

UNIC

WORK SHOP MANUAL

URW295CUR

URW295CAR

FURUKAWA UNIC CORPORATION

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29. Maintenance And Inspection Of Crane

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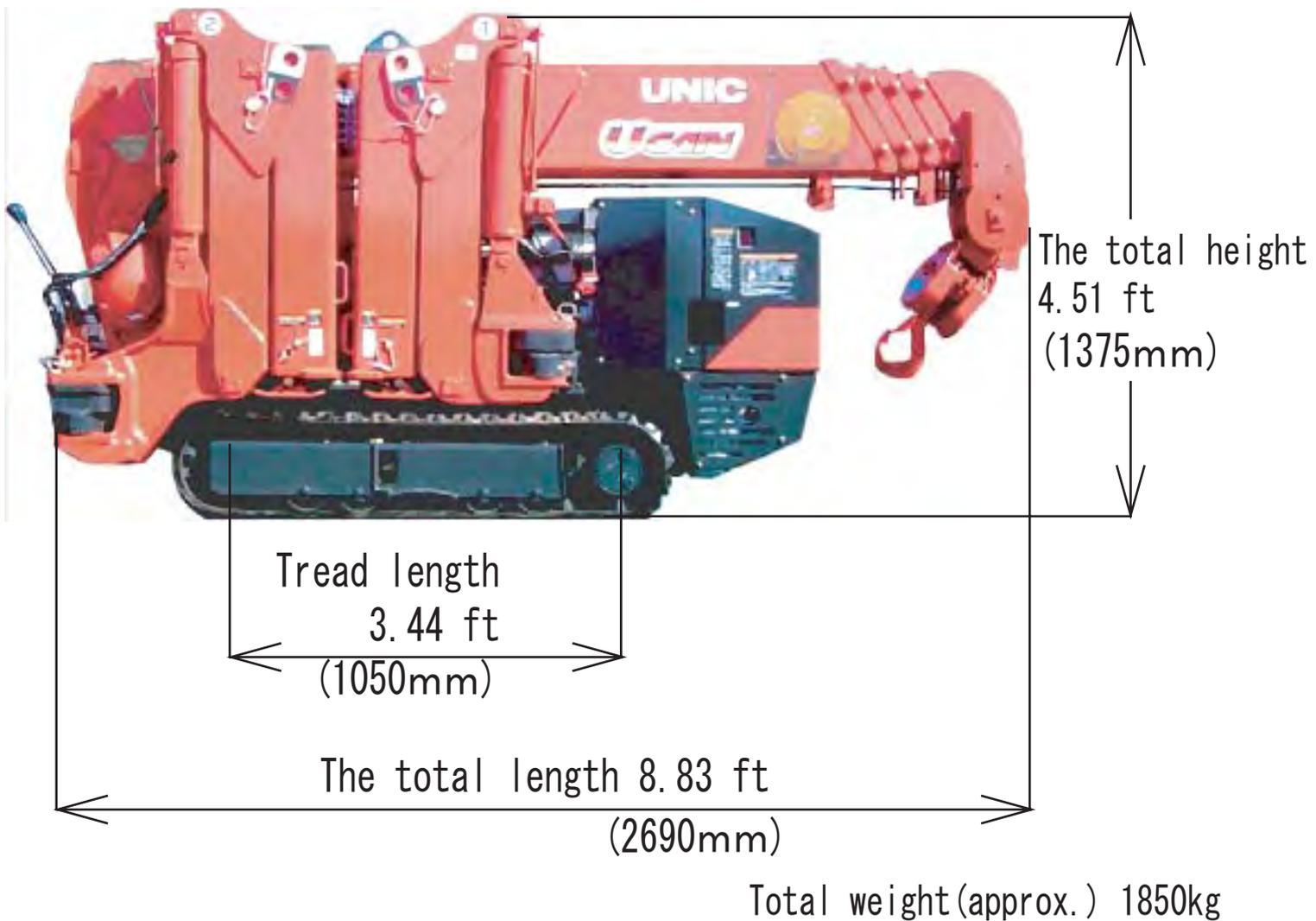
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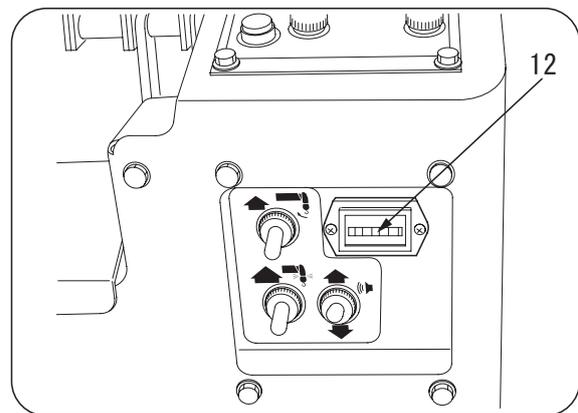
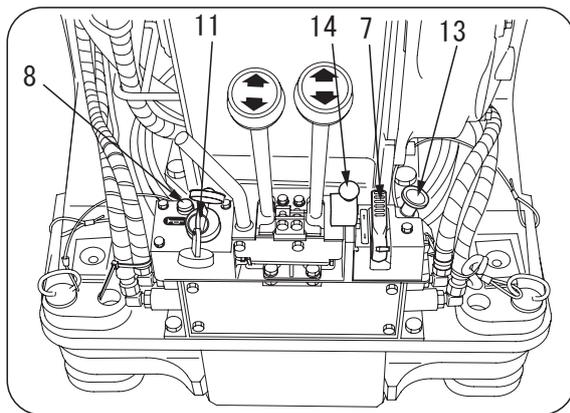
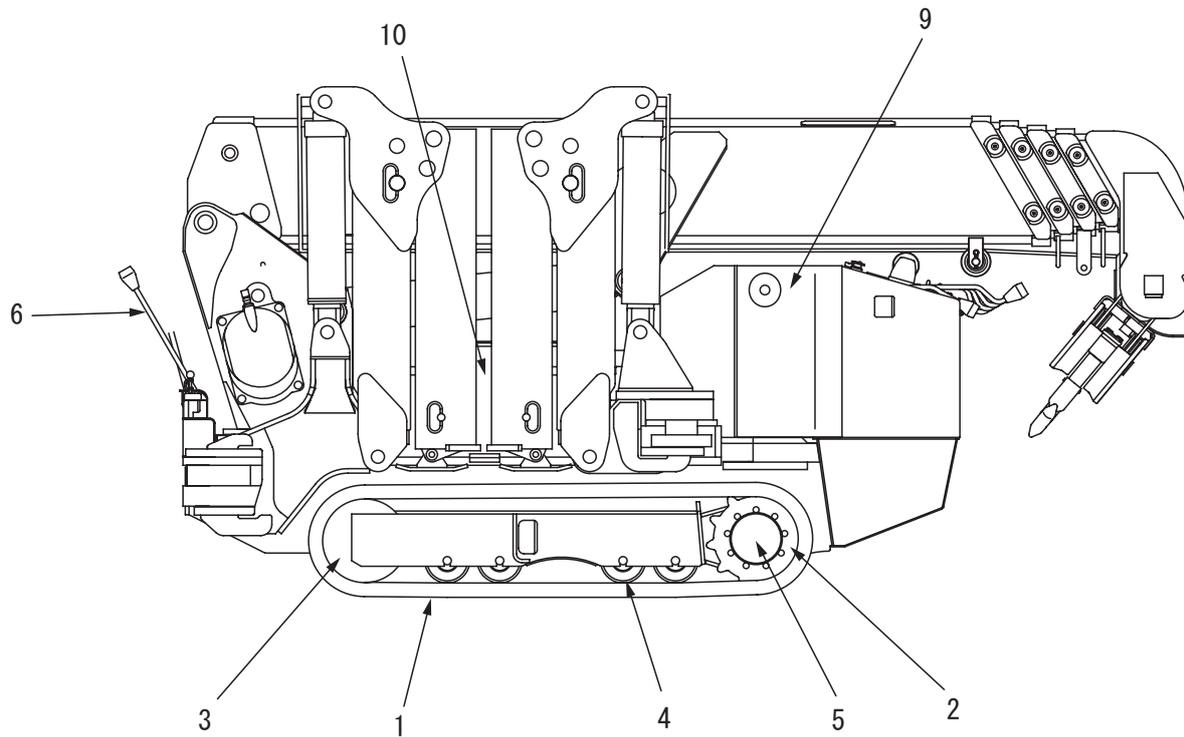
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1. Dimensions and weight of crane body

All width 1.97 ft (600mm)



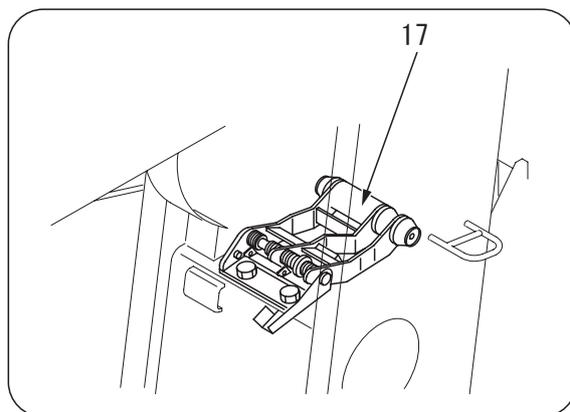
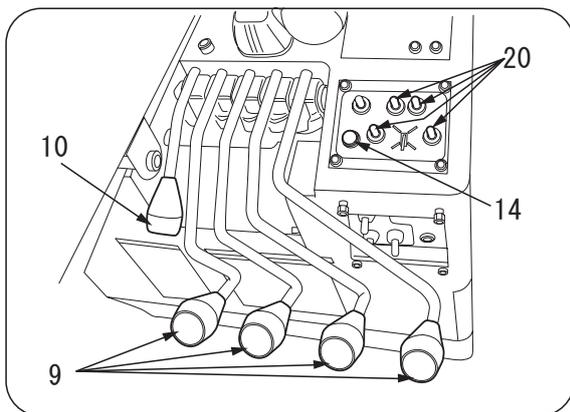
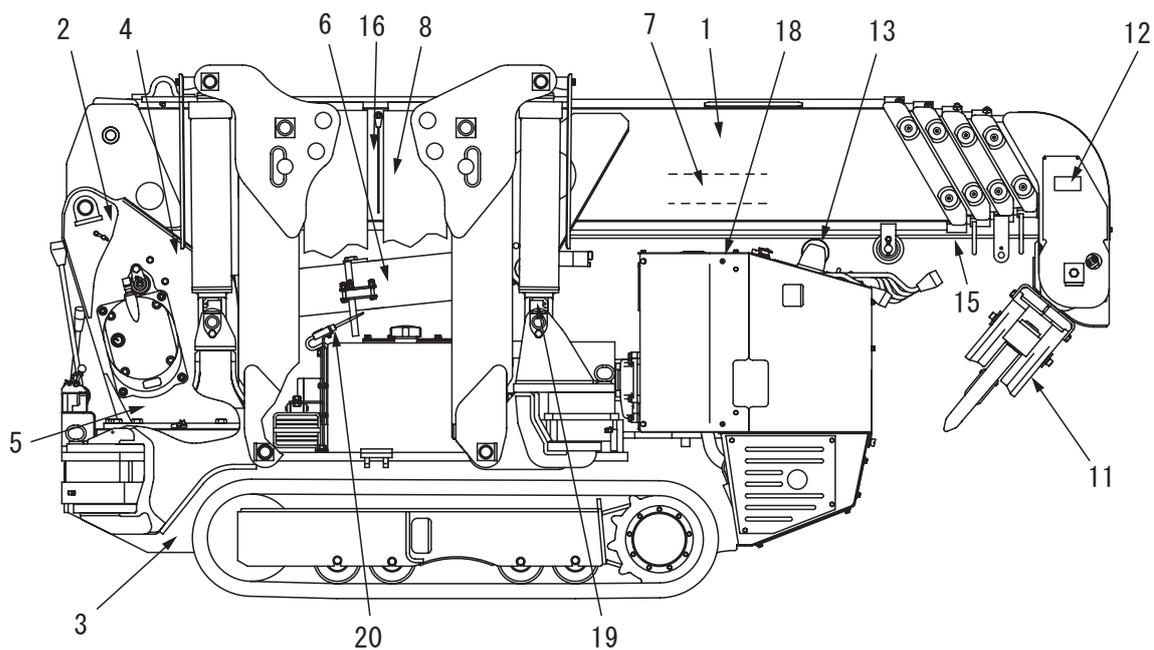
2. DESCRIPTION OF CARRIER EQUIPMENT



1	Rubber crawler
2	Wheel sprocket
3	Idle roller
4	Truck roller
5	Crawling motor
6	Crawling lever
7	Accelerator lever

8	Horn switch
9	Fuel tank
10	Hydraulic oil tank
11	Stater switch
12	Hour meter
13	Choke knob
14	Lock lever

3. DESCRIPTION OF CRANE EQUIPMENT



1	Boom
2	Column
3	Frame
4	Hoist winch
5	Slewing device
6	Derrick cylinder
7	Telescoping cylinder
8	Outrigger
9	Crane operating levers
10	Outrigger control levers
11	Hook

12	Over-winding alarm
13	Load meter
14	Warning horn
15	Wire rope
16	Load indicator
17	Automatic stop for leaving minimum wire rope (With wire rope retaining roller)(Option)
18	Level
19	Turnover prevention device (only crane equipped with device)(Option)
20	Outrigger selection switch

4. MAJOR SPECIFICATIONS

(Speed indicated in the table below is at oil temperature range of 113°F ~ 131°F (45°C ~ 55°C), operating with no-load, and at rated pump discharge.)

Model		URW295CUR or URW295CAR
Crane capacity (maximum lifting load)		6450 lbs × 4.6ft(2930kg × 1.4m) (With outriggers extended fully)
Maximum lift above ground (Hook)		Approx. 28.9ft (8.8m) with 4-part line
Boom to be extended to:		8.3ft ~ 13.4ft ~ 18.4ft ~ 23.4ft ~ 28.4ft (5-section boom)
Maximum working radius		27.6ft (8.41m)
Speed of winding-up (Rope speed)		(At 4th layer on the drum) 131.2ft (40m) /min
Hoisting speed of hook		32.8ft (10m) /min (At 4th layer on the drum, with 4-part line hooking)
Extending speed of boom		20.1ft (6.12m) /20sec
Raising speed of boom		0° ~ 78° /11sec
Slewing speed		1.5r.p.m.
Slewing range		360° (Continuous)
Hoisting rope	Construction	IWRC 6 × WS(26) Class B (Breaking load: 9520 lbs {43.2kN (4400kgf)})
	Diameter × length	5/16in. (8mm) × 155ft (47.5m)
Outrigger		Direct pushing by double acting hydraulic cylinder (directly connected to hydraulic automatic locking device)
Hydraulic pump	Rated pressure	Crane:2990psi {20.6MPa (210kgf/cm ²)} Travel:3130psi {21.6MPa (220kgf/cm ²)}
	Rated discharge	Approx. 10gal. (381) /min
	Rated rotation	Approx. 2000rpm
Hydraulic oil tank capacity		7.13gal. (27 liters)

MAJOR SPECIFICATIONS

Equipment and construction

Model	URW295CUR or URW295CAR
Boom telescoping	Boom: 5-section, Hexagonal box beam
	Telescoped by direct pushing of hydraulic cylinder and by wire rope (With hydraulic automatic locking device) (2nd & 3rd sections: sequential actuation, 4th & 5th sections: simultaneous actuation)
Boom derricking	Direct pushing by hydraulic cylinder (With hydraulic automatic locking device)
Hoisting	Hydraulic motor: Axial plunger type
	Reduction gears: Spur-gear reduction
	Brake: Automatic mechanical brake
Slewing	Hydraulic motor: Trochoid type (With hydraulic automatic locking device)
	Reduction gears: Worm-gear+Spur-gear reduction (Supported by ball bearings)
	Brake: Worm self-lock
Hydraulic pump	Variable delivery piston pump
Hooking capacity	6450 lbs (2930kg) Parts of hoist reeving: 4
Safety device	Pressure relief valve for hydraulic circuit
	Hydraulic automatic lock (Counterbalance valves and pilot-operated check valves)
	Automatic stop for overwinding
	Overwinding alarm
	Alarm buzzer
	Hook safety latch
	Interlock for crane-crawl lever and outriggers
	Turnover prevention device
Level	
Weight	Approx. 4100 lbs (1850kg)

MAJOR SPECIFICATIONS



Crawling device

Model	URW295CUR or URW295CAR (5-section boom)
Crawling	Endless rubber crawler
Crawler	7 1/8 (in.) × 40 links × 2 7/8 (in.) FR (180(mm) × 40 links × 72 (mm) FR)
Length of ground contact	3.44ft (1050mm)
Pressure of ground contact	6.96psi {48.0kPa (0.49kgf/cm ²)}
Crawling speed	Forward/Backward: 0~2.3km/h 0~1.4mph (2.3km/h)
Hill-climbing ability	20°
Engine	Rated output 9.6kW (13hp)/2000r.p.m
Crawling	Independently driven by hydraulic power
Parking brake	Disc brake with hydraulic motor built-in
Starting engine	Electric starter
Fuel tank	Capacity: 1.58gal (6 liters)

5. Chart of rated load

RATED LOADS

BOOM SECTION		1	1+2							
WORKING RADIUS(ft)		3.0	4.5	5.0	6.0	7.0	8.0	10.0	11.0	12.58
RATED LOAD (lbs)	MAX EXT. OUTRIGGERS	6450	6450	5850	4950	4350	3800	2850	2450	2000
	NOT MAX EXT. OUTRIGGERS	4450	4450	4450	3150	2250	1600	1100	950	600

BOOM SECTION		1+2+3								
WORKING RADIUS(ft)		7.0	8.0	9.0	10.0	11.0	12.0	14.0	15.0	17.62
RATED LOAD (lbs)	MAX EXT. OUTRIGGERS	3050	3050	3050	2750	2450	2150	1650	1450	1000
	NOT MAX EXT. OUTRIGGERS	1850	1550	1250	1150	1000	850	600	550	300

BOOM SECTION		1+2+3+4								
WORKING RADIUS(ft)		11.0	12.5	13.0	15.0	16.0	17.0	18.0	20.0	22.61
RATED LOAD (lbs)	MAX EXT. OUTRIGGERS	1950	1950	1750	1350	1200	1100	1000	850	660
	NOT MAX EXT. OUTRIGGERS	1000	800	750	600	510	450	370	280	200

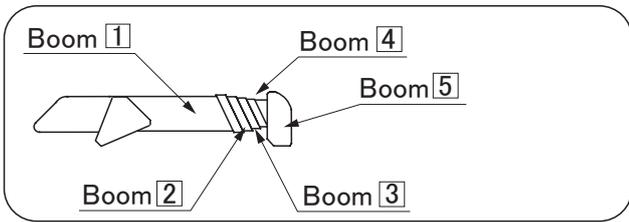
BOOM SECTION		1+2+3+4+5								
WORKING RADIUS(ft)		12.5	13.5	15.0	16.0	18.0	19.0	21.0	23.0	25.0
RATED LOAD (lbs)	MAX EXT. OUTRIGGERS	1280	1280	1050	920	750	700	590	500	440
	NOT MAX EXT. OUTRIGGERS	850	700	600	530	420	380	300	220	180

 CAUTION RATED LOADS

- The rated loads show the performance of the crane on level ground and are based on the actual working radiuses including the deflection of boom under load condition. The rated loads are also based on strength and stability of crane.
- "Max extended outriggers" means inner boxes are extended to the max. extended position and a swing jack pin of each outrigger arm is inserted into the normal position. Other than the above, operate according to figures of "not max ext. outriggers"
- If even one outriggers are not fully extended, operate according to the figures of "not max. ext. outriggers".
- Improper set-up of outriggers may cause a turnover of the crane. Extend outriggers fully and Place them on firm and level ground. Make sure lock pins are inserted properly.
- Boom 1+2+3+4 means boom 4 is extended up to  mark.
- Operate according to the figures of 1+2+3 when boom 3 is extended even a bit. Do according to 1+2+3+4 when boom 4 is extended even a bit. Do according to 1+2+3+4+5 when  mark in the side of boom 4 moves away from boom 3 even a bit.

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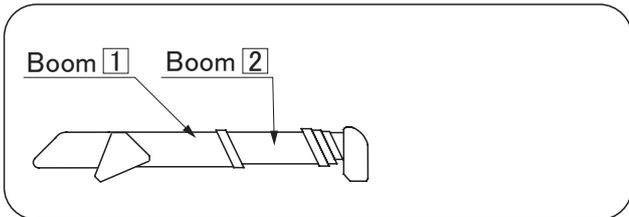
MAJOR SPECIFICATIONS



● How boom-sections are extended

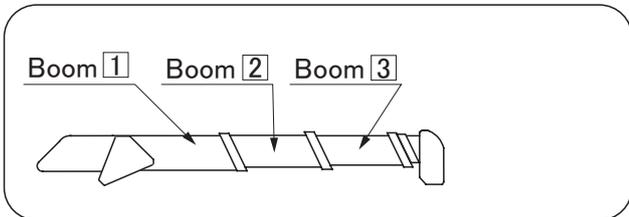
Boom : **1**

All boom sections are retracted.



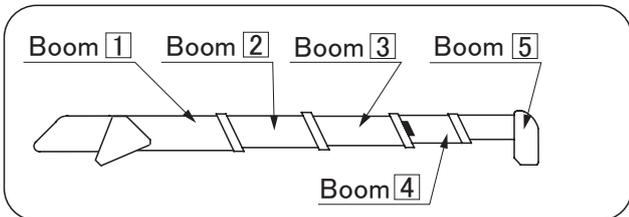
Boom : **1+2** or **2**

Boom section(2) only is extended.



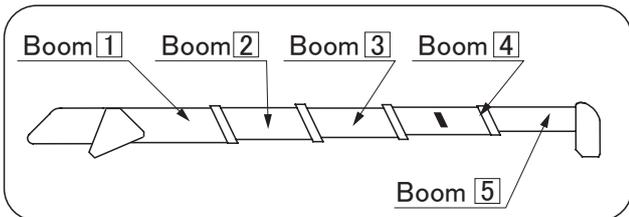
Boom : **1+2+3** or **3**

Boom sections(2) and (3) are extended.



Boom : **1+2+3+4** or **4**

Boom section(4) is extended to the mark .



Boom : **1+2+3+4+5** or **5**

Boom-sections(2), (3), (4), and (5) are fully extended.

6. 1 Inspection before crane operation



Mode indicator lamp

Do not operate the crane for about 2 seconds after starter switch has been tuened on.

The crane is carrying out the system diagnosis to prevent incorrect operation.

The mode indicator lamp is to be fully lit up for 2 seconds during the system diagnosis.

If the crane is operated during the system diagnosis, voice message , “Beep, Service remote control, Service remote control” , sounds and the crane is turned into inoperable conditions.

In this case, please turn off starter switch. Please operate the crane after turning on starter switch again and hearing Remote control ready. After the system diagnosis has been completed, operate the crane when the voice message “Remote control ready, Remote control ready” is heard.

2. How to make an emergency stop

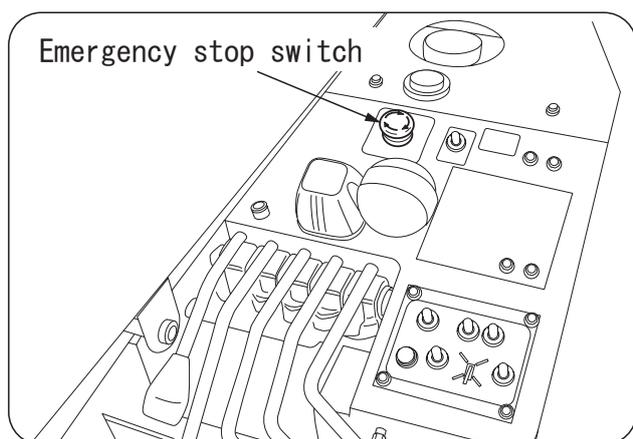
In case of emergency such as that the crane does not stop operation or the engine will not return to idling speed even if no crane operation has been made, depress the “EMERGENCY” switch on the switch panel.

This makes the crane and the engine to stop operation forcibly.

WARNING

★When releasing the emergency stop switch, release it while no crane operation is being carried out.

Releasing the emergency stop switch while operating the crane allows the crane to make an abrupt movement that is very dangerous.



●How to make an emergency stop

for the crane and reset it
Depress the “EMERGENCY” stop switch on the switch panel of crane body.

The switch is held pushed in allowing the engine to stop operation.

When the switch is held pushed in, the engine cannot be re-started.

Rotate the emergency stop switch clockwise in arrow direction to return to its original state to release the switch.

●Remarks

When the emergency stop is reset by turning the “EMERGENCY” stop switch clockwise after the crane has been stopped by depression of “EMERGENCY” stop switch, the engine speed may increase in a moment which is not abnormal.

When the crane is operated with the “EMERGENCY” stop switch held pushed in, voice message, “Beep. Service remote Service remote control” may be issued or the mode indicator lamp may show incorrect indication.

6. 3 Shock-less function

In order to prevent a lifted cargo from swinging, it allows the crane to make a smooth stop when operated through radio remote control.

When making the crane a sudden stop, actuate the “selector switch” controlling opposite function while the shock-less is functioning.

(Do not pull the speed lever during this operation.)

In order to inactivate the shock-less function, turn ON the “hook winding-down” switch with the “Mode switch” depressed.

6. 4 Interlocking balance control function

This is the function that controls the movement of lever and the engine speed for every combination of interlocking operation through radio remote control.

Examples listed below are not a fault:

When controlled through radio remote control device, the movement of lever differs each time of operation or the control lever will not be shifted to its maximum.

When operation is switched from interlocking to independent, control speed may become slower than that of the independent operation in itself. Stop the radio remote control operation once and go back to independent operation again to return it to the original control speed.

This is a measure preventing its operating speed from making an abrupt increase when operation is switched from interlocking to independent.

Following gives a serious influence on performance of interlocking operation:

Unspecified hydraulic pump has been mounted.

The rated speed of hydraulic pump has not been set as specified.

Any of control levers has been altered.

Hooking system has been changed.

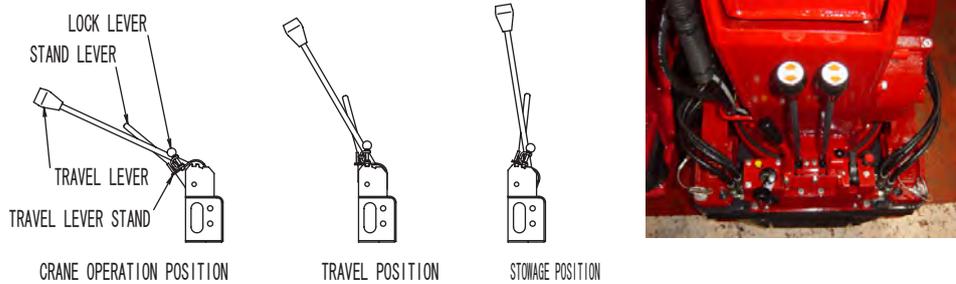
7.1 Switching of mode (Manual mode ⇔ Radio control mode)

However, this operation is possible under the following condition.

1) Starter switch on.



2) Shift the travel lever to "CRANE OPERATION" position.

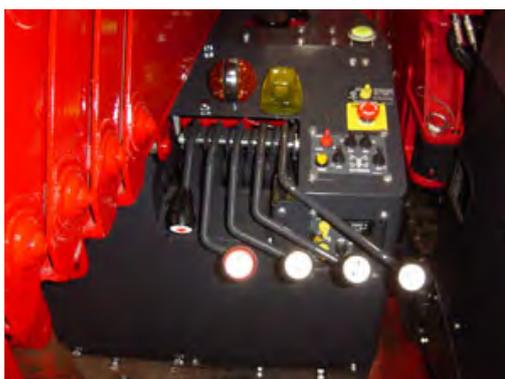


3) Push the mode selector switch to switch it to the radio remote control mode.
The Mode indicator lamp



Manual mode

The Mode indicator lamp lights off.
Manual lever only



Radio control mode

The Mode indicator lamp lights on.
Radio control only



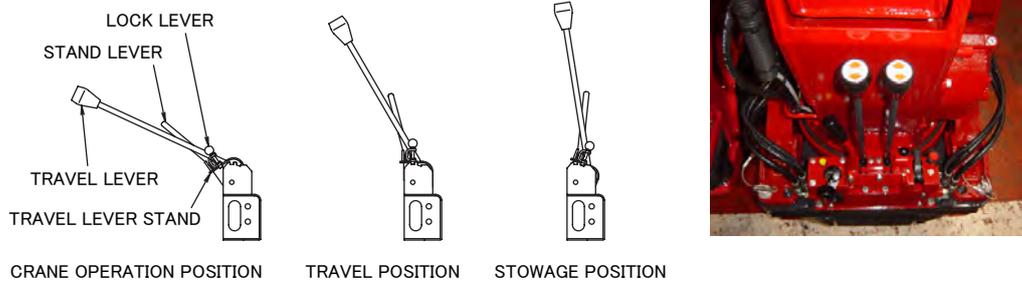
7.2 How to operate outriggers by manual lever.

However, this operation is possible under the following condition.

- 1) Starter switch on.



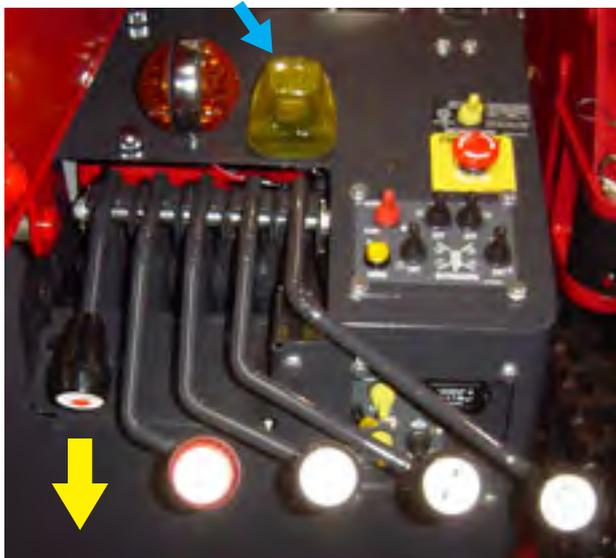
- 2) Shift the travel lever to “CRANE OPERATION.” position.



- 3) Operation mode switch is changed to the outrigger side.



Outrigger mode indicator lamp lights on.



- 4) There are four (4) outrigger control switches and each switch is numbered. Select an outrigger control switch to throw it to desired function and operate the outrigger lever accordingly.

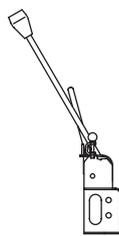
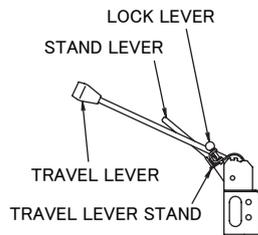
7.3 How to operate outriggers by radio control transmitter.

However, this operation is possible under the following condition.

1) Starter switch on.



2) Shift the travel lever to "CRANE OPERATION" position.



CRANE OPERATION POSITION

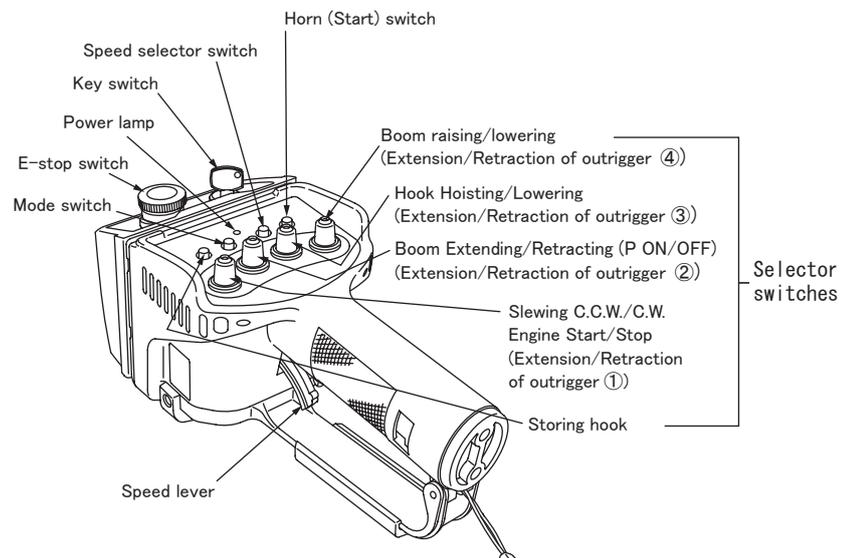
TRAVEL POSITION

STOWAGE POSITION

3) Operation mode switch is changed to the outrigger side.



4) Mode selector switch is changed.
Mode indicator lamp lights on.
Outrigger mode indicator lamp lights on.



5) The key switch of the transmitter is turned on.

6) Power lamp is lit pushing start switch i of the transmitter.

7) The selection switch is changed, and the speed lever is pulled.



7.4 Switching of mode indicator (State ⇌ Operation)

Depress both winding-up and mode selector switch simultaneously.

State indication
(normal case)



Operation indication

Depress both winding-up and mode selector switches at the same time or turn OFF power to crane and turn it ON again.



7.5 Resetting of interlocking balance control

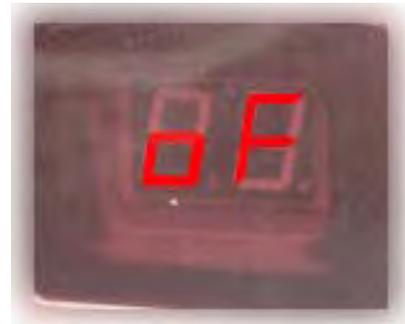


Depress the switch for storing hook with the switch for boom-down turned ON.

Retaining function of
dividing operation ON
(normal case)



Depress the switch for storing hook with the switch for boom-down turned ON.



Retaining function of
dividing operation OFF

Mode indicator shows [oF].

Voice message, "change control mode" is issued



7.6 Switching of "shockless" function (Operate it when it is not over-wound)



Turn ON winding-down switch with para-hook switch depressed.



"shockless"
(normal case)



No "shockless"
"[-]" appears on the left side of mode indicator.

Turn ON winding-up switch with para-hook switch depressed.



7.7 Switching of low-temperature operation mode



Depress the switch for storing hook with the switch for slewing C.C.W.turned ON.



Low-temperature
operation mode
OFF(normal case)



Low-temperature
operation mode ON

Depress the switch for storing hook with the switch for slewing C.W.turned ON.

Mode indicator shows [06].

Voice message, "change control mode" is issued.



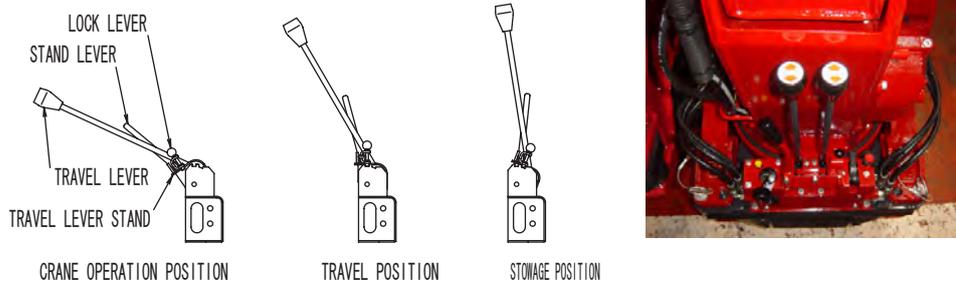
7.8 Method of engine start and stop that uses radio controller

However, this operation is possible under the following condition.

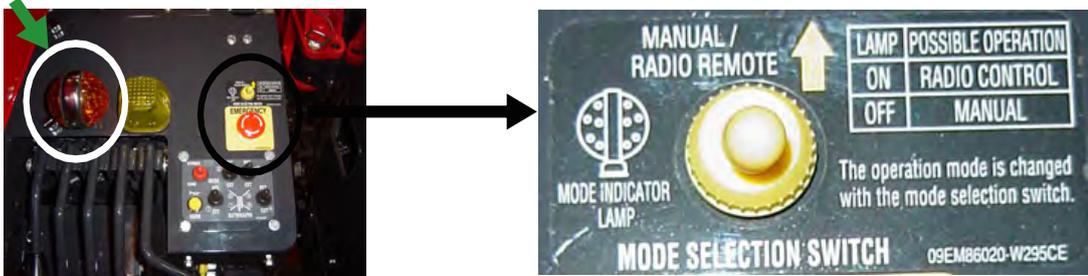
- 1) Starter switch on.



- 2) Shift the travel lever to “CRANE OPERATION.” position.



- 3) Push the mode selector switch to switch it to the radio remote control mode. The Mode indicator lamp lights on.



- 4) Key switch on.



Depress the switch for mode select with the switch for slewing C.C.W.turned ON.

Engine stop

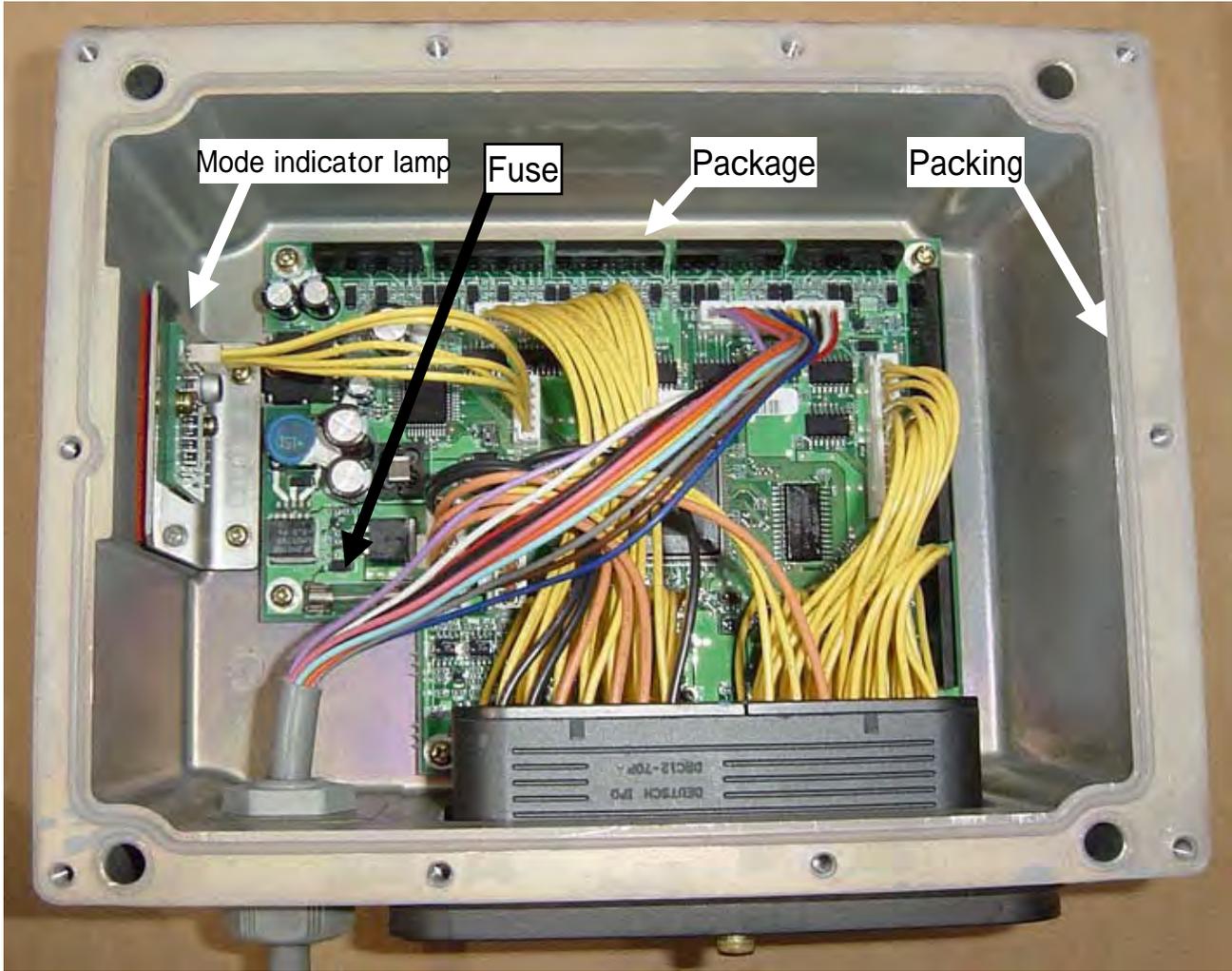


Engine start

Depress the switch for mode select with the switch for slewing C.W.turned ON.



8 . 1 Internal view of control box



Matters to be attended when carrying out electric welding

When carrying out electric welding, a large amount of electric current from the welder flows back through ground circuit which in turn may damage the control box.

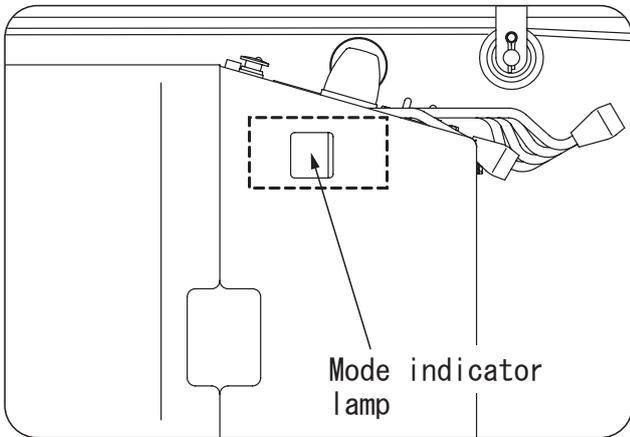
Be sure to observe the following:

- (1) Turn OFF the starter switch.
- (2) Disconnect the cable from the " - " (negative pole) terminal of battery.
- (3) Be sure to connect the ground cable of welder securely to the nearest position from the point to be welded.



FUSE type T15AL250VP
5.2 x 20mm

The “mode indicator lamp” is mounted in the control box indicating conditions of crane operation and troubles in detail.



When the “mode indicator lamp” lights, the crane system is working normally.

When the ” mode indicator lamp” blinks, the crane system is in a trouble or prohibited operation is being carried out.

8.2 Mode indication when crane is in normal operation

It indicates each operation mode and condition of the crane when it is normal. Description of mode indication when it is in normal is as follows:

Mode	Mode description	Radio control operation mode	Manual operation mode	Priority
0F	Current control is on traveling mode. No operation other than traveling is possible either by manual control or by radio remote control.	×	×	1
00	Current control is on normal crane operation mode. Operation is possible either by manual control or by radio remote control.	○	×	9
01	Current control is on normal crane operation mode. Operation can only be carried out manually but not through radio remote control device.	×	○	9
04 05	Current operation is in outrigger radio control mode. Extension and retraction of outriggers can only be possible by manual control when in manual control mode or by radio remote control when in radio remote control mode. Operation other than the above is impossible either by manual or by radio remote control.	○	×	5
		×	○	
06	Current control is on low temperature operation mode. Operation can be carried either by manual control or by radio remote control device.	(○)	(○)	8

Mode	Mode description	Radio control operation mode	Manual operation mode	Priority
07.	Current control is on low temperature operation mode. Operation can be carried by manual control but not through radio remote control.	×	○	8
10	Hook hits against weight for over-winding alarm (over-wound condition).	—	—	7
13	During operation of storing hook.	—	—	6
14	Automatic stop for over-winding reset switch is being controlled	—	—	4
15	Outriggers fail to touch the ground or overturn threshold alarm is actuated (URW series only).	—	—	2
16	Outriggers fail to be set up on the ground securely or overturn prediction alarm is actuated (URW series only).	—	—	3

●Remarks

Since priority is assigned for each mode description, it is to be indicated in the order of higher priority.

If the [.] (dot) is indicated on the bottom right of “mode indicator lamp”, it means the “radio control OFF” mode.

Crane cannot be operated through radio control transmitter.

When operated on outrigger radio control mode, crane operation other than extension/retraction of outriggers cannot be carried out.

When the shock-less function has been cancelled, the letter on the left indicated in the mode indicator changes to [-].

Mode display	
When shock-less function active:	When shock-less function inactive:
00	-0
01	-1
04	-4
06	-6
07	-7

8.3 Mode indication when crane is mistakenly operated

When prohibited operation or combination of operation which may invites dangerous situations has been carried out, the “mode indicator lamp” will blink corresponding numbers (operation error indication).

When the operation error is indicated, the ” mode indicator lamp” blinks showing corresponding numbers accordingly.

Confirm and follow the mode description concerned on the table illustrated below:

●Remarks

The operation error indication is not to indicate that the crane system is in trouble.

The error indication is to be reset when stopping the operation concerned.

Mode description when crane is mistakenly operated (Blinking indication)

Mode	Description of wrong operation	Measures to be taken
01	Radio remote control operation is carried out in manual control mode. ●Mode indicator lamp located on the top of cover will not be lit when in manual control mode.	Radio remote control cannot be carried out in manual control mode. When operating with radio remote controller, turn the selector switch located on the top of cover to radio remote control mode. ●Mode indicator lamp located on the top of cover will be lit when in radio remote control mode.
04	Crane is being operated when in outrigger mode.	Crane cannot be operated when in outrigger control mode. When operating crane, turn the mode selector switch to “crane” to select crane mode.
	Crane and outriggers are operated simultaneously.	When crane and outriggers are operated simultaneously, both operating functions are stopped automatically to avoid a risk. Stop the simultaneous operation once and carry out either one of operation.
06	“Low temperature operation mode” is being switched during crane operation.	In order to avoid a risk, “low temperature operation mode” cannot be switched during crane operation. Stop crane operation once to switch it to “low temperature operation mode” .

Mode	Description of wrong operation	Measures to be taken
10	Either one of operation such as "boom Up", "hook Up", or "boom Extend" (when operated on para-hook mode) is being carried out while hook has hit against weight for over-winding alarm.	Detach hook from weight for over-winding alarm. When raising boom through radio control device with hook hit against the weight for over-winding alarm, boom is to be "Up" while hook is winding "Down" as this operation allows hook to be released. Do not lift up a cargo while this is being indicated.
90	Emergency stop switch on the remote control device is pressed.	Release the Emergency stop switch when operating crane.
96	Operation of winding down hook is carried out while the sensor detecting minimum wire rope is being activated.	Stop winding down hook and wind it up so that the sensor detecting minimum wire rope will not be activated.

8 . 4 Mode indication of each operation

Mode indication	Operation
2 0	Fastest speed mode
2 1	Medium speed mode
2 2	Slow speed mode
2 3	2 interlocking operation
2 4	3 interlocking operation
2 5	4 interlocking operation
2 6	5 interlocking operation
2 7	6 interlocking operation
2 8	7 interlocking operation

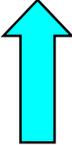
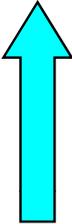
Mode indication	Operation
3 0	Raising boom
3 1	Lowering boom
3 2	Hoisting-up
3 3	Hoisting-down
3 4	Retracting boom
3 5	Extending boom
3 6	Slewing C.W.
3 7	Slewing C.C.W

Mode indication	Operation
3 8	Storing hook
3 9	Mode select
4 0	Horn
0 0 ~ 0.0	Speed: 0 ~ 100%

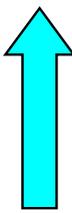
When wind-up switch of transmitter and radio control selector switch are pushed at the same time, it is change to the operation display.
It returns to the state display when wind-up switch of transmitter and radio control selector switch are pushed at the same time again.

8 . 5 Error indication

When an error is detected, the mode indicator goes off or blinks and the voice message "Service remote control" sounds.

Mode indication	Trouble		Available operation	Measures		
17	Turnover prevention error		No operation is possible.	Check all load cell wirings on outrigger and Digital Amplifier wirings. Zero-Point Adjust Digital Amplifier. Replace Digital Amplifier.		
None	System error		No operation is possible.	Replace fuse in control box. Turn power ON again. In case where it happens again, replace control box.		
42						
43						
44						
45						
46					No operation is possible.	Readjust zero point.
47					Operation is possible.	Turn power ON again.
48				In case where it happens again, replace control box.		
49						
50						
51	Failure in radio controller receiver Transmitter lever has been pulled before indication on indicator "8.8" goes off.	Transmitter switch has be depressed before indication on indicator "8.8" goes off.Signal from receiver failed to be received	Radio controller cannot be operated.	Check transmitter and receiver. After turning power ON again, wait until mode on "8.8" indicator goes off to operate radio controller. Check connection of cable to receiver.		
52						
53						
55	"Hook storing/releasing switch"on crane side has been controlled before indicator "8.8" goes off. "Radio controller selector switch" in control box has been controlled before indicator "8.8" goes off.		Operation is possible.	After turning power ON again, wait until mode on "8.8" indicator goes off to operate radio controller. Turn power ON again. In case where it happens again, replace control box.		
56	System error		No operation is possible.	Turn power ON again. In case where it happens again, replace control box.		
57						
58	Unloading error	Radio controller cannot be operated.	Replace control box.			
60	Spool neutral error Manual lever (spool) fails to be returned to neutral within 2 seconds after power has been turned ON.	Derrick	No operation is possible.	After turning power ON again, wait until "8.8" on mode indicator goes off to operate radio controller. Check that manual lever has not been caught. If lever has no problem, replace proportional solenoid valve.		
61		Hoisting				
62		Telescoping				
63		Slewing				
64		Outrigger				
65		Acceleration				

When an error is detected, the mode indicator goes off or blinks and the voice message "Service remote control" sounds.

Mode indication	Trouble	Available operation	Measures
66	Outrigger selection switch	Front right RET/EXT	Damaged switch exchange It is possible to operate it excluding the damaged switch.
67		Front left RET/EXT	
68		Rear right RET/EXT	
69		Rear left ET/EXT	
70	Spool deviation error. Manual lever (spool) fails to be controlled as intended while radio controller is operated.	Derrick	No operation is possible. Check if oil pressure is applied.
71		Hoisting	
72		Telescoping	
73		Slewing	
74		High outrigger	
75		Acceleration	
76	Transmitter switch is broken.	Derrick	
77		Hoisting	
78		Telescoping	
79		Slewing	
80	Feed-back signal wire is broken. Differential transformer is not functioning normally.	Derrick	No operation is possible. Check connector of differential transformer for connection. If there is no problem, replace differential transformer.
81		Hoisting	
82		Telescoping	
83		Slewing	
84		Outrigger	
85		Acceleration	
98	The voltage of the battery is nine volts or less.	No operation is possible.	Battery exchange 98 blinking when the engine starts is not abnormal.
99	Transmitter batteries are dead. When batteries have run out, voice message requesting replacement of batteries is to be issued.	Operation is possible.	Replace batteries of transmitter to turn it ON again. Radio controller is wrong unless power indicator lamp on transmitter lights or blinks quickly.

8. 6 Zero point adjustment

Start "Store Hook" SW being pushed one by one from the "CC" blinking when you do not exchange the control boxes.

Mode indication

Setting procedures

Engage start or ACC/ON key switch.

Depress "Mode selector" switch and "Slewing C.W." switch simultaneously until beep sound is heard, then depress "Slewing C.C.W." switch within 2 second with "Mode selector Operation mode" switch depressed

Blinks for 5 seconds



Depress "Store Hook" switch.

Figures blink

Specification	Figures	Figures
Normal	0	0
Automatic stop leaving minima wire rope	0	1

Depress "Store Hook" switch.

Setting neutral position of spool

Blinks



Check each lever and the accelerator is at its neutral position to depress "Store Hook" switch.

Setting full stroke position of spool

Blinks



Shift lever in both directions to their full strokes.

Actuate accelerator cylinder to full stroke.

Depress "Store Hook" switch.

Lights



This completes zero point adjustment

Mode indicator



Mode selector switch



8. 7 Zero point adjustment procedures when spool, differential transformer, or accelerator unit has been replaced

The adjustment is needed only when any of following components has been disassembled/re-assembled or replaced: Differential transformer, Spool, Acceleration cylinder, and Control valve.

1. Engine start or ACC/ON key switch

2. Depress "Mode selector" switch and "slewing C.W." switch simultaneously until beep sound is heard, then depress "slewing C.C.W." switch within 2 second with "Mode selector" switch depressed.

Mode indication
"—" blinks.

3. Depress "Store Hook" switch within 5 seconds until beep sound is heard. Blinking "figures" is for setting type code

"Figures" blinks.

Mode indicator

Specification	Figures	Figures
Normal	0	0
Automatic stop leaving minimum wire rope	0	1

When the figure had blinked, it had not fixed it yet.

4. A left display of "Mode indication" is displayed by operating "Boom up/down selector" SW, "0".

Afterwards, depress "Store Hook" switch

5. A right display of "Mode indication" is displayed by operating "Boom up/down selector" SW, "0" or "1" or "2".

Afterwards, depress "Store Hook" switch

6. Depress "Store Hook" switch again until beep sound is heard.

"CC" blinks.

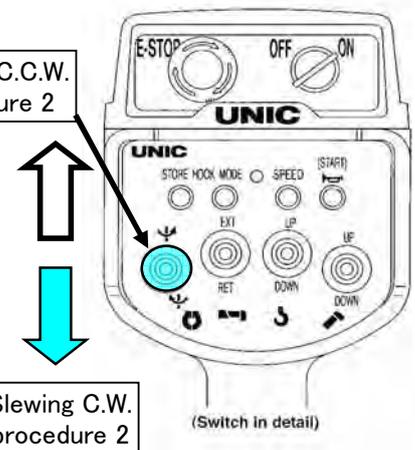
7. Check that each manual control lever stays at its neutral position.

8. Depress "Store Hook" switch again until beep sound is heard.

"CF" blinks.

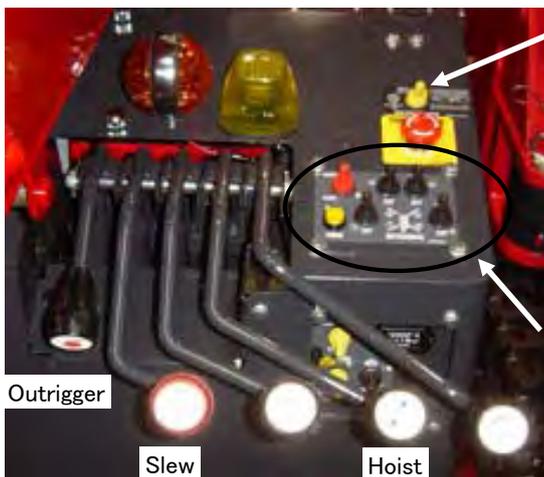
9. Shift manual levers for controlling boom derrick, hook Up/Down, telescoping, slewing, and outrigger in both directions to their full strokes.

Slewing C.C.W. procedure 2



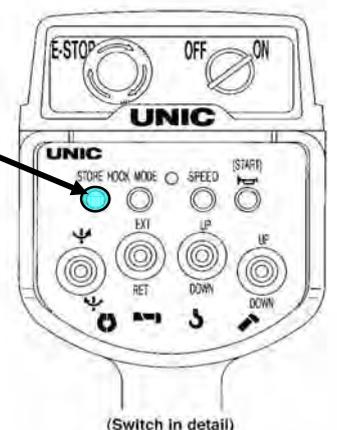
Slewing C.W. procedure 2

(Switch in detail)



Mode selector switch

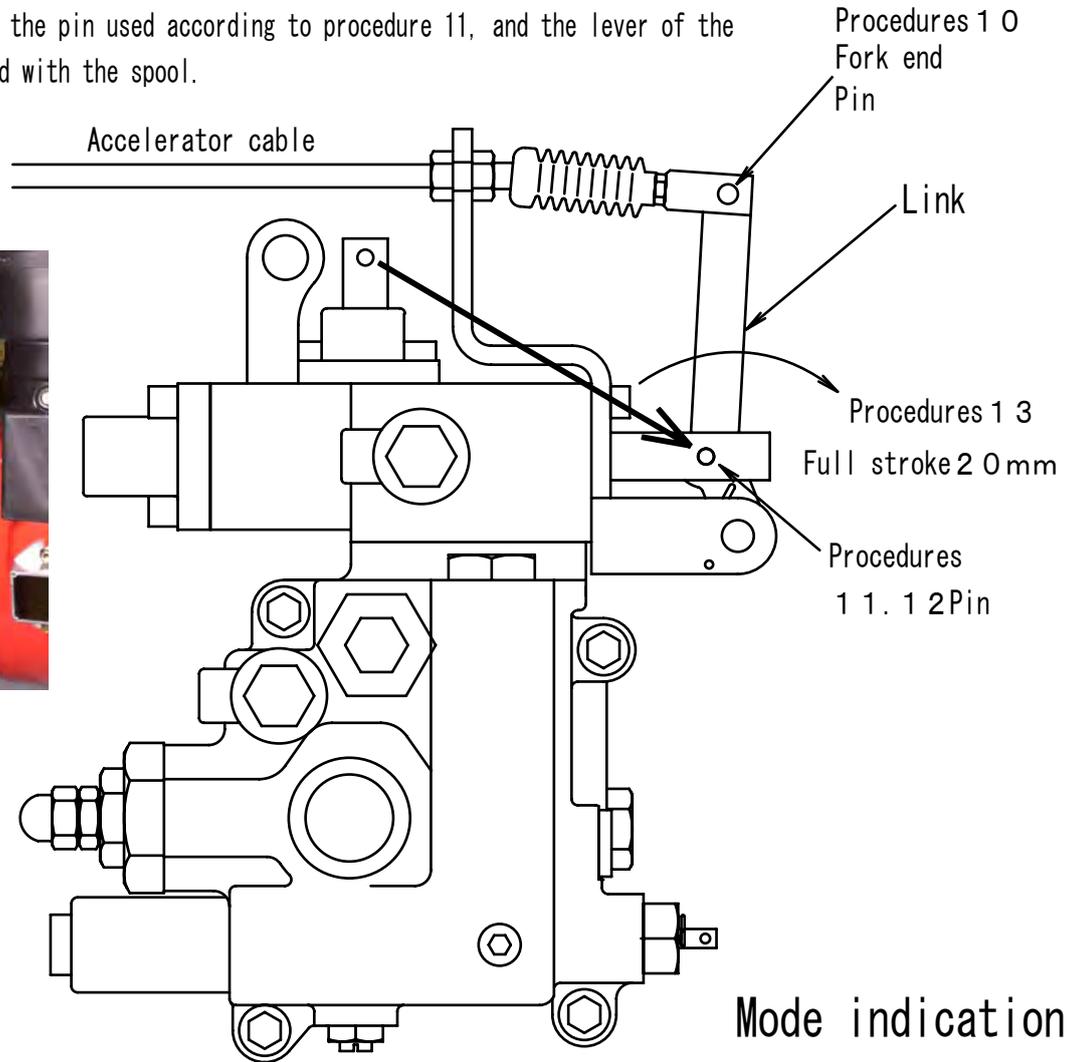
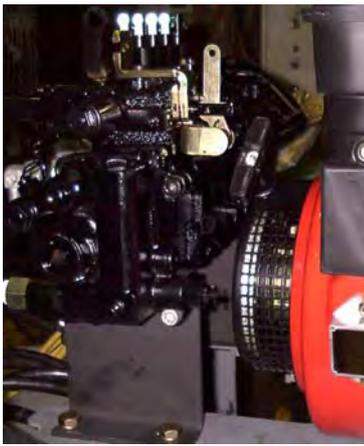
Store Hook procedure 3,4,5,6,8



(Switch in detail)

The switch of the Outrigger operation is not operated at this time.

- 1 0. The pin that connects the fork end of the accelerator cable with the link is pulled out, and the cable is made free.
- 1 1. The pin that connects the lever of the derrick with the spool is pulled out.
- 1 2. Connect the acceleration cylinder with the link by using the extracted pin.
- 1 3. Rotate the link with a spanner to move the acceleration cylinder in full stroke.
- 1 4. It returns based on the pin used according to procedure 11, and the lever of the derrick is connected with the spool.



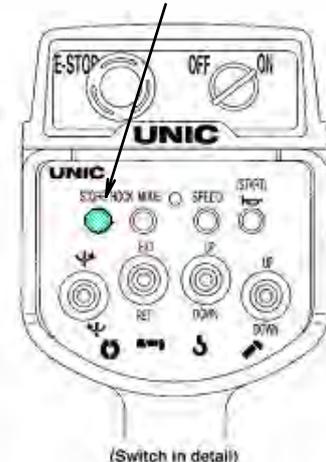
Mode indication
 " 8 . 8 . " light
 " 0 0 " light

When Store Hook SW is pushed according to procedure 15, 0 point adjustment is fixed.

- 1 5. Depress the "Store Hook" switch on the remote controller until voice message, "Remote control ready", is heard.
- 1 6. This completes the zero point adjustment of spool.

Procedures 1 5
Store Hook switch

Error will be indicated if all manual levers and acceleration cylinder have not been moved to their full strokes. If this happens, return to the procedure 6 to retry.



Mode indication	Where in error	Mode indication	Where in error
d	Derrick	S	Slewing
H	Hoisting	o	Outrigger
T	Telescoping	A	Acceleration cylinder

8. 8 Mode indication when zero point adjustment has been in failure

When differential transformer has not been connected, following modes blink:

Mode indication	Where in error	Mode indication	Where in error
d . . .	Derrick	o . r .	Outrigger: Right
H . . .	Hoisting	o . L .	Outrigger: Left
T . . .	Telescoping	o . d .	Outrigger: Right/Left
S . . .	Slewing	A . . .	Acceleration

When full stroke for the spool has not been set correctly, following modes blink:

Mode indication	Where in error	Mode indication	Where in error
d . . .	Derrick down	o . r .	Outrigger right: Retract
d . . .	Derrick up	o . r .	Outrigger right: Extend
H . . .	Hoisting down	o . L .	Outrigger left: Retract
H . . .	Hoisting up	o . L .	Outrigger left: Extend
T . . .	Telescoping extend	o . d .	Outrigger right/left: Extend
T . . .	Telescoping retract	o . d .	Outrigger right/left: Retract
S . . .	Slewing C.C.W.	A . . .	Acceleration
S . . .	Slewing C.W.		

Control box



Mode indicator



Dot on the left

Dot on the right

8-9 How to correct crane operation speed when it will not be right even after pump has been set at the rated speed

Slewing speed may be too fast or too slow (Speed between 35 and 45 seconds per revolution is normal). If this occurs, adjust it as follows:

Step1

Turn ON the voice switch with the crane on working conditions.

Step2

Keep depressing the reset switch for overwinding automatic stop and the mode selector switch simultaneously. When in the accelerator adjustment mode, "A C" of mode indicator blinks and make a "beep" sound.

Step3

Shift the slewing lever to either direction slightly to read the mode indicator for blinking figures. Factory set accelerator rate: 70

Step4

If slewing is too fast: Shift the lever toward C.C.W. to decrease the figures on the mode indicator by 5.

If slewing is too slow: Shift the lever toward C.W. to increase the figures on the mode indicator by 5.

Step5

Keep depressing the reset switch for overwinding automatic stop. This allows to give off a sound and turn into normal mode to settle the accelerator rate for slewing.

Step6

If slewing speed will be out of the rated range: Return to step 2 to re-adjust the accelerator rate for slewing.

If slewing speed will be within the rated range: Follow the same procedures of steps 3 through 5 to adjust acceleration rate by increasing and decreasing by the same amount as for slewing, derrick-down, retraction of boom, extension and retraction of outrigger, and retraction of high-outrigger. For outriggers, adjustment of either outrigger on this side or on other side is accepted.

Reason why the accelerator rate should be increased or decreased by the same amount as that of the slewing:
The slewing speed may not reach the rated speed even if the speed has been set according to the "Engine speed setting table". This means that derrick-down, retraction of boom, and retraction of high-outrigger which come to relief pressure before reaching the rated speed in the same way are out of normal speed or the outriggers have been set to half throttle. In order to make a correction, the accelerator rate has to be adjusted.

Factory set accelerator rate

Operation by which working pressure releases before reaching the rated speed. Although pressure for extension and retraction of outrigger does not reach the relief pressure, the speed is limited to half throttle.

Lowering boom	80
Retracting boom	80
Slewing C.W./C.C.W.	70

Mode indicator Voice
Normal mode

Accelerator adjustment mode
"A C" blinks Beep
Figures blink

Figures blink

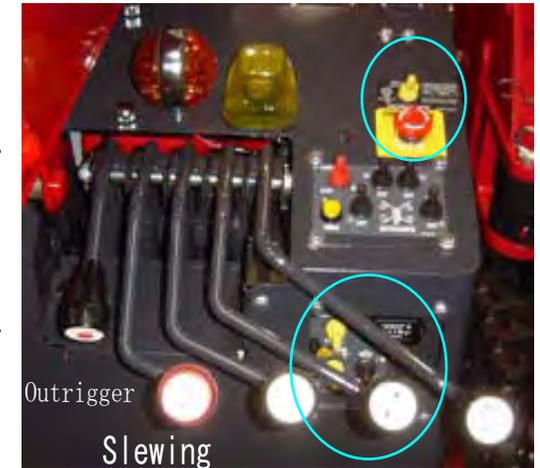
Normal mode
"Remote control ready"

In case where accelerator adjustment mode is canceled to return to normal mode.

- 1 minute has passed without any operation.
- Depress mode selector switch.

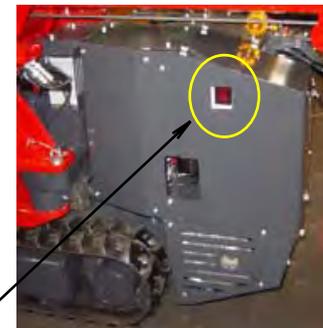


Mode selector switch



Shifting the lever to derrick-down, extending boom, and slewing C.C.W. decreases the accelerator rate. Figure varies successively with the lever kept being shifted.

Shifting the lever to derrick-up, retracting boom, and slewing C.W. increases the accelerator rate. Figure varies successively with the lever kept being shifted.



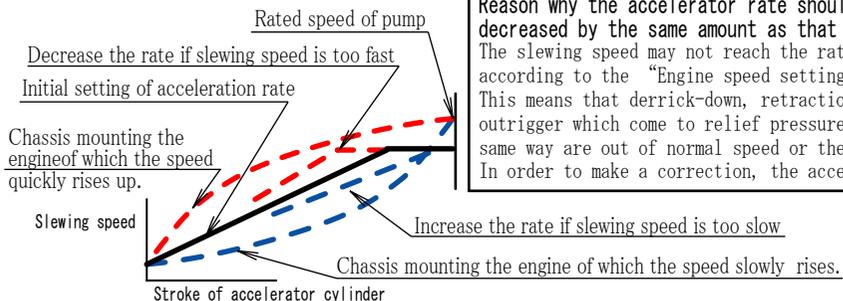
Mode indicator Showing accelerator rate



Reset switch for overwinding automatic stop

Alarm sound ON/OFF switch

(8-12)



8.10 How to correct engine speed when operating at medium and slow speed by radio remote control

When setting the engine speed, it is normal if the engine speed is as follows:

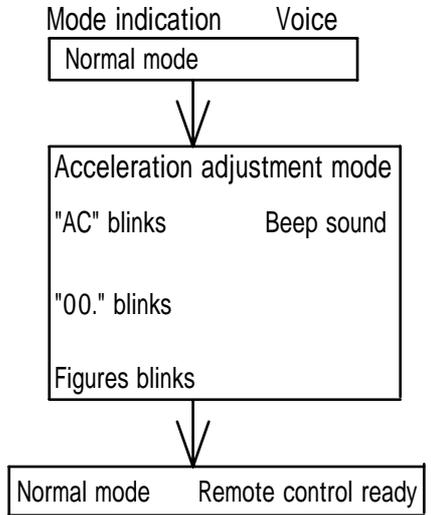
Engine speed on the medium speed mode is about half the speed on the maximum speed mode.

Engine speed on the slow speed mode is somewhat higher than the idle speed.

Prerequisite: Slewing speed on maximum speed must be somewhere between 35 and 40 seconds per revolution.

Procedure

- 1 Turn ON the voice switch with the crane under operating condition.
- 2 Depress both "the reset switch for overwinding automatic stop" switch and "mode selector" switch at the same time for a certain amount of time.
When it is turned into acceleration adjustment mode, "AC" blinks and "Beep" sounds.
- 3 Medium speed correction Turn speed mode to "Medium"
(Power indicator lamp on transmitter lights in orange.)
Slow speed correction Turn speed mode to "Slow"
(Power indicator lamp on transmitter lights in green.)
Only one of corrections above is necessary.
- 4 When too slow: Throw selector switch on transmitter to "Up" to decrease mode indication by 10.
When too fast: Throw selector switch on transmitter to "Down" to increase mode indication by 10.
- 5 Depress the reset switch for overwinding automatic stop switch for a certain period of time.
Voice sounds, mode returns to normal, and acceleration rate for medium and slow mode is to be fixed.
Depression of mode selector switch allows acceleration adjustment mode to return to normal mode.



Mode selector switch



Reset switch for overwinding automatic stop switch



Voice switch



Power indicator lamp
 Red Maximum speed mode
 Orange Medium speed mode
 Green Slow speed mode

Acceleration rate decreases
 Up ↑
 Down ↓
 increases

Caution

Initial setting on factory shipment is "100" for either medium or low speed mode.

Changeable range of acceleration rate on both medium and low speed modes:

Minimum ~ Initial ~ Maximum
 0 100 199

If indication of acceleration rate is more than 100, Dot mark "[.]" appears on the bottom-right side.

Example: 90 90 100 00. 110 10.

Unlike the maximum speed mode, adjustment for each operation is impossible when in medium and low speed mode. The acceleration adjustment mode returns to the normal mode by "waiting for 1 minute without operation" or by "depression of mode selector switch".

Mode indicator Showing accelerator rate

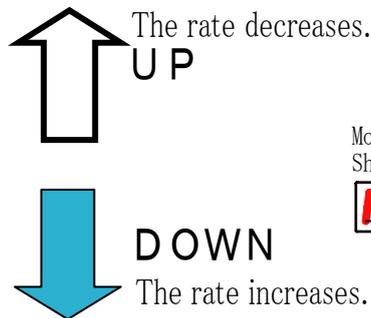


8.11 How to correct store of hook

Procedure

- 1 Turn on the voice switch with the crane under operating condition.
- 2 Depress both "the reset switch for overwinding automatic stop" switch and "mode selector" switch at the same time for a certain period of time. When it is turned into acceleration adjustment mode, "AC" blinks and "Beep" sounds.
- 3 Depress the horn switch of the radio controller transmitter. Hh blinks when becoming a hook storage adjustment mode. Depress the mode selector switch to start over from the beginning when the operation has been mistake and the mode display indicates PC. When the set value has been changed in the PC mode operating performance is affected.
- 4 Confirm the initial value by controlling the hook UP/Down switch on the transmitter to hook up once.
- 5 When allowing the speed of winding up hook to be faster. Control the hook down switch on the transmitter to increase mode indication by 0.1 at a time. When allowing the speed of winding down hook to be slower. Control the hook up switch on the transmitter to decrease mode indication by 0.1 at a time.
- 6 Throw the "the reset switch for overwinding automatic stop" switch to "reset to memorize the setting. The voice sounds and it returns to normal mode.

Mode indication	Voice
Normal mode	
Hook store adjustment mode "A C" blinks	Beep
"H h" blinks	
W295C→7.5 blinks	
Figure blinks	
Normal mode	Remote control ready



Mode indicator
Showing accelerator rate



Automatic stop for over-winding reset switch

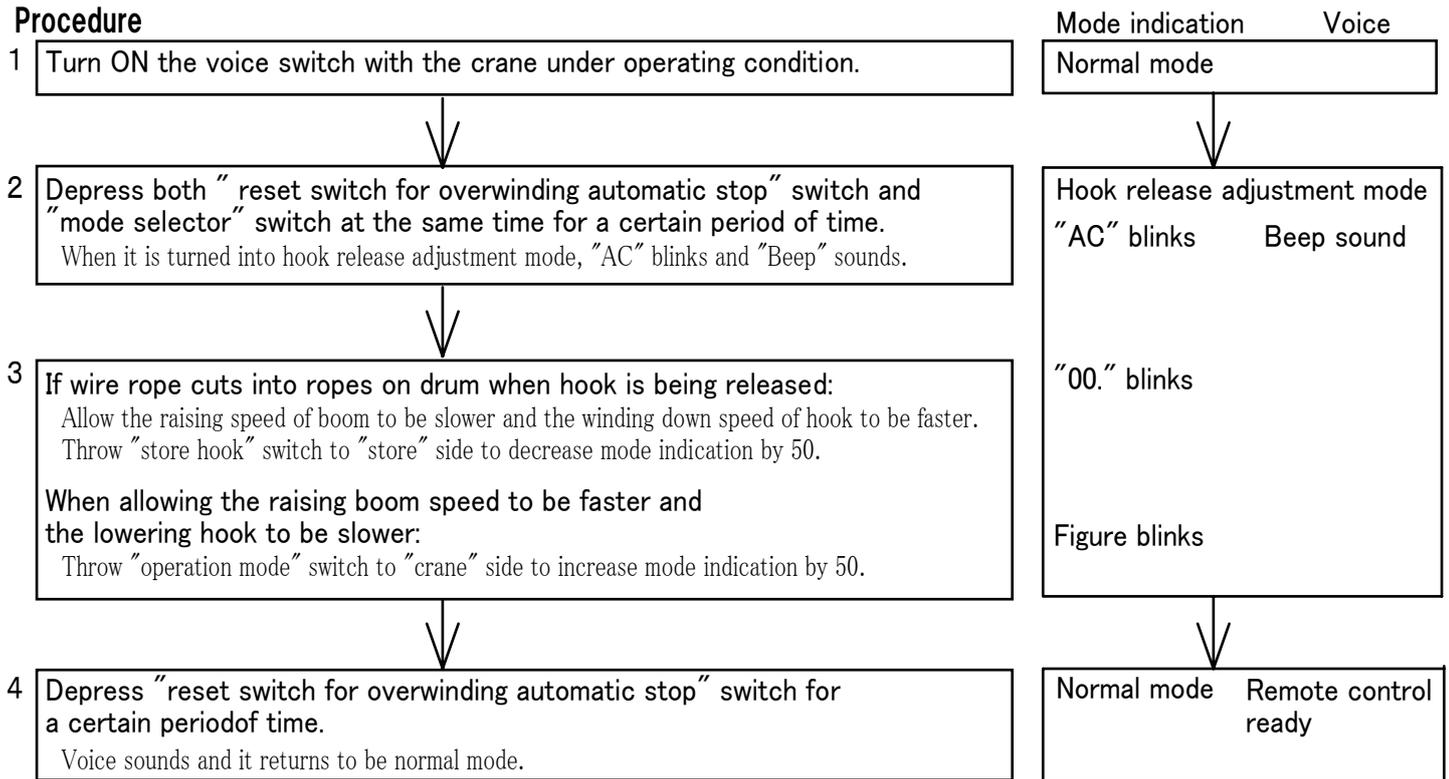


Mode selector switch



8.12 How to correct release of hook

Procedure



Caution

Initial setting for the rate of releasing hook on factory shipment is "100".

Changeable range of hook release: Minimum~Initial~Maximum

0 100 199

If indication of hook release is more than 100, dot mark "[.]" appears on the bottom-right side.

Example: 90 ⇒ 90 100 ⇒ 00. 110 ⇒ 10.

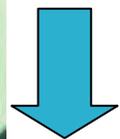
The hook release adjustment mode returns to the normal mode by "waiting for 1 minute without operation" or by "depression of model selector switch".



The rate decreases.

UP

Mode indicator
Showing accelerator rate



DOWN

The rate increases.



Mode selector switch



Hook storing switch

Reset switch for overwinding automatic stop



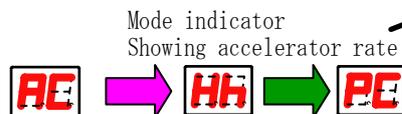
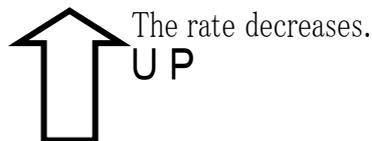
8.13 PWM value correction procedure

Procedure

- 1 Turn ON the voice switch with the crane put under operating condition.
- 2 Depress the "reset switch for overwinding automatic stop" switch and the "mode selector" switch at the same time for a certain period of time. When it is turned into acceleration adjustment mode, "AC" blinks and "Beep" sounds.
- 3 Depress the horn switch on the radio control transmitter "Hh" blinks when turned into hook storage adjustment mode.
- 4 Depress the horn switch on the radio control transmitter. "PC" blinks when turned into PWM adjustment mode.
- 5 Confirm the initial value by controlling the hook Up/Down switch on the transmitter to hook up once.
- 6 Throw the hook Up/Down switch on the transmitter to hook up to allow the indication showing "2".
- 7 Throw the "reset switch for overwinding automatic stop" switch to "reset" to memorize the setting. The voice sounds and it returns to normal mode.

Mode indication	Voice
Normal mode	
Hook store adjustment mode "AC" blinks	Beep
"Hh" blinks	
PWM adjustment mode "PC" blinks	
"O 4" blinks (PWM initial value)	
"O 2" blinks	
Normal mode	Radio control ready

Check the operation to complete the work if the hunting will not occur. If the hunting still persists, repeat the work from the procedure 2 and see the state by increasing the indication to "6" at the procedure 6.



Reset switch for overwinding automatic stop



Mode selector switch

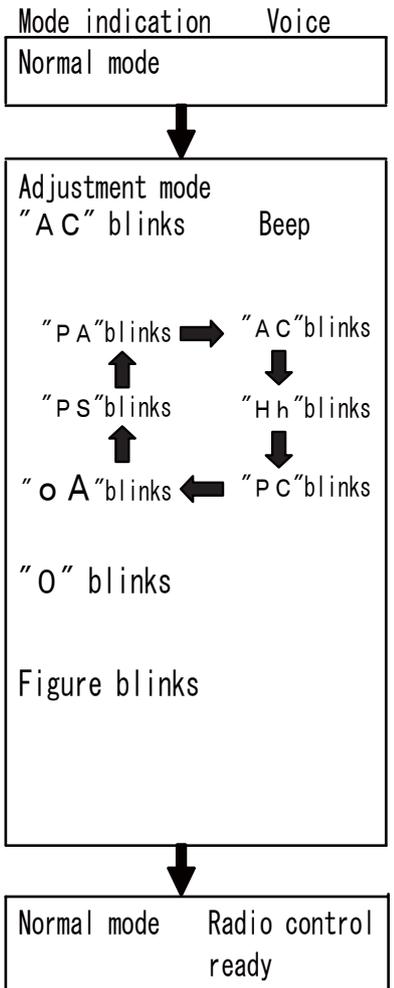


8.14 Outrigger operation idol improvement procedure

When Crane operates four outrigger at the same time, the load of the pump might become large too much. Therefore, the engine might stop when outrigger is operated by a low engine rotation. The idol improves when four outrigger is operated at the same time to prevent this. The amount of the idol improvement is set beforehand. However, it can be adjusted if necessary.

Procedure

- 1 The power supply is turned on to the control box.
- 2 Depress the "automatic stop for over-winding reset" switch and the "radio remote control selector" switch at the same time for a certain period of time. When it is turned into acceleration adjustment mode, "AC" blinks and "Beep" sounds.
- 3 Depress the horn switch on the radio controll transmitter and Mode indication of the control box is made "oA"
- 4 Confirm the initial value by controlling the winding Up/Down switch on the transmitter to winding up once.
- 5 Method of improving response of spool when radio controller is operated
 - ↳ The rate increases by operating the down switch of the transmitter.
 - ↳ The spool vibrates little by little when the radio controller is operated.
 - ↳ The rate decreases by operating the up switch of the transmitter.
- 6 Throw the "automatic stop for over-winding reset" switch to "reset" to memorize the setting. The voice sounds and it returns to normal mode.



Caution

Initial setting for the rate of servo gain on factory shipment is "0".

Stroke of accelerrator cylinder : 0 ~ 19.9 mm

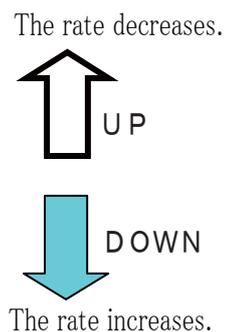
Mode indicator : 0.0 ~ 9.9.

Example

accelrator cylinder : 0 ~ 1.0 ~ 9.9 ~ 10.0 ~ 10.1 ~ 11.0 ~ 19.9

Mode indicator : 0.0 ~ 1.0 ~ 9.9 ~ 0.0. ~ 0.1. ~ 1.0. ~ 9.9.

The adjustment mode returns to the normal mode by "waiting for 1 minute without operation" or by "depression of radio remote control selector switch".

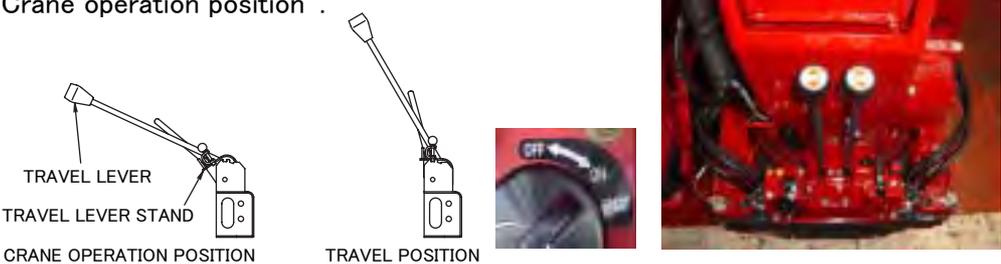
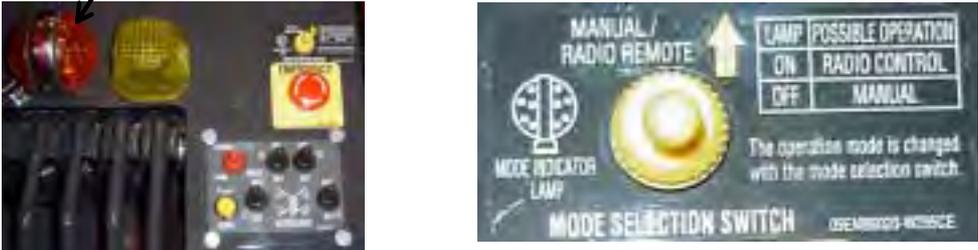
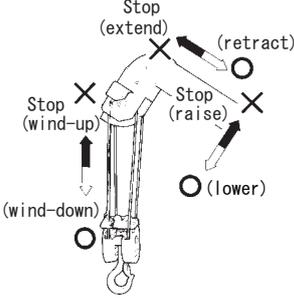


Mode indication

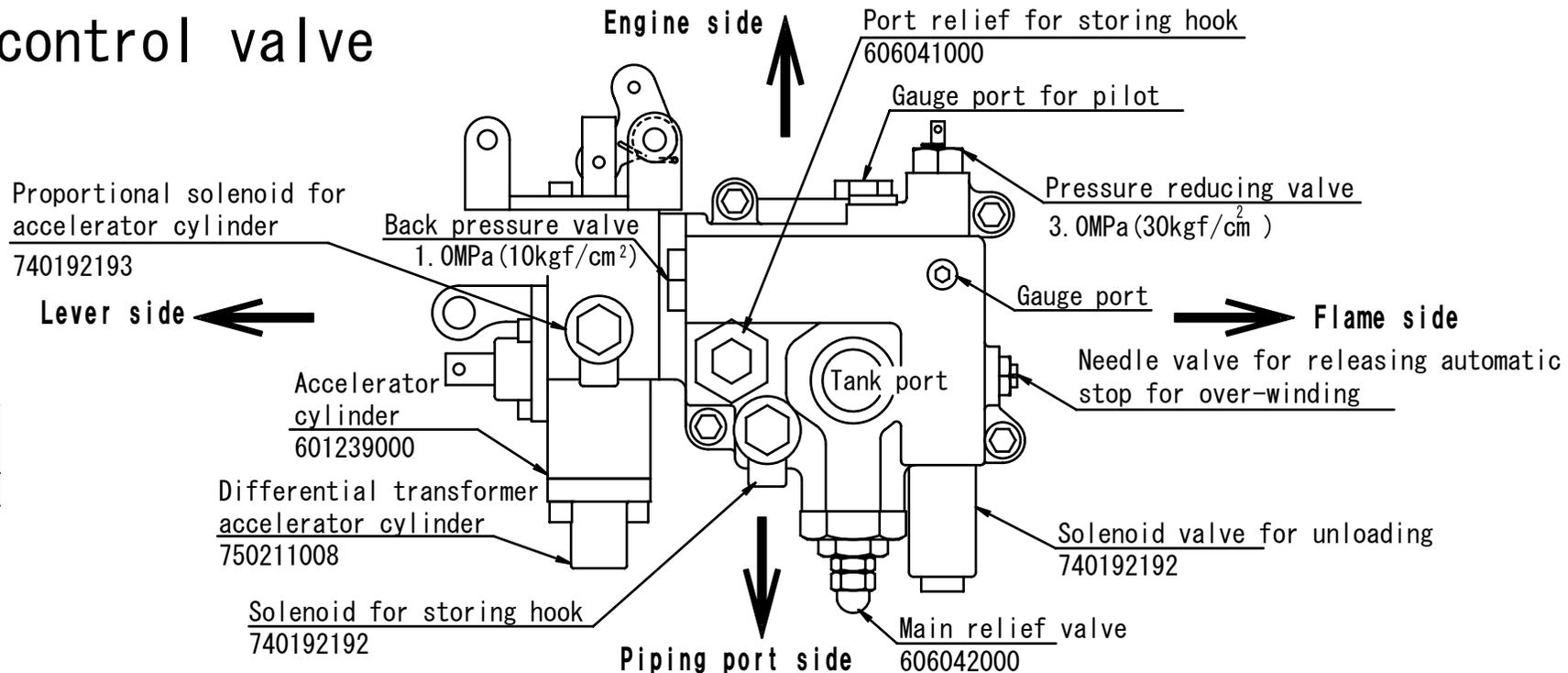


Automatic stop for over-winding reset switch

8.15 Voice message list

<p>Crane mode</p>	<p>Starter switch on. And when you change "Travel lever" from "Travel position" to "Crane operation position".</p>  <p>TRAVEL LEVER TRAVEL LEVER STAND CRANE OPERATION POSITION TRAVEL POSITION</p>						
<p>Outrigger mode</p>	<p>When "Operation mode switch" is changed to "Outrigger side", and "Outrigger mode indicator lamp" lights.</p> 						
<p>Remote control ready</p>	<p>When "Mode selector switch" is changed to "Remote control mode", and "Mode indicator lamp" lights.</p>  <p>MANUAL/ RADIO REMOTE MODE INDICATOR LAMP MODE SELECTION SWITCH</p> <table border="1"> <thead> <tr> <th>LAMP</th> <th>POSSIBLE OPERATION</th> </tr> </thead> <tbody> <tr> <td>ON</td> <td>RADIO CONTROL</td> </tr> <tr> <td>OFF</td> <td>MANUAL</td> </tr> </tbody> </table> <p>The operation mode is changed with the mode selection switch.</p>	LAMP	POSSIBLE OPERATION	ON	RADIO CONTROL	OFF	MANUAL
LAMP	POSSIBLE OPERATION						
ON	RADIO CONTROL						
OFF	MANUAL						
<p>Stop winch up</p>	<p>The hook stops being wind-up automatically when it hits against the weight for over-winding alarm.</p> 						
<p>Secure lifting hook</p>	<p>When the Hook store switch is operated.</p> 						
<p>Change control mode</p>	<p>When changed to the low temperature operation mode. When the low temperature operation mode has been released.</p>						
<p>Service remote control</p>	<p>When the mode display blinks one of [42-58] and [60-85].</p>						
<p>Low transmitter battery</p>	<p>When the battery of the transmitter has been run out.</p>						

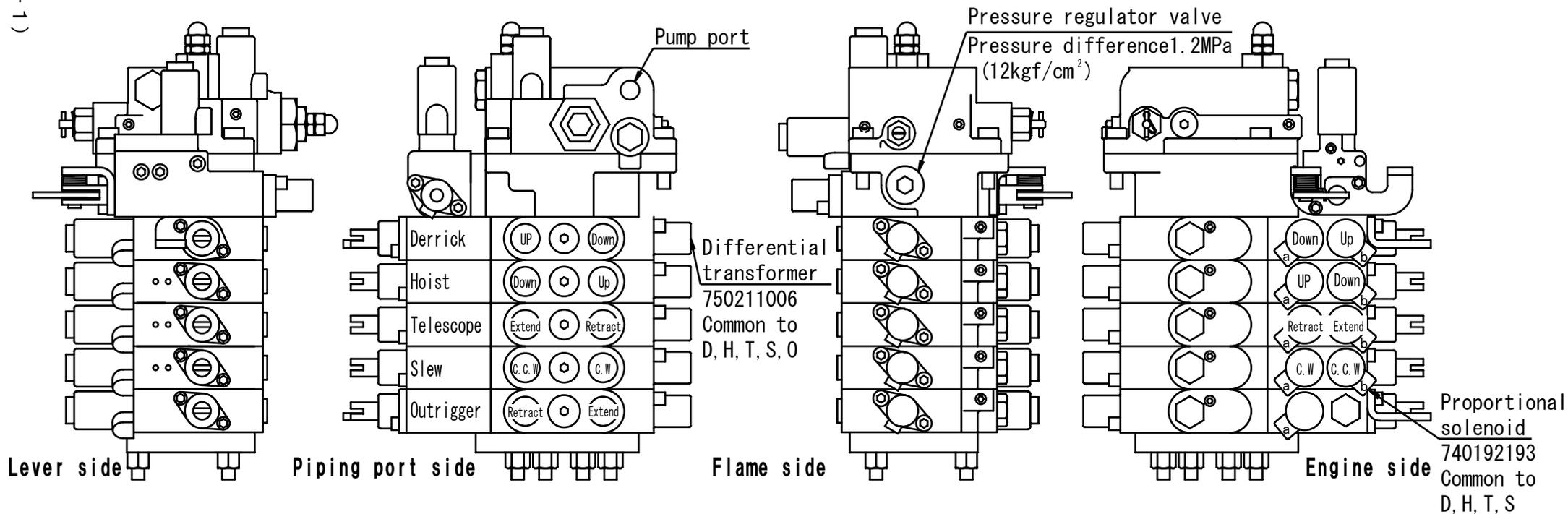
9.1 MRV-500 control valve



Main relief set pressure	Pump speed
20.6MPa (210kgf/cm ²) at 38L/min	2000 rpm

Relief for storing hook set Pressure
3.9MPa (40kgf/cm²) at 17L/min

(9 - 1)

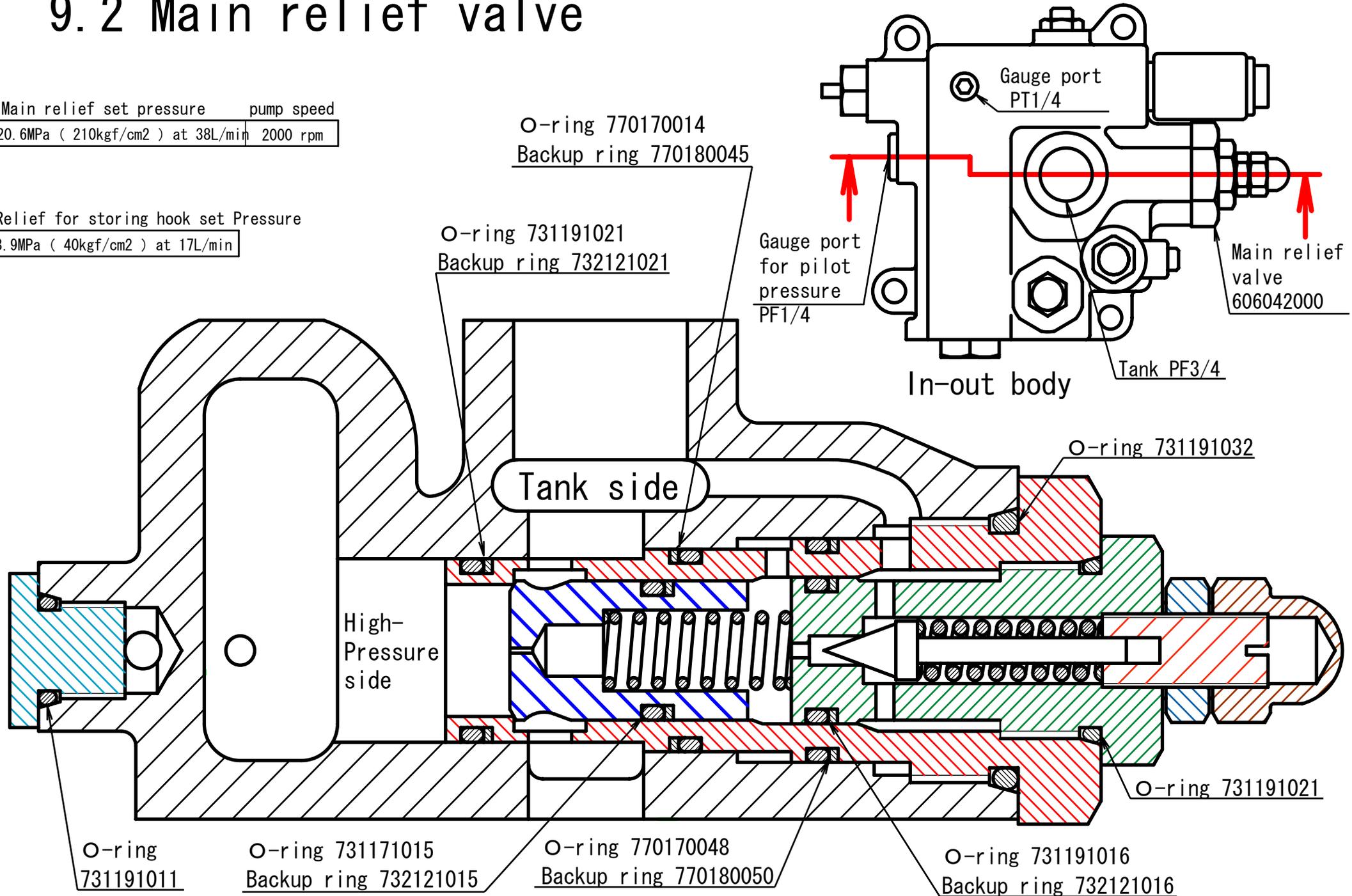


9.2 Main relief valve

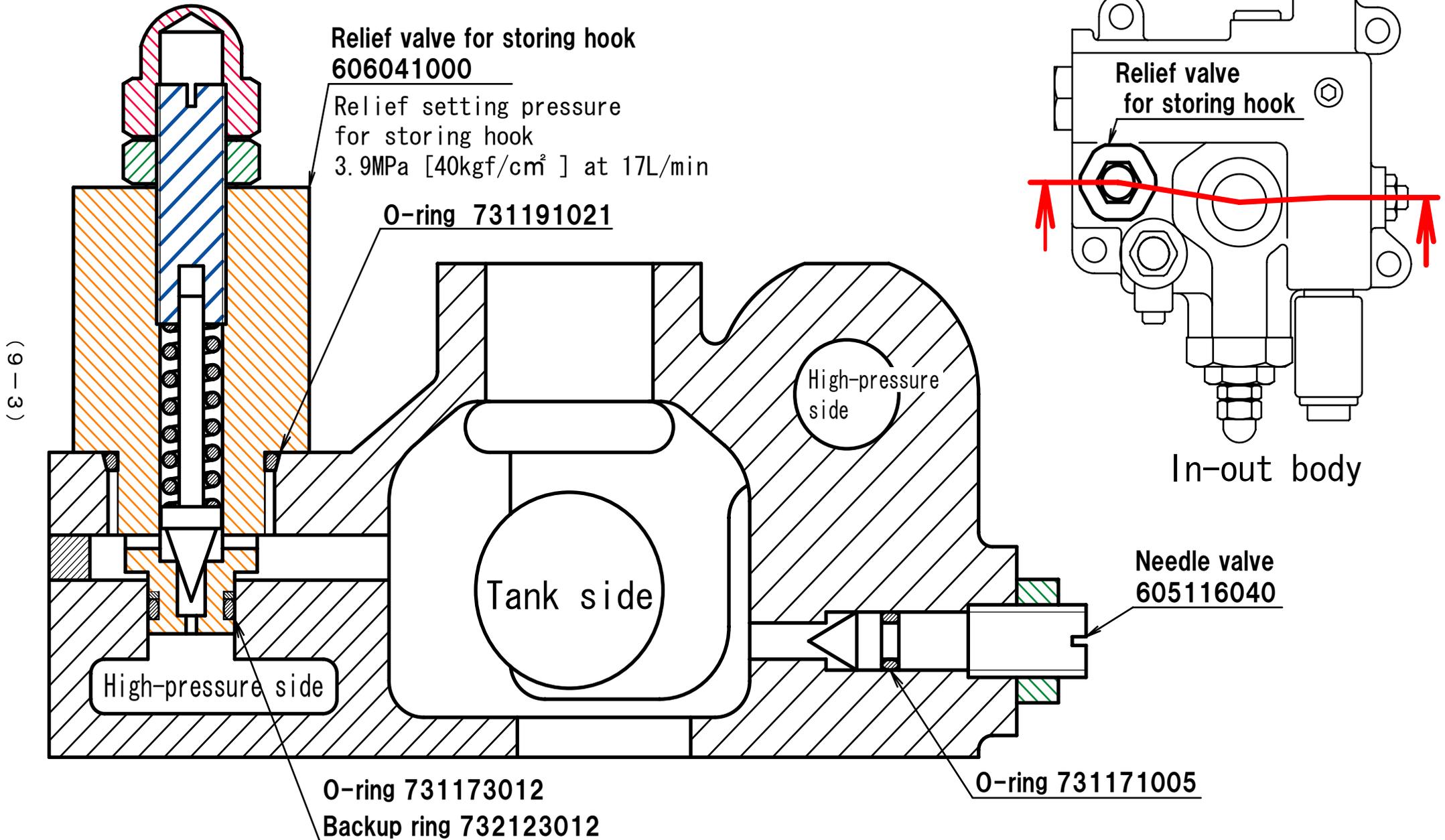
Main relief set pressure	pump speed
20.6MPa (210kgf/cm ²) at 38L/min	2000 rpm

Relief for storing hook set Pressure
3.9MPa (40kgf/cm ²) at 17L/min

(9 - 2)



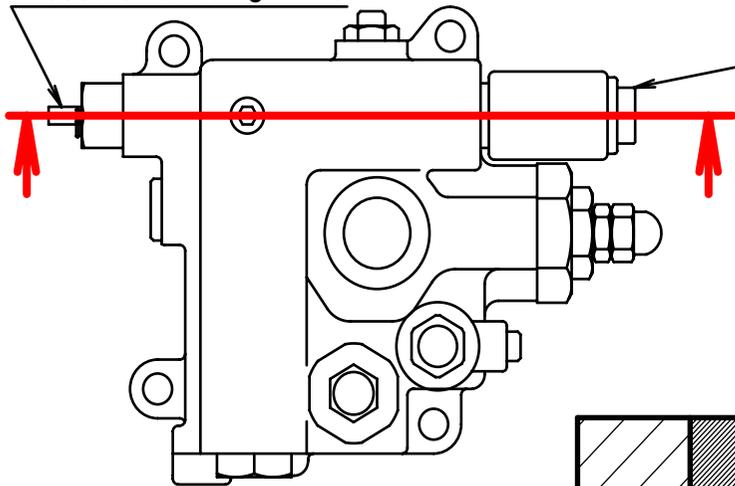
9.3 Relief valve for storing hook



9.4 Pressure reducing valve

Pressure reducing valve

Solenoid valve for unloading
740192192



In-out body

O-ring 731171005
Back-up ring
732121005

Sleeve

Spring

Pump port
PF1/2

Main relief
To be connected to
pilot section

O-ring
731171512

Push-rod

Spool

O-ring
731191014

Filter 605686290
Parts of regular replacement

Pilot pressure

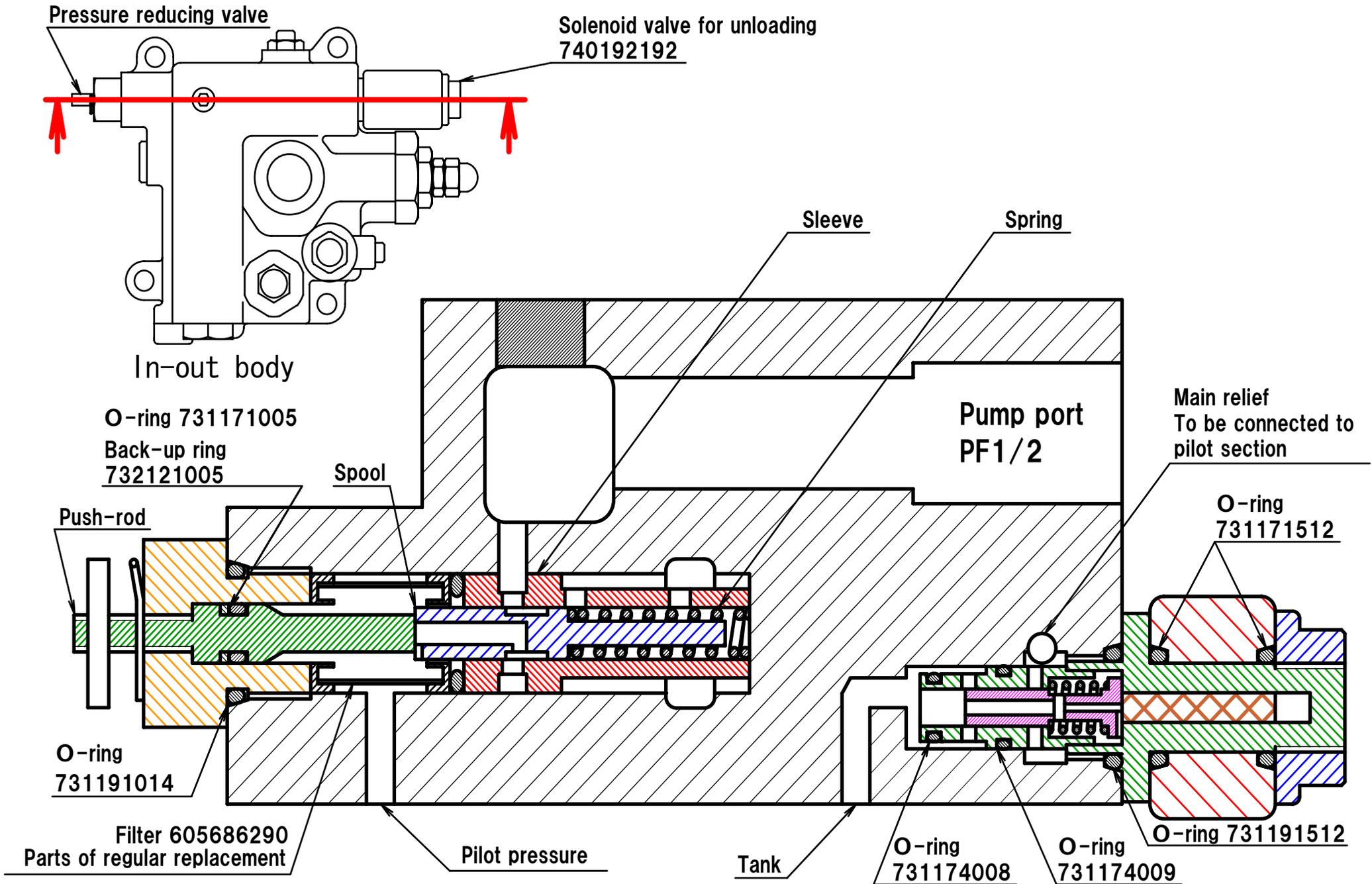
Tank

O-ring
731174008

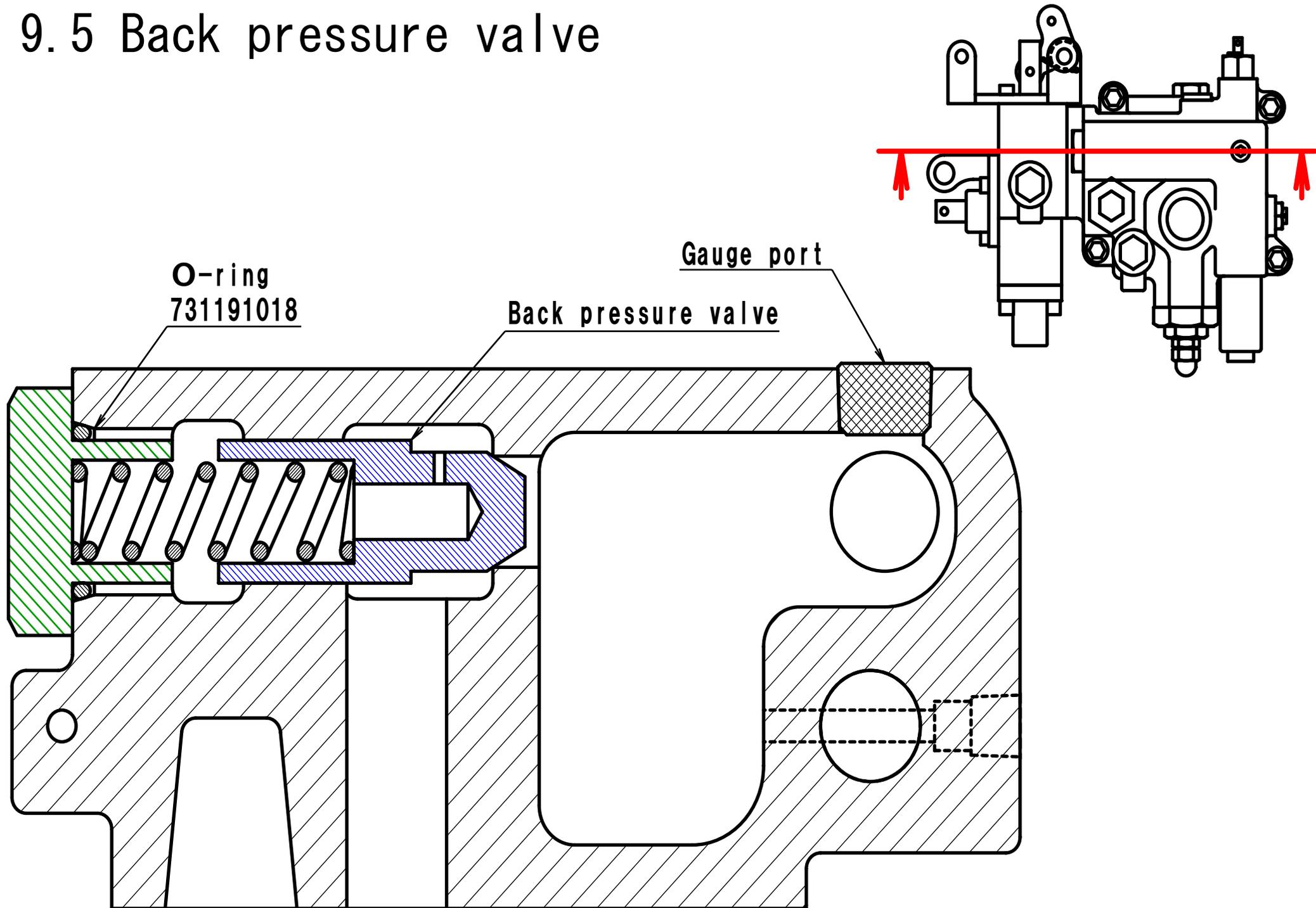
O-ring
731174009

O-ring 731191512

(9-4)

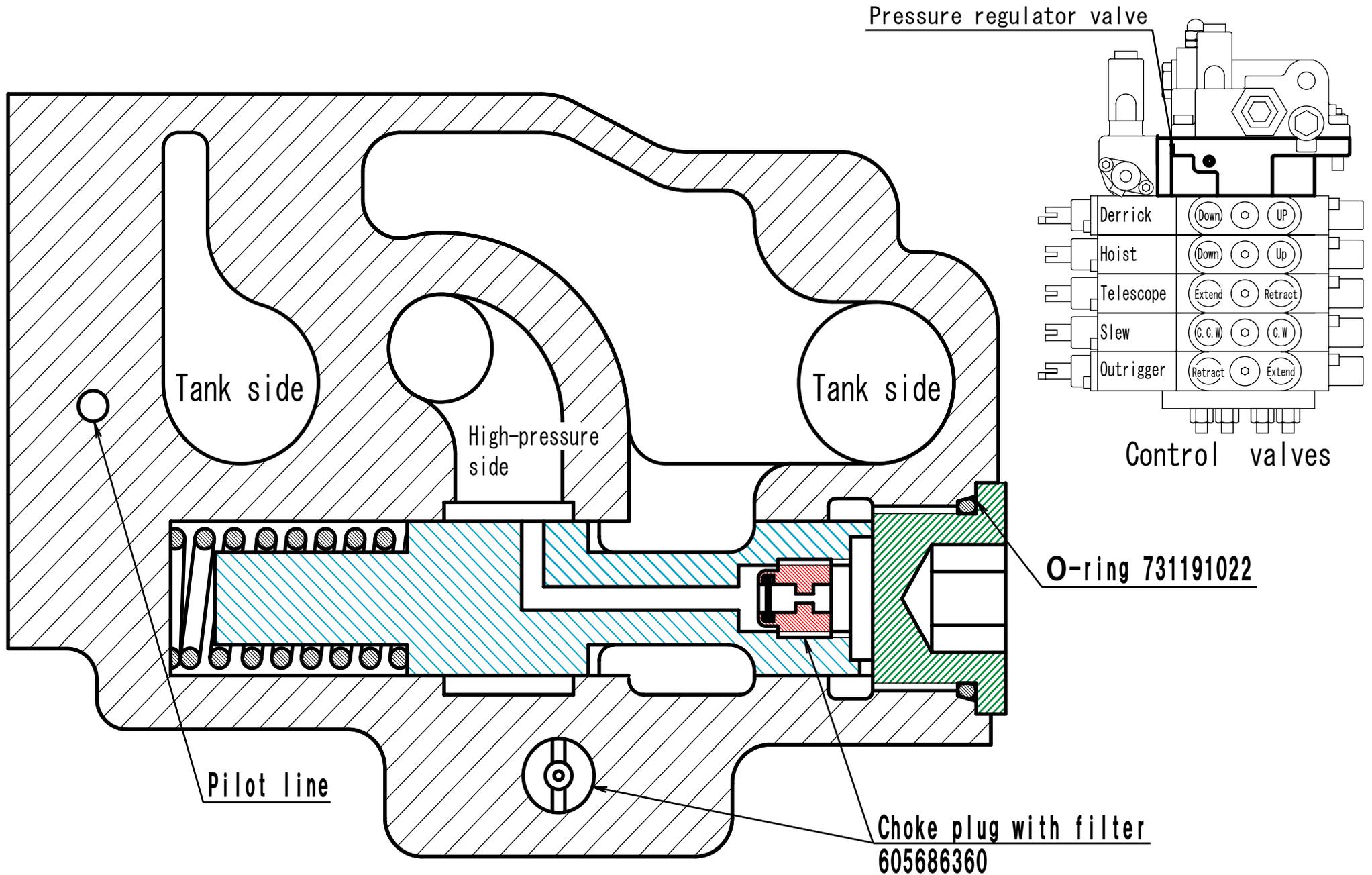


9.5 Back pressure valve

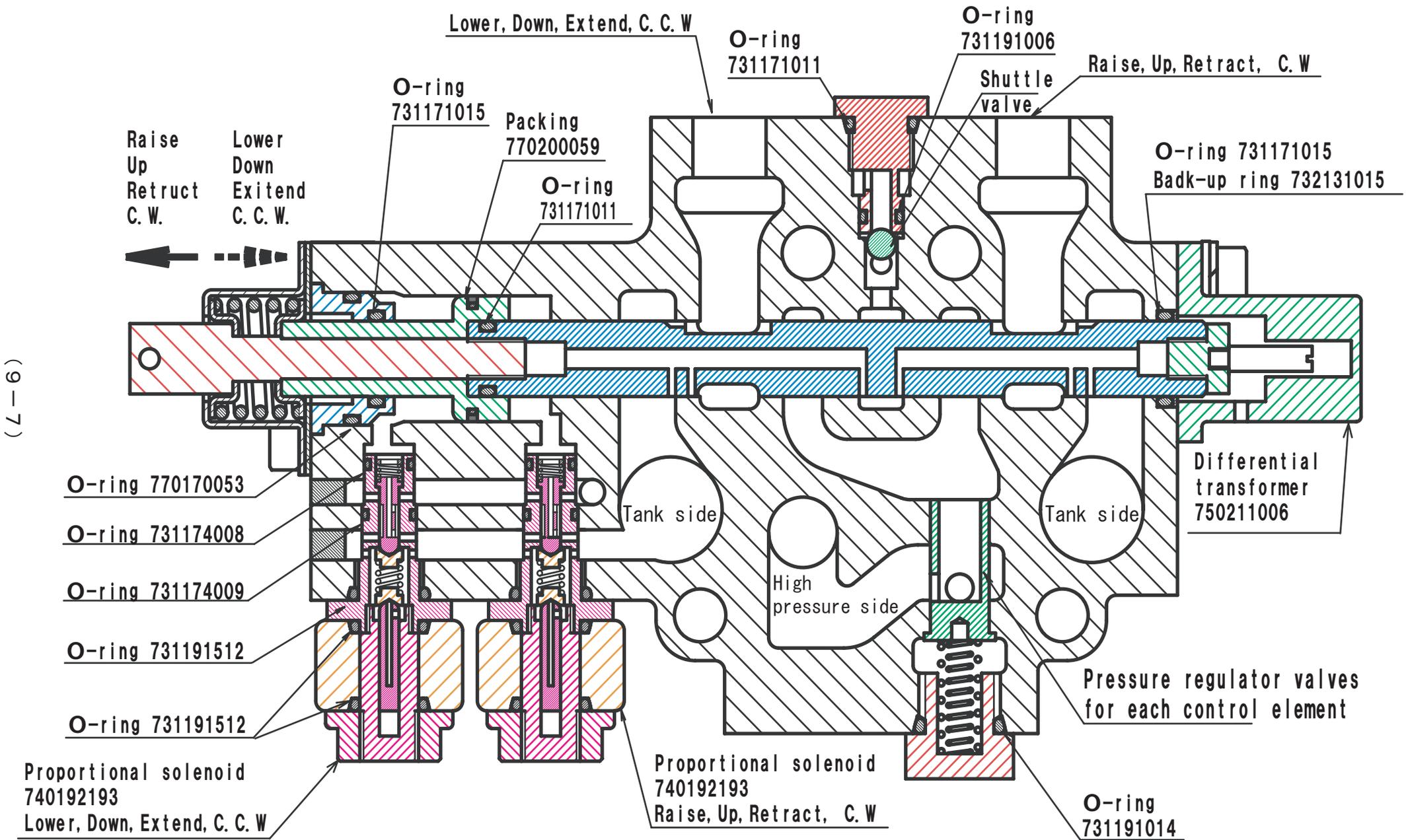


9.6 Pressure regulator valve

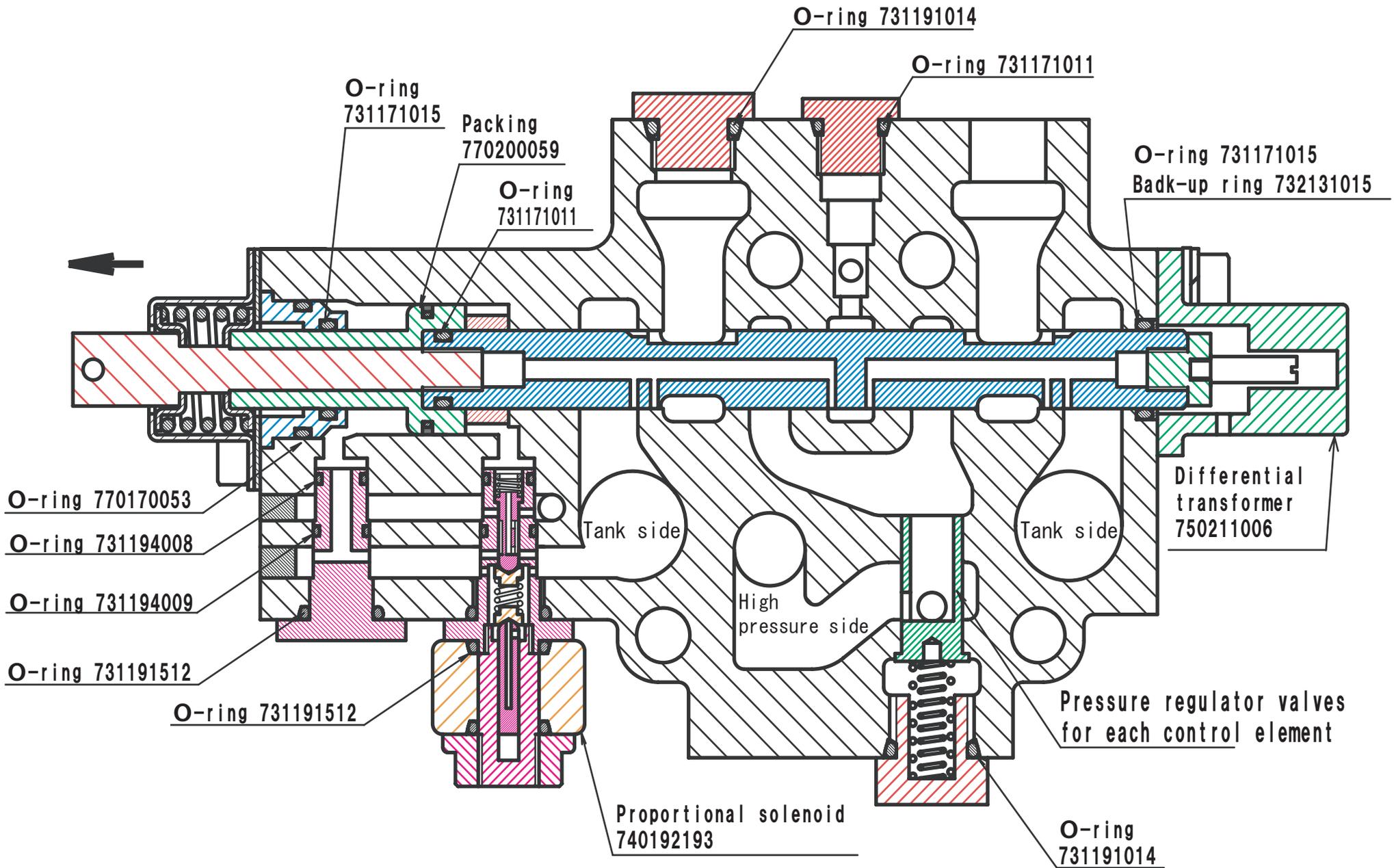
(9-6)



9.7 Valve body (D, H, T, S)

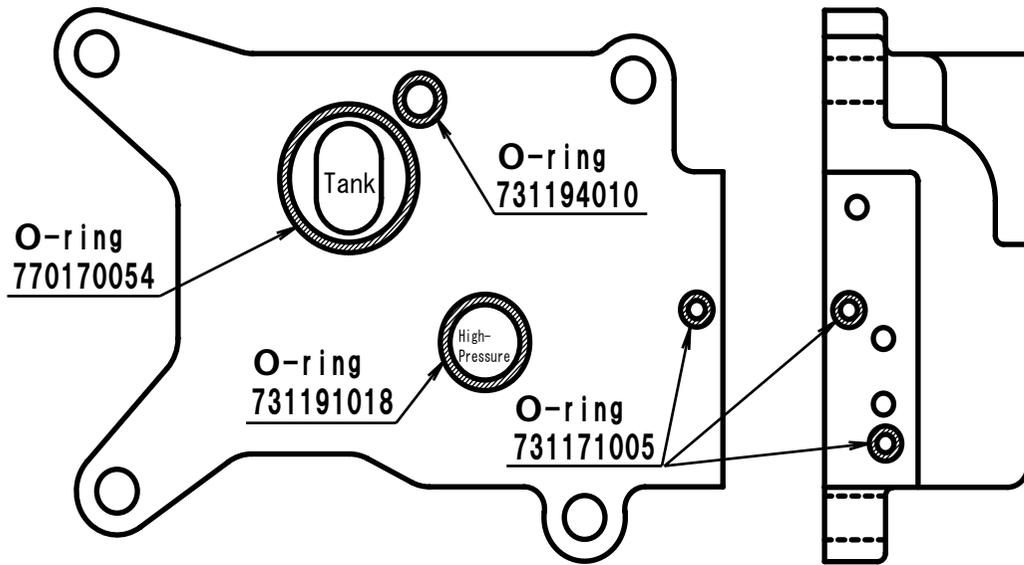


9.8 Valve body (Outrigger)



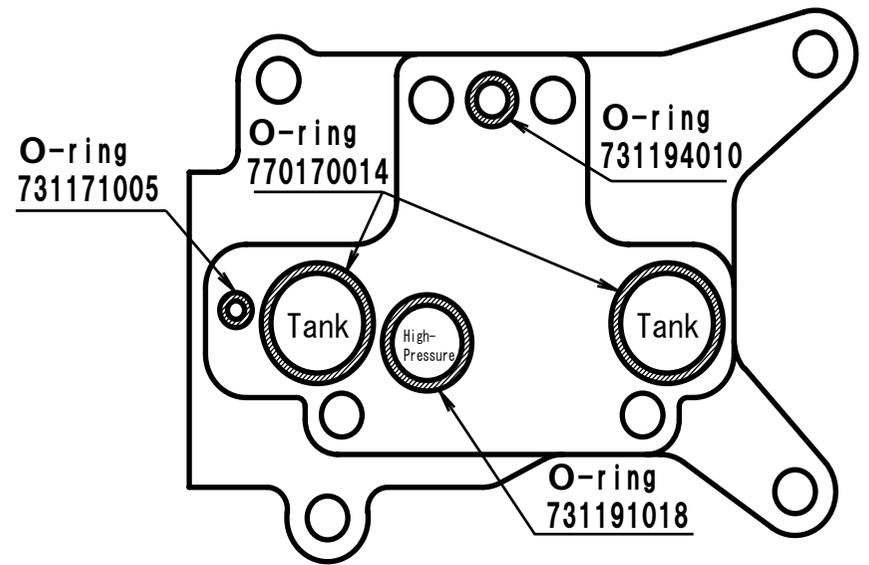
(8-6)

9.9 O-ring fitted on jointing surface of valve body



In-out body side

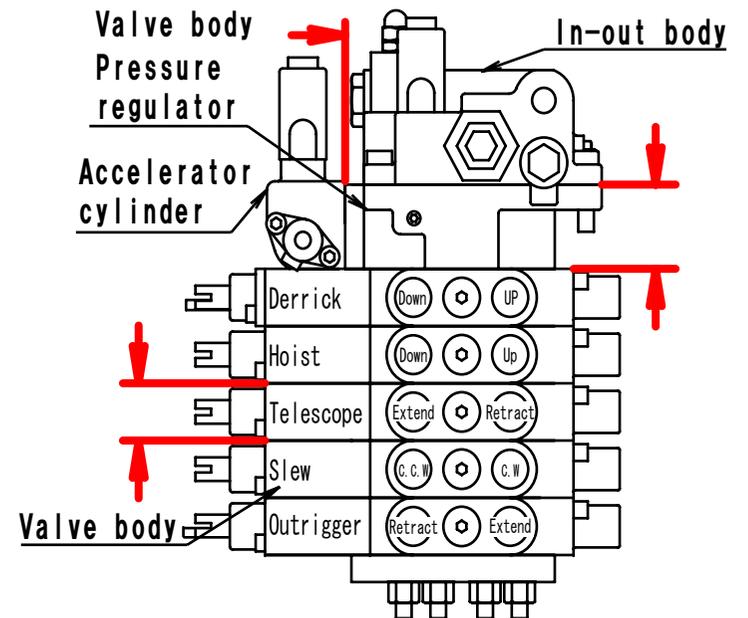
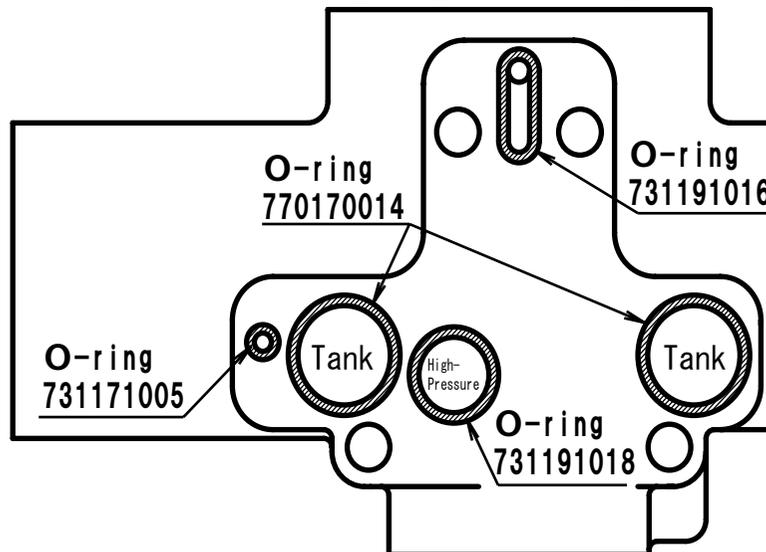
Accelerator cylinder side



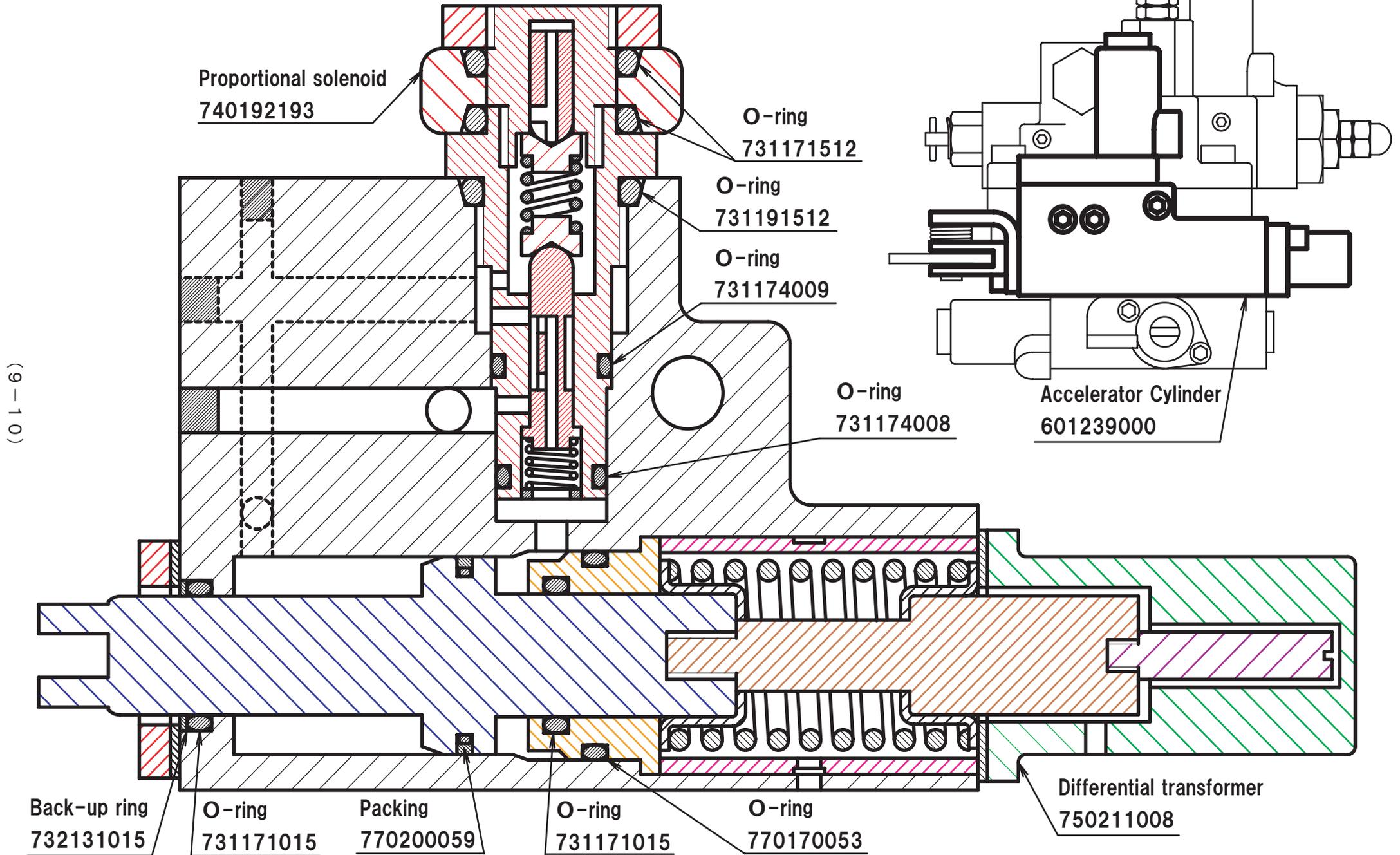
Valve body side (Derrick, Hoist, telescoping, Slewing)

Valve body (Pressure regulation)

Valve body (Derrick, Hoist, Telescoping, Slewing)



9.10 Accelerator cylinder



9.11 Spool assembly (types of D, H, T, S)

Zero point adjustment is needed when spool assembly has been replaced.

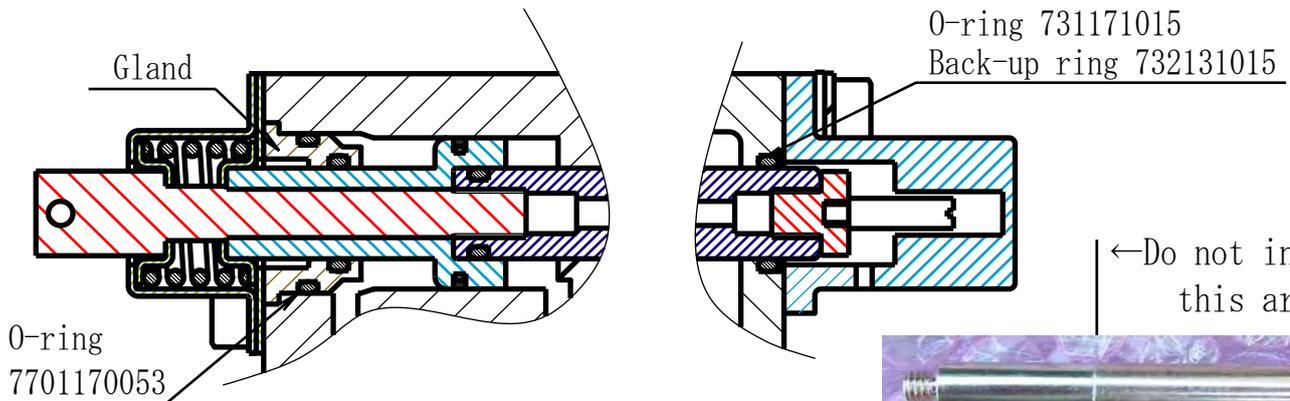
Designation	Part number	Application
Spool assembly (D)	910000140	For derrick
Spool assembly (H)	910000141	For hook-up/down
Spool assembly (T)	910000142	For telescoping
Spool assembly (S)	910000143	For slewing



It is recommended that the spool should be replaced as an assembly because following attention must be paid when removing the cap screw and the spool end to re-assemble.

1. Remove the sealing agent stuck to the screw threads on both ends of the spool.
2. Degrease the spool thoroughly and dry it.
Pay special attention to screw threads to carry out this work.
Oil remained will deteriorate its sealing property.
3. Since the thread of both cap screw and of spool end have been treated by specialist companies, replace the removed parts with new ones.
Reuse of removed parts by covering them with a sealing tape will not provide good results as the thread is of M-type screw.
4. Apply grease to inside/outside of the gland and to the spring.
5. In order for the thread to become firm, do not circulate oil for at least 1 hour after the screws have been tightened up.

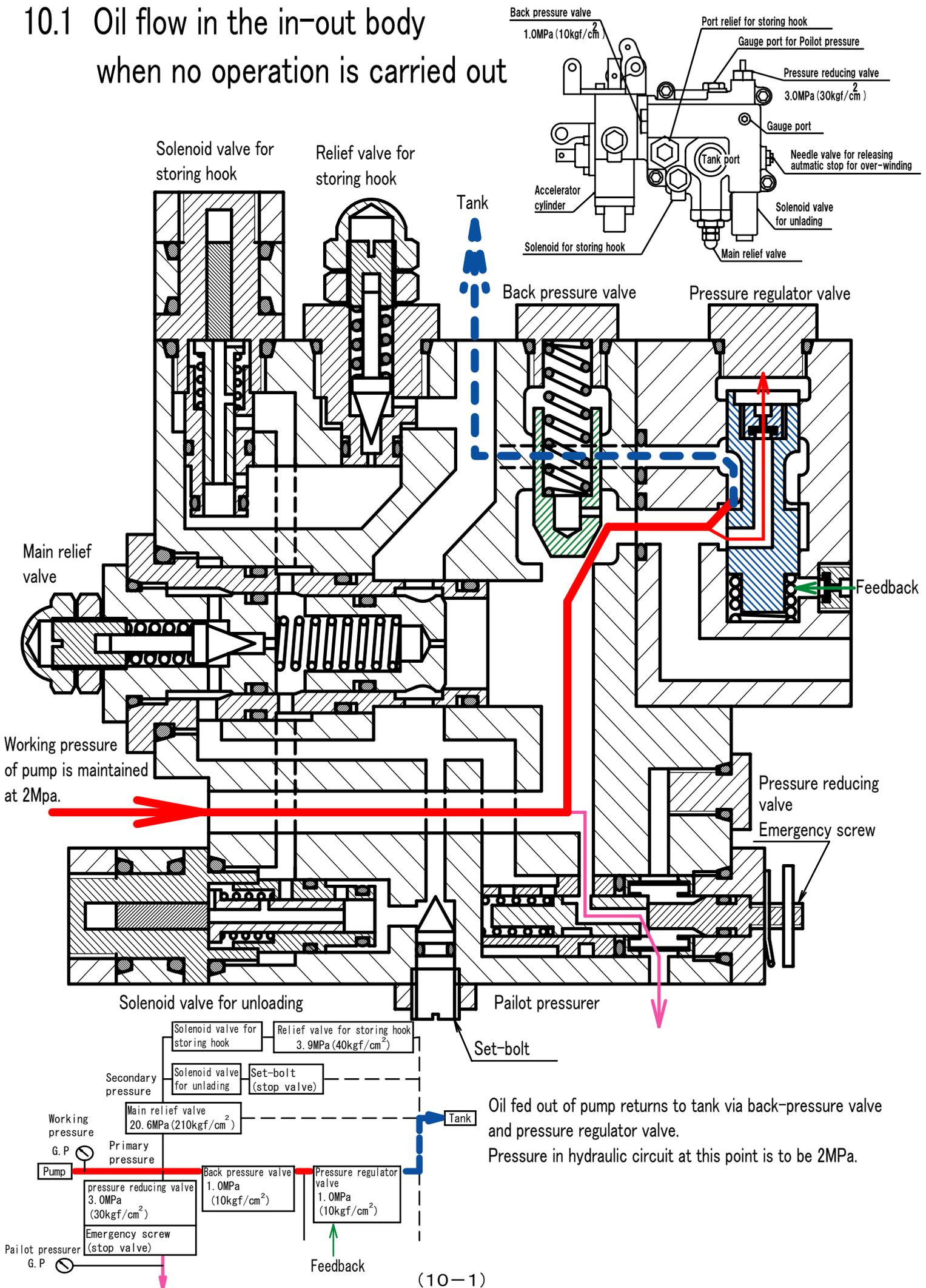
In many cases where oil leaks out of the spool, it may be due to damage in the O-rings in the gland and/or in the valve body while the spool is being inserted. Therefore, observe the O-rings carefully when the spool has been extracted.



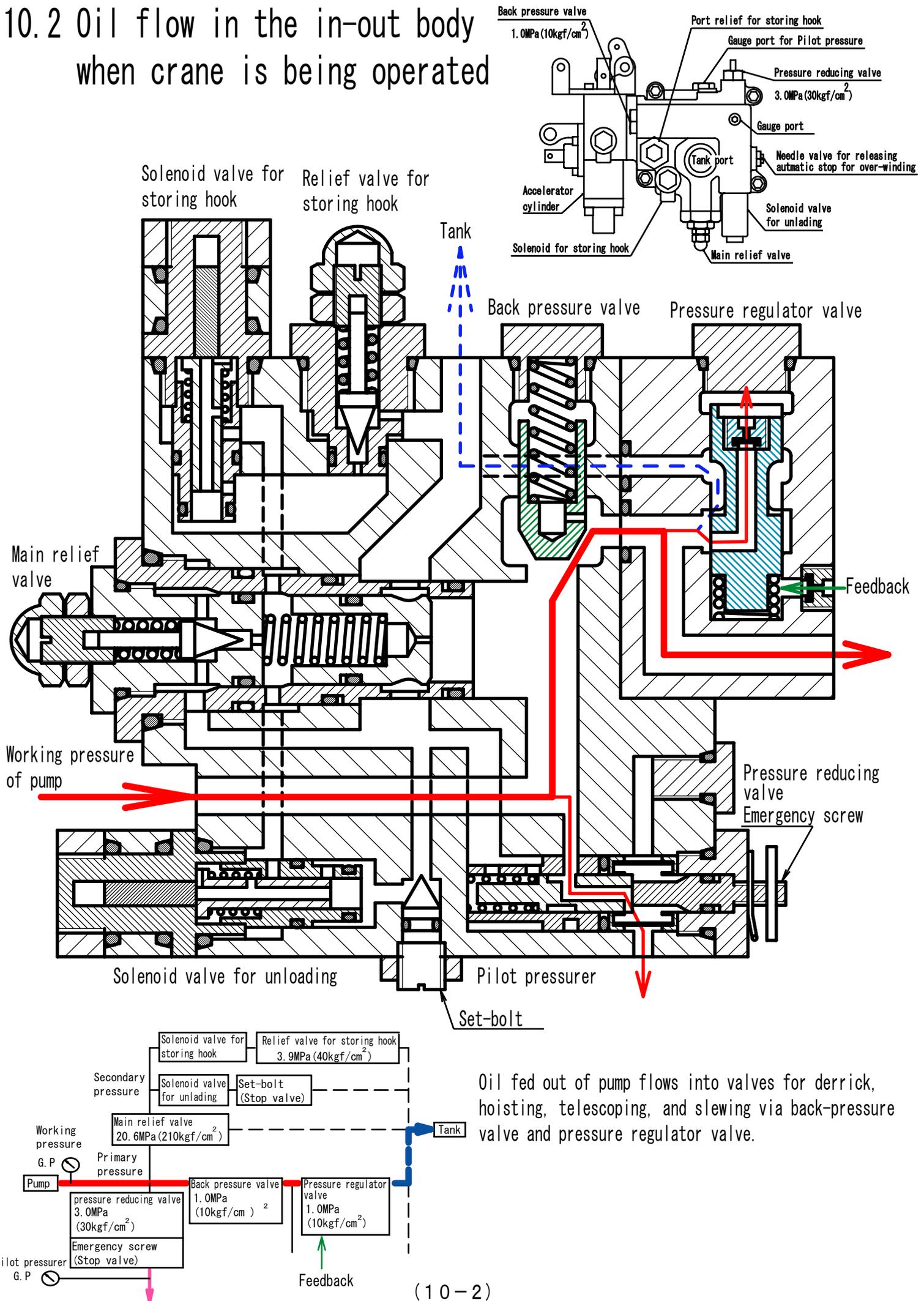
How to remove/attach the core of differential transformer (this part is to be ordered separately)

1. When removing it, fix the cap screw with a spanner and turn the core with pliers by gripping it at its base.
2. Apply Lock Tight #242 to the screw threads when the core is being tightened.

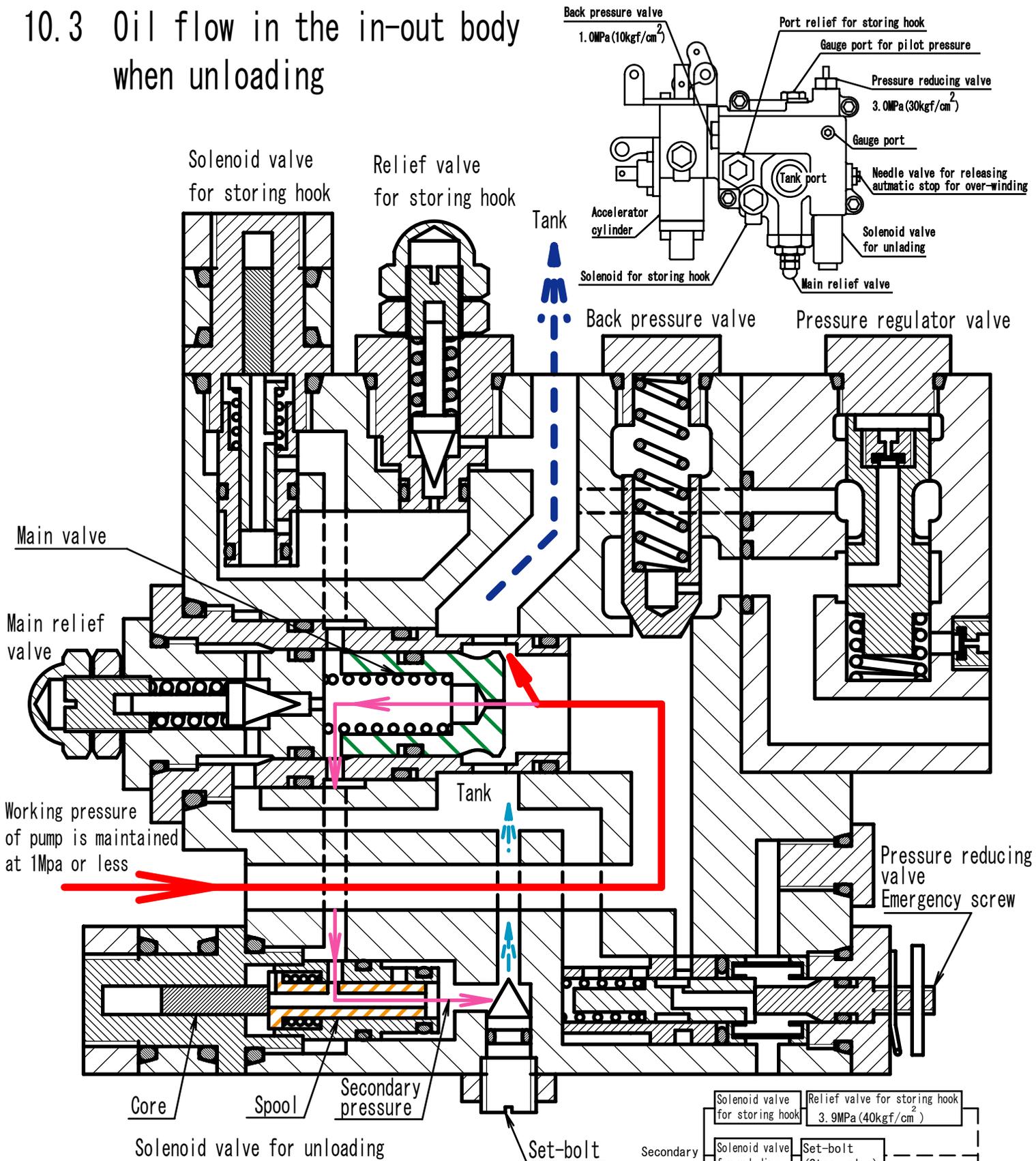
10.1 Oil flow in the in-out body when no operation is carried out



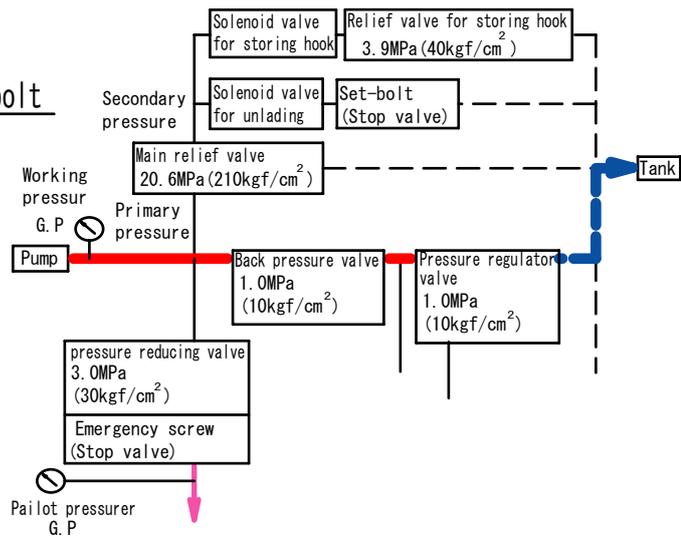
10.2 Oil flow in the in-out body when crane is being operated



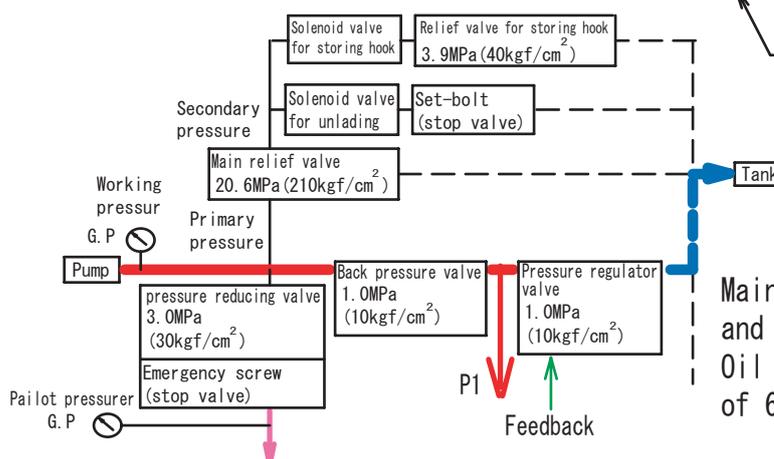
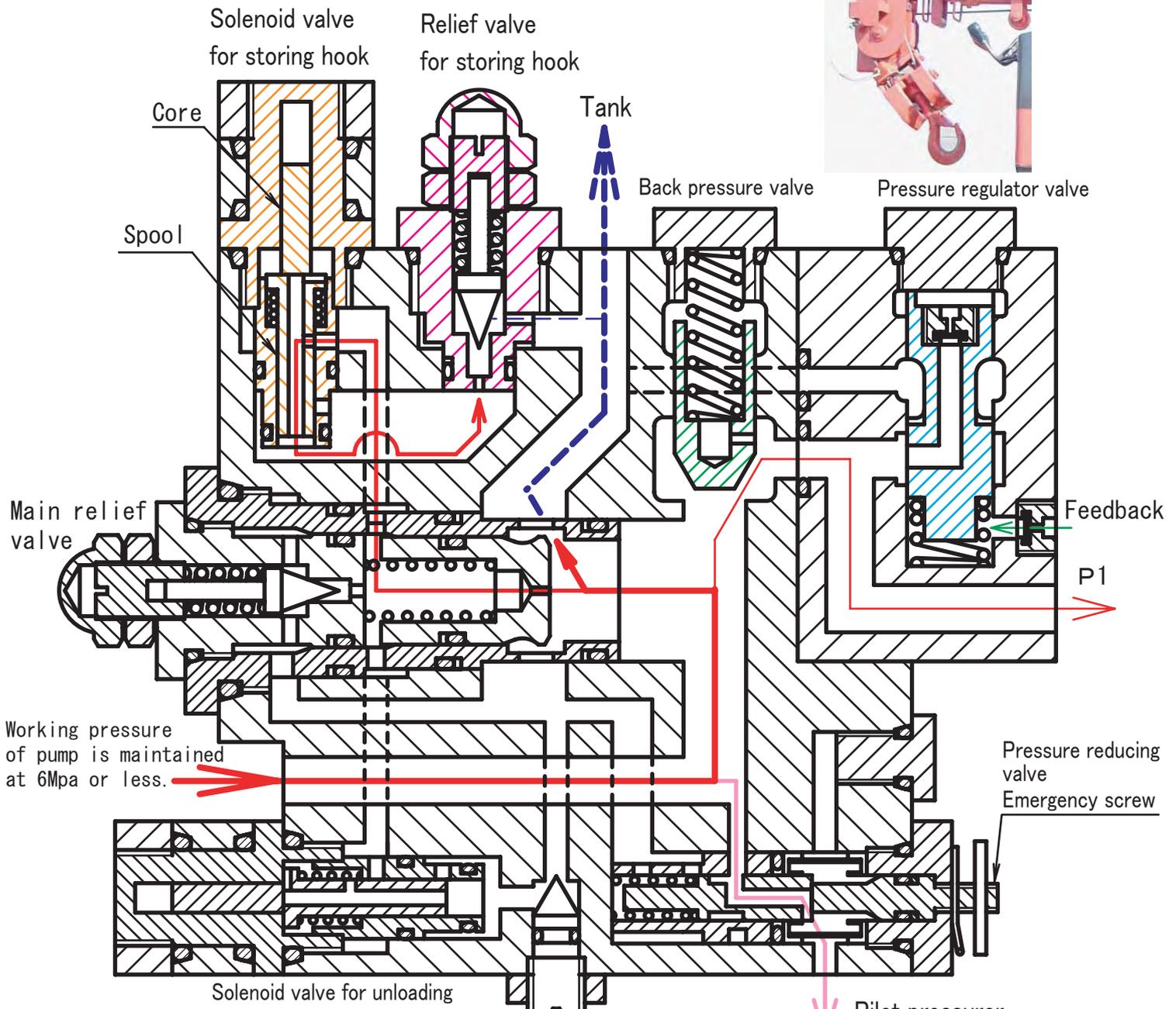
10.3 Oil flow in the in-out body when unloading



When electric current flows through the unloading solenoid, the core in the solenoid is magnetized. Magnetized core allows the spool to move to the right to lead main relief secondary pressure to the tank. Main valve opens to return all the oil fed out of the pump to the tank. Pressure in the circuit at this point is 1Mpa or less and the back-pressure valve and the pressure regulator valve are closed. Locking with the spool in the unloading solenoid connected to the tank allows all the crane functions to turn into inoperable condition. If this happens, tighten the set-bolt so that the main relief secondary pressure will not be returned to the tank to allow the crane to be operated.



10.5 Oil flow in the in-out body when hook storing relief valve is being functioned by hook storing operation

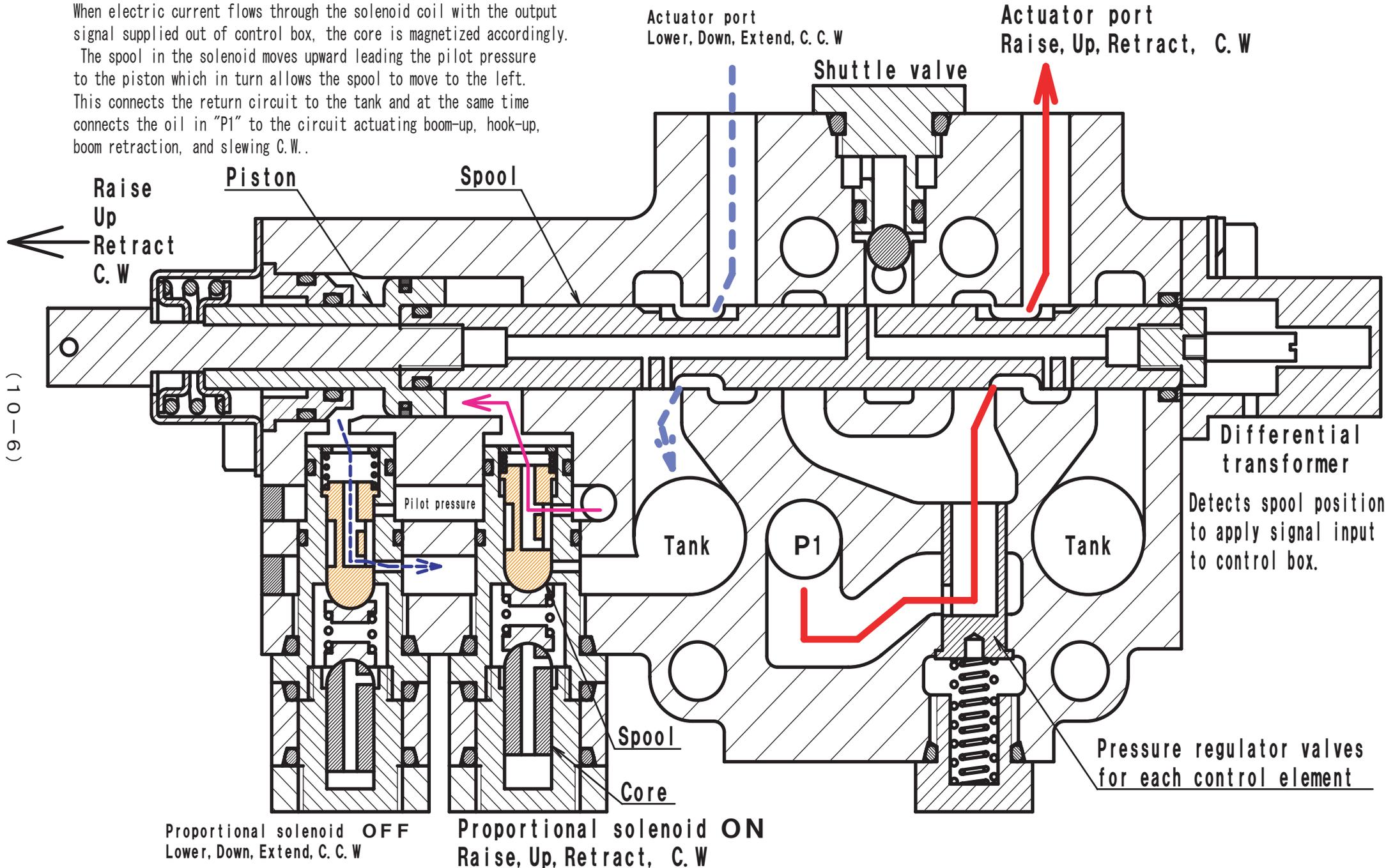


Main relief valve opens when the hook has been stored and the relief valve for storing hook is actuated. Oil fed out of pump, while generating pressure of 6Mpa, allows surplus oil to flow into the tank.

10.6 Oil flow in the valve body when boom up, hook up, boom retraction, and slewing C.W. are functioning

When electric current flows through the solenoid coil with the output signal supplied out of control box, the core is magnetized accordingly.

The spool in the solenoid moves upward leading the pilot pressure to the piston which in turn allows the spool to move to the left. This connects the return circuit to the tank and at the same time connects the oil in "P1" to the circuit actuating boom-up, hook-up, boom retraction, and slewing C.W..



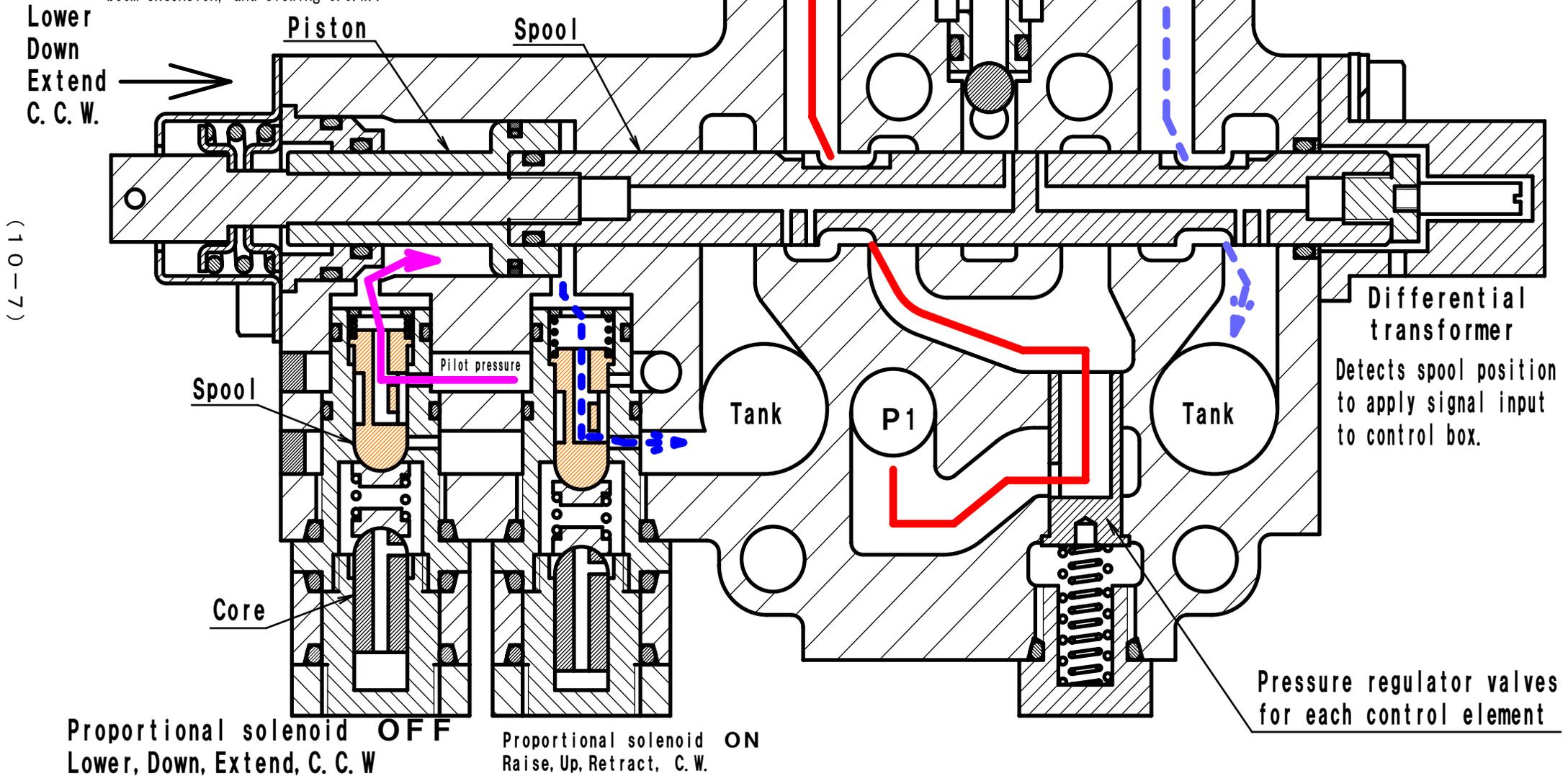
Proportional solenoid OFF
Lower, Down, Extend, C. C. W

Proportional solenoid ON
Raise, Up, Retract, C. W

10.7 Oil flow in the valve body when boom down, hook down, boom extension, and slewing C.C.W. are functioning

When electric current flows through the solenoid coil with the output signal supplied out of control box, the core is magnetized accordingly.

The spool in the solenoid moves upward leading the pilot pressure to the piston which in turn allows the spool to move to the left. This connects the return circuit to the tank and at the same time connects the oil in P1 to the circuit actuating boom-down, hook-down, boom extension, and slewing C.C.W..



(10-7)

10.8 Description of acceleration cylinder function

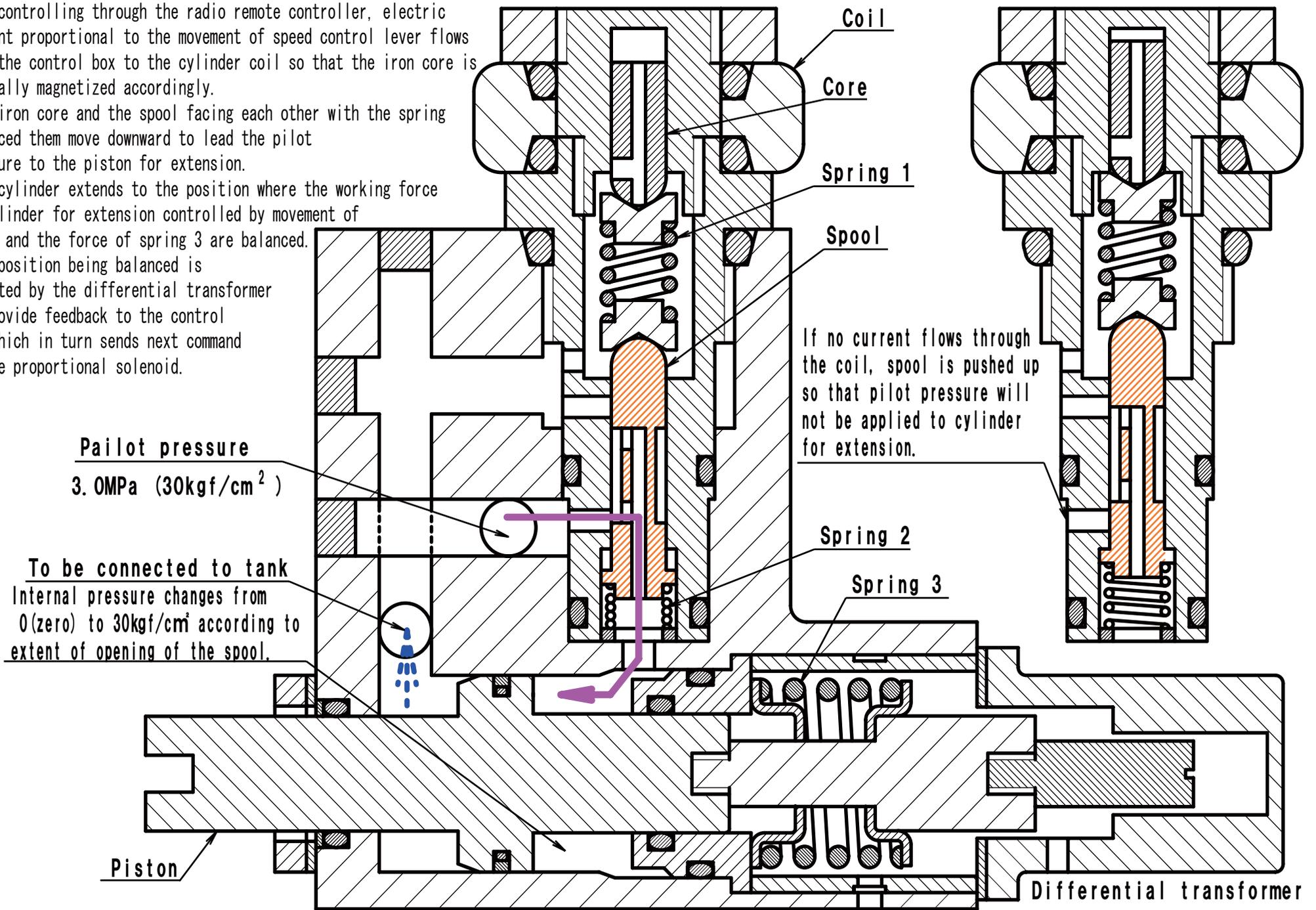
When controlling through the radio remote controller, electric current proportional to the movement of speed control lever flows from the control box to the cylinder coil so that the iron core is gradually magnetized accordingly.

The iron core and the spool facing each other with the spring 1 placed them move downward to lead the pilot pressure to the piston for extension.

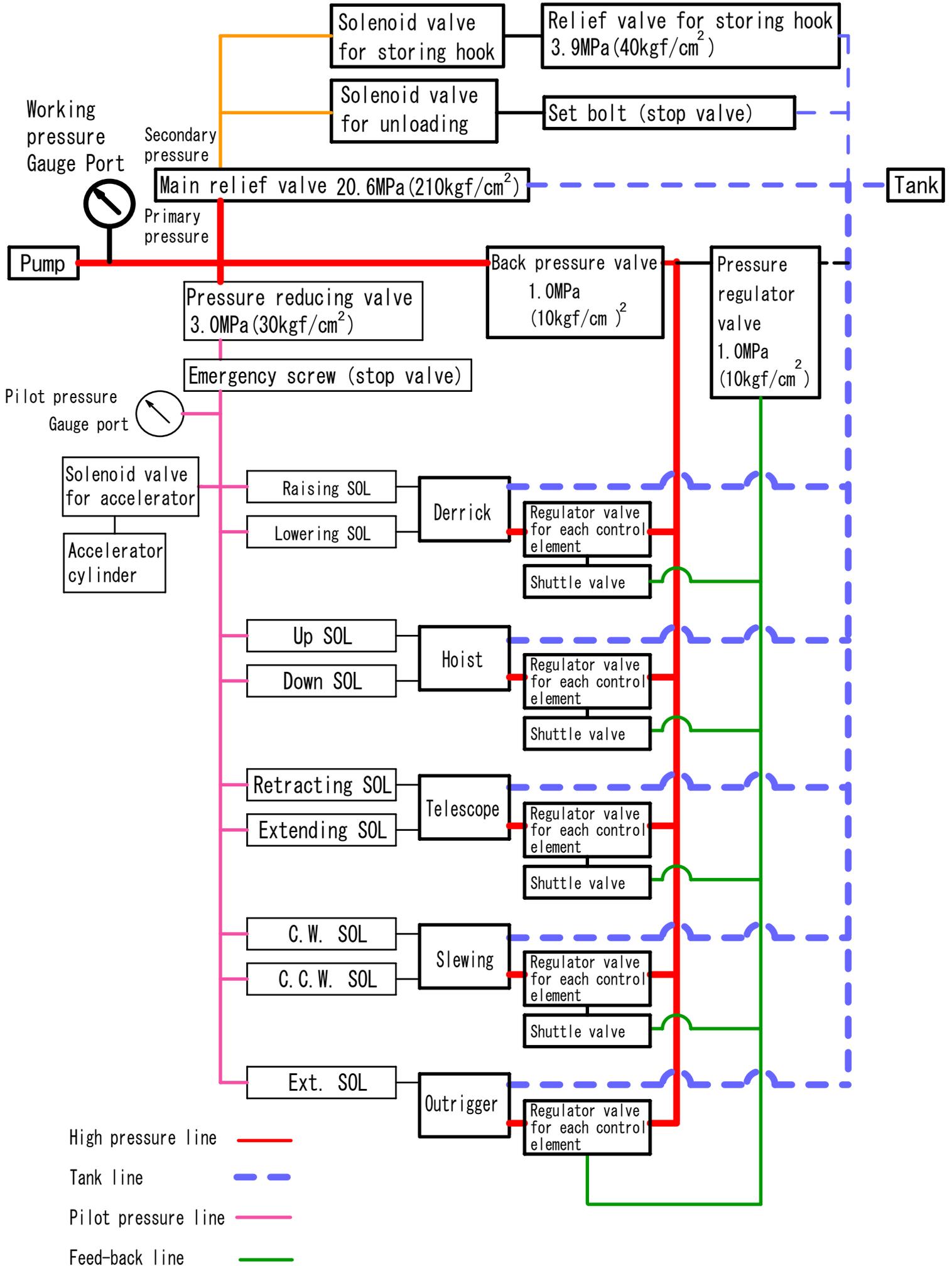
The cylinder extends to the position where the working force of cylinder for extension controlled by movement of spool and the force of spring 3 are balanced.

The position being balanced is detected by the differential transformer to provide feedback to the control box which in turn sends next command to the proportional solenoid.

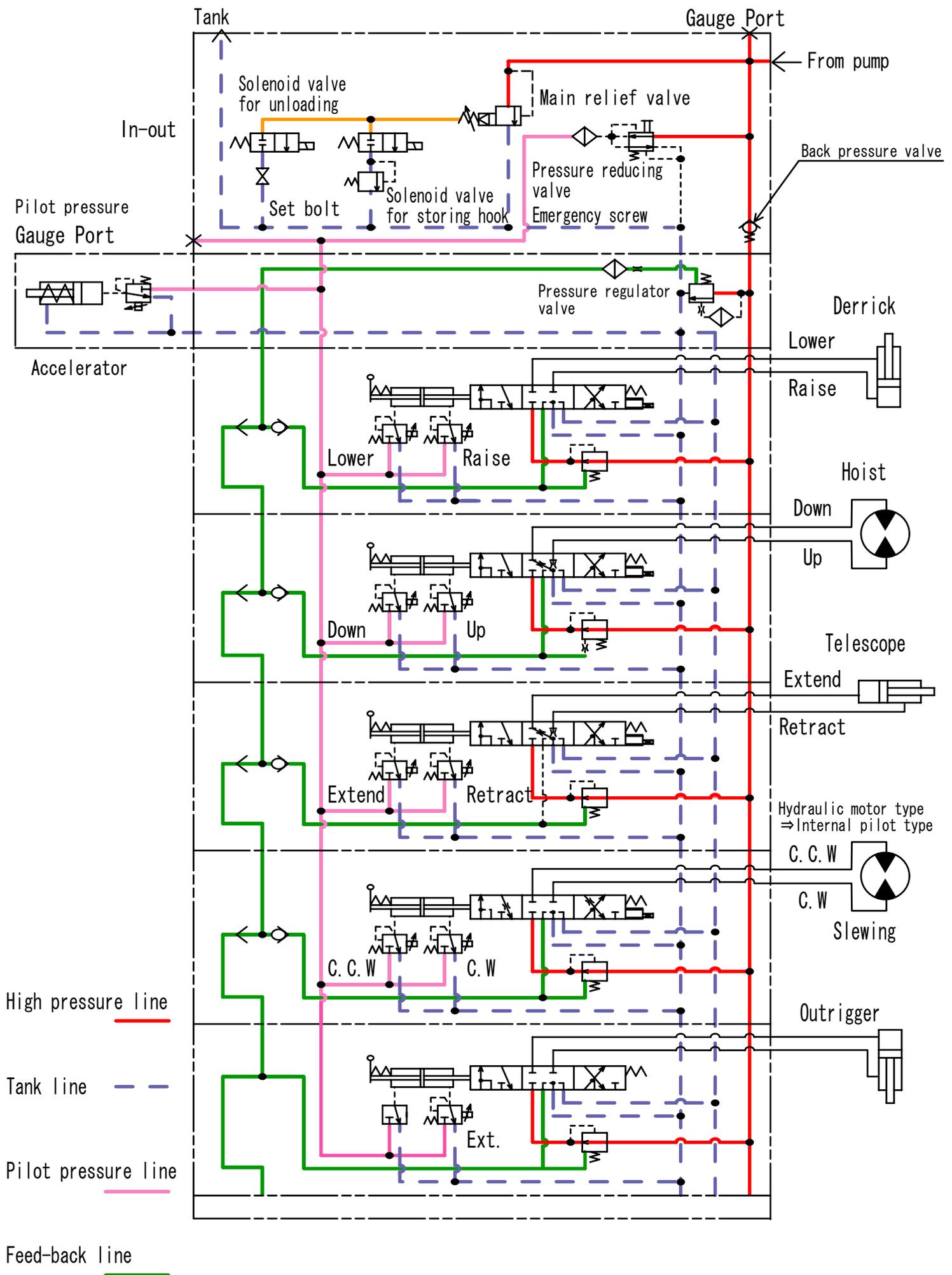
(1 0 - 8)



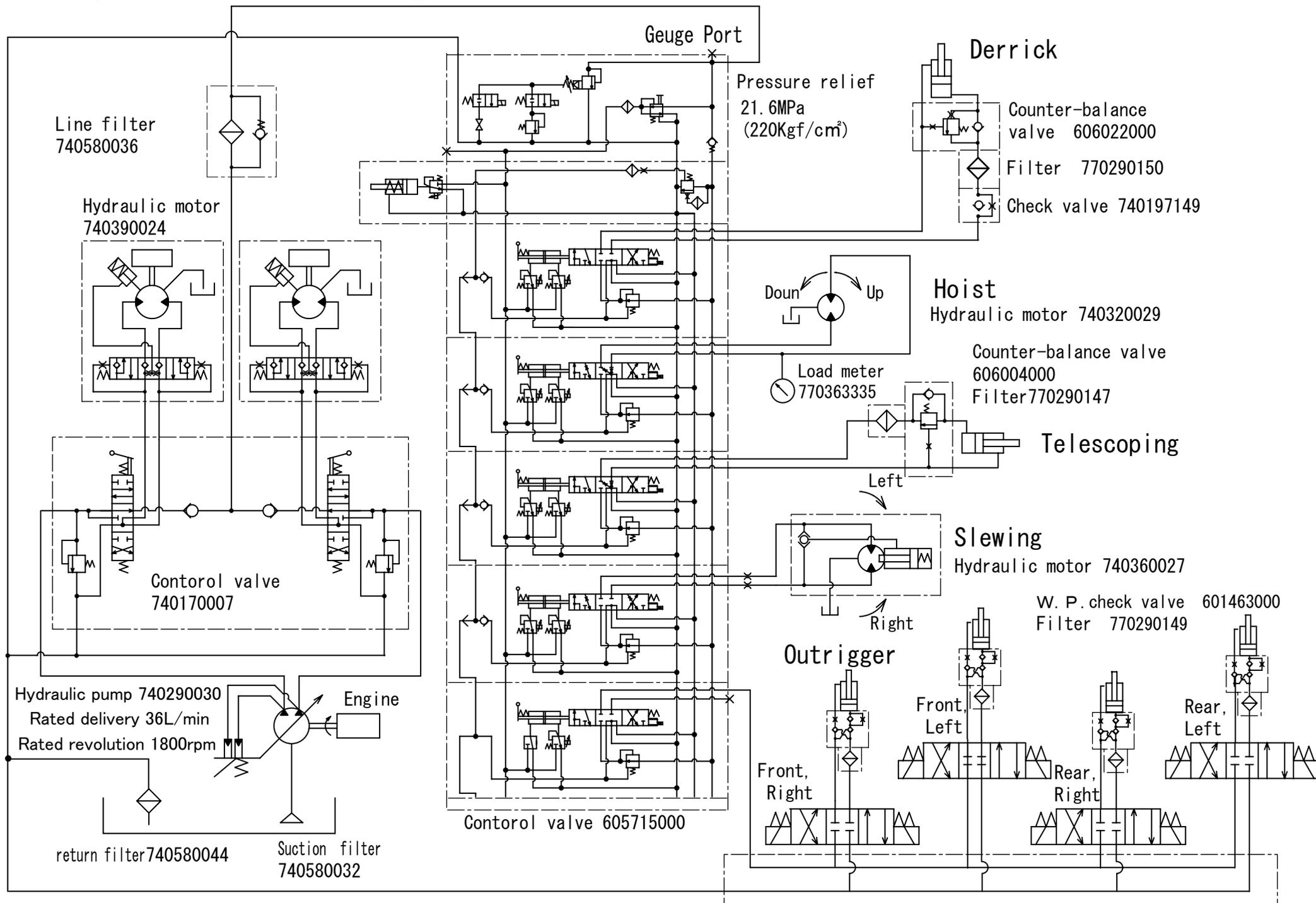
11.1 Hydraulic System



11.2 Hydraulic Circuit Diagram (control valve)

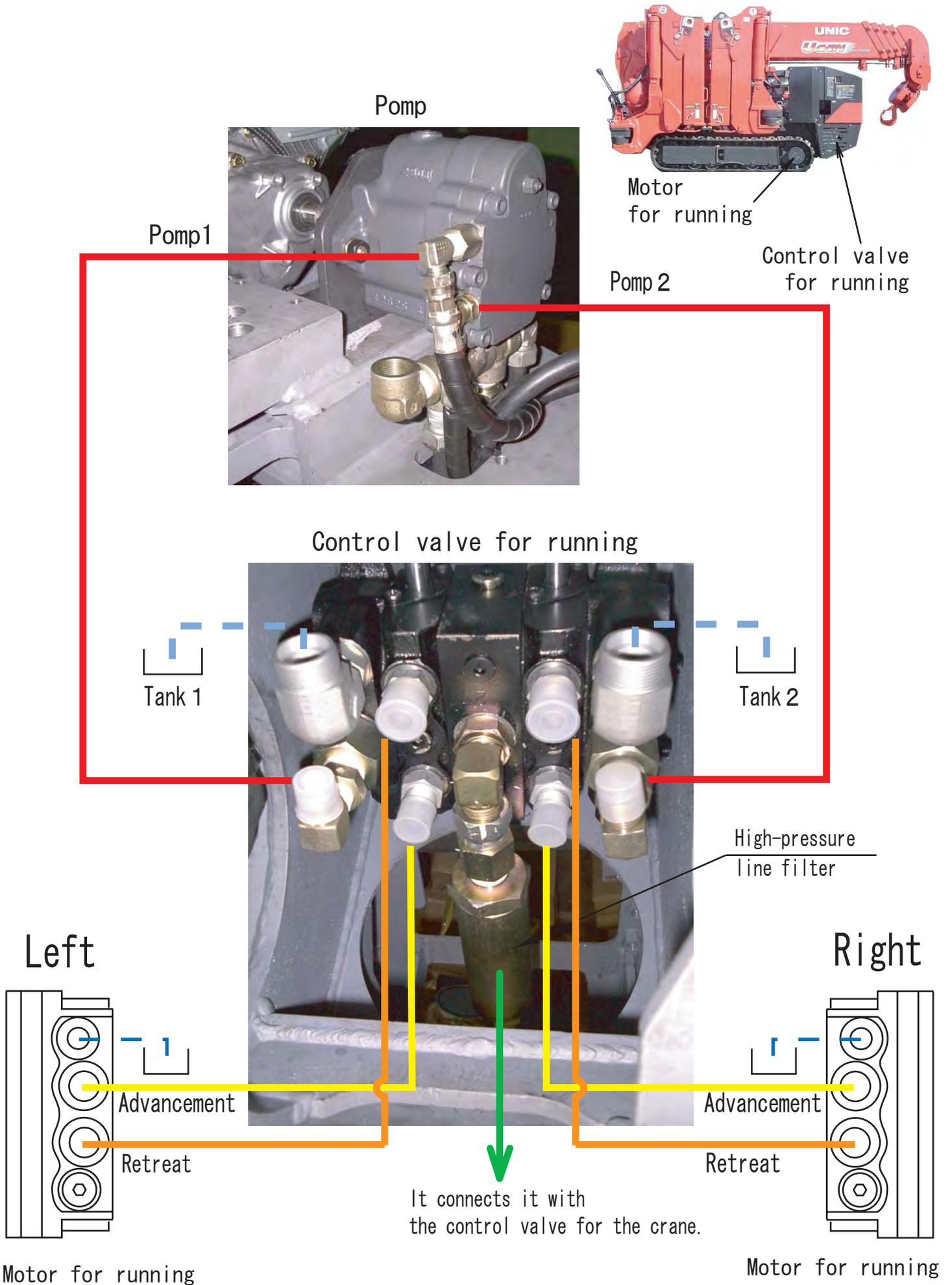


11.3 Hydraulic Circuit Diagram



(11-3)

12.1 Control valve piping for running



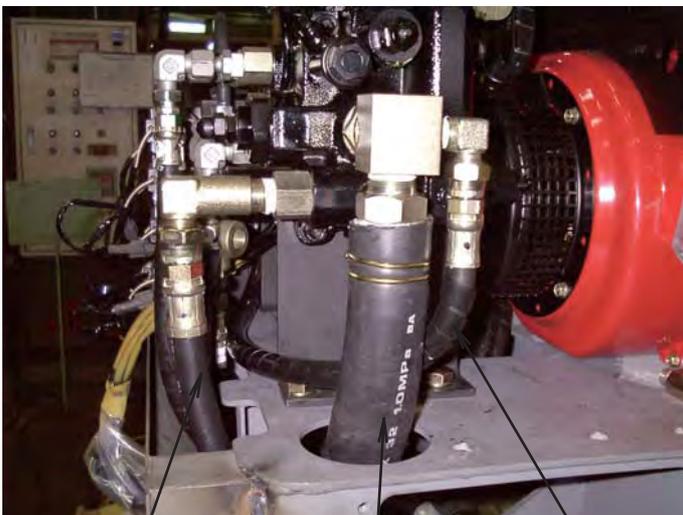
12.2 Control valve piping for crane



← View A

Plug	Slewing	Telescoping	Hoist	Derrick
✕	○	○	○	○
	Left	Extention	Down	Lowering
○	○	○	○	○
Outrigger	Right	Retraction Up		Raising

Control valve for crane



View A

Connection from
control valve for running

To tank

It connects it from
Outorigashirinda to the tank.

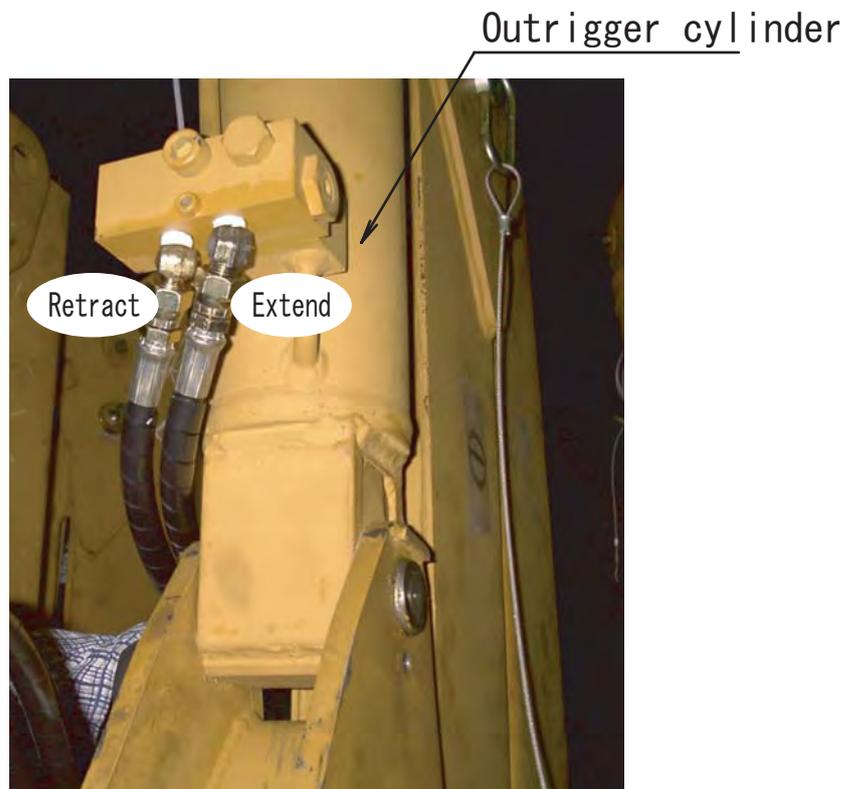
12.3 Control valve piping for outrigger



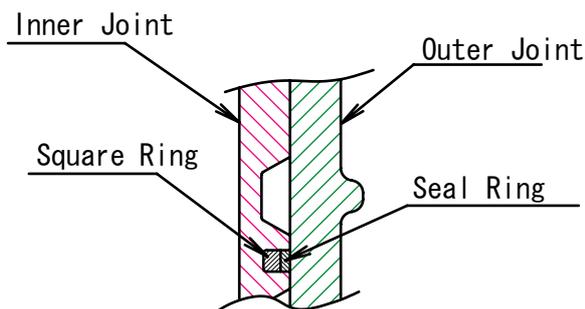
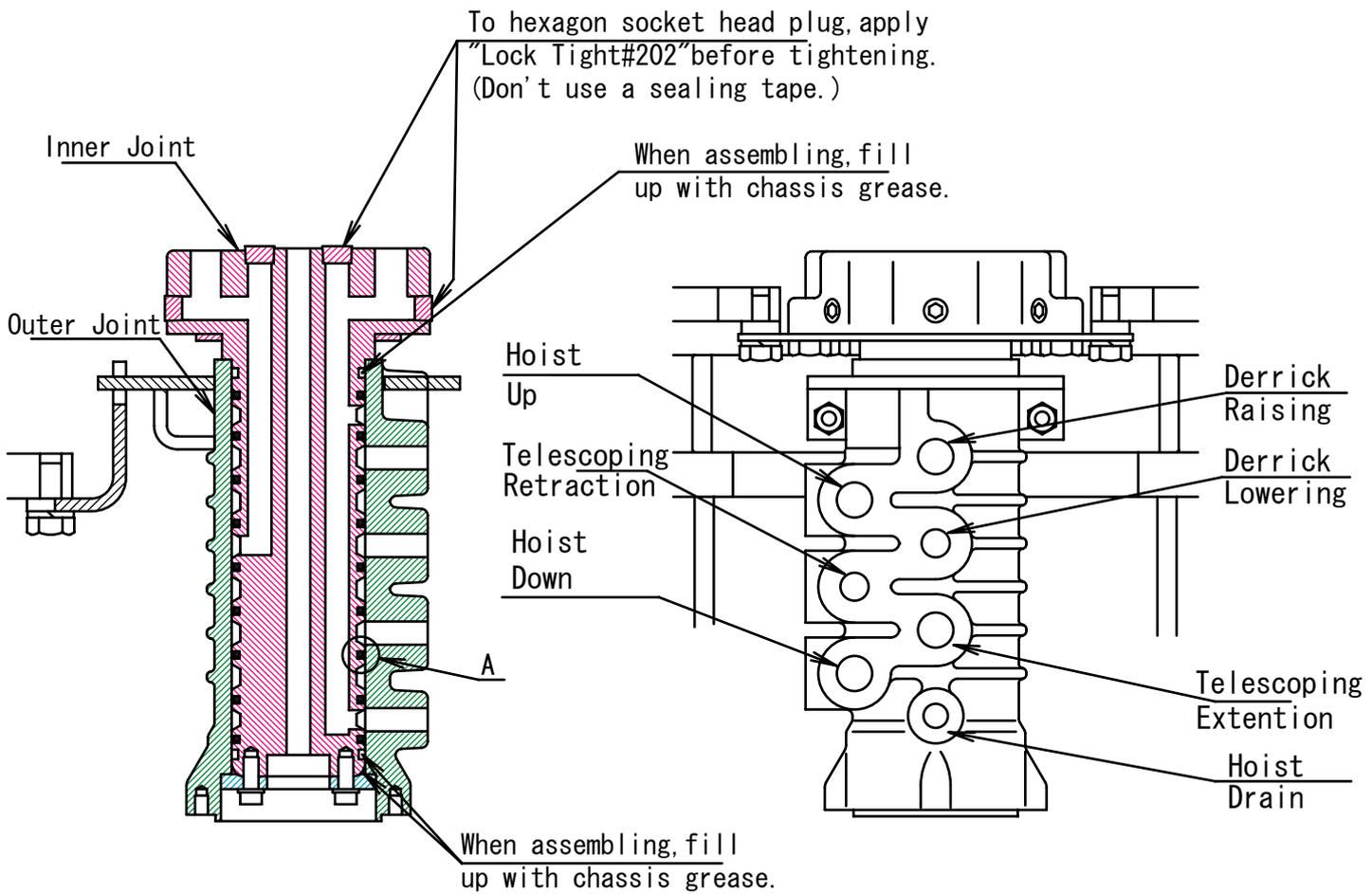
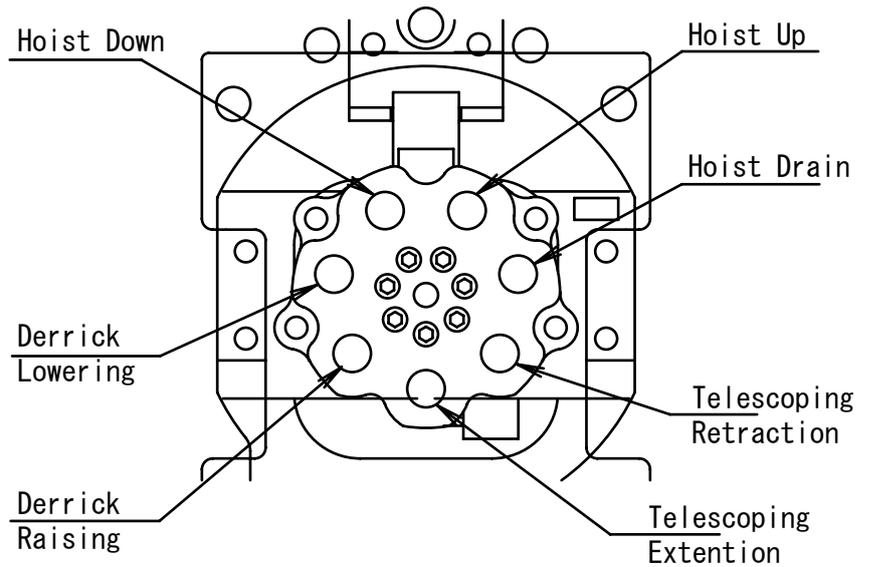
It connects it with the crane side control valve.

Outrigger

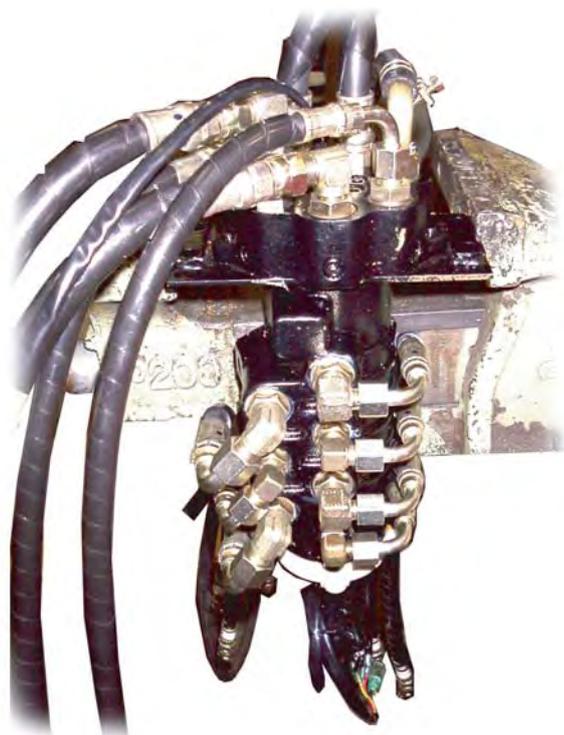
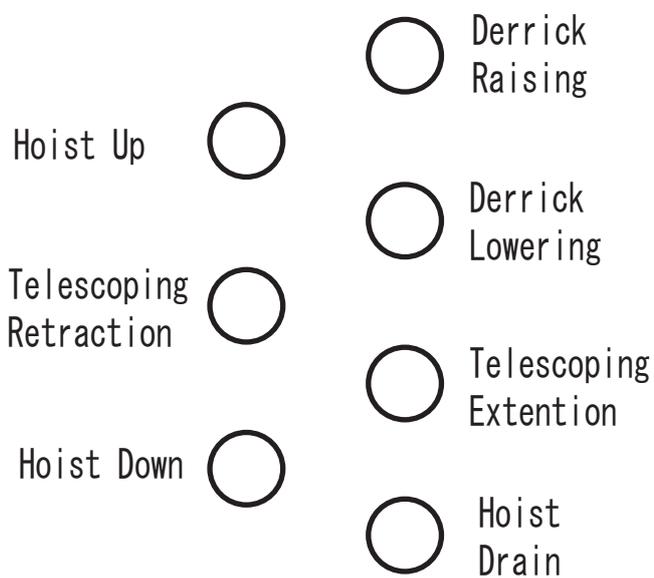
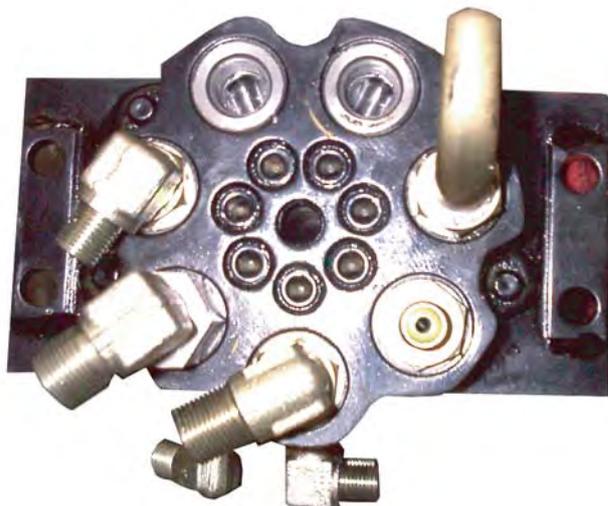
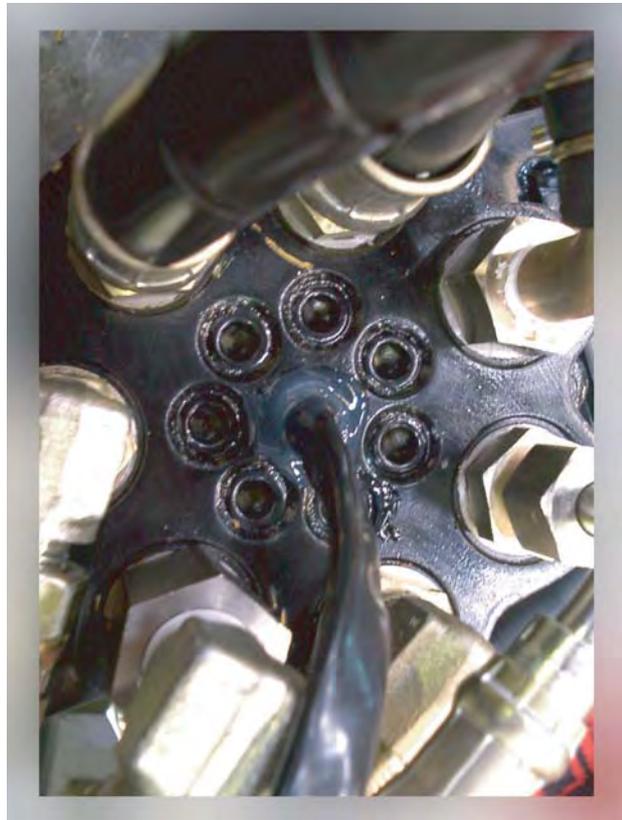
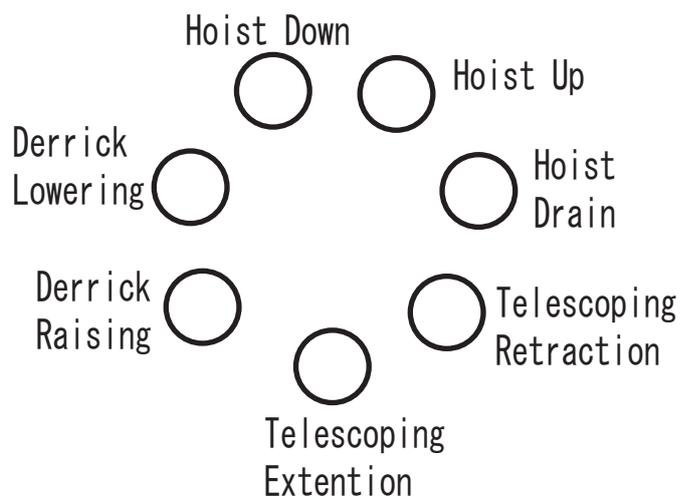
- | | | | |
|--------------------|-----------------------|-----------------------|---------------------|
| Rear left extend | <input type="radio"/> | <input type="radio"/> | Rear left retract |
| Rear Right extend | <input type="radio"/> | <input type="radio"/> | Rear Right retract |
| Front left extend | <input type="radio"/> | <input type="radio"/> | Front left retract |
| Front Right extend | <input type="radio"/> | <input type="radio"/> | Front Right retract |



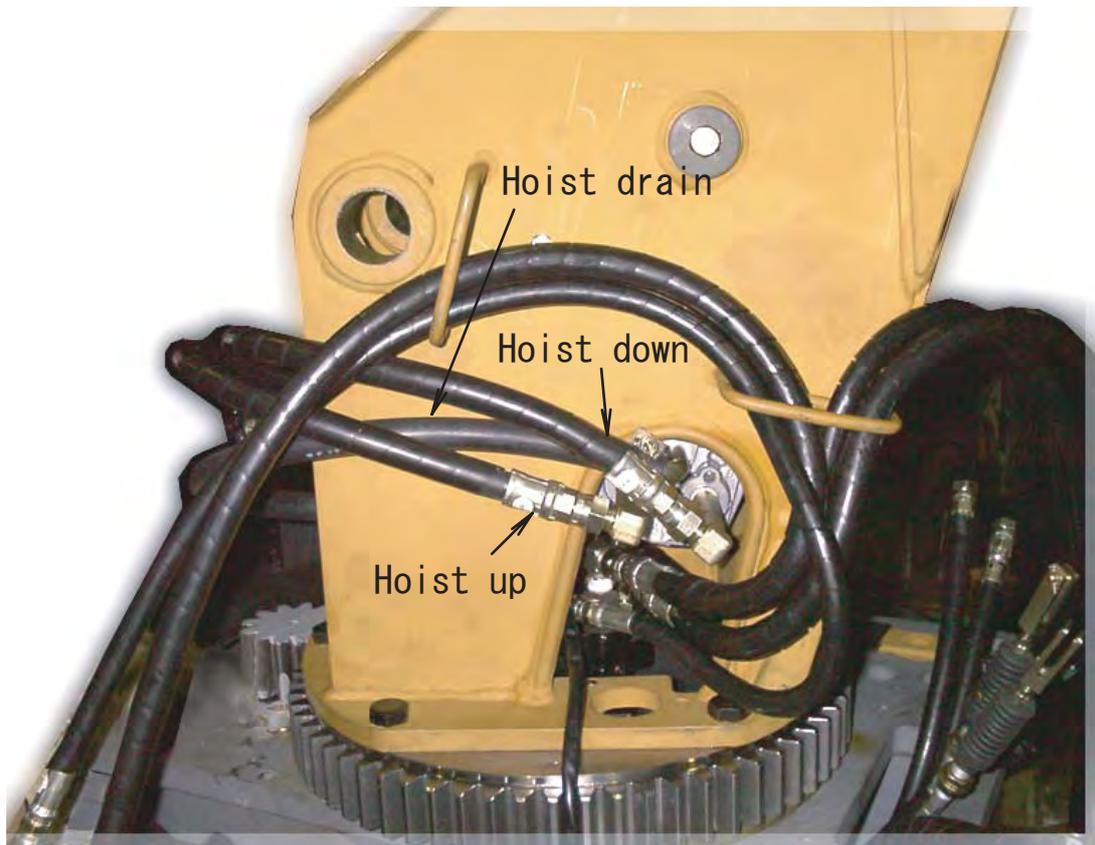
12.4 Construction of swivel joint and position of houses.



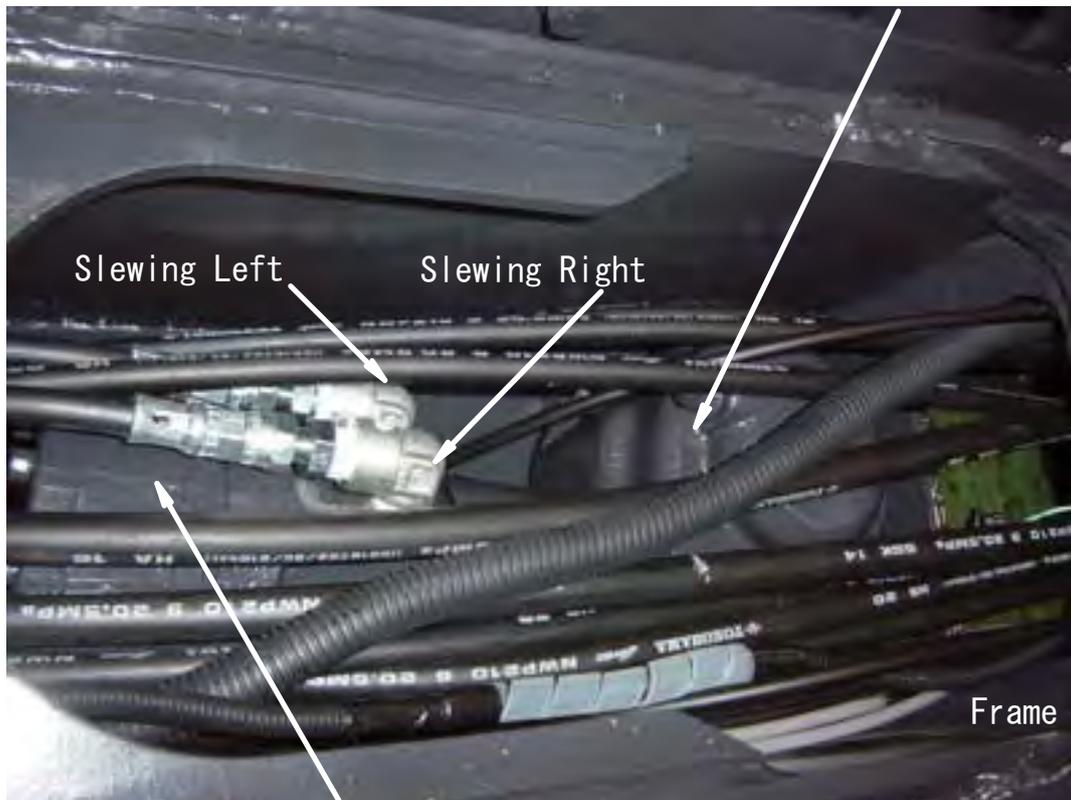
Section A in detail, STK seal fitting
(1 2 - 4)



12.5 Piping of Column



Slewing reduction gear assy

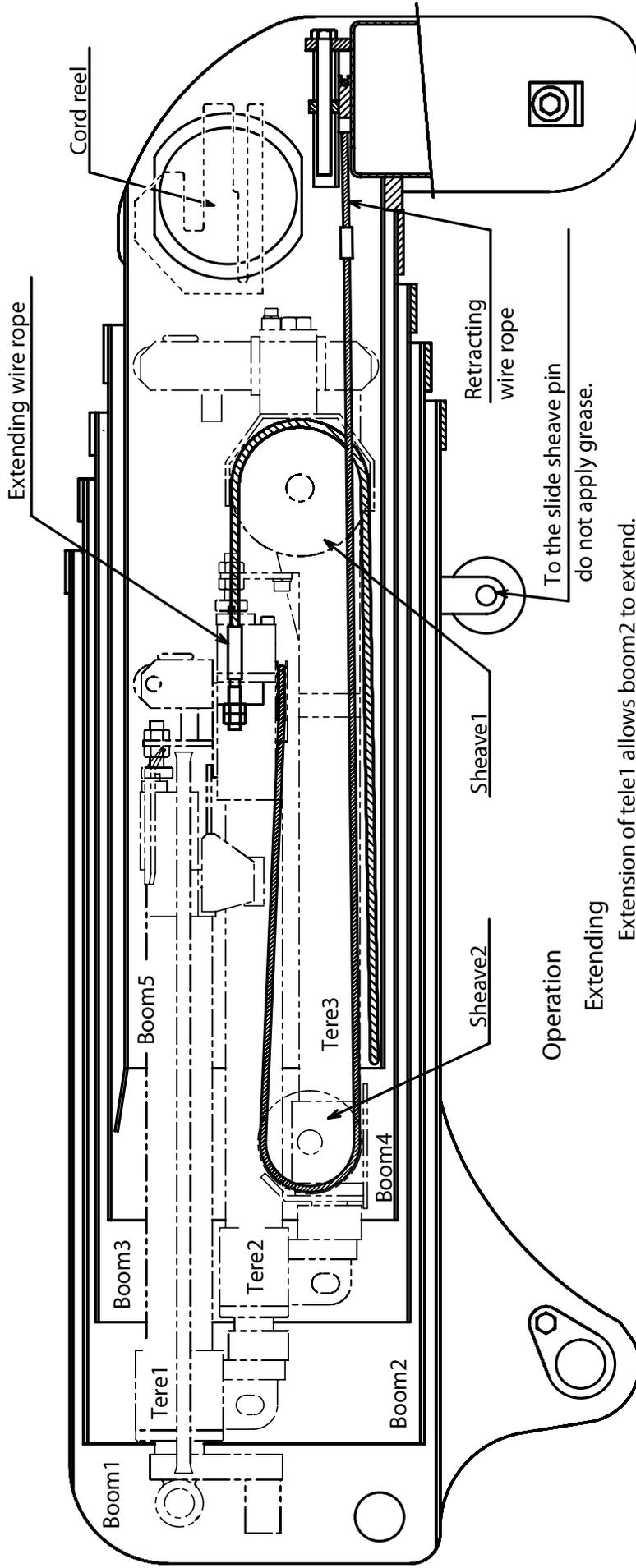


Hydraulic motor (Slewing)

Please prepare the hose and the same part when you exchange the hoses.
Please connect the exchanged hoses with a new hose, drag out the exchanged hoses, and change a new hose and the insertion.

13. BOOM (5-section boom)

(1) Simultaneous telescoping of boom4 and boom5



Inspection of slide plate

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

Operation

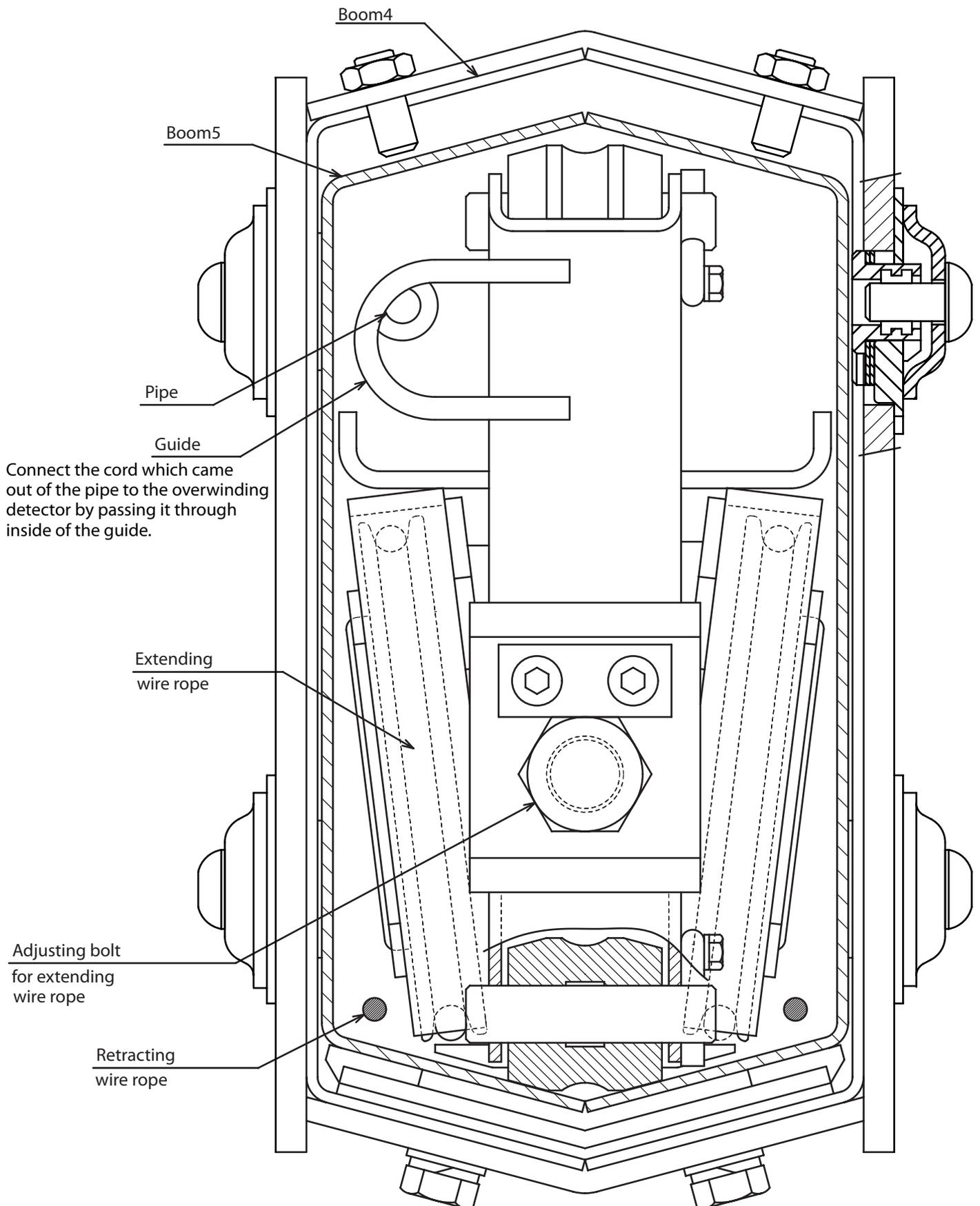
Extending

Extension of tele1 allows boom2 to extend.
 Extension of tele2 allows boom3 to extend.
 Extension of tele3 allows boom4 to extend.
 Extension of tele3 allows sheave 1 to shift and boom5 is to be extended as it is pulled by extending wire.
 Retracting wire follows accordingly .

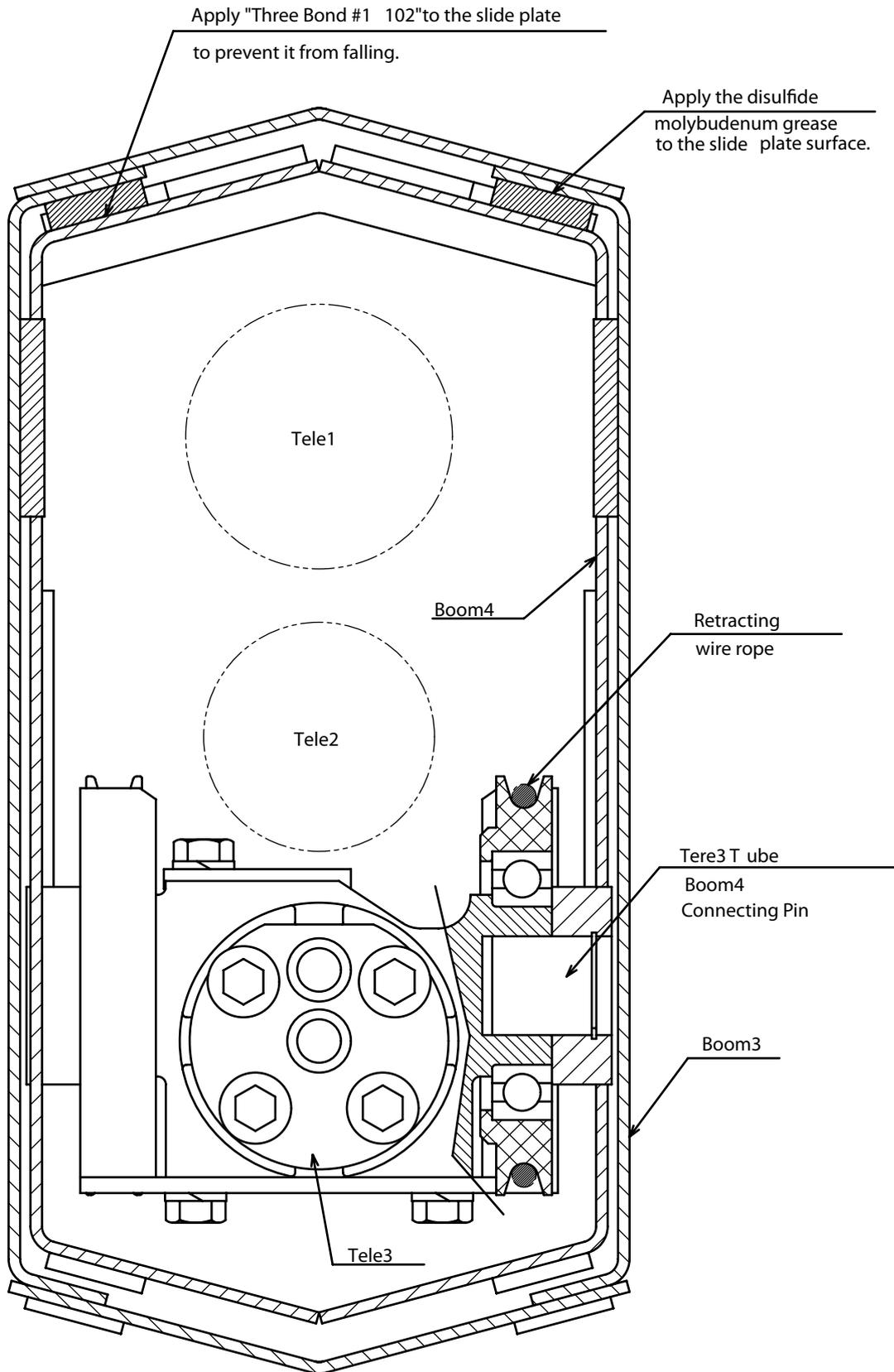
Retracting

Retraction of tele1 allows boom2 to retract.
 Retraction of tele2 allows boom3 to retract.
 Retraction of tele3 allows boom4 to retract.
 Retraction of tele3 allows sheave 2 to shift and boom5 is to be retracted as it is pulled by retracting wire.
 Extending wire follows accordingly .

(2) Boom 4, 5 front side section in detail

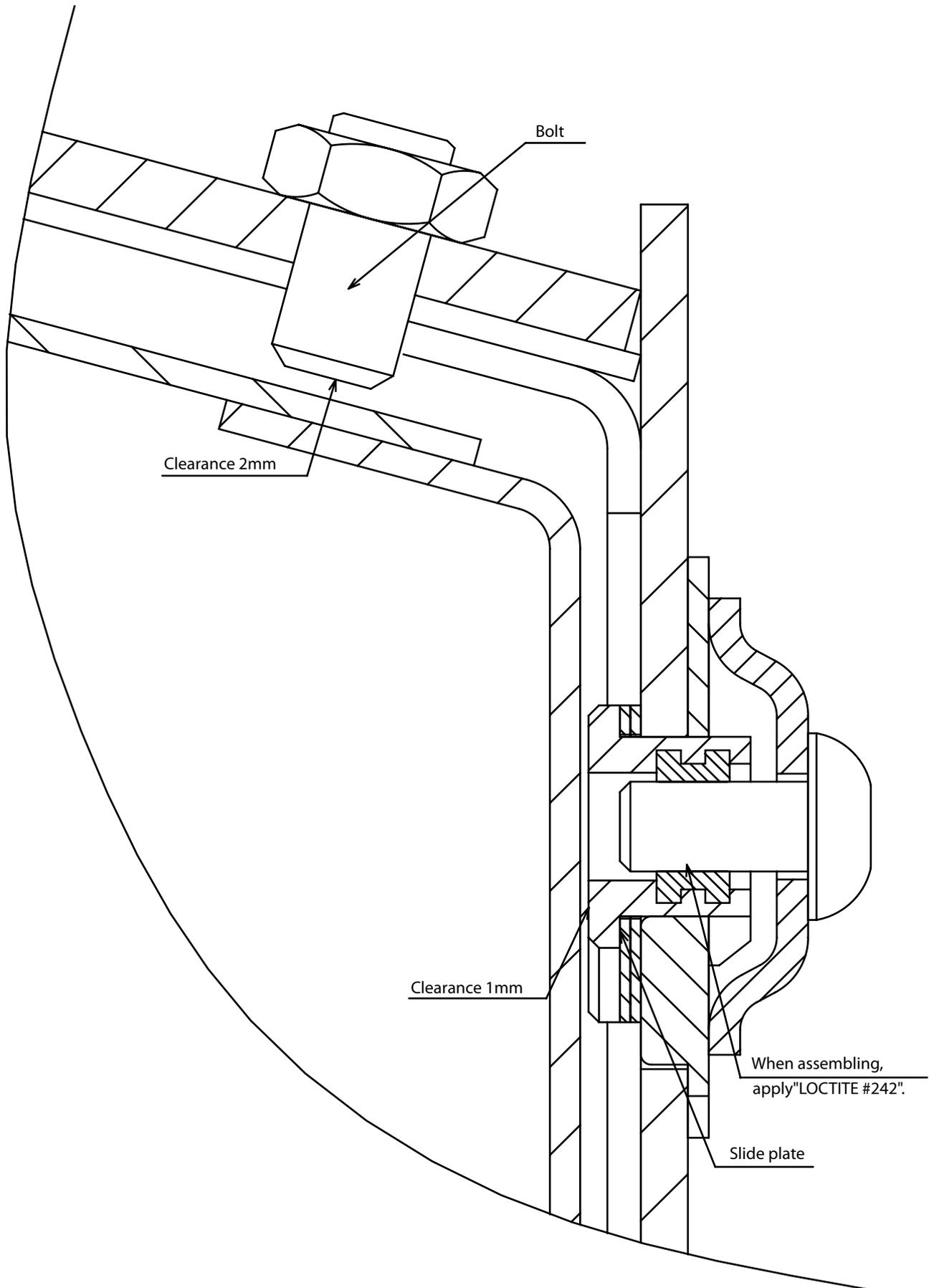


(3) Boom 3, 4 rear side section in detail



(4) Installation procedures for slide plate and guide

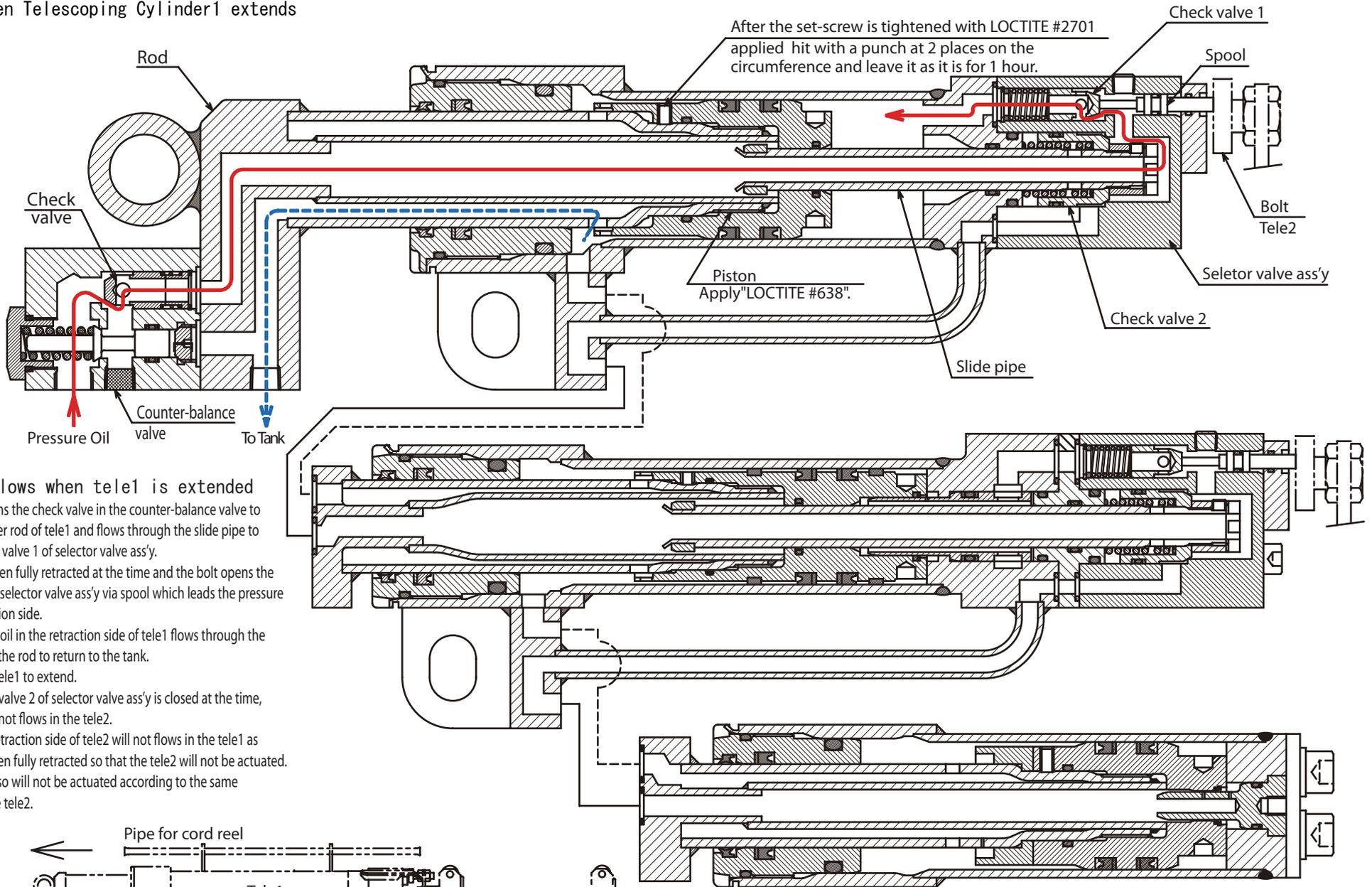
It has similar construction irrespective of number of boom section



1 4. TELESCOPING CYLINDER

14-1 5-Section Boom (Triple Cylinder) Operation

(1) When Telescoping Cylinder1 extends



How oil flows when tele1 is extended

Pressure oil opens the check valve in the counter-balance valve to enter the cylinder rod of tele1 and flows through the slide pipe to reach the check valve 1 of selector valve ass'y.

The tele2 has been fully retracted at the time and the bolt opens the check valve 1 of selector valve ass'y via spool which leads the pressure oil to the extension side.

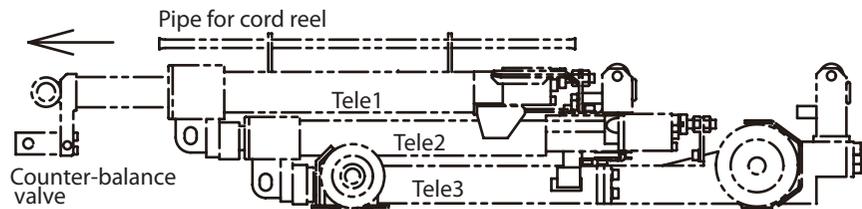
Simultaneously, oil in the retraction side of tele1 flows through the dual cylinder in the rod to return to the tank.

This allows the tele1 to extend.

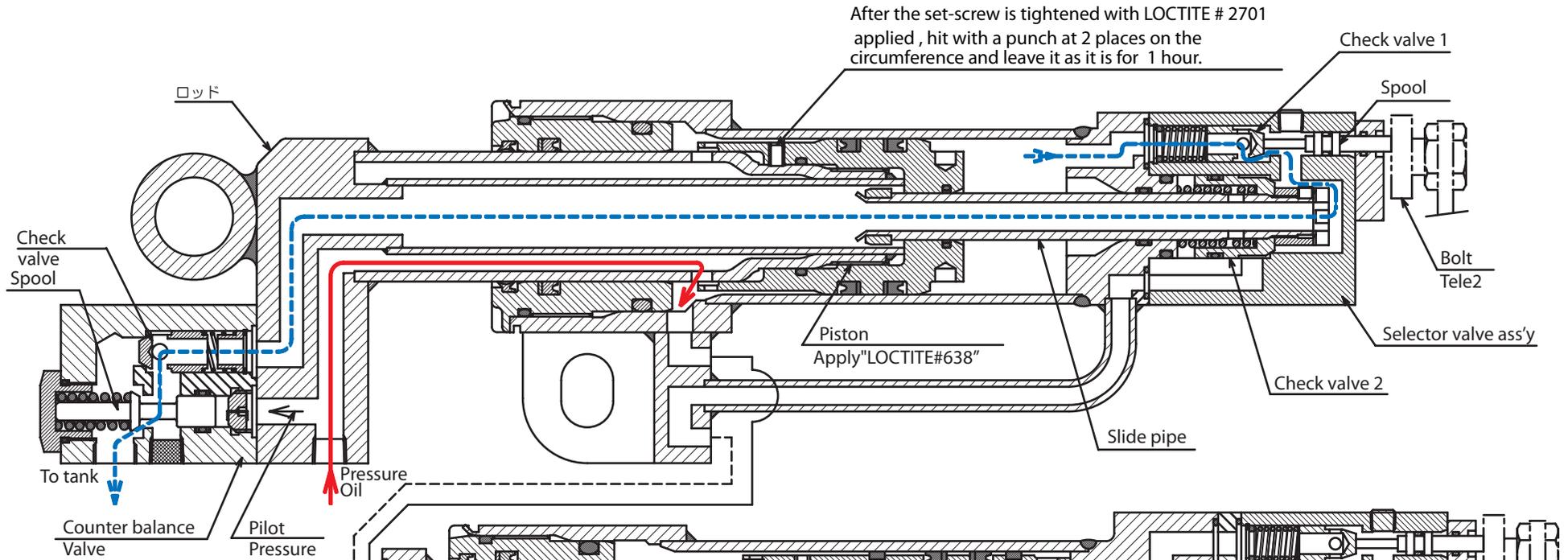
Since the check valve 2 of selector valve ass'y is closed at the time, pressure oil will not flow in the tele2.

Also, oil in the retraction side of tele2 will not flow in the tele1 as the tele2 has been fully retracted so that the tele2 will not be actuated.

And the tele3 also will not be actuated according to the same reasons as in the tele2.



(2) When Telescoping Cylinder1 retracts



How oil flows when tele1 is retracted

Pressure oil flows through the dual cylinder of cylinder rod of tele1 to enter the retraction side of tele1.

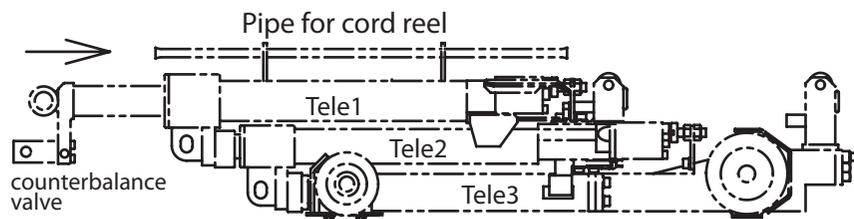
At this stage, the bolt opens the check valve 1 of selector valve ass'y via spool which leads the oil in the extension side to the counter-balance valve by way of slide pipe.

Although the check valve in the counter-balance valve is closed at this time, the spool is opened by pilot pressure from the retraction side allowing the oil in the extension side to return to the tank.

This allows the tele1 to retract.

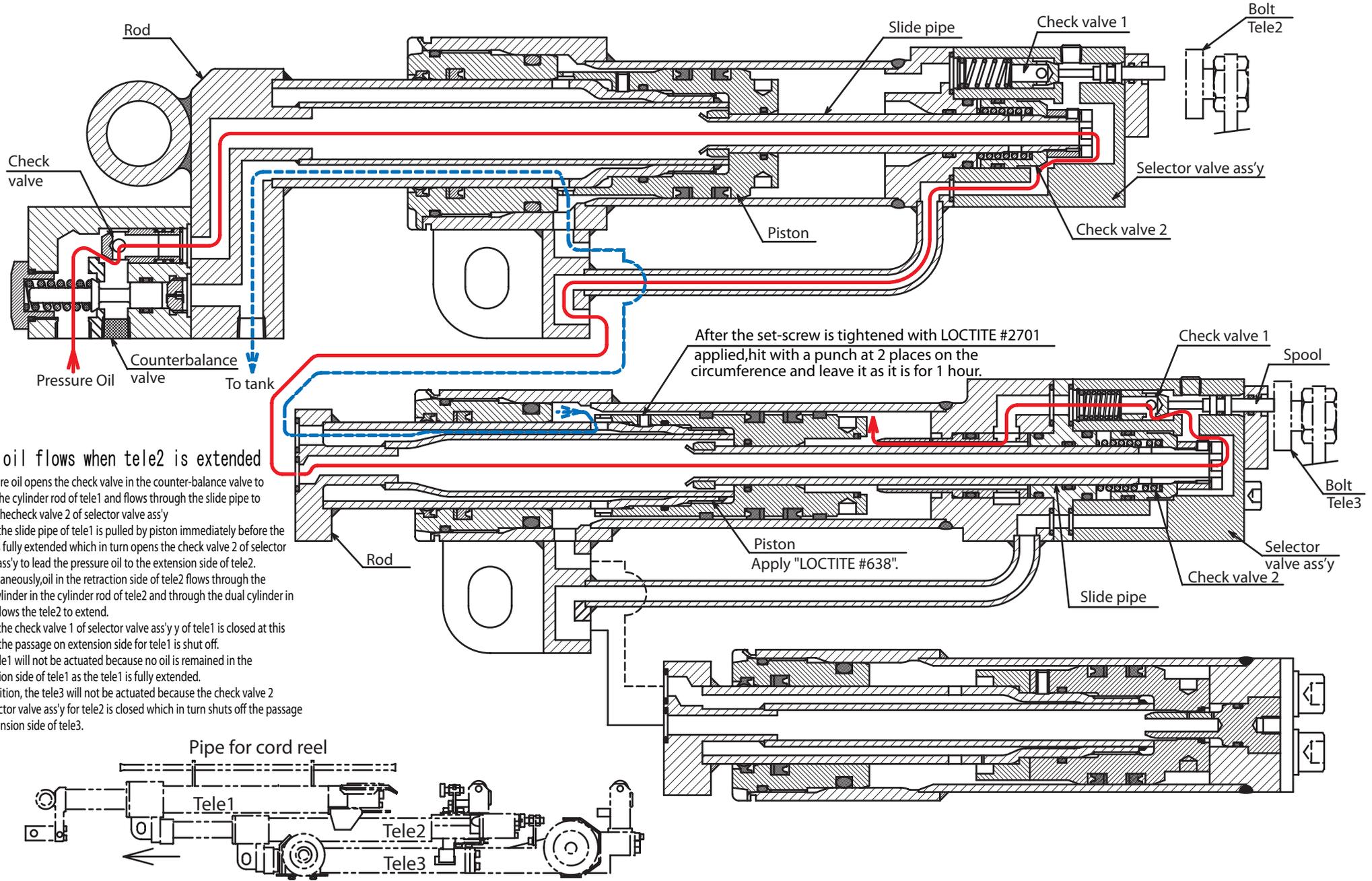
Although pressure is also applied to the retraction side of tele2 at this stage, the tele2 will not be actuated because the check valve 1 of selector valve ass'y for tele1 is closed and the passage to the extension side of tele2 is shut off so that no oil is to be remained in the extension side of tele2.

And the tele3 also will not be actuated according to the same reasons as in the tele2.



(3) When Telescoping Cylinder2 extends

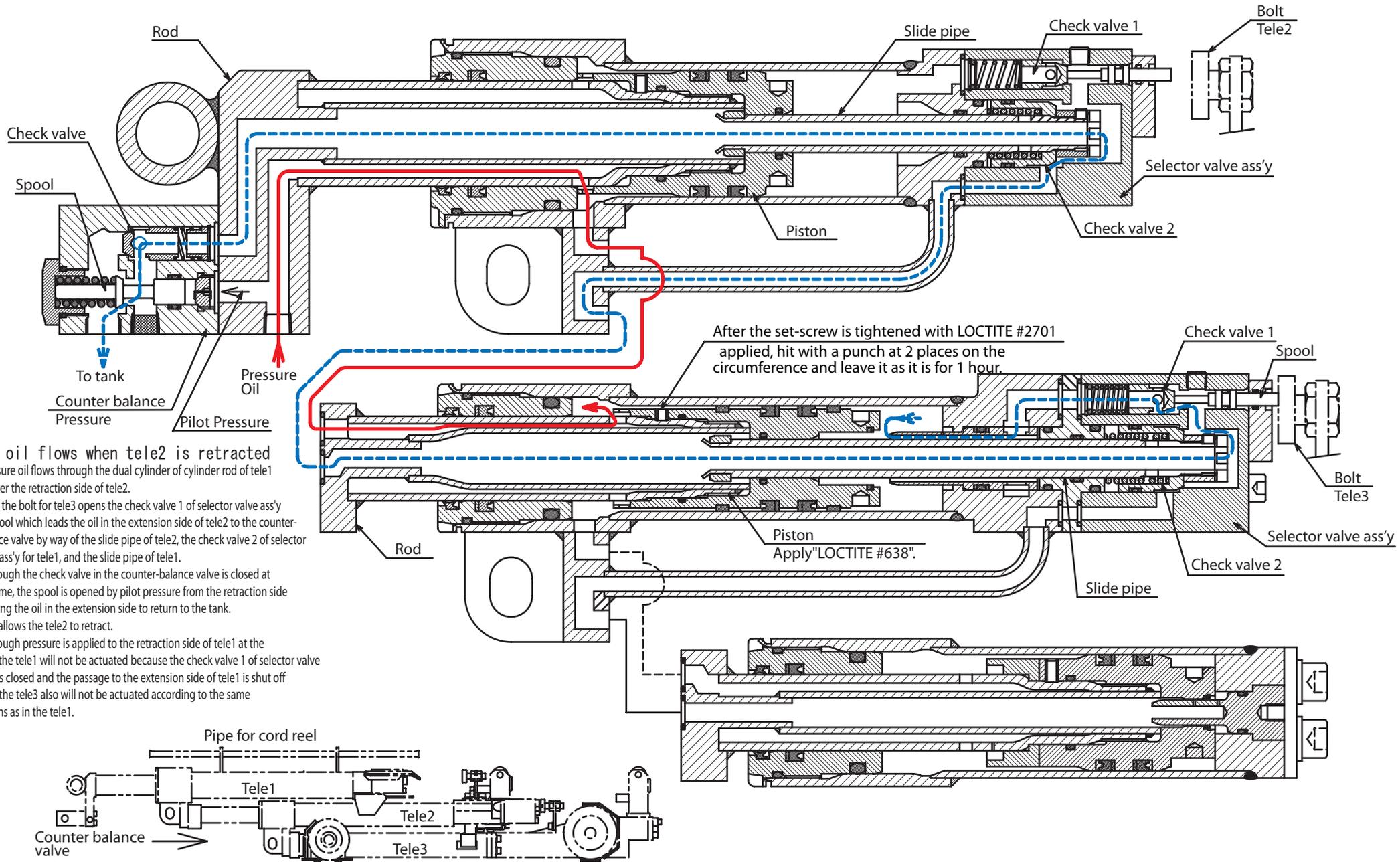
(14-3)



How oil flows when tele2 is extended

Pressure oil opens the check valve in the counter-balance valve to enter the cylinder rod of tele1 and flows through the slide pipe to reach the check valve 2 of selector valve ass'y. Since the slide pipe of tele1 is pulled by piston immediately before the tele1 is fully extended which in turn opens the check valve 2 of selector valve ass'y to lead the pressure oil to the extension side of tele2. Simultaneously, oil in the retraction side of tele2 flows through the dual cylinder in the cylinder rod of tele2 and through the dual cylinder in. This allows the tele2 to extend. Since the check valve 1 of selector valve ass'y of tele1 is closed at this stage, the passage on extension side for tele1 is shut off. The tele1 will not be actuated because no oil is remained in the retraction side of tele1 as the tele1 is fully extended. In addition, the tele3 will not be actuated because the check valve 2 of selector valve ass'y for tele2 is closed which in turn shuts off the passage to extension side of tele3.

4) When Telescoping Cylinder2 retracts



(14-4)

How oil flows when tele2 is retracted

Pressure oil flows through the dual cylinder of cylinder rod of tele1 to enter the retraction side of tele2.

Also, the bolt for tele3 opens the check valve 1 of selector valve ass'y via spool which leads the oil in the extension side of tele2 to the counter-balance valve by way of the slide pipe of tele2, the check valve 2 of selector valve ass'y for tele1, and the slide pipe of tele1.

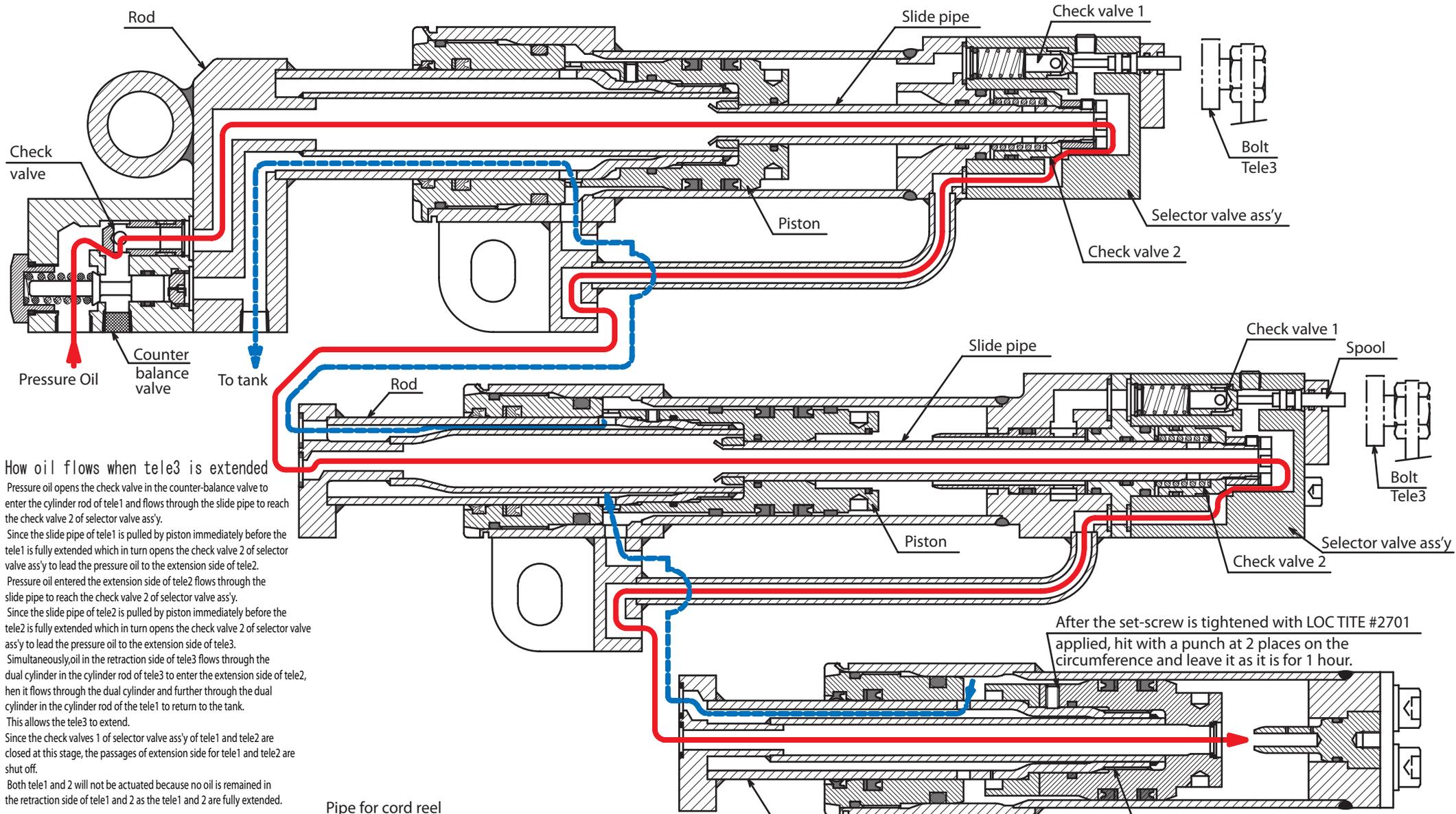
Although the check valve in the counter-balance valve is closed at this time, the spool is opened by pilot pressure from the retraction side allowing the oil in the extension side to return to the tank.

This allows the tele2 to retract.

Although pressure is applied to the retraction side of tele1 at the time, the tele1 will not be actuated because the check valve 1 of selector valve ass'y is closed and the passage to the extension side of tele1 is shut off

And the tele3 also will not be actuated according to the same reasons as in the tele1.

(5) When Telescoping Cylinder3 extends



(14-5)

How oil flows when tele3 is extended

Pressure oil opens the check valve in the counter-balance valve to enter the cylinder rod of tele1 and flows through the slide pipe to reach the check valve 2 of selector valve ass'y.

Since the slide pipe of tele1 is pulled by piston immediately before the tele1 is fully extended which in turn opens the check valve 2 of selector valve ass'y to lead the pressure oil to the extension side of tele2.

Pressure oil entered the extension side of tele2 flows through the slide pipe to reach the check valve 2 of selector valve ass'y.

Since the slide pipe of tele2 is pulled by piston immediately before the tele2 is fully extended which in turn opens the check valve 2 of selector valve ass'y to lead the pressure oil to the extension side of tele3.

Simultaneously, oil in the retraction side of tele3 flows through the dual cylinder in the cylinder rod of tele3 to enter the extension side of tele2, then it flows through the dual cylinder and further through the dual cylinder in the cylinder rod of the tele1 to return to the tank.

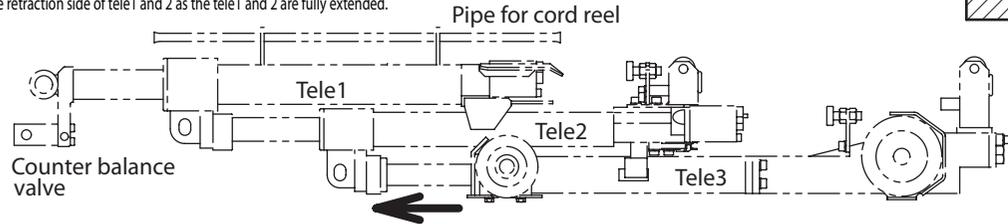
This allows the tele3 to extend.

Since the check valves 1 of selector valve ass'y of tele1 and tele2 are closed at this stage, the passages of extension side for tele1 and tele2 are shut off.

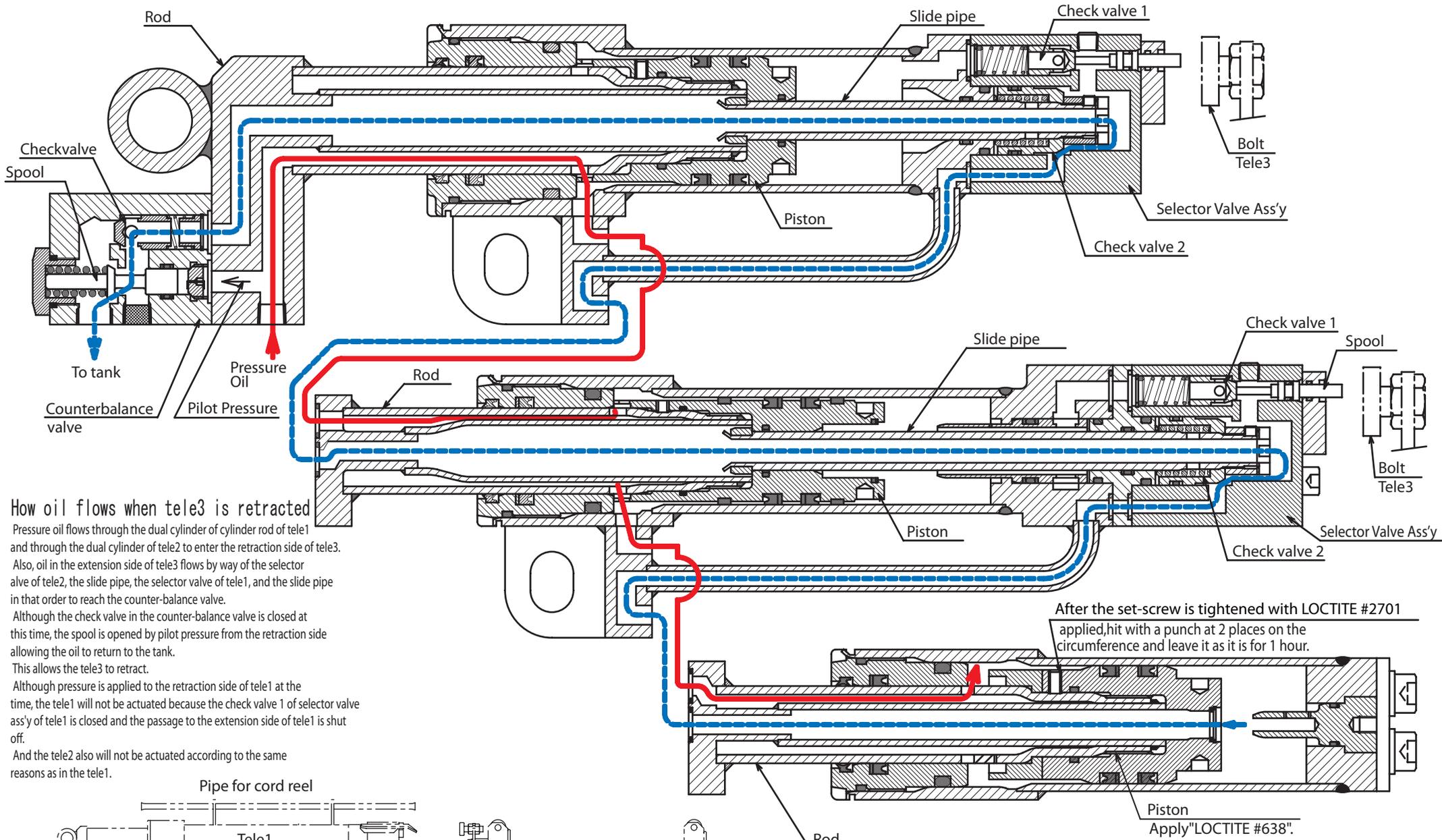
Both tele1 and 2 will not be actuated because no oil is remained in the retraction side of tele1 and 2 as the tele1 and 2 are fully extended.

After the set-screw is tightened with LOC TITE #2701 applied, hit with a punch at 2 places on the circumference and leave it as it is for 1 hour.

Piston Apply "LOCTITE #638".



(6) When Telescoping Cylinder3 retracts



(14-6)

How oil flows when tele3 is retracted

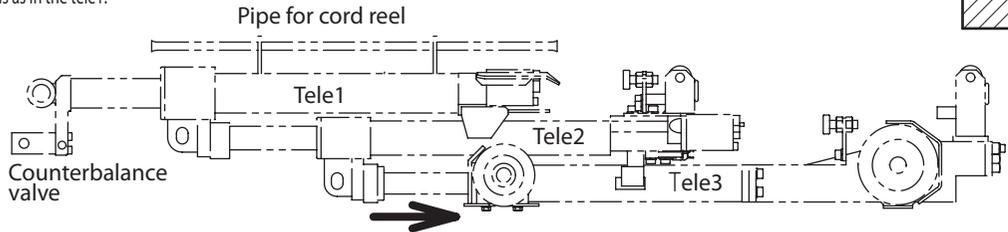
Pressure oil flows through the dual cylinder of cylinder rod of tele1 and through the dual cylinder of tele2 to enter the retraction side of tele3. Also, oil in the extension side of tele3 flows by way of the selector valve of tele2, the slide pipe, the selector valve of tele1, and the slide pipe in that order to reach the counter-balance valve.

Although the check valve in the counter-balance valve is closed at this time, the spool is opened by pilot pressure from the retraction side allowing the oil to return to the tank.

This allows the tele3 to retract.

Although pressure is applied to the retraction side of tele1 at the time, the tele1 will not be actuated because the check valve 1 of selector valve ass'y of tele2 is closed and the passage to the extension side of tele1 is shut off.

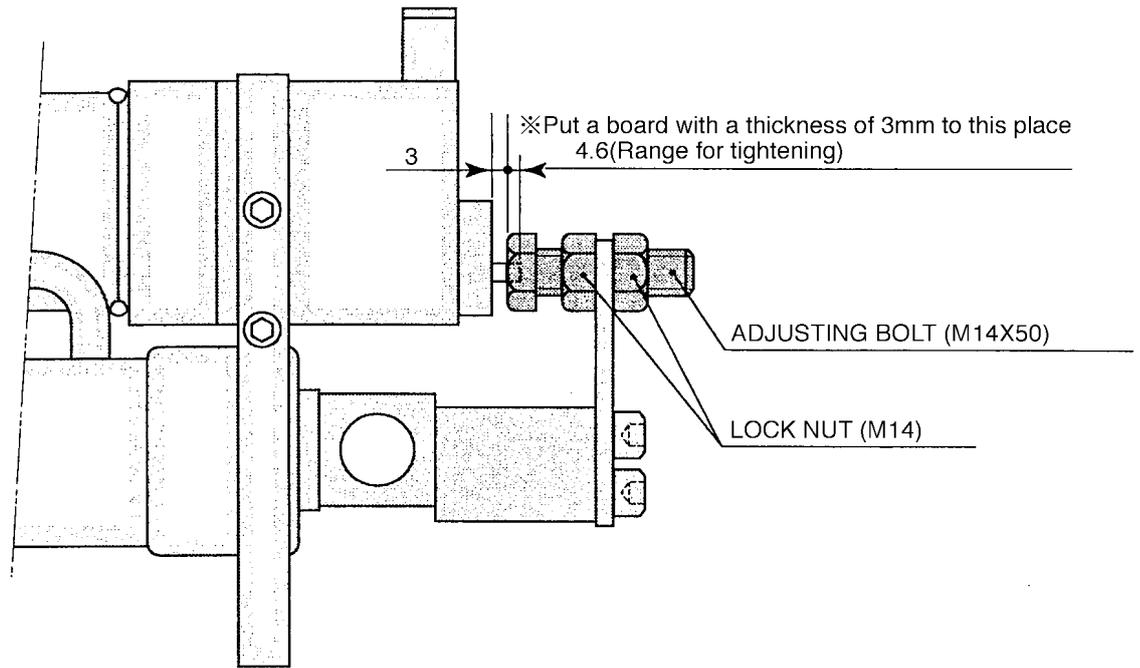
And the tele2 also will not be actuated according to the same reasons as in the tele1.



After the set-screw is tightened with LOCTITE #2701 applied, hit with a punch at 2 places on the circumference and leave it as it is for 1 hour.

Piston Apply "LOCTITE #638".

7) Adjusting Procedures for Selector Valve with Adjusting Bolt



☞ Adjusting Procedures with Adjusting Bolt

- ① Retract telescoping cylinders (1) and (2) to their minimum.
- ② Apply LOCTITE #242 to the threads of the adjusting bolt.
- ③ Put a board with a thickness of 3mm to the part marked with* and tighten the adjusting bolt.
- ④ After adjusting, lock with the lock nut.

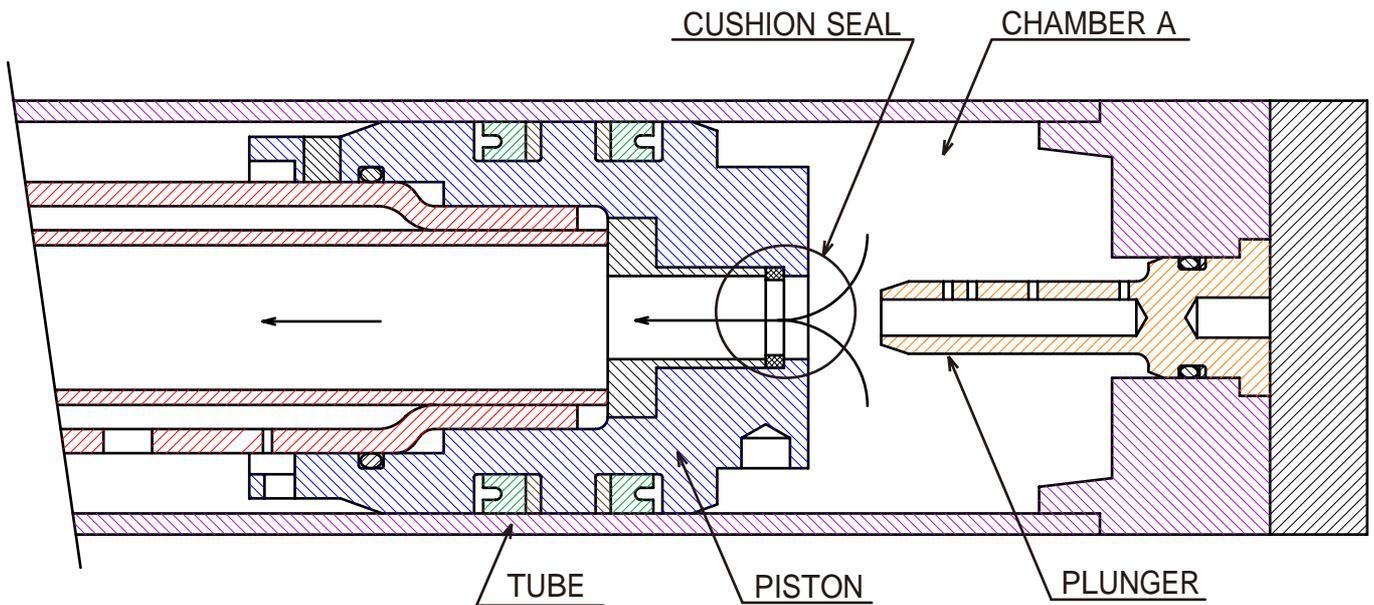
14.2 Function and Working of Cushion Seal

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

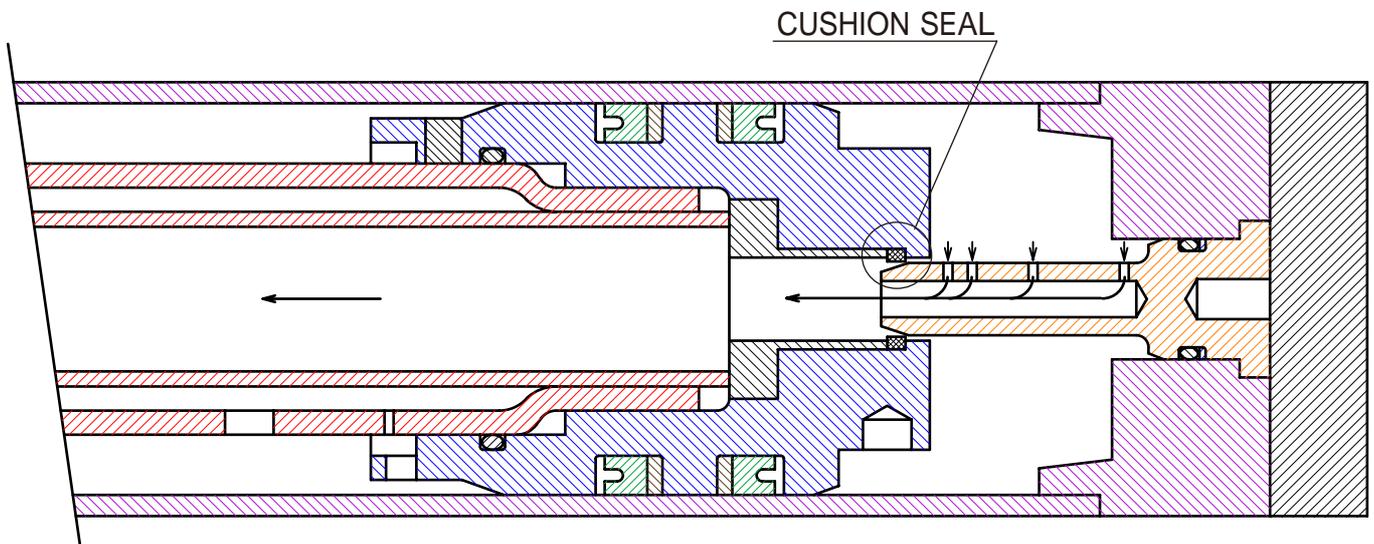
(1) Flow of Pressure Oil When Retracting

1. Cushion mechanism of the telescoping cylinder (3) for 5-section booms.

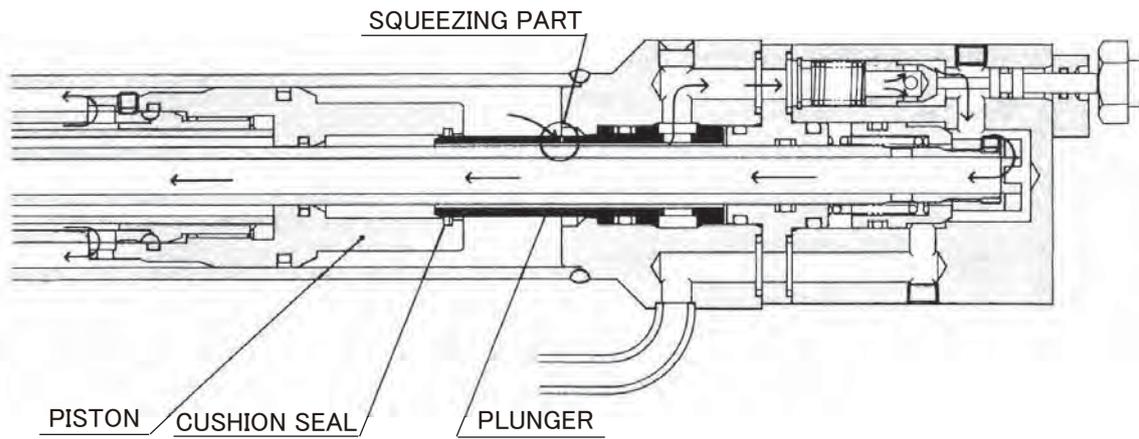
In the retracting process, before the piston gets in the plunger, the pressure oil in the chamber A flows through the central part of the piston as shown in the illustration and returns to the tank without being squeezed.



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

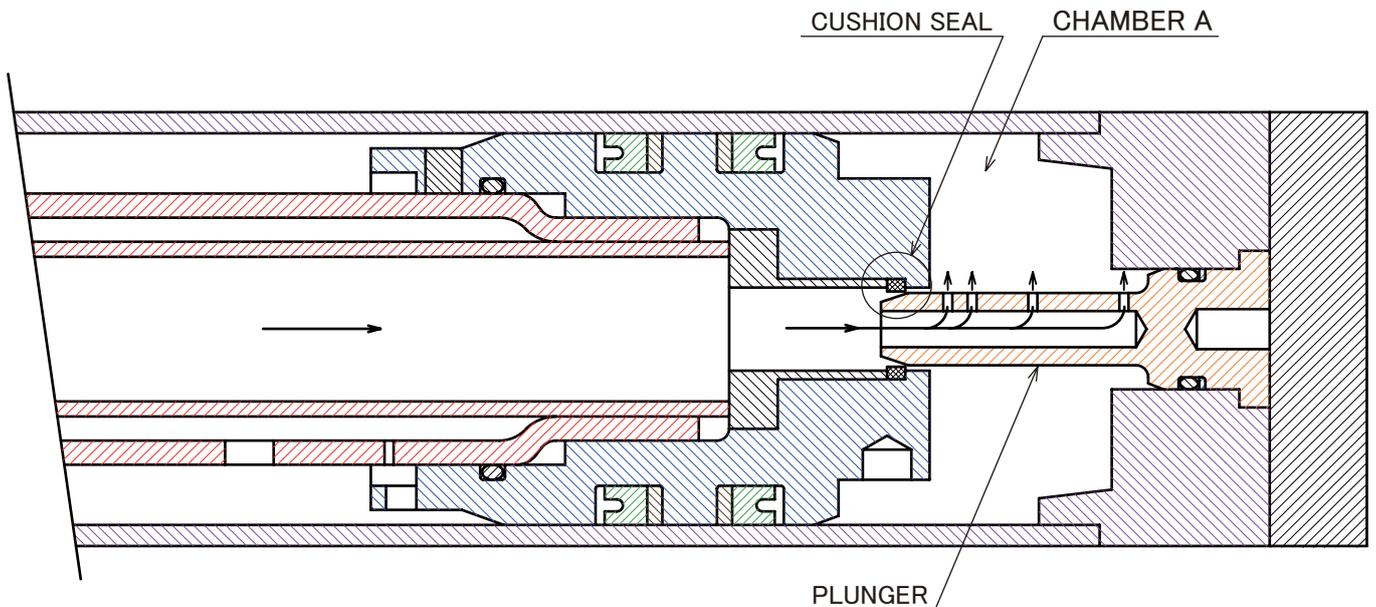


2. Cushion mechanism of the telescoping cylinder (2) for 5-section and 5-section boom.

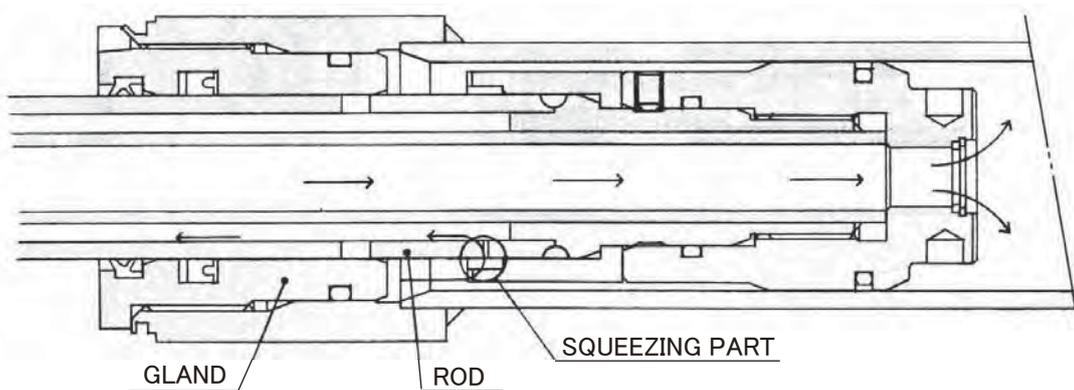


(2) Flow of Pressure Oil When Extending

- ① When extending, the pressure oil flows into the chamber A as shown in the illustration. In this way, the telescoping cylinder extends.



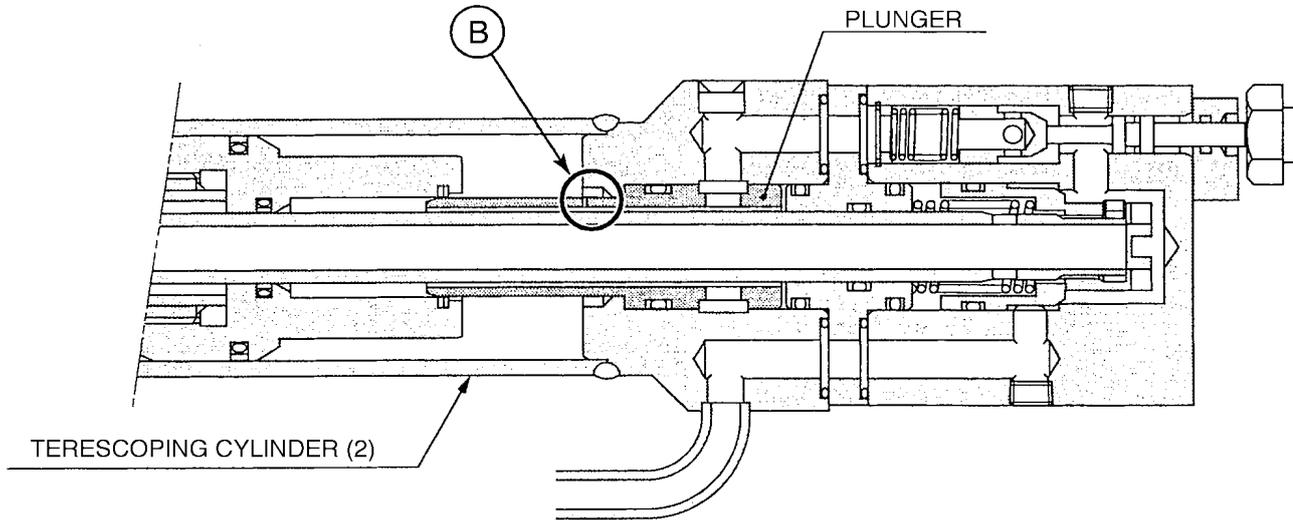
- ② Cushion mechanism of the telescoping cylinder for 5-section and 6-section booms is to squeeze the return pressure oil at the position just before the end of extension and absorb the piston shock to the stroke end.



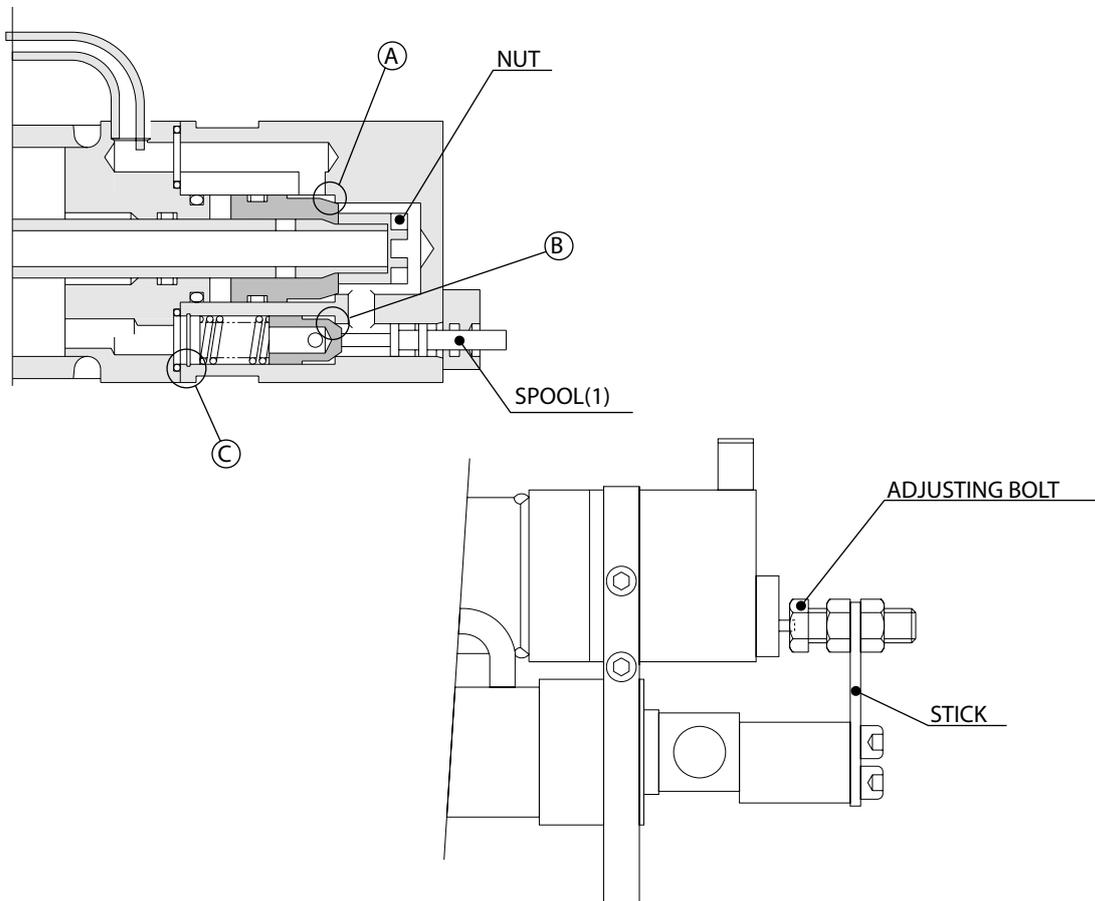
14. 3 Cause of Troubles and Measures to be Taken

(1) 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 of the plunger of the telescoping cylinder (2).



(2) Cause of Troubles and Remedy

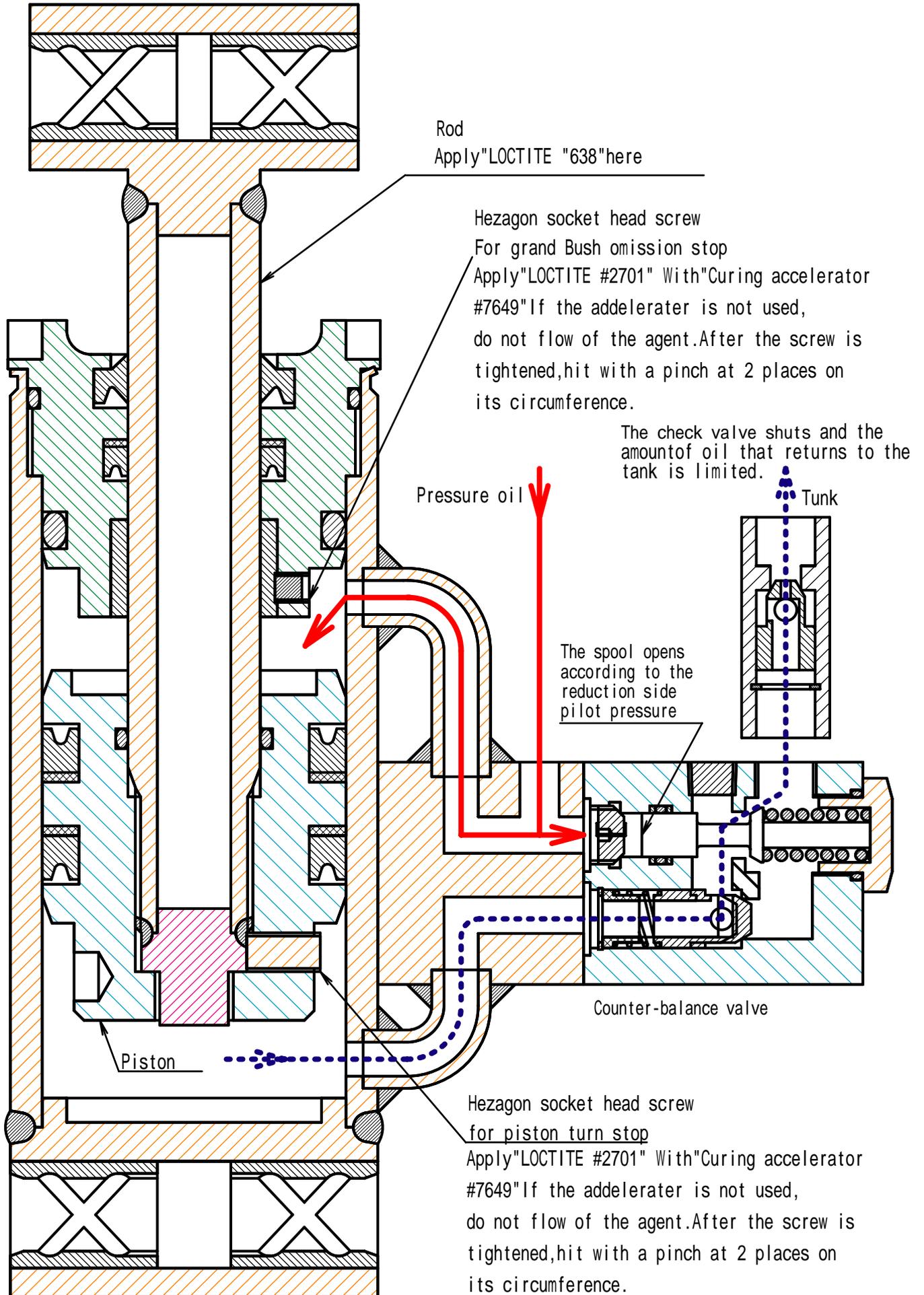


5-section boom (Triple cylinders)

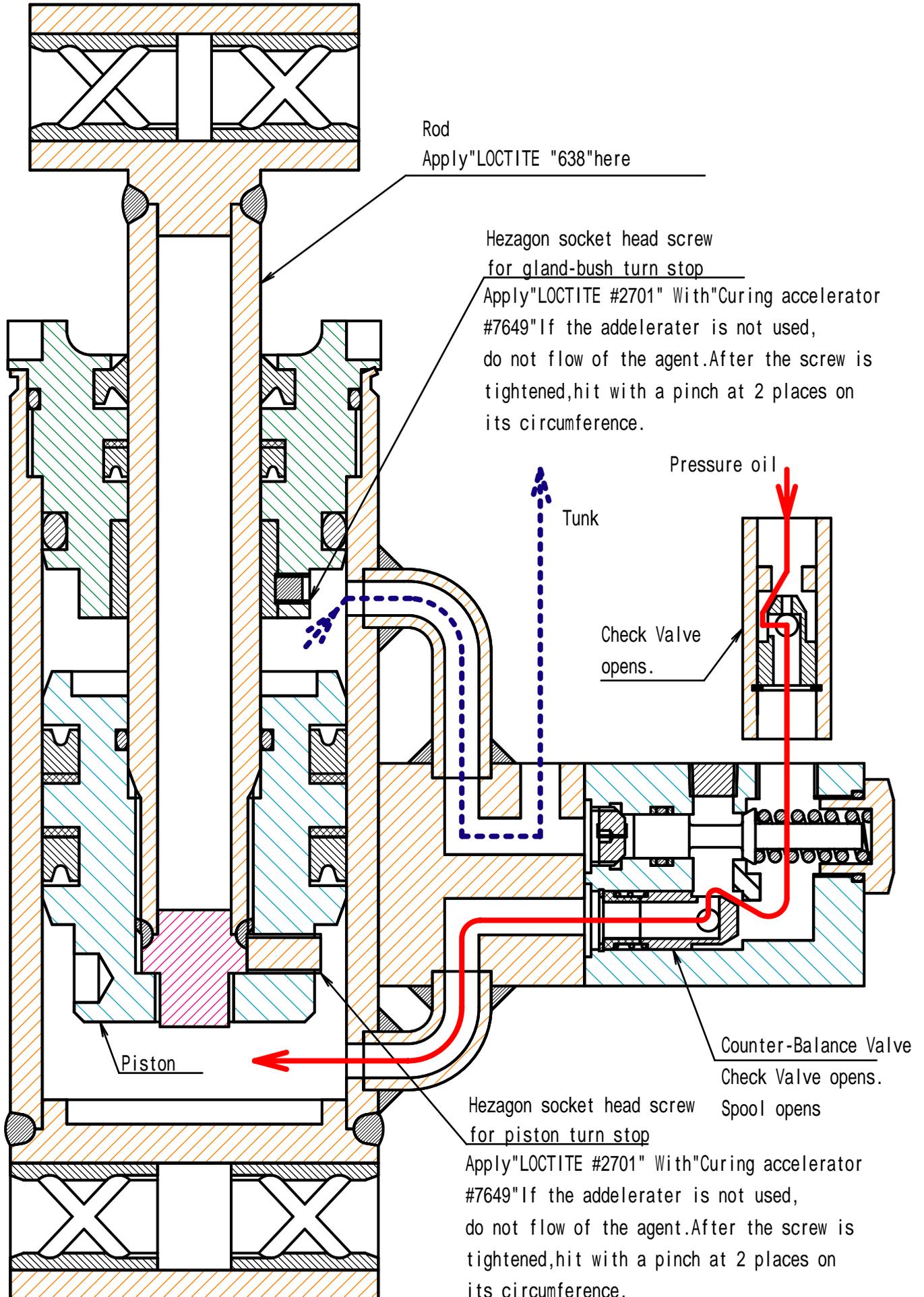
Troubles	Possible cause	Measures to be taken
① Retraction is normal, but when extending, booms (2) and (3) extend at the same time, in other words disorderly.	<ul style="list-style-type: none"> ●Some foreign substances are clogging the part of selector valve of telescoping cylinder (1). 	<ul style="list-style-type: none"> ●Disassemble selector valve for cleaning, or replace it with a new one.
② Extension is normal, but when retracting, booms (3) (4) and (5) retract at the same time, in other words disorderly.	<ul style="list-style-type: none"> ●Some foreign substances are clogging the part of selector valve of telescoping cylinder (2). 	
③ Extension is normal, but when retracting, booms (3), (4) and (5) retract at the same time, in other words disorderly .	<ul style="list-style-type: none"> ●Some foreign substances are clogging the part of selector valve of telescoping cylinder (2). ●Snap ring at the part of selector valve of telescoping cylinder (2) got out of place. 	<ul style="list-style-type: none"> ●Disassemble selector valve for cleaning, or replace it with a new one. ●Rearrange snap ring.
④ Extension is normal, but when retracting, booms (2) and (3) retract at the same time, in other words disorderly.	<ul style="list-style-type: none"> ●Some foreign substances are clogging the part of selector valve of telescoping cylinder (1). ●Snap ring at the part of selector valve of telescoping cylinder (2) got out of place. 	
⑤ Boom (2) extends but boom (3) does not extend.	<ul style="list-style-type: none"> ●Nut at slide pipe of telescoping cylinder (1) was loosened. 	<ul style="list-style-type: none"> ●Disassemble telescoping cylinder (1) and tighten the nut.
⑥ Boom (2) and (3) extend, but boom (4) and (5) does not extend.	<ul style="list-style-type: none"> ● Nut at 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, booms (5) retracts but boom (3) does not retract.	<ul style="list-style-type: none"> ● Adjusting bolt pushing the spool of selector valve of telescoping cylinder (2) was loosened. ● Selector valve spool of telescoping cylinder (2) was bent. 	<ul style="list-style-type: none"> ● Adjust the bolt. ● Replace selector valve ass'y with a new one.
⑧ Boom (3), (4) and (5) retracts but boom (2) does not retract.	<ul style="list-style-type: none"> ● Adjusting bolt pushing the spool of selector valve of telescoping cylinder (1) was loosened. ● Selector valve spool of telescoping cylinder (1) was bent. 	

Note: During operation test after disassembling and repairing, the reason why the booms (4), (5) and (6) stop extending halfway is presumed that the left and the right wire ropes for extension were crossed when reassembling.

15.1 Flow of oil,when lowering



15.2 Flow of oil, when raising



16 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 1.5mm 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.)

TELESCOPING/DERRICK CYLINDER ASS'Y, MEASURES TO PREVENT PISTON FROM BEING LOOSE

(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.

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

(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.)

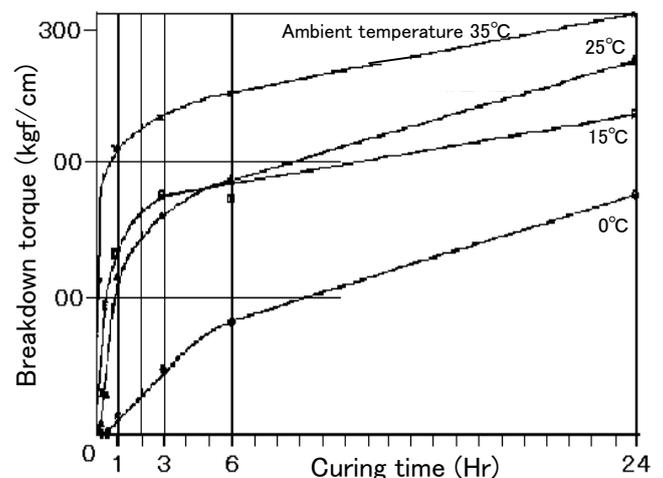
- Try shortening the working period from the time when application of the "LOCTITE" to a primed component to completion of fitting the component.

(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 time
When using "LOCTITE #638 with 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 a component temperature of 15 °C 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".

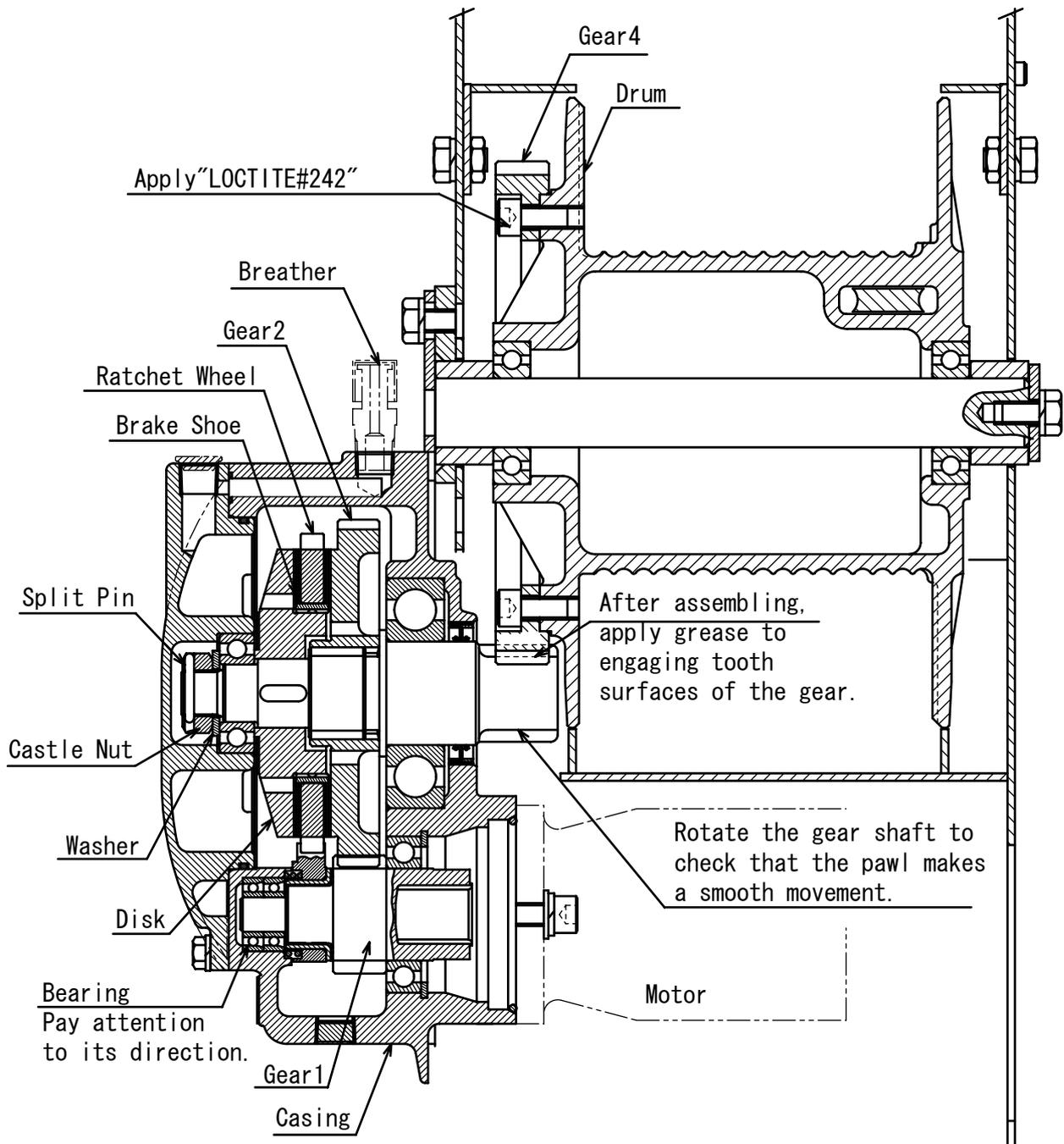
Curing speed of #7469 is faster than that of #7471 but adhesion strength is lower.

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).

17.HOIST WINCH

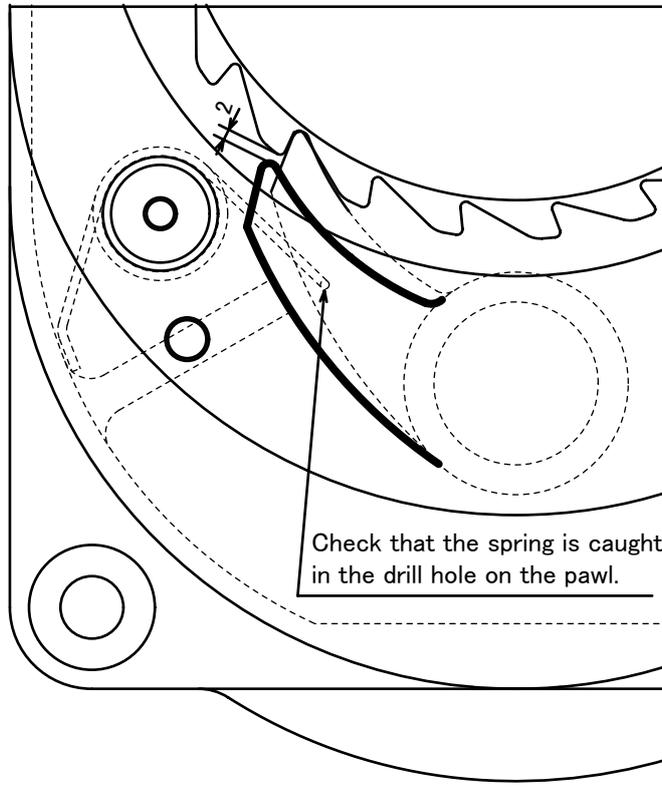
17.1 Construction of Hoist Winch and brake shoe adjusting procedure



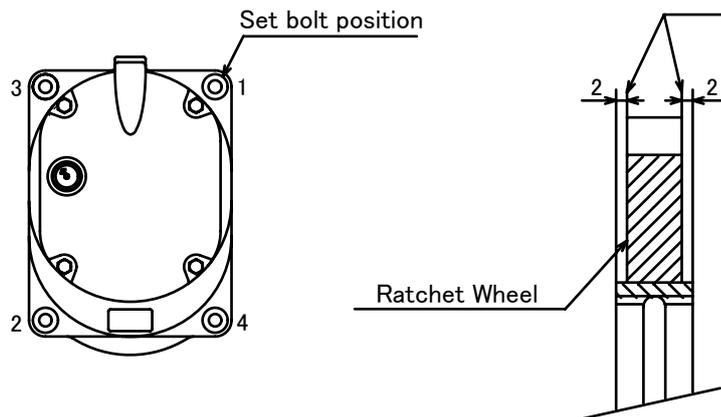
Brake Shoe Adjusting procedures

1. Tighten the castle nut lightly with a spanner.
2. After tightening, 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.

17. 2 Caution to be taken when reassembling hoist winch



Dimensions on both sides should be equally arranged when fitting the ratchet wheel.

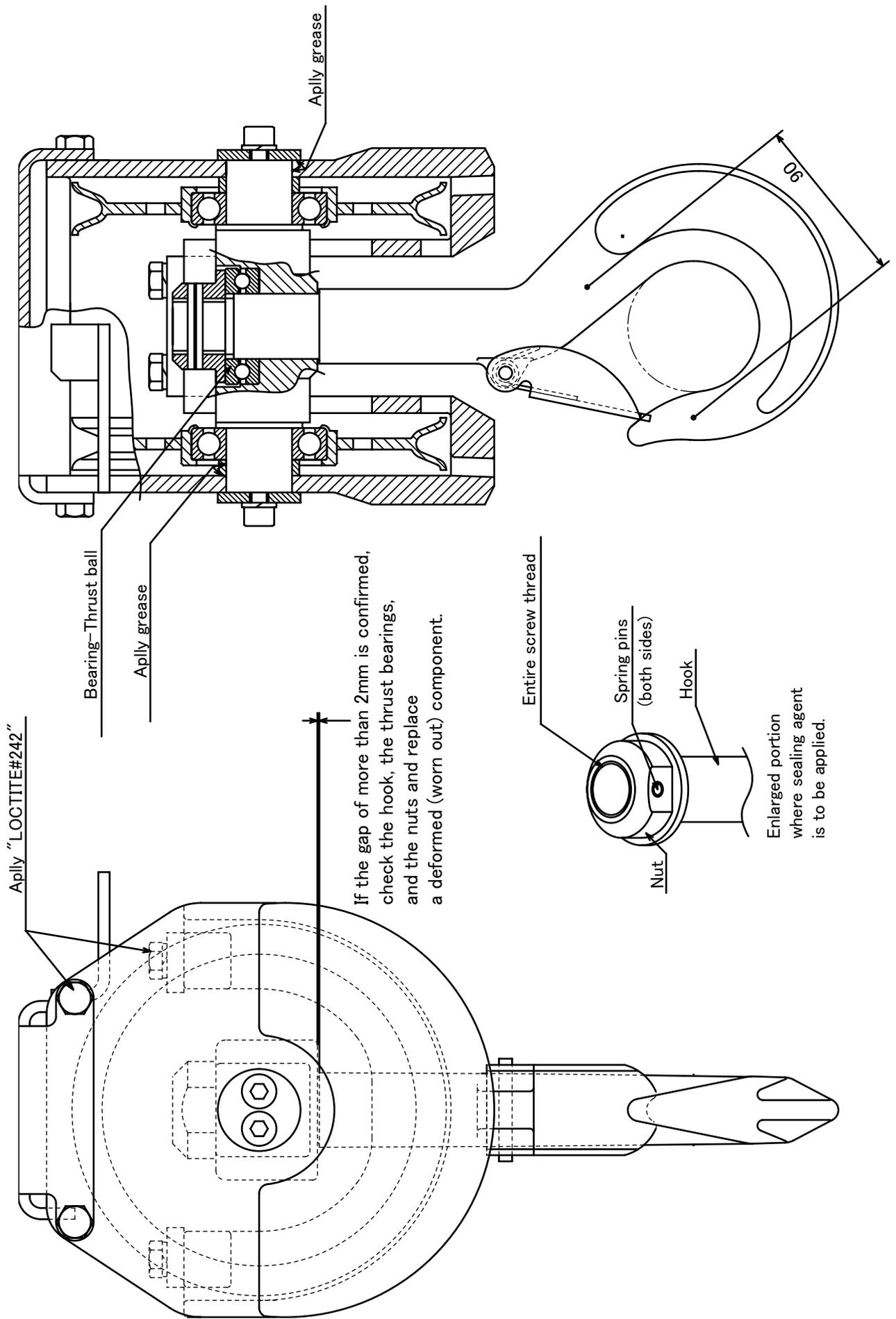


Tightening order of bolts for mounting reduction gear
Tighten the hexagon socket head screws in diagonal order after the set bolt has been fastened first to align each screw hole.

17.3 Cause of Troubles and Measures to be Taken (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.	Adjust tightening of brake shoe.
	Drum or reduction gear is defective.	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.	Replace spring.
	Bushing the part of fitting pawl is worn out.	Replace bushing.

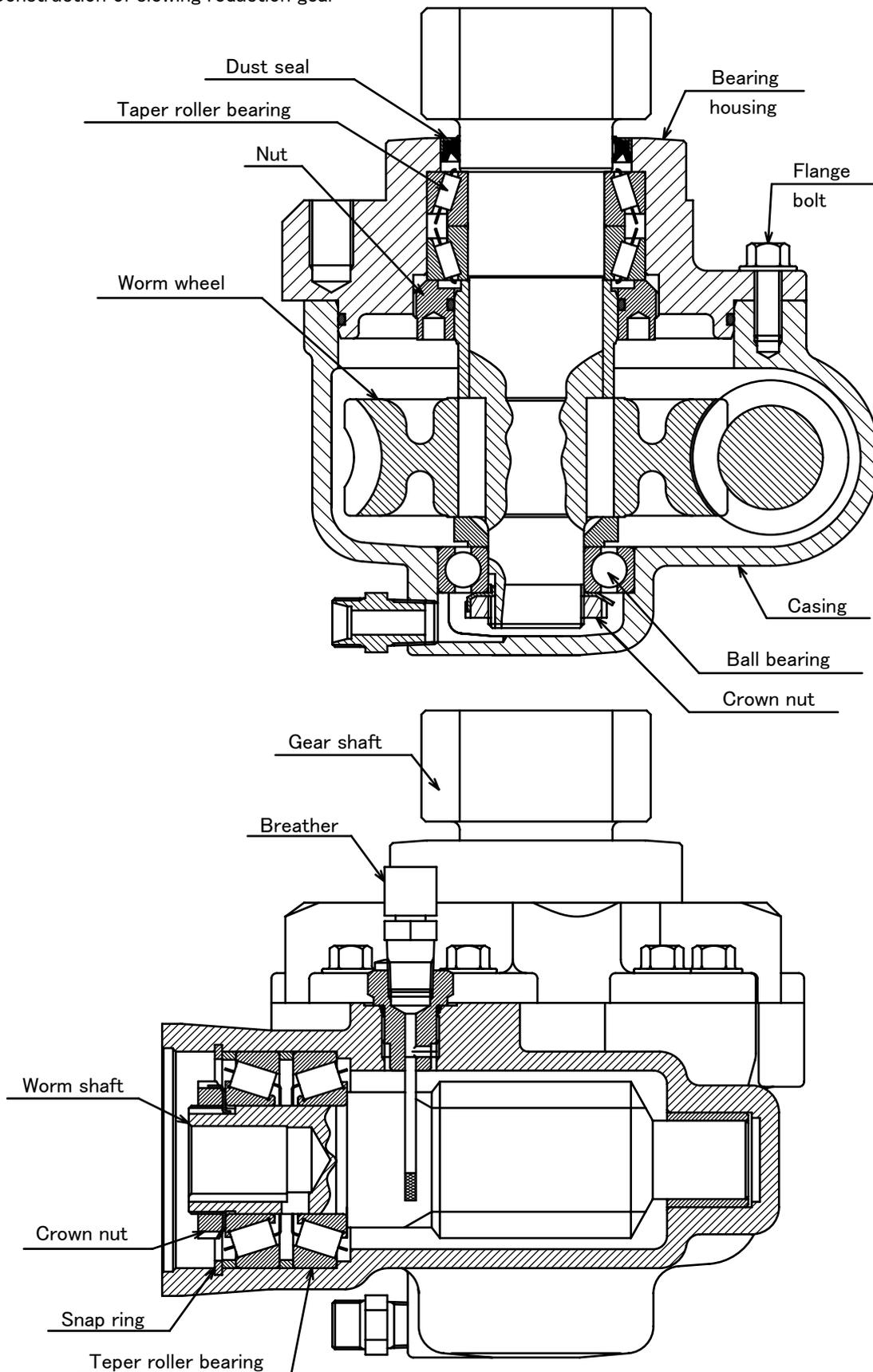
18. HOOK



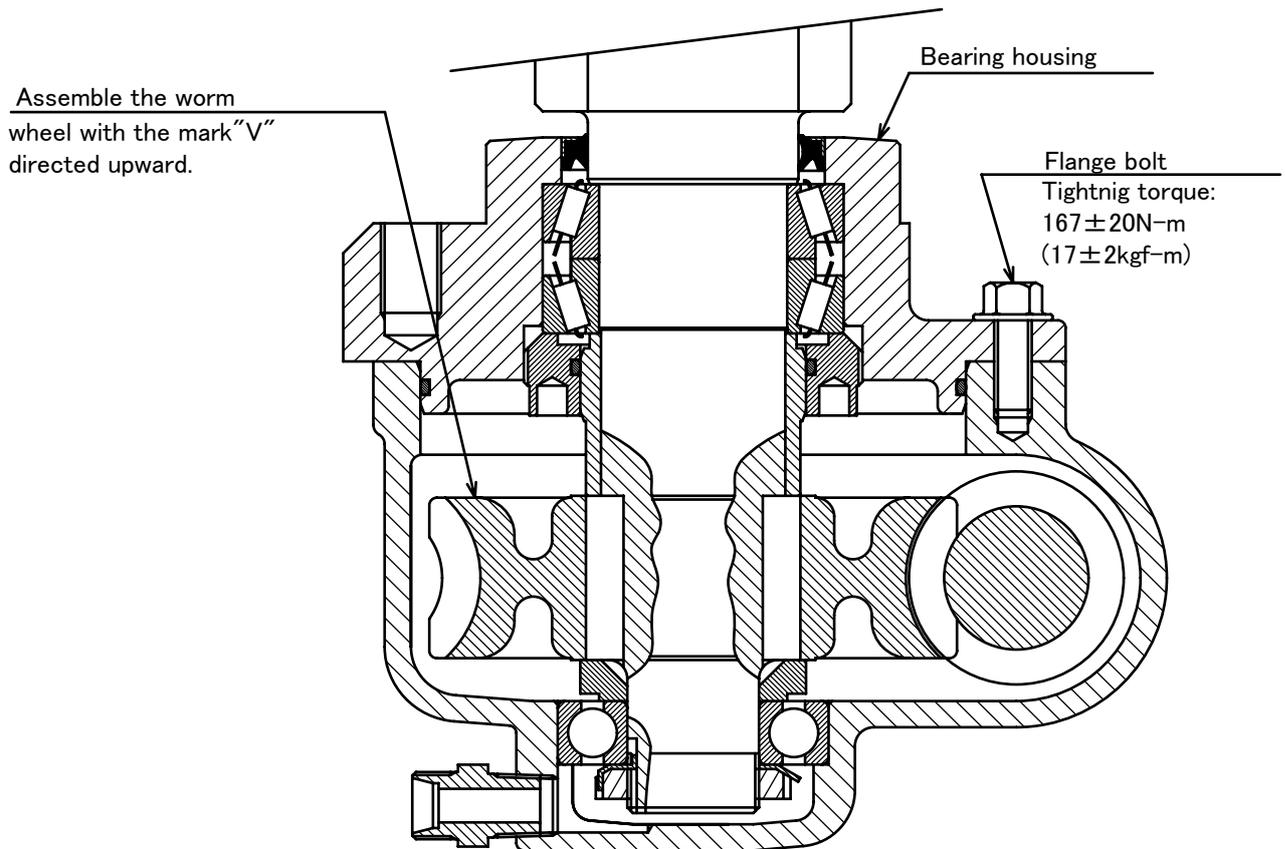
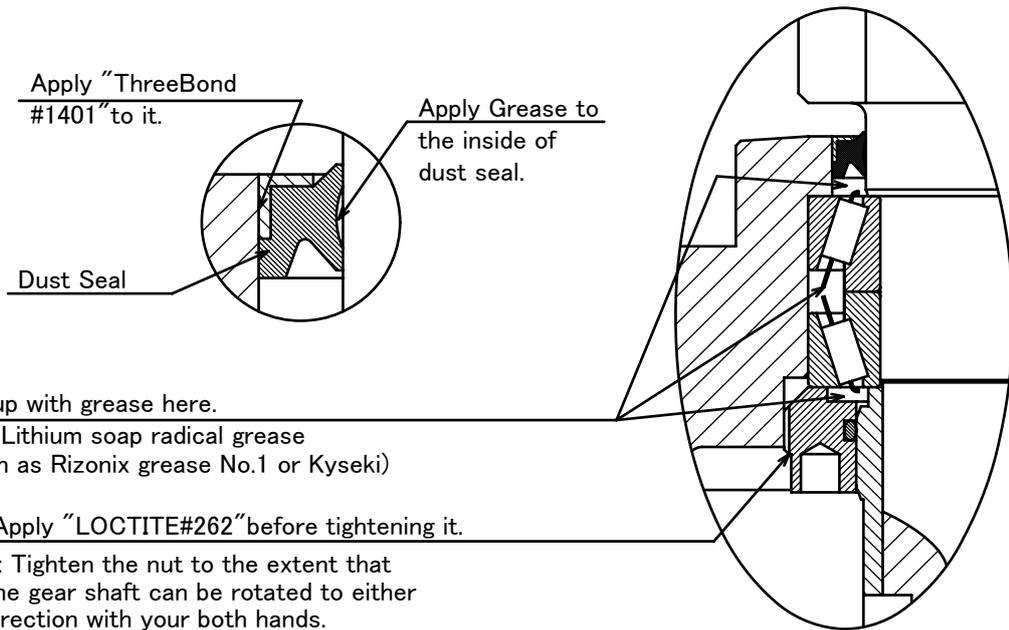
19. SLEWING

1 Slewing reduction gear

(1) Construction of slewing reduction gear

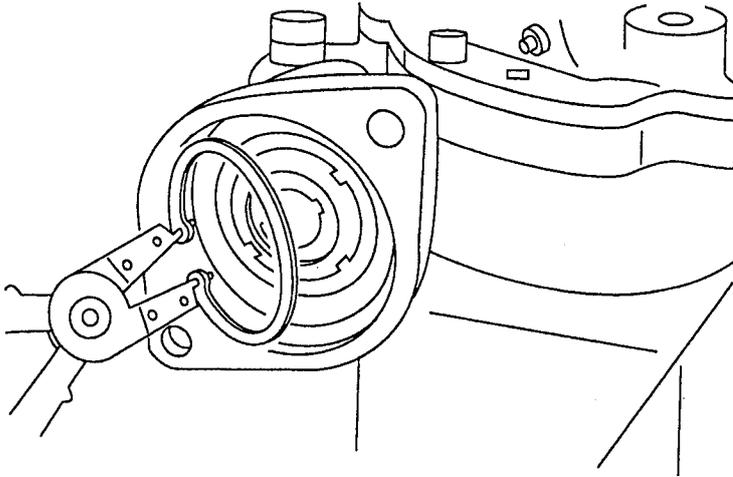


(2) Construction to be taken when reassembling slewing reduction gear

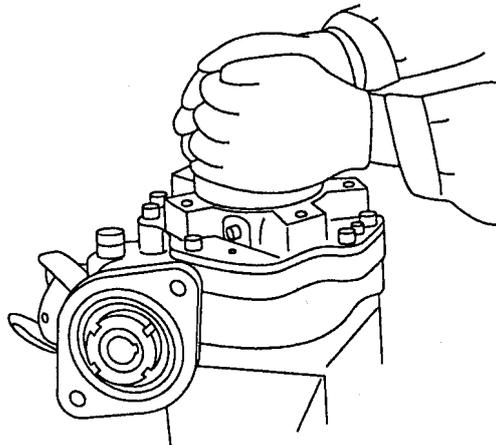


(3) Slewing reduction gear disassembly procedures

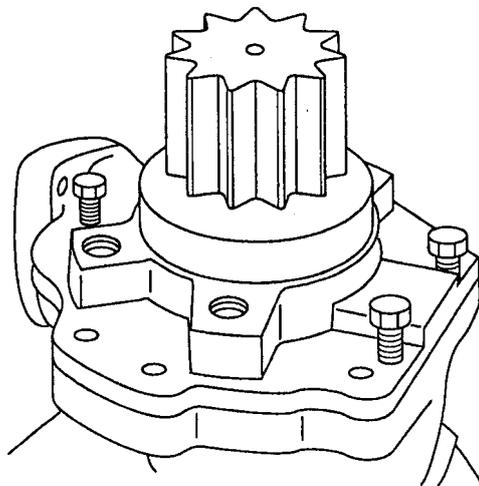
- ① Remove a snap ring (H-80) retaining the taper roller bearing which sustains the worm shaft.



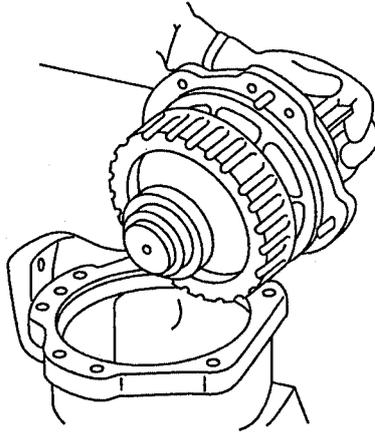
- ② Turn the gear shaft counterclockwise, and pull out the worm shaft from the casing. (Use of special tool for removing worm shaft is recommended.)



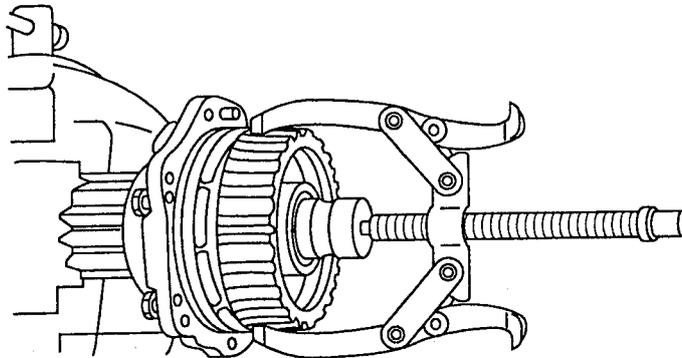
- ③ Remove 8 pcs. of bolt (M10 X 25 \varnothing) which fasten the bearing housing and pull out the housing, utilizing 3 pcs. of bolt for 3 through holes in the housing.



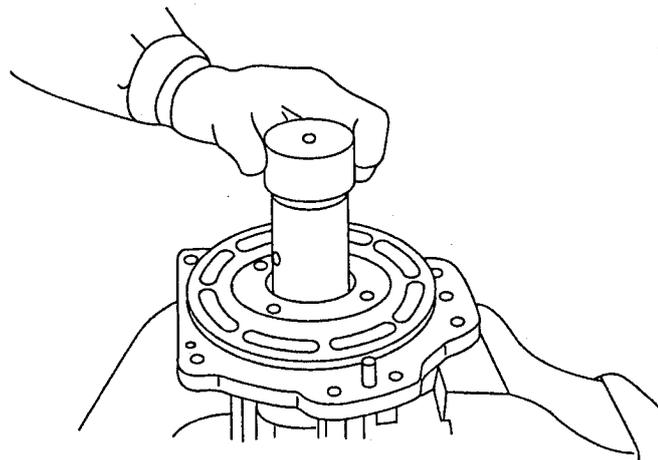
④ This figure shows the pulled out housing with gear shaft and worm wheel.



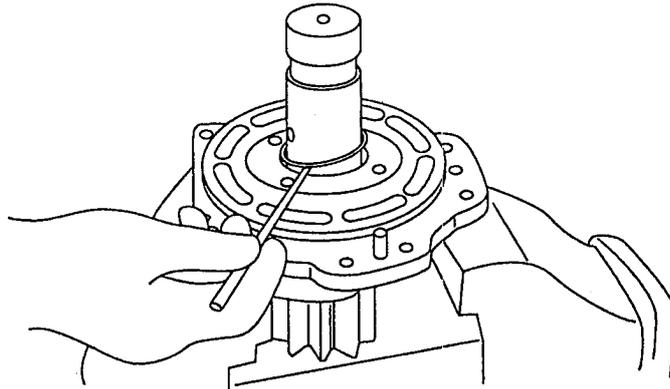
⑤ Grip the housing with a vice and pull out the worm wheel with a gear puller.



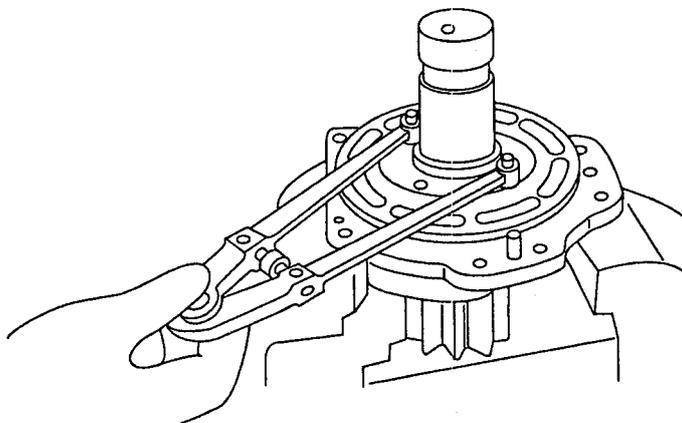
⑥ Pull out the collar which is assembled in the nut.



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



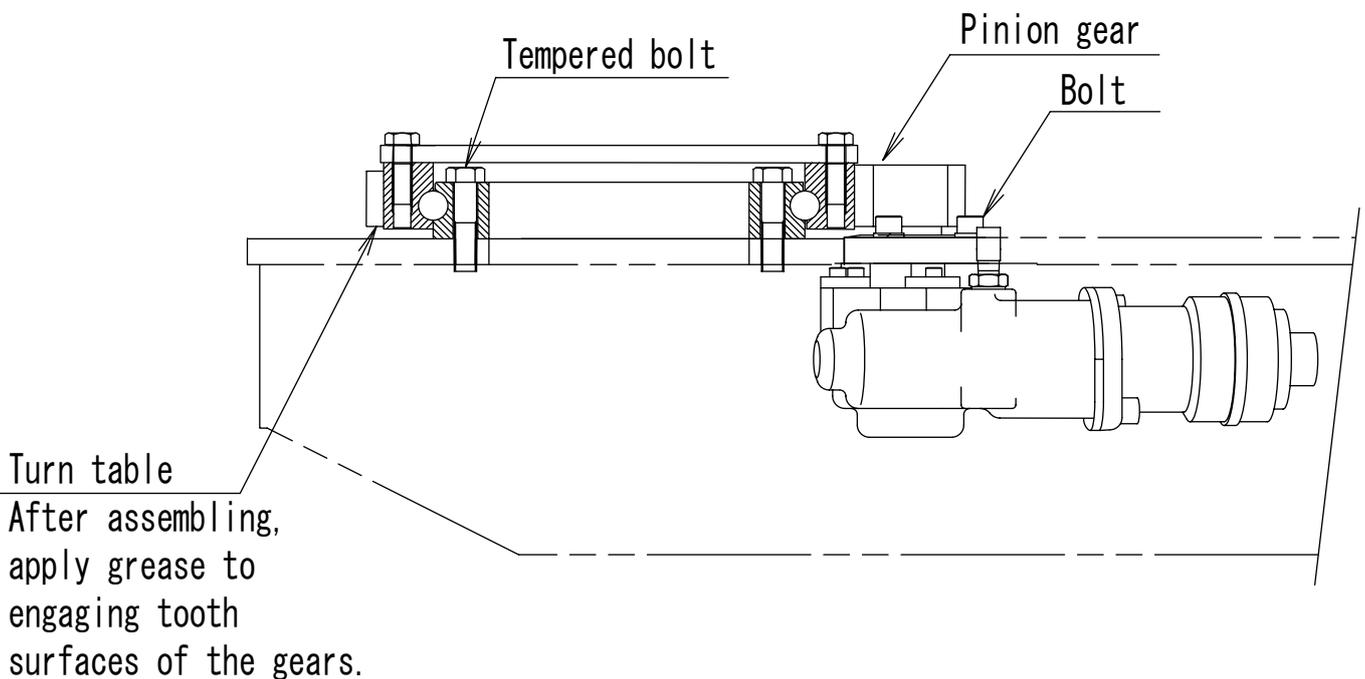
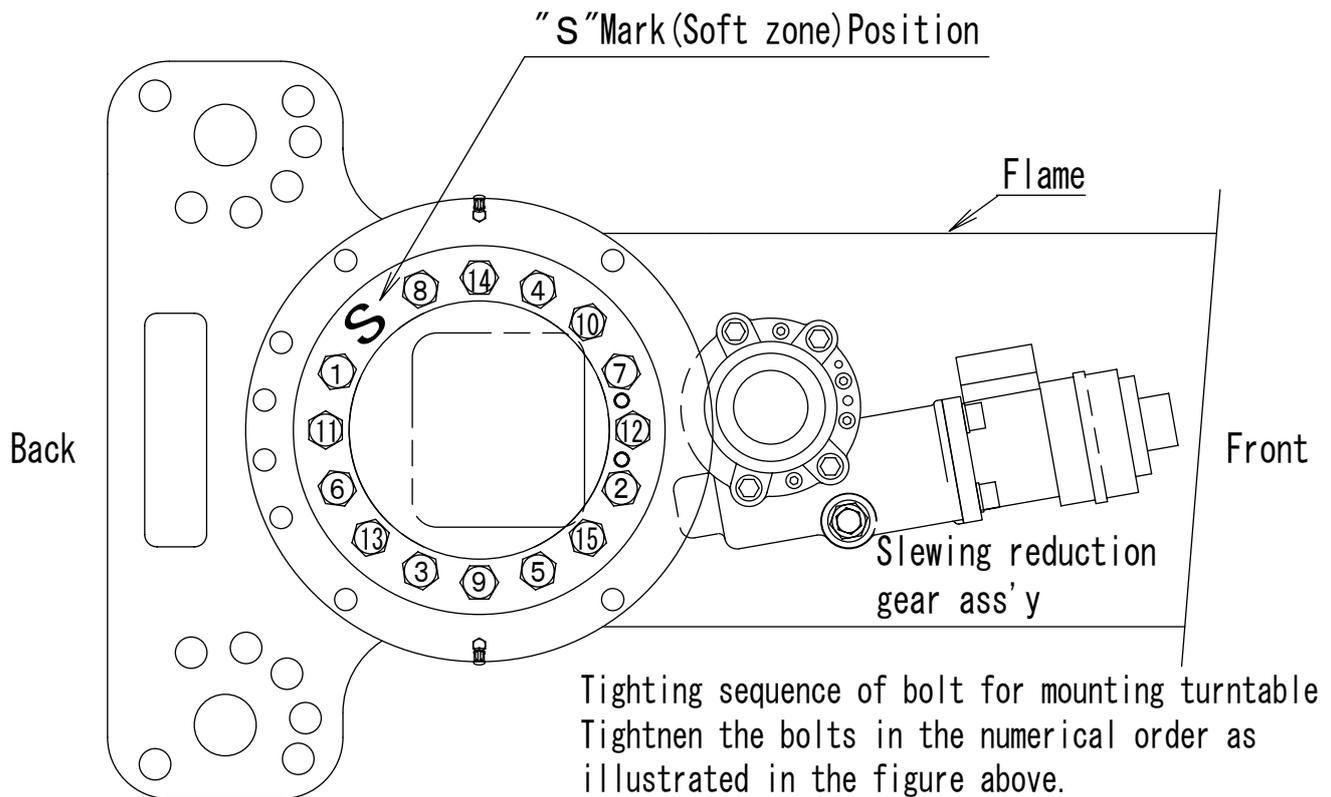
⑧ With a pin spanner, remove the nut which retains the taper roller bearing.



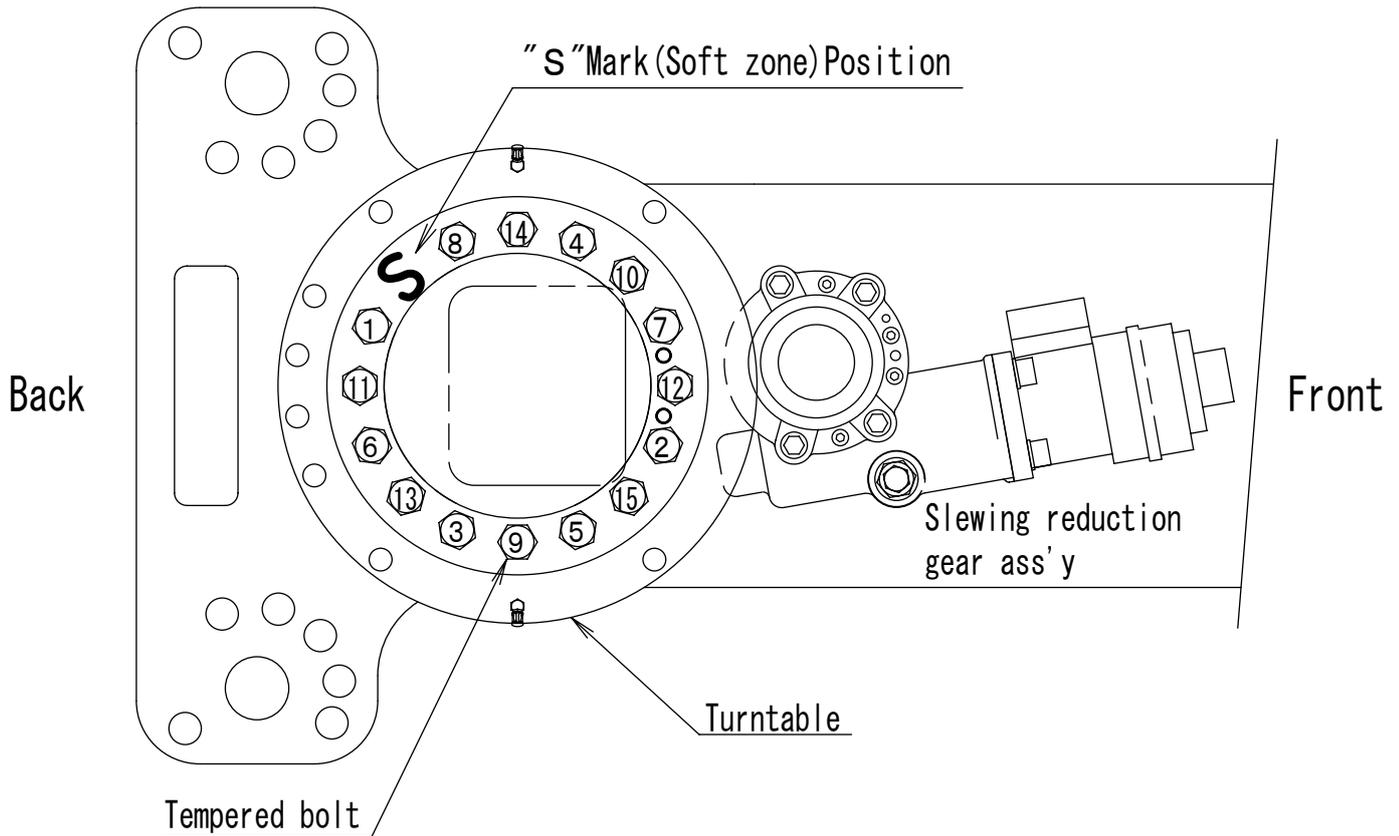
Note: To the threaded part of the nut, LOCTITE was applied. Therefore, when loosening, warm up lightly the threaded part with gas flame, and then loosen. When reassembling, be sure to apply LOCTITE #262 to the threaded part.

2 0 . 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.
- 4 So as not to part from the turntable and the pinion gear, it tightens with the specified torque in the order of tightening the installation bolt.
- 5 After it assembles it, grease is painted on the gear tooth combination side.



2 0 . 2 Position of soft zone, tightening sequence of bolts and tightening torque



Tightning sequence of bolt for mounting turntable
Tighten the bolts in the numerical order as illustrated in the figure above.

Tightening torque for bolts
fastening slewing reduction gear ass'y

Parts Name	Torque
Bolt M14 × 40L 716114D40	$167 \pm 20 \text{ N-m}$ ($17 \pm 2 \text{ kgf-m}$)

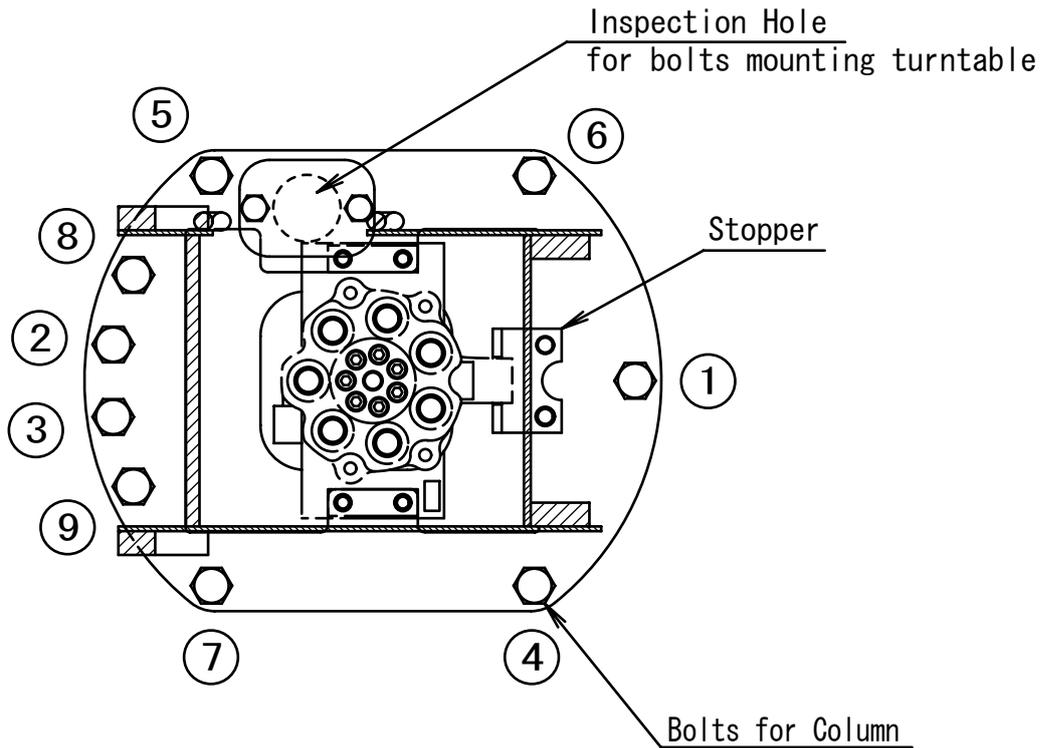
Tighten the mounting bolts in diagonal order.

Tightening torque for bolts
fastening turntable

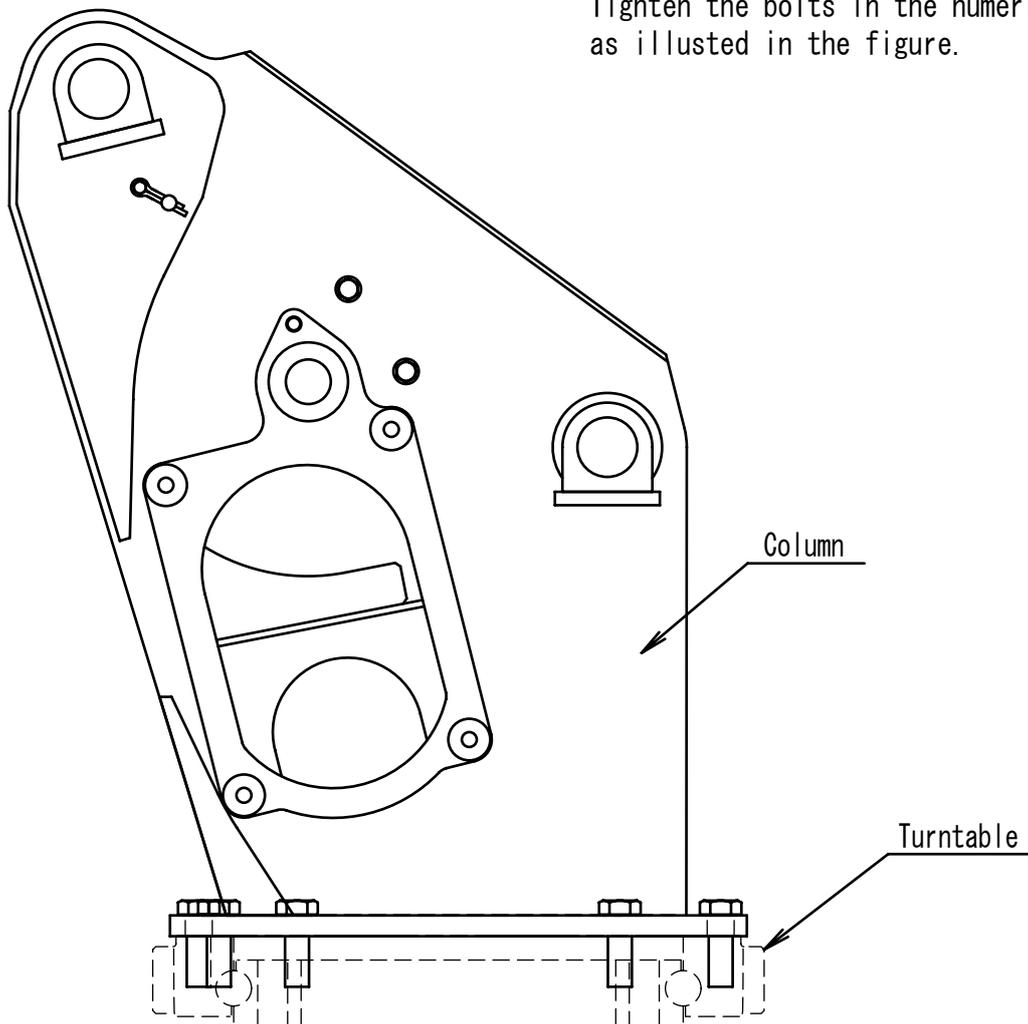
Parts Name	Torque
Tempered Bolt M18 × 75L (12. 9) 018542020	$353 \pm 29 \text{ N-m}$ ($36 \pm 3 \text{ kgf-m}$)

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

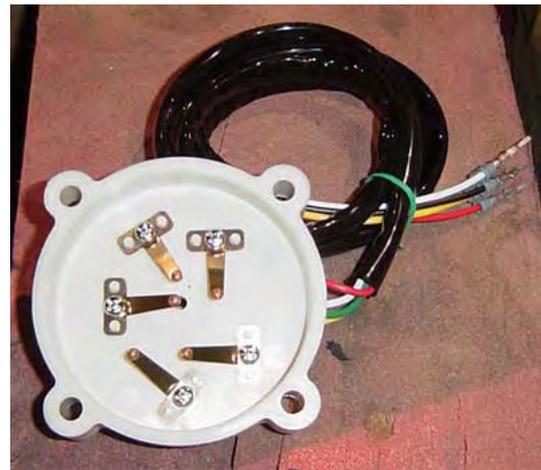
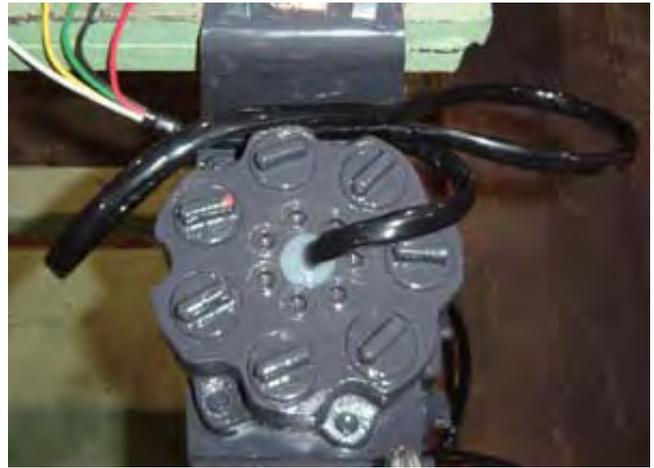
2 1. 1 Tightening torque for bolts fastening column and tightening order



MJ 6 × 5 0 (1 2 T) 0 8 H 6 5 1 0 6 0
 When assembling, apply "LOCTITE # 9 6 2 T"
 Tightening Torque: 25 ± 2 K g f · m
 Tighten the bolts in the numerical order
 as illustrated in the figure.



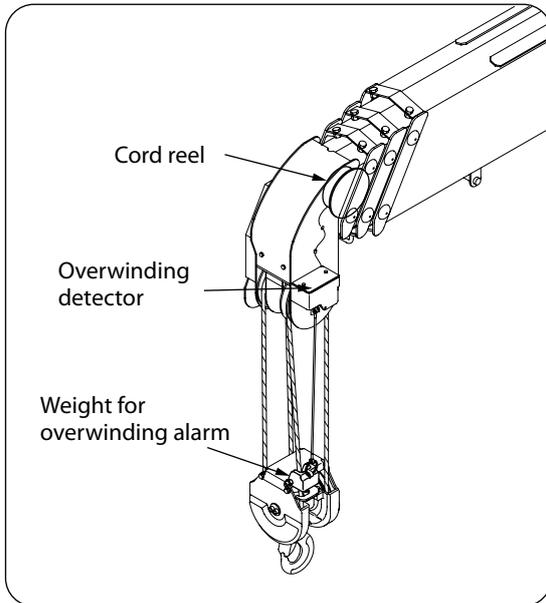
22.1 Construction of slipring



23.1 Overwinding alarm

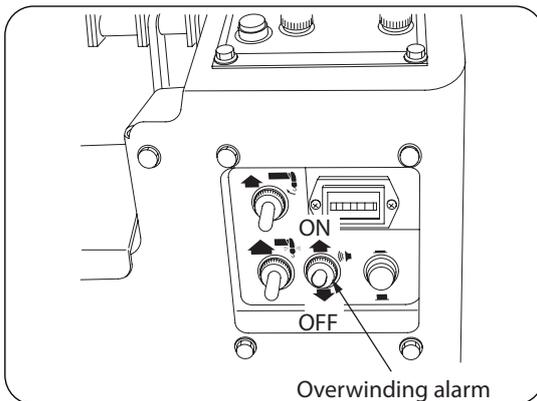
1. Function of overwinding alarm and procedures for operation

(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.

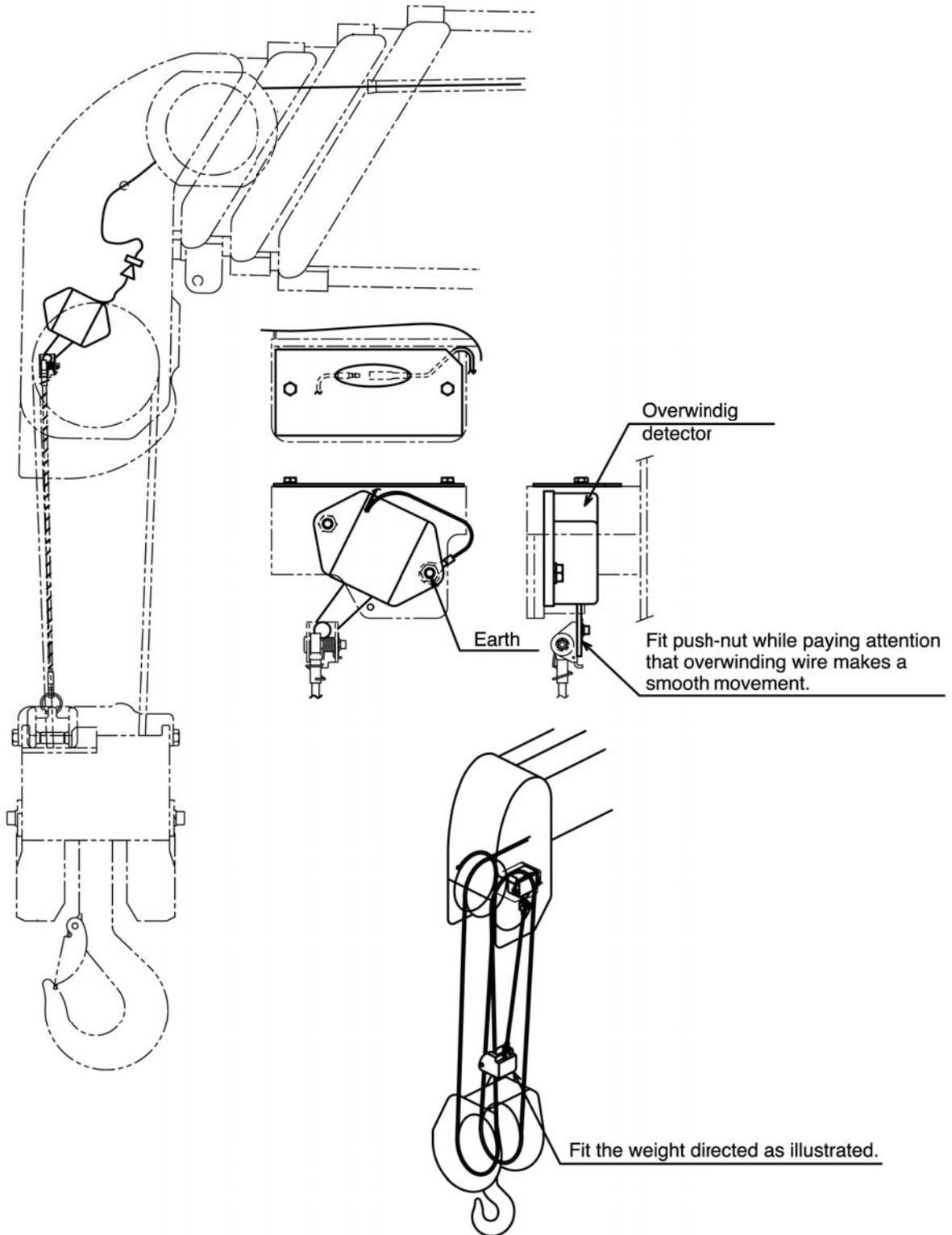
Be sure to turn the switch ON before starting crane work and check that the alarm sounds every time when the weight for overwinding alarm is lifted up.

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

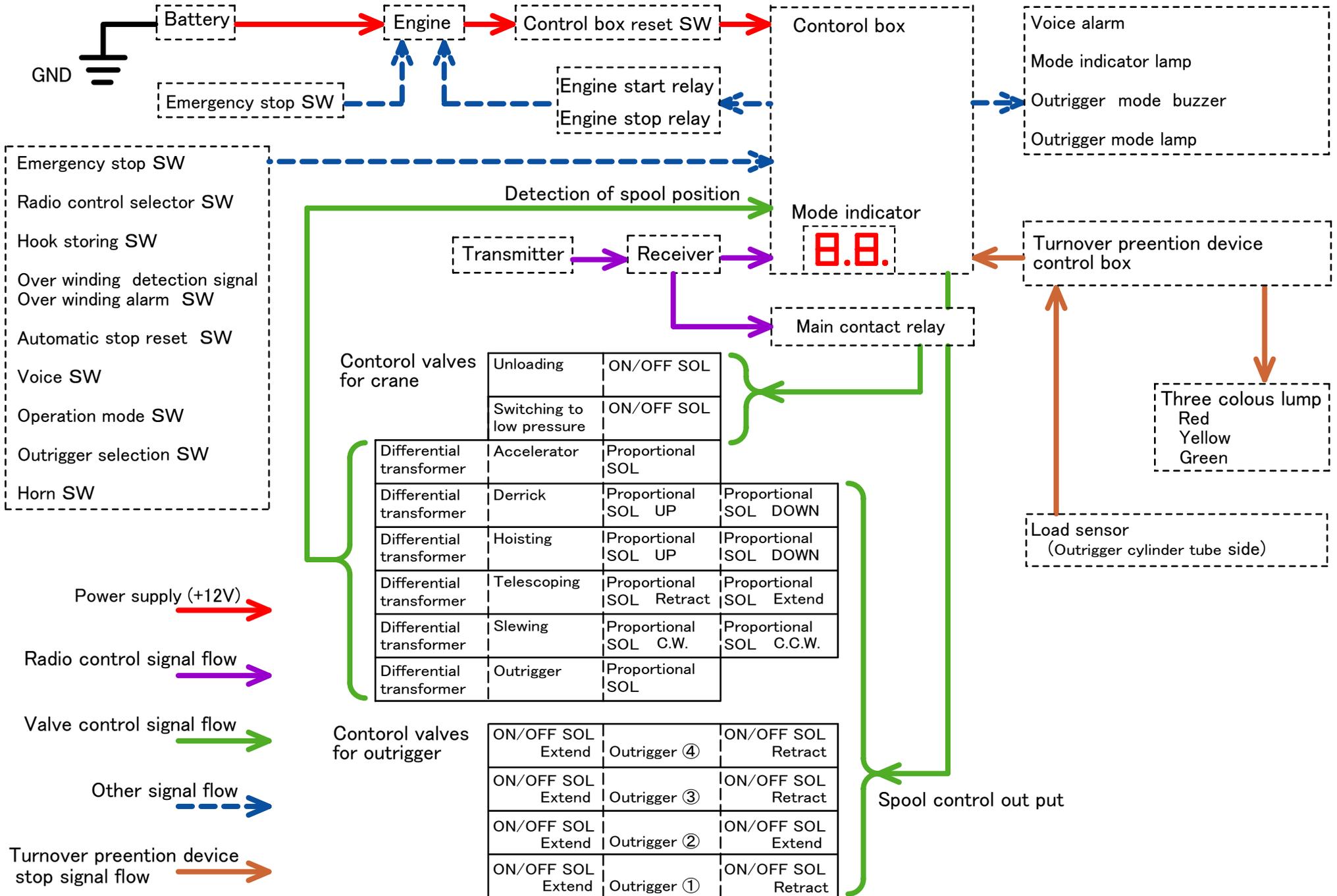
★ The alarm will not sound if the wires(cords) connected to the overwinding detector at the boom top is broken.

Pay attention to the wires(cords).

23.2 Boom top in detail



24.1 System structure



24.2 URW295CUR (GASOLINE ENGINE TYPE)



OPERATION MODE LAMP
OUTRIGGER MODE LAMP
MODE SELECTOR SW



LEAVING MINIMAM WIRE ROPE DETECTOR



CONTROL BOX (for CRANE)

CONTROL VALVE (for CRANE)

CONTROL VALVE (for OUTRIGGER)



GASOLINE ENGINE



FUSE

MODE SELECTOR SW (TRAVEL ↔ CRANE)

KEY SW



OUTRIGGER BUZZER



LOAD CELL AMP



(24 - 2)

The following device is added with the power unit.

CONTROL BOX (for POWER UNIT)



POWER UNIT

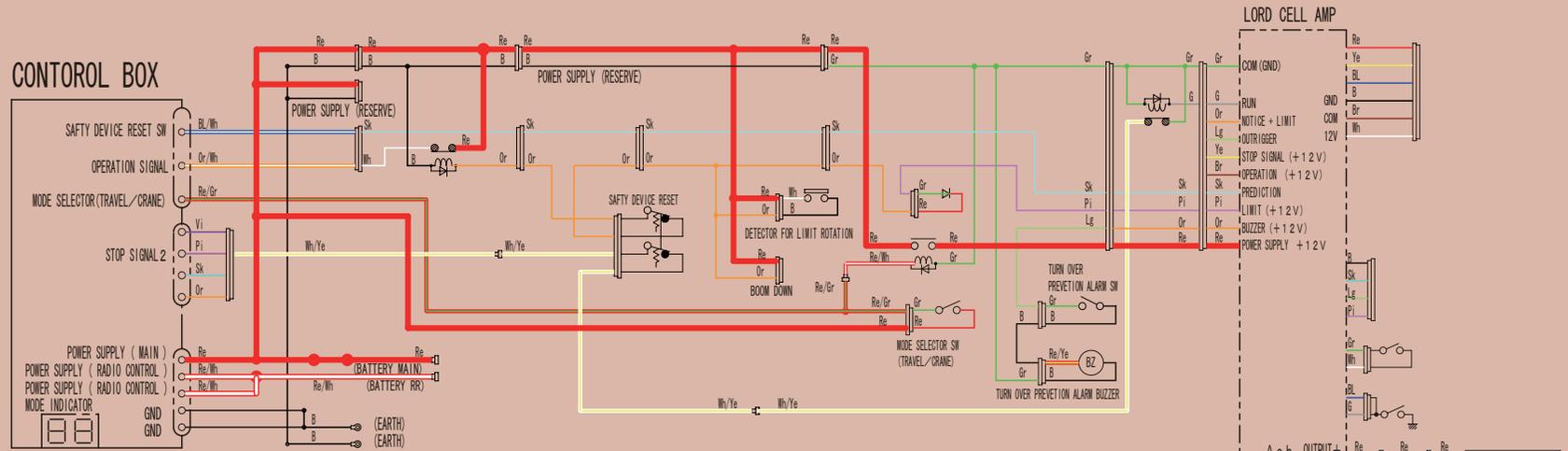


DETECTOR FOR LIMIT ROTATION



POWER UNIT

24. 6 URW295CUR ELECTRIC WIRING DIAGRAM (TURN OVER PREVENTION DEVICE)



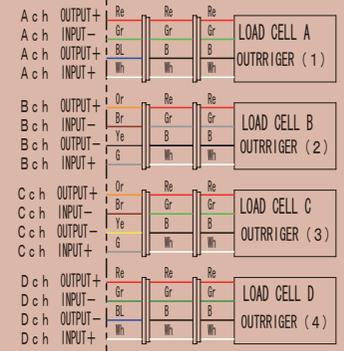
Arrangement place of Loading cell amp.



Diesel engine type



MODE SELECTOR SW(TRAVEL/CRANE)



(24 - 6)



Gasoline engine type



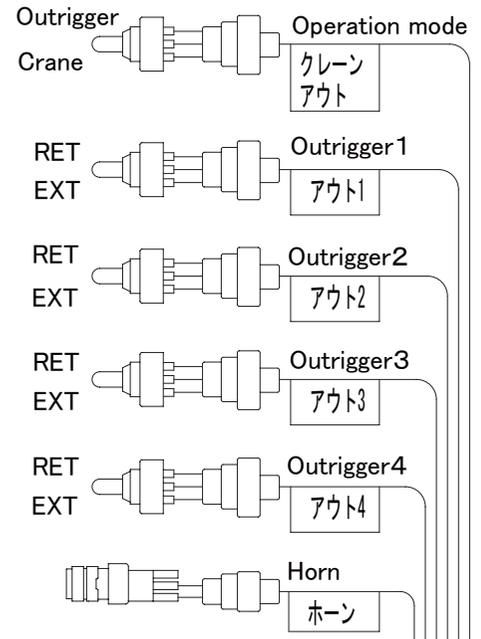
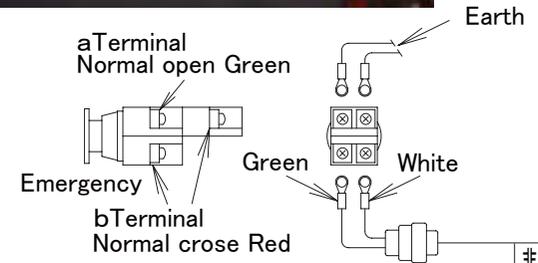
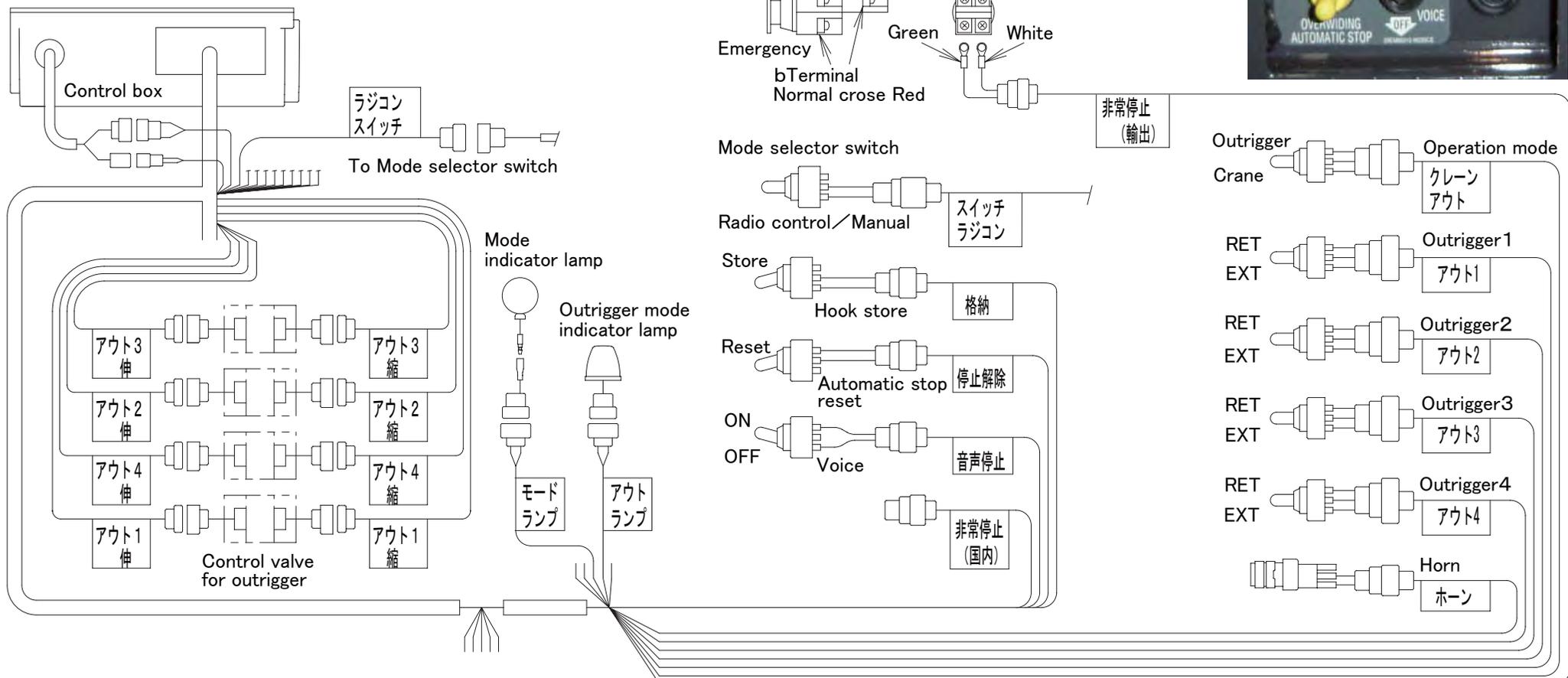
DETECTOR FOR LIMIT ROTATION

- Ye → Yellow
- Br → Brown
- BL → Blue
- Re → Red
- G → Grey
- Lg → Lightgreen
- B → Black
- Wh → White
- Gr → Green
- Vi → Violet
- Sk → Skyblue
- Pi → Pink
- Or → Orange
- Wh/B → White/Black
- Wh/BL → White/Blue
- Wh/Br → White/Brown
- Wh/Or → White/Orange
- Wh/Pi → White/Pink
- Wh/Re → White/Red
- Wh/Vi → White/Violet
- Wh/Ye → White/Yellow
- Vi/B → Violet/Black
- Vi/Wh → Violet/White
- Ye/B → Yellow/Black
- Ye/BL → Yellow/Blue
- Ye/Gr → Yellow/Green
- Ye/Re → Yellow/Red
- Ye/Wh → Yellow/White
- Re/B → Red/Black
- Re/BL → Red/Blue
- Re/Gr → Red/Green
- Re/Wh → Red/White
- Re/Ye → Red/Yellow
- B/BL → Black/Blue
- B/Gr → Black/Green
- B/Pi → Black/Pink
- B/Re → Black/Red
- B/Ye → Black/Yellow
- BL/B → Blue/Black
- BL/Gr → Blue/Green
- BL/Or → Blue/Orange
- BL/Re → Blue/Red
- BL/Ye → Blue/Yellow
- Br/B → Brown/Black
- Br/Re → Brown/Red
- Br/Wh → Brown/White
- Br/Ye → Brown/Yellow
- G/B → Grey/Black
- G/Re → Grey/Red
- G/Wh → Grey/White
- G/Ye → Grey/Yellow
- Gr/B → Green/Black
- Gr/BL → Green/Blue
- Gr/Or → Green/Orange
- Gr/Pi → Green/Pink
- Gr/Re → Green/Red
- Gr/Vi → Green/Violet
- Gr/Ye → Green/Yellow
- Or/Gr → Orange/Green
- Or/Wh → Orange/White
- Pi/BL → Pink/Blue
- Pi/Wh → Pink/White
- Pi/Ye → Pink/Yellow

24.7 Electric wiring around control box

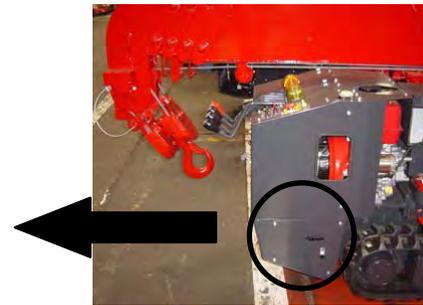
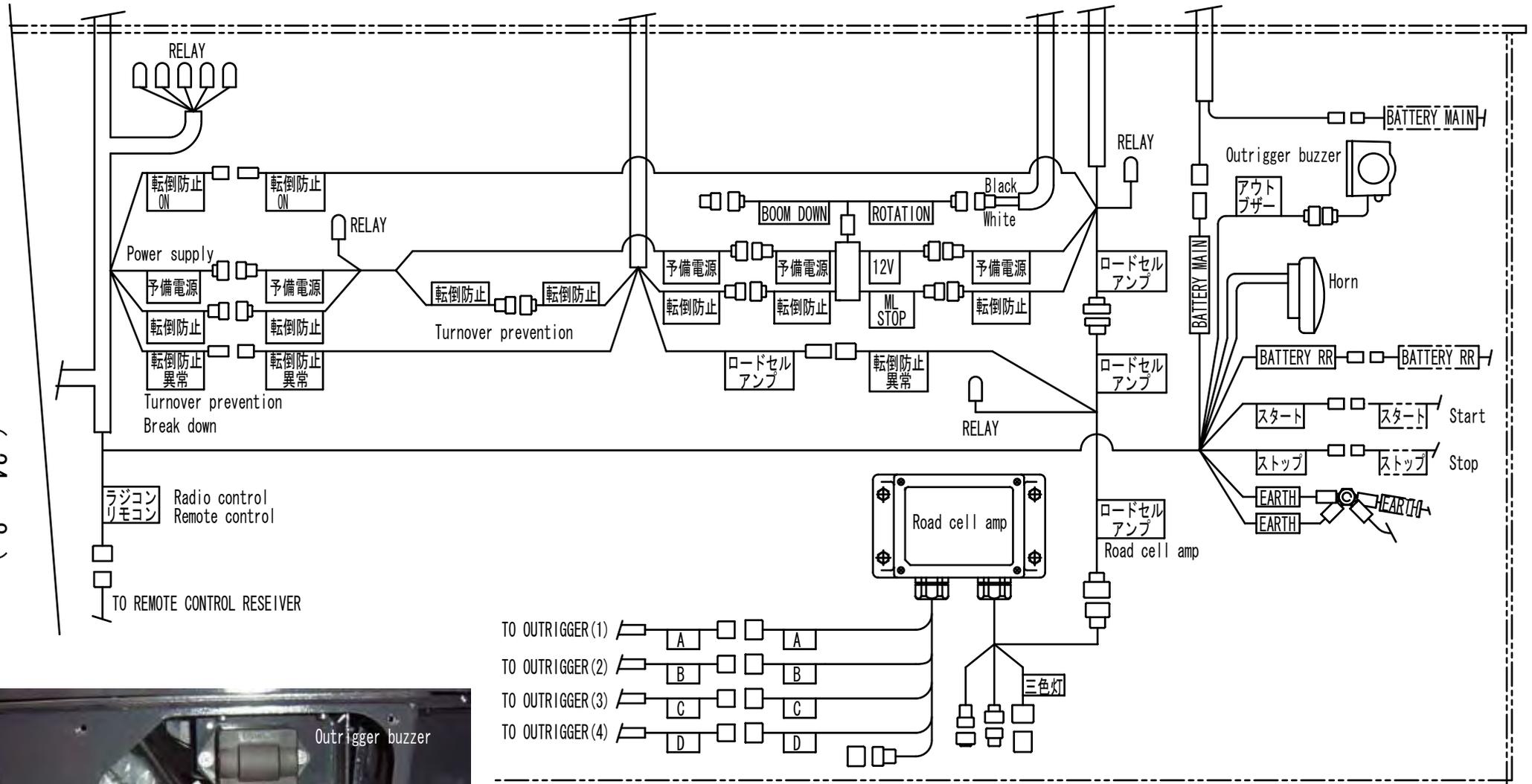


(24 - 7)



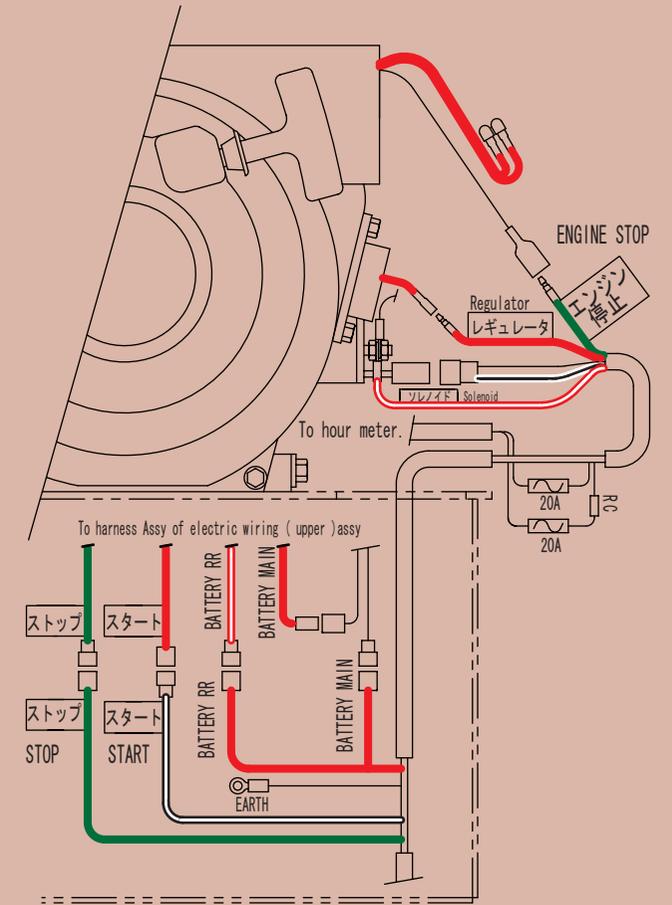
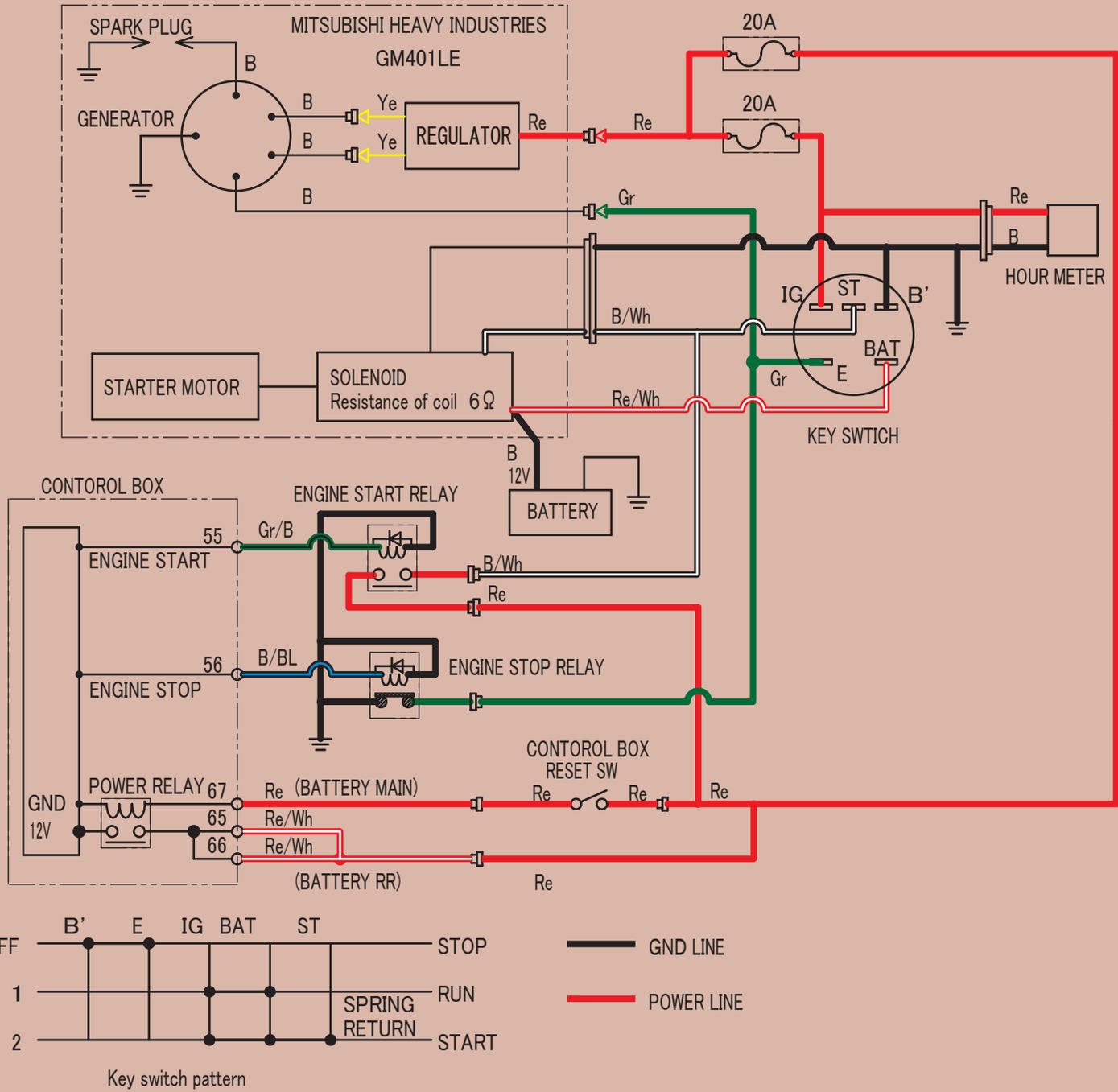
24.8 Electric wiring under control valve for crane

(24 - 8)

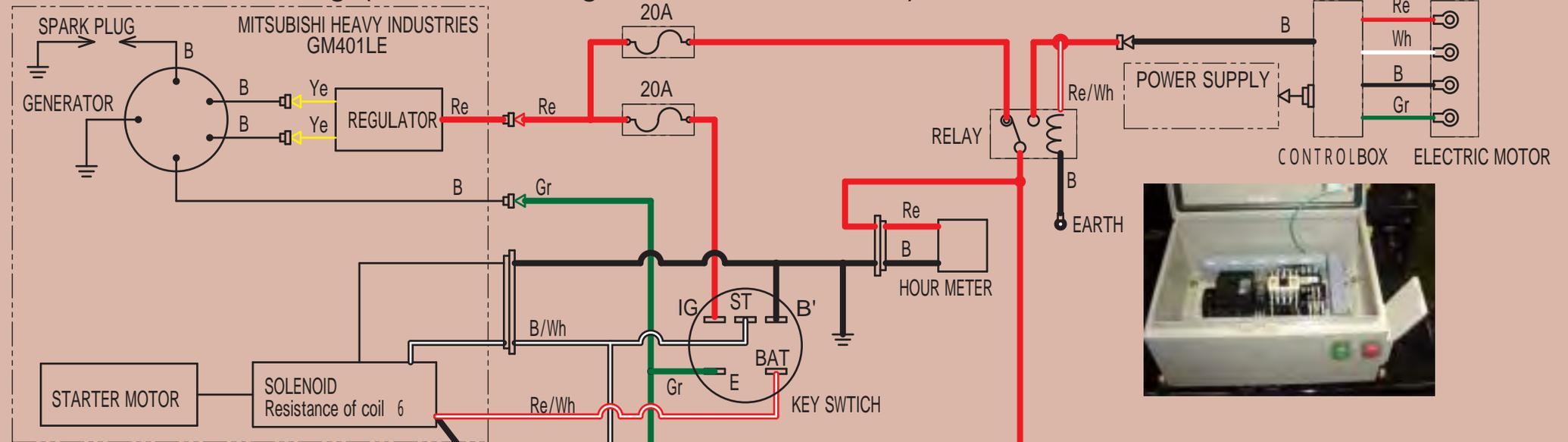


24.9 Electric wiring (Gasoline engine)

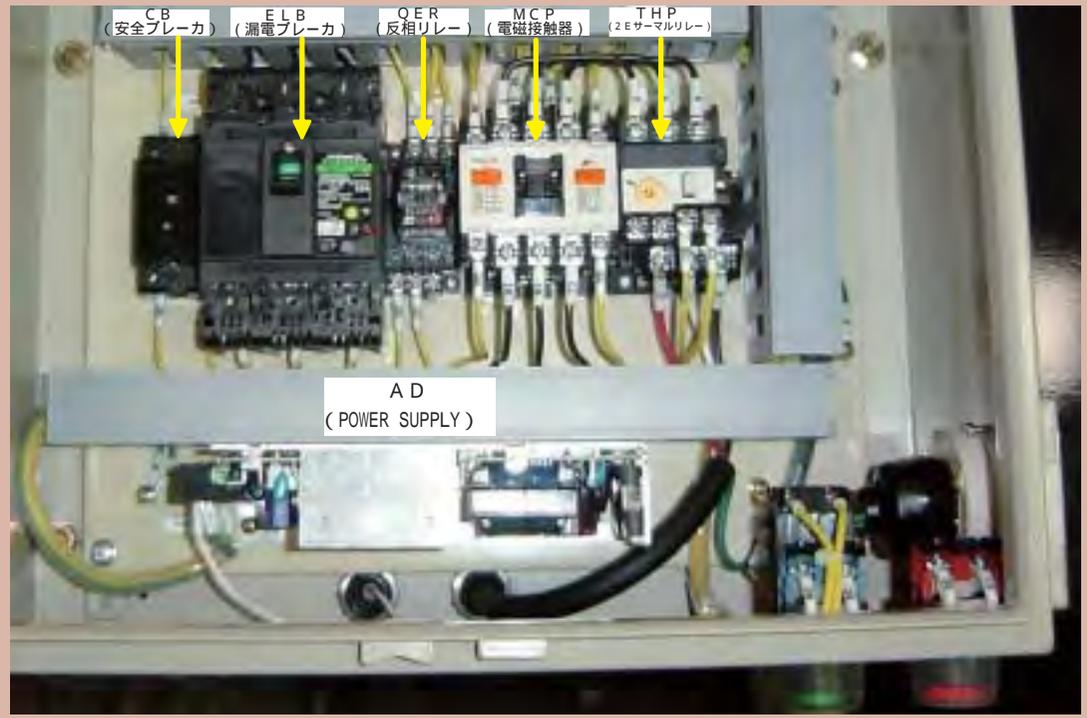
(24 - 9)



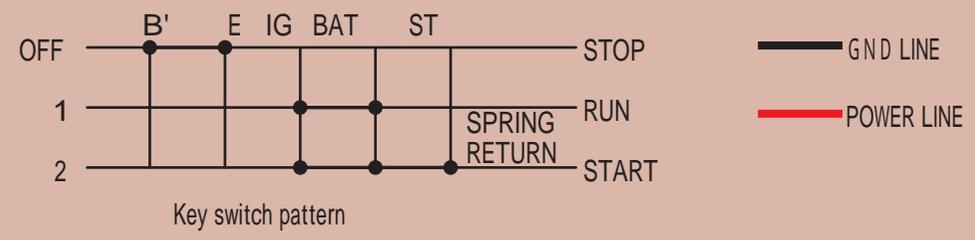
24.10 Electric wiring (Gasoline engine + Power Unit)



CONTROL BOX (for power unit)



(24 - 10)



URW295CDR (DIESEL ENGINE TYPE)

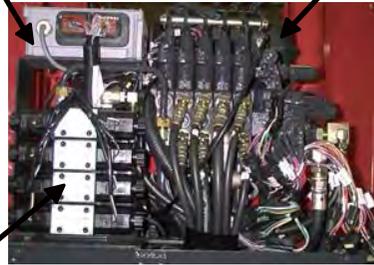


LEAVING MINIMAM WIRE ROPE DETECTOR



CONTROL BOX (for CRANE)

CONTROL VALVE (for CRANE)



CONTROL VALVE (for OUTRIGGER)

DIESEL ENGINE



OUTRIGGER BUZZER



MONITOR LAMP



OIL PRESSURE

CHARGE



WATER TEMPERATURE

GLOW

HORN

OPERATION MODE LAMP
OUTRIGGER MODE LAMP
MODE SELECTOR SW



(24 - 12)



LOAD CELL AMP



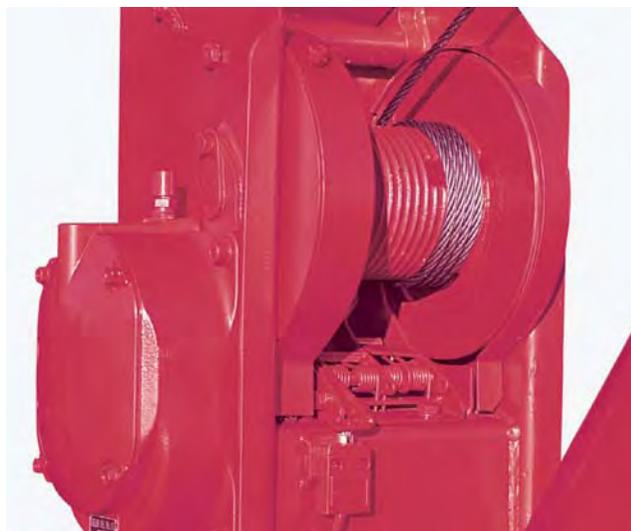
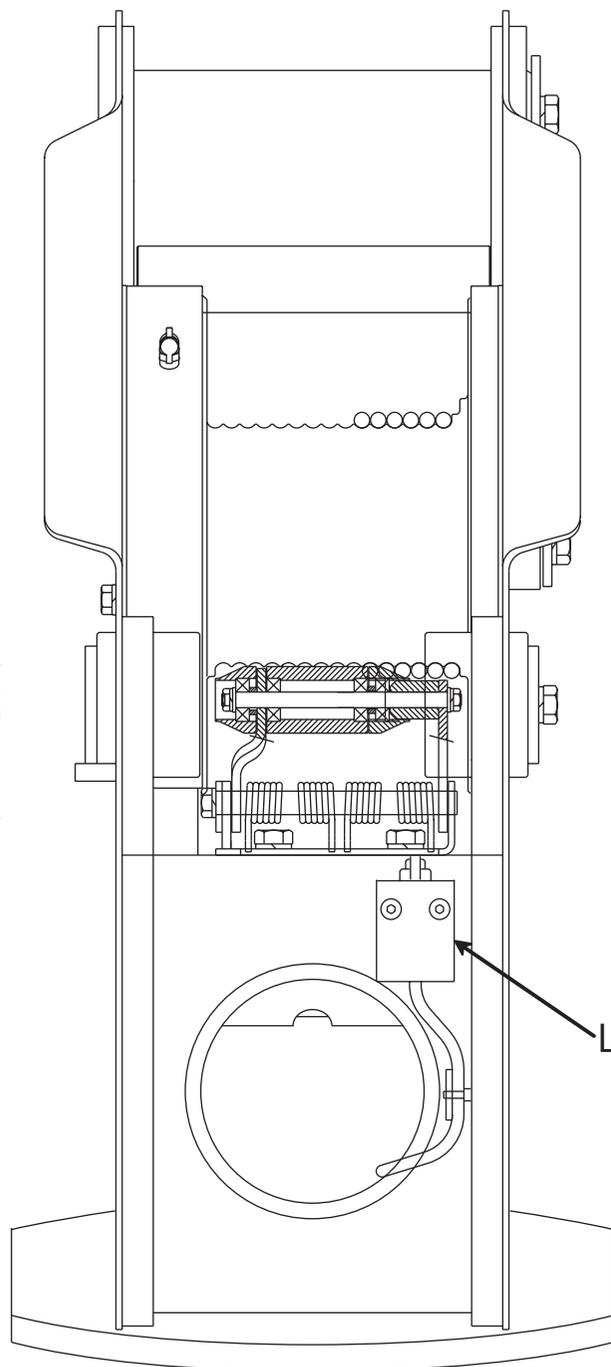
MODE SELECTOR SW (TRAVEL ↔ CRANE)



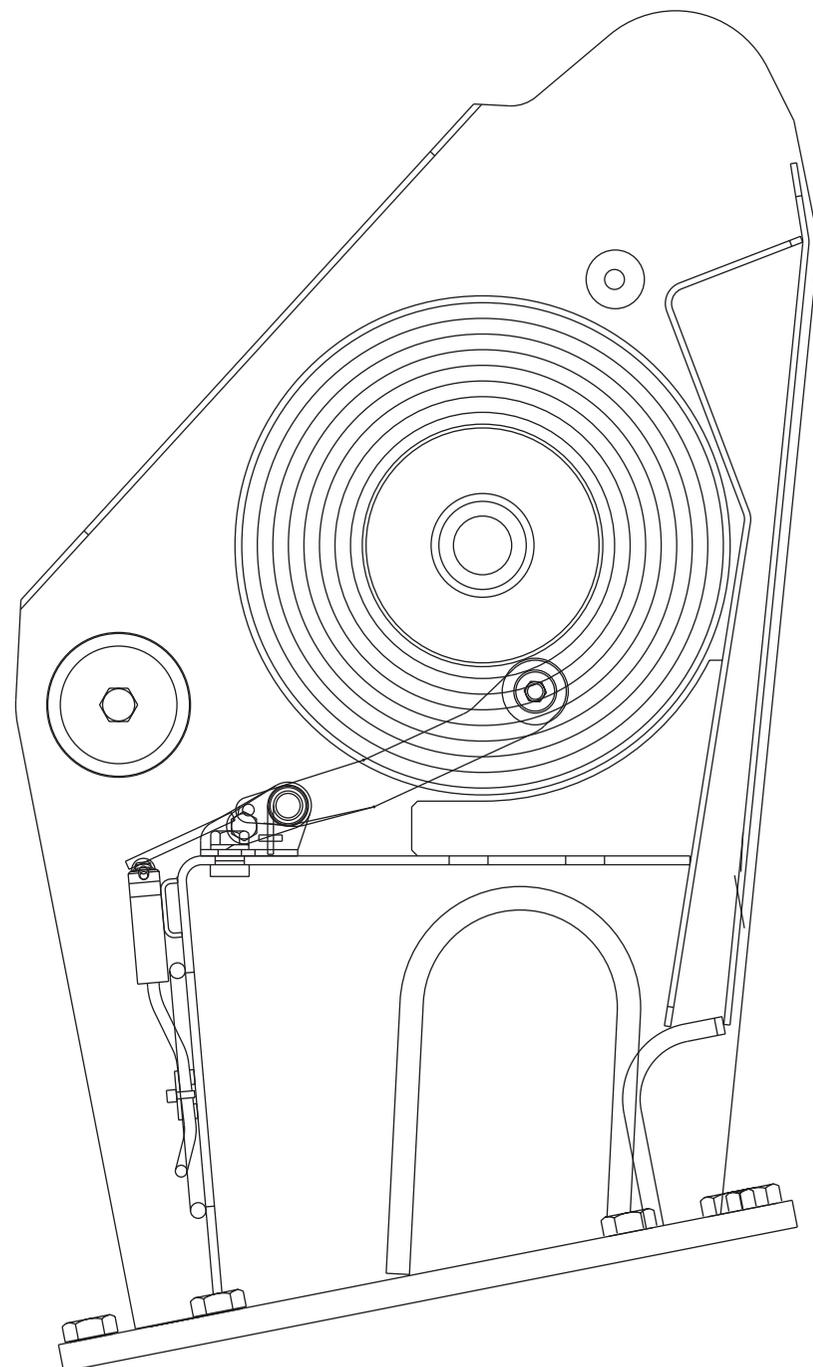
KEY SW

WIRE ROPE RETAINING MECHANISM

(25 - 1)



Limit switch
750306029

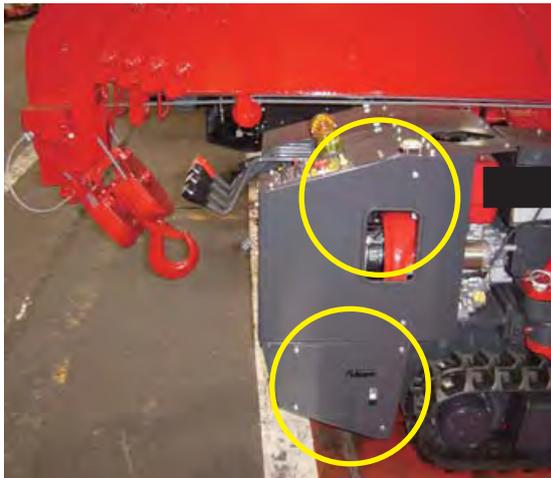


Outrigger Mode indicator lamp
 Outrigger Mode ⇒ Light on
 Crane Mode ⇒ Light off

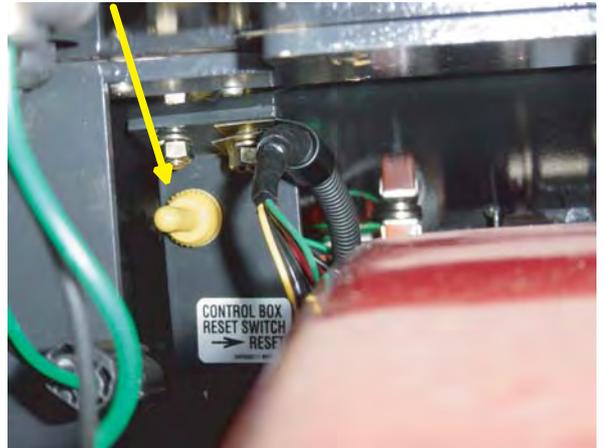


Mode indicator lamp
 Radio control Mode ⇒ Light on
 Manual Mode ⇒ Light off

The Outrigger mode indicator lamp lights when the operation mode is changed to Outrigger and outrigger buzzer rings.



Control box reset switch



Outrigger buzzer



Load cell AMP



Position of earth



Detector for limit rotation

Limit switch for
change detection of running and crane operation



26.1 Emergency measures when crane will not function at all

- 1) Check that all manual levers are at their neutral positions.



- 2) Re-start the engine and wait for 2seconds to operate the crane.



- 3) Hasn't the emergency stop switch been depressed?
Reset the emergency stop switch to operate the crane.



Normal



Emergency stop



- 4) Please store the crane while resetting overwinding automatic stop switch.



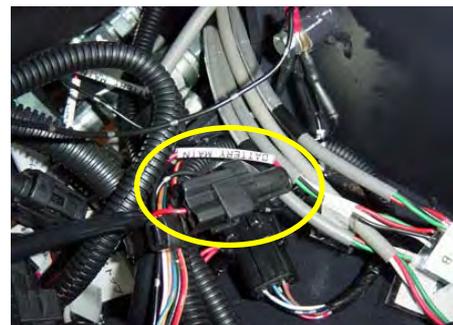
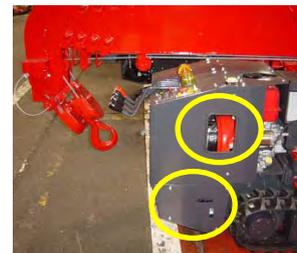
Set bolt
Procedure(5)

Emergency screw
Procedure(6)

- 5) Unfasten the hexagon nut by 3 turns with the set bolt locked with a screwdriver.
Tighten up the set bolt fully while paying attention that the hexagon nut will not be turned together with the set bolt.
Lock the set bolt with the hexagon nut to prevent it from being loosened.
This allows the crane to be operated by manual control but the automatic stop for over-winding will not function



- 6) Extract the lock pin with your hand to screw in the emergency screw and disconnect the power connector, "BATTERY MAIN".
Although both the automatic stop for over-winding and the auto acceleration will not function, this allows the crane to be operated by manual control.



Connector, "BATTERY MAIN".

If the crane can be operated by taking measures described in sections 4) and 5) above, contact local UNIC crane sales agent or service shop immediately as the crane is faulty.

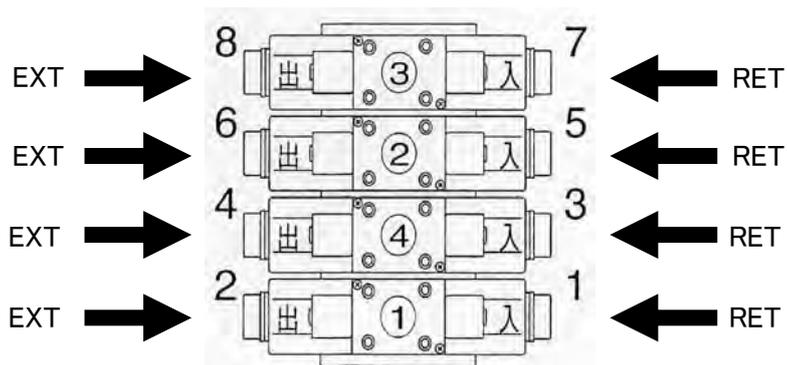
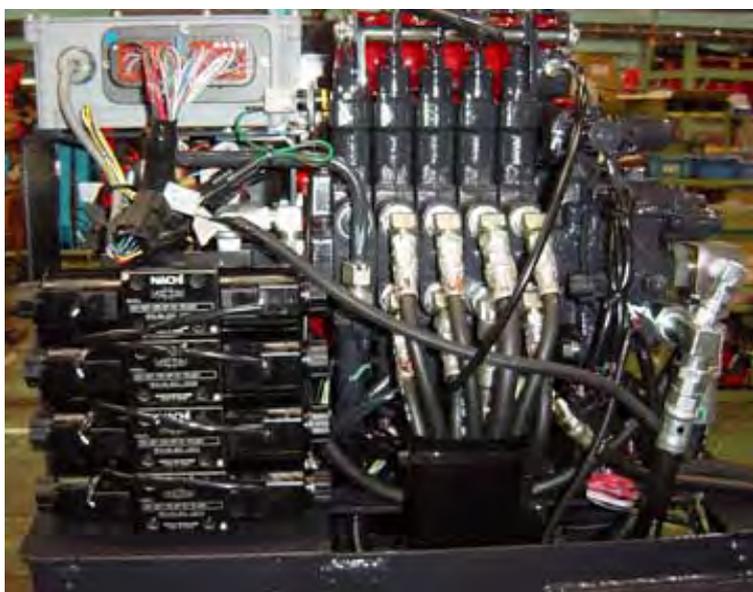
26.2 How to control outriggers when in an emergency

1. Remove cover.



2. In order to operate each function in any one of outriggers, operate the outrigger control lever while depressing, with a screwdriver, the button located on the side of the solenoid valve operate.

Outrigger to be operated		How to operate
Outrigger ①	Extend	Operate lever with button 1 depressed
	Retract	Operate lever with button 2 depressed
Outrigger ②	Extend	Operate lever with button 5 depressed
	Retract	Operate lever with button 6 depressed
Outrigger ③	Extend	Operate lever with button 7 depressed
	Retract	Operate lever with button 8 depressed
Outrigger ④	Extend	Operate lever with button 3 depressed
	Retract	Operate lever with button 4 depressed



The button at the center of the electro magnetic valve is pushed with a screwdriver

26.3 How to judge differential transformer (750211003) for break or short-circuit of coil

In order to prevent the differential transformer from being broken, use a circuit tester with digital display when checking it.

When differential transformer coil breaks or short-circuits:

No crane operation can be possible.

Voice message "Service remote control" sounds.

Mode indicator on the control box blinks to show where in trouble.

Mode indication	Area in trouble
80	Derrick
81	Hoist
82	Telescoping
83	Slewing
84	Outrigger
85	Accelerator

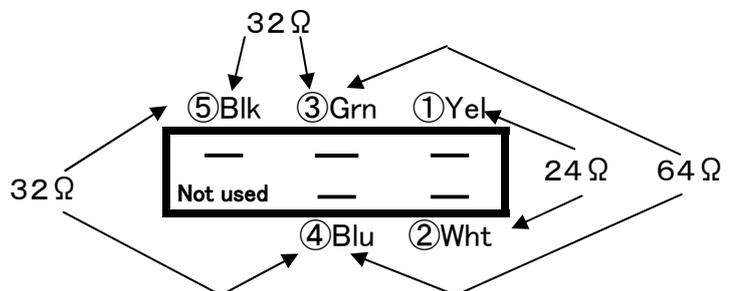


How to check differential transformer:

① Measure resistance between each combination of terminals.

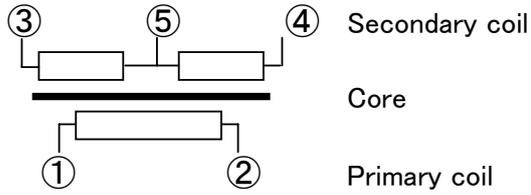
If any of measured resistance shows a big difference, replace the transformer.

Terminals between	Resistance
1 ↔ 2	24 Ω
3 ↔ 4	64 Ω
3 ↔ 5	32 Ω
4 ↔ 5	32 Ω



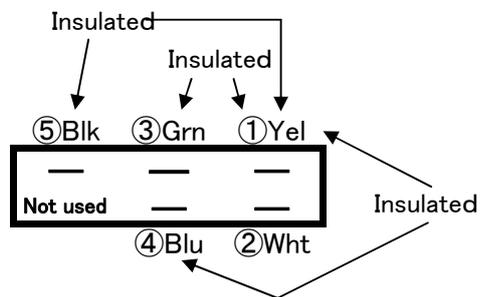
Terminal arrangement of connector of differential transformer

- ② Check the insulation between coils of primary and of secondary.
 If measurement reads even in $M\Omega$ range, replace the transformer. Measurement of some resistance between primary and secondary coils suggest that moisture may be entered into the connector.



Measure resistance of terminal ① from each terminal of ③, ④, ⑤.

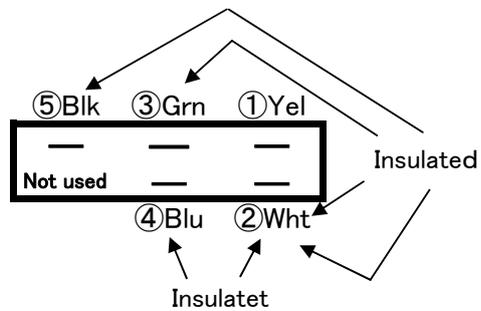
Terminals between	Resistance
1 ↔ 3	Insulated(∞)
1 ↔ 4	Insulated(∞)
1 ↔ 5	Insulated(∞)



Terminal arrangement of connector of differential transformer

Measure resistance of terminal ② from each terminal of ③, ④, ⑤.

Terminals between	Resistance
2 ↔ 3	Insulated(∞)
2 ↔ 4	Insulated(∞)
2 ↔ 5	Insulated(∞)



Terminal arrangement of connector of differential transformer

If correct resistance is measured at both steps ① and ② above, replace the wire harness.

26. 4 Inspection of derrick cylinder

(1) Preparation before inspection

- ① Raise booms to an angle of approx. 60° .
- 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 the 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).

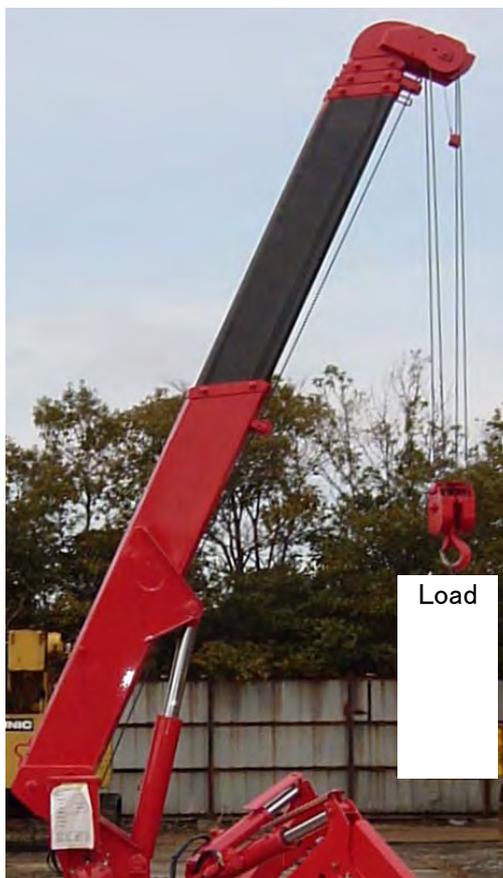
If oil overflows out of the port on lowering side, it suggests internal leakage in the cylinder.

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

Put a mark on the rod with felt pen



Fig2



Counter balance valve
Fault in seat surface

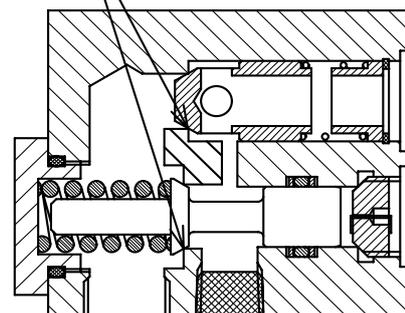


Fig3

26.5 INSPECTION PROCEDURES WHEN CYLINDER SINK

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 the 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 a fault 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.

(3) Inspection of tele1

- ⑥ Extend booms to a position where it is a little bit shorter than 2-section boom to put a mark on the boom (refer to Fig. 4).
 - ⑦ Raise booms to their maximum to sling a load.
 - ⑧ In order to release pressure remained in the telescoping system, stop the engine and shift the manual lever for telescoping booms.
 - ⑨ Remove the retraction hose.
- If oil overflows out of cylinder port of retraction side and boom2 sinks, there may be internal oil leakage in tele1. In addition, check how far boom2 sinks simultaneously.

(4) Inspection of tele2

- ⑩ Allow booms to be horizontal and extend them fully to put a mark on each boom section (refer to Fig. 1).
 - ⑪ Raise booms to their maximum to sling a load.
 - ⑫ In order to release pressure remained in the telescoping system, stop the engine and shift the manual lever for telescoping booms.
 - ⑬ Remove the retraction hose.
- If oil overflows out of cylinder port of retraction side and boom3 sinks, there may be internal oil leakage in tele2. In addition, check how far boom3 sinks simultaneously.

The same procedures in checking boom sinkage are applied for 5-section boom

Be sure to check the boom sections one by one reliably.

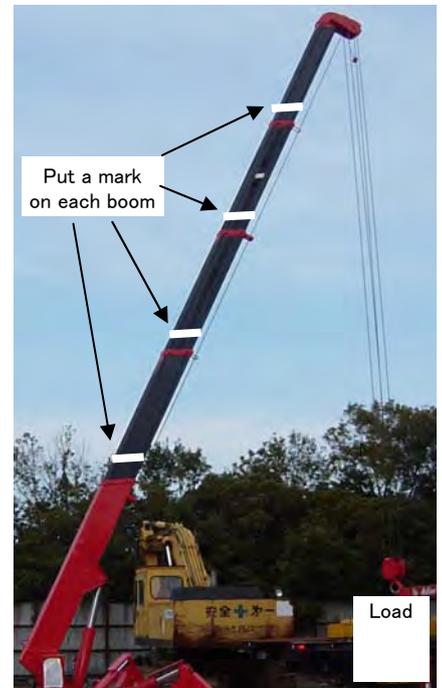


Fig1

Counterbalance valve
Fault in seat surface

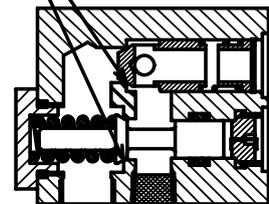


Fig2

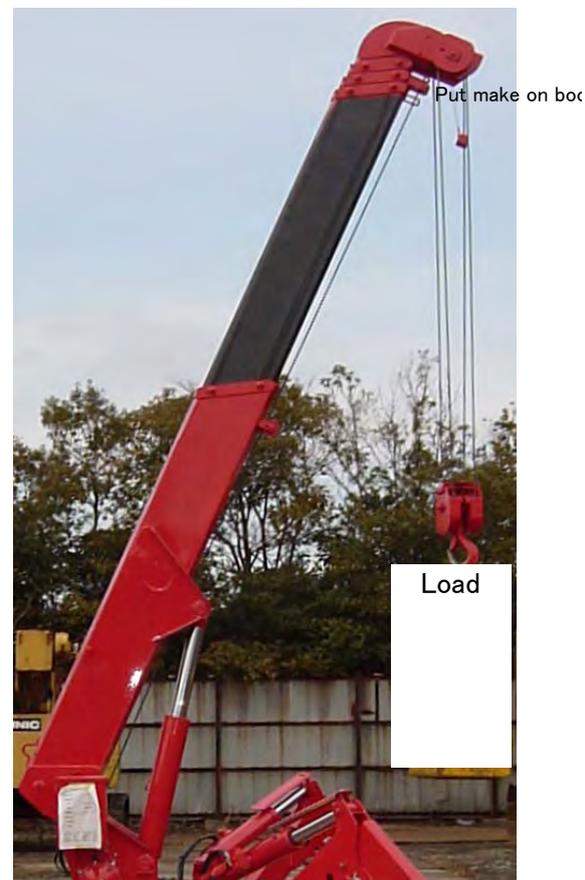


Fig3

26.6 Procedures for checking outriggers for sinking

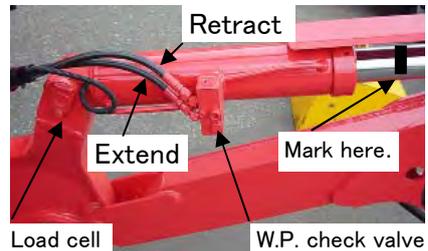
In case where outrigger sinks during crane operation

Test 1

Putting the crane on a solid level ground, extend the outriggers to their extremes and raise the crane mounted vehicle by 50mm from the ground to check the sinking condition.

1. Stop the engine to release pressure remaining in the outrigger circuit.
2. Disconnect all 8 hoses connecting to the W.P. check valve.
3. Mark each rod of 4 outrigger cylinders.
4. Measure the movement of each rod.

Raise vehicle by 50mm.



Test 2

Exchange the W.P. check valve measuring maximum sinking and the one measuring minimum sinking to repeat the same procedures of "Test 1" above.



Judgment by comparison

When position of sinking is reversed in "Test 1" and "Test 2"; W.P. check valve is faulty.

If in failure, oil continuously comes out of the cylinder for extension.

When position of sinking has not changed; Cylinder is faulty.



Starter key

Outrigger mode indicator lamp



Mode indicator "04" is indicated.

Caution

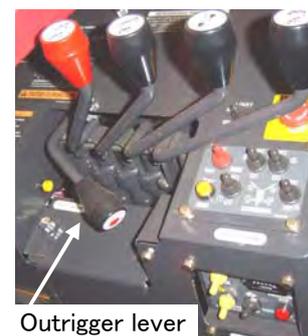
When a cylinder has been replaced of, re-adjustment of the load cell amplifier is needed.

How to release pressure out of outrigger cylinder circuit

Be sure to operate by using the switch and the lever illustrated in the picture.

Even if outriggers are controlled via radio controller, pressure in the circuit will not be released as the engine has been shut off so that oil pressure will not be generated and as a result the lever controlling outrigger will not move.

1. Shift the lever to CRANE position to start the engine.
2. Put the control mode switch at OUTRIGGER position.
3. Extend outriggers to allow each cylinder to extend to its stroke end and relief it.
4. Stop the engine.
5. Turn ON the starter key again to light the outrigger mode indicator lamp. At this time, do not start the engine.
6. Turn outrigger control switches ① through ④ to STORAGE side to throw the outrigger control lever. Release of hydraulic pressure can be felt by holding the hose on extension side.
7. Turn outrigger control switches ① through ④ to EXTENSION side to throw the outrigger control lever. Release of hydraulic pressure can be felt by holding the hose on retraction side.



Outrigger lever

Operation mode switch



Outrigger control switch

27.1 Initial zero point adjustment procedures for Outrigger grounding detector control box

Procedures 1

Turn OFF the engine key switch and unfasten the screws to open the cover of the control box.

Procedures 2

Turn the rotary switch to align the arrow mark to "0" position.

Rotary switch	Application model
0	URW104C
1	URW295C
2	URW375C, 376C
3	URW375C, 376C
4~5, 7~9, A~F	Not use
6	URW295CMR/-A



Outrigger grounding detector control box

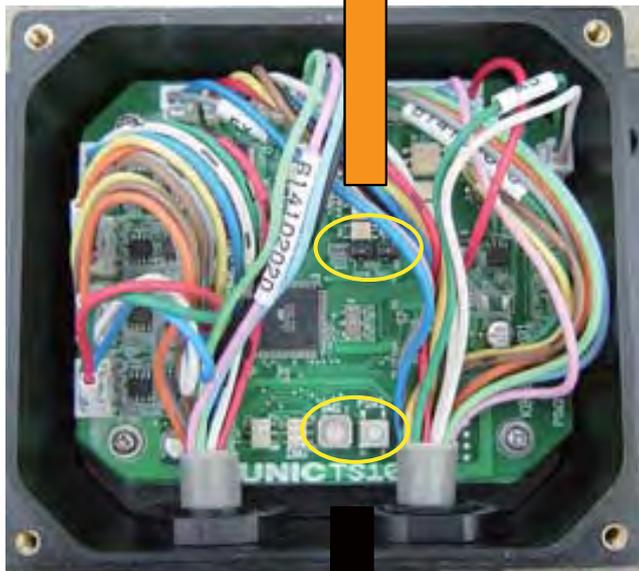


Volume change switch

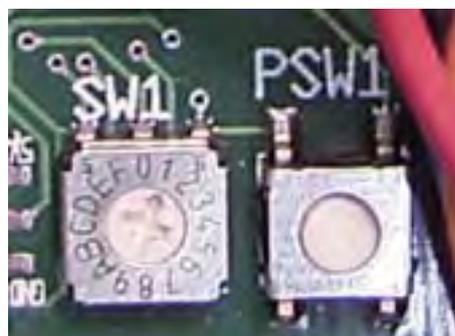
Type selection switch

Set the type selection switch to "B" side (right-hand side).

The crane will not work if setting it to "A" side (left-hand side).



Zero reset



Rotary switch

Adjustment switch of initial zero points

If the machine type has been set by controlling the rotary switch without turning OFF the power to the crane, the "ERR" lamp on the control box blinks and the crane will not function when the crane is started again.

In this case, try the initial zero point adjustment again.

Procedures 3

The engine is started and travel lever is adjusted to the crane operation position to blink the "ERR" lamp.

Procedures 4

After the outriggers have been set up, retract all the functions to their extremes. (The purpose is to fit the load cells closely to remove residual strain of the load cells.)

Procedures 5.

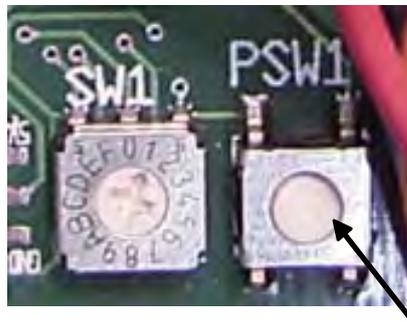
- ① Keep pressing "the initial zero point adjustment switch"
- ② Keep pressing "the zero reset switch".
(Do not release "the initial zero point adjustment switch")
- ③ Keep pressing above both switches at least 5 seconds and then release both switches.

The self-diagnosis lamps light fully for 2 seconds and the buzzer ceases sounding during this period.

Afterward, the "RUN" lamp lights, both lamps of "ch. A" ~ "ch. D" blink, and the buzzer is to make a continuous sound (Limit warning).



Outrigger grounding detector control box

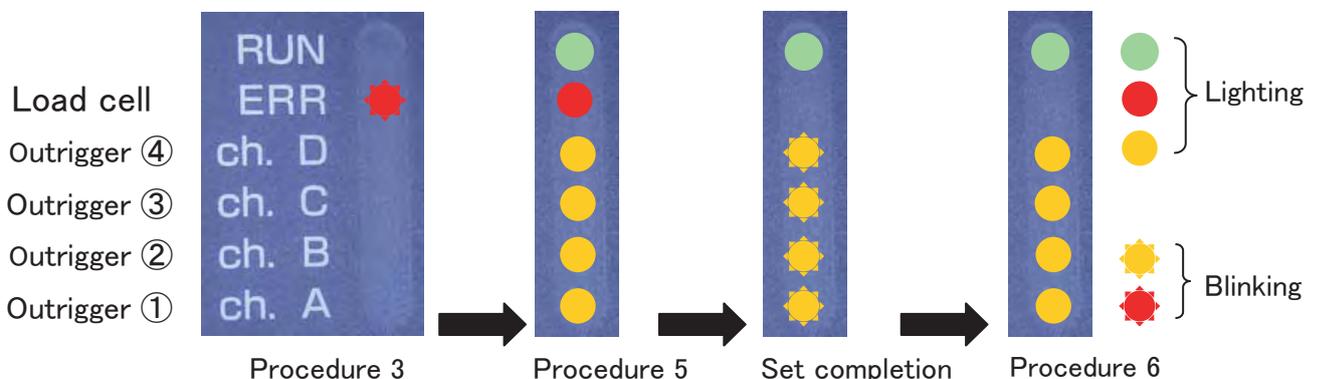


Adjustment switch of initial zero points

Zero reset

In case "the self-diagnosis lamp" is blinking and showing "ERR", go to I or II.

- I** If "ch.A" ~ "ch.D" are not blinking either, turn off electric power supply and turn on again. Then return to procedure 5-①.
- II** If "Ch.A" ~ "Ch.D" are blinking, load cell is failed.
 - Blinking "Ch.A" → Replace load cell in the outrigger ①.
 - Blinking "Ch.B" → Replace load cell in the outrigger ②.
 - Blinking "Ch.C" → Replace load cell in the outrigger ③.
 - Blinking "Ch.D" → Replace load cell in the outrigger ④.
 After you replaced failed load cell, start "initial zero point adjustment" over again.



Procedure 6

Check that both lamps of "ch. A" ~ "ch. D" change from blinking to lighting when the outrigger have been set up.

Procedure 7

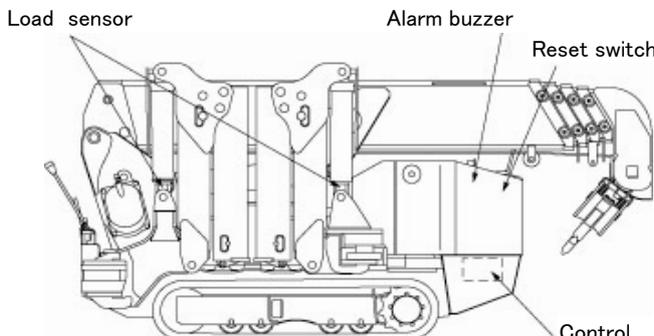
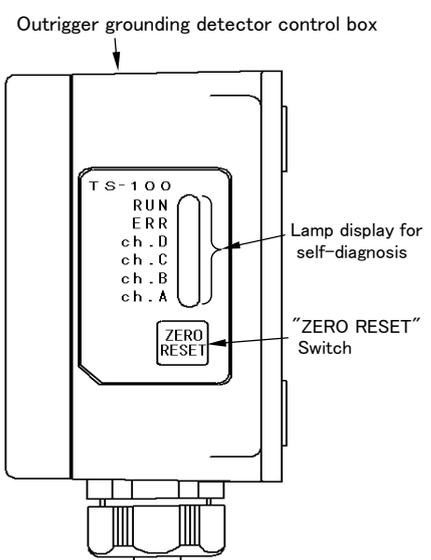
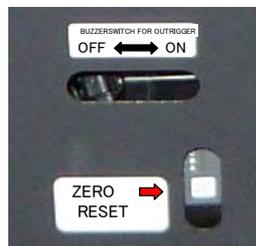
After the wiring system, the control box, and the stickers have been attached to the crane, check functions of overturn prevention equipment

Use a sheet of photocopy of this sheet for checking before starting operation.

CHECK SHEET BEFORE STARTING OPERATION

Y/M/D _____ Weather(_____) _____

Place _____ Operator _____

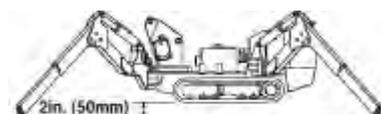
Safety device against overturning	Content of check	Check result		Treatment
		Good	Defect	
Self-diagnosis lamp of "ERR" will not blink in 5 seconds after completion of zero point adjustment for overturn prevention equipment.				
Alarm buzzer ceased to sound when outriggers have been set up right.				
When retracting an outrigger slightly, alarm buzzer makes an intermittent sound (beep, beep, !). (Prediction warning)				
When retracting an outrigger further, alarm buzzer makes a continuous sound (bee eep !). (Limit warning)				
While threshold alarm is being actuated, crane operation of extending boom/lowering boom/winding-up hook/swinging cannot be carried out.				
<p>★ First, press "ZERO RESET" switch on the control box of overturn prevention equipment for 1 second with outriggers being stored to carry out zero point adjustment for overturn prevention equipment.</p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> <div style="display: flex; justify-content: center; margin-top: 10px;">   </div>				

◆2. Inspection before starting crane operation

Check the following before starting crane operation.

If found something wrong with the turn over prevention device, make contact with a UNIC authorized service shop as soon as possible because it will not function as a safety device.

- 1 When operation has been switched from traveling mode to crane mode, check that the continuous alarm sound (bee ee) of the turn over prevention device is issued before outriggers is set up.(Always keep alarm buzzer ON/OFF switch turn ON.)
- 2 Following procedures for setting up outriggers,allow slewing function, and both outer and inner boxes to be operating condition and secure each with lock pins. At this time, retract the outrigger cylinders fully without outriggers setting up on the ground.
- 3 Depress the "ZERO RESET" switch on the control box for overturn prevention equipment located inside for 1 second through the opening on the side of crane body.
When the zero point adjustment is completed right, the alarm buzzer stops sounding for 2 seconds.
The alarm buzzer gives off continuous sound (Beeeeeep) again after the 2 seconds.
- 4 If the alarm buzzer fails to stop sounding for 2 seconds due to system error,check that outriggers are not set up on the ground to depress the "ZERO RESET" switch for 1 second again.
- 5 Check that the alarm buzzer stops sounding when the outriggers have been set up on a solid and level ground.
(Set up the crane body so that the buzzer sounds when it comes to 2in.(50mm) above the ground.)



27.4

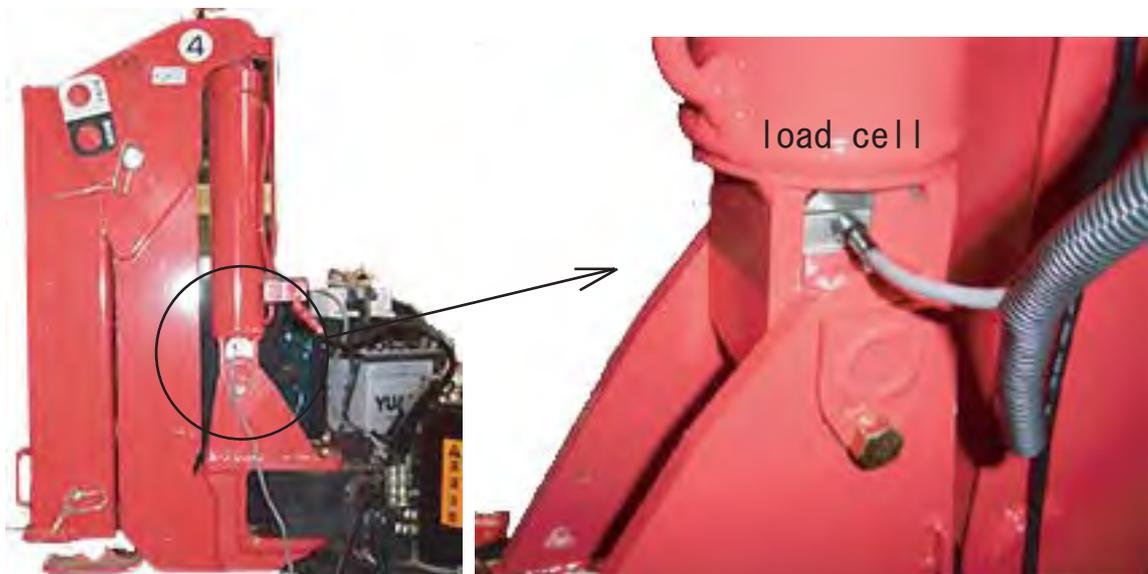
Check points of "TURN OVER PREVENTION DEVICE"

1. Please remove the wiring connector of the load cell.
Please measure the resistance between each terminal.
Please confirm whether in the following ranges.

①↔③	348 Ω ~ 358 Ω	①↔②	260 Ω ~ 270 Ω
②↔④	348 Ω ~ 358 Ω	①↔④	260 Ω ~ 270 Ω
③↔④	260 Ω ~ 270 Ω	②↔③	260 Ω ~ 270 Ω



2. If wiring is moved, and resistance changes greatly,
it is a disconnection or a loose connection.
In that case, please exchange four load cells and
the amplifier.
And, please adjust "TURN OVER PREVENTION DEVICE" again.



28.1 Inspection before operation

WARNING

★ Since the machine uses gasoline as fuel, check the hose for crack and connections for tightness if you have a smell of gasoline around the engine.

If fuel leaked in the vicinity of engine and muffler which are very hot may cause a fire.

Wipe it off completely.

★ Be sure to stop the engine, and store the boom and the outriggers before carrying out maintenance and inspection.

★ A fire source such as smoking cigarette in mouth is strictly prohibited.

★ Do not start maintenance and inspection immediately after the engine has been stopped.

Carry it out after the engine and the heated parts have been cooled down.

In order to secure safety in crane operation and to improve working efficiency, be sure to inspect each part of the carrier according to the table as follows:

Device	Servicing item	Device	Servicing item
Engine	Fuel leakage Remaining fuel quantity Engine oil quantity/Filling up Battery electrolytic solution level check Unusual vibration, Noise Loose bolt, Broken bolt	Hydraulic oil tank	Oil leakage, Oil quantity, Filling up
		Interlock for crane-crawl lever	Function
		Crawling lever	Slack, Travel
		Wheel sprocket	Loose bolt
		Rubber crawler	Crack, Damage, Tension
		Frame	Bend, Crack, Deformation
		Truck roller	Loose nut, Oil leakage

CAUTION

★ Perform monthly and annual inspection according to “Voluntary inspection table” in the warranty which is provided separately.

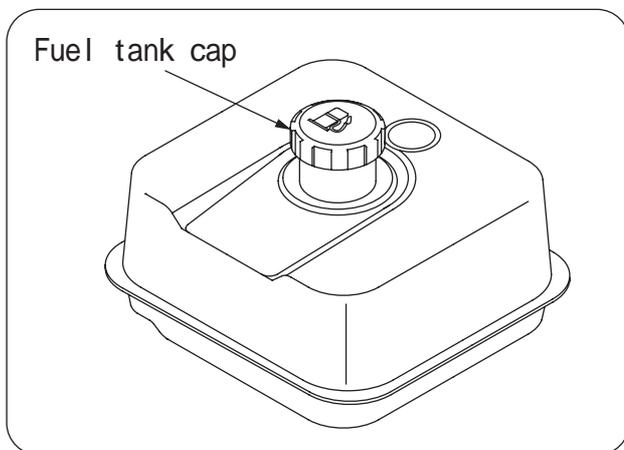
★ Keep the crawler crane in good condition so that it will be always ready for normal operation.

1. Check for remaining fuel quantity / Draining water

WARNING

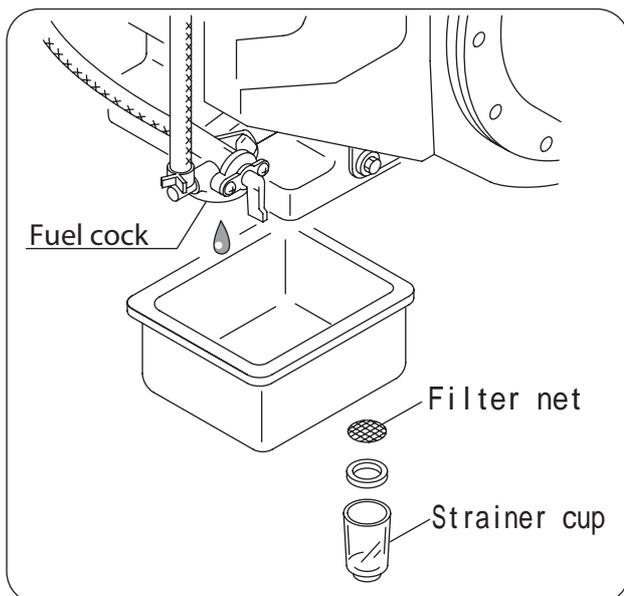
Fuel (gasoline) is highly inflammable.
Do not smoke and bring a fire source close to the fuel when refueling and draining sediment.

Wipe up spilled fuel thoroughly after refueling as it may cause the fire.



When refueling, remove the cap and never fail to put the strainer of fuel tank in order to prevent water and dust from entering the tank.

Fuel tank capacity: 6 liters



When draining fuel in order to transport the crane and store it for long period of time, remove the strainer cup in the fuel cock to extract it.

In addition, clean up the filter net with the fuel strainer cup removed.

2. Check for engine oil quantity / Filling up / Change

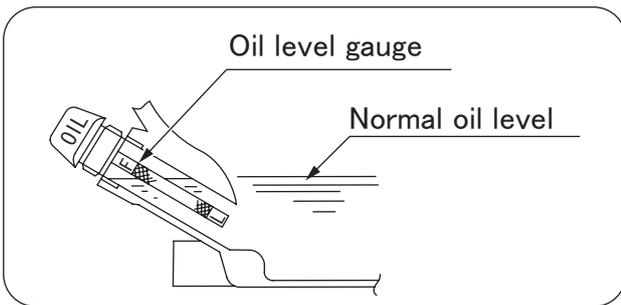
! WARNING

★Wipe up spilled oil thoroughly after filling it up as it may cause the fire.

★Do not check and change the engine oil while it is still hot.

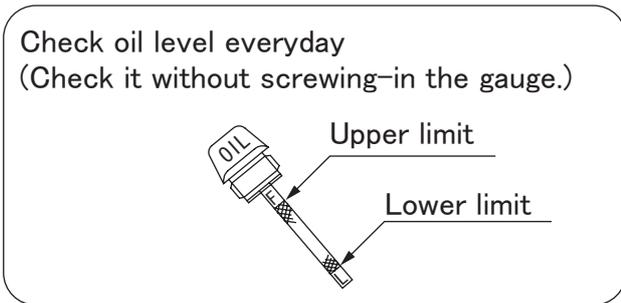
! CAUTION

★Replace engine oil after 25 hours of operation for initial replacement, and after every 50-hour operation thereafter.



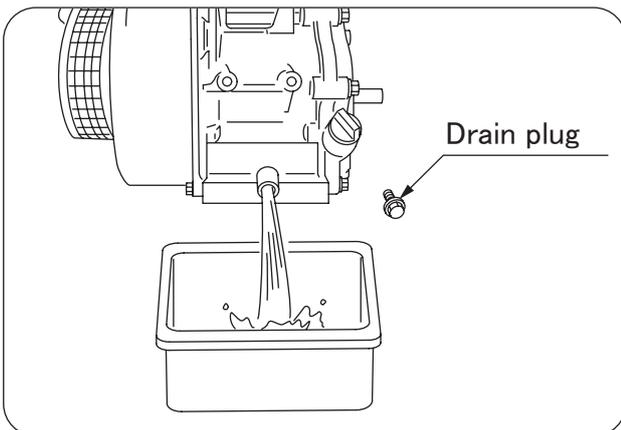
Check engine oil quantity before starting the engine with the crawler crane parked on a flat ground.

If the engine has been started, stop the engine and wait at least more than 5 minutes to check the oil level.



- Extract the oil level gauge and wipe it off with a piece of clean rag. Insert the gauge fully again then extract it slowly to check the level gauge to find where it is wetted with oil. (Check the oil for contamination and viscosity at the same time.)

- If engine oil level is found too low, supply it from the filling port.
Oil quantity to be filled up: 1.2 liters



3. Check for battery electrolytic solution level / Filling up

! WARNING

★ Gas evaporated from the battery solution is inflammable.

Do not bring a fire source close to the battery during battery maintenance.

And, be sure to disconnect the negative (-) side of battery cord.

★ Battery electrolytic solution contains sulfuric acid so that you may be blinded or burned by the solution when your eye, skin, or clothes was stained with the solution.

Wear safety goggles and rubber gloves as a protective measures when working at battery.

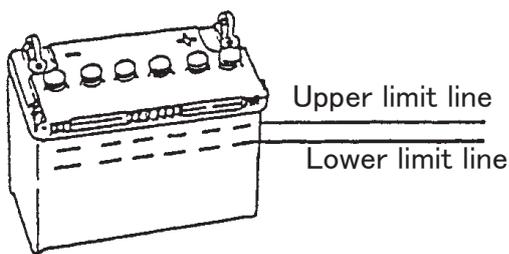
If the solution stuck to your skin or clothes, wash it away with plenty of water immediately.

In case where it entered into your eye accidentally, see a doctor for treatment.

★ When the crane will not be operated for a long period of time such as in being stored, charge the battery as follows:

Warm season (May to September) Once a month

Cold season (October to April) Once every 2nd month



- Check that the battery solution level is somewhere between the upper and the lower limit lines with the battery placed level.
- If solution level is found below the lower limit line, remove the cap to fill it up with distilled water (It is available at a gas station.)
Tighten the caps securely after the water has been filled.
- Pay attention that the crane body may be eroded by the battery solution due to leakage during operation if solution level exceeds beyond the upper limit line.

4. Check hydraulic oil tank for oil level / Filling up

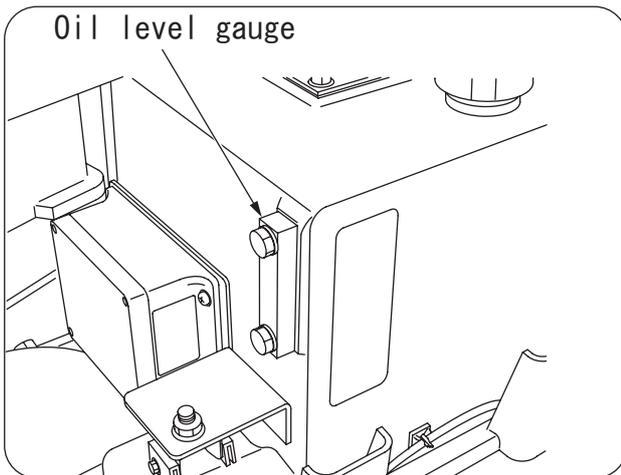
! WARNING

★ Since temperature on the hydraulic oil tank surface is too high immediately after operation, remove the cap of the filling port after the temperature has gone down.

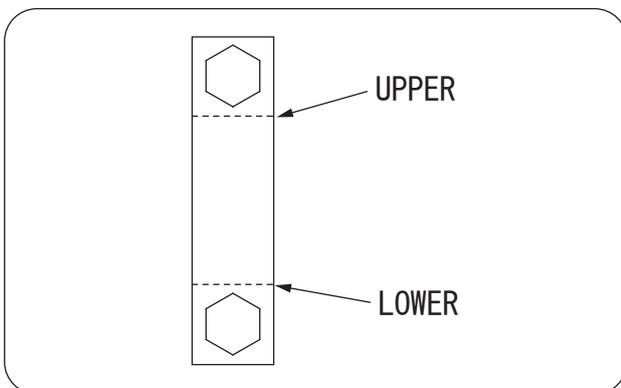
! CAUTION

★ Replace hydraulic oil for the first time after 3 months of operation, and every year or every 500 hours of operation thereafter.

★ Clean up the suction strainer and the return-filter once a year.



- Park the crawler on a flat ground to stop the engine.
- Check the oil quantity at the oil level gauge located in front of oil tank.
Capacity of hydraulic oil tank: 27 liters



- A proper quantity of hydraulic oil is somewhere between "UPPER" and "LOWER" limits as illustrated in the figure.

- If oil level is found below the "LOWER" limit, remove the cover to the tank and remove the cap to fill it up with a specified oil.

5. Check for rubber crawler / Adjustment

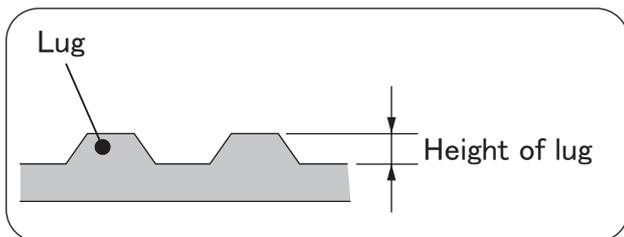
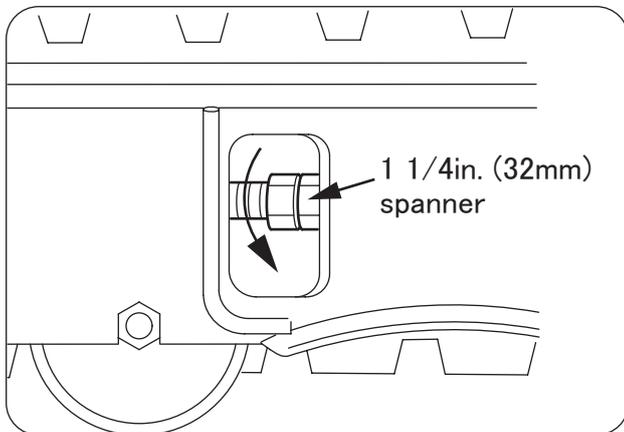
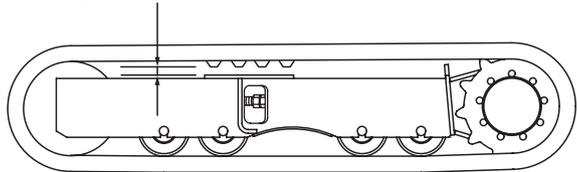
! WARNING

★Do not check rubber crawler tension with the crane body raised above the ground.

It is very dangerous because an accidental fall of the crane may happen during inspection.

Be sure to carry out tension check with the crane touched the ground.

Standard: Approx. 5/8in. (15~17mm)
Adjust if found less than 3/8in. (10mm)



■ Inspection/Adjustment

Check the rubber crawler for wear and for tension whenever necessary as the wear varies according to operating and ground conditions.

- Initial check/adjustment: After 30 hours of operation and whenever necessary.
- When tensioning the rubber crawler, turn the nut following the arrow direction as illustrated and lock it with another nut (double-nut system).
- If the tension is too tight, it shortens service life of rubber crawler, wheel sprocket, and idle roller.

- Replace the rubber crawler when the lug height becomes less than 1/8 in (3 mm).

! CAUTION

★Adjust the tension again after 30 hours of operation if the new rubber crawler has been mounted.



CAUTION

- ★ Do not crawl over lying rocks or stones with sharp edges.
- ★ Do not change direction where there is a difference in ground level.
- ★ Do not make a quick change of direction as it may cause the wheels to go off the rubber crawler.
- ★ Do not operate the crane on a ground being heated to the temperature of more than 140° F (60° C.)
- ★ Do not stain the rubber crawler with oils such as fuel, hydraulic oil, grease, and the other oil.
- ★ Do not operate the crane at a place where salt content is abundant.
- ★ When storing the crane for long period of time, store it indoors where it will not be exposed to the ray of the sun or to the rain directly.

Inspection and Maintenance which is to be carried out every 250 hours or 3 months

1. Check/Cleaning of air cleaner element

! WARNING

★Do not make a cleaning and a replacement of air cleaner while engine is running.

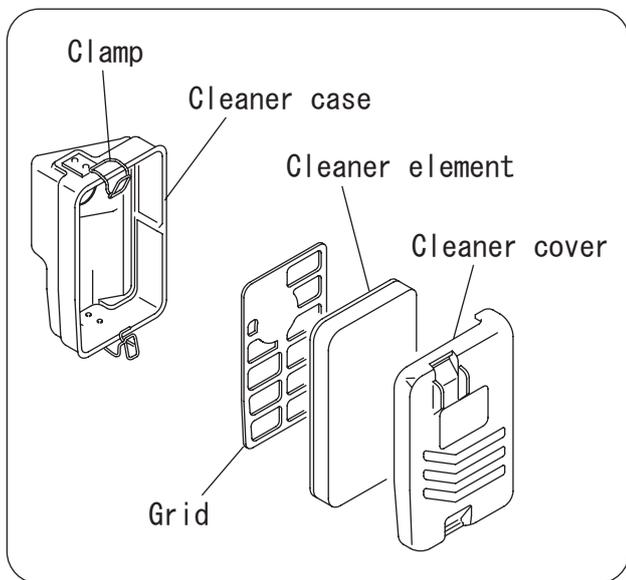
! CAUTION

★If the crane is operated in dusty environment, shorten the time when making inspection and cleaning accordingly.

Check and clean the air cleaner element when the crane has been operated for 250 hours (3 months).

1 Unfasten the clamps to remove the air cleaner cover.

2 Clean the air cleaner element.



2. Check oil quantity in the reduction gears of crawling motor/Filling up
(Change oil every 1,000 hours)

! WARNING

★Do not rush to work as each section of crawling devices is heated to a high temperature immediately after the crane operation.

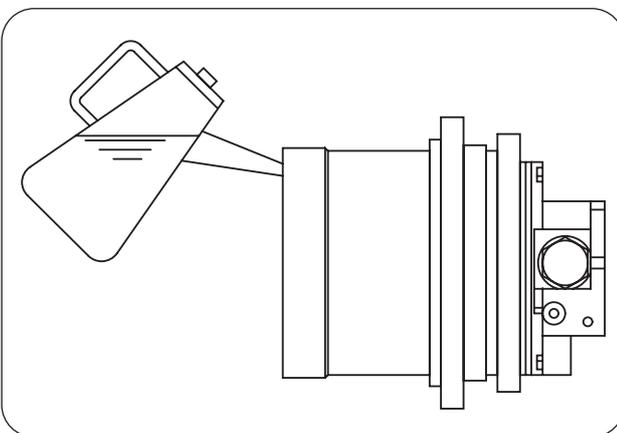
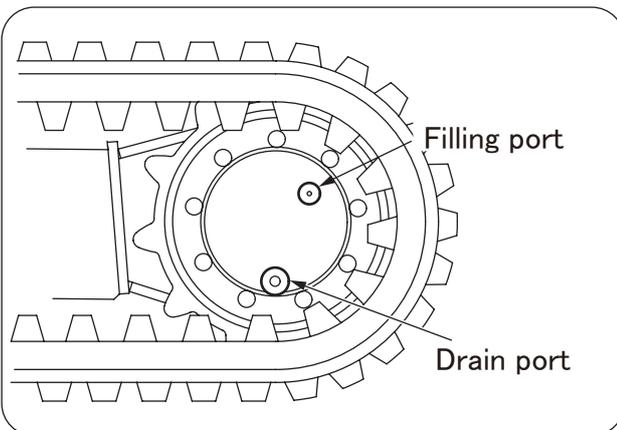
Work after temperature of crawling devices has cooled down.

★Pressure may be remained inside of the reduction gears of crawling motor.

Unfasten the filling port plug by 2~3 turns slowly to release the internal pressure and then remove the plug.

An abrupt removal of the plug may cause the plug to pop out or the oil to spurt out which is dangerous.

Do not turn your body or face toward the plug.



- 1** Park the crane on a flat ground.
- 2** Position 2 (two) plugs at the end of reduction gears of crawling motor as illustrated in the figure, "position for inspection", and stop the engine.
- 3** Unfasten the filling port plug slowly to bleed air.
- 4** Remove the filling port plug and oil quantity is correct if oil flows out of the filling port.
If oil quantity is insufficient, fill it with the oil specified.
- 5** Check the sealing of each plug, replace it with new seal if it is found damaged.
- 6** Put the plug on the filling port and tighten it.

1. Inspection before operation

In order to secure safe operation and improve working efficiency, be sure to inspect daily each part of the crane according to the table as follows:

Device	Servicing item	Device	Servicing item	Device	Servicing item
Pump	Tightness of each mounting Oil leakage Unusual noise	Hook	Rotation of hook Function of retaining mechanism	Frame	Mounting of crane body Cracks Tightness of bolts Missing bolt
Hydraulic oil tank	Oil level Oil leakage	Wire rope	Damage Condition of rope-end	Slinging implements	Items necessary for crane operation are provided
Outriggers	Natural descent Function Deformation Damage Oil leakage Cracks	Overwinding alarm	Function Alarm sound	Automatic storing device for hook	Function of automatic stop and storing operation
Hoisting winch	Function Braking function Irregular winding	Interlock for crane-crawl lever	Crane will not function when the lever is shifted to "crawl". Carrier will not crawl when the lever is shifted to "crane".	Automatic stop for leaving minimum wire rope	Further unwinding stops automatically when remaining wire rope on the drum comes to 3 turns.
Slewing device	Function Oil leakage	Load meter	Oil leakage Function	Turn over prevention device	Inspection before starting operation Daily inspection Trouble inspection Alarm spection Inspection for automatic stop Check wiring for damage Check sensor mounting for tightness
Derricking boom	Function Oil leakage Mounting of foot-pin	Warning horn	Function		
Telescoping boom	Function Oil leakage Deformation Cracks Mounting of fixing pin	Piping, Hydraulic hose	Oil leakage Damage		

CAUTION

★Perform monthly and annual inspection according to "Voluntary inspection table" in the warranty which is provided separately.

★Keep the crawler crane in good condition so that it will be always ready for normal operation.

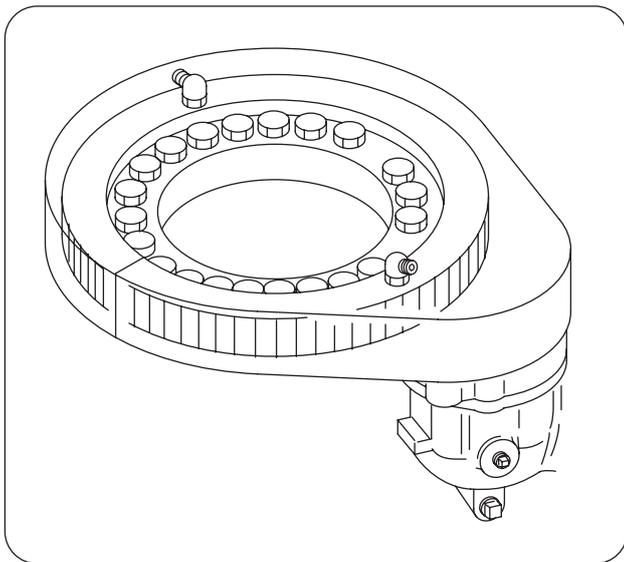
2. Cleaning

Keep the crane clean at any time.

Sands and fine dusts may cause an abnormal wear .

Do not wash the crane by splashing highly pressurized water to prevent it from entering into the electric system by which may cause malfunction of the crane.

3. Inspection of bolts mounting slewing bearings



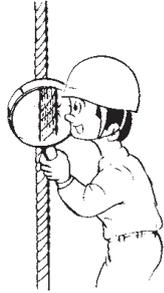
When the slewing device makes an unusual noise while operating or crawling the crane, or when a gap is created on the mounting surface, contact a UNIC authorized service shop for inspection and/ for repair.



CAUTION

★Break of the bolts mounting slewing bearings may invite an accident such as overturn and destruction of the crane. Check the mounting bolts (outer ring side) for tightness once every 6 months.

4. Replacement of wire rope (for winding-up)



Wire rope in active service should be visually inspected once every working day. A thorough inspection of such rope should be made at least once a month and dated records kept as to rope condition.

Replace the rope according to the following standard.

1. In running ropes, six randomly distributed broken wires in one rope lay, or three broken wires in one strand in one rope lay. (A rope lay is the length along the rope in which one strand makes a complete revolution around the rope.)

2. In pendants or standing ropes, evidence of more than one broken wire in one lay.

3. Abrasion, scrubbing, or peening causing loss of more than $1/3$ of the original diameter of the outside wires.

4. Evidence of severe corrosion.

5. Severe kinking, severe crushing, or other damage resulting in distortion of the rope structure.

6. Evidence of any heat damage from a torch or arc caused by contact with electrical wires.

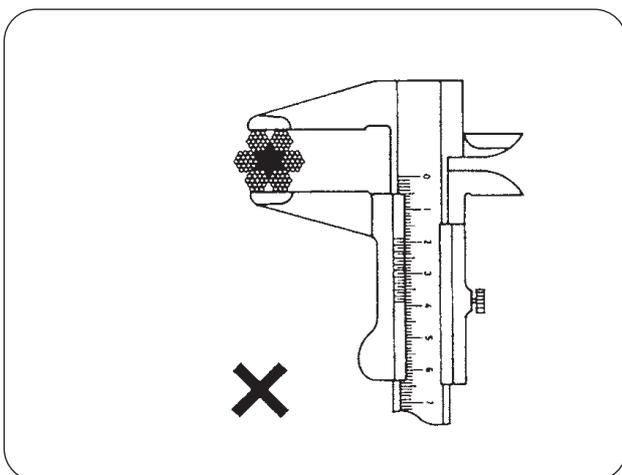
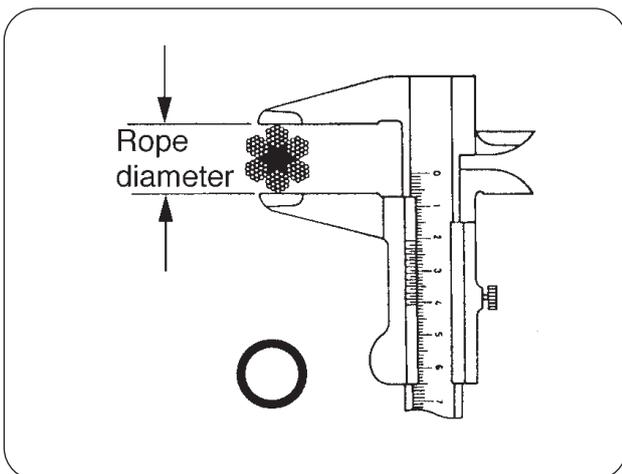
7. Reduction from nominal rope diameter of more than $1/64$ in. (0.4 mm) for diameters $13/32$ in. (10.0 mm);

Marked reduction in diameter indicates deterioration of the core, resulting in lack of proper support for the load carrying strands. Excessive rope stretch or elongation may also be an indication of internal deterioration.

8. Evidence of "bird caging" or other distortion resulting in some members of the rope structure carrying more load than others.

9. Noticeable rusting or development of broken wires in the vicinity of attachments.

(Note: If this condition is localized in an operating rope and the section in question can be eliminated by making a new attachment, this can be done rather than replacing the entire rope.)



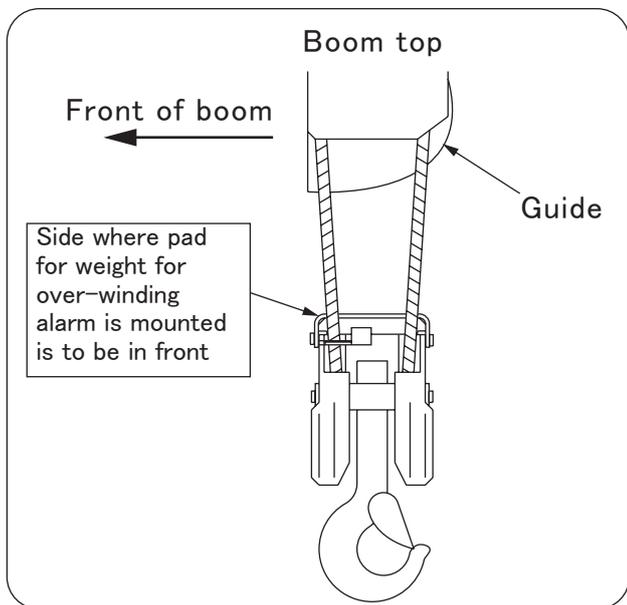
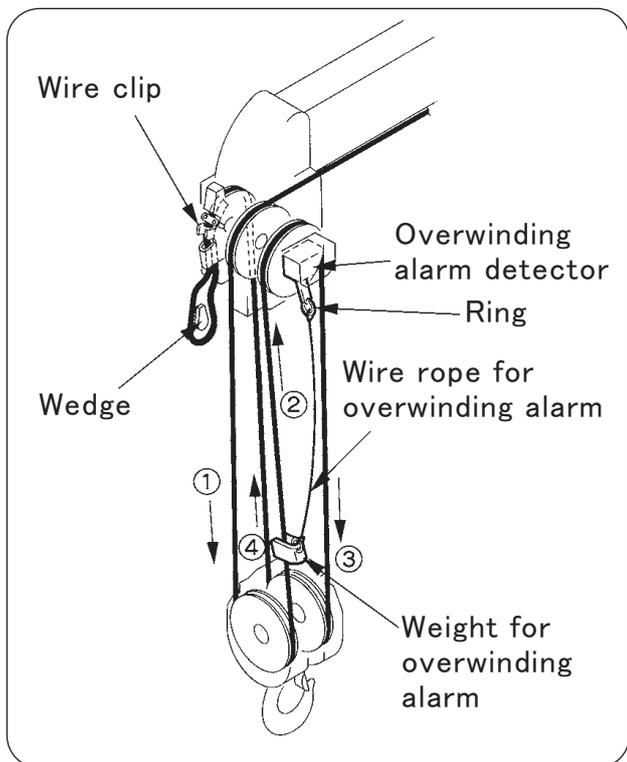


CAUTION

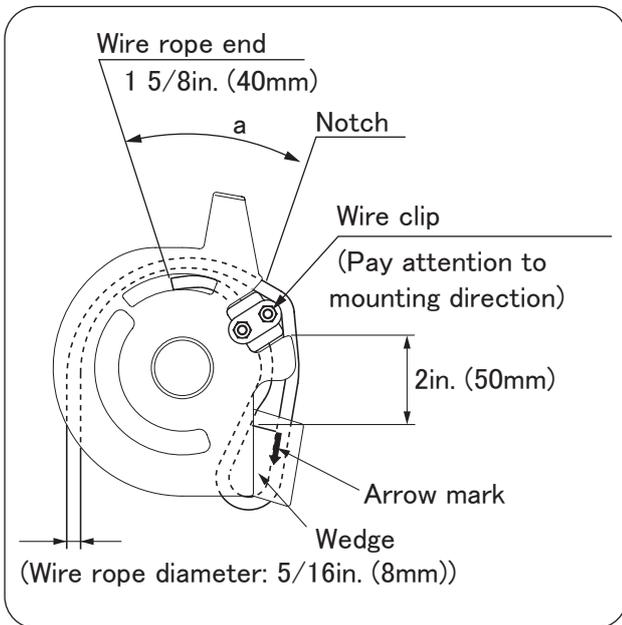
★Wear leather gloves when replacing wire ropes.

◆ 2. How to replace wire ropes

1. Refer to the figure in the left for how to hook the wire ropes for winding -up and for where the weight for over-winding alarm is to be mounted.



Refer to the figure in the left for how to attach the hook.

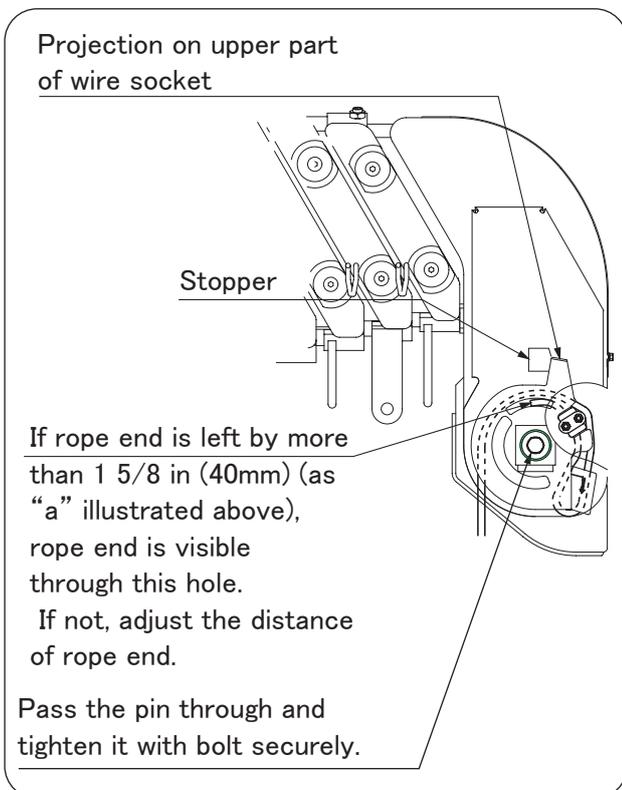


2. How to fix wire rope end

① When passing the wire rope end through the wire socket, be sure to pass it as indicated by the arrow mark on the socket.

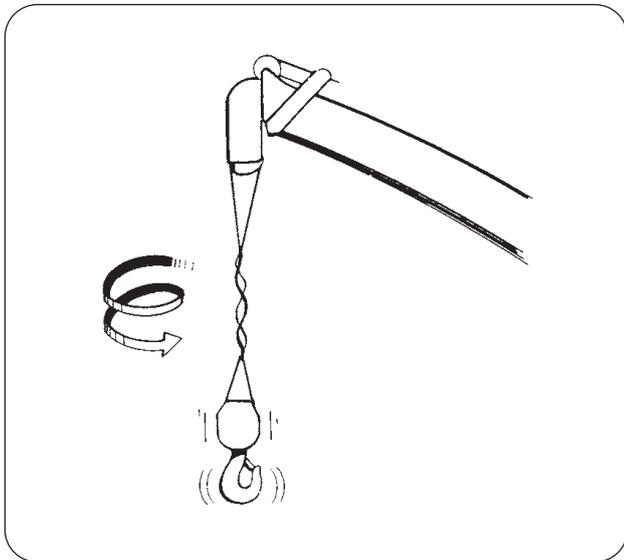
If it is passed from the opposite direction, service life of wire rope becomes shorter as the wire rope is kept bent all the time.

② Do not forget to mount the wedge and the wire clip as illustrated in the figure in the left. Leave the wire rope end to allow a distance from the notch to the rope end by more than 40mm as illustrated in the figure as "a".



③ Pass the pin through with the wire socket held with your hand and tighten it with the bolt securely.

MAINTENANCE AND INSPECTION OF CRANE



◆ 3. How to correct twisted wire ropes

Wire ropes tend to turn in untwisting direction when they are under tension.

If two or more wire ropes are hooked together, they tend to be twisted particularly while they are new.

The twist will decrease as the ropes are getting fit to the crane.

If wire ropes are twisted, correct them as follows:

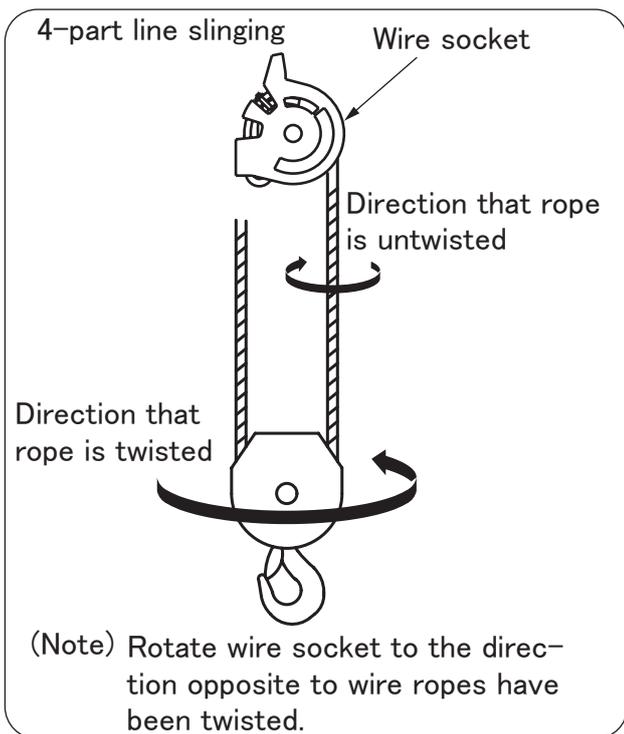
1. Unload the hook.
2. Extend the boom fully.
3. Raise the boom to an angle of approximately 65° .
4. Unwind the hook until it comes close to the ground.
5. Check how many turns the wire rope has been twisted.
6. Wind up the hook and retract the boom to be on a stored condition.
7. Remove the wire socket and turn the socket in the untwisting direction by as many turns as the wire ropes have been twisted multiplied by the number of wire ropes being hooked.

However, remember that the wire socket may be turned up to 4 turns at a time.

8. Attach the wire socket and repeat winding up and down the rope 2 or 3 times between both extremes.

Then, check if twist of the wire ropes is corrected.

If they remain twisted, repeat the procedures shown above.

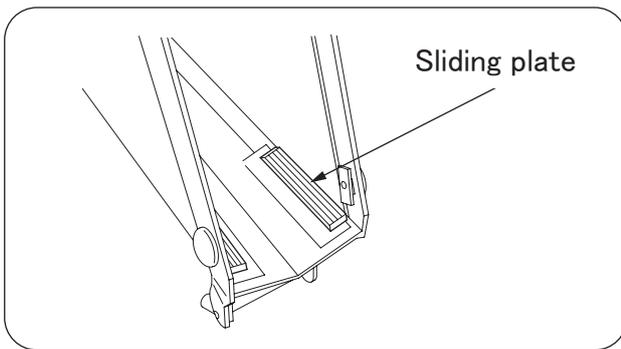


5. Replacement of expendable parts

- ◆ 1. Replacement of gaskets and seals for each cylinder

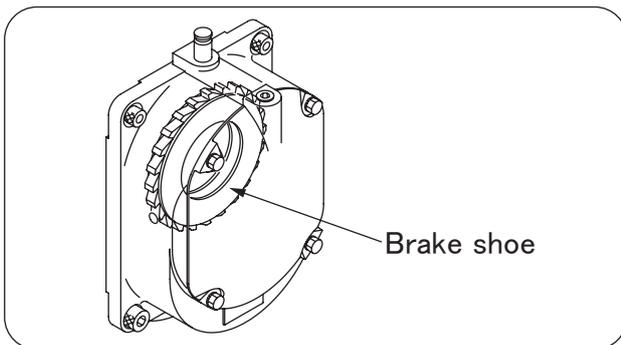
Although timing of replacement of a part varies according to how frequently the crane has been operated, replace gaskets and seals used in each cylinder after every 3 years of operation (period during which crane has not been operated is included) in order to operate the crane safely.

Ask a local UNIC authorized service shop for replacement of gaskets and/or seals.



- ◆ 2. Replacement of sliding plate of boom

Replace it every 3 years.

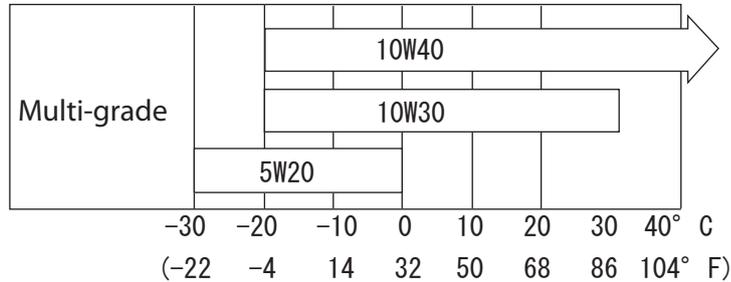


- ◆ 3. Replacement of brake shoe of hoisting winch

Replace it every 3 years.

1. List of recommended lubricant for carrier

◆1. Use the engine oils as below:



The selection of engine oil is very important to a engine.
 If an unsuitable oil is used, or oil change is neglected, it may result in damage, and a shorter engine life.
 Use oils that meet API Engine Service Classification CD.

◆2. Use the recommended grease for lubrication as below.

Chassis grease
 Use NLGI No. 2 grade for most temperatures.
 Use NLGI No. 1 grade for extremely low temperatures.

◆3. Use the fuel as specified below.

Use only automobile non-leaded gasoline

◆4. Hydraulic oil is the same as the oil used in the crane.

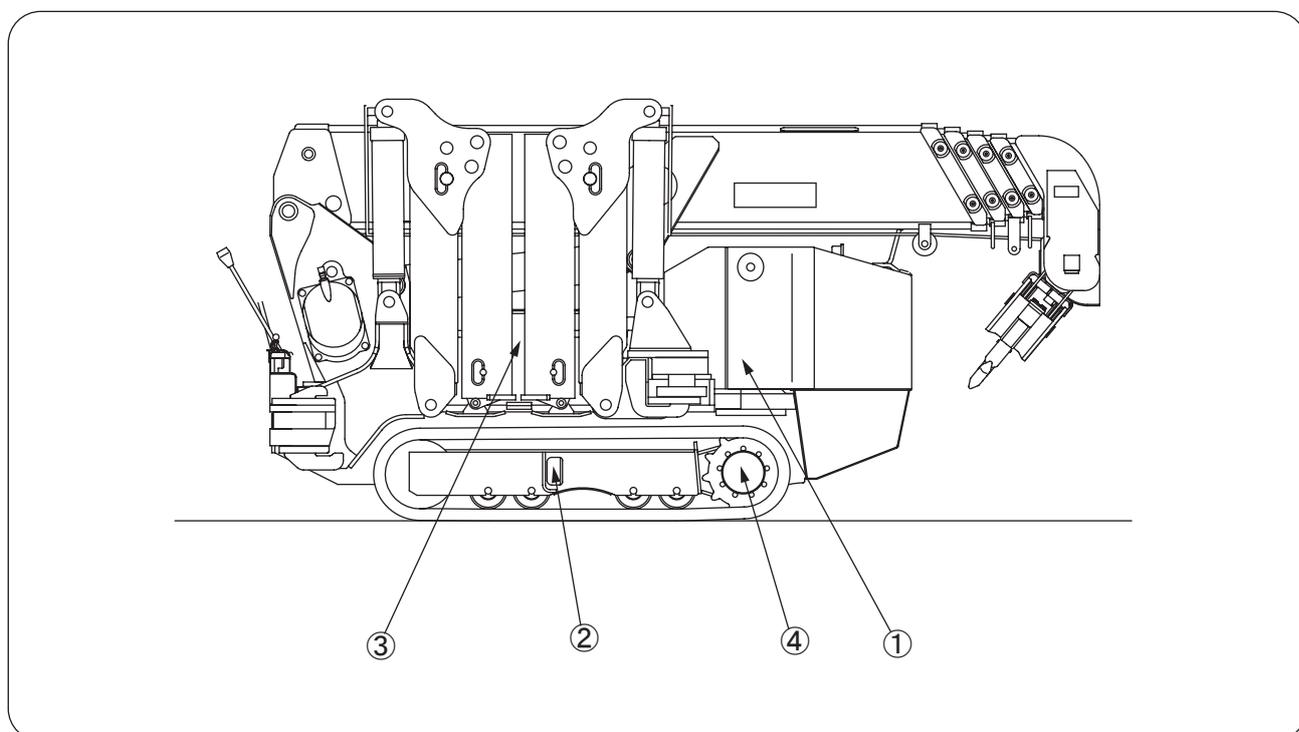
◆5. Use the gear oils for the reduction gears of crawling motor as below:

Classification	Depending on atmospheric temperature						
	(- 22	- 4	14	32	50	68	86°F)
Rating to be applied	- 30	- 20	- 10	0	10	20	30°C
Engine oil							
Diesel engine oil of CD class	SAE30						

- SHELL: DONAX TT or TD
- CALTEX: RPM TRACTOR HYDRAULIC FLUID
- CHEVRON: TRACTOR HYDRAULIC FLUID
- TEXACO: TDH OIL
- MOBIL: MOBILAND SUPPER UNIVERSAL.

It is possible to substitute engine oil CLASS-CD SEA 30.

2. Filling water and lubrication chart



Service interval	Where to lubricate	No. of part	Lubricant	Tool
Initial: Replace after 25 hours After : Replace every 50 hours	① Engine 0.3 gal. (1.2 liters)	1	Engine oil	
Initial : 30 hours, Whenever necessary	② Tension adjustment of rubber crawler	2		1 1/4 gal. (32mm) spanner
Initial: Replace after 3 months After : Replace once a year or every 500 hours	③ Hydraulic oil tank 7.1 gal. (27 liters)	1	Hydraulic oil	
Replace every 1000 hours	④ Reduction gears of crawling motor 0.1 gal. (0.33 liters)	2 (Right/Left)	Diesel engine oil	

·Refer to “MAINTENANCE AND INSPECTION OF CARRIER” for replacement procedures.

Fuel	Gasoline
Fuel tank capacity	1.6 gal. (6 liters)

3. List of recommended lubricant for crane

◆1. List of recommended lubricants

- ★Use the UNIC genuine hydraulic oils listed below as hydraulic oil for the crane.
Use industrial-type hydraulic oil
ISO VG 46 for temperatures above 32F.
ISO VG 32 for temperatures below 32F.

Petroleum Maker	Brand	
	ISO VG 32	ISO VG 46
ESSO	Spinesso 32	Teresso 46
MOBIL	Mobil DTE 32	Mobil DTE Oil Medium
CALTEX	Spindura oil 32	Rando Oil 46
SHELL	Shell Tellus Oil 32	Shell Tellus Oil 46

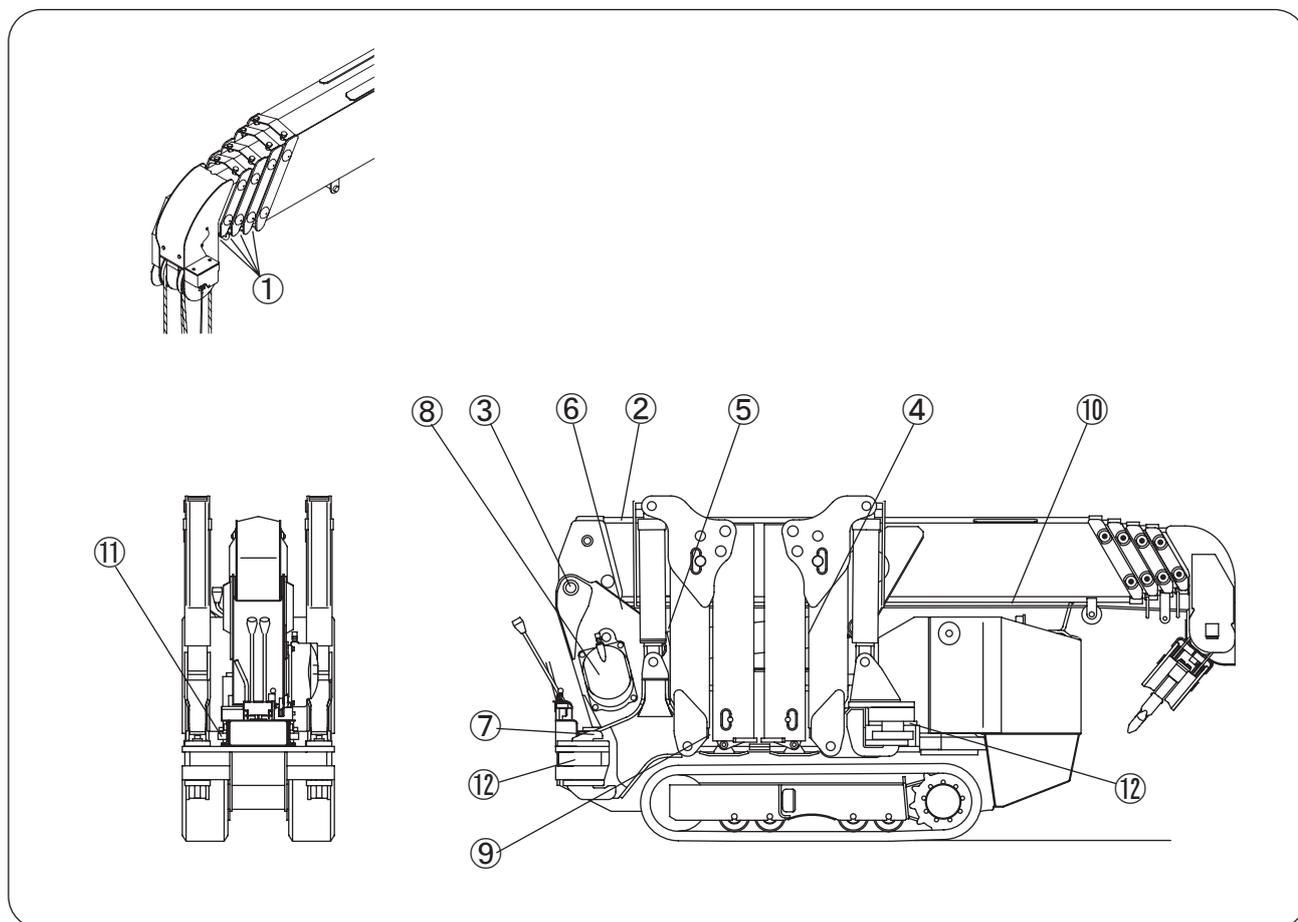
- ★Use the recommended lubricants listed below as gear oil for lubrication.

Aplication	Petroleum Maker	Brand
Reducer for winch	Shell	Shell Spirax EP 90
Reducer for slewing gear	Use API service GL-4 gear oils. (Refer to the followings)	
	ESSO	Standard gear oil 90
	MOBIL	Mobilube GX 90
	CALTEX	Universal Thuban SEA 90
	SHELL	Shell Spirax EP 90

- ★ Use the recommended greases listed below as grease for lubrication.
 - (a) Chassis grease
Use NLGI No. 2 grade for most temperatures.
Use NLGI No. 1 grade for extremely low temperatures.
 - (b) Molybdenum grease
Use NLGI No. 2 grade.

Petroleum Maker	Brand
ESSO	Beacon G2
MOBIL	Mobilplex Special
CALTEX	Molytex Grease EP2
SHELL	Retinax AM

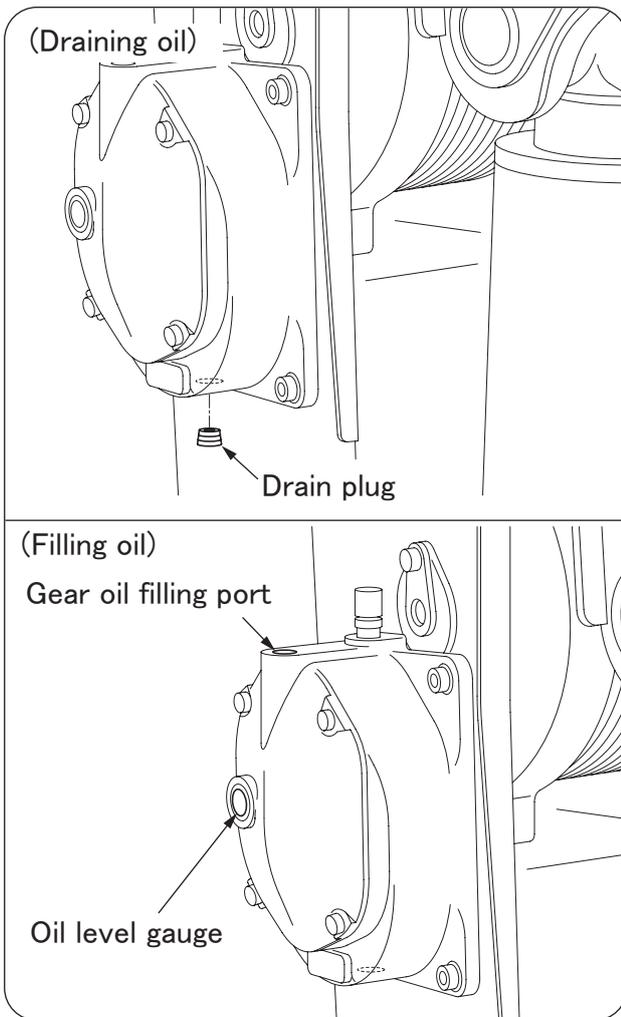
4. Lubrication chart for crane



Service interval	Where to lubricate	No. of part	Lubricant	Tool
Daily	① Boom slide plate (Underside & side face of boom sections ②, ③, ④, and ⑤) For 5-section boom	4	Molybdenum grease	Manual application
	② Boom slide plate (Upper side of boom section ①)	4	Molybdenum grease	Grease pump
	③ Boom foot pin	1	Chassis grease	Grease pump
	④ Upper support pin of derrick cylinder	1	Chassis grease	Grease pump
	⑤ Lower support pin of derrick cylinder	1	Chassis grease	Grease pump
Weekly	⑥ Winch drum gears	1	Chassis grease	Grease pump
	⑦ Slewing gears	1	Chassis grease	Manual application
Monthly	⑧ Winch reduction gears Approx. 0.3 gal. (1.0 liter)	1	Gear oil	
	⑨ Slewing reduction gears Approx. 0.1 gal. (0.3 liters)	1	Gear oil	
	⑩ Wire rope	1	Rope grease	Spray gun
	⑪ Slewing bearings	2	Chassis grease	Grease pump
	⑫ Outrigger fulcrum pin	4	Chassis grease	Grease pump

Lubrication

Winch reduction gears



◆ 1. Replacement of gear oil (Winch reduction gears and Slewing Reduction gears)

★ Air enters in and out of the gear case so that dirt and moisture are brought in the gear case.

In addition, since hydraulic equipment gradually wears to produce worn particles, replace gear oil after 6 months from the start of operation.

★ Afterward, replace gear oil:

- Once a year for winch reduction gears, and
- Once every 2 years for slewing reduction gears.



CAUTION

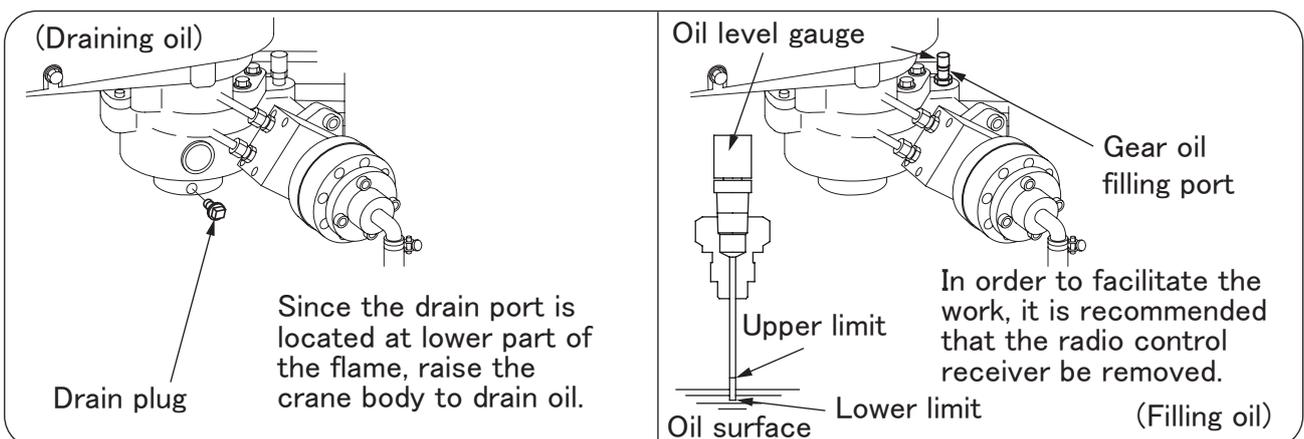
★ Replace gear oil after oil temperature has dropped.

★ Fill up the oil for winch reduction gears until oil level comes to halfway between upper limit and lower limit on the oil level gauge (oil quantity: approx. 0.3 gal. (1.0 liter)).

★ Fill up the oil for slewing reduction gear until oil level comes to halfway between upper limit and lower limit on the oil level gauge (oil quantity: approx. 0.1 gal (0.3 liters)).

In order to check oil level, insert the level gauge until it just touches the oil level port (not screwing it in).

Slewing reduction gears



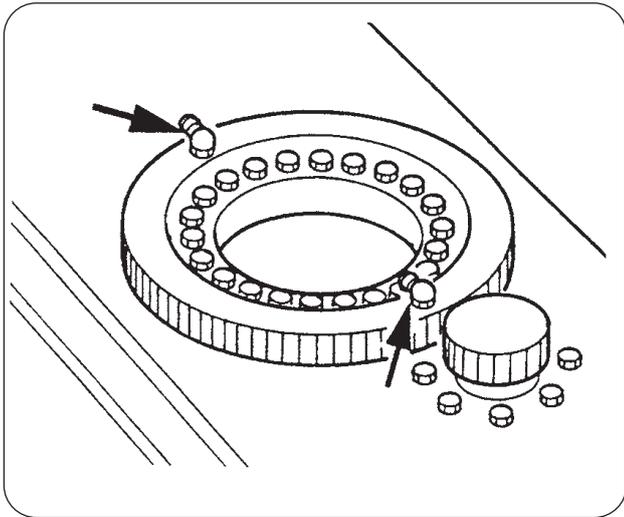
LUBRICATION TO CRANE

◆2. Lubrication to slewing bearings

The crane employs ball bearings as the slewing bearing.

Be sure to lubricate the bearings as insufficient lubrication may cause it to make unusual noise.

Grease the nipples while slewing the boom once a month for moderate operation, and once a week for heavy-duty operation.



31.1 Battery removal procedures for models of URW295C (Gasoline engine type)

(1) Battery is installed on the battery mount as illustrated in the Fig. 1.

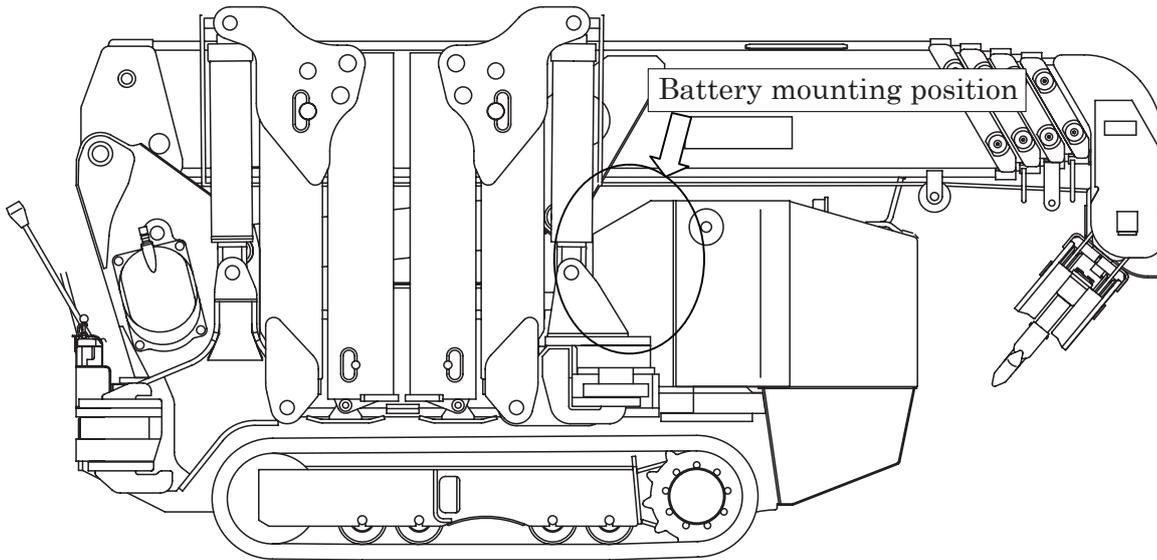


Fig. 1 Battery mounting position

(2) Remove the M8 bolt shown in the Fig. 2 to remove the cover. Then remove the M8 double nut system to remove the battery attachment bracket.

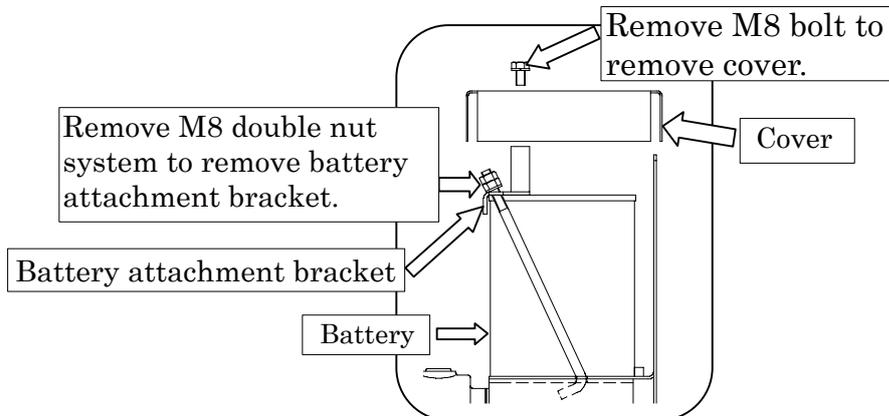


Fig. 2 Battery mounting position in detail

(3) Put the extension angle of outrigger ④ to an angle of approx. 90° as in the Fig. 3.

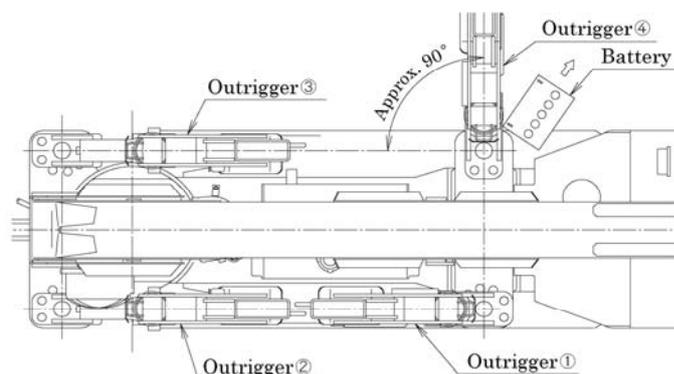


Fig. 3 Extension angle of outrigger in detail

(4) Disconnect each battery cable from both battery terminals of (+) and (-) to pull out the battery as illustrated in the Fig. 4.
Be sure to disconnect the cable to the (-) terminal first, then the cable to the (+) terminal. While the battery is being pulled out, pay special attention that any of battery terminals will not touch any part of the crane.



Fig.4 Extension angle of outrigger in detail

31.2 Battery removal procedures for model of URW295C (Diesel engine type)

(1) Battery is installed on the battery mount as illustrated in the Fig. 5

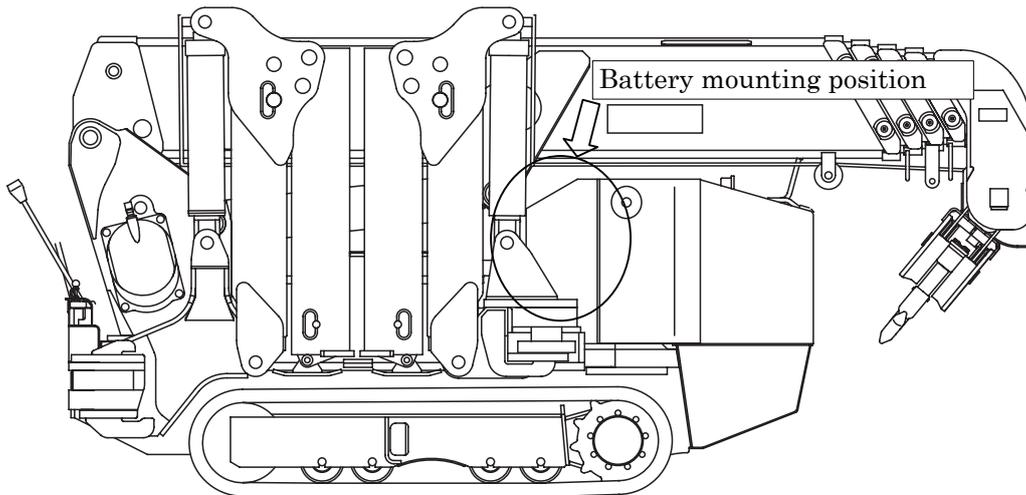


Fig.5 Battery mounting position

(2) Remove the M6 bolts (5 places) to remove the cover (1) and the cover (2) shown in the Fig. 6 and Fig. 7.

Put the cover (2) at the place indicated in the Fig. 8 when it is hard to be removed.

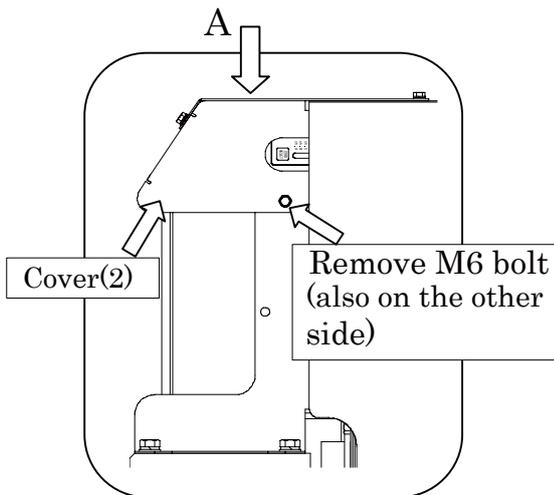


Fig.6 Battery mounting position in detail

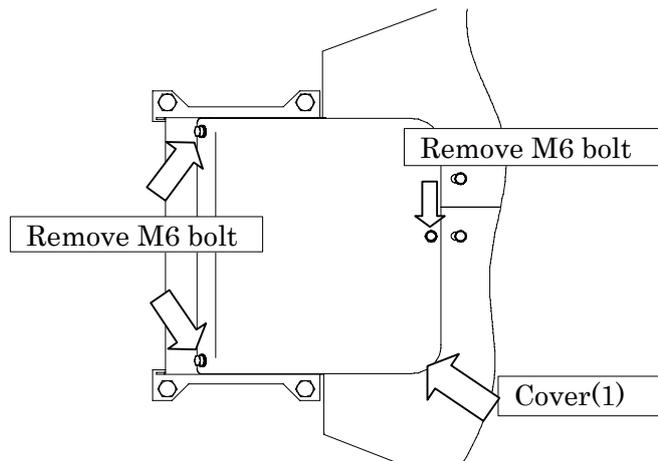


Fig.7 Illustrated by viewing from arrow A

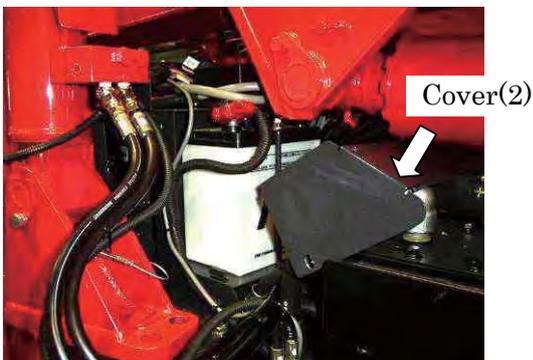


Fig. 8 Removing position of cover (2)

- (3) Remove the M8 bolt and the M8 double nut system to remove the battery attachment bracket illustrated in the Fig. 9.

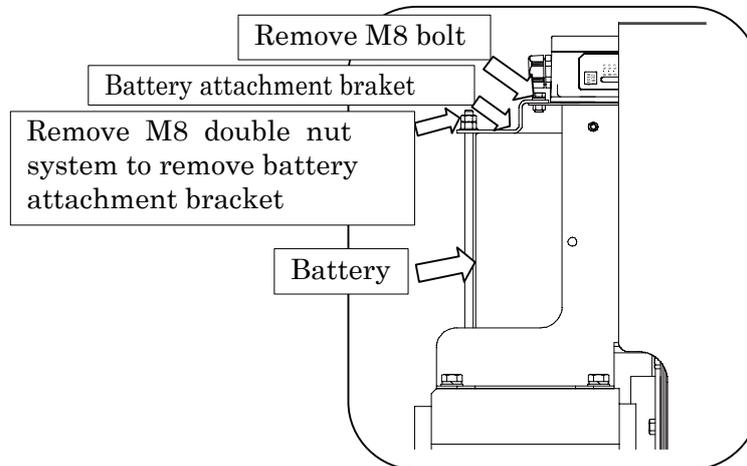


Fig.9 Mounting battery in detail

- (4) Disconnect each battery cable from both battery terminals of (+) and (-) as illustrated in the Fig. 10 and pull out the battery from the side of outrigger ④ illustrated in the Fig. 11. Be sure to disconnect the cable to the (-) terminal first, then the cable to the (+) terminal. While the battery is being pulled out, pay special attention that any of battery terminals will not touch any part of the crane.



Fig. 10 Pulling out battery

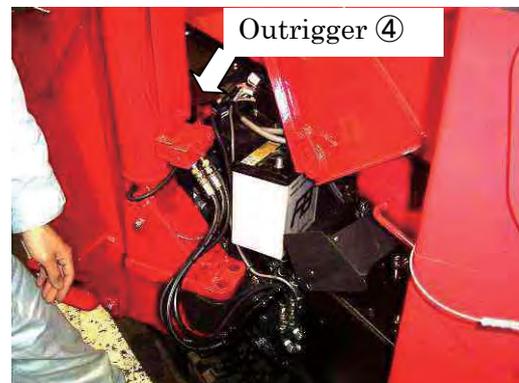


Fig.11 Position where battery is to be pulled out