UNIC Hydraulic Crane

UNIC Hydraulic Cranes

URA343-C

MAINTENANCE MANUAL

FURUKAWA UNIC Corporation

INTRODUCTION

This technical instruction manual describes the construction of the UNIC UR 343-C crane and maintenance procedures for the servicemen engaged in its maintenance.

Please carefully read the manual to acquire the proper maintenance skills and provide efficient, speedy, correct services that are essential to customer trust. In this way, the truck crane will be able to deliver their superb performance and be kept in satisfactory operating condition.

It is recommended that separate parts list be referred to together with this manual.

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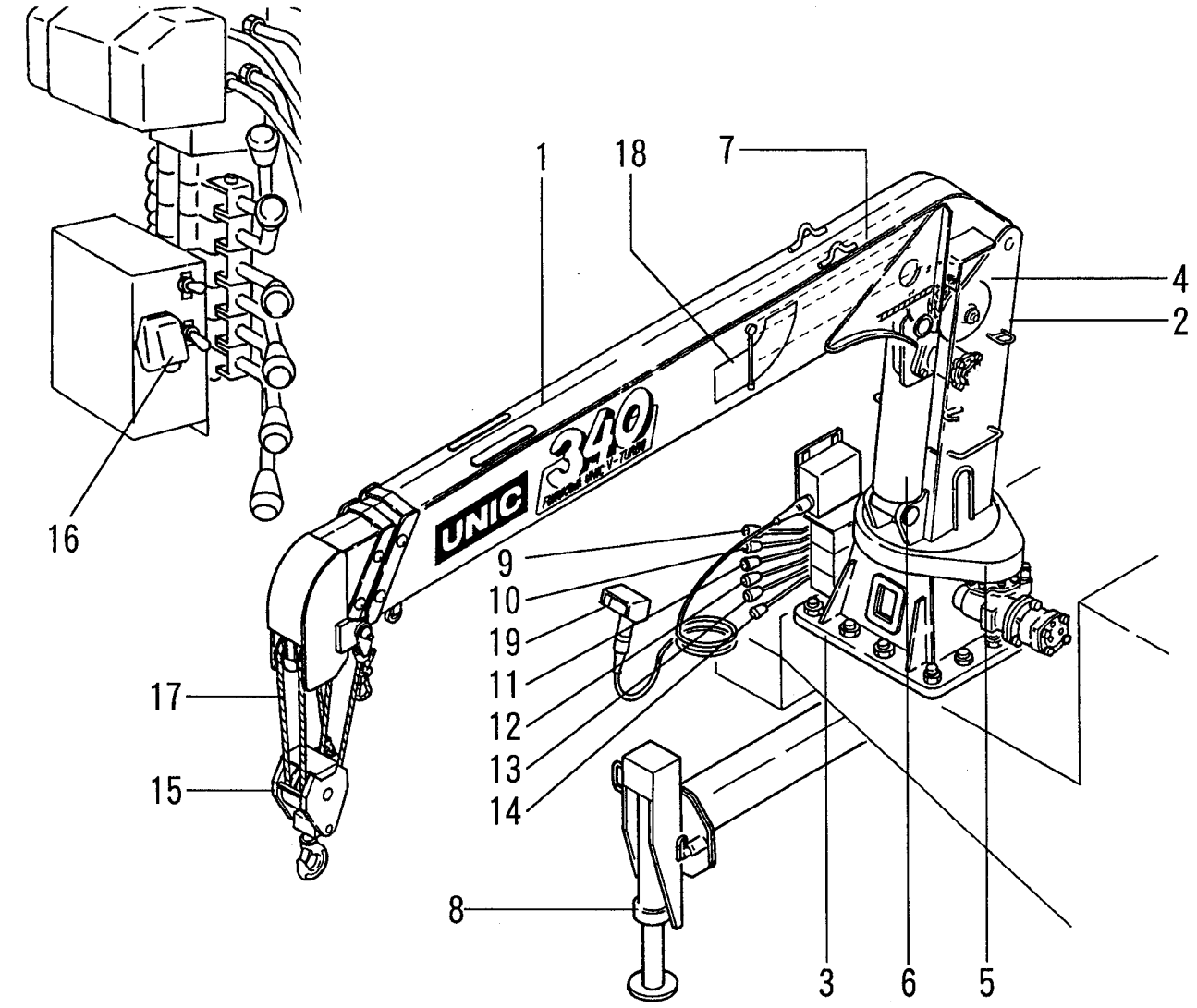
§1. GENERAL VIEW



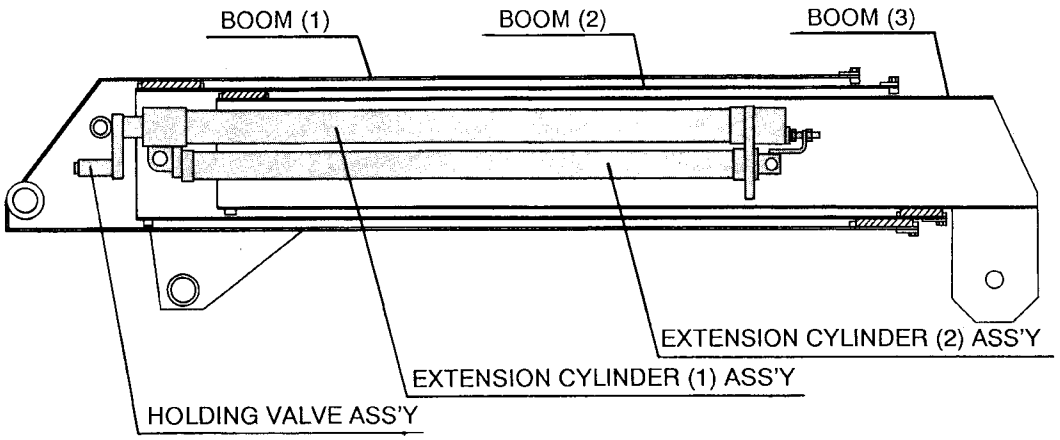
No.	Description
1	3-section BOOM ASS'Y
2	COLUMN ASS'Y
3	BASE ASS'Y
4	HOIST WINCH ASS'Y
5	SWING DEVICE ASS'Y
6	BOOM LIFT CYLINDER ASS'Y
7	EXTENSION CYLINDER ASS'Y
8	OUTRIGGER ASS'Y
9	BOOM LIFT CONTROL LEVER
10	HOIST WINCH CONTROL LEVER

No.	Description
11	BOOM EXTENSION CONTROL LEVER
12	SWING CONTROL LEVER
13	OUTRIGGER CONTROL LEVER (Street side)
14	OUTRIGGER CONTROL LEVER (Curb side)
15	HOOK BLOCK ASS'Y
16	WARNING HORN
17	WIRE ROPE
18	BOOM ANGLE INDICATOR
19	REMOTE CONTROLER ASS'Y

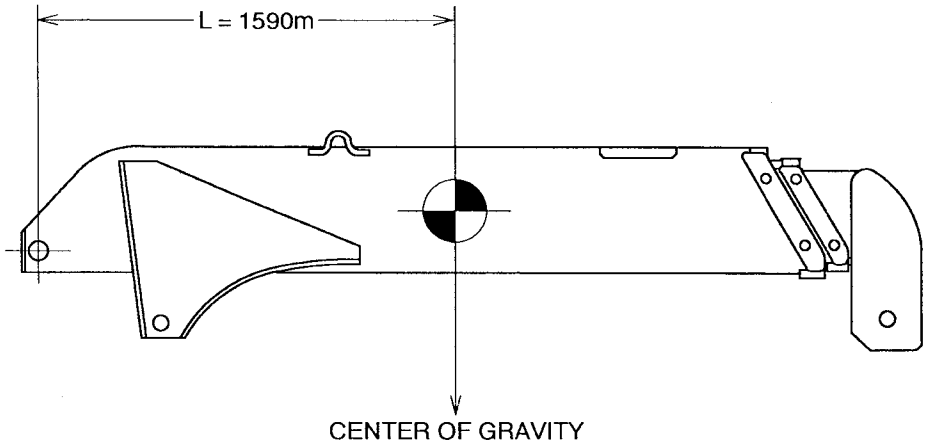
§2. 3-section BOOM ASS'Y

1) Construction of Boom and Extension Cylinder Installation

(1) 3-section Boom (Dual Cylinder)

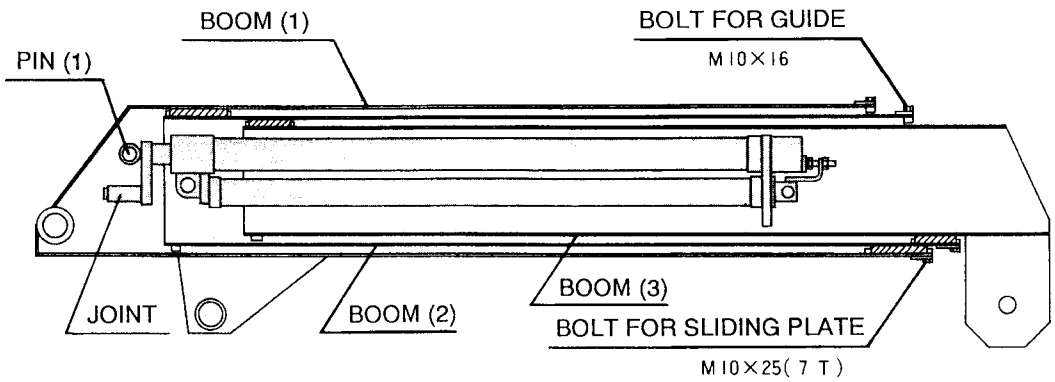


※ Center of gravity of the boom ass'y (including the extension cylinder)



2) Boom Disassembly Procedure (3-section Boom)

(1) Pull out the booms (2) and (3) from the boom (1).

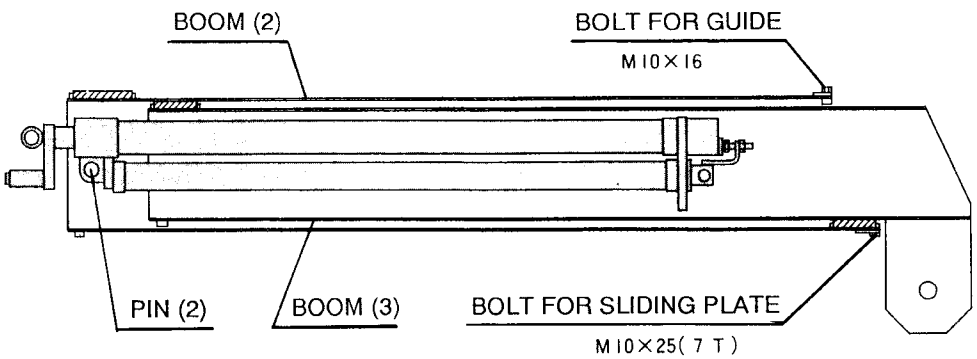


① Remove the joint (for piping) of the extension cylinder.

② Remove the slide plates, plates, and guide.

③ Remove the pin (1) from the boom (1), and pull the booms (2) and (3) out of the boom (1).

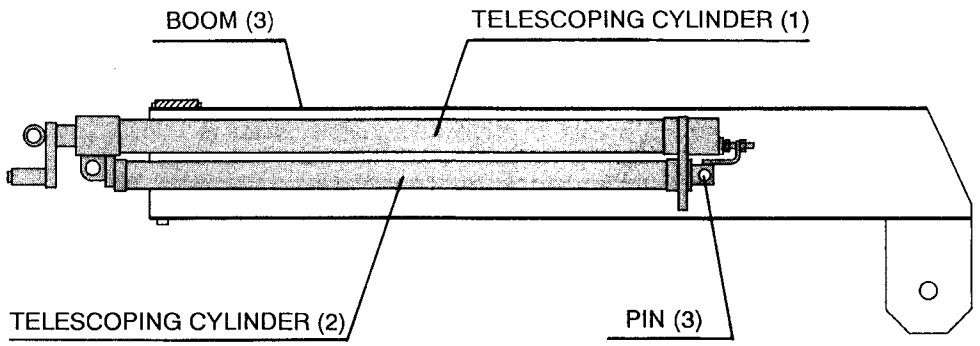
(2) Pull out the boom (3) from the boom (2).



① Remove the slide plates and guide.

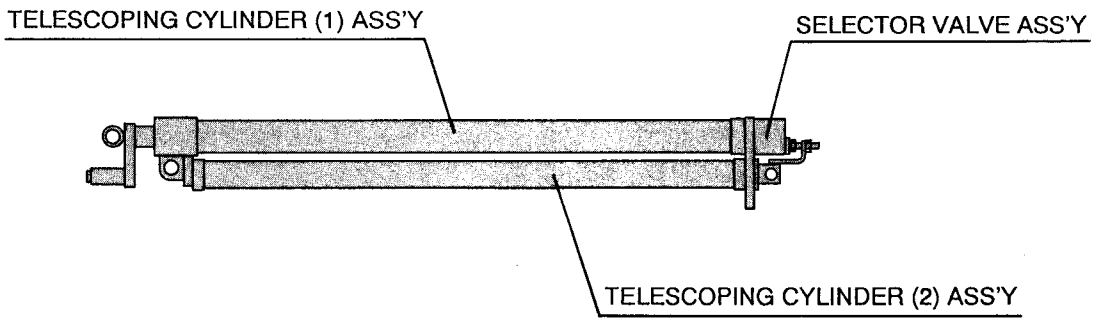
② Remove the pin (2) from the boom (2), and pull out the boom (3).

(3) Pull out of extension cylinders (1) Ass'y and (2) Ass'y from the boom (3).



① Pull out the extension cylinder (2) ass'y and the pin (3) from the boom (3).

② From the boom (3) pull out the extension cylinder (1) ass'y and the extension cylinder (2) ass'y in the direction towards the rear.



※ Reassembling shall be made in reverse order of the disassembly procedures.

Notes :

① When assembling the pin, apply grease to the inside of its base for rust proof purpose.

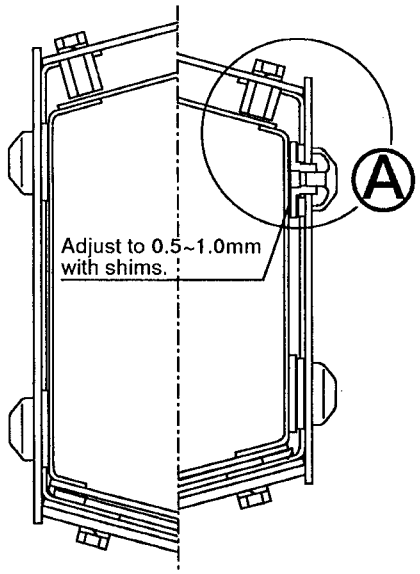
② Apply grease (Chassis Grease No.1) to the inner surface of the bush.

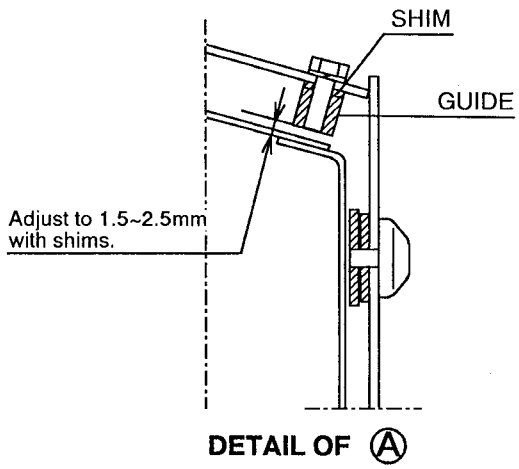
③ Apply "THREE BOND #1102" to the slide plate for the purpose to prevent it from falling. To the slide plate surface apply the disulfide molybdic grease.

④ To the slide sheave pin do not apply grease.

3) Installation Procedures for Slide Plate and Guide

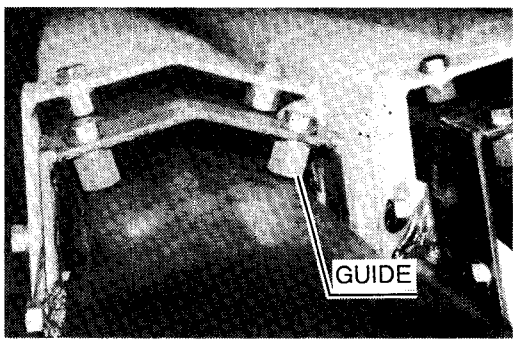
(1) Installation of slide plate and guide



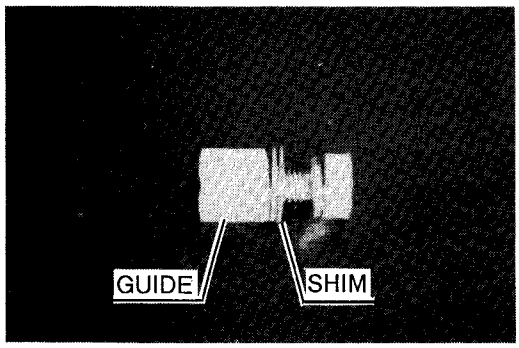


Note:

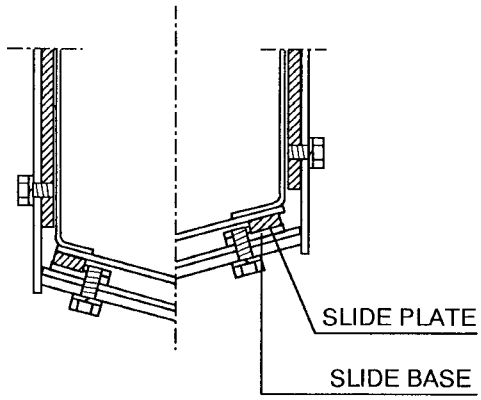
1. When taking out shim of the guide, put a plain washer under the conical spring washer.

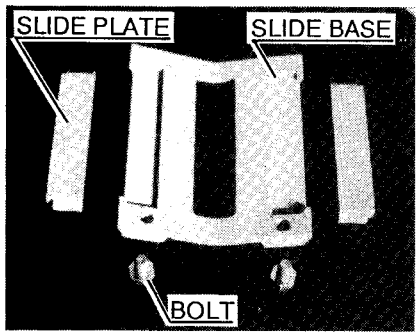


Fit guide to this place

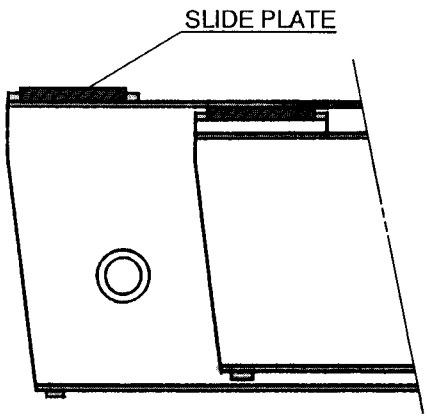


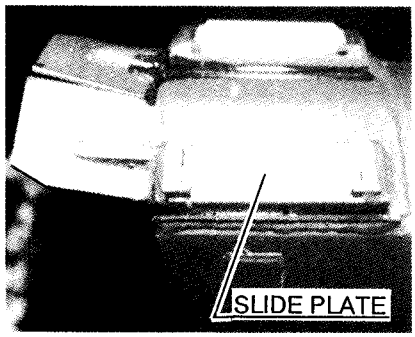
(2) Installing the lower slide plate





(3) Installing the slide plate at the rear end of the boom (upper part)





Note:

Apply "THREE BOND #1120" to the slide plate for preventing it from falling off.

※ Slide plate use limit

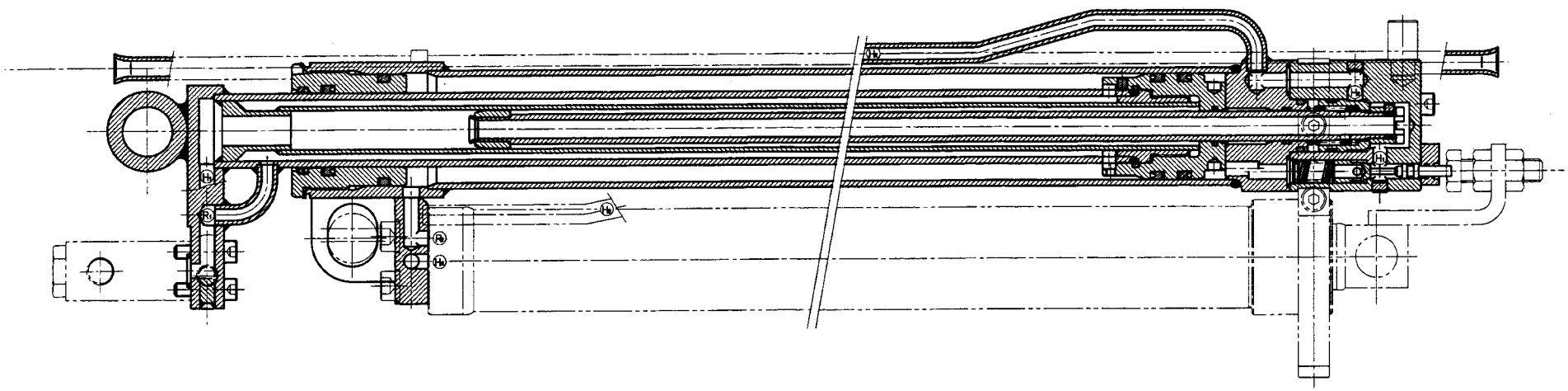
If and when the slide plate were out for 2 mm, be sure replace it with a new one.

Slide plate	**Before use**	**Use limit**
(thickness in mm)	$t= 7.0^{+0.5}_{0}$	t= 5.0

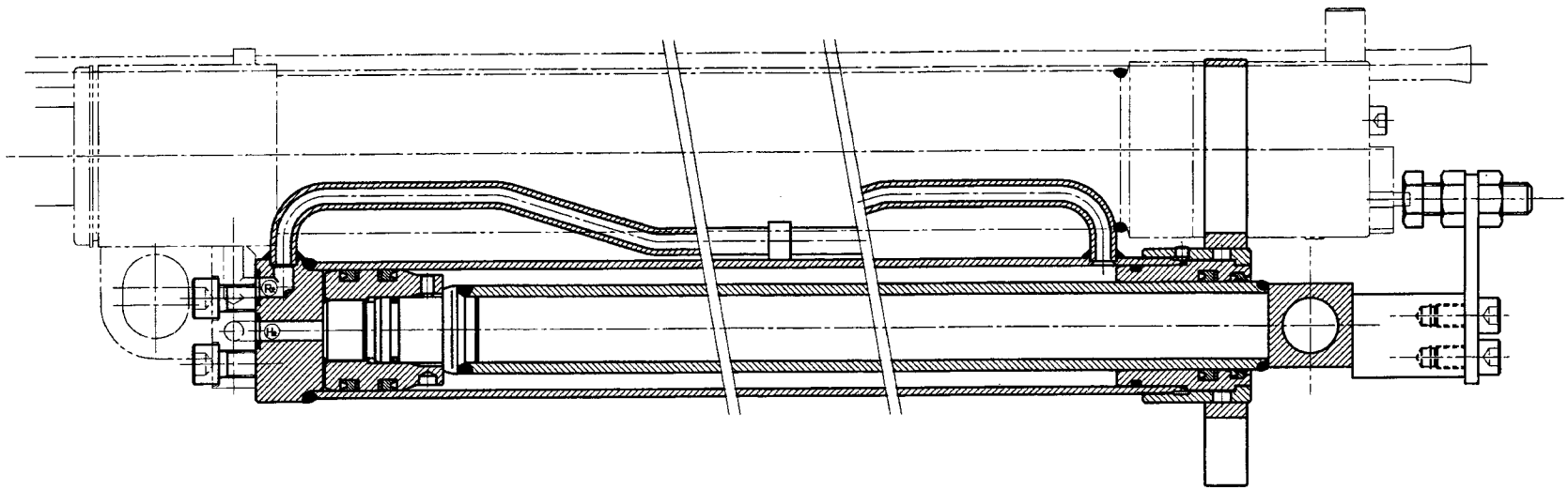
§3. EXTENSION CYLINDER ASS'Y

1) Constructions

(1) Construction of extension cylinder (1) ass'y

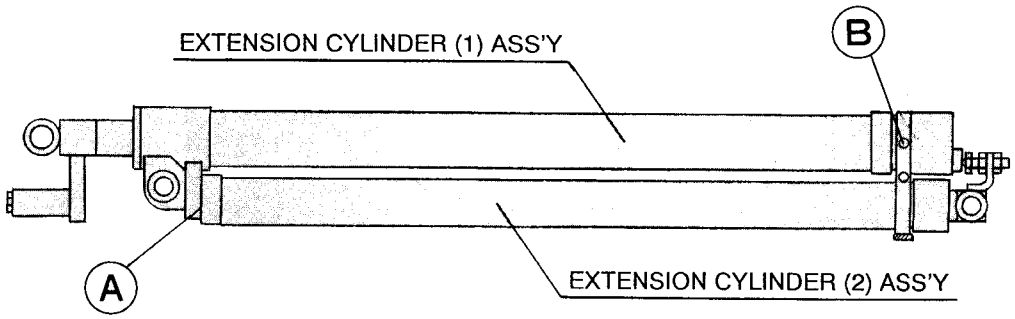


(2) Construction of extension cylinder (2) ass'y

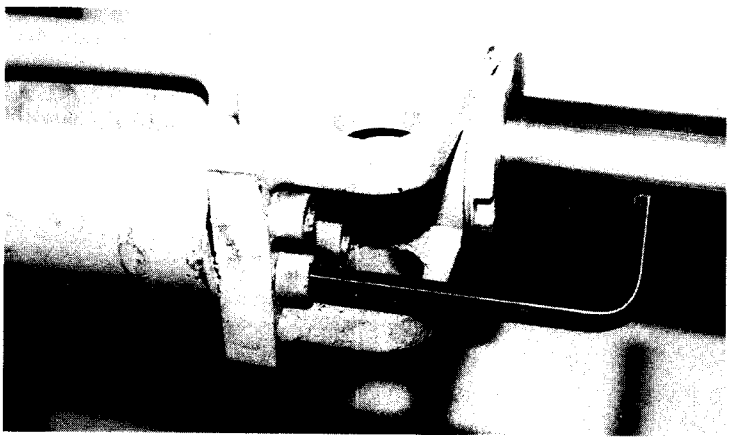


2) 3-section Boom (Disassembly Procedures for Dual Extension Cylinders)

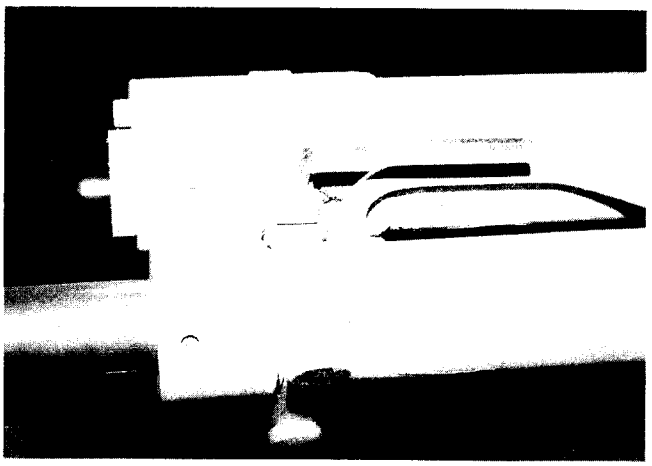
(1) Remove the bolt which connects the extension cylinder (1) ass'y with the extension cylinder (2) ass'y and separate the one from the other.



① Remove 3 pcs. of hexagon socket head bolt from the part Ⓐ.

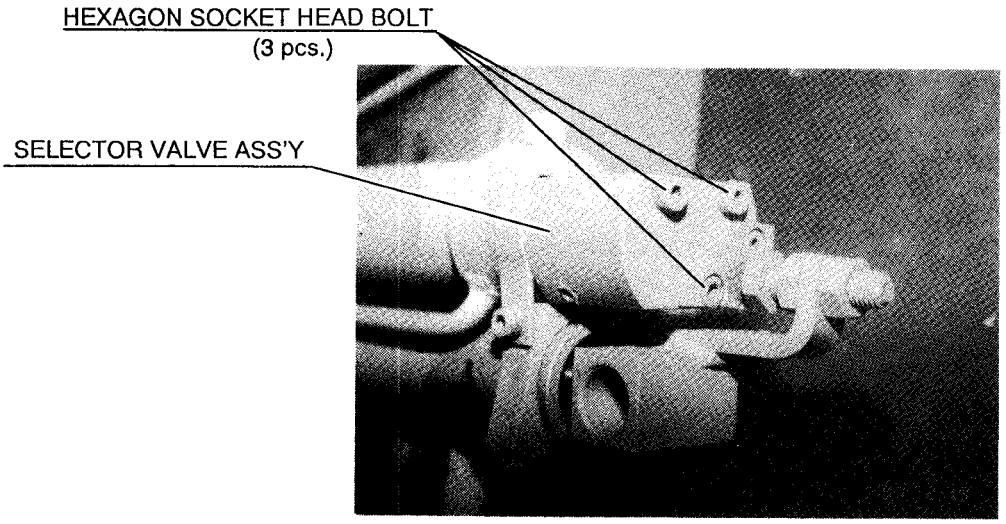


② Next, remove 4 pcs. of hexagon socket head bolt from part Ⓑ.

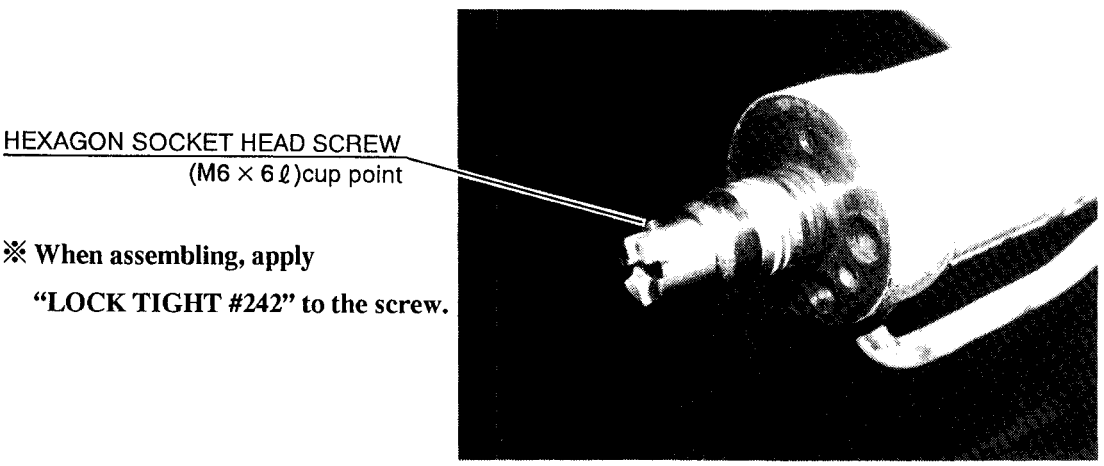


(2) Disassembly procedures for extension cylinder (1) ass'y

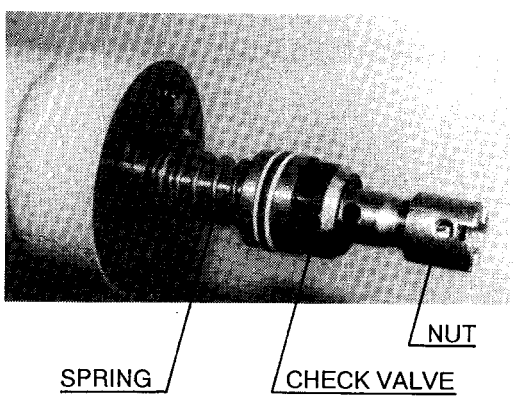
① Remove 3 pcs. of hexagon socket head bolt which fasten the selector valve ass'y.

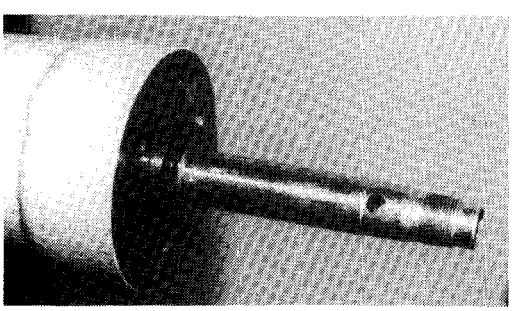


② Remove a lock screw for nut of the slide pipe.

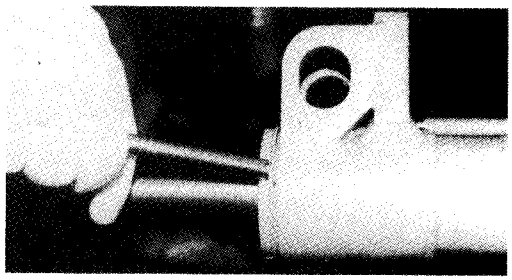


③ From the slide pipe remove the nut, check valve, and spring.

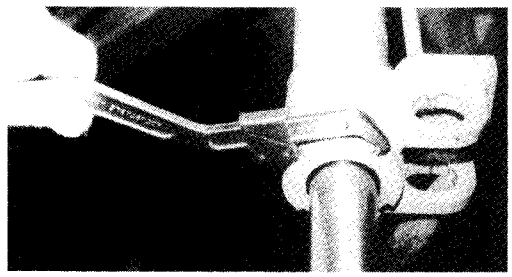




④ Compensate the revolution stopper of the gland, remove the grand from the tube ass'y with a hook-spanner, and pull out the rod ass'y from the tube (1) ass'y.

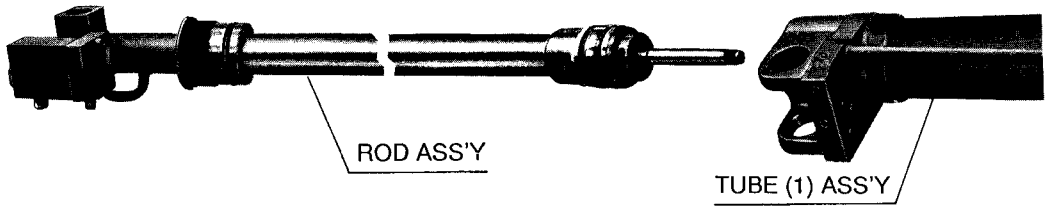


Compensate revolution stopper.

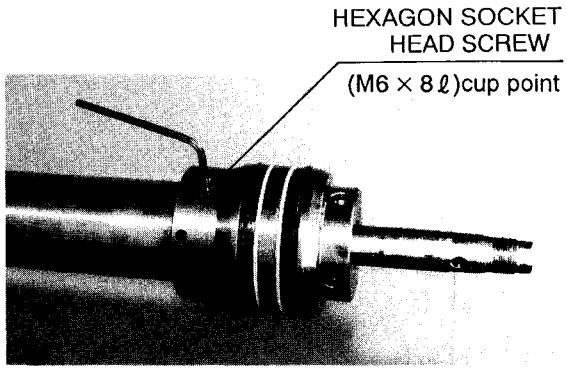


Loosen the gland.

Pull out the rod ass'y from the tube (1) ass'y.

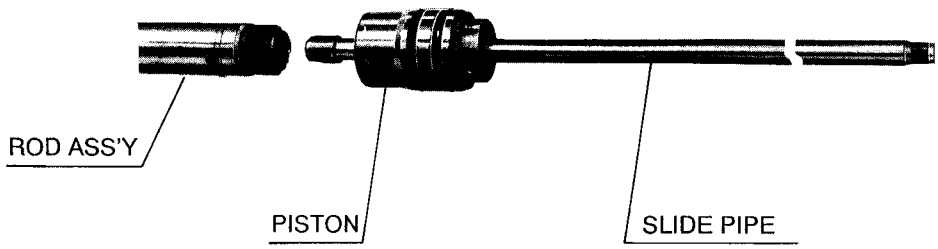


⑤ Loosen the screw which stops revolution of the piston, and take out the piston from the rod ass'y.

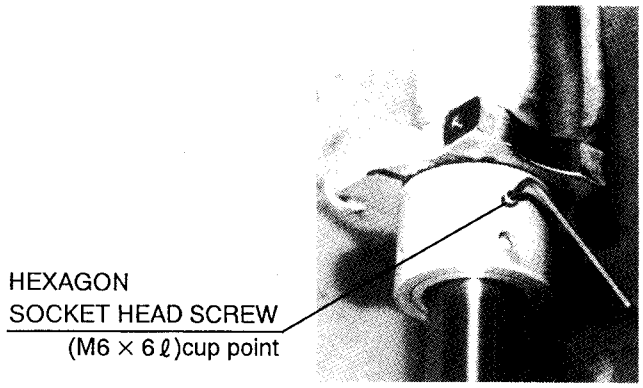


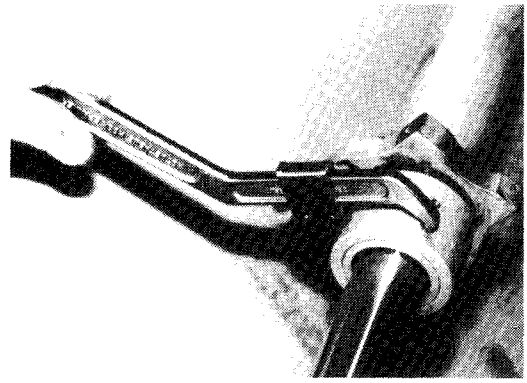
※ When assembling, apply "LOCKTIGHT #242" to the screw.

⑥ From the rod ass'y pull out the piston and the slide pipe at the same time.



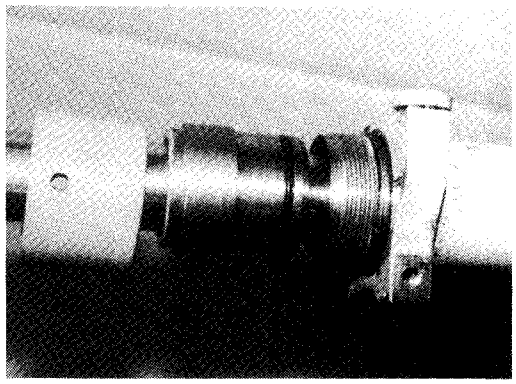
(3) Disassembly procedures for extension cylinder (2) ass'y



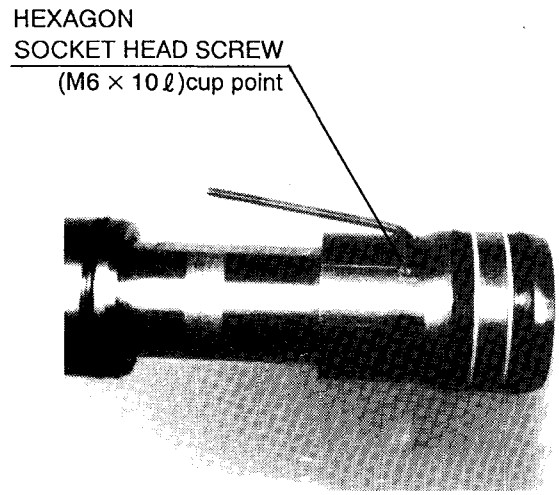


① Remove hexagon socket head lock screw for the cylinder cover.

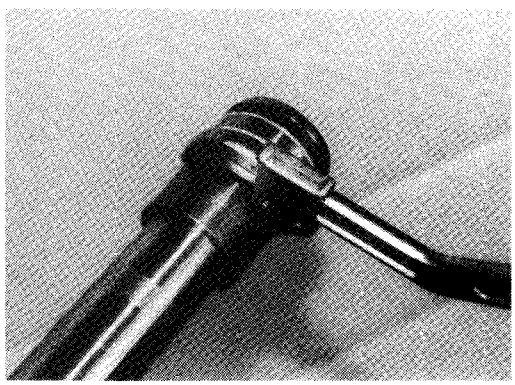
※ When assembling, apply "LOCK TIGHT # 242".



② Loosen the cylinder cover with a hook-spanner.



③ Pull out the rod ass'y from the tube (2) ass'y



④ Remove the lock screw of the piston.

※ When assembling, apply "LOCK TIGHT # 242".

⑤ Loosen the piston with the hook-spanner.

(4) Inspection

① Check all the parts that they are free of harmful defects for operation such as flaw, crack, deformation, rust, flash, etc.

② Check that every part is free of attachments of metal powder, foreign substances, etc.

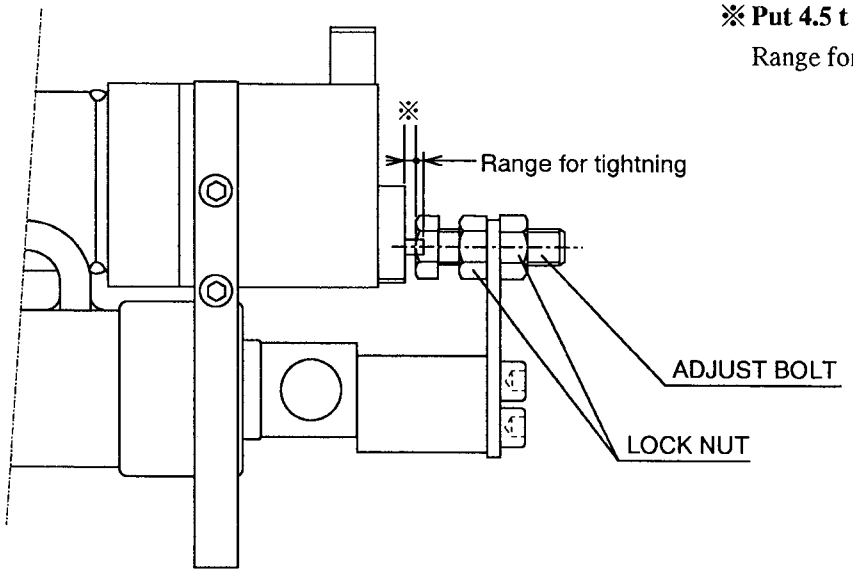
③ Check to see if the piston rod sliding surface is free of damages harmful for operation.

④ In principle, packings and seals shall be replaced with new ones when disassembled. However, if these parts are forced to be reused, check very carefully and confirm that they are free of damage and foreign substances.

※ Assembly procedure is in the reverse order of disassembly.

● Check that every part is free of metal powder attachment and then soak the parts in hydraulic oil.

(5) Adjusting procedure for selector valve with adjust bolt



※ Put 4.5 t board to this place.
Range for tightening for 3 mm

Adjusting Procedure with Adjust Bolt

① Put the extension cylinders (1) ass'y and (2) ass'y in the most retracted state.

② Apply "LOCK TIGHT # 262" to the threaded part of the adjust bolt.

③ Put at above board to the part marked ※ and tighten the adjust bolt.

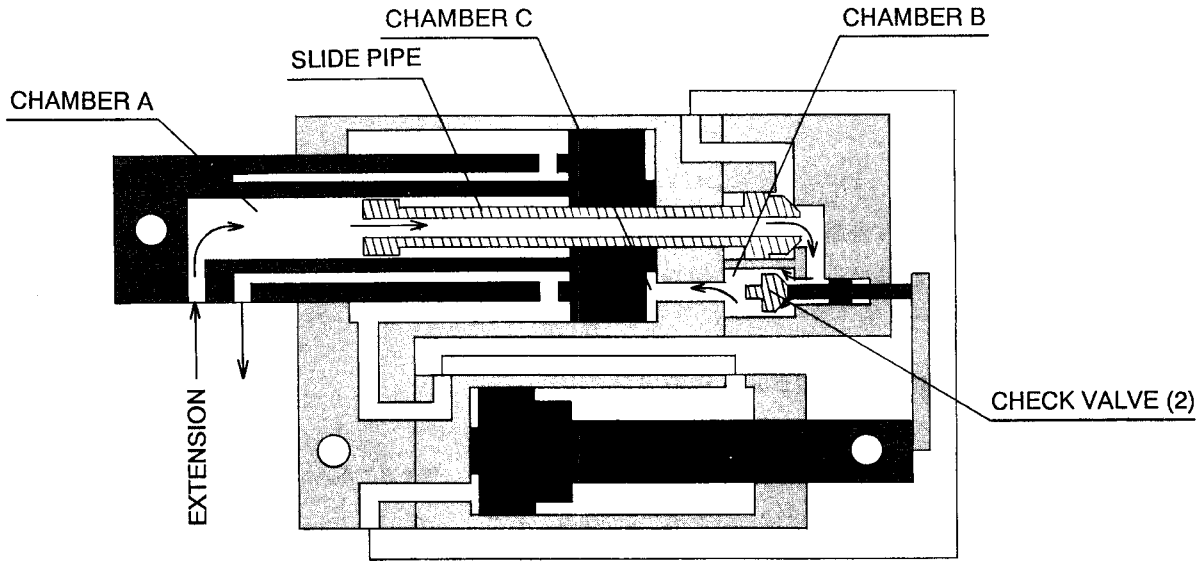
④ After adjusting, lock with the lock nut.

3) 3-section Boom Ass'y (Explanation of Dual Cylinder Operation)

(1) Just before extending extension cylinder

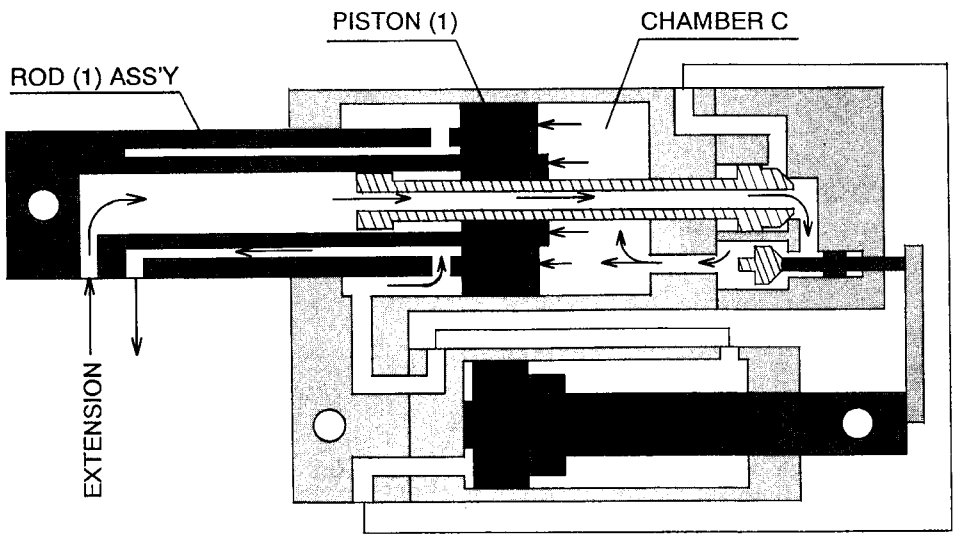
Pressure oil enters into the chamber A, and passes through the slide pipe.

Then it goes through the check valve (2) of the selector valve and the chamber B too. Finally it reaches the chamber C.



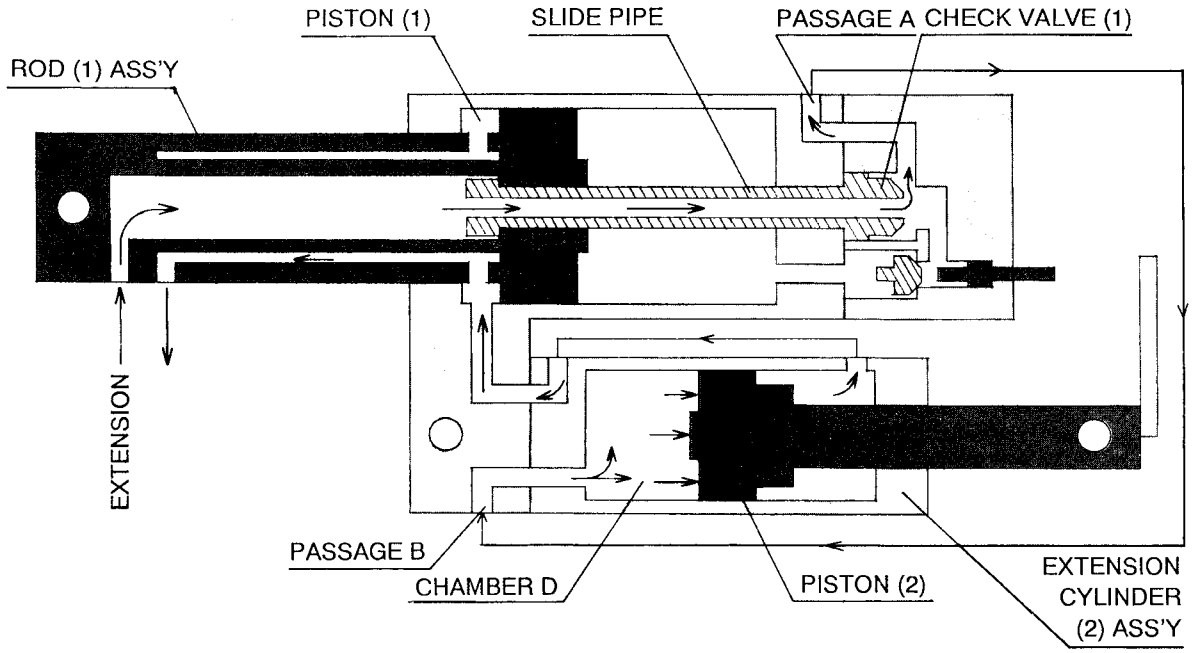
(2) Extending extension cylinder (1) ass'y

Pressure oil entered chamber C pushes up the piston (1) ; and the rod (1) ass'y extends.



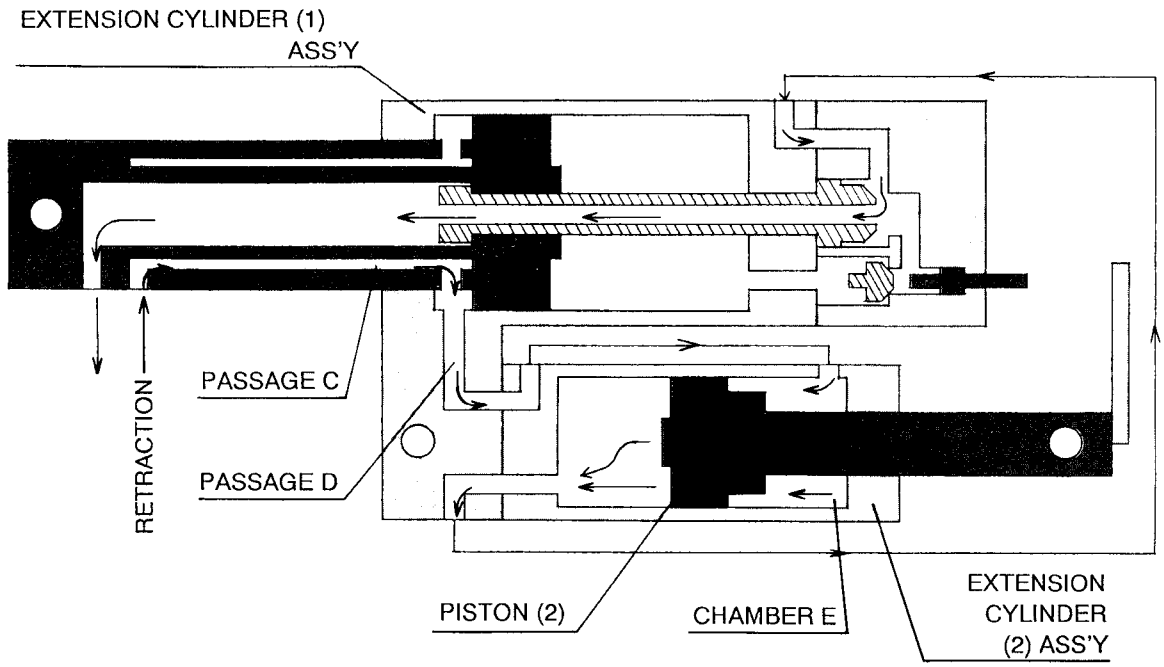
(3) Extending extension cylinder (2) ass'y

Just before the rod (1) ass'y of the extension cylinder (1) ass'y reaches its maximum extension, the stopper of the slide pipe hits the piston (1), and both of them are pushed up. Just at the same time, the check valve (1) of the selector valve opens. The pressure oil passage A and B, and reaches the chamber D of the extension cylinder (2) ass'y, where it pushes up the piston (2) ; and as a result, the extension cylinder (2) ass'y extends.



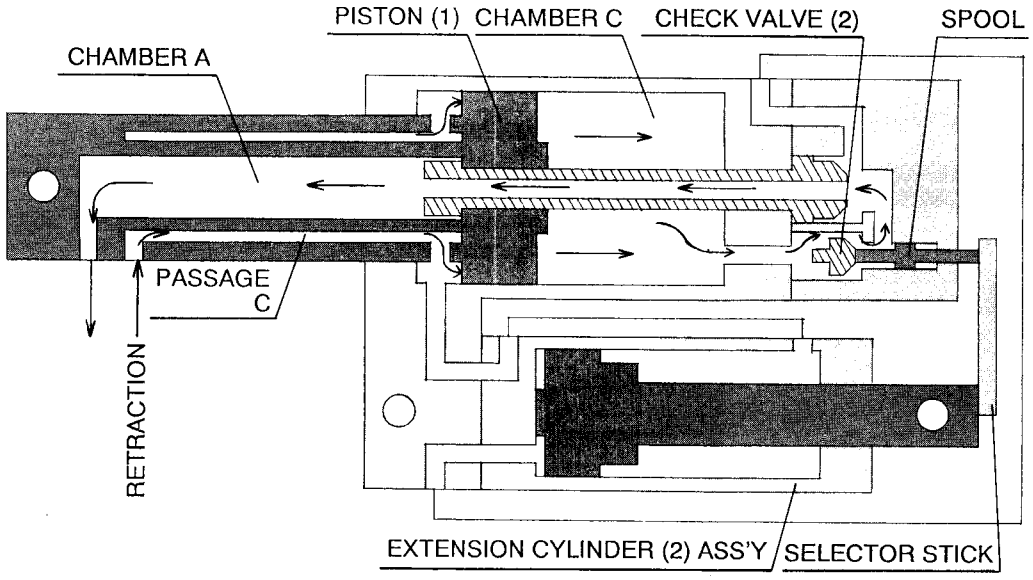
(4) Retracting extension cylinder (2) ass'y

Through the passage C of the extension cylinder (1) ass'y the pressure oil flows in, and it enters into the chamber E via the passage D and pushes down the piston (2). As a result, the extension cylinder (2) ass'y starts retracting.



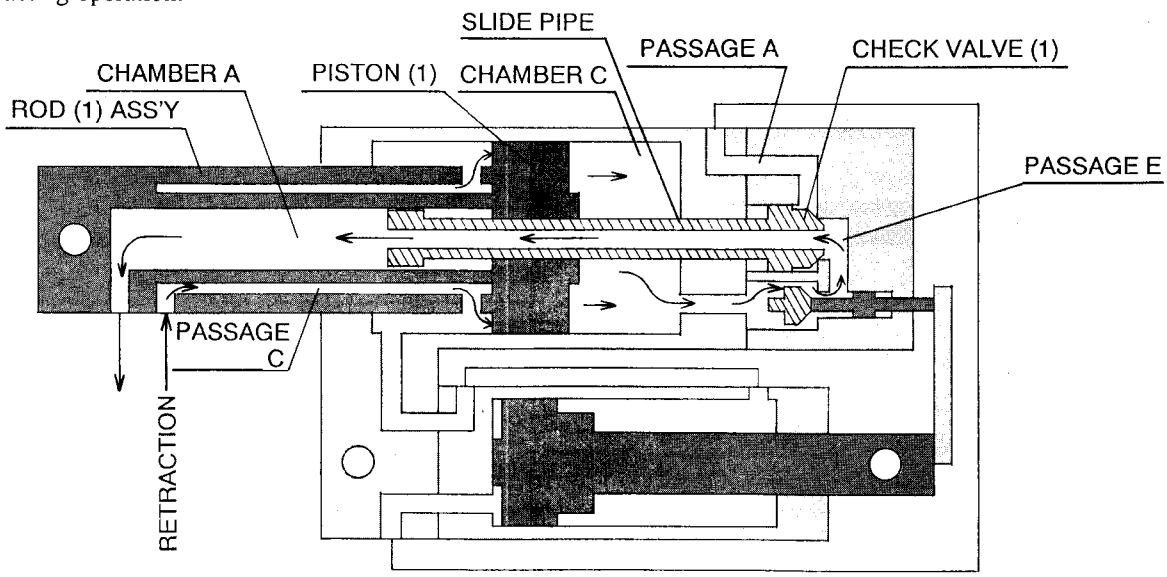
(5) Extension cylinder (1) ass'y starts retracting

By means of the flow of pressure oil from the passage C the extension cylinder (2) ass'y retracts rapidly. Just before reaching the minimum retraction, the spool is pushed by the selector stick locating at the tip of the rod (2) ass'y, and the check valve (2) opens, when the piston (1) starts to be pushed down. The pressure oil in the chamber D flows through the check valve (2) and the slide pipe, and reaches the chamber A. Then, it returns to the tank via the holding valve.

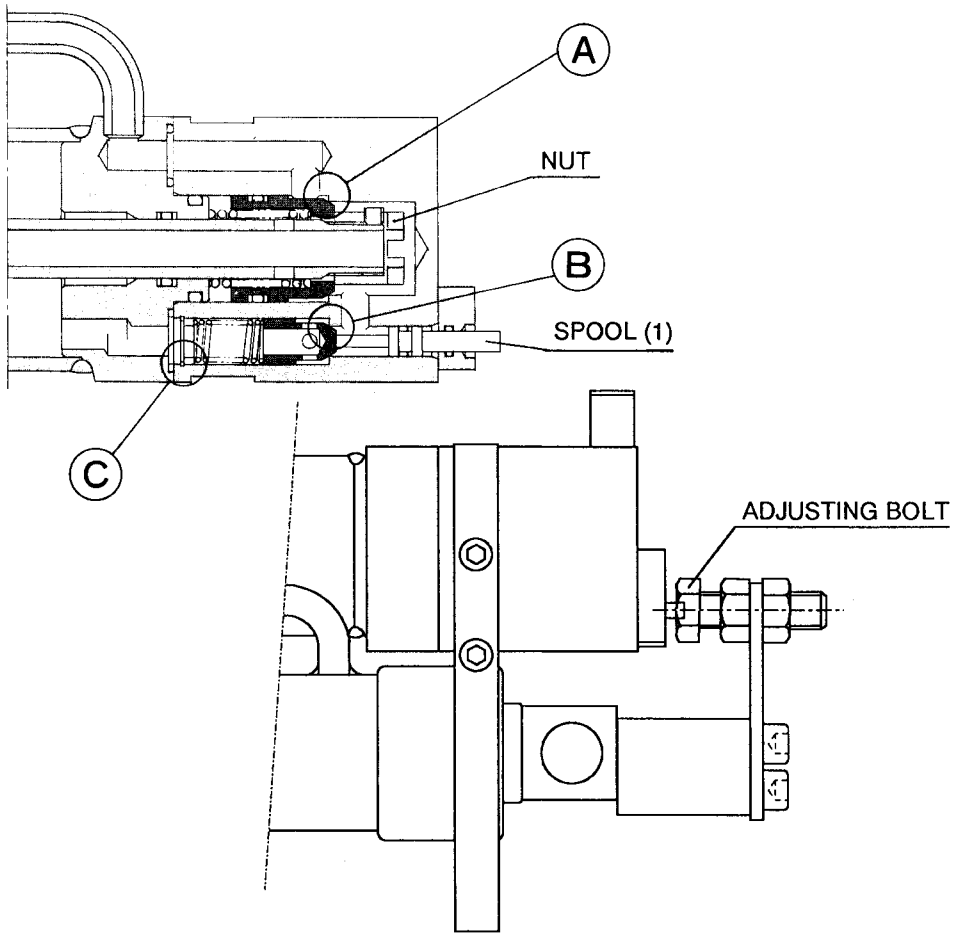


(6) Retraction of extension cylinder (1) ass'y

By means of the flow of pressure oil from the passage C the piston (1) is pushed down, and the rod (1) ass'y retracts. When the rod (1) ass'y retracts, the slide pipe returns to its original position from the position to which it was pushed up by the piston (1) ; and the passage A and E are shut by the check valve (1). When the rod (1) ass'y retracts, all of the pressure oil in the chamber C passes through the passage E and the slide pipe, and returns to the tank via the chamber A. In this way, the extension cylinder (1) ass'y finishes its retracting operation.



4) Cause of Troubles and Remedy

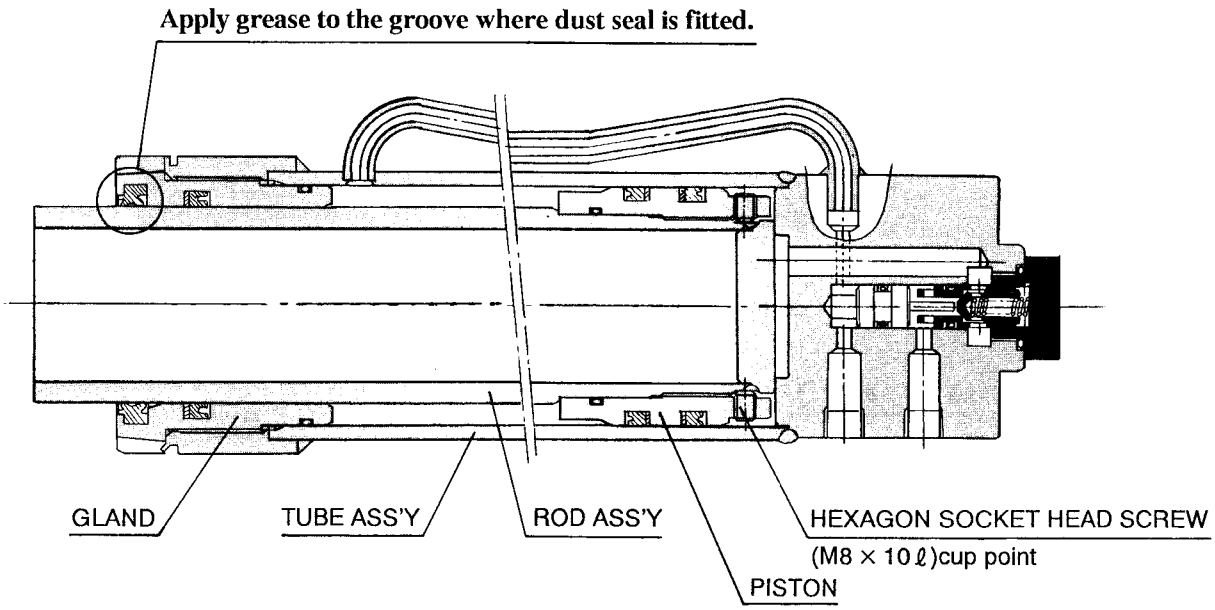


① 3-section boom ass'y (Dual cylinders)

Abnormal phenomenon	Presumed cause	Remedy
1. Retraction is normal, but when extending, 2 and 3 booms extend at a time or not in a good order.	a) The part A of the selector valve is clogged with foreign substances.	• Disassemble selector valve and clean it, or replace it with a new one.
2. Extension is normal, but when retracting, 2 and 3 booms retract at a time or not in a good order.	a) The part B of the selector valve is clogged with foreign substances. b) Snap ring of the part C god out of place.	• Disassemble selector valve and clean it, or replace it with a new one. • Rearrenge snap ring.
3. Boom (2) extends but boom (3) does not extend.	a) Nut at the slide pipe of extension cylinder (1) ass'y loosened.	• Disassemble extension cylinder (1) ass'y and tighten the nut.
4. After full extension of booms, boom (3) retracts but boom (2) does not retract.	a) Adjust bolt pushing the spool of selector valve loosened. b) Selector valve spool (1) was bended.	• Adjust the bolt. • Straighten bended stick. • Replace selector valve ass'y with a new one

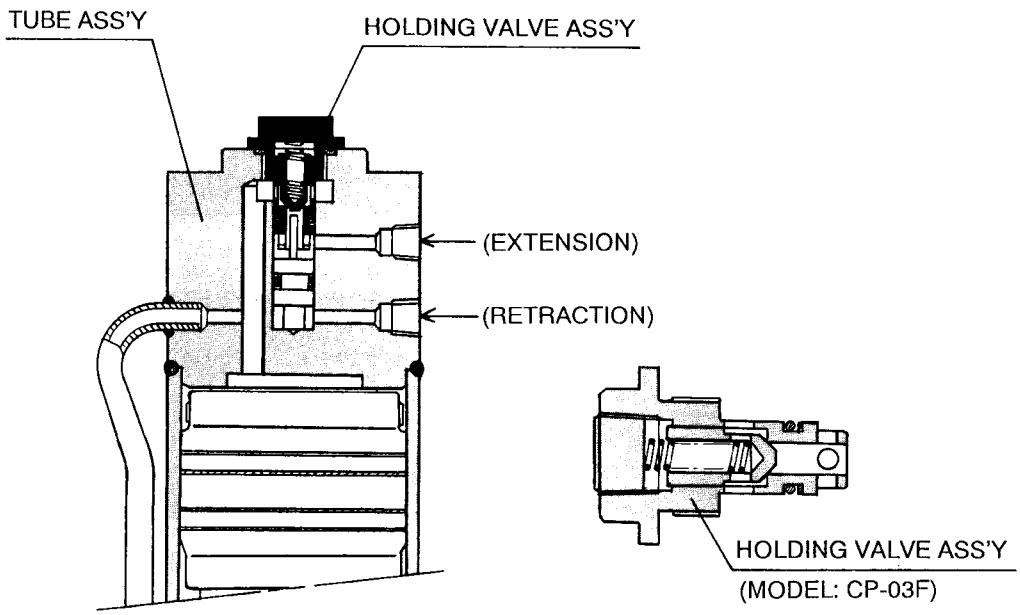
§4. OUTRIGGER CYLINDER ASS'Y

1) Construction of Vertical Outrigger Cylinder



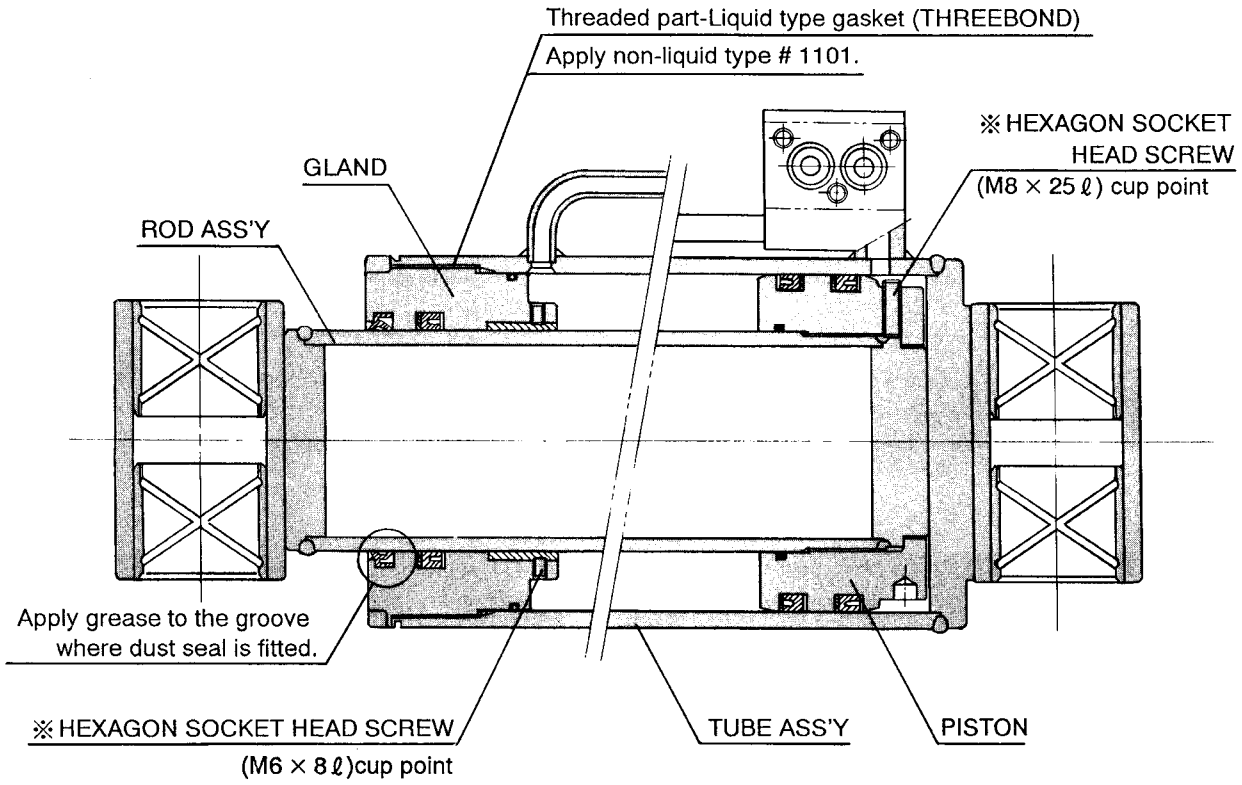
Note : Before fastening hexagon socket head screw for piston, apply "LOCKTIGHT # 242". (After applying, do not flow hydraulic oil for about 1 hour.)

2) Construction of the Part where Holding Valve Ass'y is Fitted



§5. BOOM LIFT CYLINDER ASS'Y

1) Construction



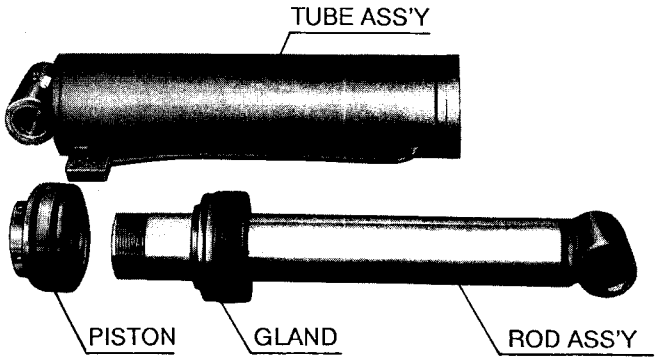
Note : Before tightening hexagon socket head screws to the piston and gland, apply "LOCK TIGHT # 242". (After applying, do not flow hydraulic oil.)

2) Disassembling Procedure

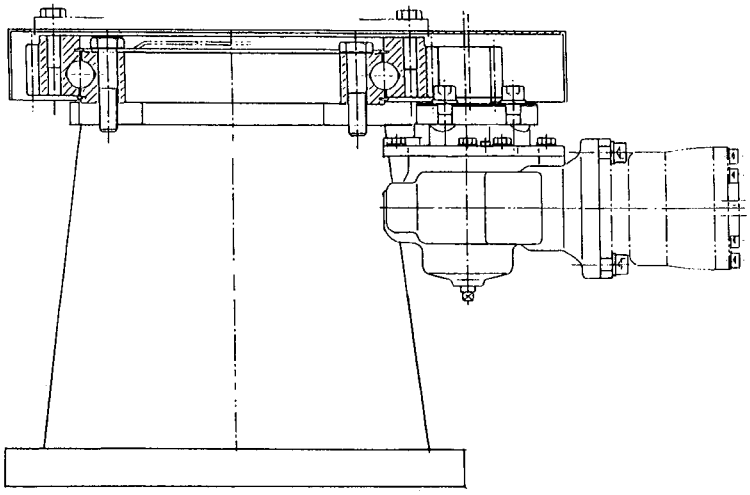
① Remove the holding valve ass'y.

② Compensate rotation stopper of the gland and then loosen and remove it from the cylinder tube ass'y. Pull out the piston rod.

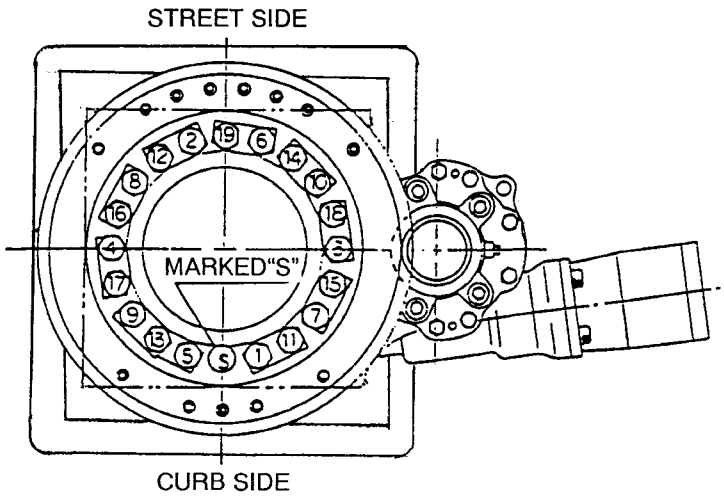
③ Remove hexagon socket head screw which stops rotation of the piston. Pull out the piston from the rod ass'y.



§6. SWING DEVICE ASS'Y



1) Position of Soft Zone "S" on the Turntable

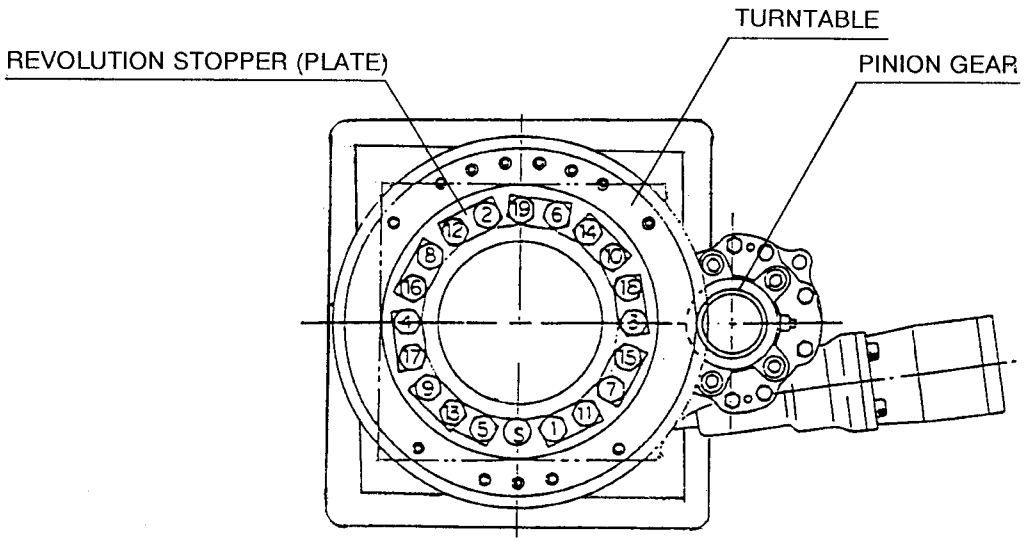


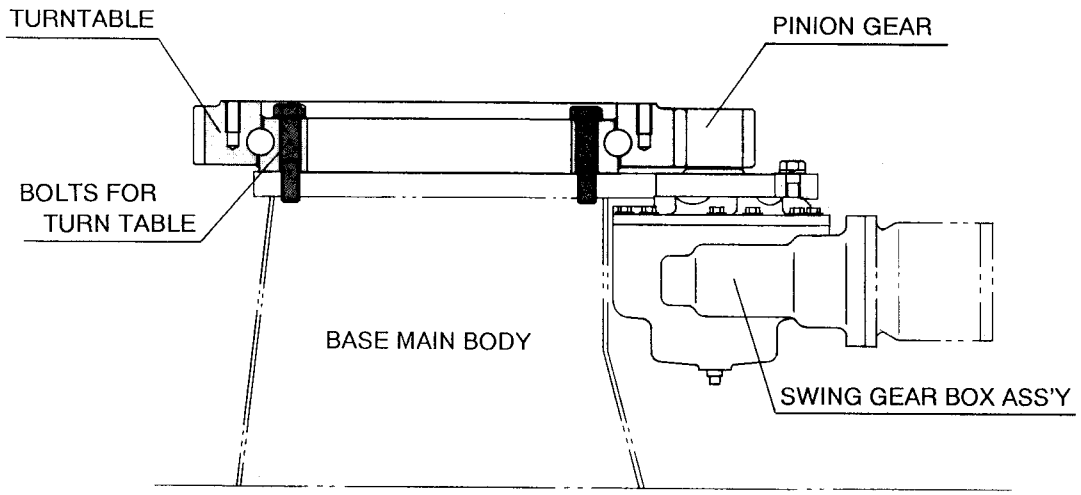
● **When mounting the turntable, the inner soft zone marked "S" on the turntable must be positioned on the curb side.**

2) Tightening Order of Turntable Bolts

● Tighten the bolts in the numerical order as shown in the above illustration.

3) Turntable Mounting Procedure

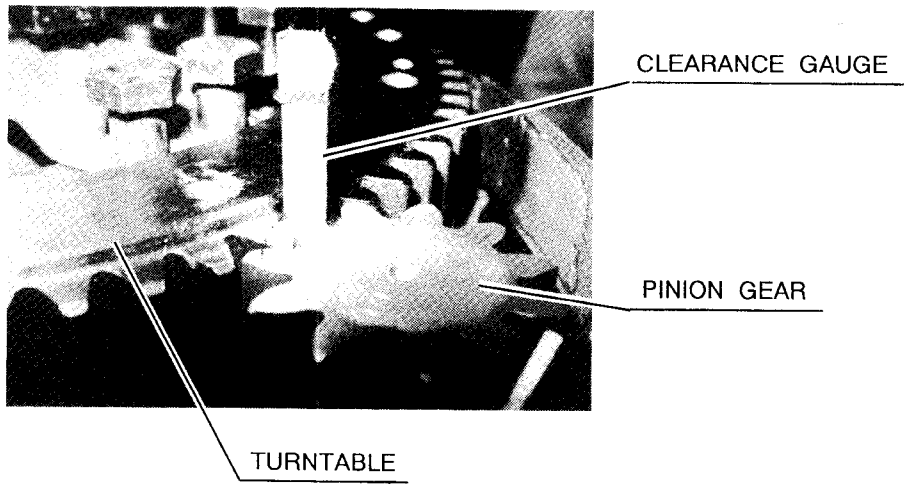




① Install the swing gear box ass'y to the base main body.

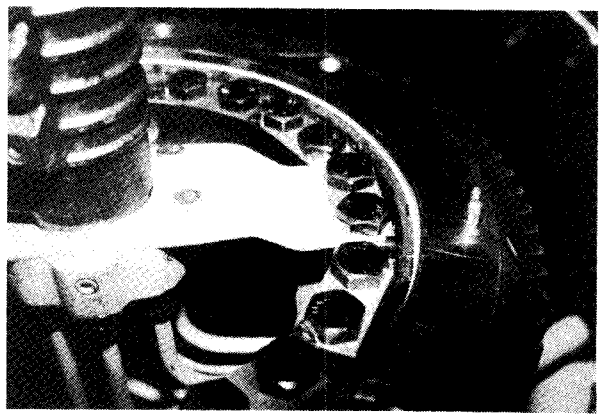
② Mount the turntable on the base and screw lightly the turntable bolts in the base main body.

③ Insert the clearance gauge (0~0.2 mm) into the space between the turntable gear and the pinion gear, and press strongly the turntable to the pinion gear.



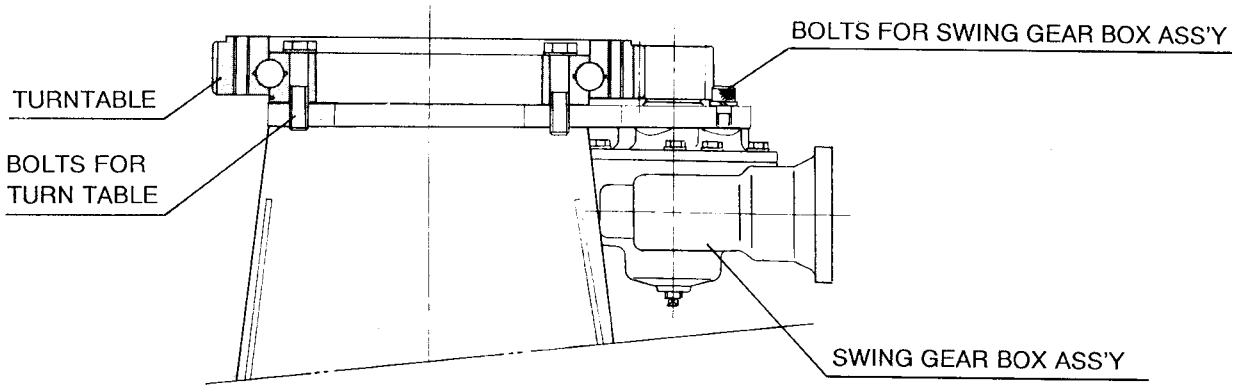
④ Fasten turntable bolts following the specified tightening torque and the numerical order so that it will not part from the pinion gear.

⑤ After tightening turntable bolts, fold the inside square corner of the revolution stopper plate to follow one flat side of the hexagon bolt head.



⑥ After assembling, apply grease to engaging tooth surfaces of the gears.

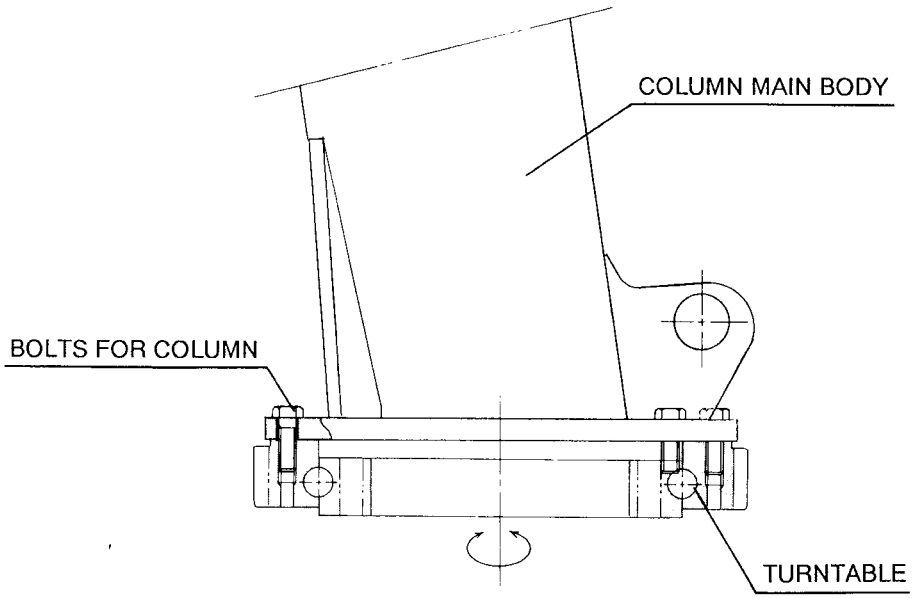
4) Tightening Torque for Bolts Fastening Turntable and Swing Gear Box Ass'y



Place of use	Part name	Tightening torque
Swing gear box ass'y	Tempered bolt M16 × 50(10T)	23~29 kg-m (Desired value:26 kg-m)
Turntable (Turntable inner ring)	Tempered bolt M20 × 92 ℓ (12T)	45~51 kg-m (Desired value:48 kg-m)

Note : The bolts for the turntable (tempered bolts) must be UNIC genuine bolt, on the head of which "UNIC 12" is inscribed.

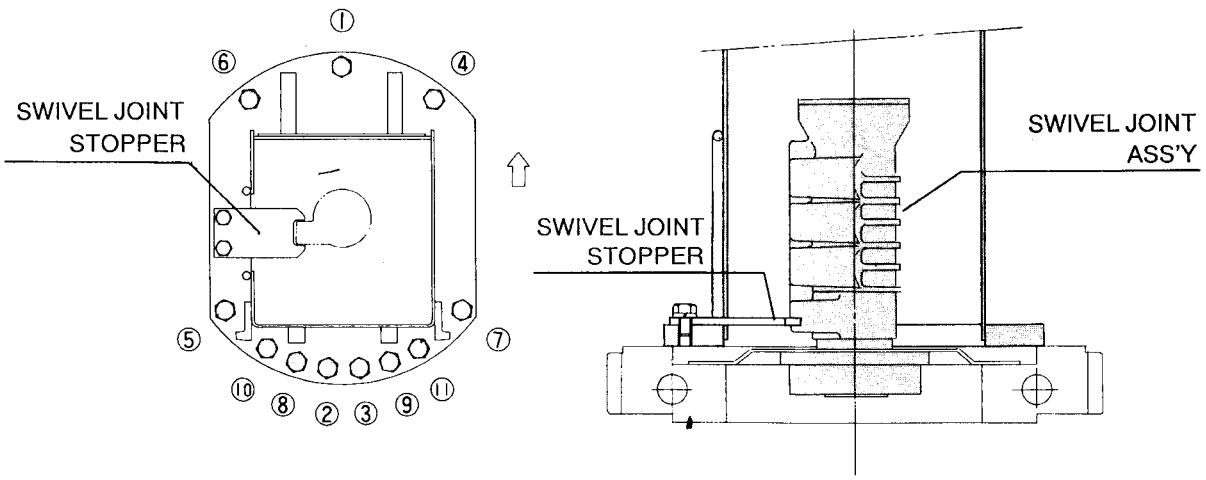
5) Tightening Torque for Bolts Fastening Column Ass'y



Place of use	Part name	Tightening torque	Caution when teightening
Column ass'y (Turntable outer ring)	Tempered bolt M16 × 50 ℓ (12T)	23~27 kg-m (Desired value:25 kg-m)	Follow the below mentioned numerical order.

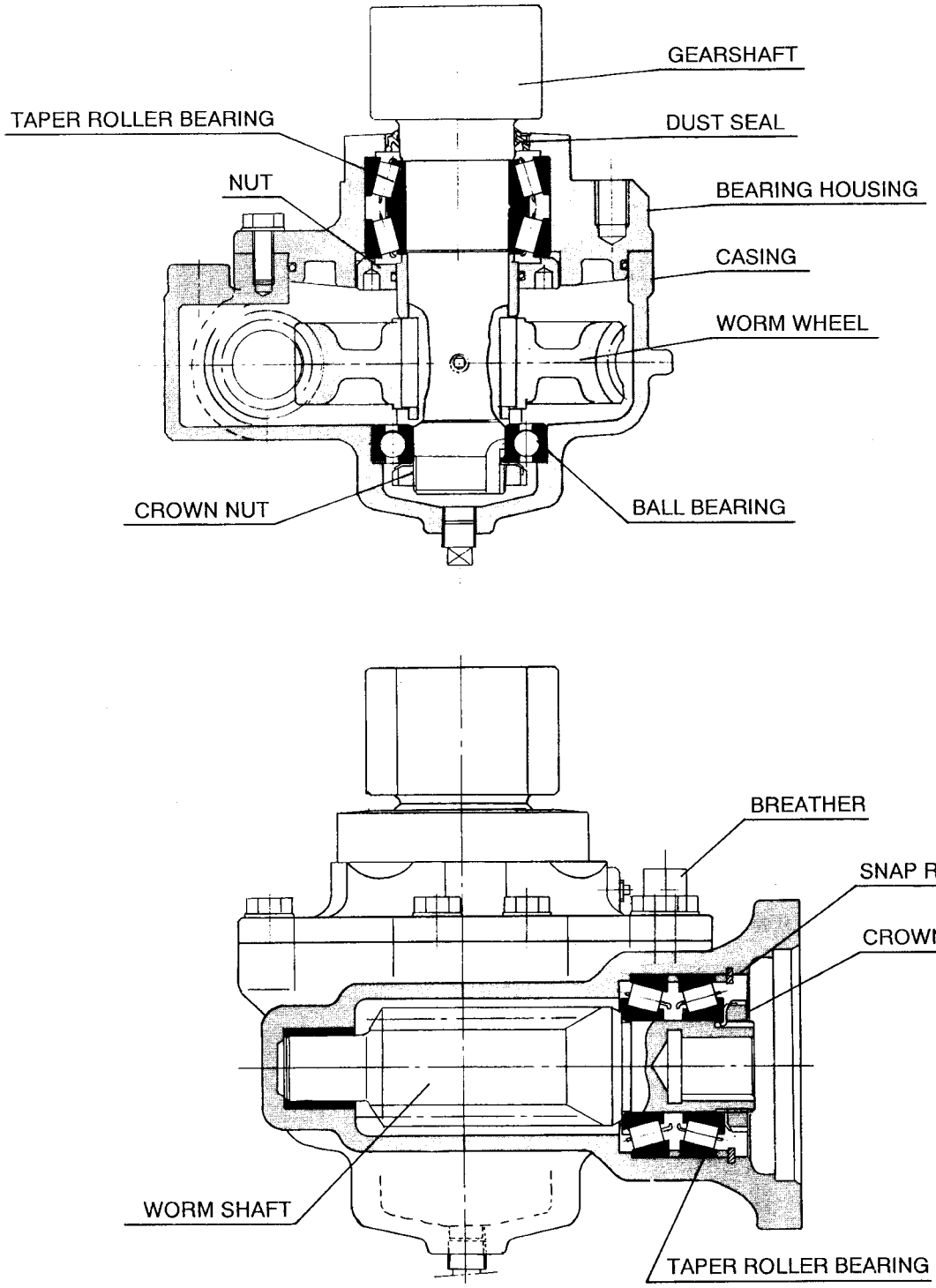
Note : Before tightening the bolts for column, apply "LOCKTIGHT # 262".

6) Numerical Tightening Order for Bolts Tightening Column



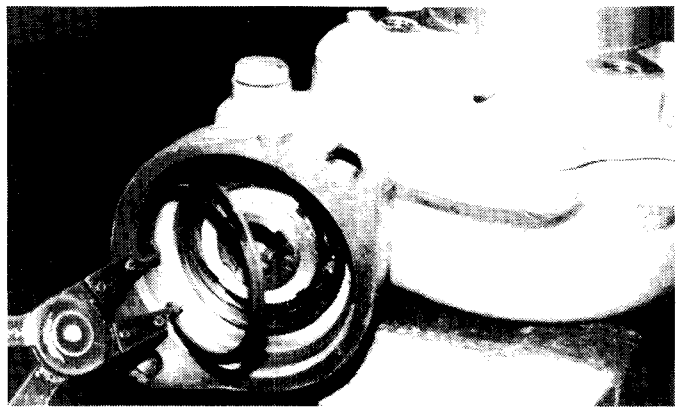
§8. SWING GEAR BOX ASS'Y

1) Construction



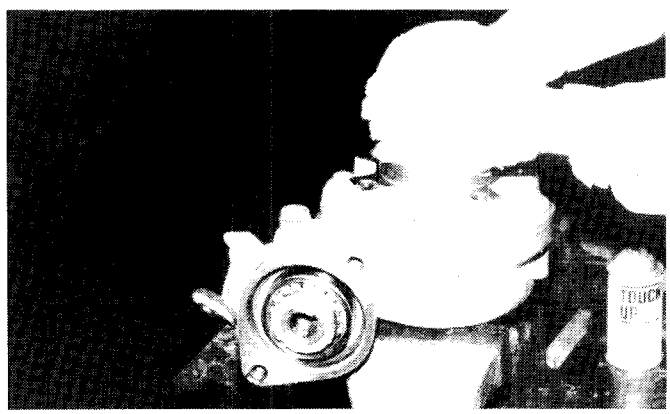
2) Disassembly Procedure

① Remove a snap ring (H-80) which retains the taper roller bearing which sustains worm shaft.

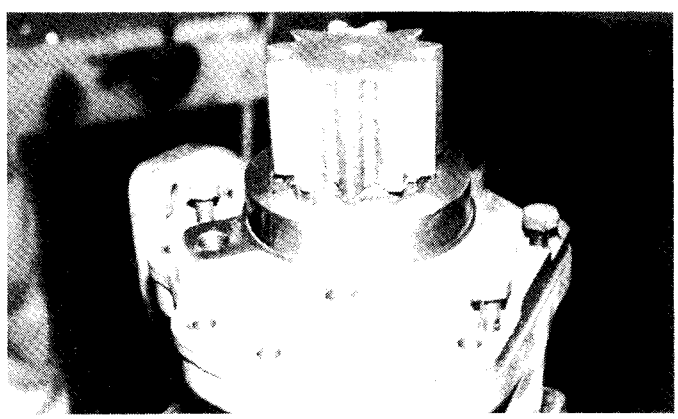


② Turn the gear shaft counterclockwise, pull out the worm shaft from the casing. (Use of special tool for removing worm shaft is recommended.)

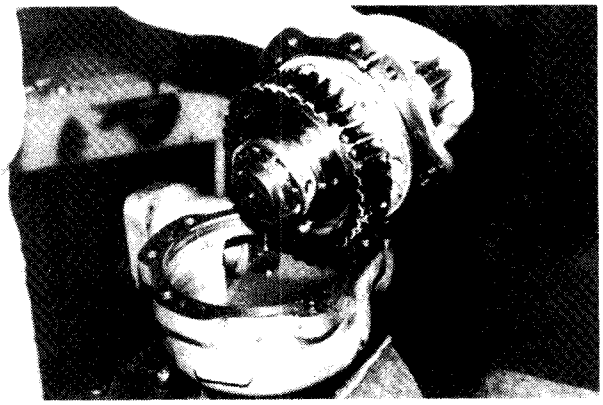
※ **For special tool, refer to page 28.**



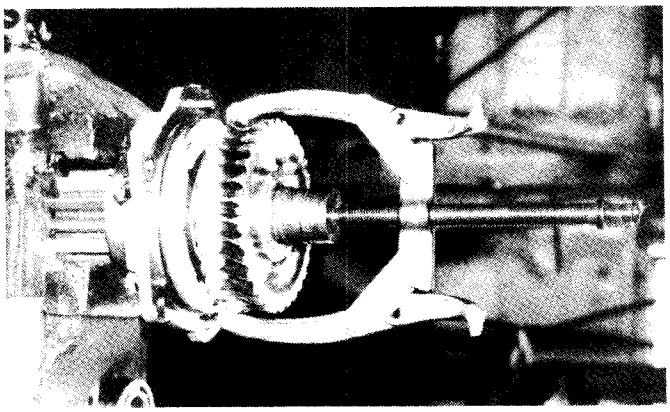
③ Remove 8 pcs. of bolt (M10 × 25 ℓ) which fasten the bearing housing and pull out the housing, utilizing 3 pcs. of bolt for 3 through holes in the housing.



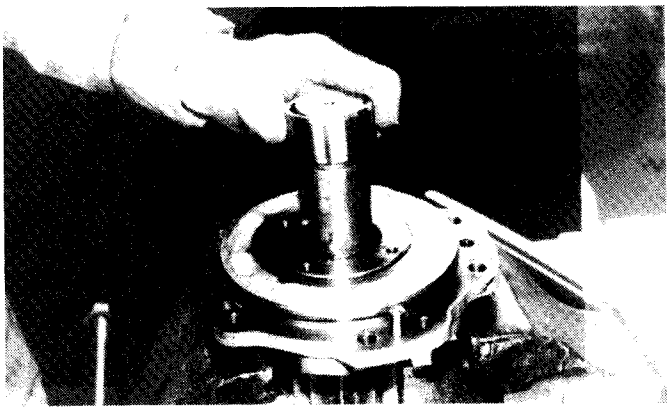
④ This photo shows the pulled out housing with gear shaft and worm wheel.



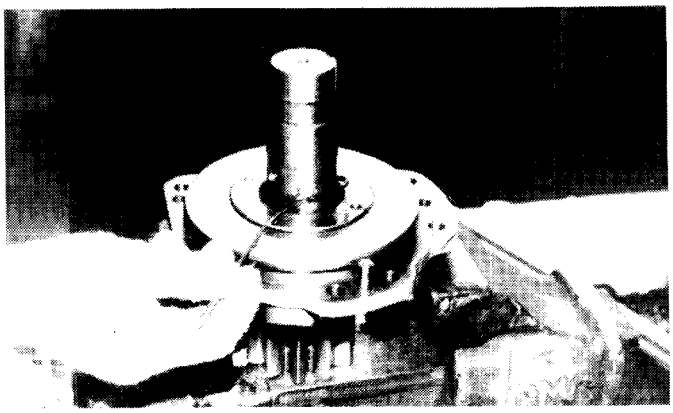
⑤ Grip the housing with a vice and pull out the worm wheel with a gear puller.



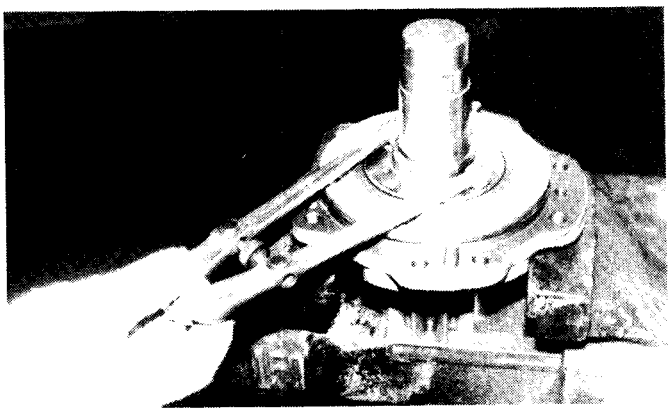
⑥ Pull out the collar which is assembled in the nut.



⑦ Pull out the O-ring which is assembled in the nut.



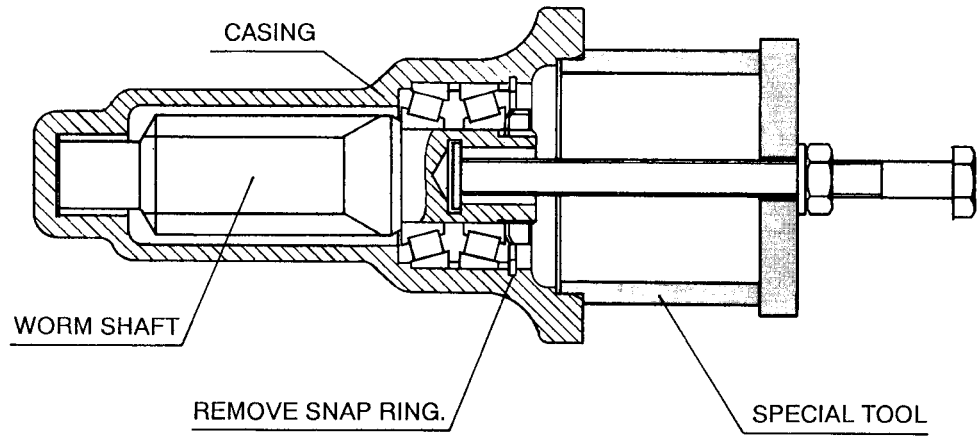
⑧ With a pin spanner remove the nut which retains the taper roller bearing.



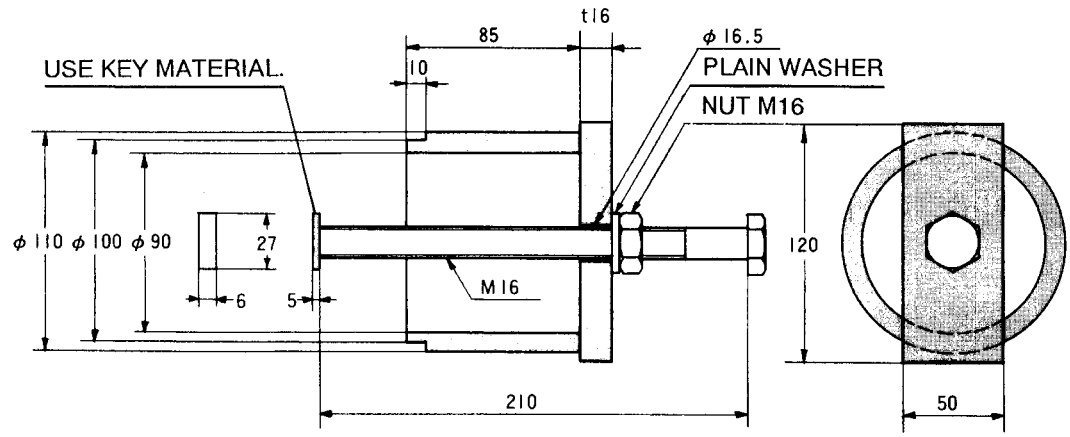
Note : To the threaded part of the nut "LOCKTIGHT" was applied. Therefor, when loosing, warm up lightly the threaded part with gas flame, and then loosen. When reassembling, be sure to apply "LOCKTIGHT # 262" to the threaded part.

※ Special tool for removing the worm shaft from the swing gear box ass'y

(Sectional view of worm shaft in assembly)

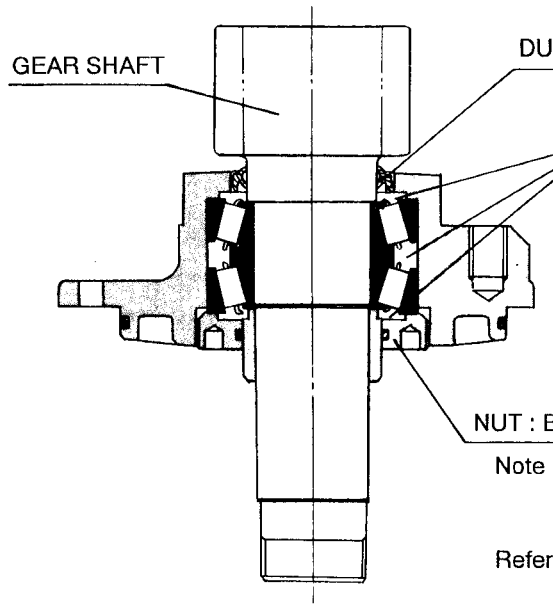


(Detailed drawing of special tool)

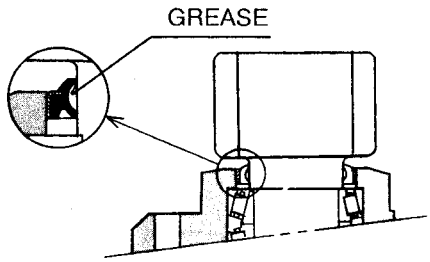


3) Caution When Assembling

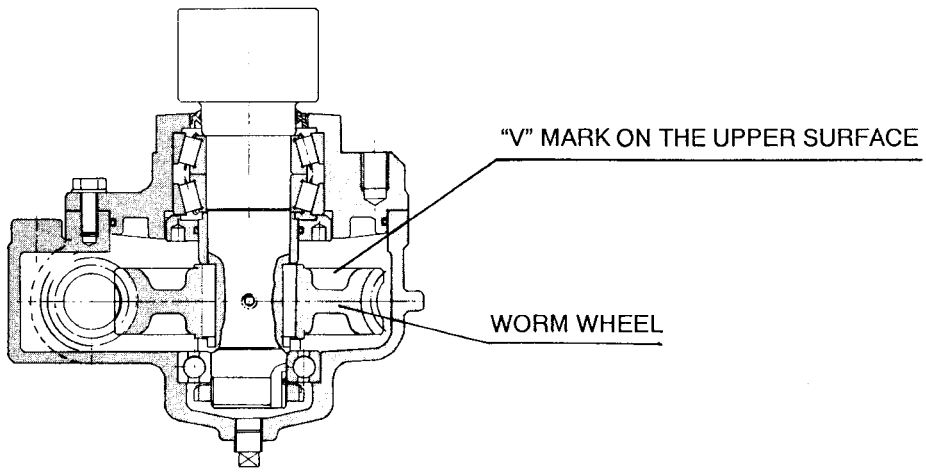
(1)



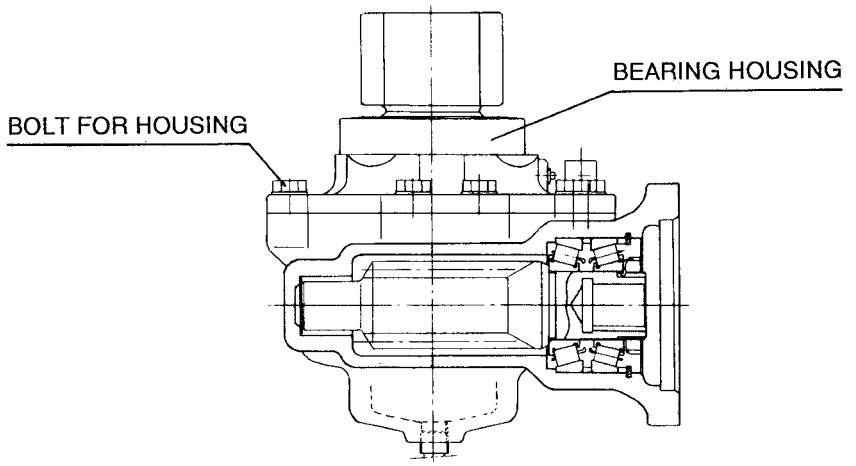
(2) Apply grease to the inside of lip of the dust seal.



(3) When assembling, be sure to have the side with the "V" face up.



4) Bolt Tightening Torque for Bearing Housing



Place of use	Part name	Tightening torque	Caution when teightening
Installation of swing gear box ass'y	Tempered bolt M10 × 25 ℓ (7T)	5~7 kg-m Desired value:6 kg-m	Before tightening tempered bolts, remove oil or grease from the bolts, and then apply "LOCKTIGHT # 262".

5) Gear Oil

The air goes in and out freely the inside of the gear case, and accordingly, water and dust are mixed in the gear oil. Also the gears themselves produce abrasion powder during operation. Therefore, make initial gear oil change at the time 6 months after the first use, and thereafter, make gear oil change once a year.

Quantity of gear oil
Approx. 0.7 liter (0.8 liter for new crane)

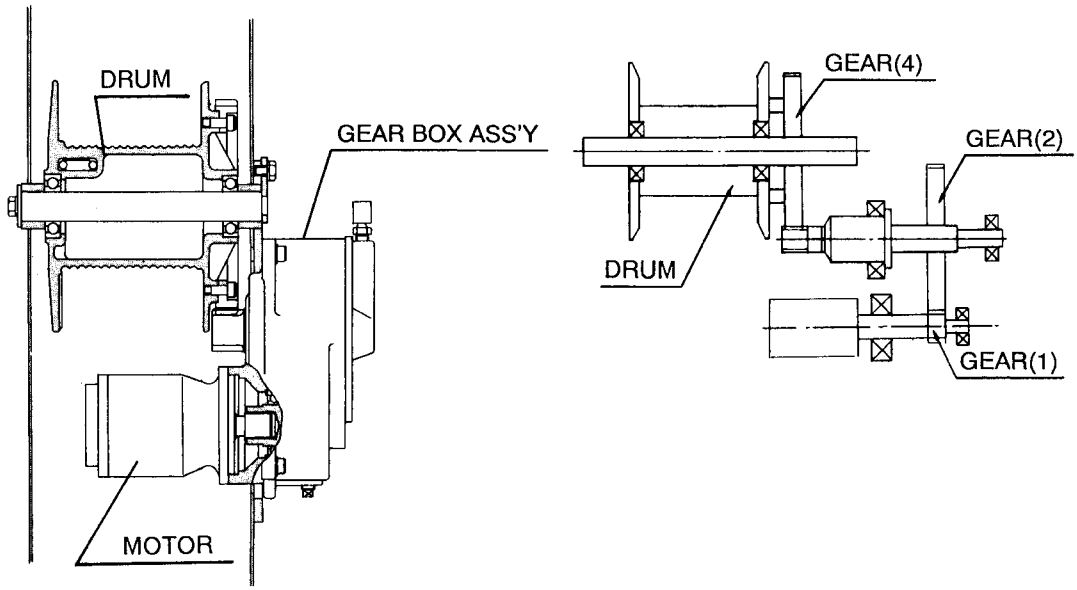
RECOMMENDED GEAR OIL

Use API Service GL-4 gear oils.

Petroleum Maker	Brand
ESSO	Standard gear oil 90
MOBIL	Mobilube GX90
CALTEX	Universal Thuban SAE 90
SHELL	Shell Spirax EP90

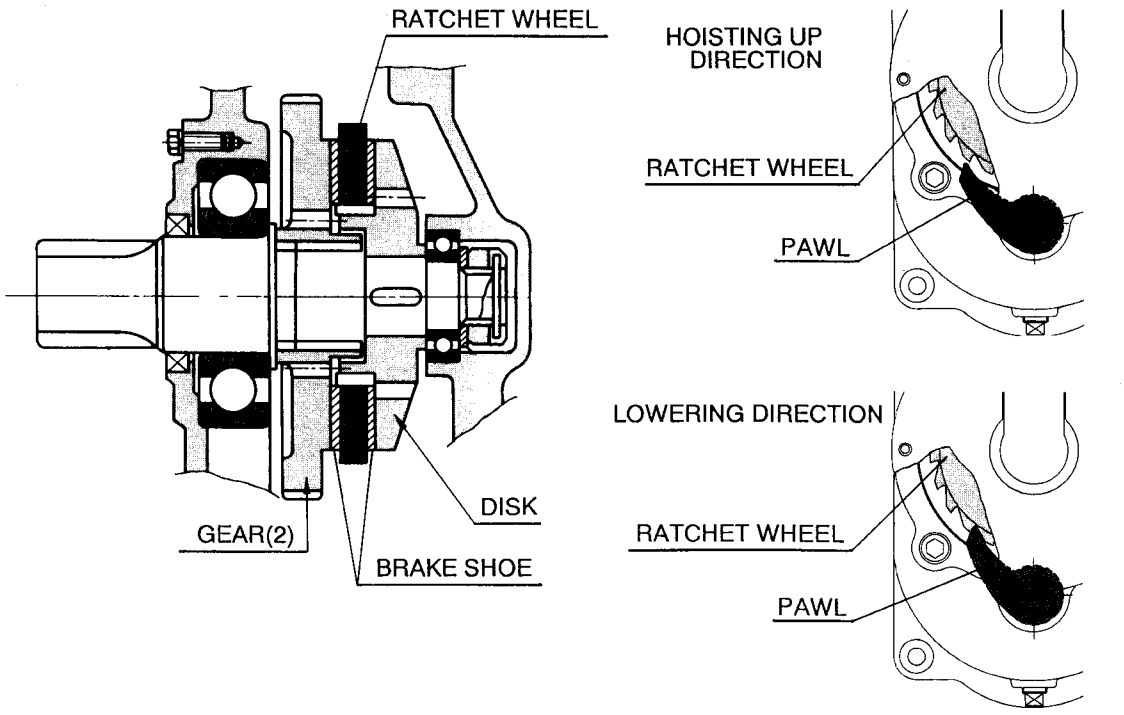
§9. HOIST WINCH ASS'Y

1) Construction of Hoist Winch Ass'y

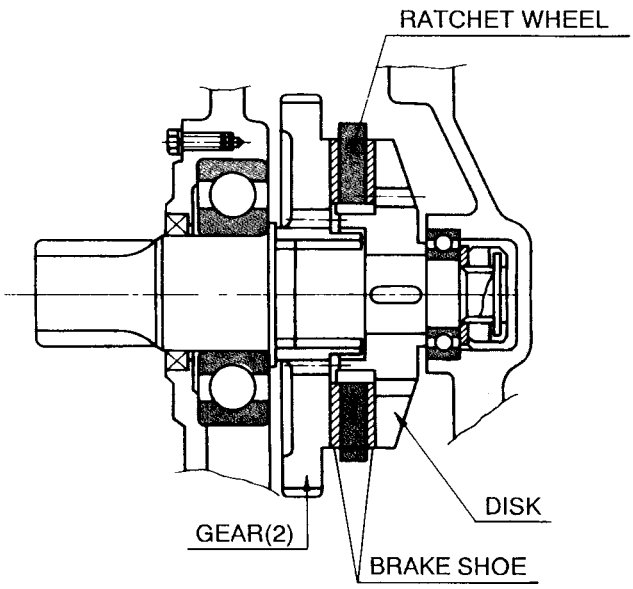


2) Construction of Brake

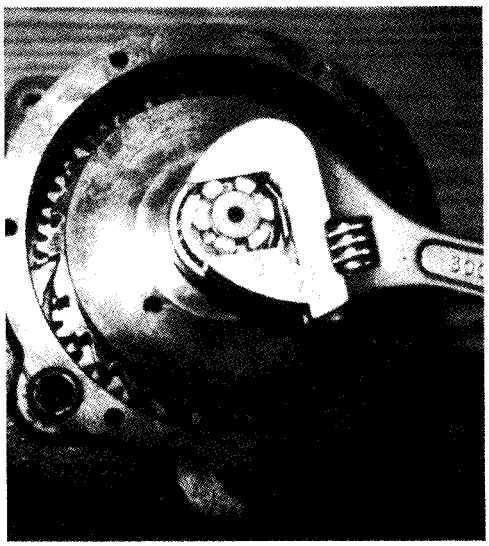
Brake shoe is put in the space between the gear (2) and ratchet wheel, and also in the space between the disk and ratchet wheel. Ratchet wheel can freely be rotated as long as the direction of rotation is winding up. However, when lowering, rotation is stopped by a pawl, and the gear (2) is pressed against the ratchet wheel through the brake shoe. Thus, the brake is applied in the lowering direction.



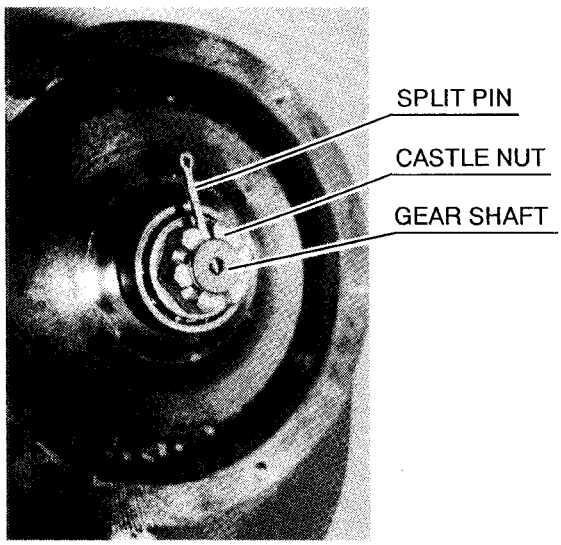
3) Brake Shoe Adjusting Procedure



Assemble in the order of gear (2), brake shoe, ratchet wheel, disk, and plain washer ; and tighten castle nut with a spanner. Then loosen the castle nut for 1/6 turn and within this range match the hole for split pin in the gear shaft to the groove of the castle nut ; and fix with the split pin. If tightened too much, it may cause jogging.



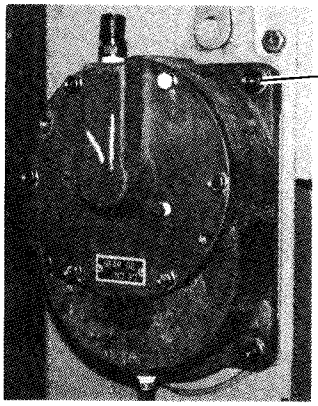
① Tighten castle nut with a spanner.

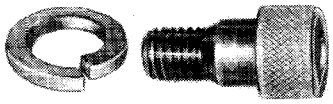


② Then loosen the castle nut for 1/6 turn and within this range match the hole for split pin in the gear shaft to the groove of the castle nut.

4) Bolt Fastening Gear Box Ass'y

Bolt locating at the upper right of the gear box ass'y is a set bolt for positioning the casing. Other 3 pcs. are hexagon socket head bolts.





Set bolt

Hexagon socket head bolt (3 pcs.)

Note : Tightening order of bolt : Set bolt for positioning is the first, and then tighten the hexagon socket head bolts diagonally.

5) Gear Oil

The air goes in and out freely the inside of the gear case, and accordingly, water and dust are mixed in the gear oil. Also the gears themselves produce abrasion powder during operation. Therefore, make initial gear oil change at the time 6 months after the first use, and thereafter, make gear oil change once a year.

Quantity of gear oil
Approx. 0.8 liter (0.9 liter for new crane)

RECOMMENDED GEAR OIL

Use API Service GL-4 gear oils.

Petroleum Maker	Brand
ESSO	Standard gear oil 90
MOBIL	Mobilube GX90
CALTEX	Universal Thuban SAE 90
SHELL	Shell Spirax EP90

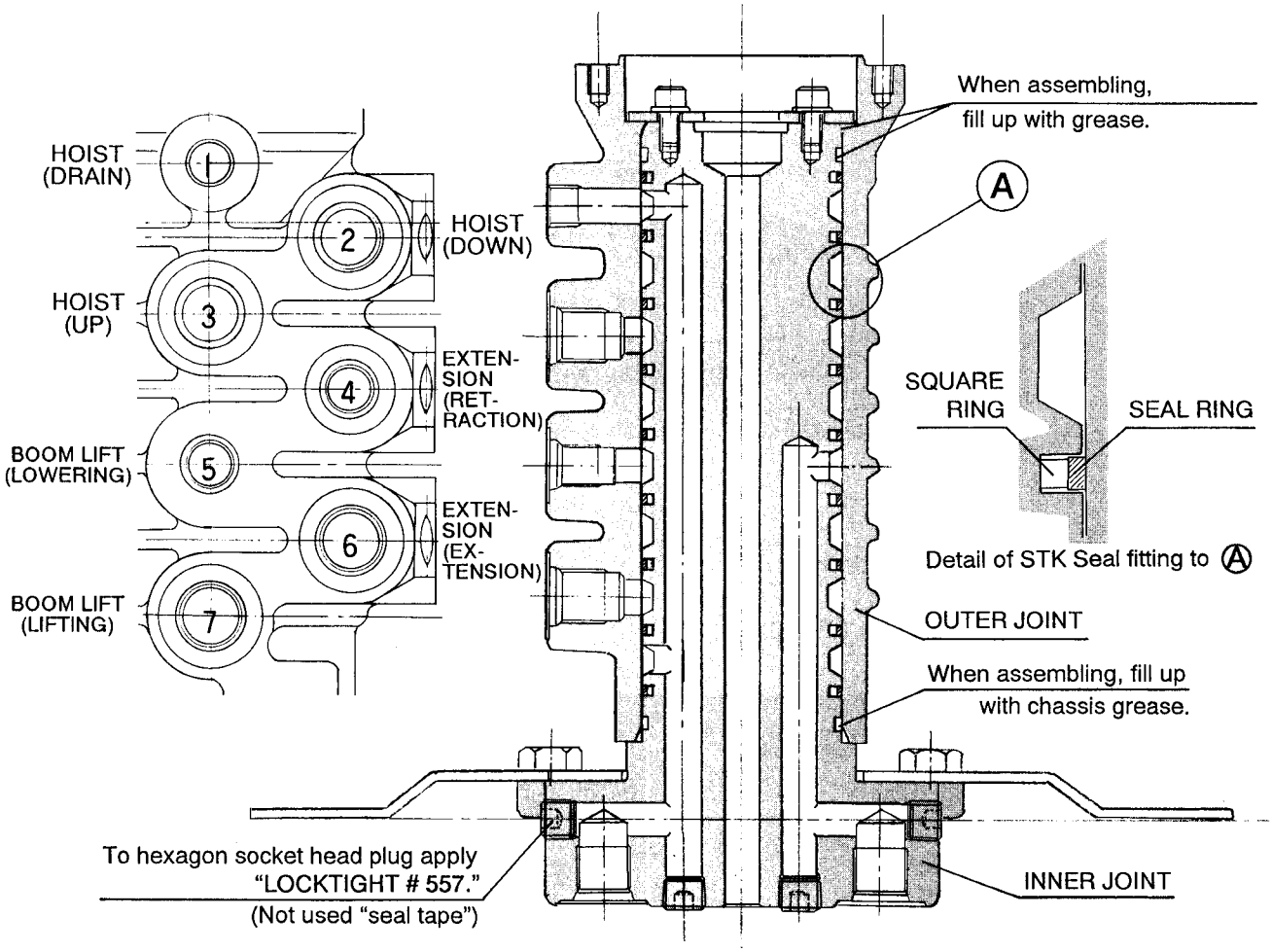
6) Cause of Troubles and Remedy

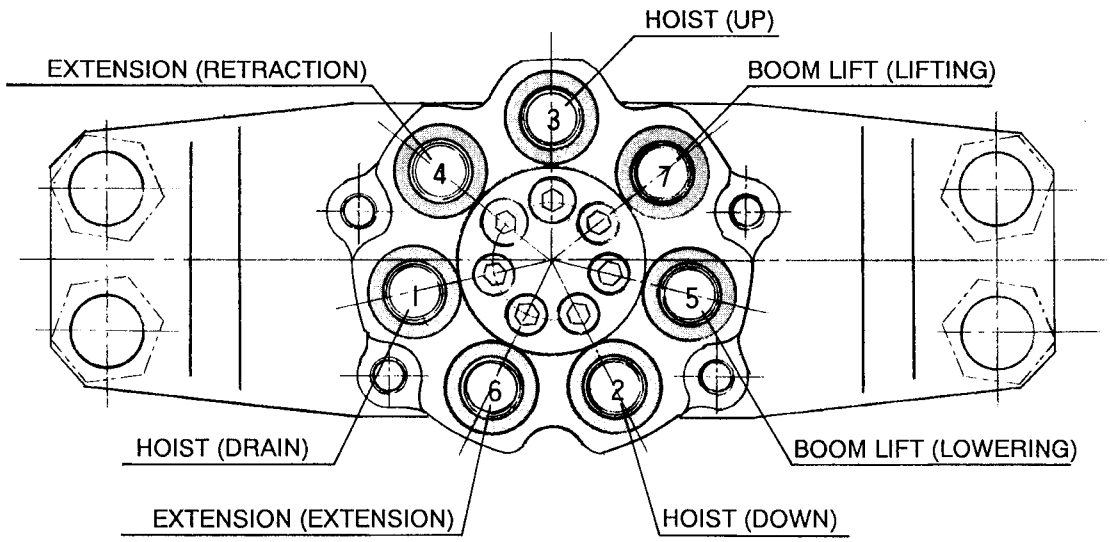
Hoist Winch

Abnormal phenomenon	Presumed cause	Remedy
1. Pressure does not rise.	a) Pump is faulty. (Pressure does not rise at idling rpm.) (Total pressure required for operation is insufficient.)	• Replace.
	a) Relief set of control valve is faulty. (Pressure rises but not enough.)	• Adjust or replace.
	a) O-ring and other parts of relief valve of control valve are faulty. (Adjust bolt of relief valve is tightened but unable to control pressure.)	• Replace parts or replace relief ass'y with a new ones.
	a) Hoist motor is faulty. (Quantity of drain is smaller than specified one.)	• Replace.
2. Pressure rises but hoisting up is impossible.	a) Drum or internal mechanism of gear box is faulty.	• Disassemble gear box. • Inspect the drum.
3. Pressure rises but lowering is impossible.	a) Drum or internal mechanism of gear box is faulty.	• Too much tightening of brake shoe. • Disassemble gear box. • Inspect the drum.
4. Unable to maintain suspended load.	a) Brake shoe is faulty. b) Pawl is faulty.	• Replace brake shoe. • Replace pawl.
5. When lowering, jogging occurs.	a) Brake shoe is faulty. b) Too much tightening of brake shoe. c) Internal mechanism of gear box is faulty.	• Inspect brake shoe and check quantity of oil. • Adjust tightening of nut. • Disassemble gear box.
6. When hoisting up, clattering sound is heard.	a) Spring to press the pawl against slide plate is faulty. b) Bush at the part of fitting pawl worn out.	• Replace spring. • Replace bush.

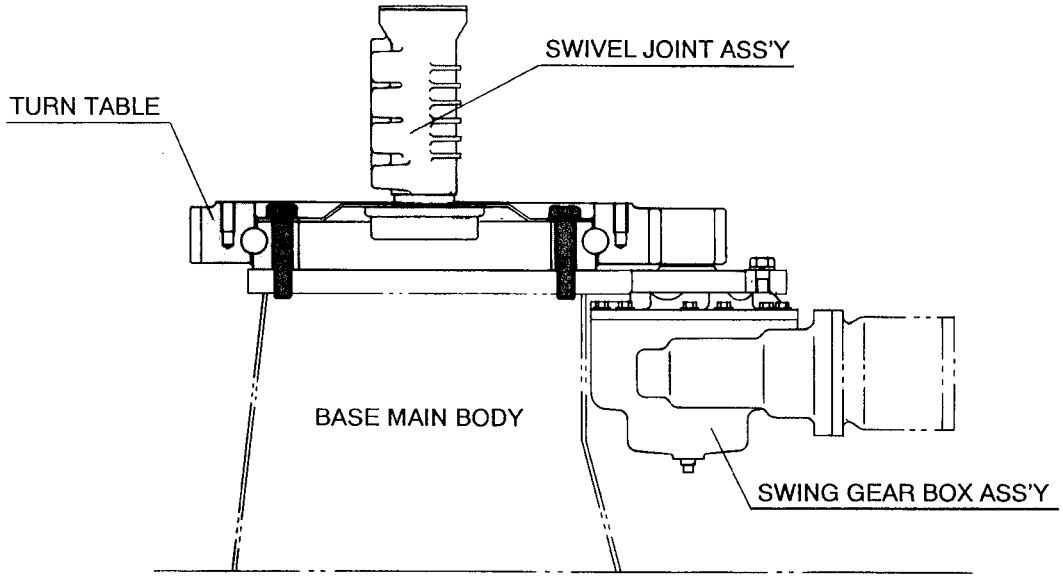
§9. SWIVEL JOINT ASS'Y

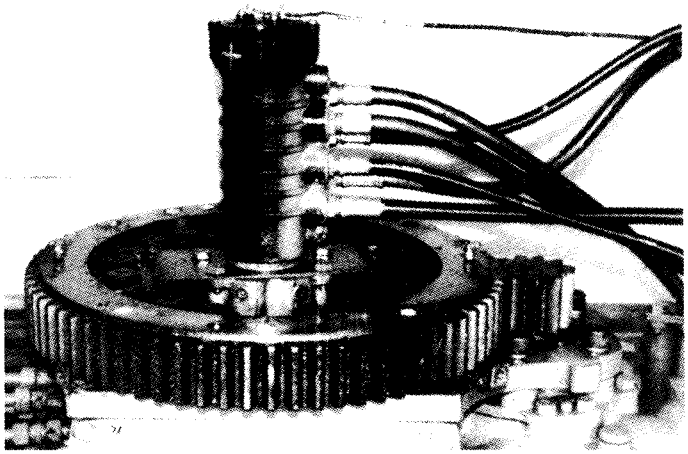
1) Construction of Swivel Joint Ass'y and Positions of Hoses





Swivel Joint Ass'y is Installed.





2) Swivel Joint Assembling Procedure

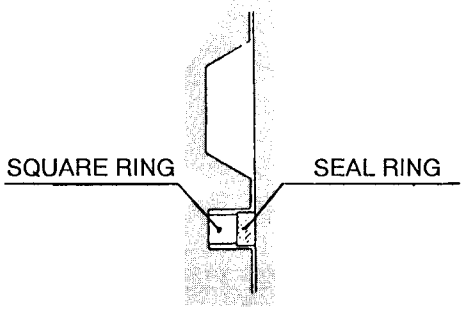
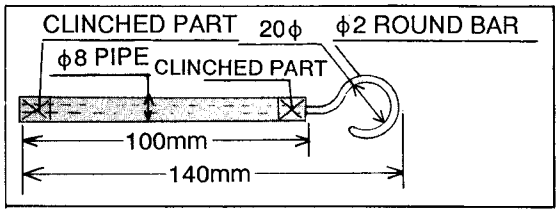
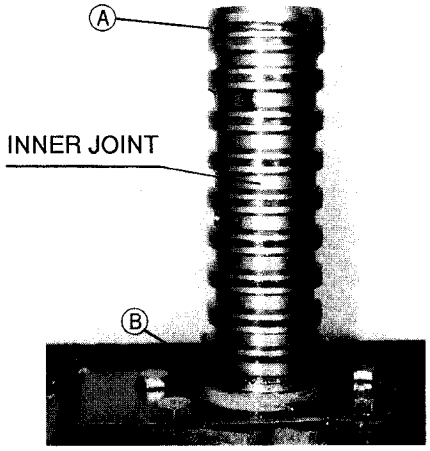


Illustration of STK Seal fitting

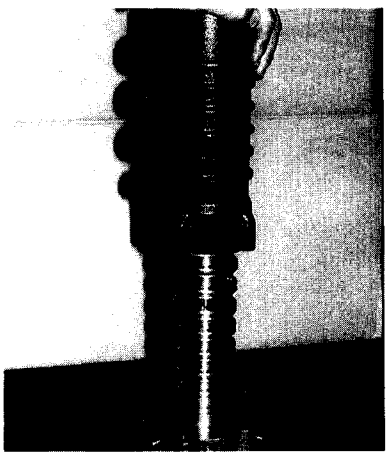


- After fitting the square ring, check to see if it is twisted, then fit the seal ring.

※ When fitting seal ring, it is recommended to use the jig as shown below.



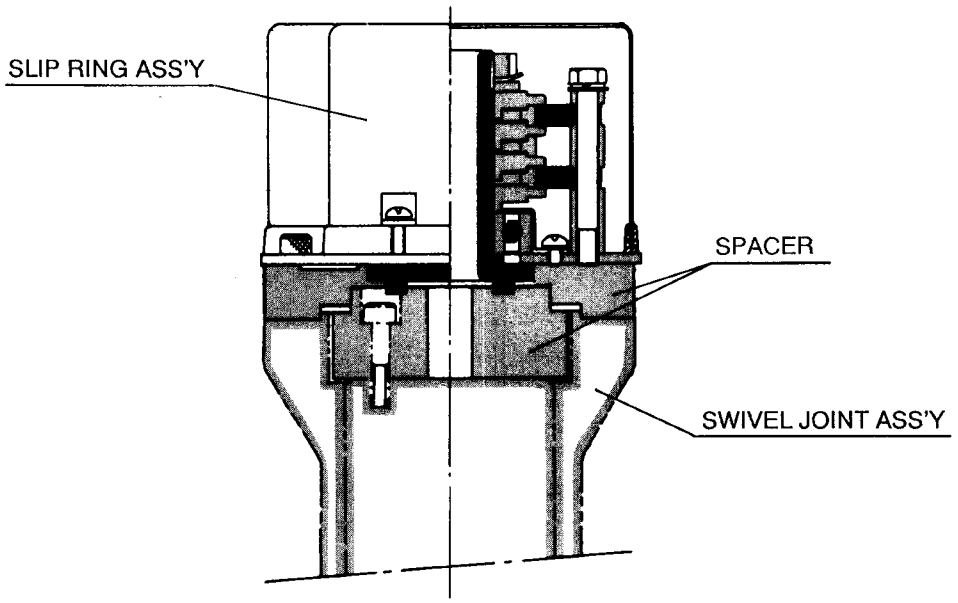
- The upper most Ⓐ and the lower most Ⓑ of the inner joint must be filled up with grease.
- To the part where STK seal is to be fitted apply chassis grease thinly.



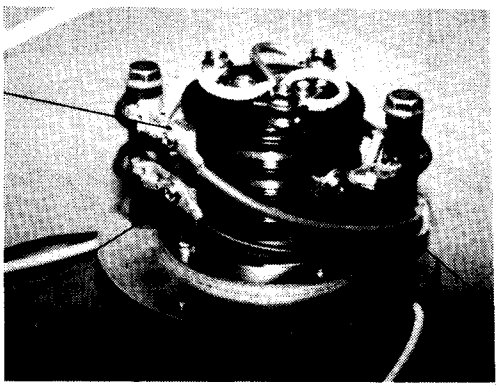
- Put the outer joint over the inner joint taking are that the STK seal fitted to the inner joint will not be bit.

§10. SLIP RING ASS'Y

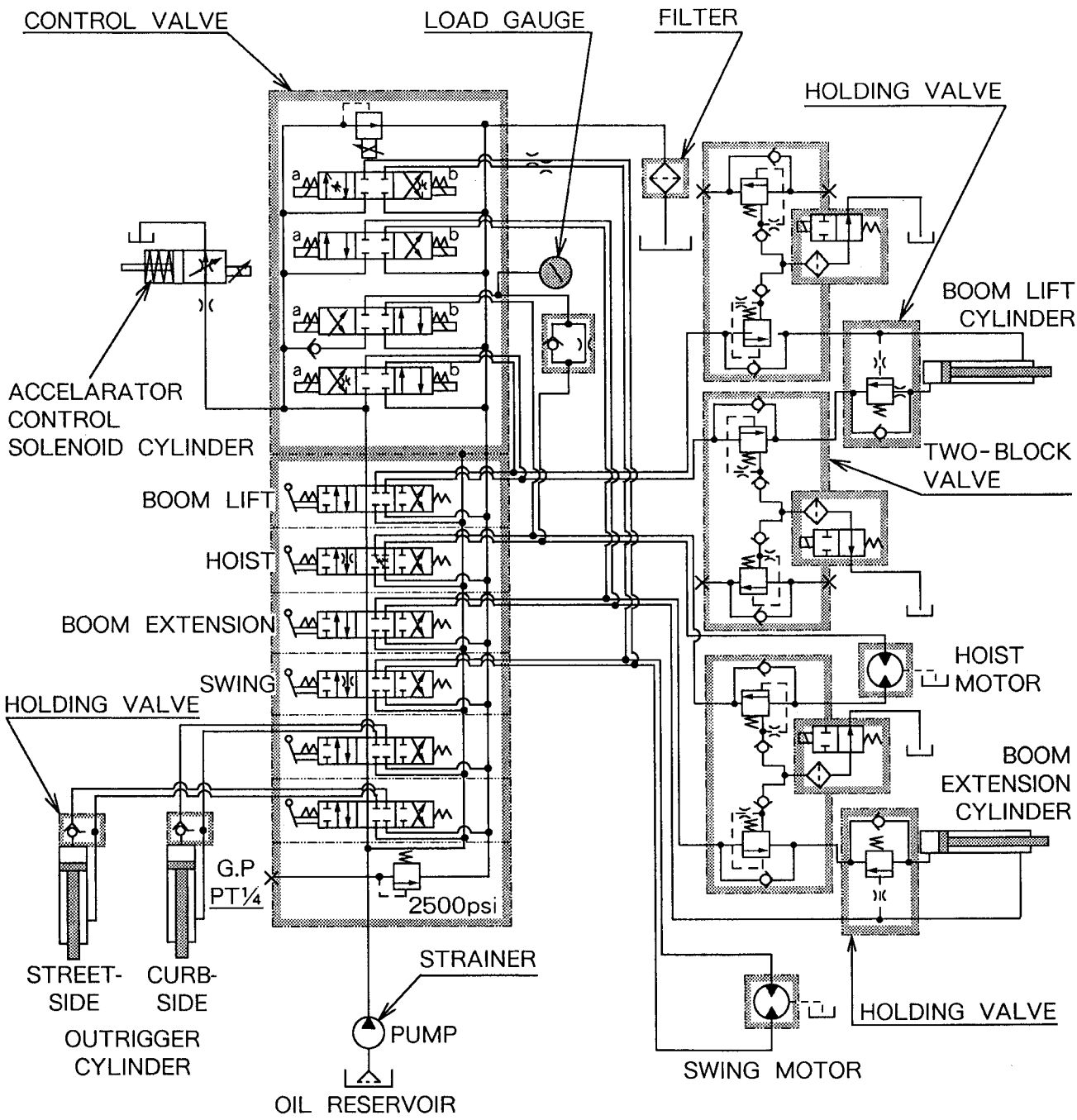
1) Construction of Slip Ring Ass'y and Its Fitting Position



Construction

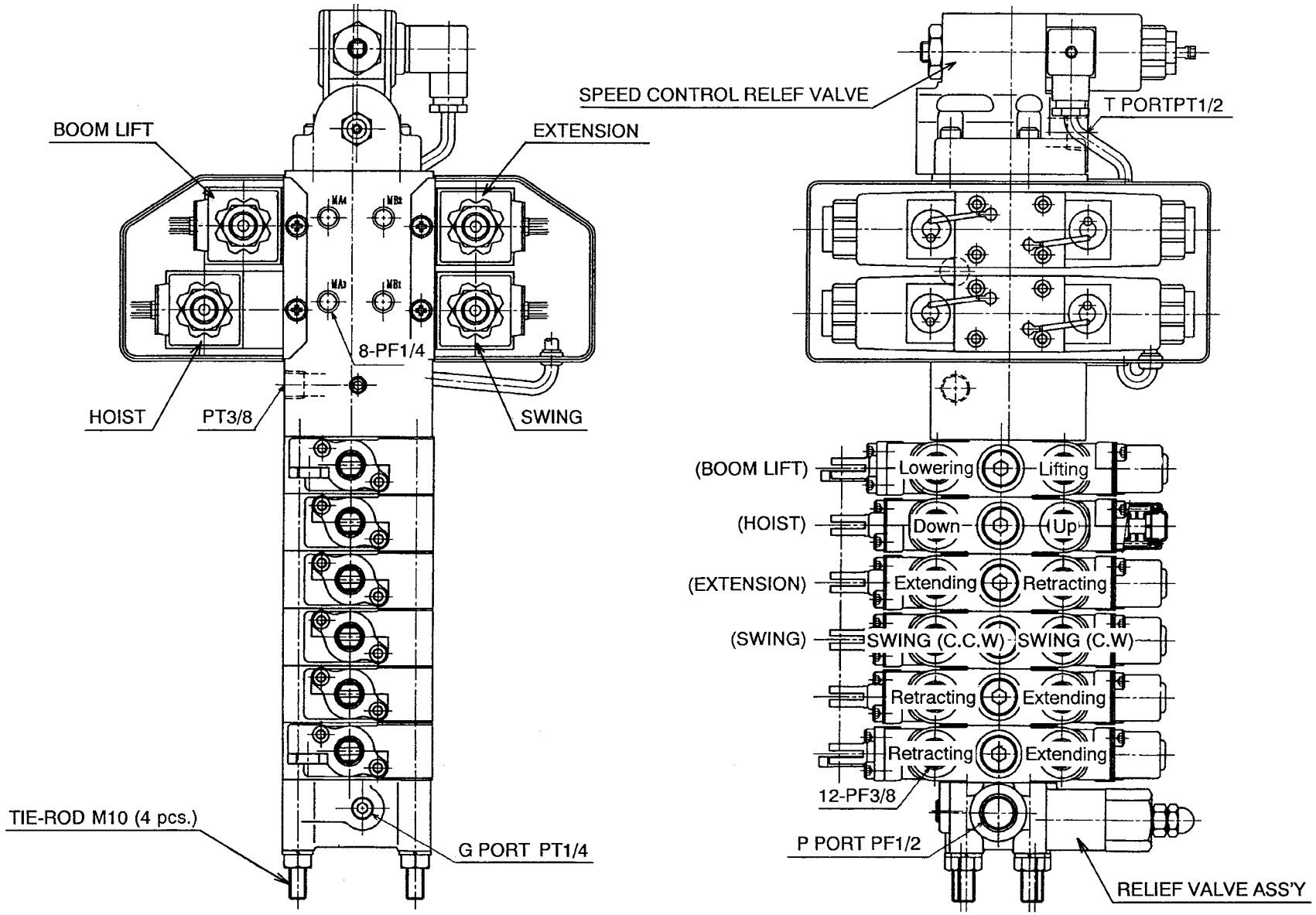


§11. HYDRAULIC CIRCUIT



§12. CONTROL VALVE ASS'Y

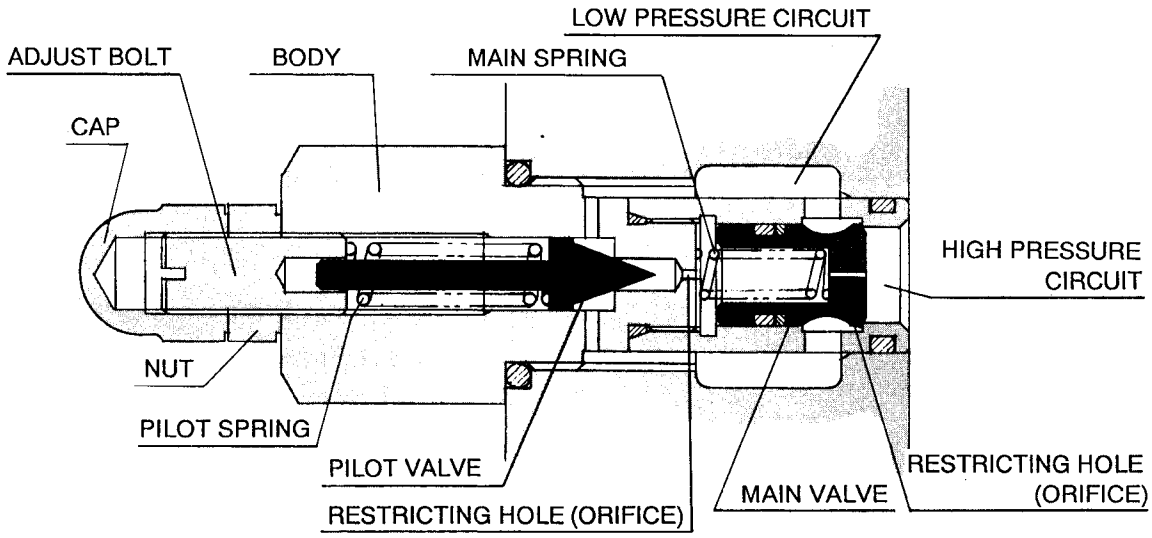
1) Composition of Valves



2) Relief Valve Ass'y

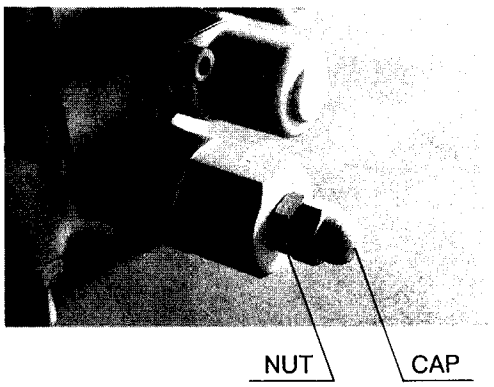
The relief valve ass'y is a preventive valve to control the pressure in the hydraulic circuit would not become higher than specified pressure.

(1) Construction of Valve

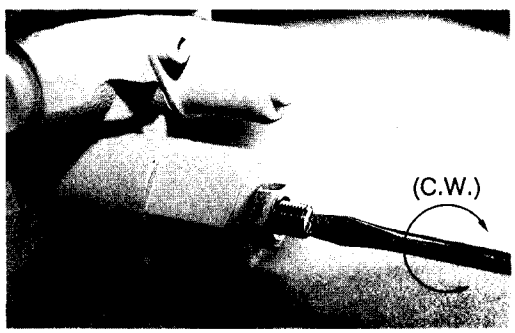


(2) Adjusting Procedure

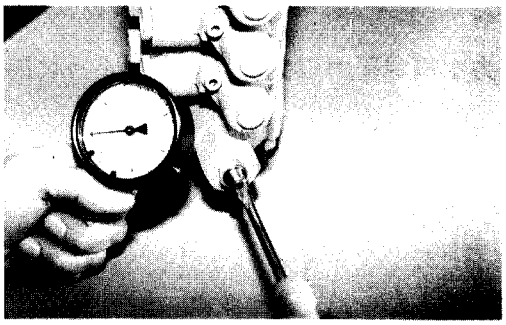
The hydraulic pressure in the relief valve is decided by the movable allowance of its adjust screw. For adjusting the pressure, loosen the cap and nut, and turn the screw clockwise with a (−) driver to increase the pressure, while on the contrary turn the screw counterclockwise for reducing the pressure.



ⓐ Remove the cap and loosen the nut.



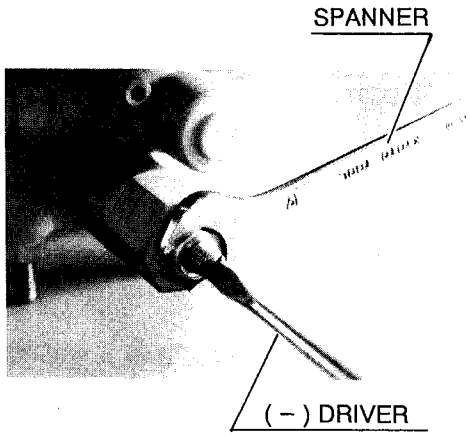
ⓑ When tightening the nut and the cap, hold the screw with the (−) driver as it is feared that loosening of screw is apt to happen while tightening.



ⓒ Retract the outrigger, extension, or boom lift cylinder, and adjust the relief pressure while watching the pressure gauge.

Setting up Hydraulic Pressure.....2500 psi

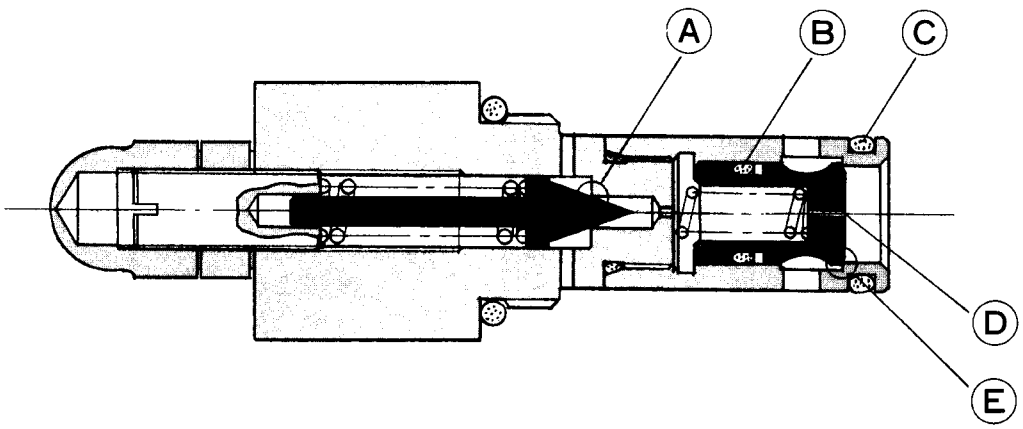
※ Run the engine at the rated pump speed, not at idling or high speed, while setting relief pressure.



ⓓ When tightening the nut and the cap, hold the screw with the (−) driver as it is feared that loosening of screw is apt to happen while tightening.

(3) Relief valve check point

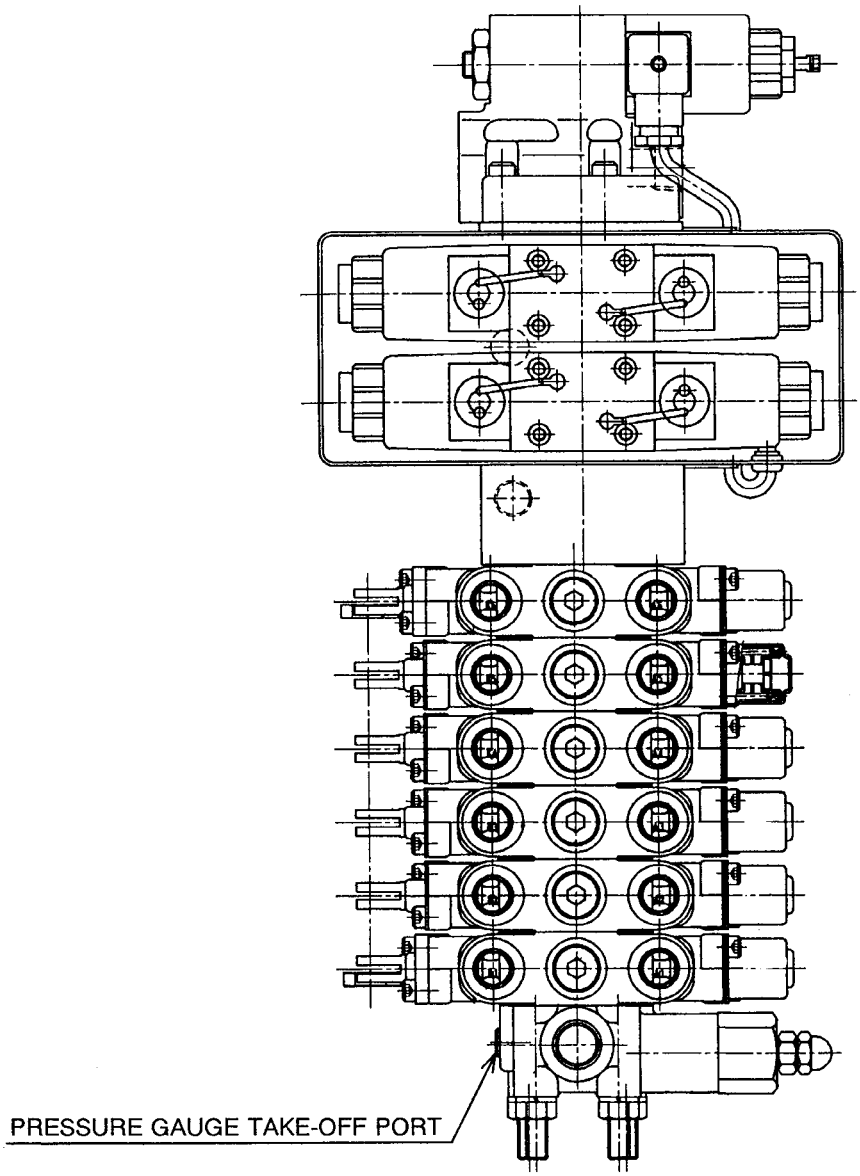
If hydraulic oil pressure fails to rise, check the relief valve at the following points.



1. Foreign matter caught at part Ⓐ ; damage to seat surface
2. O-ring at part Ⓑ broken
3. O-ring at part Ⓒ broken
4. Foreign matter caught in orifice in main valve at part Ⓓ
5. Foreign matter caught at part Ⓔ ; damage to seat surface

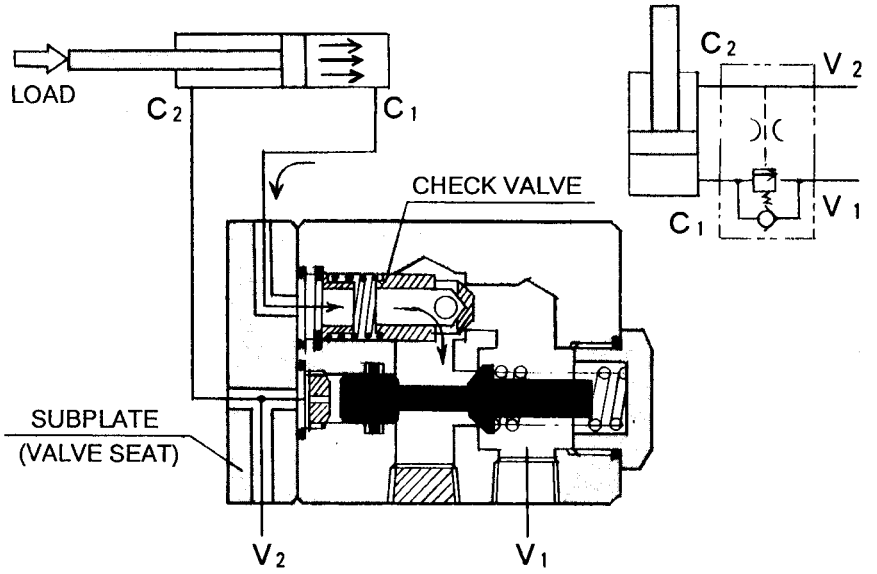
Note : If nothing is found wrong at the above points, the hydraulic pump is defective.

3) Pressure Measuring Gauge Take-off Port



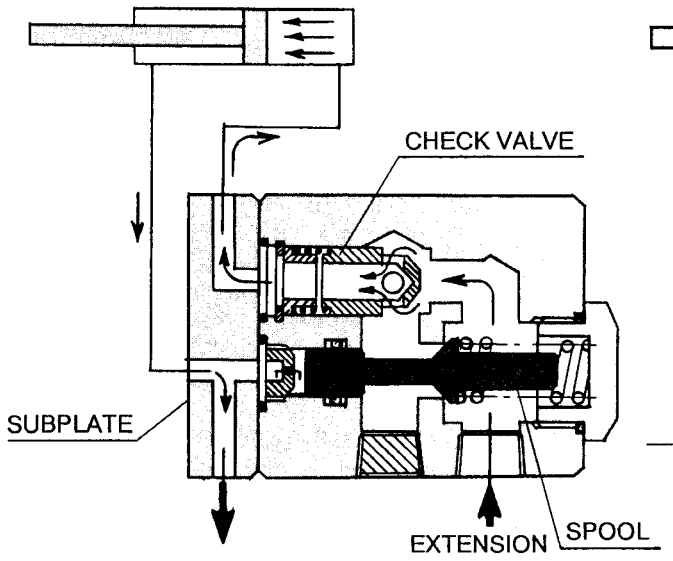
§13. HOLDING VALVE ASS'Y

The holding valve applies the set back pressure to the oil flow in the retracting direction, and permits free flow of oil in the extending direction.

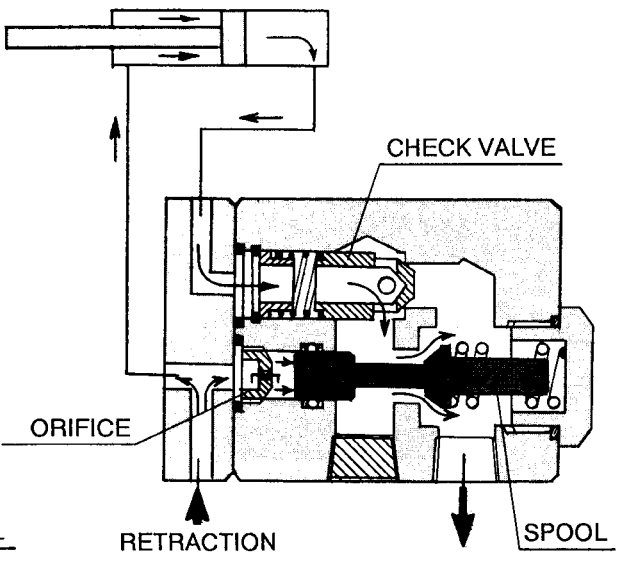


When the control valve is neutral, oil flow is blocked to both cylinder parts, extension and retraction. Even if the cylinder is subjected to a load and a force in the retracting direction, the oil in the extending direction is blocked by the body of the holding valve and the seat of the check valve so that the cylinder remains as it is.

1) Description of Holding Valve Operation



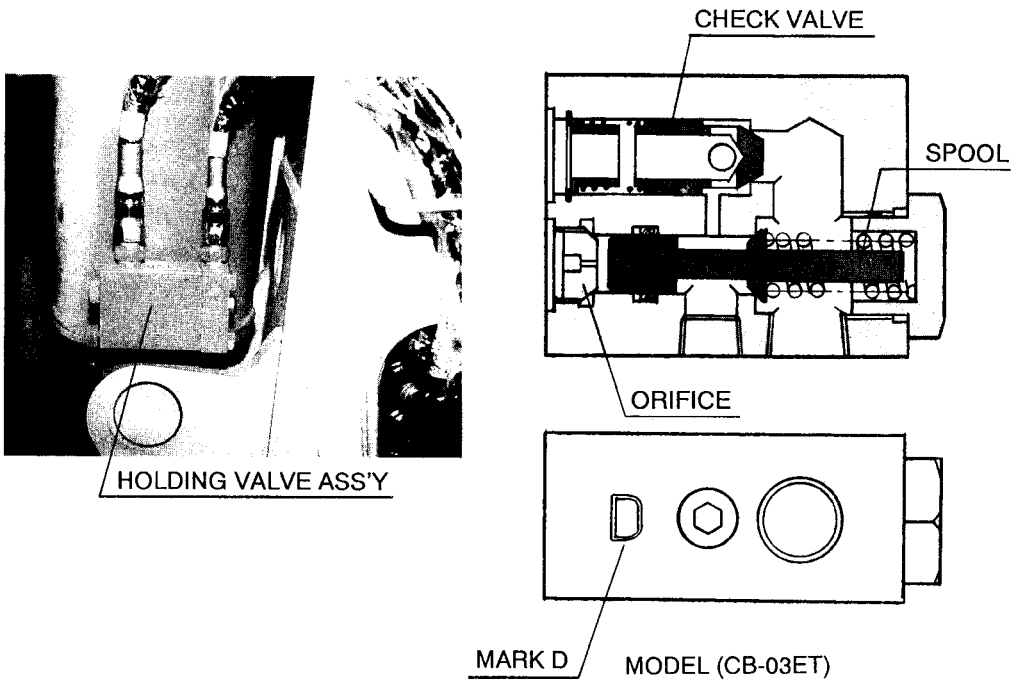
Direction of oil flow (Cylinder – extension)



Direction of oil flow (Cylinder – retraction)

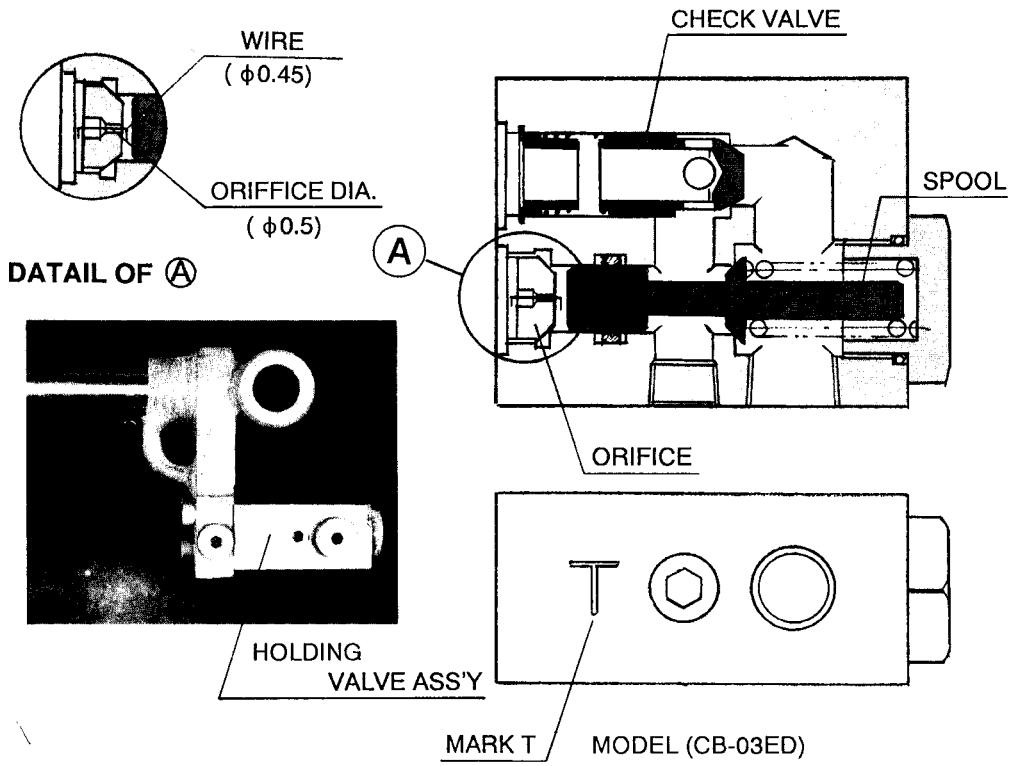
2) Construction of Holding Valve Ass'y (for Boom lift and extension cylinder)

(1) Construction of holding valve ass'y (for boom lift)



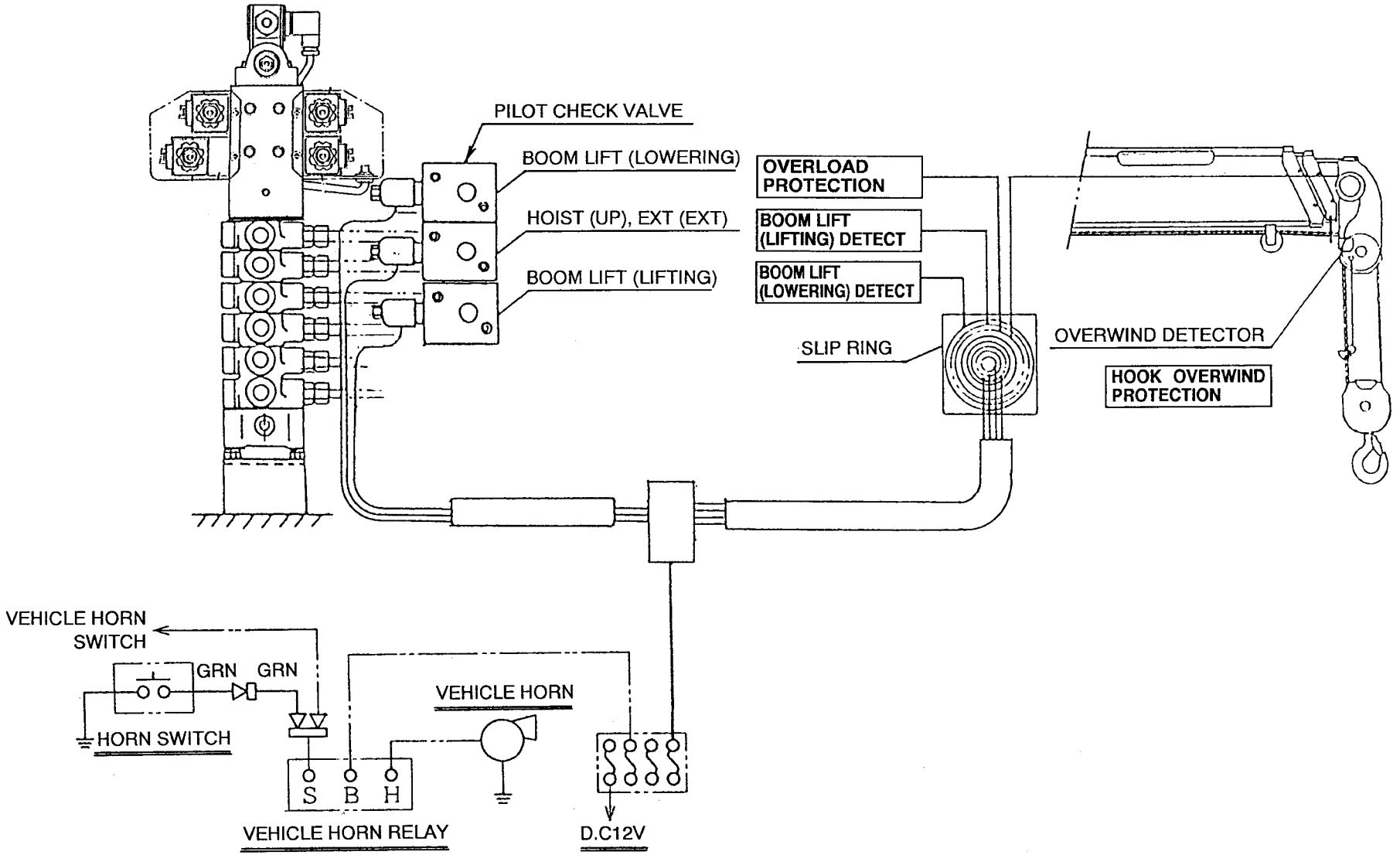
(2) Construction of holding valve ass'y (for extension cylinder)

※ The holding valve ass'y for extension cylinder has a wire in the part Ⓐ shown below (to prevent hunting when the extension cylinder is retracted).

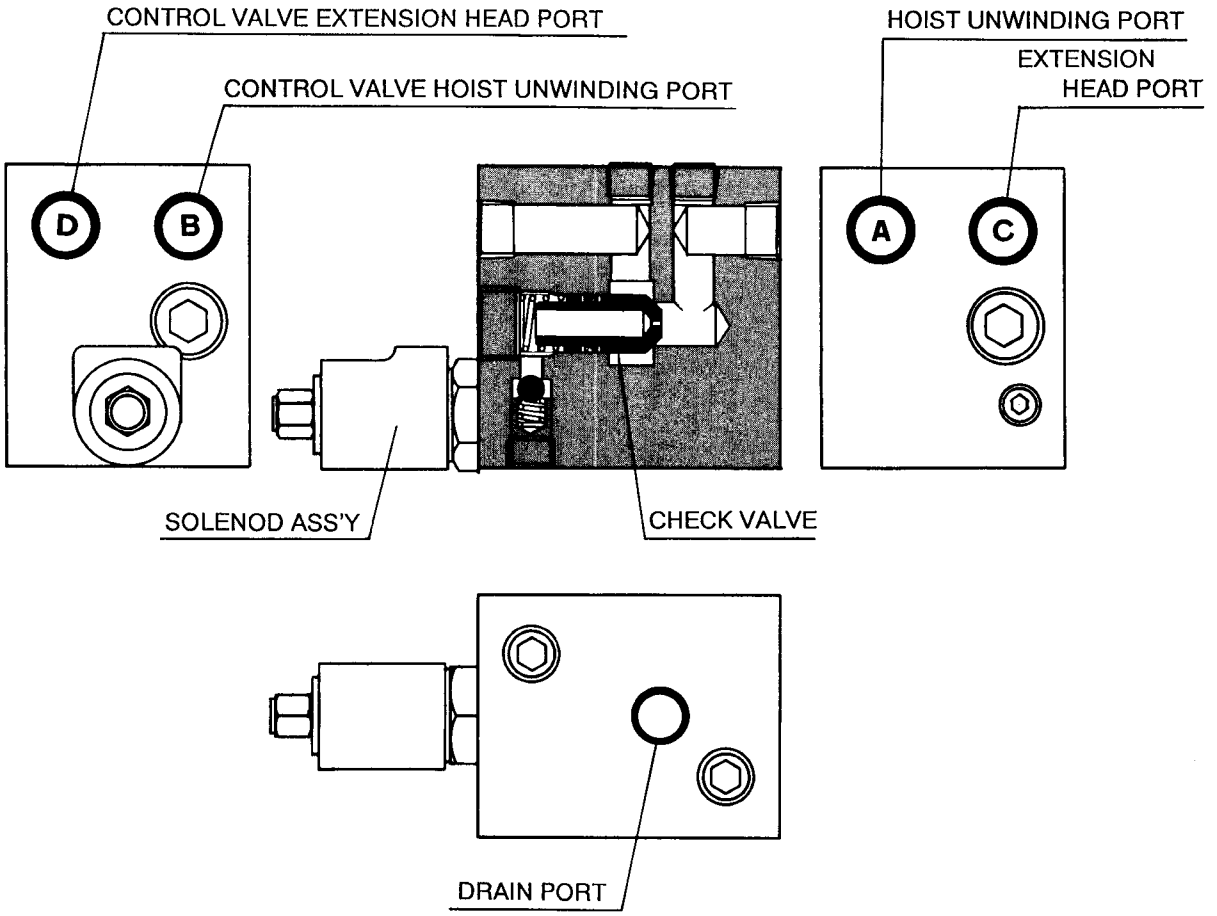


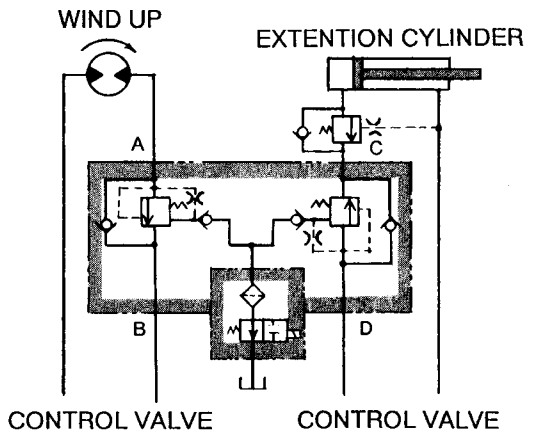
§14. MECHANISN of AUTOMAITC STOP

when any of the switches in safty device (for hook overwound protection, overload protection, and boom lift lifting/lowering detection) actuates. The pilot check valve blocks oil to stop the crane operation automatically.



1) Construction of Pilot Check Valve Ass'y





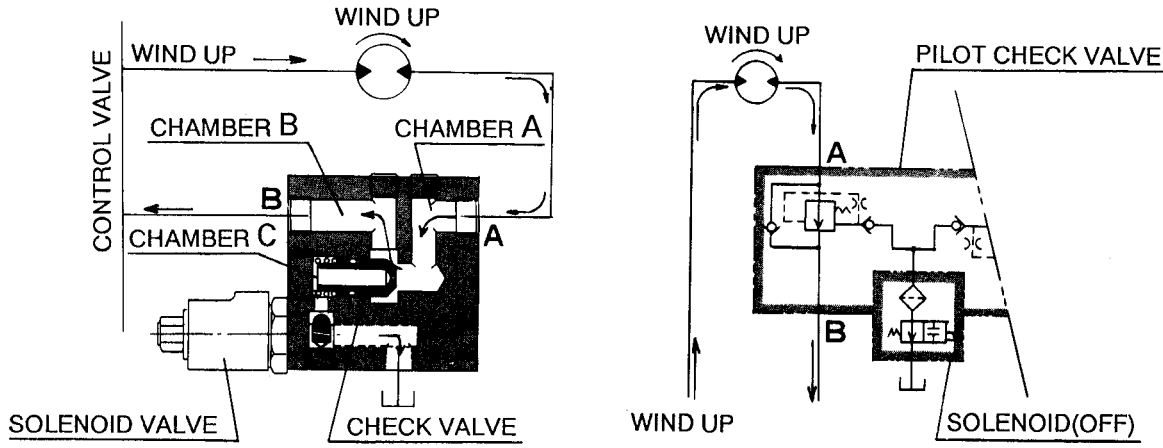
HYDRAULIC CIRCUIT

2) Description of Pilot Check Valve Operation

The pilot check valve is described as to oil flow through it and its check operation in winding/unwinding the hoist and extending/retracting the extension cylinders.

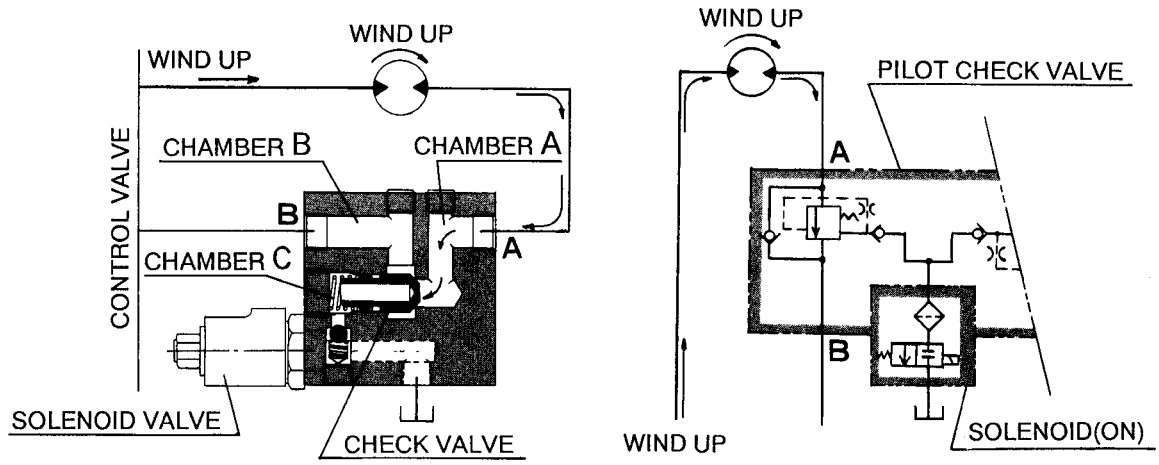
(1) Hoist winding (In normal operation state, over wind detector is ON and solenoid valve OFF.)

In normal operation, the over wind detector is ON and the pilot check valve's solenoid valve is OFF. The return port is open to the tank port, and the oil in chamber C flows into the tank. Thus, the return oil in chamber A from the motor pushes open the check valve to flow via chamber B and the control valve back into the tank. This causes the motor to drive the hoist to wind.



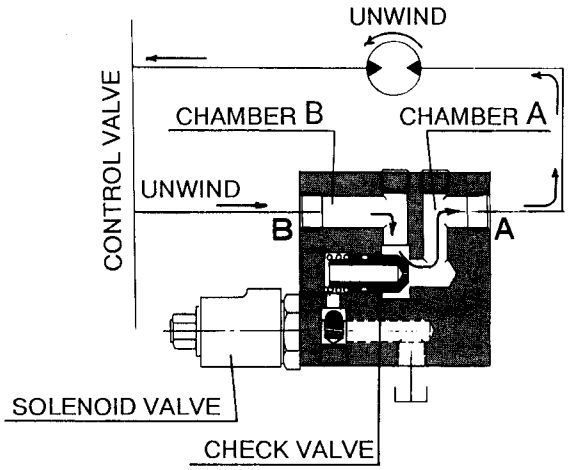
(2) Hoist winding stop (In overwound state, over wind detector is OFF and solenoid valve ON.)

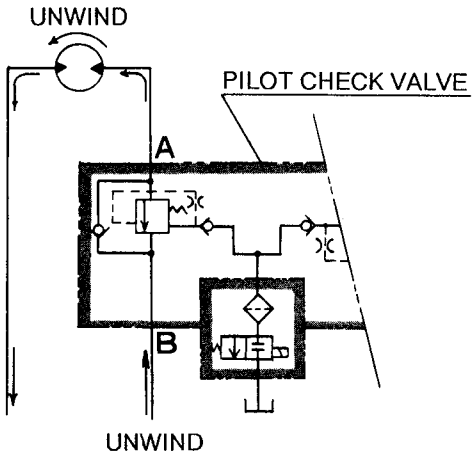
In an overwound state, the over wind detector turns off and the solenoid valve of the pilot check valve turns on. The operation of the solenoid valve closes the tank port so that the return oil in chamber A from the motor enters chamber C through the hole drilled in the check valve. Because the tank port is closed, chamber A and C become the same in pressure, and the check valve is pushed to the right due to the area difference between chambers A and C. Thus, the return oil in chamber A is shut off by the check valve, causing the motor to stop running and the hoist to stop winding.



(3) Hoist unwinding

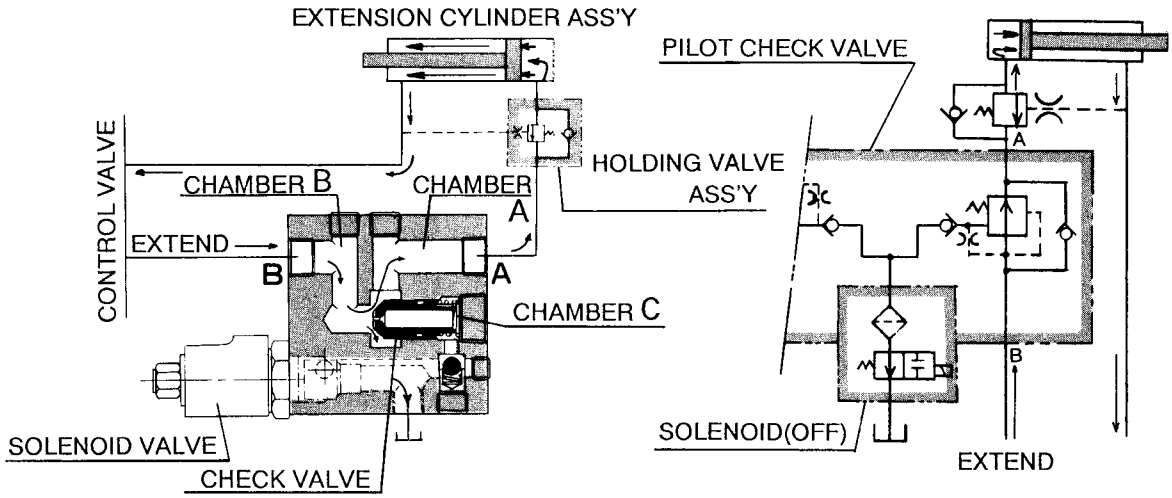
The oil entering chamber B from the control valve moves the check valve to the left to flow into chamber A and the unwinding end of the motor. The return oil from the motor flows via the control valve back into the tank, causing the motor to drive the hoist to unwind.





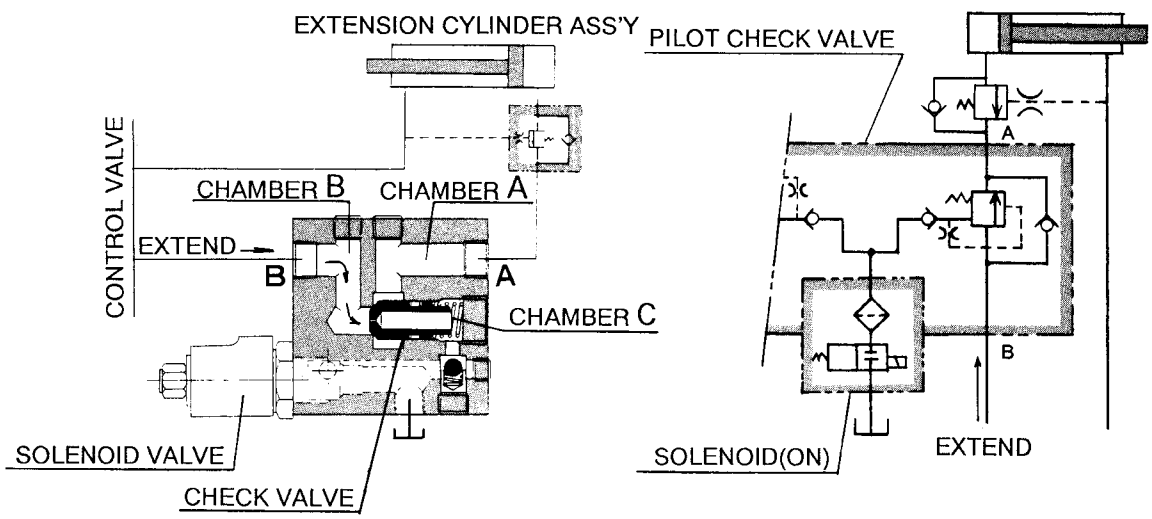
(4) Extension cylinder extending operation (In normal operating state, over wind detector is ON and solenoid valve OFF.)

In normal operation, the over wind detector is ON and the solenoid valve of the pilot check valve is OFF. The return port is open to the tank so that the oil in chamber C flows into the tank. Thus, the oil in chamber B from the control valve pushes the check valve open to flow into chamber A, from which it passes through the holding valve into the extending end of the cylinder to extend it.



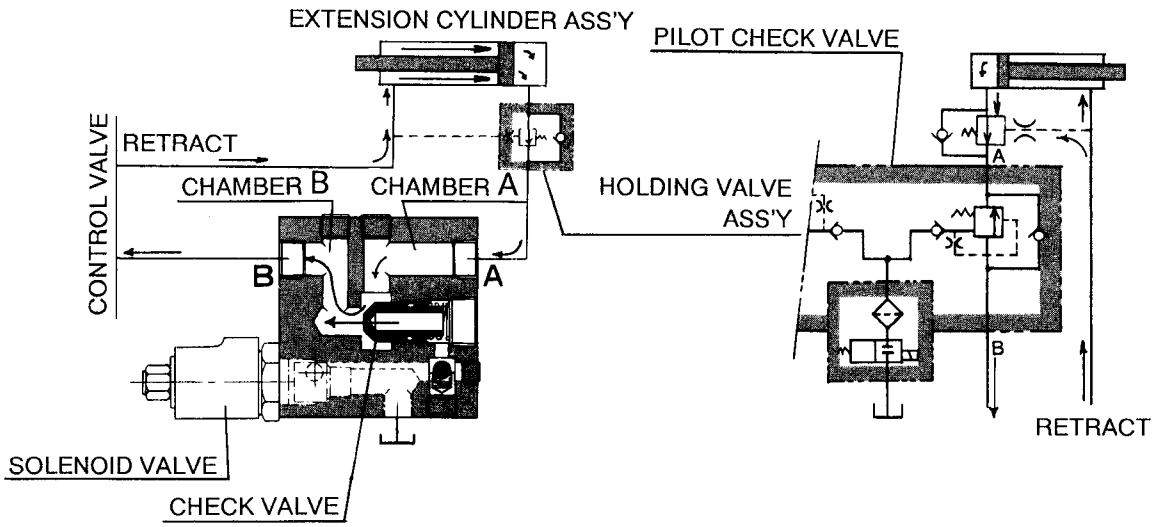
(5) Extension cylinder extension stop (In overwound state, over wind detector is OFF and solenoid valve ON.)

In an overwound state, the over wind detector turns off and the solenoid valve of the pilot check valve turns on. The operation of the solenoid valve closes the tank port so that the oil in chamber B from the control valve enters chamber C through the hole drilled in the check valve. Because the tank port is closed, chambers B and C become the same in pressure, and the check valve is pushed to the left due to the area difference between chambers B and C. Thus, the oil in chamber B is shut off by the check valve, and no longer flows into chamber A. This stops cylinder extending operation.

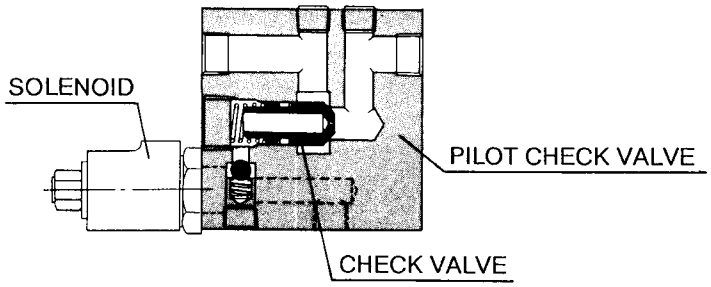


(6) Extension cylinder retracting operation

When the oil flows from the control valve into the retraction end of the cylinder, the oil in the cylinder pushing part flows via the holding valve into chamber A of the pilot check valve to move the check valve to the right. Thus, it flows into chamber B and returns to the tank via the control valve to retract the cylinder.



3) Check Point Troubles of Pilot Check Valve Ass'y

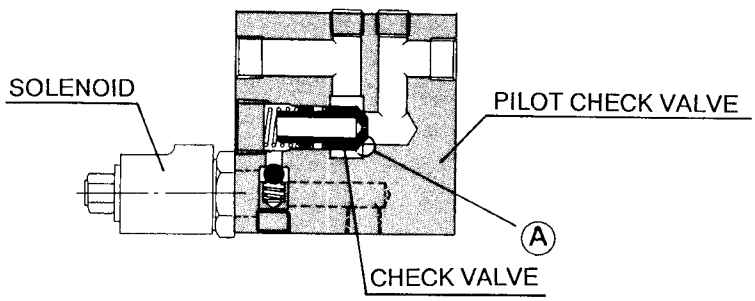


※ Hear discusses by taking an example of pilot check valve mounted in hoisting (winding) and extension cylinder (extending).

(1) Extension cylinder retracting operation

Either of hoisting (winding) or extension cylinder (extending) operates even when safety device is actuated. In this state, both of functions should normally stop operation because the oil is blocked by the pilot check valve.

(Possible cause): A foreign sabstance may caught in the check section of Ⓐ or Ⓑ where in trouble.



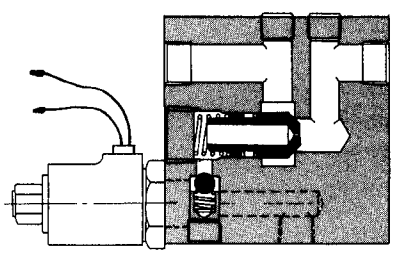
(2) Both of hoisting (winding) and extension cylinder (extending) operate when safety device is actuated even if voltage (12V) is applied to the solenoid wiring connections in the pilot check valve.

(Possible cause) : Defect in the solenoid ass'y of pilot check valve.

※ Check the solenoid for continuity.

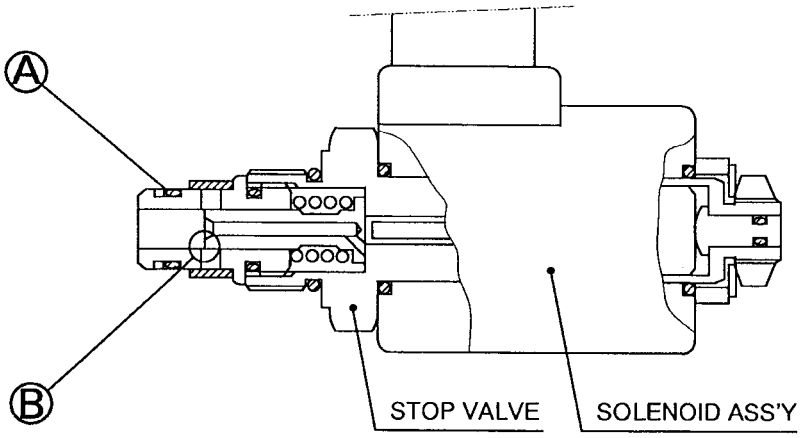
○ If there is no continuty, the solenoid is in defect. → Replace it.

○ If there is continuty, the solenoid is Normal. → Check the check valve.



(Normal coil resistance : 10 Ω)

※ **Check point of solenoid ass'y**



(Check point)

1. Ⓐ Section defect of O-ring.
2. Ⓑ Section check of spool head a foreign matter caught.

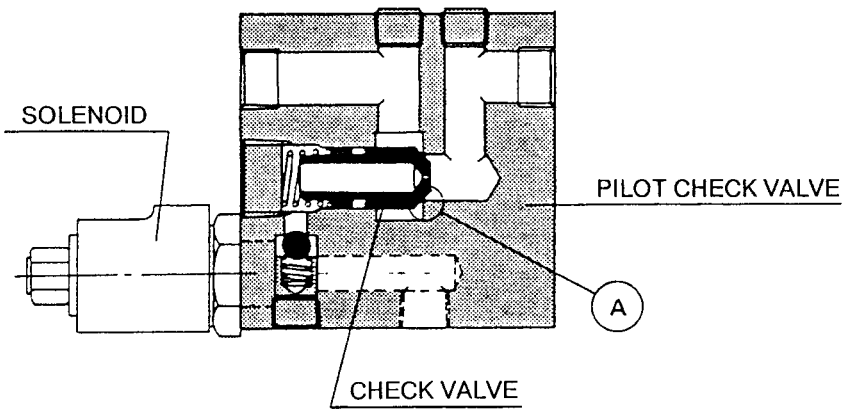
4) Troubleshooting

(1) Neither the hoist winds nor the extension cylinder extends in a normal operating state (not in an overwound state).

Suspected cause	Remedy
1. No electric power	Check.
2. Wire is broken somewhere between overwind detector and solenoids, or cable is disconnected from connection terminal.	Check cables and connection terminals.
3. Overwind detector defective	Check and repair or replace.
4. Cord reel defective	Check and repair or replace.
5. Solenoid of pilot check valve defective	Check and repair or replace.
6. Slip ring defective	Check and repair or replace.
7. Relay defective	Check and repair or replace.

(2) Either the hoist winds or the extension cylinder extends in an overwound state. Suspected cause:

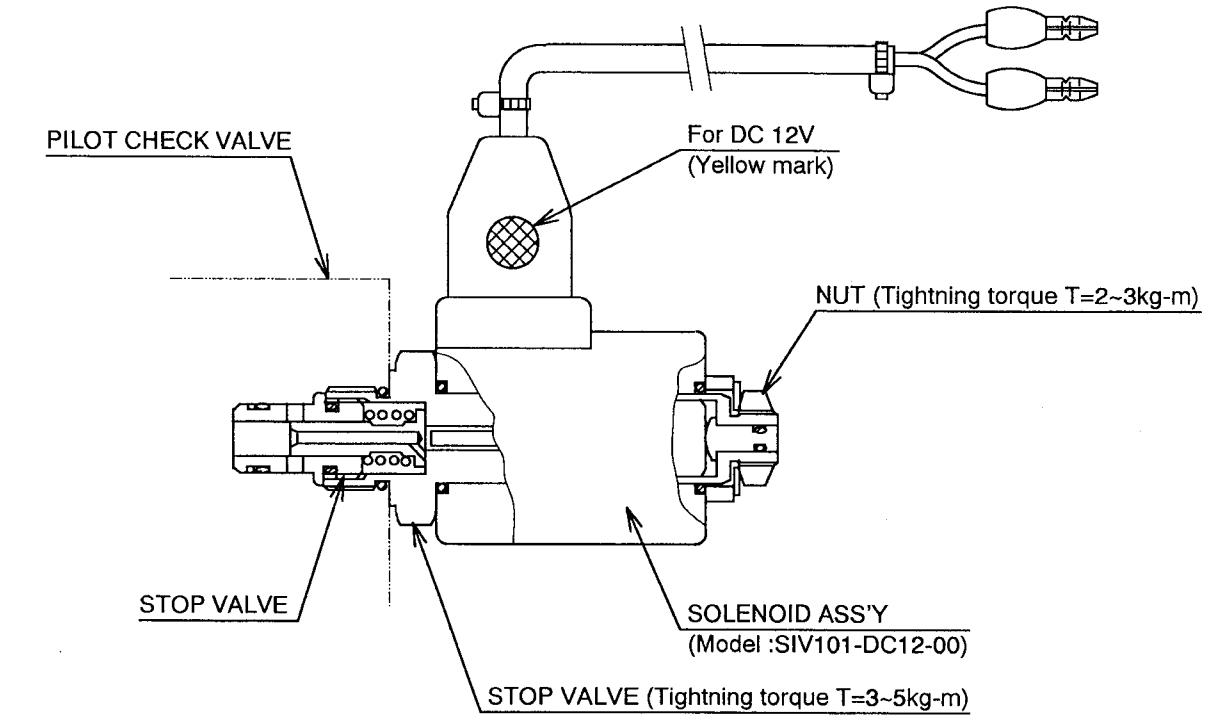
- Check the pilot check valve for foreign matter that might be caught in part Ⓐ.

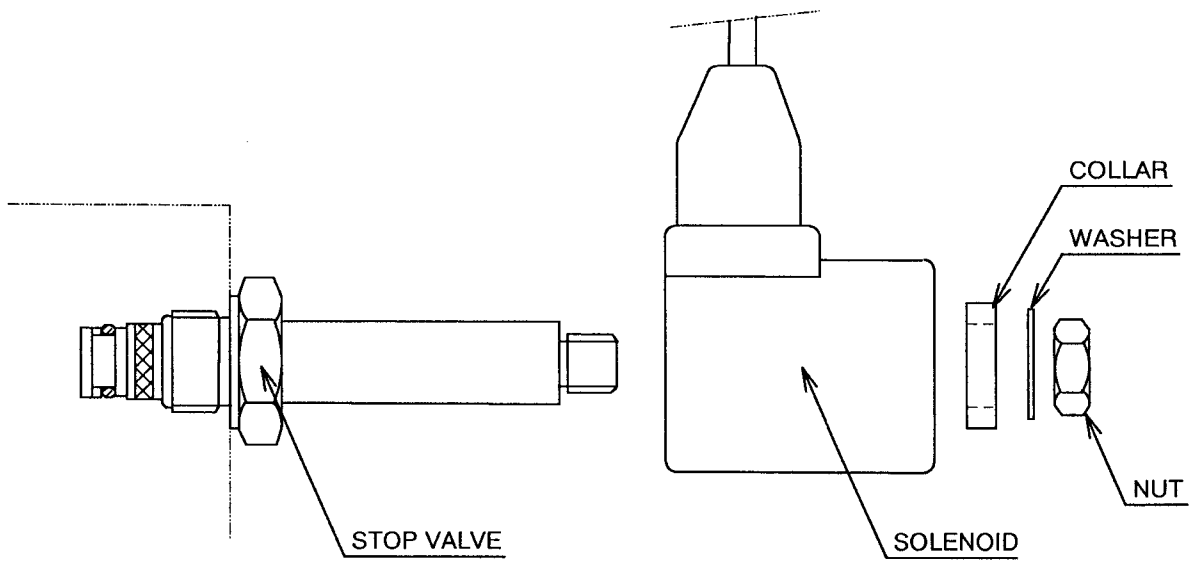


(3) Both the hoist winds and extension cylinder extends in an overwound state.

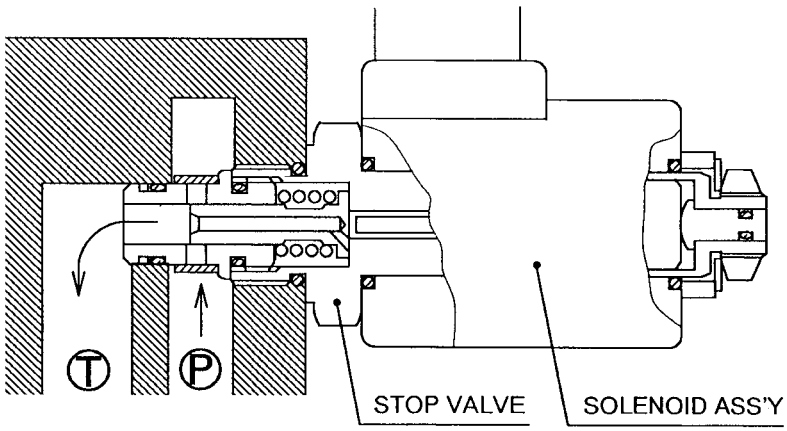
Suspected cause	Remedy
1. No electric power	Check.
2. Wrong wiring of power supply, relay, or solenoid.	Check
3. Overwind detector defective	Check and repair or replace.
4. Relay defective	Check and repair or replace.
5. Solenoid of pilot check valve defective	Check and repair or replace.

5) Construction of Solenoid Ass'y



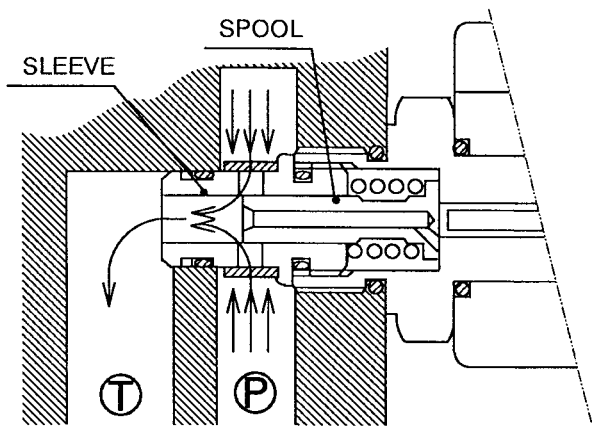


6) Description of Stop Valve Operation



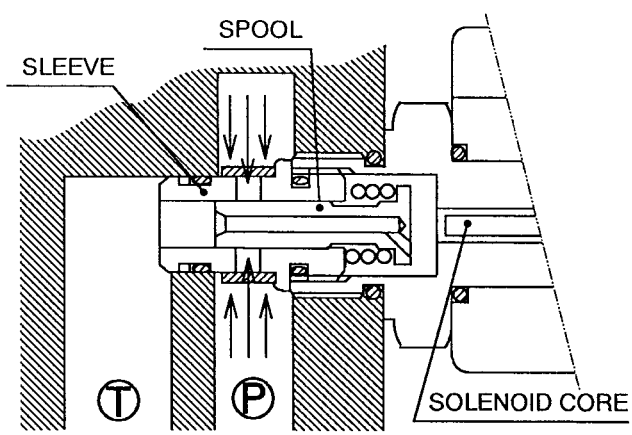
(1) Oil-flow when solenoid turns OFF

Since the hole in the sleeve is not blocked, oil from the port Ⓟ flows to the tank port as shown in the illustration.



(2) Oil -Flow when solenoid turns ON

Oil from the port Ⓟ is blocked as shown in the illustration because the solenoid core moves the spool to the left to block the sleeve hole with the spool when the solenoid turns ON.



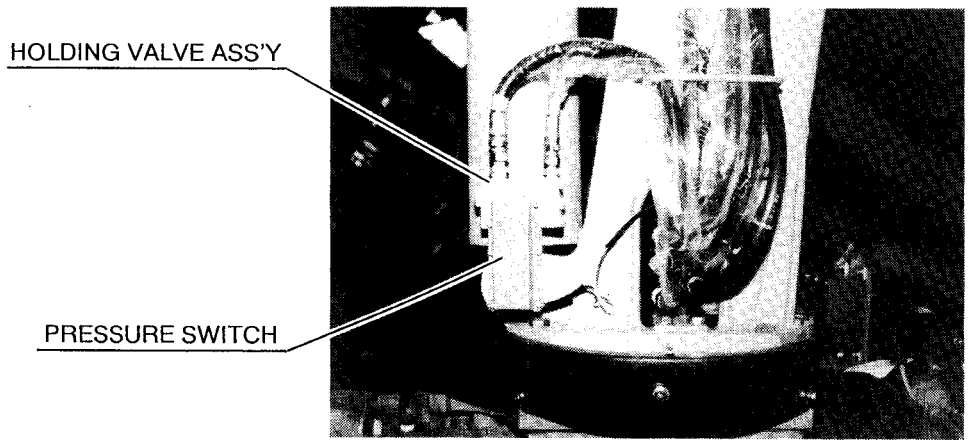
§15. MOUNTING OF SWITCHES IN SAFETY DEVICE

1) Mounting of Pressure Switch (for Overload protection)

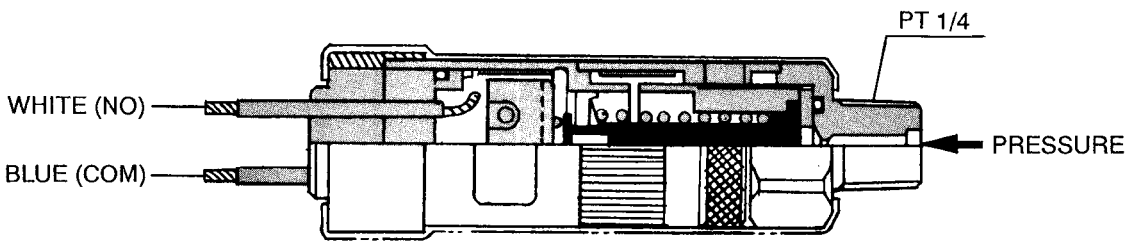
Internal pressure in the boom lift cylinder is detected by the pressure switch to turn the switch (ON) when a load reaches the set level.

※ Pressure switch actuates when internal pressure in the boom lift cylinder reaches the set pressure of 130kg/cm².

(1) Where it is mounted



(2) Constructions of pressure switch



※ Wiring the pressure switch :

Connect white lead (No) to power line (12V) and blue lead (COM) to the machine body ground.

(Check for pressure switch)

Check the pressure switch for continuity between white lead (NO) and blue lead (COM) with no load and no pressure applied.

○ If there is no continuity, the switch is in normal.

○ If there is continuity, the switch is in defect.

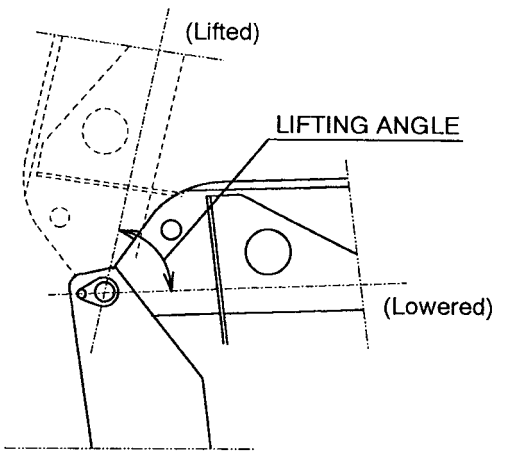
2) How to Attach Limit Switches Boom Lifting (lifting/lowering)

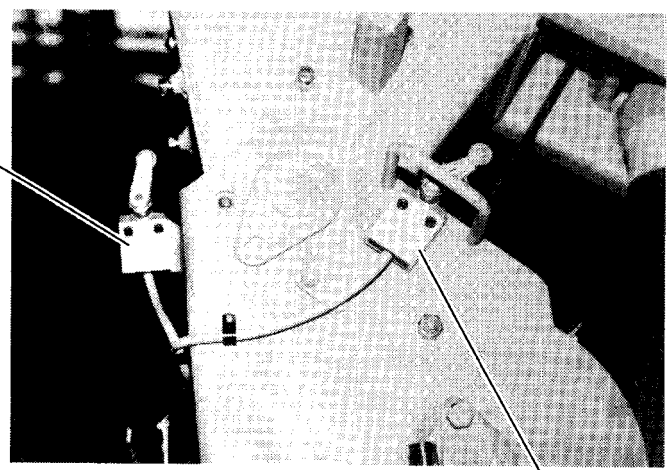
Since overload preventing for hoisted load is carried out by detecting internal pressure in the cylinder by the pressure switch, set each limit switch to a position before cylinder stroke ends to prevent the cylinder from extending or retracting further to its stroke ends.

(How to adjust)

Position each limit switches for boom lifting where it actuates when the boom lift cylinder comes to 5mm before its stroke ends.

1. It must actuates when boom is lowered to 2° thru 3°
2. It must actuates when boom is lowered to 76° thru 77°



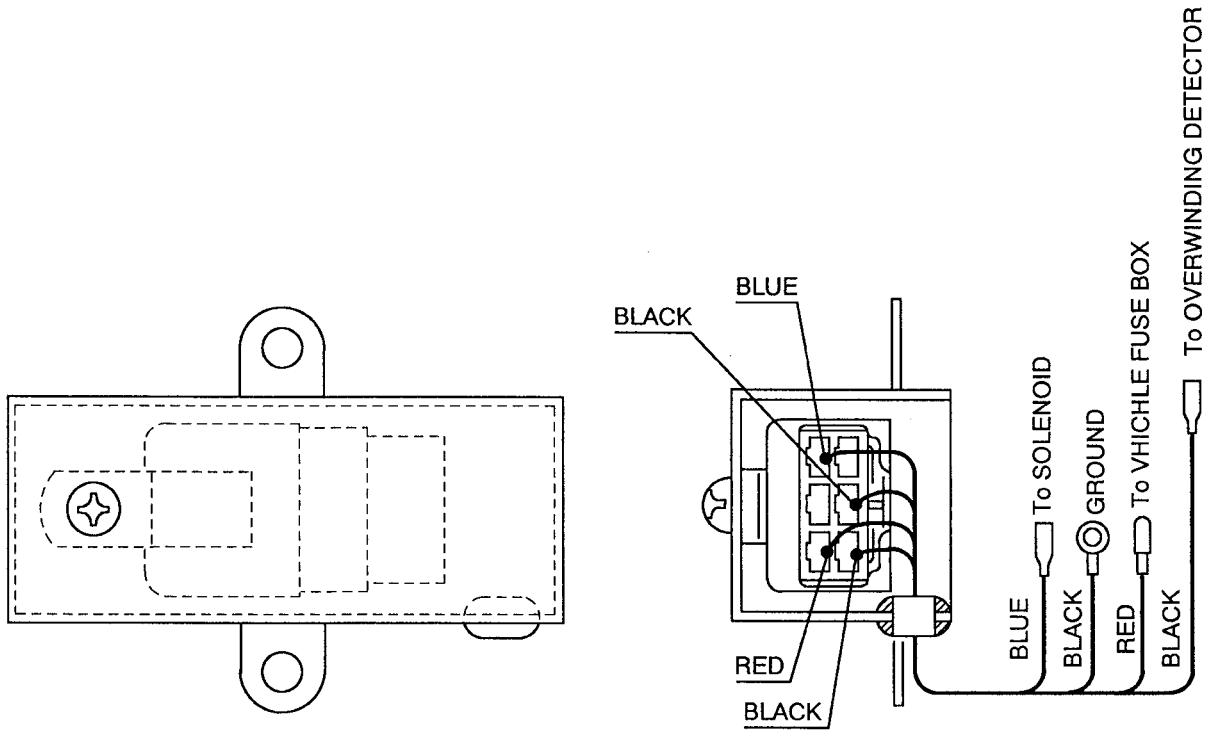


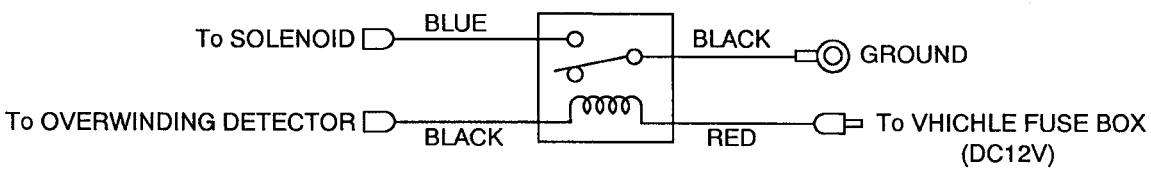
3) Relay

(1) Relay

Overwound detector turns OFF When the crane is under being overwound, which should normally be turned ON.

The relay connects the ground wire of pilot check valve solenoid for housing (winding) and extension cylinder (extending) with the ground to allow the crane actione as the detector turns OFF.

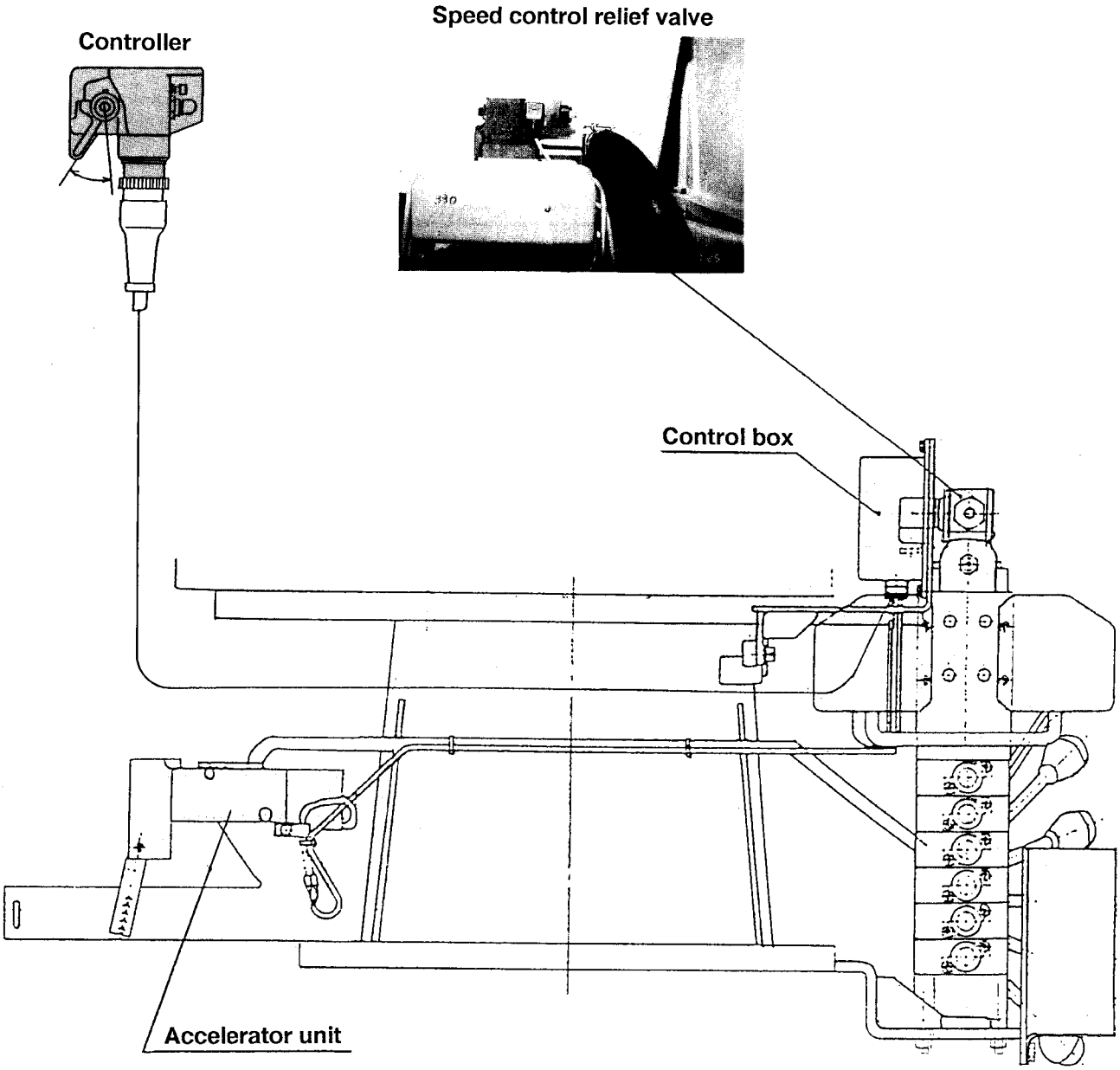




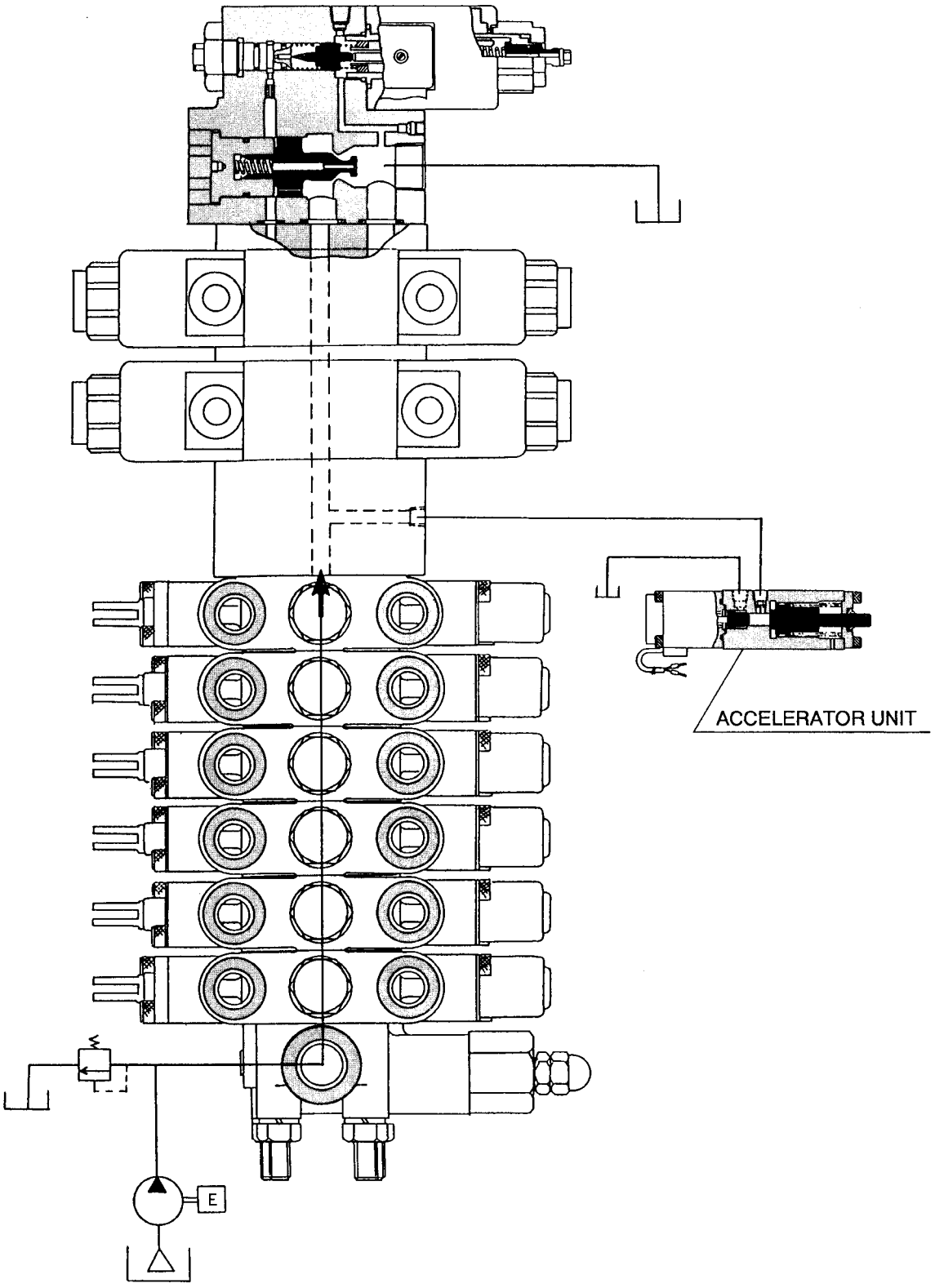
§18. REMOTE CONTROL DEVICE

1) Basic Outline of Remote Controller

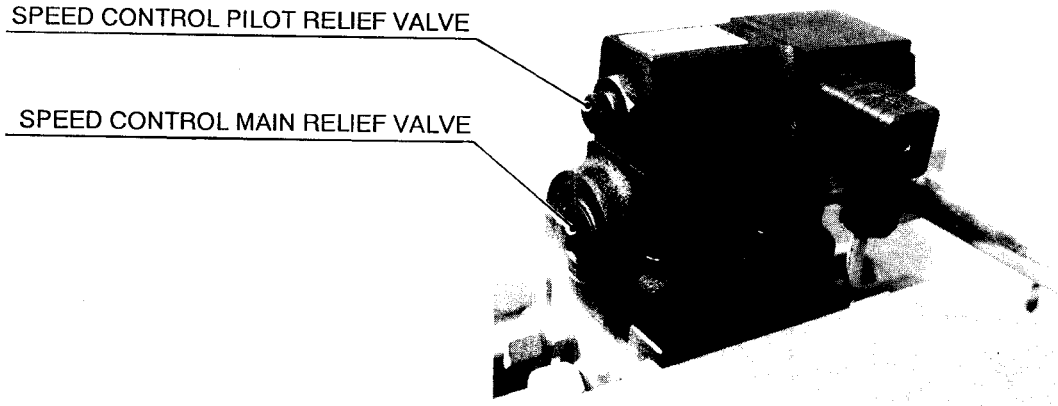
When the pictured devices are mounted on the standard crane, it can be operated according to the remote control specifications.



4) Oil-flow from Control Valve to Remote Control Valve...



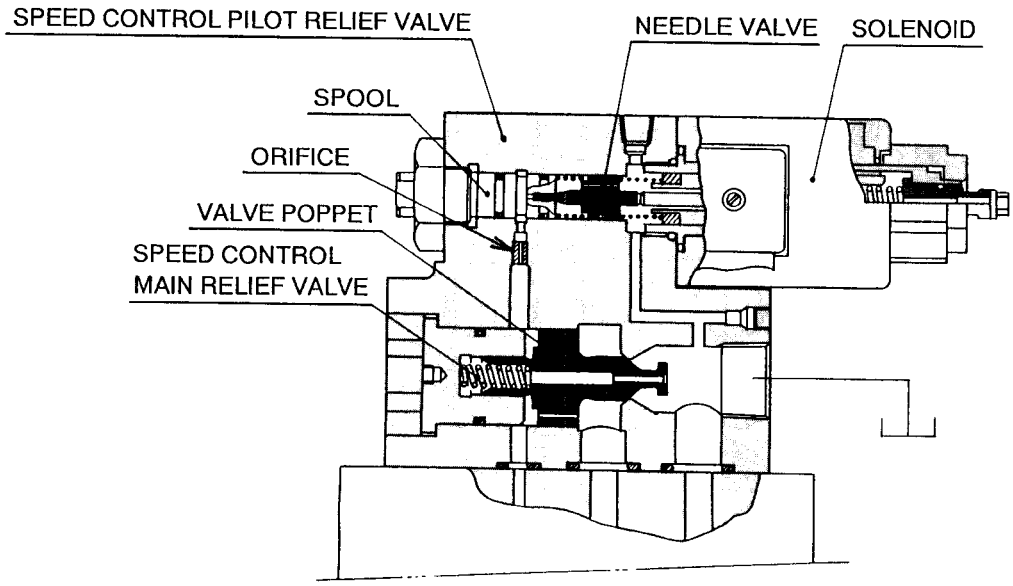
5) Construction and Operation of Speed Control Relief Valve



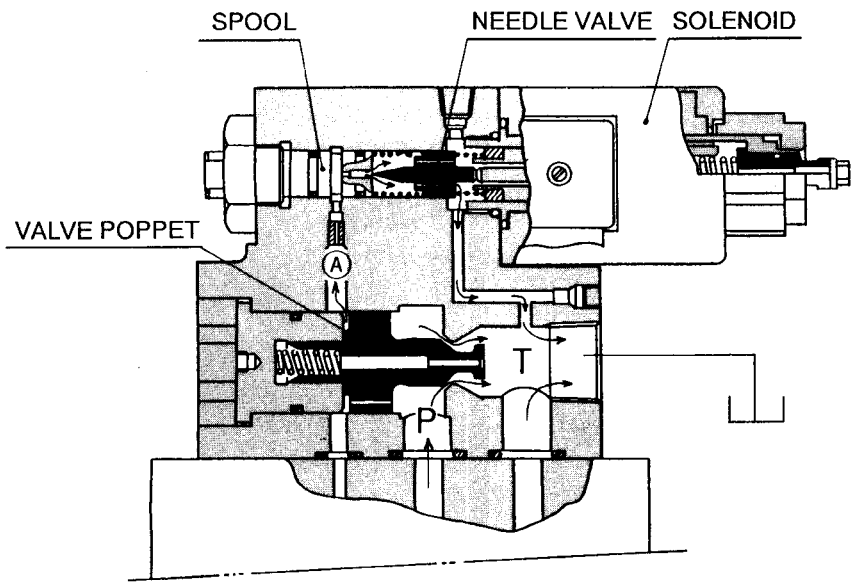
A) Construction

The speed control relief valve consists of a pilot relief valve and a main relief valve.

When the lever is pulled with the control switch on the controller turned on, the solenoid is activated so that the speed control pilot relief valve and the main relief valve control oil flow rate which in turn controls oil pressure in the P chamber.



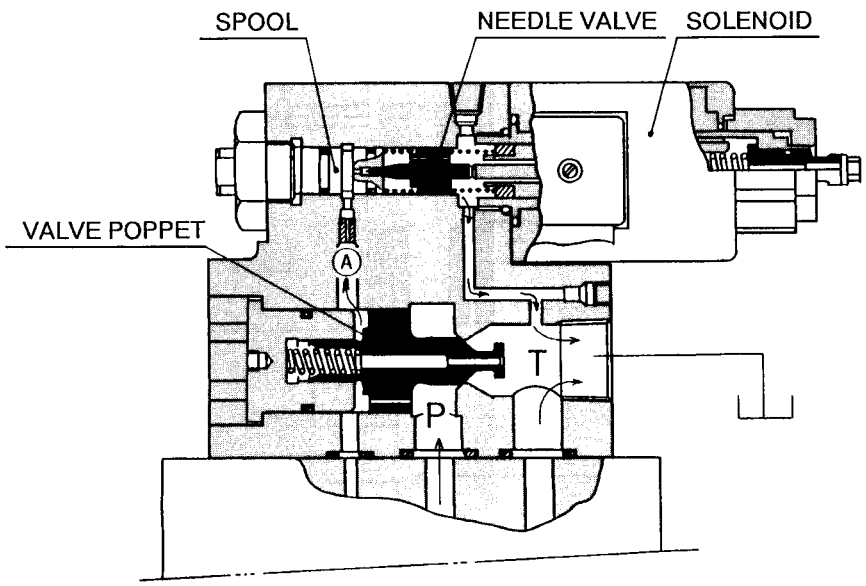
B) Speed control (when the controller is not functioning)



When the controller is not operated, oil pressure in the chamber A is low because the oil out of chamber A is flowing from choke section in the needle valve to the tank port.

As a result, the valve poppet moves to left hand side due to the area difference so that the oil out of the P port flows into the tank port.

C) Speed control (when the controller is functioning)

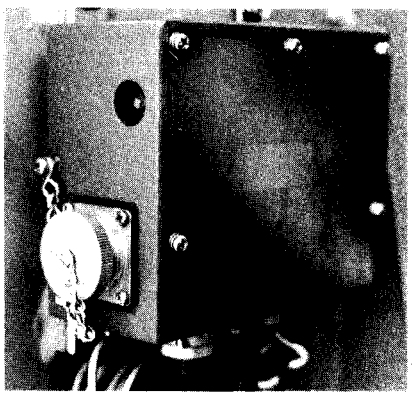


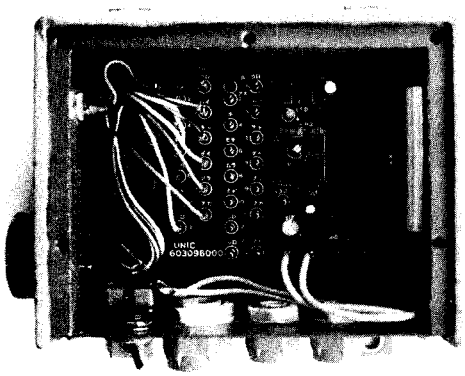
When the lever is pulled with the control switch on the controller turned on, the solenoid is activated so that it presses the needle valve against the spool.

As a result, the oil from chamber A is restricted at choke section in the needle valve so that flow rate of oil coming from the P port is controlled and the speed is controlled by regulating the oil pressure proportionally.

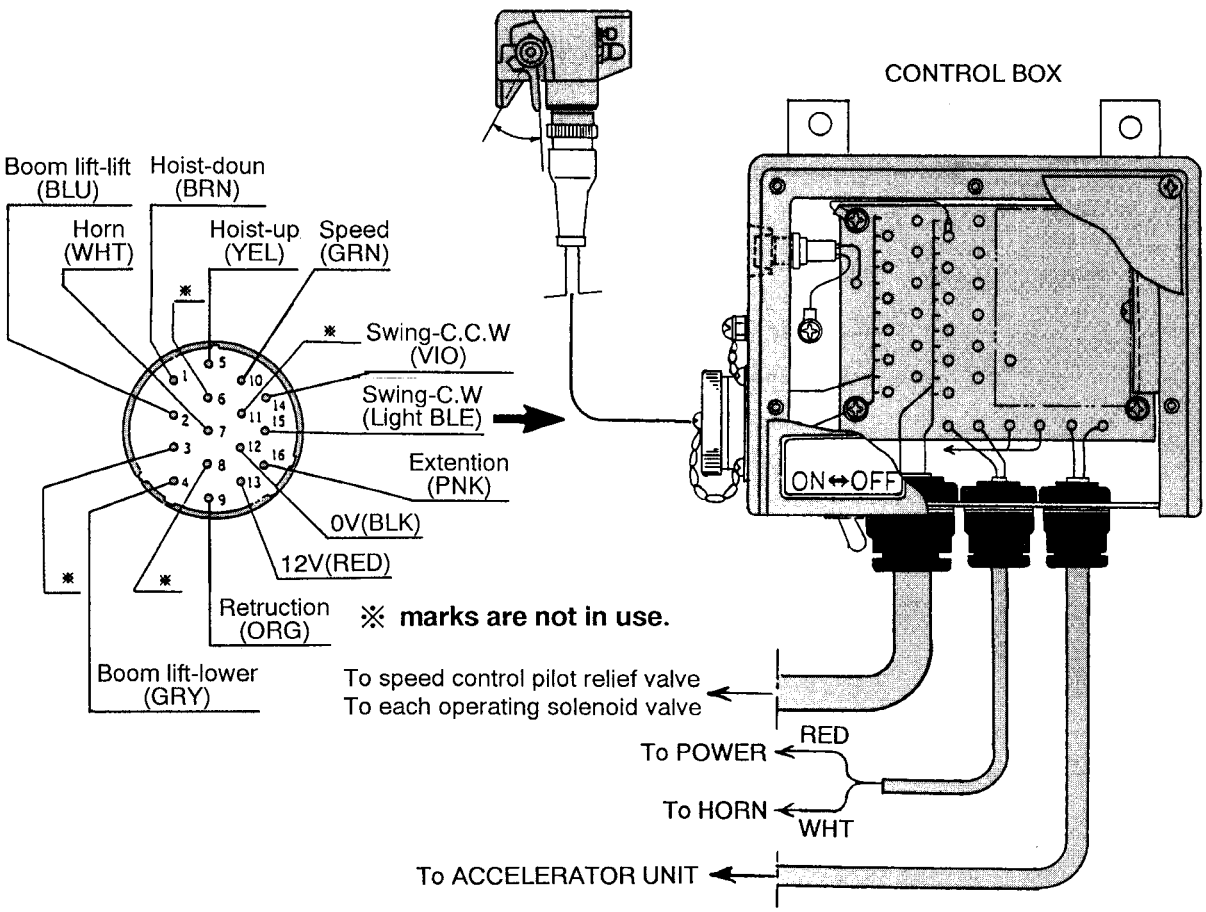
6) Construction of Control Box

The control box is a junction box which accepts power supplied from chassis to connect it to the speed control relief valve and the accelerator unit, and controls operating instructions provided to the speed control relief valve, each operating solenoid valve, and the accelerator unit through remote controller operation.





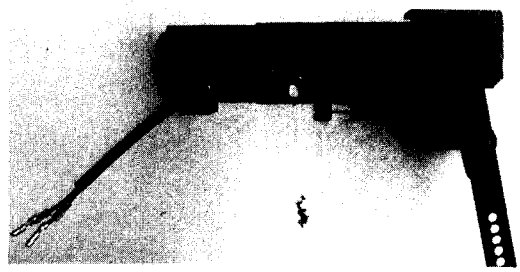
(Construction)



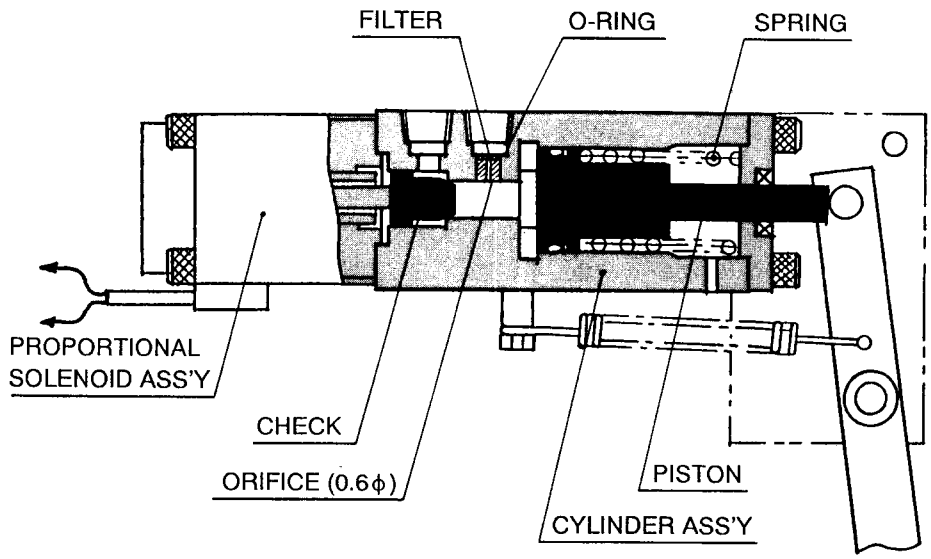
7) Construction of Accelerator Unit

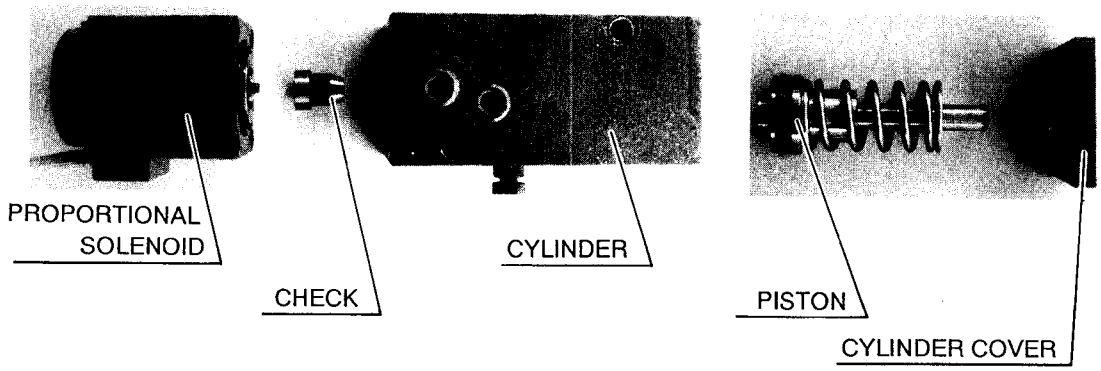
The accelerator unit is constructed by combining a proportional solenoid with a cylinder.

When the lever is pulled with the control switch on the controller turned on, the cylinder rod is extended to move the lever in the accelerator unit which in turn activates the accelerator cable.



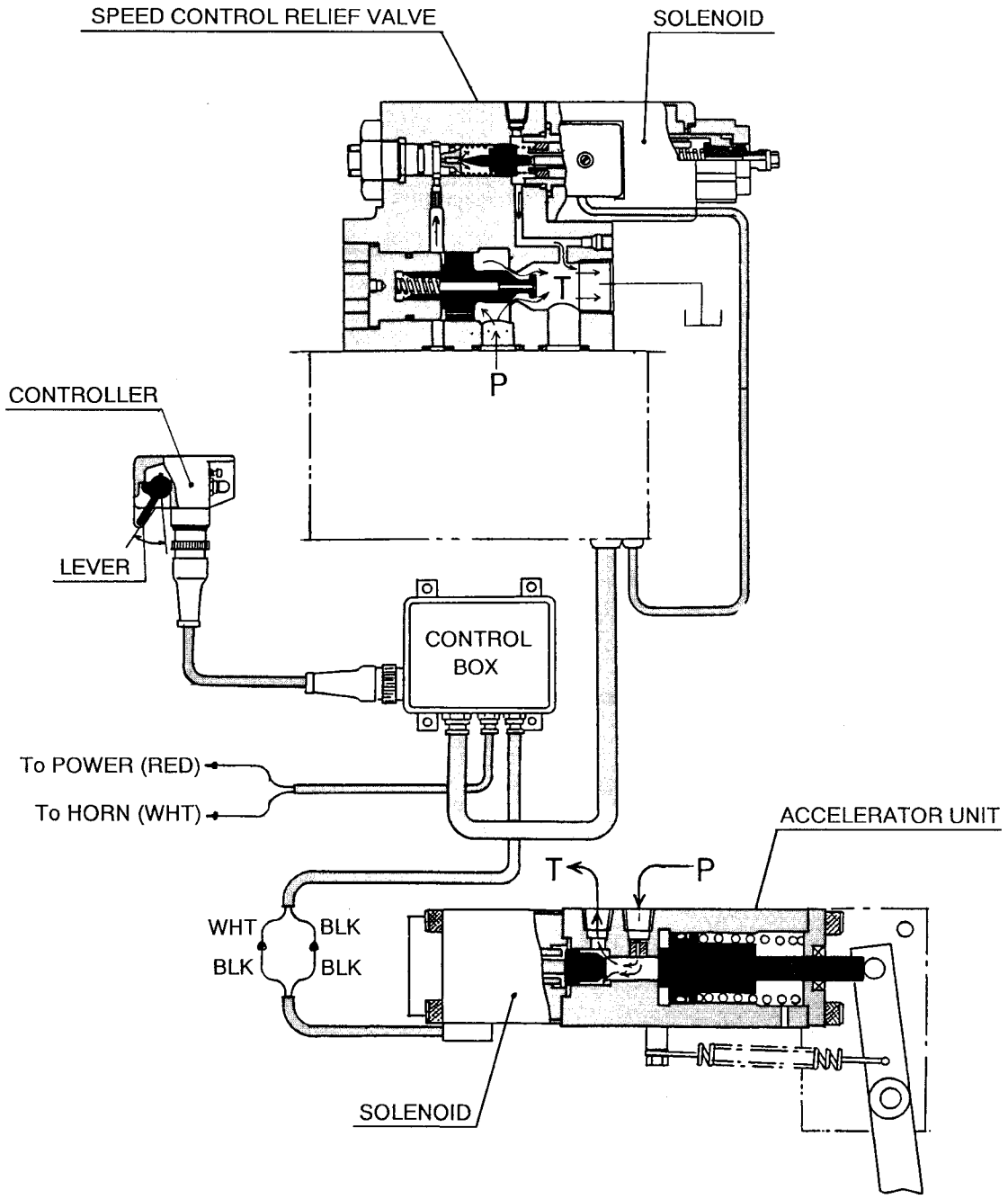
(Construction)





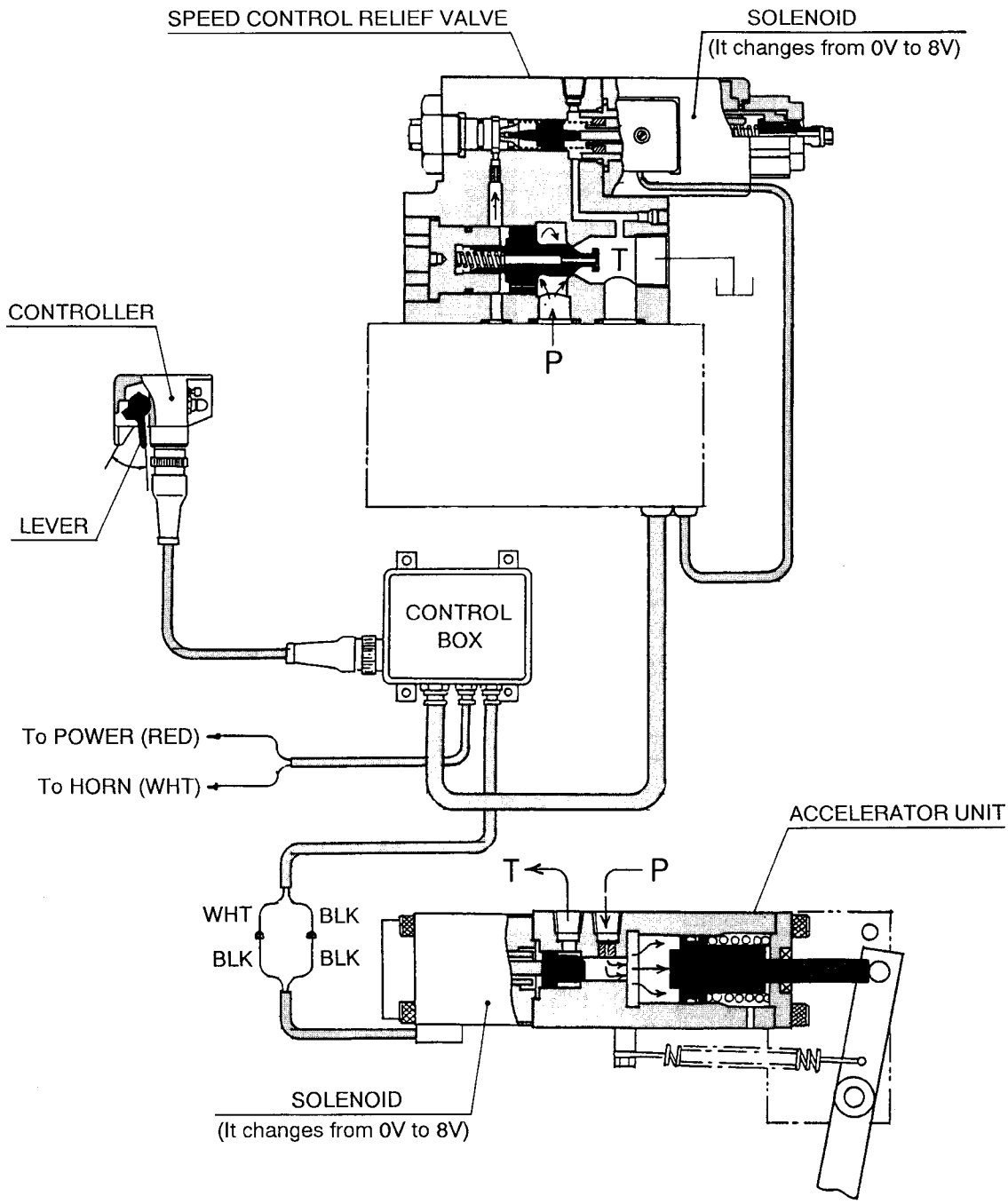
8) Model RC-30S (Operation of remote controller)

A) Oil-flow when it is not functioning



When the lever on the controller is not pulled, the speed relief valve and the solenoid in the accelerator unit are not functioning so that oil coming from P port flows into the tank.

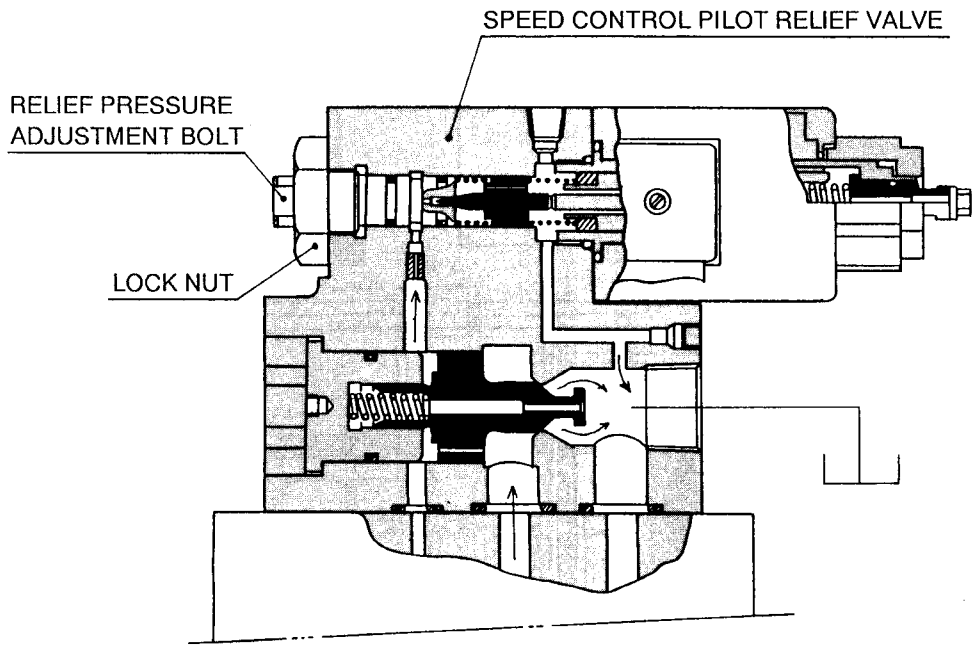
B) Oil-flow when it is functioning



When the lever is pulled with the control switch on the controller turned on, the speed control relief valve and the solenoid in the accelerator unit are activated so that oil-flow coming from the P port is controlled and the speed is controlled by regulating oil pressure in the P port proportionally.

9) How to Adjust The Pilot Relief Valve for Speed Control

When the speed control pilot relief valve has been overhauled, conduct pressure adjustment as illustrated below.



A) Preparation before adjustment

(1) Attach a pressure gauge, capable of measuring more than 3555.68 PSI (250kg/cm^2=24.52 MPa) of pressure, to the pressure output port in the control valve.

(2) Remove the controller in advance.

B) Adjustment

(1) Start the engine and rotate the hydraulic pump by engaging PTO.

(2) Loosen the lock nut for the relief pressure adjustment bolt in the speed control pilot relief valve.

(3) Turn clockwise the relief pressure adjustment bolt slowly until the pressure reaches the following set pressure of the crane.

UR343-C ---------- P=2488.98 PSI (175kg/cm^2=14.16 MPa)

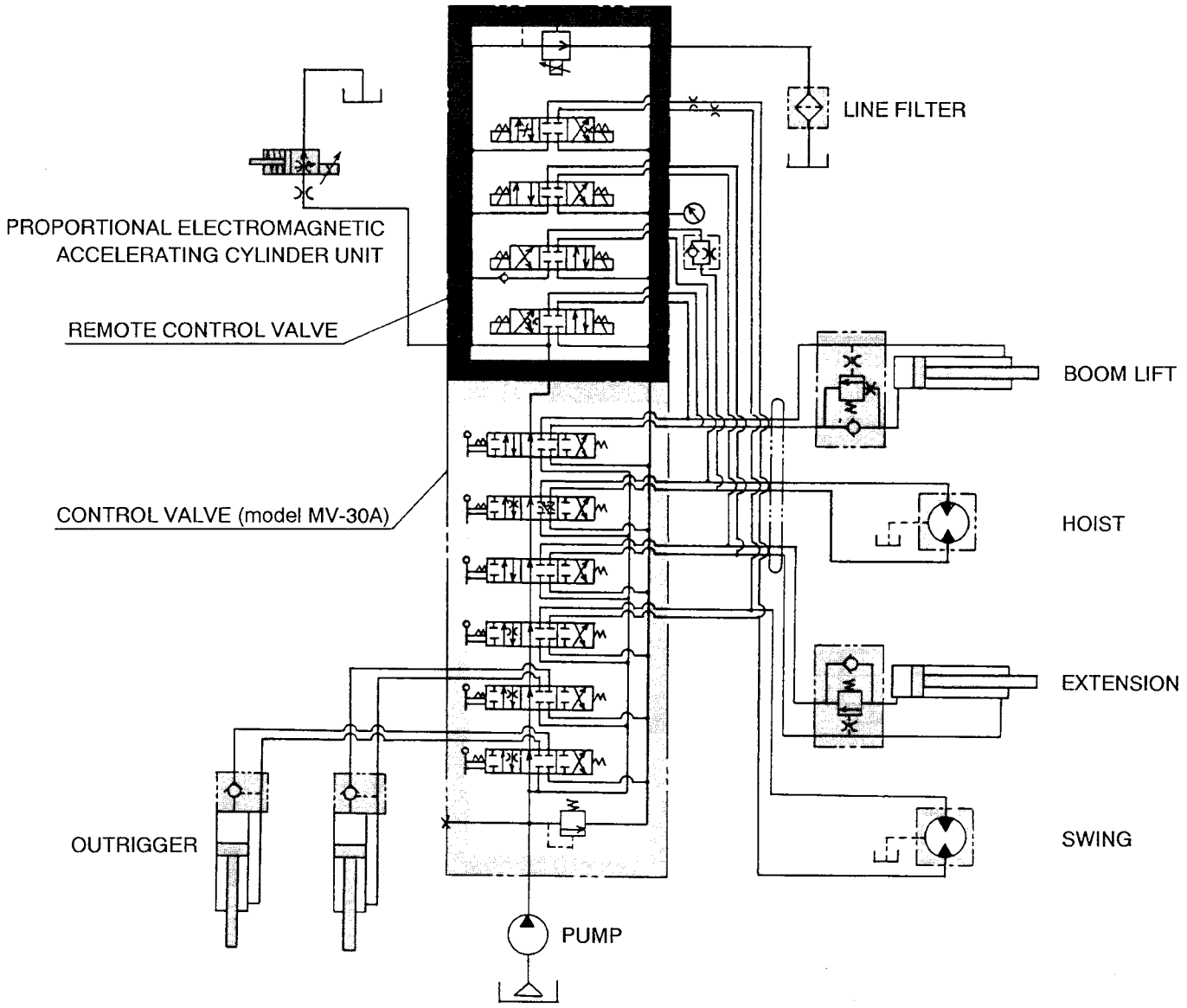
(4) Turn counterclockwise the relief pressure adjustment bolt to loosen it after making sure that the correct pressure reads on the pressure gauge.

(5) Lower the pressure to read 142.23 PSI (10kg/cm^2=0.98 MPa) (minimum pressure) on the pressure gauge.

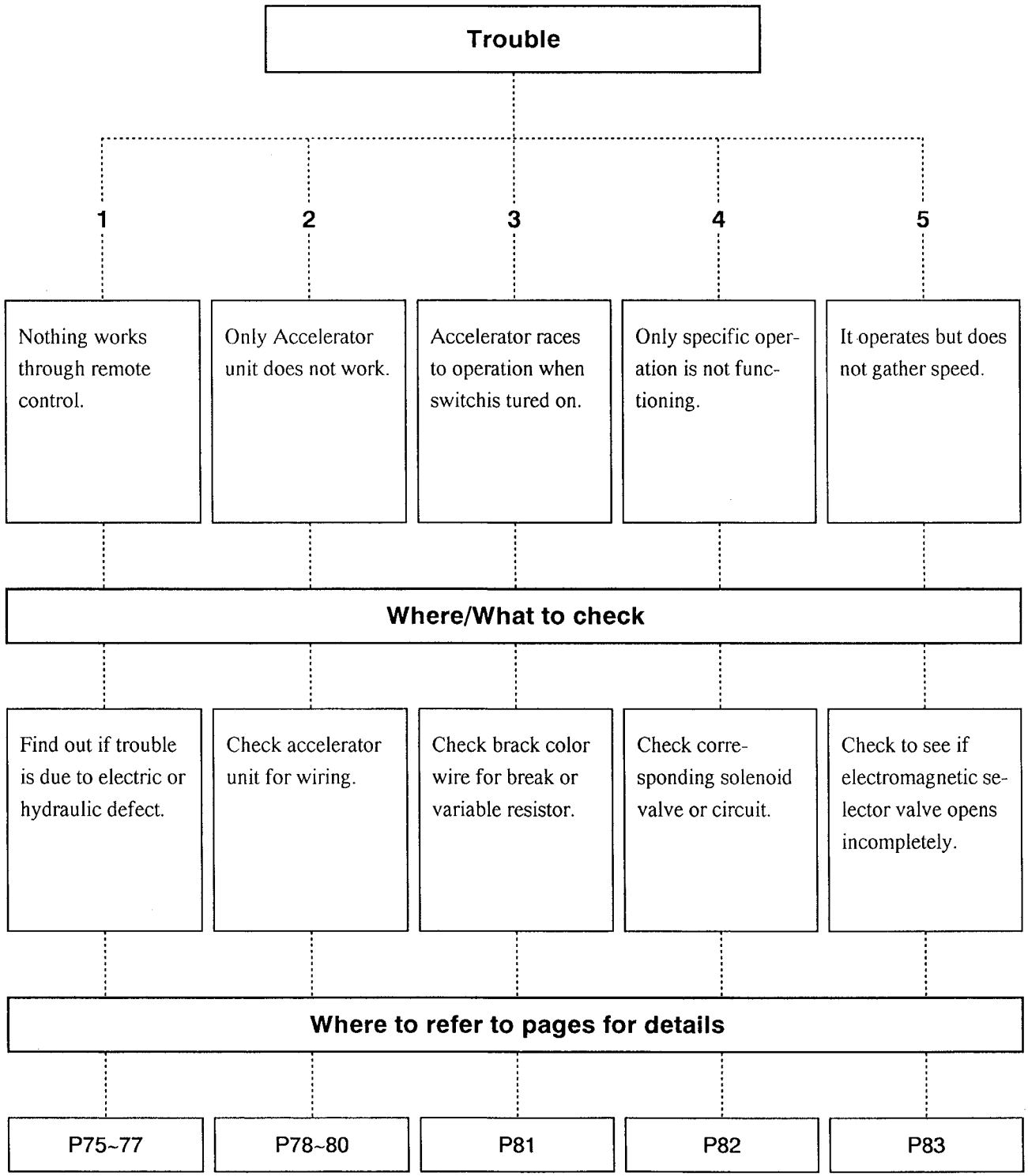
(6) Secure the relief pressure adjustment bolt at this position and lock it with the lock nut.

This concludes the adjustments.

9) Hydraulic Schematic (with Remote control valve)

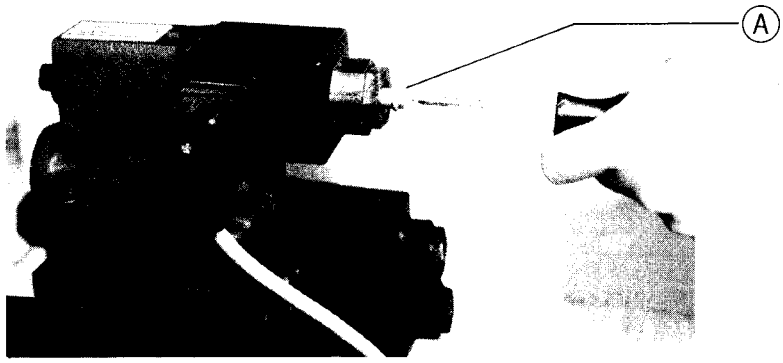


11) Trouble-shooting Procedures for Remote Controller (Model RC-30S)

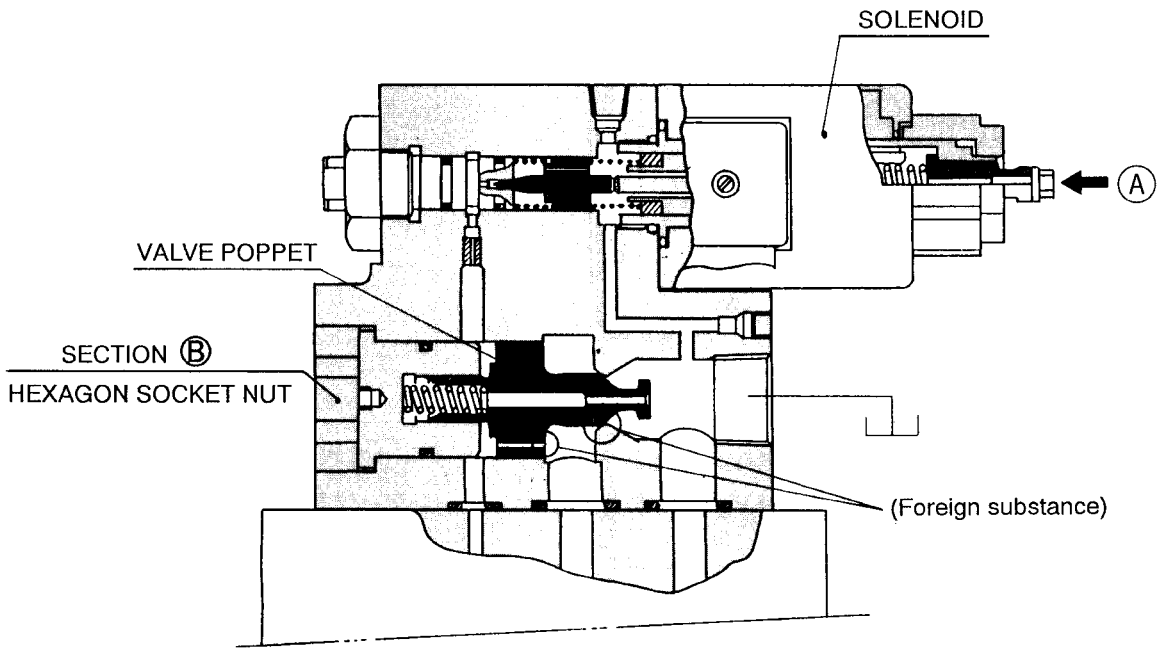


A) Nothing works through remote control.

To make sure whether the speed control relief valve is in electric or in hydraulic trouble, try to push the point A of the solenoid in the speed control pilot relief valve with a screwdriver as illustrated.



(1) When it is in hydraulic trouble;



ⓐ No operating (hissing) sound coming from the relief valve is heard.

ⓑ Pressure does not build up even after pressure has been confirmed.

(Possible causes)

Foreign substances may be stuck in the valve poppet section as shown in the illustration above.

(Corrective measures)

Unsighted the hexagon socket nut located in section B and extract the valve poppet to make overhaul cleaning.

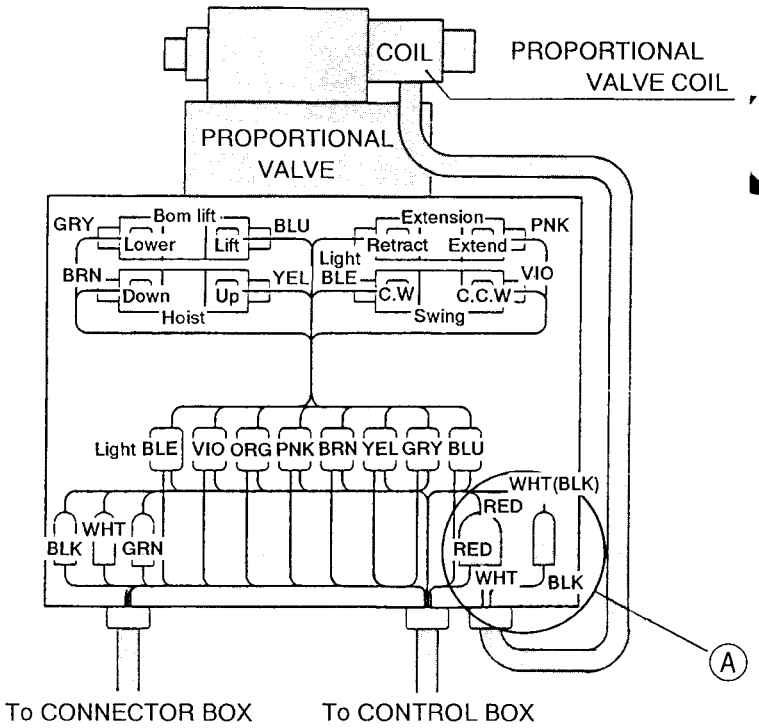
(2) When it is in electrical trouble;

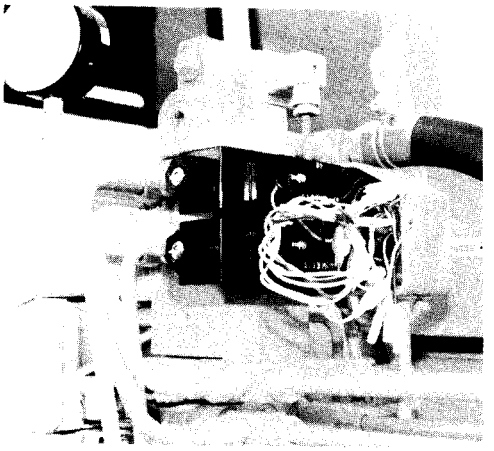
If pressure build up when the point Ⓐ of the solenoid in the speed control pilot relief valve is pushed, the trouble is in electrical area.

Check it as follows:

ⓐ Check to use if the fuse is not blown and DC12V power supplied from chassis is applied into the control box.

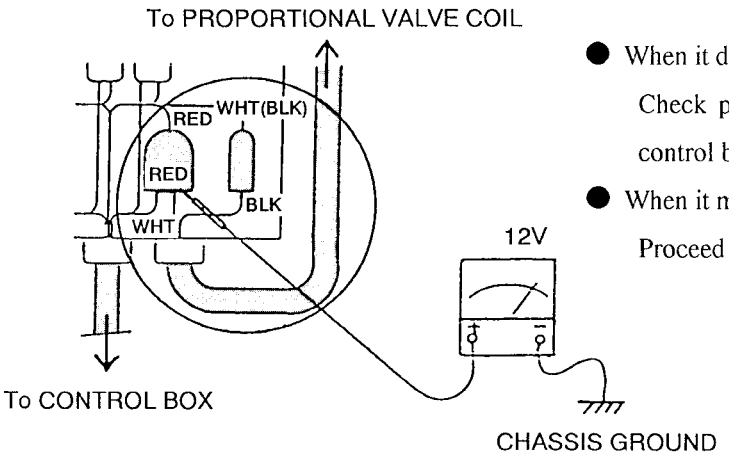
ⓑ Remove the cover for the 1/4 electromagnetic selector valve to check the wiring inside.





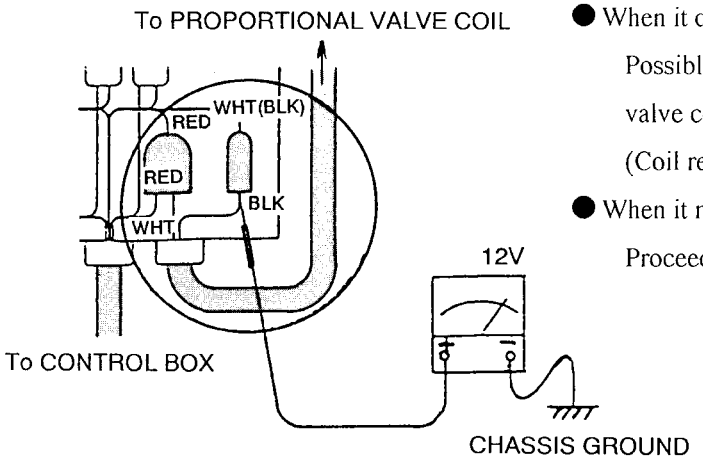
ⓒ Check voltage using a circuit tester at the terminals shown within the point Ⓐ in the above illustration where white wire and black wire from the proportional valve are connected.

① Check to see if the voltage between the terminal, where white and red wires lead from proportional valve are terminated, and the chassis ground measures DC12V.



- When it does not measure DC12V ➡ Failure.
  Check power wiring led from the chassis to the control box.
- When it measures DC12V ➡ Normal.
  Proceed to next stop ②.

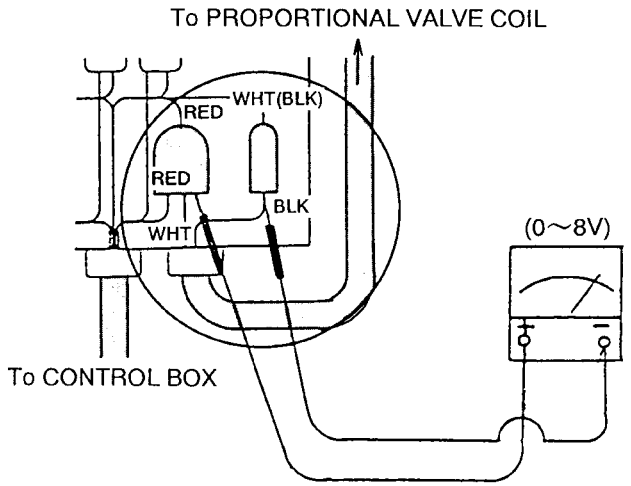
② Check to see if the voltage between the terminal, where 2(two) wires of black and white/black coming from proportional valve are terminated, and the chassis ground measures DC12V.



● When it does not measure DC12V ➡ Failure.
Possible causes may be break of proportional valve coil or poor contacts at the connector.
(Coil resistance should be approx. 6 Ω)

● When it measures DC12V ➡ Normal.
Proceed to next step ③.

③ Check to see if the voltage between terminals changes 0V to 8V as the controller lever is being pulled with the plus (+) probe of circuit tester connected to one terminal (where white and red wires are terminated) and minus (－) probe to other terminal (where black and black/white wires are terminated).



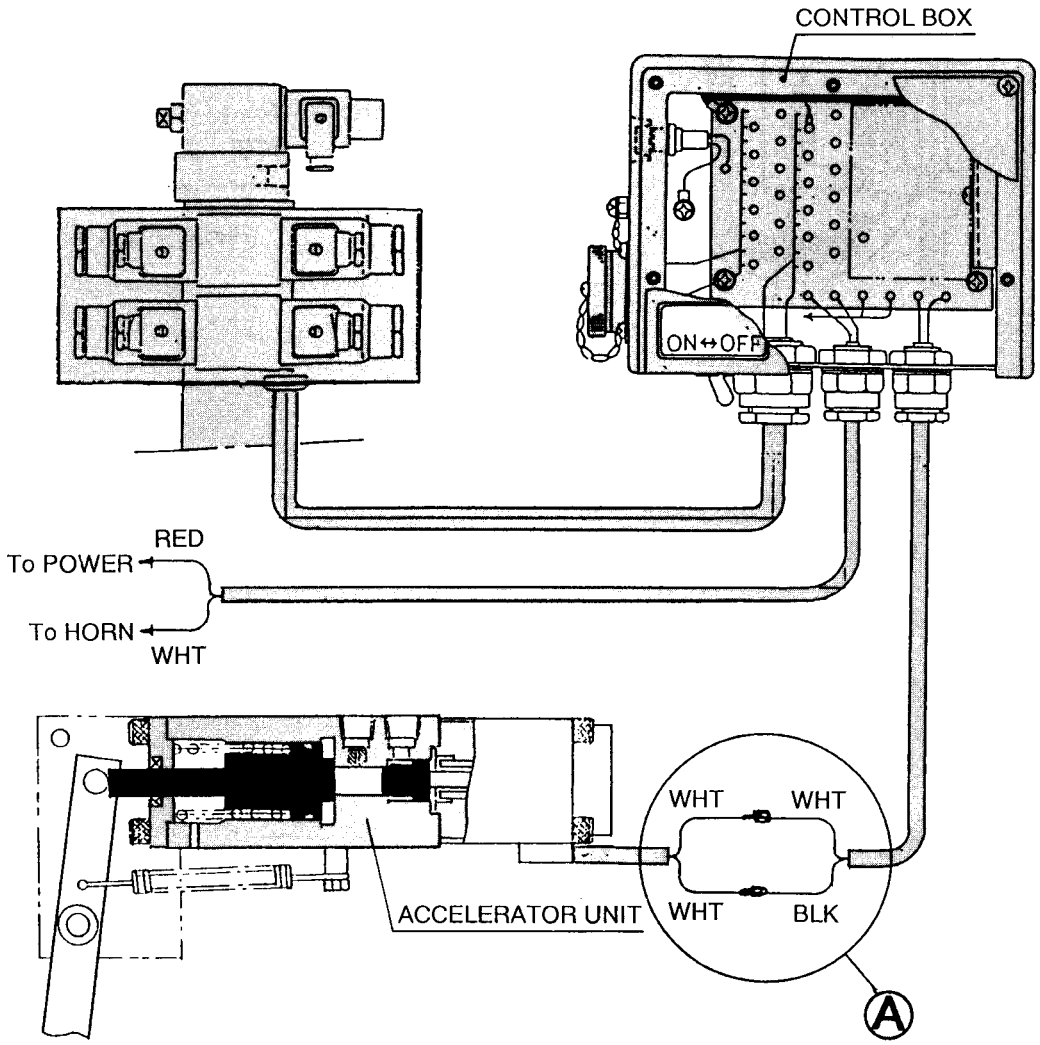
● Voltage does not change from 0V to 8V ➡ Failure.
Possible causes may be broken power cable (red) of the controller or damage in control box.

● Voltage changes from 0V to 8V ➡ Normal.

(Note) Power voltage (DC12V) drops when the controller is operated.

※ **An extra load may be added to the power distribution section. Check the power distribution section. (It frequently occurs when mounting a loading.)**

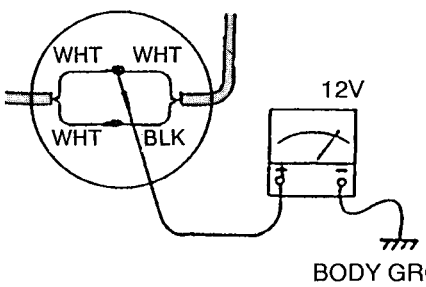
B) **Only accelerator unit does not work.**



(1) If the accelerator unit does not work at all, check it as follows;

Check, using a tester, voltage at the terminals to which wires from control box are terminated as shown within the circle.

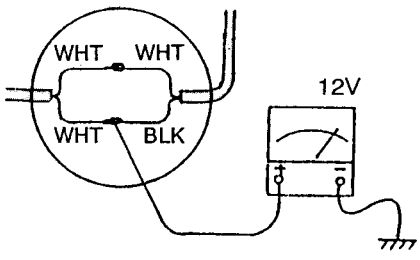
ⓐ Check to see if the voltage between the junction of white wire led from control box and white wire from accelerator unit (with the plus (+) probe of circuit tester inserted into the junction) and the body ground (with the minus (⁻) probe touched to the body) measures DC12V.



● When it does not measure DC12V ➡ Failure.
Check power wiring leading to the control box.

● When it measures DC12V ➡ Normal.
Proceed to next step ②.

ⓑ Likewise, check if voltage between the junction of black wire from control box and white wire from accelerator unit (with the plus (+) probe inserted into the junction) and the body ground (with the minus (－) probe touched to the body) measures DC12V.

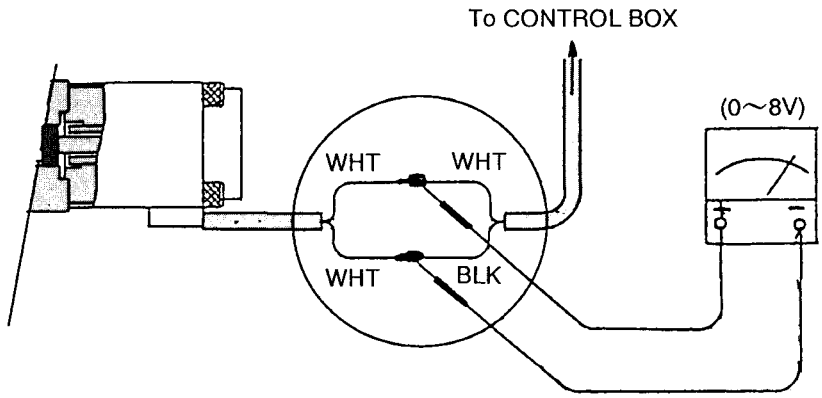


● When it does not measure DC12V, ➡ Failure.
Accelerator coil is broken.
(Coil resistance should be 3.8 Ω)

● When it measures DC12V, ➡ Normal.
Proceed to next step. ⓒ

ⓒ If found normal at the checks in step ⓐ and step ⓑ, then check as follows;

(Check) : Insert plus (+) probe of circuit tester into one junction of white wire from control box and white wire from accelerator unit, and minus (－) probe into the other junction of black wire from control box and white wire from accelerator unit.
Check then if voltage across the junctions changes from 0V to DC 8V as the control lever is being pulled with the switch in the controller turned on.



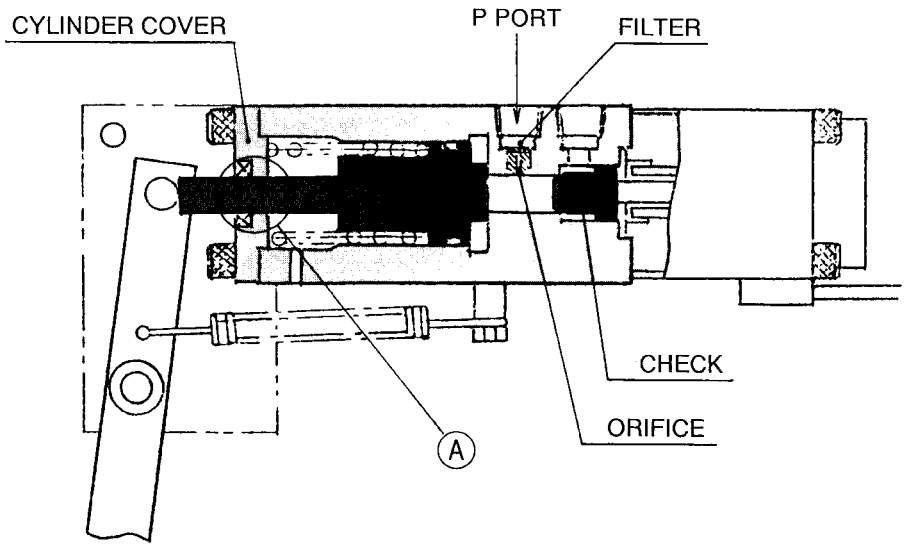
● No voltage. ➡ Failure.
Defects in the package located inside of the control box.

● Voltage changes from 0V to DC 8V ➡ Normal.

(2) Failure is in hydraulic area if it is found normal electrically.

(Possible causes)

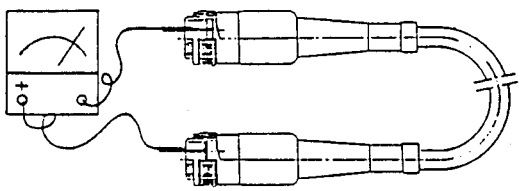
- Foreign substances may be stuck to the P port in accelerator unit.
- Section A in the cylinder cover may be locked up with rust.
- Foreign substances may be stuck into valve check section and prevent it from smooth operation.



C) **Accelerator races to operation only when switch is turned on.**

(1) Check the controller cable for continuity.

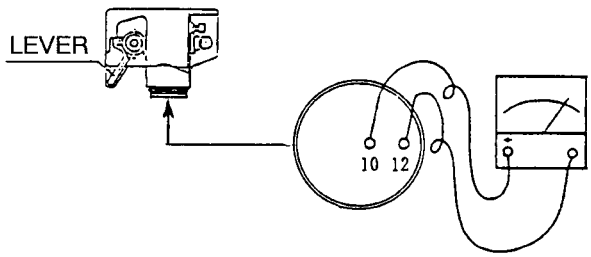
※ If either of black wire or green wire is broken, accelerator races.



ⓐ Check terminal No. 10 (green wire) and terminal No. 12 (black wire) for continuity.

- If there is no continuity, ➡ Failure.
  Cable is broken.
- If there is continuity, ➡ Normal.
  Proceed to next step ⓑ.

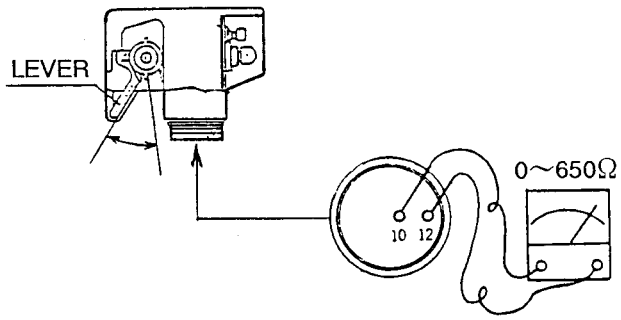
(2) Check connector pins in the controller for continuity.



ⓑ Check continuity between terminal No. 10 and terminal No. 12.

- If there is no continuity, ➡ Failure.
  Variable resister is defective or wiring is broken.
- If there is continuity, ➡ Normal.
  Proceed to next step ⓒ.

(3) Inspect the variable resistor in the controller.

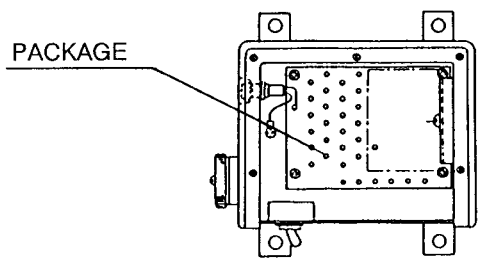


ⓒ Check if resistance varies smoothly from 0 Ω to approx. 650 Ω as the controller lever is being pulled.

- If an indicator fluctuates, ➡ Failure.
  Variable resistor is defective.
- If resistance makes a smooth change, ➡ Normal.
  Proceed to next step ⓓ.

(4) Check the control box.

※ Check the package located inside of the control box and the wiring if no defects have been found in the controller and the controller cables.

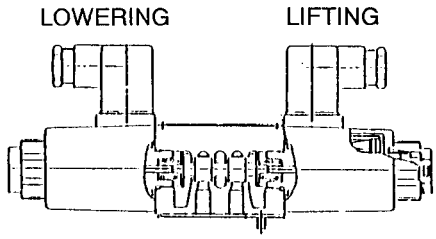


ⓓ Check wiring concerned -(green wire) (black wire)- for the package located inside of the control box and check the package terminals for being tightened.
Check if inside of the control box has not been wet.

D) A specific operation is not functioning.

(1) Check the solenoid valve for the operation that is not functioning.

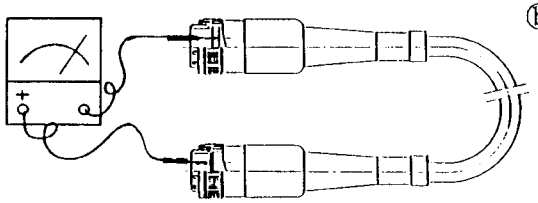
(Example) When the boom lift fails to lower;



ⓐ Check boom lift operation by exchanging connection by switching connectors or wirings leading to solenoid valves for lowering and lifting.

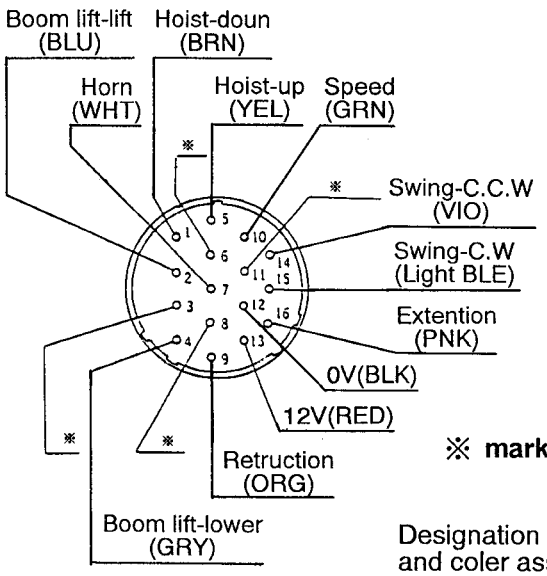
- If boom lift still fails to lower, ➡ Failure.
  The solenoid valve for lowering is defective.
- If boom lift lowers, ➡ Normal.
  Proceed to next step ⓑ.

(2) Check the controller cable for continuity.



ⓑ Check continuity between both ends of the cable at terminals of No. 4 (gray) if the defect is in the lowering system.

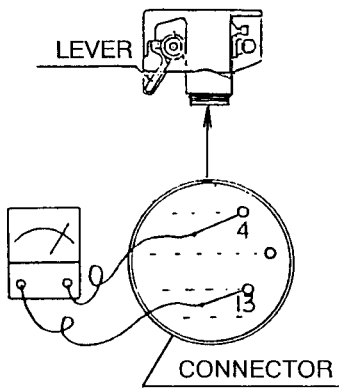
- If there is no continuity, ➡ Failure.
  Controller cable is broken.
- If there is continuity, ➡ Normal.
  Proceed to next step ⓒ.



※ marks are not in use.

Designation of the connector pin and coler assigment of the cable

(3) Check the switch in the controller.

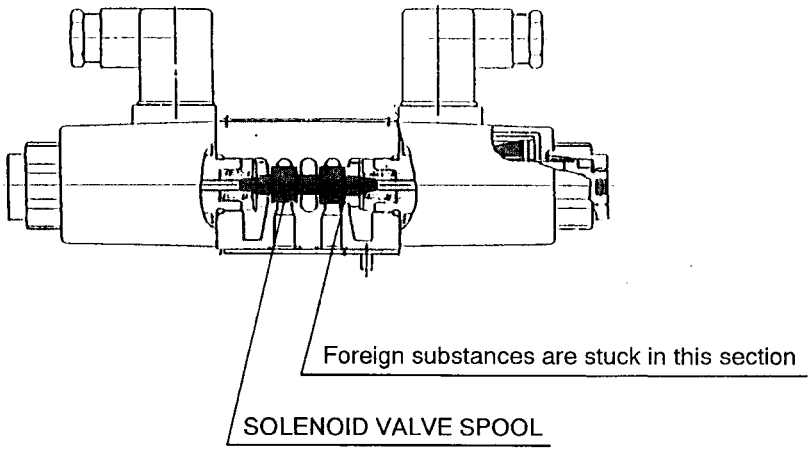


ⓒ Check continuity by turning the controller switch ON and OFF repeatedly with one of the tester probes contacted to connector pin No. 4 and the other to pin No. 13.

- If there is no continuity, ➡ Failure.
  The switch is defective or lead wire(s) is disconnected
- If there is continuity, ➡ Normal.

E) It operates but does not gather speed (on manual operation)

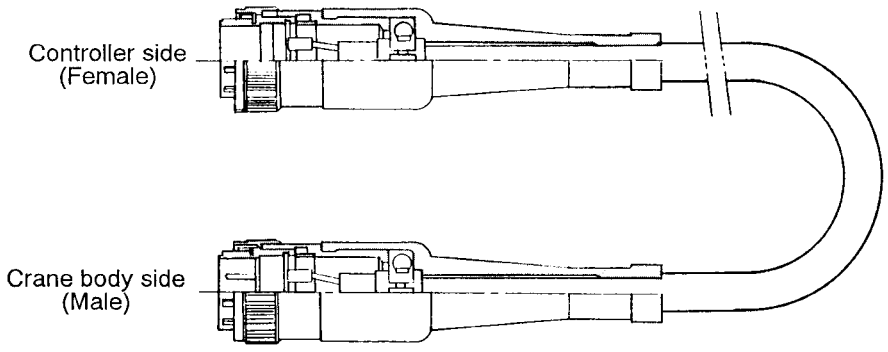
(Example) Speed of only boom lift lowering side is slow when the remote control crane is manually operated.



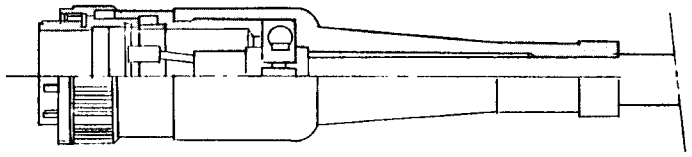
Check to see if foreign substances are stuck in the spool of the 1/4 electromagnetic selector valve for boom lift control and if the solenoid valve spool has been engaging.

※ When the above failure occurred, operation speed becomes slows because oil escapes from the tank port of solenoid valve since the tank port links with the tank when operated manually.

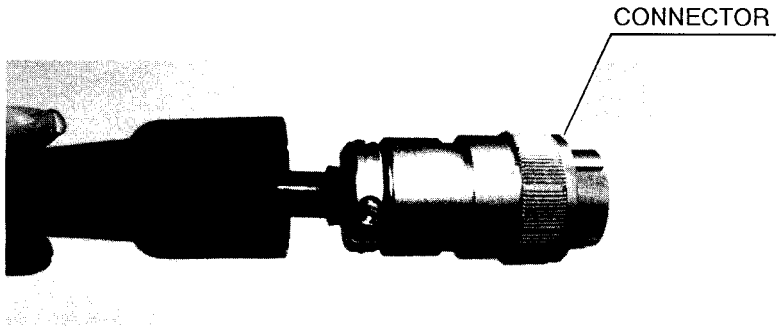
12) Controller Cable (Model RC-30S)



A) Construction of connector.



B) Cautions to be taken when cable connector is being disconnected.

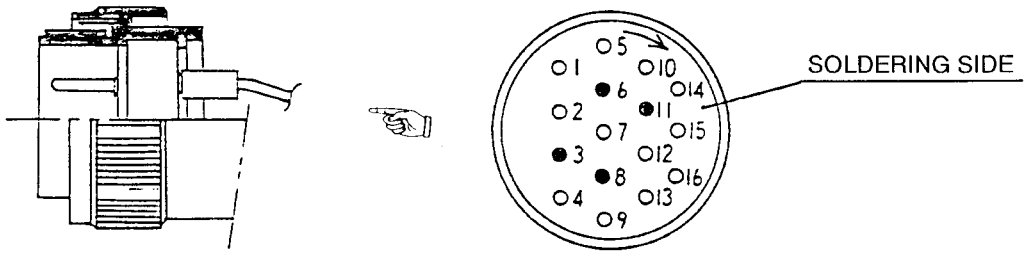


The connector screw can easily be loosened after heating the connecting sections by soaking it in hot water of approx. 194°F (90°C) for about 2 to 3 minutes. An anti-loose agent (lock-tight) has been applied to the connector threads.

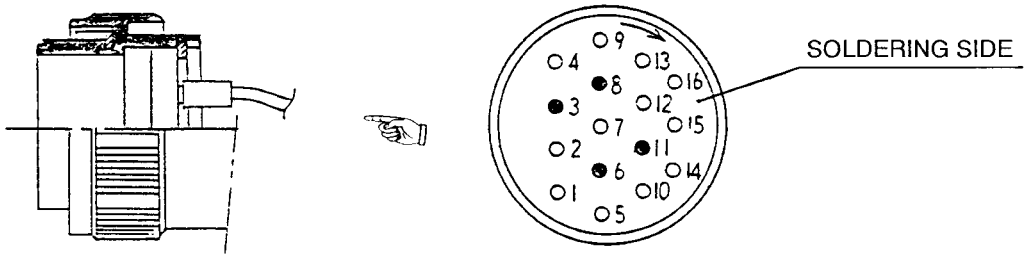
(Note) Remember that the connector can crack if it is forcibly unscrewed.

C) How to wire connector.

Wiring will easily be done in the order from pin No. 7 ➡ No. 12 ➡ No. 10 and then following the arrow mark to the final No. 5.



CABLE CONNECTOR (Male) – (Crane body side)



CABLE CONNECTOR (Female) – (Controller side)

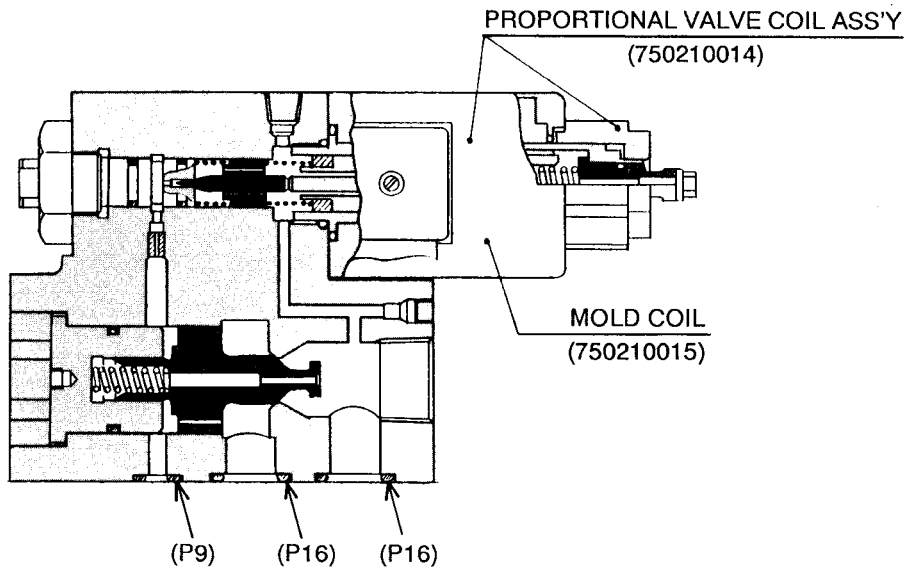
① Brown	② Blue	③ Not in use (gray)	④ Gray	⑤ Yellow	⑥ Not in use
⑦ White	⑧ Not in use	⑨ Orange	⑩ Green	⑪ Not in use	⑫ Black
⑬ Red	⑭ Violet	⑮ Light blue	⑯ Pink		

13) Part Designation and Part Number

A) Part designation and part number of 3/8 electromagnetic proportional pressure control valve ass'y

(1) 3/8 electromagnetic proportional pressure control valve

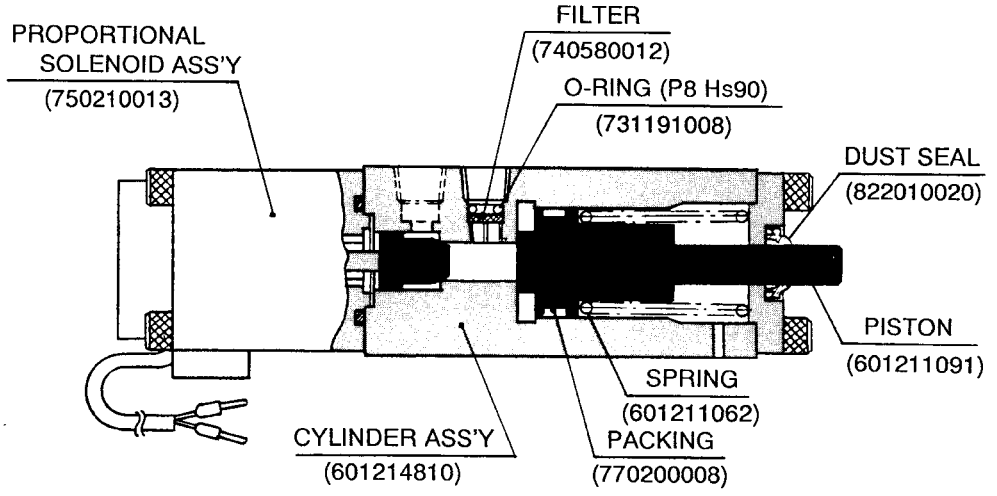
(Part number **740192044**)



B) Part designation and part number of accelerator unit

(1) Model RC-30S

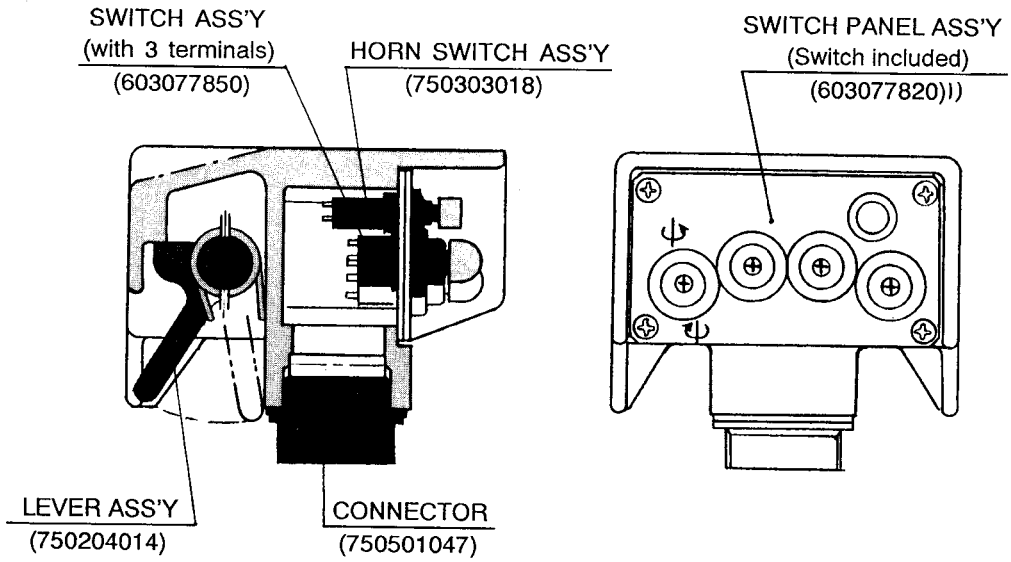
● Accelerator unit Ass'y (Part number **603188000**)



C) **Part designation and part number of remote controller ass'y.**

(1) Model RC-30S

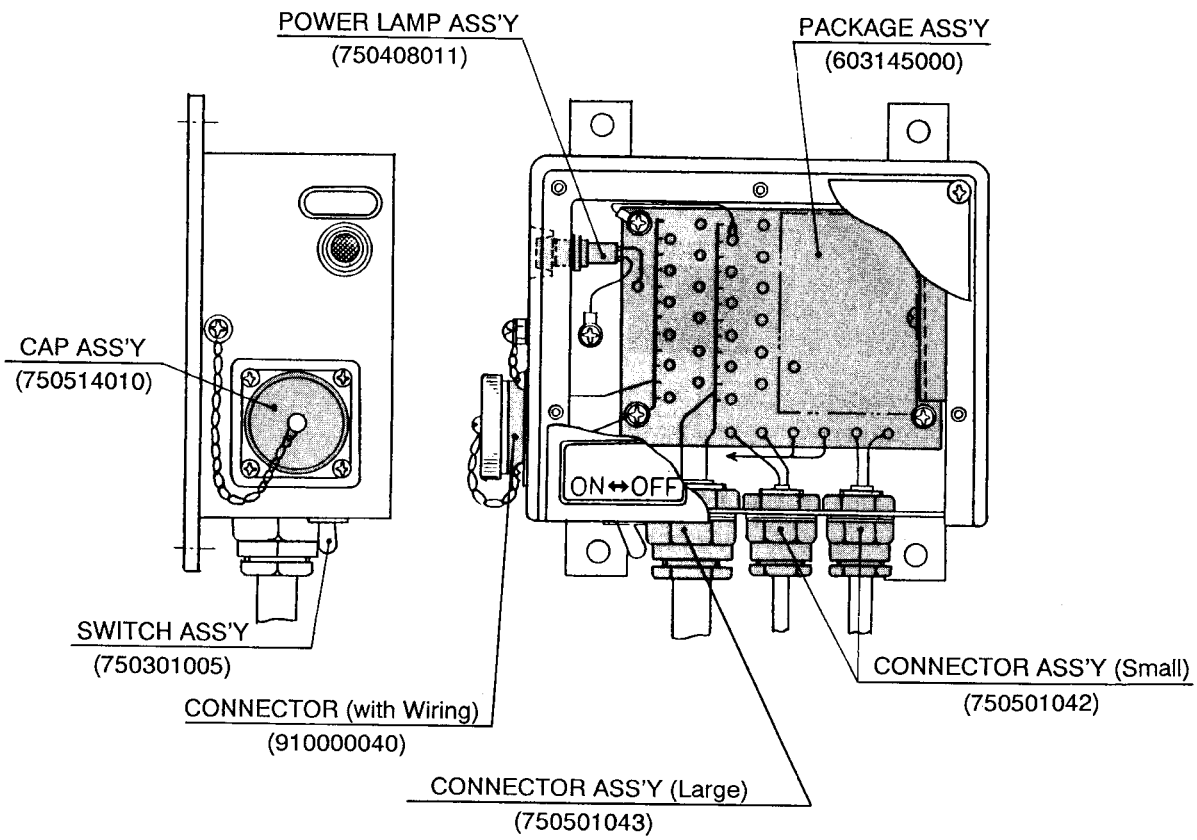
Controller ass'y (P/N **603077000**)



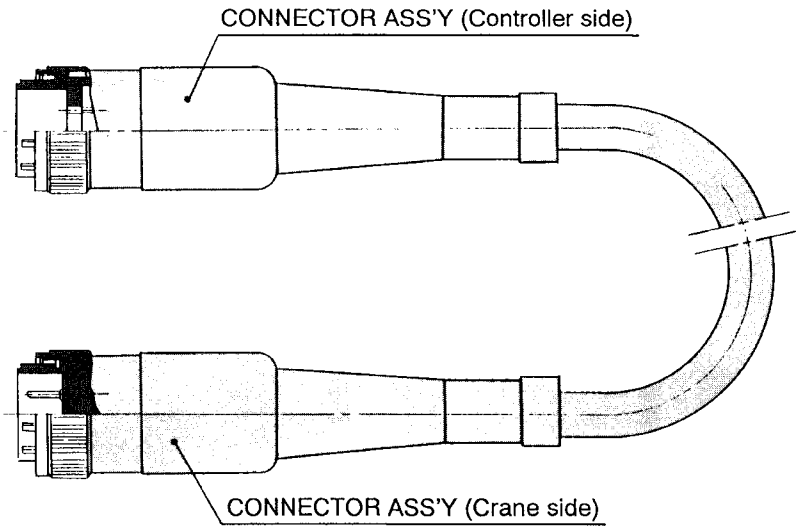
D) **Part designation and part number of control box ass'y.**

(1) Control box ass'y

(P/N **603187000**)



E) **Part designation and part number of controller cable**



(1) Controller cable for model RC-30S

- Connector ass'y (Controller side) ——————(P/N **750501045**)
- Connector ass'y (Crane body side) ——————(P/N **750501046**)

Controller cable ass'y

Cable length	Cable ass'y (P/N)
32.89F (10m)	**603081000**

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