

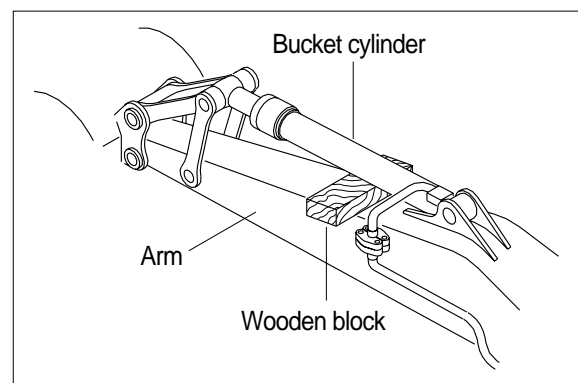
## GROUP 13 BOOM, ARM, BUCKET AND DOZER CYLINDER

### 1. REMOVAL AND INSTALL

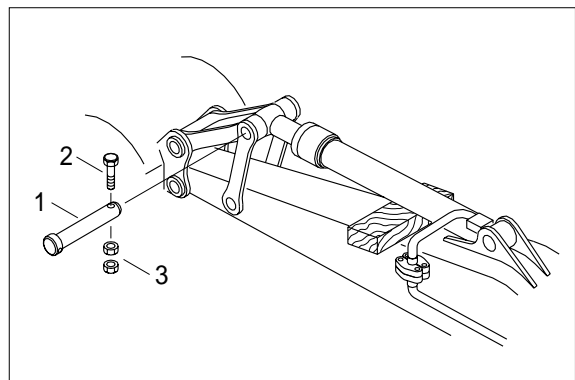
#### 1) BUCKET CYLINDER

##### (1) Removal

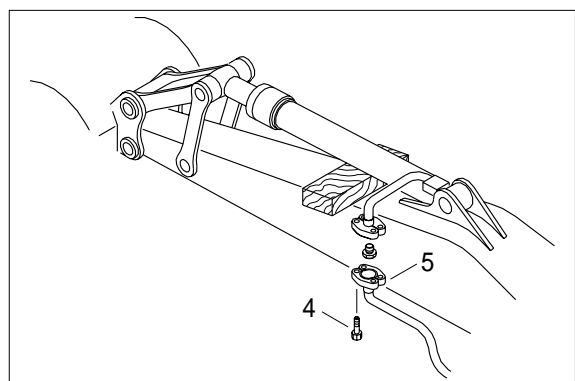
- ※ Expand the arm and bucket fully, lower the work equipment and dozer blade to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ⚠ Escaping fluid under pressure can penetrate the skin causing serious injury.
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.
- ① Set block between bucket cylinder and arm.



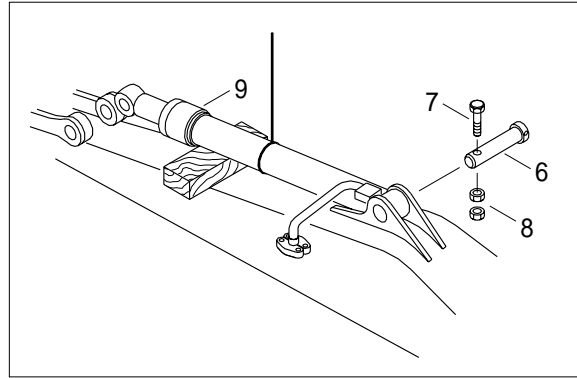
- ② Remove nut(3), bolt(2) and pull out pin(1).
- ※ Tie the rod with wire to prevent it from coming out.



- ③ Loosen socket bolt(4) to disconnect bucket cylinder hoses(5) and put plugs on cylinder pipe.



- ④ Sling bucket cylinder assembly(9), and remove nut(8), bolt(7), then pull out pin(6).
- ⑤ Remove bucket cylinder assembly(9)
  - Weight : 135kg(298lb)



## (2) Install

- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.
- ※ Bleed the air from the bucket cylinder.
  - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

## 2) ARM CYLINDER

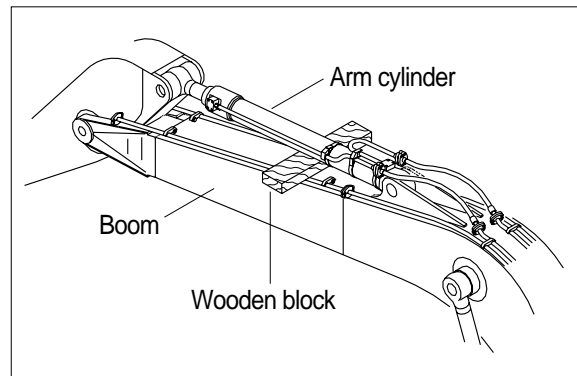
### (1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment and dozer blade to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ Escaping fluid under pressure can penetrate the skin causing serious injury.

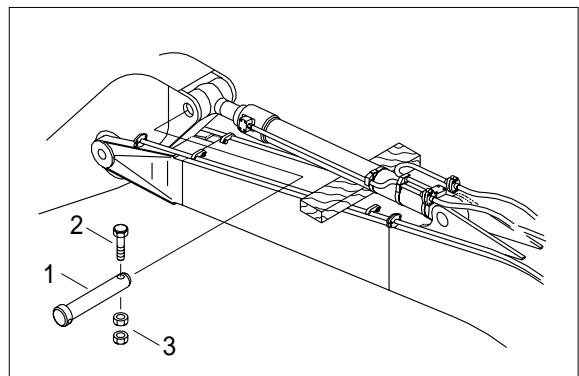
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

- ① Set block between arm cylinder and boom.



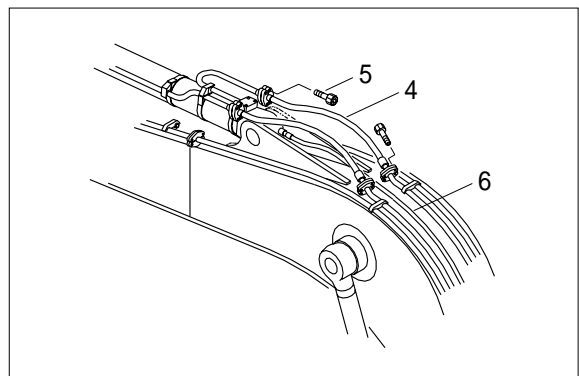
- ② Remove nut(3), bolt(2) and pull out pin(1).

- ※ Tie the rod with wire to prevent it from coming out.

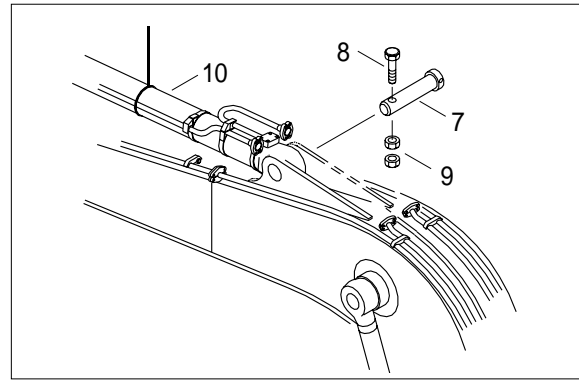


- ③ Loosen socket bolt(4) to disconnect arm cylinder hose(5) and put plugs on cylinder pipe.

- ④ Disconnect greasing hoses(6).



- ⑤ Sling arm cylinder assembly(10), and remove nut(9), bolt(8), then pull out pin(7).
- ⑥ Remove arm cylinder assembly(10).
  - Weight : 183kg(403lb)



## (2) Install

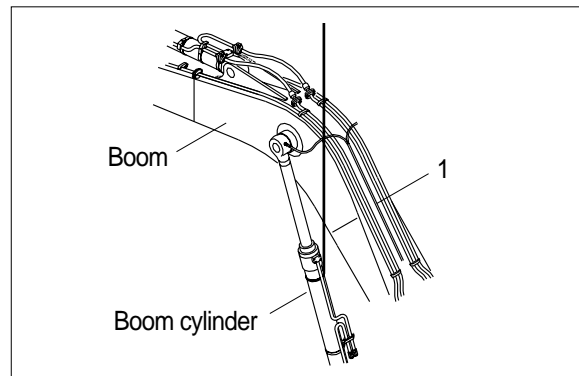
- ① Carry out installation in the reverse order to removal.
- ⚠ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.
- ※ Bleed the air from the arm cylinder.
  - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

### 3) BOOM CYLINDER

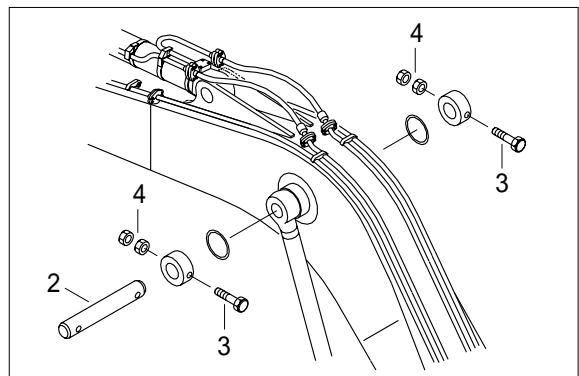
#### (1) Removal

- ※ Expand the arm and bucket fully, lower the work equipment and dozer blade to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ▲ Escaping fluid under pressure can penetrate the skin causing serious injury.
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

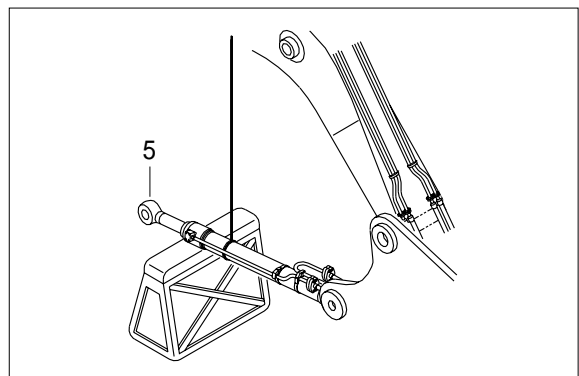
- ① Disconnect greasing hoses(1).
- ② Sling boom cylinder assembly.



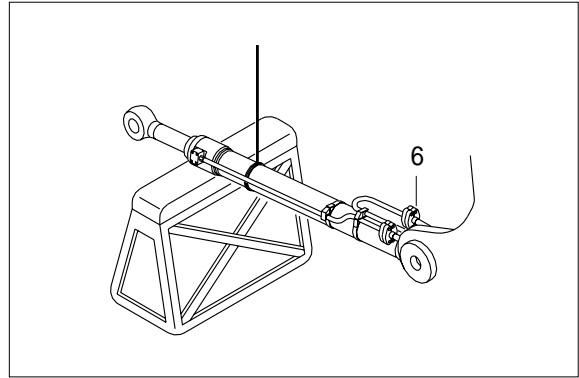
- ③ Remove nut(4), bolt(3) and pull out pin(2).
- ※ Tie the rod with wire to prevent it from coming out.



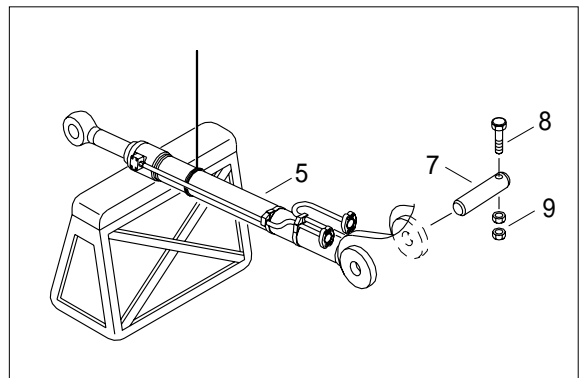
- ④ Lower the boom cylinder assembly(5) on a stand.



- ⑤ Disconnect boom cylinder hoses(6), and put plugs on cylinder pipe.



- ⑥ Remove spring(9), pin stopper(8), then pull out pin(7).  
⑦ Remove boom cylinder assembly(5).  
· Weight : 145kg(320lb)



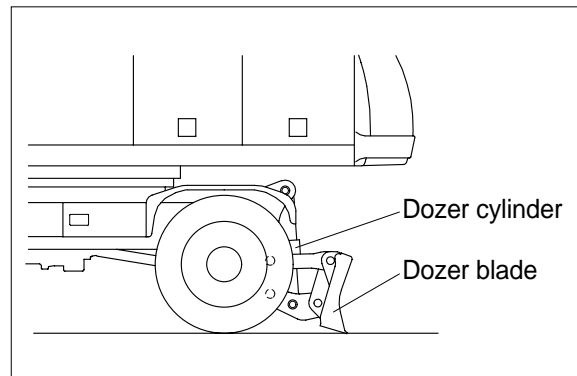
## (2) Install

- ① Carry out installation in the reverse order to removal.
- ⚠ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.
- ※ Bleed the air from the boom cylinder.
  - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.

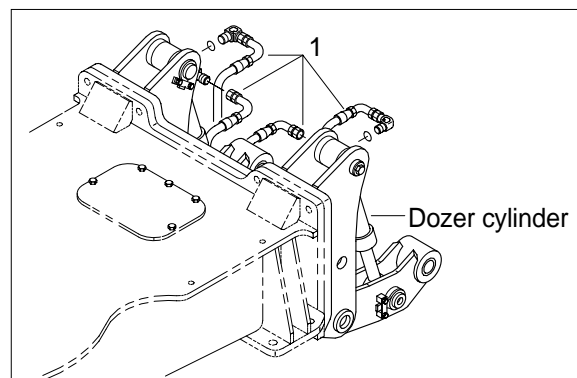
#### 4) DOZER CYLINDER

##### (1) Removal

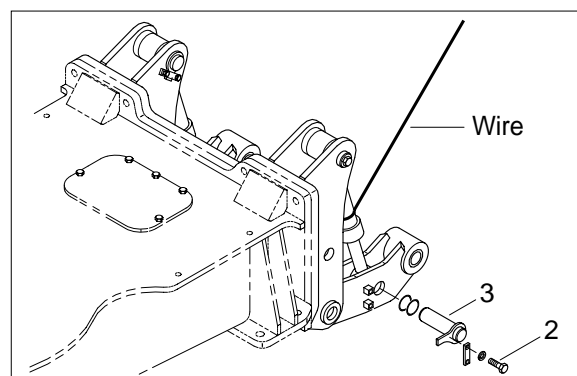
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ⚠ Escaping fluid under pressure can penetrate the skin causing serious injury.
- ※ Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.
- ① Lower the dozer blade to the ground.



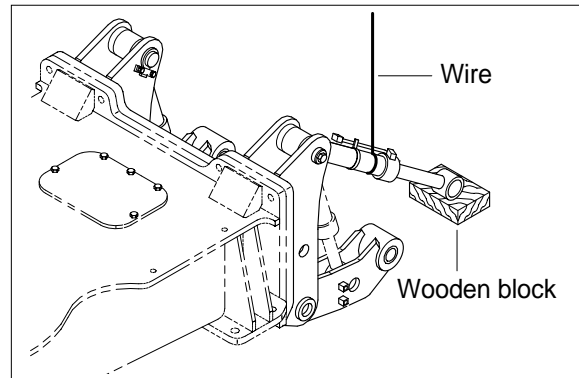
- ② Disconnect dozer cylinder hoses(1), and put plugs on cylinder pipe.



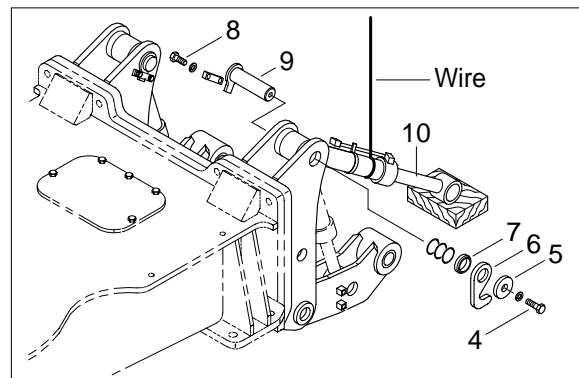
- ③ Sling dozer cylinder assembly.
- ④ Remove bolt(2) and pull out pin(3).
- ※ Tie the rod with wire to prevent it from coming out.



- ⑤ Lower the dozer cylinder rod side on a wooden block.



- ⑥ Loosen the bolt(4) and remove lock washer(5), hook plate(6), and spacer(7).  
⑦ Remove bolt(8) and pull out pin(9).  
⑧ Remove the dozer cylinder assy(10).  
• Weight : 62kg(140lb)



## (2) Install

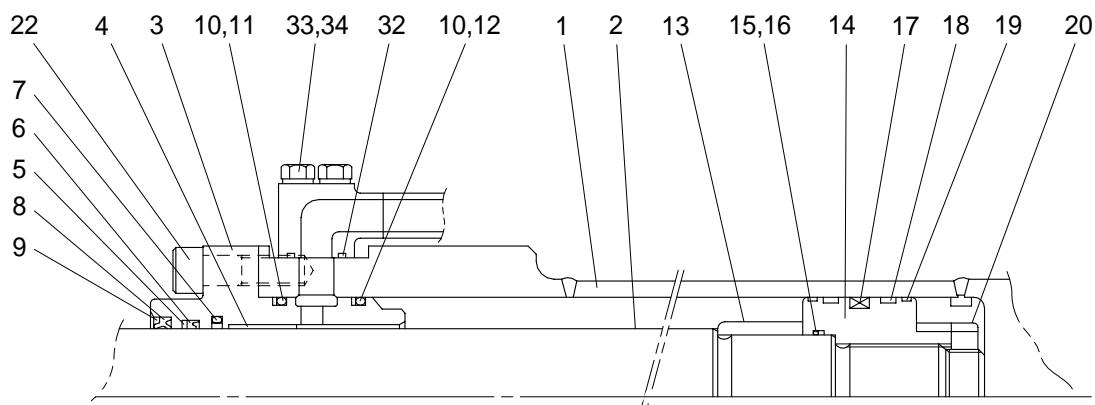
- ① Carry out installation in the reverse order to removal.
- ▲ When aligning the mounting position of the pin, do not insert your fingers in the pin hole.
- ※ Bleed the air from the dozer cylinder.
  - ※ Confirm the hydraulic oil level and check the hydraulic oil leak or not.



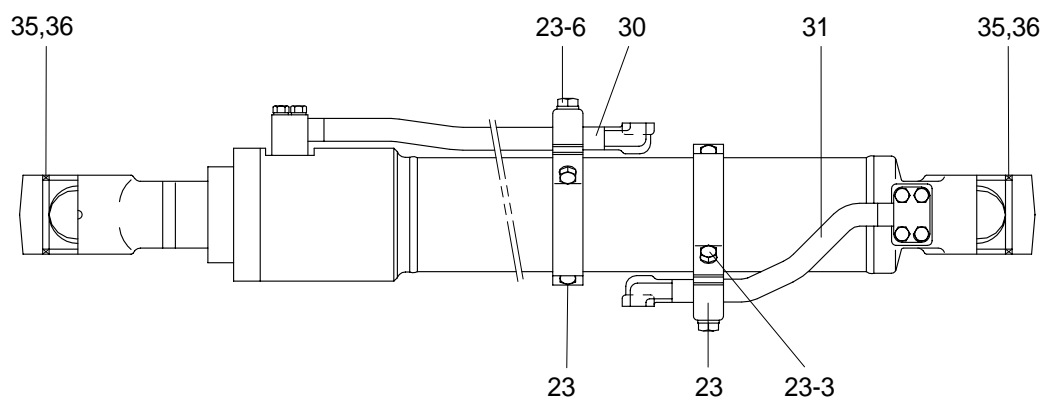
## 2. DISASSEMBLY AND ASSEMBLY

### 1) STRUCTURE

#### (1) Bucket cylinder

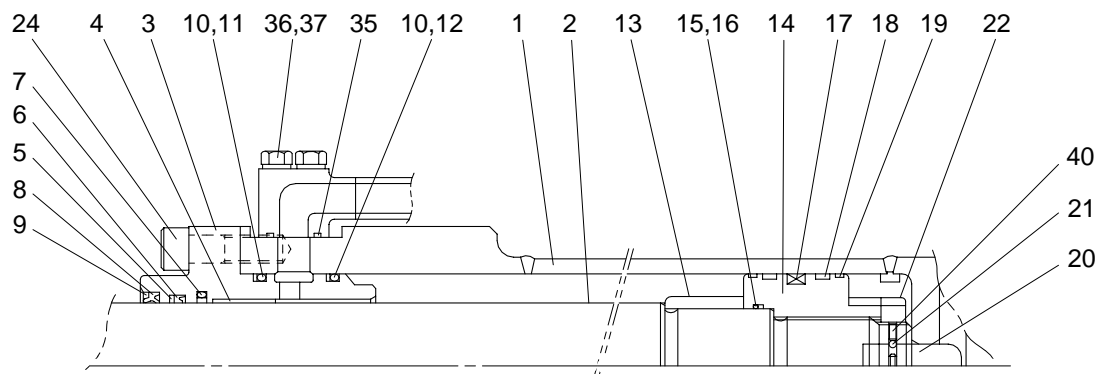


Internal detail

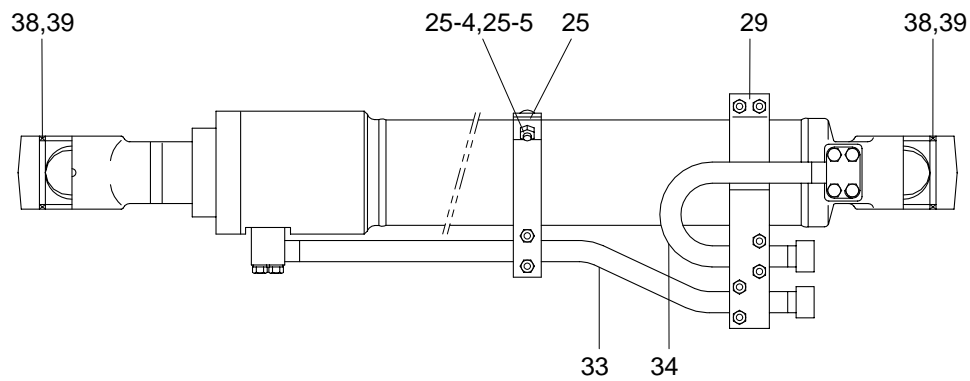


1	Tube assembly	11	Back up ring	22	Hexagon socket head bolt
2	Rod assembly	12	Back up ring	23	Band assembly
3	Gland	13	Cushion ring	23-3	Hexagon bolt
4	Du bushing	14	Piston	23-6	Hexagon bolt
5	Rod seal	15	O-ring	30	Pipe assembly(R)
6	Back up ring	16	Back up ring	31	Pipe assembly(B)
7	Step seal	17	Piston seal	32	O-ring
8	Dust wiper	18	Wear ring	33	Hexagon bolt
9	Snap ring	19	Dust ring	34	Spring washer
10	O-ring	20	Lock nut	35	Pin bushing
				36	Dust seal

## (2) Arm cylinder

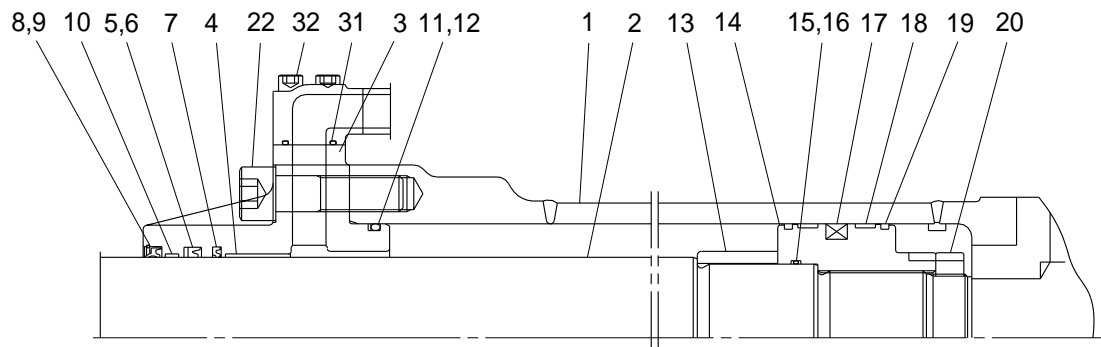


Internal detail

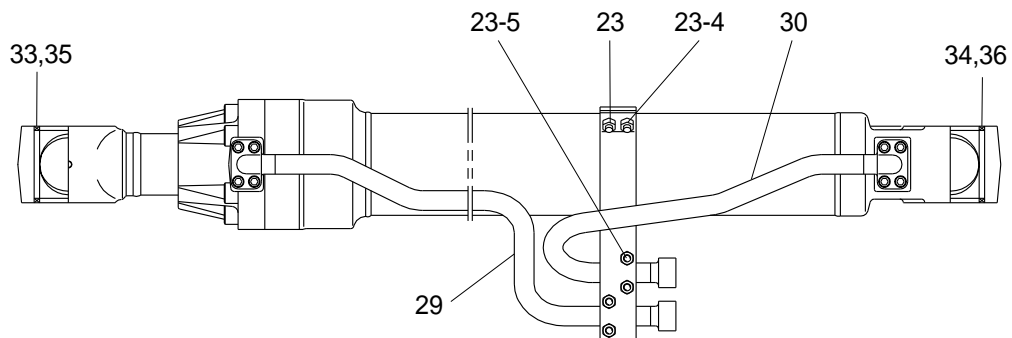


1	Tube assembly	13	Cushion ring	25-4	Hexagon bolt
2	Rod assembly	14	Piston	25-5	Hexagon bolt
3	Gland	15	O-ring	29	Band assembly(B)
4	Du bushing	16	Back up ring	33	Pipe assembly(R)
5	Rod seal	17	Piston seal	34	Pipe assembly(B)
6	Back up ring	18	Wear ring	35	O-ring
7	Step seal	19	Dust ring	36	Hexagon bolt
8	Dust wiper	20	Cushion spear	37	Spring washer
9	Snap ring	21	Steel ball	38	Pin bushing
10	O-ring	22	Lock nut	39	Dust seal
11	Back up ring	24	Hexagon socket head bolt	40	Set screw
12	Back up ring	25	Band assembly(R)		

### (3) Boom cylinder

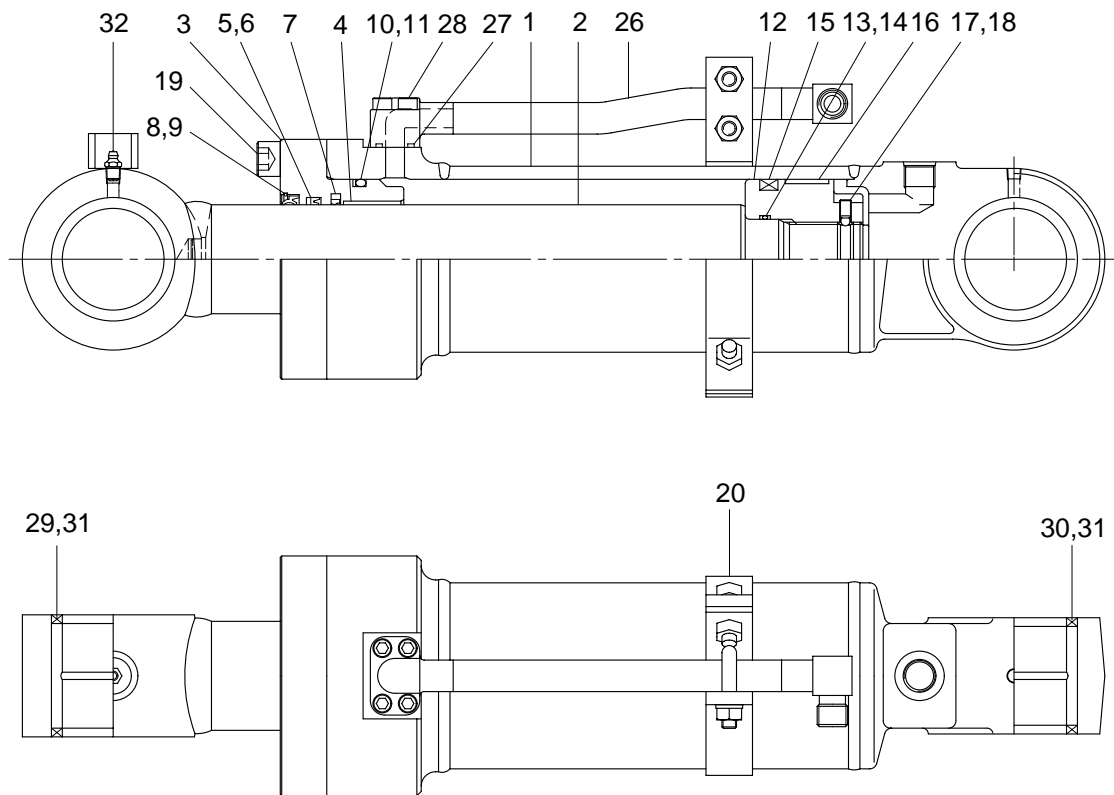


Internal detail



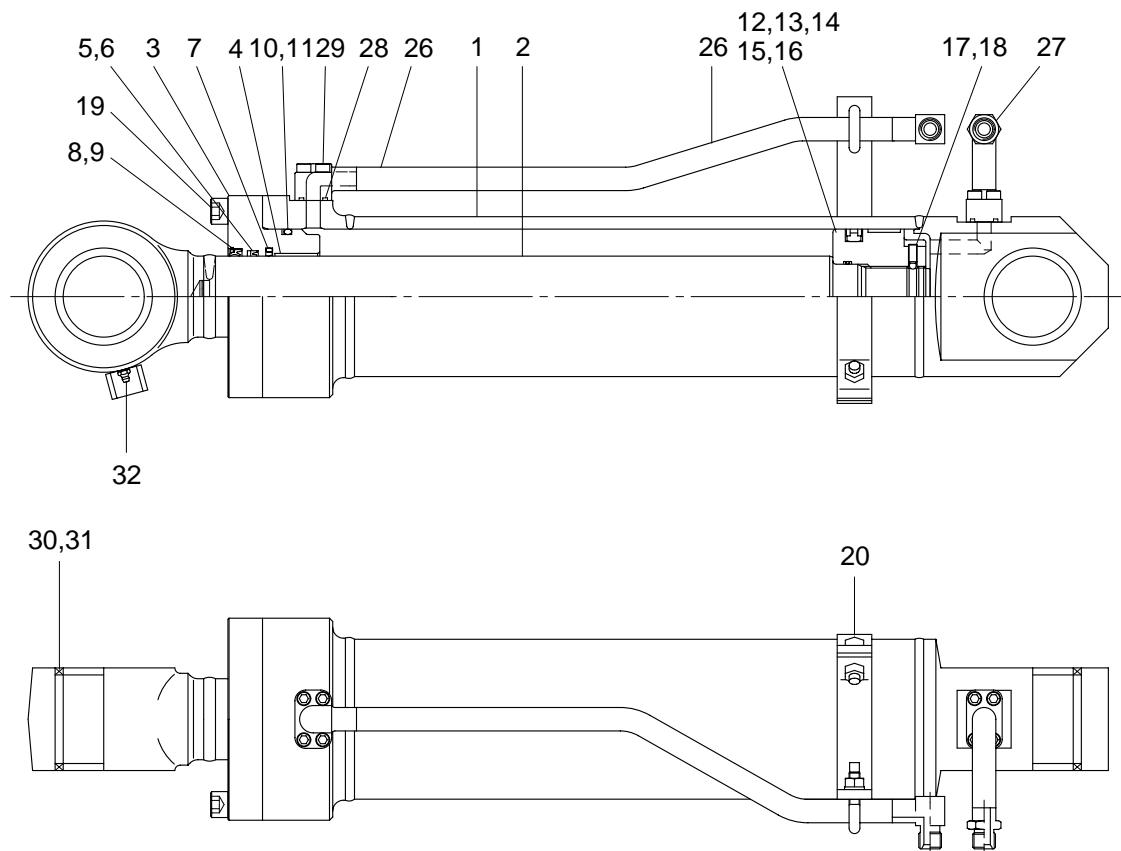
1	Tube assembly	12	Back up ring	23-4	Hexagon bolt
2	Rod assembly	13	Cushion ring	23-5	Hexagon nut
3	Gland	14	Piston	29	Pipe assembly(R)
4	Du bushing	15	O-ring	30	Pipe assembly(B)
5	Rod seal	16	Back up ring	31	O-ring
6	Back up ring	17	Piston seal	32	Hexagon bolt
7	Step seal	18	Wear ring	33	Spring washer
8	Dust wiper	19	Dust ring	34	Pin bushing
9	Snap ring	20	Lock nut	35	Pin bushing
10	O-ring	22	Hexagon socket head bolt	36	Dust seal
11	Back up ring	23	Band assembly	37	Dust seal

#### (4) Dozer cylinder



1	Tube assembly	10	O-ring	20	Band assembly
2	Rod assembly	12	Piston	26	Pipe assembly
3	Gland	13	O-ring	27	O-ring
4	Du bushing	14	Back up ring	28	Hexagon socket head bolt
5	Rod seal	15	Piston seal	29	Pin bushing
6	Back up ring	16	Wear ring	30	Pin bushing
7	Step seal	17	Set screw	31	Dust seal
8	Dust wiper	18	Steel ball	32	Grease nipple
9	Snap ring	19	Hexagon socket head bolt		

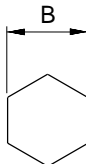
## (5) Outrigger cylinder



1	Tube assembly	10	O-ring	20	Band assembly
2	Rod assembly	12	Piston	26	Pipe assembly(R)
3	Gland	13	O-ring	27	Pipe assembly(B)
4	Du bushing	14	Back up ring	28	O-ring
5	Rod seal	15	Piston seal	29	Hexagon socket head bolt
6	Back up ring	16	Wear ring	30	Pin bushing
7	Step seal	17	Set screw	31	Dust seal
8	Dust wiper	18	Steel ball	32	Grease nipple
9	Snap ring	19	Hexagon socket head bolt		

## 2) TOOLS AND TIGHTENING TORQUE

### (1) Tools

Tool name	Remark	
Allen wrench	14	
spanner	13	
	17	
	19	
(- )Driver	Small and large sizes.	
Torque wrench	Capable of tightening with the specified torques	

### (2) Tightening torque

Part name		Item	Size	Torque	
				kgf · m	lbf · ft
Socket head bolt	Bucket cylinder	22	M18	32±3.0	231.5±21.7
	Boom cylinder				
	Arm cylinder	24	M20	46±5.0	332.7±36.2
Socket head bolt	Dozer cylinder	19	M16	23±2.0	116.4±14.5
	Outrigger cylinder				
	Dozer cylinder	28	M8	2.7±0.3	19.5±2.2
	Ortirgger cylinder	29			
Hexagon head bolt	Bucket cylinder	23-3	M10	3.2±0.3	23.1±2.2
	Arm cylinder	25-4			
	Boom cylinder	23-4			
	Bucket cylinder	23-6	M12	5.5±0.6	39.8±4.3
	Arm cylinder	36	M10	5.4±0.5	39.1±3.6
	Boom cylinder	32			
	Bucket cylinder	33			
Hexagon head bolt	Dozer cylinder	20-4	M10	3.2±0.3	23.1±2.2
	Outrigger cylinder				
Hexagon head nut	Arm cylinder	25-5	M10	3.2±0.3	23.1±2.2
	Boom cylinder	23-5			
Lock nut	Bucket cylinder	20	-	100±10	723.3±72.3
	Boom cylinder				
	Arm cylinder	22	-		
Piston	Bucket cylinder	14	-	150±15	1085.0±108.5
	Arm cylinder				
	Boom cylinder				
	Dozer cylinder	12			
	Outrigger cylinder				
Set screw	Dozer cylinder	17	M 8	2.7±0.3	19.5±2.2
	Outrigger cylinder	17			
	Arm cylinder	40			

## 1) DISASSEMBLY

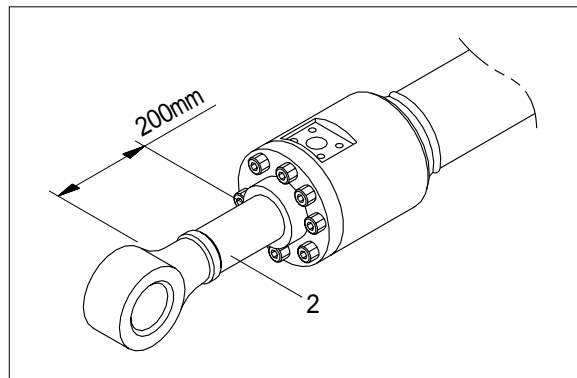
### (1) Remove cylinder head and piston rod

① Hold the clevis section of the tube in a vise.

※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

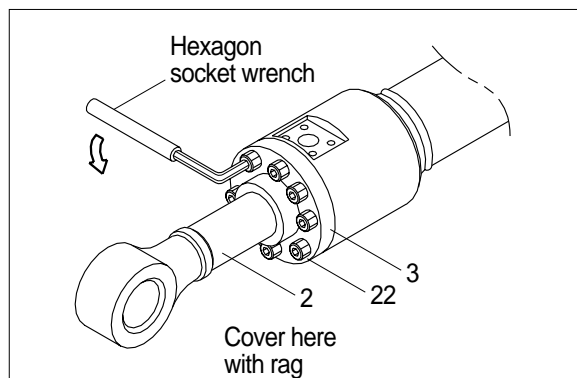
② Pull out piston rod(2) about 200mm(8in).

Because the piston rod is rather heavy, finish extending it with air pressure after the oil draining operation.



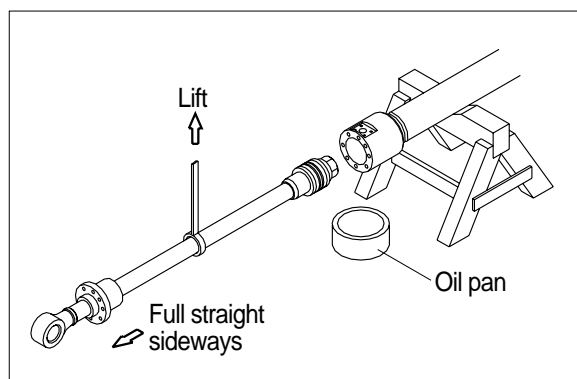
③ Loosen and remove socket bolts(22) of the cylinder head in sequence.

※ Cover the extracted piston rod(2) with rag to prevent it from being accidentally damaged during operation.

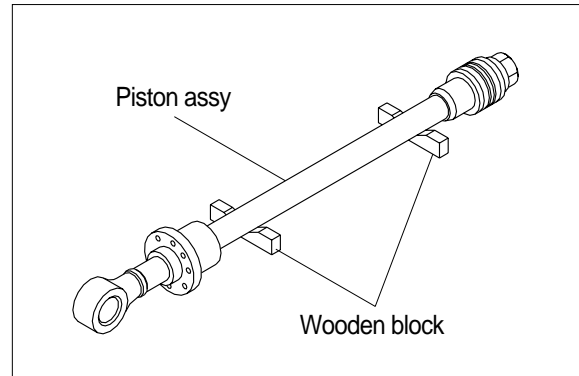


④ Draw out gland(3) and piston rod assembly(2) together from cylinder tube (1).

※ Since the piston rod assembly is heavy in this case, lift the tip of the piston rod(2) with a crane or some means and draw it out. However, when piston rod(2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.

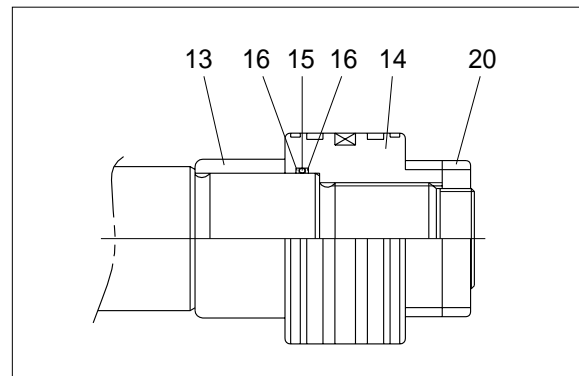


- ※ Note that the plated surface of piston rod(2) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.
- ⑤ Place the removed piston rod assembly on a wooden V-block that is set level.
- ※ Cover a V-block with soft rag.

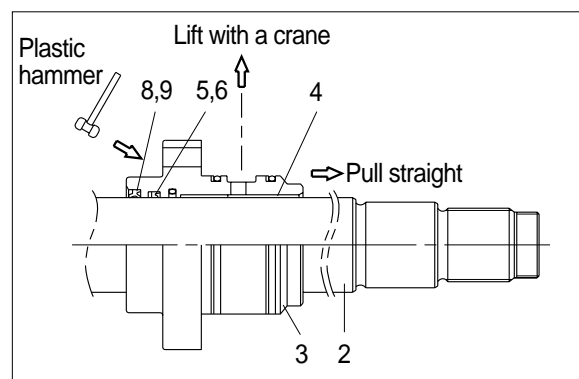


## (2) Remove piston and cylinder head

- ① Remove lock nut(20).
- ※ Since lock nut(20) is tightened to a high torque, use a hydraulic and power wrench that utilizes a hydraulic cylinder, to remove the lock nut(20).
- ② Remove piston assembly(14), back up rings(16), and O-ring(15) and cushion ring(13).



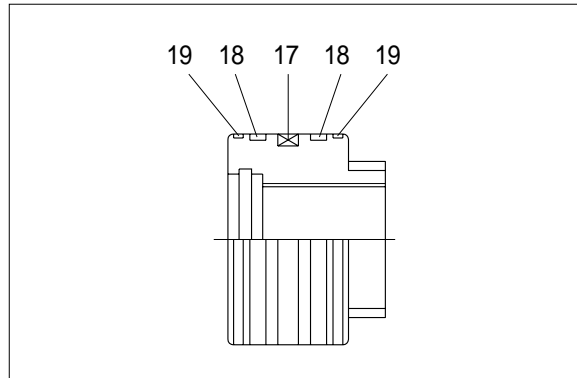
- ③ Remove the cylinder head assembly from piston rod(2).
  - ※ If it is too heavy to move, move it by striking the flanged part of gland(3) with a plastic hammer.
  - ※ Pull it straight with gland assembly lifted with a crane.
- Exercise care so as not to damage the lip of Du bushing(4) and packing (5,6,8,9) by the threads of piston rod(2).





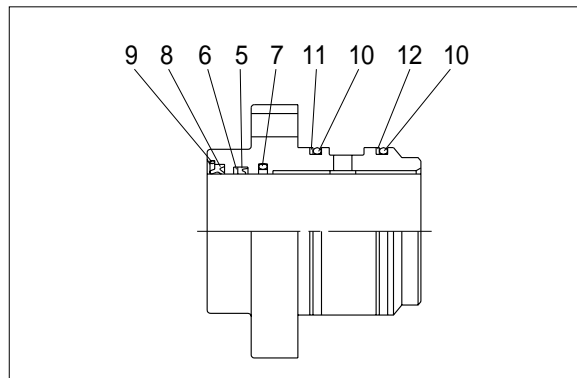
### (3) Disassemble the piston assembly

- ① Remove wear ring(18).
  - ② Remove dust ring(19) and piston seal(17).
- ※ Exercise care in this operation not to damage the grooves.



### (4) Disassemble cylinder head assembly

- ① Remove back up ring(12) and O-ring (10).
  - ② Remove back up ring(11) and O-ring(10).
  - ③ Remove snap ring(9) and dust wiper(8).
  - ④ Remove back up ring(6), rod seal(5) and step seal(7).
- ※ Exercise care in this operation not to damage the grooves.
- ※ Do not remove seal and ring, if does not damaged.

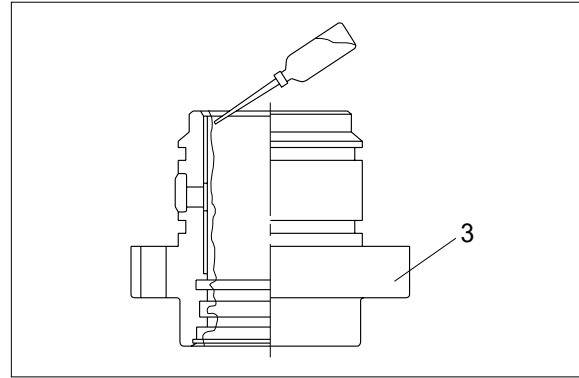


#### 4) ASSEMBLY

##### (1) Assemble cylinder head assembly

※ Check for scratches or rough surfaces if found smooth with an oil stone.

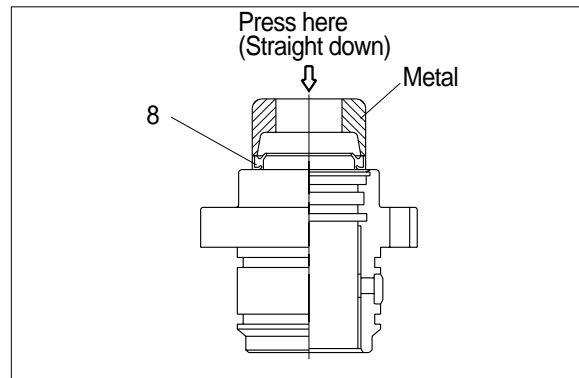
① Coat the inner face of gland(3) with hydraulic oil.



② Coat dust wiper(8) with grease and fit dust wiper(8) to the bottom of the hole of dust wiper.

At this time, press a pad metal to the metal ring of dust wiper.

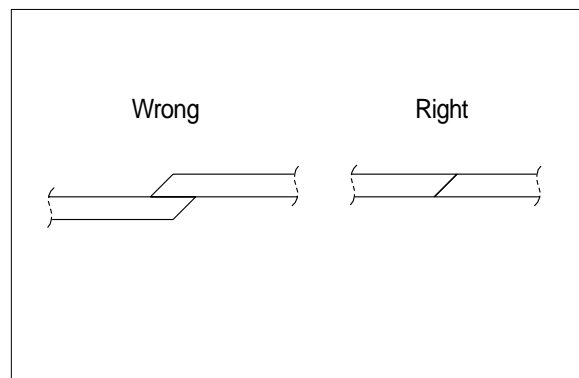
③ Fit snap ring(9) to the stop face.



④ Fit back up ring(6), rod seal(5) and step seal(7) to corresponding grooves, in that order.

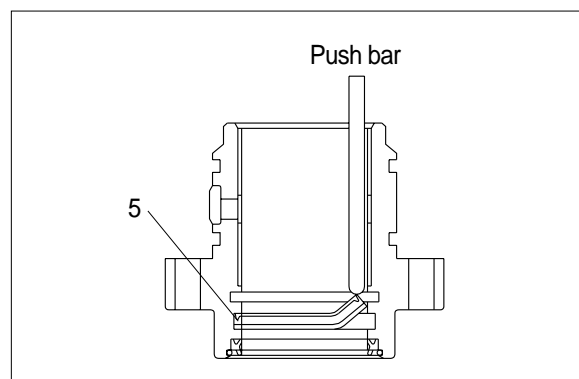
※ Coat each packing with hydraulic oil before fitting it.

※ Insert the backup ring until one side of it is inserted into groove.

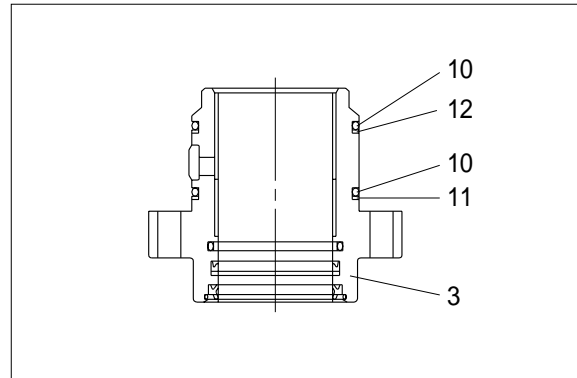


※ Rod seal(5) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting rod seal(5) up side down may damage its lip. Therefore check the correct direction that is shown in fig.

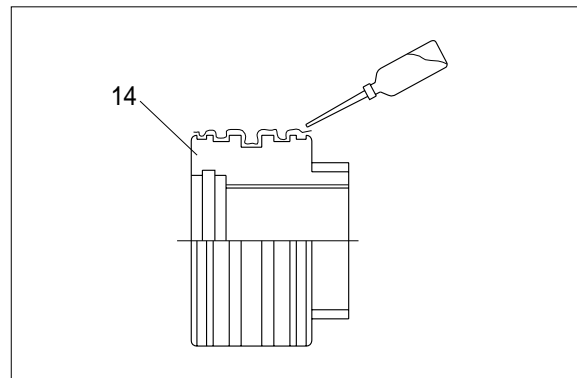


- ⑤ Fit back up ring(11,12) to gland(3).
- ※ Put the backup ring in the warm water of 30~50°C
- ⑥ Fit O-rings(10) to gland(3).

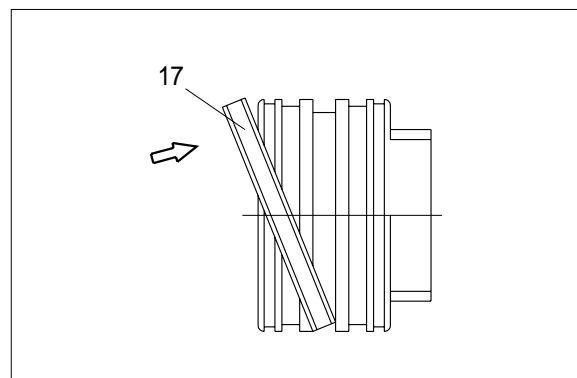


## (2) Assemble piston assembly

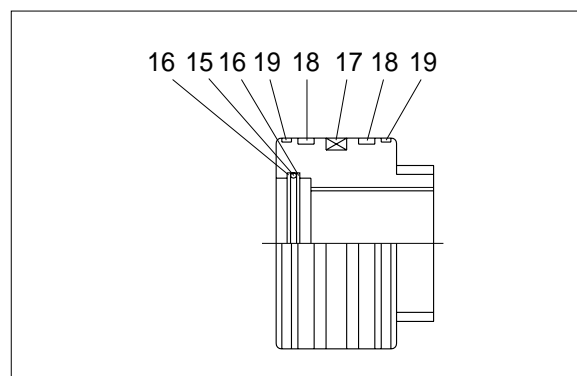
- ※ Check for scratches or rough surfaces.  
If found smooth with an oil stone.
- ① Coat the outer face of piston(14) with hydraulic oil.



- ② Fit piston seal(17) to piston(14).
- ※ Put the piston seal in the warm water of 60~100°C for more than 5 minutes.
- ※ After assembling the piston seal, press its outer diameter to fit in.

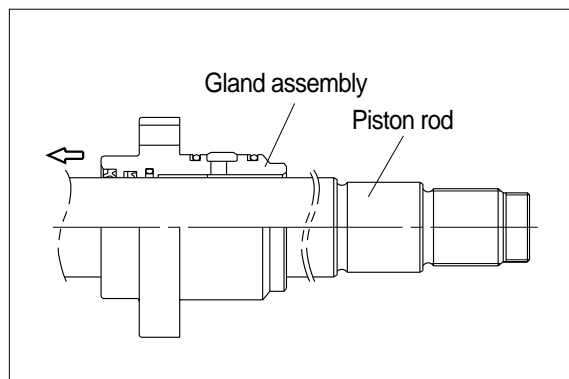


- ③ Fit wear ring(18) and dust ring(19) to piston(14).
- ④ Fit back up rings(16) and O-ring(15) to piston(14).

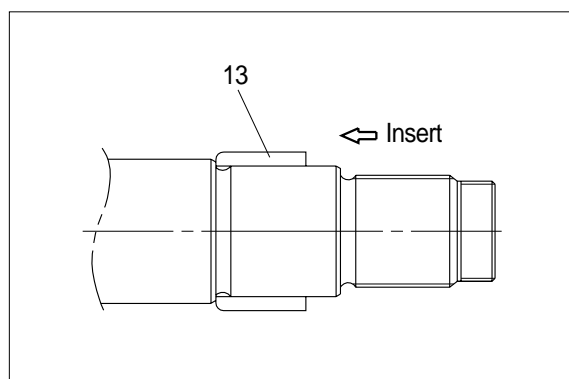


### (3) Install piston and cylinder head

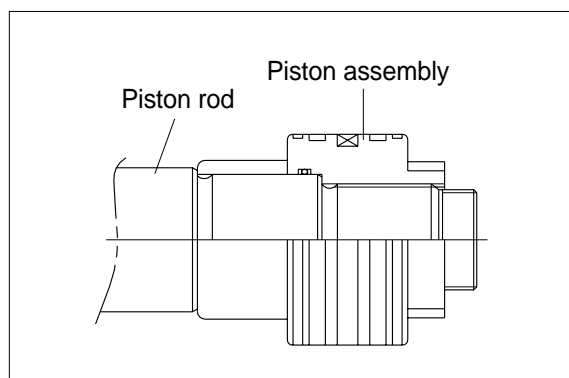
- ① Fix the piston rod assembly to the work bench.
- ② Apply hydraulic oil to the outer surface of piston rod(2), the inner surface of piston and cylinder head.
- ③ Insert cylinder head assembly to piston rod.



- ④ Insert cushion ring(13) to piston rod.
- ※ Note that cushion ring(13) has a direction in which it should be fitted.

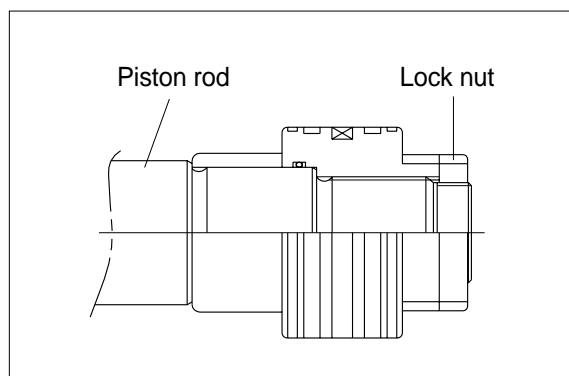


- ⑤ Fit piston assembly to piston rod(2).
- Tightening torque :  
 $100 \pm 10 \text{ kgf} \cdot \text{m} (723.3 \pm 72.3 \text{ lbf} \cdot \text{ft})$



- ⑥ Fit lock nut(20) to piston rod(2).
- Tightening torque

Item	kgf · m	lbf · ft
Bucket(20)	$150 \pm 15$	$1085 \pm 109$
Boom(20)		
Arm(22)		



#### (4) Overall assemble

- ① Place a V-block on a rigid work bench.  
Mount the cylinder tube assembly(1) on it and fix the assembly by passing a bar through the clevis pin hole to lock the assembly.
  - ② Insert the piston rod assembly in to the cylinder tube assembly, while lifting and moving the piston rod assembly with a crane.
- ※ Be careful not to damage piston seal by thread of tube assembly.
- ③ Match the bolt holes in the gland flange to the tapped holes in the cylinder tube assembly and tighten socket bolts to a specified torque.
- ※ Refer to the table of tightening torque.

