

UNIC Hydraulic Cranes

URA340-Series

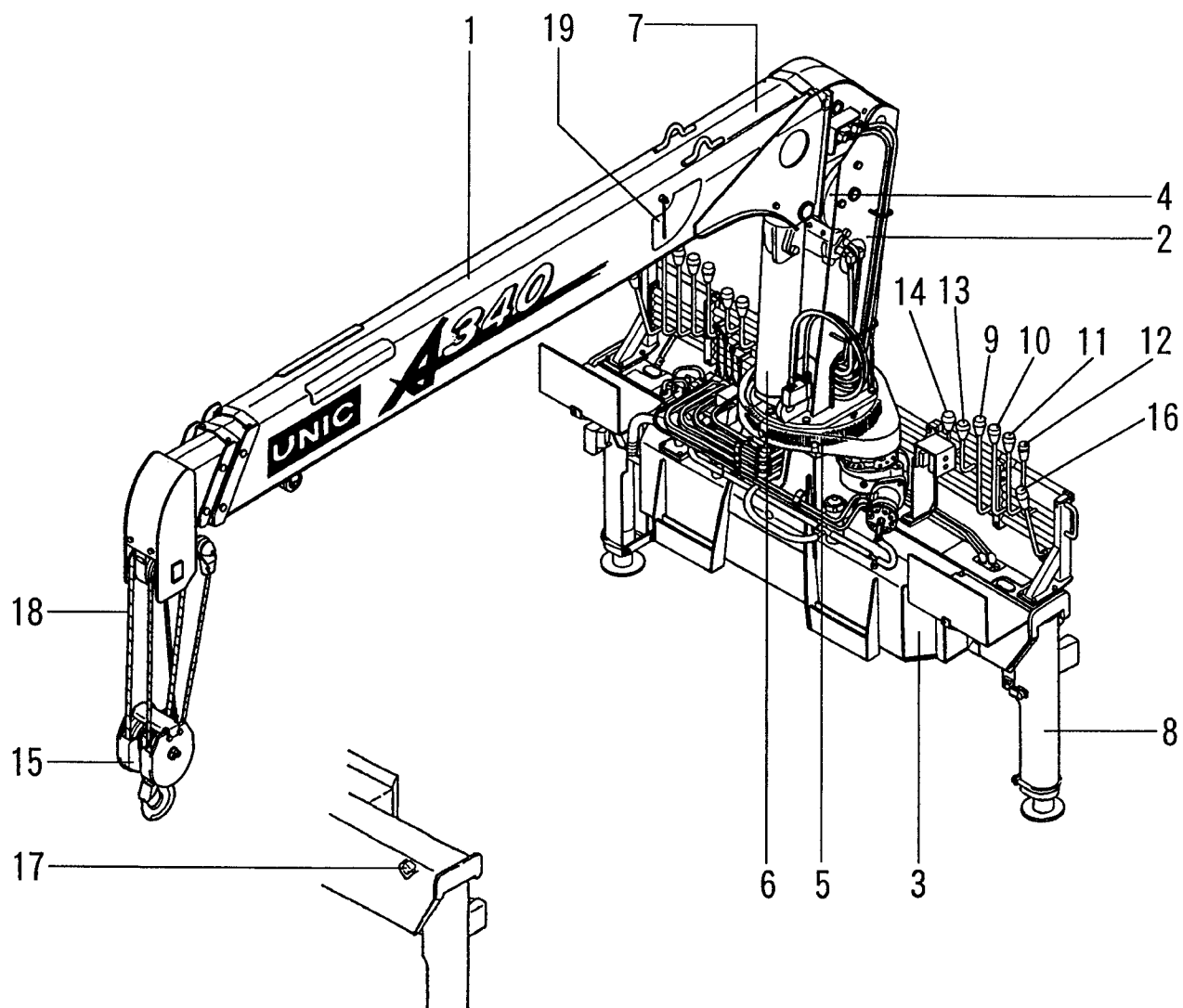
**MAINTENANCE
MANUAL**

FURUKAWA UNIC Corporation

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§1. GENERAL VIEW



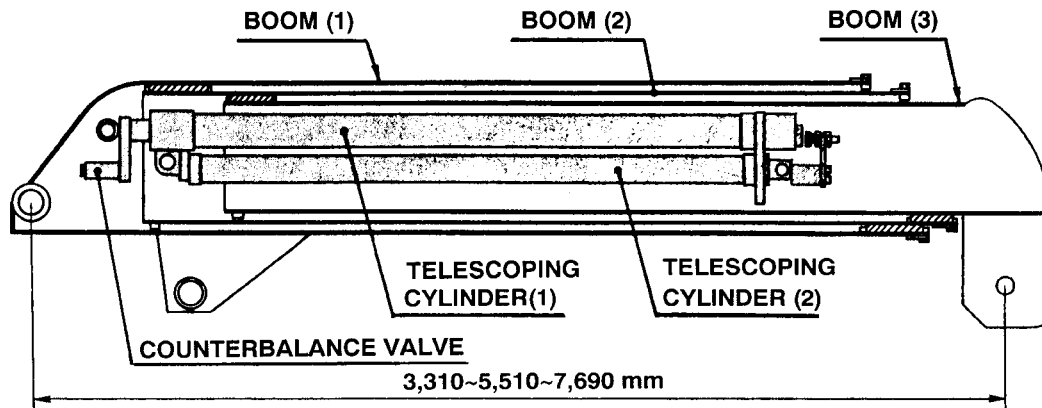
No.	Description
1	Boom
2	Column
3	Base
4	Hoist winch
5	Swing device
6	Topping cylinder
7	Telescoping cylinder
8	Outrigger
9	Boom topping control lever
10	Winch control lever

No.	Description
11	Boom telescoping control lever
12	Swing control lever
13	Outrigger control lever (Curb side)
14	Outrigger control lever (Street side)
15	Hook block
16	Accelerator lever
17	Warning horn
18	Wire rope
19	Boom angle chart

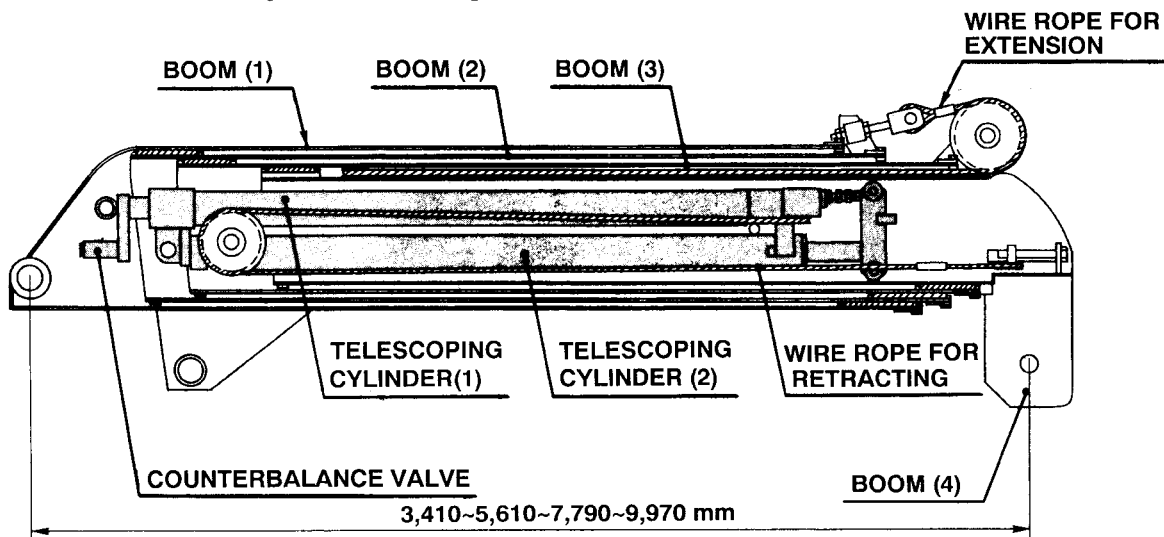
§2. BOOM ASS'Y

1) How Boom and Telescoping Cylinder are Mounted

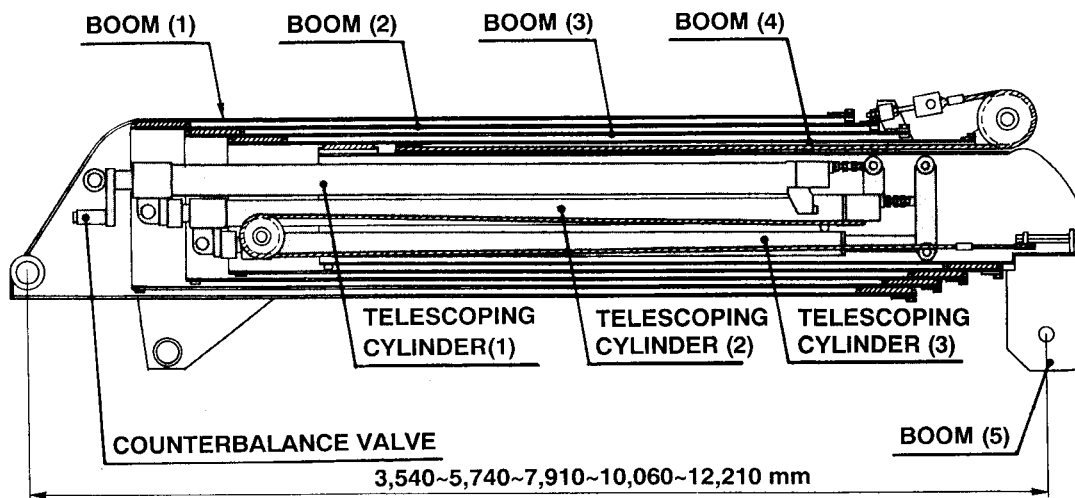
(1) 3-section Boom (Dual Cylinder)



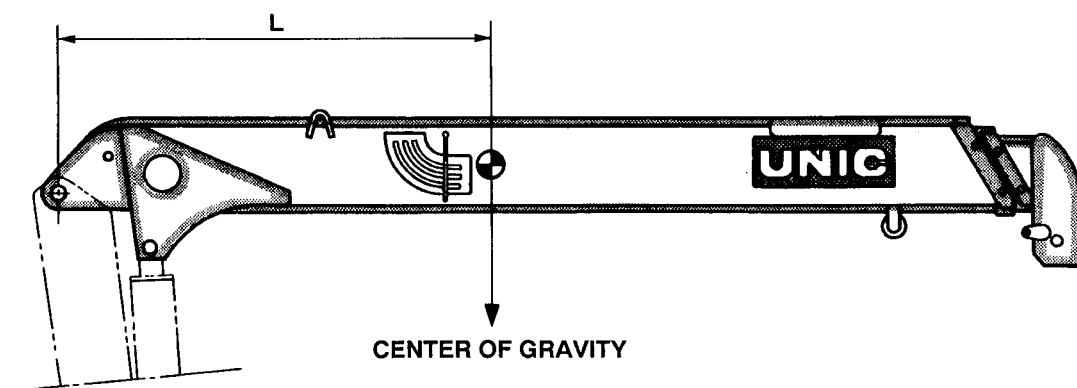
(2) 4-section Boom (Dual Cylinder + Wire rope)



(3) 5-section Boom (Triple Cylinder + Wire rope)



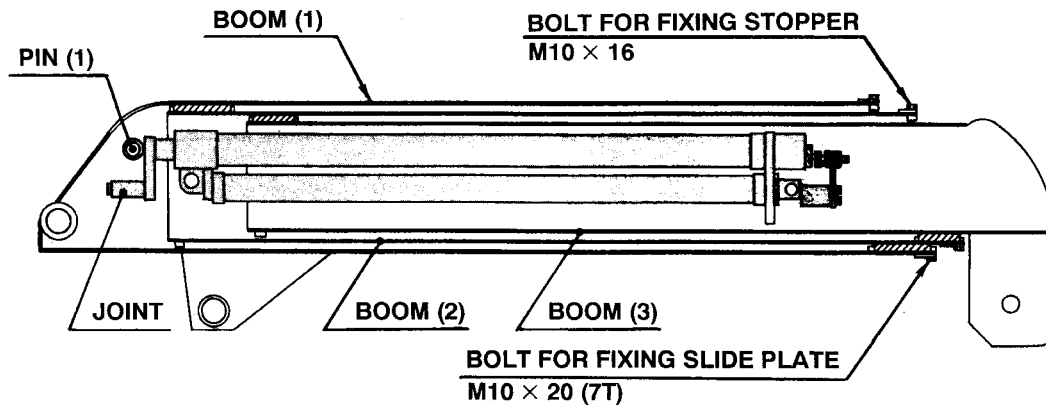
(4) Center of Gravity of Boom Assembly(including telescoping cylinders)



URA343-A2	3-Section Boom	L=1550 mm
URA344-A2	4-Section Boom	L=1680 mm
URA345-A2	5-Section Boom	L=1770 mm

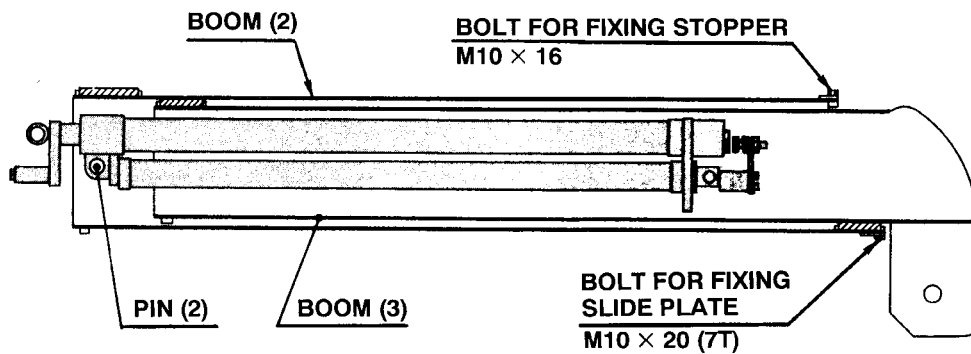
2) How to Disassemble Boom(for 3-section boom)

- ① Pull out booms (2) and (3) out of boom (1).



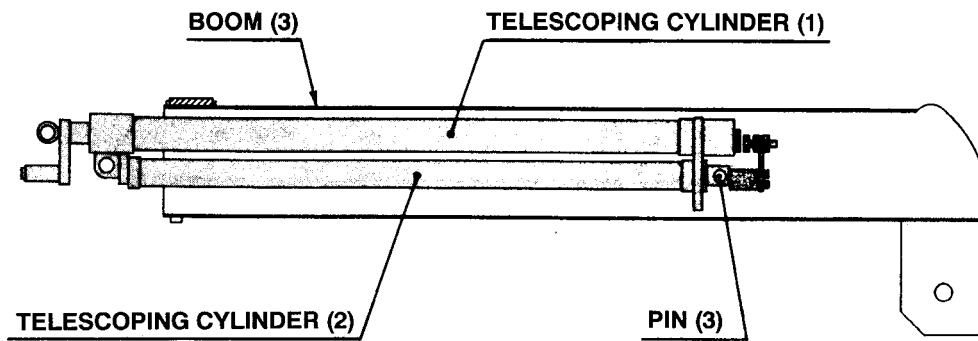
1. Remove the joint (for piping) of telescoping cylinder.
2. Remove slide plates (side plate, bottom plate) and stopper.
3. Remove pin (1) from boom (1), and pull booms (2) and (3) out of boom (1).

- ② Pull out boom (3) from boom (2).

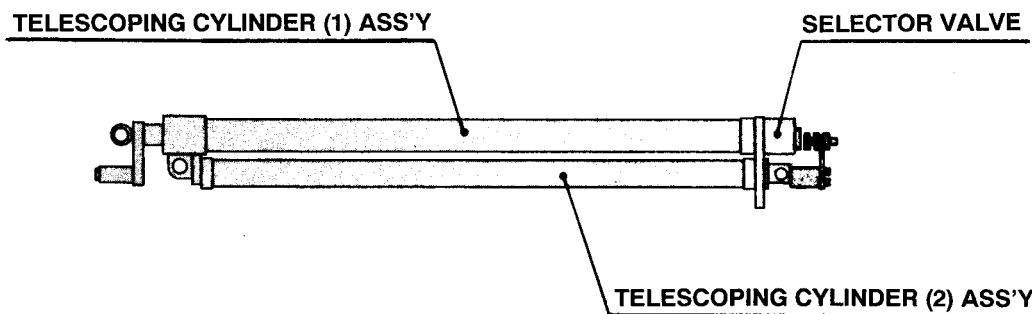


1. Remove slide plates (side plate, bottom plate) and stopper.
2. Remove pin (2) from boom (2), and pull out boom (3).

- ③ Pull telescoping cylinders(1) and (2) out of boom(3).



1. Pull telescoping cylinder (2) and pin (3) out of boom (3).
2. Pull telescoping cylinder (1) ass'y and telescoping cylinder (2) ass'y out of boom (3) to remove them toward the rear side.



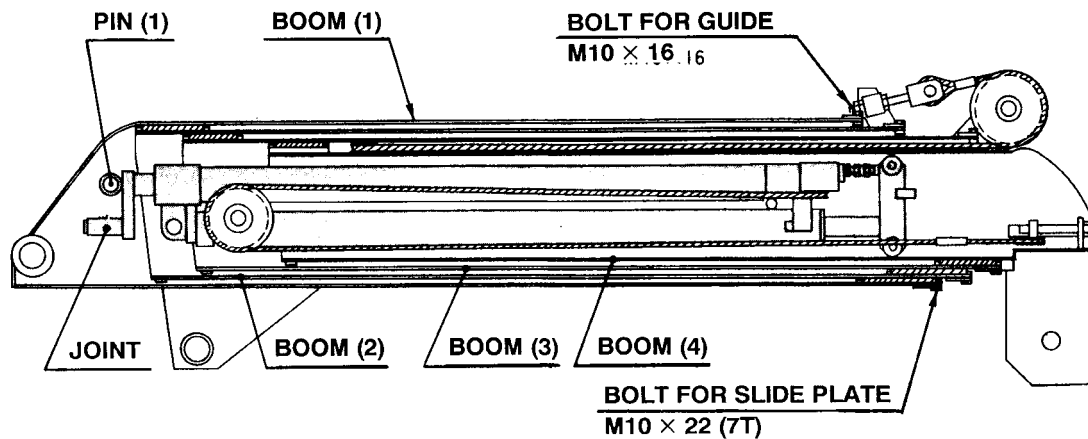
※ Carry out re-assembling in reverse order of disassembling procedures.

Notes :

1. When assembling the pin, apply grease to the inside of the boss to prevent rust.
2. Apply grease (chassis grease No.1) to the inner surface of bushing.
3. Apply adhesive "Three Bond #1102" to the slide plate to prevent it from coming off.
Also, apply molybdenum disulfide grease to the surface of slide plate.
4. Do not apply grease to the slide sheave pin.

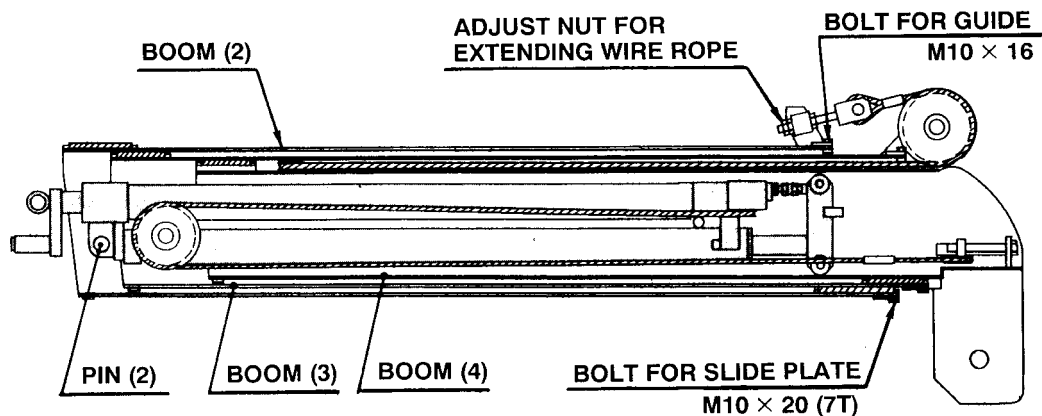
3) How to disassemble boom(for 4-section boom)

- ① Put out Boom (2), (3), and (4) from boom (1).



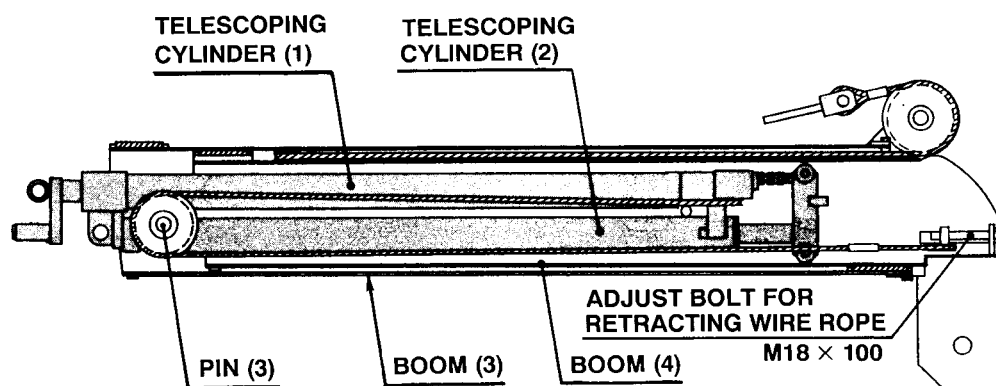
1. Remove telescoping cylinder joint (for piping).
2. Remove slide plate and stopper.
3. Remove pin (1) from boom (1), and then pull out boom (2), (3), and (4).

- ② Pull out booms (3) and (4) from boom (2).

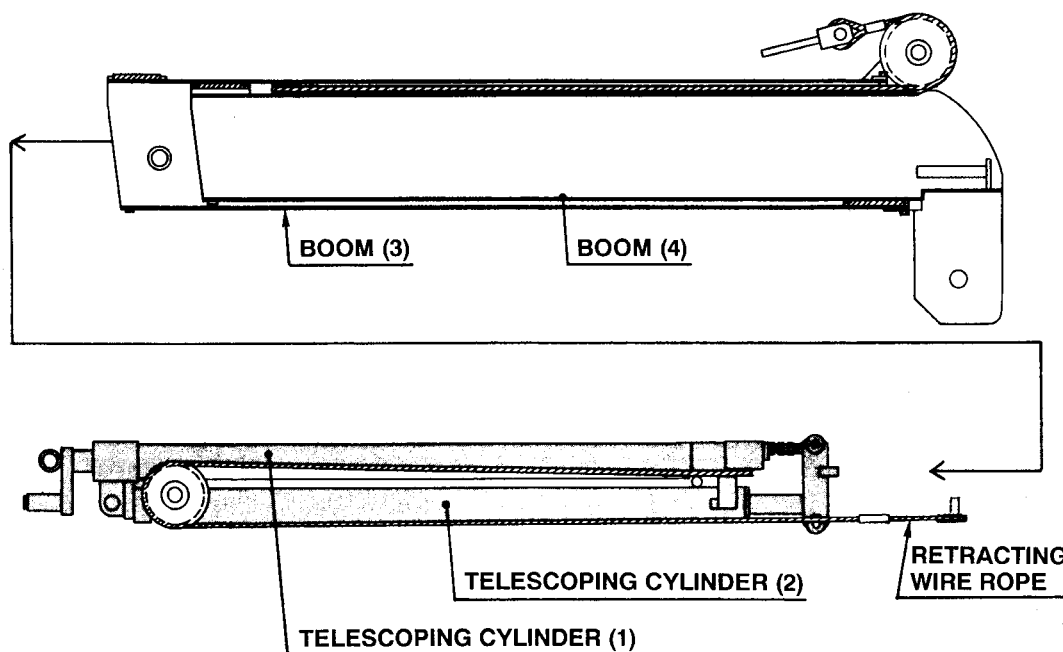


1. Remove slide plates (side plate and lower plate) and stopper.
2. Remove adjust nut for extending wire rope.
3. Remove pin (2) from boom (2), and then pull out booms (3), and (4).

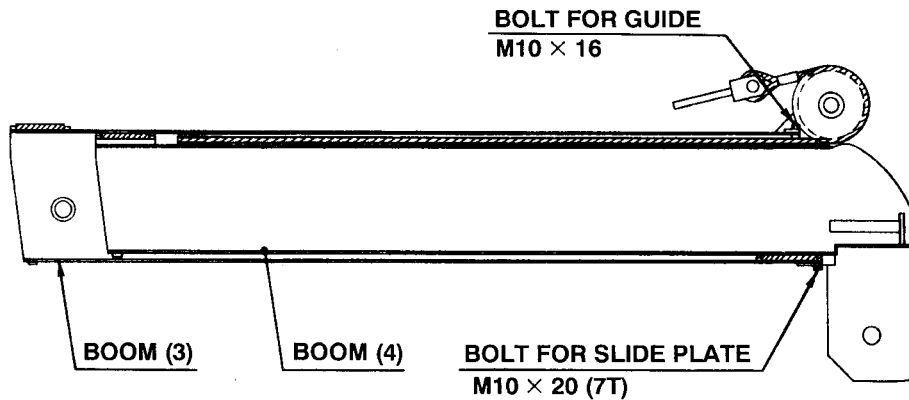
- ③ Pull out telescoping cylinders (1) and (2) from booms (3) and (4).



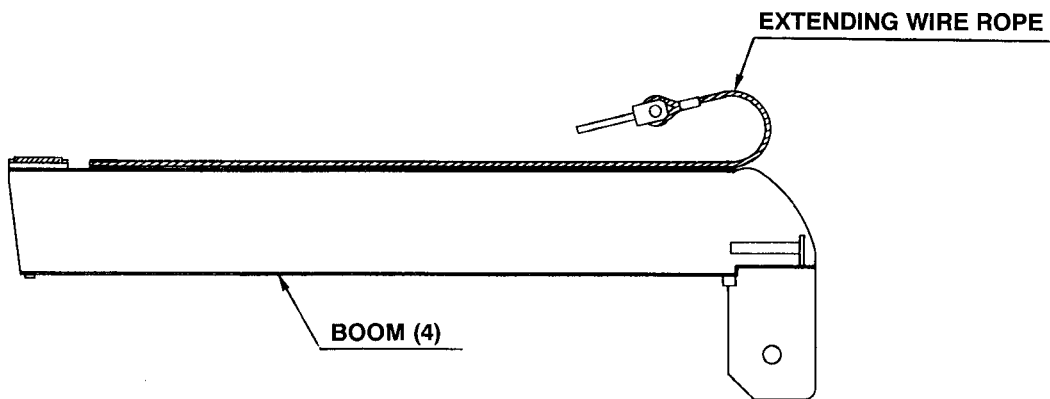
1. Remove adjust bolt for retracting wire rope.
2. Pull out left and right pins (3) from rear end of boom (3).
3. From booms (3) and (4) pull out telescoping cylinder ass'ys (1) and (2) rearward.



- ④ Pull out boom (4) from boom (3).



1. Remove slide plate (lower plate) and stopper.
2. Pull out boom (4) from boom (3).



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

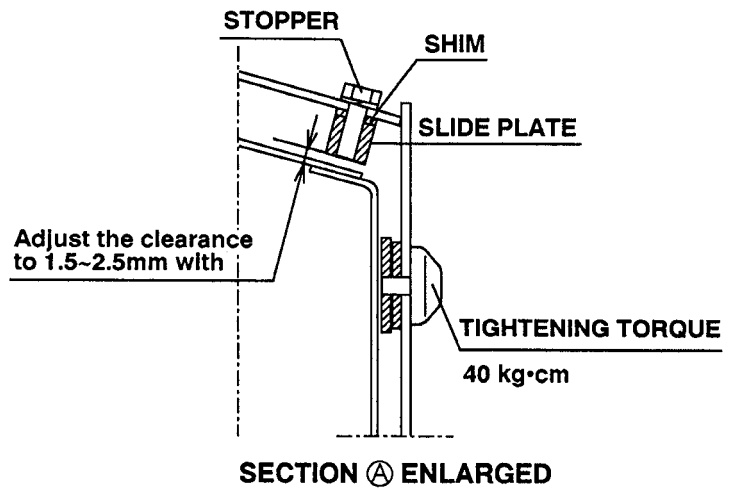
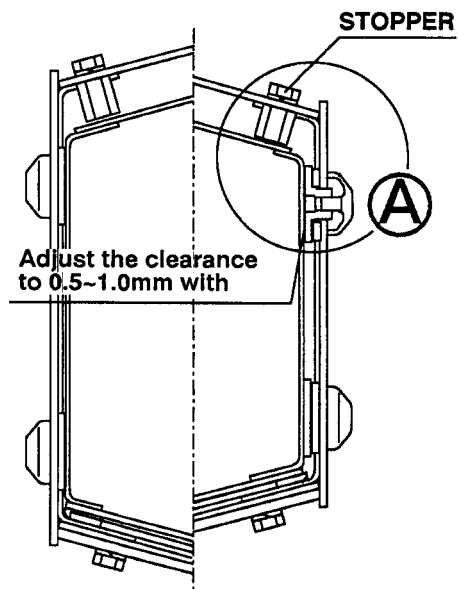
Notes:

1. When assembling the pin, apply grease to the inside of its base for rustproof 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.

* Disassembly and assembly of 5-section booms, refer to the above procedures.

4) How Slide Plate and Stopper are Mounted

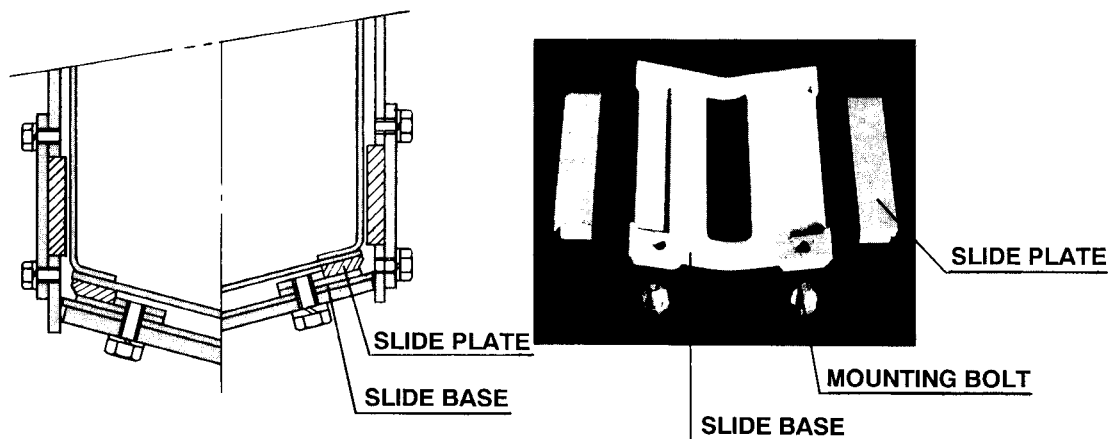
① Slide plate and stopper



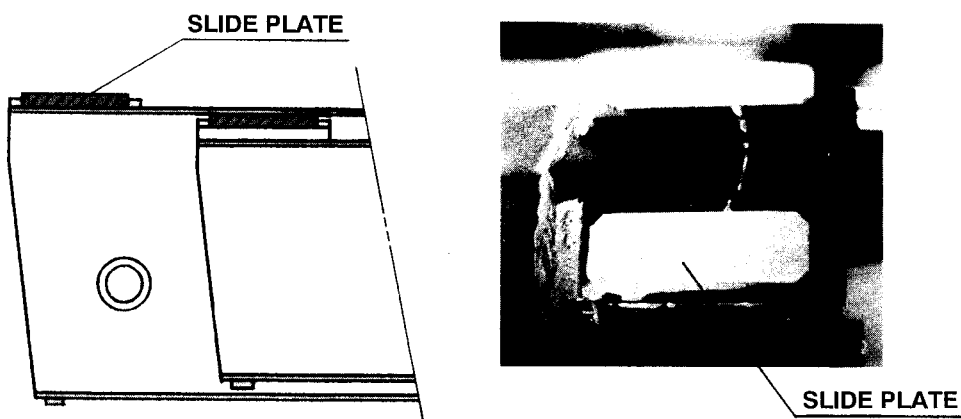
Note:

1. If sliding resistance has been found too heavy between the slide plate and the boom, adjust it by putting shims.
2. When removing the shim for stopper, put a plain washer under the conical spring washer.

② Installing the slide plate in bottom plate section



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



Note:

Apply adhesive “Three Bond #1102” to the slide plate to prevent it from coming off.

④ Check slide plate

Measure thickness of the slide plate and replace it if it is beyond the limits.

※ **Applicable limits of slide plate**

When the slide plate has been worn out by 2 mm, replace it with a new one.

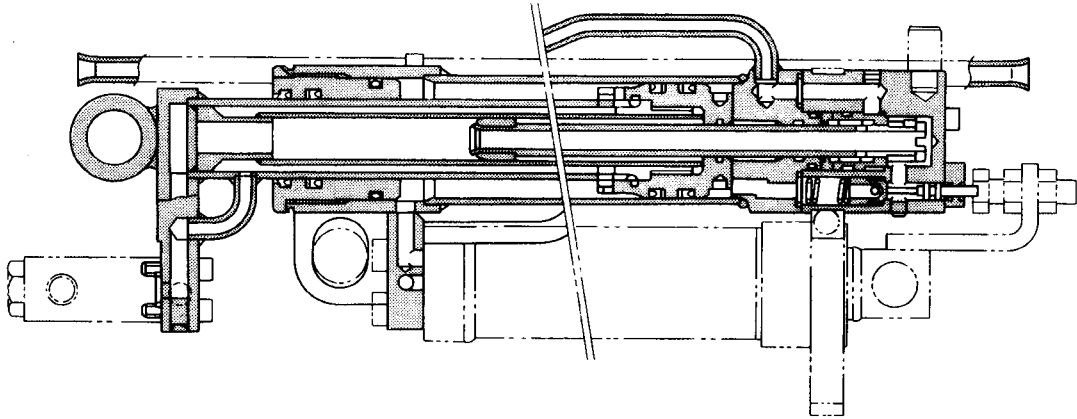
	Before use	Replace when
Thickness of slide plate (mm)	$t=10.5^{+0.5}_0$	$t=8.5$
	$t=9.0^{+0.5}_0$	$t=7.0$
	$t=7.0$	$t=5.0$

§3. TELESCOPING CYLINDER

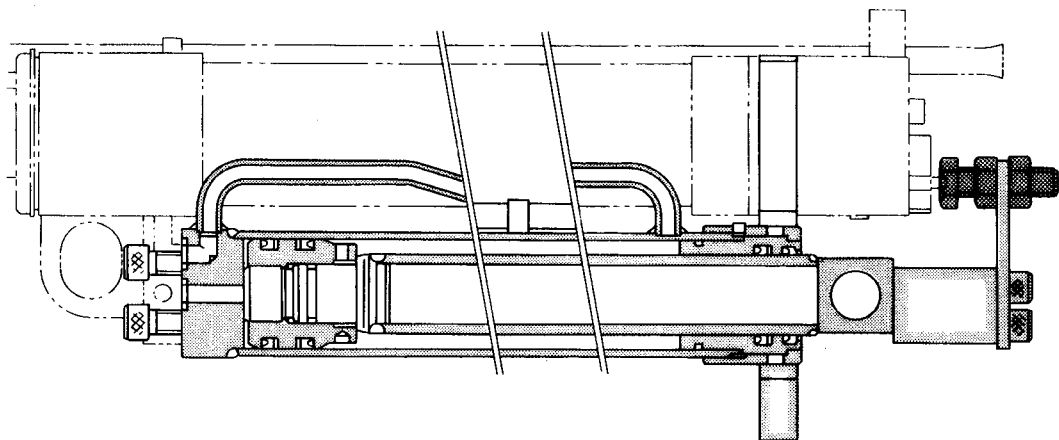
1) Construction

(1) 3-Section Boom Dual Telescoping Cylinders

① Construction of telescoping cylinder (1)

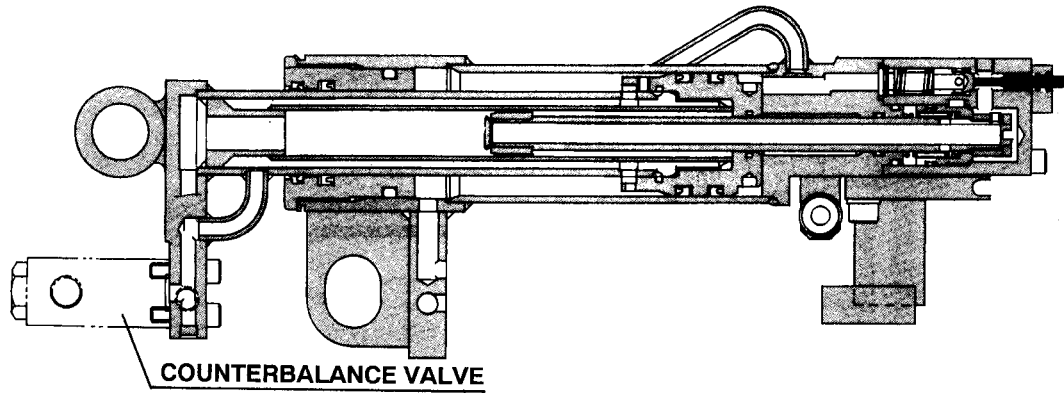


② Construction of telescoping cylinder (2)

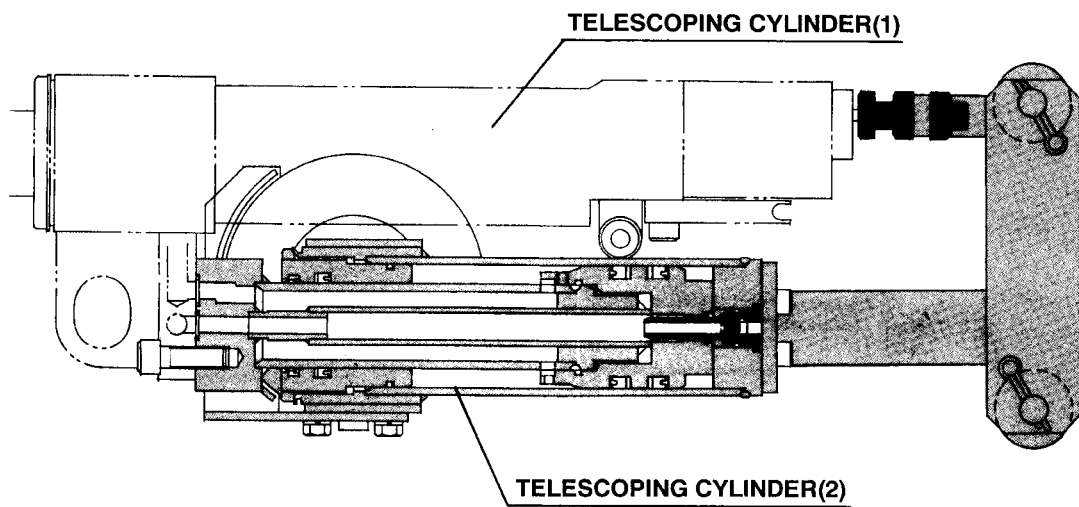


(2) 4-Section Boom Dual Telescoping Cylinders

① Construction of telescoping cylinder (1)

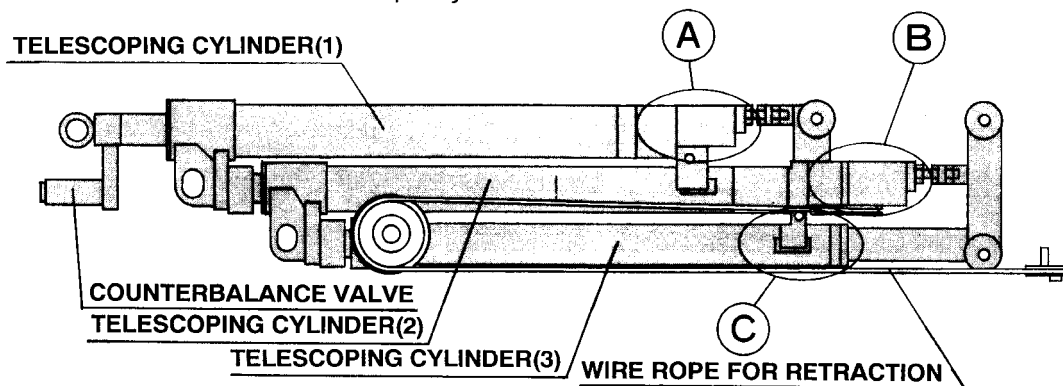


② Construction of telescoping cylinder (2)

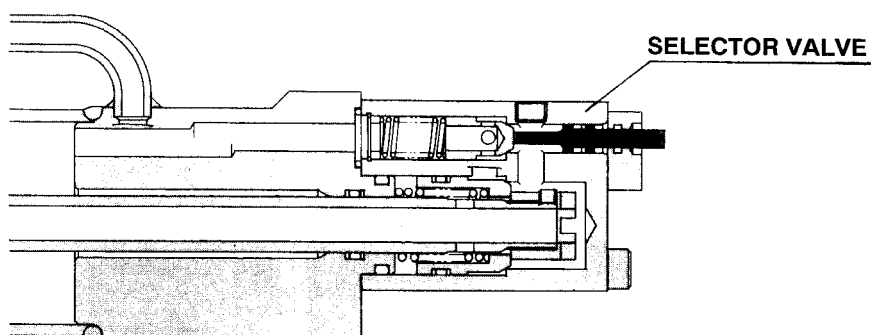


(3) 5-Section Boom Triple Telescoping Cylinders

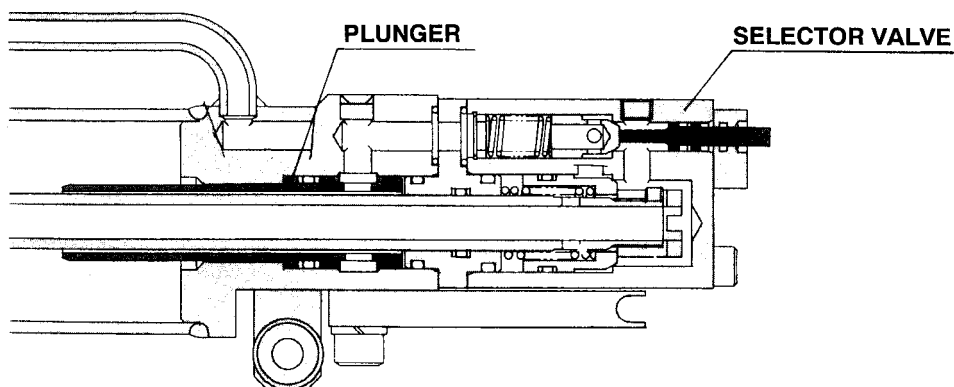
Combinational construction of triple cylinders



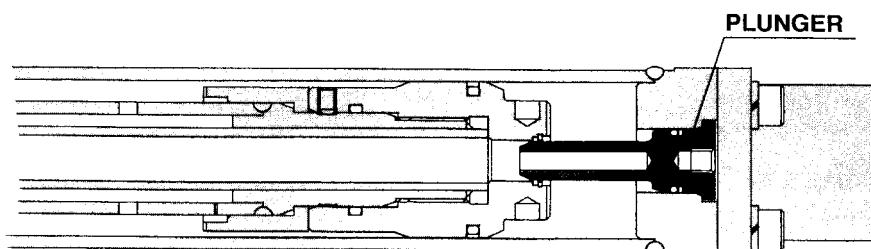
① Telescoping cylinder (1), Sectional view of Part (A) of Selector Valve



② Telescoping cylinder (2), Sectional view of Part (B) of Selector Valve

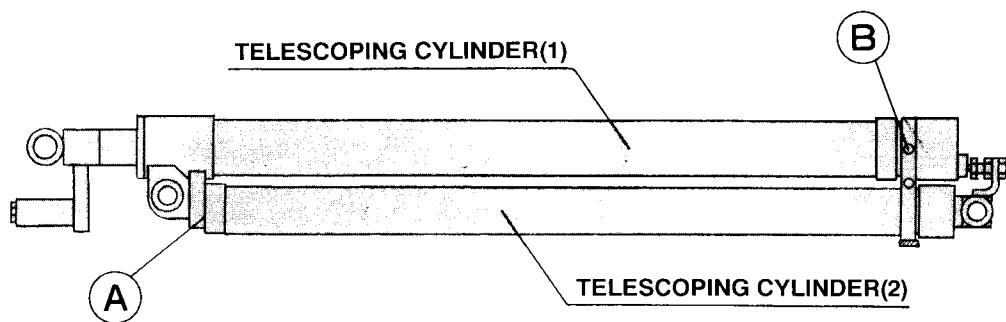


③ Telescoping cylinder (3), Sectional view of Part (C) of Selector Valve

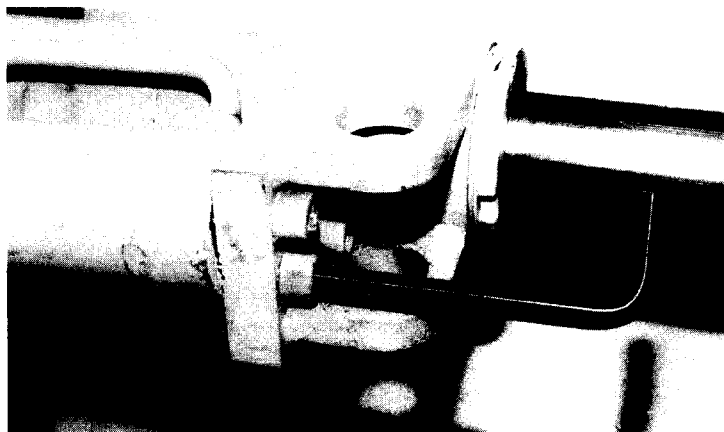


2) How to Disassemble 3-Section Boom (with dual-cylinder)

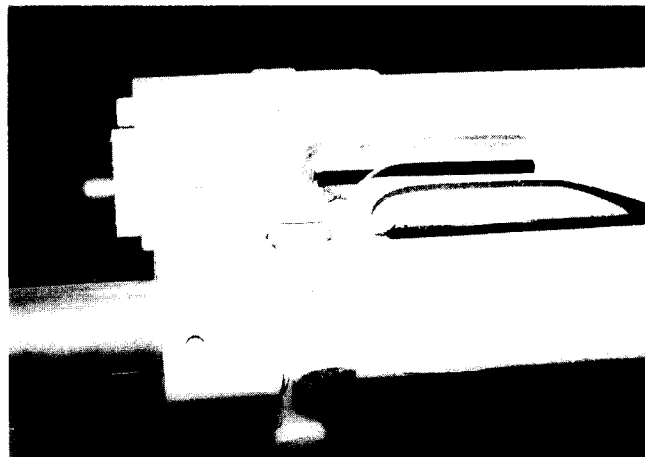
Remove the bolt connecting telescoping cylinder (1) with telescoping cylinder (2) to separate them.



- ① Remove the hexagon socket head bolts (3 pcs) in the section ①.



- ② Remove the hexagon socket head bolts (4 pcs) in the section ②.



(1) How to Disassemble Telescoping Cylinder (1)

- ① Remove the hexagon socket head bolts (3 pcs) securing the selector valve.

SELECTOR VALVE

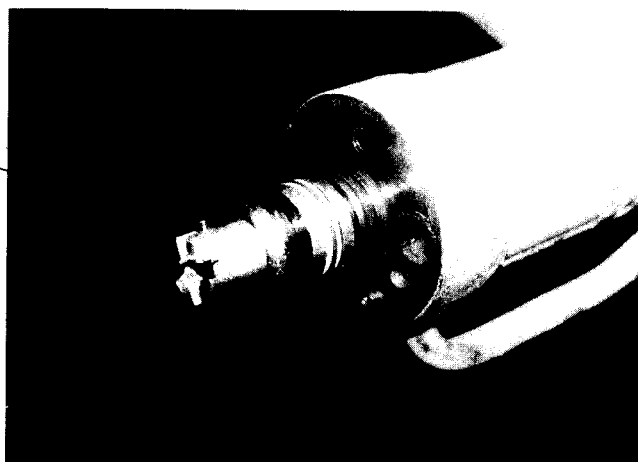
HEXAGON SOCKET HEAD BOLTS
(3 pcs)



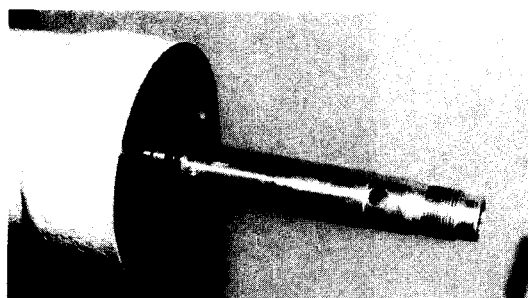
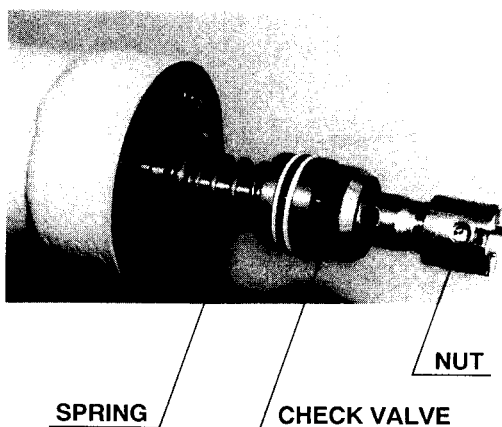
- ② Remove a lock screw for the nut of slide pipe section.

HEXAGON SOCKET HEAD SCREW
(M6 × 6 ℓ cup point)

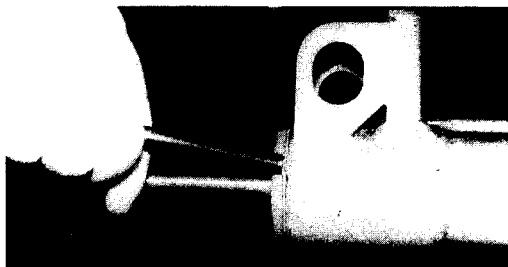
※ Apply “Lock Tight #242”
when re-assembling.



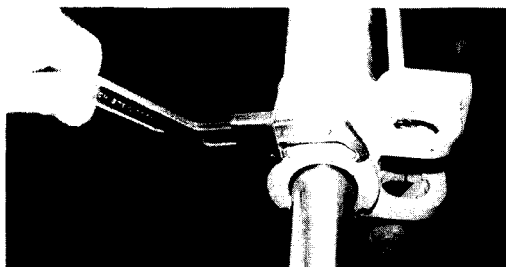
- ③ Remove the nut, the check valve, and the spring out of the slide pipe



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

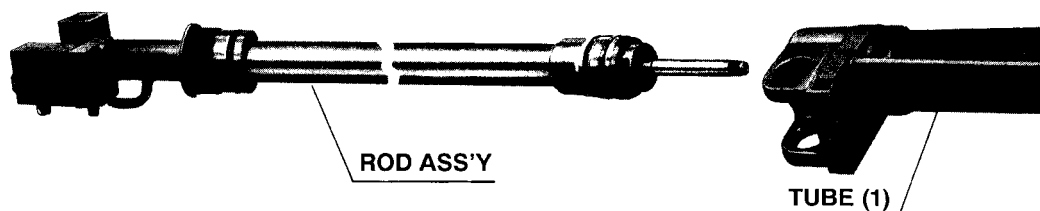


Compensate revolution stopper.



Loosen the gland.

Extract the rod ass'y out of the tube (1).

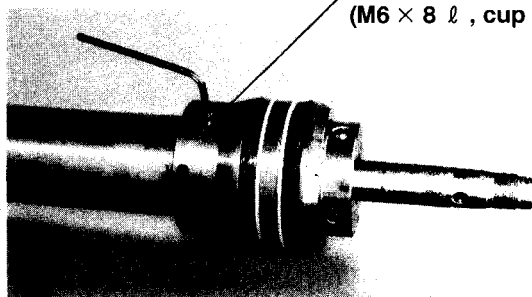


- ⑤ Loosen the screw preventing the piston from turning to remove the piston out of the rod ass'y.

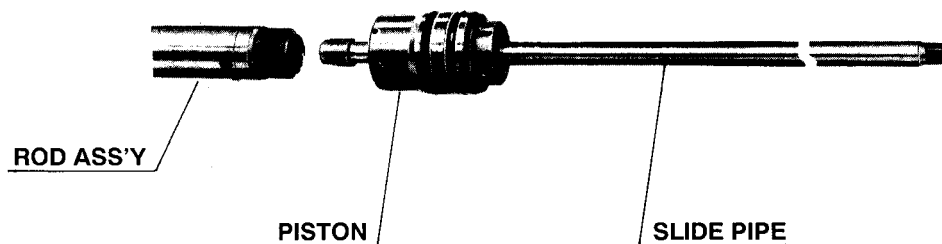
HEXAGON SOCKET HEAD SCREW

(M6 × 8 ℓ , cup point)

※ Apply "Lock Tight #242"
when re-assembling.

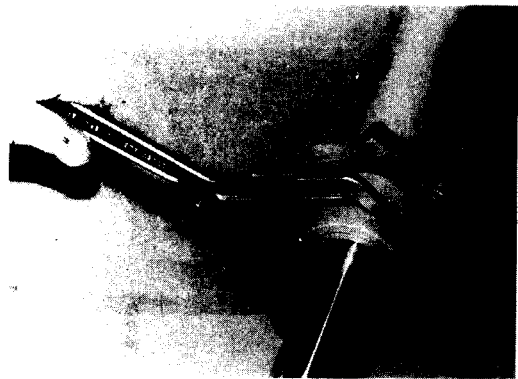
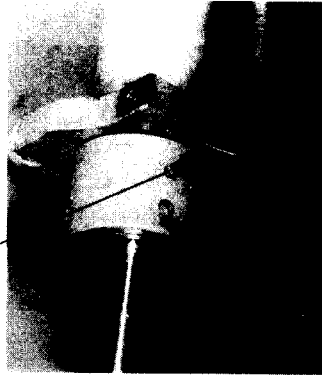


- ⑥ Extract the piston and the slide pipe at the same time from the rod ass'y.



(2) How to Disassemble Telescoping Cylinder (2)

HEXAGON SOCKET
HEAD SCREW
(M6 × 6 ℓ , cup point)

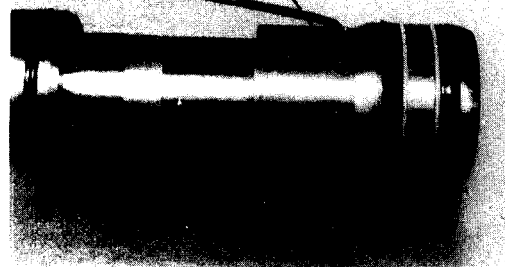
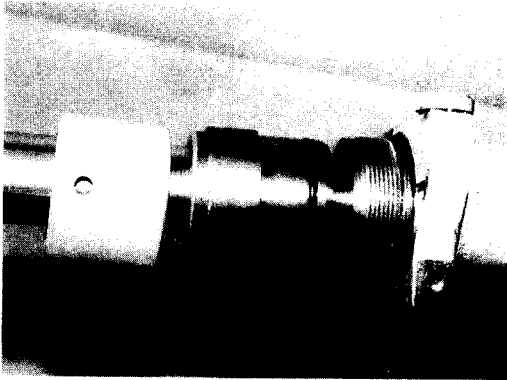


① Remove the hexagon socket head screw securing the cylinder cover.

② Loosen the cylinder cover with a hook-spanner.

※ Apply “Lock Tight #242” when re-assembling.

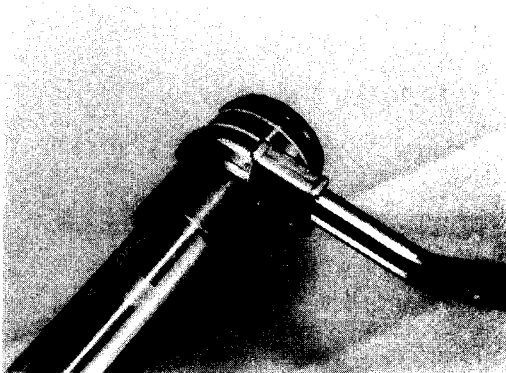
HEXAGON SOCKET
HEAD SCREW
(M6 × 10 ℓ , cup point)



③ Extract the rod ass'y from the tube (2).

④ Loosen the screw preventing the piston from turning.

※ Apply “Lock Tight #242” when re-assembling.



⑤ Loosen the piston with a hook-spanner.

(3) Inspection

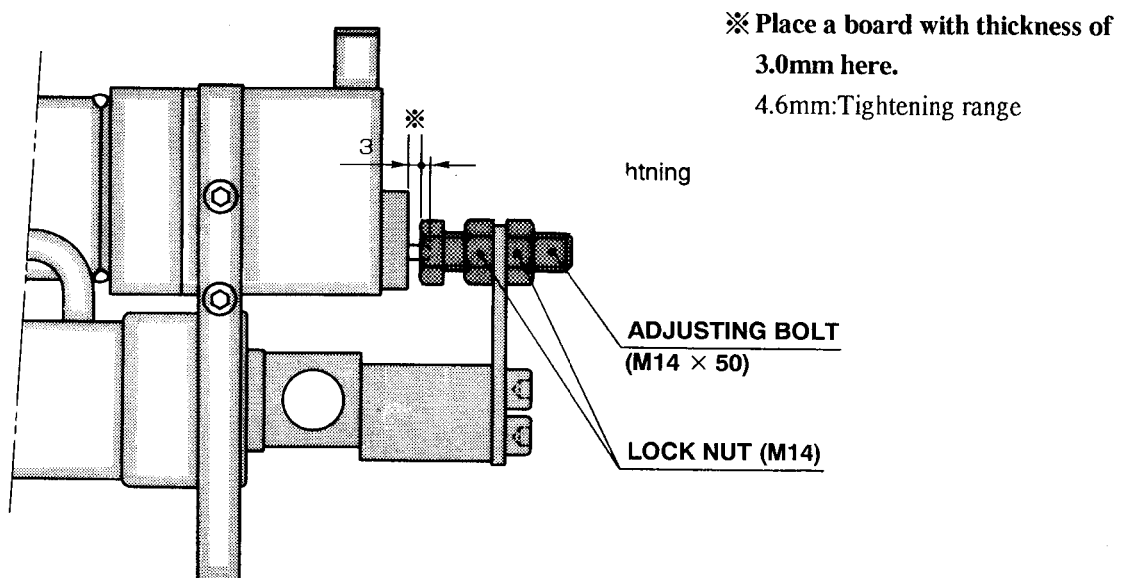
- ① Check overall that there are no flaws, cracks, deformation, rust, burrs, and flashes which may obstruct practical operation in terms of functional aspects.
- ② Check that metal particles and other foreign substances are not stuck to each part.
- ③ Check that there are no damages on the sliding surface of piston rod which may affect operation.
- ④ As a rule, replace packings and seals with new one.

If they are forced to be reused, check that they are not damaged, do not have a sign of cut, and there are not a foreign substance stuck on the packings.

※ Carry out re-assembling in reverse order of disassembling procedures.

- Check that metal particles and other foreign substances are not stuck to each component, then soak it into hydraulic oil for lubrication.

(4) How to Adjust the Adjusting Bolt in the Selector Valve



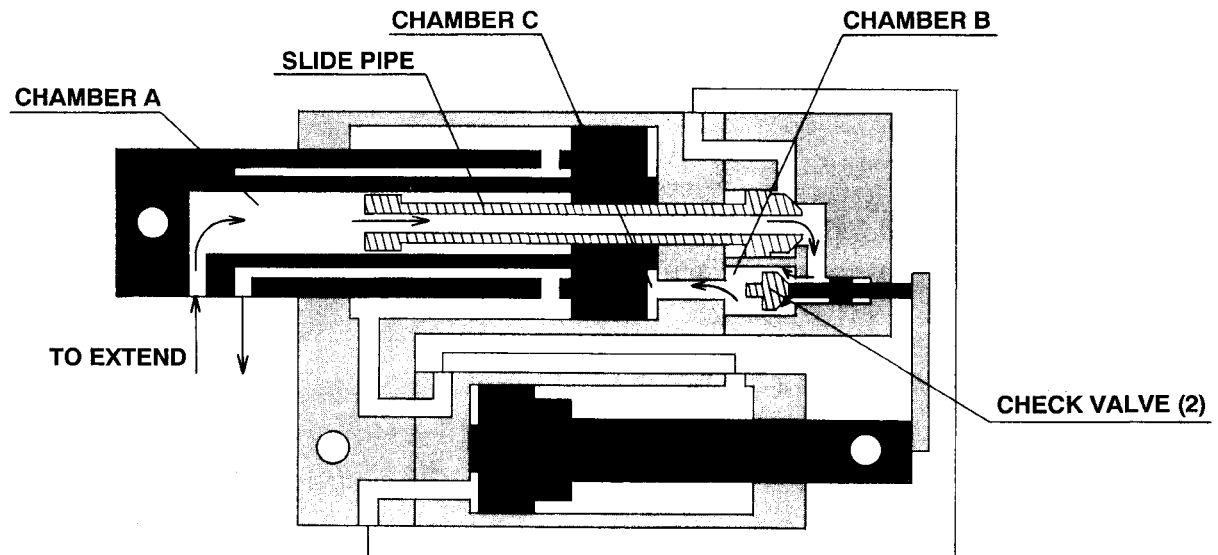
How to adjust the bolt

- ① Retract both telescoping cylinders (1) and (2) to their minimum extremes.
- ② Apply "Lock Tight #242" to the threaded portion of adjusting bolt.
- ③ Tighten the bolt with a 3mm-thick-board placed at where marked ※.
- ④ Lock it with lock nuts after adjustment.

3) How 3-Section Boom (dual cylinder) operates

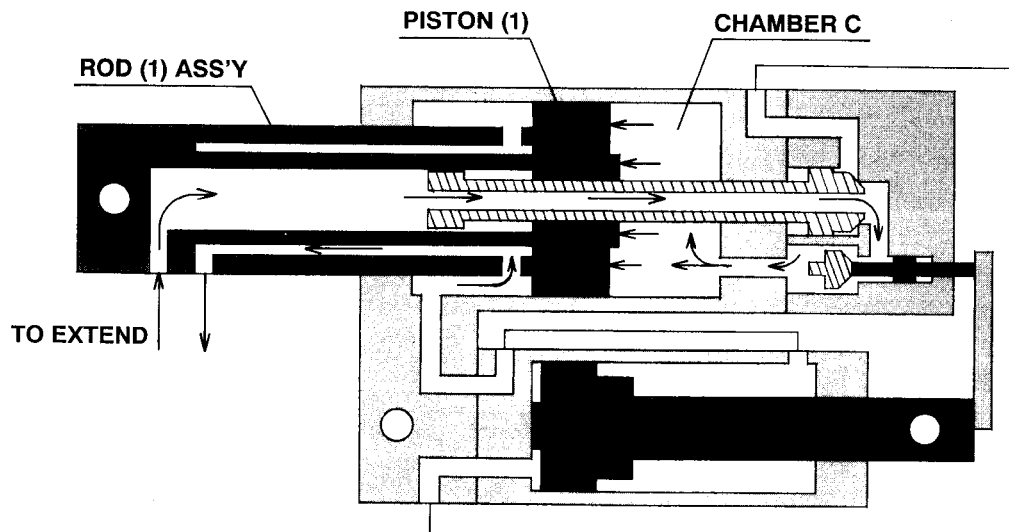
(1) Immediately before when telescoping cylinder starts extension

Pressurized oil flown into the chamber A passes through the slide pipe, the check valve (2) of selector valve, the chamber B to reach the chamber C.



(2) When telescoping cylinder (1) extends

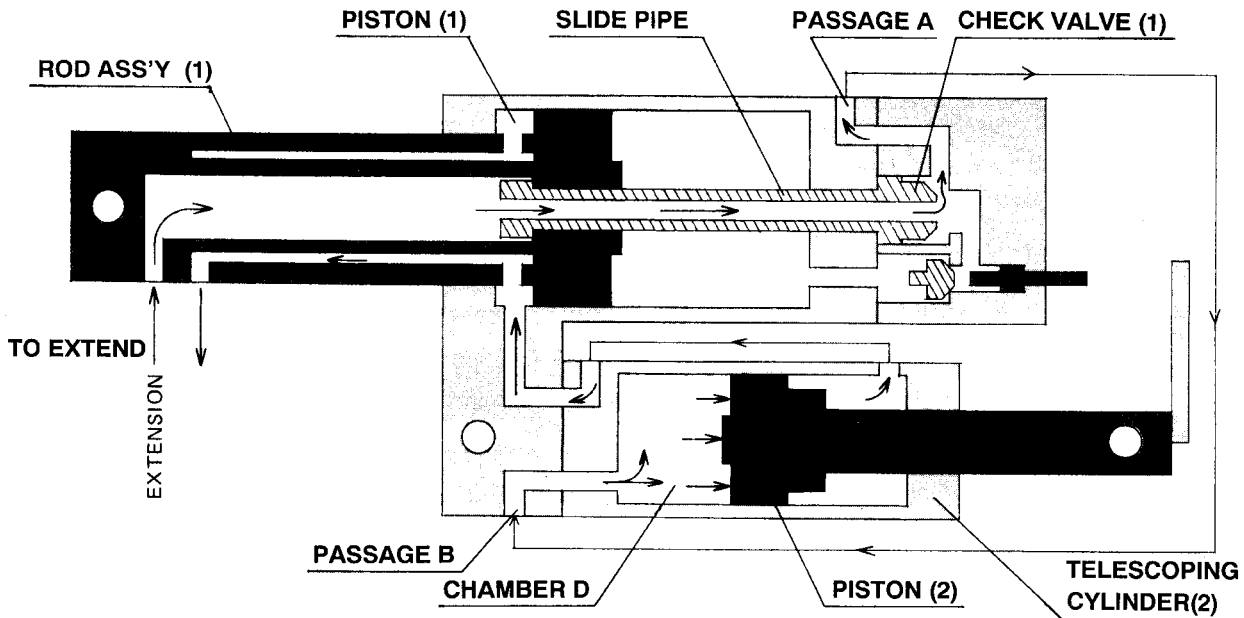
Pressurized oil flown into the chamber C pushes up the piston (1) which in turn extend the rod ass'y.



(3) When telescoping cylinder (2) extends

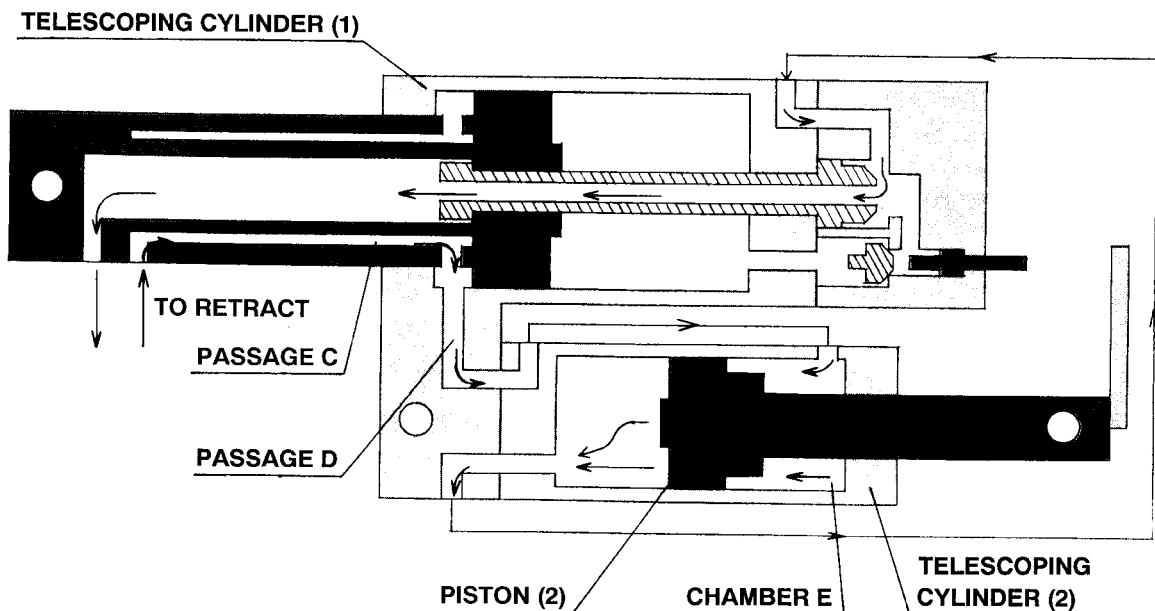
Just before the rod ass'y in the telescoping cylinder reaches its maximum extension, the stopper of the slide pipe hits the piston (1) and it is pushed up together with the piston (1), and the check valve (1) of the selector valve opens at the same time.

Pressurized oil passes through the passage A, the passage B, to reach the chamber D pushing up the piston (2) by which the telescoping cylinder (2) starts extending.



(4) When telescoping cylinder (2) retracts

Pressurized oil enters through the passage C of telescoping cylinder (1) and flows into the chamber E via the passage D to push down the piston (2) by which the telescoping cylinder (2) starts retracting.

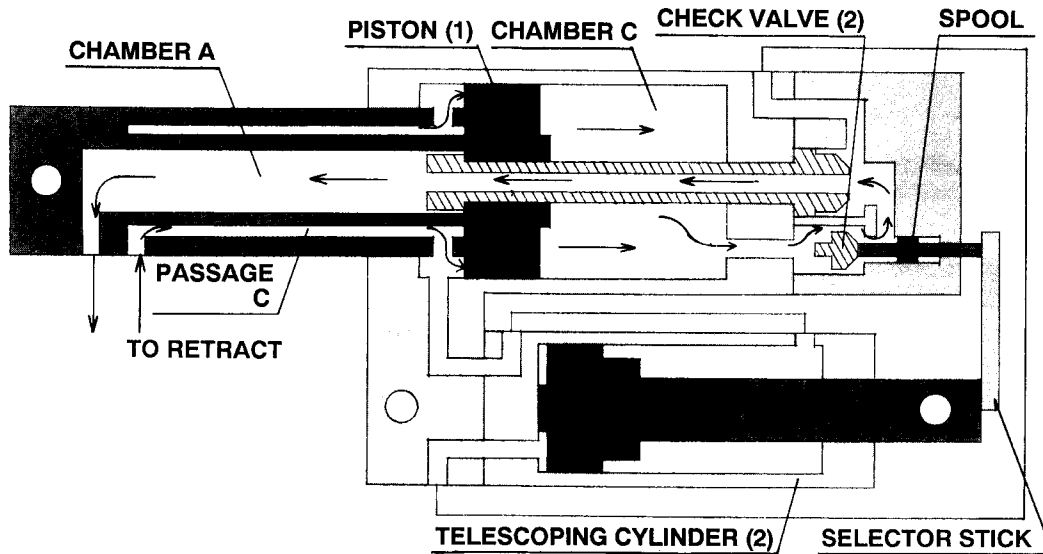


(5) When telescoping cylinder (1) starts retracting

The telescoping cylinder (2) retracts rapidly by pressurized oil flow into the passage C.

Immediately before the telescoping cylinder reaches to the minimum retraction, the spool is pushed by the selector stick mounted at the top of the rod (2) ass'y (2) to open the check valve (2) by which the piston starts to be pushed up.

Hydraulic oil in the chamber C flows through the check valve (2), the slide pipe, the chamber A, and passes through the counterbalance valve to return to the oil tank.



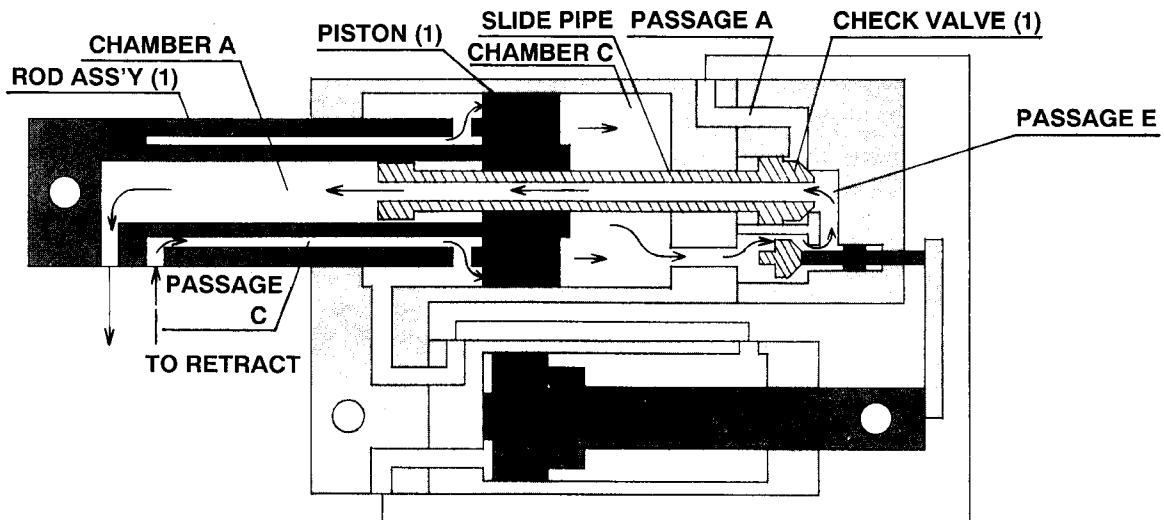
(6) When telescoping cylinder (1) retracts

Pressurized oil flow into the passage C pushes up the piston (1) to retract the rod ass'y (1).

When the rod ass'y retracts, the slide pipe which has been pushed up by the piston (1) returns to its original position and as a result the passage A and E are shut off by the check valve (1).

On the other hand, the hydraulic oil in the chamber C passes through the passage E, the slide pipe, and into the chamber A to return to the oil tank.

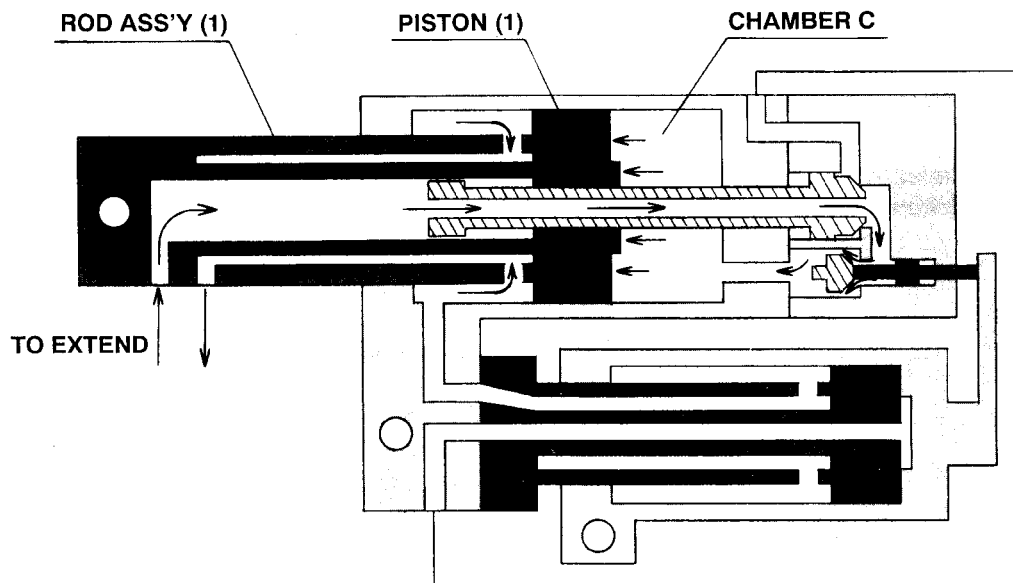
This completes retraction of the telescoping cylinder (1).



4) How 4-Section Boom (dual cylinder) operates

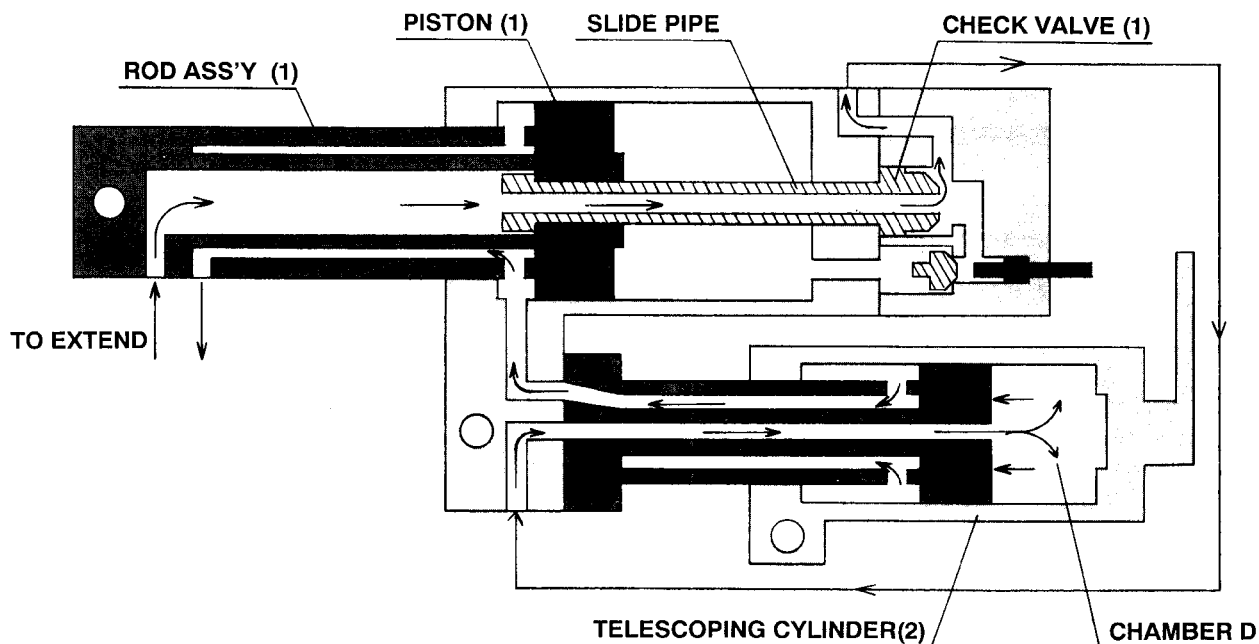
(1) When telescoping cylinder (1) extends

The extending process of the telescoping cylinder (1) is same as that of 3-section boom. Pressure oil entered into the chamber C pushes up the piston (1) and the rod ass'y (1) extends.



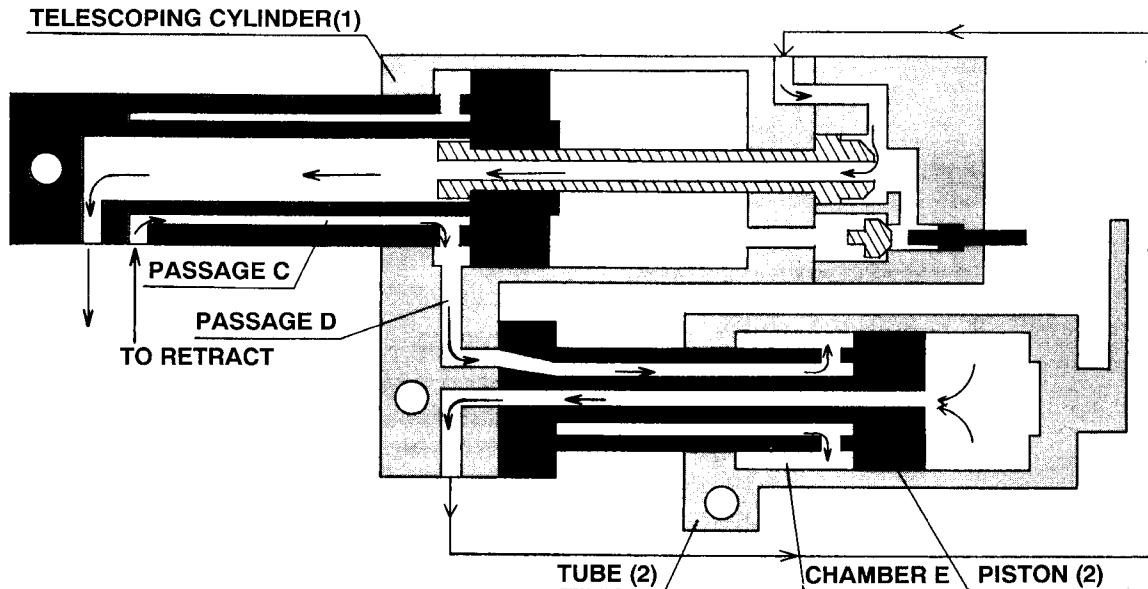
(2) When telescoping cylinder (2) extends

Just before the rod ass'y (1) of the telescoping cylinder (1) reaches its maximum extension, the slide pipe is pushed up by the piston (1), and the check valve (1) of the change-over valve opens. The pressure oil enters into the chamber D of the telescoping cylinder (2), and then the telescoping cylinder extends.



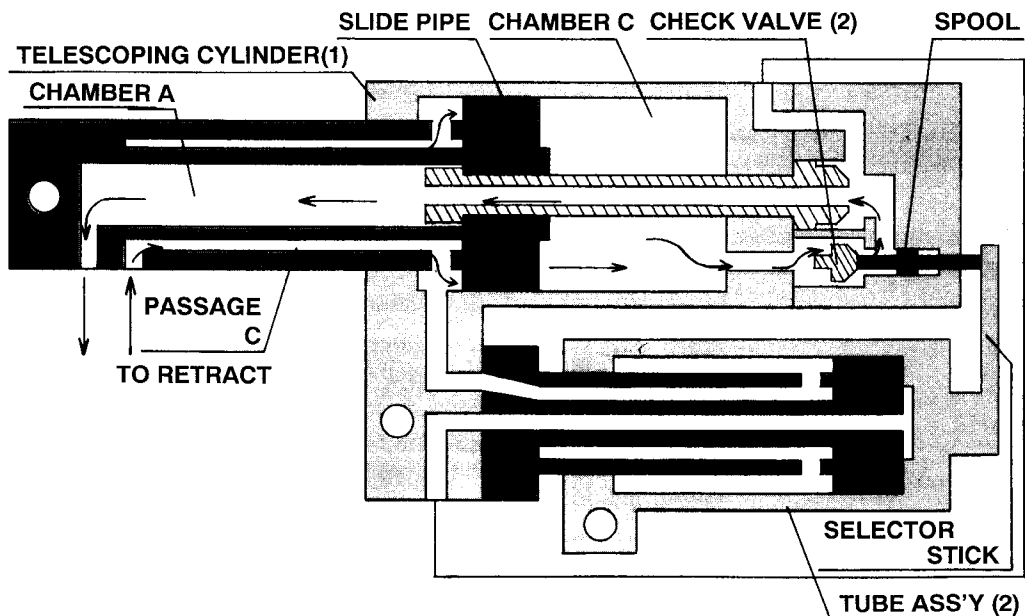
(3) When telescoping cylinder (2) retracts

Through the passage C of the telescoping cylinder (1) the pressure oil flows in, and after passing through the passage D, it enters into the chamber E of the telescoping cylinder (2), and it pushes down the tube (2). Then telescoping cylinder (2) starts retracting operation.



(4) When telescoping cylinder (1) retracts

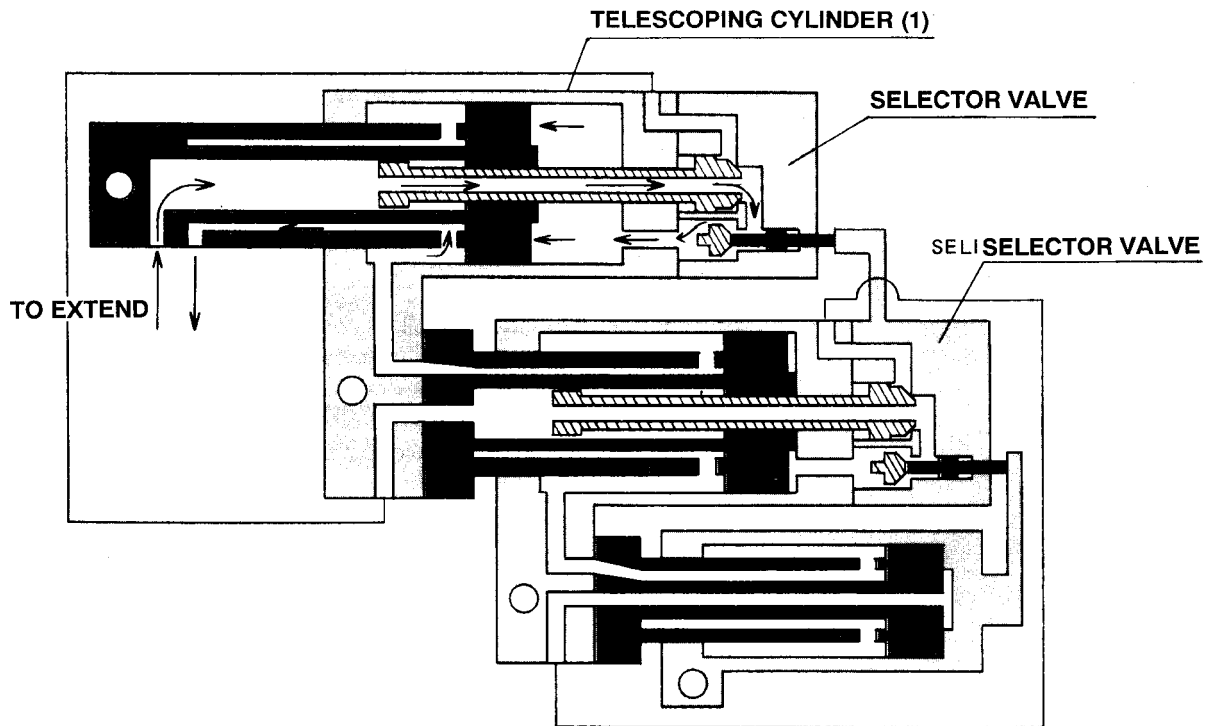
Telescoping cylinder (2) retracts following the flow of pressure oil from the passage C. Just before the retraction, the selector stick locating at the tip of the tube ass'y (2) pushes the spool to open check valve (2). The pressure oil in the chamber C goes through the check valve (2), slide pipe, chamber A and returns to tank. In this way, the telescoping cylinder (1) retracts.



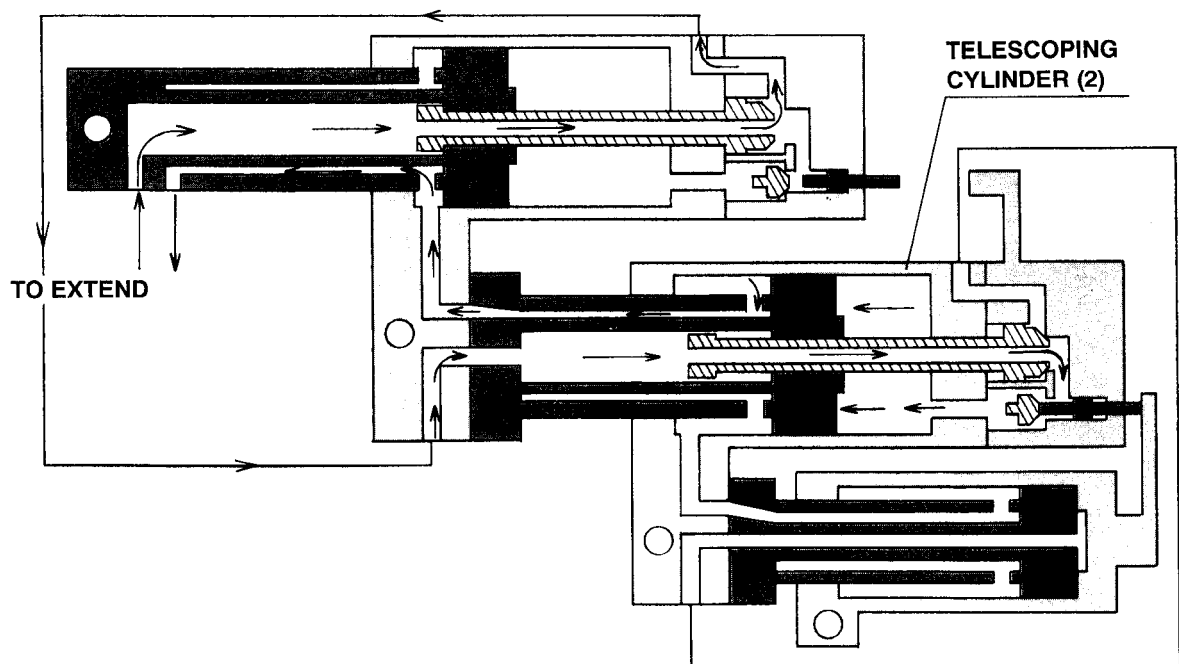
5) How 5-Section Boom (triple cylinder) operates

Extending process of the telescoping cylinder is same as that of 4-section boom, i. e. their change-over operation is conducted by the selector valves and they extend in the order of telescoping cylinders (1), (2), and (3).

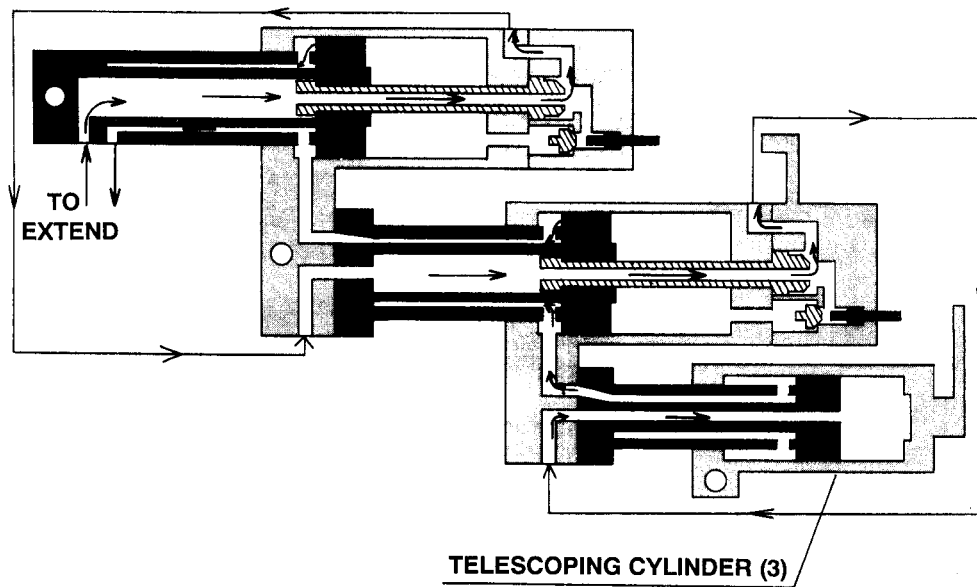
(1) When Extending Telescoping Cylinder (1)



(2) When Extending Telescoping Cylinder (2)



(3) When Extending Telescoping Cylinder (3)



*** Retracting operation is in the reverse order of extending, and the telescoping cylinders retract in the order of (3), (2), and (1).**

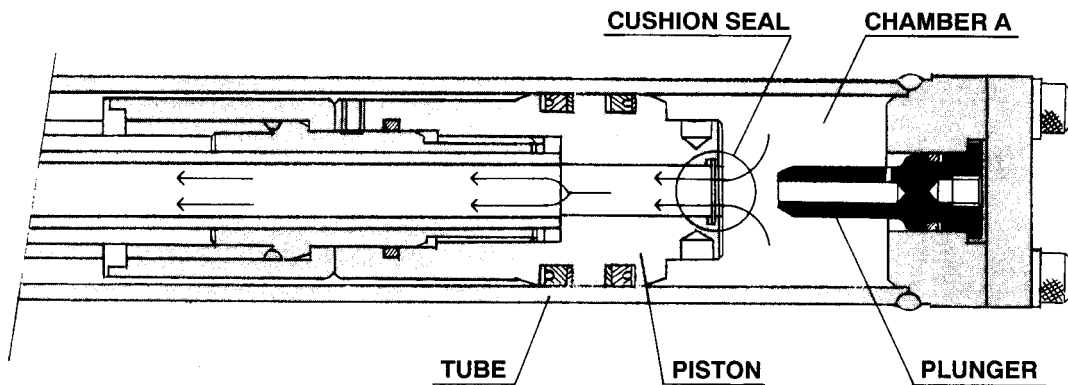
6) How Cushion Seal Functions

For the purpose of absorbing a piston shock to the stroke end, the 4-section boom has a cushion seal in the part of piston of the telescoping cylinder (2), while the 5-section boom and 6-section boom have the cushion seal in their telescoping cylinders of (2) and (3).

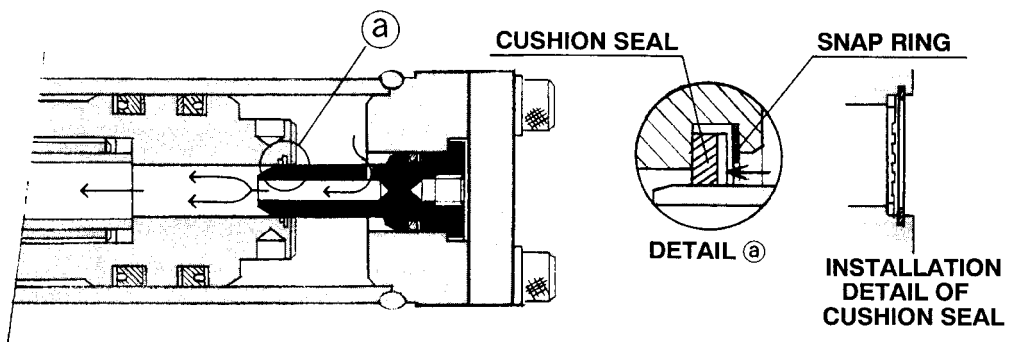
(1) Flow of Pressure Oil When Retracting

Cushion mechanism of the telescoping cylinder (2) for 4-section boom and that of the telescoping cylinder (3) for 5-section and 6-section booms.

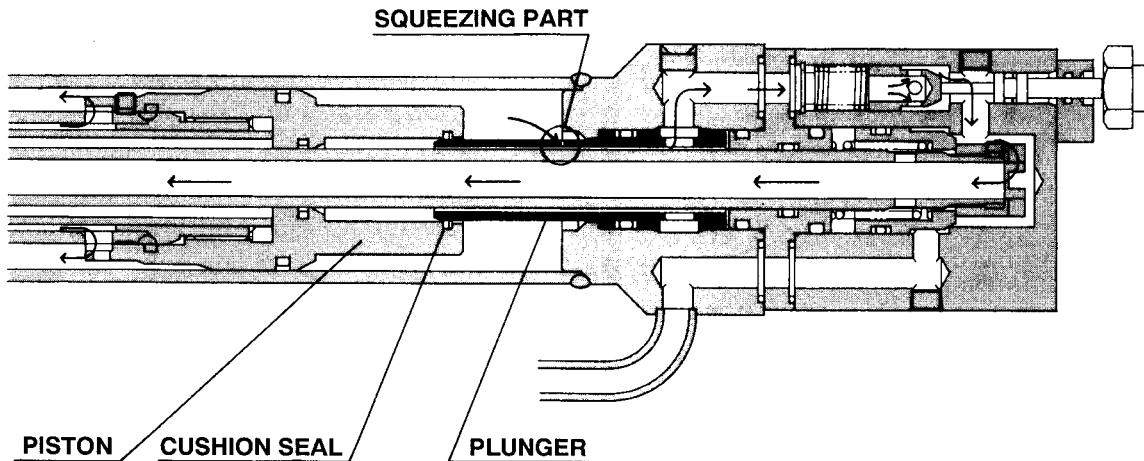
- ① In the retracting process, before the piston gets in the plunger, the pressure oil in the chamber A flows through the central part of the piston as shown in the illustration and returns to the tank without being squeezed.



- ② At the same time when the piston gets in the plunger, the chamber A is closed with the cushion seal (a). As a result, the pressure oil in the chamber A is forced to return only through a drilled $\phi 1$ hole in the state of being squeezed. Thus the piston shock at the stroke end is absorbed.

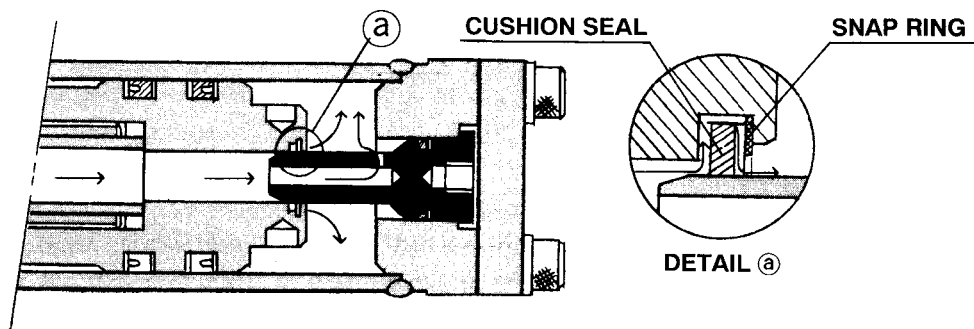


③ Cushion mechanism of the telescoping cylinder (2) for 5-section

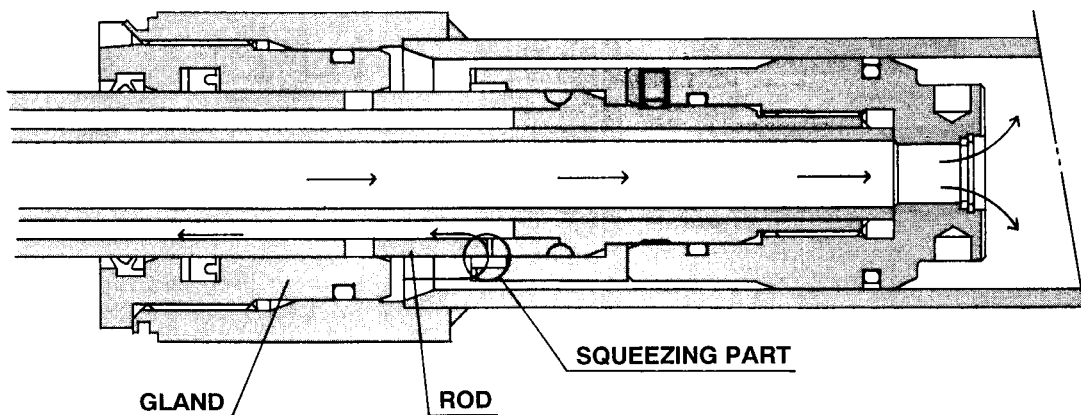


(2) Flow of Pressure Oil When Extending

- ① When extending, the cushion seal (a) is pushed to the snap ring side, and the pressure oil flows into the chamber A without being shut as shown in the illustration. In this way, the telescoping cylinder extends.



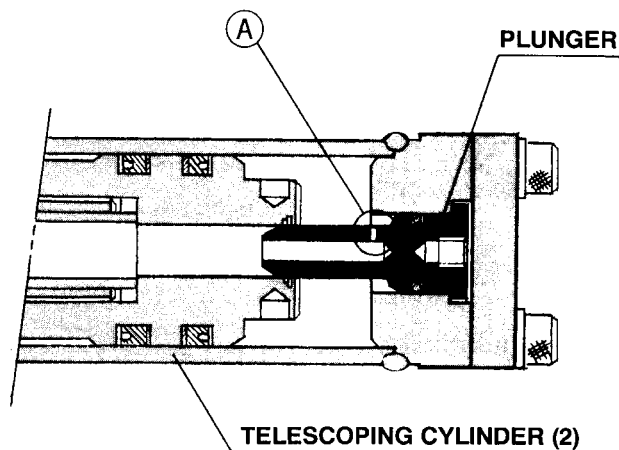
- ② Cushion mechanism of the telescoping cylinder for 5-section and 6-section boom is to squeeze the return pressure oil at the position just before the end of extension and absorb the piston shock to the stroke end.



(3) Cause of Troubles and Remedy

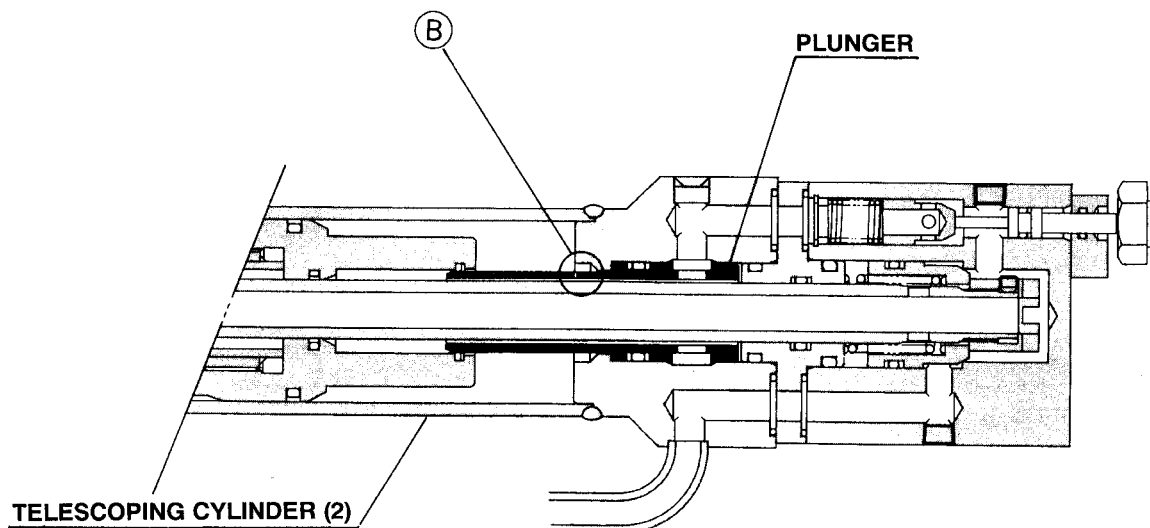
(4-section boom)

- ① Just before the full retraction of the booms (3) and (4), and before changing over to the boom (2), i. e. 30~40mm before changing over to the boom (2), retracting operation has suddenly stopped. In such a case, it is presumed that some foreign substance clogged a drill hole at the position ① of the plunger of the telescoping cylinder (2).

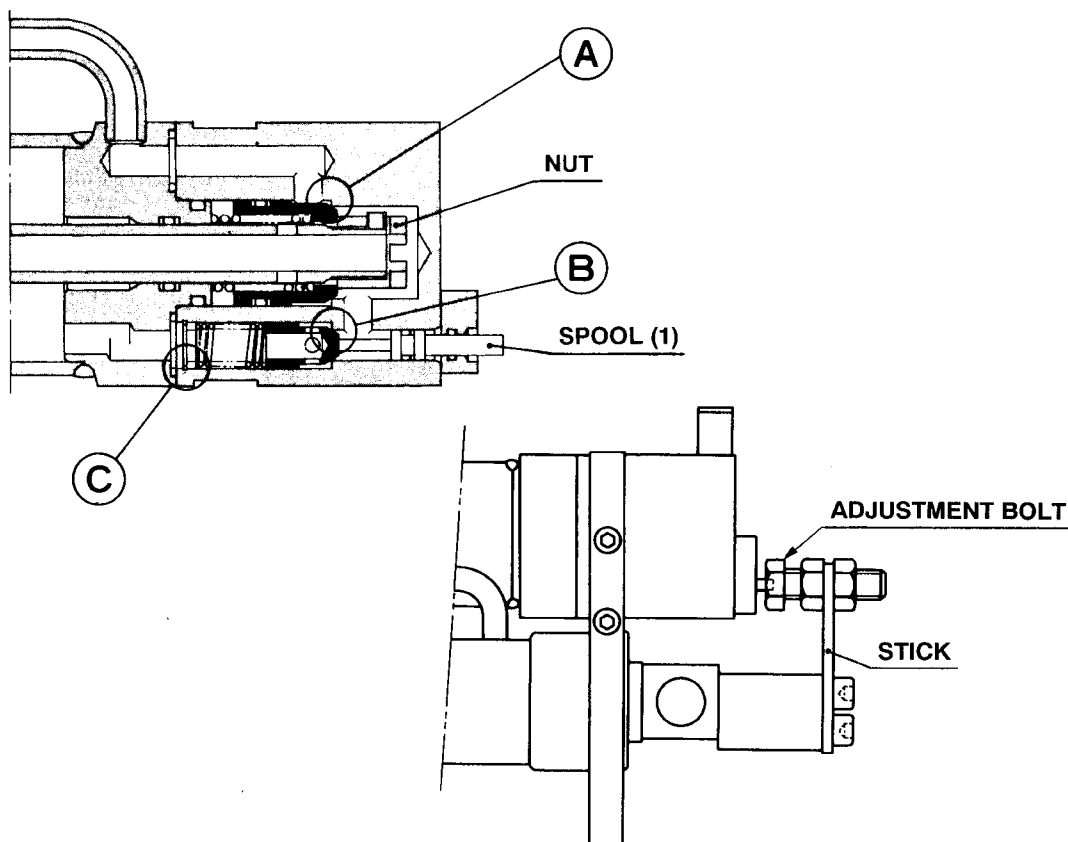


(5-section boom)

- ① When retraction of the boom (3) becomes impossible at the position just before full retraction of the booms (4), (5) and (6), inspect the plunger which is assembled in the telescoping cylinder (3).
- ② When the boom (3) does not change over to the boom (2), and retraction becomes impossible at the position just before full retraction, inspect the drilled hole at the position ② of the plunger of the telescoping cylinder (2).



7) Cause of Troubles and Measures to be Taken



① 3-section boom(dual cylinder)

Troubles	Possible cause	Measures to be taken
① Booms (2) and (3) extend simultaneously or in wrong order, but they retract normally.	<ul style="list-style-type: none"> ● Foreign substances are caught in the section ① of selector valve. 	<ul style="list-style-type: none"> ● Make an overhaul-cleaning of selector valve, or replace it.
② Booms (2) and (3) retract simultaneously or in wrong order, but they extend normally.	<ul style="list-style-type: none"> ● Foreign substances are caught in the section ② of selector valve. ● Snap ring in the section ③ has come off. 	<ul style="list-style-type: none"> ● Make an overhaul-cleaning of selector valve, or replace it. ● Fit the snap ring.
③ Boom (3) fails to extend, but boom (2) extends normally.	<ul style="list-style-type: none"> ● The nut at the slide pipe of telescoping cylinder (1) is loosened. 	<ul style="list-style-type: none"> ● Disassemble telescoping cylinder (1) to tighten the nut.
④ After the booms are extended fully, boom (2) fails to extend, but boom (3) telescopes normally.	<ul style="list-style-type: none"> ● Adjusting bolt which pushes the spool of selector valve is loosened, or the stick is bent. ● Spool (1) of selector valve is bent. 	<ul style="list-style-type: none"> ● Adjust the bolt. ● Straighten the bent stick. ● Replace selector valve.

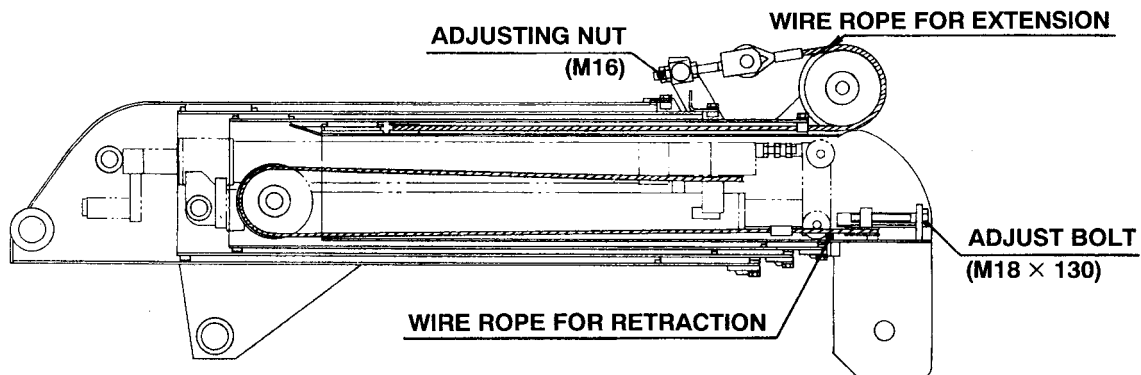
② 5-section boom (Triple cylinders)

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 of telescoping cylinder (1) is clogged with foreign substances.	<ul style="list-style-type: none"> Disassemble selector valve and clean it, or replace it with a new one.
2. Retraction is normal, but when extending, (3) booms extend at a time or not in a good order.	a) The part A of the selector valve of telescoping cylinder (2) is clogged with foreign substances.	
3. Extension is normal, but when retracting, (3), (4) and (5) booms retract at a time or not in a good order.	a) The part B of the selector valve of telescoping cylinder (2) is clogged with foreign substances. b) Snap ring of the part C got out of place.	<ul style="list-style-type: none"> Disassemble selector valve and clean it, or replace it with a new one. Rearrange snap ring.
4. 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 of telescoping cylinder (1) is clogged with foreign substances. b) Snap ring of the part C got out of place.	
5. Boom (2) extends but boom (3) does not extend.	a) Nut at the slide pipe of telescoping cylinder (1) loosened.	<ul style="list-style-type: none"> Disassemble telescoping cylinder (1) and tighten the nut.
6. Boom (2) and (3) extends but boom (4) and (5) does not extend.	a) Nut at the slide pipe of telescoping cylinder (2) loosened.	<ul style="list-style-type: none"> Disassemble telescoping cylinder (2) and tighten the nut.
7. After full extension of booms, boom (4) and (5) retracts but boom (3) does not retract.	a) Adjust bolt pushing the spool of selector valve of telescoping cylinder (2) loosened or the stick was bended. b) Selector valve spool (1) was bended.	<ul style="list-style-type: none"> Adjust the bolt. Straighten bended stick. Replace selector valve ass'y with a new one.
8. After full extension of booms, boom (3), (4) and (5) retracts but boom (2) does not retract.	a) Adjust bolt pushing the spool of selector valve of telescoping cylinder (1) loosened or the stick was bended. b) Selector valve spool (1) was bended.	

Note: If booms (4) and (5) fail to extend fully while checking operation after disassembling and repairing the boom, the cause of it may be possibly the right and left extension wires crossing each other.

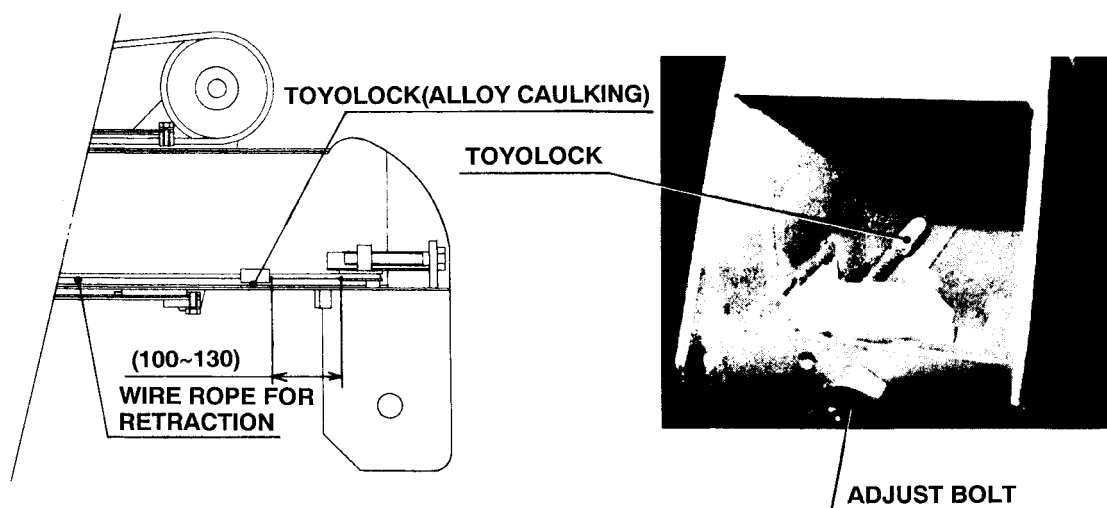
※ Check the 4-section boom for the above in the same way as in the case of the 5-section boom.

8) How to adjust wire rope for telescoping boom(for 4-section boom)



(1) Adjusting wire rope for retraction

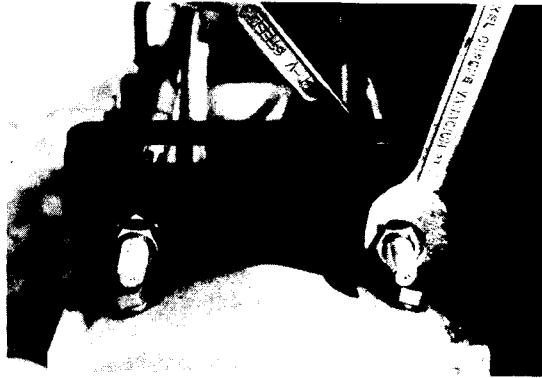
- ① Retract the boom (3) until it touches the tip of the boom (2).
- ② Tighten the adjust bolt of the wire rope for retraction until the boom (4) touches the boom (3).



Note: When fitting the wire rope for retraction, the WIRE TOYOLOCK (alloy caulking) shall be fitted so that it will be located at the position as shown in the above illustration (100~130mm).

(2) Adjusting the wire rope for extension

- ① Adjust by tightening the adjust nut of the wire rope for extension to an extent that a gap will not be made between the boom (4) and the tip of the boom (3),
(After tightening the adjust nut, be sure to tighten the lock nut firmly.)
- ② If the wire rope for extension is stretched too tight, tension of the wire rope for retraction would become larger. Therefore, adjust the tension of the wire rope for extension a little slack.



*** After checking the extension/retraction movement, retract fully and check to see if there is any gap between the tip of the boom (3) and the boom (4). If a gap is found, readjust.**



After completion of the above adjusting and checking work, fit the plate which prevents the adjust bolt of wire rope for rotation from loosening.



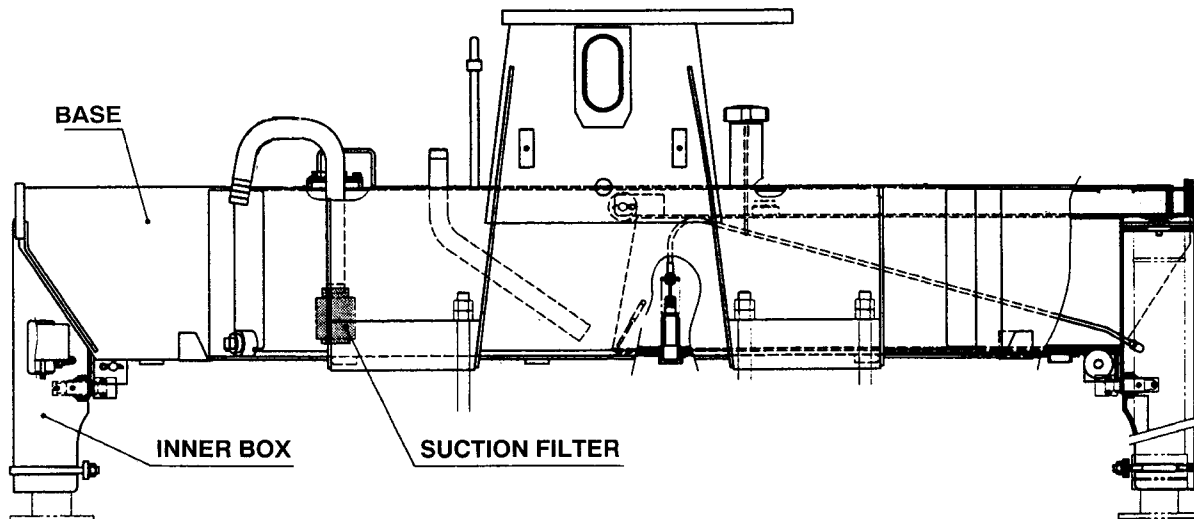
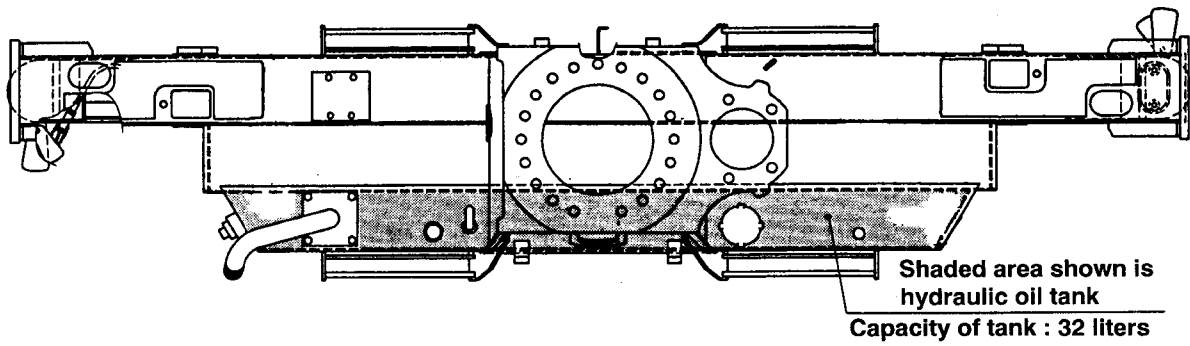
* Adjustment of the wire rope for extension/retraction of 5-section boom shall be made in accordance with the same procedures as those for 4-section boom.

(3) Inspection of the wire ropes for extension and retraction

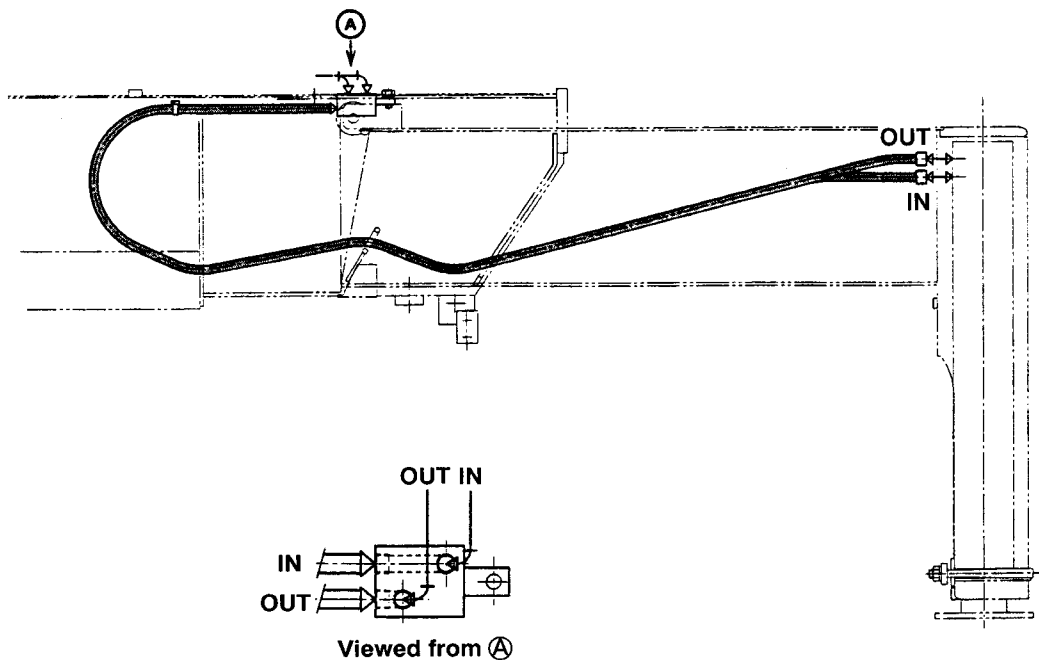
- ① Check to see if the element wires are broken. If negative is the case, replace the wire rope with a new one.
- ② Check to see if the wire rope is deformed remarkably, kinked, corroded.
When abnormality is found, replace it with a new one.
- ③ Check the diameter. If decreased amount of the diameter is more than 7% of the nominal diameter, replace it with a new one.
- ④ Check to see if the oil and grease applied are proper both in quality and quantity. If improper and insufficient, apply enough quantity of proper ones.

§4. BASE

1) Construction of Base

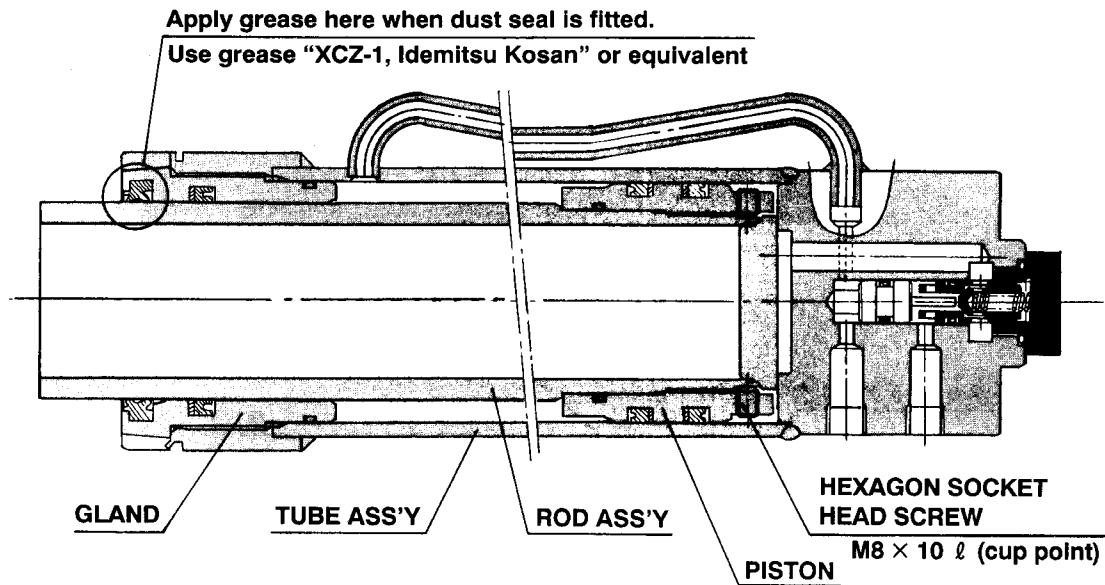


2) Piping to Outrigger Cylinder



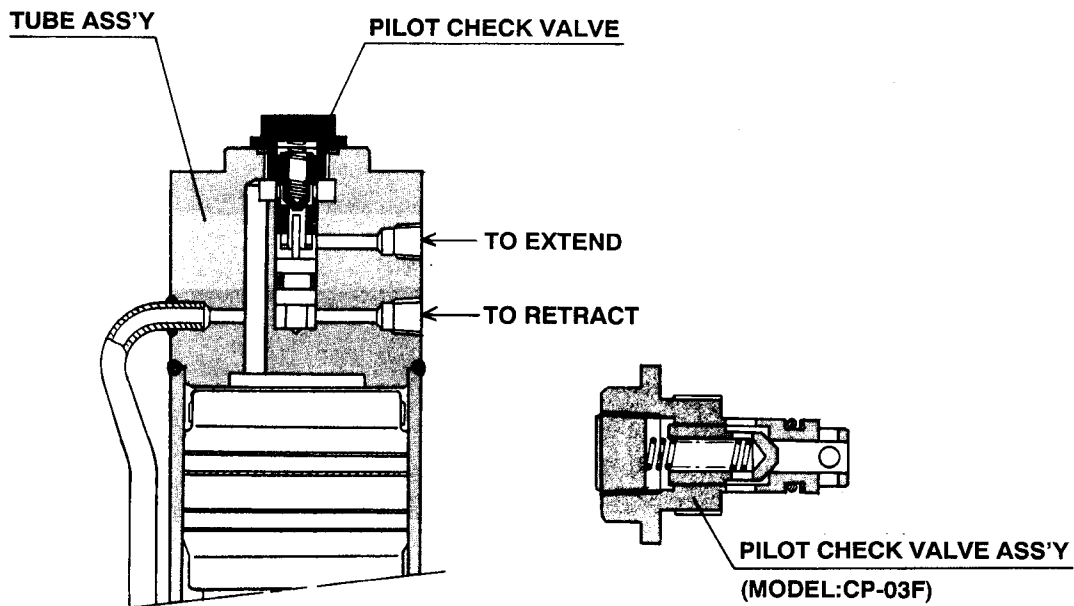
§5. OUTRIGGER CYLINDER

1) Construction of Outrigger Cylinder



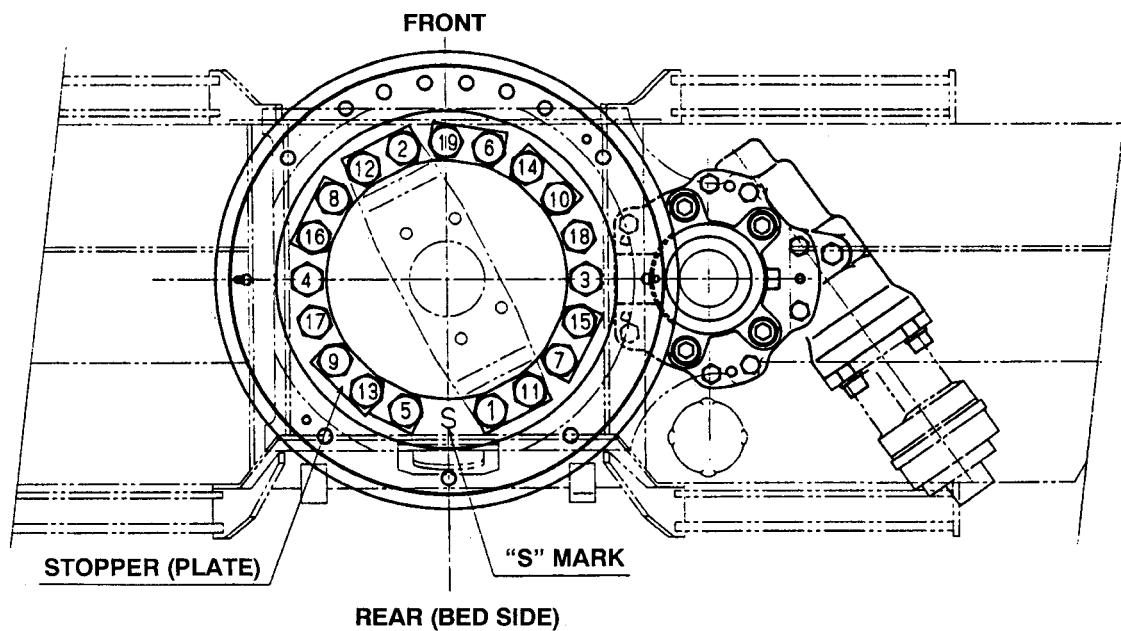
Note : Apply "LOCK TIGHT #242" to each hexagon head socket screw in the piston before tightening it.
(Do not flow hydraulic oil less than 1 hour after grease has been applied.)

2) How Pilot Check Valve is Mounted



§6. SLEWING DEVICE

1) Where to Position "S", SOFT ZONE, on Turntable

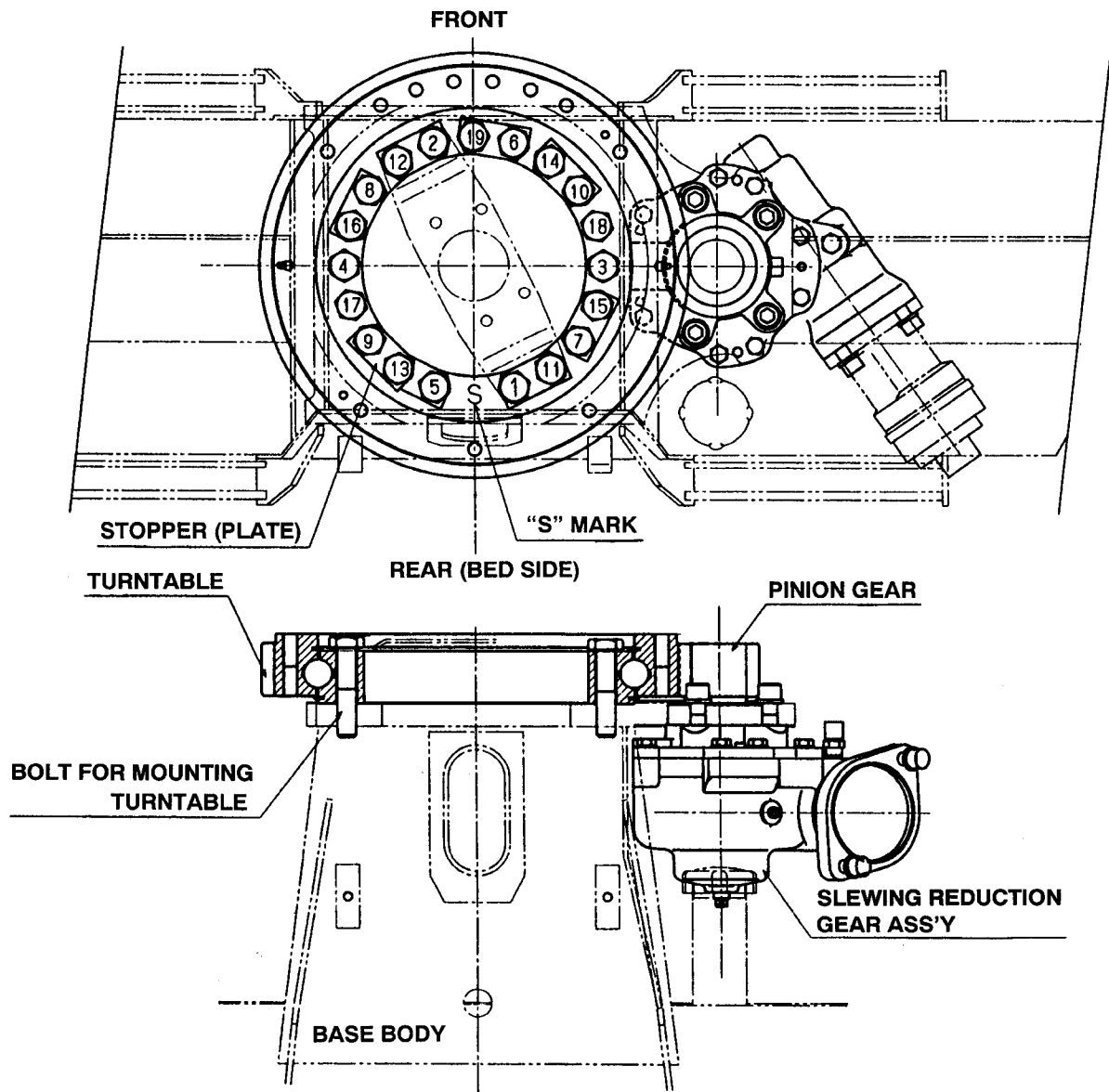


- Position the soft zone mark "S" on inner side of turntable to the rear (bed side) when mounting the turntable.

2) Tightening Sequence of Bolts for Mounting Turntable

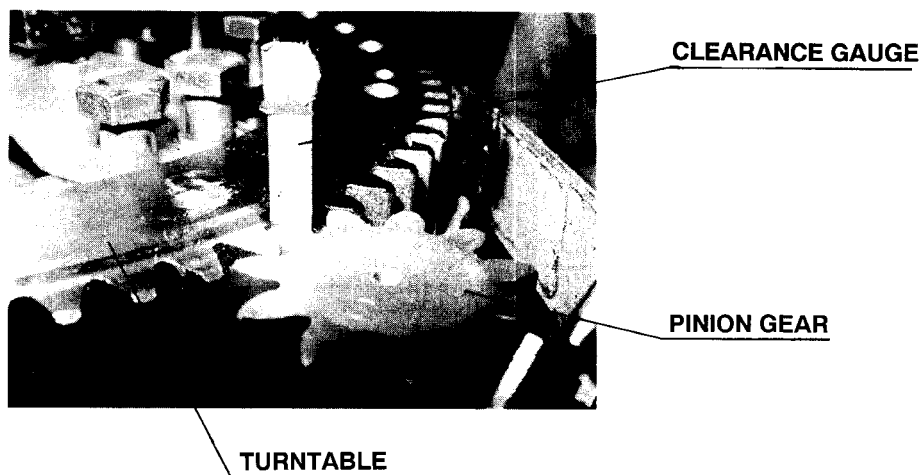
- Tighten the bolts in the numerical order as illustrated in the figure above.

3) How to Mount Turntable

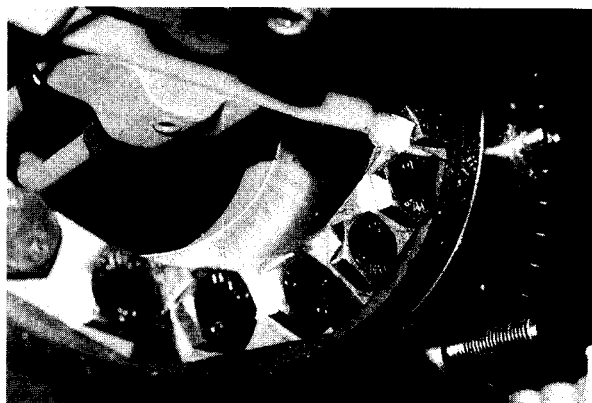


- ① Install the slewing reduction gear to the base body.
- ② Set the turntable on the base to screw-in the bolts for mounting turntable lightly.

- ③ Put a clearance gauge (0.1~ 0.2 mm) between the turntable and the pinion gear and press the turntable against the pinion gear firmly.

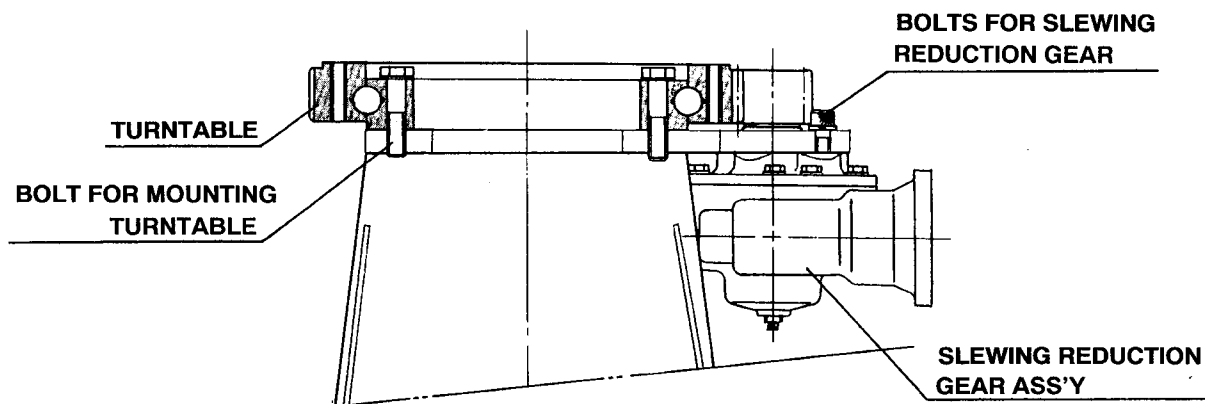


- ④ Tighten the bolts for mounting turntable with the specified torque in accordance with tightening order with the turntable and the pinion gear held together firmly.
- ⑤ After the bolts have been tightened, fold the inside corner of the stopper (plate) to follow one side of the hexagon bolt head.



- ⑥ Apply grease to engaging teeth of the gears after it has been assembled.

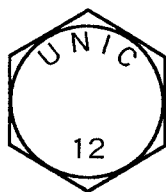
4) Tightening torque for the bolts for mounting turntable



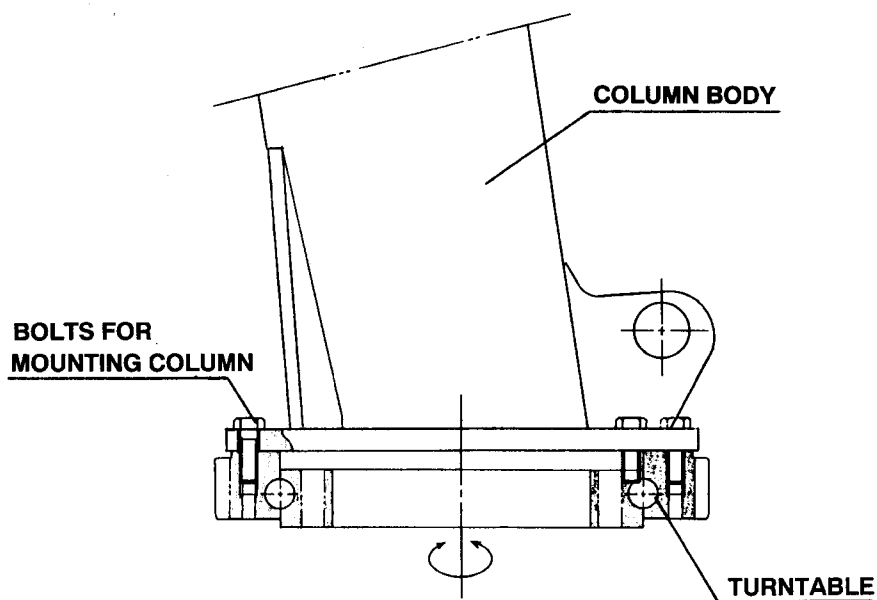
Place of use	Part name	Tightening torque
Slewing reduction gear	Tempered bolt M16 × 50 ℓ (10T)	23~29 kg-m (Target : 26 kg-m)
Turntable (at inner ring)	Tempered bolt M20 × 95 ℓ (12T)	45~52 kg-m (Target : 48 kg-m)

Note : Use UNIC genuine bolts (tempered bolts) for mounting turntable.

To identify them as genuine, “UNIC 12” is inscribed on each bolt head.



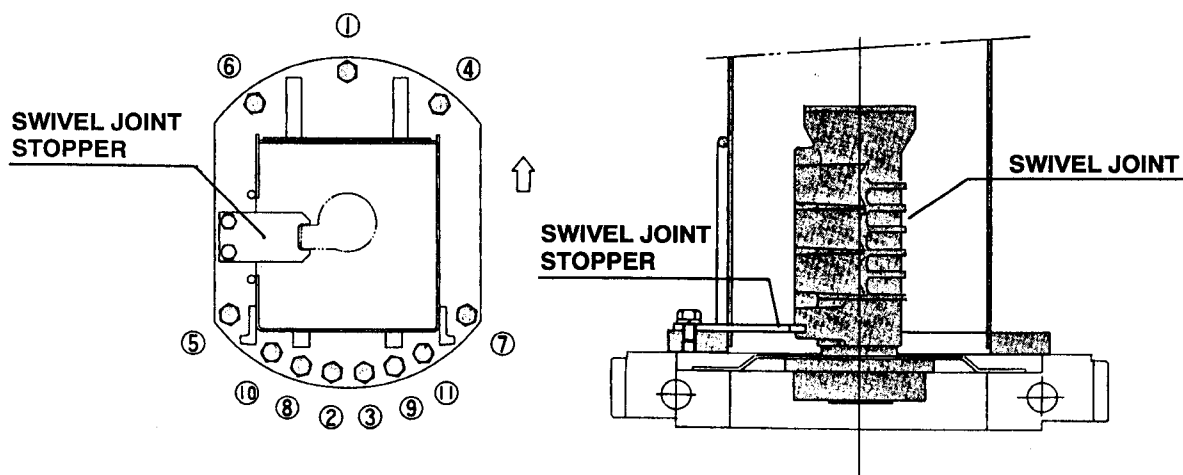
5) Tightening torque for the bolts for mounting column



Place of use	Part name	Tightening torque	Note for tightening
Column (at outer ring of turntable)	Tempered bolt MJ16 × 50 ℓ (12T)	23~27 kg-m (Target : 25 kg-m)	Follow numerical order shown below for tightening sequence of bolts.

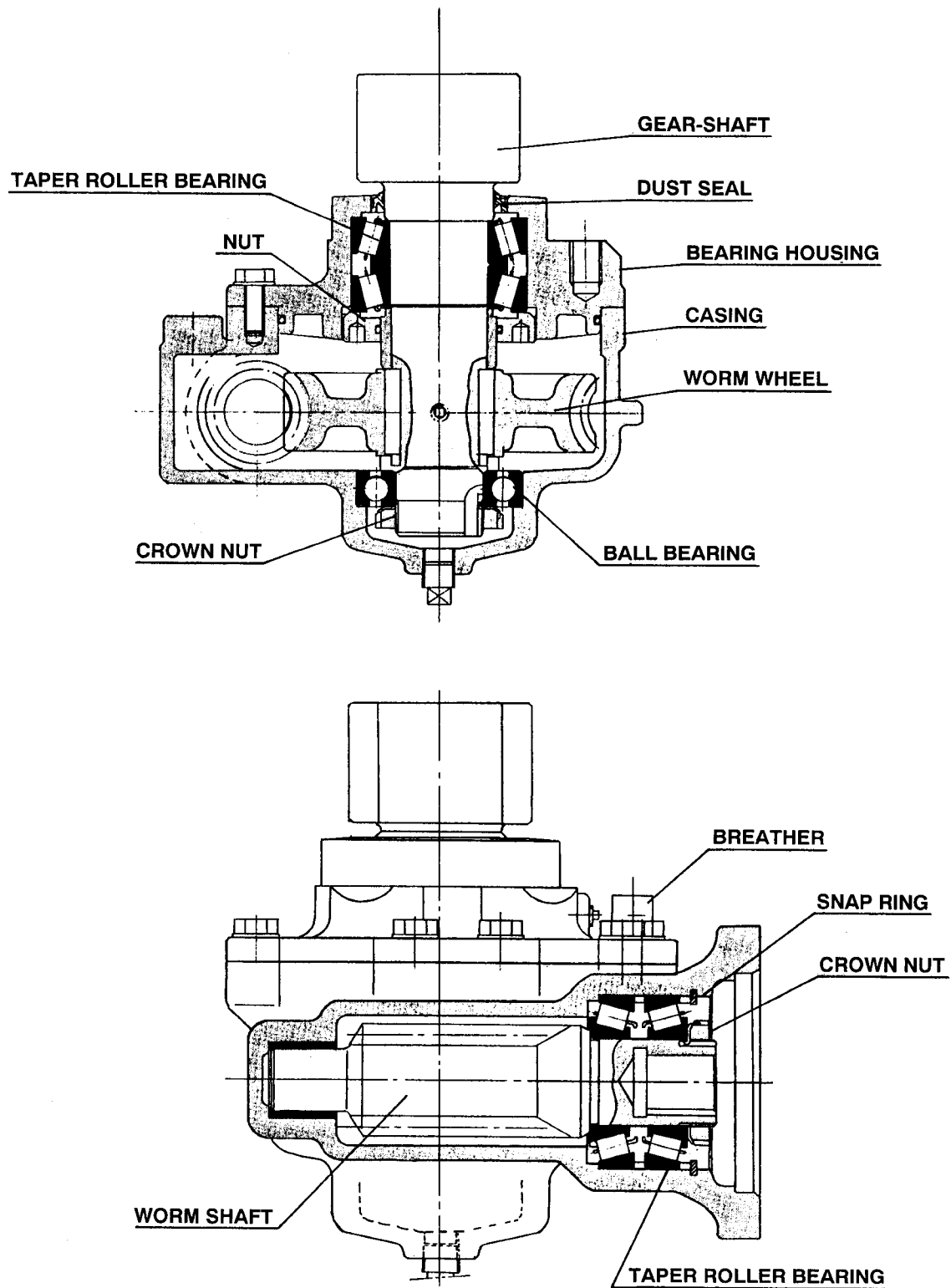
Note : Apply “LOCK TIGHT #962T” to the bolts for mounting column before tightening them.

6) Tightening sequence of bolts for mounting column



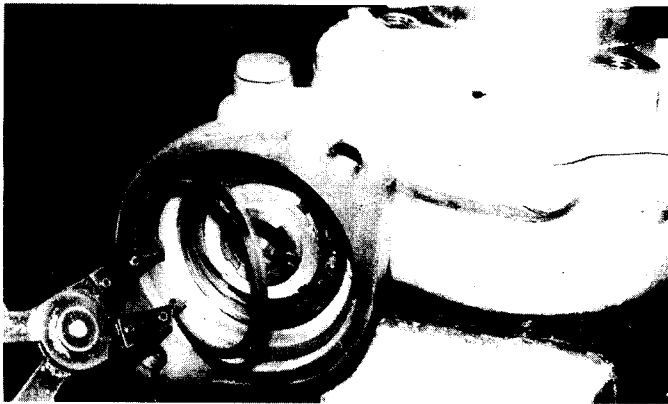
§7. SLEWING REDUCTION GEAR

1) Construction



2) How to Disassemble Reduction Gear

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



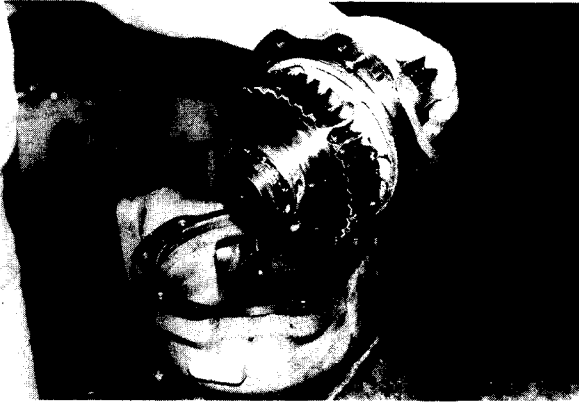
- ② Turn the gear-shaft counterclockwise and pull out the worm shaft out of casing.
(Use of a special tool for removing worm shaft is recommended.)



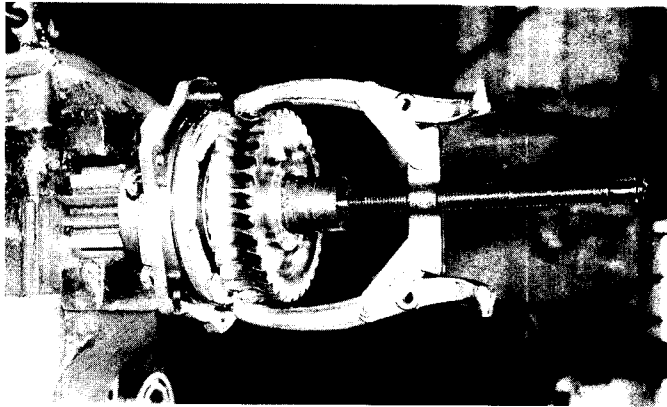
- ③ Remove 8 pcs. of bolts for mounting bearing housing and pull out the housing by removing 3 pcs. of bolts in the through-holes (3 places) of housing.



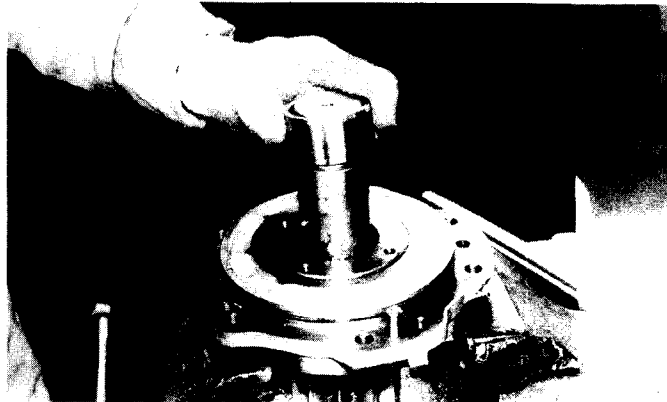
- ④ The following illustration shows the housing (with gear-shaft and worm wheel) being pulled out.



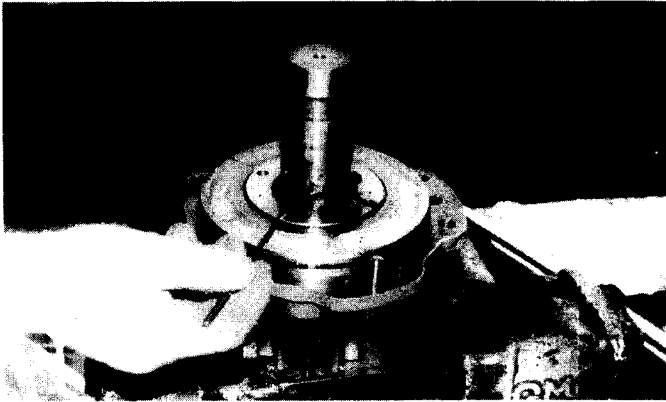
- ⑤ Grip the housing with a vice to pull out the worm wheel by using a gear puller.



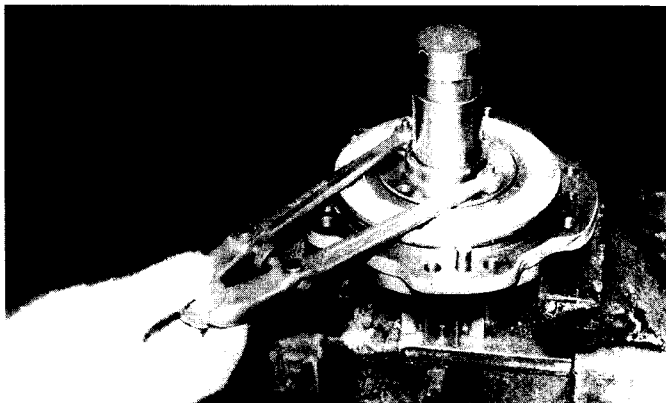
- ⑥ Extract the collar assembled in the nut.



- ⑦ Extract the O-ring assembled in the nut.



- ⑧ Remove the nut securing the taper roller bearing by using a pin spanner.

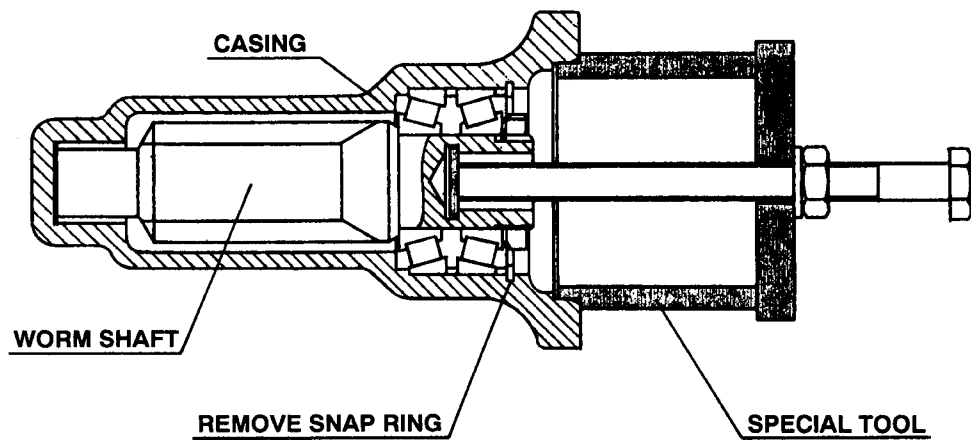


Note : Adhesive “LOCK TIGHT” has been applied to the thread of the nut, therefore heat up the threaded area with a gas flame to facilitate to loosen the nut.

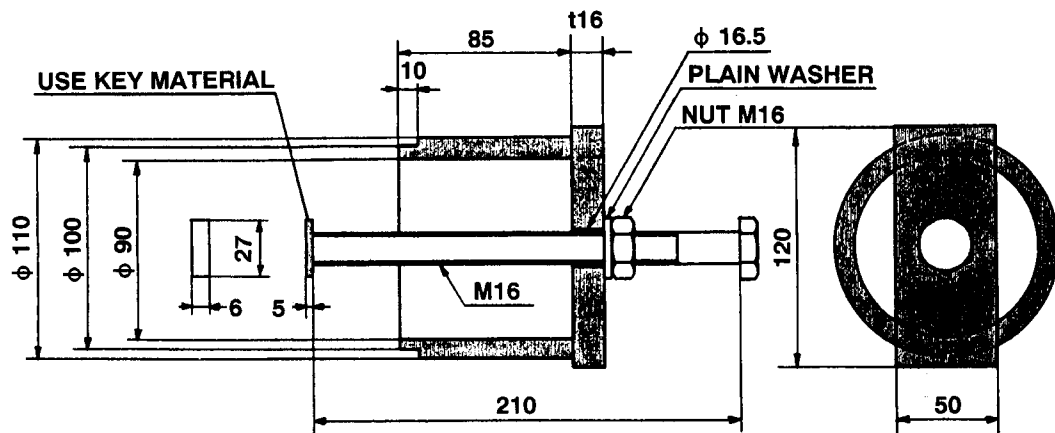
When re-assembling the nut, be sure to apply “LOCK TIGHT #262” to the thread before tightening it.

3) Special Tool for Removing Worm Shaft of Slewing Reduction Gear

(Sectional view of the worm shaft)

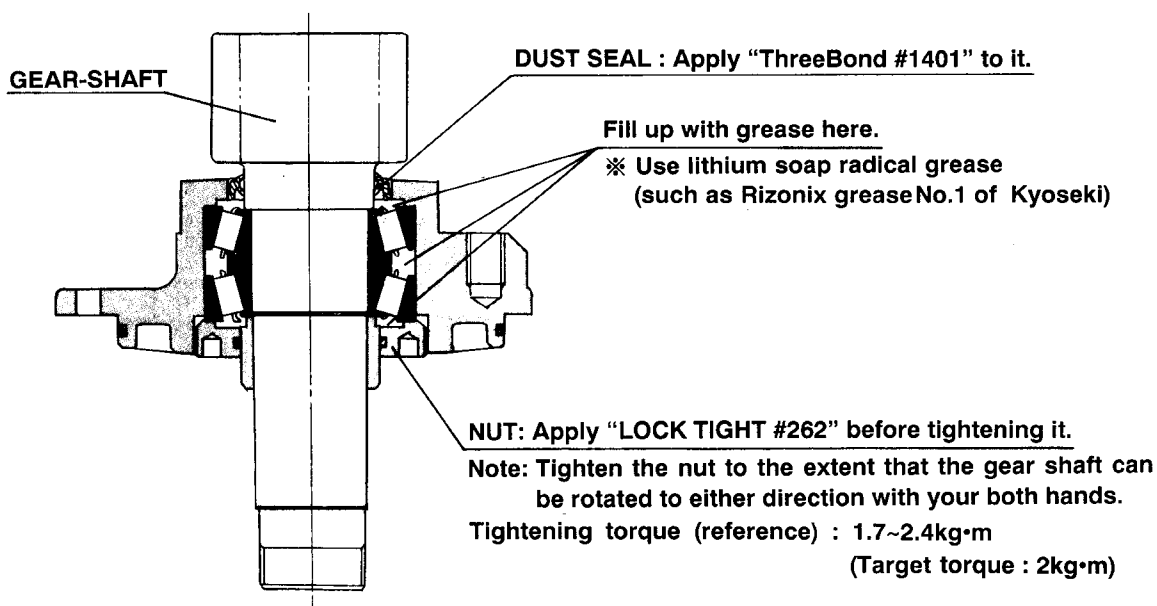


(Special tool in detail)

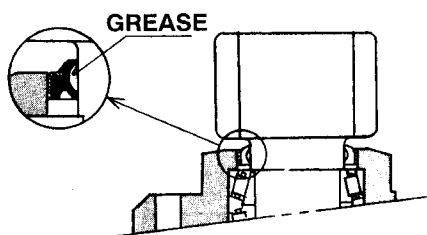


4) Caution to be Taken When Re-assembling Slewing Reduction Gear

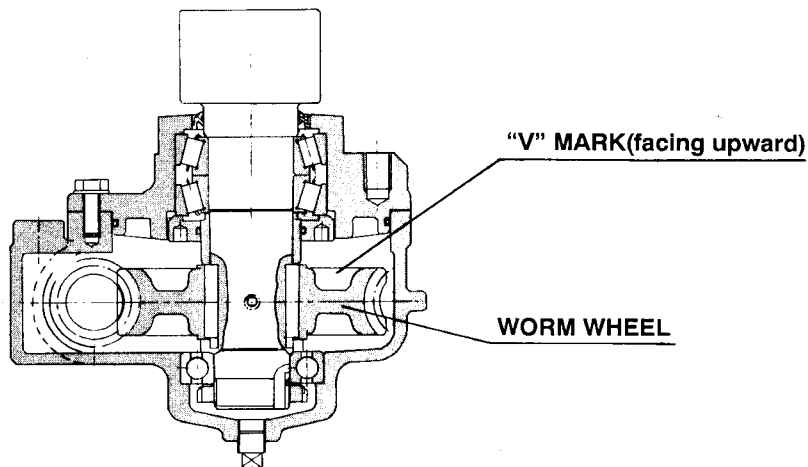
① Places to be applied



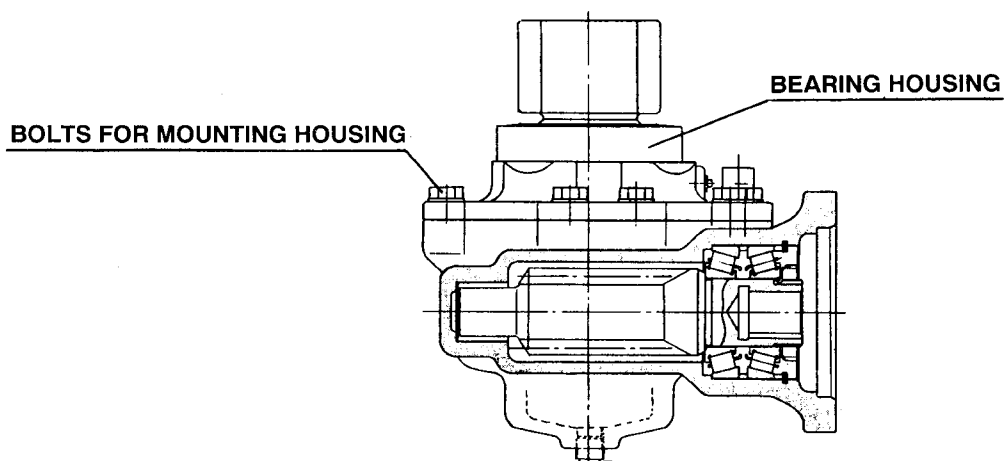
② Apply grease to the inside of lip of dust seal.



③ Assemble the worm wheel with the mark "V" directed upward.



5) Tightening Torque of Bolts for Mounting Bearing Housing



Place of use	Part name	Tightening torque	Note for tightening
Housing of slewing reduction gear	Tempered bolt M10 × 25 ℓ (7T)	5~7 kg-m (Target : 6 kg-m)	Degrease the tempered bolts then apply "LOCK TIGHT #262" before tightening them.

6) Gear Oil for Reduction Gear

Air entered in the gear case brings dirts and moisture which can mix with oil.

In addition, since gears themselves gradually wears and produce abrasion particles during operation, replace the gear oil 6 months after the start of crane operation, then once every 2nd year thereafter.

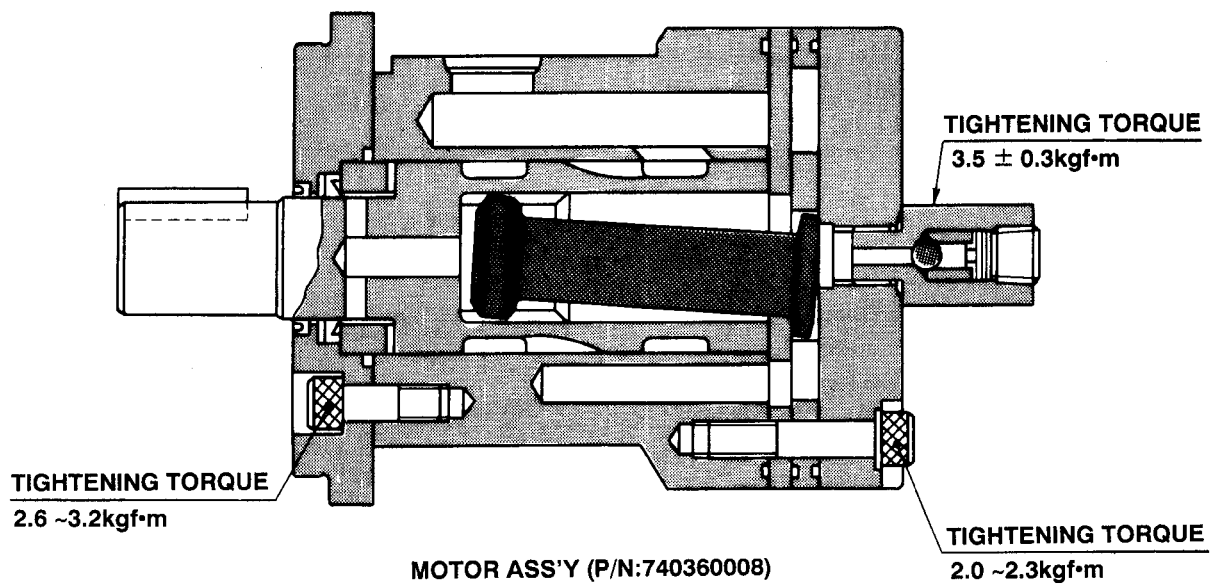
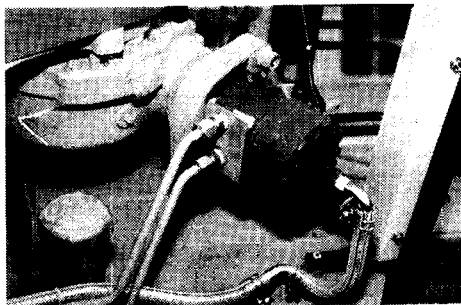
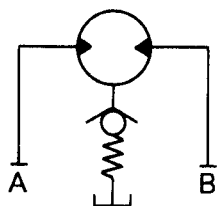
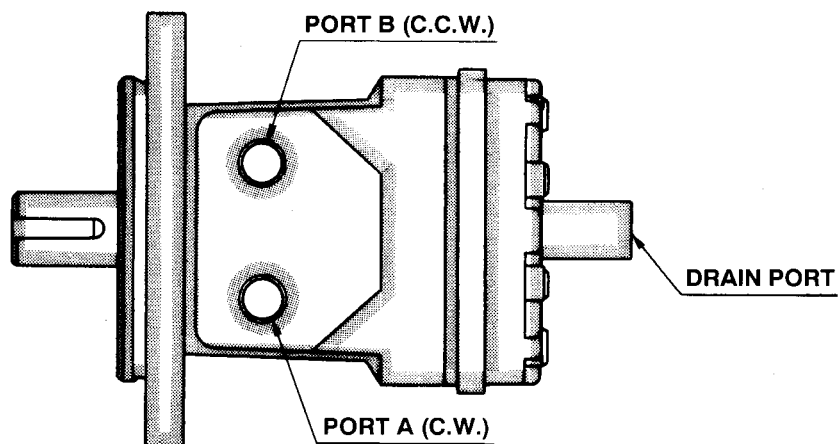
Quantity of gear oil
Approx. 0.7 liter (0.8 liter for new crane)

RECOMMENDED GEAR OIL

Use API Service GL-4 gear oils.

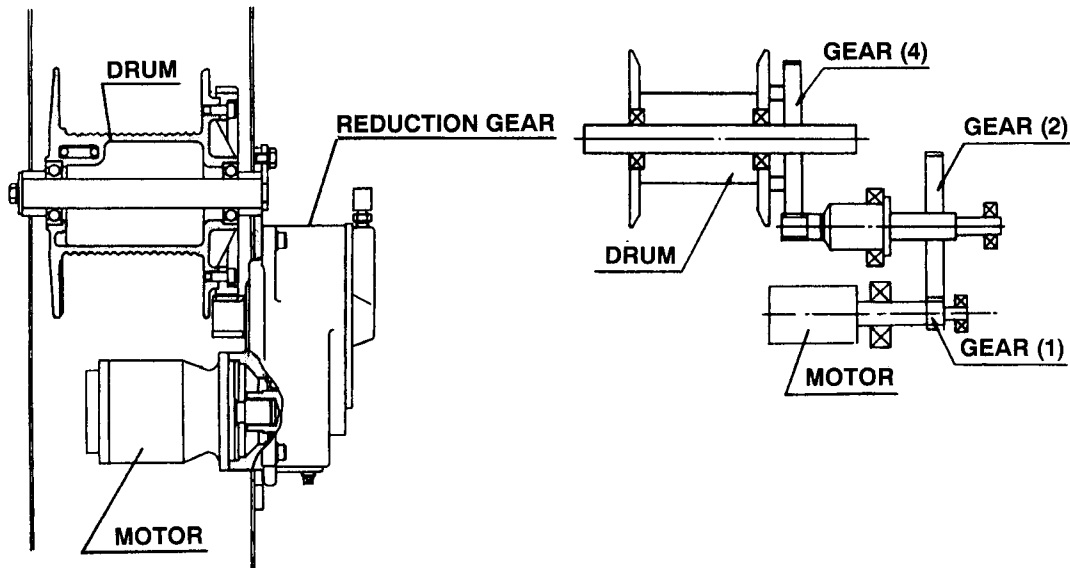
Petroleum Maker	Brand
ESSO	Standard gear oil 90
MOBIL	Mobilube GX90
CALTEX	Universal Thuban SAE 90
SHELL	Shell Spirax EP90

7) Construction of Hydraulic Motor for Slewing



§8. HOIST WINCH

1) Construction of Hoist Winch

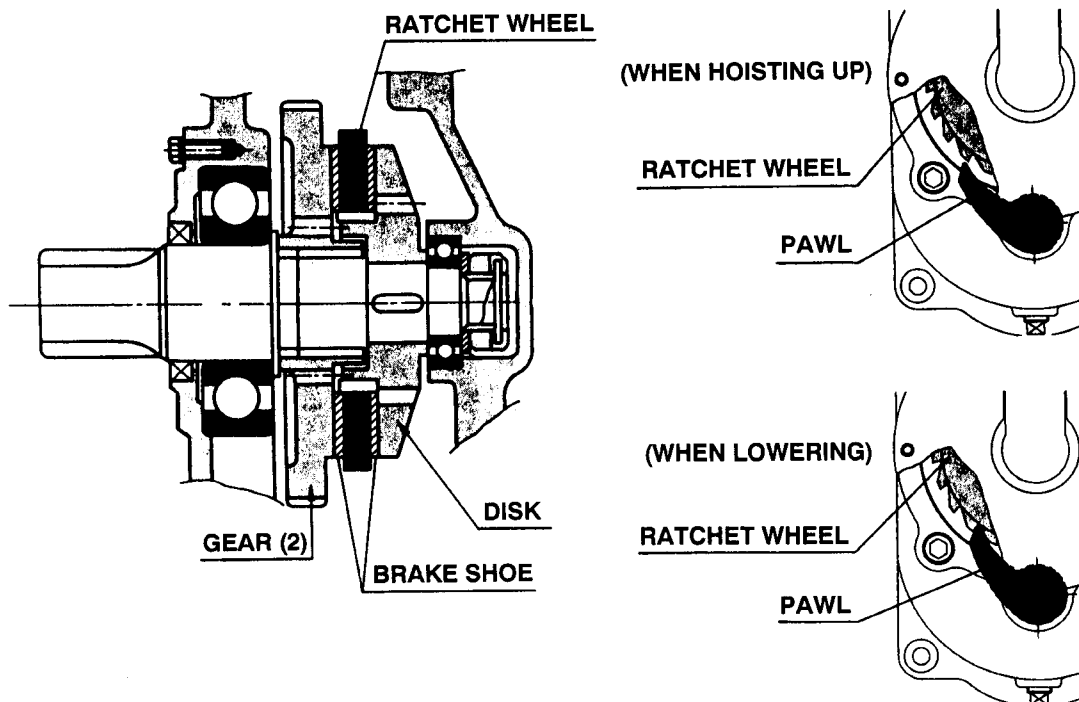


2) Construction of Brake

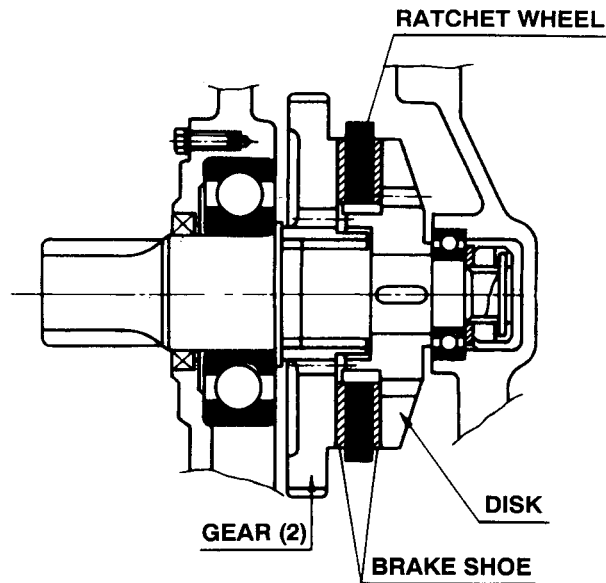
Brake shoes are mounted between the gear (2) and the ratchet wheel, and also between the disk and the ratchet wheel.

Although the ratchet wheel can freely be rotated in the direction of hoisting up, rotation is stopped by a pawl when lowering and the gear (2) is pressed against the ratchet wheel through the brake shoe.

Thus, the brake is applied when lowering.



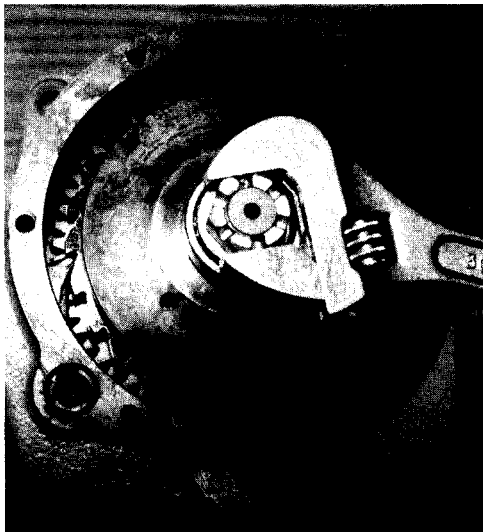
3) How to Adjust Brake Shoe



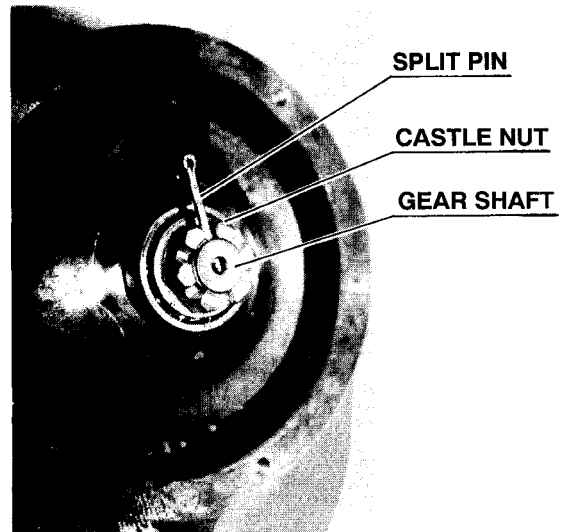
Assemble in the order of the gear (2), the brake shoe, the ratchet wheel, the disk, and the plain washer, then tighten the castle nut with a spanner.

Align each hole for inserting split pin both in the castle nut and the gear shaft by turning the castle nut within a range of 1/6 turn and insert the split pin to fix it.

If over-tightened, it may cause hunting of brake.



① Tighten castle nut lightly with a spanner.

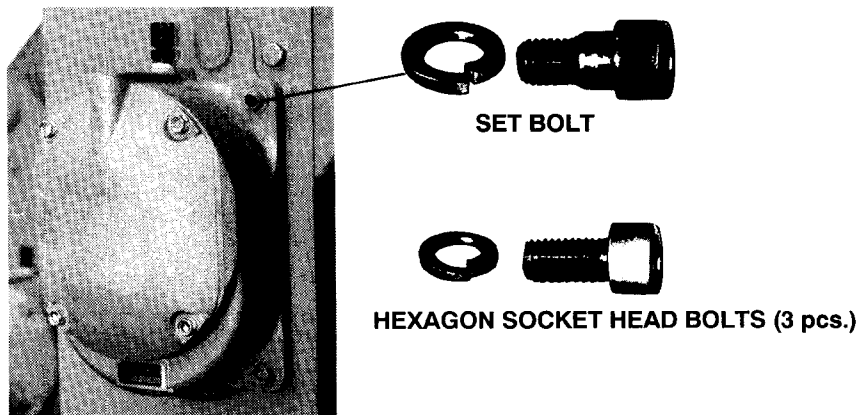


② After the nut has been tightened, align each hole both in the castle nut and in the gear shaft by turning the castle nut within a range of 1/6-turn and insert the split pin to fix it.

4) Bolts for Mounting Reduction Gear Casing

The bolt located at the upper right of reduction gear casing is a set bolt for positioning the casing.

The other bolts (3 pcs.) are hexagon socket head bolts.



Note : When mounting the reduction gear casing, tighten the set bolt first, then tighten hexagon socket head bolts in diagonal order.

5) Gear Oil for Reduction Gear

Air entered in the gear case brings dirt and moisture which can mix with oil.

In addition, since gears themselves gradually wear and produce abrasion particles during operation, replace the gear oil 6 months after the start of crane operation, then every 2nd year thereafter.

Quantity of gear oil
Approx. 1.0 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

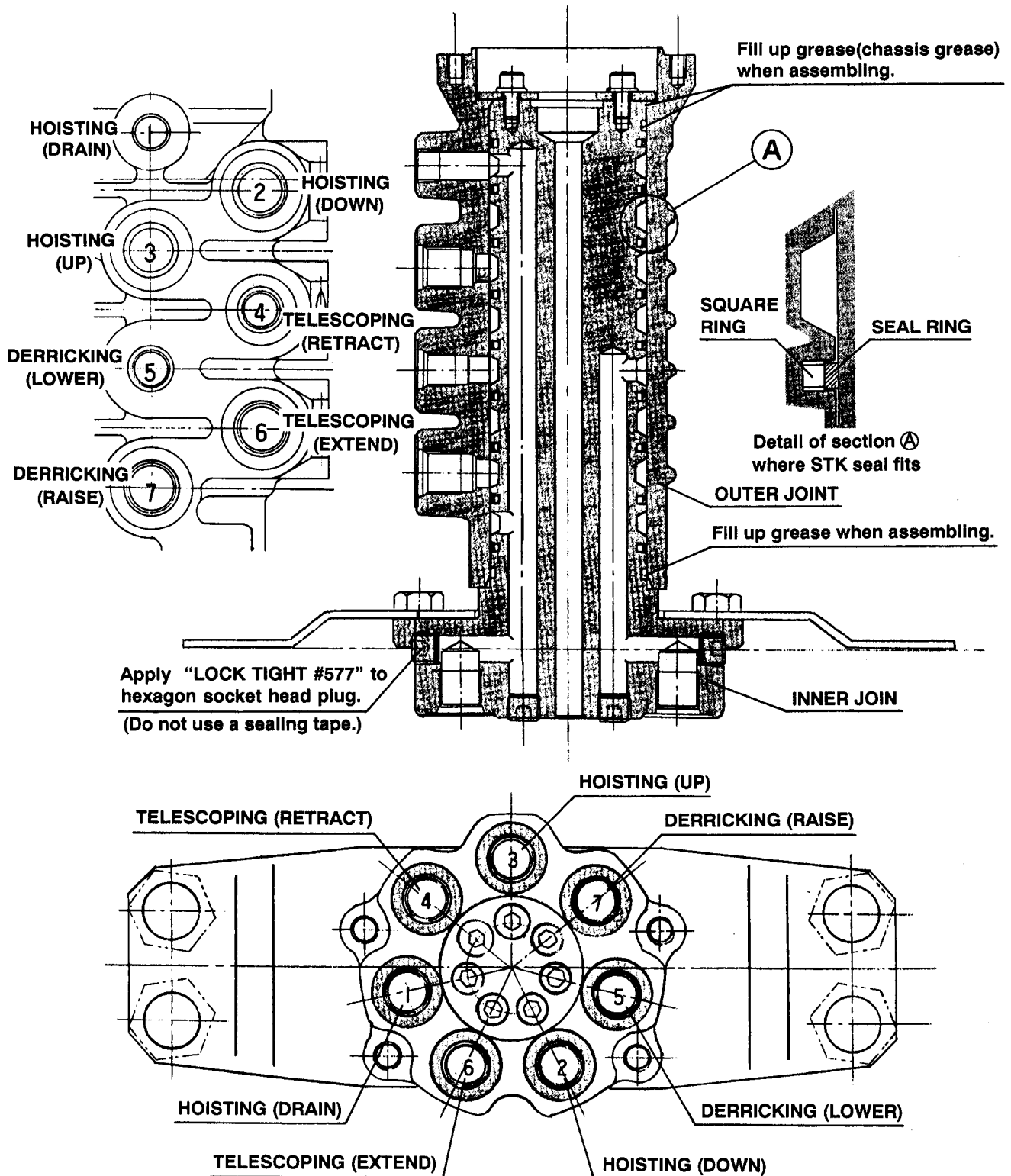
6) Cause of Troubles and Measures to be Taken

Hoist Winch

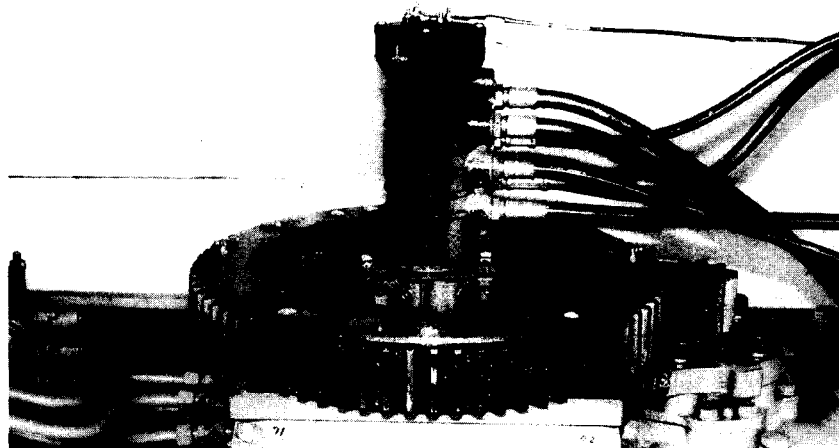
Troublesn	Possible cause	Measures to be taken
1. Pressure does not rise.	<ul style="list-style-type: none"> ● Pump is faulty. (Pressure does not rise at idling speed.) (Overall working pressure is insufficient.) 	<ul style="list-style-type: none"> ● Replace.
	<ul style="list-style-type: none"> ● Relief setting of control valve is faulty. (Pressure rises to a certain level but not enough.) 	<ul style="list-style-type: none"> ● Adjust or replace.
	<ul style="list-style-type: none"> ● O-ring and other parts of relief valve in control valve may be faulty. (Screwing-in adjusting bolt for relief valve fails to adjust pressure.) 	<ul style="list-style-type: none"> ● Replace parts or replace relief ass'y.
	<ul style="list-style-type: none"> ● Hoist motor is faulty. (Quantity of drain is larger than the specified.) 	<ul style="list-style-type: none"> ● Replace.
2. Pressure rises but hoisting-up is impossible.	<ul style="list-style-type: none"> ● Drum area or reduction gear is faulty. 	<ul style="list-style-type: none"> ● Overhaul reduction gear. ● Inspect drum.
3. Pressure rises but lowering is impossible.	<ul style="list-style-type: none"> ● Drum area or reduction gear is faulty. 	<ul style="list-style-type: none"> ● Over-tightening of brake shoe. ● Overhaul reduction gear. ● Inspect drum.
4. Unable to hold suspended cargo.	<ul style="list-style-type: none"> ● Brake shoe is faulty. ● Pawl is faulty. 	<ul style="list-style-type: none"> ● Replace brake shoe. ● Replace pawl.
5. Hunting occurs while lowering.	<ul style="list-style-type: none"> ● Brake shoe is faulty. ● Over-tightening of brake shoe. ● Reduction gear is faulty. 	<ul style="list-style-type: none"> ● Check brake shoe and quantity of oil. ● Adjust tightening nut. ● Overhaul reduction gear.
6. Clattering sound is heard while hoisting up.	<ul style="list-style-type: none"> ● Spring pressing pawl along sliding direction is faulty. ● Wear of pawl and/or shoe of bushing in mounting section. 	<ul style="list-style-type: none"> ● Replace spring. ● Replace bushing.

§9. SWIVEL JOINT

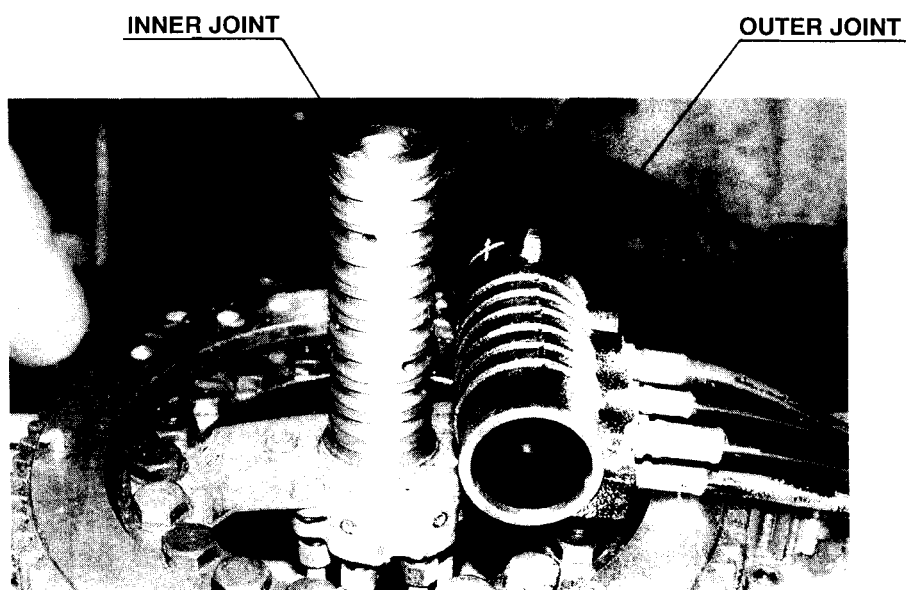
1) Construction of Swivel Joint and Where Hoses are Attached



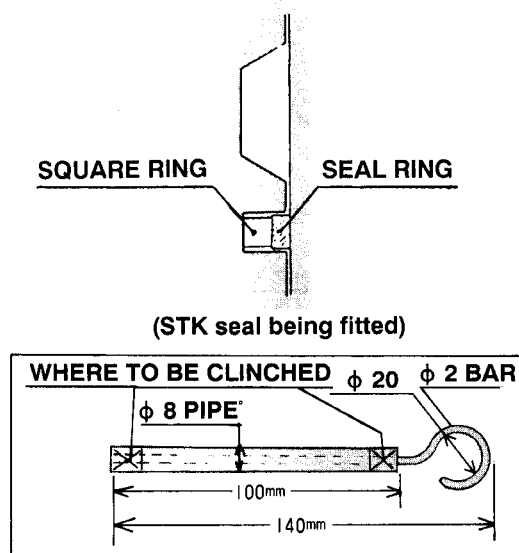
① Swivel joint being installed



② Swivel joint with the outer joint extracted

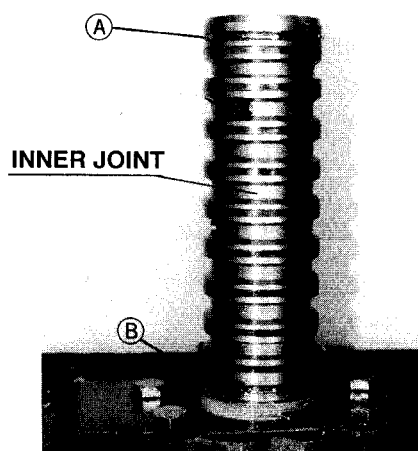


2) How to Assemble Swivel Joint



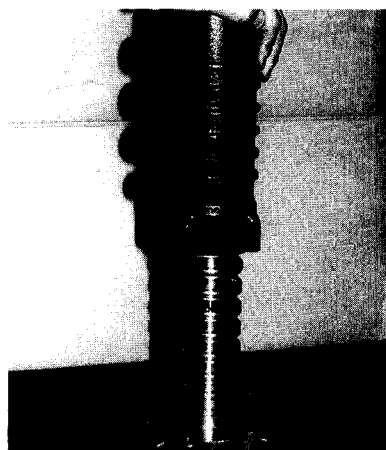
- After the square ring has been fitted, check to see if it is not twisted, then fit the seal ring.

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



- Fill up chassis grease to the grooves located both at the upper most of section A of inner joint and at the lower most of section B.

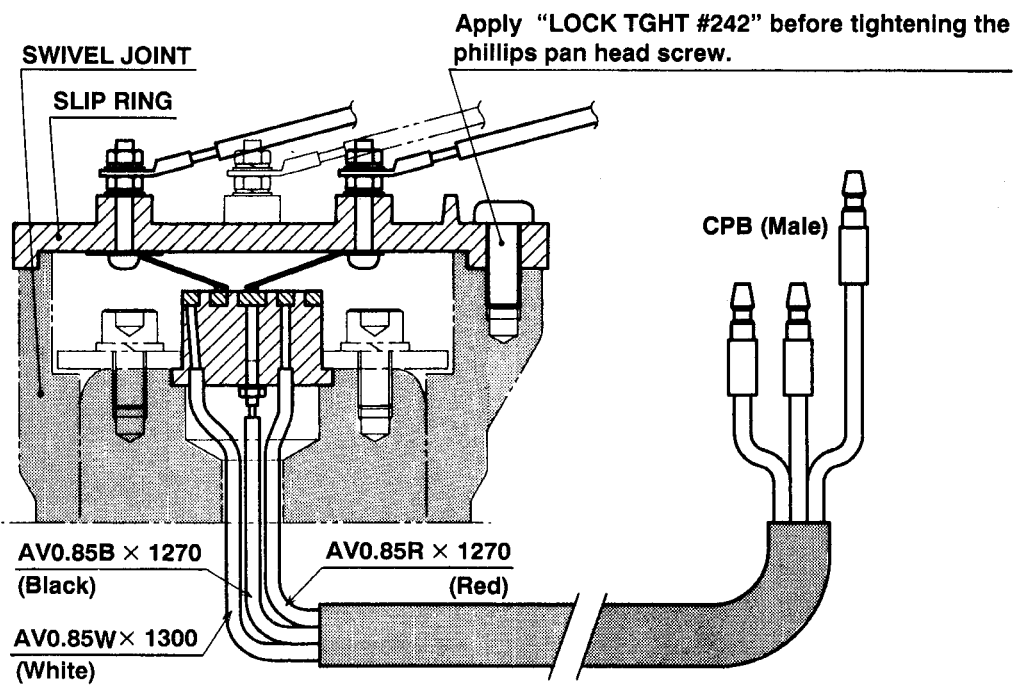
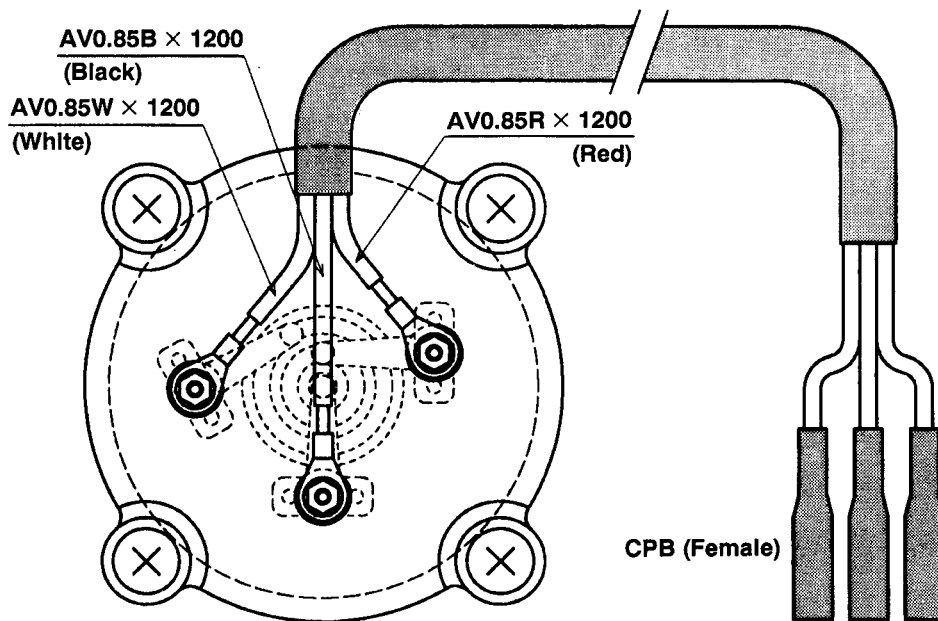
- Apply chassis grease sparingly to where STK seal is fitted.



- Fit the outer joint so that the STK seal mounted to the inner joint will not get caught in.

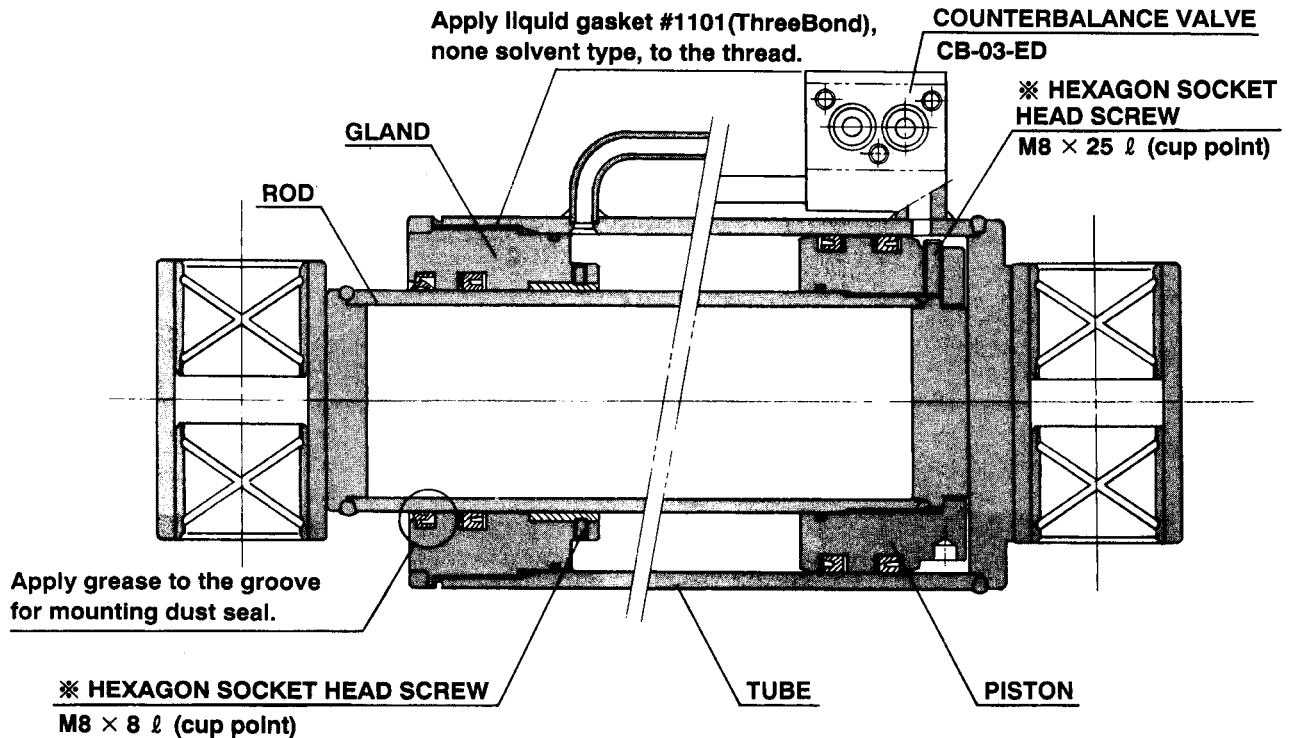
§10. SLIP RING

1) Construction of Slip Ring and Where It is Mounted



§11. DERRICKING CYLINDER

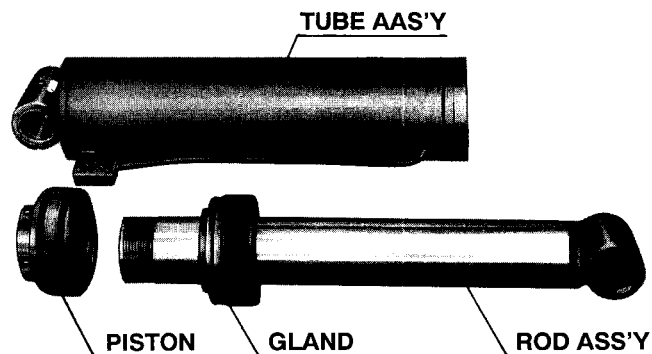
1) Construction of Derricking Cylinder



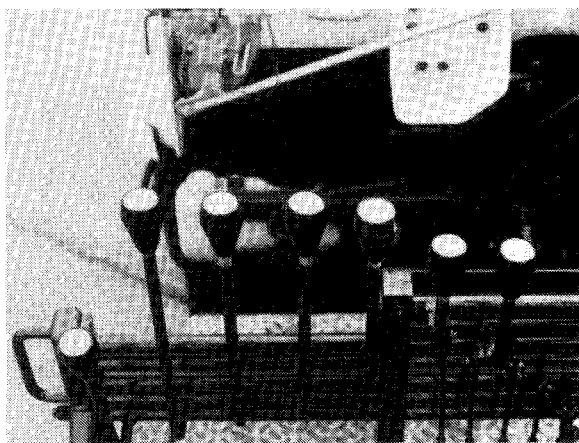
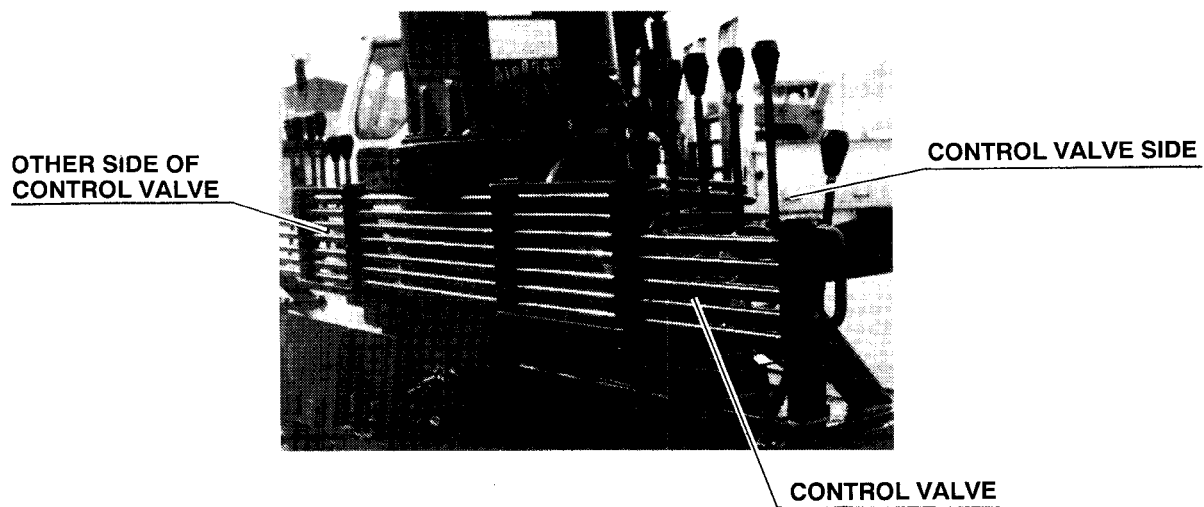
Note : Apply “LOCK TIGHT #242” to each hexagon socket head screw both in the piston and in the gland. (Do not flow hydraulic oil within 1 hour after grease has been applied.)

2) How to disassemble derricking cylinder

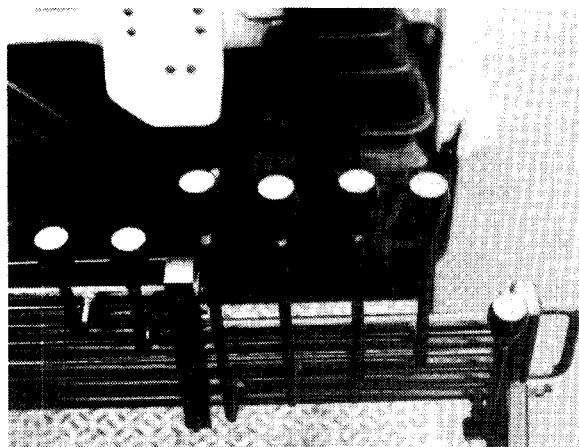
- ① Remove counterbalance valve.
- ② Compensate the stopper for preventing the gland from turning and loosen the gland to remove it out of the cylinder tube, and extract the piston rod.
- ③ Unscrew the hexagon socket head screws, M8 × 25 ℓ cup point, to extract the piston out of rod ass'y.



§12. CONTROL

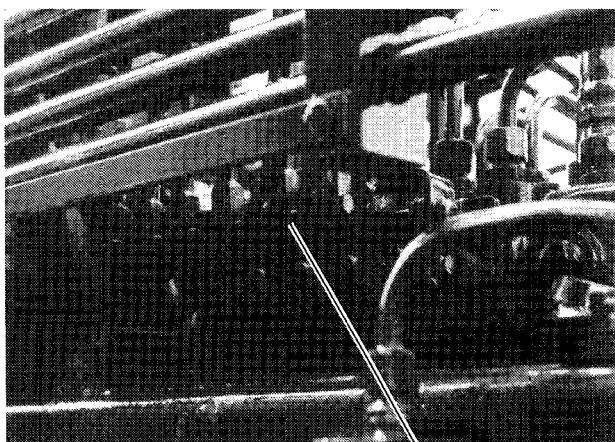


Control valve side



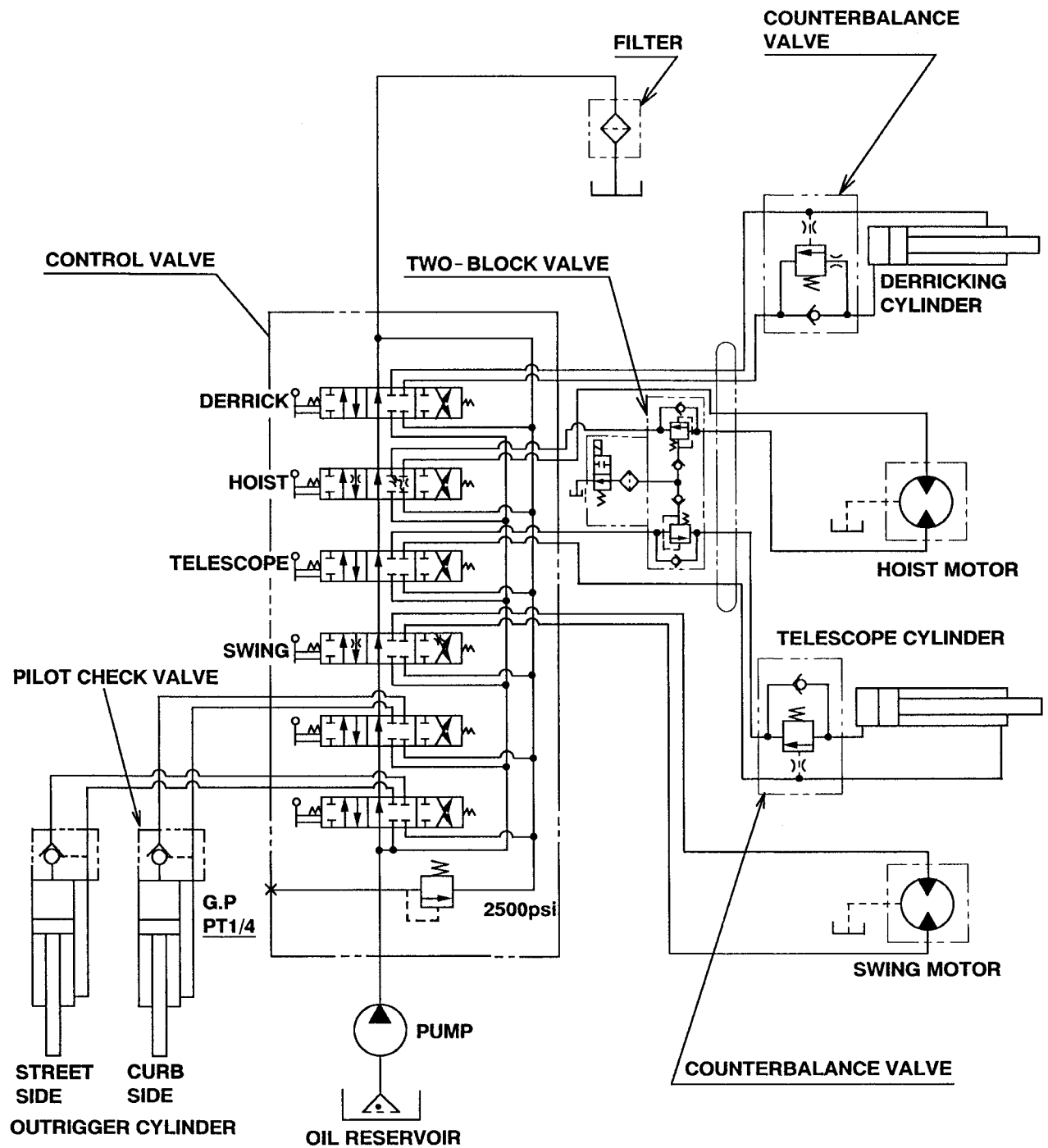
Other side of control valve

Adjust the screw in the clevis section for neutral position of control lever.



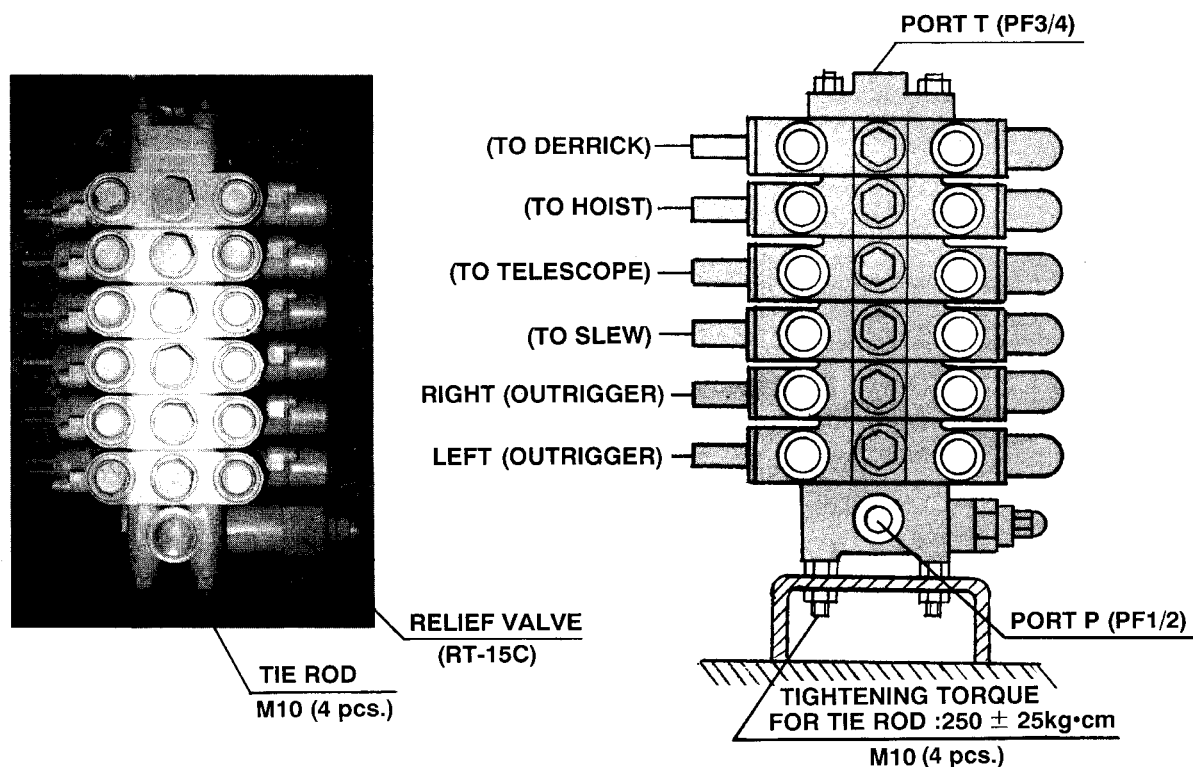
CLEVIS SECTION

§13. HYDRAULIC CIRCUIT



§14. CONTROL VALVES

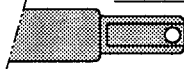

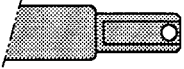







1) Construction of Control Valves and Stamp on Spool



※ It controls operation of each actuator in the crane section.

Spool built in the control valve varies from actuator to actuator.

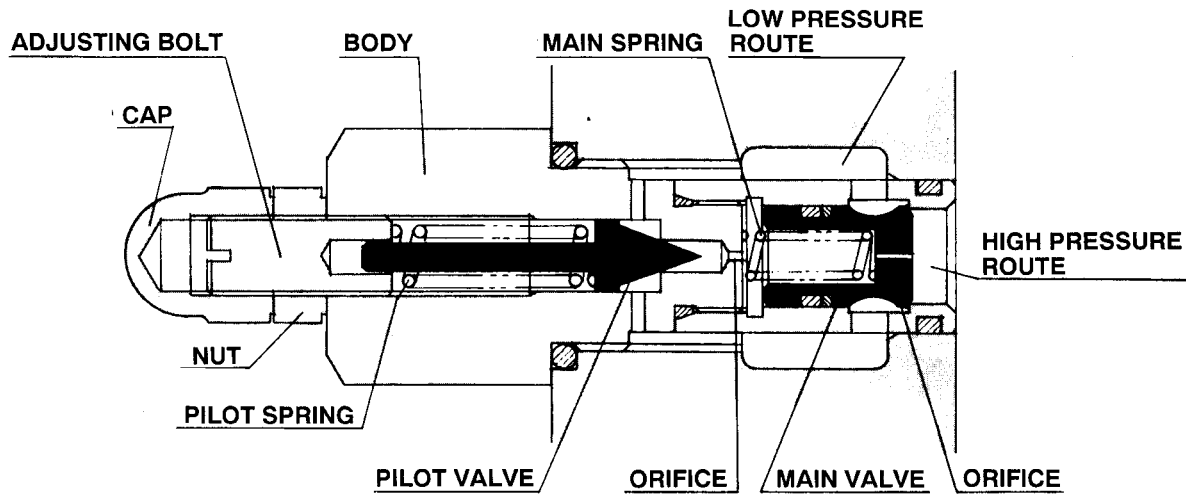
Refer to stamped marks on the spool end.

Model	URA343
Spools	
For derricking	Stamped "X"
Spool metering in/out	 
For hoisting	Stamped "P"
Spool metering out	 
For telescoping	Stamped "T"
Spool metering in	 
For slewing	Stamped "G"
Spool metering out	 
For outrigger	Stamped None
Spool metering in	 

2) Relief Valve

This is a valve which functions to prevent pressure in the hydraulic circuit from going beyond the specified limit.

(1) Construction of Relief Valve

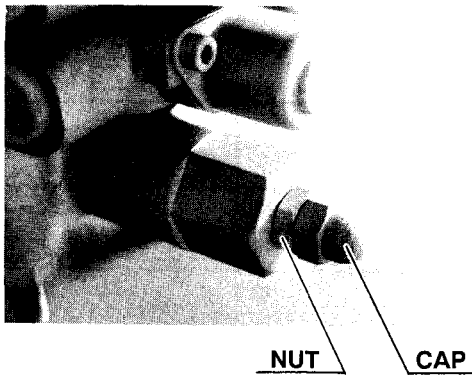


(2) How to Adjust Relief Valve

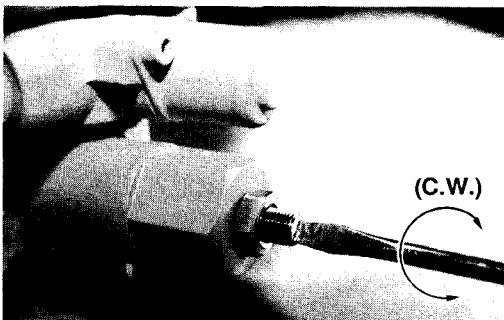
Pressure level is to be set by threading the adjusting bolt in the relief valve.

In order to adjust pressure, remove the cap and loosen the nut to turn the adjusting bolt with a screwdriver.

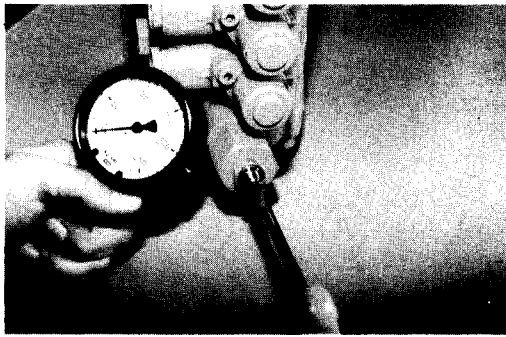
Turning the bolt clockwise increases the set pressure and turning it counterclockwise lowers the pressure.



Ⓐ Remove the cap and loosen the nut.



Ⓑ Turning it clockwise with a screwdriver raises the set pressure and turning it counterclockwise lowers the pressure.

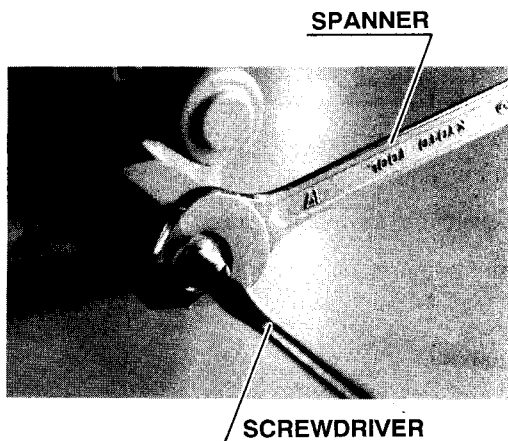


- © Set the pressure while monitoring pressure gauge with either one of the cylinders (for outrigger, telescoping or derricking) retracted.

Relief pressure to be set.....2500 psi

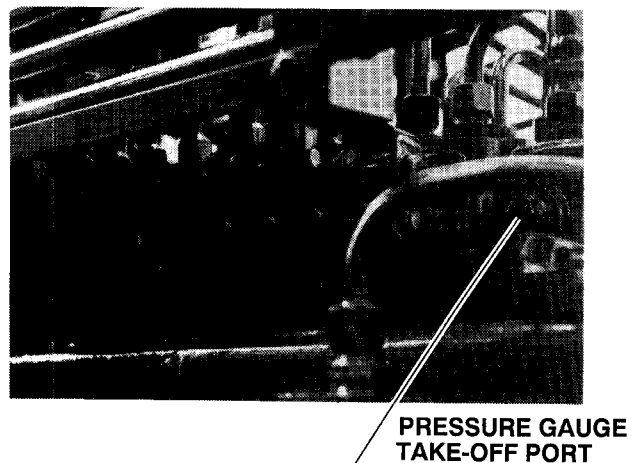
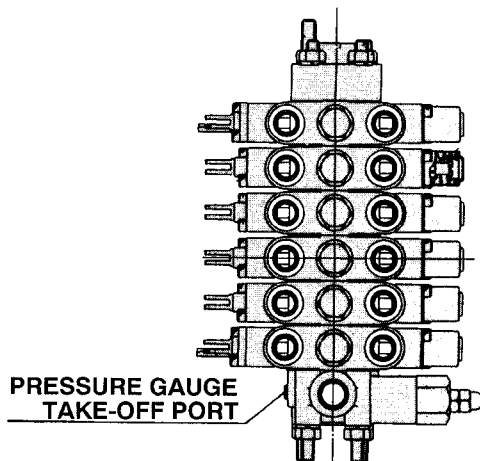
- ※ Set the pressure at an engine speed by which the pump rotates at the rated speed.

Do not run the an engine at idling speed or a higher speed while pressure is setting.



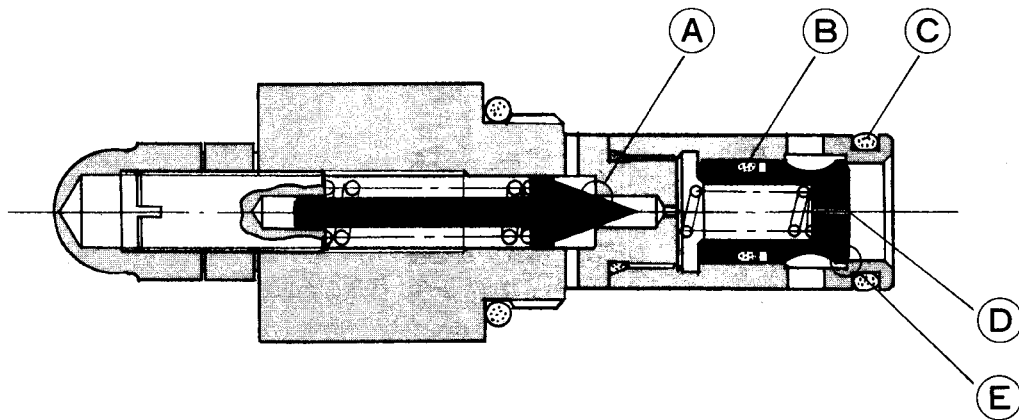
- ④ Since the adjusting bolt may be loosened while tightening the nut and the cap, lock the nut with a spanner while holding the bolt by a screwdriver.

(3) Pressure gauge take-off port



(4) Where to check on the relief valve

If pressure fails to increase, check the relief valve that:

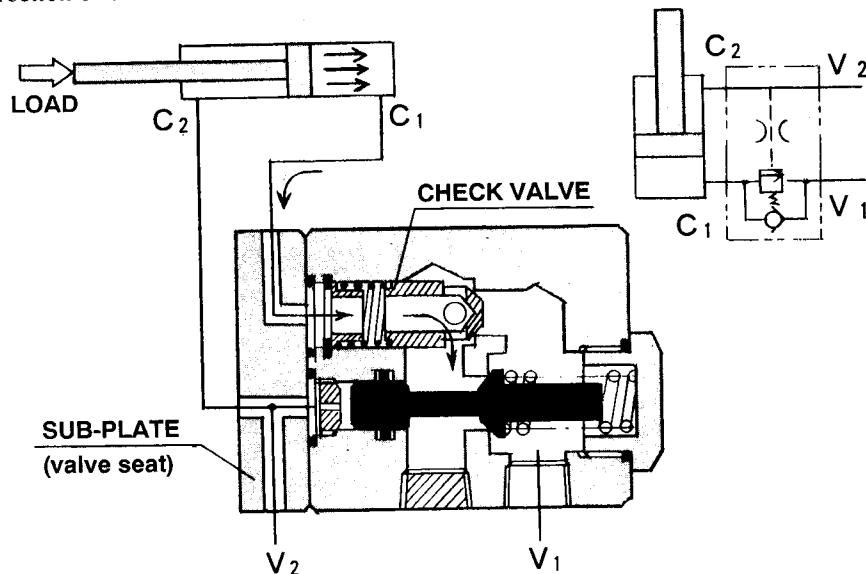


1. No foreign object are caught in section **A** and/or the seat surface does not have any flaw.
2. O-ring at section **B** is not damaged.
3. O-ring at section **C** is not damaged.
4. No foreign object are caught in the drill hole, section **D** , in the main valve.
5. No foreign object are caught in section **E** and/or the seat surface does not have any flaw.

Note : If found nothing wrong in the above check, the pump is suspected.

§15. COUNTERBALANCE VALVE

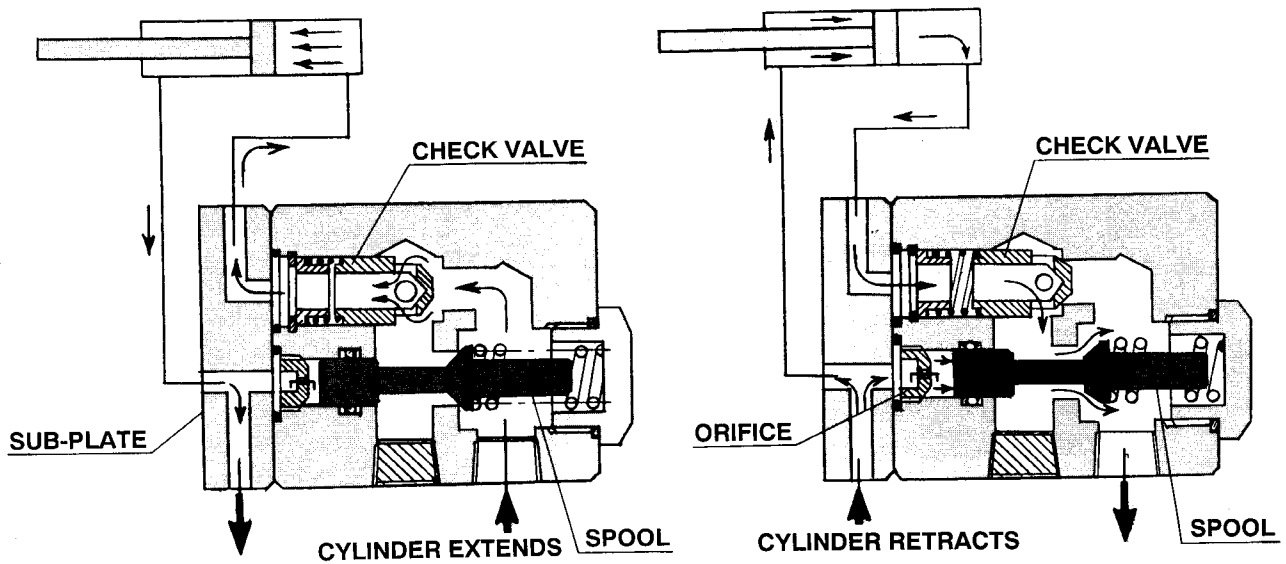
This is a valve that applies a specified back pressure to the flow in the direction of retraction and permits the flow in the direction of extension to be free.



When the control valve is at neutral, both ports for extension and retraction in the cylinder are blocked.

In this condition, oil actuating extension can not escape to any direction because the oil is shut off as the passage between the counterbalance valve body and the check valve seat is closed even if retracting force is applied by a load to the cylinder for this reason, the cylinder stays as it was.

1) Description of Counterbalance Valve Operation

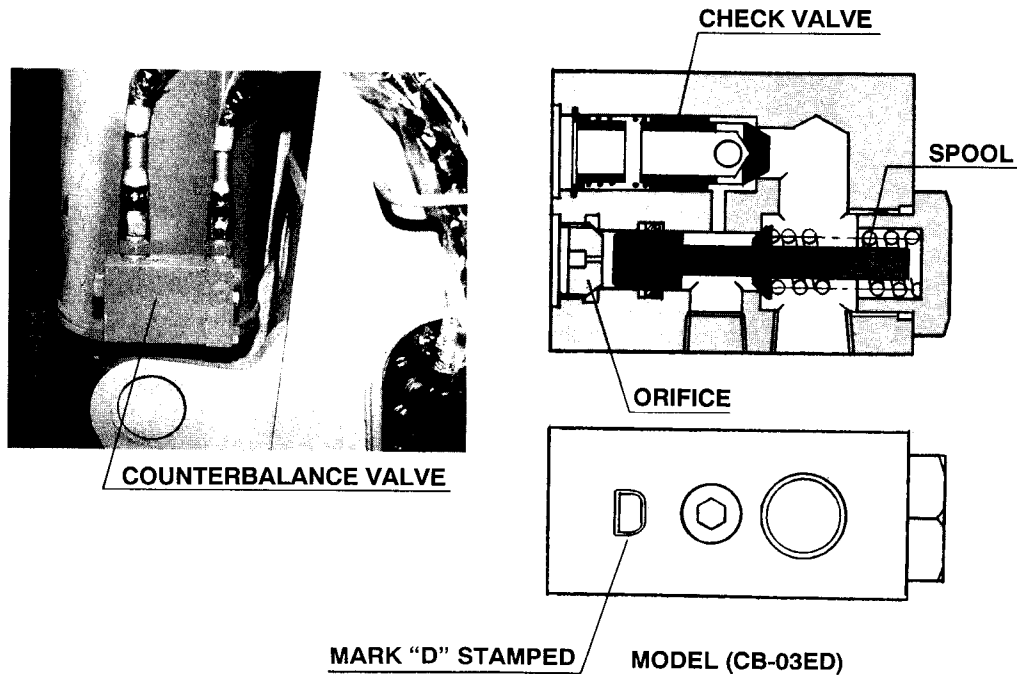


Oil-flow when cylinder extends

Oil-flow when cylinder retracts

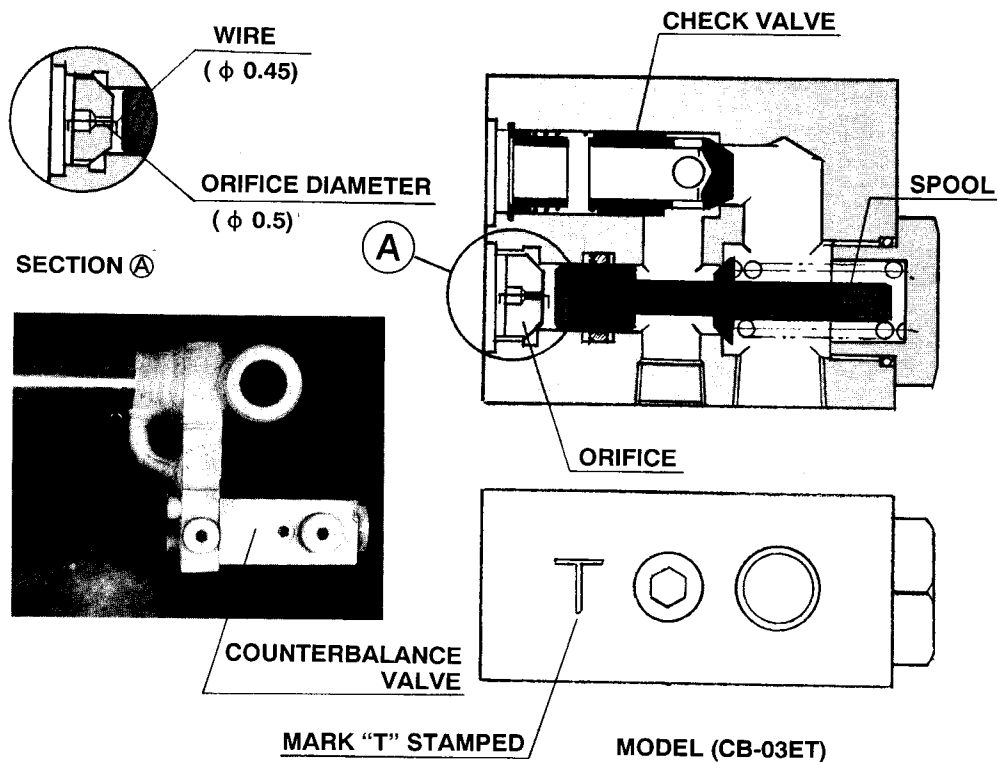
2) Construction of Counterbalance Valve (for derricking and telescoping)

(1) Construction of counterbalance valve (for derricking)



(2) Construction of counterbalance valve (for telescoping)

※ A wire is attached in section ① shown in the figure below for the counterbalance valve for telescoping (to prevent hunting when being retracted.)



3) Possible Cause for Sinking of Cylinder

※ The following explains sinking of derricking cylinder as an example.

Internal oil leakage either in the counterbalance valve or in the cylinder may be considered as the cause.

(1) How to check it

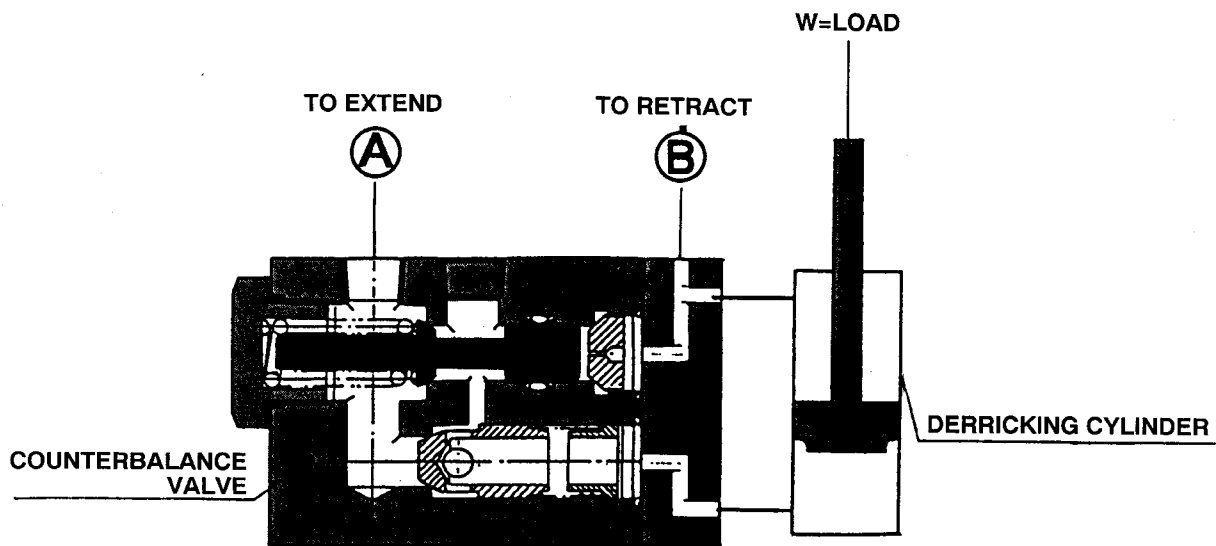
- ① Lift-up a load less than the rated load and stop the engine running.

Remove the pressurized hoses connected to the joints (both at extension and at retraction) in the counterbalance valve.

Note : 1. Before removing pressurized hoses, be sure to release the pressure by moving control lever right and left after the engine has stopped.

2. Make sure that the oil will not gush out of the hose joints and/or the boom will not be lowered in derricking while loosening the hoses.

In addition, carry out the check after confirming that there is not a person or an obstacle under the boom. (If boom is found lowering, stop removing the hoses.)



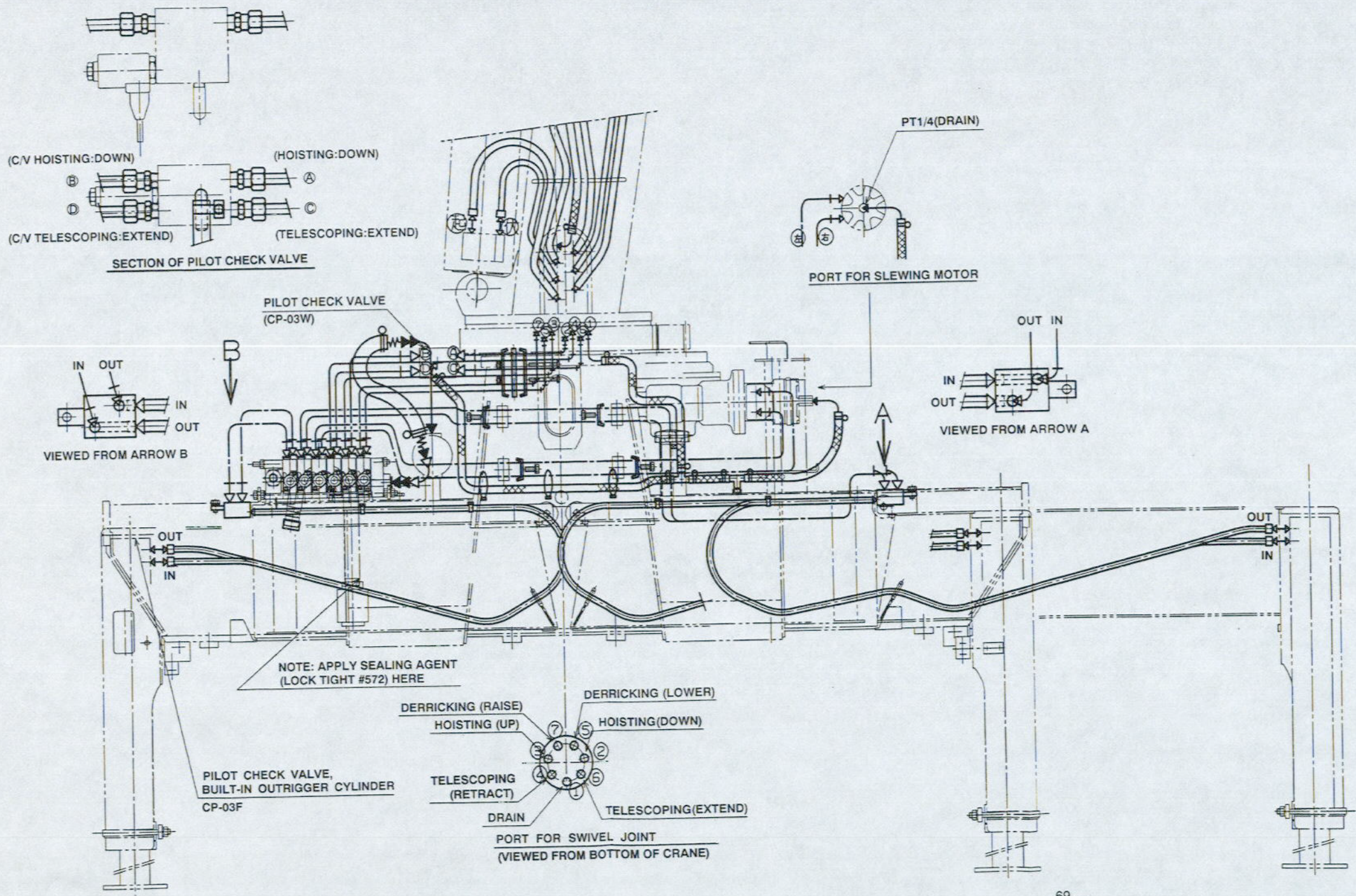
Judging criteria

1. If oil spreads out of the hose joint (A) (extend), it means internal leakage in the counterbalance valve.

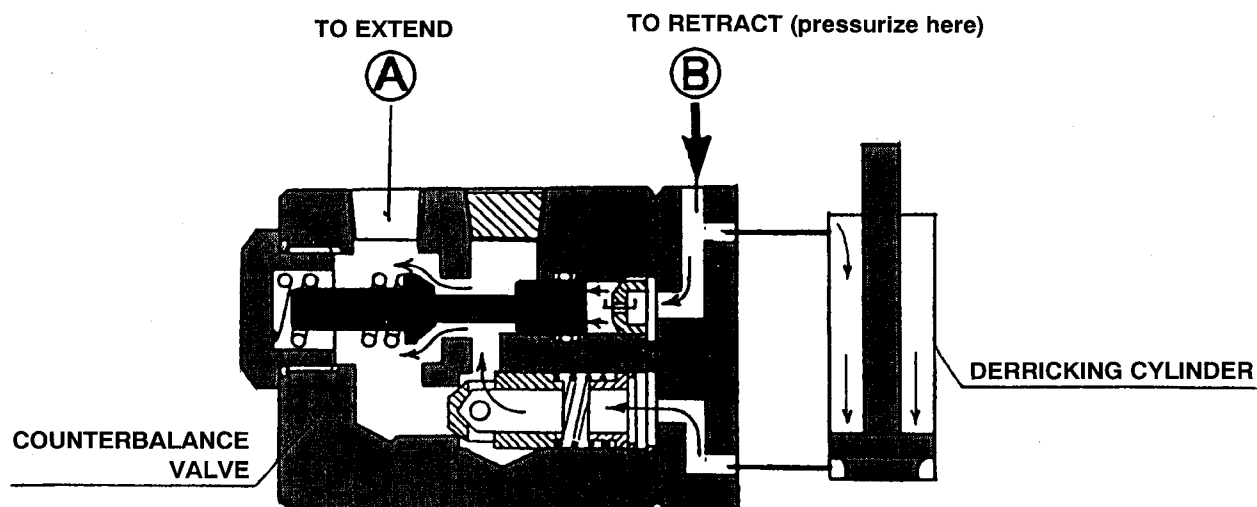
Measures to be taken: Carry out overhaul cleaning or replace the counterbalance valve ass'y.

2. If oil spreads out of the hose joint (B) (retract), it means internal leakage in the derricking cylinder.

Measures to be taken: Replace the packing or replace the tube ass'y.



- ② Retract derricking cylinder to its extreme and remove a pressurized hose out of joint ① to pressurize joint ② (retract).



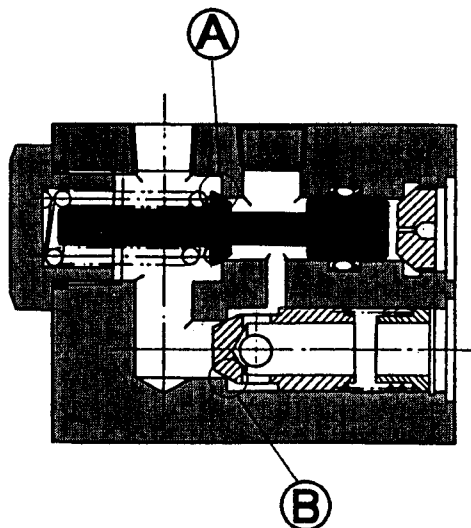
Judging criteria

If oil spreads out of the hose joint ① (extend), it means internal leakage in the derricking cylinder.

Measures to be taken: Replace the packing or replace the tube ass'y.

Note : When carrying out checks above, put a false plug in the joint (extend) or place an oil container as leaked oil may come out of the removed hose joint.

※ If internal leakage is found in the counterbalance valve, check if:



1. Foreign objects are caught in section ① or injuries are on the valve seat, or
2. Foreign objects are caught in section ② or injuries are on the valve seat.

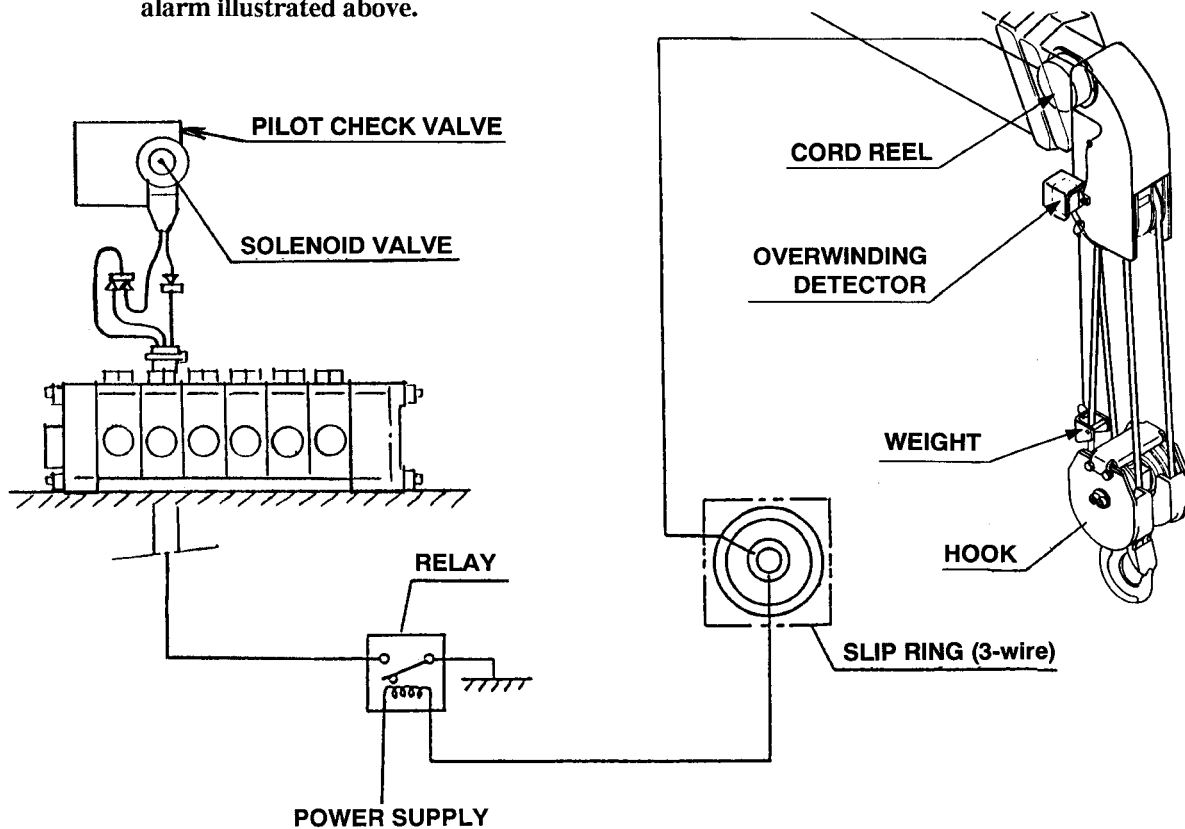
★ The same procedures can also be applied for the telescoping cylinder and outrigger cylinder to confirm cause of sinking.

§17. SAFETY DEVICES

1) Function of Overwinding auto-stop device

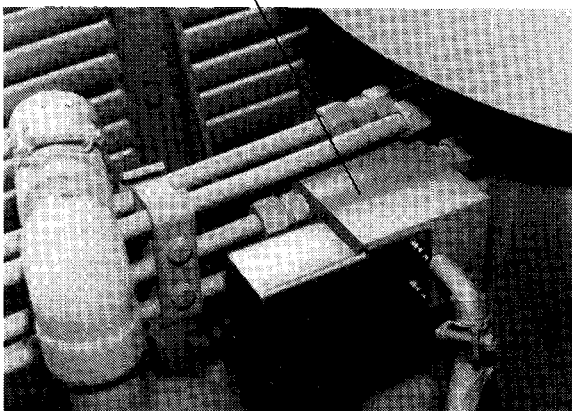
If the overwinding alarm switch is turned OFF by the weight being pushed up by the hook when the hook is being hoisted up or the boom is extending, the solenoid valve is to be energized to operate so that the pilot check valve shuts off the oil flow for hoisting up (return side of motor) and for extending boom to stop the crane functioning further.

※ Note that the hook can be hoisted down and the boom can be retracted even when in overwinding alarm illustrated above.

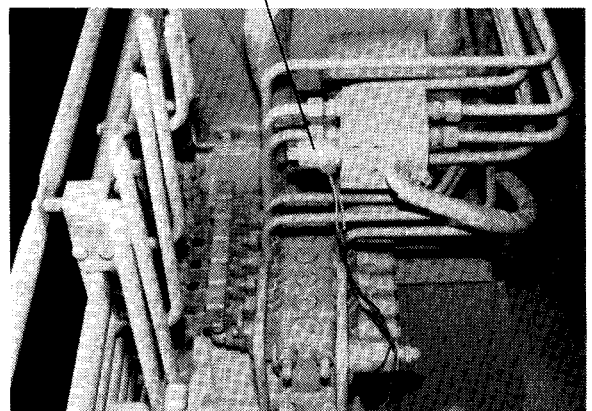


Where the pilot check valve is mounted

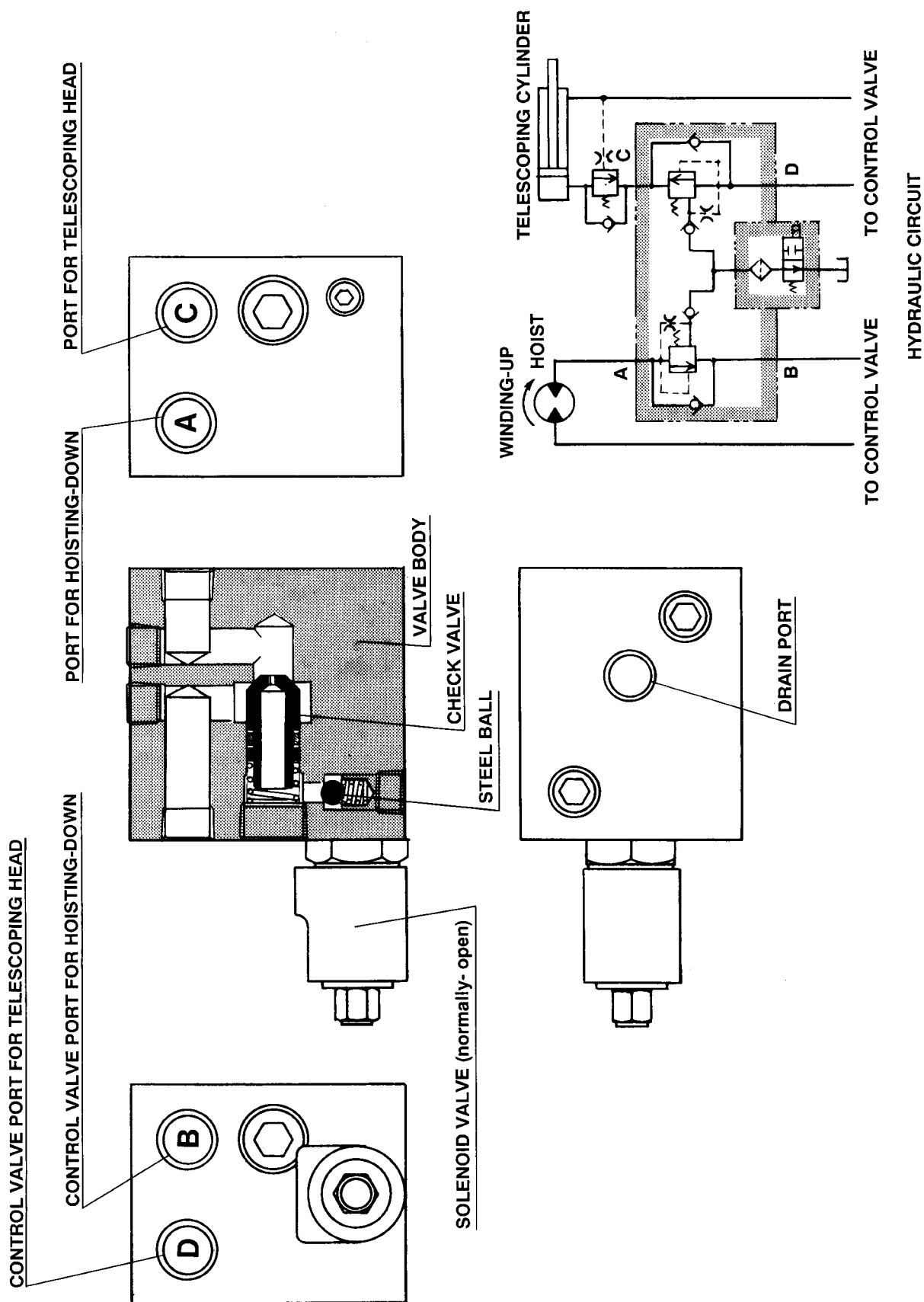
PILOT CHECK VALVE



SOLENOID VALVE



2) Construction of Pilot Check Valve



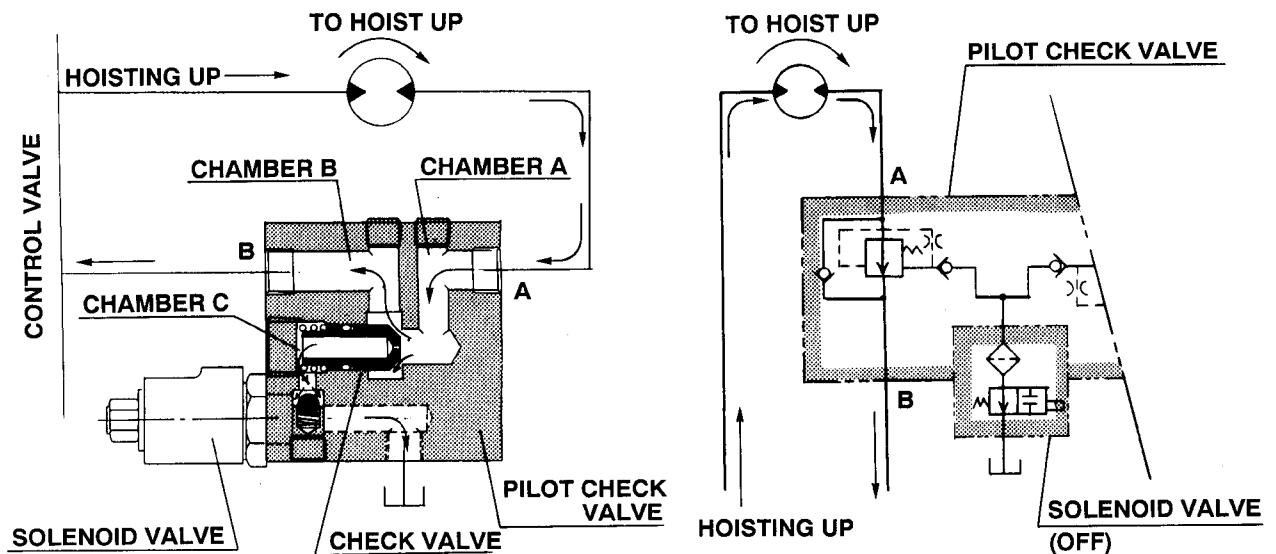
3) How Pilot Check Valve Operates

The section describes hydraulic oil flow in the pilot check valve and the movement of check valve when hoisting (up/down) and telescoping (extend/retract) cylinders are operating.

(1) When hook hoists up (In normal state: Overwinding detector-ON, Solenoid valve-OFF)

In normal operation, the overwinding detector is turned ON, and the solenoid valve in the pilot check valve is turned OFF. Since the return port is opened to the tank port, oil in the chamber C flows into the tank.

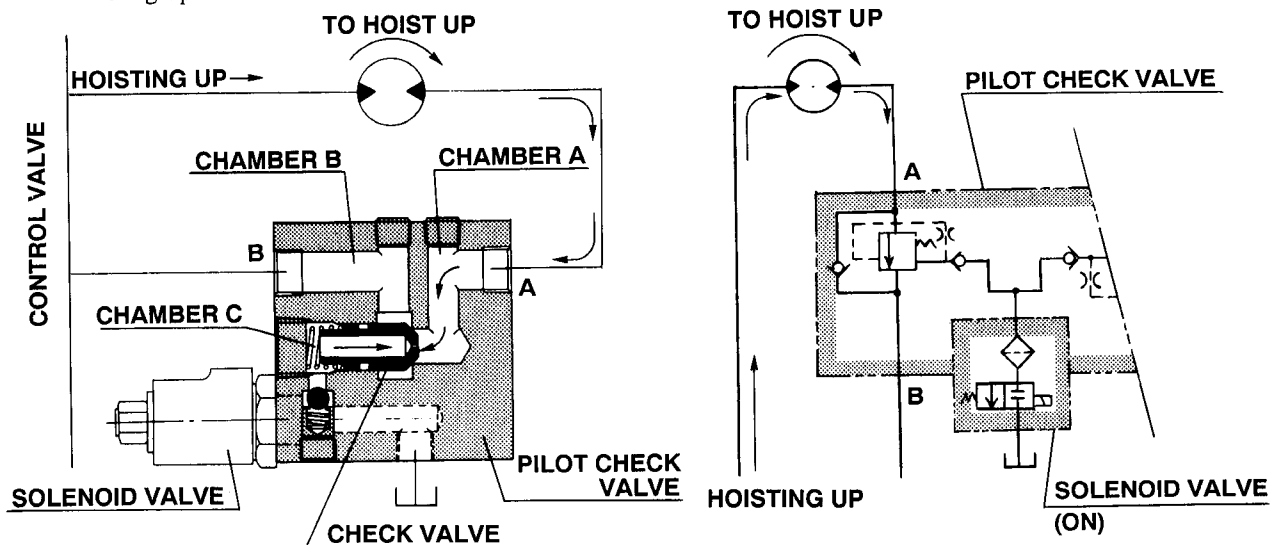
The oil in the chamber A, or return oil from the motor, pushes the check valve to open so that it flows through the chamber B, the control valve, and back into the tank. This allows the motor to hoist up the hook.



(2) When hook stops hoisting up (In overwound state: Overwinding detector-OFF, Solenoid valve-ON)

In overwound state, the overwinding detector is turned OFF, and the solenoid valve in the pilot check valve is turned ON. Since the tank port is closed by actuating of the solenoid valve, oil in the chamber A, or return oil from the motor, enters the chamber C through the hole drilled in the check valve.

Since pressure in the chamber A and in the chamber C becomes the same level because the tank port is closed, the check valve is pushed to the right due to area difference between chambers A and C. Thus, the return oil in the chamber A is shut off by the check valve allowing the motor to stop which in turn stops hoisting up the hook.

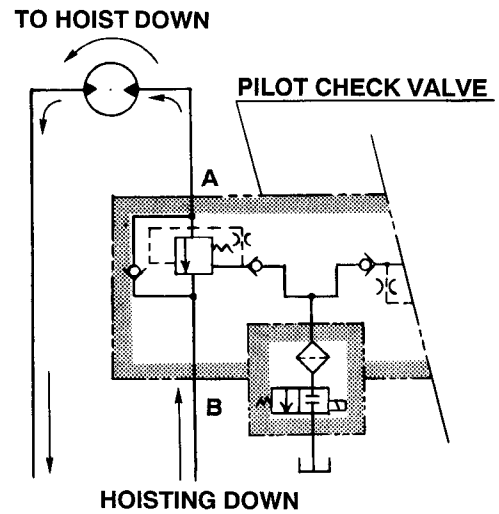
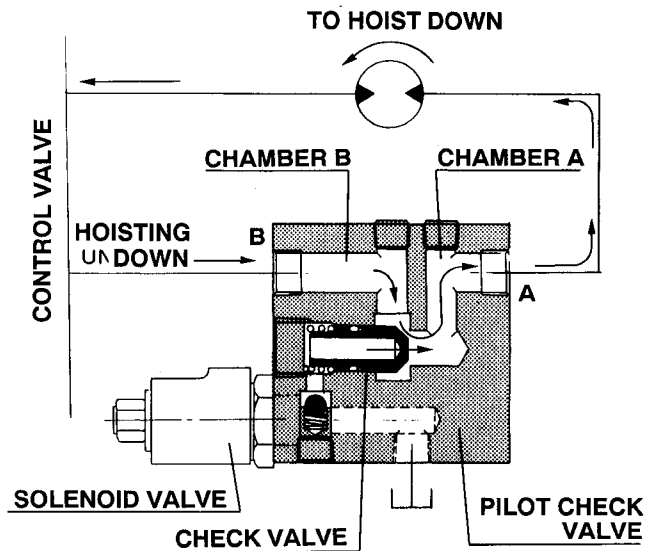


(3) When hook hoists down

The oil fed into the chamber B from the control valve moves the the check valve to the left to flow into the chamber A, then into the port for hoisting down of the motor.

The return oil from the motor flows through the control valve and back into the tank.

This allows the motor to hoist down the hook.

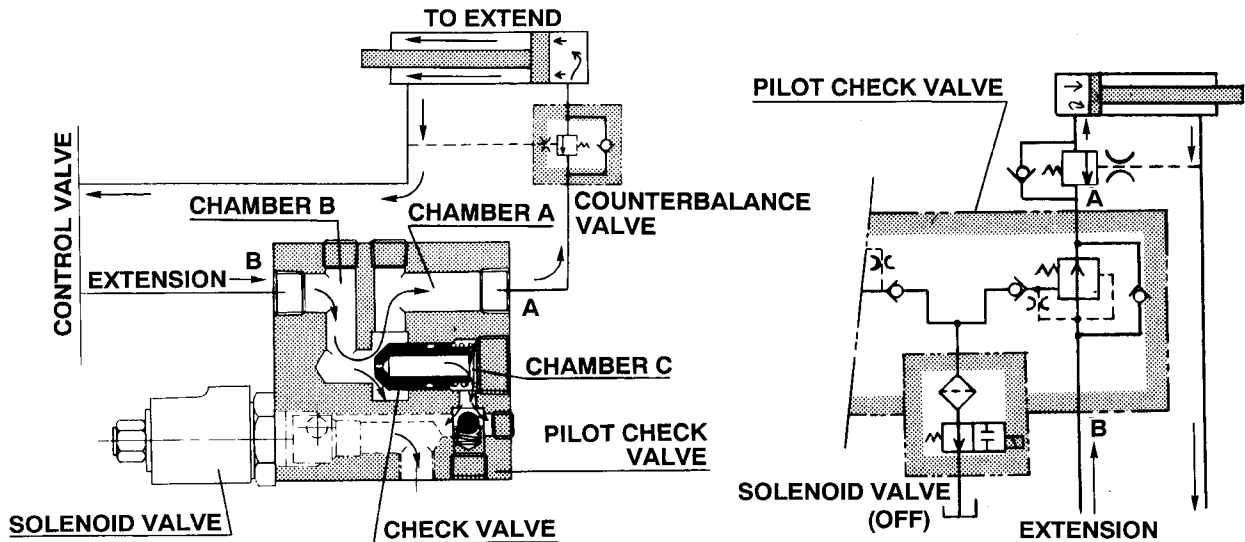


(4) When telescoping cylinder extends (In normal state: Overwinding detector-ON, Solenoid valve-OFF)

In normal operation, the overwinding detector is turned ON, and the solenoid valve in the pilot check valve is turned OFF.

Since the return port is opened to the tank port, oil in the chamber C flows into the tank.

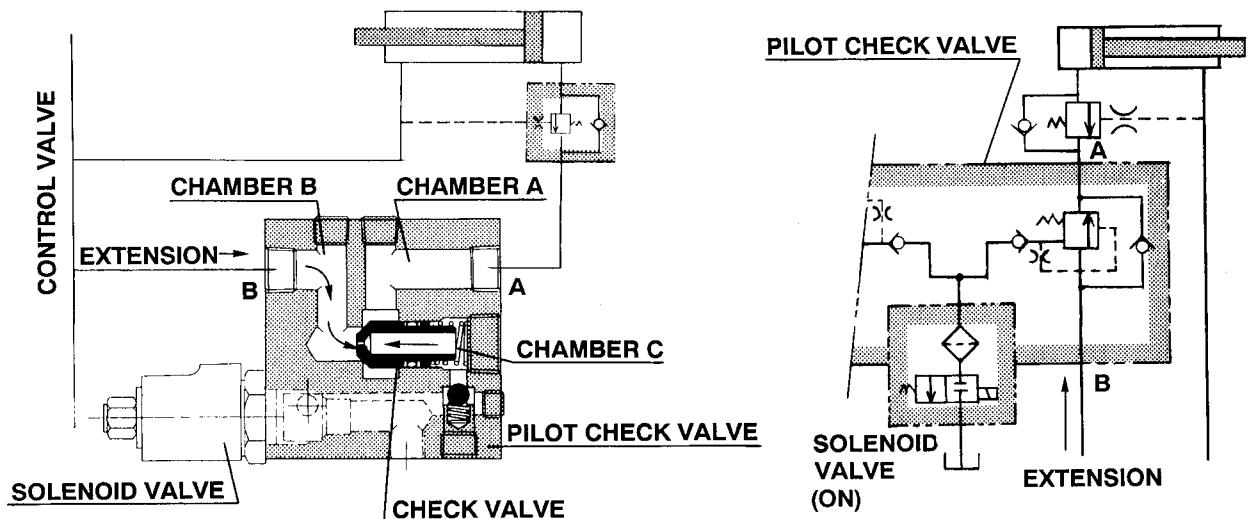
The oil in the chamber B flown out of the control valve pushes the check valve to open so that it flows through the chamber A, the counterbalance valve, and into the extending port on the cylinder to extend it.



(5) When telescoping cylinder stops extending (In overwound state: Overwinding detector-OFF, Solenoid valve-ON)

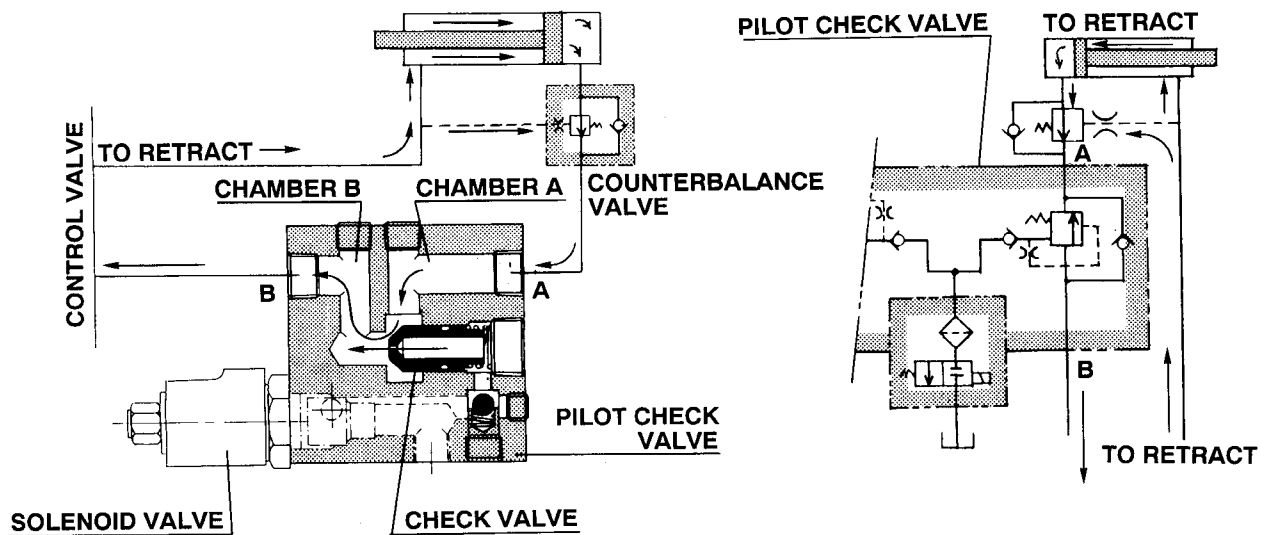
In overwound state, the overwinding detector is turned OFF, and the solenoid valve in the pilot check valve is turned ON. Since the tank port is closed by actuating of the solenoid valve, oil in the chamber B flown out of the control valve enters the chamber C through the hole drilled in the check valve.

Since pressure in the chamber B and in the chamber C becomes the same level because the tank port is closed, the check valve is pushed to the left due to area difference between chambers B and C. Thus, the oil in the chamber B is shut off by the check valve so that oil in the chamber B can not flow into the chamber A which allows the cylinder to stop extending.



(6) When telescoping cylinder retracts

When the oil flow out of the control valve is fed into the retracting port on the cylinder, the oil for pushing in the cylinder flows through the counterbalance valve, the chamber A in the pilot check valve to move the check valve to the right, then it flows into the chamber B to return back to the tank. This allows the cylinder to retract.



4) Cause of Troubles and Measures to be Taken

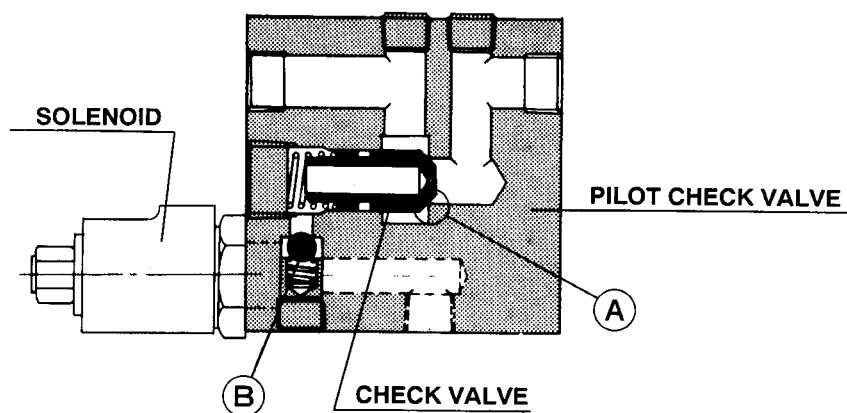
(1) Neither motor hoists up hook nor telescoping cylinder extends in normal operation (not in overwound state).

Possible cause	Measures to be taken
1. Electric power is not supplied. 2. Wire is broken somewhere between overwind detector and solenoids, or cable is disconnected from connection terminal. 3. Overwinding detector is faulty. 4. Cord reel is faulty. 5. Solenoid in pilot check valve is faulty. 6. Slip ring is faulty. 7. Relay is faulty.	Check. Check cables and connection terminals. Repair or replace. Repair or replace. Repair or replace. Repair or replace. Repair or replace.

(2) Either motor hoists up hook or telescoping cylinder extends in an overwound state.

Possible cause

- Foreign substances are caught in section (A) or in (B) in the pilot check valve.



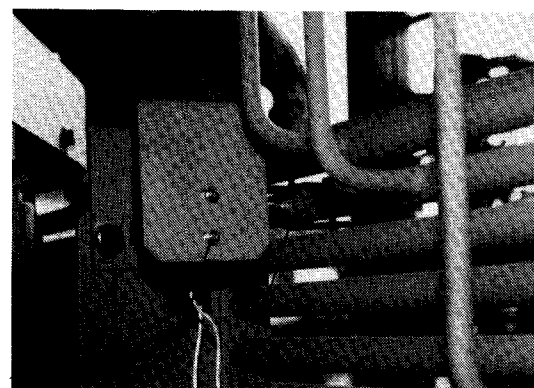
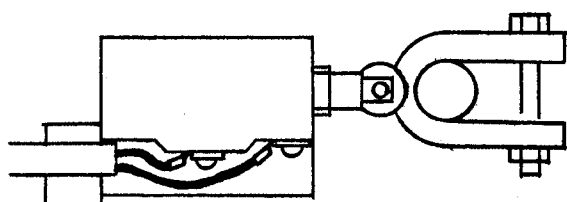
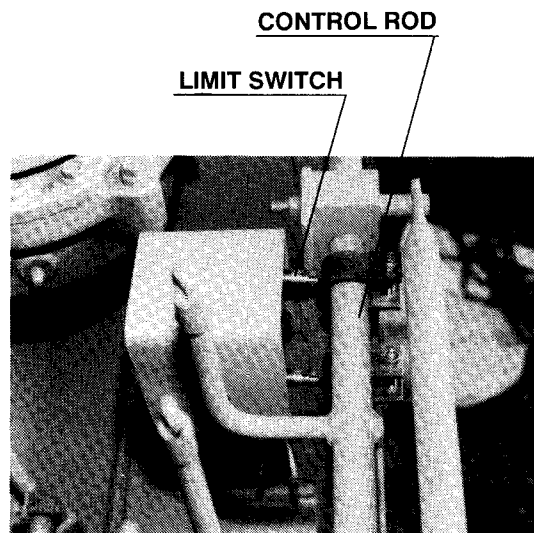
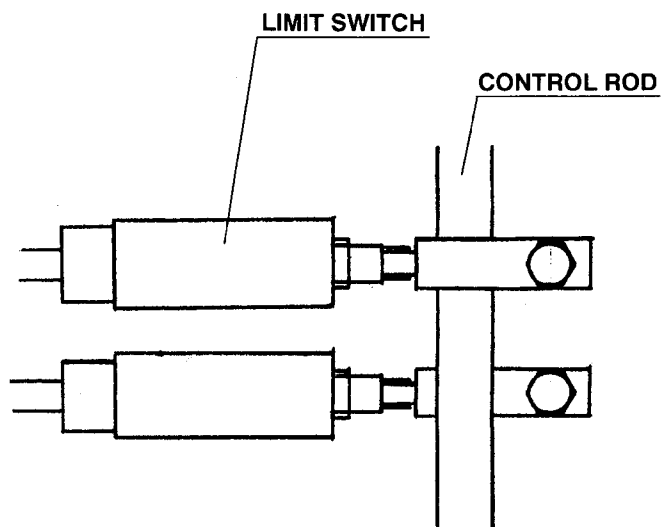
(3) Both motor hoists up hook and telescoping cylinder extends in an overwound state.

Possible cause	Measures to be taken
1. Electric power is not supplied. 2. Wrong wiring between power supply, valve, or a connector terminal is disconnected. 3. Overwinding detector is faulty. 4. Relays is faulty. 5. Solenoid in pilot check valv is faulty.	Check. Check and terminals for connection. Check and repair or replace. Check and repair or replace. Check and repair or replace.

5) Alarm for Outrigger Extension/Retraction

When the outrigger control lever is shifted to extension/retraction, the control rods connecting right and left members of outrigger are to push the limit switches to trigger an alarm.

(1) Construction

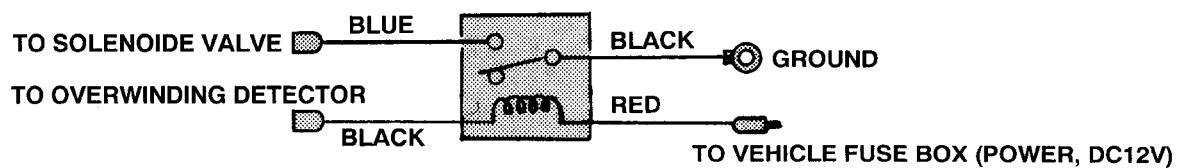
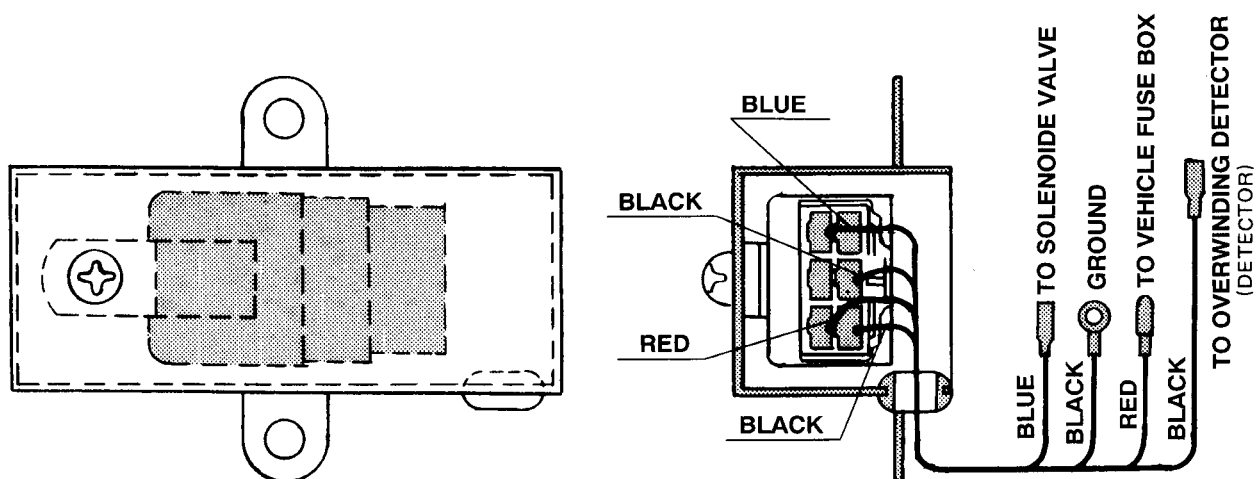


(2) How to mount and adjust limit switch

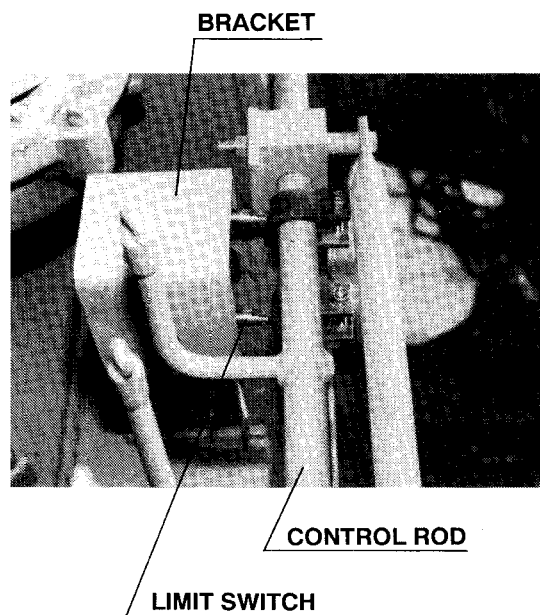
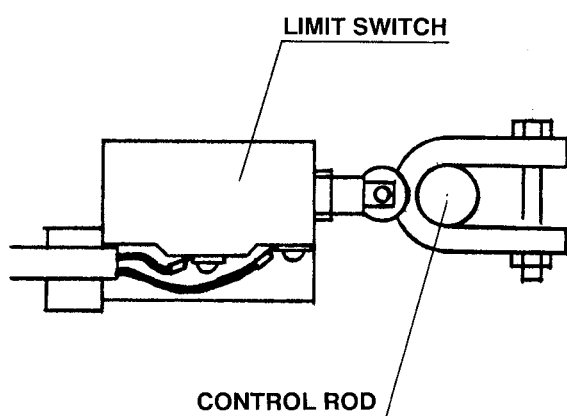
Position each limit switch and the bracket so that the limit switch \textcircled{A} turns ON when the outrigger cylinders start to extend or retract through controlling the outrigger lever, then secure it with the bolts.

6) Relay and Limit Switch

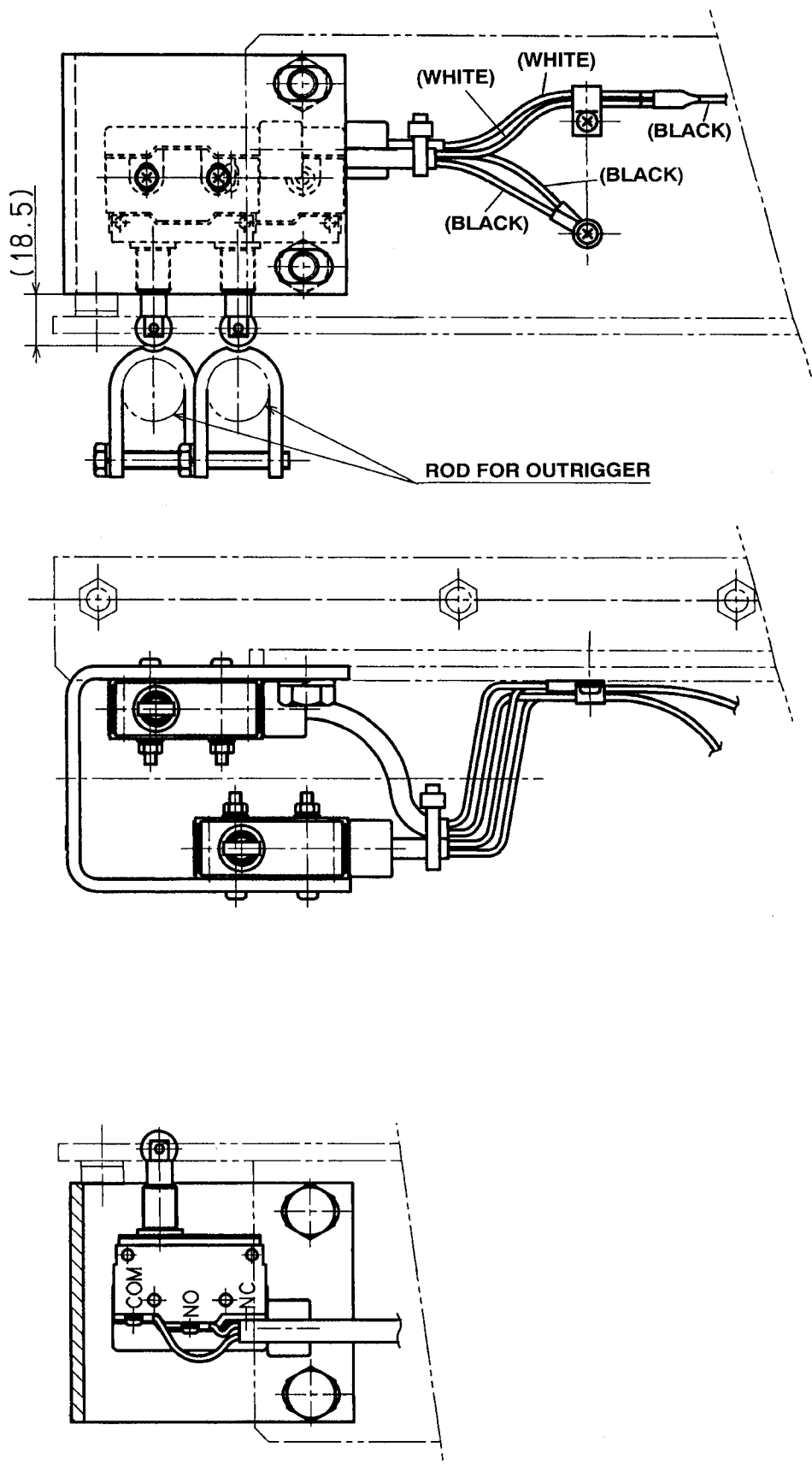
(1) Relay



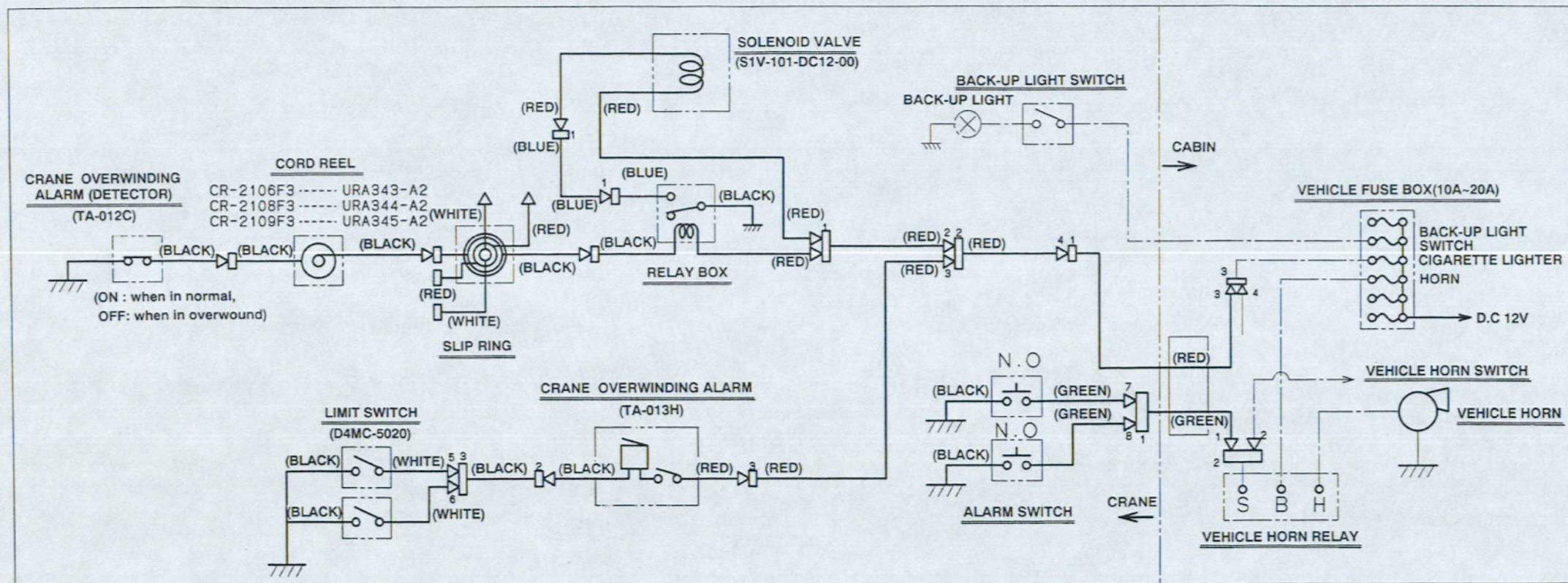
(2) Limit switch

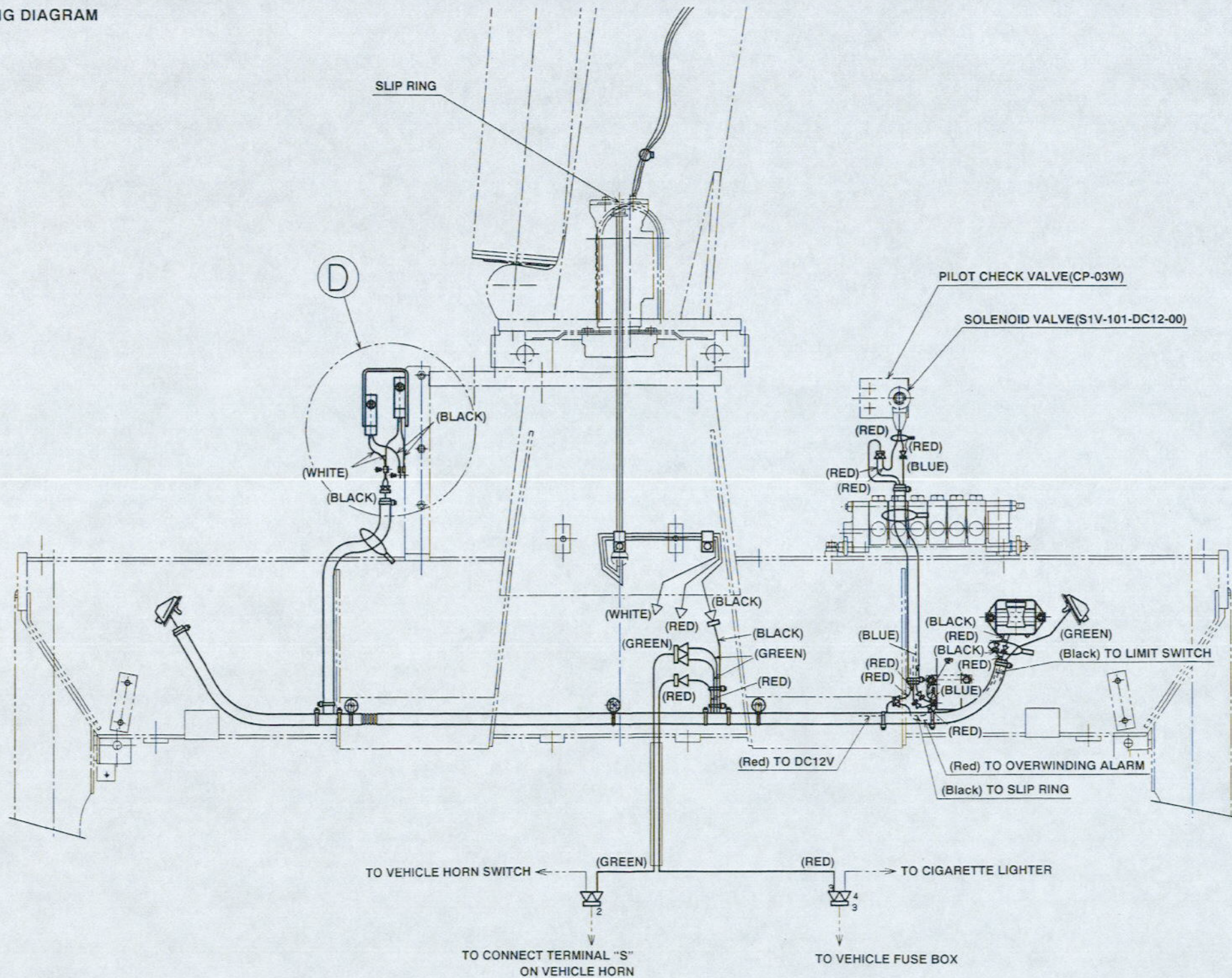


(3) How limit switch is mounted

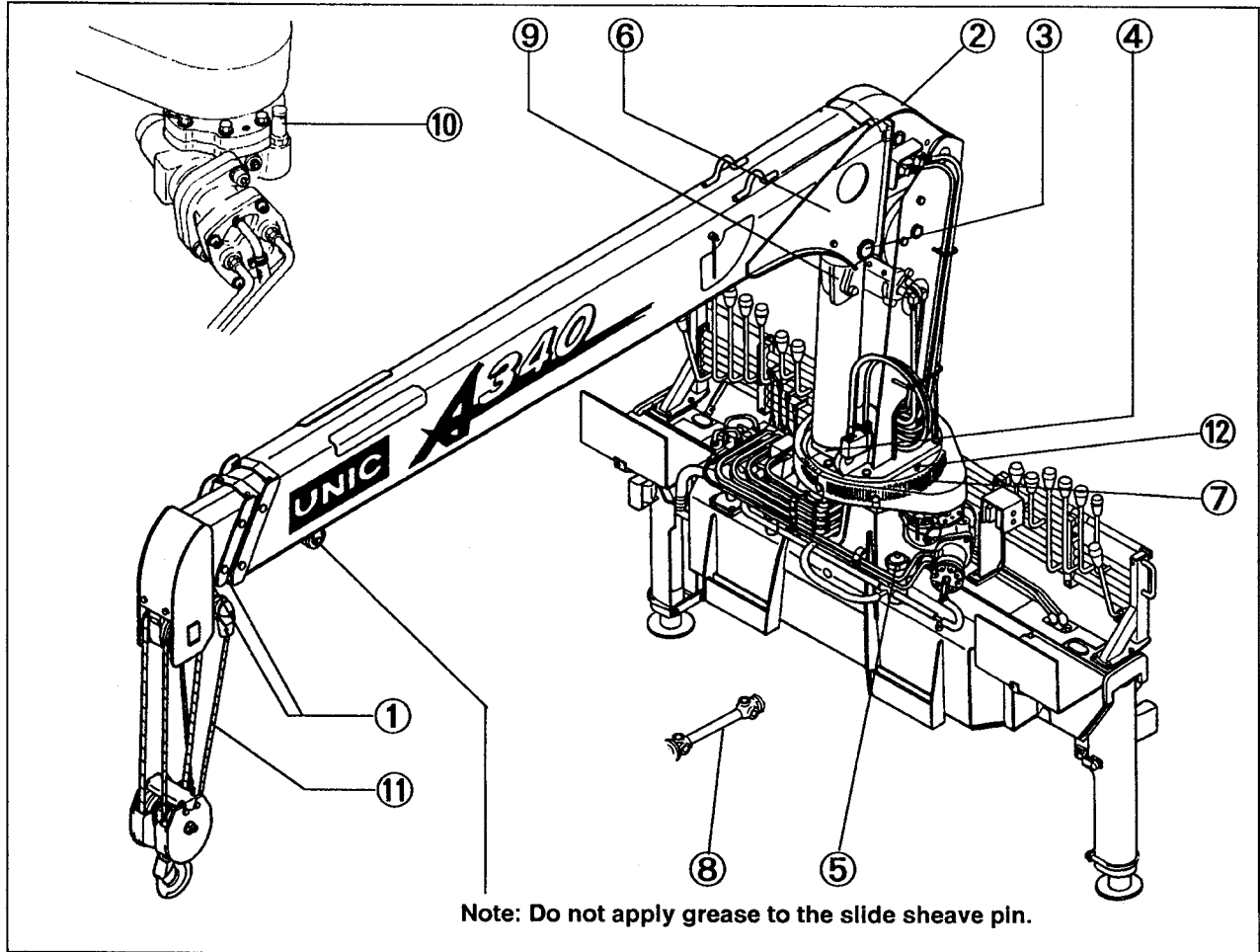


§18. ELECTRIC CIRCUIT DIAGRAM





§20. LUBRICATION CHART

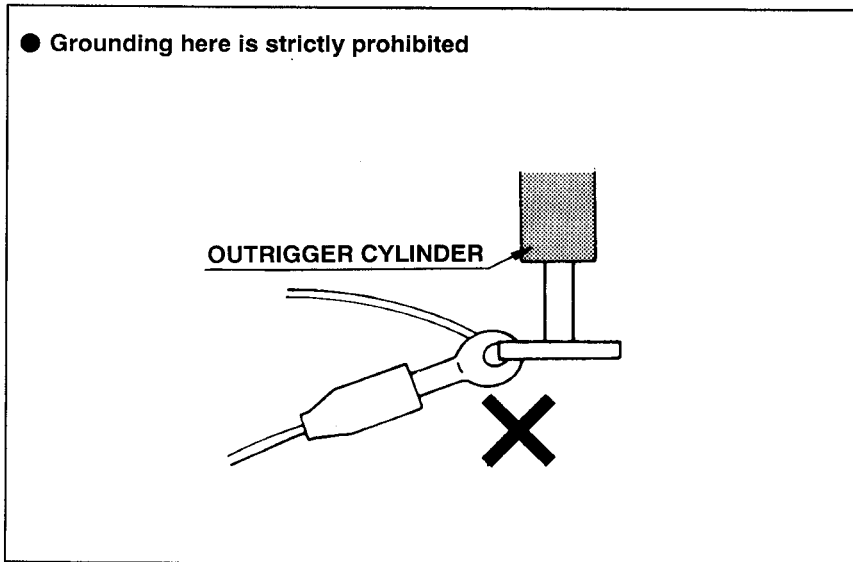


Service Interval	Where to lubricate	Q'ty	Lubricant	Means
Daily	① Boom slide plate (Boom sections②, ③), 3-section boom	2	Molybdenum grease	Hand application
	② Foot pin of boom	1	Chassis grease	Grease pump
	③ Upper support pin of derricking cylinder	1	Chassis grease	Grease pump
	④ Lower support pin of derricking cylinder	1	Chassis grease	Grease pump
	⑤ Oil tank (32 liters)	1	Hydraulic oil (Up to a middle of level gauge)	
Weekly	⑥ Gears for winch drum	1	Chassis grease	Grease pump
	⑦ Slewing gears	1	Chassis grease	Hand application
	⑧ Propeller shaft	3	Chassis grease	Grease pump
Monthly	⑨ Reduction gears for winch (approx. 0.9 liters)	1	Gear oil	
	⑩ Reduction gears for slewing (about 0.7 liters)	1	Gear oil	
	⑪ Wire rope	1	Chassis grease	Hand application
	⑫ Slewing bearings	2	Chassis grease	Grease pump

§21. CAUTION TO BE TAKEN WHEN WELDING

When welding is needed for some reason, do not use the outrigger cylinder for a welding ground.

A large welding current flow into the inside of cylinder sparks which in turn may damage the rod, the piston, and the like.



OTHERS

1) Recommended grease

(1) Chassis grease

Use NLGI No. 1 grade.

Petroleum Maker	Brand
ESSO	Chassis grease L
MOBIL	HP221
CALTEX	Multifak EPI
SHELL	RETINAX – CD

(2) Molybdenum grease

Use NLGI No. 2 grade.

Petroleum Maker	Brand
ESSO	Beacon Q2
MOBIL	Mobilplex Special
CALTEX	Molytex Grease EP2
SHELL	Retinax AM

2) Recommended gear oil

Use API Service GL-4 gear oils.

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

3) Recommended hydraulic oil

Use industrial - type hydraulic oil;

ISO VG 46 for most temperatures.

ISO VG 32 extremely low temperatures.

Petroleum Maker	Brand	
	ISO VG 32	ISO VG 46
ESSO	UNVICE J32	Teresso 46
MOBIL	Mobil DTE 13	Mobil DTE 25
CALTEX	Rando Oil HD AZ32	Rando Oil 46
SHELL	Shell Tellus Oil 32	Shell Tellus Oil 46

