CONFIDENTIAL

CR270
SHOP MANUAL

SAKAI®

PREFACE

To make a machine working to maximum efficiency over a long period of time without any troubles, correct OPERATION, PREVENTIVE MAINTENANCE, TROUBLE-SHOOTING and REPAIR are of vital importance.

This shop manual provides instructions, for the most part, on GENERAL INFORMATION, STRUCTURE/FUNCTION, CHECKING/ADJUSTMENT, TROUBLE-SHOOTING and DISASSEMBLY/ASSEMBLY of the SAKAI CR270 Vibrating Rollers.

This manual is designed to serve as a guide for the operator and maitenance personnel to acquire correct information and repair procedure on these machines in order to give a correct decision on problems which the machines will confront, thus leading to quality repair. Fully understand the contents of the manual and make the best of it.

We will make utmost efforts to make this manual more useful for you through revisions. Your opinions and advices will be particularly welcome and will be carefully considered.

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SPECIFICATION DATA

SPECIFICATION DATA

1. External Views and Specification Data

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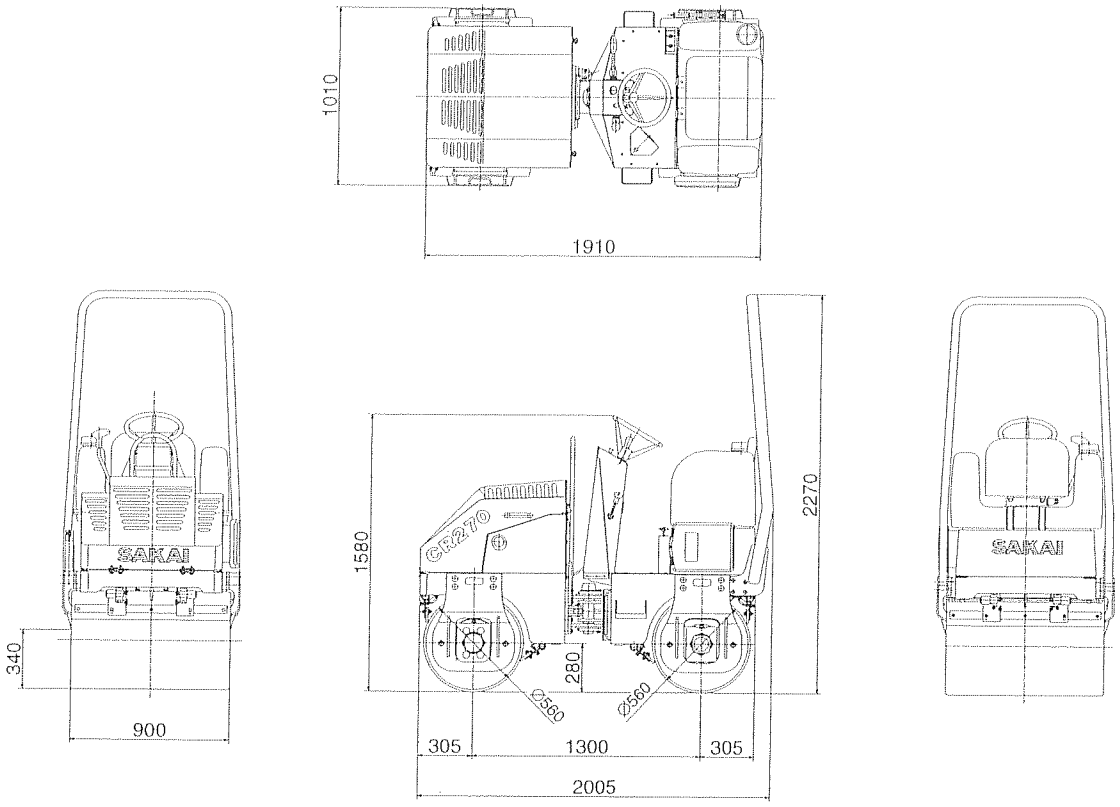
1-1. CR270



Model	CR270
Weight:	
Gross weight	1,320 kg (2,910 lbs)
Empty weight	1,130 kg (2,491 lbs)
Dimension:	
Overall length	1,910 mm (75")
Overall width	1,010 mm (40")
Overall height	2,270 mm (89")
Wheelbase	1,300 mm (51")
Wheel	
Front	Roll (dia. x width) 560 × 900 mm (22" × 35")
Rear	Roll (dia. x width) 560 × 900 mm (22" × 35")
Performance:	
Travel speed (forward/reverse)	0 ~ 7.5 km/h (0 ~ 4.7 mile/h)

Vibrating power:	
Frequency	66.7 Hz {4,000 vpm}
Centrifugal force	13.2kN {1,350kgf}(2,976 lbs)
Gradability	18.8 degrees
Rolling width	900 mm (35")
Minimum turning radius	2.8 m (110")
Engine:	
Model	HONDA "GX610" Engine
Total displacement	0.618 liters {618 cc}(37.7 cu.in)
Rated output	10.7 kW {14.4 PS}/3,600 min^{-1} (14.4 HP/3,600 rpm)
Max. torque	43.1N · m {4.39 kgf · m}/2,500 min^{-1} (31.8 ft-lbs/2,500 rpm)
Tank capacity:	
Fuel tank	30 litres (7.9 gal)
Hydraulic tank	30 litres (7.9 gal)
Sprinkler tank	190 litres (50.2 gal)

NOTE: Gradability is the calculated value. It may vary with ground surface conditions.

STRUCTURE & OPERATION

STRUCTURE & OPERATION

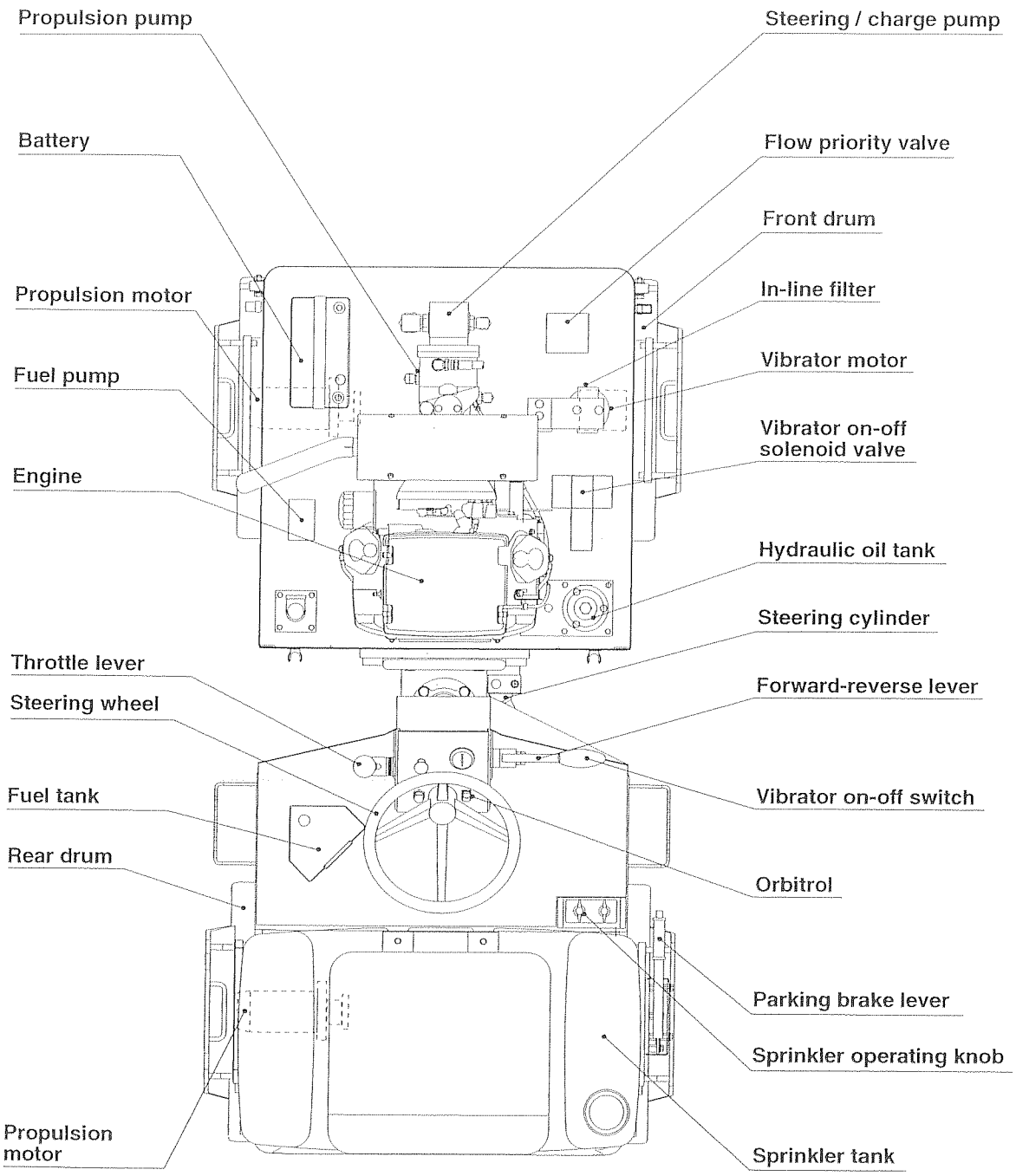
7. Description of Hydraulic System

8. Hydraulic Circuit

9. Electric Circuit

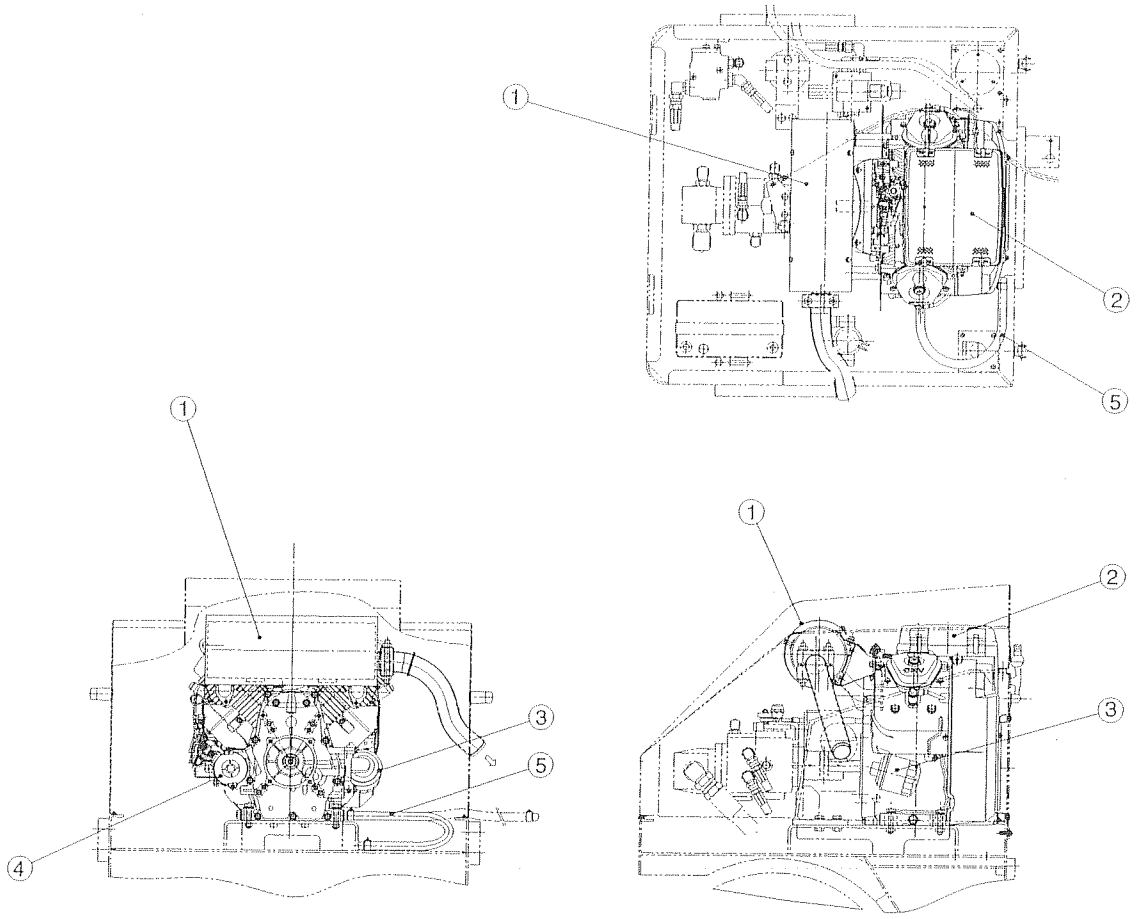
1. Location of Key Units

1-1. Location of key units



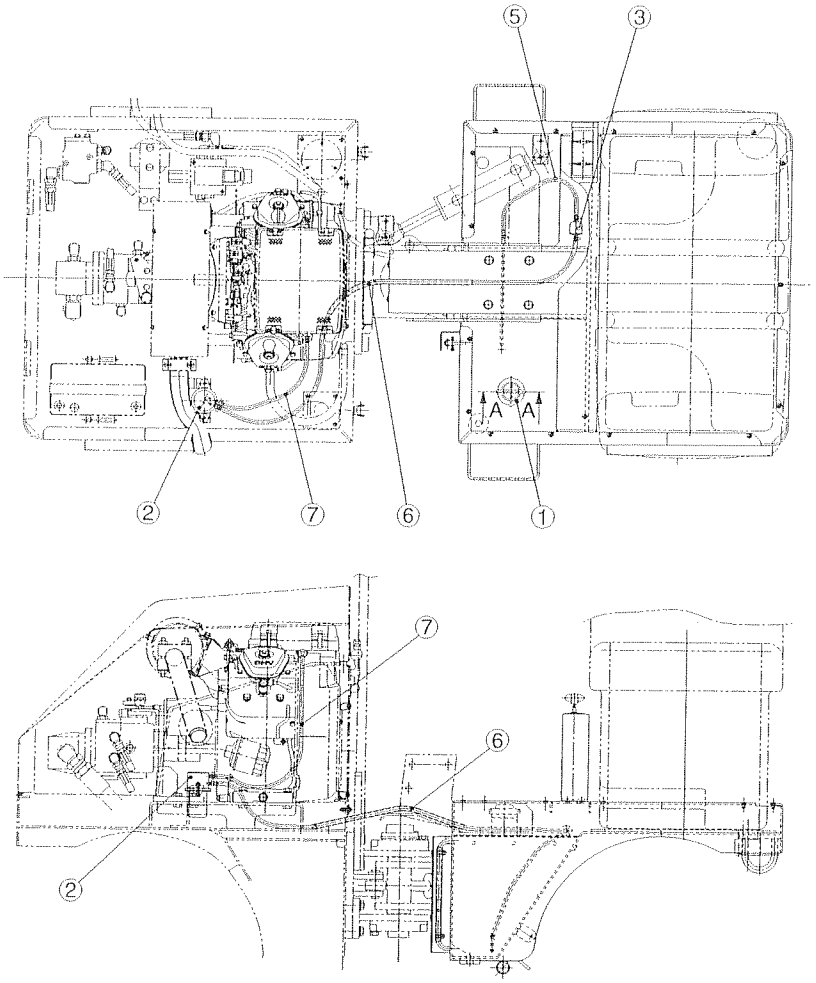
2. Location of Engine-related Parts

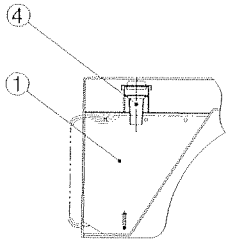
2-1. Parts fitted on engine



① Muffler
② Air cleaner
③ Filter element
④ Starter motor
⑤ Drain hose

2-2. Fuel piping & fuel tank

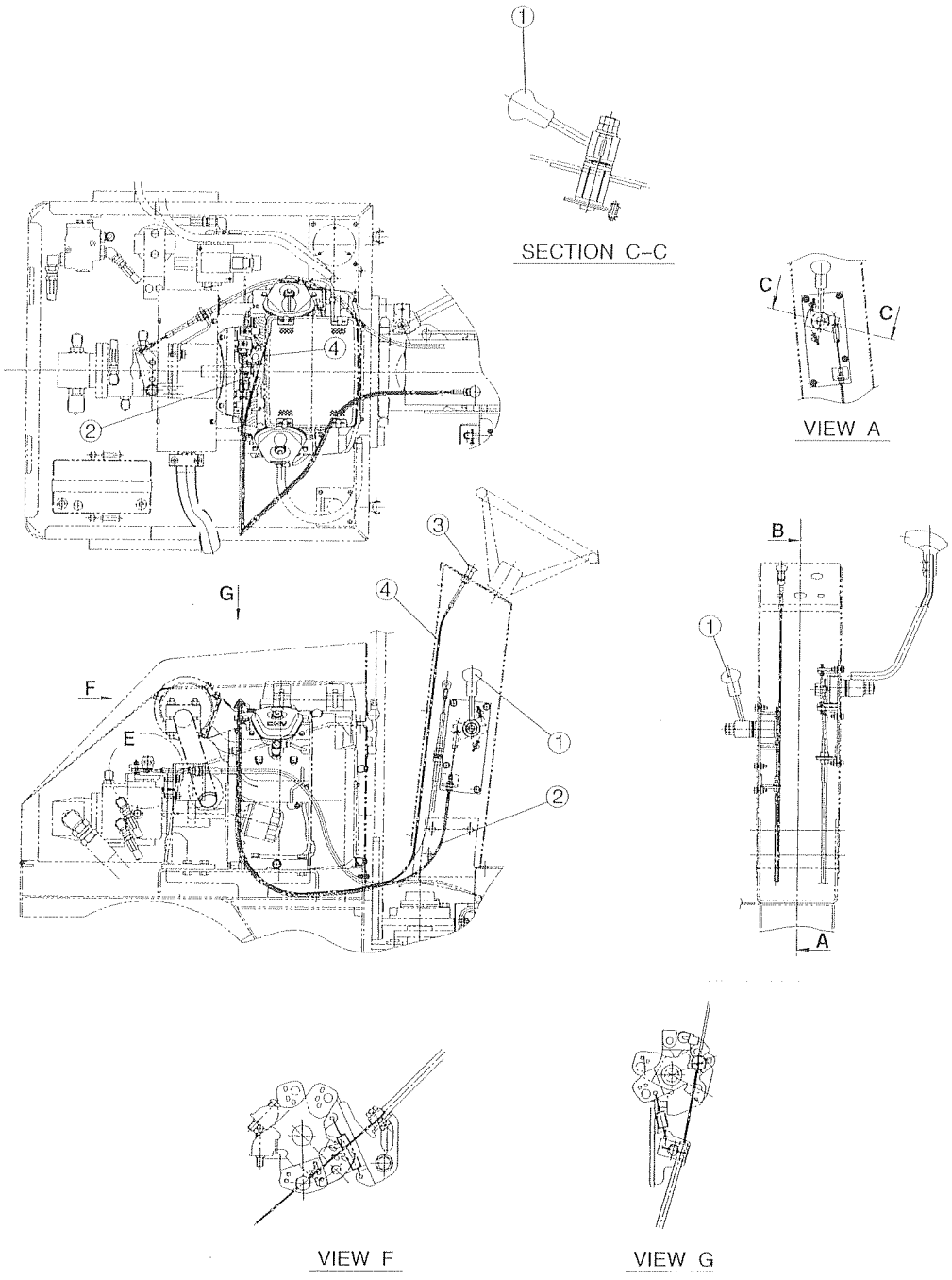




SECTION: A-A

① Fuel tank
② Fuel pump
③ Strainer (suction line)
④ Strainer (fuel tank)
⑤ Fuel hose (fuel tank to strainer)
⑥ Fuel hose (strainer to fuel pump)
⑦ Fuel hose (fuel pump to engine)

2-3. Fuel controls

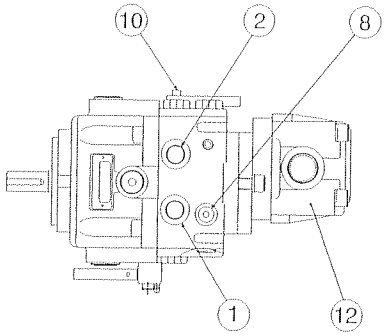


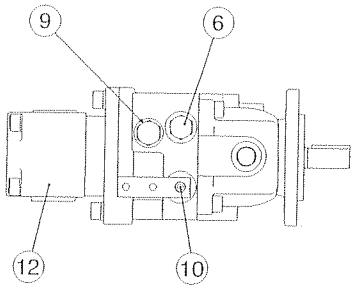
① Throttle lever
② Throttle cable
③ Choke knob
④ Choke cable

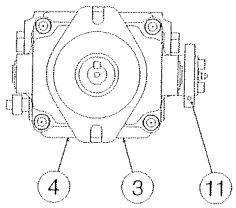
3. Location of Hydraulic Components

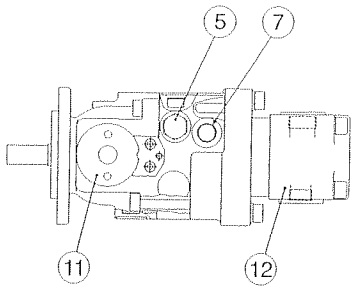
3-1. Propulsiopn line

3-1-1. Propulsion pump ass'y







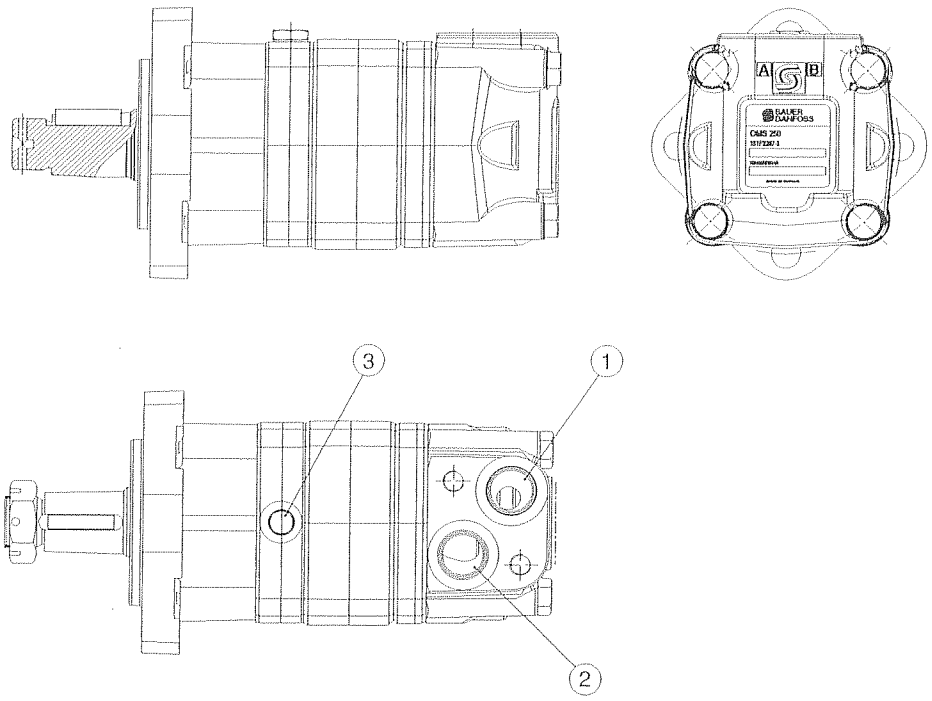


① Port A
② Port B
③ High pressure gauge port (port A)
④ High pressure gauge port (port B)
⑤ High pressure relief valve (port A)
⑥ High pressure relief valve (port B)
⑦ Charge pump suction port
⑧ Charge pressure gauge port
⑨ Charge relief valve
⑩ Unloader valve
⑪ Forward-reverse control lever
⑫ Steering / charge pump

Technical data

- Model : PV10-632
- Displacement : 10 cm^3/rev (cc/rev)
- High pressure line setting : 19.4 MPa (190 kgf/cm^2) 2700 psi
- Charge pump capacity : 10.97 cm^3/rev (cc/rev)
- Charge line setting : 0.5 MPa (5 kgf/cm^2) 72 psi

3-1-2. Propulsion motor ass'y

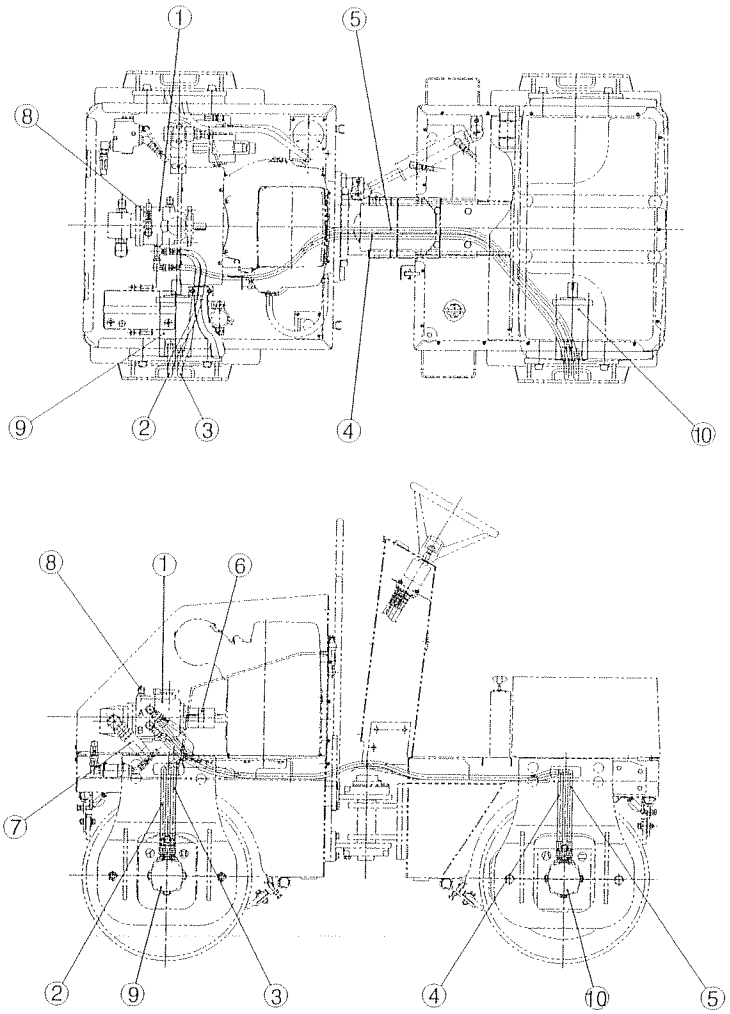


① Port B ② Port A ③ Drain port

Technical data

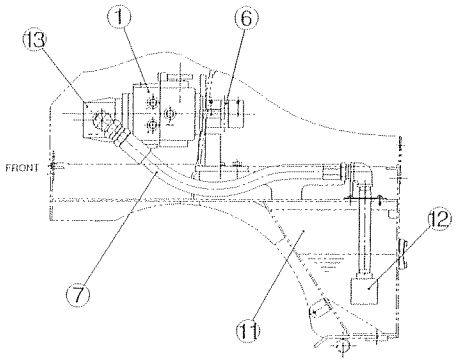
- Model : OMS 250
- Displacement : 250 cm^3/rev (cc/rev)
- Constant rated pressure: 230 MPa (23.5 kgf/cm^2)
- Max. revolution speed : 360 rpm

3-1-3. Hydraulic piping [I]

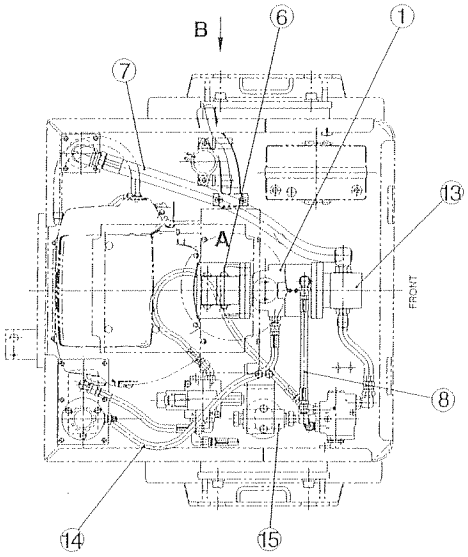


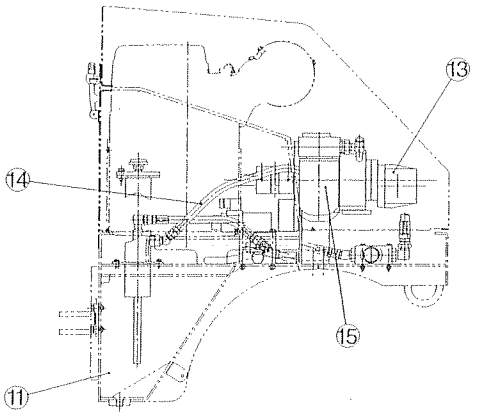
① Propulsion pump
② High pressure hose (port A of front motor)
③ High pressure hose (port B of front motor)
④ High pressure hose (port A of rear motor)
⑤ High pressure hose (port B of rear motor)
⑥ Coupling
⑦ Suction hose
⑧ Charge feed hose
⑨ Front propulsion motor
⑩ Rear propulsion motor

3-1-4. Hydraulic piping [II]



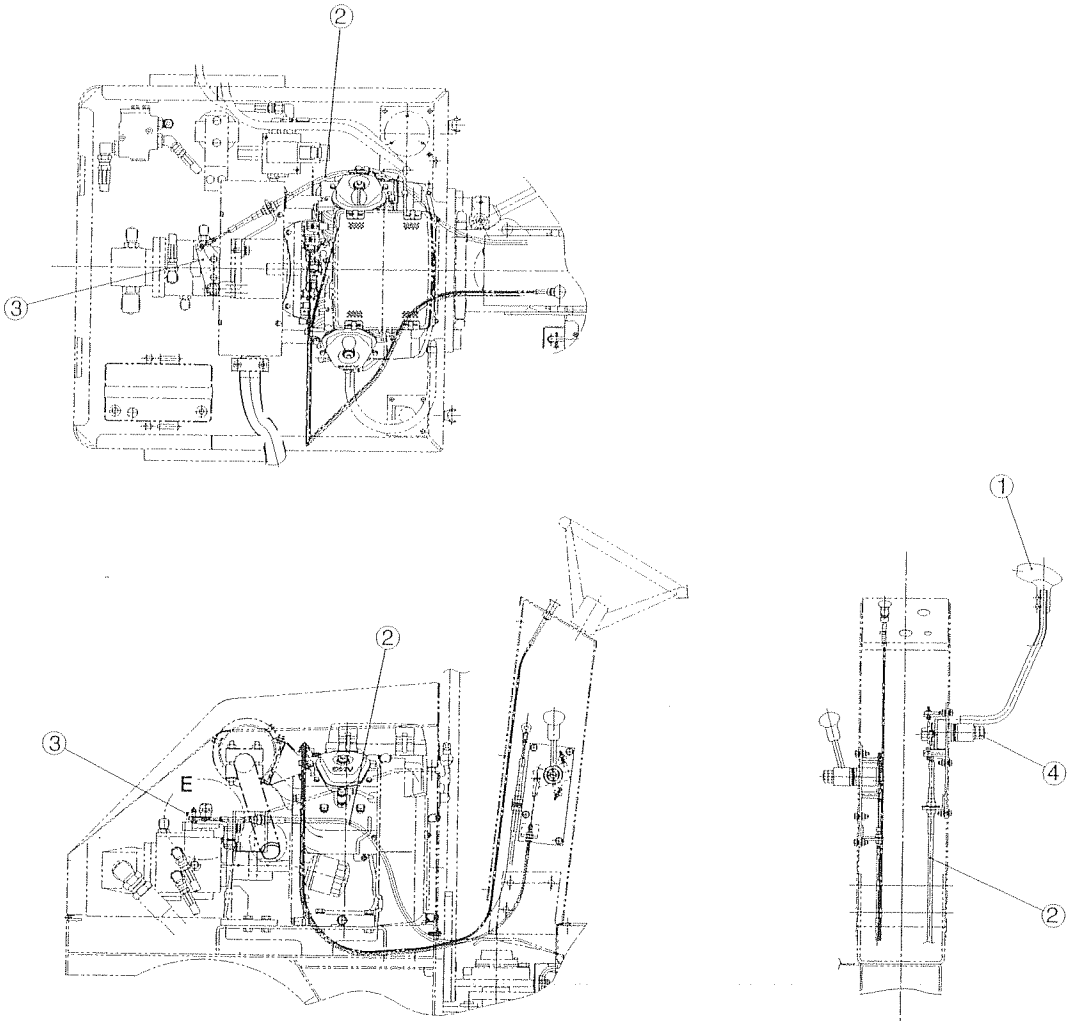
VIEW B





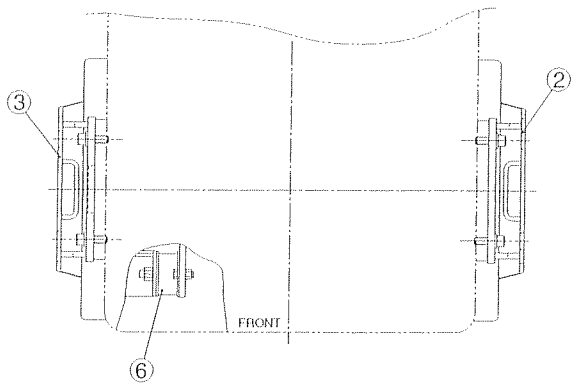
⑪ Hydraulic tank
⑫ Suction filter
⑬ Charge/vibration pump
⑭ Drain hose
⑮ In-line filter

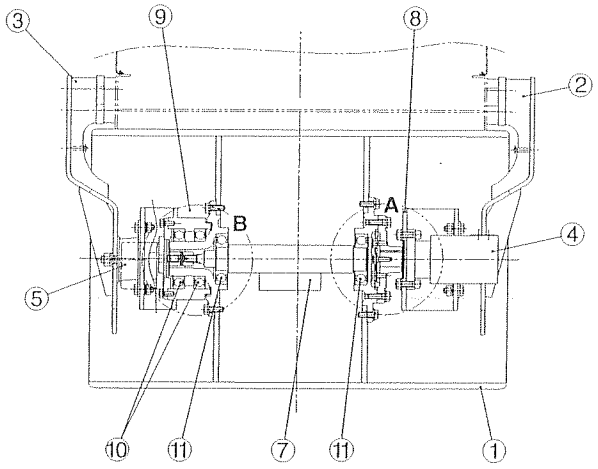
3-1-5. Propulsion controls



① Forward-reverse lever
② Control cable
③ Forward-reverse lever (pump)
④ Operating force adjusting nut

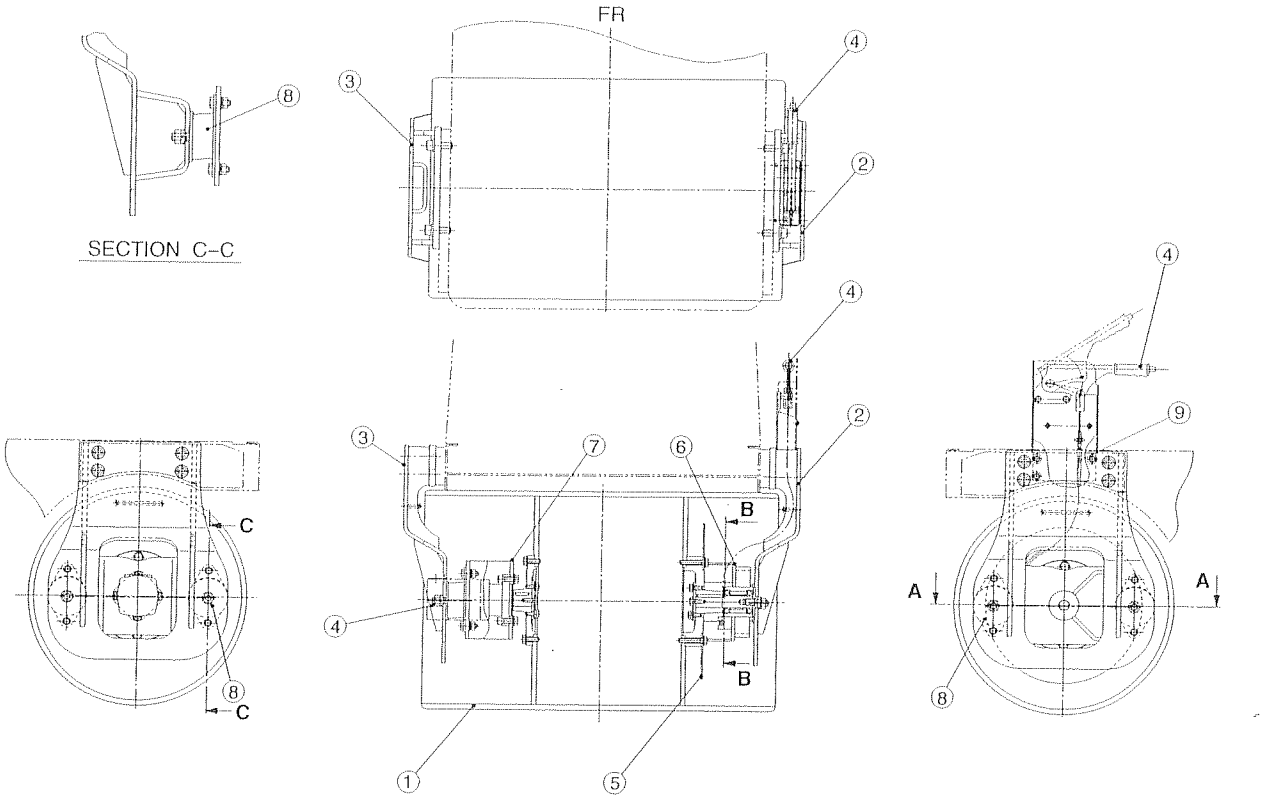
3-1-6. Front drum





① Front drum
② L.H. side frame
③ R.H. side frame
④ Propulsion motor
⑤ Vibrator motor
⑥ Shockmount
⑦ Vibrator shaft
⑧ L.H.Disc
⑨ R.H. Disc
⑩ Axle Bearing
⑪ Vibrator shaft bearing

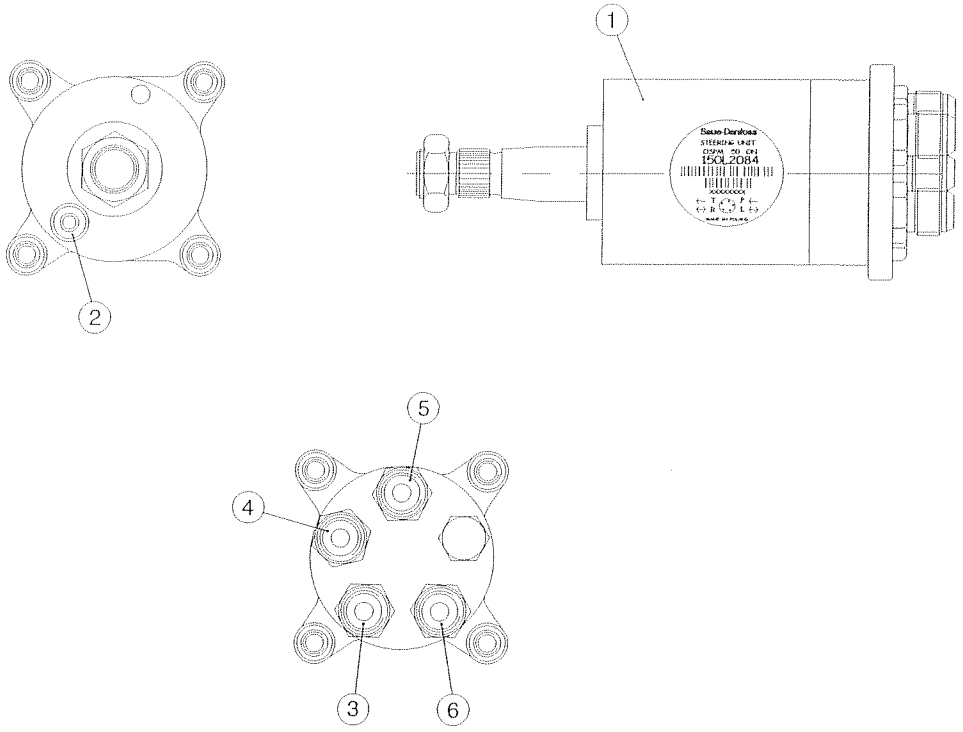
3-1-7. Rear drum



① Rear drum
② L.H. side frame
③ R.H. side frame
④ Brake lever
⑤ Brake disc
⑥ L.H. disc
⑦ R.H. disc
⑧ Shockmount
⑨ Brake cable

3-2. Steering system

3-2-1. Orbitrol

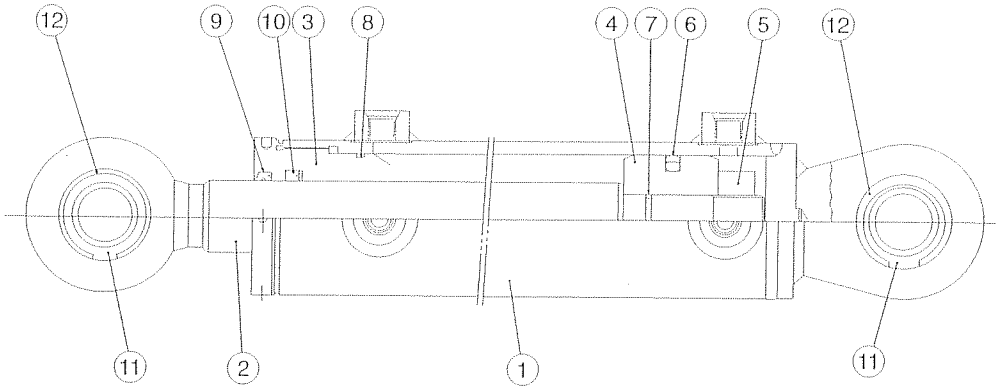


① Orbitrol
② Pressure relief valve
③ Pressure port
④ L.H. high pressure port
⑤ R.H. high pressure port
⑥ Drain port

Technical data

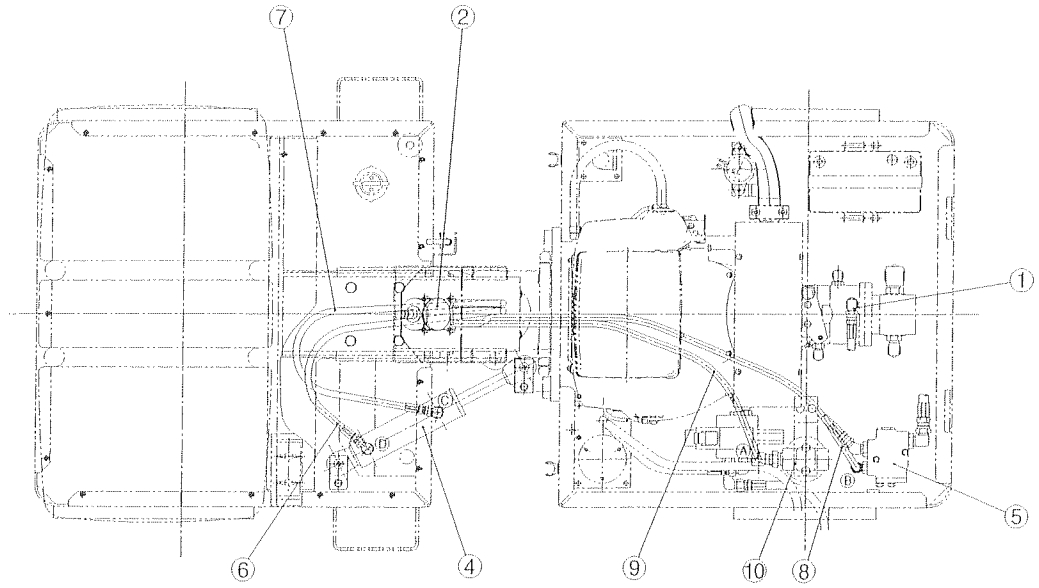
- Valve system : Open center non-load reaction type
- Displacement : 50 cm^3/rev (cc/rev)
- Pressure setting : 9.2 MPa (90 kgf/cm^2)
- Allowable back pressure: 3.6 MPa (35 kgf/cm^2)

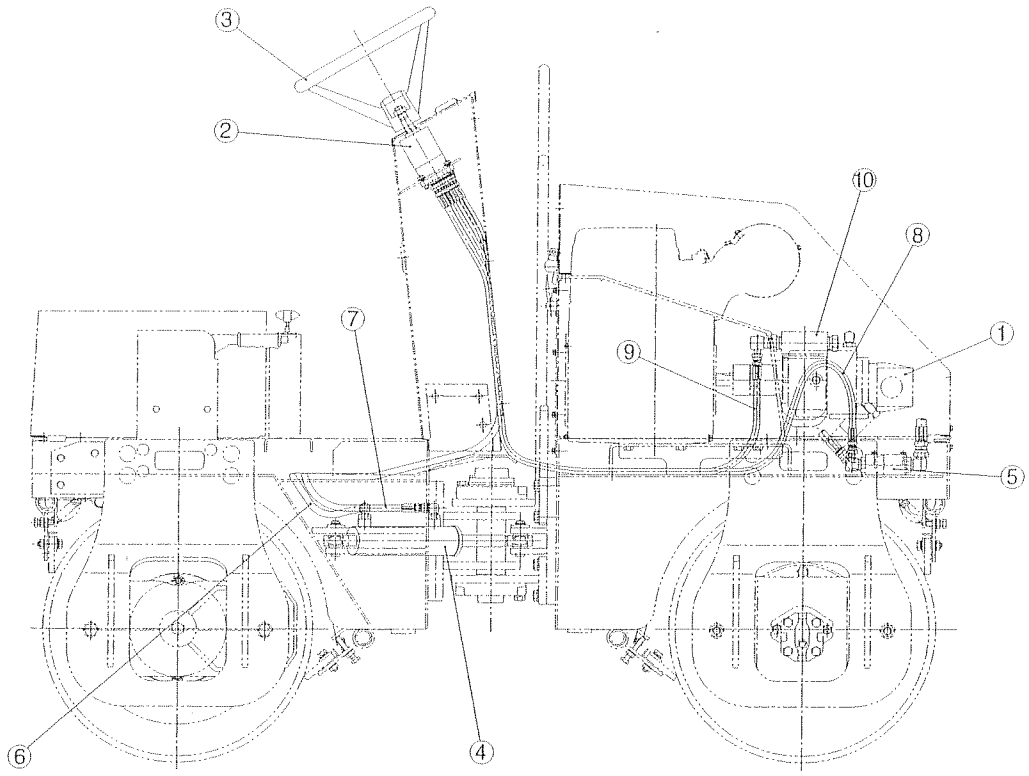
3-2-2. Steering cylinder



① Cylinder	⑤ Nut	⑨ Dust seal
② Piston rod	⑥ Piston seal	⑩ Packing
③ Bush	⑦ O-ring	⑪ Spherical bearing
④ Piston	⑧ O-ring	⑫ Lock ring

3-2-3. Hydraulic piping

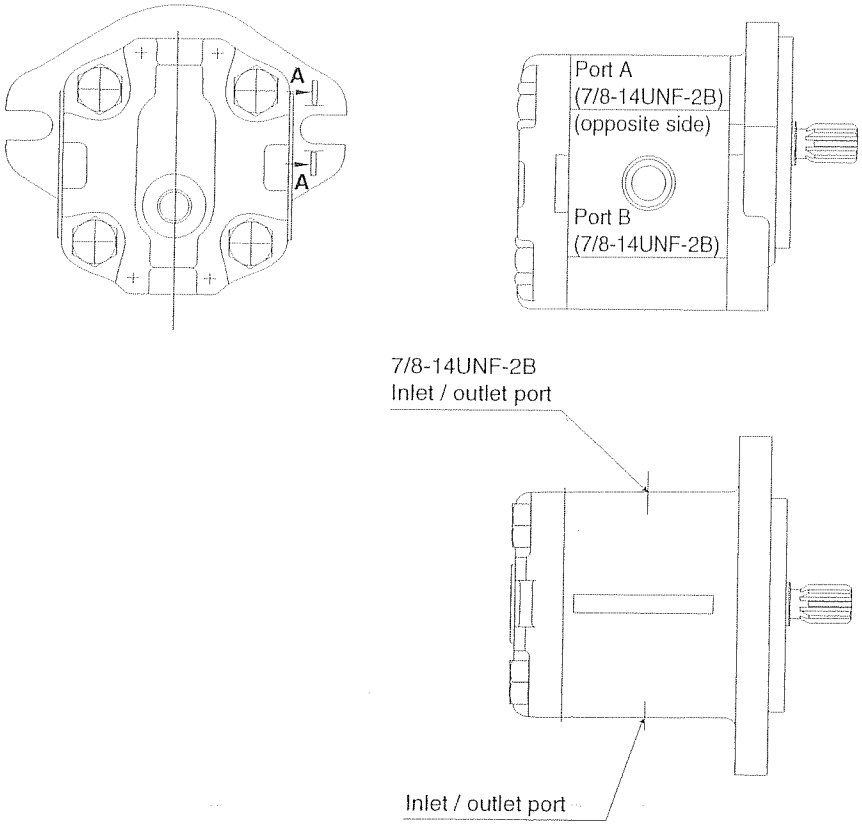




① Steering pump
② Orbitrol
③ Steering wheel
④ Steering cylinder
⑤ Flow priority valve
⑥ Hydraulic hose (left turn)
⑦ Hydraulic hose (right turn)
⑧ Hydraulic hose (port P)
⑨ Hydraulic hose (drain)
⑩ In-line filter

3-3. Vibrating system

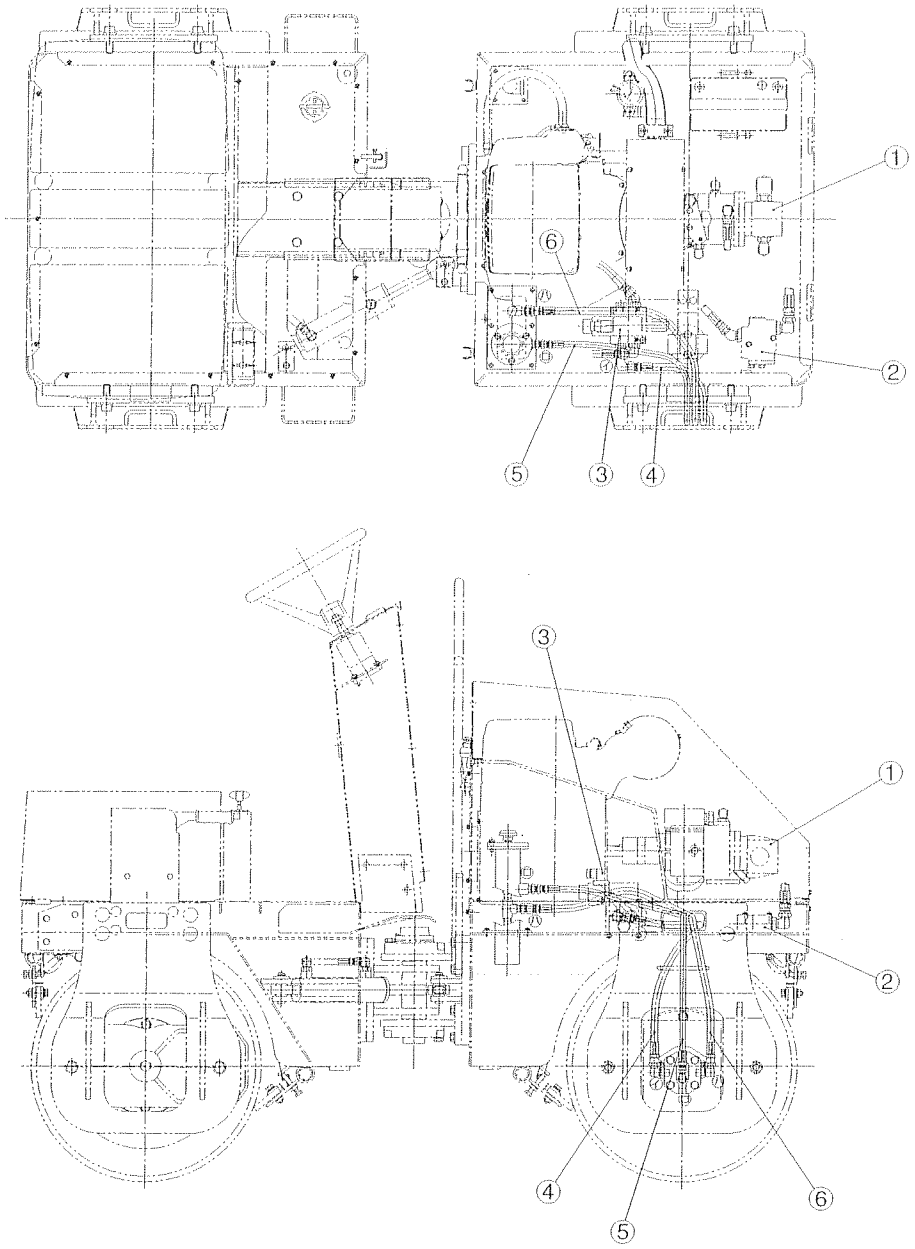
3-3-1. Vibrator motor



Technical data

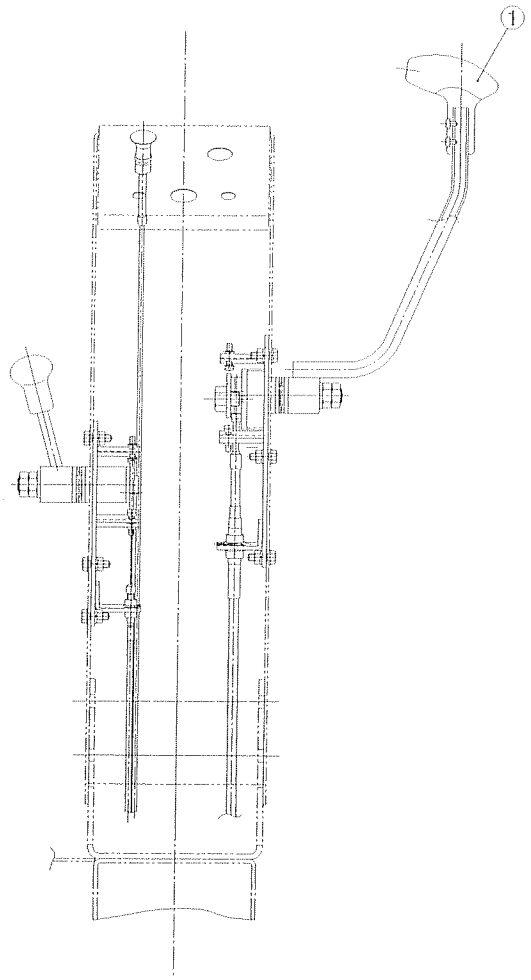
- Displacement : 6 cm^3 (cc/rev)
- Pressure setting : 21.5 MPa (210 kgf/cm^2)
- Max. revolution speed: 4,000 rpm

3-3-2. Hydraulic piping



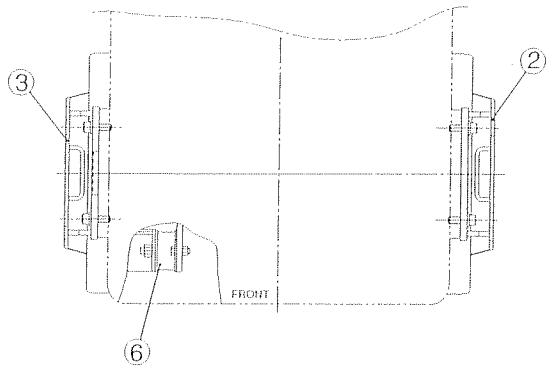
① Vibrator pump
② Flow priority valve
③ Vibrator on-off valve
④ Hydraulic hose
⑤ Hydraulic hose
⑥ Hydraulic hose (drain)

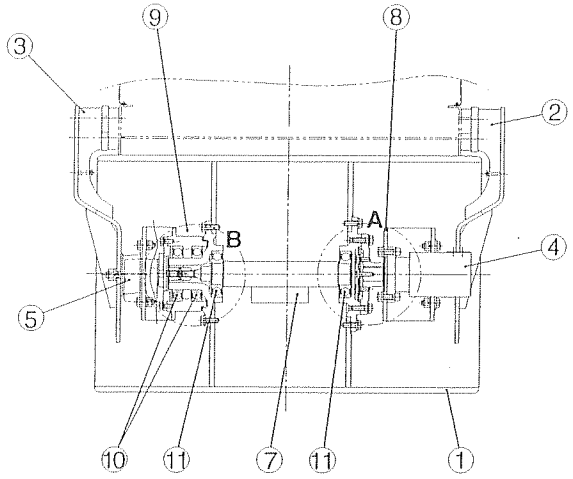
3-3-3. Vibrator control



① Vibrator on-off switch

3-3-4. Vibratory drum

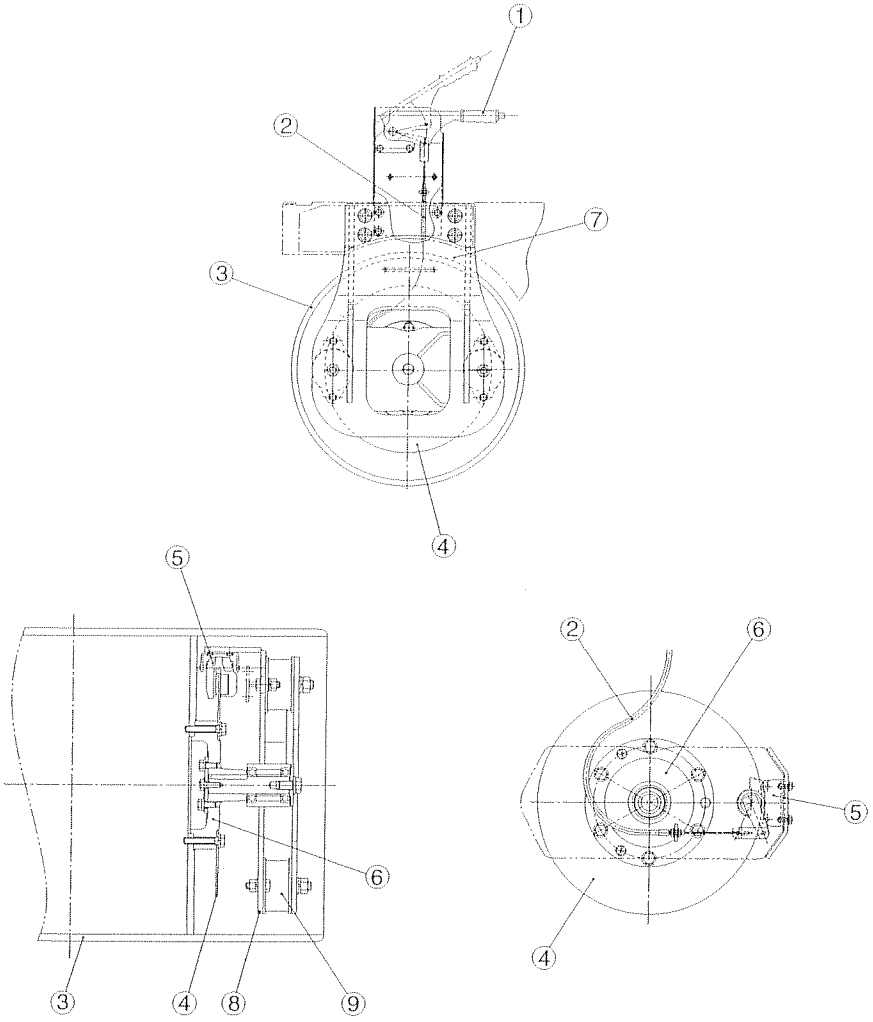




① Front drum
② L.H. side frame
③ R.H. side frame
④ Propulsion motor
⑤ Vibrator motor
⑥ Shockmount
⑦ Vibrator shaft
⑧ L.H. disc
⑨ R.H Disc
⑩ Axle bearing
⑪ Vibrator shaft Bearing

4. Brake System

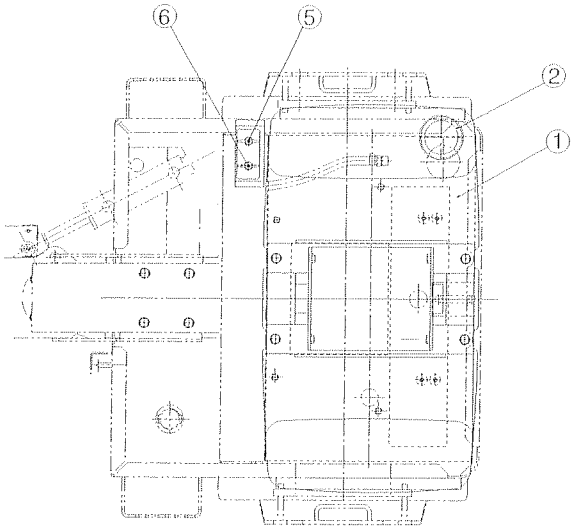
4-1. Brake system

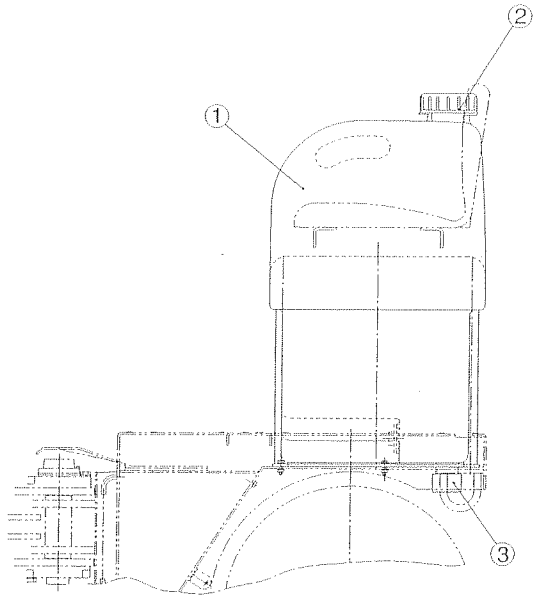


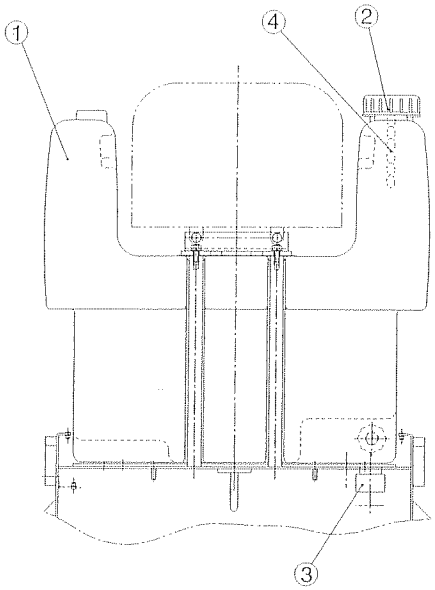
① Brake lever
② Brake cable
③ Rear drum
④ Brake disc
⑤ Disc brake
⑥ Flange
⑦ R.H. side frame
⑧ Disc
⑨ Shockmount

5. Sprinkler

5-1. Sprinkler tank

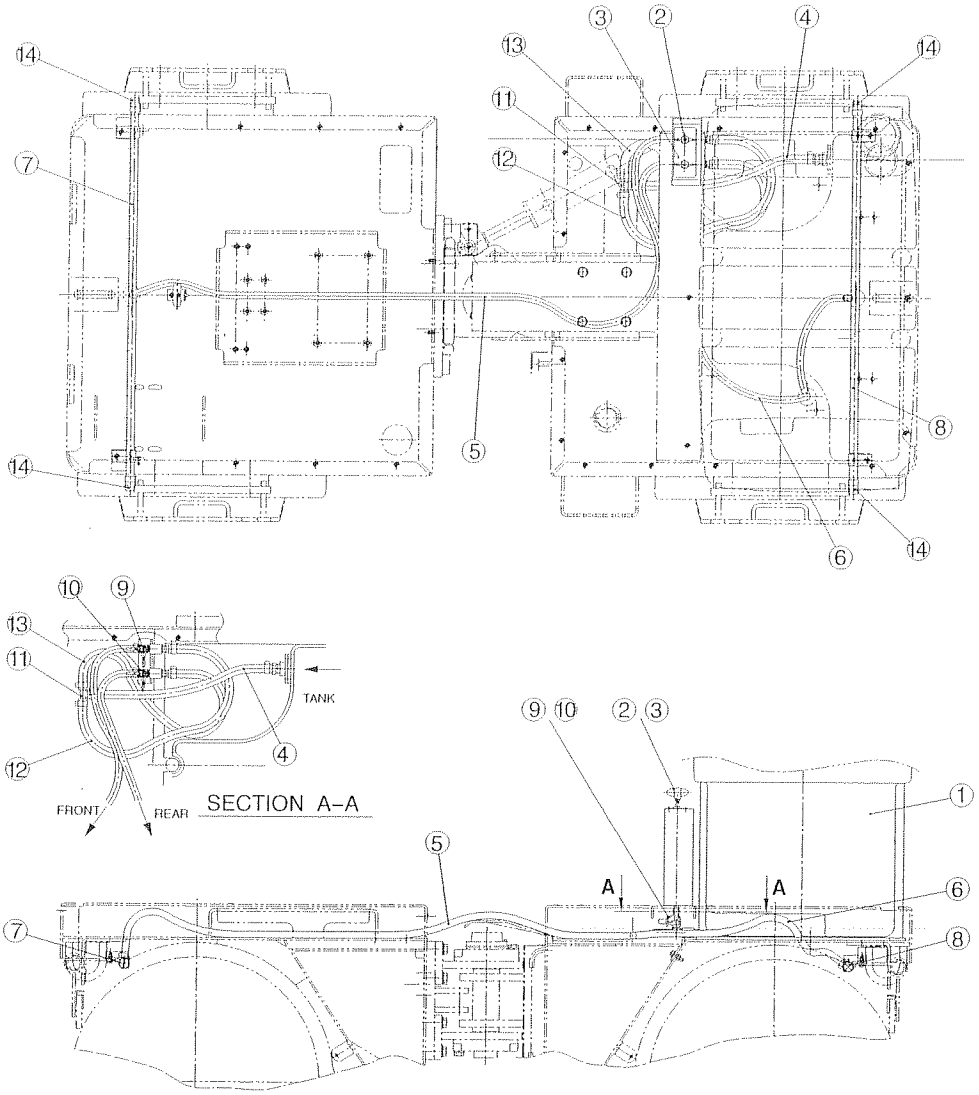






① Sprinkler tank
② Filler cap
③ Drain cap
④ Cap holder chain
⑤ Open-close knob (front)
⑥ Open-close knob (rear)

5-2. Sprinkler piping



① Sprinkler tank
② Front open-close knob
③ Rear open-close knob
④ Sprinkler hose
⑤ Front sprinkler hose
⑥ Rear sprinkler hose
⑦ Front sprinkler pipe
⑧ Rear sprinkler pipe
⑨ Front open-close valve
⑩ Rear open-close valve
⑪ Tee
⑫ Sprinkler hose
⑬ Sprinkler hose
⑭ Sprinkler pipe end cap

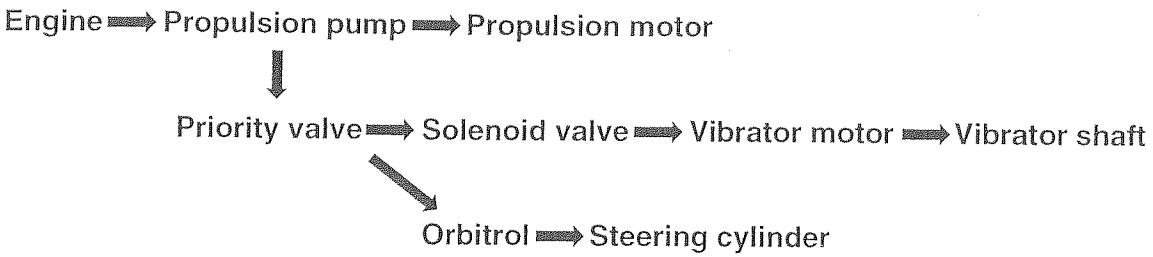
6. Description of Each System

6-1. Engine

HONDA GX610 air-cooled gasoline engine (V90° OHV 614 cc)

6-2. Power flow

The engine powers the propulsion pump via a flexible coupling. The pump feeds hydraulic fluid under pressure to propulsion and vibrator motors.



6-3. Propulsion system

Engine power is conveyed to the hydrostatic transmission ~~consisting of~~ using a combination of a variable displacement propulsion pump and fixed displacement propulsion motors to provide a propulsive power. Selection of direction of travel is accomplished by shifting the forward-reverse lever forward or backward from the neutral position. Travel speed is controlled within the range of 0 to 7.5km/h (0 to 4.7mile/h) by varying the angular position of the forward-reverse lever.

6-4. Vibrating system

The vibrator is of a single shaft eccentric type housed in the front drum. The vibrator pump powers the vibrator motor to which vibrator shaft connects. The vibrator on-off switch fitted inside the grip of the forward-reverse lever starts and stops the vibrator. The vibratory frequency the vibrator provides is 4,000vpm and the vibratory force is approxmately equal to the weight of the machine. The bearings that sustain the vibrator shaft are of a maintenance-free sealed type.

6-5. Safety system

Interlock switch

The switch prevents the starter motor from coming into motion if a careless attempt is made to start the engine with the forward-reverse lever not in the neutral position.

Oil ~~alart~~ alert

The engine is not started if engine oil is not up to the specified level.

Rear drum brake

The rear drum houses a disc brake which is engaged by pulling the brake lever on the right side of the operator's seat.

CAUTION: When stopping or parking on a slope, chock the front and rear drums to prevent ~~unattempted moving down~~ rollings.

6-6. Steering system

Pressurized steering fluid from the steeing pump is fed to the Orbitrol via a flow divider. Operation of steering wheel operates the steering cylinder to achieve steering. The steering valve, Orbitrol feeds an amount of steering fluid to the steering cylinder according to the amount of steering wheel turn and the speed at which the steering wheel is rotated.

6-7. Sprinkler

Gravity fed type. Opening a valve located on the right side of the operator's seat feeds water from the sprinkler tank to the front and rear sprinkler pipes to sprinkle.

7. Description of Hydraulic System

7-1. Propulsion line

7-1-1. Propulsion pump

Type

A variable displacement pump is used which selects forward drive, neutral drive and reversing by varying the swashplate angle, and thus varying the piston stroke.

High pressure line

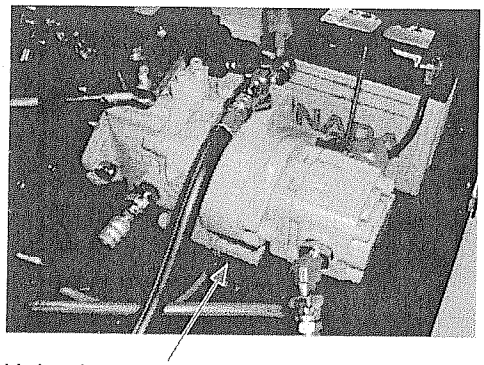
The propulsion pump has a high pressure relief valve built in it which relieves the circuit pressure if it exceeds the setting of the valve, thus protecting the circuit.

Charge circuit

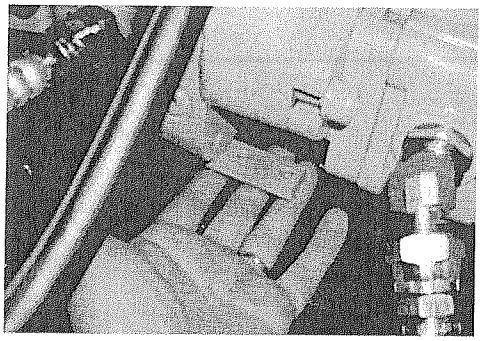
The propulsion main circuit is of a closed loop circuit, which needs feeding of oil into it for compensation of oil loss and for other purposes such as cooling the oil. The steering/vibration gear pump fitted at the rear of the propulsion pump feeds oil into Orbitrol (steering valve). Then the whole oil flows into the low pressure line of the main circuit irrespective of the steeing wheel operation. The pressure adjustment is achieved by a charge pressure relief valve built in the propulsion pump.

Unloader valve

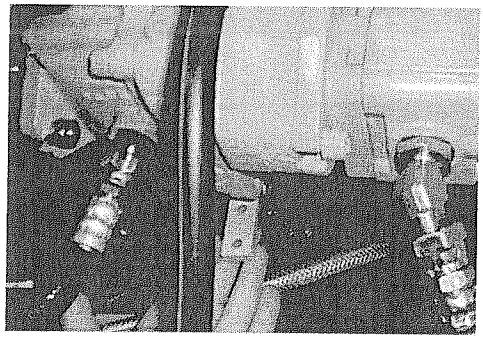
In the closed circuit hydrostatic transmission of this roller, the main circuit is blocked to make the machine come to a standstill if the hydraulic system becomes uncontrollable due to failure. In such a case, set the unloader valve to the UNLOAD position. This allows the machine to be towed to a safer place. In normal operation, the unloader valve remains closed. When towing, a bypass path is established to make the high pressure line of the main circuit lead to the low pressure line by selecting the UNLOAD position of the unloader valve located under the propulsion pump.



Unloader valve selector lever



ONLOAD position



UNLOAD position

7-1-2. Propulsion motor

For propulsion, a high torque Orbit motor is used. The pressurized oil from the propulsion pump powers the propulsion motor, generating a rotary motion to drive the drum. Changing the angular position of the forward-reverse lever by moving it forward or backward from the neutral position changes in turn the angular position of the propulsion pump swashplate through a control cable. Variation of the pump swashplate causes the pump piston stroke to vary the speed and change the rotating direction of the propulsion motor. The oil displaced from the propulsion pump runs into the propulsion motor through the parallel main circuit. Moving the forward-reverse lever angularly forward and backward from the neutral position propels the machine forward and backward respectively.

7-2. Steering system

Made up of gear pump, flow priority valve, Orbitrol (steering valve) and steering cylinder.

The oil displaced from the gear pump is fed via the flow priority valve into Orbitrol. From it an amount of steering fluid is sent to the steering cylinder according to the direction in and the speed at which the steering wheel is turned.

In addition to the role as steering pump, the gear pump plays the part of charge pump. Return oil from Orbitrol is supplied to the propulsion pump past the in-line filter.

7-2-1. Flow priority valve

A limited fluid flow of 14^{L}/min discharged from the gear pump is sent with priority to Orbitrol.

7-2-2. Orbitrol

Orbitrol is a steering valve of an open center non-reaction load sensing type that feeds steering fluid from the flow priority valve to the steering cylinder corresponding to the speed at which the steering wheel is spinned.

7-3. Vibrating system

Consists of gear pump, vibrator on-off solenoid valve, drive motor and vibrator. The complete assembly is housed in the front drum. The gear pump discharges oil all the time that it is driven. When the vibrator is not in motion, oil displaced from the gear pump runs back into the tank through the vibrator on-off solenoid valve.

7-3-1. Vibrator on-off solenoid valve

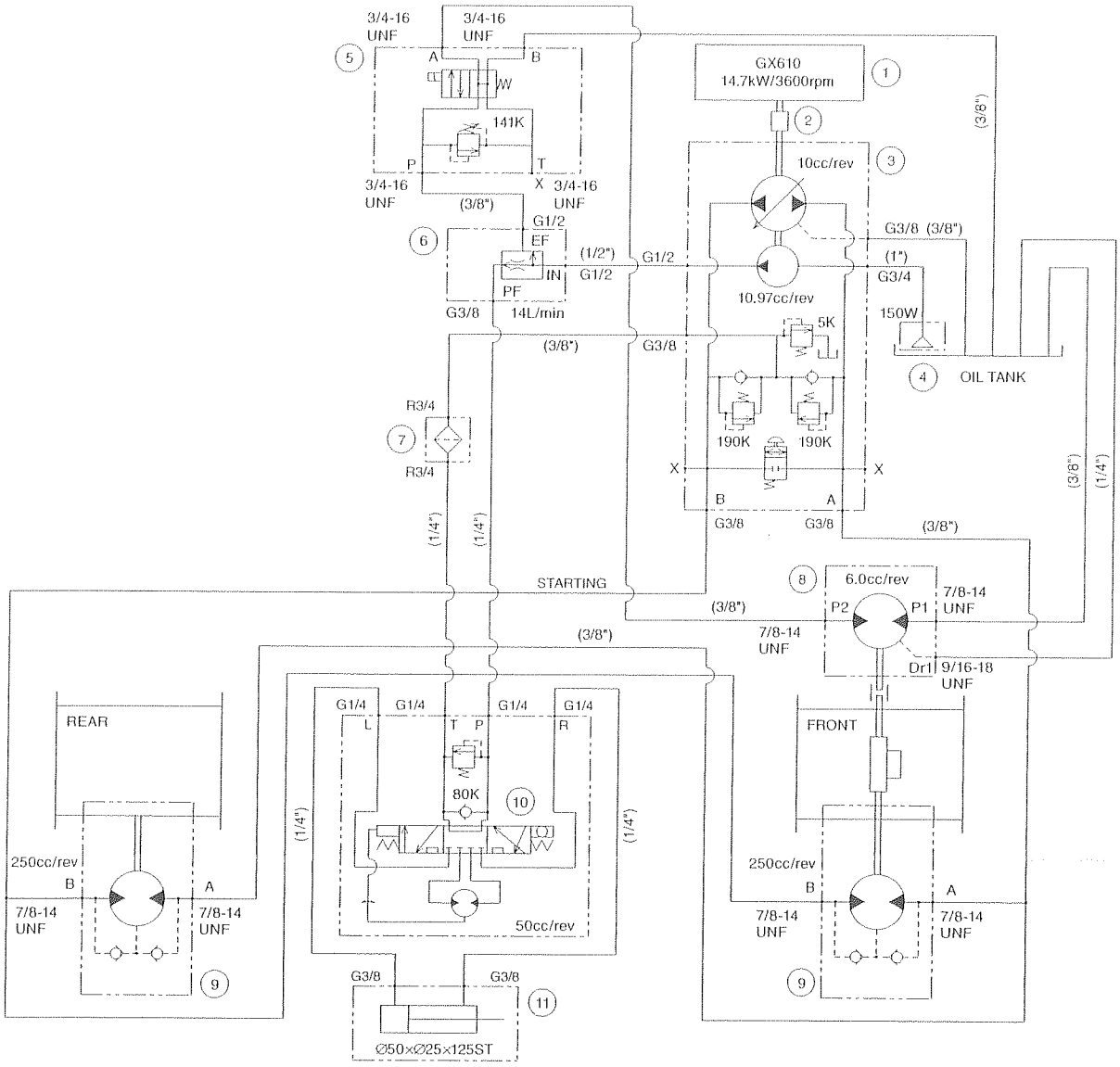
Switching on the vibrator on-off switch fitted on top of the forward-reverse lever actuates the vibrator on-off solenoid valve to block the vibrator unload circuit and make the vibrator motor circuit live.

7-3-2. Vibrator motor

A gear pump powers the vibrator. The output shaft of the vibrator motor is coupled to the vibrator shaft with a coupling. Pressurized oil is fed from the flow priority valve to the motor. The rotating speed of the vibrator shaft is approximately proportional to the speed of the engine.

8. Hydraulic Circuit

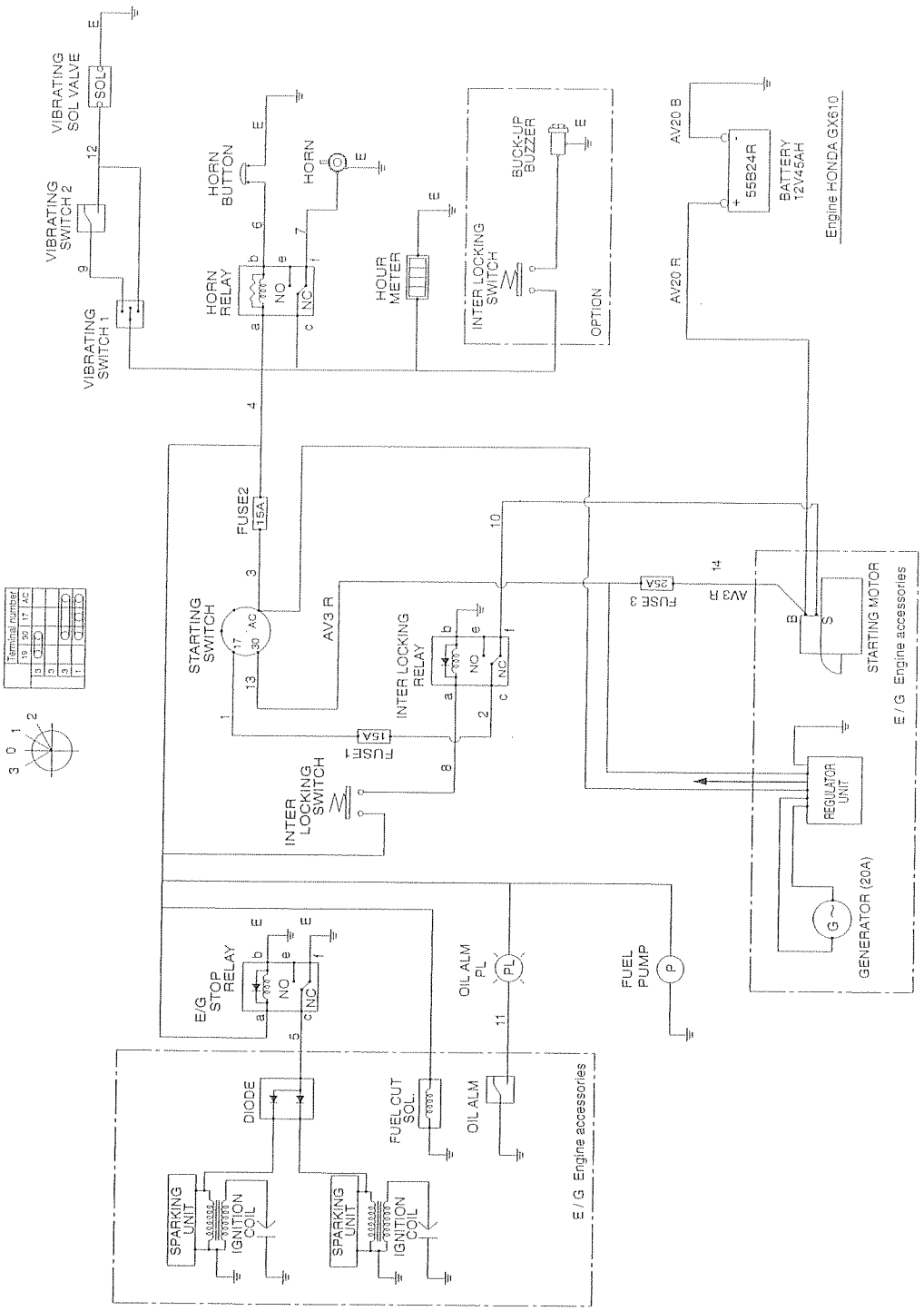
8-1. Hydraulic circuit diagram



① Engine
② Coupling
③ Propulsion pump
④ Hydraulic tank
⑤ Flow priority valve
⑥ Orifice
⑦ In-line filter
⑧ Vibrator motor
⑨ Propulsion motor
⑩ Orbitrol
⑪ Steering cylinder

9. Electric Circuit

9-1. Electric wiring diagram



INSPECTION , ADJUSTMENT & FAULT DIAGNOSIS

INSPECTION , ADJUSTMENT & FAULT DIAGNOSIS

★ Precautions for use of standard value chart

1) Values in the chart are based upon ones approved when machine leaves the factory. They should be used for estimation of wear after extended operation and for guidance when the machine is repaired.
2) Vaules in the chart are ones based on various test results etc. They should be used for a quide for fault finding practice in due consideration of the past repair frequency and operating record of the machine.
3) Values in the chart should not be used for the standard for claim application.

★ Precautions for Checking, Adjustment and Fault Finding

⚠ For checking, adjustment and fault finding practices, park the machine on level ground and engage the safety pins.

⚠ When working with workmates, use hand signals positively and keep people not concerned away from the work area.

⚠ Cool off the engine coolant or hydraulic fluid when removing the radiator cap or the hydraulic tank filler cap. Hot fluids can burn you.

⚠ Do not put your hands close to parts in motion such as fan belts.

1. Standard Value Chart

1-1. Standard value chart for machine body

	Item	Measuring conditions		Standard value for new machine
Operating force	Throttle lever	Top of lever		34N (3.5kgf)
	F-R lever			
Speed	Travel	Full throttle	Forward	0 ~ 7.5 km/h (0 ~ 4.7 mile/h)
			Reverse	
	Vibrator shaft	Full throttle		4000 rpm
Hydraulic pressure	High pressure line	Hydraulic oil temp: 50 ± 5°C		190 kg/cm² (19.4 Mpa)
	Charge line			5 kg/cm² (0.5 Mpa)
	Vibrator line			141 kg/cm² (14.4 Mpa)
	Steering line			80 kg/cm² (8.2 Mpa)
	HST pump capacity			0 ~ 10 cc/rev
	Charge pump capacity			10.97 cc/rev
	Propulsion motor capacity			250 cc/rev
	Vibrator motor capacity			6 cc/rev
	Priority flow of Orbitrol			14 L/min

★ Precautions for use of standard value chart

1) Values in the chart are based upon ones approved when machine leaves the factory. They should be used for estimation of parts wear after extended operation and for guidance for repair.
2) Values in the chart should not be used as standard for claim application.

★ Precautions for inspection and adjustment

⚠ For checking, adjustment and fault finding practices, park the machine on level ground and engage the parking lock.

⚠ When working with workmates, use hand signals positively and keep people not concerned away from the work area.

2. Inspection and Adjustment

2-1. Hydraulic pressure measurement

(1) Measurement of relief pressure in proulsion high pressure line and charge circuit

Hydralulic oil temperature: 45 to 55°C

⚠ Park the machine on level ground, stop the engine and apply parking brake.

High pressure line:

Take off the plug (7/16-20UNF-2B) from the high pressure measurement port and attach a 0 - 500 kg/cm² (51MPa) pressure gauge.

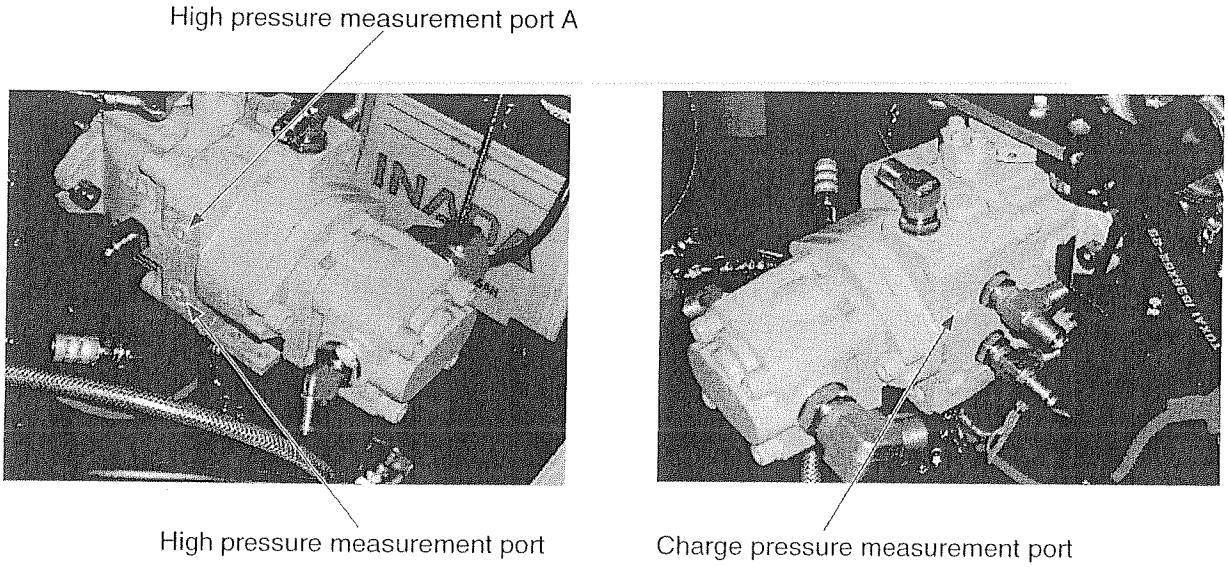
Charge pressure line:

Take off the plug (7/16-20UNF-2B) from the charge pressure measurement port and connect a 0 - 20 kg/cm² (2MPa) pressure gauge.

Take the measurements by angularly moving the forward-reverse lever forward and backward with the engine running at its maximum speed.

(2) The relief valves are not adjustable. Renew any malfunctioning relief valves.

External view of propulsion pump



2-2. Adjustment of forward-reverse control cable

⚠ **Park the machine on level ground.**

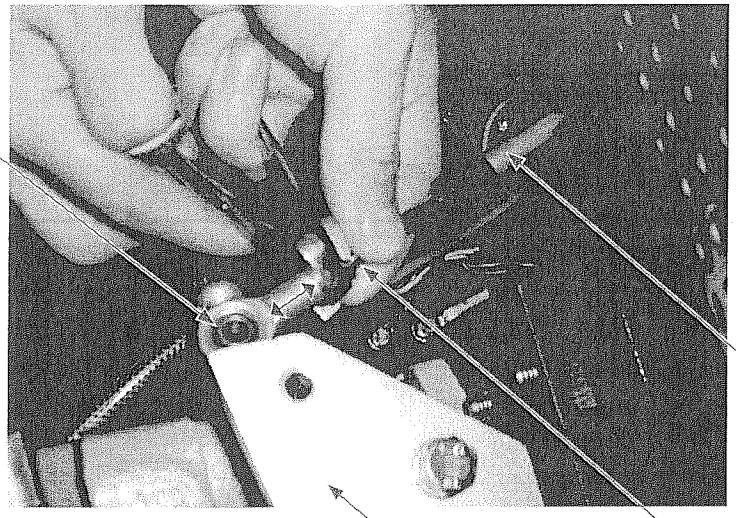
(1) Disengage the parking brake.

Ensure that the machine comes to a stop if the forard-reverse lever is brought to the neutral position with the engine running at full speed.

(2) Adjustment

If the machine fails to come to a halt with the forward-reverse lever moved to the neutral position, adjust the neutral position as follows:

1) Take off the forward-reverse cable from the propulsion pump plate.
2) Check to see if the plate and forward-reverse lever are in the detent position which keeps the forward-reverse lever in the exact neutral position.
3) Check that the hole in the plate aligns with the hole on rod end of the forward-reverse control cable. If they do not align, adjust as follows:
4) Slacken the rod end lock nut and make the hole of the plate align with the hole of the rod by rotating the rod in either direction.
5) Connect the forward-reverse control cable to the plate.
6) Tighten the rod end lock nut.
7) Start the engine and propel the machine to check that the correct neutral position has been restored.



3.Fault Diagnosis

3-1.Precautions for fault diagnosis

- Fault diagnosis is to determine the root cause of a trouble. Repair faulty parts as quickly as practicable, and prevent recurrence of the trouble.
- Important when making a fault diagnosis is of course to well undertand the structure and function of the machine at fault. For effective fault diagnosis, however, it is of prime importance to have a clear picture of the trouble concerned by contacting the operator.

1. When a trouble has occured, do not attempt to disassemble suspected parts blindly. Disassembling in a hurry without careful considerations will invite disadvantageous situations as described below:
   - Parts which need not to be disassembled may be disassembled.
   - Tracing the cause of trouble will become more difficut.

   These will cause increased service costs because of wasteful service hours, spare parts or expendables like oil or grease. To make matters worse, such a careless practice will invite operator's (customer's) distrust.
   For these reasons, a full investigation and a prudent diagnosis in accordance with fault dignosis procedures recommended are essential for efficient fault finding practices.

2. Questions to be addressed to the operator (customer)
   1) Are there any trouble other than the trouble in question?
   2) Had there been any unusual conditions with the machine before the trouble has occurd?
   3) Has the trouble occurd suddenly without showing any signs of unusual conditions in advance?
   4) In what occation has the trouble occurd?
   5) Had the machine been repaired before the trouble has occurd? If so, when had it been repaired?
   6) Had similiar trouble occurd before the trouble has developed?

3. Before-diagnosis inspection
   1) Perform daily inspections.
   2) Perform other inspections necessary for diagnosis.

4. Confirmation of trouble

Know the degree of the trouble. Determine whether the trouble is attributable to a structual defect etc. or caused by incorrect handling.

★ When making the trouble reccur in an attempt to trace the source of the trouble by putting the machine in motion, use care not to cause more damages to the machine.

5. Fault diagnosis

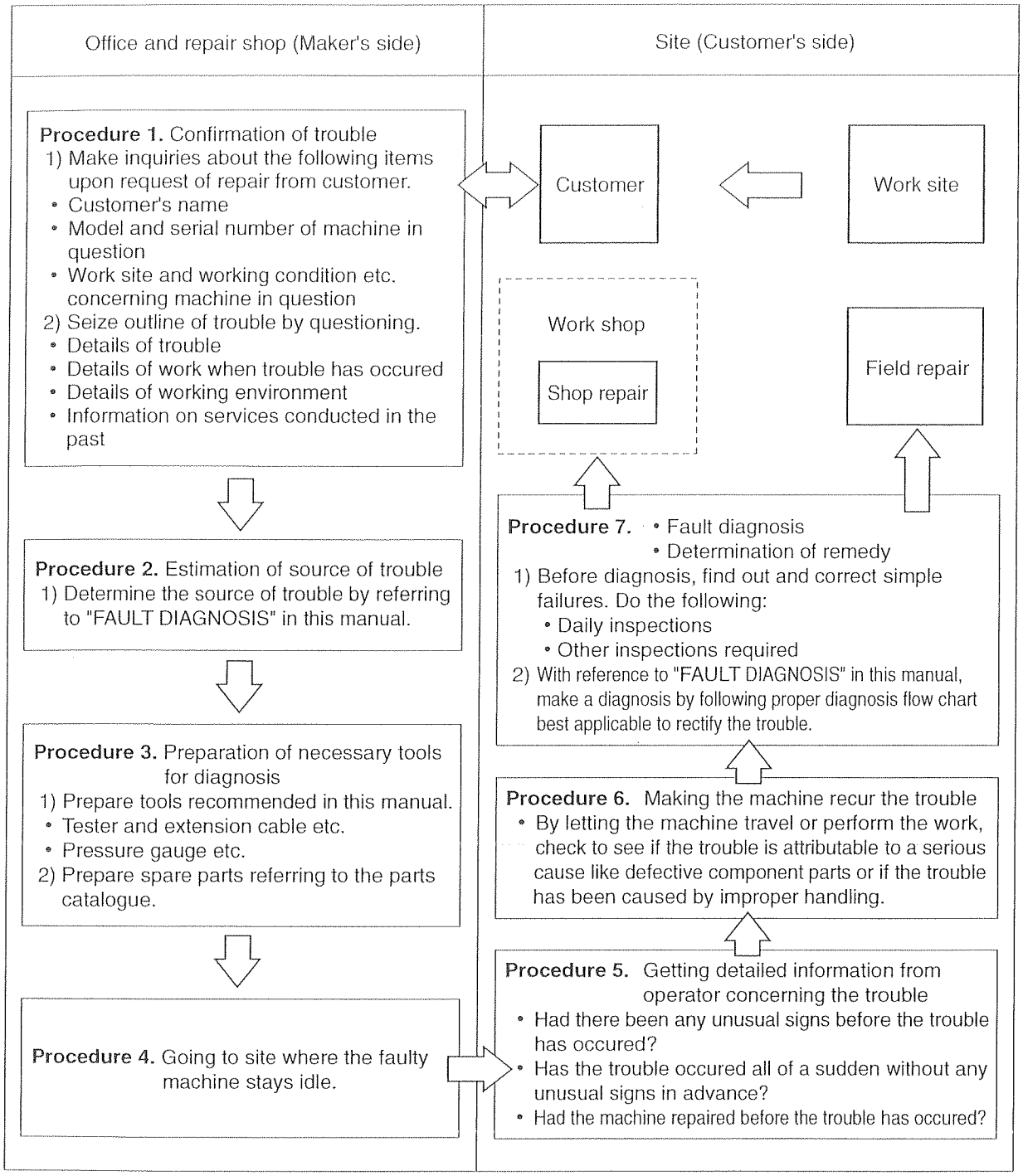
From the results obtained from items 2 to 4 above, narrow down the cause of the trouble, and pinpoint its source by utilizing the diagnosis flow chart.

★ The basic points of the diagnosis are:
   1) Start from the simple portion.
   2) Start from the portion having a high probability.
   3) Investigate related matters.

6. Fundamental remedy for a trouble

Even if a trouble has been rectified, it will develop again if its cause is not determined. It is of prime importance to grasp the very cause of the trouble.

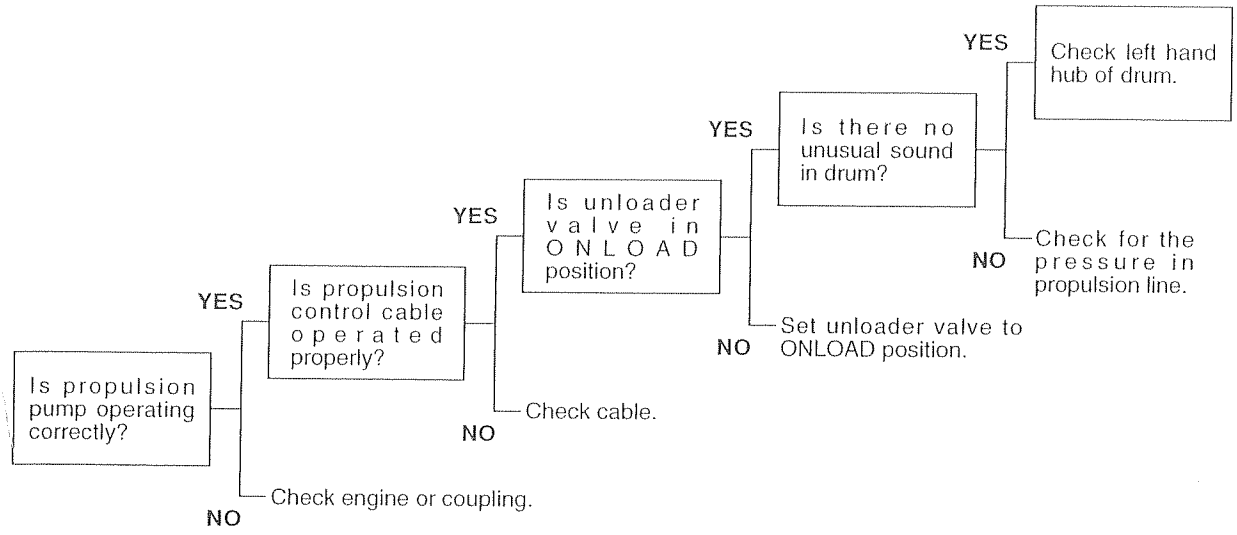
3-2.How to Make a Fault Diagnose



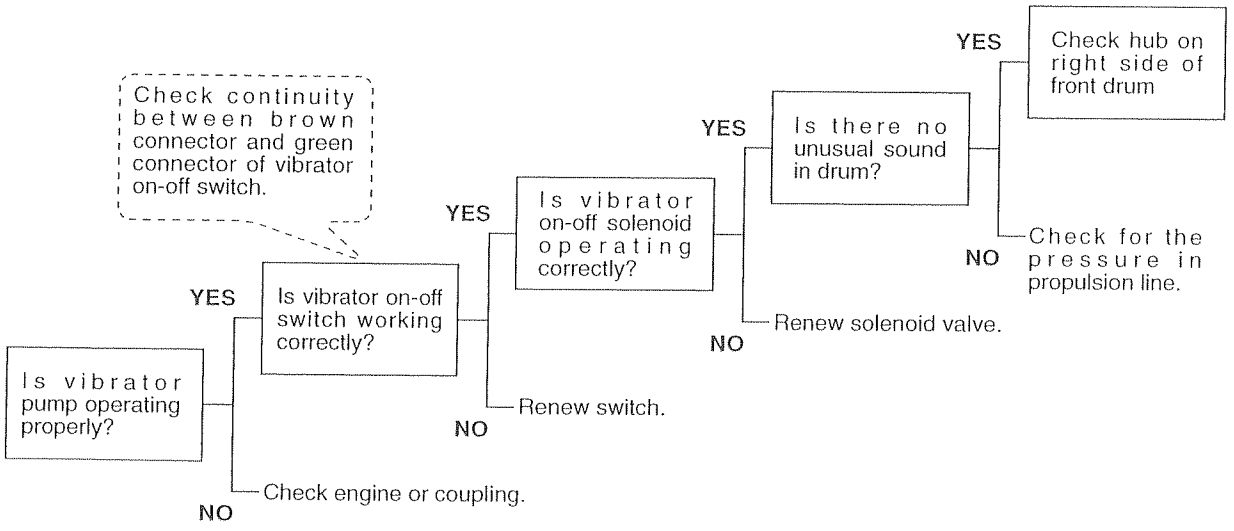
3-3. Fault diagnosis flow chart

3-3-1. Machine not propelled or slow speed or low traction

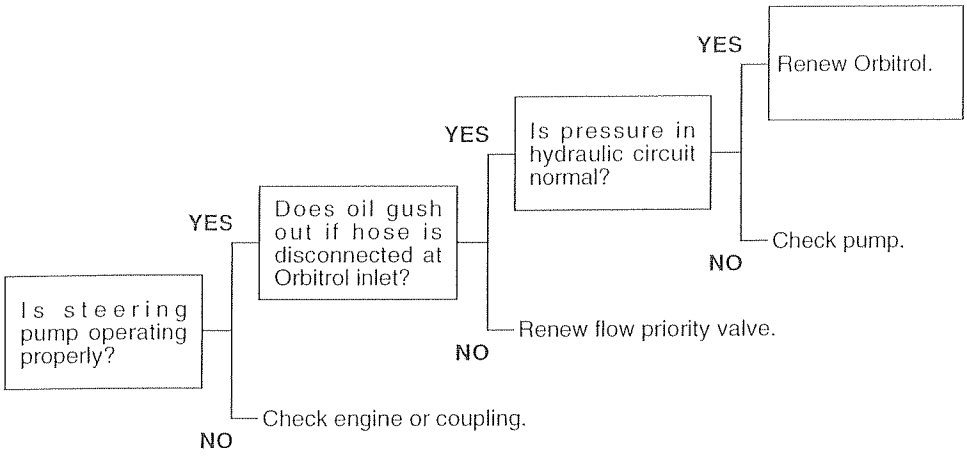
★ Ensure that the parking brake lock lever is in the RELEASE position.
★ Before making a fault diagnosis, check the hydraulic oil level.



3-3-2. Vibrator does not operate or vibration is not intense.



3-3-3. Steering not made



DISASSEMBLY & ASSEMBLY

DISASSEMBLY & ASSEMBLY

Precautions

★ For removal, disassembly, assembly and installation of key units, observe the following general precautions.

1. Precautions for removal
   - Blank the open end of disconnected hoses to prevent ingress of dust.
   - When draining oil, use a container of sufficient capacity.
   - When disassembling, apply match marks as necessary to parts for correct assembling.
   - When disconnecting electric wires, hold and pull off their connectors.
   - Label wires and pipes to ensure reconnetion to their original positions.
   - Retain shims after checking their number and total thickness.
   - When lifting parts, use a hoisting device of sufficient capacity.
   - Clean around units before removal. After removal, cover them to keep free from foreign materials.

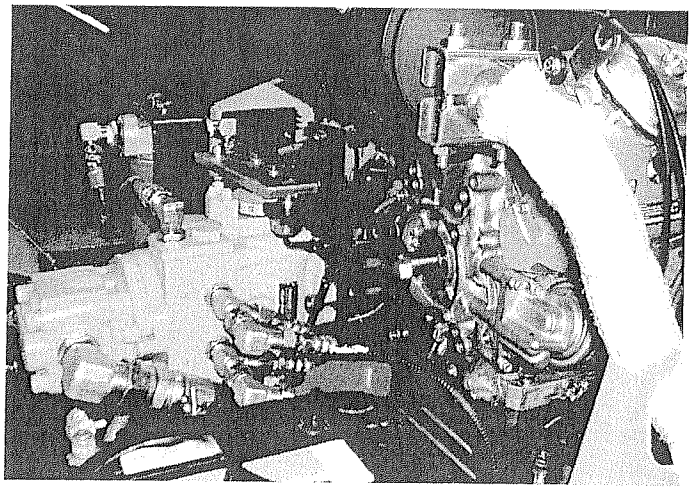
2. Precautions for installation
   - Tighten bolts and nuts (sleeve nuts) to the specified torque.
   - Connect hoses ensuring that they are not twisted or not in contact with other parts.
   - Renew used gasket, O-ring, split pin or lockplate.
   - When applying a liquid sealant to thread, throughly wash clean the thread to remove residual grease or oil, and apply two to three drops of the sealant.
   - When using a liquid sealant, throughly wash clean the coating surface to remove old grease or oil. Coat the sealant uniformly after ensuring that there is no scores and dust, etc. on the surface.
   - Thoroughly clean removed items. Repair any parts with noticeable scores, nicks, burrs and rust, etc.
   - Apply a coat of engine oil to running surfaces of moving parts like parts in rotary motion.
   - Apply grease to press-fit parts.
   - Check that lock rings are properly seated in grooves.
   - Surely connect electric wiring connectors after cleaning oil, dust and water, etc.
   - Use lifting bolts with no signs of fatigue or deformation. Screw them securely into parts to be lifted.

3. Precautions when work is complete
   - In case hydraulic components have been removed and reinstalled, add hydraulic oil to the tank to the specified level. Recheck the level after operating the engine and allowing the oil to circulate through the hydraulic lines.

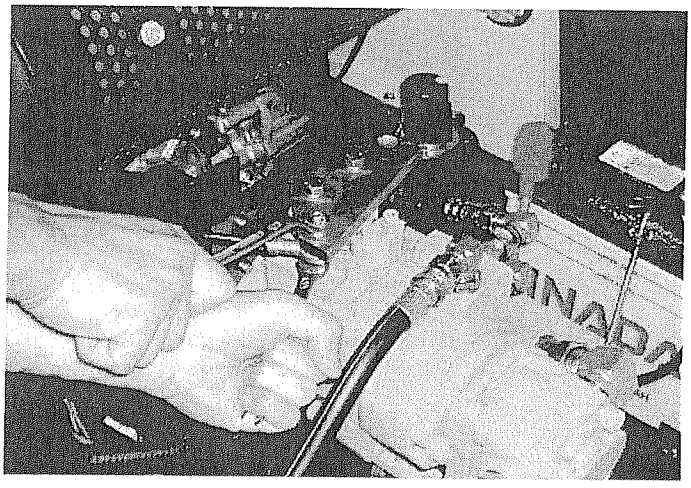
1. Removal and Installation of Hydraulic Pump

1-1.Removal

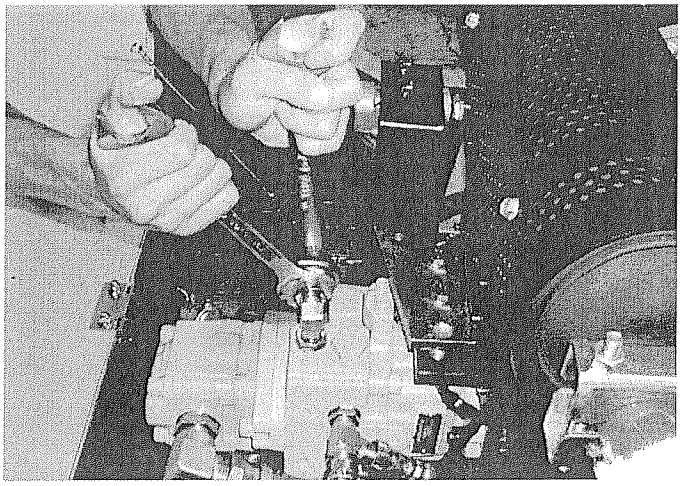
(1) Disconnect both the earth terminal of battery and the connector of interlock switch.



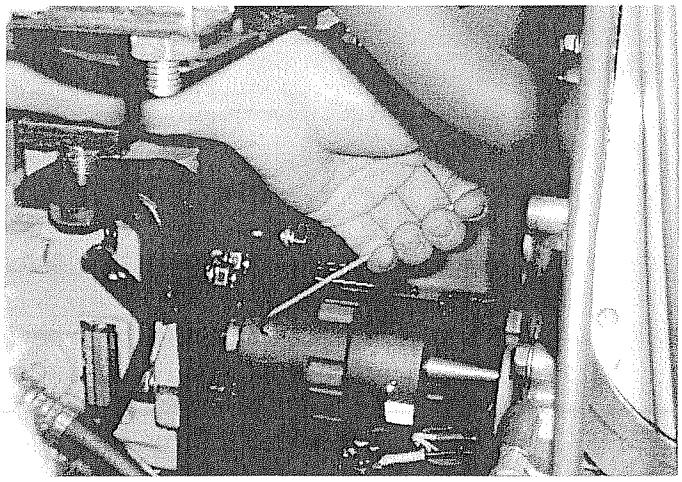
(2) Disconnect the forward-reverse control cable at the plate on the hydraulic pump.



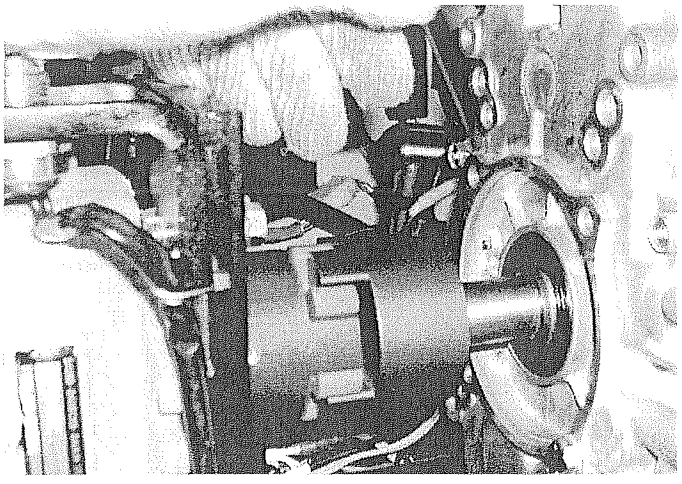
(3) Disconnect all the hoses from the hydralulic pump.



(4) Slacken the two setscrews of the coupling hub fitted on the pump input shaft side.

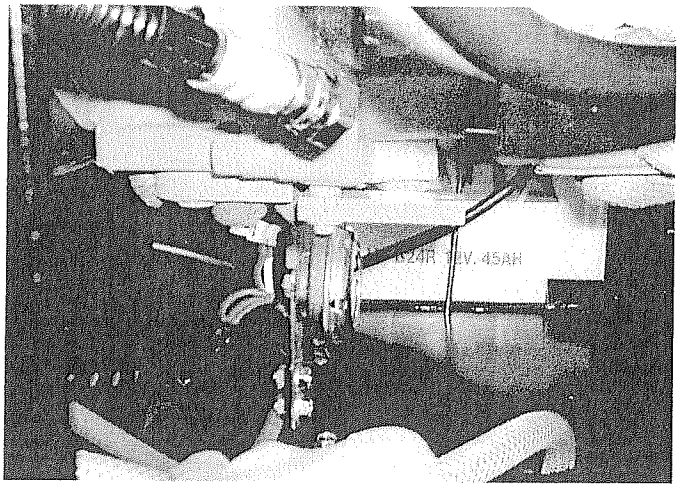


(5) Slide the coupling hub toward the pump.

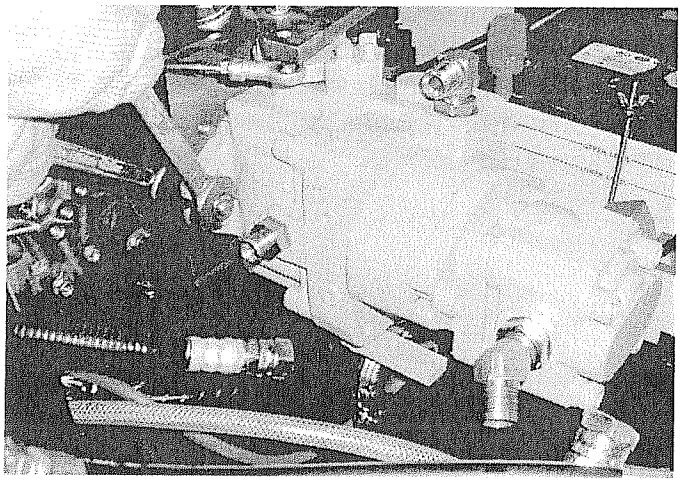


(6) Disconnect the harness at the horn located under the pump.

(7) Remove the horn mounting bracket from the frame.

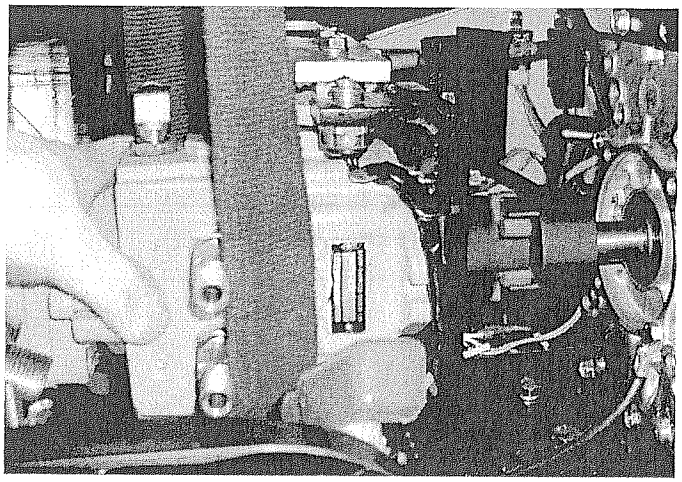


(8) Remove the two pump fixing bolts.



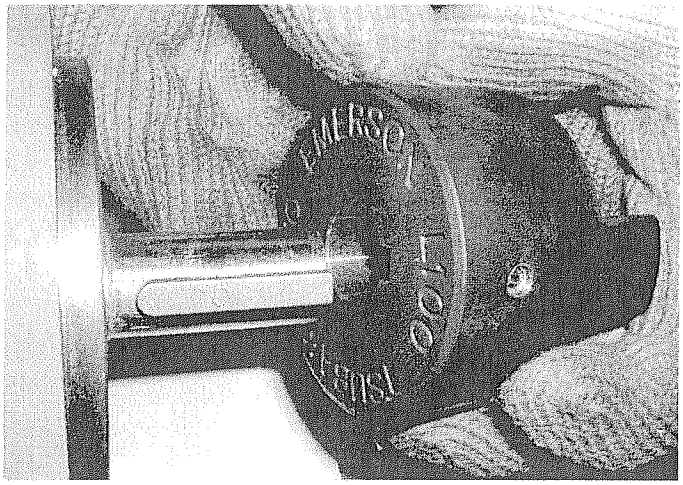
(9) Attach a hoisting device to the pump and widthdraw the pump from the bracket.

(10) Slide the coupling hub off the pump input shaft.

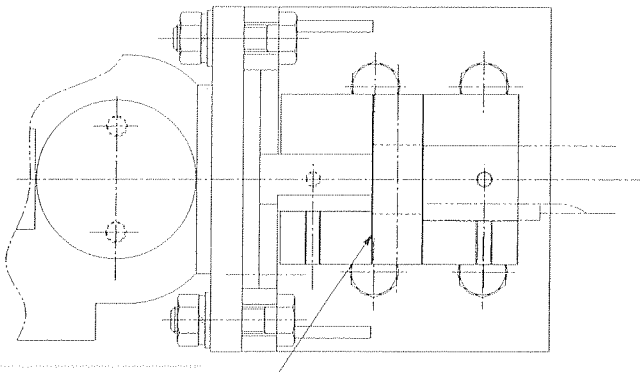


1-2.Installation

(1) Align the pump input shaft key with the coupling hub key groove, and slide the coupling hub onto the pump input shaft.



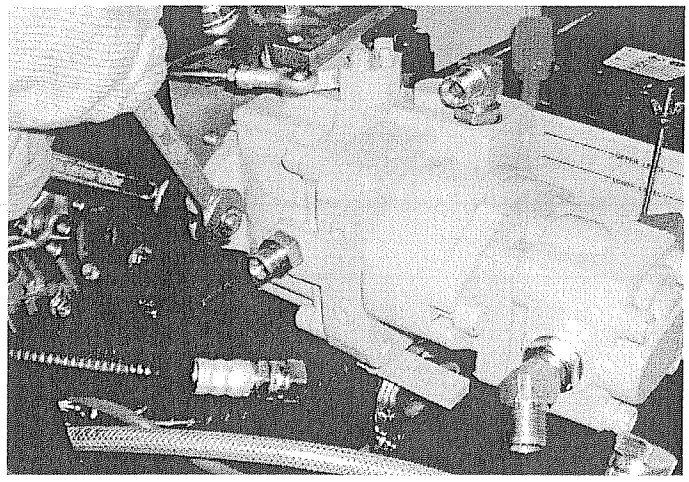
(2) Slide the coupling hub onto the pump input shaft until the shaft end surface is flush with the hub surface as shown. Tighten the setcrews.



Shaft end flush with hub surface.

(3) Mount the pump to the brakect and tighten the fixing bolts.

★ When mounting the pump on the bracket, ensure that the engine output shaft end is flush with the coupling hub surface as shown in the middle view.

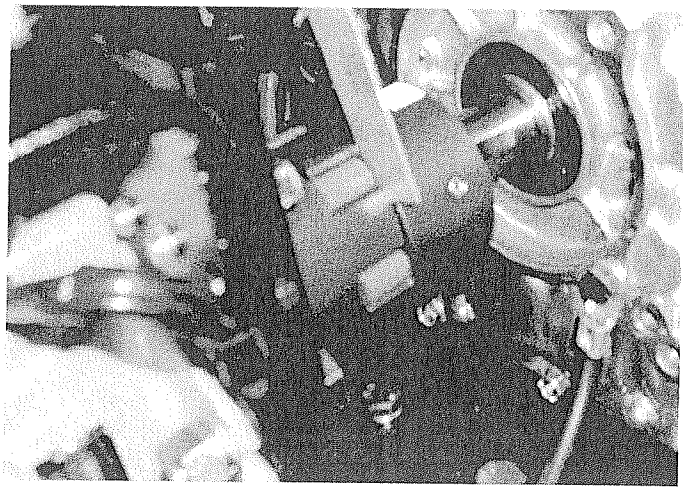


(4) Measure and adjust the clearance between the coupling hub on the pump side and the coupling hub on the engine side by inserting a thickness gauge into the clearance.

★ Hub to hub clearance: Assembly standard: 1.9±0.7mm

(5) Tighten the two setscrews of the pump side copupling hub.

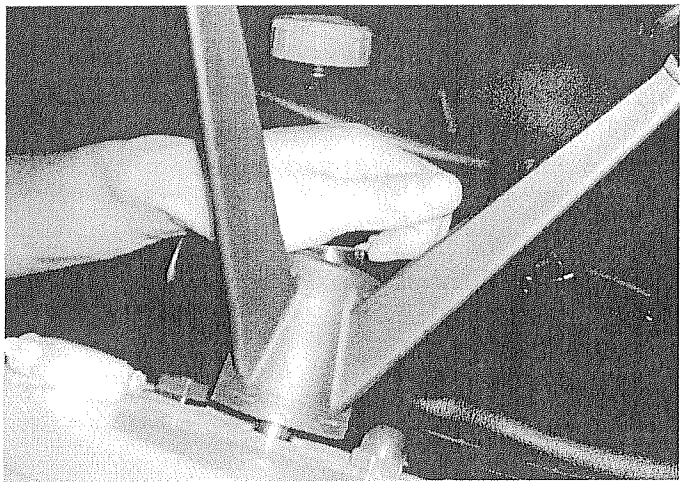
(6) For installation, reverse the removal procedure.



2.Removal and Installation of Orbitrol

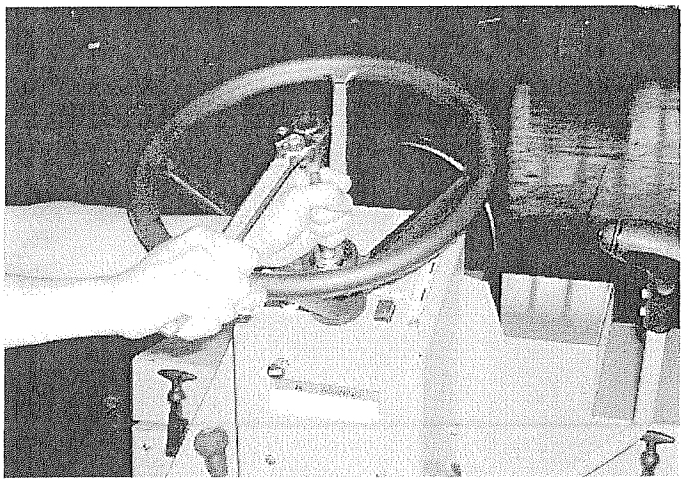
2-1. Removal

(1) Remove the cap form the steering wheel boss.



(2) Loosen the lock nut that fixes the steering wheel.

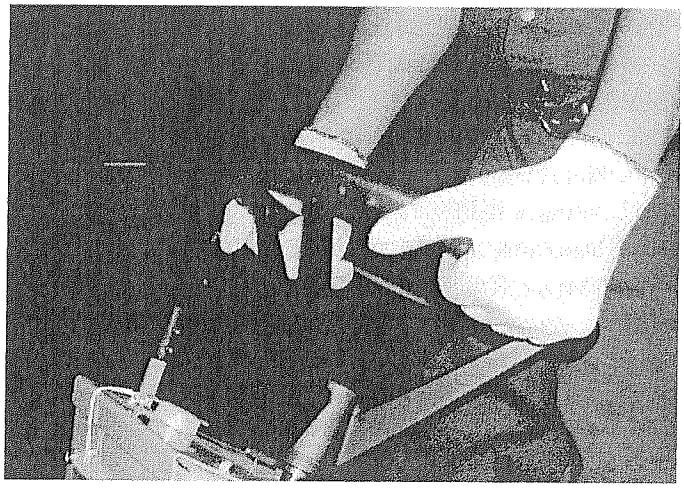
CAUTION:
Do not remove the lock nut but screw out until the top surface of the column shaft is flush with the lock nut top surface.



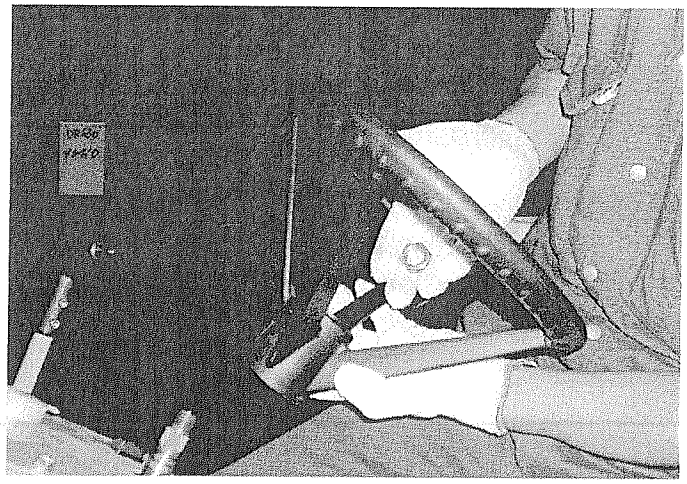
(3) Pull up the steering wheel off the column shaft.

⚠ If hard to take off, lightly tap the head of column shaft with a copper hammer while pulling up the steering wheel.

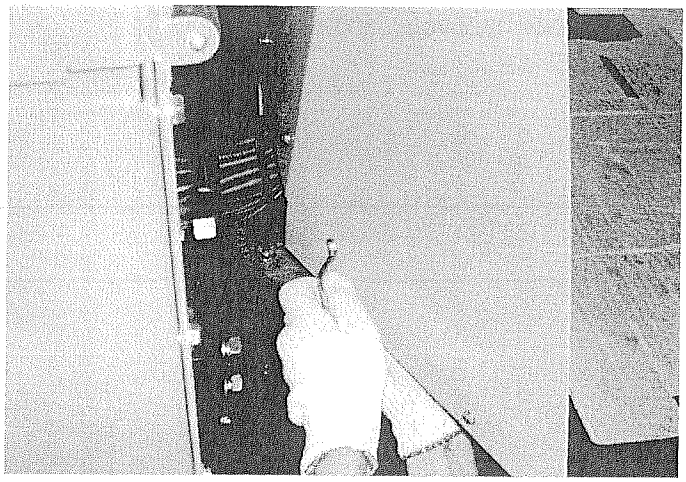
CAUTION:
Do not give a sharp blow, as this can cause damage to the column shaft or Orbitrol.



(4) Remove the locknut and remove the steering wheel from the column shaft.



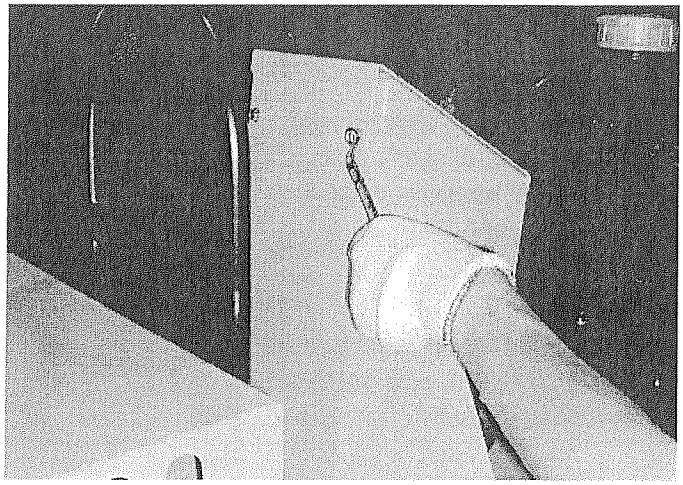
(5) Remove four fixing bolts from the lower part on right and left sides of the sealed cover fitted in front of the column box.



(6) Remove six center fixing bolts of the sealed cover fitted in front of the column box.

CAUTION:
When taking off the last bolt, hold the sealed cover to prevent falling free or ask help of an assistant.

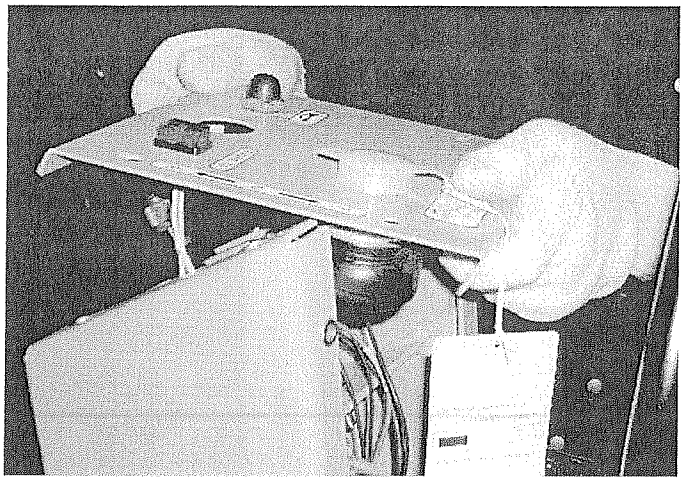
(7) Remove the sealed cover.



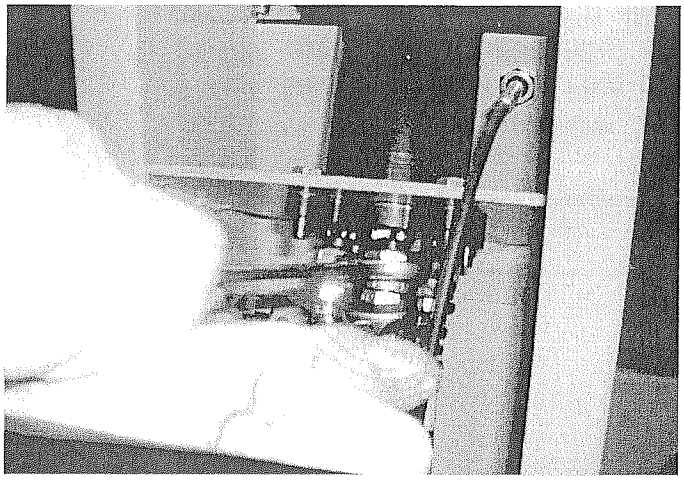
(8) Remove four control panel securing bolts.

(9) Remove the control panel.

CAUTION:
If electric wiring is disconnected, record the identification color and identification number of each wire for correct reconnection.



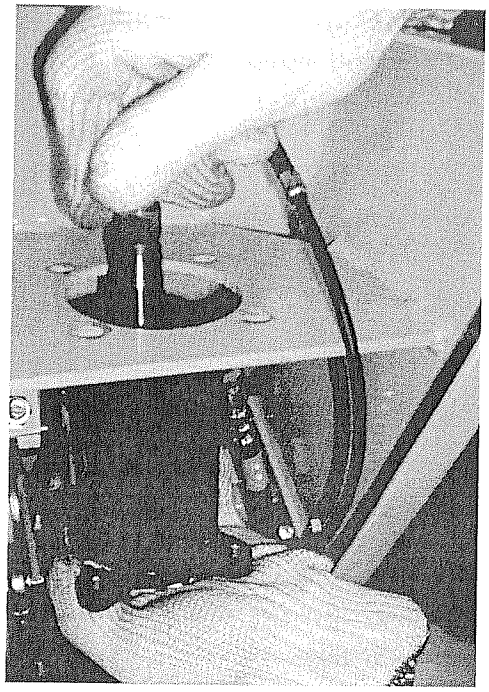
(10) Disconnect four hydraulic hoses at Orbitrol.



(11) Remove four Orbitrol retaining bolts.

(12) Pull off Orbitrol downward.

CAUTION:
When taking off the last bolt, hold the sealed cover to prevent falling free or ask help of an assistant.



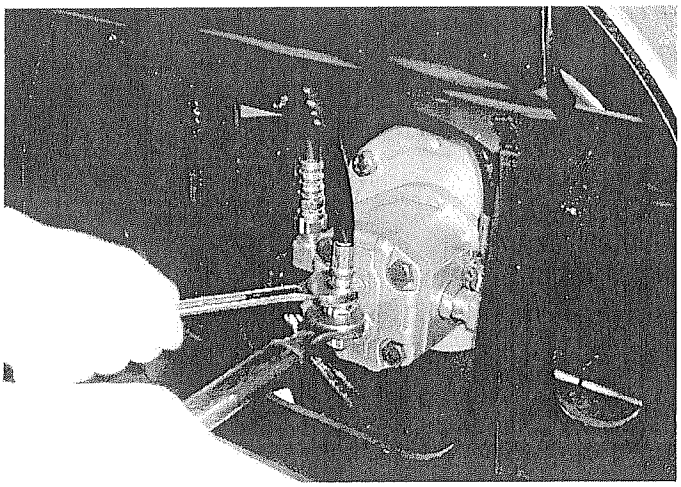
2-2. Installation

★ Use the removal procedure in reverse sequence.

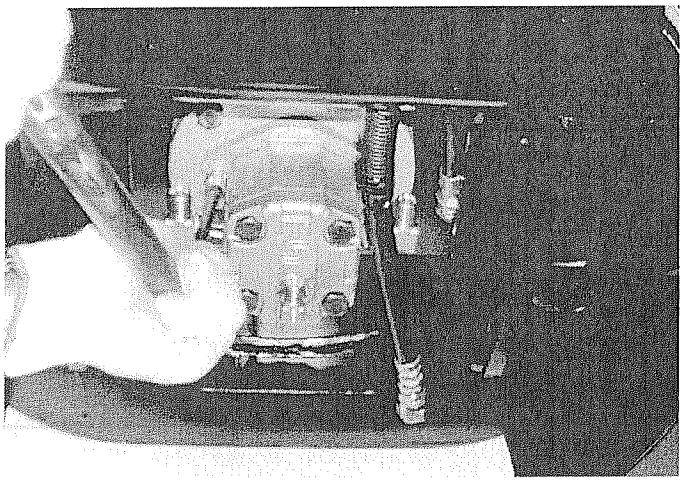
3. Removal and Installation of Vibrator Motor

3-1. Removal

(1) Disconnect all the hydraulic hoses from the vibrator motor.



(2) Take off two motor securing bolts and pull off the motor toward near side.



⚠ Removal of the motor is performed by repeating the following procedure: Screw out the motor fixing bolts to some extent and pull the motor toward near side.

3-2. Installation

★ Reverse the removal procedure.

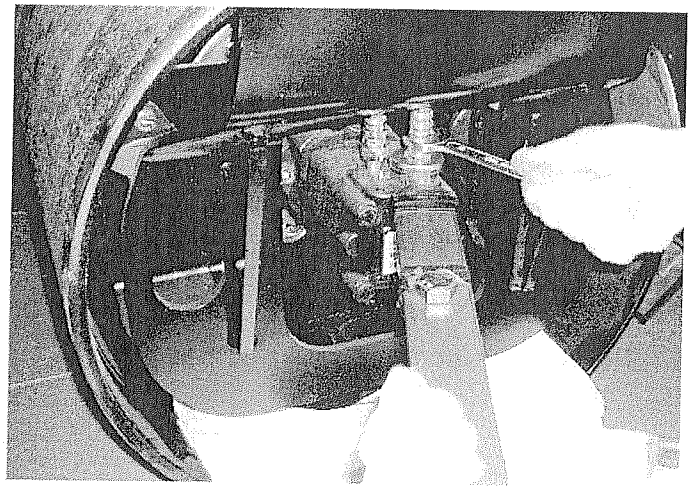
4. Removal and Installation of Propulsion Motor

4-1. Propulsion motor removal

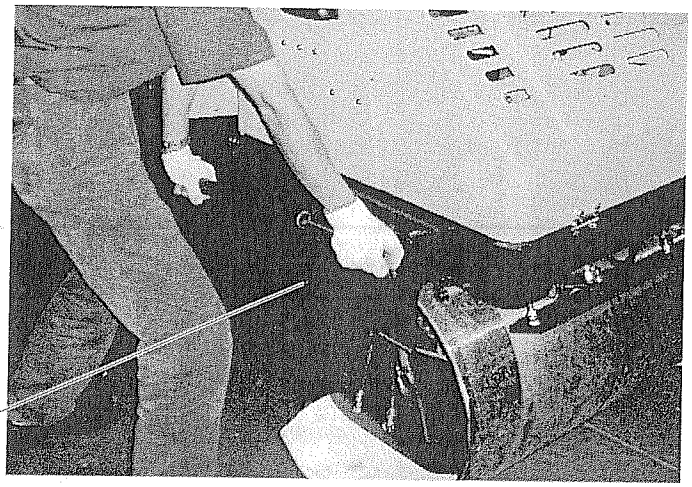
4-1-1. Front drum removal

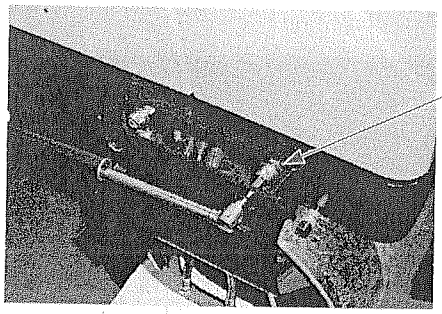
(1) Disconnect all the hydraulic hoses from both the propulsion motor and vibrator motor.

(2) Place the disconnected hoses inside the frame.



(3) Loosen four side bracket fastening bolts.

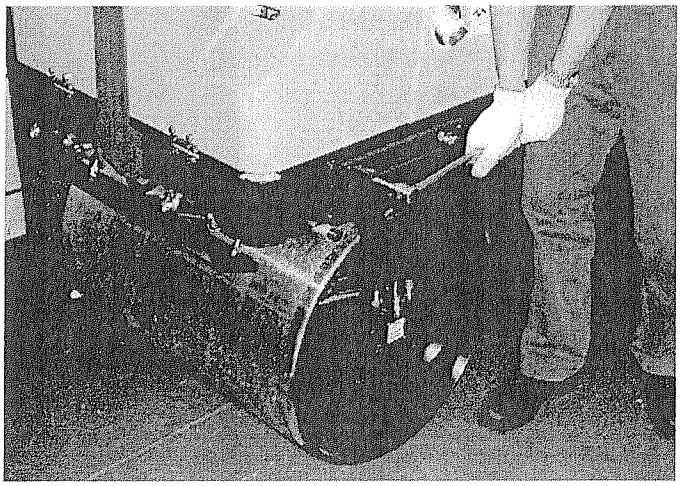




(4) Engage a hoisting gear to the draw hook and lift the machine till the drum is about to float.(Lifting band is stretched tight.)

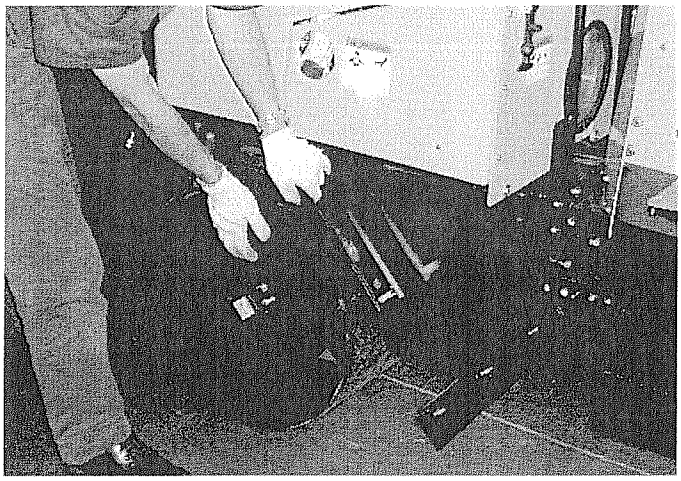
(5) Remove four side bracket fixing bolts from the left and right sides each.

(6) Latch the scraper blade off the drum.



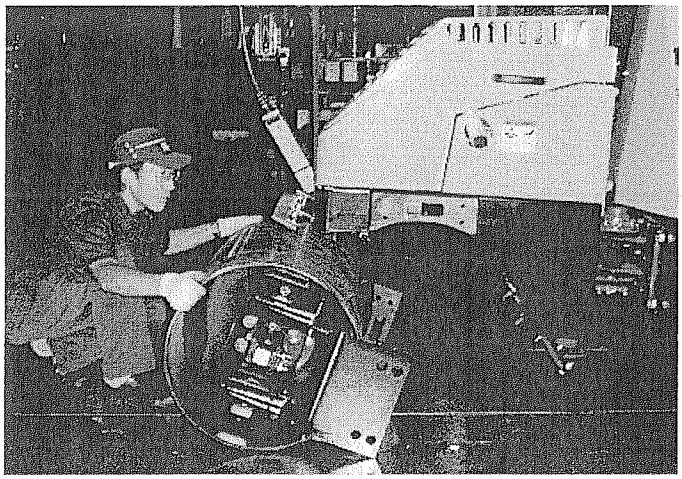
(7) Let the right and left side brackets fall down toward rear and place there temporarily.

(8) Lift the machine body to allow the front drum to be withdrawn forward.



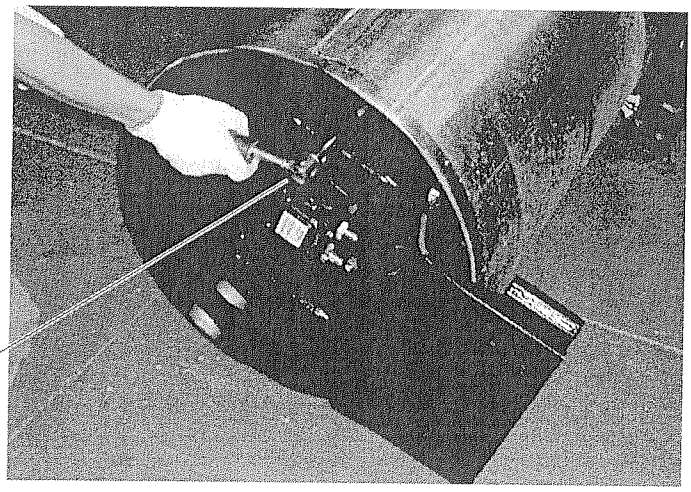
(9) Roll out the front drum forward.

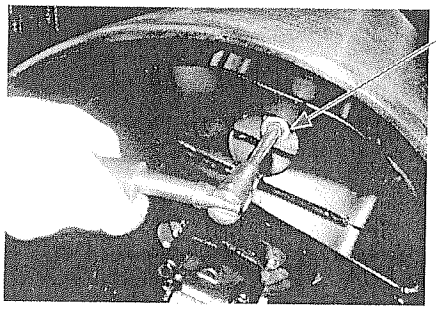
(10) Put safety stands under the front frame and lower it onto the stands.



4-1-2. Front propulsion motor removal

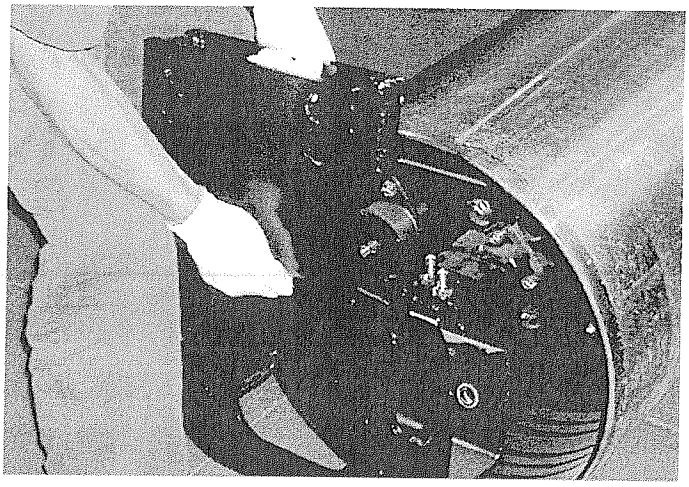
(1) Remove two shockmount-bracket fixing bolts on right and left sides each.



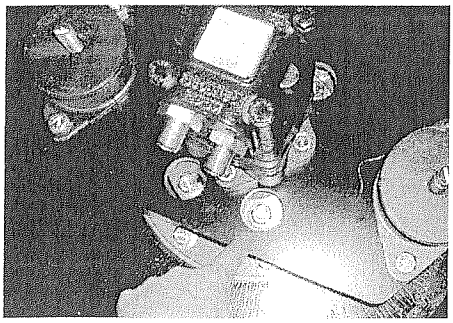


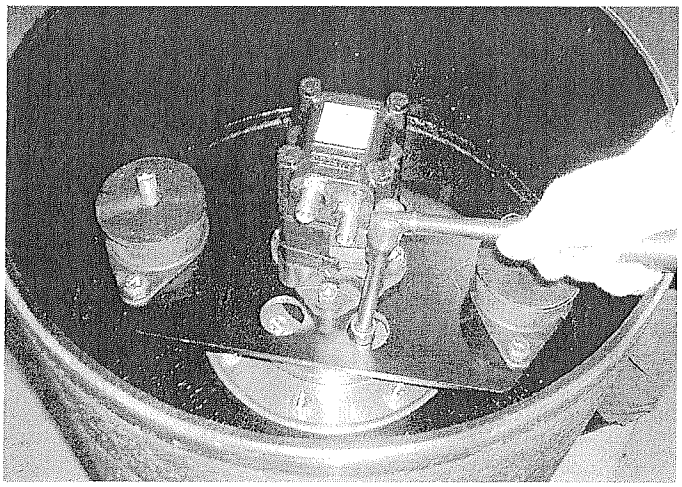
(2) Remove the side brackets.

(3) Stand the front drum with the propulsion motor up.



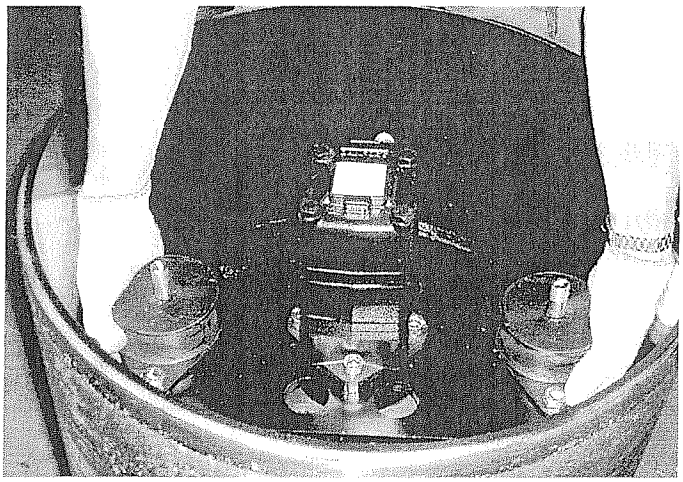
(4) By rotating the disc, align the access holes of the disc with the flange fixing bolts.
Remove the bolts.





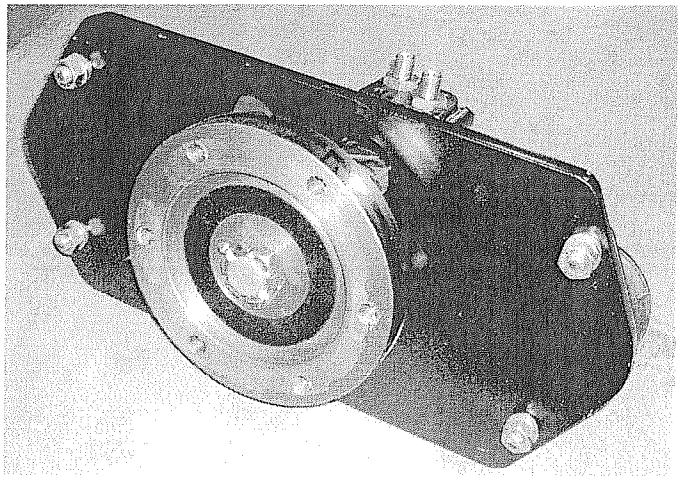
(5) Pull up the disc off the drum.

⚠ If hard to pull off, lift both ends of the disc only slightly on a hoist. Place proper wooden blocks between the drum end plate and disc, and tap the outer end of the block with a hammer to loosen the disc.



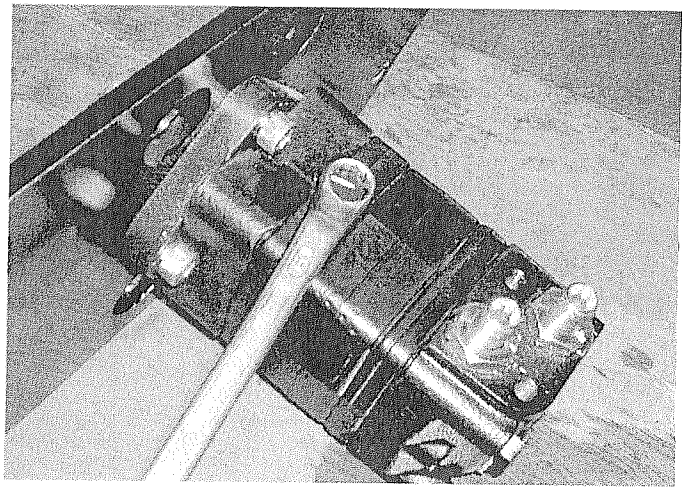
(6) Pull off the cotter pin, screw out and remove the castle nut.
(7) Using a puller, pull off the flange from the propulsion motor output shaft.

⚠ The flange is taper-fitted to the propulsion motor output shaft. The flange may separate from the shaft and fall free all of a sudden.
When removing, use extreme caution not to be injured by an unexpectedly falling flange.



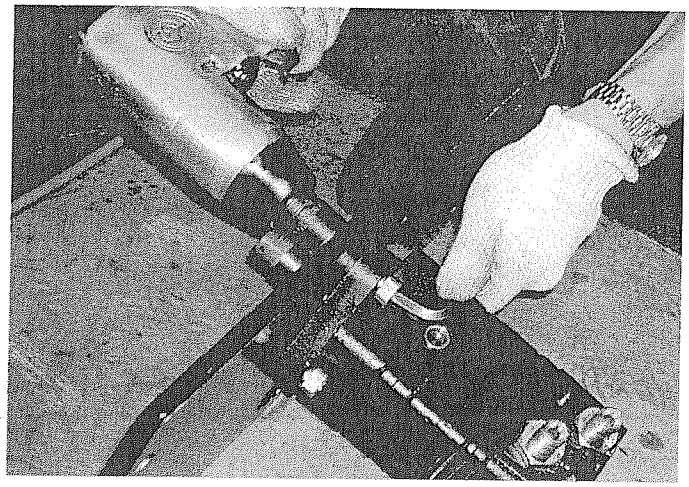
(8) Take off the key from the propulsion motor output shaft.

(9) Take off the drain plug of the motor.



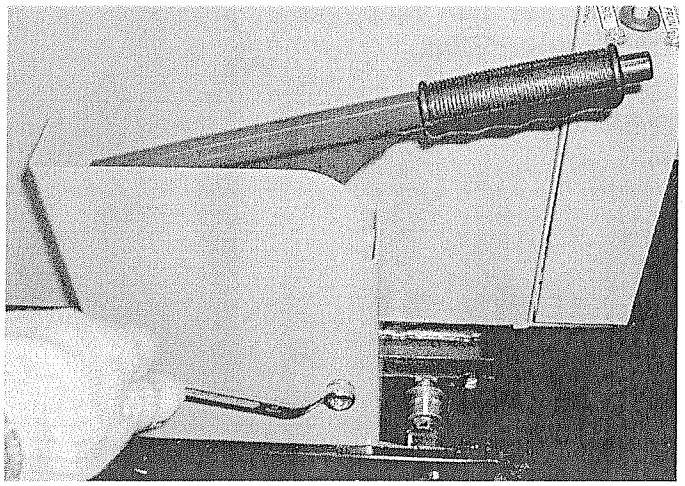
(10) Remove four motor retaining bolts.

(11) Separate the disc from the motor.

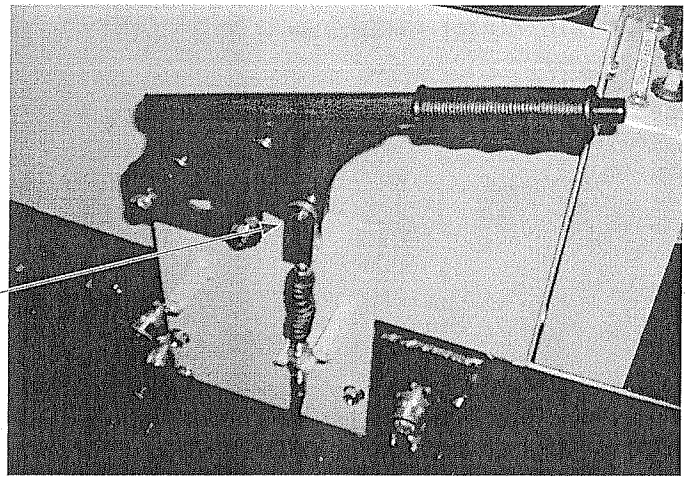


4-1-3. Rear drum removal

(1) Remove two bolts that secure the parking brake lever cover and remove the cover.

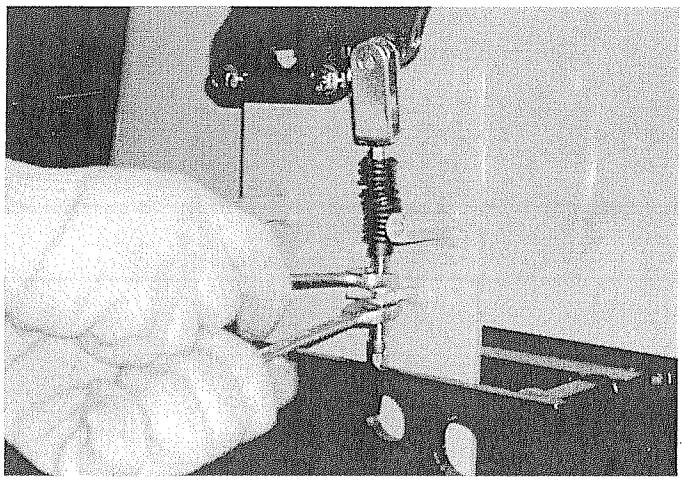


(2) Disconnect the brake cable which connects to the parking brake lever.

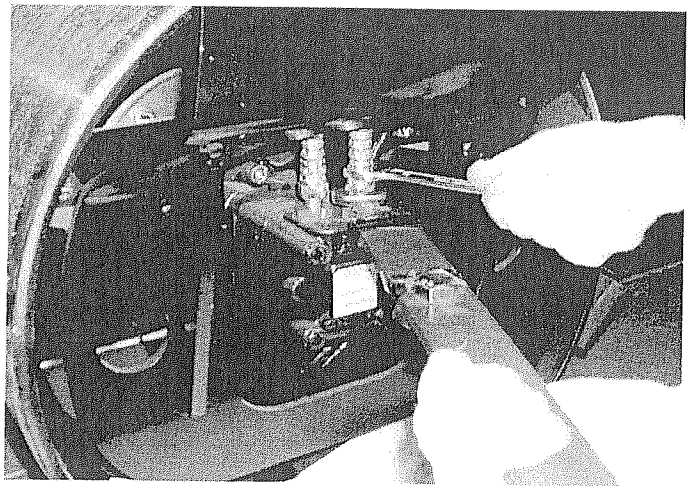


(3) Loosen the brake cable fixing nuts and remove the cable from the bracket.

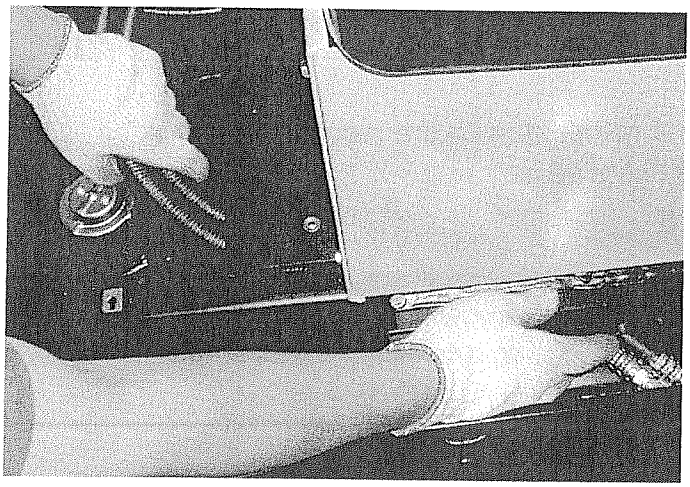
(4) Withdraw the cable off the side bracket into the drum.



(5) Disconnect the two hydraulic hoses at the propulsion motor.



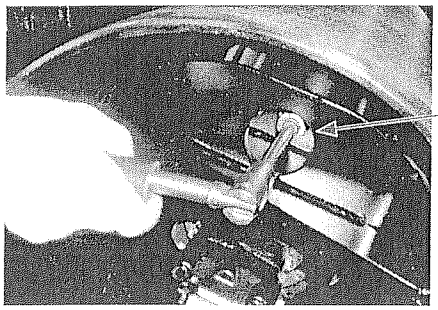
(6) Take off the floor board and pull out the disconnected hoses.

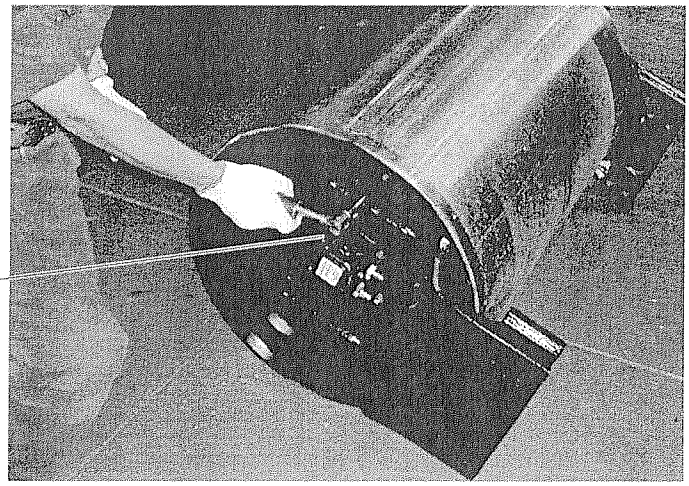


(7) For procedures of rear drum removal, see step (3) and subsequent steps under " 4-1-4. 1.Front drum removal".

4-1-4. Rear propulsion motor removal

(1) From right and left side brackets each, remove two shockmount fixing nuts.

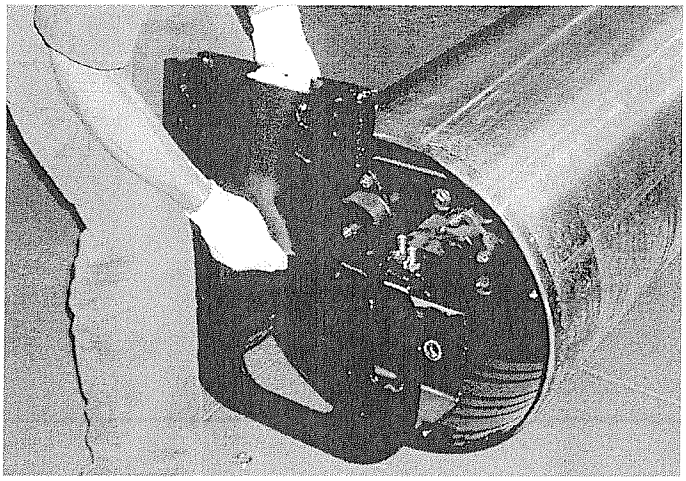




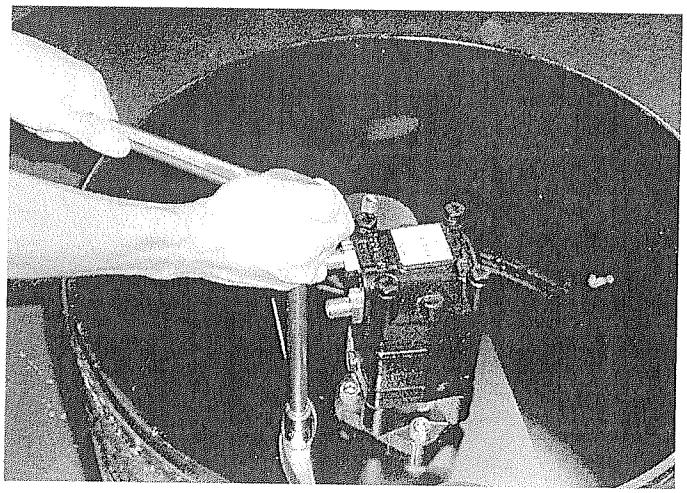
(2) Remove the right and left side brackets.

(3) Stand the drum with the propulsion motor up.

CAUTION:
When standing the drum, use caution not to allow the brake cable to get caught between the drum and floor.



(4) Align the recess of the disc with the flange securing bolts by rotating the disc and remove the six securing bolts.



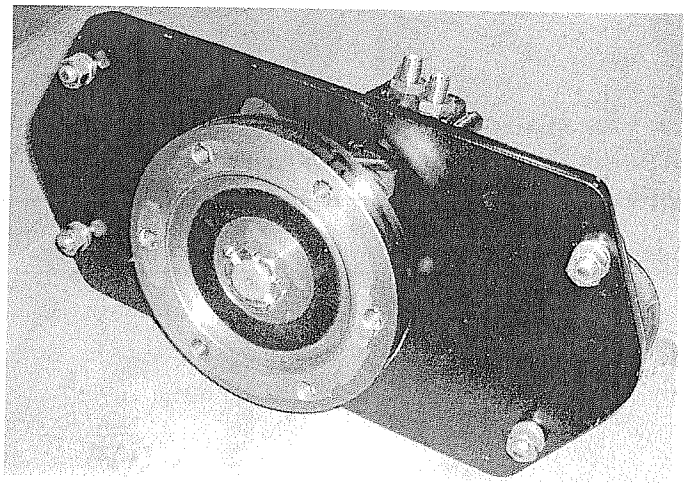
(5) Pull up the disc off the drum.

⚠ If hard to pull off, lift both ends of the disc only slightly on a hoist. Place proper wooden blocks between the drum end plate and disc, and tap the outer end of the block with a hammer to loosen the disc.

(6) Pull off the cotter pin, screw out and remove the castle nut.

(7) Using a puller, pull off the flange from the propulsion motor output shaft.

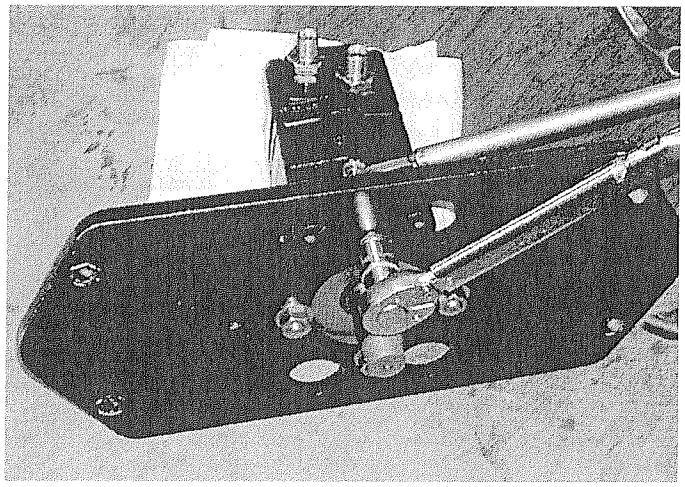
⚠ The flange is taper-fitted to the propulsion motor output shaft. The flange may separate from the shaft and fall free all of a sudden. When removing, use extreme caution not to be injured by an unexpectedly falling flange.



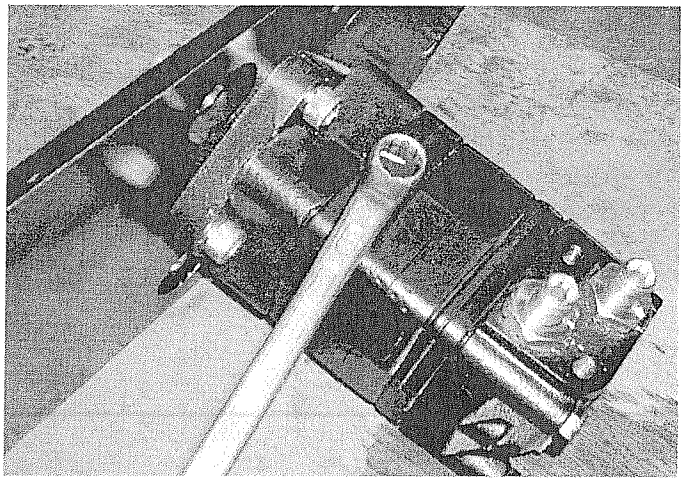
4-1-5. Propulsion motor installation

(1) Fit the propulsion motor to the disk and tighten the four fixing bolts to the specified torgue.

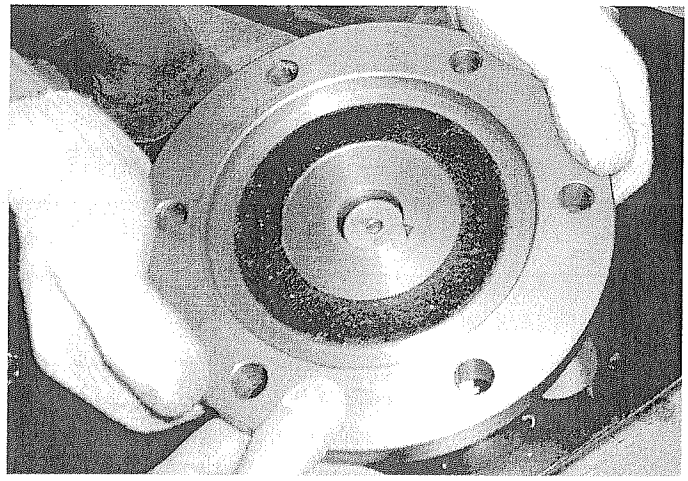
Torque setting:
108N · m (11kgf · m)



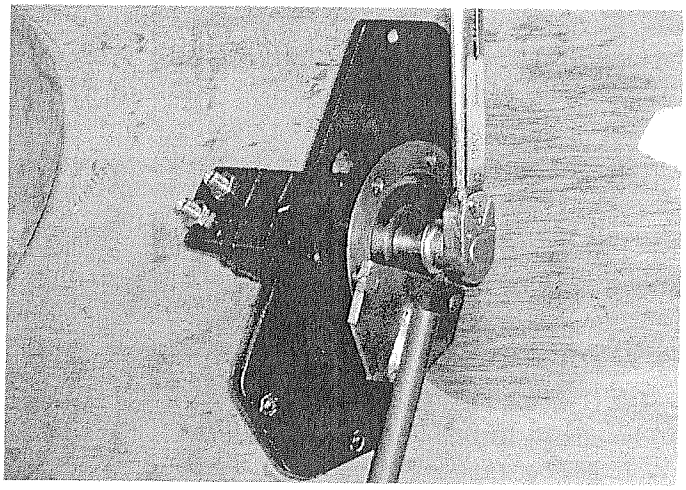
(2) Screw the drain plug into the drain port of propulsion motor and tighten.



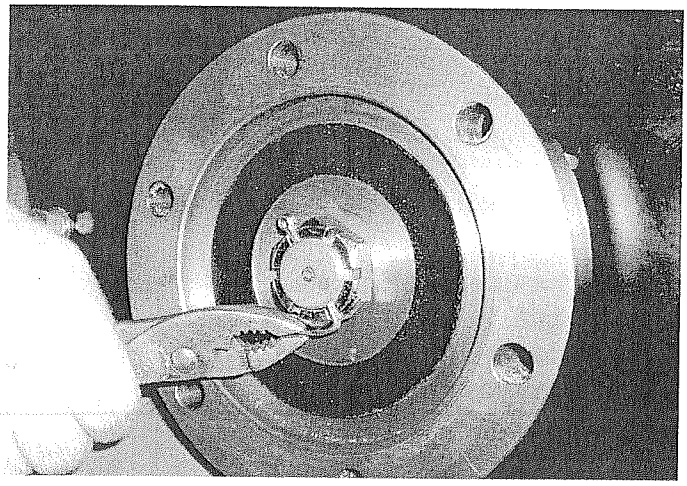
(3) Slide the flange onto the propulsion output shaft with the key way alingned with the key.



(4) Screw the castle nut onto the output shaft and tighten to specification.
Torque setting:
200N · m (20.4kgf · m)



(5) Fit and fold the cotter pin.



(6) For installation, follow the procedures in the reverse order outlined in step (5) and subsequent steps under "4-1-2. Front propulsion motor removal" and "4-1-4. Rear propulsion motor removal".

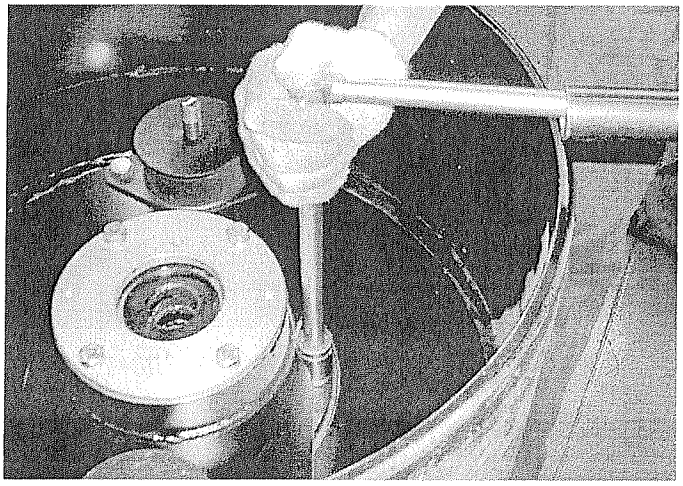
5. Removal and Installation of Vibrator Shaft

5-1. Vibrator shaft removal

5-1-1. Front drum removal

Perform removal work referring to "4-1-1. Front drum removal" in "3-1. Vibrator motor removal" and "4-1. Propulsion motor removal".

5-1-2. Vibrator shaft removal



(1) Stand the front drum with the vibrator motor up.

CAUTION:
If standing the drum with the propulpulsion motor mounted, place it on wooden blocks or safety stands.

(2) Align the recess of the disc with the fixing bolts by rotating the disc and remove eight fixing bolts.

(3) Pull up the disc off the drum.

⚠ If hard to remove, attach a hoisting equipment to both ends of the disc and raise only slightly. Place wooden blocks between the drum end plate and disc, and tap the disc with a hammer to loosen the disc.

(4) Slide the vibrator shaft off the drum.

5-2. Vibrataor shaft installation

★ Reverse the removal procedure.

6. Disassembly and Assembly of Parking Brake

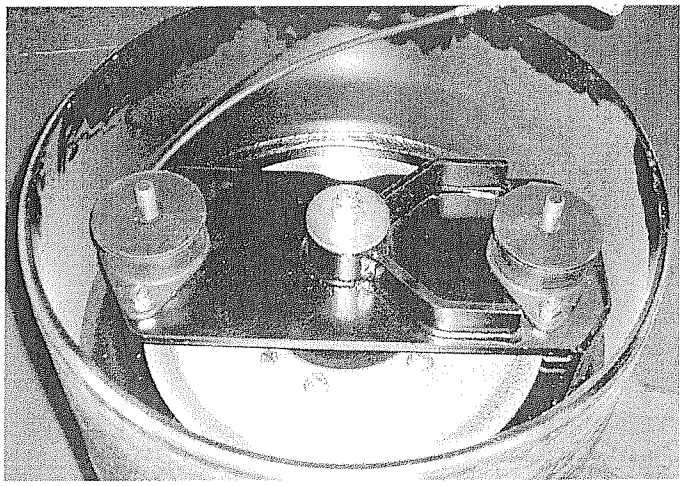
6-1. Parking brake removal

6-1-1. Rear drum removal

Remove the drum as in "4-1-3. Rear drum removal" in "4-1. Propulsion motor removal".

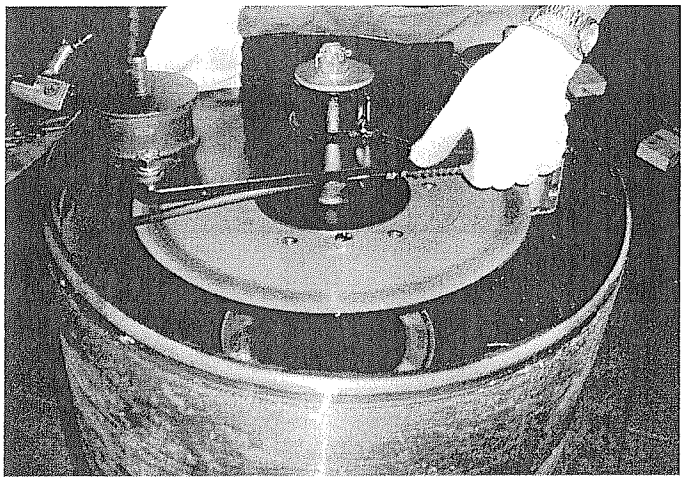
6-1-2. Disassembly of parking brake

(1) Stand the drum with the parking brake up.
(2) If standing the drum with the propulpulsion motor mounted, place it on wooden blocks or safety stands.
(3) Align the recess of the disc with the fixing bolts by rotating the disk, and remove eight fixing bolts.

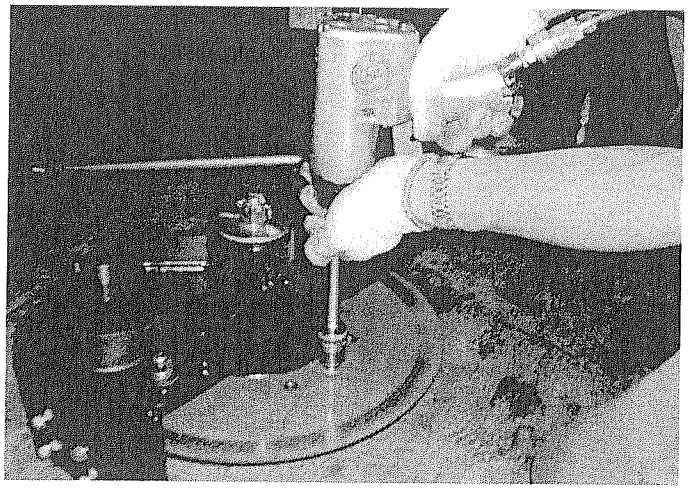


(4) Pull up the disc off the drum.

⚠ If hard to remove, raise both ends of the disc on a hoist only slightly.
Place wooden blocks between the drum end plate and disc, and tap the disc with a hammer to loosen the disc.

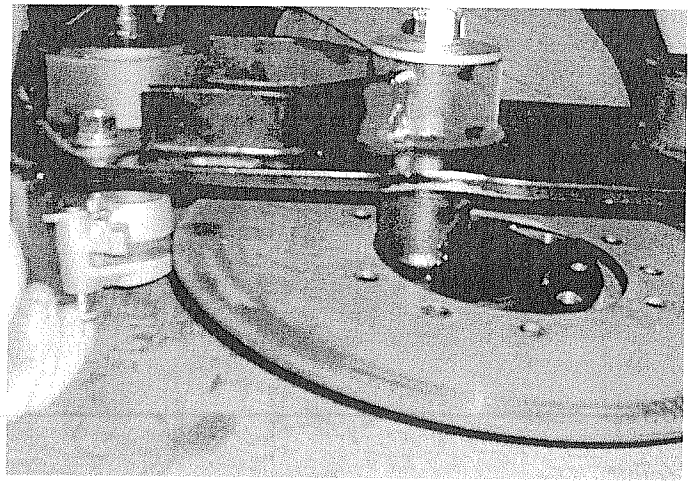


(5) Remove three parking brake disc retaining bolts.

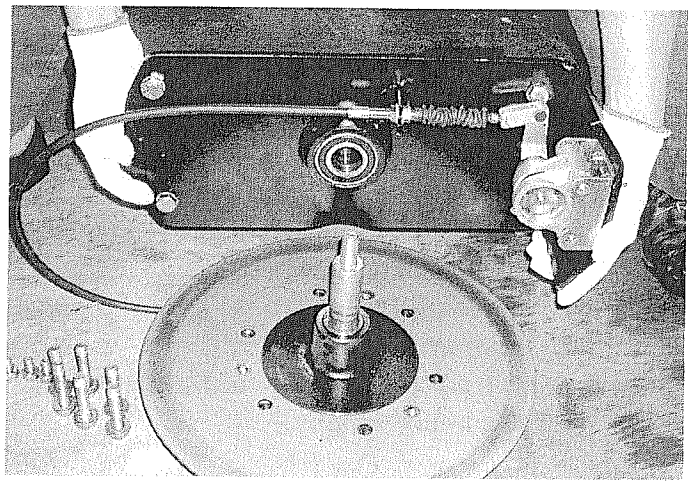


(6) Move the brake disc sidewise to separate it from the brake pad.

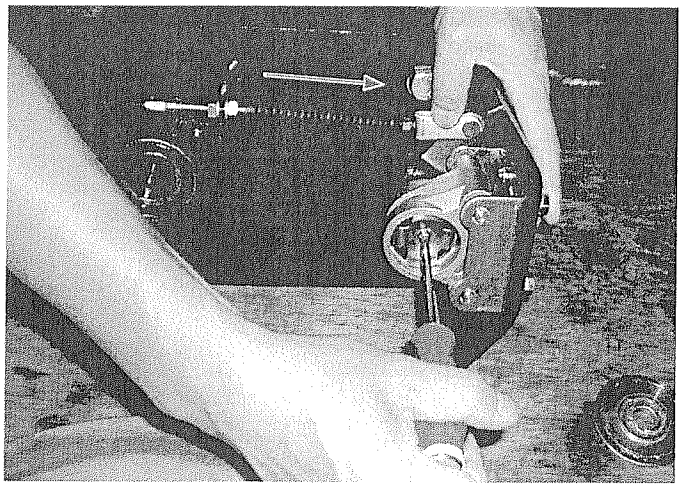
(7) Remove the cotter pin and castle nut from the hub shaft.



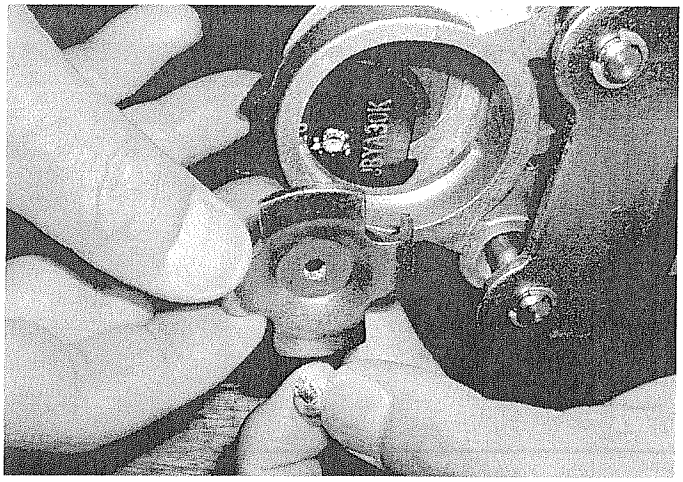
(8) Pull up the disc off the hub shaft.



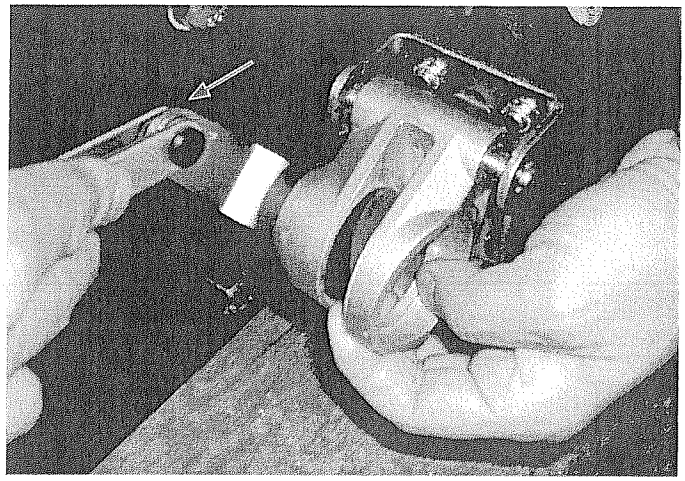
(9) Move the disc brake operating lever toward the RELEASE position. Slacken the fixed pad retaining bolt.



(10) Remove the pad retaining bolt, lock plate and pad.



(11) Move the disc brake operating lever toward ENGAGE position and remove the working pad.



6-2. Assembly of parking brake

For assembling, reverse the disassembling procedure.

⚠ When tightening the fixed pad retaining bolts, apply a coat of sealing compound, LOCKTIGHT.

No. 98081-0

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