UNIC

WORK SHOP MANUAL

URV346-C

FURUKAWA UNIC CORPORATION

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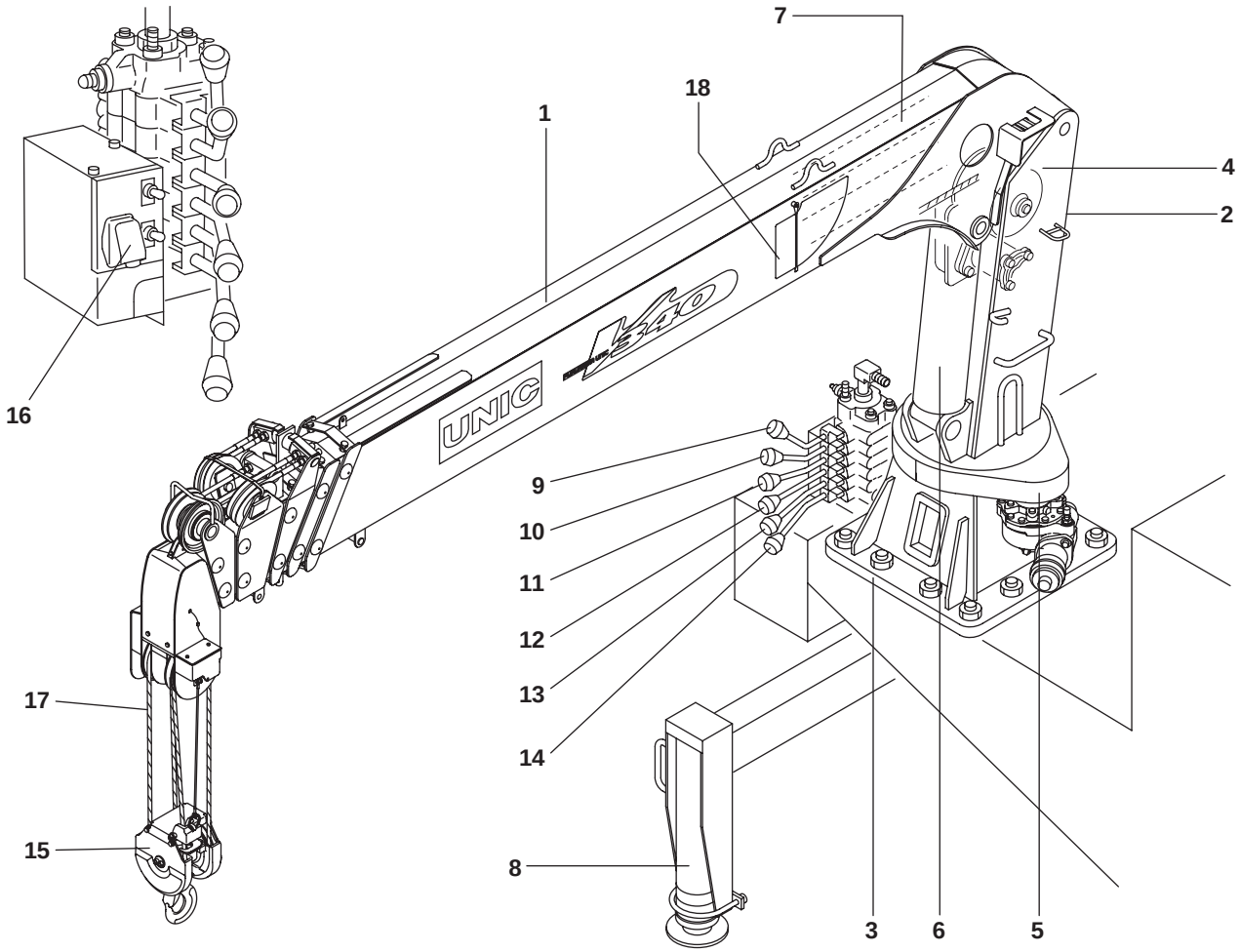
1.DESCRIPTION OF MAJOR EQUIPMENTS

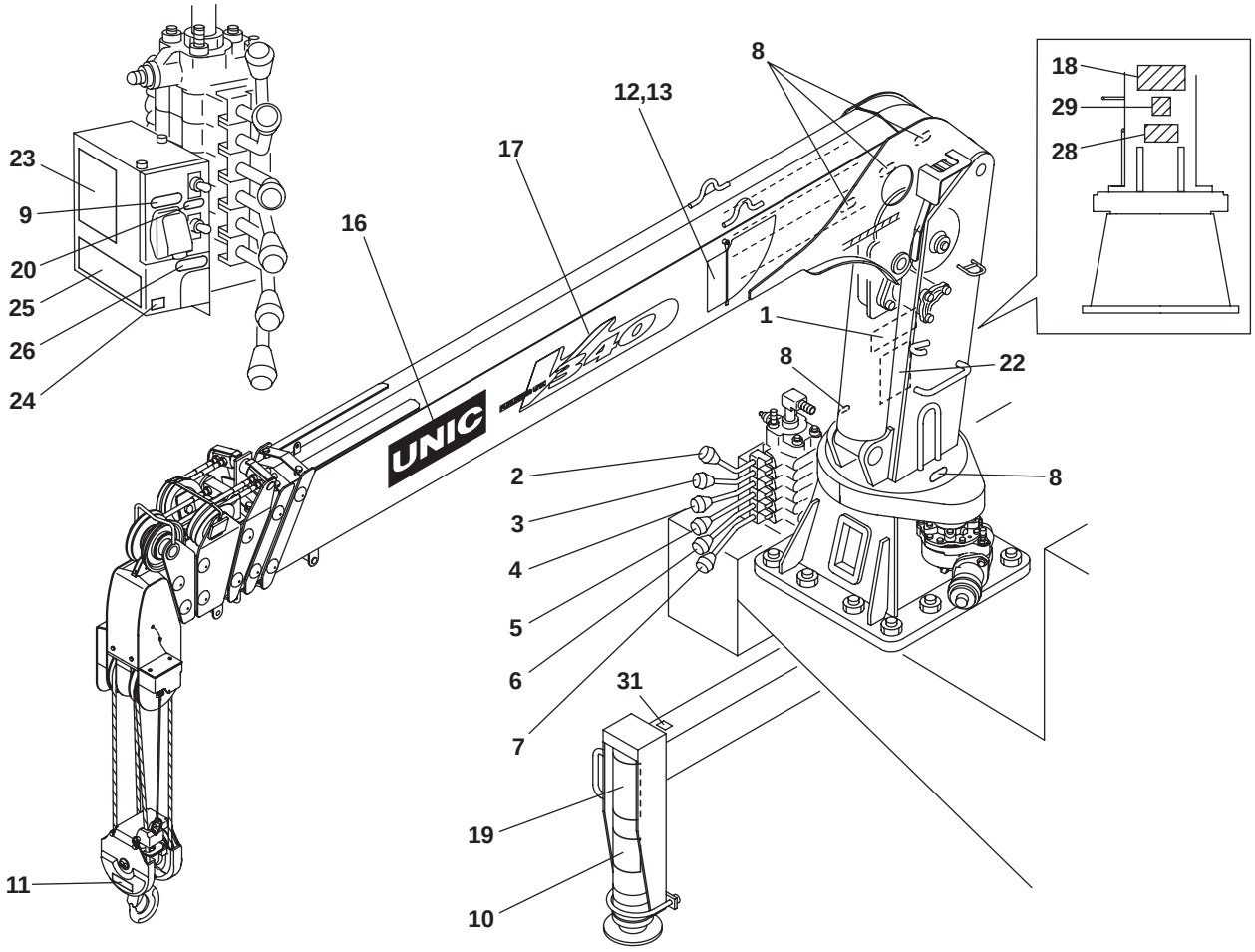
Names of Crane Parts



No.	Descri ption
1	Boom
2	Column
3	Base
4	Hoist winch
5	Slewing gear
6	Topping cylinder
7	Telescoping cylinder
8	Outrigger
9	Boom topping control lever

No.	Descri ption
10	Winch control lever
11	Boom telescoping control lever
12	Swing control lever
13	Outrigger control lever (Street side)
14	Outrigger control lever (Curb side)
15	Hook block
16	Warning horn
17	Wire rope
18	Boom angle indicator

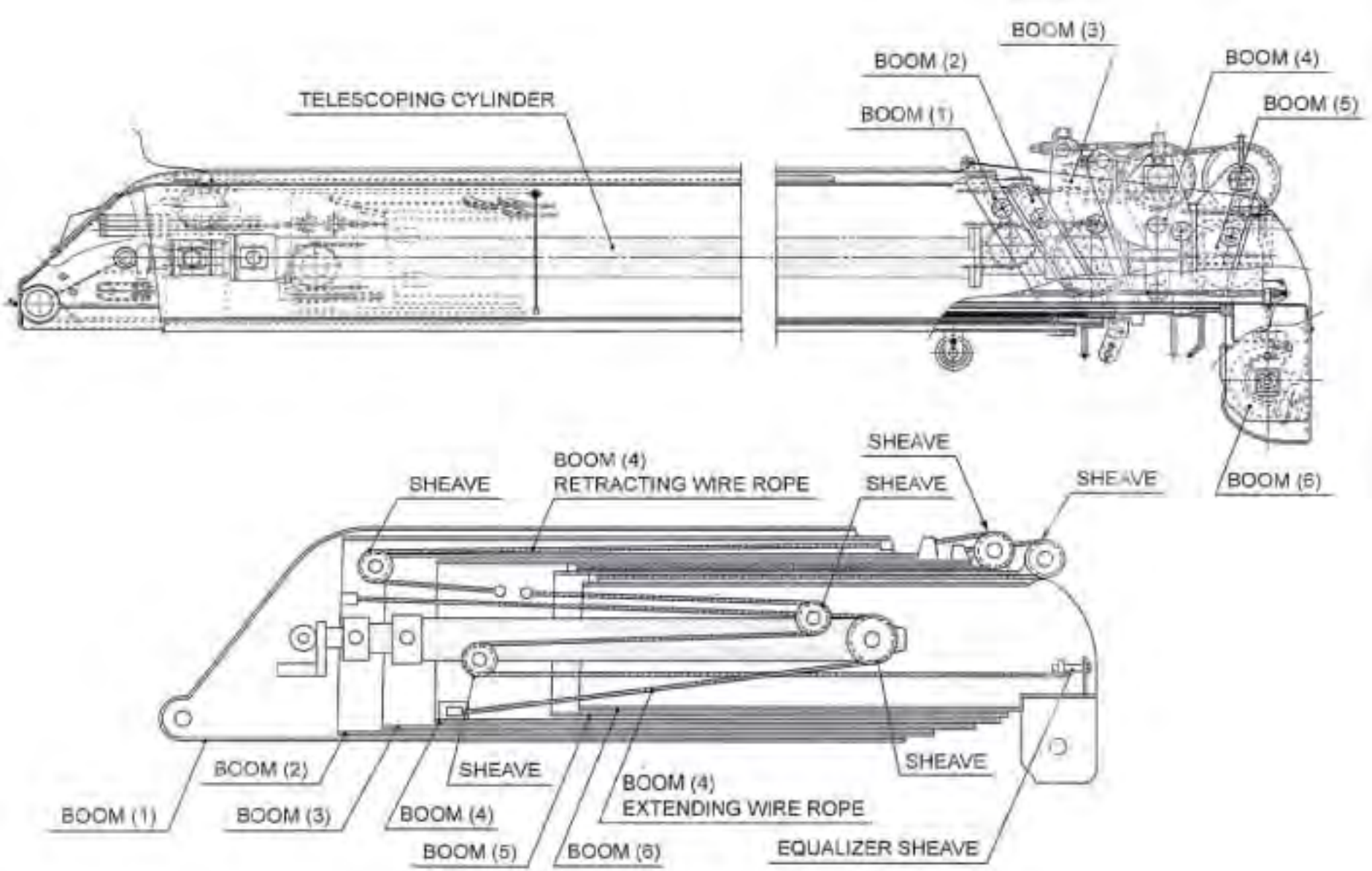
2.PLACARD LOCAUTION CHART



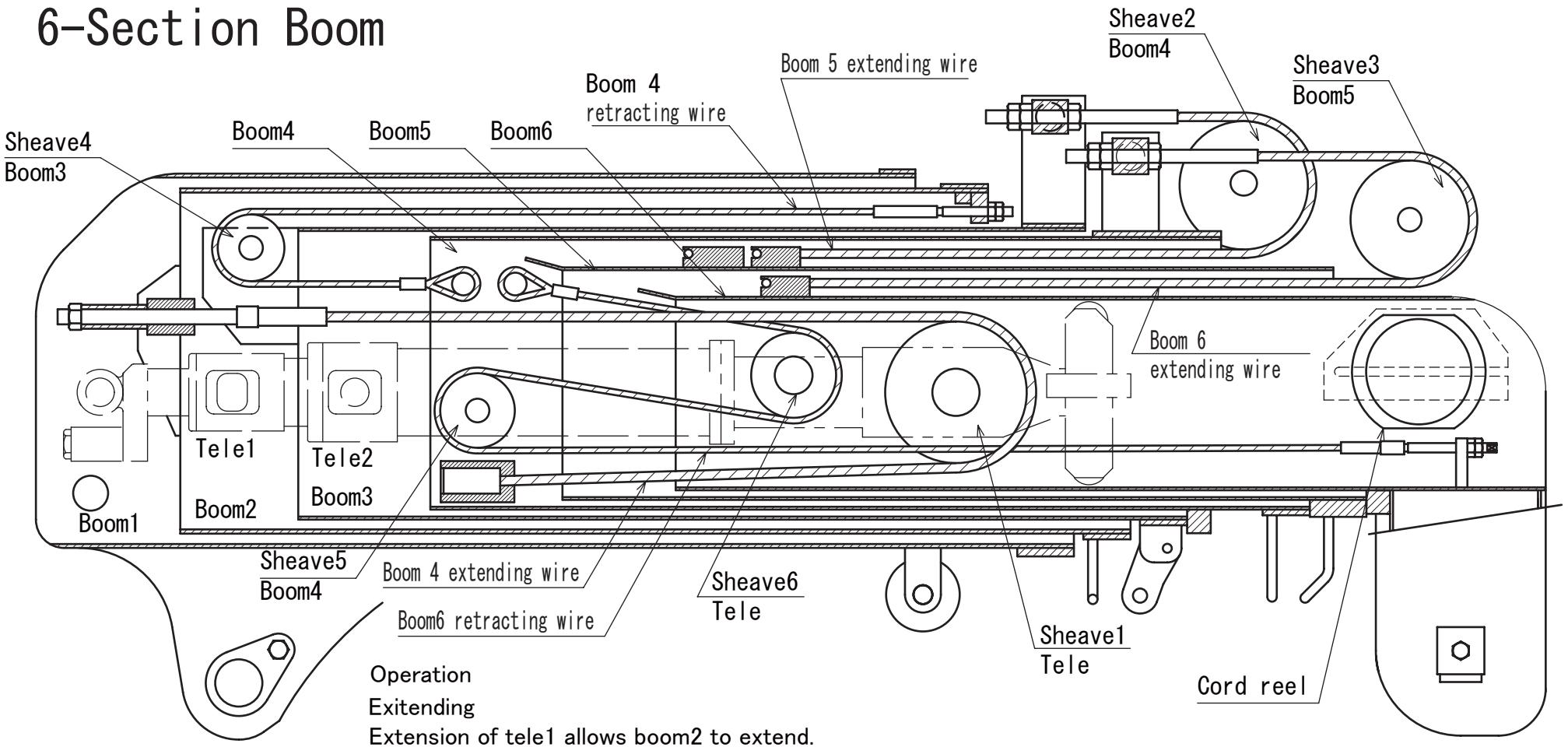
No.	Part Name	Part No.	Q'ty
1	Crane Model Name Plate	602104560	1
2	Placard (Raise / Lower)	080A86010	1
3	Placard (Hoist)	080A86020	1
4	Placard (Telescoping)	080A86030	1
5	Placard (Swing)	080B81120	1
6	Placard (Outrigger Street Side)	080A86050	1
7	Placard (Outrigger Curb Side)	080A86040	1
8	Placard (Grease)	080581060	10
9	Placard (Horn)	08J081240	1
10	Placard (Caution, O / R Operation)	08V883040	2
11	Placard (Hook)	08A481140	2
12	Placard (Boom Angle R.H.)	C-514023	1
13	Placard (Boom Angle L.H.)	C-514024	1
14	Placard (Rated Loads)	C-514025	1
15	Placard (Operating Instructions)	08A481080	1
16	Placard (UNIC)	090B81250	2

No.	Part Name	Part No.	Q'ty
17	Placard (340)	090G81090	2
18	Placard (Electrocution Hazard)	088F81090	2
19	Placard (Danger, O / R Operation)	088F81050	2
20	Placard (Replacement Warning)	088F81070	2
21	Placard (Electrocution Hazard)	088F81110	1
22	Placard (Caution, Inspect Vehicle)	08A481090	2
23	Placard (Danger, Two Blocking)	08A481110	2
24	Placard (Hydraulic Release)	08V883030	1
25	Placard (Working Lamp)	08V883020	1
26	Placard (Overwinding Alarm)	602103291	1
27	Placard (Range Diagram)	B-523167	1
28	Placard (Hoisting Personnel)	08A481130	2
29	Placard (Ride Load Line)	08A481120	2
30	Placard (Molybden grease)	08AB83010	1
31	Placard (Caution For Travelling)	088483070	2

3 6-Section boom



6-Section Boom



Operation

Exitending

Extension of tele1 allows boom2 to extend.
Extension of tele2 allows boom3 to extend.
Extension of tele2 allows sheave 1 to shift and boom4 is to be extended as it is pulled by extending wire.
Extension of boom4 allows sheave 2 to shift and boom5 is to be extended as it is pulled by extending wire.
Extension of boom5 allows sheave 3 to shift and boom6 is to be extended as it is pulled by extending wire.
Retracting wire follows accordingly.

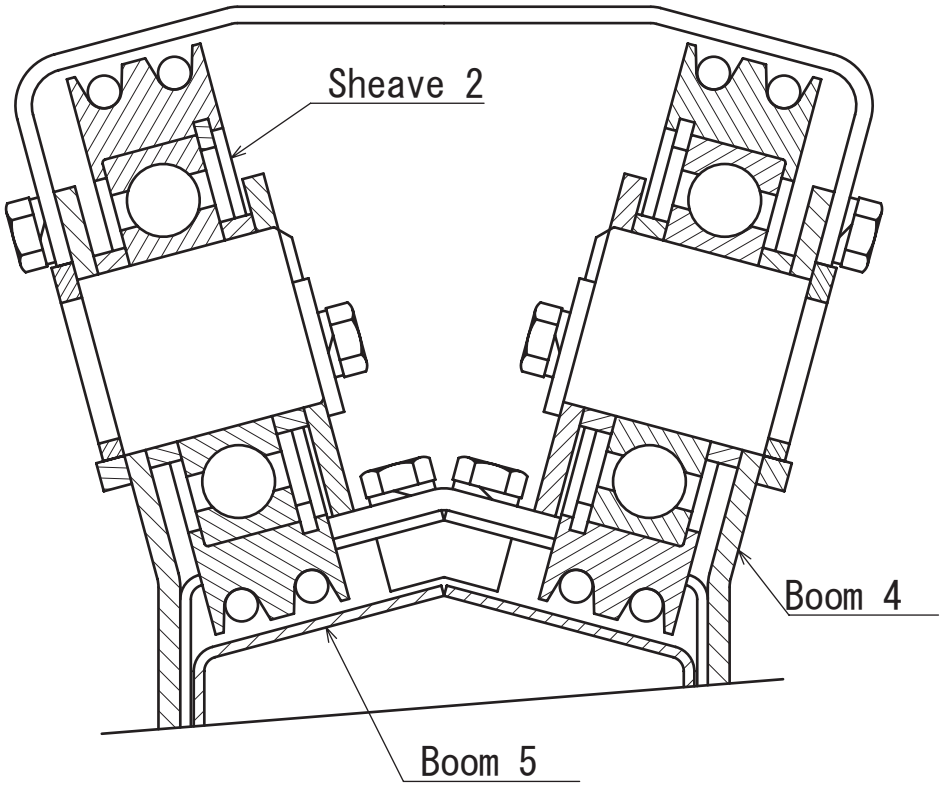
Retracting

Retraction of tele1 allows boom2 to retract.
Retraction of tele2 allows boom3 to retract.
Retraction of tele2 allows sheave 2 to shift and boom5 is to be retracted as it is pulled by retracting wire.
Retraction of boom4 allows sheave 5 and sheave 6 to shift and boom6 is to be retracted as it is pulled by retracting wire.
Retraction of boom6 and boom5 is to be retracted as it is pulled by retracting wire.
Extending wire follows accordingly.

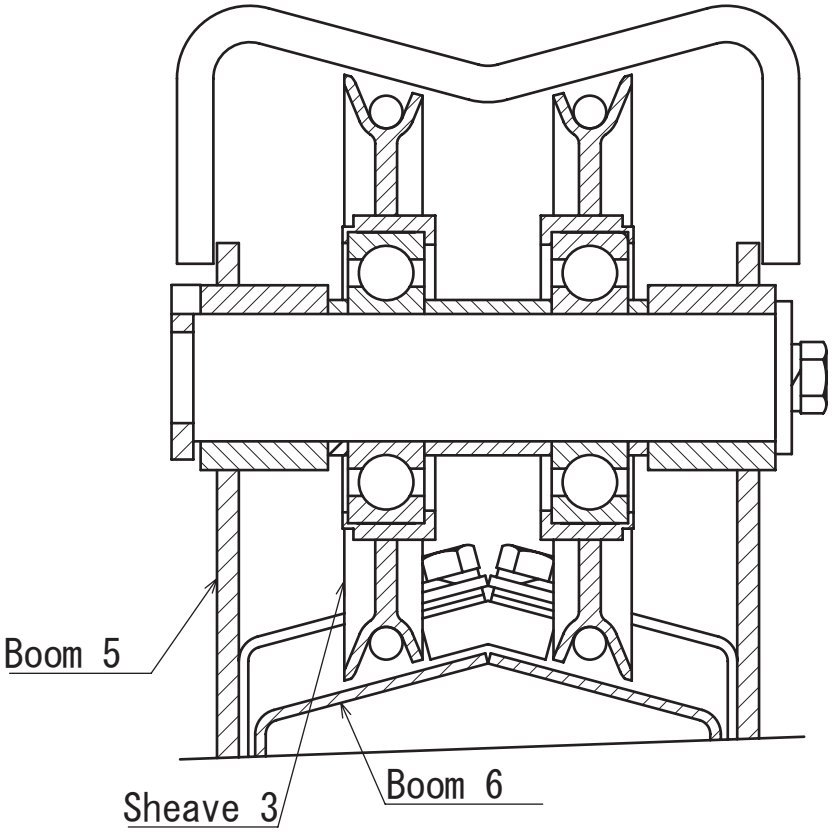
Inspection of slide plate
Replace the slide plate with
a new one when it is worn out
by 2mm or more.

6 section boom

Boom 4 front side section in detail

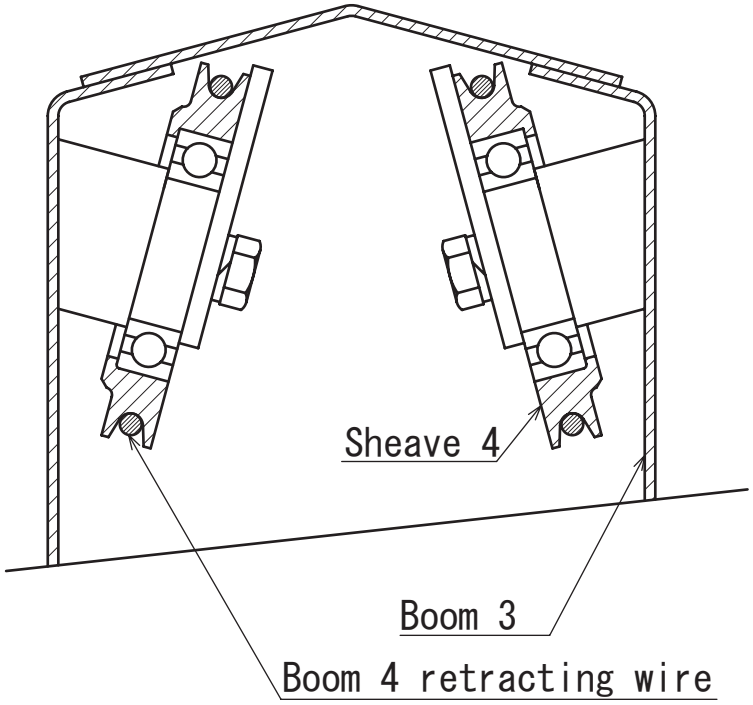


Boom 5 front side section in detail

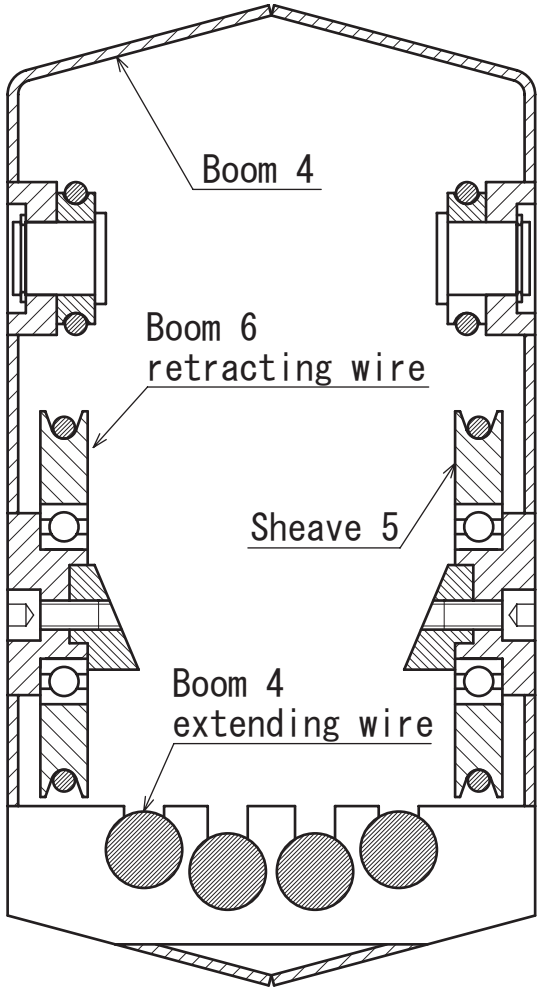


6 section boom

Boom 3 rear side section in detail

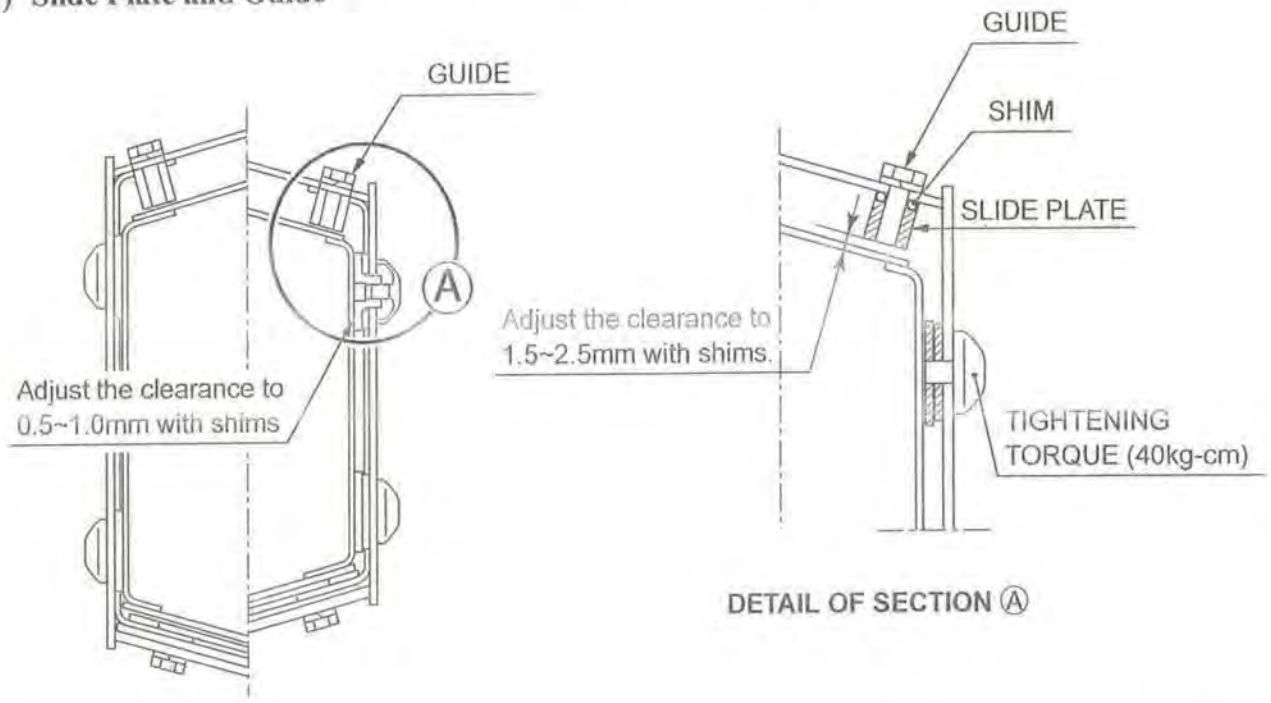


Boom 4 rear side section in detail



Installation Procedures for Slide Plate and Guide

(1) Slide Plate and Guide



Notes: 1. If the sliding resistance is too heavy between the slide plate and boom, adjust it by putting shims.

2. When removing the shim from the guide, put a plain washer under the conical spring washer.

(2) Use Limit of Slide Plates at Lower Plate Unit and at Boom Rear End (Upper)

Measure the thickness of the slide plate and, when it reaches the use limit, replace it with a new one.

☞ Use limit of slide plate

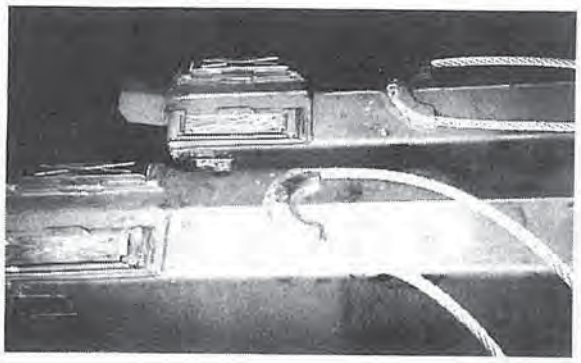
Replace the slide plate with a new one when it is worn 2mm or more.

	Before use	Use limit
Slide plate (thickness in 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

Boom Assembly Procedure (6-Section Boom)

① Apply the boom (6) retracting wire rope to the boom (6). Then, bend the end of the plate.

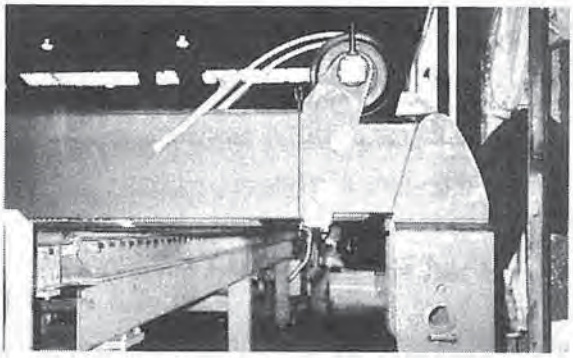
☞ Make the right and left length of the wire rope equal.



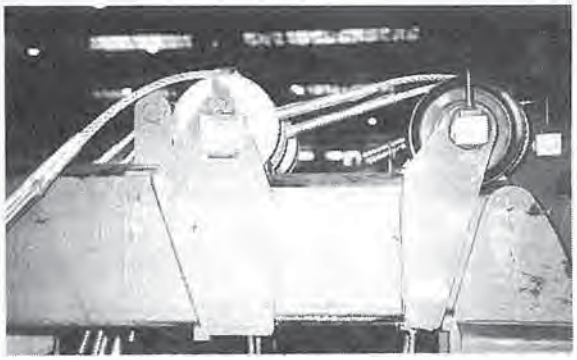
② Apply the boom (5) extending wire rope to the boom (5).
Then bend the end of the plate.

☞ Two wire ropes should be applied to the boom (5). They are different in length, so be careful.

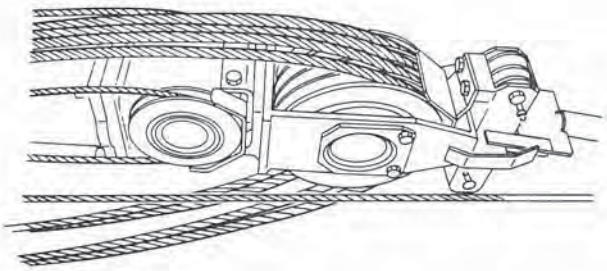
③ Put the boom (6) into the boom (5). Leave part (approx. 200mm) of the boom (6) outside.



④ Put the booms (5) and (6) into the boom (4).

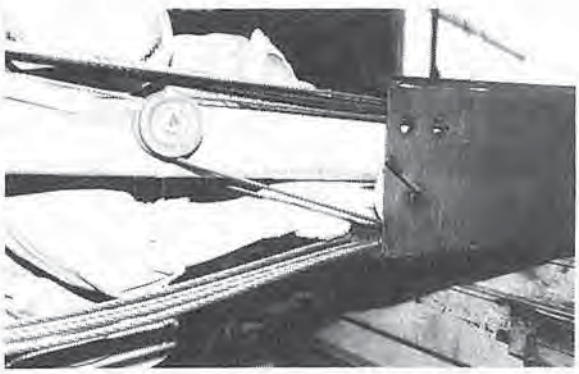


⑤ Apply the four boom (4) extending wire ropes and the one retracting wire rope to the telescoping cylinder. Install the wire rope cover.



☞ Fix the wire ropes with rubber tape, etc. so as not to twist them with each other. Refer to the above illustration.

⑥ Assemble the telescoping cylinder to the booms (4), (5) and (6).



⑦ Put the sheave to which the boom (6) retracting wire rope is applied into the pin at the rear end of the boom (4), and fix the plate.

⑧ Put the pin which runs through the thimble of the boom (6) retracting wire rope into the innermost boss at the rear upper end of the boom (4), and fix it with the snap ring. (Fig.1)

⑨ Put the pin through which the boom (4) retracting wire rope runs into the boss on the front side, and fix it with the snap ring.

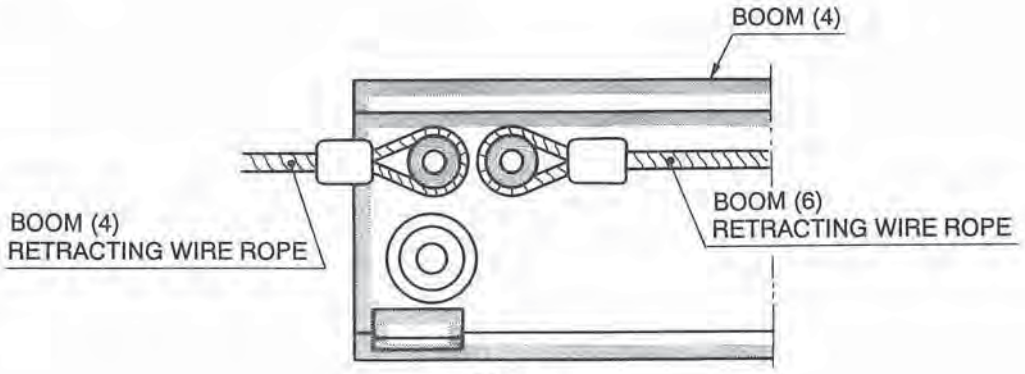


Fig. 1

⑩ Push the booms (5) and (6) into the boom (4) fully, and then push the telescoping cylinder.

⑪ Fix the boom (6) retracting wire rope lightly with the bolt at the boom end.

⑫ Pass the boom (5) extending wire rope sheave through the pin and fix it.

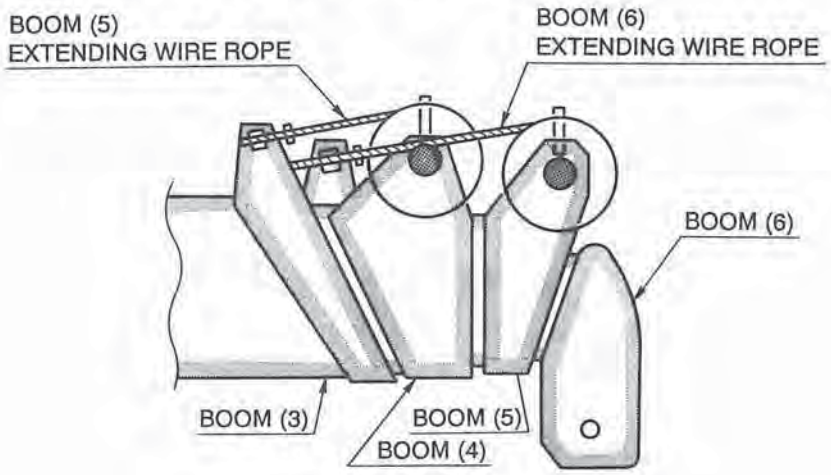


Fig. 2

⑬ Put the booms (4), (5), (6) and the telescoping ass'y into the boom (3).

☞ Leave part (approx. 200mm) of the boom (4) outside.

⑭ Fix the thread end of the boom (5) extending wire rope on the boom (3) lightly.

⑮ Put the sheave to which the boom (4) retracting wire rope is applied into the rear end of the boom (3), and fix it. (Fig.3)

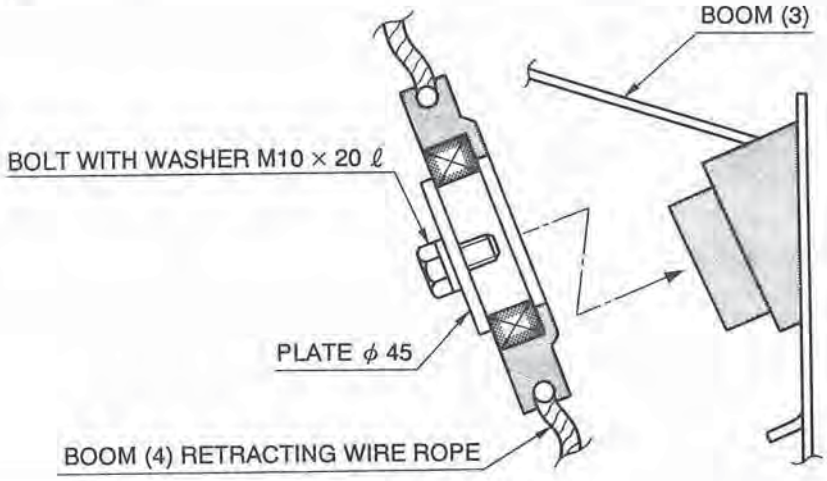


Fig. 3

⑯ Set the end of the boom (4) retracting wire rope at the boom end and put the booms (3), (4), (5), (6) and the telescoping cylinder ass'y into the boom (2).

1. Set the four boom (4) extending wire ropes and fix them with the lock nut.
2. Set the boom (4) retracting wire rope at the end of the boom (2).
3. Set the telescoping cylinder pin.

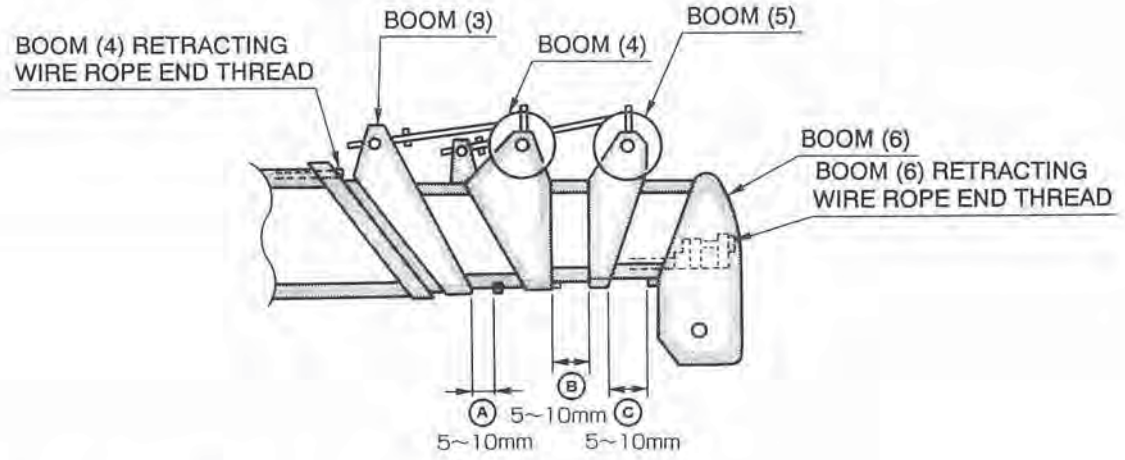
⑰ Assemble the booms (2), (3), (4), (5), (6) and the telescoping cylinder ass'y into the boom (1). Leave part (approx.200mm) of the boom (2) outside.

1. Install the boom rear-end cover.
2. Install the joint.

6-Section Boom

① Retract and extend the boom fully two or three times. Exhaust air from the telescoping cylinder and retract the boom fully.

② Make sure that the booms (6), (5) and (4) are extending a little (5~10mm).
If they are not so, loosen the extending wire rope and extend the boom manually.

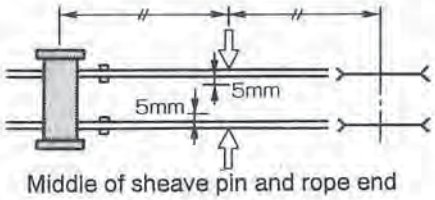


③ Tighten the boom (4) retracting wire rope till the part Ⓐ is lost.
Then, tighten it by two more turns and fix it with the double nut.

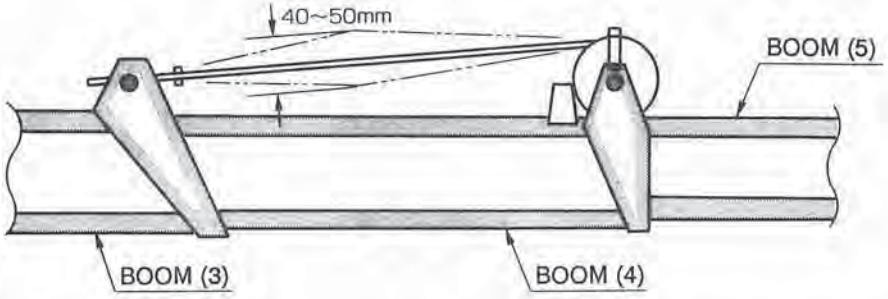
④ Tighten the boom (4) extending wire rope from the boom (1) rear end.
While the wire rope end is pulled with 16 ± 2kg, turn the long nut by hand lightly and put it against the boom (2) bracket. Then, tighten it by two more turns and fix it with the double nut.

⑤ Tighten the boom (6) retracting wire rope till the parts Ⓑ and Ⓒ are lost. Then, tighten it by two more turns and stop turning.

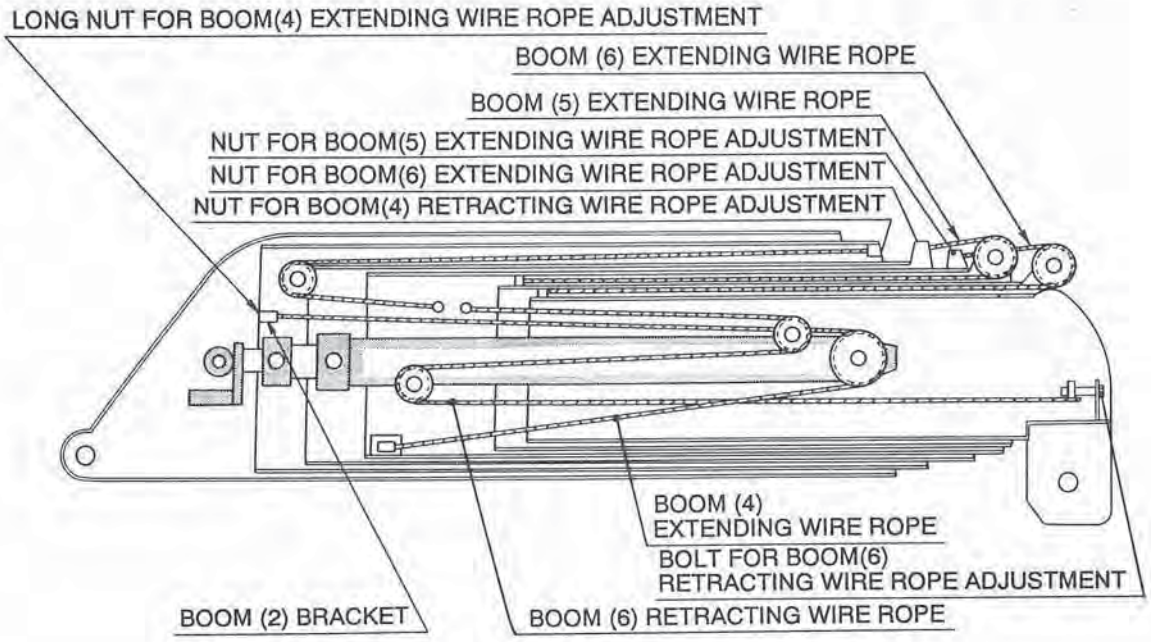
⑥ Tighten the boom (6) extending wire rope uniformly both right and left.
Holding the right and left wire ropes by hand, tighten them till each of them can move approx. 5mm.



⑦ Extend the boom fully, and then retract it 50~100mm to slacken the boom (5) extending wire rope.
Tighten the extending wire rope till it is not slackened any more, and fix it with the double nut.
Don't make the tension of the boom (5) extending wire rope too tight. (It should be moved 40~50mm up and down in the middle by hand.)



Note: ***When applying a nut to the thread end, take care not to turn the wire rope together.***



6-Section Boom

No	Content of work		Working hours
1	Boom Ass'y	Installation and detaching	4.0
2	Boom Ass'y	Disassembly and assembly	12.0
3	Guide	Replace	1.0
4	Slide sheave	Replace	0.5
5	Slide plate under forward of boom	Replace	0.5

(Hour)

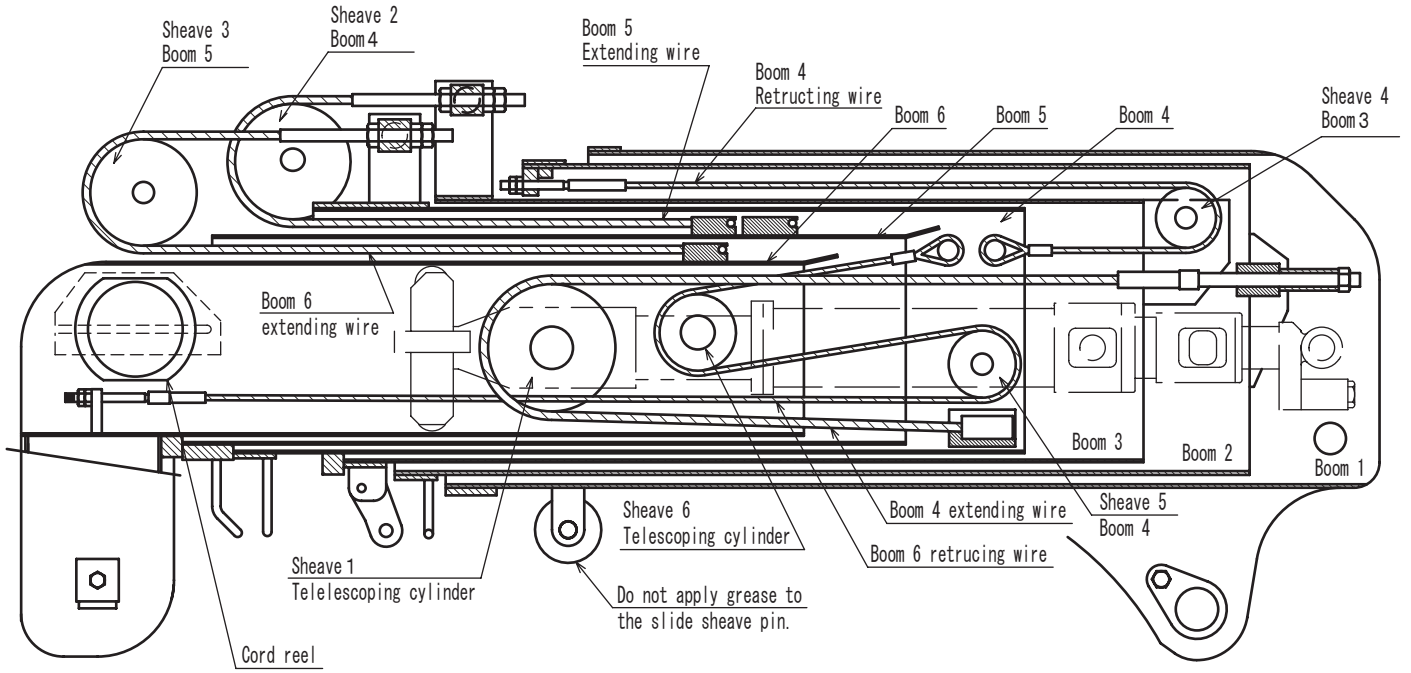
Use limit of slide plate
Replace the slide plate with a new one when it is worn out by 2mm or more.

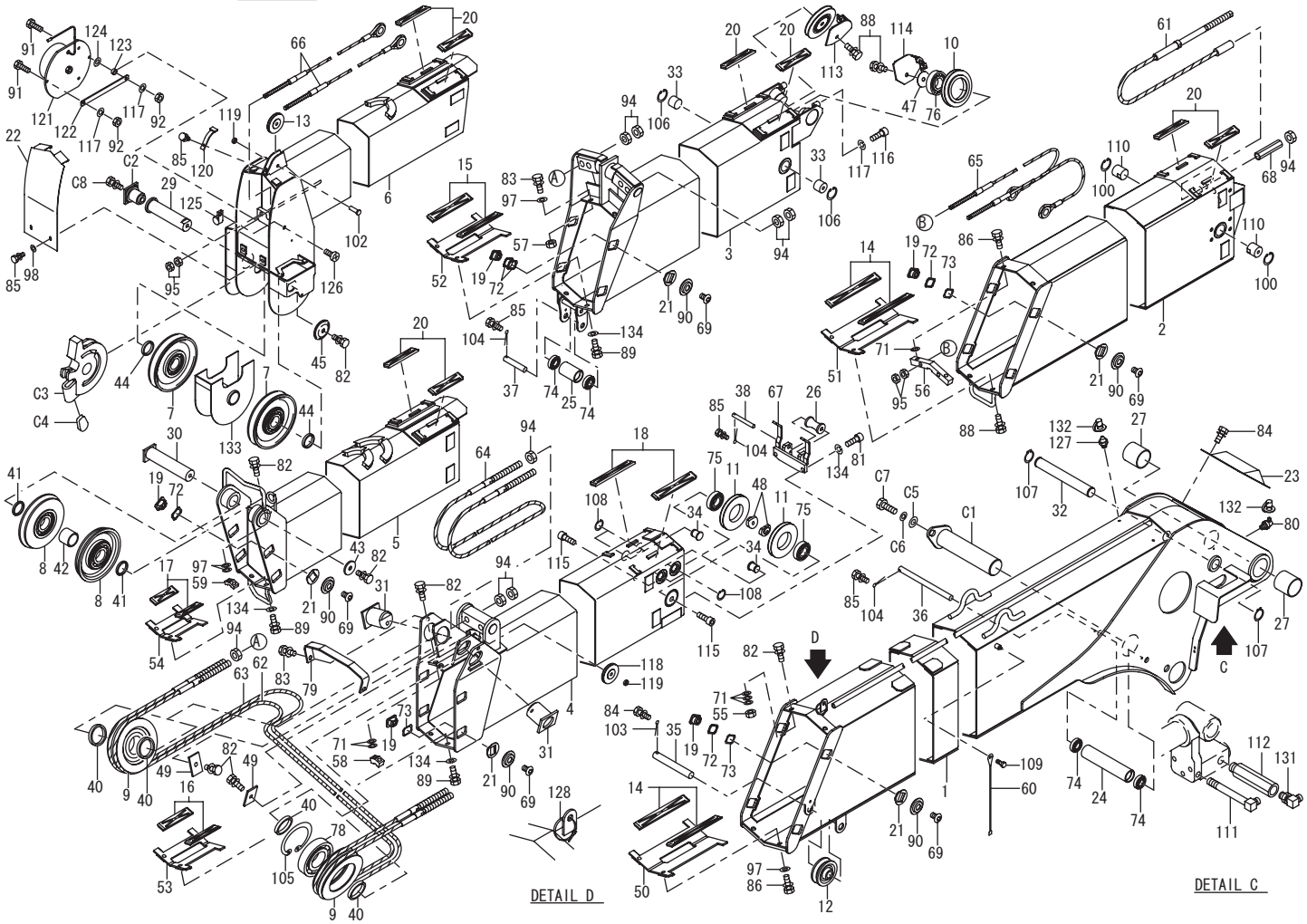
Remarks

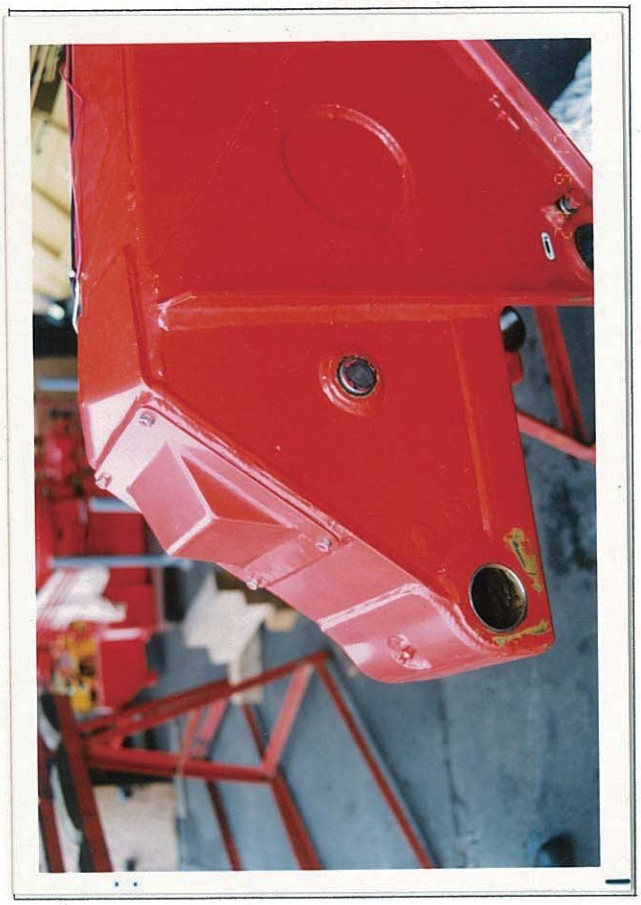
"Removal of boom Ass'y" means the work to remove the hook and then remove the booms (2) to (6) and the telescoping cylinder Ass'y from the boom (1).

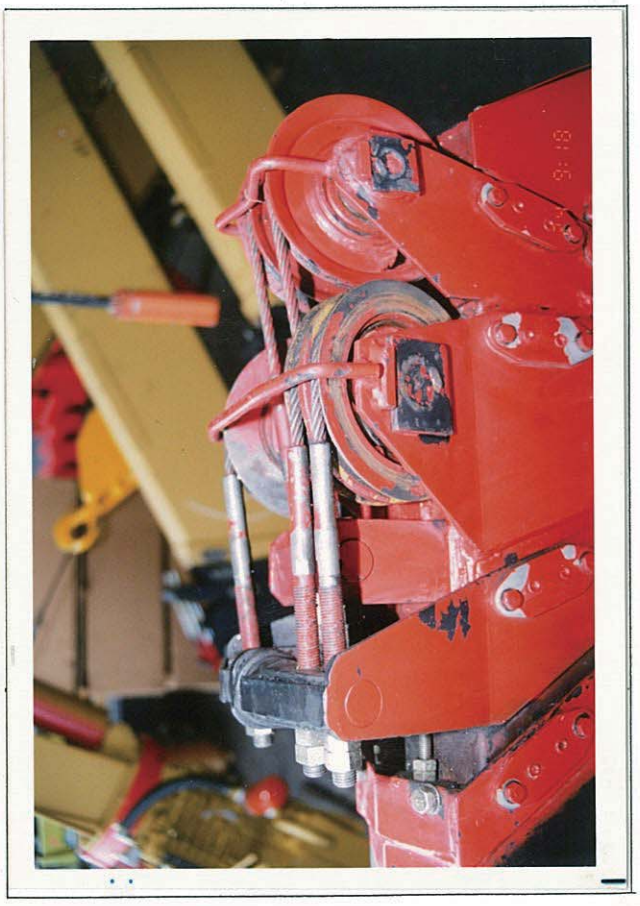
"Disassembly/assembly of boom Ass'y" means the disassembly and assembly of only the boom Ass'y.

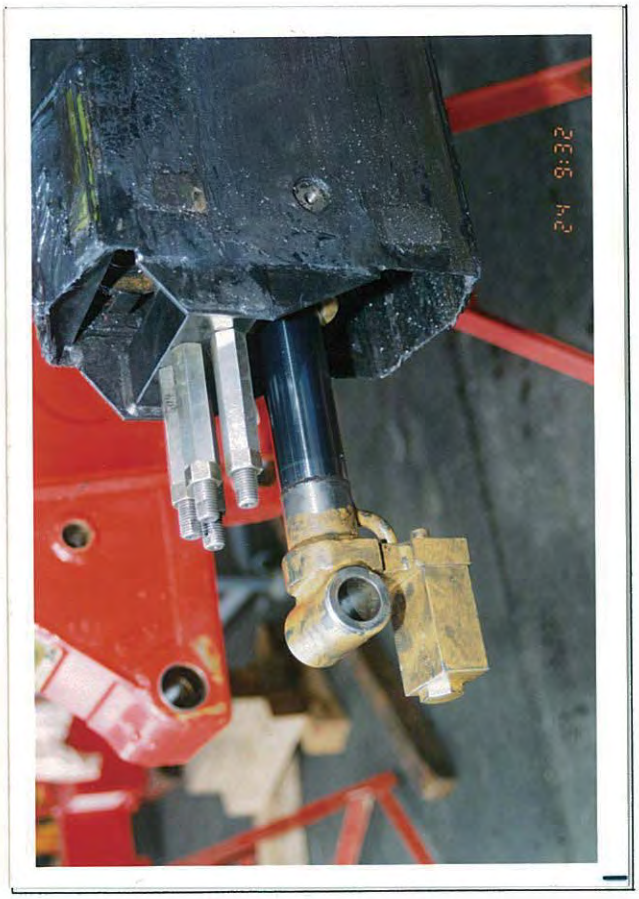
"Disassembly/assembly of boom Ass'y" includes "Installation/removal of telescoping cylinder Ass'y".

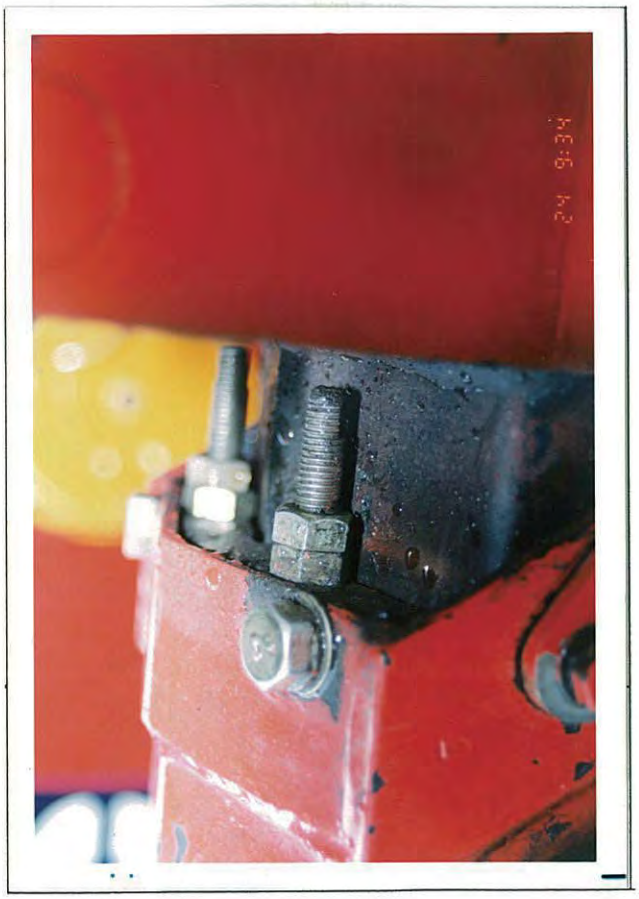


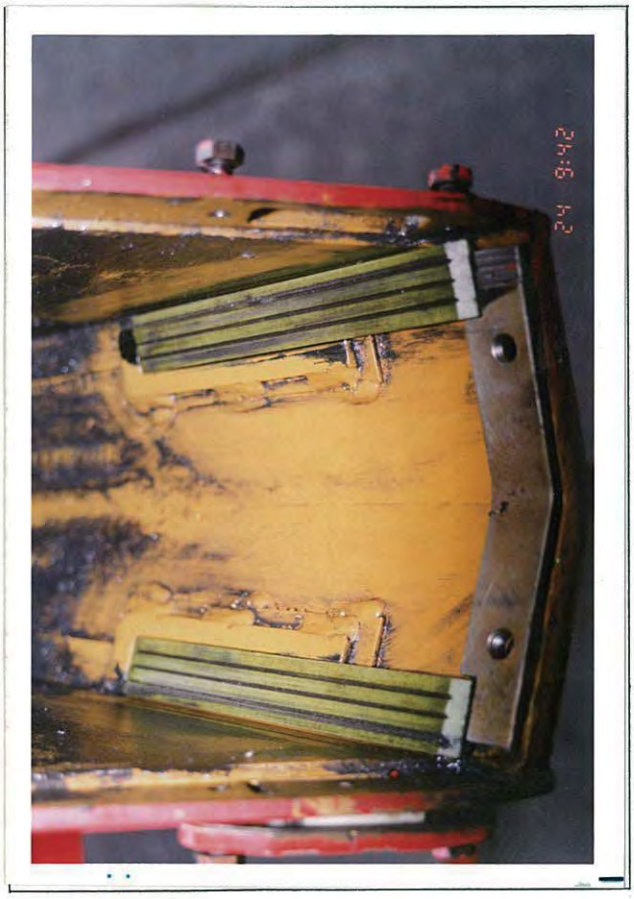


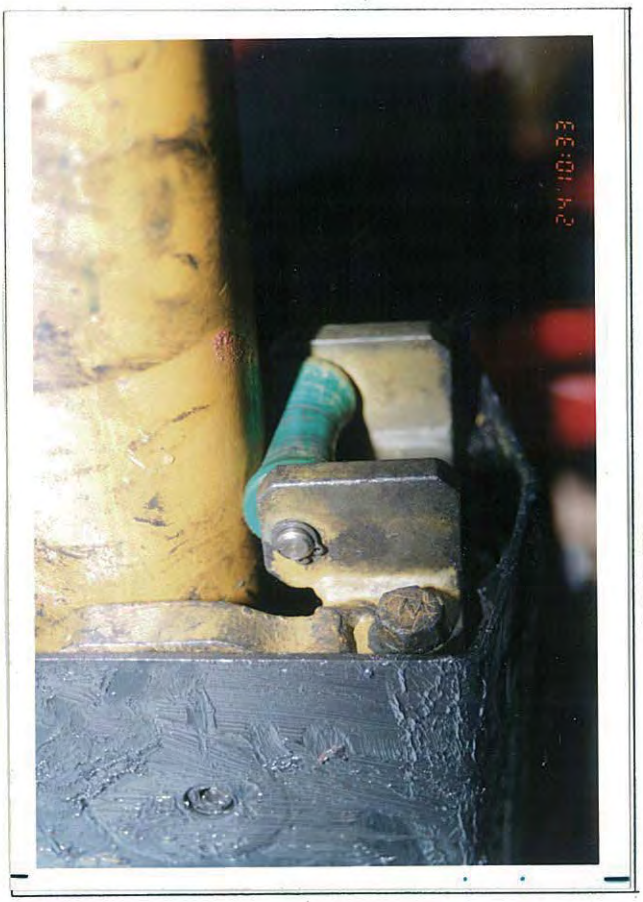


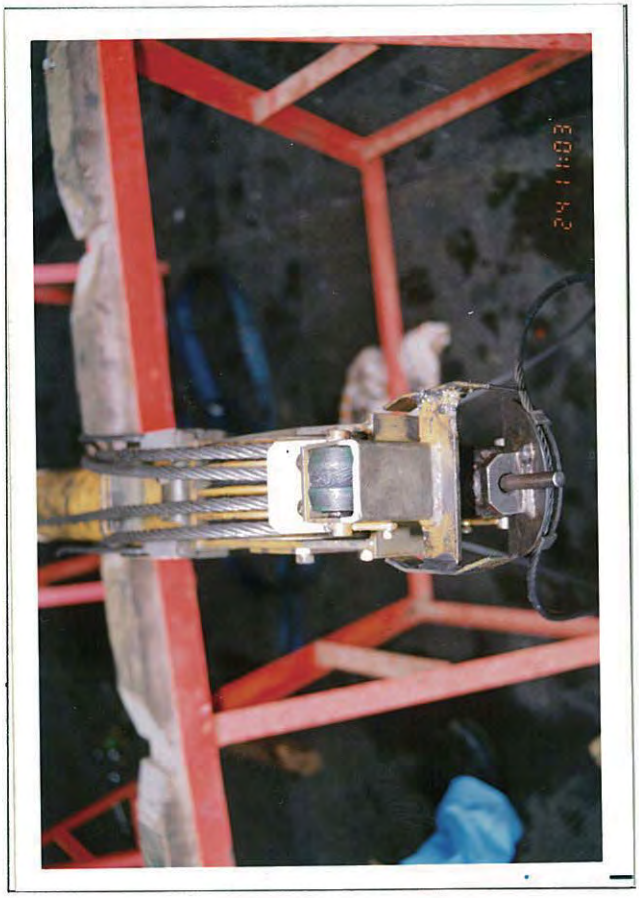


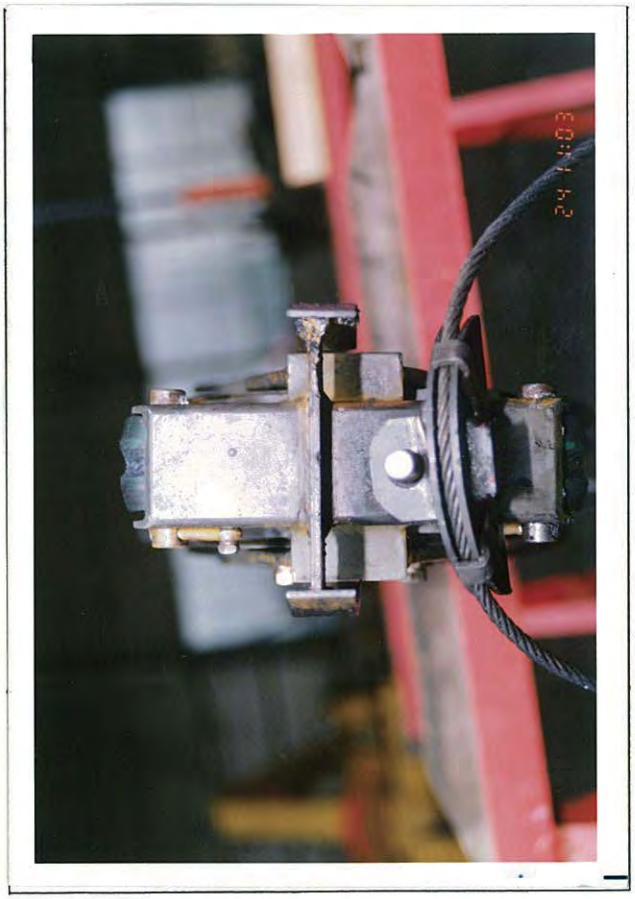


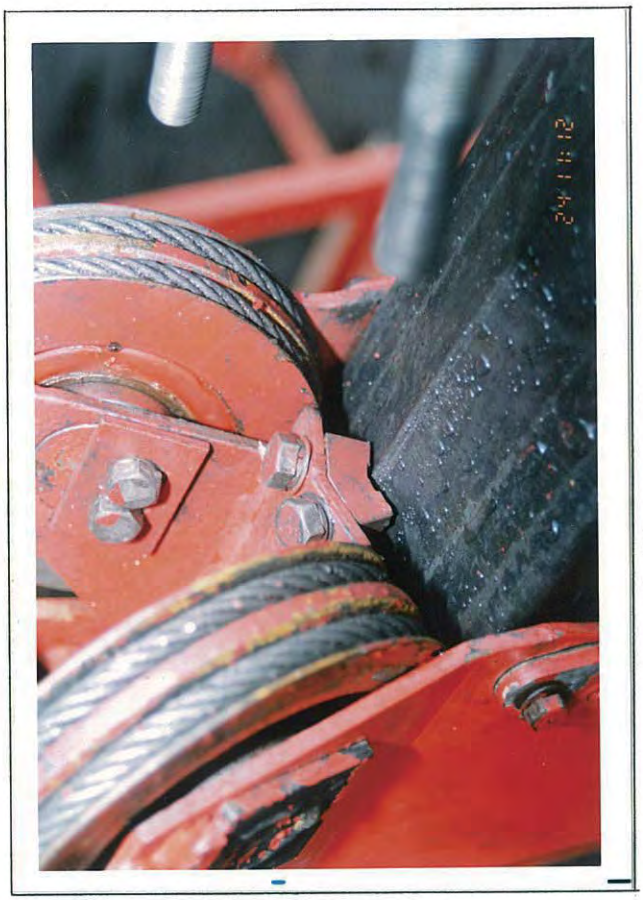


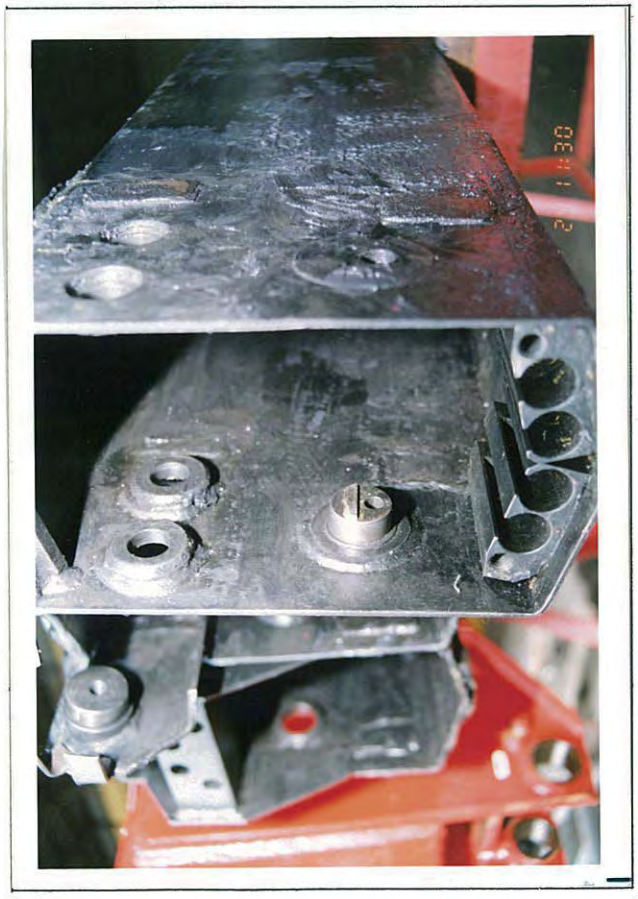


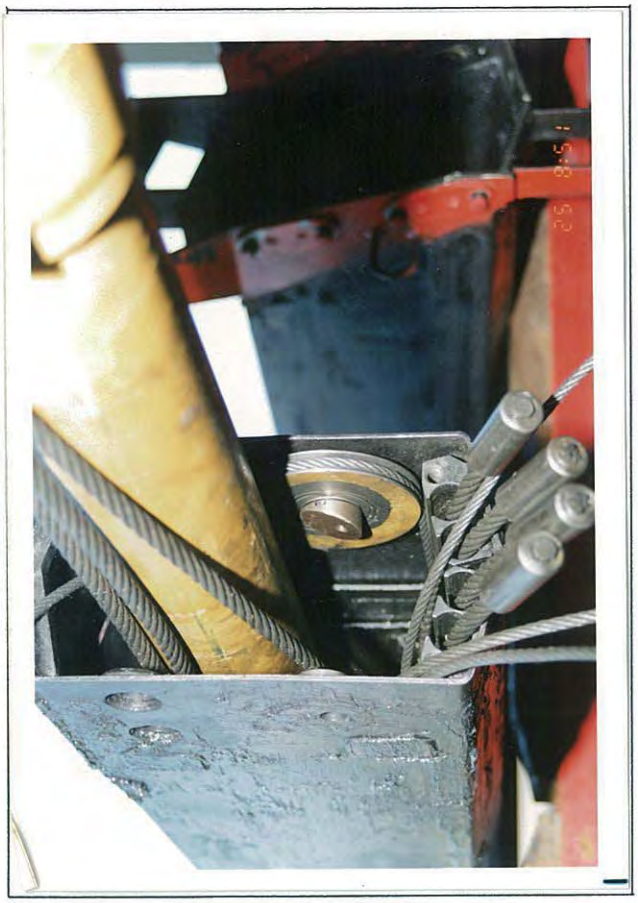












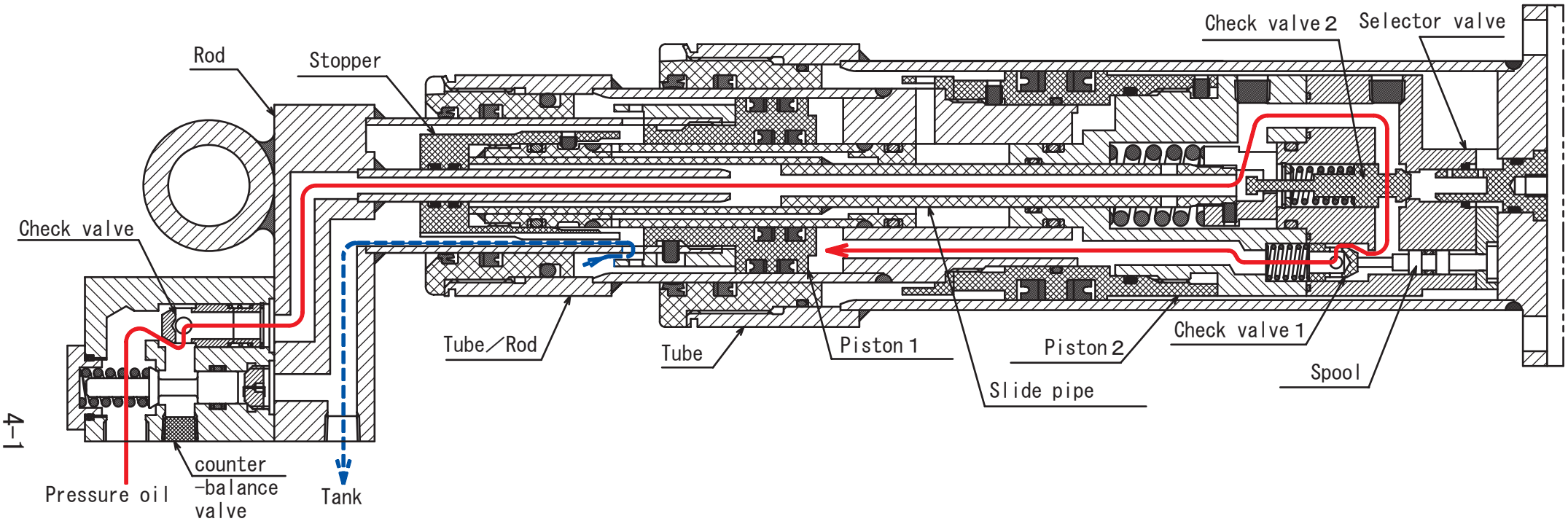

UNC
360


95.8.25
360
UWC

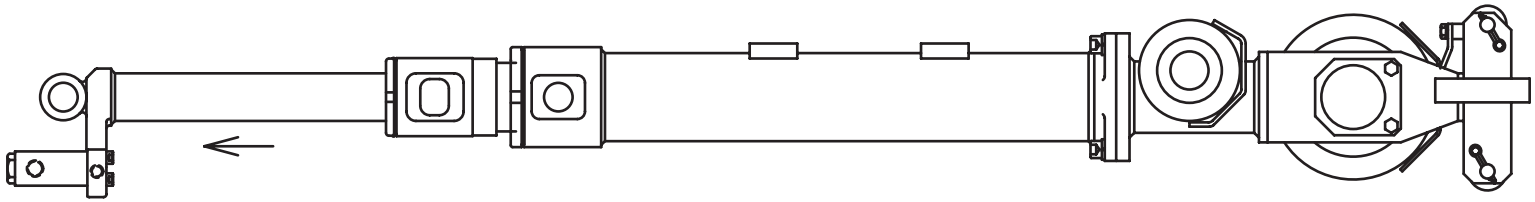

C


95.10.25

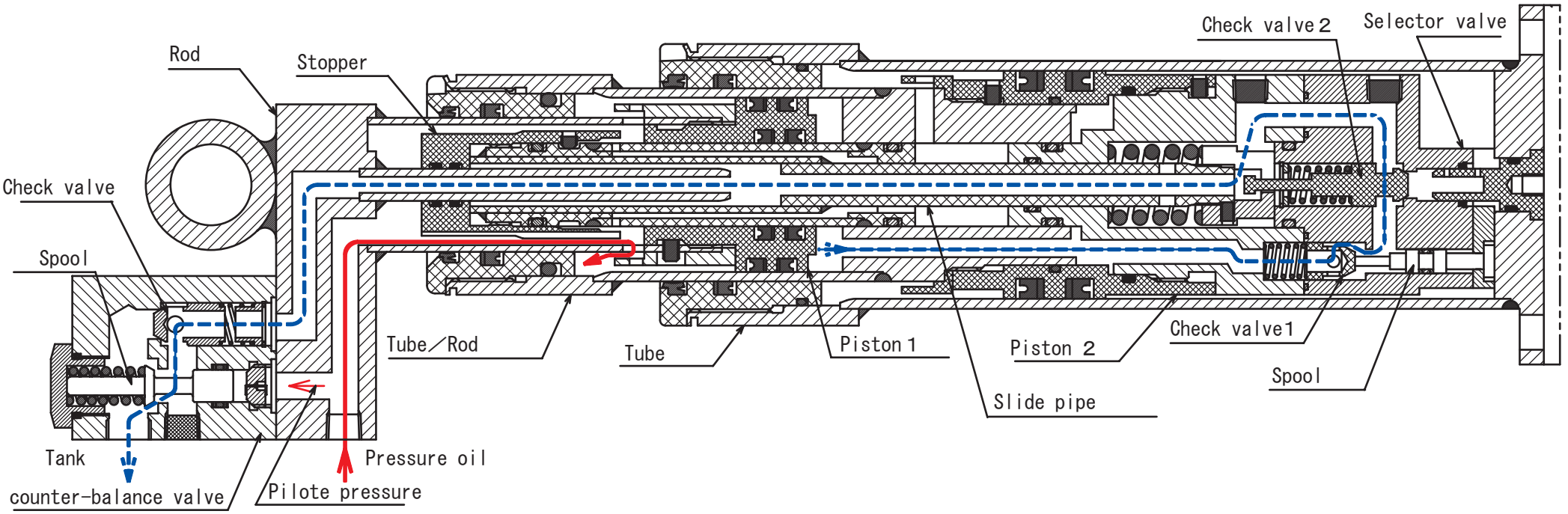
4 URV346 Flow of oil when 1st section of telescoping cylinder extends



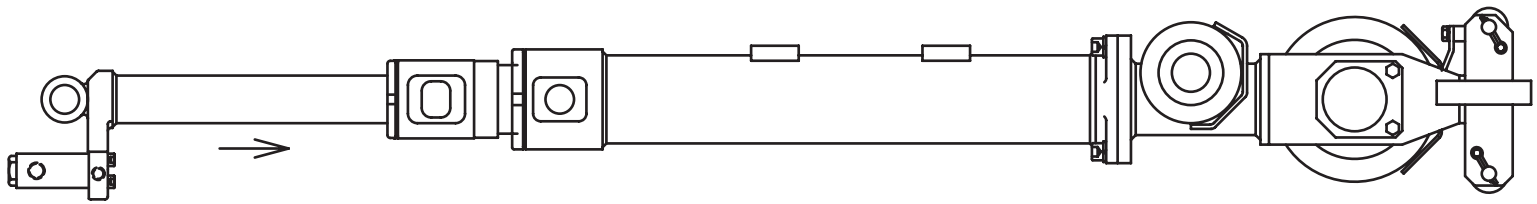
Extending process of 1st section
The pressure oil opens the check valve of counter-balance valve, goes into the rod and reaches the check valve 1 of selector valve.
At this time, the check valve 1 of selector valve is opened and the pressure oil is led to the extension side of 1st section.
At the same time, the oil at the retraction side of 1st section passes through the rod and returns to the tank.
So, the 1st section is extended.



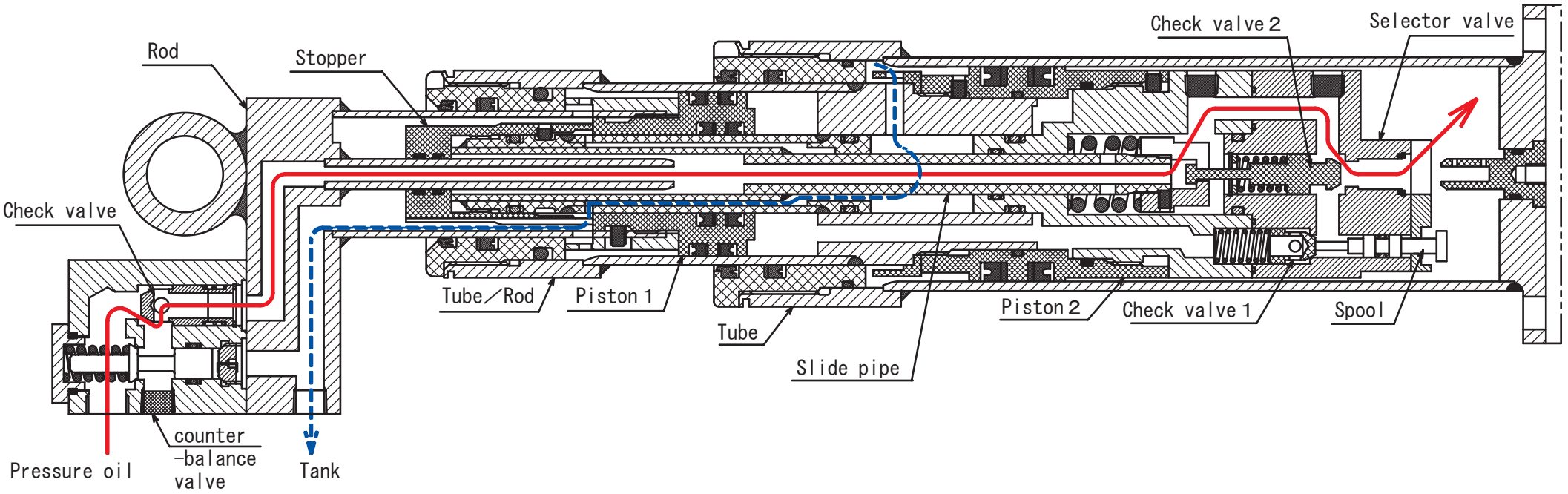
４ＵＲＶ３４６ Flow of oil when 1st section of telescoping cylinder retracts.



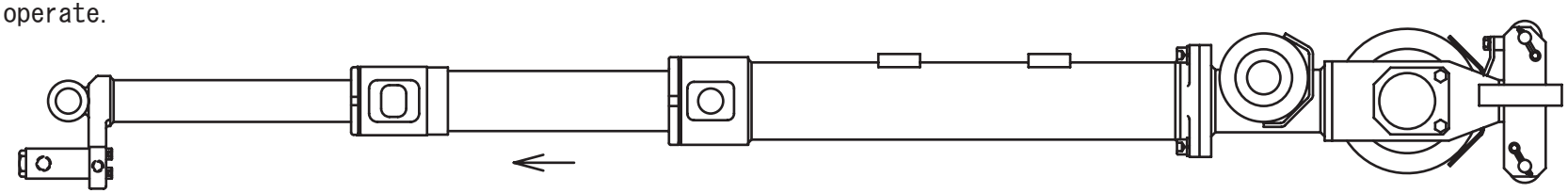
Retracting process of Tele 1
The pressure oil passes through the rod and goes into the retraction side of 1st section.
At this time, the check valve 1 of selector valve is opened and the oil at the extension side of 1st section is led to the counter-balance valve.
The check valve of counter-balance valve is closed.
But the pilot pressure from the retraction side opens the spool and the oil at the extension side returns to the tank.
So, the 1st section is retracted.
The check valve 2 of selector valve is closed.
So, the 2nd section is not retracted.



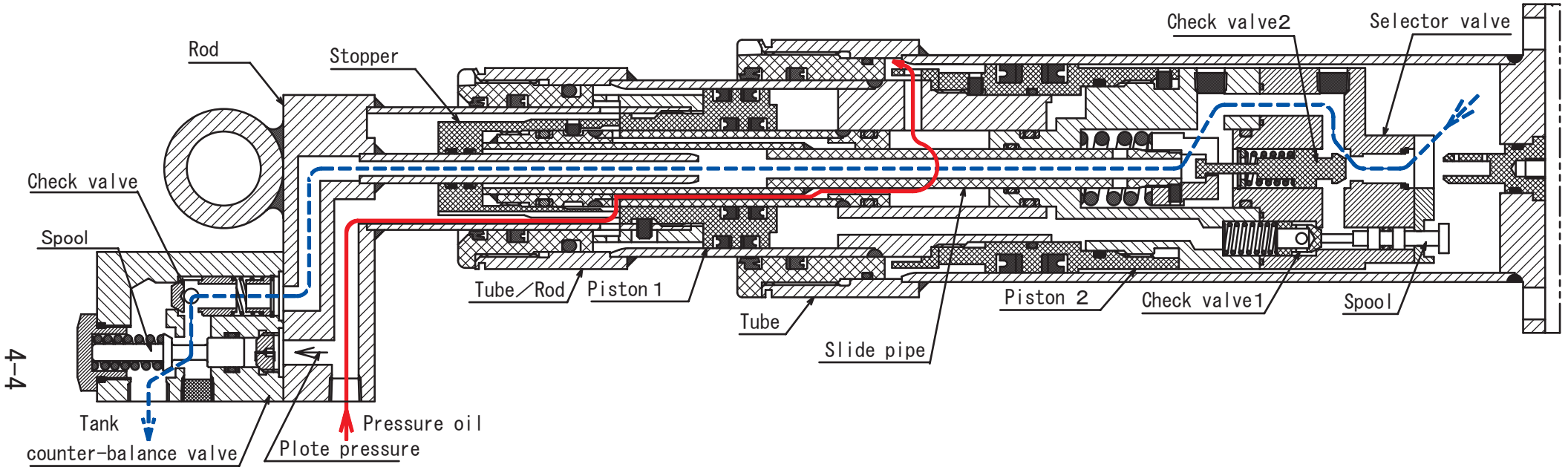
4 URV346 Flow of oil when 2nd section of telescoping cylinder extends



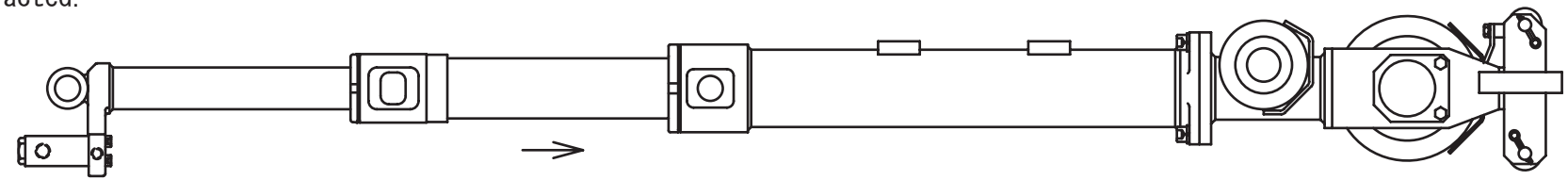
Extending process of 2nd section
The pressure oil opens the check valve of counter-balance valve, goes into the rod and reaches the check valve 2 of selector valve.
At this time, the check valve 2 of selector valve is opened and the pressure oil is led to the extension side of 2nd section.
At the same time, the oil at the retraction side of 2nd section passes through the rod and returns to the tank.
So, the 2nd section is extended.
At this time, the check valve 1 of selector valve is closed and the pressure oil does not flow into the 1st section.
The 1st section is already extended to full stroke.
So, the 1st section does not operate.



4 URV346 Flow of oil when 2nd section of telescoping cylinder retructs

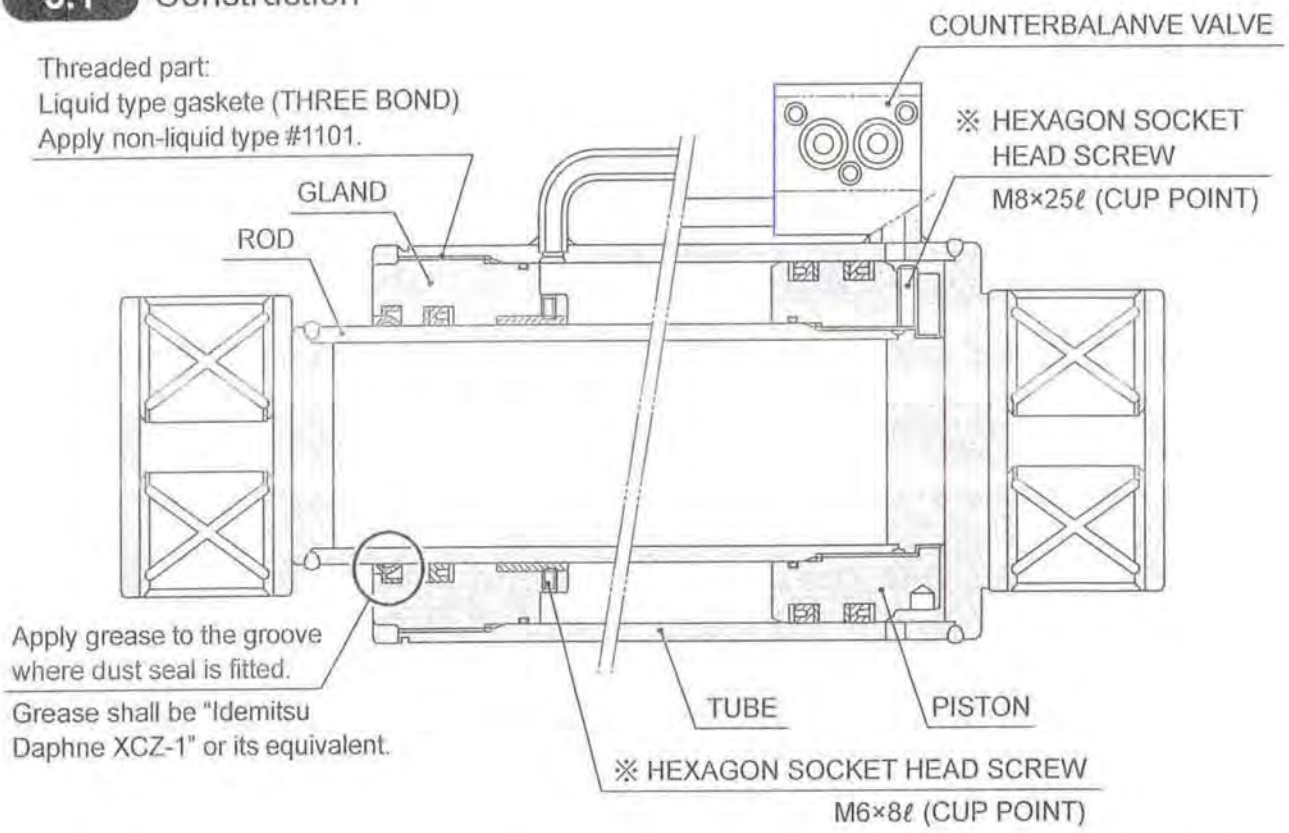


Retracting process of 2nd section
The pressure oil passes through the rod and goes into the retraction side of 2nd section.
At this time, the check valve 2 of selector valve is opened and the oil at the extension side of 2nd section is led to the counter-balance valve.
The check valve of counter-balance valve is closed.
But the pilot pressure from the retraction side opens the spool and the oil at the extension side returns to the tank.
So, the 2nd section is retracted.
The check valve 1 of selector valve is closed.
So, the 1st section is not retracted.



§5 DERRICK CYLINDER

5.1 Construction



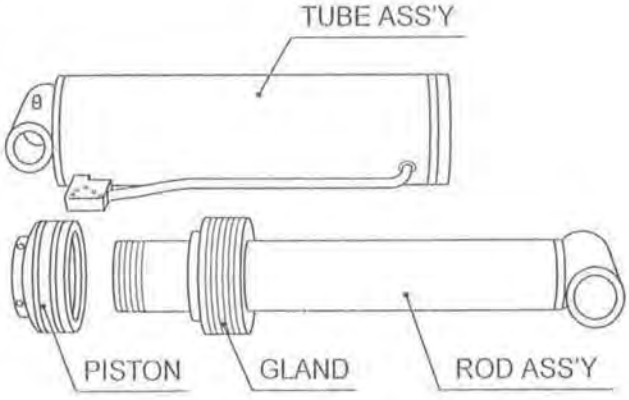
Note: Before tightening hexagon socket head screws to the piston and gland, apply "LOCK TIGHT #2701."
(After applying, do not flow hydraulic oil for about 1 hour.)

5.2 Disassembling Procedure

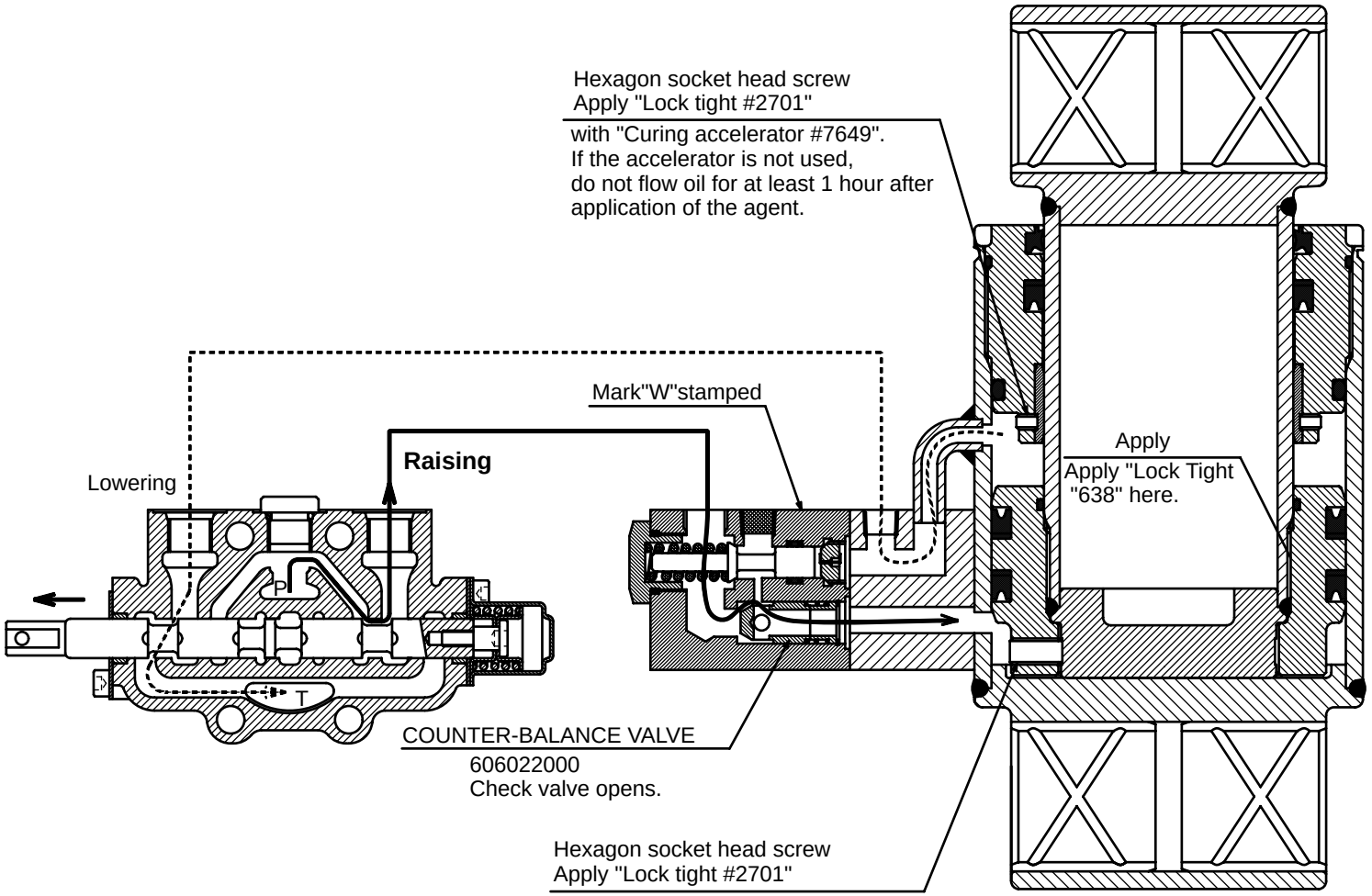
① Remove the counterbalance valve.

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

③ Remove the hexagon socket head screw (cup point, M8×25ℓ) which stops rotation of the piston. Pull out the piston from the rod ass'y.

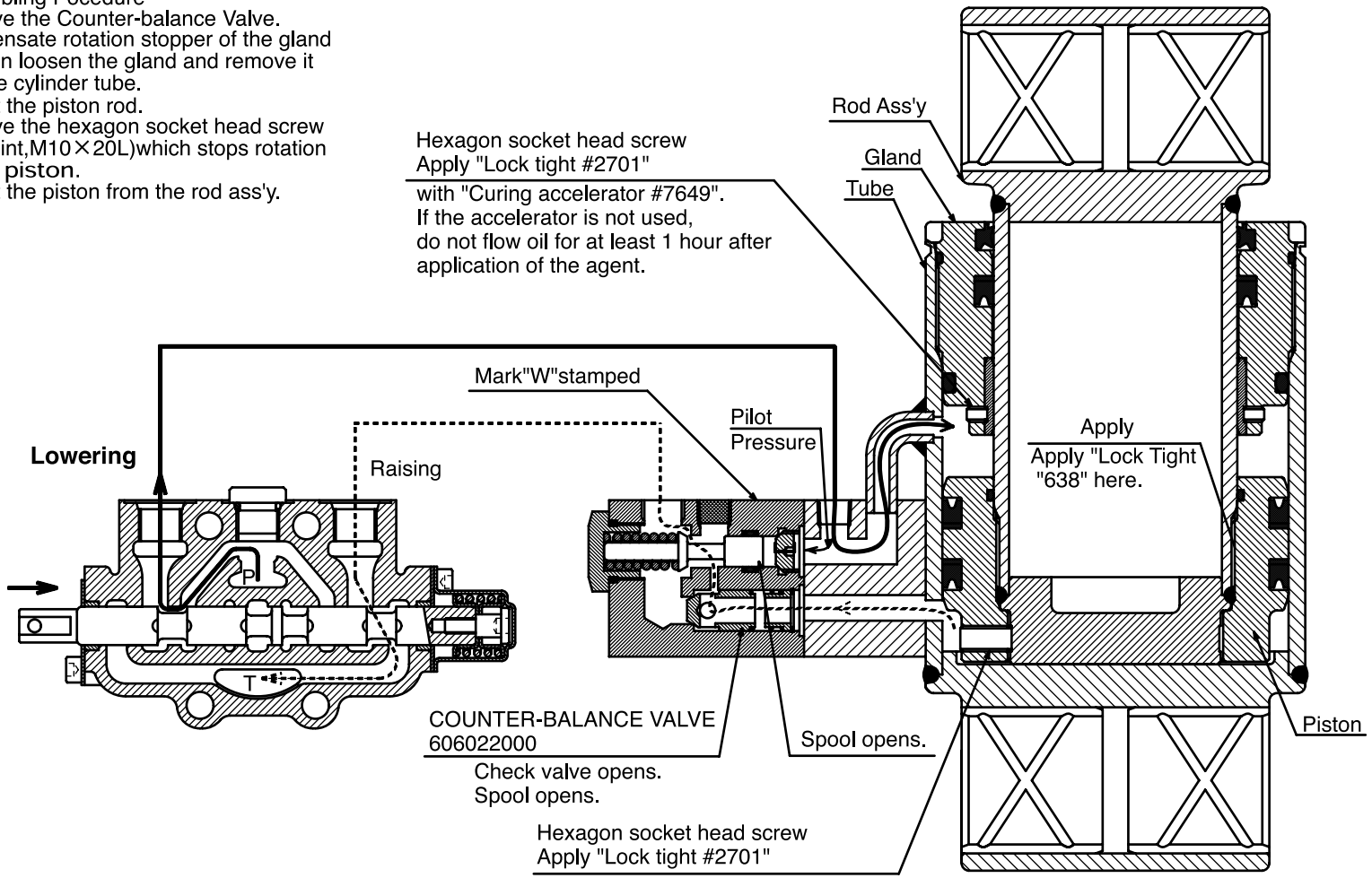


5. 3 Flow of oil, when raising



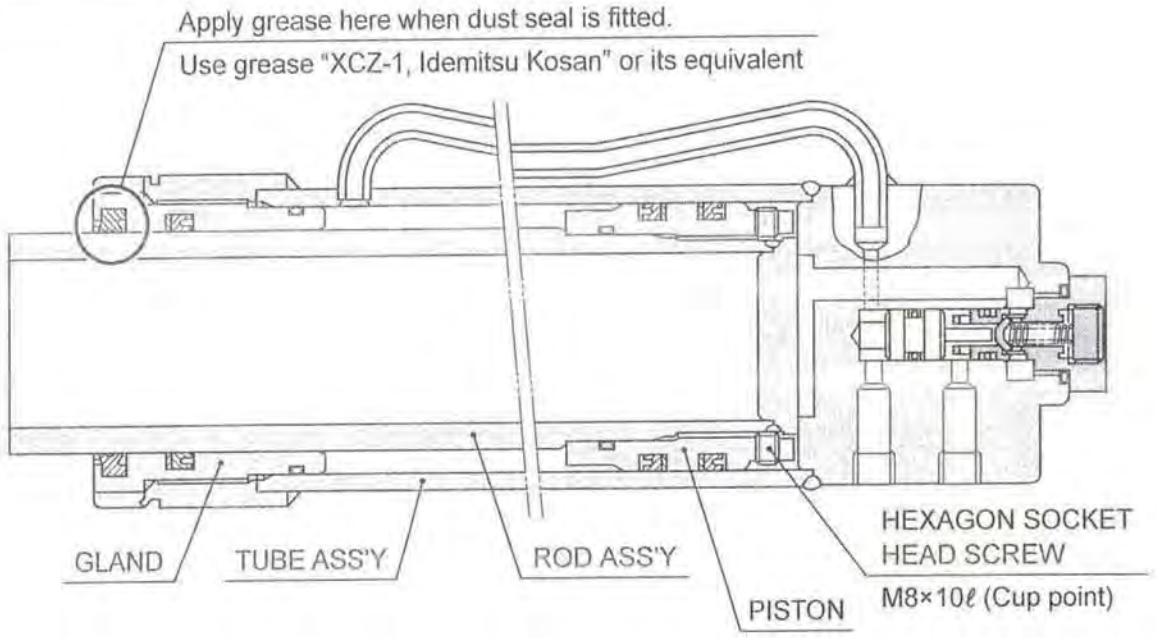
5. 4 Flow of oil, when lowering

Disassmbling Pocedure
1.Remove the Counter-balance Valve.
2.Compensate rotation stopper of the gland and then loosen the gland and remove it from the cylinder tube.
Pull out the piston rod.
3.Remove the hexagon socket head screw (cup point,M10×20L)which stops rotation of the piston.
Pull out the piston from the rod ass'y.



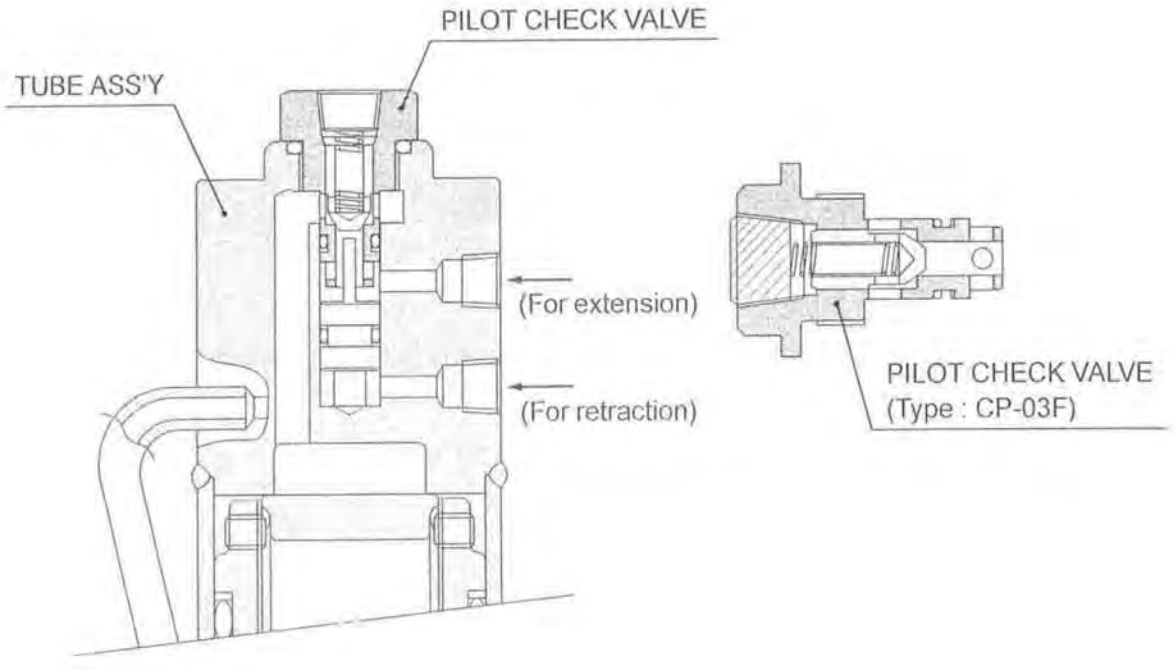
§6 OUTRIGGER CYLINDER

6.1 Construction of Outrigger Cylinder



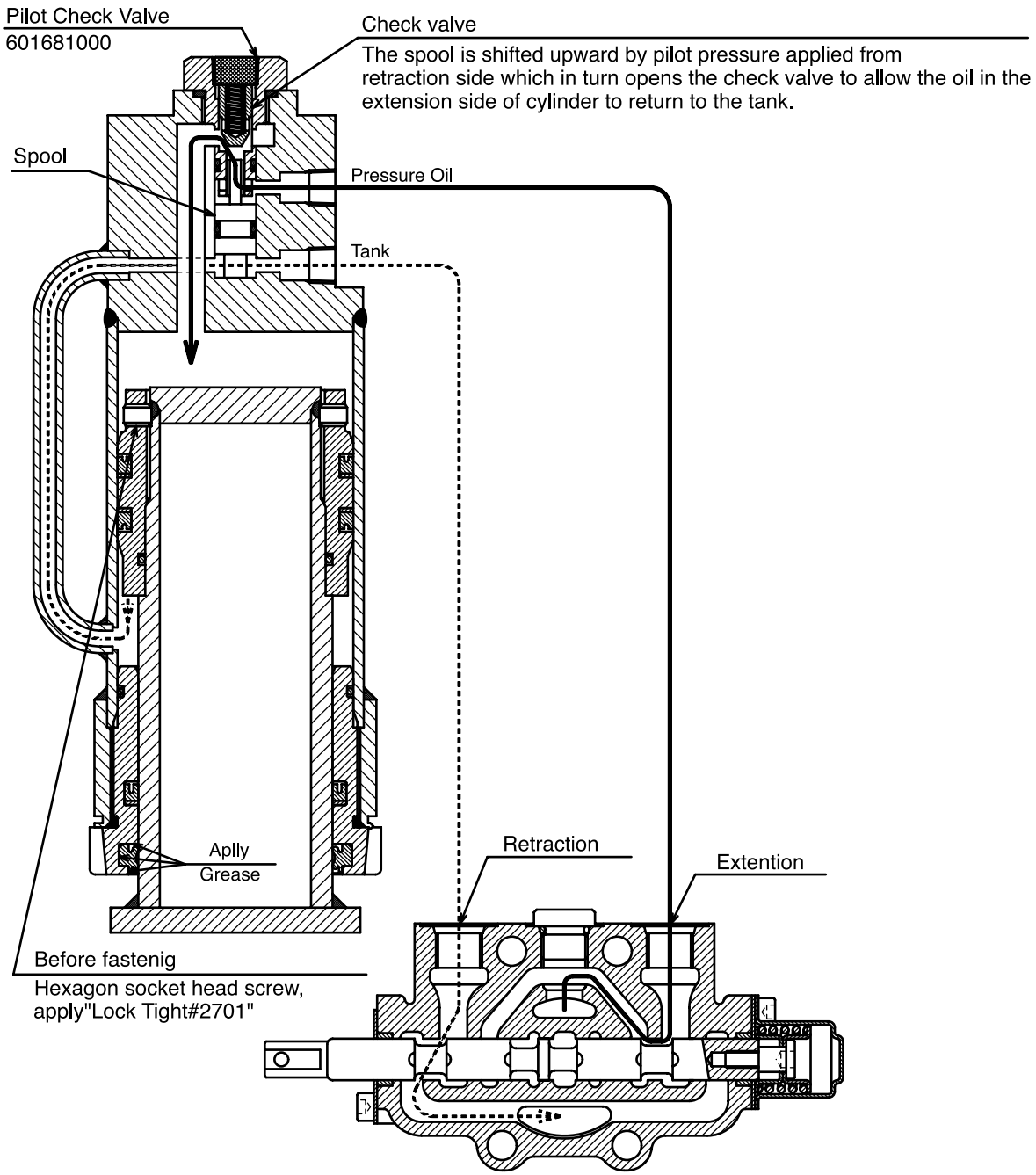
Note: Before fastening hexagon socket head screw for piston, apply "LOCK TIGHT #2701." (After applying, do not flow hydraulic oil for about 1 hour.)

6.2 Construction of the Part where Pilot Check Valve is Fitted

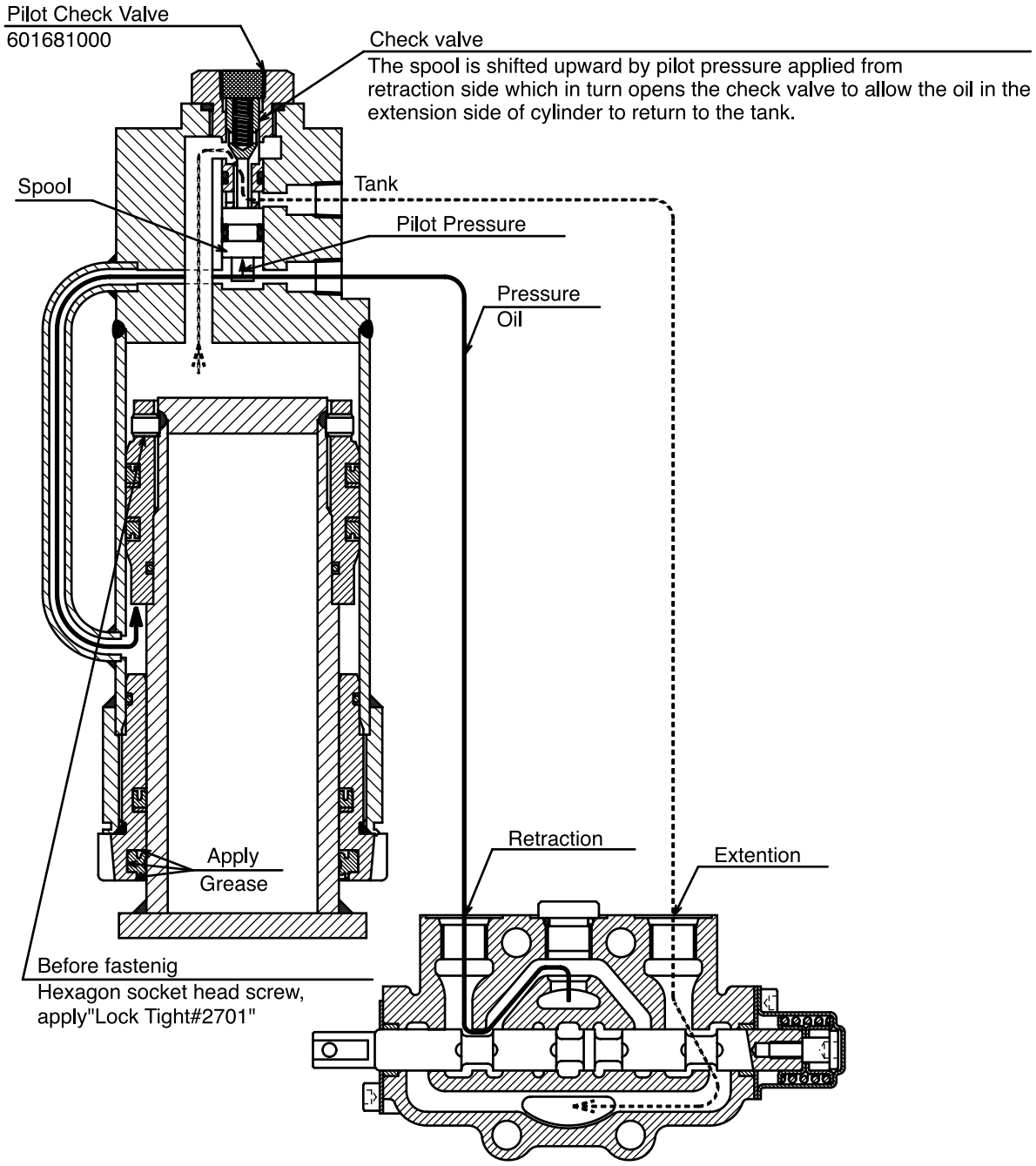


6.3 Outrigger Cylinder

(1) Flow of oil when extending

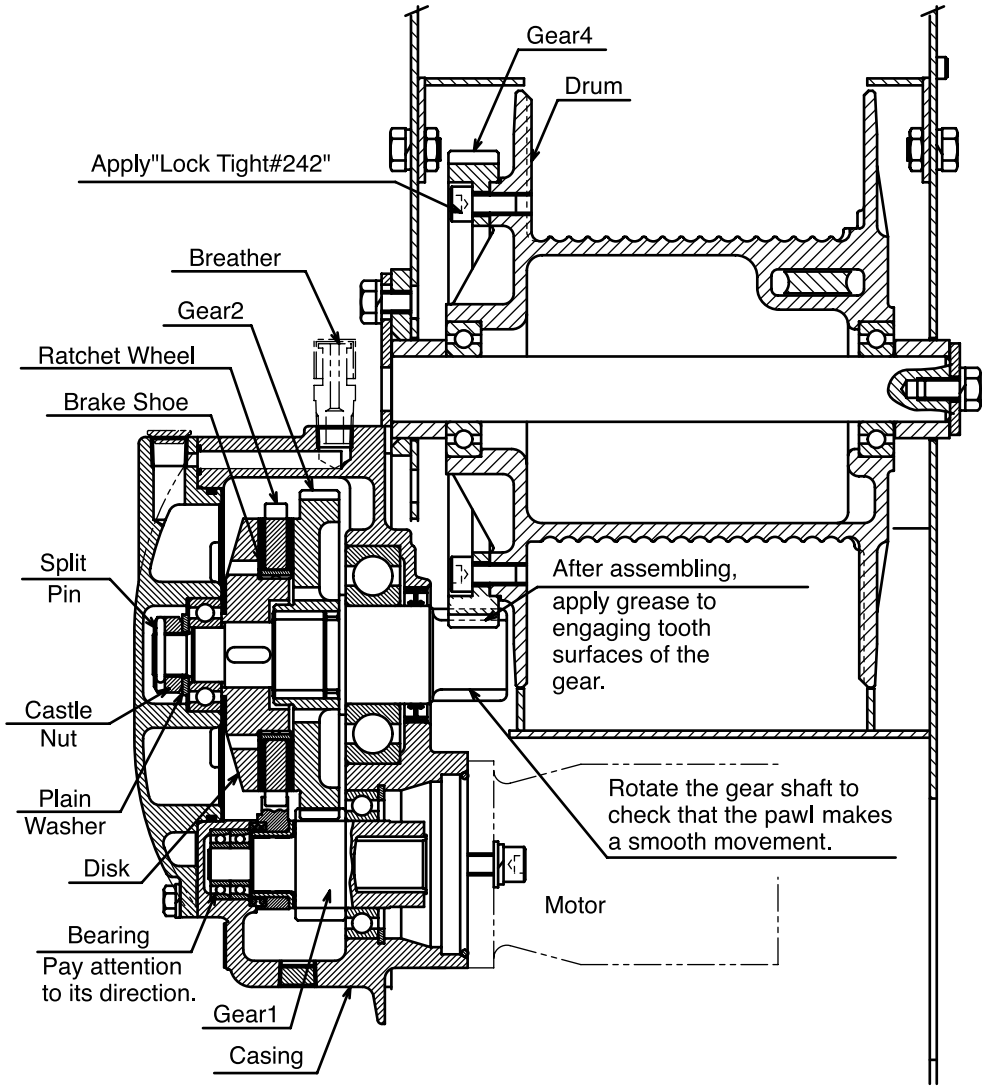


(2) Flow of oil when retracting



7. HOIST WINCH

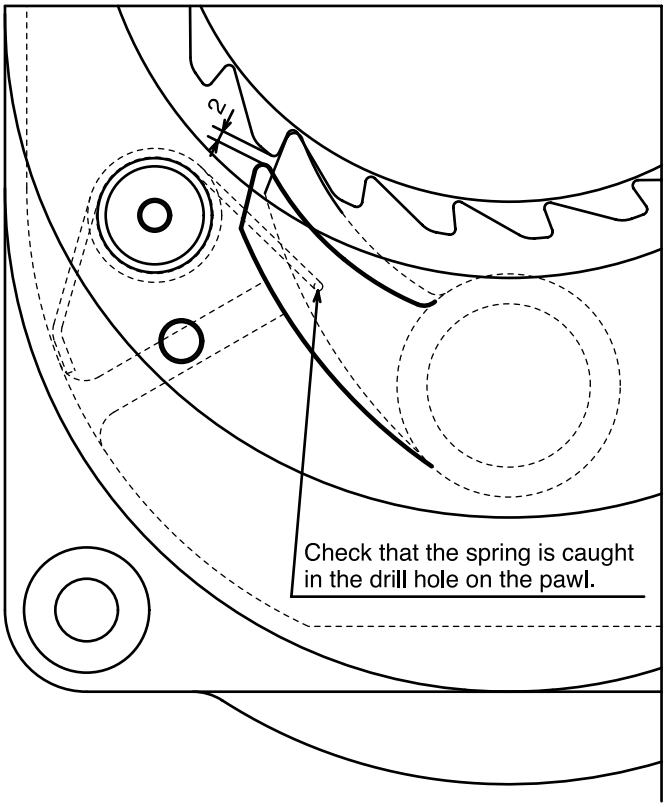
7. 1 Construction of Hoist Winch and brake shoe adjusting procedure

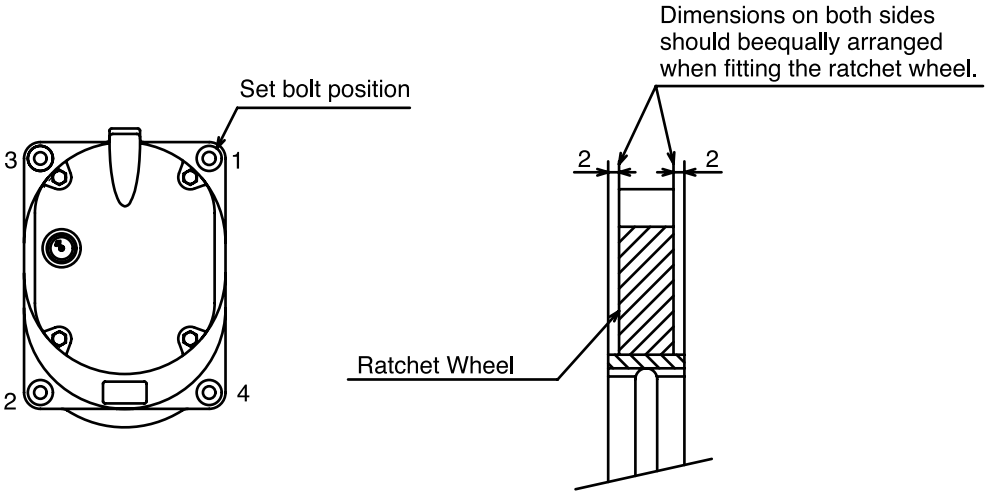


Brake Shoe Ajusting procedures

1.Tighten the castle nut lightly with a spanner.
2.After tighning,loosen the castle nut for approx.1/6 turn
and within this range align the castle nut with the hole in the
gear shaft;and fix it with the split pin.
3.Replace the break shoe every 3years.

7. 2 Caution to be taken when reassembling hoist winch





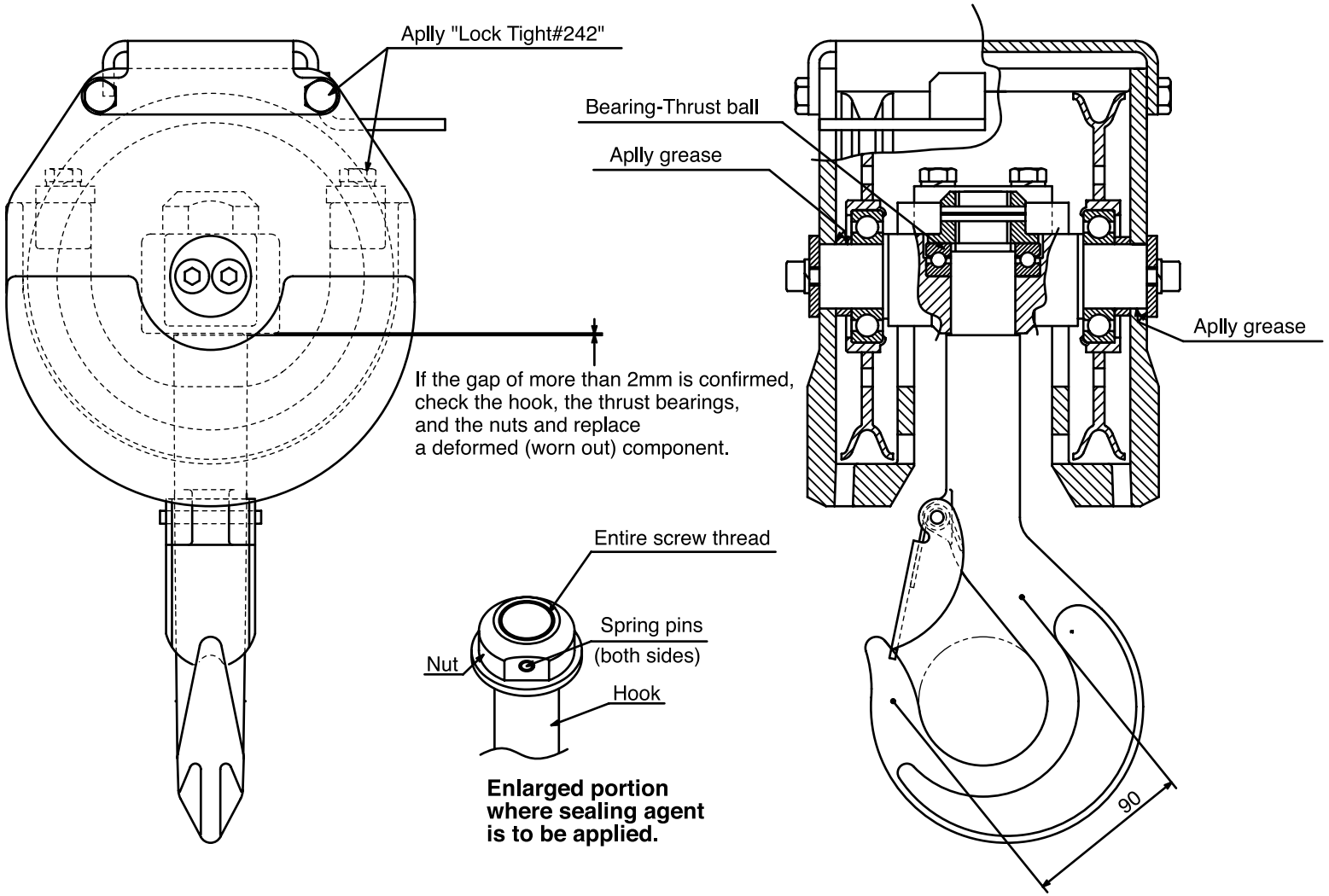
Tightening order of bolts for mounting reduction gear
Tighten the hexagon socket head screws in diagonal order
after the set bolt has been fastened first to align each screw hole.

7. 3 Cause of Troubles and Measures to be Taken

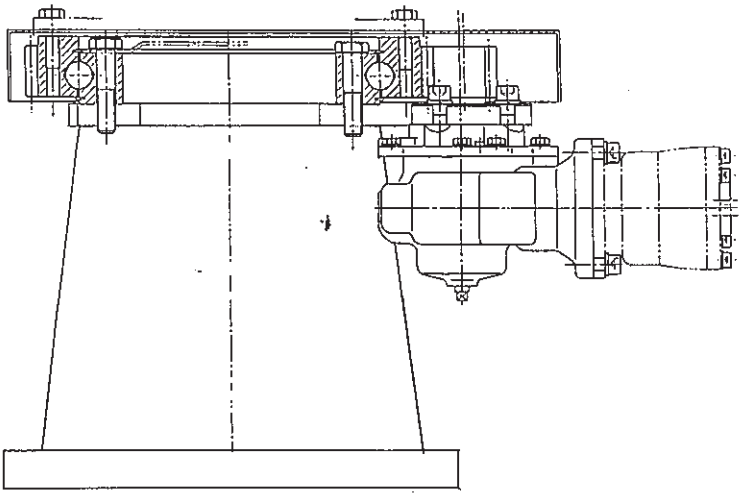
(1) Hoist winch

Problems	Possible cause	Measures to be taken
① Pressure does not rise.	• Pump is faulty. (Pressure does not rise at idling speed.) (Total pressure required for operation is insufficient.)	• Replace.
	• Relief set of control valve is faulty. (Pressure rises but not enough.)	• Adjust or replace.
	• O-ring and other parts of relief valve of control valve are faulty. (Adjusting bolt of relief valve is tightened but unable to control pressure.)	• Replace parts or replace relief ass'y with new one.
	• Hoist motor is faulty. (Quantity of drain is larger than the specified.)	• Replace.
② Pressure rises but hoisting up impossible.	• Drum or internal mechanism of reduction gear is faulty.	• Overhaul reduction gear. • Inspect the drum
③ Pressure rises but lowering is impossible.	•Brake shoe is over-tightened.. •Drum or reduction gear is defective.	• Adjust tightening of brake shoe. • Overhaul reduction gear. • Check drum.
④ Unable to maintain suspended load.	• Brake shoe is faulty. • Pawl is faulty.	• Replace brake shoe. • Replace pawl.
⑤ When lowering, hunting occurs.	• Brake shoe is faulty. • Over-tightening of brake shoe. • Internal mechanism of reduction gear is faulty.	• Inspect brake shoe and check quantity of oil. • Adjust tightening of nut. • Disassemble reduction gear.
⑥ When hoisting up, clattering sound is heard.	• Spring pressing the pawl against slide plate is faulty. • Bushing the part of fitting pawl is worn out.	•Replace spring. • Replace bushing.

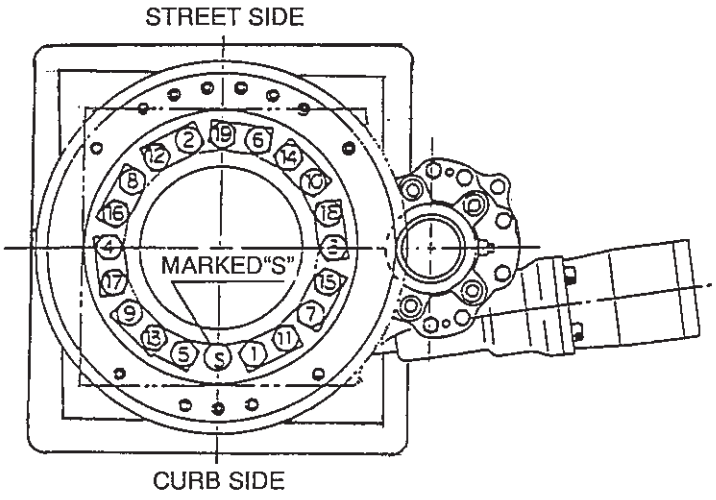
8. HOOK


Aplly "Lock Tight#242"
Bearing-Thrust ball
Aplly grease
Aplly grease
If the gap of more than 2mm is confirmed,
check the hook, the thrust bearings,
and the nuts and replace
a deformed (worn out) component.
Entire screw thread
Spring pins
(both sides)
Nut
Hook
Enlarged portion
where sealing agent
is to be applied.
90

9 SWING DEVICE ASS'Y



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

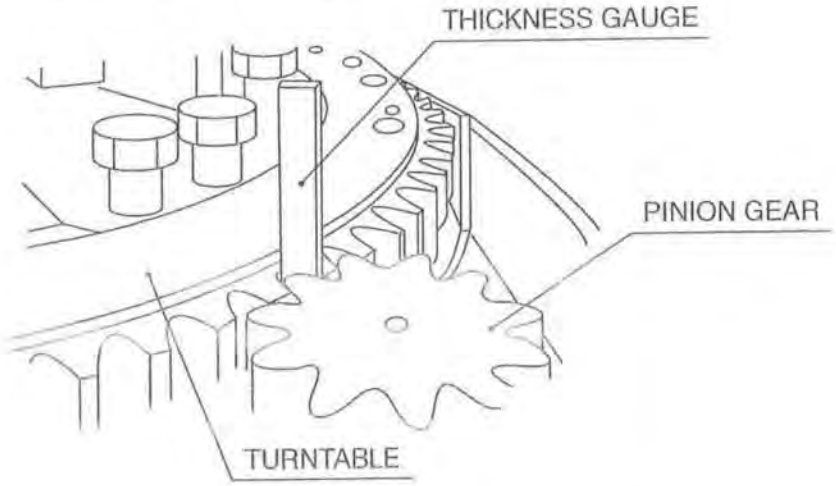


● **When mounting the turntable, the inner soft zone marked "S" on the turntable must be positioned on the curb side.**

2) Tightening Order of Turntable Bolts

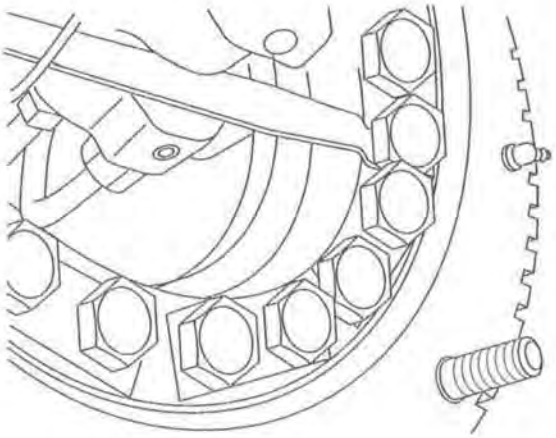
● Tighten the bolts in the numerical order as shown in the above illustration.

③ Insert the thickness gauge (0.1~0.2 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.

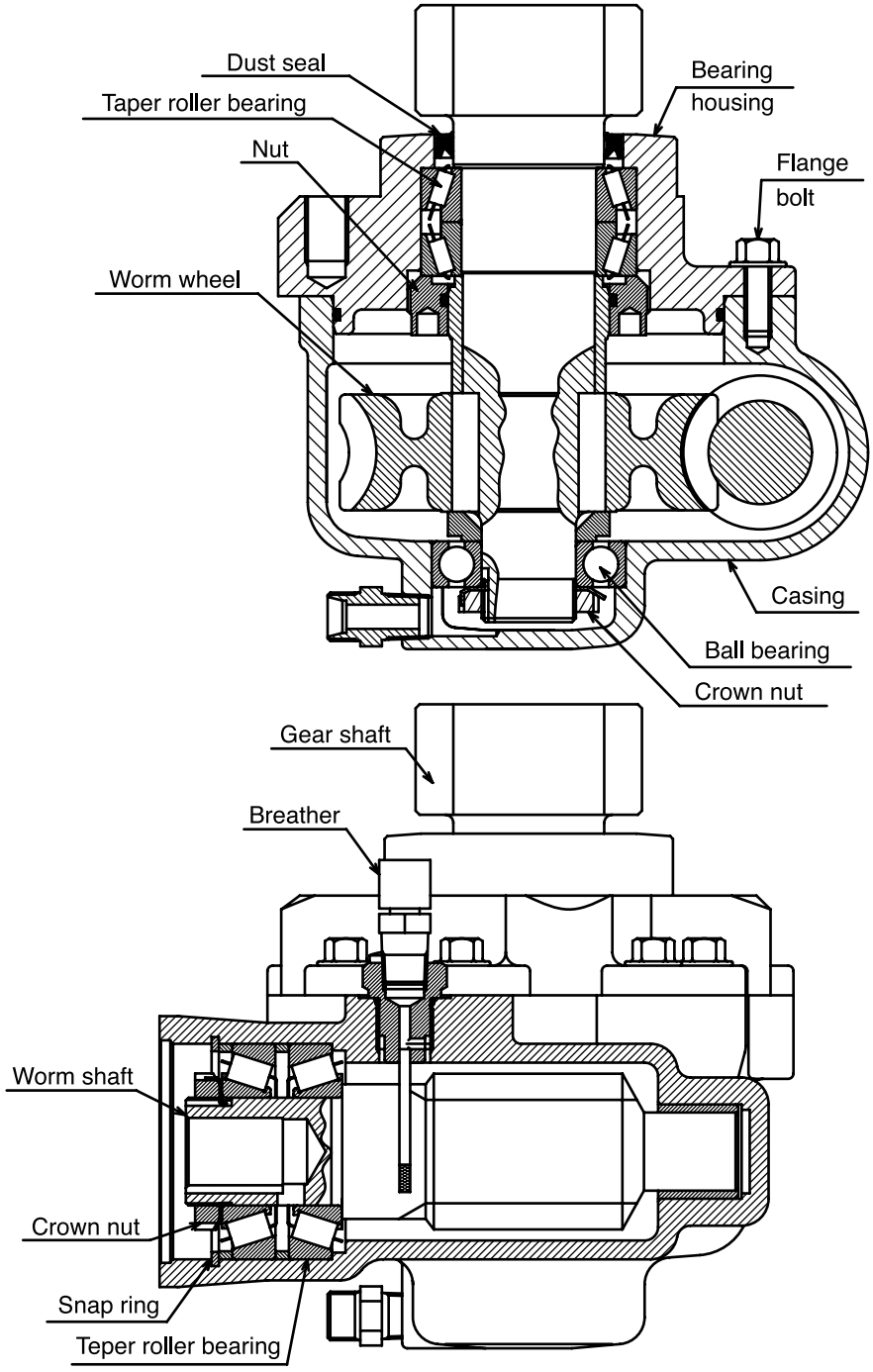
⑤ After tightening turntable bolts, fold the inside square corner of the revolution stopper plate to follow one flat side of the hexagon bolt head.



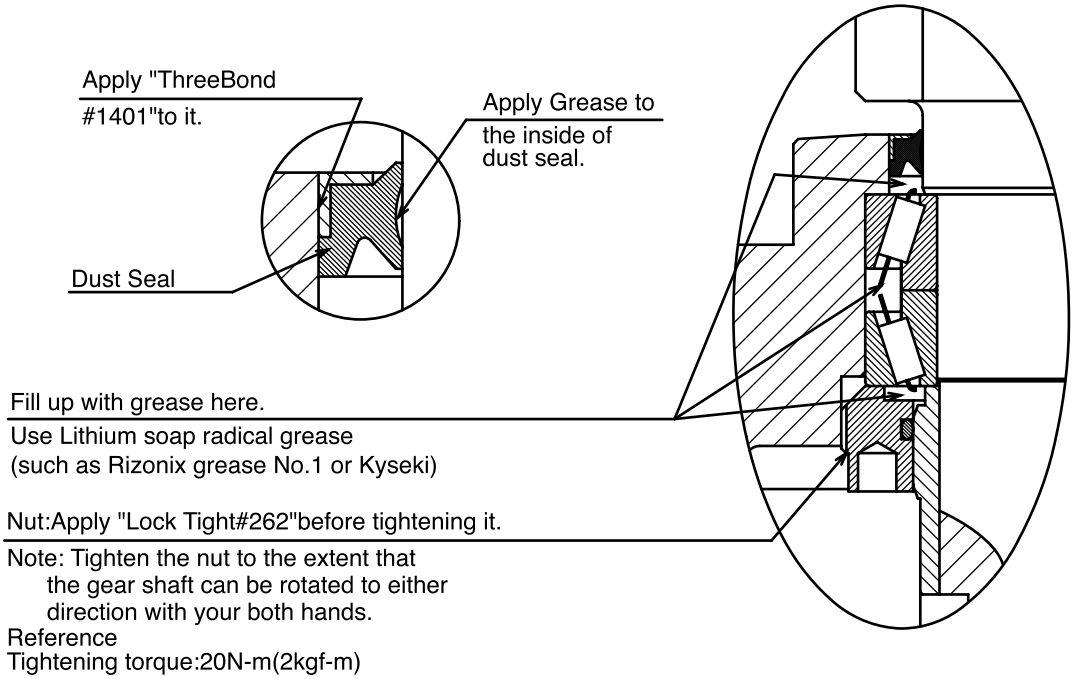
⑥ After assembling, apply grease to engaging tooth surfaces of the gears.

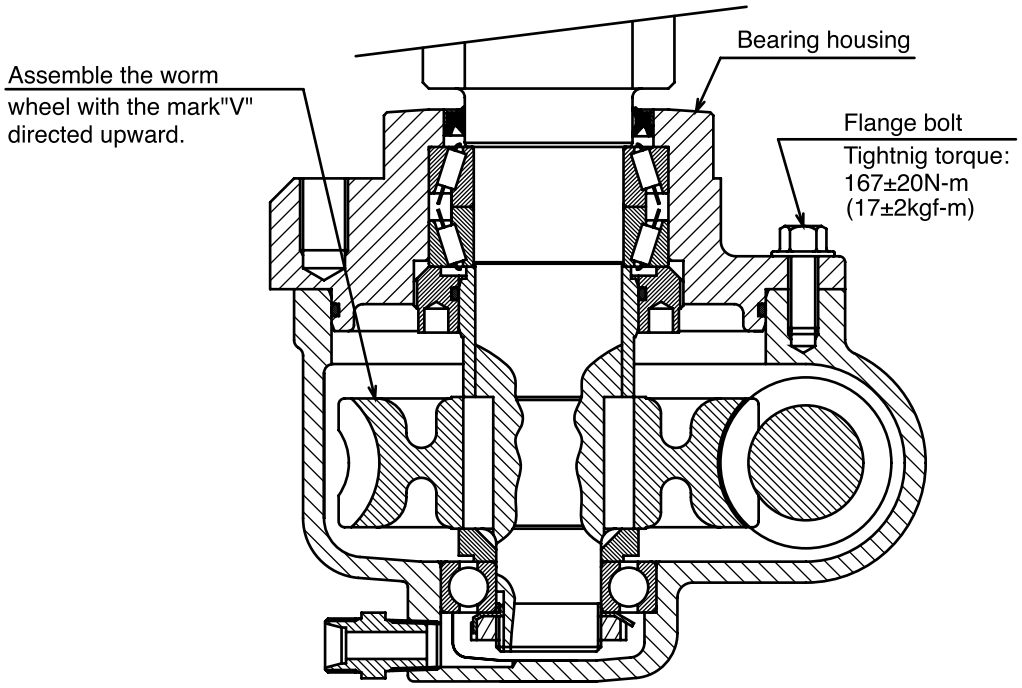
Slewing reduction gear

(1) Construction of slewing reduction gear



(2) Construction to be taken when reassembling slewing reduction gear



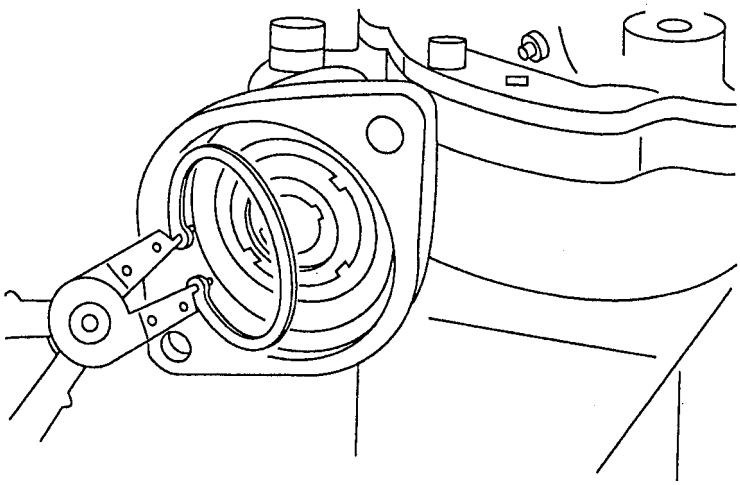


Tightnig torque fo flange bolt

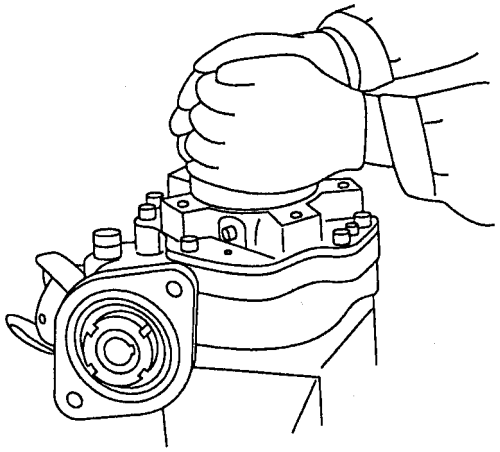
Model	Parts Name	Torque
V34*、V37*、V50*	Flange bolt M10×25 760129049	59N-m (6kgf-m)

(3) Slewing reduction gear disassembly procedures

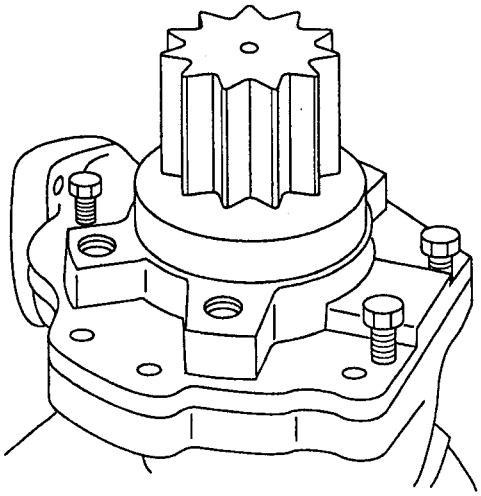
① Remove a snap ring (H-80) retaining the taper roller bearing which sustains the worm shaft.



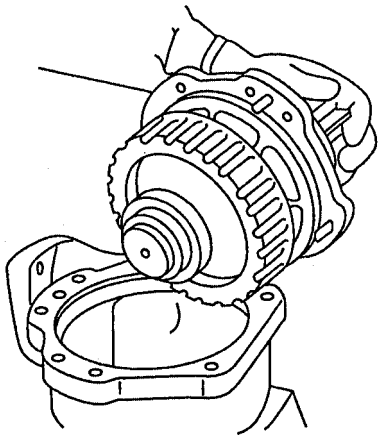
② Turn the gear shaft counterclockwise, and pull out the worm shaft from the casing. (Use of special tool for removing worm shaft is recommended.)



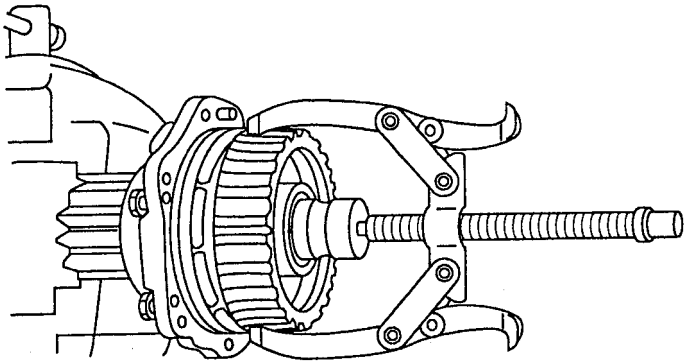
③ Remove 8 pcs. of bolt (M10 X 25 ℓ) which fasten the bearing housing and pull out the housing, utilizing 3 pcs. of bolt for 3 through holes in the housing.



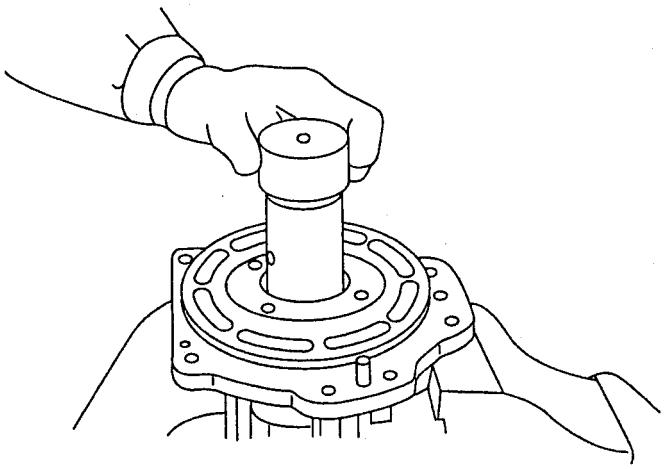
④ This figure shows the pulled out housing with gear shaft and worm wheel.



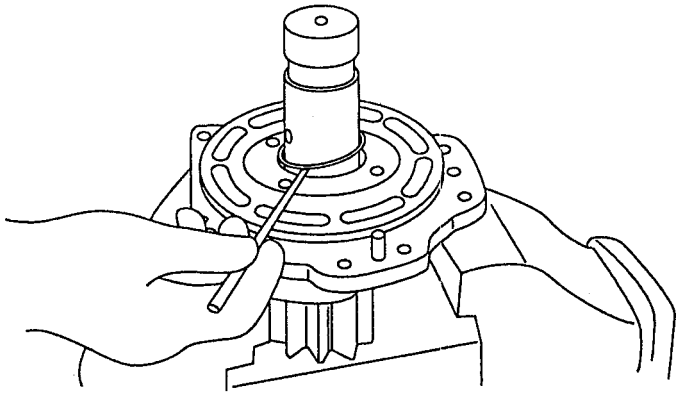
⑤ Grip the housing with a vice and pull out the worm wheel with a gear puller.



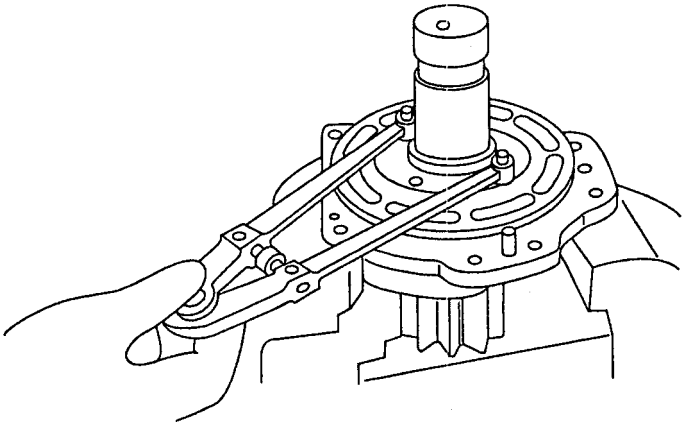
⑥ Pull out the collar which is assembled in the nut.



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.

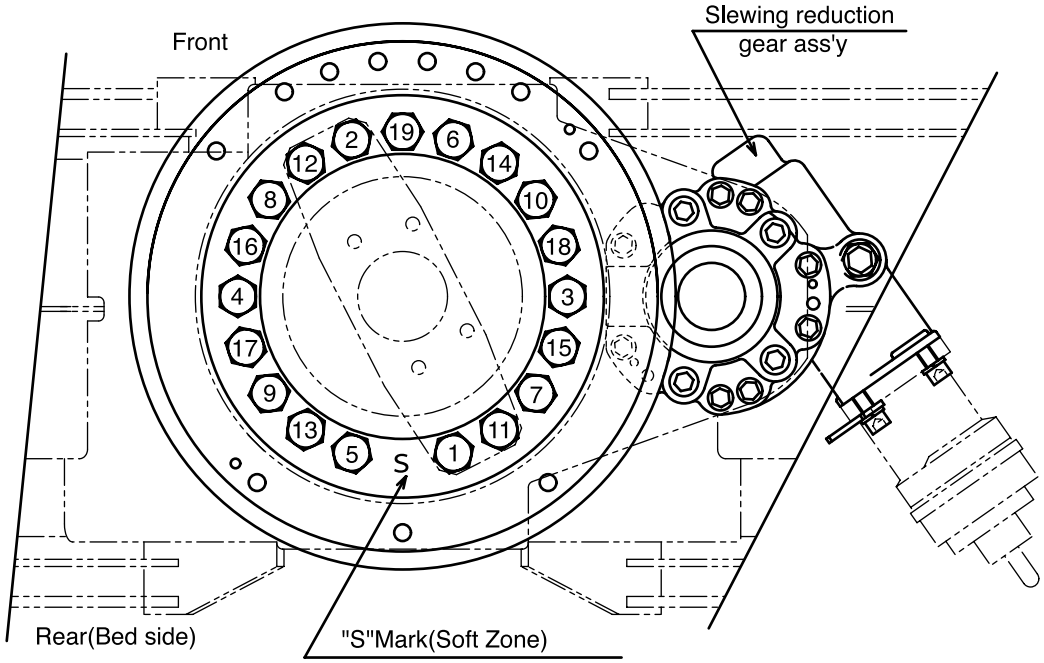


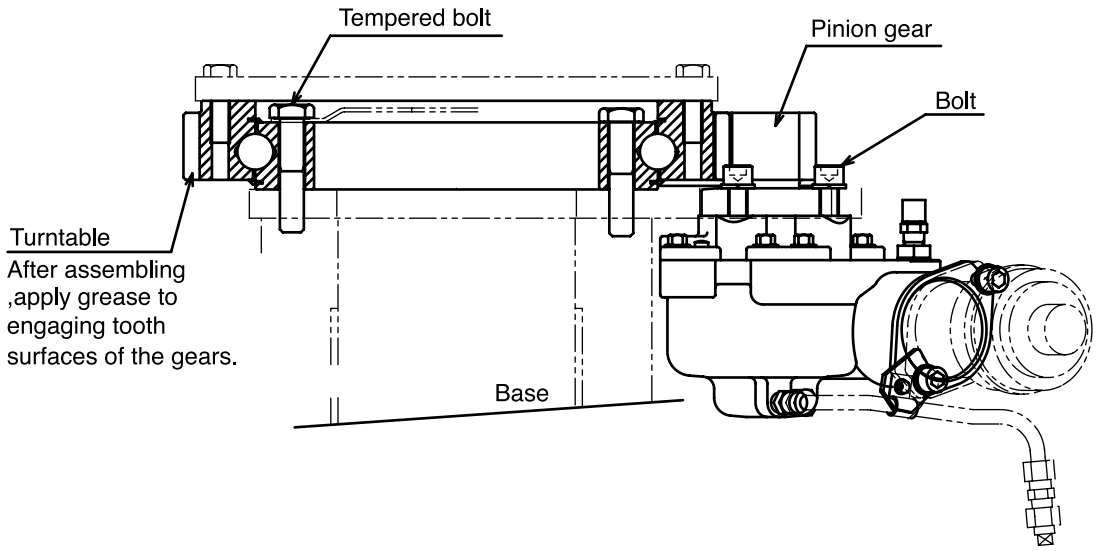
Note: To the threaded part of the nut, “LOCK TIGHT” was applied. Therefore, when loosening, warm up lightly the threaded part with gas flame, and then loosen. When reassembling, be sure to apply “LOCK TIGHT #262” to the threaded part.

Turntable Mounting Procedures

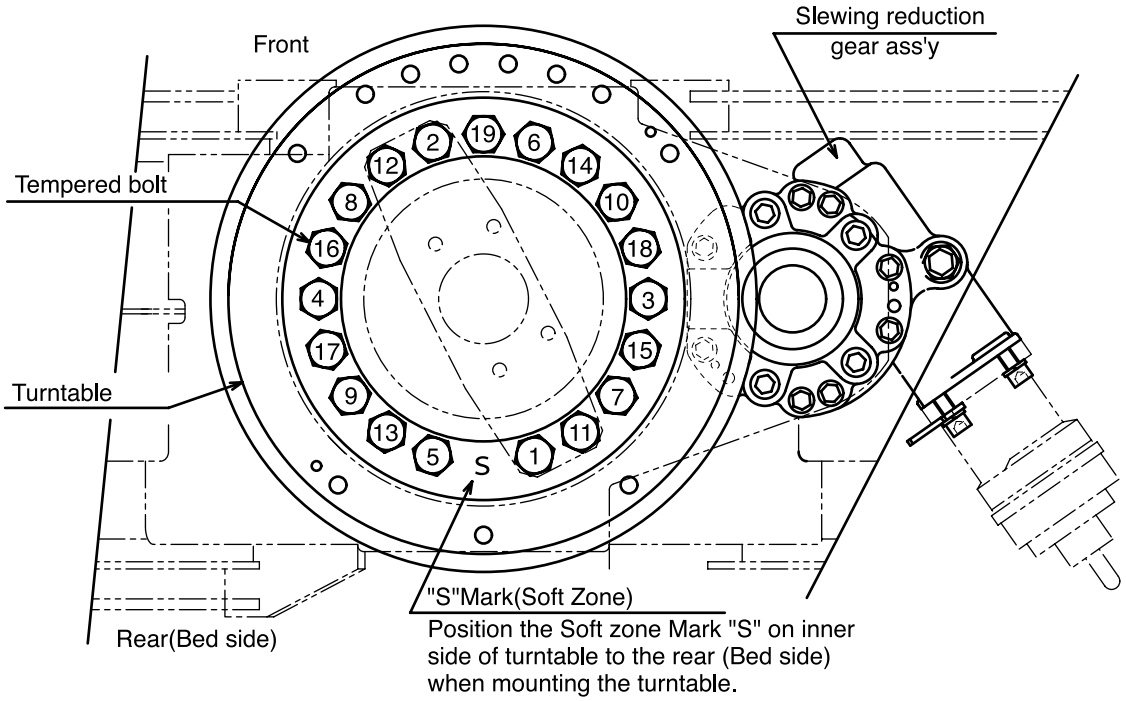
(1) Turntable mounting procedures

1.Install the slewing reduction gear to the base.
2.Set the turntable on the base to screw-in the bolts for mounting turntable lightly.
3.Insert the thickness gauge(0.1～0.2mm)into the space between the turntable gear and the pinion gear,and press strongly the turntable to the pinion gear.





(2) Position of soft zone, tightening sequence of bolts and tightening torque



Tightning sequence of bolt for mounting turntable

Tightnen the bolts in the numerical order as illustrated in the figure above.

Tightning torque for bolts fastening slewing reduction gear ass'y

Model	Parts Name	Torque
V346C	Bolt M16X50L 716116050	255±29N-m (26±3Kgf-m)

Tighten the mounting bolts in diagonal order.

Tightning torque for bolts fastening turntable

Model	Parts Name	Torque
V346C	Tempered Bolt M20X95L(12T) 088541040	471±39N-m (48±4Kgf-m)

Before mounting bolts are tightened, degrease the bolts and the tapped holes to apply "Lock Tight #262" to the bolts and tighten them with an equal torque.

UNC 12

Note:The bolts for fastening the turntable(tempered bolts)must be UNIC genuine bolts,on which mark "UNIC12" is inscribed on the head.

10. COLUMN

10. 1 Tightening torque for bolts fastening column and tightening order

Bolts for Swivel Joint

Model	Parts Name	Torque
V346C	Bolt M12X20 714112020	78N-m (8kgf-m)

When assembling, apply"Lock Tight#262T"

Bolts for Column

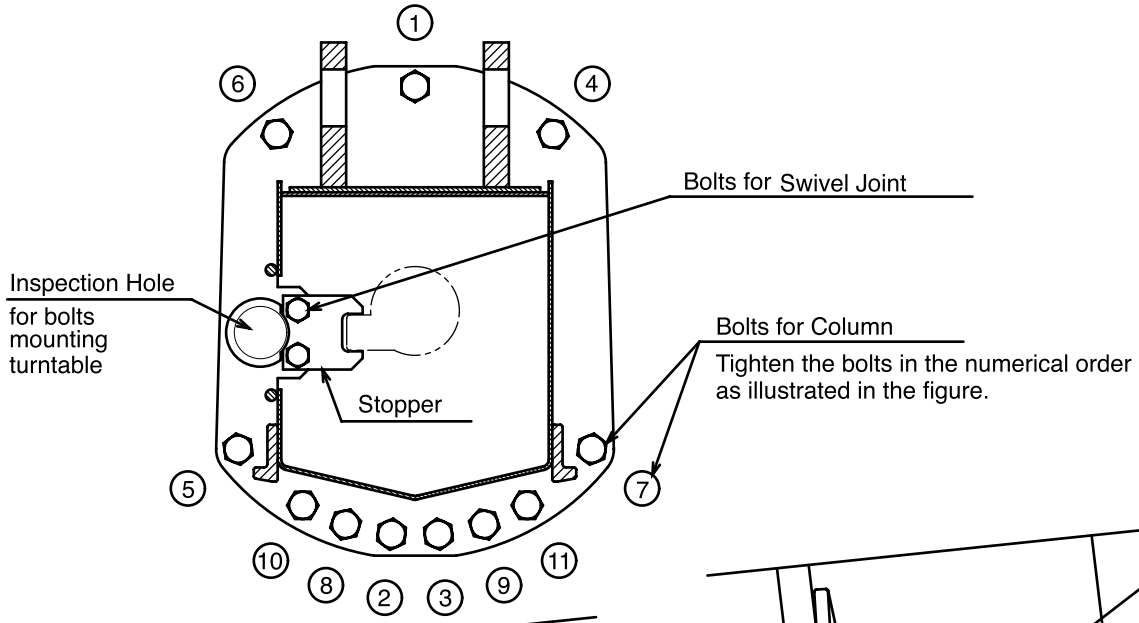
Model	Parts Name	Torque
V346C	Bolt 12T MJ16X50 08H651060	245N-m (25kgf-m)

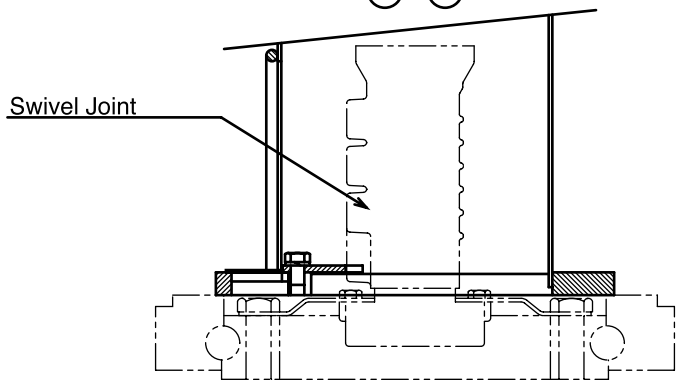
When assembling,apply"Lock Tight#962T"

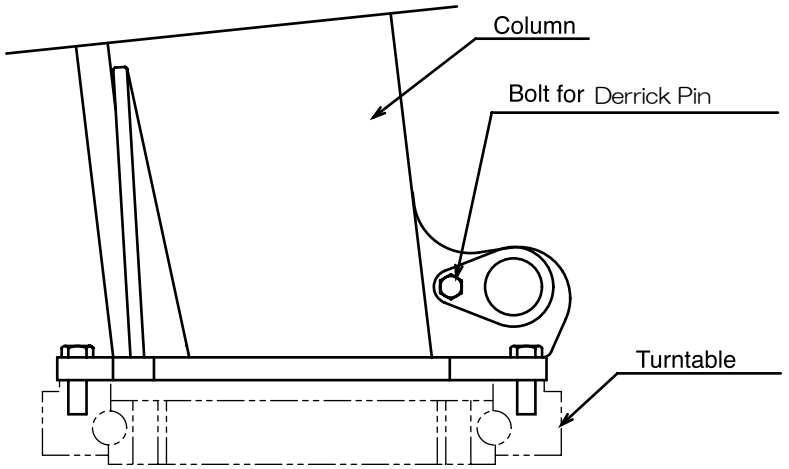
Bolt for Derrick Pin

Model	Parts Name	Torque
V346C	Bolt 10T M12X30 711912D30	78N-m (8kgf-m)

When assembling, apply"Lock Tight#262T"

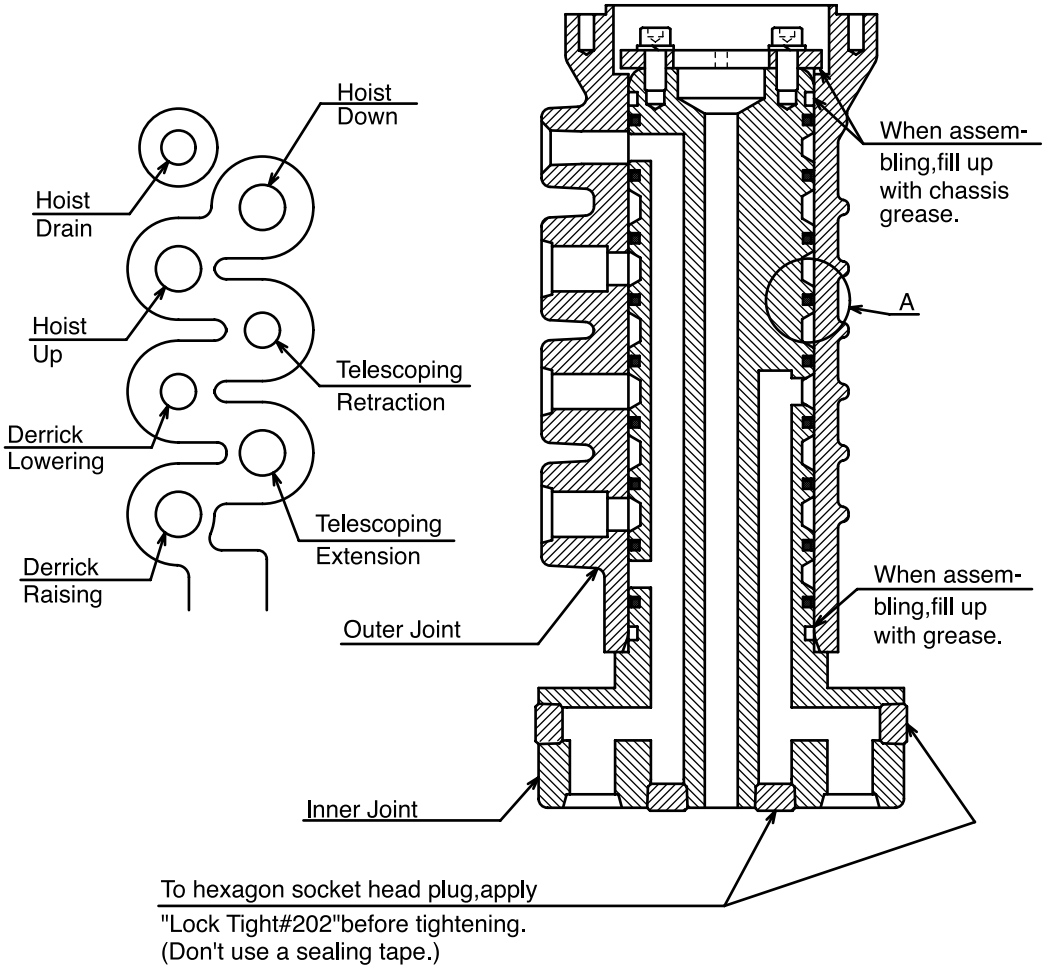


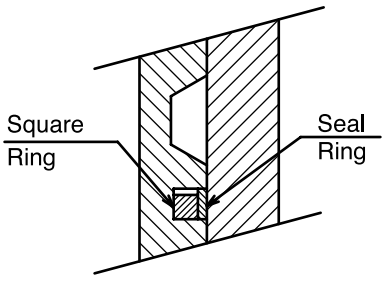




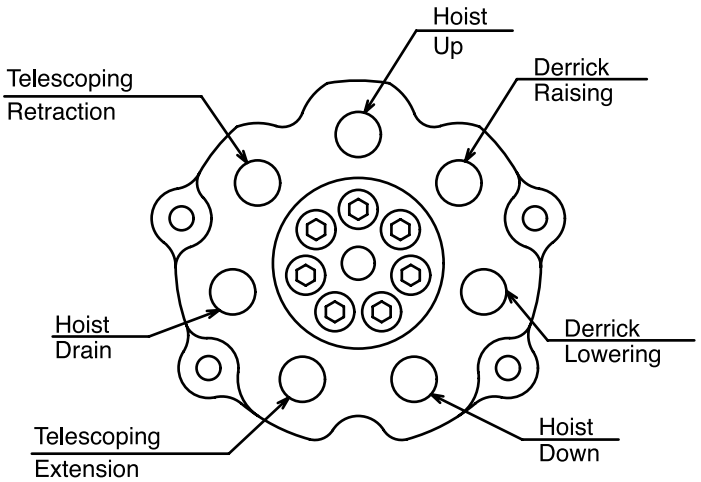
11. SWIVEL JOINT

11. 1 Construction of swivel joint and position of hoses

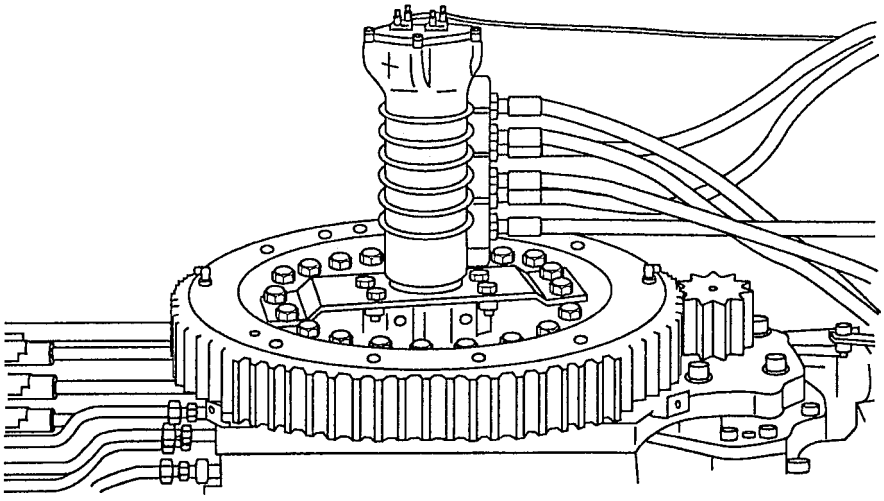




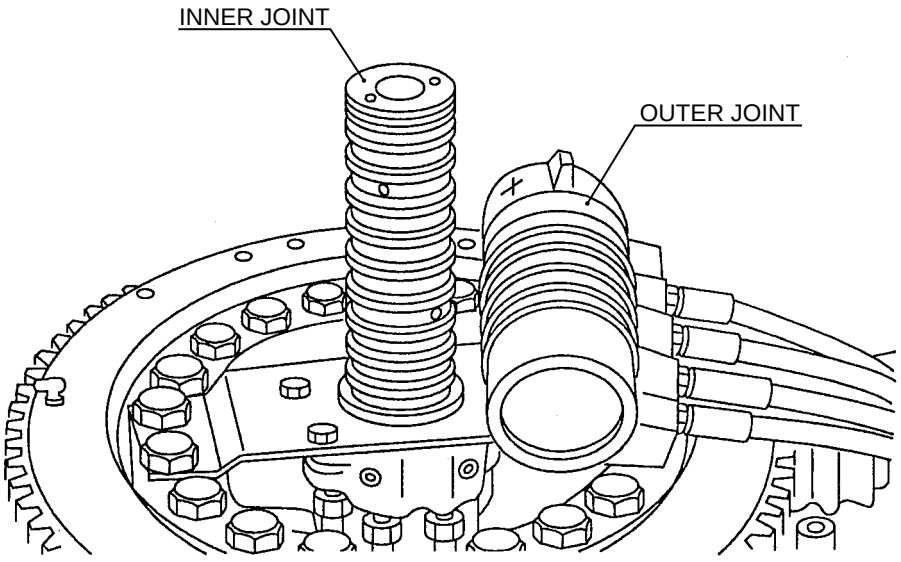
Detail of STK
Seal fitting to A



① Figure shows swivel joint is installed.



② Figure shows outer joint is taken out.



11. 2 Swivel joint assembling procedures

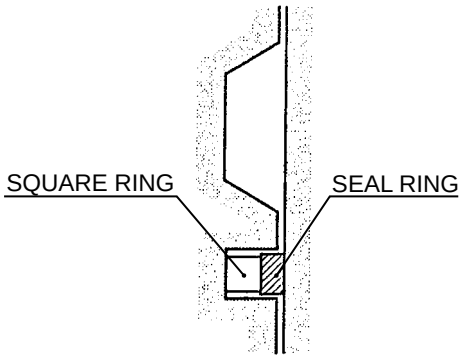
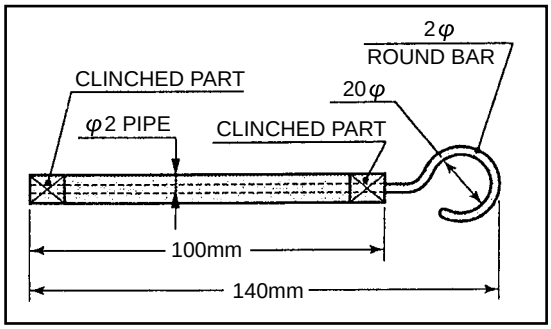
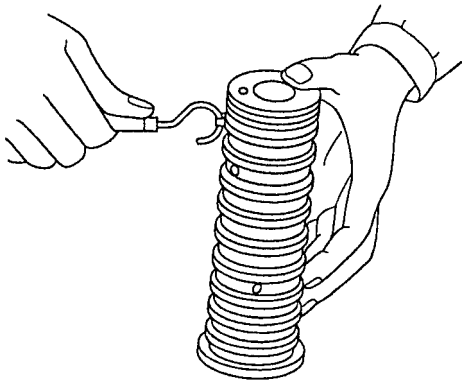


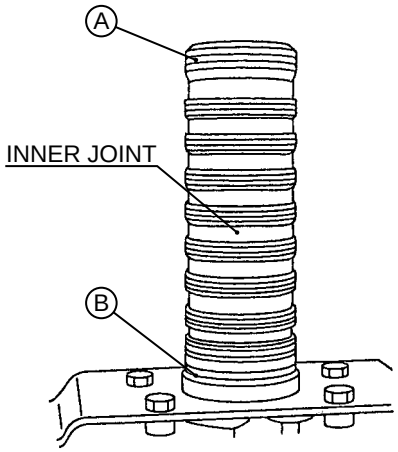
Illustration of STK Seal fitting



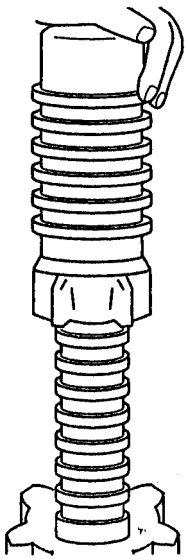
• After fitting the square ring, check to see if it is twisted, then fit the seal ring.

☞When fitting seal ring, it is recommended to use the jib as shown below.





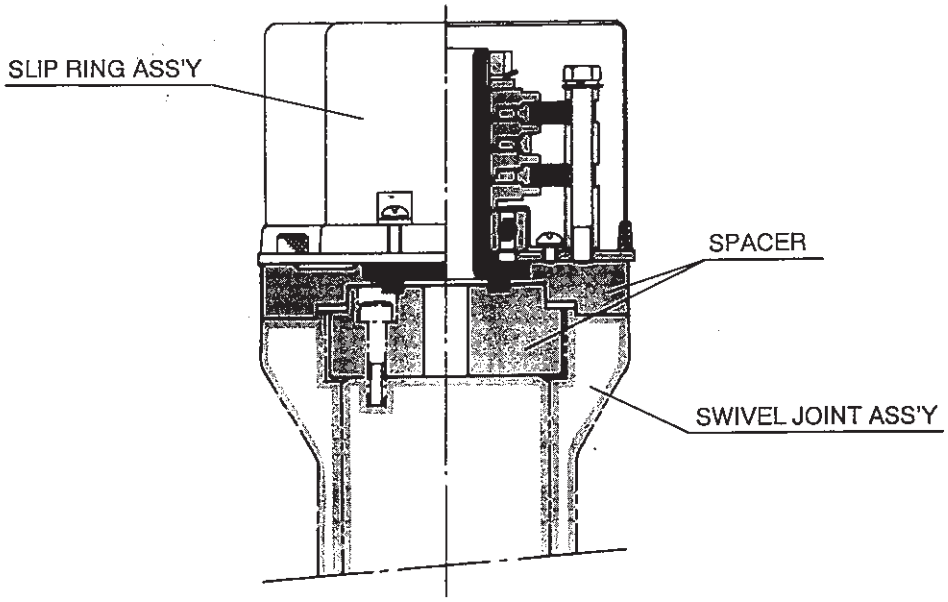
• The upper most A and the lower most B of the inner joint must be filled up with grease. To prevent the mix of water or others and the corrosion).
• To the part where STK seal is to be fitted, apply chassis grease sparingly.



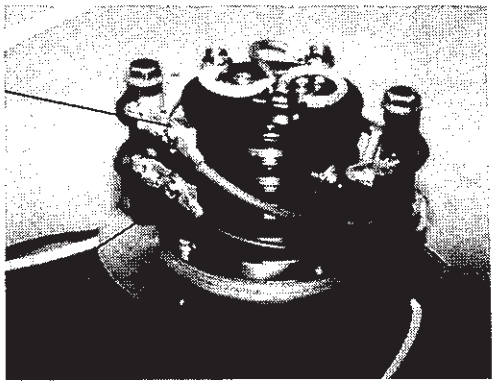
• Put the outer joint over the inner joint while taking care that the STK seal fitted to the inner joint will not be bit.

12 SLIP RING ASS'Y

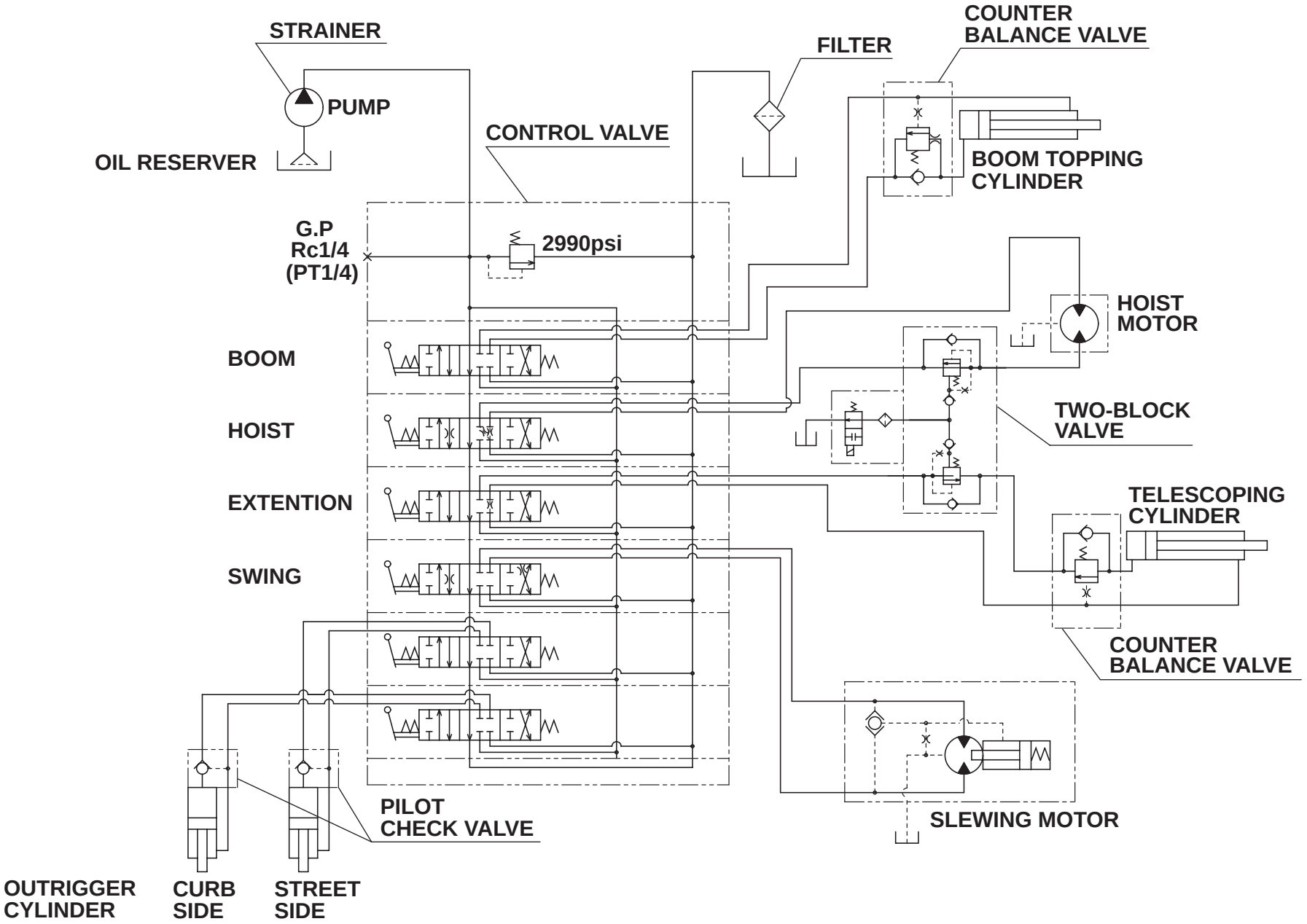
1) Construction of Slip Ring Ass'y and Its Fitting Position



Construction

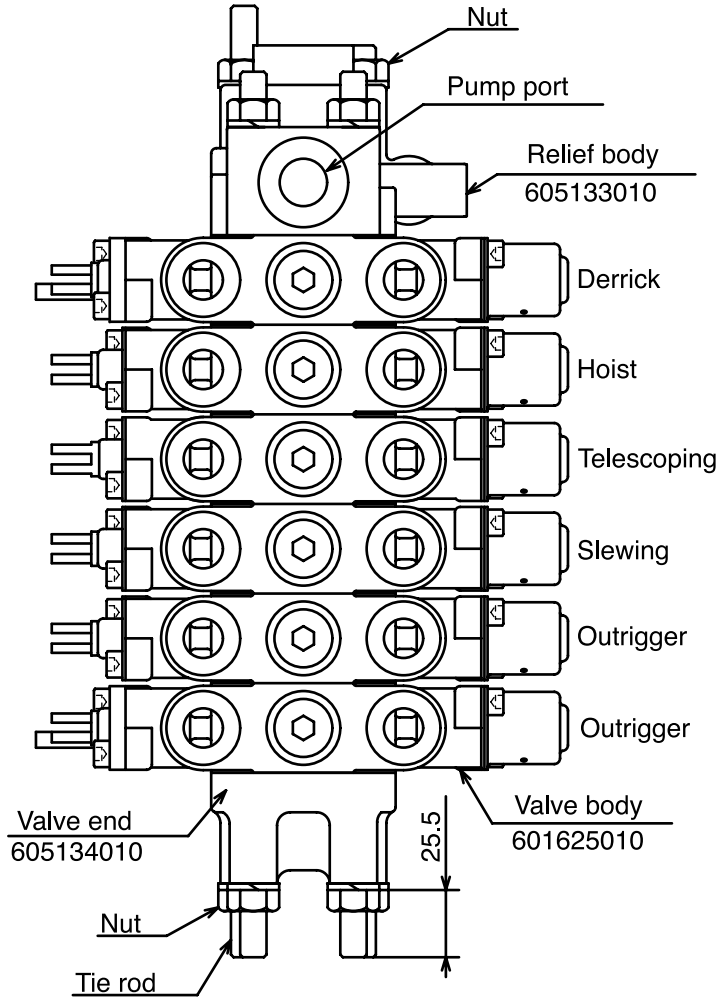


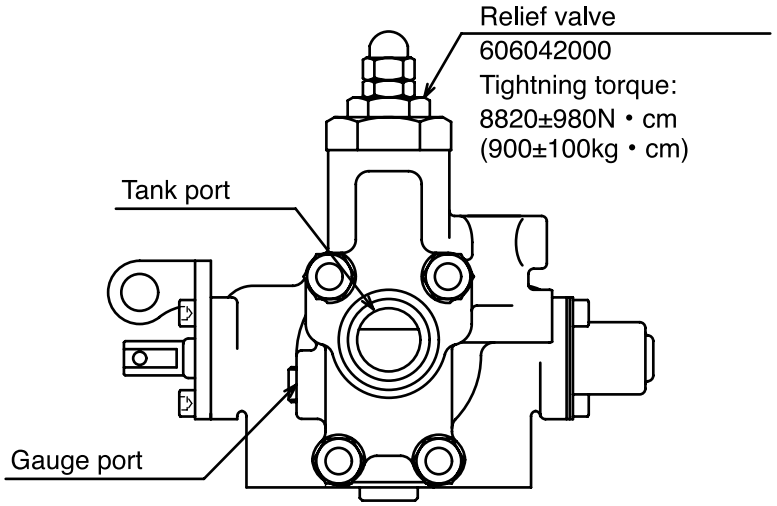
13.HYDRAULIC CIRCUIT



14. CONTROL VALVE

14. 1 General view and specifications

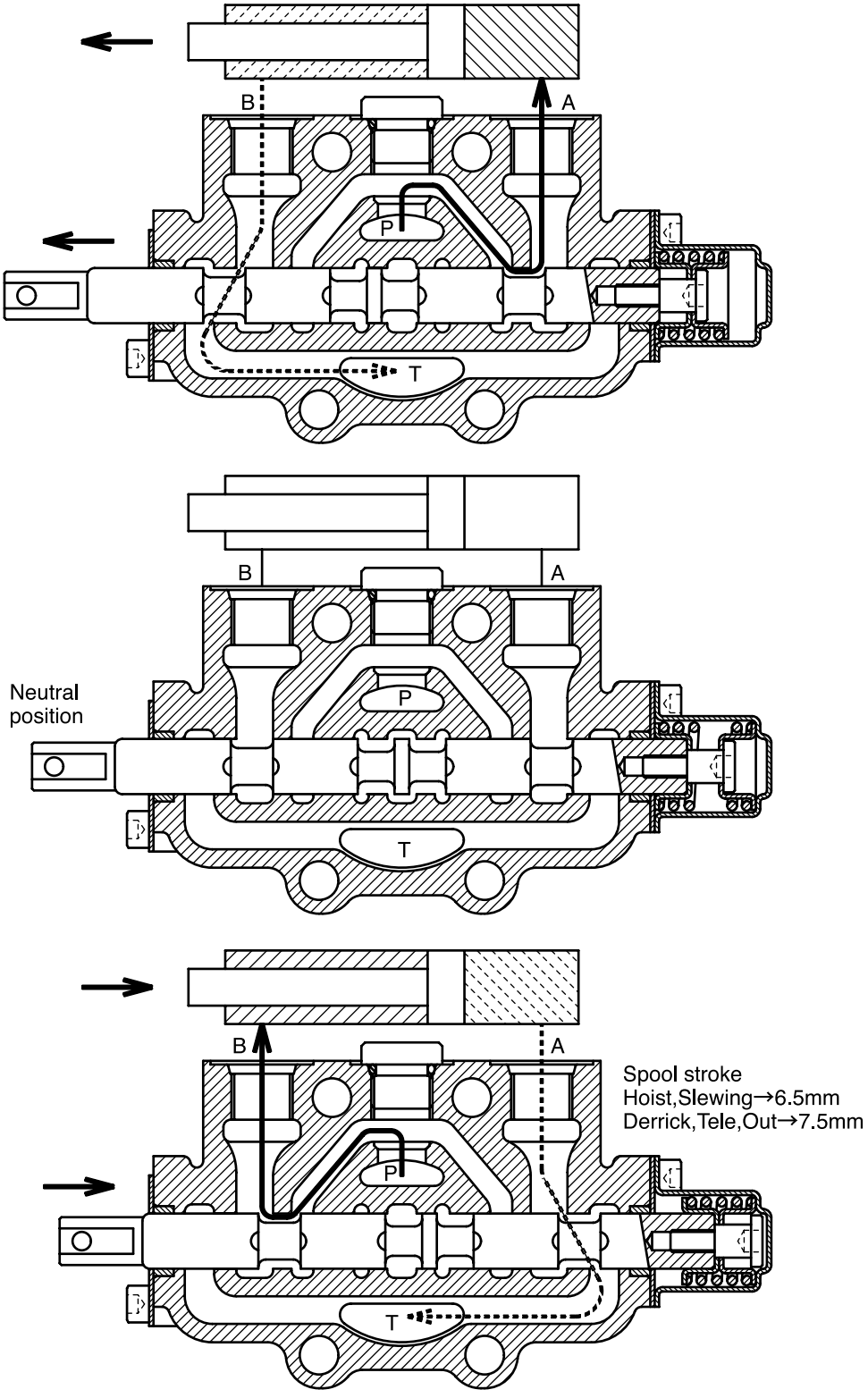




Specifications

Rated delivery	60ℓ/min
Rated pressure	20.6MPa ($210kg/cm^2$)
Tightning torque of tie rod	2450±245N • cm (250±25kg • cm)
Maxmum permissible pressure of tank port	0.3MPa ($3kg/cm^2$)

14. 2 How oil flows in control valve

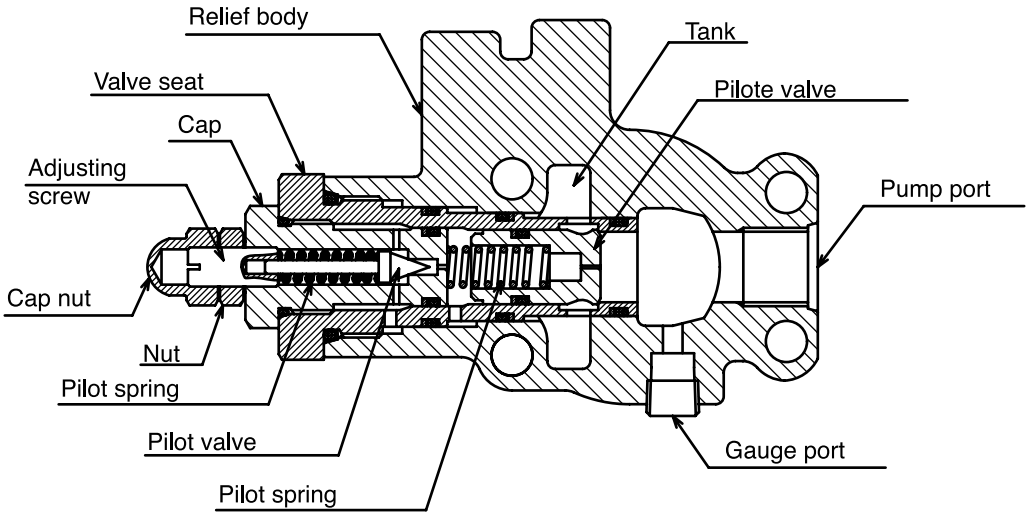


14. 3 Relief valve

The relief valve is a preventive valve to control the pressure in the hydraulic circuit.

The pressure should not become higher than the specified.

(1) Construction of relief valve



(2) Adjusting procedures

The hydraulic pressure in the relief valve is decided by the movable allowance of its adjusting screw.
For adjusting the pressure,loosen the cap nut and the nut to turn the screw clockwise with a screwdriver to increase the pressure.Turn the screw counterclockwise to reduce the pressure.

①Remove the cap nut and loosen the nut.

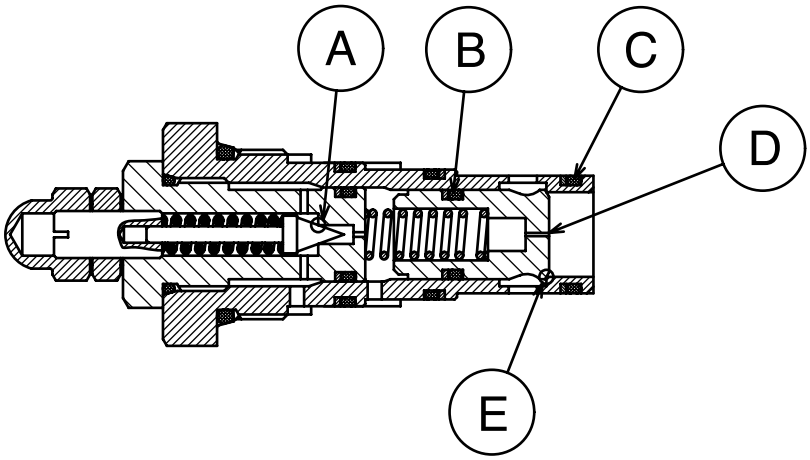
②Turn the screw clockwise with a screwdriver to increase the pressure.
Turn the screw counterclockwise to reduce the pressure.

③When setting up,be sure to watch the pressure meter while one of the cylinders (outrigger or telescoping or derrick)is being retracted.
Engine speed at the time of setting up the hydraulic pressure should conform to the rated revolution of the pump.
Never set up the hydraulic pressure when the engine is running at idling speed or higher speed.

④When tightening the nut and the cap nut,the adjusting screw may be loosened.
Therefore, hold the screw with a screwdriver and lock the nut with spanner when tightening the nut.

(3) Check points of relief valve

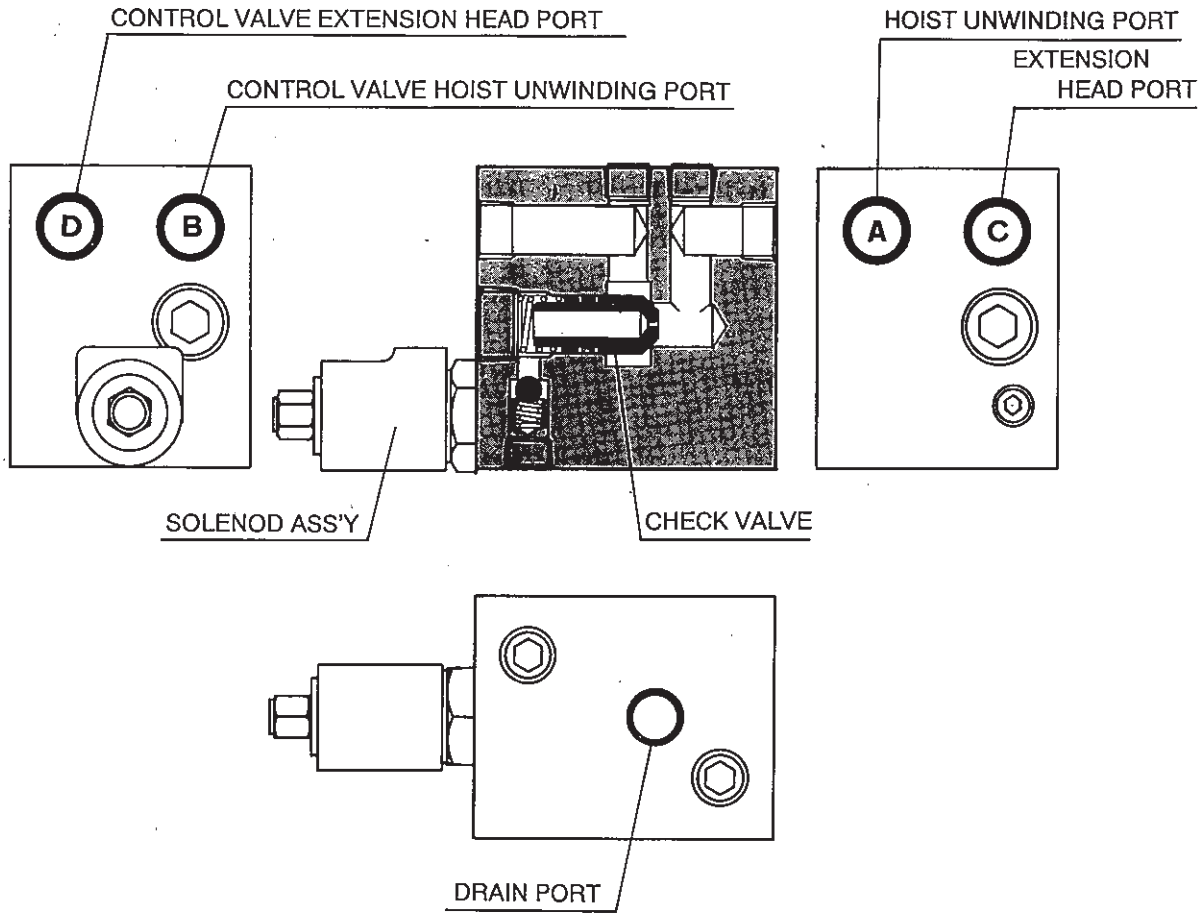
If the pressure it not increase, check the points of the relief valve as shown below.

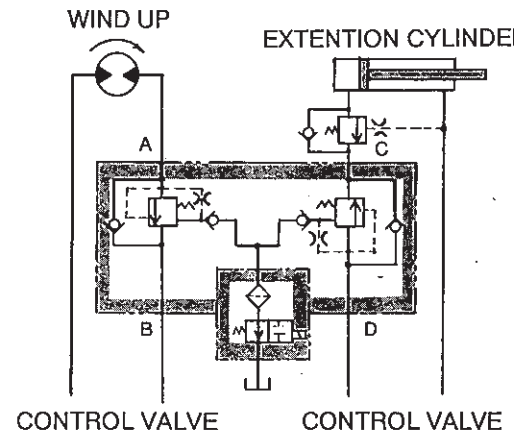


①. Foreign substance is caught in A section and the seat surface is damaged.
②. The O-ring in B section is broken.
③. The O-ring in C section is broken.
④. Foreign substance is caught in the drill hole of the D main valve.
⑤. Foreign substance is caught in E section and the seat surface is damaged.

Note : If the above-mentioned points have no trouble,the hydraulic pump is defective.

15 1) Construction of Pilot Check Valve Ass'y





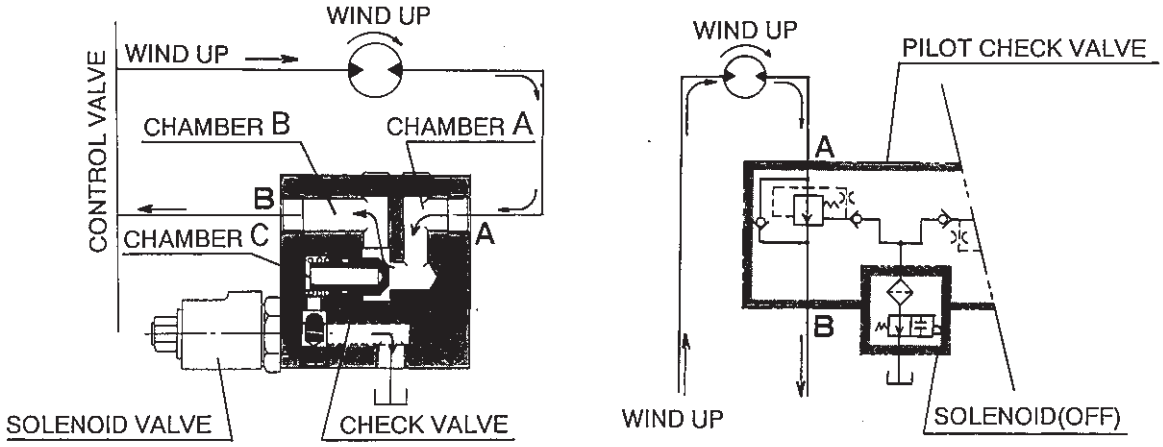
HYDRAULIC CIRCUIT

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.

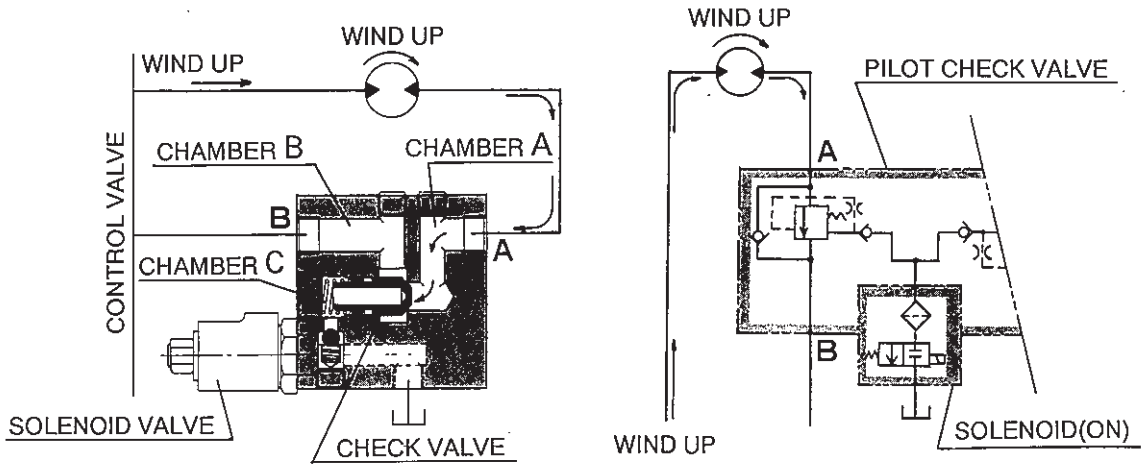
(1) Hoist winding (In normal operation state, over wind detector is ON and solenoid valve OFF.)

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.



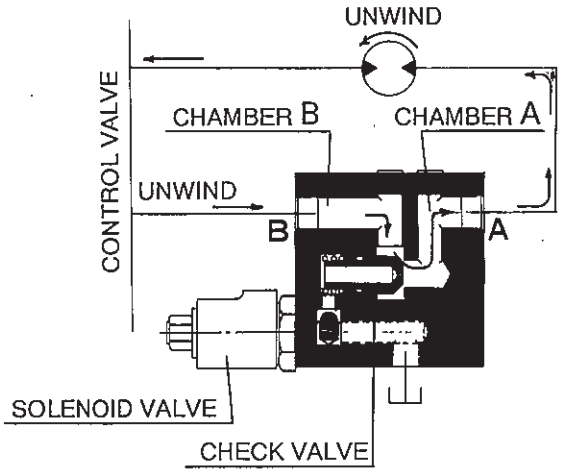
(2) Hoist winding stop (In overwound state, over wind detector is OFF and solenoid valve ON.)

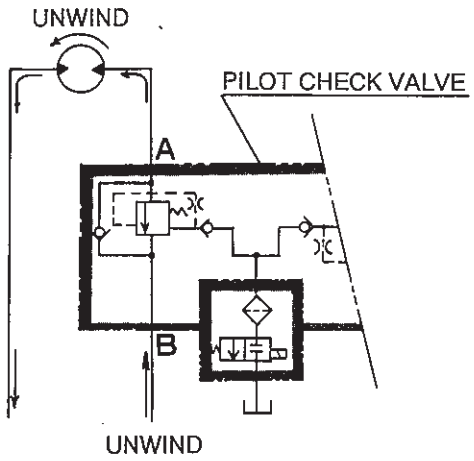
In an overwound state, the over wind detector turns off and the solenoid valve of the pilot check valve turns on. The operation of the solenoid valve closes the tank port so that the return oil in chamber A from the motor enters chamber C through the hole drilled in the check valve. Because the tank 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

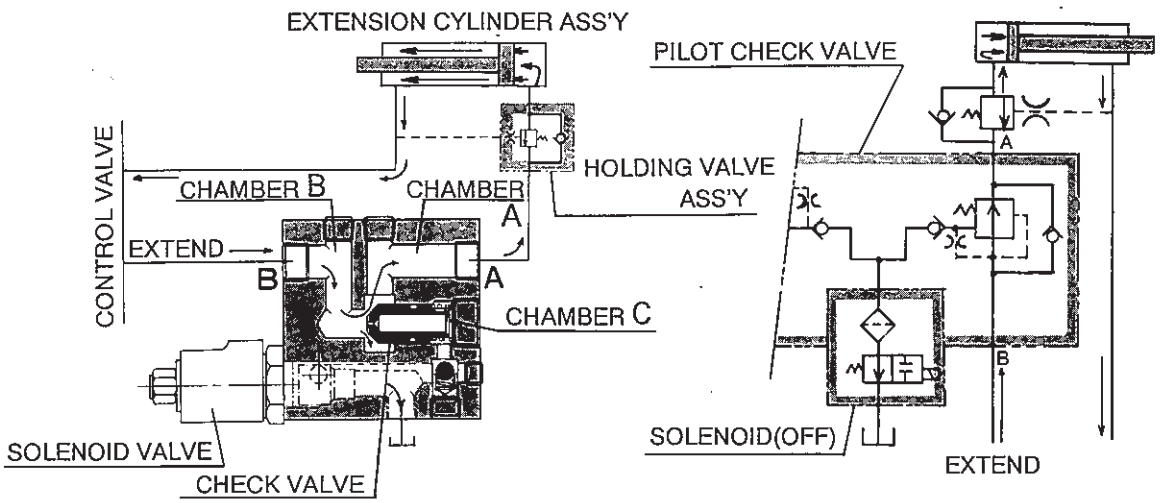
The oil entering chamber B from the control valve moves the check valve to the left to flow into chamber A and the unwinding end of the motor. The return oil from the motor flows via the control valve back into the tank, causing the motor to drive the hoist to unwind.





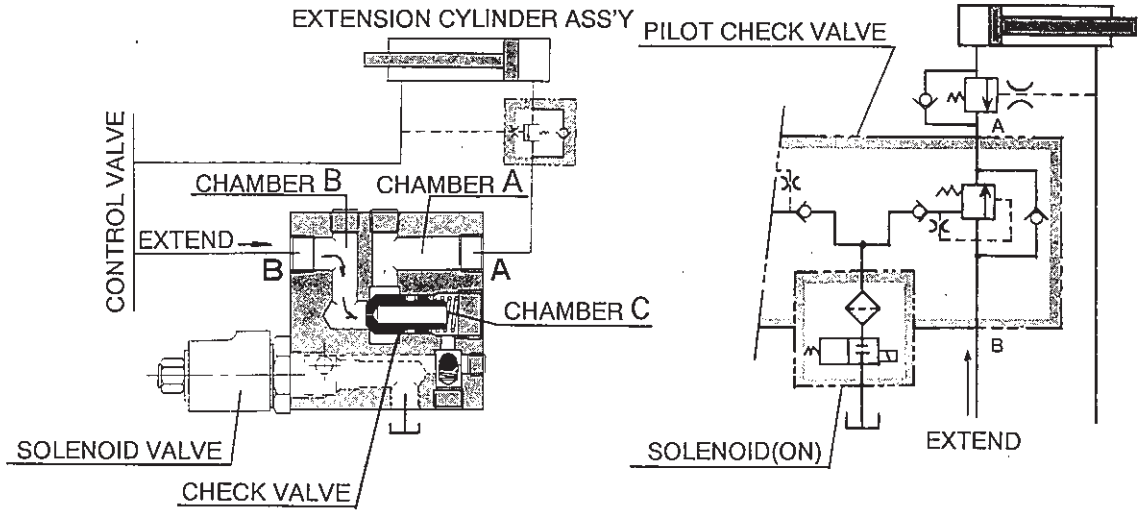
(4) Extension cylinder extending operation (In normal operating state, over wind detector is ON and solenoid valve OFF.)

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.



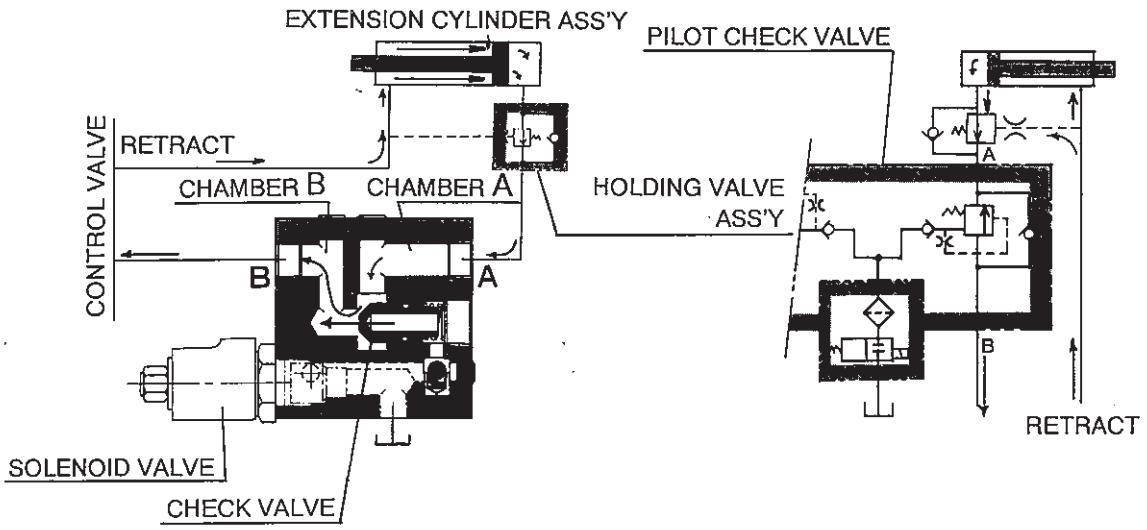
(5) Extension cylinder extension stop (In overwound state, over wind detector is OFF and solenoid valve ON.)

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.

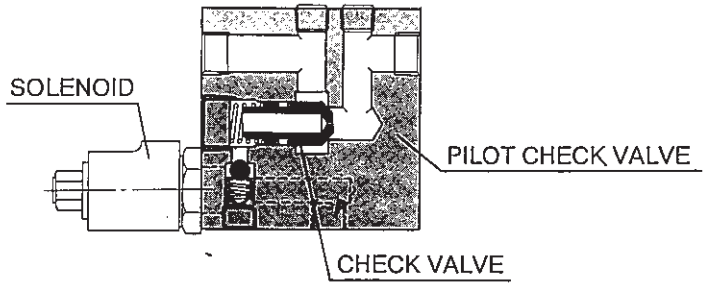


(6) Extension cylinder retracting operation

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

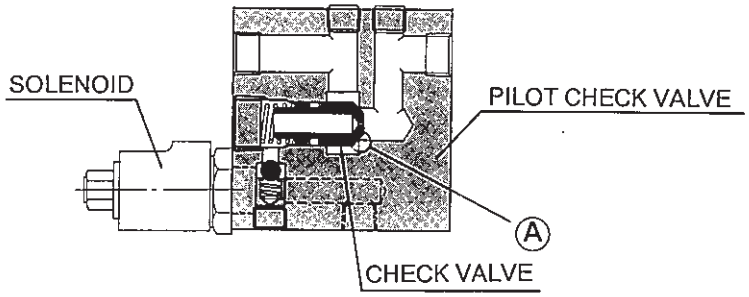


※ Hear discusses by taking an example of pilot check valve mounted in hoisting (winding) and extension cylinder (extending).

(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.



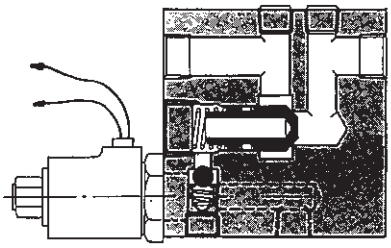
(2) Both of hoisting (winding) and extension cylinder (extending) operate when safety device is actuated even if voltage (12V) is applied to the solenoid wiring connections in the pilot check valve.

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

※ Check the solenoid for continuity.

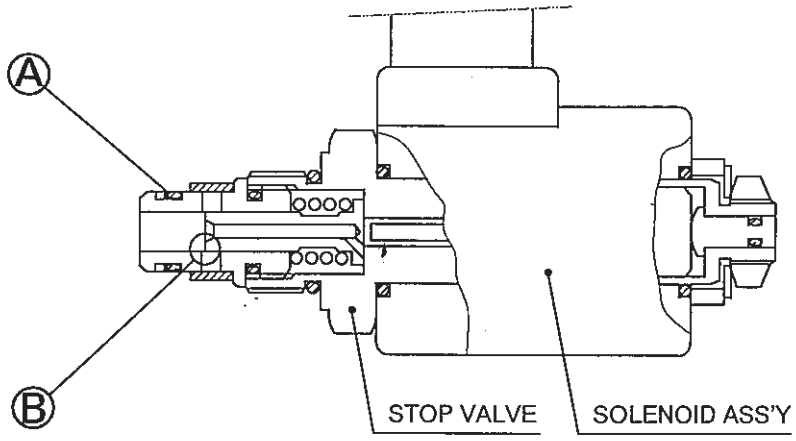
○ If there is no continuty, the solenoid is in defect. → Replace it.

○ 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.

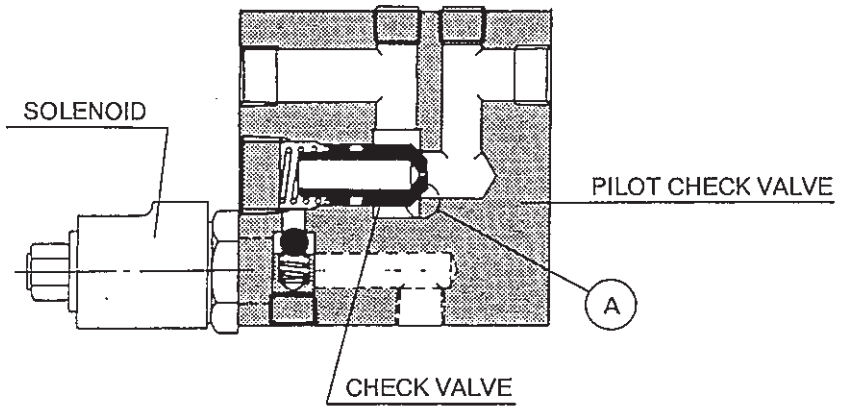
4) Troubleshooting

(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:

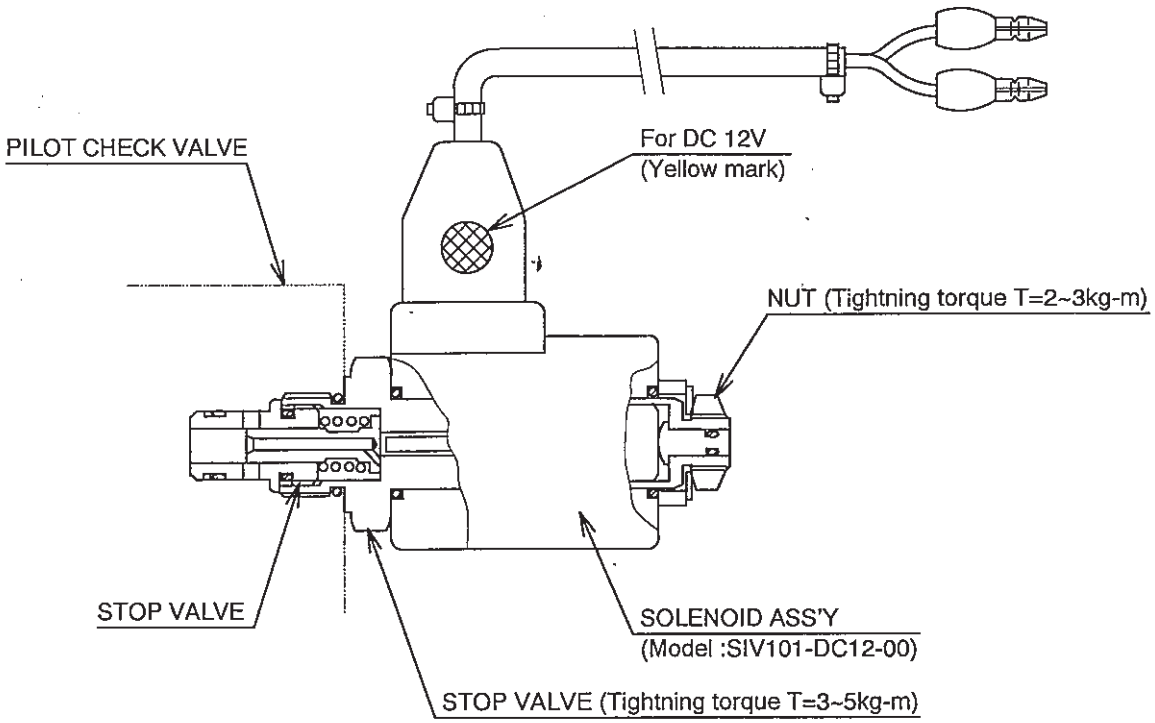
- Check the pilot check valve for foreign matter that might be caught in part Ⓐ.

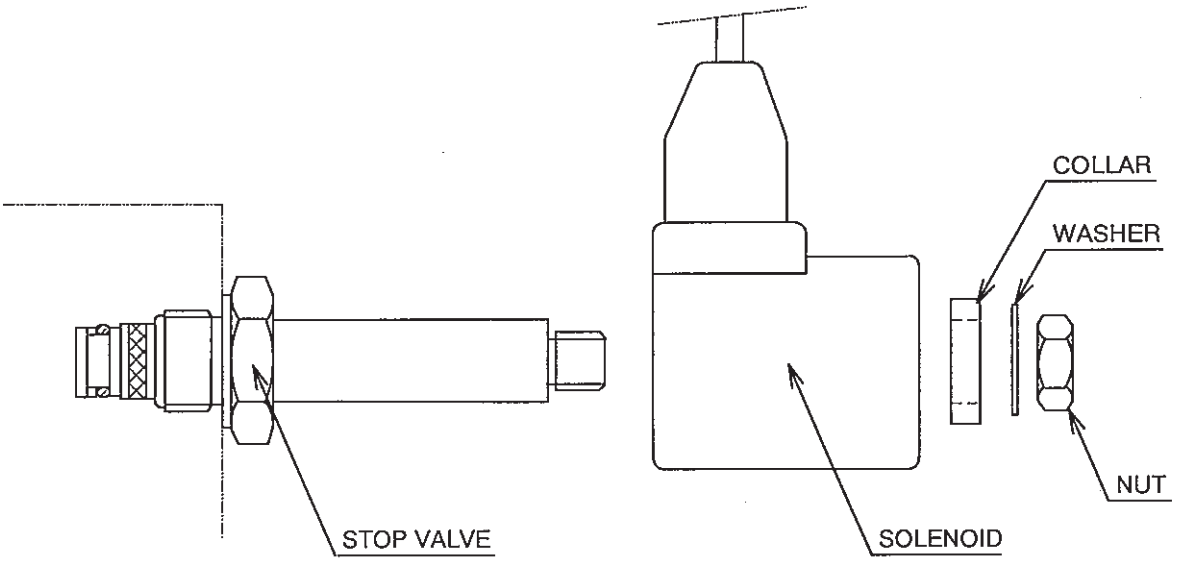


(3) Both the hoist winds and extension cylinder extends in an overwound state.

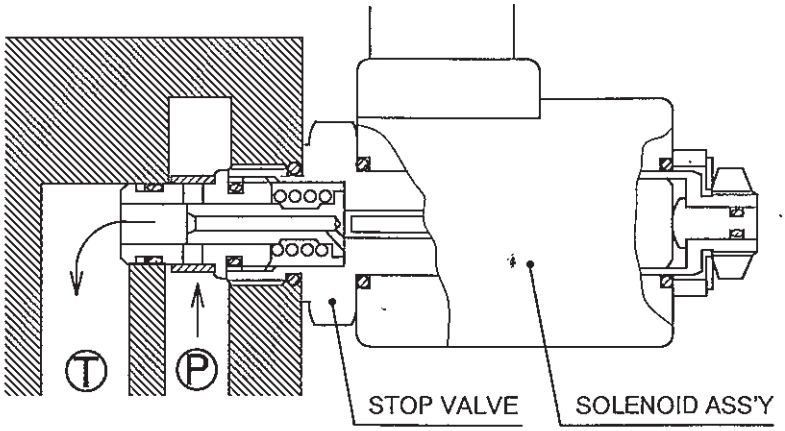
Suspected cause	Remedy
1. No electric power	Check.
2. Wrong wiring of power supply, relay, or solenoid.	Check
3. Overwind detector defective	Check and repair or replace.
4. Relay defective	Check and repair or replace.
5. Solenoid of pilot check valve defective	Check and repair or replace.

5) Construction of Solenoid Ass'y



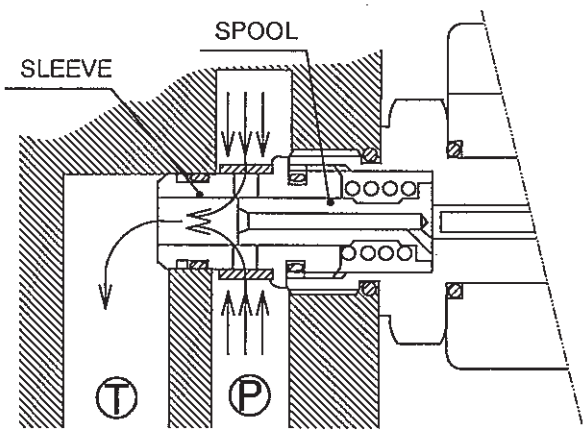


6) Description of Stop Valve Operation



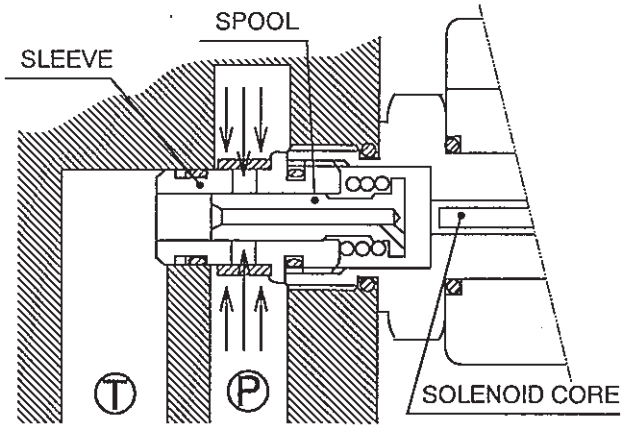
(1) Oil-flow when solenoid turns OFF

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

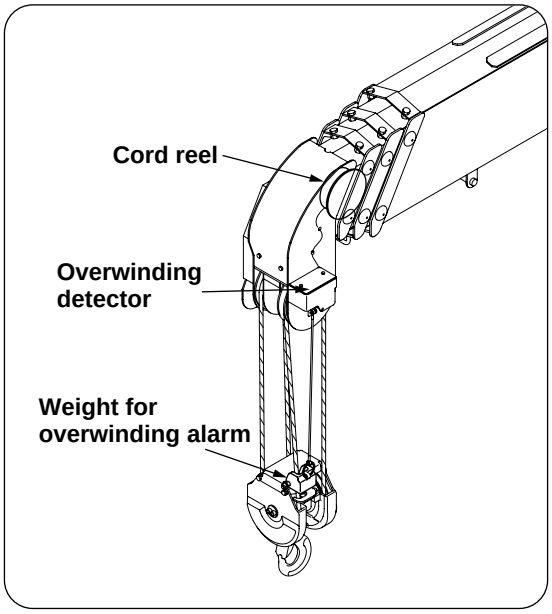
Oil from the port Ⓟ is blocked as shown in the illustration because the solenoid core moves the spool to the left to block the sleeve hole with the spool when the solenoid turns ON.



16. OVERWINDING ALARM

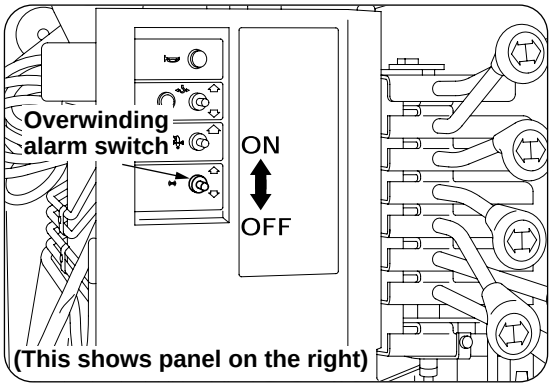
16. 1 Function of overwinding alarm and procedures for operation

(1) Function of overwinding alarm



The device automatically makes an alarm sound to warn that the wire rope is overwound when the hook comes close to the boom top.

(2) Procedures for operation



1. Turn ON the overwinding alarm switch before starting the crane operation.
   If the alarm sounds while the hook is being hoisted or the boom is being extended, stop the crane operation immediately and lower the hook or retract the boom.
2. Turn the switch OFF after completion of the crane work.

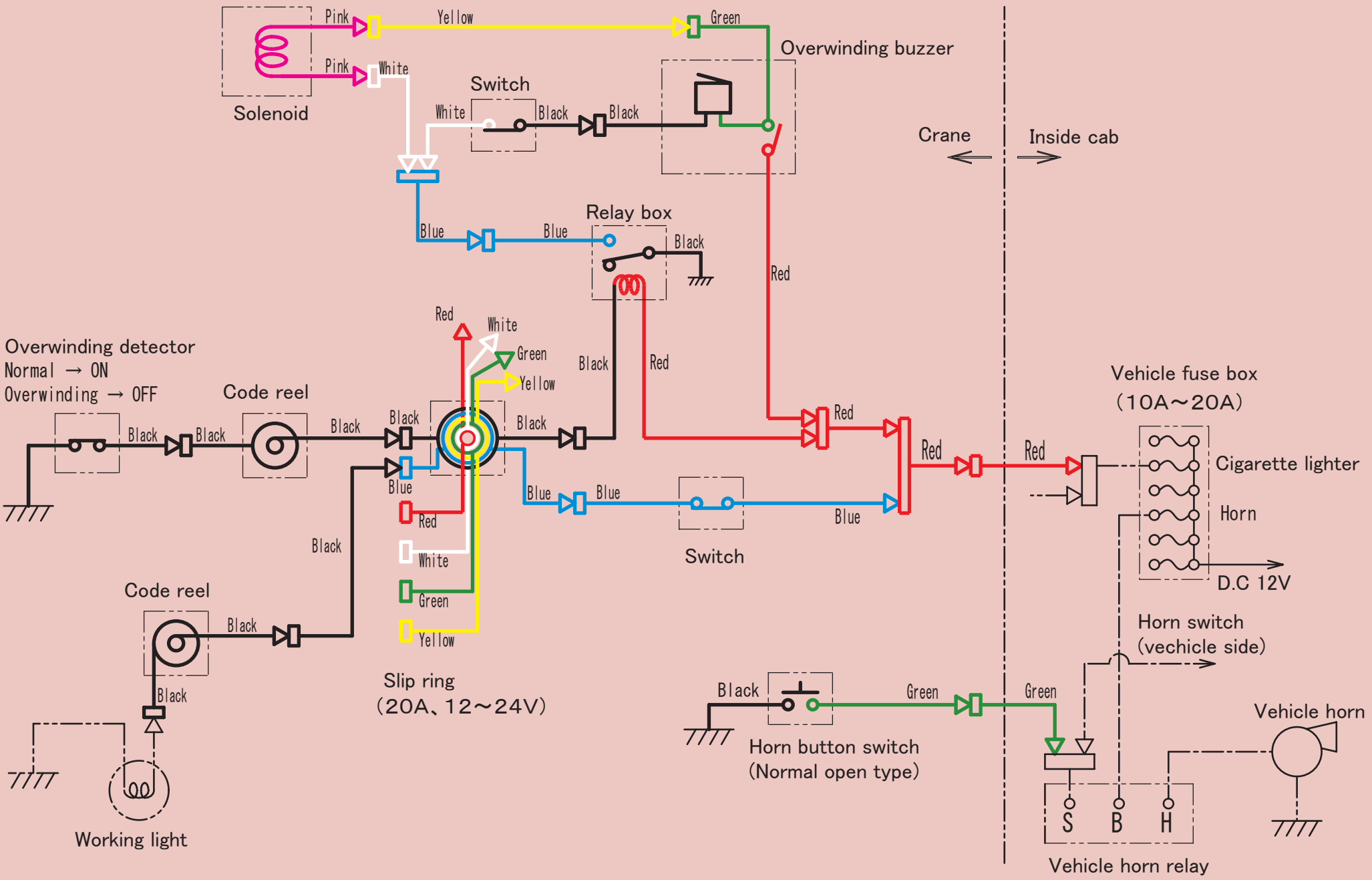
⚠ CAUTION

★The overwinding alarm will not function even if the hook is under overwound condition with the overwinding alarm switch turned OFF.
Be sure to turn the switch ON before starting crane work and check that the alarm sounds every time when the weight for overwinding alarm is lifted up.

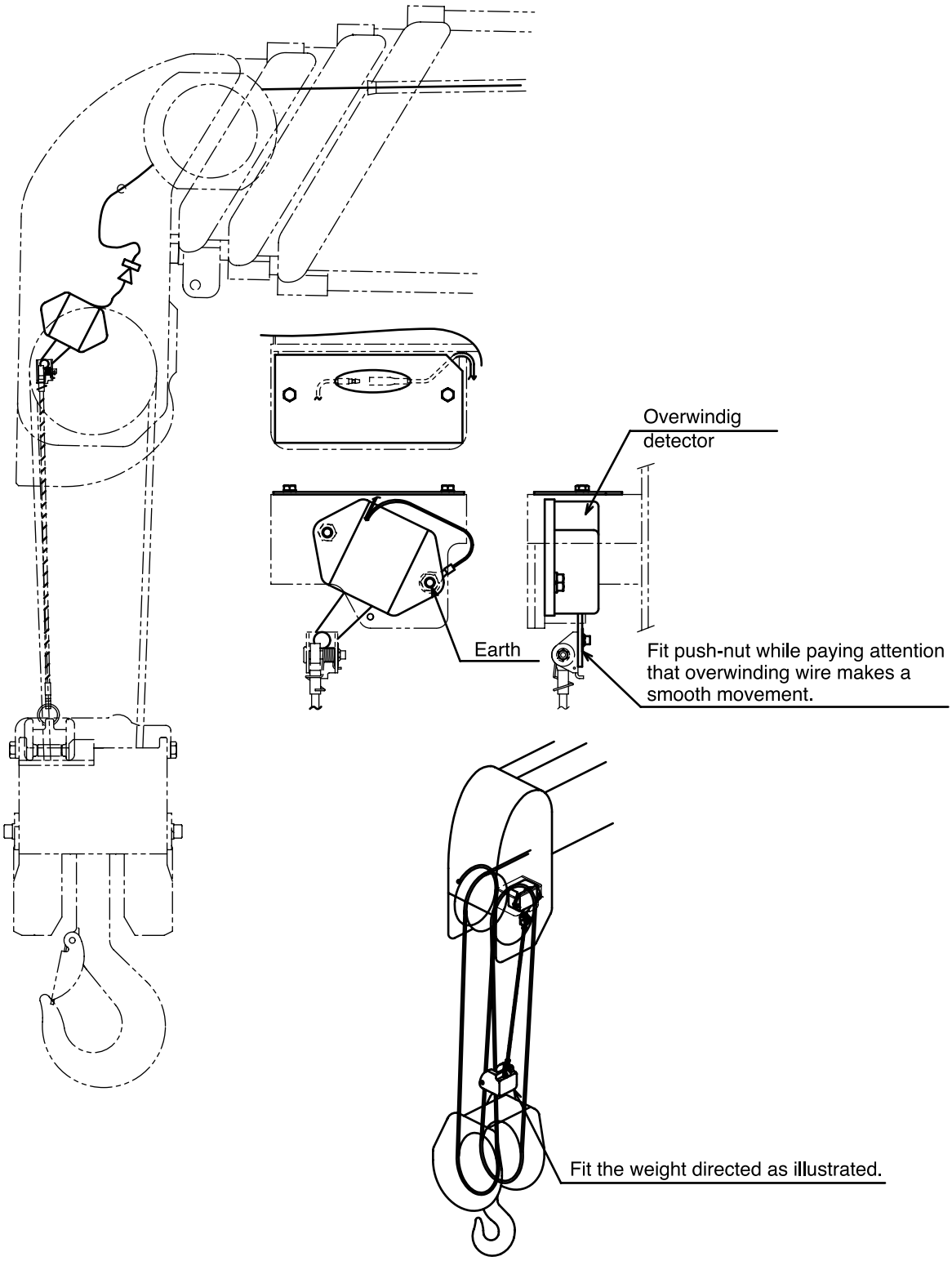
★Since the length of wire rope hanging the weight is specified by laws and regulations concerned, do not make it short at random.

★The alarm will not sound if the wires(cords) connected to the overwinding detector at the boom top is broken.
Pay attention to the wires(cords).

Electric circuit diagram

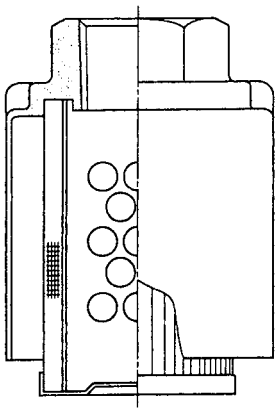


(1) Boom top in detail

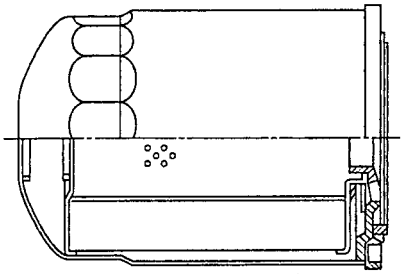


17. FILTERS (Suction Filter and Line Filter)

(1) Suction filter and line filter



SUCTION FILTER



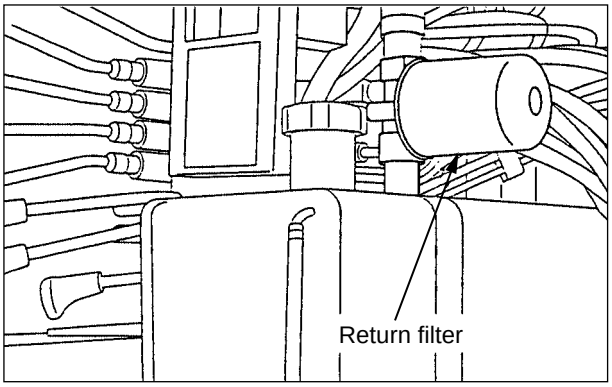
LINE FILTER

(2) Suction filter

The suction filter is attached to the inside of thfe oil tank at the end of the pump suction pipe. It is a notch-wire type. When changing hydraulic oil, check the filter that it is not clogged up. If it is, clean it.
Care must be taken against a clogged-up filter because it will adversely affect pump suction, possibly causing cavitation, abnormal noise, and pump failure.

(3) Line filter

The line filter is installed halfway between the control valve and oil tank. It is a filter paper type with a bypass valve. Filter replacing interval varies depending on the frequency of use. Generally, hpwever, replace it for the first time three months after initial use of the crane, and once a year thereafter.



18　HOW TO PUNCH

(1) Purpose

Troubles injuring the inside surface of cylinder tube due to screws mounting piston being loosened have been happened.
Therefore, we not only upgraded the screw lock agent “LOCTITE #262” to “#2701” to strengthen adhesion but also added punching process (partly carried out for derrick cylinder). The section defines how to punch.

(2) Punching procedures

1. Use a punch whose tip is hard and sharp enough.

Closeup

2. Hit the punch head hard enough with a hammer with the punch put at a distance of 1 1.5mm from the screw end.
3. Hit the punch head so hard that the diameter of punch mark will be more than 1.5mm
4. Punch 2 places around the screw thread in diagonal position.

Hexagon socket head screw
Tighten each hexagon socket screw with ″LOCTITE #2701′ applied to the threads to punch specified places close to screw threads.

Fig.1 Piston

Points to remember

1. Take care not to break the target piston while punching.
2. Make the clear punch mark as illustrated in Fig. 1.
3. Punch within 5 minutes after “LOCTITE” has been applied.

(Try not to give shock to the area where “LOCTITE” has been applied as it starts curing.)

19.TELESCOPING/DERRICK CYLINDER ASS'Y, MEASURES TO PREVENT PISTON FROM BEING LOOSENED

(Description)
In order to ensure preventing the pistons of telescoping and derrick cylinders from becoming loose, fix the screw threads on the rods and the pistons with the adhesive "LOCTITE #638" (excepting for telescopic cylinders). Besides, securing piston with screws and punching after application of "LOCTITE #2701" are also to be carried out as before
(Rods and pistons are to be fixed perfectly by application of adhesive "LOCTITE #638".)

(Main points)
Rods and pistons are fixed by tightening after application of "LOCTITE" to the threads on the rods and on the pistons.

Apply "LOCTITE" to the entire circumference of 2nd to 3rd threads from the thread end.
Apply the primer as the gap in the effective diameter of threads exceeds 0.1mm.
Use type #7474 (primer T) for the primer.
(Although type #7469 is being used currently, type #7474 is more effective as the target adhesion is to be at between metal components.)
Note : Pay special attention to observing the points to notice illustrated below while working as curing itself and curing time of "LOCTITE" depends largely on how the adhesion procedures have been carried out.

Points to notice on procedures to apply "LOCTITE"

Procedures
1. Degreasing and cleaning →2. Priming coating →3. Application of "LOCTITE" →4. Assembly 5. Curing

(1) Degreasing and cleaning
・Separate the oil well enough which has been applied to the threads (of rod/piston) to wipe it off with a rag or blow it off with compressed air.
When blowing it off with air, remember that the unclean oil will not be blown off but will just escape along the threads.
・In case of spray cleaning as well, target oil will not be removed but return if doing nothing but just spraying.
・After carrying out degreasing and cleaning, wait until cleaning fluid is dried up completely.

(2) Priming coating
・After primer #7471 has been applied, do not wipe it off but allow as it is for 5 10 minutes to dry naturally.
(Application of "LOCTITE" without complete drying may result in reduction of adhesive strength by half.)
・Although a component primed is effective for 7 days, store it by preventing dust and/or oil from being stuck before use.
・When "LOCTITE" is applied to a component and it is shut off air, curing will start after 5 minutes from application and will reach approx. 70% of curing in about 2 hours.
(Curing time will be shortened by priming, but theoretical adhesive strength will be 85% against a component without priming.)
・Do not dip a primed component in "LOCTITE" agent directly.
・Carry out priming at a place where well ventilated because priming agent escapes into air as vapor.

(3) Application of "LOCTITE"

・Apply "LOCTITE" sufficiently to the threads to fill them.
Apply "LOCTITE" to the component mounting o-ring (piston) at the 2nd to 3rd threads from the thread end.
(Refer to "Estimated adhesive consumption" illustrated below.)
・"LOCTITE #638" is an anaerobic adhesive so that the part forced out will not cure because it is in contact with air.In addition, sticking of "#638" to o-rings and packings may cause the rubber to be

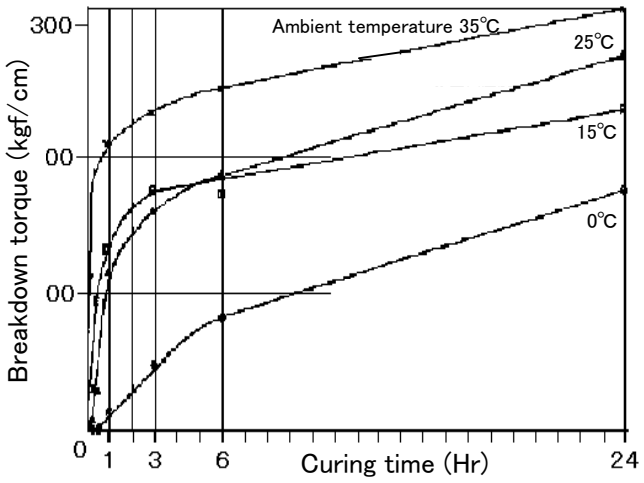
(When it is possible to be stuck on the rubber such as o-rings and packing, apply "LOCTITE" to the threads on piston side to avoid sticking to them.)
・Try shortening the working period from the time when application of the "LOCTITE" to a primed component to completion of fitting the component.

(4) Assembly

・Tighten the component after application so that applied "LOCTITE" may spread entirely to the threads of the component.
・Since "LOCTITE" forced out of the threads will not be cured, take care not the "LOCTITE" to be out during application as hydraulic oil is to be contaminated with it.
・Work quickly as the "LOCTITE" in the treads starts curing.
・Curing speed differs according to temperature(ambient temperature included) of target component. Since curing time becomes excessively longer at a temperature below 10° C, work with the component temperature raised to 15° C or over.

Chart of breakdown torque vs. curing timeWhen using "LOCKTITE #638with primer #7471 (primer T)

Bolt:M10×P1.5- L2S
Nut: M10×P1.5
Material:Soft steel (raw)



(5) Curing

・This is a period while an adhesive is being joined.
Store the components still during the period.
(Recommended conditions is at an component temperature of 15 ℃ min. for more than 1 hour.)

Reference:
Estimated adhesive consumption when it is applied to 3 spirals of thread entirely.

Threading diameter	Amount to be applied
M40	0. 46cc
M60	0. 69cc
M80	0. 92cc
M100	1. 15cc
M120	1. 38cc

Which primer of #7649 and #7471 should be used together with "LOCTITE #638".
Curing speed of #7469 is faster than that of #7471 but adhesion strength is lower.
If adhesion is to be carried out between metal articles, #7471 gives better result.
Type #7471 is to be used in normal case (refer to manufacturer's comment and catalog specifications).

20. INSUPECTION PROCEDURES WHEN CYLINDER SINKE

20. 1 Inspection of telescoping cylinder

(1) Preparation before inspection

① Allow booms to be horizontal and extend them fully to put a mark on each boom section (refer to Fig. 1).
② Raise booms to their maximum to sling a load.
③ In order to release pressure remained in the telescoping system, stop the engine and shift the manual lever for telescoping booms.

(2) Starting inspection

④ Remove the retraction hose to check if oil overflows continuously out of the cylinder port of retraction side.
At he same time, also check that which boom section sinks how far to grasp condition of booms as a whole.
If no oil flows out of the port of retraction side, the cylinder is normal.
⑤ Next, remove the extension hose, and if oil overflows continuously out of counter-balance valve port of extension side, there may be faulty on the seat surface of counter-balance valve (refer to Fig. 3).
In addition, check how far boom3 sinks simultaneously.

Caution:
In order to release pilot pressure in the retraction side, be sure to remove the extension hose after the retraction hose has been removed (refer to Fig. 2).
Since overflowing oil out of the port on retraction side means internal leakage in the cylinder, check tele1 and tele2 separately.
Be sure to measure the how far each boom sinks as it is an important point for judging that it is normal or abnormal.

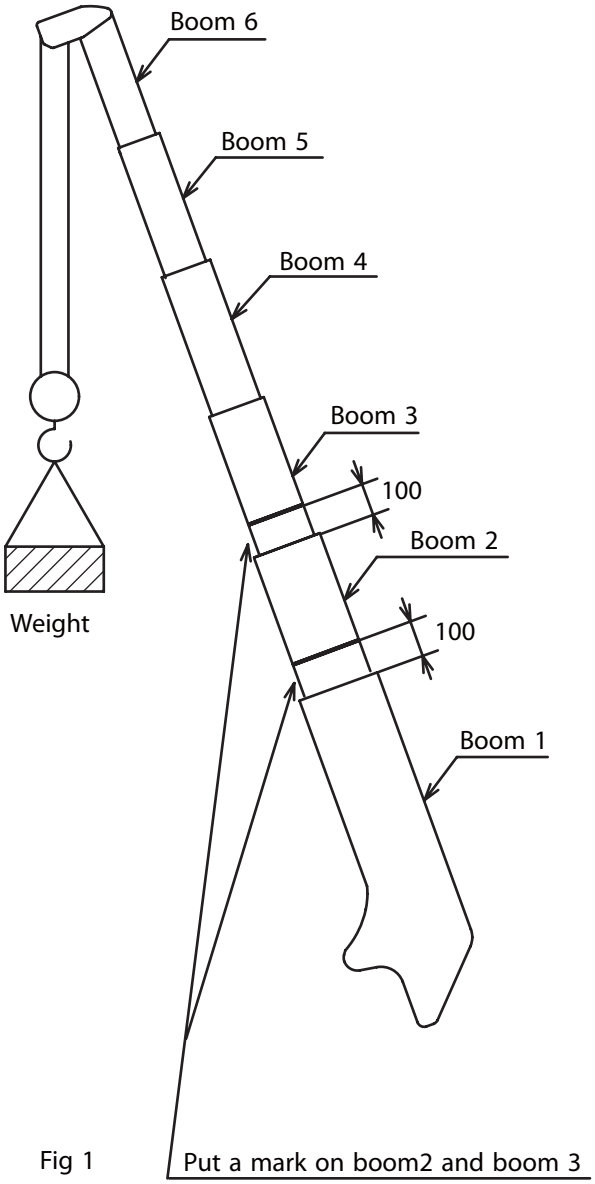


Fig 1

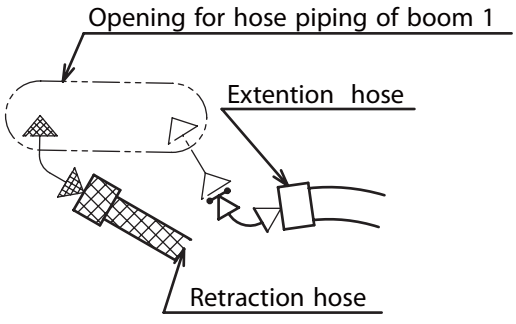


Fig 2

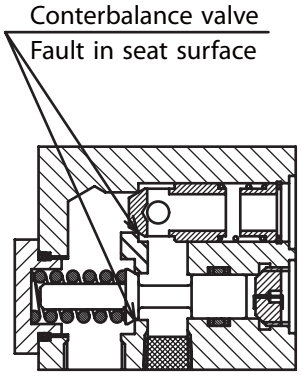


Fig 3

20. 2 Inspection of derrick cylinder

(1) Preparation before inspection

① Raise booms to an angle of approx. 30°.

② Put a mark on the rod with a felt pen (refer to Fig. 1).

③ In order to release pressure remained in the derrick system, stop the engine and shift the manual lever for raising/lowering of booms.

(2) Starting inspection

④ Remove the lowering hose to check if oil overflows continuously out of the cylinder port of lowering side. At he same time, check also that how far the rod shifts.
If no oil flows out of the port of lowering side, the cylinder is normal.

⑤ Next, remove the raising hose, and if oil overflows continuously out of counter-balance valve port of raising side, there may be faulty on the seat surface of counter-balance valve (refer to Fig. 3).
In addition, check how far the cylinder sinks simultaneously.

Caution:

In order to release pilot pressure in the lowering side, be sure to remove the raising hose after the lowering hose has been removed (refer to Fig. 2).

If oil overflows out of the port on lowering side, it suggests internal leakage in the cylinder.

Be sure to measure the how far each boom sinks as it is an important point for judging that it is

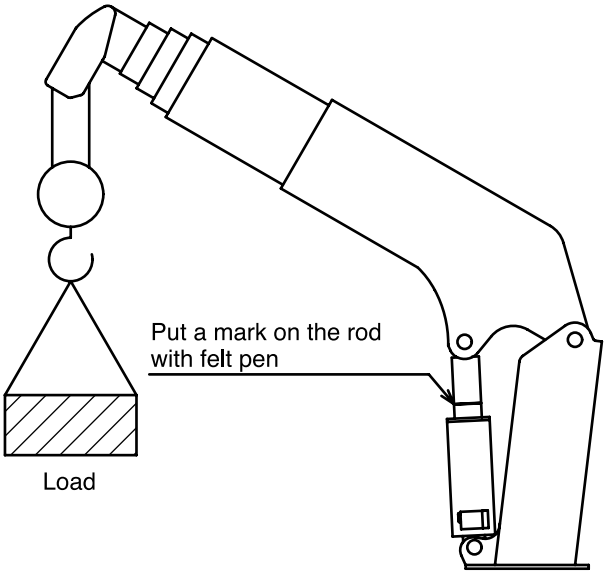


Fig1

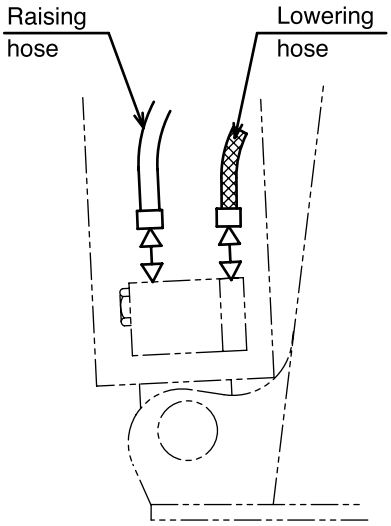


Fig2

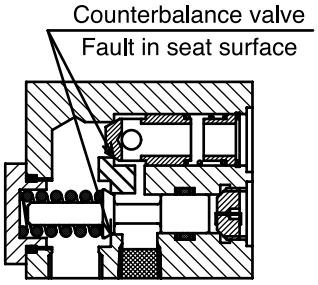


Fig3

20. 3 Inspection of outrigger cylinder

(1) Preparation before inspection

① Extend outrigger cylinders to their extremes.
② Put a mark on the rod with a felt pen (refer to Fig. 1).
③ In order to release pressure remained in the outrigger system, stop the engine and shift the manual levers for extension/retraction of outriggers.

(2) Starting inspection

④ Remove the retraction pipe to check if oil overflows continuously out of the cylinder port of retraction side.
At he same time, check also that how far the rod shifts.
If no oil flows out of the port of lowering side, the cylinder is normal.

⑤ Next, remove the extension pipe, and if oil overflows continuously out of the pilot check valve port of raising side, there may be faulty on the seat surface of pilot check valve (refer to Fig. 2).
In addition, check how far the cylinder sinks simultaneously.

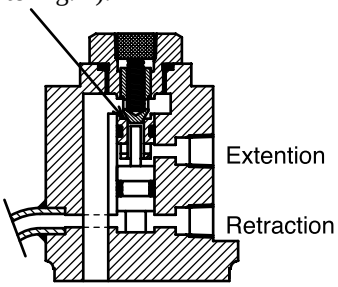


Fig2

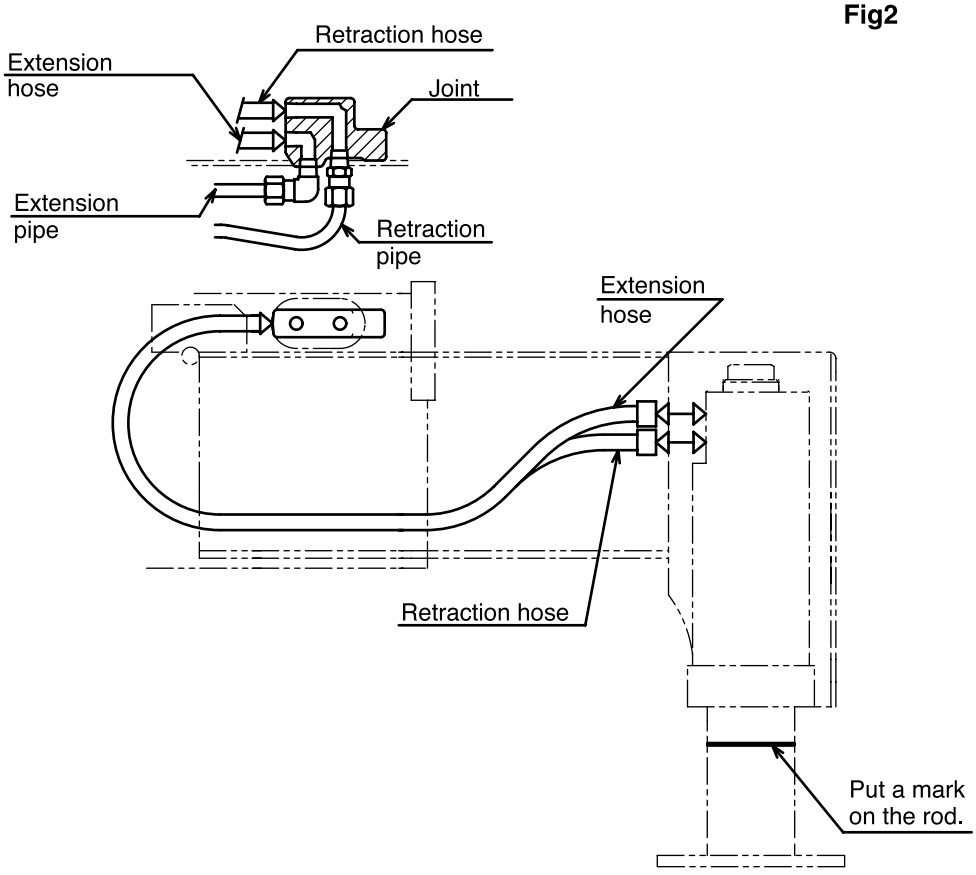


Fig1

In order to release pilot pressure in the retraction side, be sure to remove the extension pipe after the retraction pipe has been removed (refer to Fig. 1).
If oil overflows out of the port on retraction side, it suggests internal leakage in the cylinder.
Be sure to measure the how far each boom sinks as it is an important point for judging that it is