No. SEW-605BE

TCM®

SERVICE MANUAL

WHEEL LOADER

E803
E804
E805
E806

TOYO UMPANKI CO.,LTD.

0. SPECIFICATIONS

0.1 OUTER VIEWS

E803

Unit: mm (in)

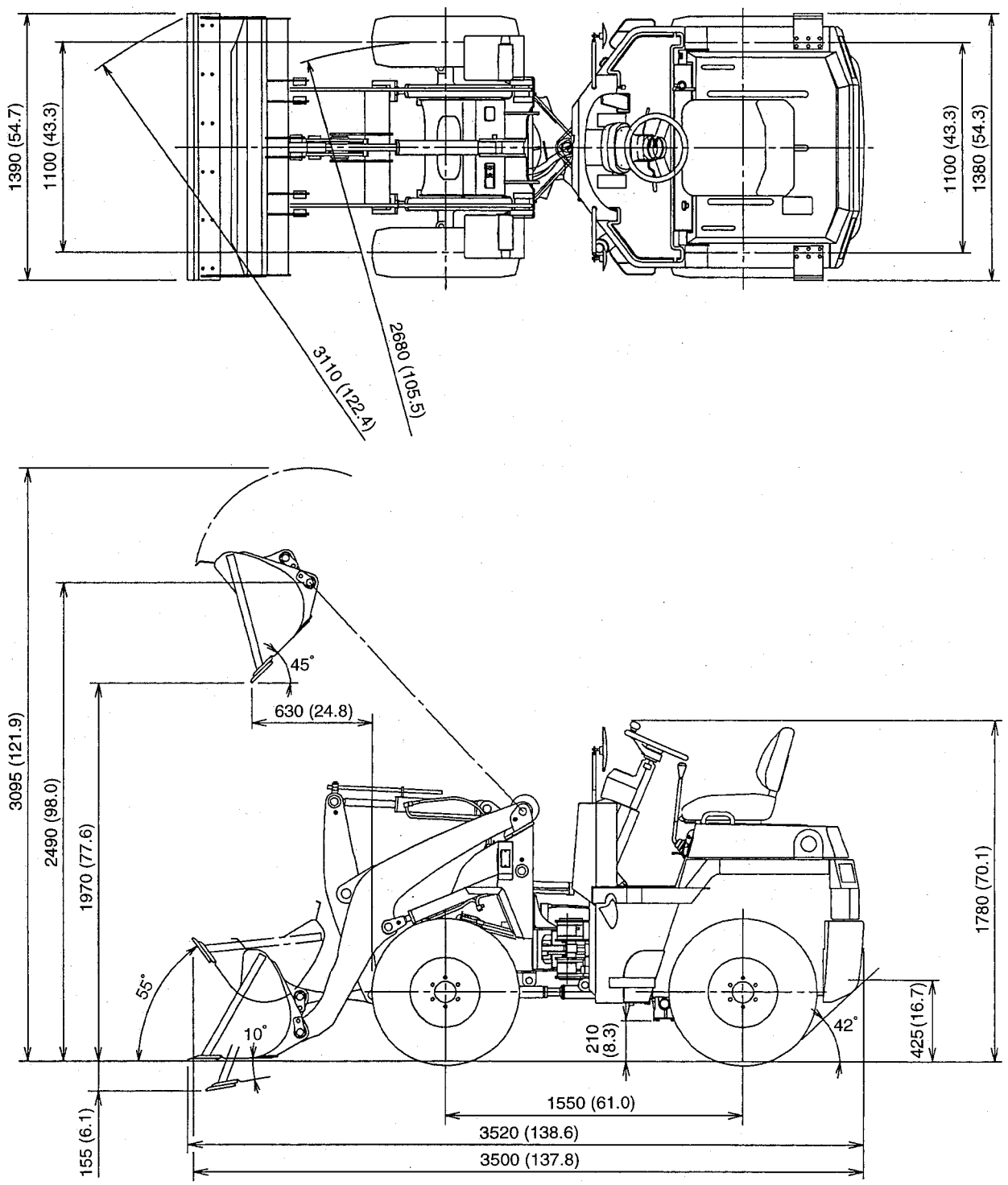
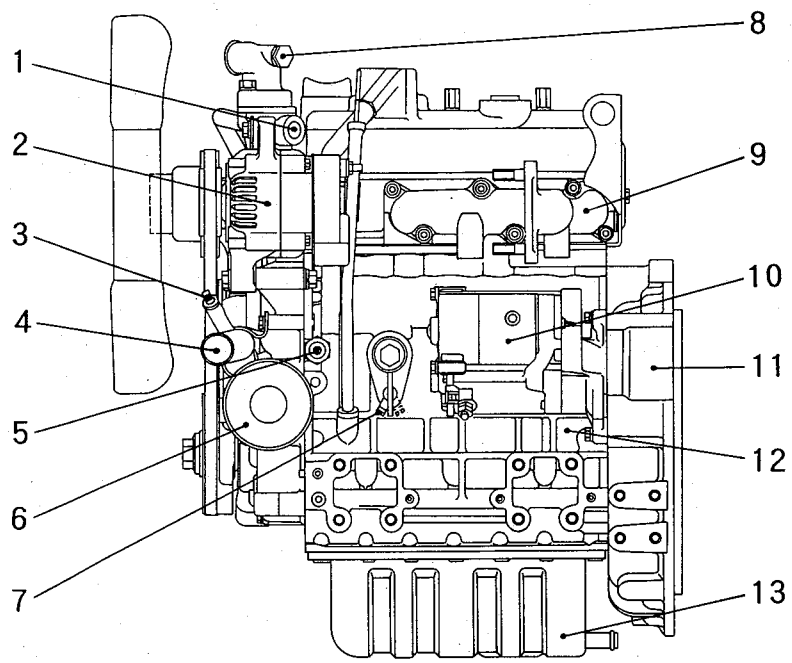


Fig. 0.1 Outer View (E803)

2. Outer Views of Engine

(1) D1105-KA Diesel Engine



1. WATER TEMPERATURE GAUGE SENSOR FITTING PORT
2. ALTERNATOR
3. CAB HEATER WATER INLET
4. COOLING WATER INLET
5. OIL PRESSURE SWITCH FITTING PORT
6. OIL FILTER
7. WATER DRAIN COCK
8. WATER TEMPERATURE SENSOR (FOR GLOW)
9. EXHAUST MANIFOLD
10. STARTER MOTOR
11. FLYWHEEL HOUSING
12. CRANK CASE
13. OIL PAN

14. NOZZLE HOLDER
15. CYLINDER HEAD COVER
16. INLET MANIFOLD
17. CYLINDER HEAD
18. ENGINE STOP SOLENOID
19. COOLING WATER OUTLET
20. CAB HEATER WATER OUTLET
21. FUEL SUCTION PIPE (FROM FUEL PUMP)
22. INJECTION PUMP
23. COOLING FAN
24. V-BELT

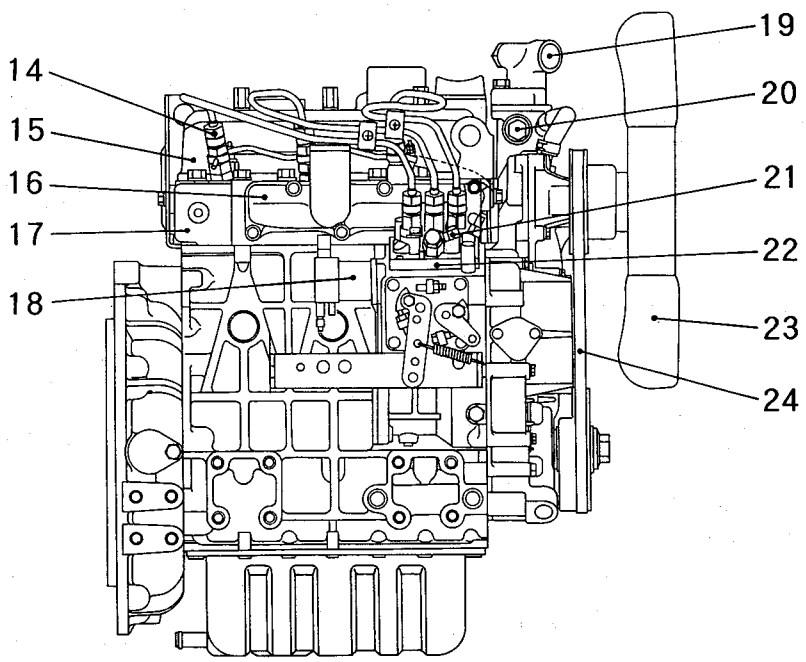
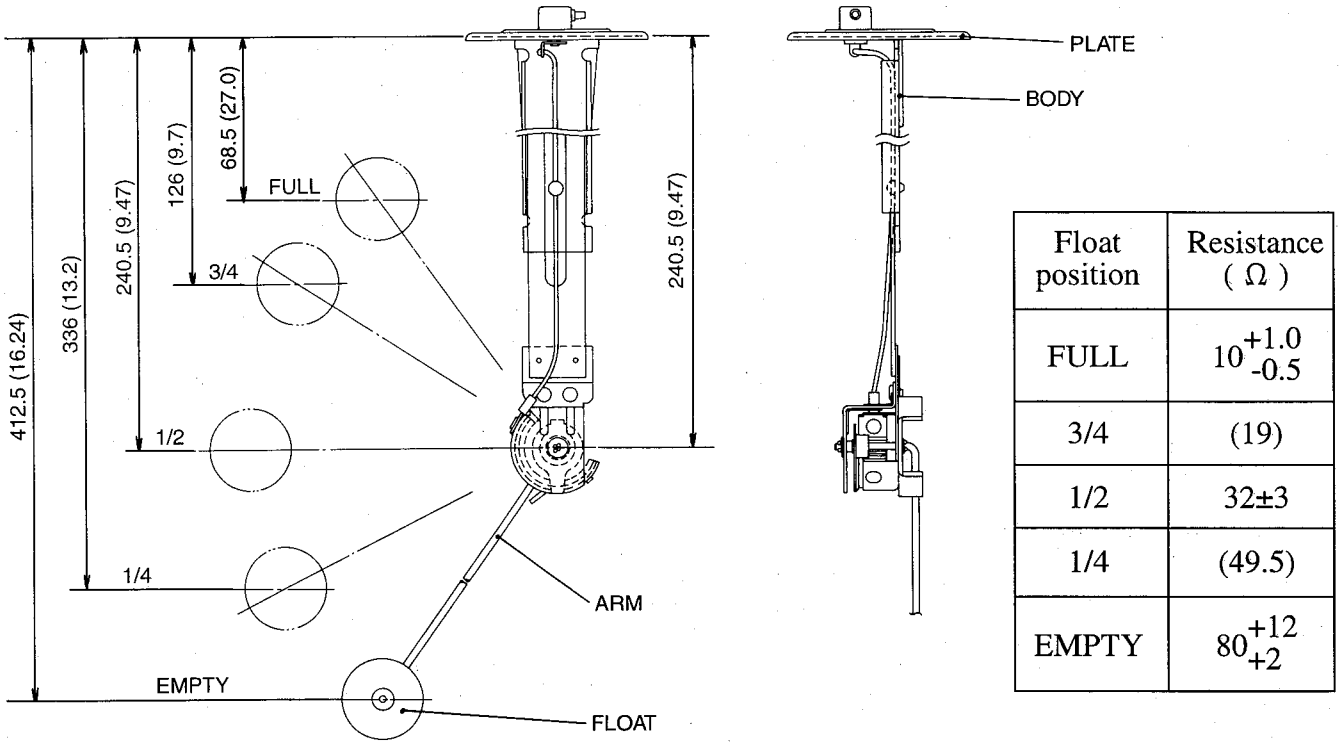


Fig. 1.2 D1105-KA Diesel Engine

(Unit: mm (in))



Float position	Resistance (Ω)
FULL	$10^{+1.0}_{-0.5}$
3/4	(19)
1/2	32±3
1/4	(49.5)
EMPTY	80^{+12}_{+2}

Fig. 1.11 Fuel Level Sender Unit

2.1 HST UNIT

2.1.1 HYDRAULIC DRIVE

1. General Description

Hydraulic drives convert engine power first to fluid power and then to mechanical power (linear or rotational motion) which drives the wheels or other components. The fluid to be used is mineral hydraulic oil. In this sense, you can call all hydraulic drives a type of hydrostatic transmission (HST). However, the hydrostatic transmission (HST) generally means the kind of hydraulic drive that transmits only rotational power.

Hydraulic drives are classified into two types: the hydrostatic type which uses pressure energy and the hydrodynamic type which uses kinetic energy.

(1) Hydrodynamic Unit

The hydrodynamic unit uses kinetic energy produced by fluid flowing at a high speed. The high-speed, low-pressure fluid is discharged from the centrifugal pump, hits the turbine wheel blades to turn the turbine wheel and thus the turbine shaft, out of which the rotational power is taken. The torque converter is a typical hydrodynamic unit and is used for wheel loaders and other vehicles.

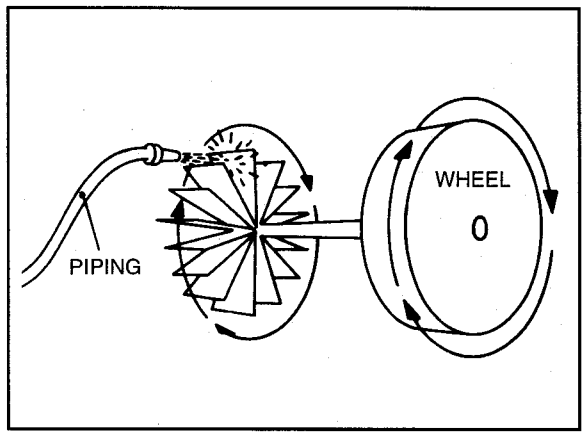


Fig. 2.3

(2) Hydrostatic Unit

The hydrostatic unit uses high-pressure, low-speed fluid (oil pressure). The pressure oil discharged from the pump is sent to the hydraulic motor which is in turn rotated to transmit the power to the drive wheels. This kind of hydrostatic unit is called a hydrostatic transmission (HST). The HST pump and HST motor form a closed loop; they are connected through the hydraulic lines so that the fluid flows between the pump and motor. Since the fluid is non-compressive, it acts as a rigid link that connects the pump to the motor. This kind of unit is used for skid steer wheel loaders and small-sized wheel loaders.

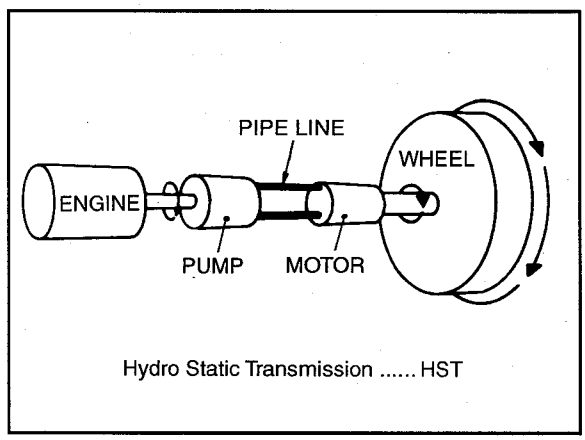
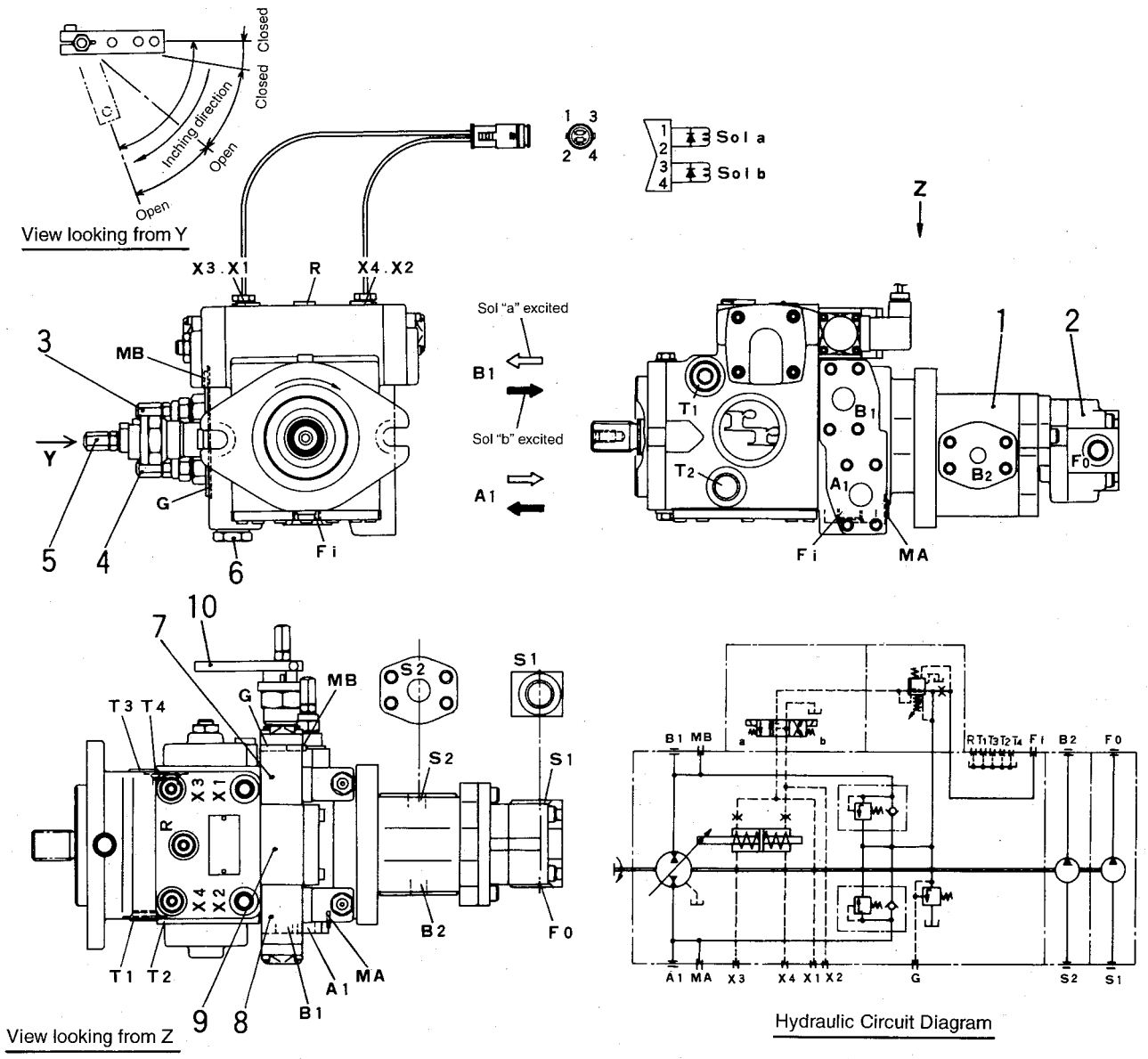


Fig. 2.4



(Explanation of ports)

A1, B1	:	Discharge port
T1, T3	:	Drain and filler port
T2, T4	:	Drain port
MA	:	Gauge port (A side)
MB	:	Gauge port (B side)
R	:	Air bleeding port
X1, X2	:	Control pressure port
X3, X4	:	Control pressure port
G	:	Gauge port (charging line)
Fi	:	Charge pressure inlet port
S1	:	Suction port
Fo	:	Charge pressure outlet port
S2	:	Suction port
B2	:	Discharge port

(Part name)

1. MAIN PUMP
2. HST CHARGING PUMP
3. HIGH-PRESSURE RELIEF VALVE (B)
4. HIGH-PRESSURE RELIEF VALVE (A)
5. DA VALVE
6. LOW-PRESSURE RELIEF VALVE
7. SOLENOID a
8. SOLENOID b
9. DIRECTIONAL CONTROL VALVE
10. INCHING LEVER

Fig. 2.16 HST Pump

(5) Automatic Speed Control

① The control pressure proportional to engine speed is connected flows from the DA valve to the tilt-rolling cylinder selected by the directional control valve.

② With the engine at idle, the control pressure is smaller than the spring pressure of the tilt-rolling piston so that the pump is in neutral and the loader stationary.

③ As engine speed increases, the control pressure also increases so that the tilt-rolling piston moves to let the pump tilt roll. Since the pump discharge varies with engine speed, it is possible to control the traveling speed of the loader smoothly with the accelerator pedal.

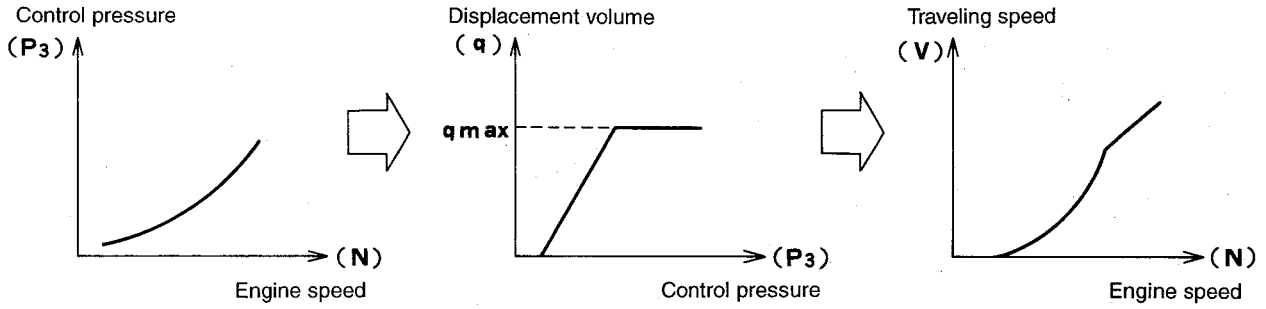


Fig. 2.28 Engine Speed vs. Traveling Speed

(6) Torque Control Function

① With the pressure increasing, the tilt-rolling restoration force increases to reduce the tilt rolling of the pump so that the pump produces an approximately constant torque control. (Fig. A)

② The setting torque is determined by the balance between the control pressure, tilt-rolling cylinder spring pressure, and tilt-rolling restoration force. With the main circuit oil pressure constant, it varies with engine speed. (Fig. B)

③ If a load exceeding engine torque were applied, engine speed would drop from N_1 to N_2. If engine speed drops, the pump's absorption torque also decreases so that the tilt rolling action of the pump is balanced with engine torque. (Fig. C) That is, when the load increases, the engine slightly slows down and the pump automatically controls its tilt rolling action, thus making good use of engine torque without stopping the engine.

Fig. A **Fig. B** **Fig. C**

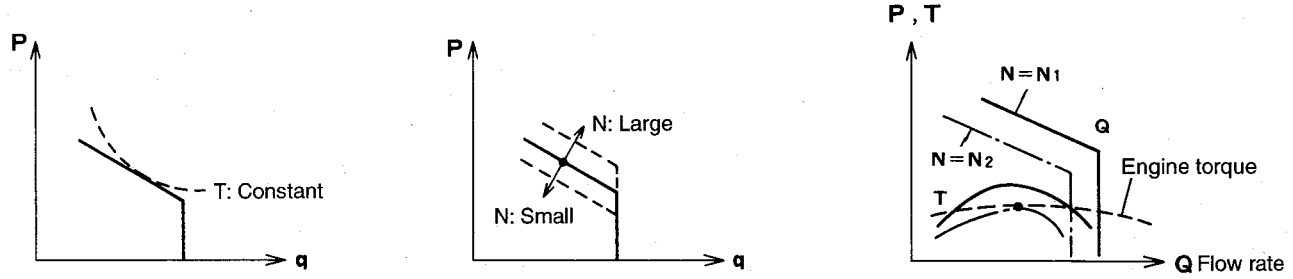


Fig. 2.29 Torque Control Function

② When the oil pressure acting on the servo spool is lower than the spring pressure, PC is directed to the oil tank (inside the housing) so that the control piston moves toward the direction of q max. By contrast, when the oil pressure higher than the spring pressure, PC is connected to PH so that the control piston moves toward the direction of q min.

Neutral (q: held constant)	$P_X \times A - P_H \times B = F_{AJ} + F_{FB}$
Tilt-rolling (changes to q max)	$P_X \times A - P_H \times B < F_{AJ} + F_{FB}$
Tilt-rolling (changes to q min)	$P_X \times A - P_H \times B > F_{AJ} + F_{FB}$

• Tilt-Rolling Start Pressure (Pi)

The tilt-rolling start pressure is adjustable with the adjusting spring pressure FAJ.

F_{AJ}: large → Pi: small

Pi varies with the change in P_X

P_X: large → Pi: large

• Override (△ P)

The override is factory set depending upon the area B and the spring coefficient of the feedback spring. Do not try to adjust the override.

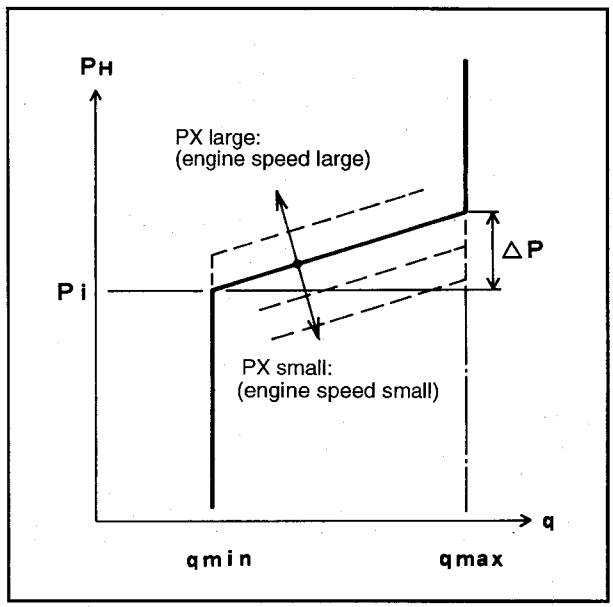
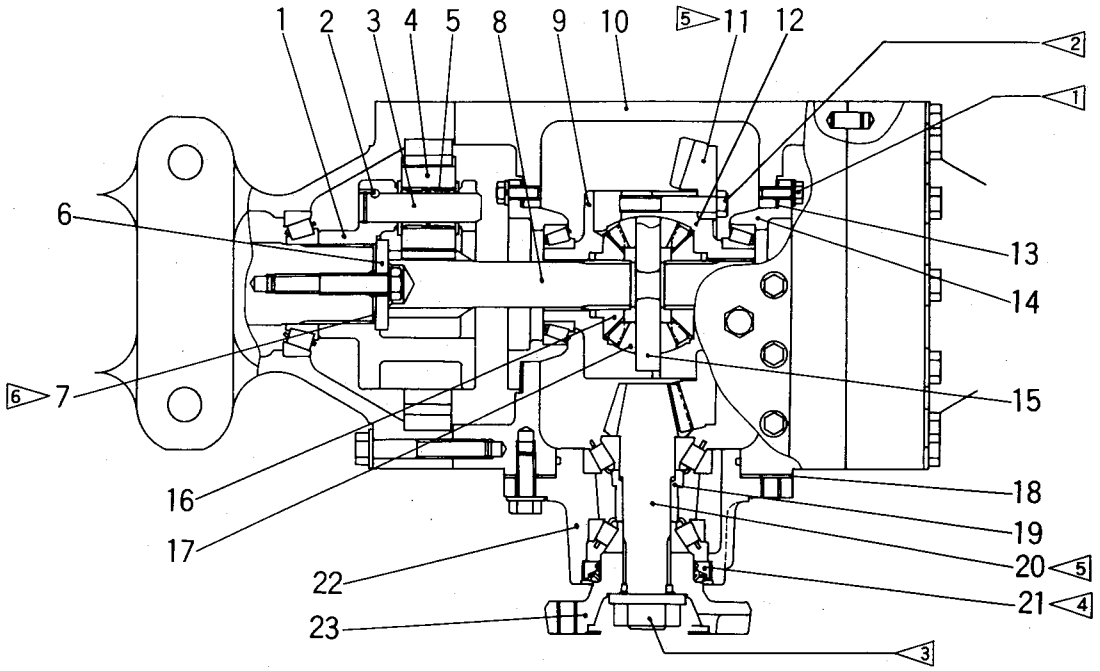


Fig. 2.39

• Loader performance and DA characteristics

The setting varies with engine speed (HST pump input speed). When the load is light and the engine runs at idle, tilt-rolling is maximized. As engine speed increases, tilt-rolling automatically shifts to the smaller side, allowing the engine to run at higher speeds. As the load increases, tilt-rolling also becomes large, thus making available larger traction force. That is, judging the intention of the operator from the engine speed, the DA regulator automatically controls the amount of torque according to the magnitude of the load.



Note: ▷1 2.9 kg-m (21 ft-lbs), Threaded area: LOCTITE #262

▷2 5.6 kg-m (40 ft-lbs), Threaded area: LOCTITE #262

▷3 25 kg-m (180 ft-lbs)

▷4 Outer diameter: Liquid seal, Between lips: Grease

▷5 Backlash between ring gear and pinion gear: 0.09 - 0.13 mm (0.0035 - 0.0051 in)

▷6 Shim adjusting procedure

① Torque retainer plate bolt to 5 kg-m (36 ft-lbs) and push in axle shaft bearing cone, turning axle shaft.

② Measure spacing between retainer plate and axle shaft. Measured value = Y.

③ Choose shims so that the spacing is $Y^{-0.15\ (0.0059\ in)}_{-0.20\ (0.0079\ in)}$.

④ Install shims and install retainer plate and bolt.

14.4 kg-m (104 ft-lbs), Threaded area: LOCTITE #262

(The bearing's rotational resistance torque is 3 to 5 kg (7 - 11 lbs) on the tube fitting bolt pitch circle.)

1. PLANET CARRIER
2. BALL
3. SHAFT
4. PLANET GEAR
5. NEEDLE BEARING
6. RETAINER PLATE
7. SHIM (0.1 - 1.0 mm (0.004 - 0.039 in), 5 types)
8. GEAR & SHAFT
9. CASE A
10. DIFFERENTIAL BODY
11. RING GEAR
12. CASE B
13. SHIM (0.1 - 1.0 mm (0.004 - 0.0039 in), 5 types)
14. BEARING RETAINER
15. PINION PIN (E803) SPIDER (E804, E805, E806)
16. SIDE GEAR
17. PINION GEAR
18. SHIM (0.1 - 1.0 mm (0.004 - 0.039 in), 5 types)
19. SPACER
20. PINION GEAR (DRIVE PINION)
21. SEAL
22. BEARING CAGE
23. FLANGE

Fig. 2.47 Final Reduction Gear Assembly and Differential

2. Service Brake Released

① When the brake pedal (1) is released, the push rod of the master cylinder (3) is pulled out to its original position, returning the brake oil from the service brake cylinder chamber (15) to the master cylinder.

② The service brake piston (9) becomes free so that the wet disk brake (16) is released.

③ The HST pump (DA valve) inching lever is returned to the original position, thus releasing the inching mode.

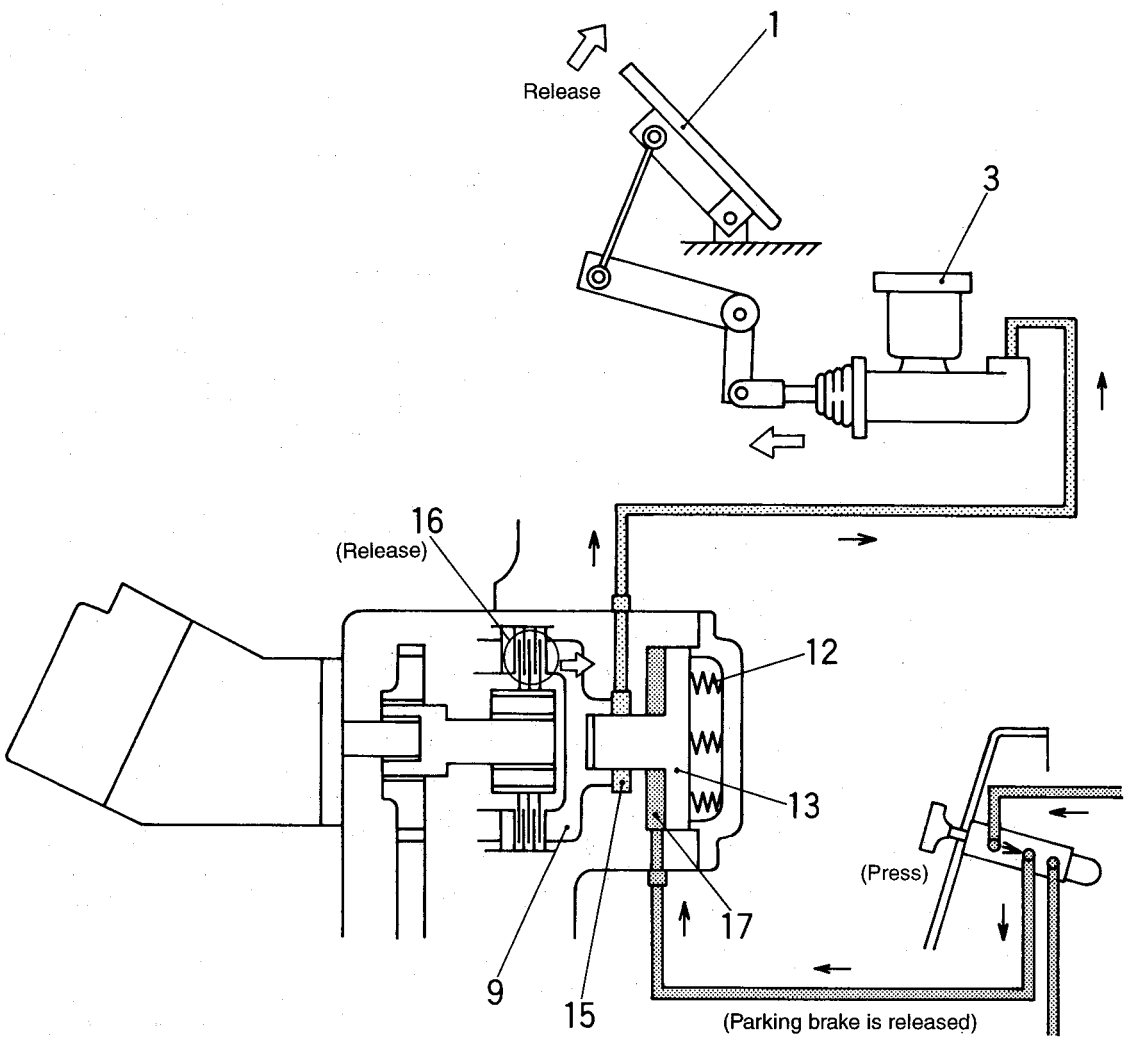
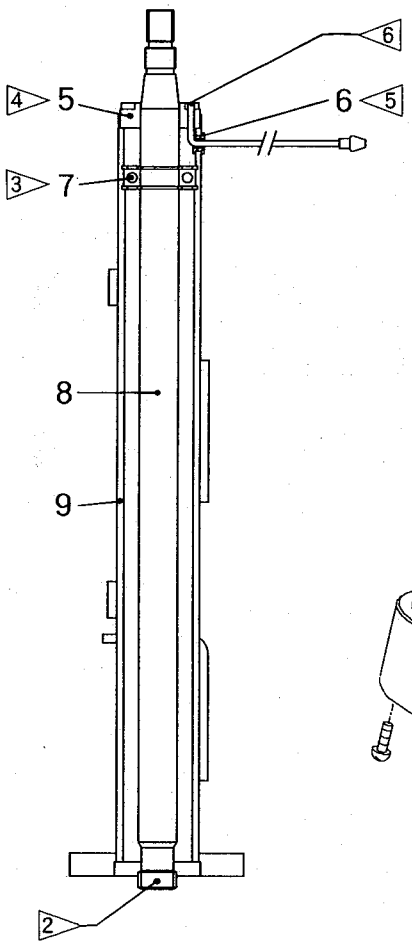


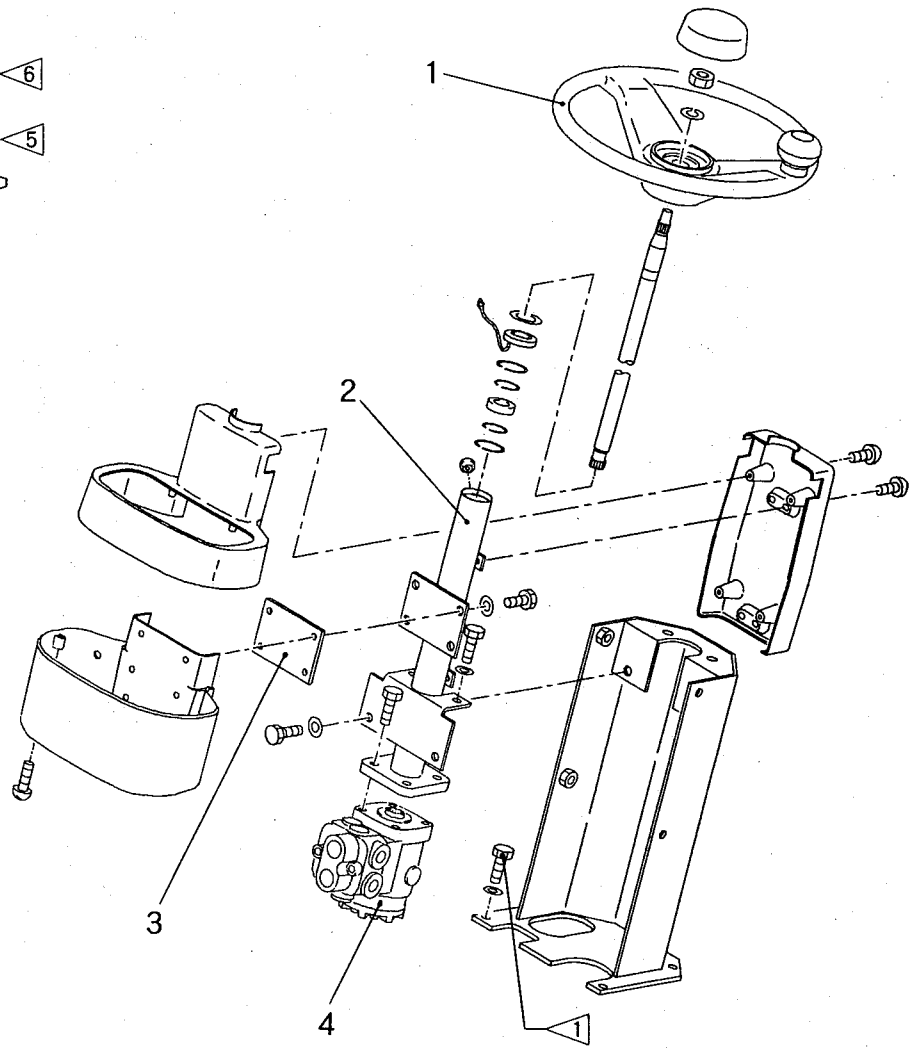
Fig. 3.4 Service Brake Released

4.3 STEERING WHEEL UNIT

The steering wheel unit is installed in the cockpit. Below it is the steer valve (orbitrol). When the steering wheel is turned, the rotation is transmitted through the steering shaft which in turn actuates the orbitrol.



Steering Wheel Unit Structure



Steering Wheel Unit Mounting

Note: 1> 4.0 ± 0.5 kg-m (29 ± 4 ft-lbs)

2> Splines: Molybdenum grease (about 3 g (0.007 lbs))

3> Grease

4> Water-proof seal

5> Synthetic rubber adhesive

6> Horn electrode contact surface: Molybdenum grease

1. STEERING WHEEL
2. STEERING WHEEL UNIT
3. MAT
4. STEER VALVE
5. BUSHING
6. GROMMET
7. BEARING
8. STEERING SHAFT
9. STEERING COLUMN

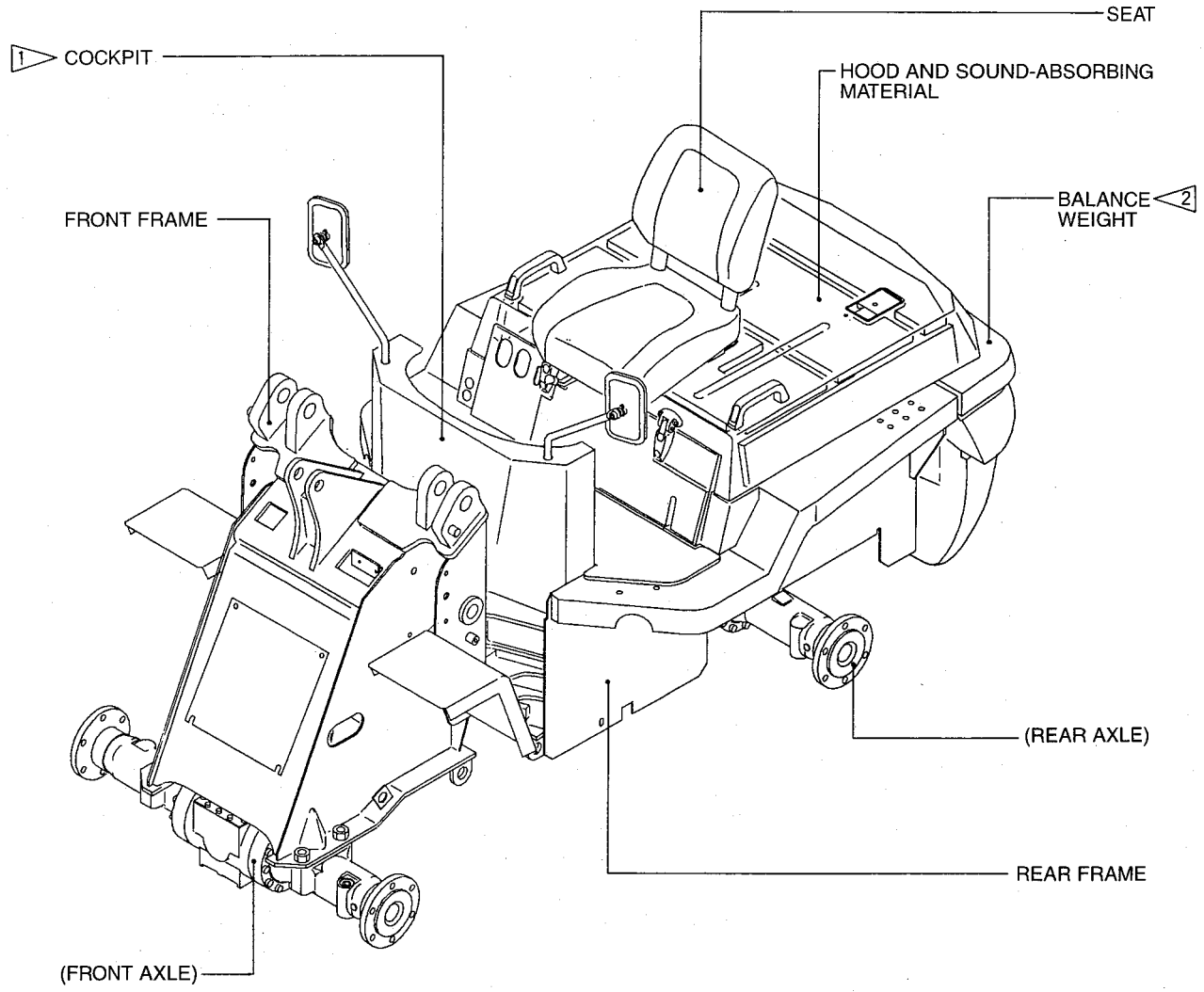
Fig. 4.4 Steering Wheel Unit

5. FRAME AND COCKPIT

5.1 FRAME

The frame is a steel-plate welded type and divided into two parts: front and rear frames. The cockpit and operator's seat are mounted on the rear frame.

⚠ Do not try to modify the ROPS (Roll-over protection structure), if mounted, without prior permission from the manufacturer. If the ROPS should get damaged or deformed due to turning over or collision, it is advisable to replace it with a new one, because a damaged or deformed ROPS has a low structural strength. Before trying to mount a new ROPS, be sure to wipe away paint and lubricant from the mounting surfaces of the structure and the frame.



Note: 1 Cockpit mounting bolt: 9.0 kg-m (65 ft-lbs)

2 Balance weight mounting bolt: 16 kg-m (120 ft-lbs)

Fig. 5.1 Frame

6.2.1 MAIN PUMP

The main pump doubles as the steering pump. The main pump picks up hydraulic oil from the oil tank and sends it to the steer valve (VP valve) where it is divided into two portions: the one for the steering hydraulic circuit and the one for the main hydraulic circuit.

6.2.2 HST CHARGING PUMP

The oil discharged from the HST charging pump is used for the following three purposes: charging the HST closed loop, pilot oil for tilt-rolling control (E804, E805, E806) and releasing the parking brake.
Note: For the HST hydraulic circuit, refer to "2.1 HST UNIT (2.1.2)."

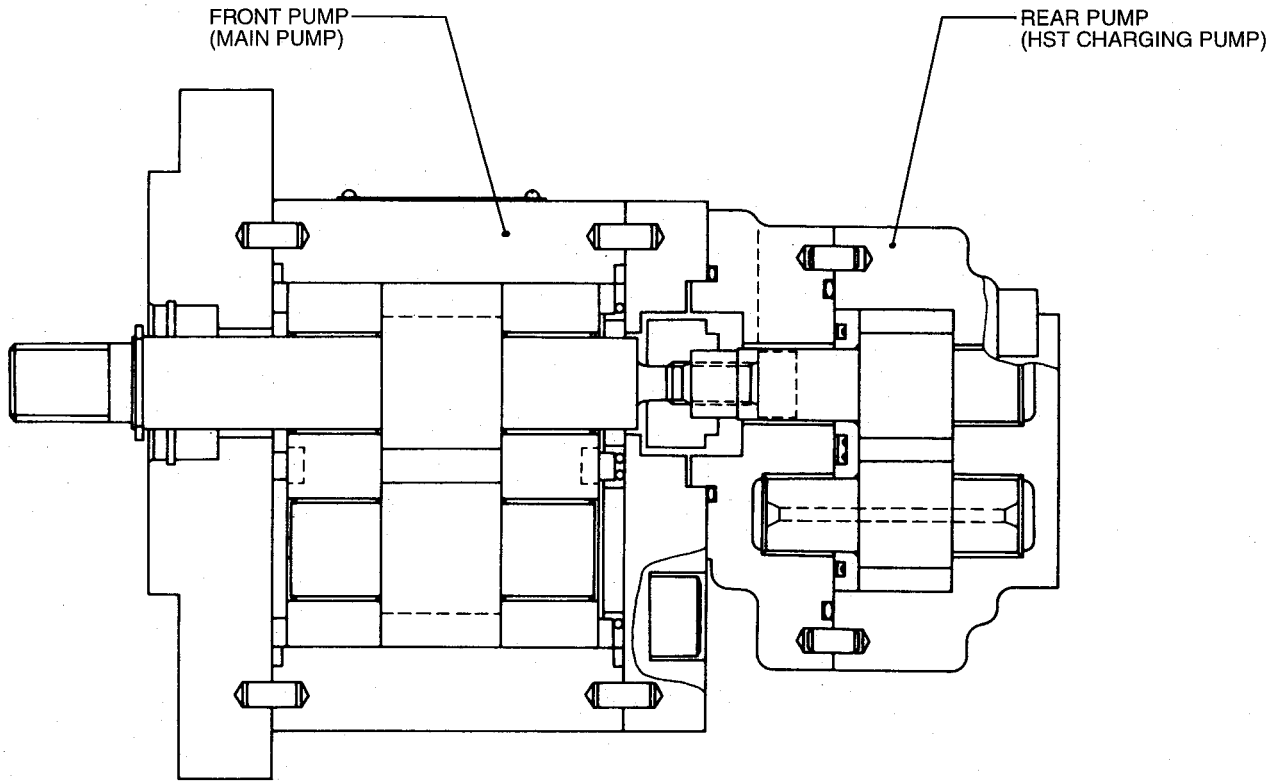


Fig. 6.6 Double Pumps

6.3.3 RELIEF VALVE

The control valve has a main relief valve and a port relief valve.

The main relief valve is located between the neutral oil passage and the low-pressure oil passage (return oil passage) in the inlet section. The port relief valve is located between the rod cylinder port and the low-pressure oil passage (return oil passage) in the bucket spool section.

Operation

(1) In Inoperative State

① The pressure oil in the high-pressure oil passage (HP) flows through the throttle hole (2) in the main poppet (1) to fill the internal cavity (3).

② Owing to the difference in area on which the hydraulic pressure acts the main poppet (1) closely seats to the sleeve (4).

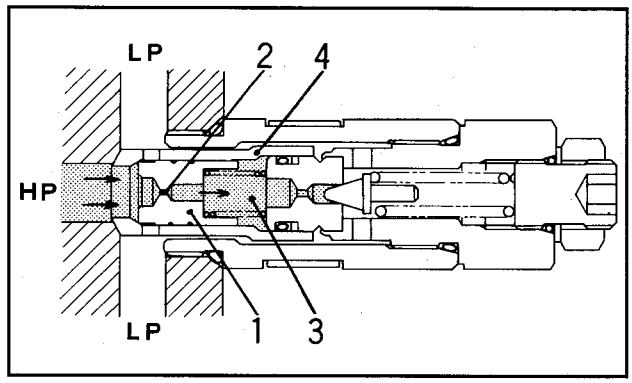


Fig. 6.17 In Inoperative State

(2) Operation (A)

① When the pressure in the high-pressure oil passage (HP) rises and exceeds the relief pressure setting, the pilot poppet (5) opens.

② The pressure oil flows from the pilot poppet into the low pressure oil passage (LP), passing between the sleeve (4) and the housing (6).

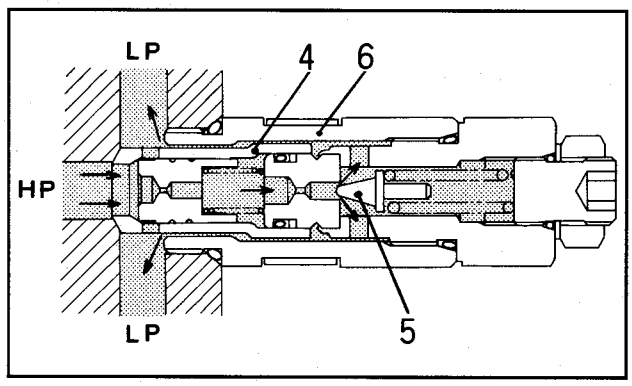


Fig. 6.18 Operation (A)

(3) Operation (B)

As the pilot poppet (5) opens, the pressure in the internal cavity (3) lowers to move the main poppet (1) so that the pressure oil in the oil passage (HP) flows directly into the lower pressure oil passage (LP).

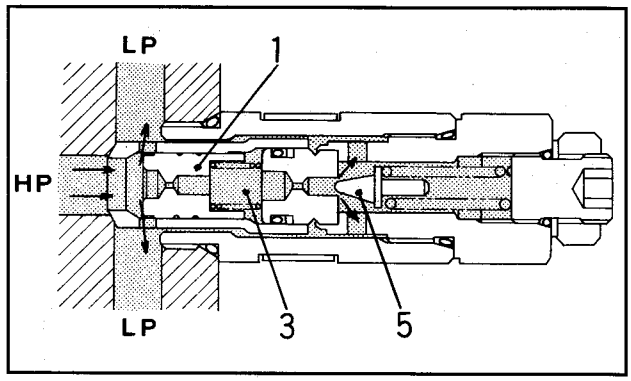
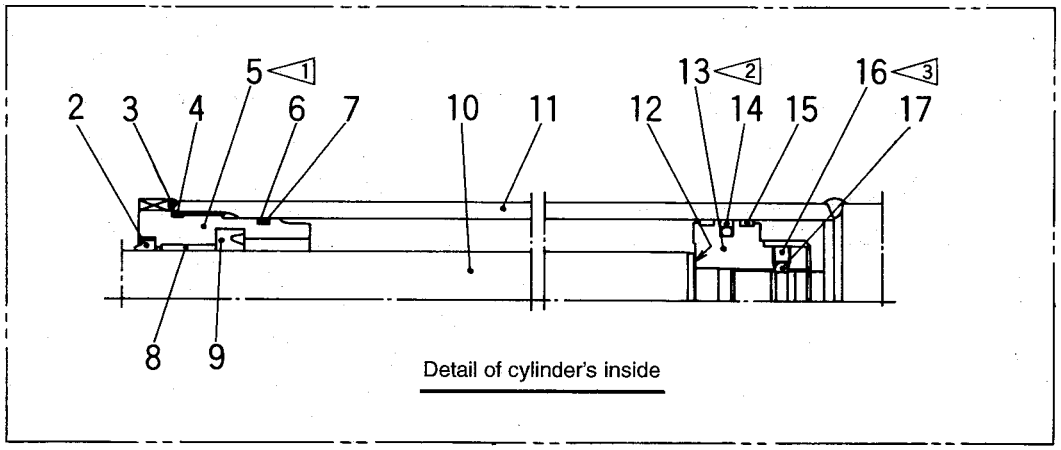
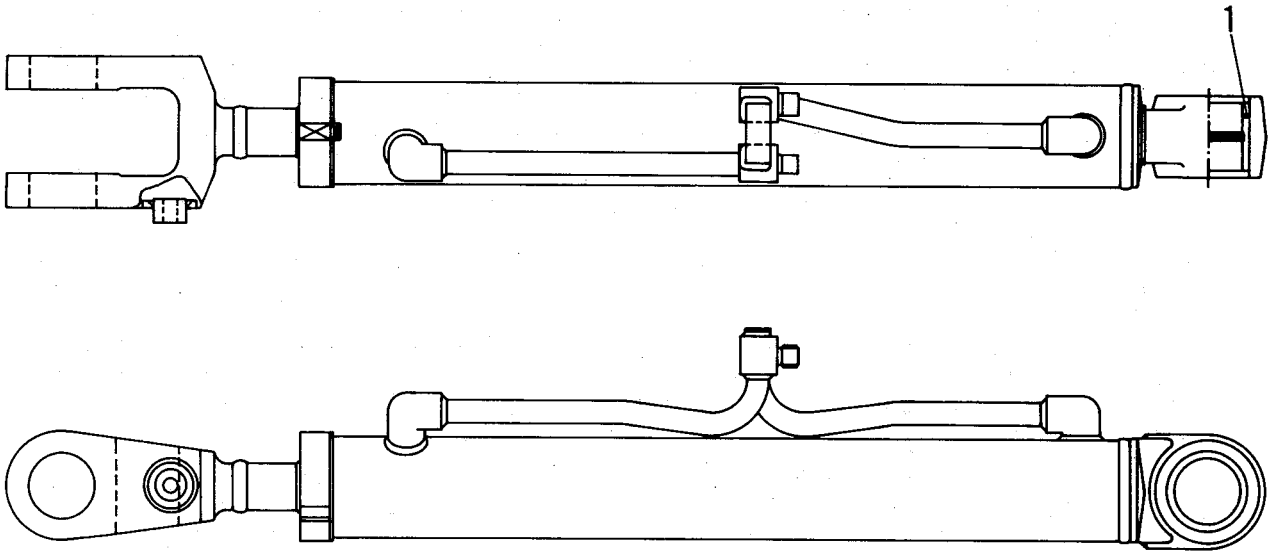


Fig. 6.19 Operation (B)





Note: 1▷ (E803): 28 kg-m (200 ft-lbs), (E804): 35 kg-m (250 ft-lbs), (E805, E806): 39 kg-m (280 ft-lbs)

Threaded area: Three Bond #1901

2▷ (E803): 29 kg-m (210 ft-lbs), (E804): 52 kg-m (380 ft-lbs), (E805, E806): 68 kg-m (490 ft-lbs)

3▷ 0.70 kg-m (5.1 ft-lbs) (After tightening, calk 2 parts.)

1. PIN BUSHING
2. WIPER RING
3. LOCK WASHER
4. O-RING
5. PISTON
6. BACK-UP RING
7. O-RING
8. BUSHING
9. U-RING
10. PISTON ROD
11. CYLINDER TUBE
12. SHIM
13. PISTON
14. SEAL RING/O-RING
15. SLIDE RING
16. SET SCREW
17. STEEL BALL

Note: The above sketch shows the boom cylinder of the E804. The size and appearance are somewhat different from those of the other models.

Fig. 7.6 Boom Cylinder