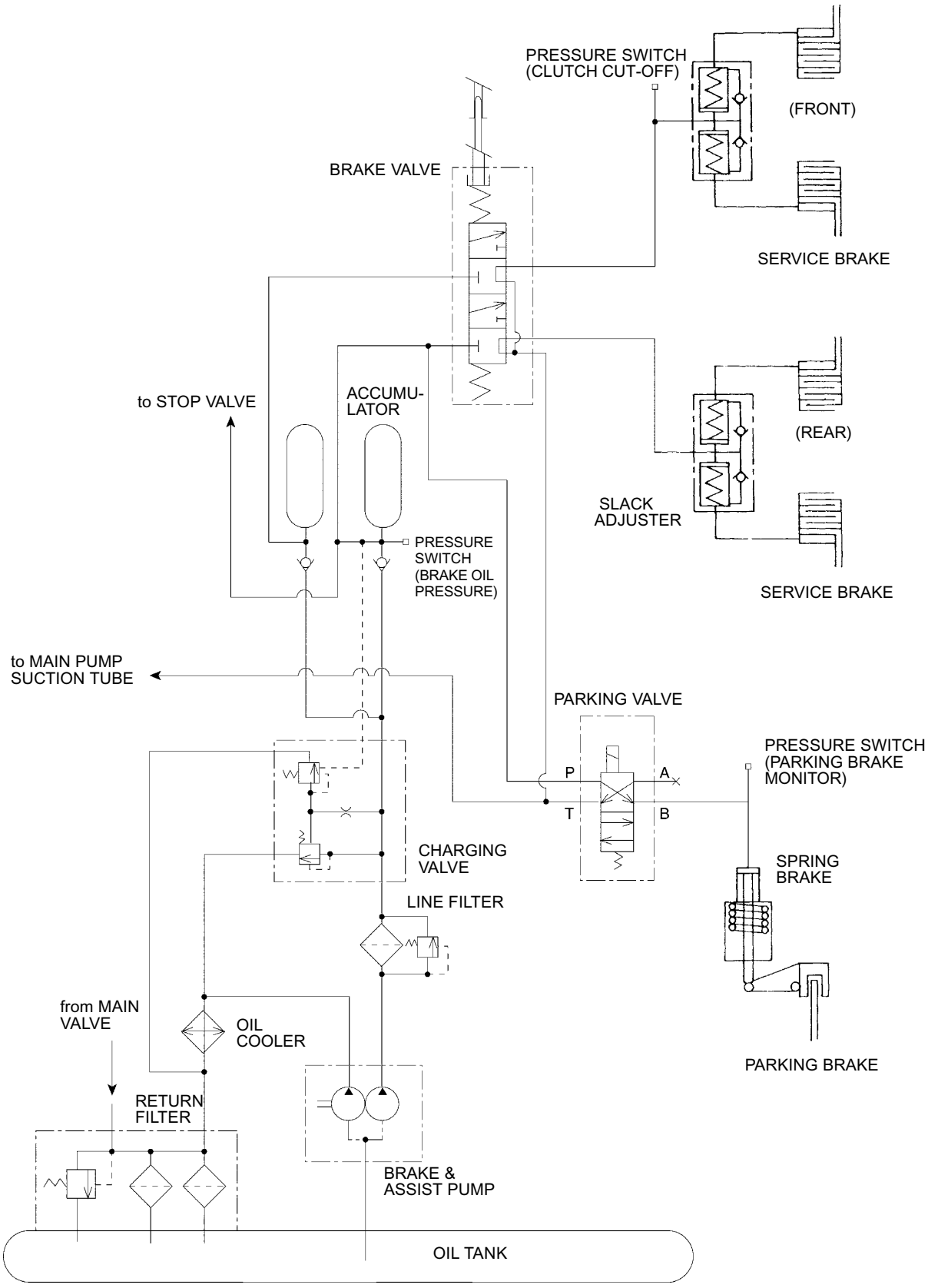


Fig. 2.59 Differential Gear Operation

(2) Limited slip differential (L.S.D)

Wheel loaders often need to work on a bad ground condition such as on sand or in a swampy place. On such a bad ground condition, a loader with the conventional differential can skid, thus making it difficult to deliver its performance. In addition, the tires will also wear out prematurely. To prevent this from happening, some models may come equipped with a limited slip differential which limits differential action.

The limited slip differential has a clutch disk inserted between the side gear and the differential case rotation, to keep the same rotation of the right and left tires using the resistance of the frictional surface of the clutch disk, thus limiting differential action.

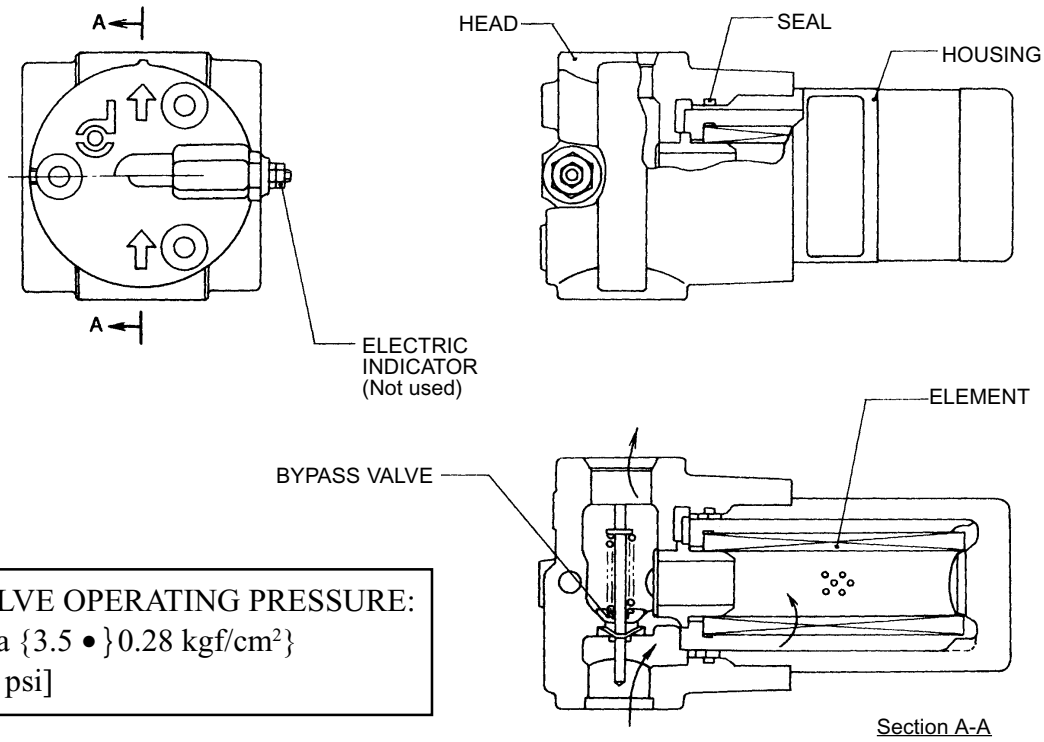


Note: This circuit diagram includes the parking brake circuit.

Fig. 3.2 Brake Oil Circuit Diagram

3.1.6 OTHER COMPONENTS

1. Filter



BYPASS VALVE OPERATING PRESSURE:
343 •}27 kPa {3.5 •}0.28 kgf/cm^2}
[49.7 •}3.92 psi]

Fig. 3.10 Filter

2. Accumulator

A piston type accumulator is used. The leakage of the sealed gas is less than the conventional plug type.

⚠ Nitrogen gas should be used for the sealed gas in the accumulator.
Do not use the explosive gas such as oxygen.

Sealed gas (N_2) pressure: 3.43 •}0.1 MPa {35 •}1 kgf/cm^2} [497 •}14.5 psi]

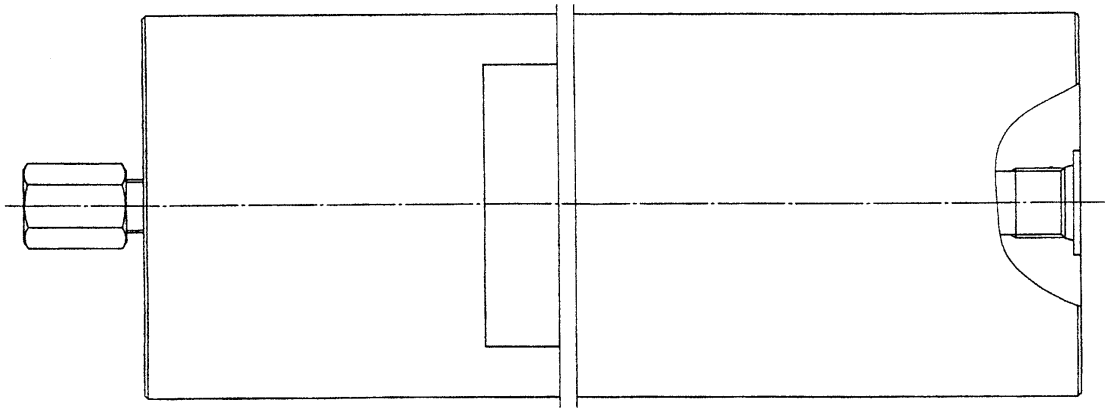
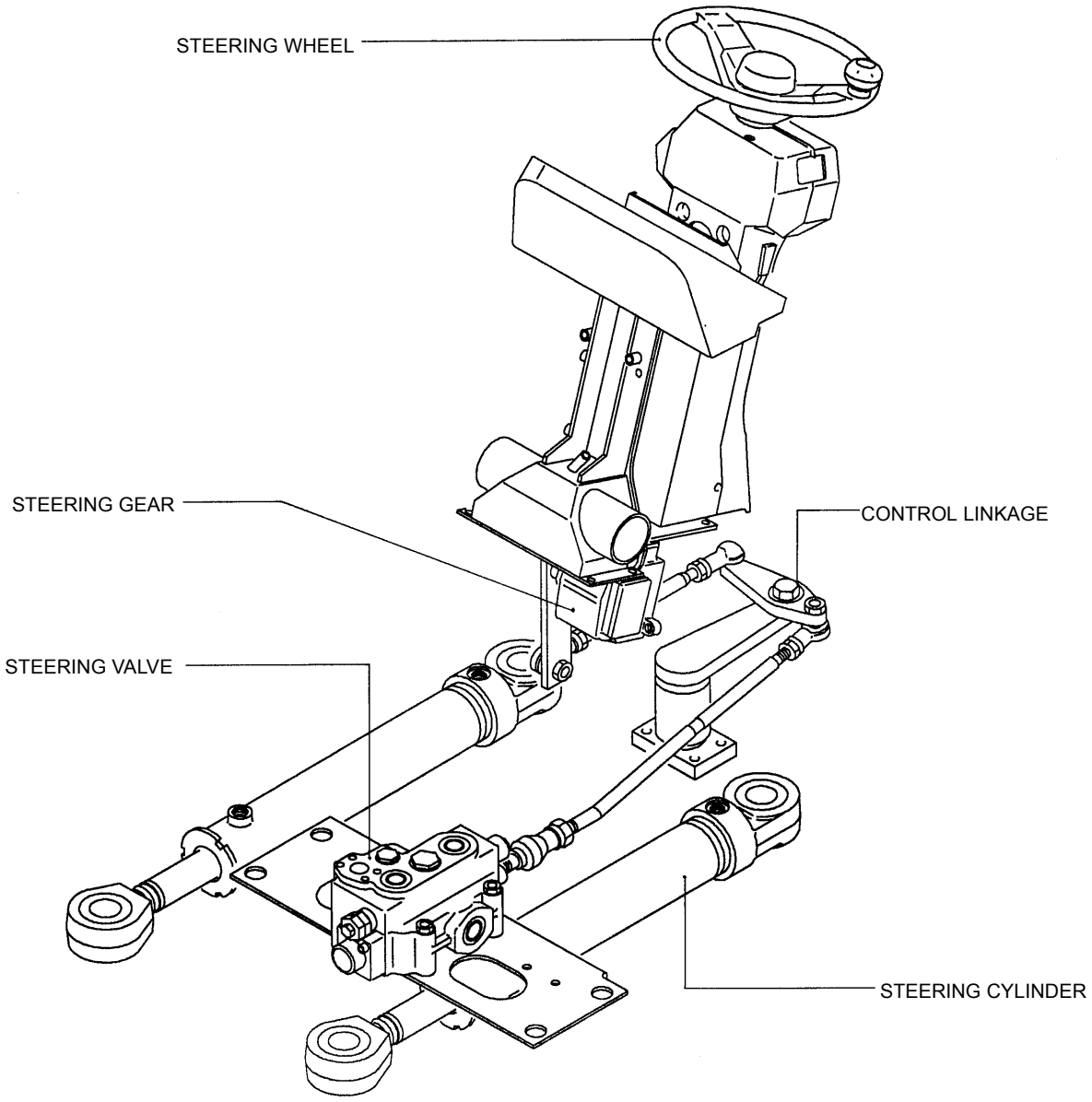


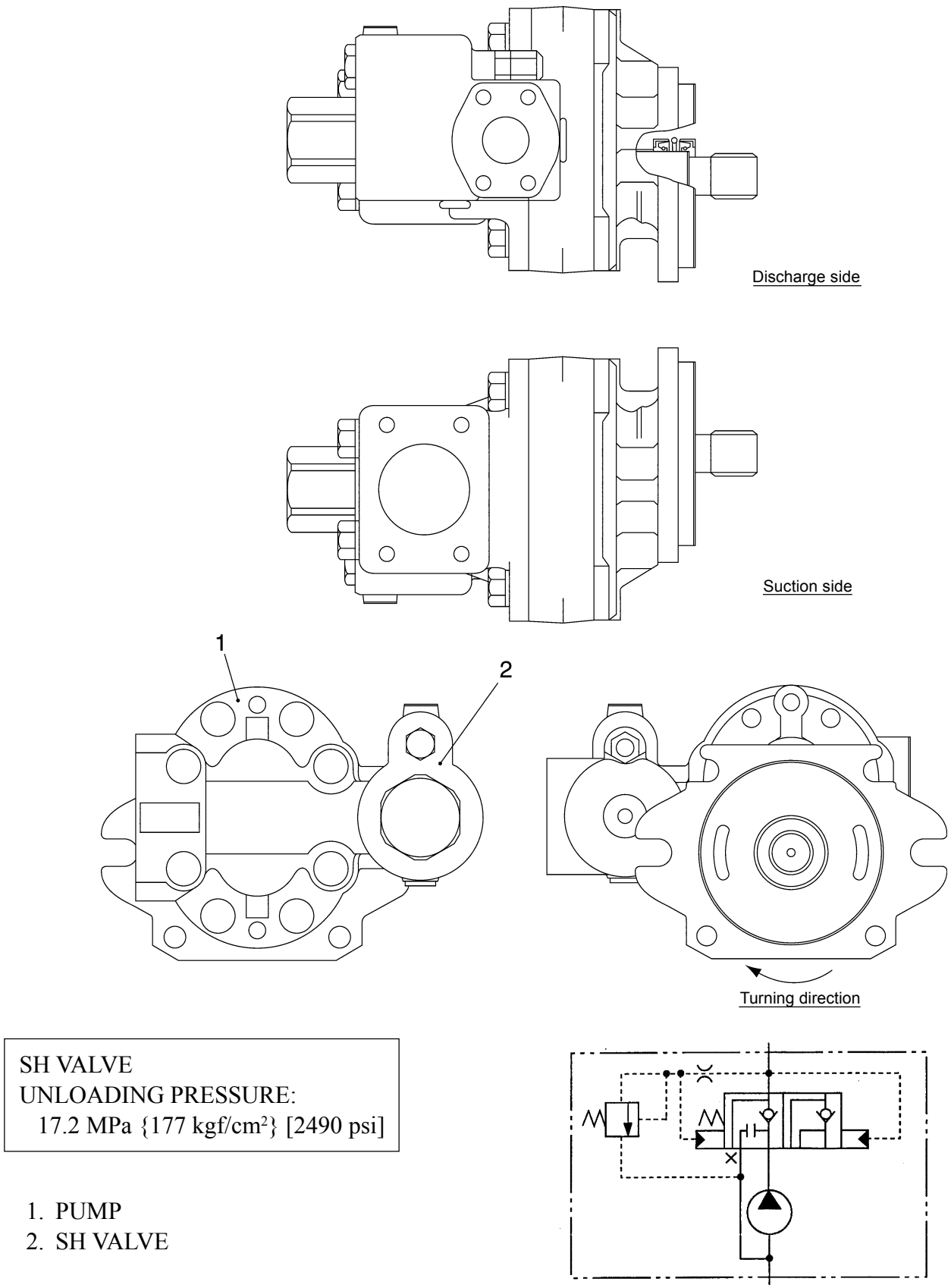
Fig. 3.11 Accumulator



Note: The above sketch does not illustrate the tubing

Fig. 4.2 Steering System

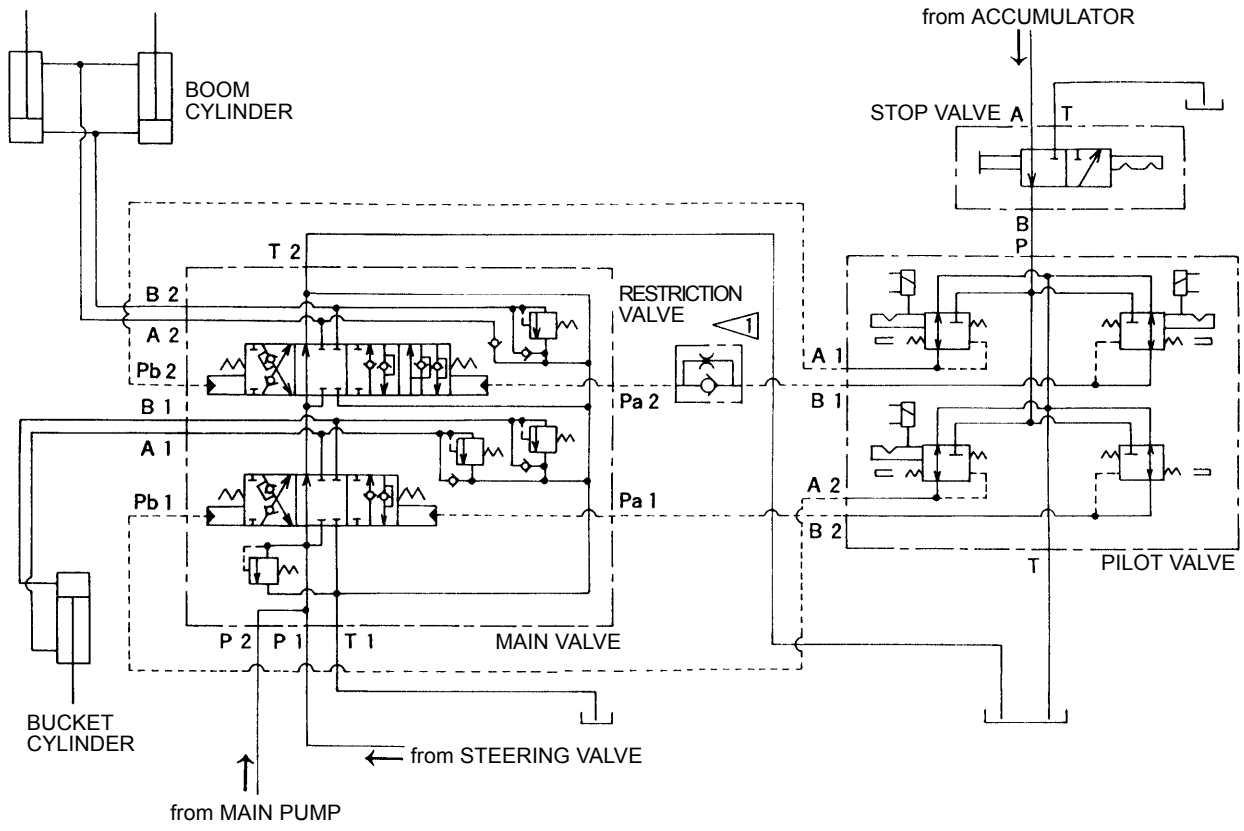
NOTE



SH VALVE
UNLOADING PRESSURE:
17.2 MPa {177 kgf/cm²} [2490 psi]

1. PUMP
2. SH VALVE

Fig. 6.4 Main Pump



Note: 1> The restriction valve is a functional component of the GSS. Refer to "7.13 BUCKET LEVELER, BOOM KICK-OUT AND GSS."

[Typical Operation] When boom lever is at "Lift" position:

1. When the boom lever is moved to the "Lift" position, A1 and B1 ports of the pilot valve are connected to the T and P ports, respectively.
2. The pressurized oil in the accumulator is sent through the stop valve to the P port of the pilot valve.
3. The pressurized oil at the P port of the pilot valve flows through the B1 port to the Pb2 port of the main valve, moving the main valve spool. Then, the pressurized oil at the P port of the main valve is discharged from the B2 port to extend the boom cylinder, raising thus the boom.
4. The oil discharged from the Pa2 port by movement of the main valve spool flows into the B1 port of the pilot valve, and returns through the T port into the oil tank.

Fig. 6.12 Hydraulic Circuit Diagram of Valve Control System

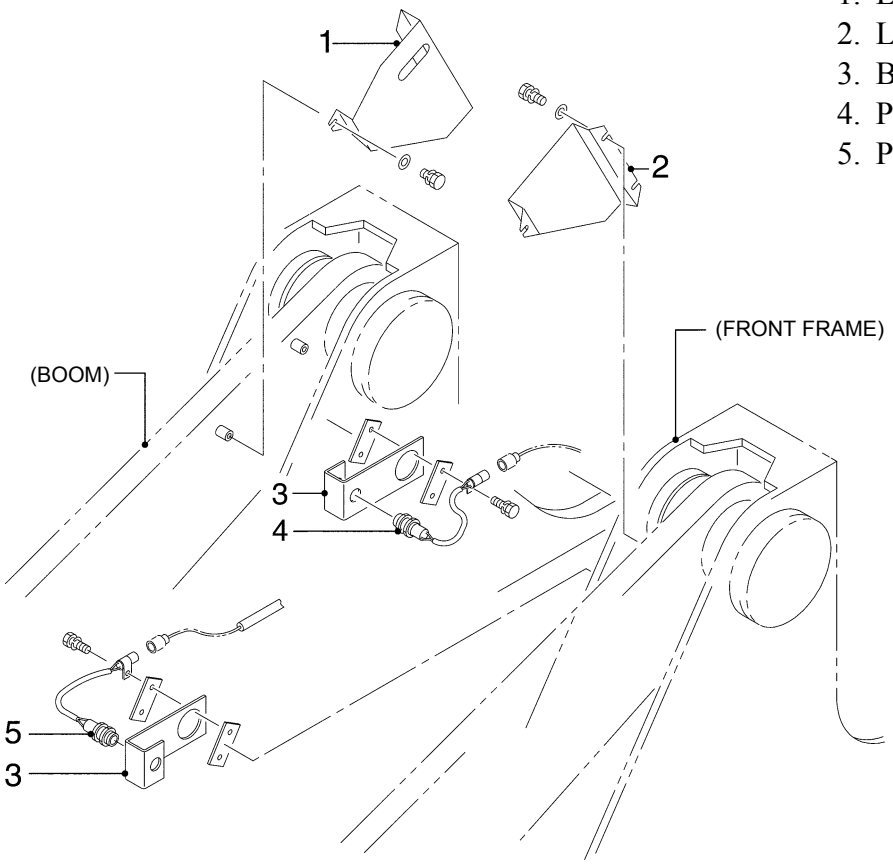
2. Boom kickout

The boom kickout device stops the booms at a preset height during the lifting phase. With the boom lever in the RAISE position, the boom kickout device automatically returns the boom lever into neutral when the booms are raised to a preset height, thus stopping the lifting operation of the booms.

Operation (See Fig. 7.7 & Fig. 7.6)

1. When the booms are in the lower position than the preset boom kickout height, the sensing surface of the proximity switch for the boom kickout is close to the level plate and the switch stays ON. When the boom lever is put in the RAISE position, the boom kickout solenoid of the pilot valve holds the position of the boom lever.
2. When the booms are raised to a preset boom kickout height, the level plate leaves the sensing surface of the proximity switch, thus turning off the switch.
3. When the boom kickout solenoid of the pilot valve is de-energized, the detent comes off to return the boom lever to neutral, stopping the lifting operation of the booms. Then, the booms stop in the preset height.

Note: With the booms beyond the preset boom kickout height, the proximity switch of the boom kickout stays OFF so that the boom lever detent mechanism in the RAISE position won't work.



1. LEVEL PLATE (for GSS)
2. LEVEL PLATE (for Kickout)
3. BRACKET
4. PROXIMITY SWITCH (for GSS)
5. PROXIMITY SWITCH (for Kickout)

Fig. 7.7 Boom Kickout Device and GSS Assembly Drawing