

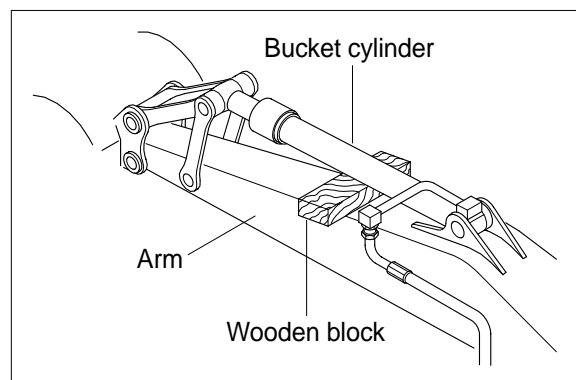
GROUP 13 BOOM, ARM, BUCKET AND DOZER CYLINDER

1. REMOVAL AND INSTALL

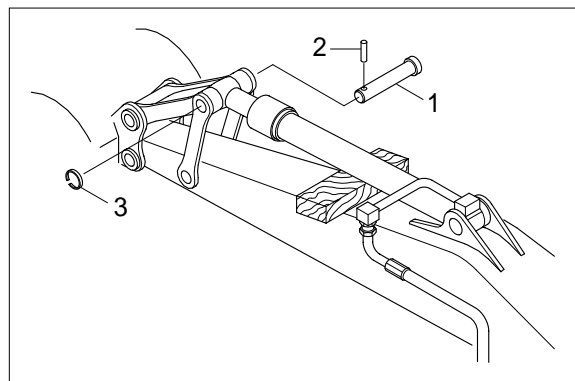
1) BUCKET CYLINDER

(1) Removal

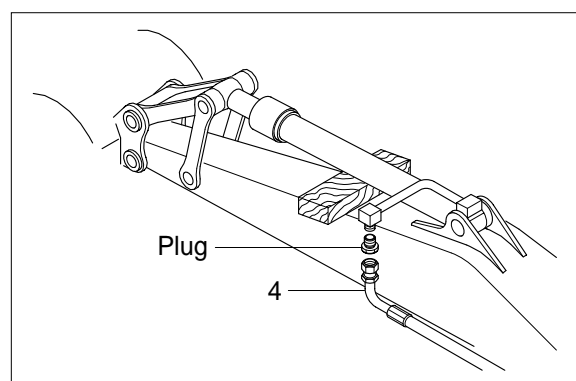
- ※ Expand the arm and bucket fully, lower the work equipment and dozer blade to the ground and stop the engine.
 - ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
 - ※ Loosen the breather slowly to release the pressure inside the hydraulic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



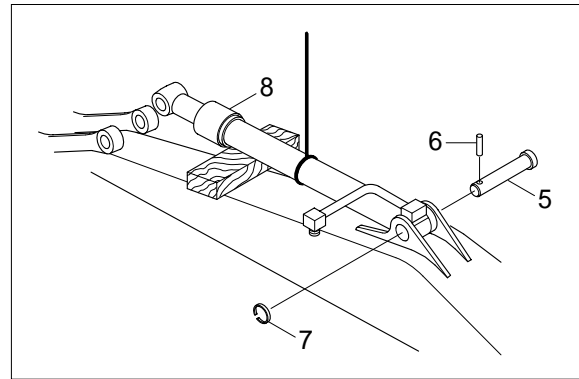
- ② Remove spring(3), pin stopper(2) and pull out pin(1).
- ※ Tie the rod with wire to prevent it from coming out.



- ③ Disconnect bucket cylinder hoses(4) and put plugs on cylinder pipe.



- ④ Sling bucket cylinder assembly(8), and remove spring(7), pin stopper(6), then pull out pin(5).
- ⑤ Remove bucket cylinder assembly(8).
 - Weight : 100kg(220lb)



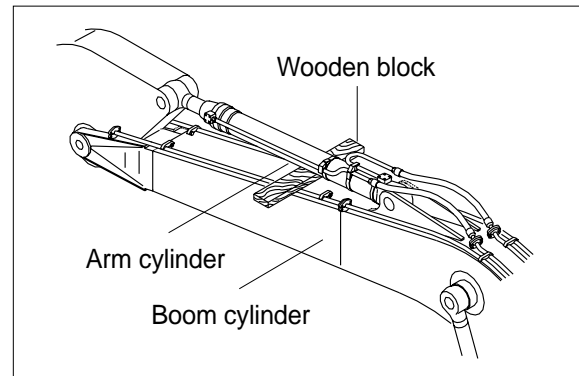
(2) Install

- 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.

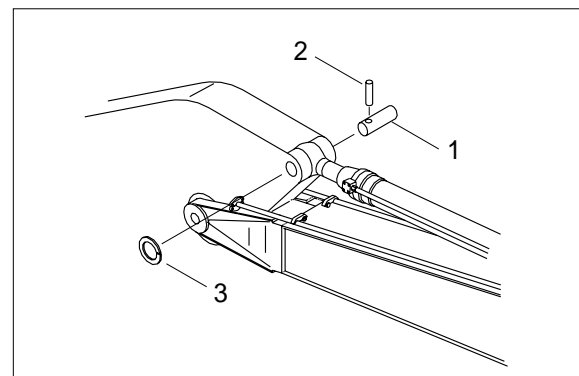
2) ARM CYLINDER

(1) Removal

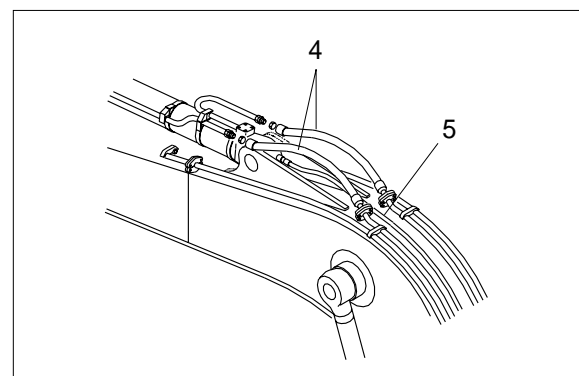
- ※ Expand the arm and bucket fully, lower the work equipment and dozer blade to the ground and stop the engine.
 - ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
 - ※ Loosen the breather slowly to release the pressure inside the hydraulic 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 spring(3), pin stopper(2) and pull out pin(1).
- ※ Tie the rod with wire to prevent it from coming out.

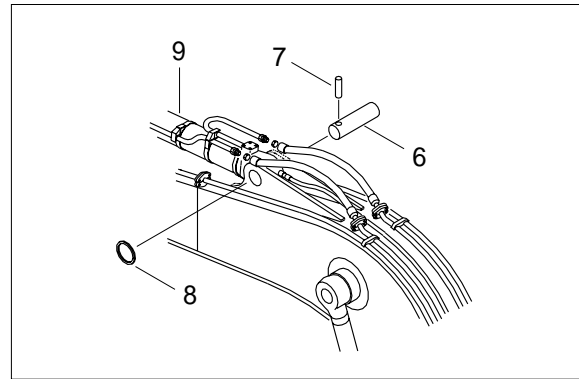


- ③ Disconnect arm cylinder hoses(4) and put plugs on cylinder pipe.
- ④ Disconnect greasing hoses(5).



- ② Sling arm cylinder assembly(9) and remove spring(8), pin stopper(7), then pull out pin(6).

- ※ Remove arm cylinder assembly(9).
 - Weight : 155kg(340lb)



(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.

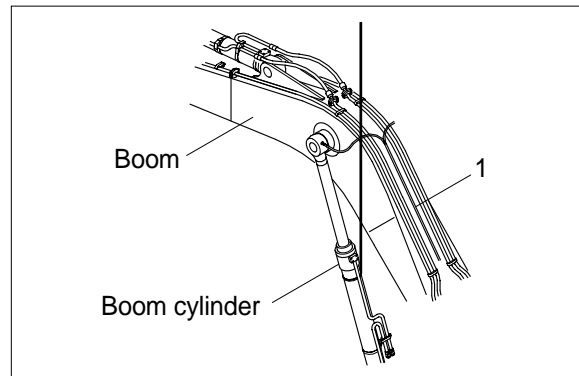
3) BOOM CYLINDER

(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.

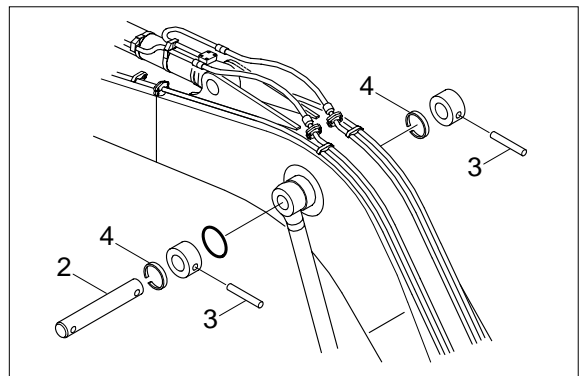
① Disconnect greasing hoses(1).

② Sling boom cylinder assembly.

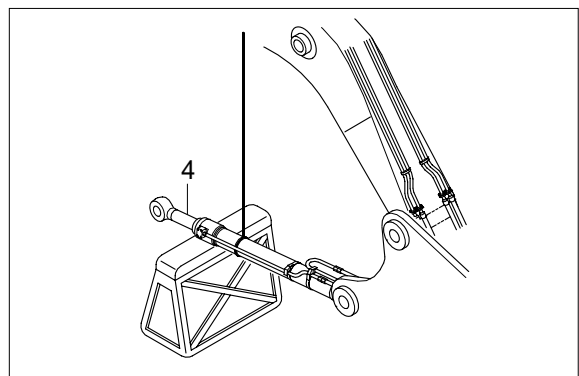


③ Remove spring(4), pin stopper(3) and pull out pin (2).

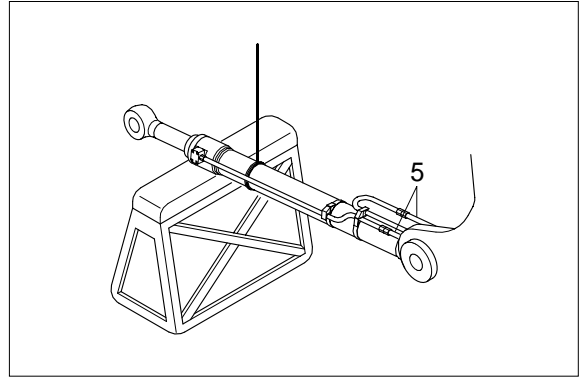
- ※ Tie the rod with wire to prevent it from coming out.



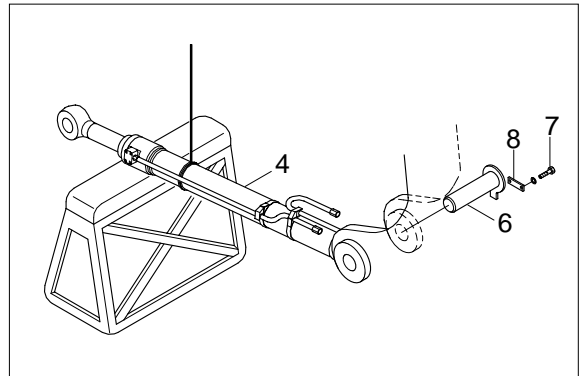
④ Lower the boom cylinder assembly(4) on a stand.



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



- ⑥ Remove bolt(7), plate(8), then pull out pin(6).
⑦ Remove boom cylinder assembly(4).
· Weight : 125kg(275lb)



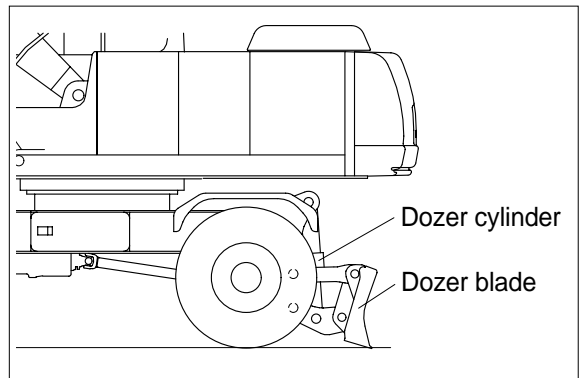
(2) Install

- 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.

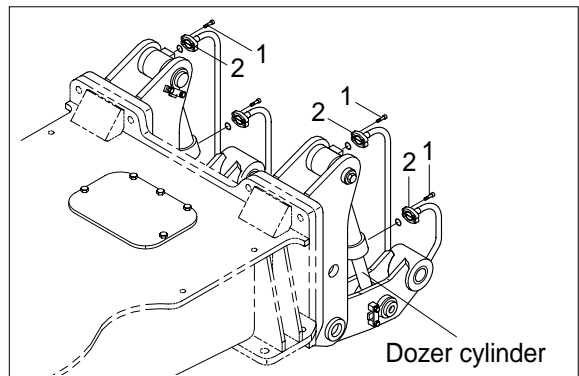
4) DOZER CYLINDER

(1) Removal

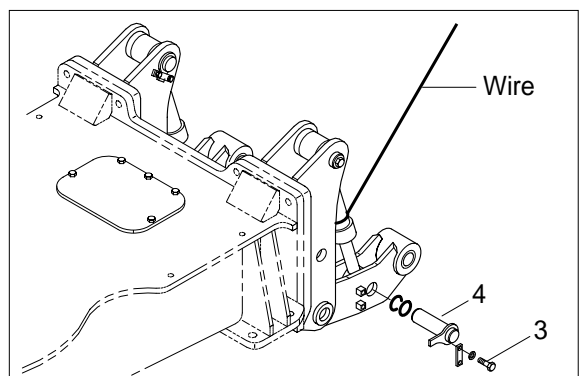
- ※ Expand the arm and bucket fully, lower the work equipment to the ground and stop the engine.
- ※ Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.
- ※ Loosen the breather slowly to release the pressure inside the hydraulic tank.
- ⚠ Escaping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



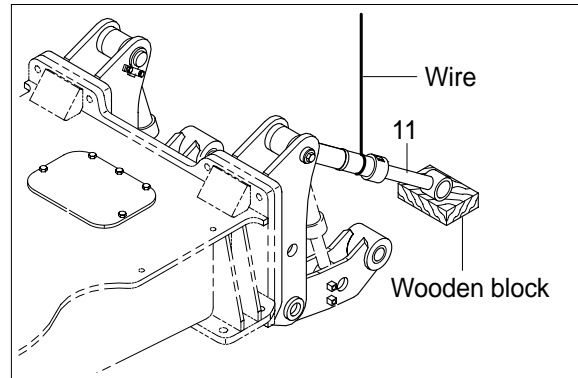
- ② Loosen the socket bolt(1) and disconnect dozer cylinder hoses(2), then put plugs on cylinder port.



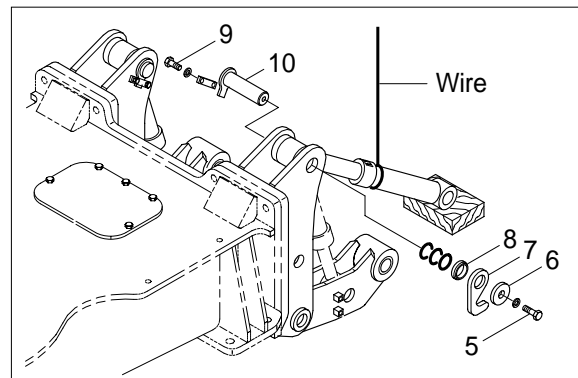
- ③ Sling dozer cylinder assembly.
- ④ Remove bolt(3) and pull out pin(4).
- ※ Tie the rod with wire to prevent it from coming out.



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



- ⑥ Loosen the bolt(5) and remove lock washer(6), hook plate(7), and spacer(8).
⑦ Remove bolt(9) and pull out pin(10).
⑧ Remove the dozer cylinder assy(11).
· Weight : 55kg(120lb)



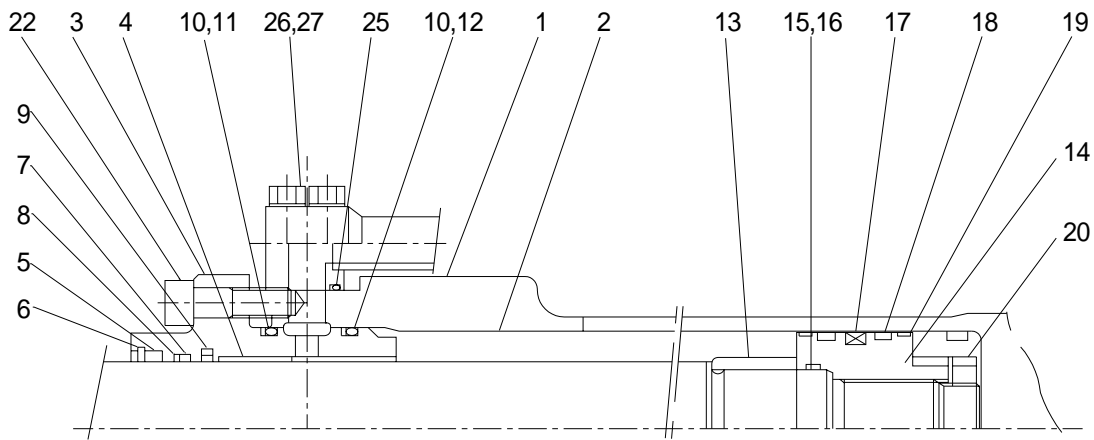
(2) Install

- 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.

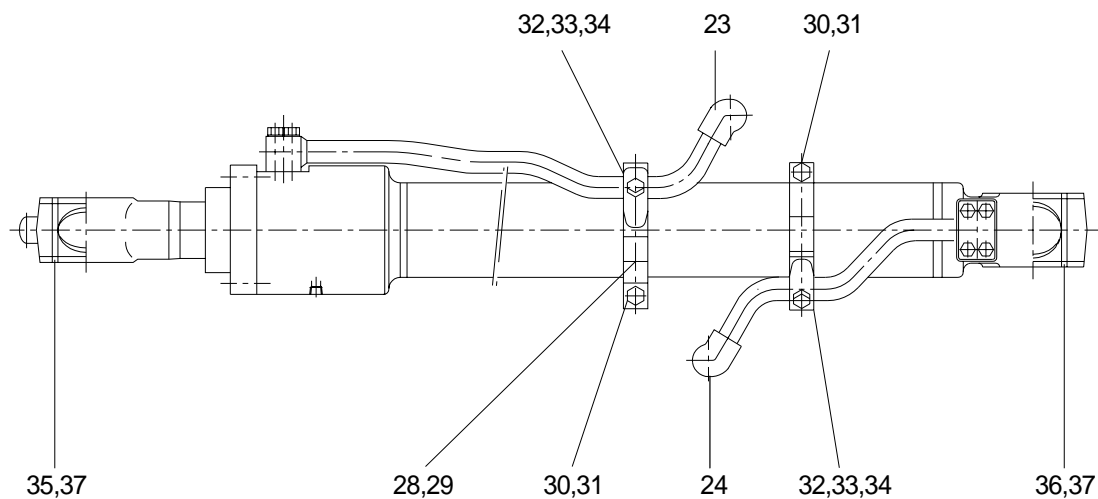
2. DISASSEMBLY AND ASSEMBLY

1) STRUCTURE

(1) Bucket cylinder

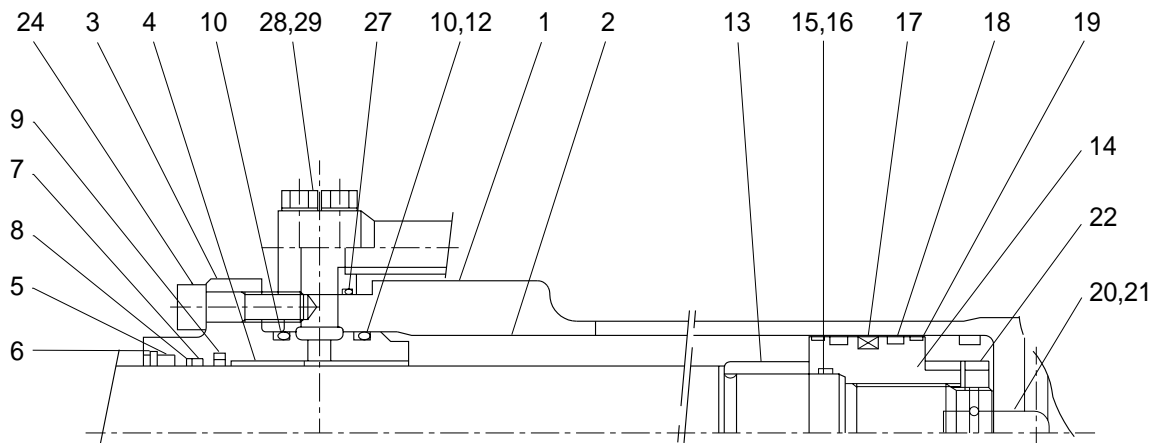


Internal detail

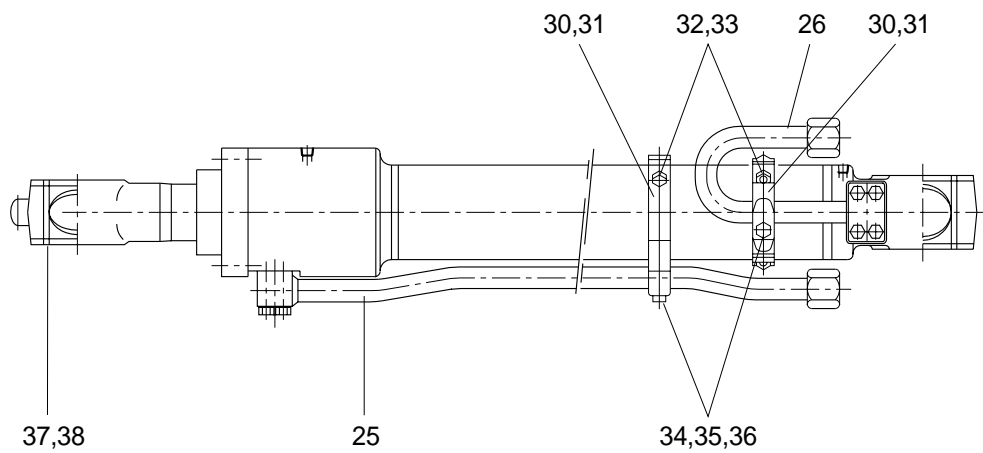


1	Tube assembly	13	Cushion ring	26	Hexagon bolt
2	Rod assembly	14	Piston	27	Spring washer
3	Gland	15	O-ring	28	Band assembly
4	Rod bushing	16	Back up ring	29	Band
5	Dust wiper	17	Piston seal	30	Hexagon bolt
6	Snap ring	18	Wear ring	31	Spring washer
7	Rod seal	19	Dust ring	32	Pipe clamp
8	Back up ring	20	Lock nut	33	Hexagon bolt
9	Step seal	22	Hexagon socket head bolt	34	Spring washer
10	O-ring	23	Pipe assembly	35	Pin bushing
11	Back up ring	24	Pipe assembly	36	Pin bushing
12	Back up ring	25	O-ring	37	Dust seal

(2) Arm cylinder

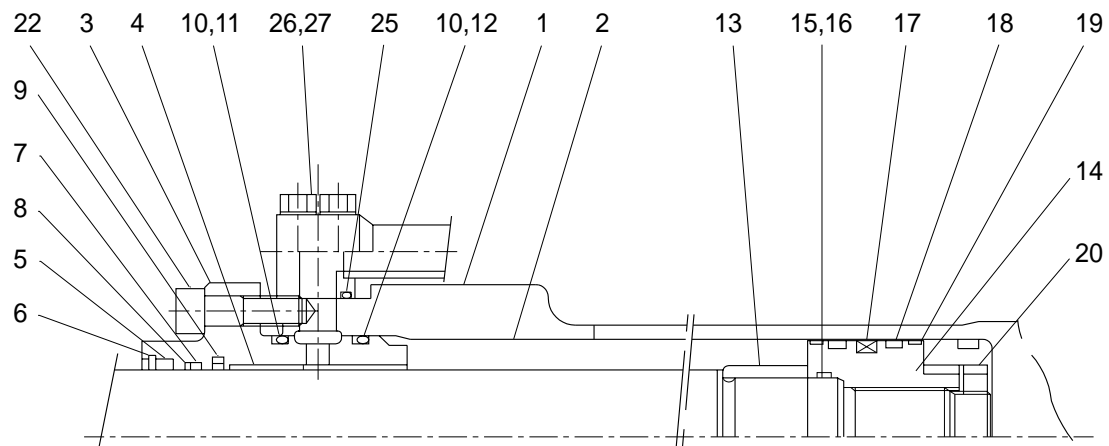


Internal detail

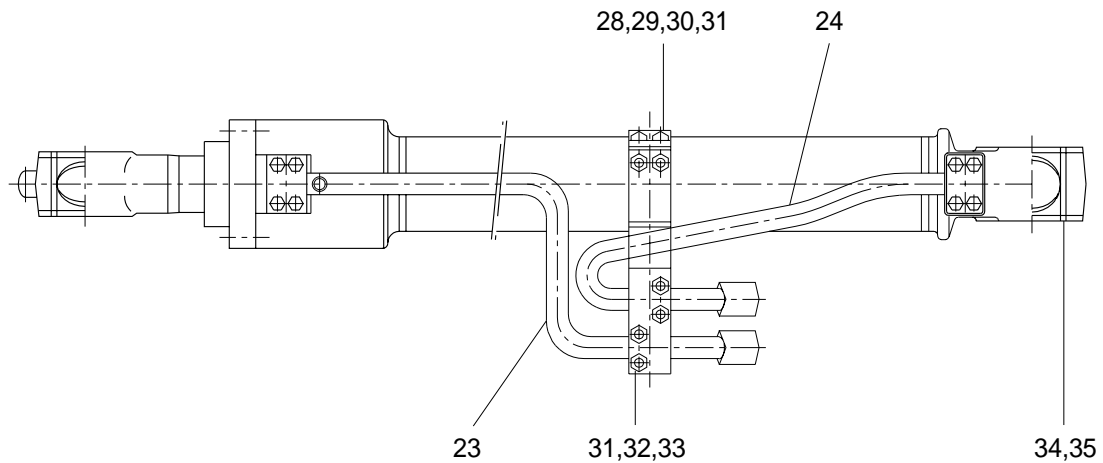


- | | | | | | |
|----|---------------|----|--------------------------|----|---------------|
| 1 | Tube assembly | 14 | Piston | 27 | O-ring |
| 2 | Rod assembly | 15 | O-ring | 28 | Hexagon bolt |
| 3 | Gland | 16 | Back up ring | 29 | Spring washer |
| 4 | Rod bushing | 17 | Piston seal | 30 | Band assembly |
| 5 | Dust wiper | 18 | Wear ring | 31 | Band |
| 6 | Snap ring | 19 | Dust ring | 32 | Hexagon bolt |
| 7 | Rod seal | 20 | Cushion spear | 33 | Spring washer |
| 8 | Back up ring | 21 | Steel ball | 34 | Pipe clamp |
| 9 | Step seal | 22 | Lock nut | 35 | Hexagon bolt |
| 10 | O-ring | 24 | Hexagon socket head bolt | 36 | Spring washer |
| 11 | Back up ring | 25 | Pipe assembly | 37 | Pin bushing |
| 12 | Back up ring | 26 | Pipe assembly | 38 | Dust seal |
| 13 | Cushing ring | | | | |

(3) Boom cylinder

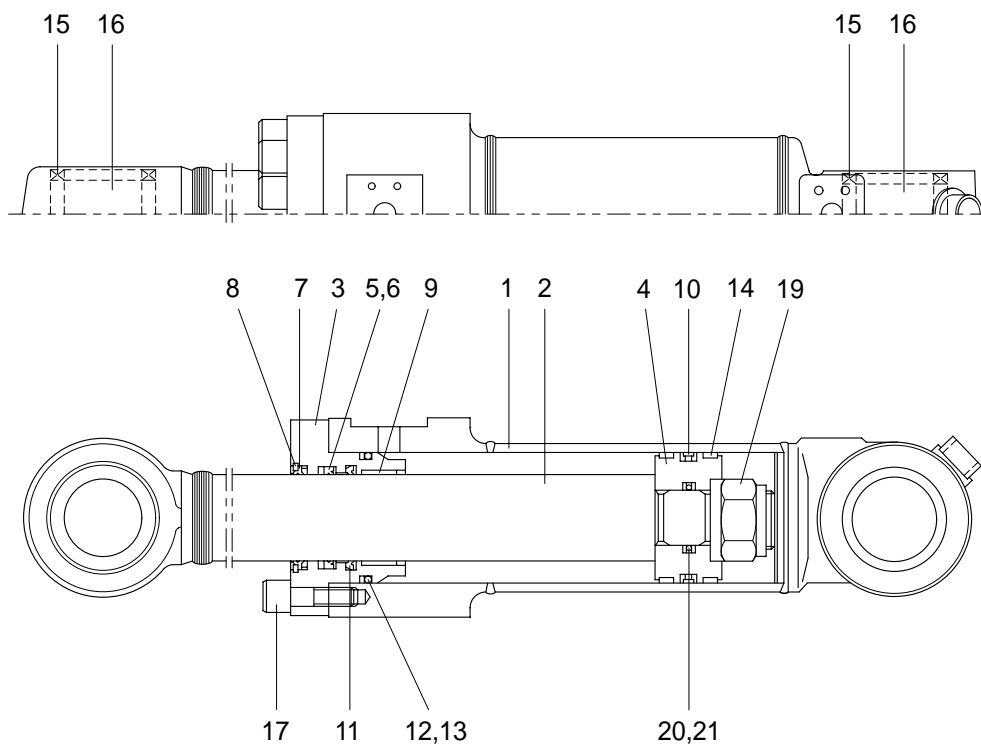


Internal detail



1	Tube assembly	13	Cushion ring	25	O-ring
2	Rod assembly	14	Piston	26	Hexagon bolt
3	Gland	15	O-ring	27	Spring washer
4	Rod bushing	16	Back up ring	28	Band assembly
5	Dust wiper	17	Piston seal	29	Band
6	Snap ring	18	Wear ring	30	Hexagon bolt
7	Rod seal	19	Dust ring	31	Spring washer
8	Back up ring	20	Lock nut	32	U-bolt
9	Step seal	22	Hexagon socket head bolt	33	Hexagon nut
10	O-ring	23	Pipe assembly	34	Pin bushing
11	Back up ring	24	Pipe assembly	35	Dust seal
12	Back up ring				

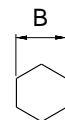
(4) Dozer cylinder



- | | | | | | |
|---|---------------|----|--------------|----|--------------------------|
| 1 | Tube assembly | 8 | Snap ring | 15 | Dust seal |
| 2 | Rod assembly | 9 | Bushing | 16 | Pin bushing |
| 3 | Gland | 10 | Piston seal | 17 | Hexagon socket head bolt |
| 4 | Piston | 11 | Buffer ring | 19 | Nylon nut |
| 5 | Rod seal | 12 | O-ring | 20 | O-ring |
| 6 | Back up ring | 13 | Back up ring | 21 | Back up ring |
| 7 | Dust seal | 14 | Wear ring | | |

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	M16	23 ± 2.3	166 ± 16.6
	Boom cylinder				
	Arm cylinder	24	M18	32 ± 3.2	232 ± 23.1
	Dozer cylinder	17	M14	15.0 ± 2.0	109 ± 14.5
Hexagon head bolt	Bucket cylinder	26	M10	5.5 ± 0.6	39.8 ± 4.3
	Arm cylinder	28			
	Boom cylinder	26	M8	3.0 ± 0.3	21.7 ± 2.2
	Bucket cylinder	30	M10	3.2 ± 0.3	23.1 ± 2.3
	Arm cylinder	32	M10	3.2 ± 0.3	23.1 ± 2.3
	Boom cylinder	30	M10	3.2 ± 0.3	23.1 ± 2.3
	Bucket cylinder	33	M12	4.1 ± 0.4	29.7 ± 3.0
	Arm cylinder	35	M12	4.1 ± 0.4	29.7 ± 3.0
Hexagon nut	Boom cylinder	33	M10	3.2 ± 0.3	23.1 ± 2.3
Lock nut	Bucket cylinder	20	-	150 ± 15	1085 ± 109
	Arm cylinder	22			
	Boom cylinder	20			
Nylon nut	Dozer cylinder	19	M14	200	1447
Piston	Bucket cylinder	14	-	100 ± 10	723 ± 72.3
	Arm cylinder				
	Boom cylinder				

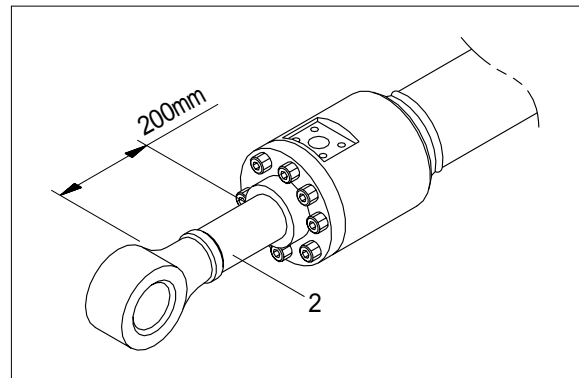
3) DISASSEMBLY

(1) Remove cylinder head and piston rod

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

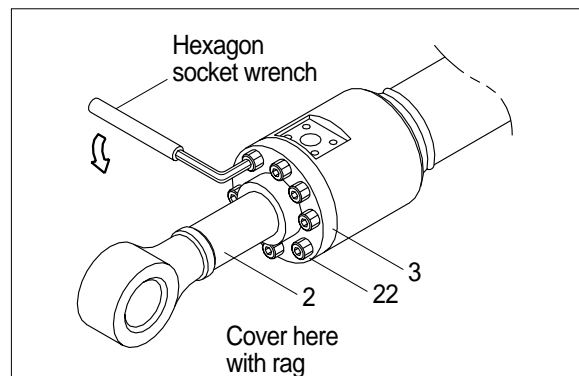
※ Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

- 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.



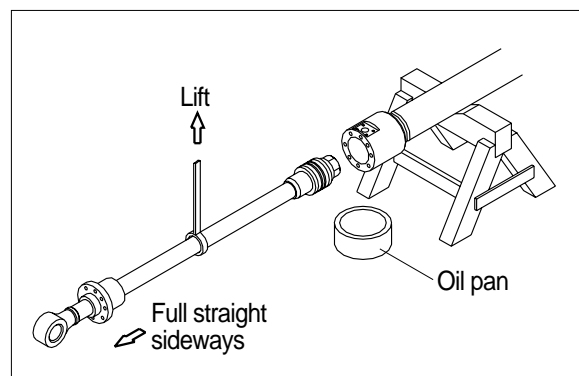
- ③ Loosen and remove socket bolts(22) of the cylinder head in sequence.

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

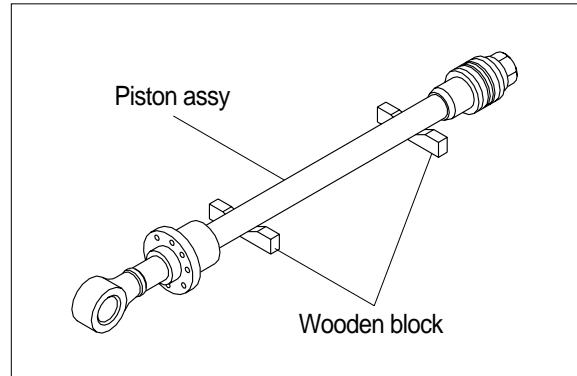


- ④ Draw out gland(3) and piston rod assembly(2) together from cylinder tube (1).

※ 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.

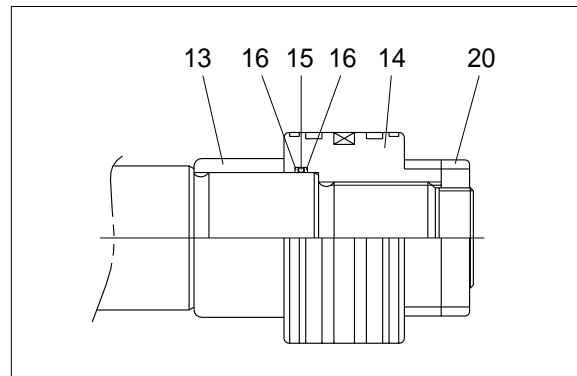


- ※ Note that the plated surface of piston rod (2) is to be lifted. For this reason, do not use a wire sling and others that may damage it, but use a strong cloth belt or a rope.
- ⑤ Place the removed piston rod assembly on a wooden V-block that is set level.
- ※ Cover a V-block with soft rag.

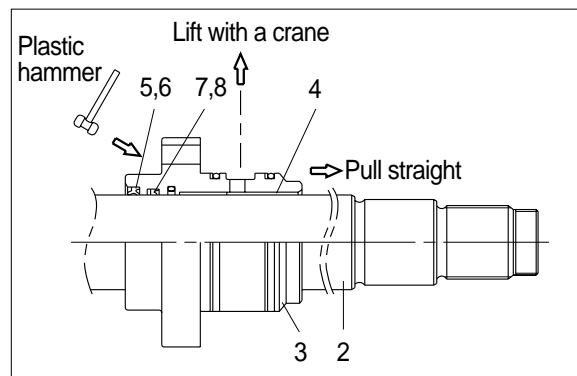


(2) Remove piston and cylinder head

- 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).

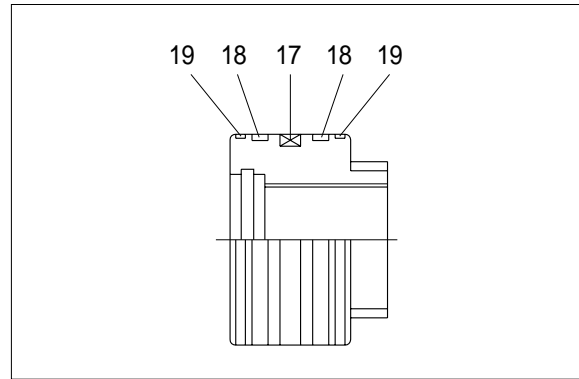


- ③ Remove the cylinder head assembly from piston rod(2).
 - ※ If it is too heavy to move, move it by striking the flanged part of gland(3) with a plastic hammer.
 - ※ Pull it straight with gland assembly lifted with a crane.
- Exercise care so as not to damage the lip of rod bushing(4) and packing (5,6,7,8) by the threads of piston rod(2).



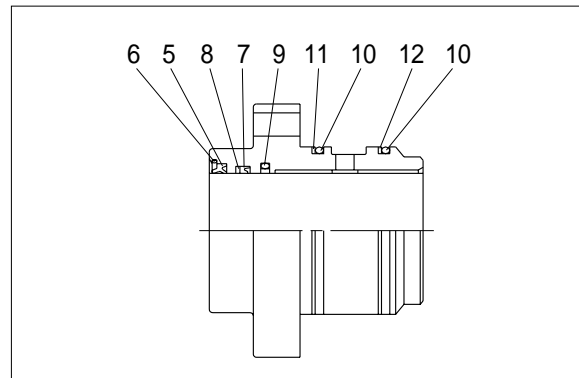
(3) Disassemble the piston assembly

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

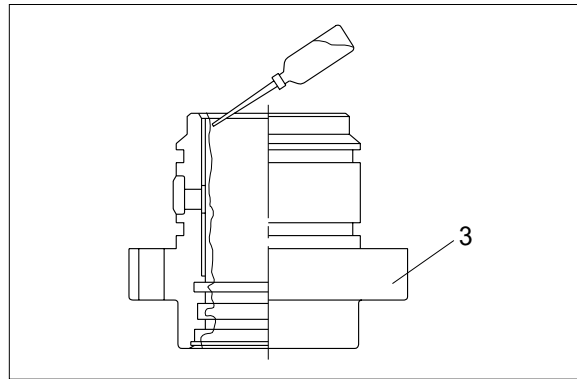


4) ASSEMBLY

(1) Assemble cylinder head assembly

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

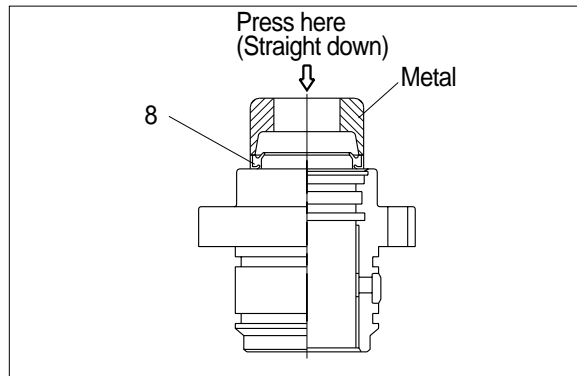
- ① Coat the inner face of gland(3) with hydraulic oil.



- ② Coat dust wiper(5) with grease and fit dust wiper(5) to the bottom of the hole of dust wiper.

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

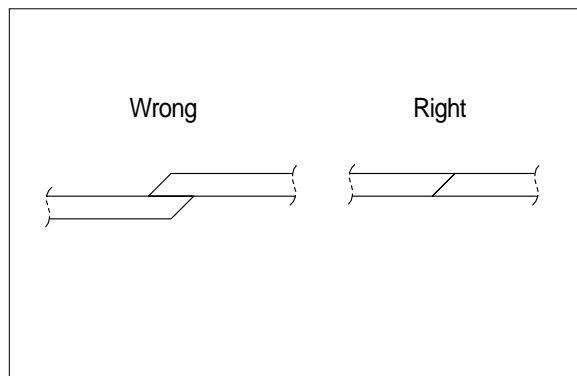
- ③ Fit snap ring(6) to the stop face.



- ④ Fit back up ring(8), rod seal(7) and step seal(9) to corresponding grooves, in that order.

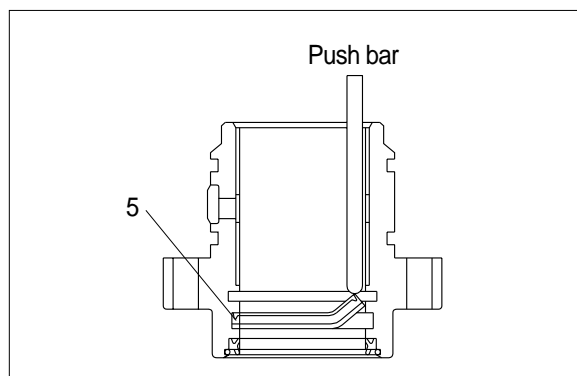
※ Coat each packing with hydraulic oil before fitting it.

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

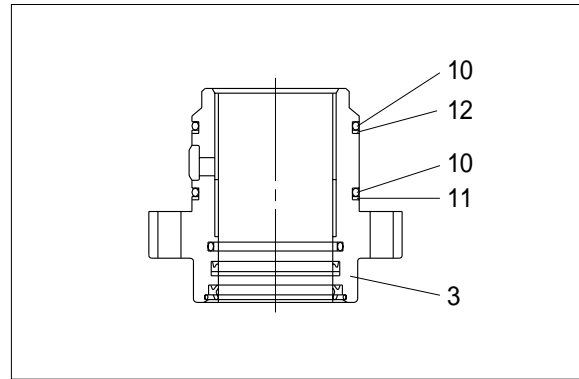


※ Rod seal(7) has its own fitting direction. Therefore, confirm it before fitting them.

※ Fitting rod seal(7) up side down may damage its lip. Therefore check the correct direction that is shown in fig.

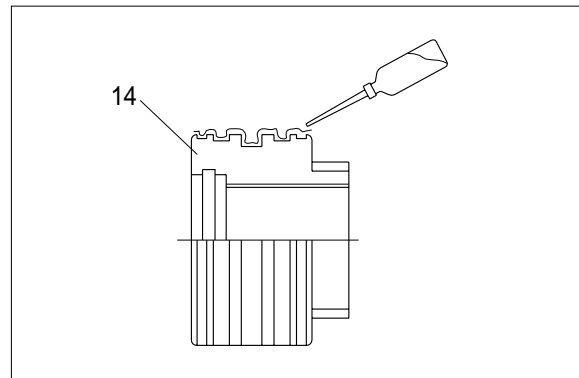


- ⑤ Fit back up ring(11,12) to gland(3).
- ※ Put the backup ring in the warm water of 30~50°C.
- ⑥ Fit O-rings(10) to gland(3).

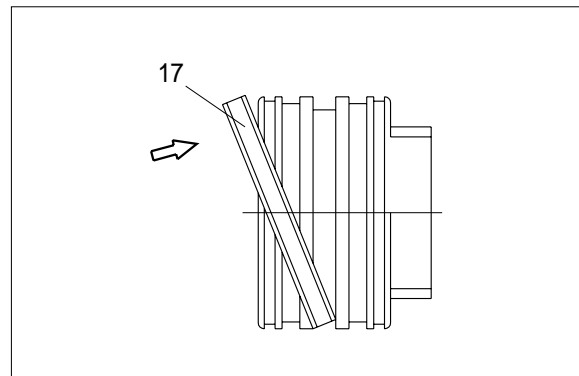


(2) Assemble piston assembly

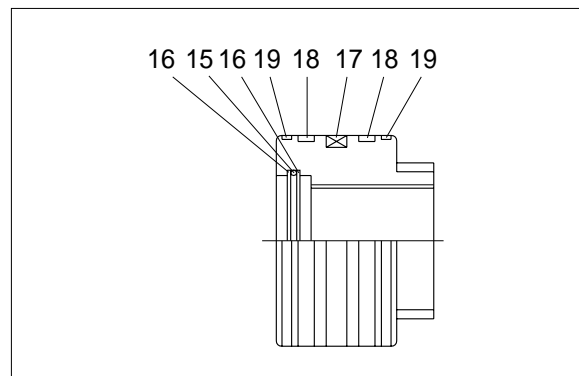
- ※ Check for scratches or rough surfaces.
If found smooth with an oil stone.
- ① Coat the outer face of piston(14) with hydraulic oil.



- 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.

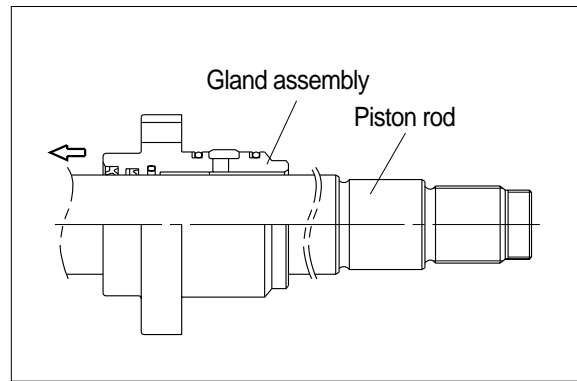


- ③ Fit wear ring(18) and dust ring(19) to piston(14).
- ④ Fit back up rings(16) and O-ring(15) to piston(14).

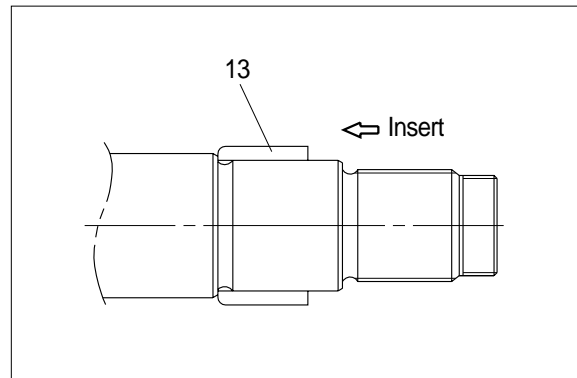


(3) Install piston and cylinder head

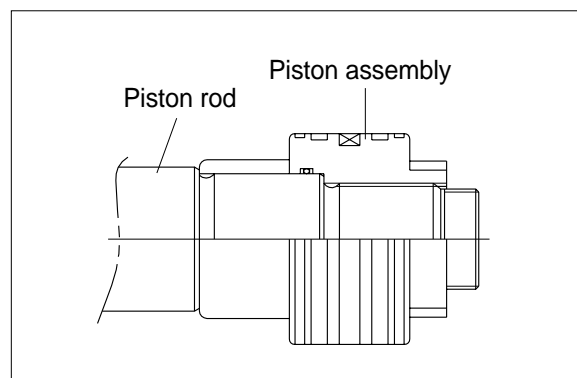
- ① Fix the piston rod assembly to the work bench.
- ② Apply hydraulic oil to the outer surface of piston rod(2), the inner surface of piston and cylinder head.
- ③ Insert cylinder head assembly to piston rod.



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

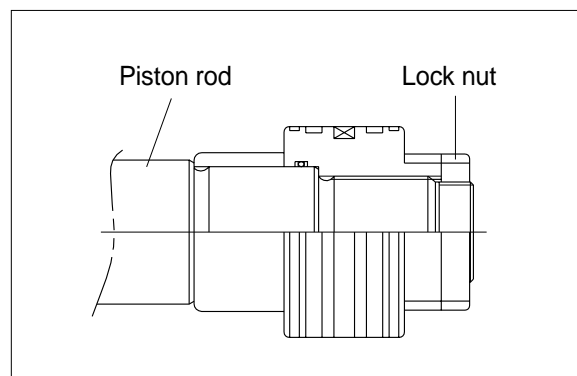


- ⑤ Fit piston assembly to piston rod(2).
- Tightening torque : $100 \pm 10 \text{ kgf} \cdot \text{m}$
 $(723 \pm 72.3 \text{ lbf} \cdot \text{ft})$



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

Item	kgf · m	lbf · ft
Bucket(20)	150 ± 15	1085 ± 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.

