

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

### 1. REMOVAL AND INSTALL

#### 1) BUCKET CYLINDER

##### (1) Removal

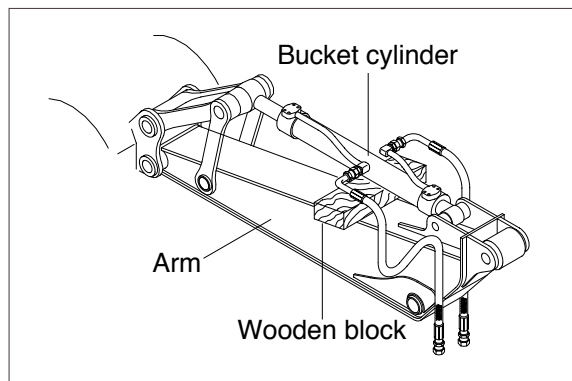
Expand the arm and bucket fully, lower the work equipment and dozer blade to the ground and stop the engine.

Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

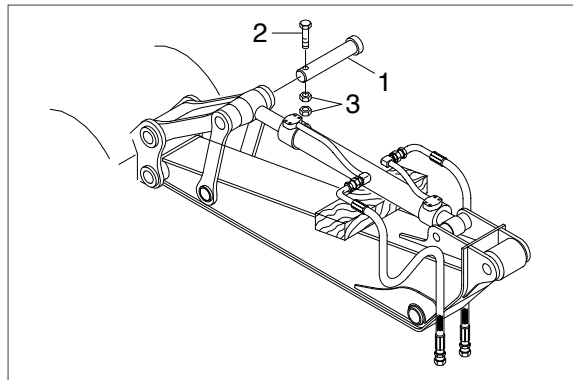
※ Loosen the breather slowly to release the pressure inside the hydraulic tank.

▲ 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.

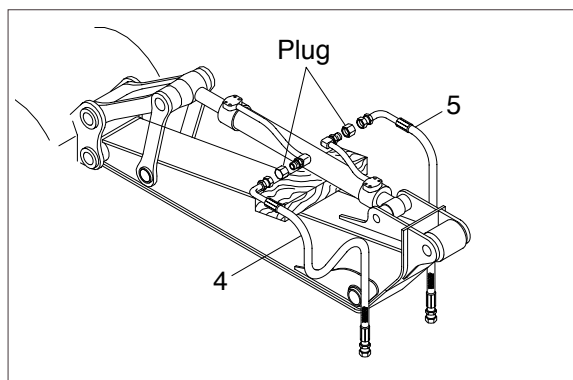
Set block between bucket cylinder and arm.



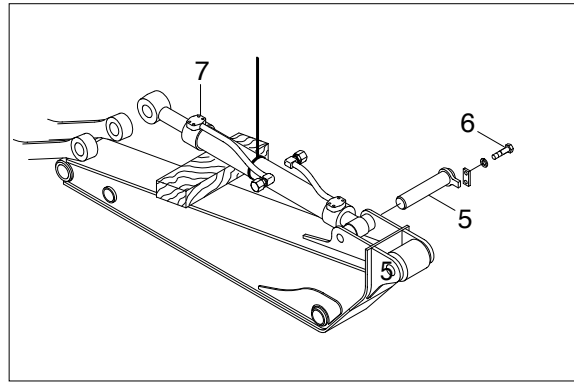
Remove bolt(2), nut(3) and pull out pin(1). Tie the rod with wire to prevent it from coming out.



Disconnect bucket cylinder hoses(4, 5) and put plugs on cylinder pipe.



Sling bucket cylinder assembly(7), and remove bolt(6), then pull out pin(5).  
Remove bucket cylinder assembly(7).  
· Weight : 65kg(143lb)



## (2) Install

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.

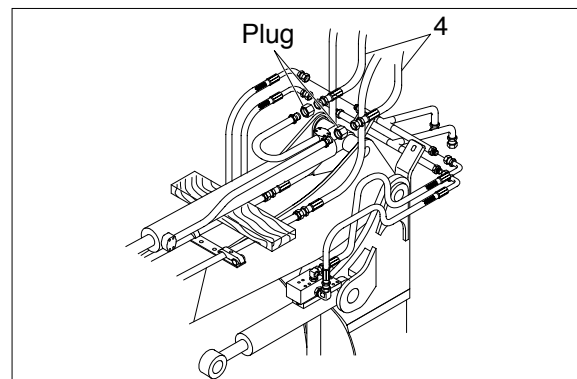
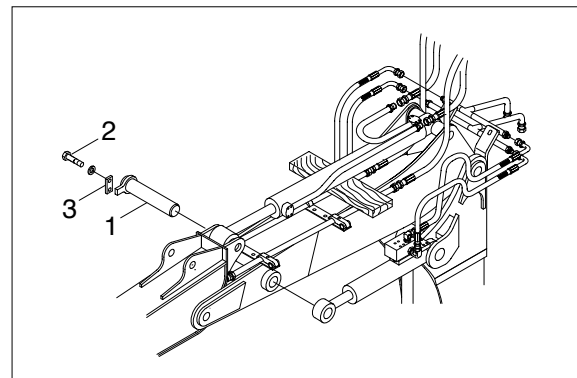
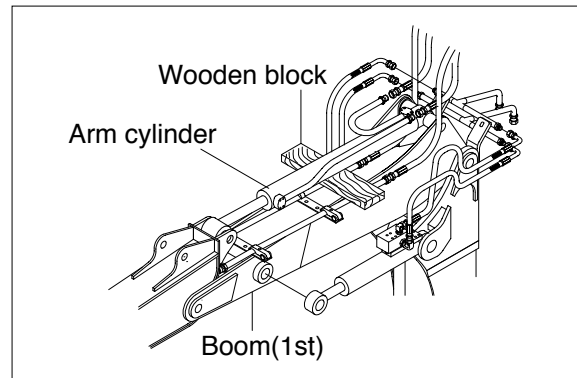
- ⚠ Escaping fluid under pressure can penetrate the skin causing serious injury. Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

Set block between arm cylinder and boom.

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

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

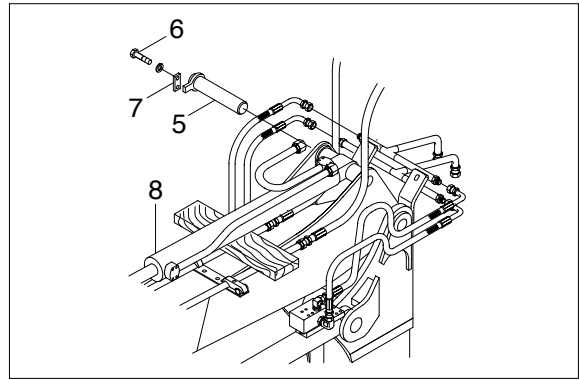
Disconnect arm cylinder hoses(4) and put plugs on cylinder pipe.



Sling arm cylinder assembly(8) and remove bolt(6), plate(7) then pull out pin (5).

Remove arm cylinder assembly(8).

· Weight : 83kg(183lb)



## (2) Install

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 AND ADJUST CYLINDER

#### (1) Removal

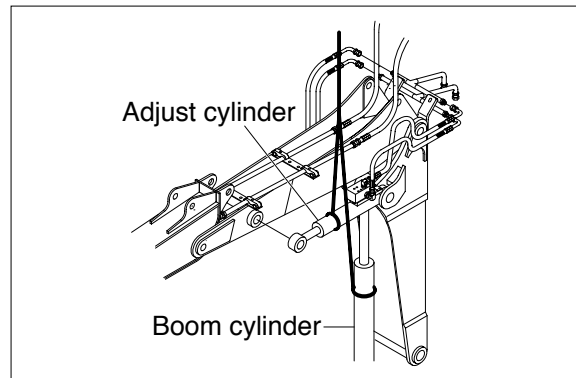
Expand the arm and bucket fully, lower the work equipment and dozer blade to the ground and stop the engine.

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.

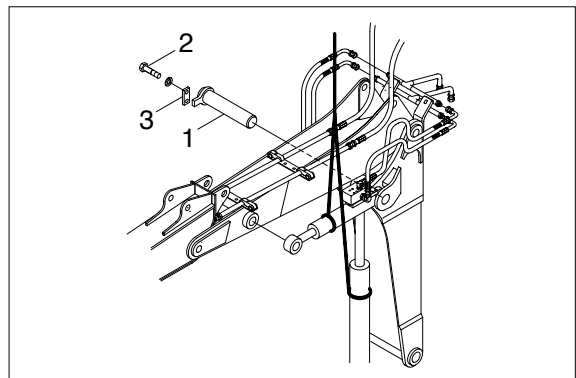
- ⚠ Escaping fluid under pressure can penetrate the skin causing serious injury. Fit blind plugs in the hoses after disconnecting them, to prevent dirt or dust from entering.

Sling boom cylinder assembly and adjust cylinder assembly.

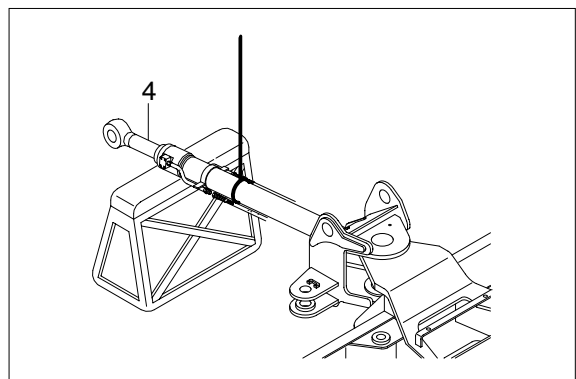


Remove bolt(2), plate(3) and pull out pin(1).

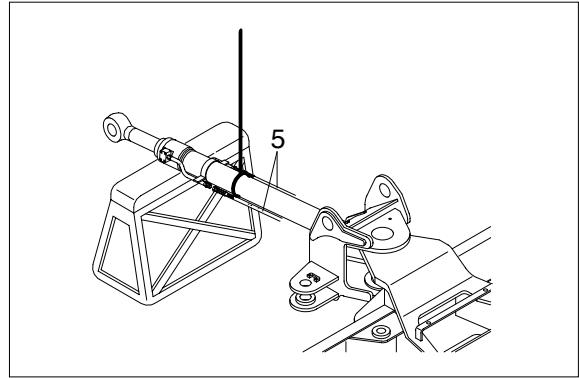
Tie the rod with wire to prevent it from coming out.



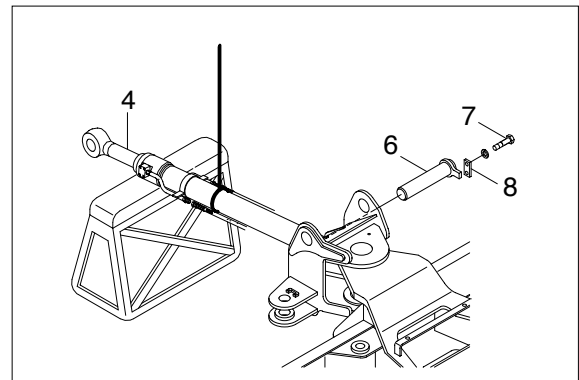
Lower the boom cylinder assembly(4) on a stand.



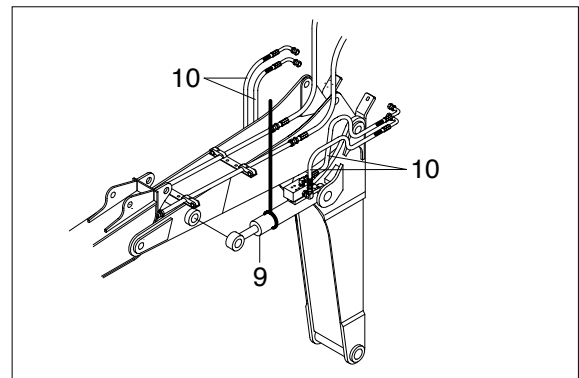
Disconnect boom cylinder hoses(5), and put plugs on cylinder pipe.



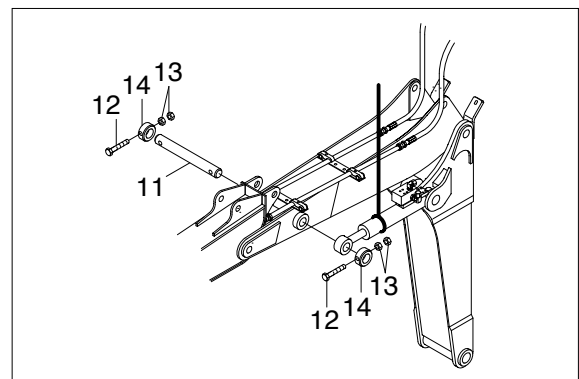
Remove bolt(7), plate(8), then pull out pin (6).  
Remove boom cylinder assembly(4).  
· Weight : 116kg(256lb)



Lower the adjust cylinder assembly(9) on a stand.  
Disconnect adjust cylinder hoses(10) and put plugs on holding valve.



Remove bolt(12), nut(13), stopper pin (14), then pull out pin(11).  
Remove adjust cylinder assembly(14).  
· Weight : 48kg(106lb)



**(2) Install**

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.

Confirmed 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.

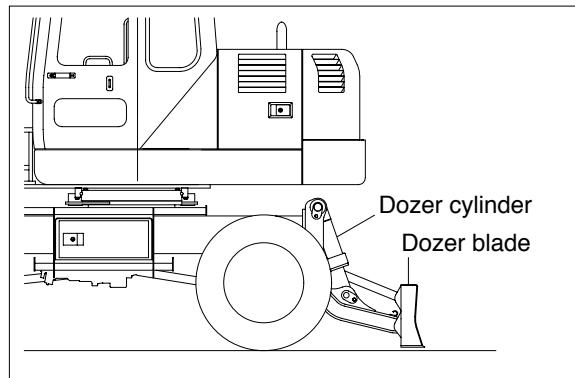
Operate the control levers and pedals several times to release the remaining pressure in the hydraulic piping.

Loosen the breather slowly to release the pressure inside the hydraulic tank.

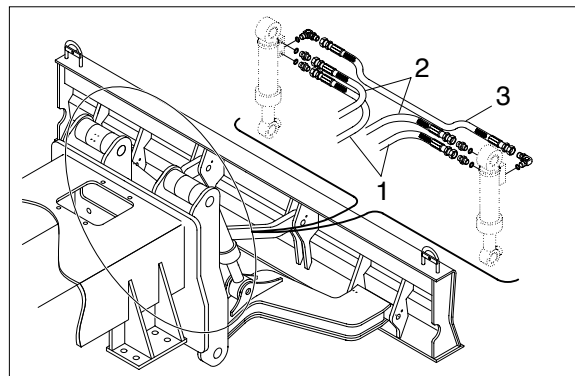
**⚠** Escaping fluid under pressure can penetrate the skin causing serious injury.

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

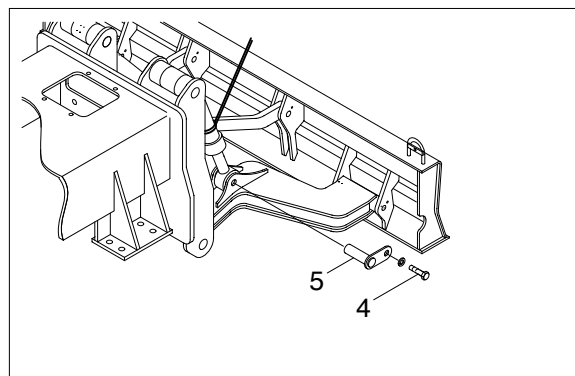
Lower the dozer blade to the ground.



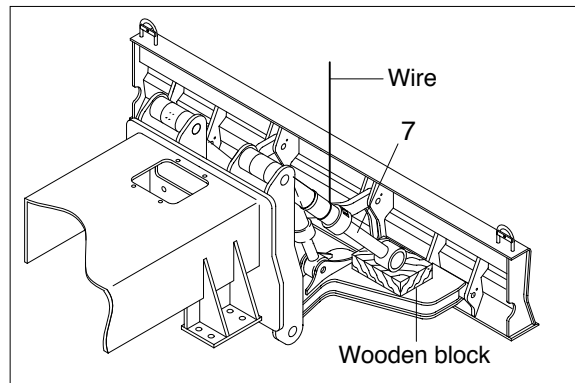
Disconnect dozer cylinder hoses(1,2,3), then put plugs on cylinder port.



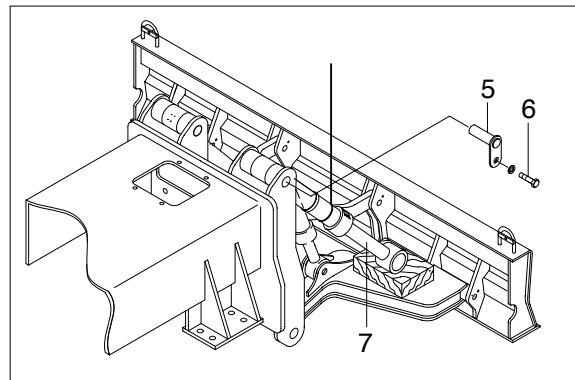
Sling dozer cylinder assembly.  
Remove bolt(3) and pull out pin(4).  
Tie the rod with wire to prevent it from coming out.



Lower the dozer cylinder rod side on a wooden block.



Remove bolt(6) and pull out pin(5).  
Remove the dozer cylinder assy(7).  
· Weight : 39.5kg(87.1lb)



## (2) Install

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.

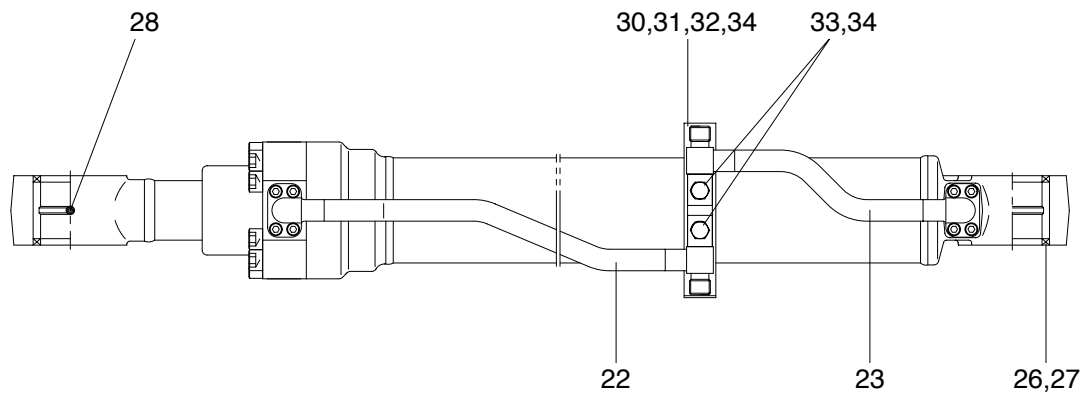
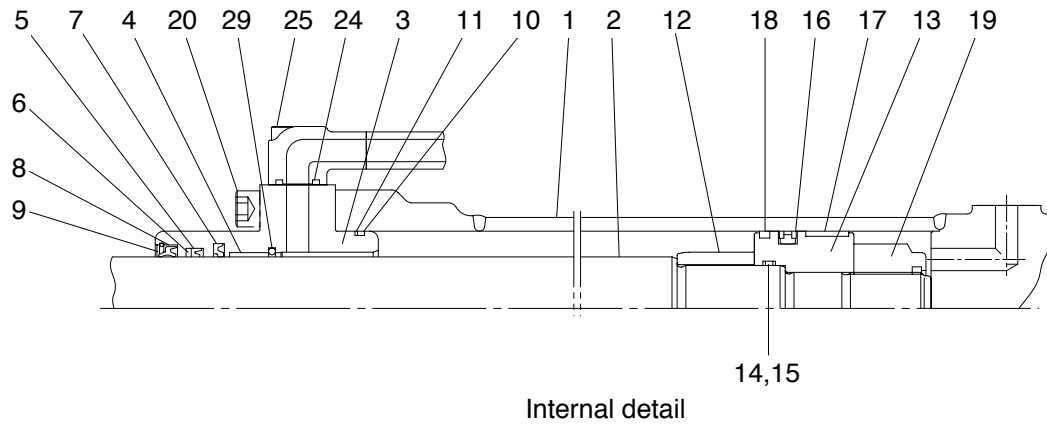
Bleed the air from the dozer cylinder.

Confirm the hydraulic oil level and check the hydraulic oil leak or not.

## 2. DISASSEMBLY AND ASSEMBLY

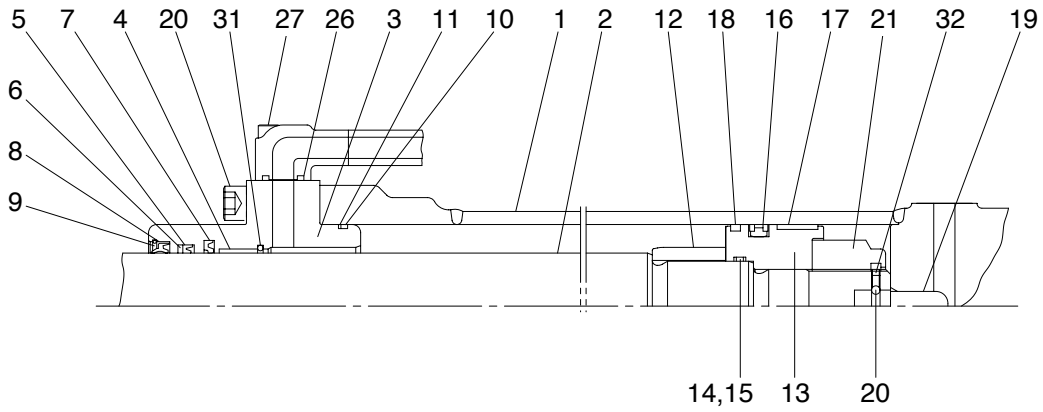
### 1) STRUCTURE

#### (1) Bucket cylinder

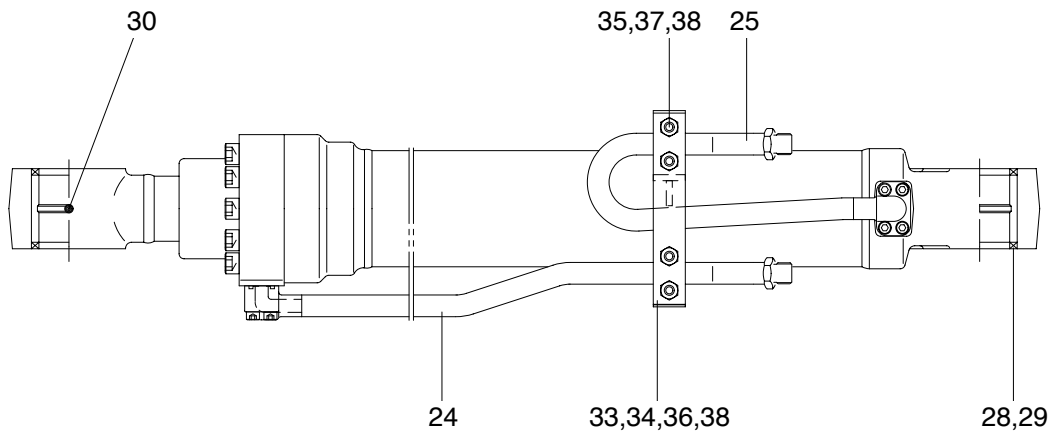


1	Tube assembly	12	Cushion ring	24	O-ring
2	Rod assembly	13	Piston	25	Socket bolt
3	Gland	14	O-ring	26	Pin bushing
4	Bushing	15	Back up ring	27	Dust seal
5	Rod seal	16	Piston seal	28	Grease nipple
6	Back up ring	17	Wear ring	29	Snap ring
7	Buffer ring	18	Dust ring	30	Band sub assembly
8	Dust wiper	19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

**(2) Arm cylinder**

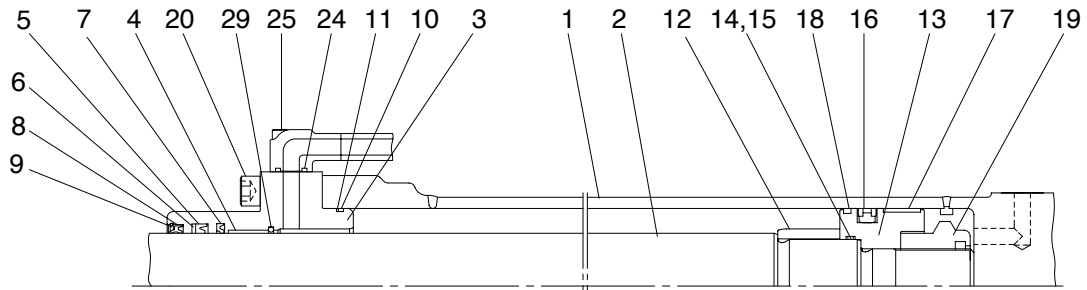


Internal detail

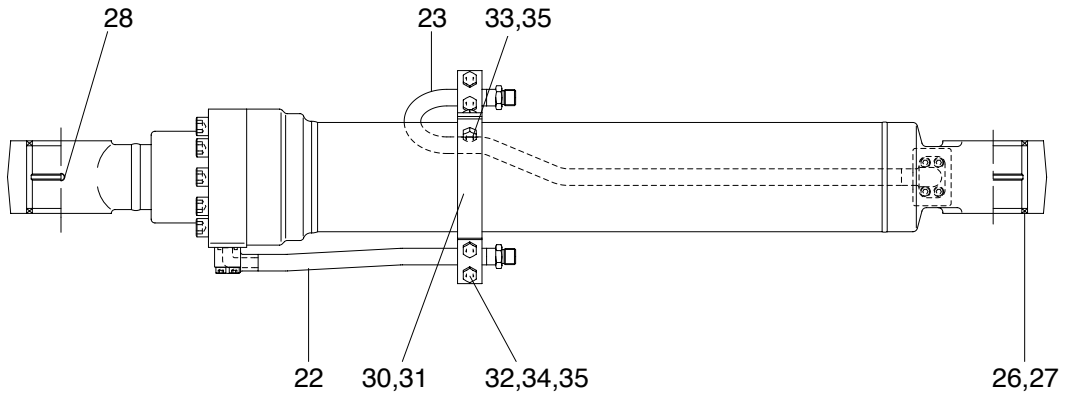


- |    |               |    |                          |    |                   |
|----|---------------|----|--------------------------|----|-------------------|
| 1  | Tube assembly | 14 | O-ring                   | 27 | Socket bolt       |
| 2  | Rod assembly  | 15 | Back up ring             | 28 |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

### (3) Boom cylinder

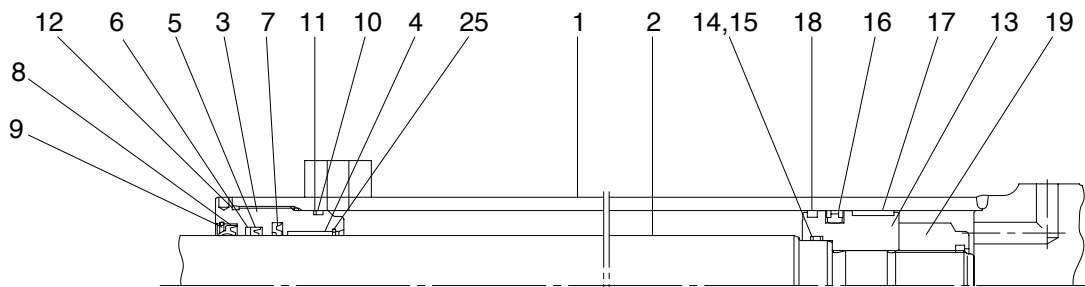


Internal detail

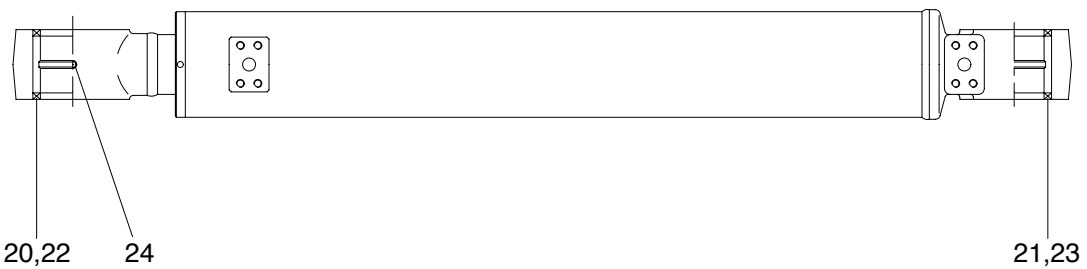


1	Tube assembly	13	Piston	25	Socket bolt
2	Rod assembly	14	O-ring	26	Pin bushing
3	Gland	15	Back up ring	27	Dust seal
4	Du bushing	16	Piston seal	28	Grease nipple
5	Rod seal	17	Wear ring	29	Snap ring
6	Back up ring	18	Dust ring	30	Band sub assembly
7	Buffer ring	19	Nylon nut	31	Band
8	Dust wiper	20	Hexagon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

#### (4) Adjust cylinder

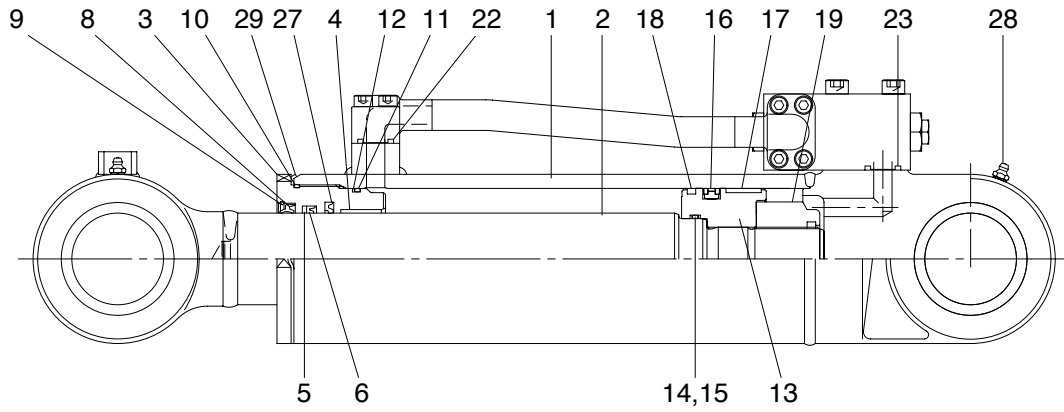


Internal detail

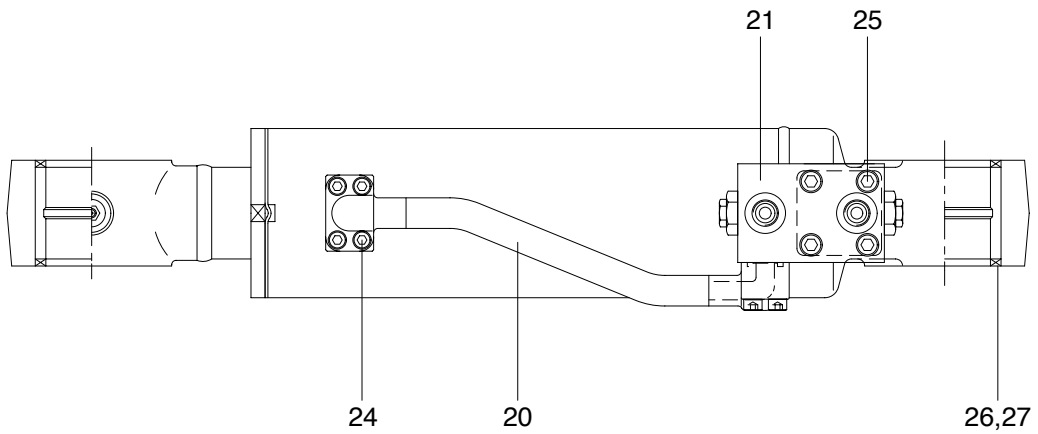


- |   |               |    |              |    |               |
|---|---------------|----|--------------|----|---------------|
| 1 | Tube assembly | 10 | O-ring       | 18 | Dust ring     |
| 2 | Rod assembly  | 11 | Back up ring | 19 | Nylon nut     |
| 3 | Gland         | 12 | O-ring       | 20 | Pin bushing   |
| 4 | Du bushing    | 13 | Piston       | 21 | Pin bushing   |
| 5 | Rod seal      | 14 | O-ring       | 22 | Dust seal     |
| 6 | Back up ring  | 15 | Back up ring | 23 | Dust seal     |
| 7 | Buffer ring   | 16 | Piston seal  | 24 | Grease nipple |
| 8 | Dust wiper    | 17 | Wear ring    | 25 | Snap ring     |
| 9 | Snap ring     |    |              |    |               |

(5) Dozer cylinder

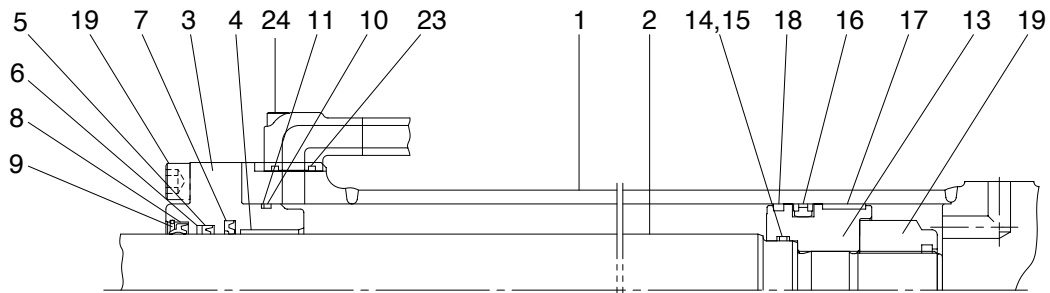


Internal detail

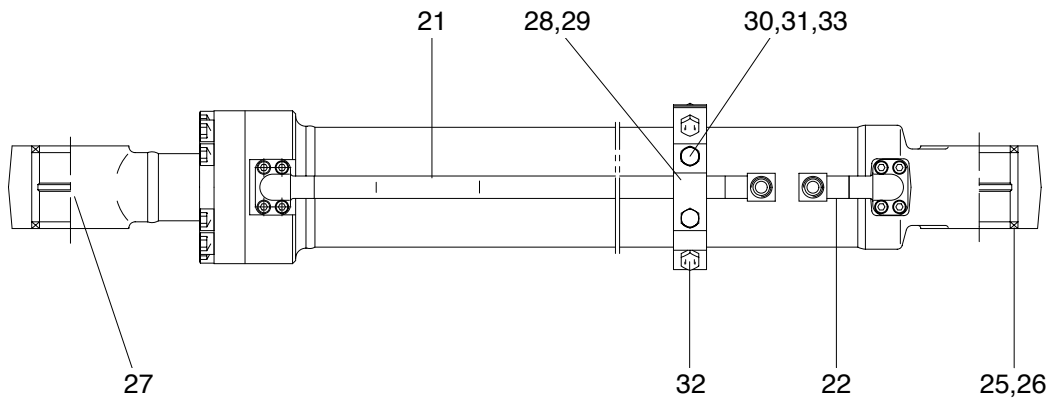


- |    |               |    |               |    |                    |
|----|---------------|----|---------------|----|--------------------|
| 1  | Tube assembly | 11 | O-ring        | 21 | Double check valve |
| 2  | Rod assembly  | 12 | Back up ring  | 22 | O-ring             |
| 3  | Gland         | 13 | Piston        | 23 | O-ring             |
| 4  | Du bushing    | 14 | O-ring        | 24 | Socket bolt        |
| 5  | Rod seal      | 15 | Back up ring  | 25 | Socket bolt        |
| 6  | Back up ring  | 16 | Piston seal   | 26 | Pin bushing        |
| 7  | Buffer ring   | 17 | Wear ring     | 27 | Dust seal          |
| 8  | Dust wiper    | 18 | Dust ring     | 28 | Grease nipple      |
| 9  | Snap ring     | 19 | Nylon nut     | 29 | Lock washer        |
| 10 | O-ring        | 20 | Pipe assembly |    |                    |

**(6) Boom swing cylinder**



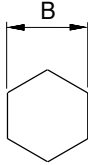
Internal detail



- |    |               |    |                  |    |                   |
|----|---------------|----|------------------|----|-------------------|
| 1  | Tube assembly | 12 | Piston           | 24 | Socket bolt       |
| 2  | Rod assembly  | 13 | O-ring           | 25 | Pin bushing       |
| 3  | Gland         | 14 | Back up ring     | 26 | Dust seal         |
| 4  | Du bushing    | 15 | Piston seal      | 27 | Grease nipple     |
| 5  | Rod seal      | 16 | Wear ring        | 28 | Band sub assembly |
| 6  | Back up ring  | 17 | Dust ring        | 29 | Band              |
| 7  | Buffer ring   | 18 | Nylon nut        | 30 | Pipe clamp        |
| 8  | Dust wiper    | 19 | Socket head bolt | 31 | Hexagon bolt      |
| 9  | Snap ring     | 21 | Pipe assembly    | 32 | Hexagon bolt      |
| 10 | O-ring        | 22 | Pipe assembly    | 33 | Spring washer     |
| 11 | Back up ring  | 23 | O-ring           |    |                   |

## 2) TOOLS AND TIGHTENING TORQUE

### (1) Tools

Tool name	Remark	
Allen wrench	6, 8, 10, 12	
spanner	17	
(-)Driver	Small and large size	
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	25	M8	2.7 ± 0.3	19.5 ± 2.2	
	Boom cylinder					
	Arm cylinder					
	Dozer cylinder	24				
	Bucket cylinder	20	M12	9.4 ± 1.0	68 ± 7.2	
	Arm cylinder	22	M14	15 ± 2.0	108 ± 14.5	
	Boom swing cylinder	19				
	Boom cylinder	20	M16	23 ± 2.0	166 ± 14.5	
	Dozer cylinder	25	M10	5.4 ± 0.5	39.1 ± 3.6	
Hexagon head bolt	Bucket cylinder	32, 33	M10	3.2 ± 0.3	23.1 ± 2.3	
	Arm cylinder	36				
	Boom cylinder	33				
	Boom swing cylinder	31, 32				
Hexagon head nut	Arm cylinder	37	M10	3.2 ± 0.3	23.1 ± 2.3	
	Boom cylinder	34				
Nylon nut	Bucket cylinder	19	42	236 ± 23	1708 ± 166	
	Adjust cylinder					
	Arm cylinder	21	45	292 ± 29	2112 ± 210	
	Dozer cylinder	18				
	Boom swing cylinder					
	Boom cylinder	19	56	551 ± 55	3985 ± 398	

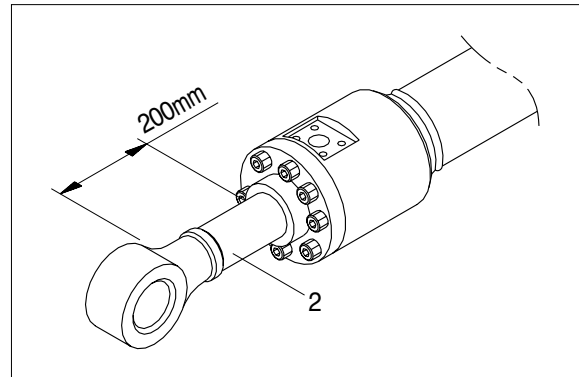
### 3) DISASSEMBLY

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

Hold the clevis section of the tube in a vise.

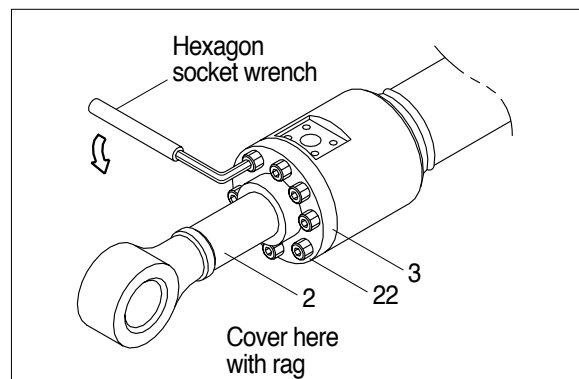
Use mouth pieces so as not to damage the machined surface of the cylinder tube. Do not make use of the outside piping as a locking means.

Pull out piston rod(2) about 200mm(7.9in). Because the piston rod is rather heavy, finish extending it with air pressure after the oil draining operation.



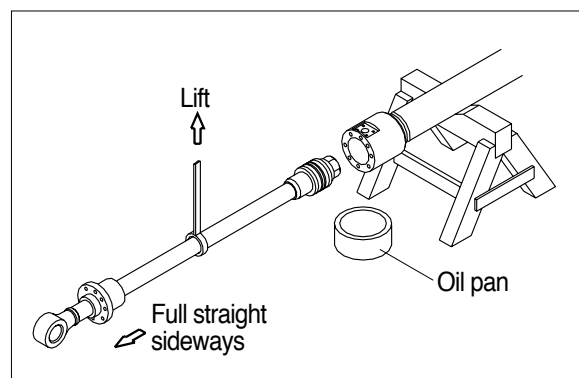
Loosen and remove socket bolts(22) of the cylinder head in sequence.

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



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

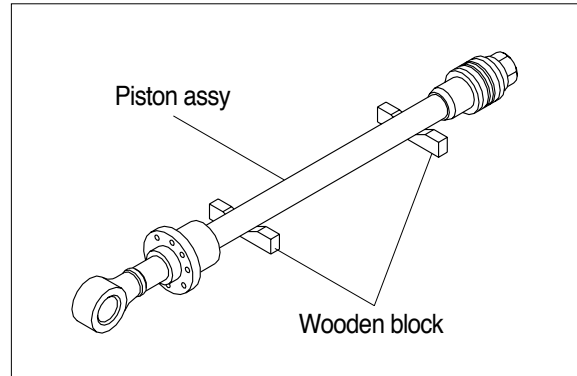
Since the piston rod assembly is heavy in this case, lift the tip of the piston rod(2) with a crane or some means and draw it out. However, when piston rod(2) has been drawn out to approximately two thirds of its length, lift it in its center to draw it completely.



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.

Place the removed piston rod assembly on a wooden V-block that is set level.

Cover a V-block with soft rag.

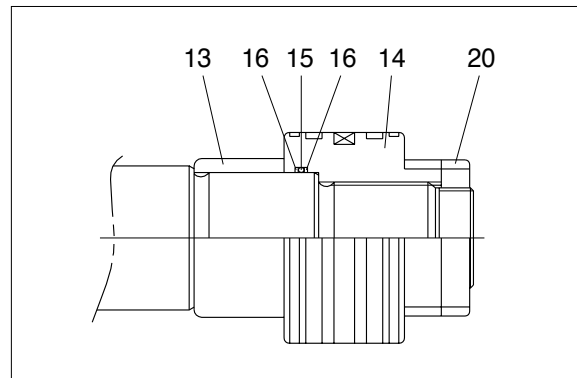


## (2) Remove piston and cylinder head

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).

Remove piston assembly(14), back up rings(16), and O-ring(15) and cushion ring(13).

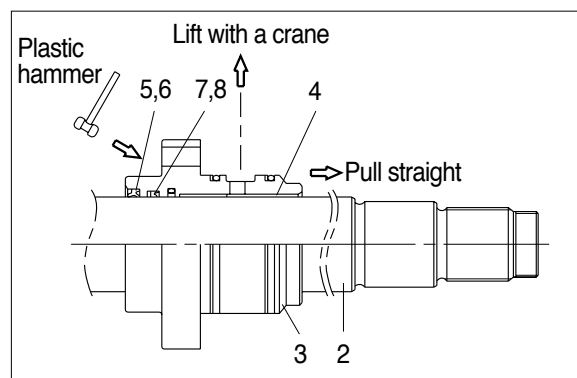


Remove the cylinder head assembly from piston rod(2).

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).

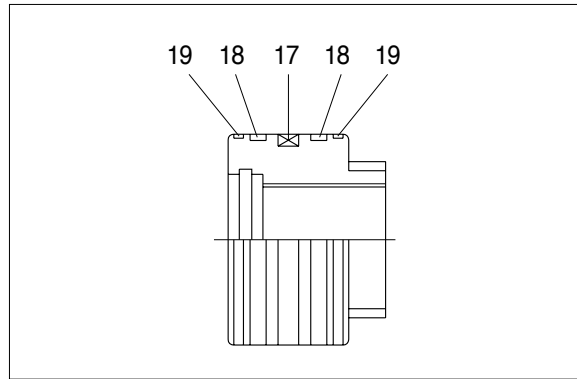


**(3) Disassemble the piston assembly**

Remove wear ring(18).

Remove dust ring(19) and piston seal(17).

Exercise care in this operation not to damage the grooves.



**(4) Disassemble cylinder head assembly**

Remove back up ring(12) and O-ring (10).

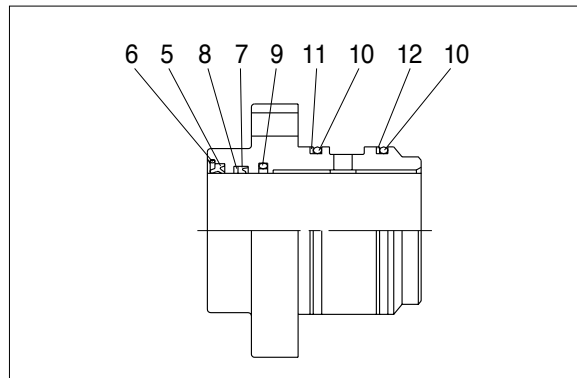
Remove back up ring(11) and O-ring(10).

Remove snap ring(6) and dust wiper(5).

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.

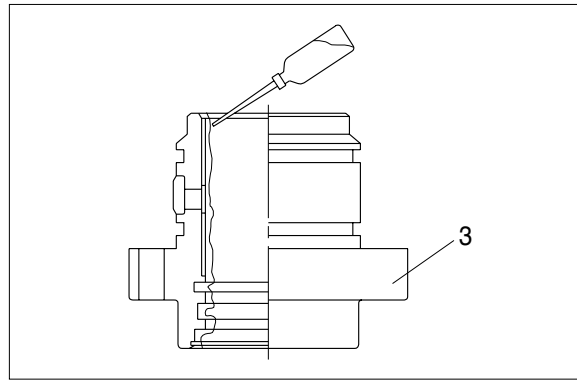


#### 4) ASSEMBLY

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

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

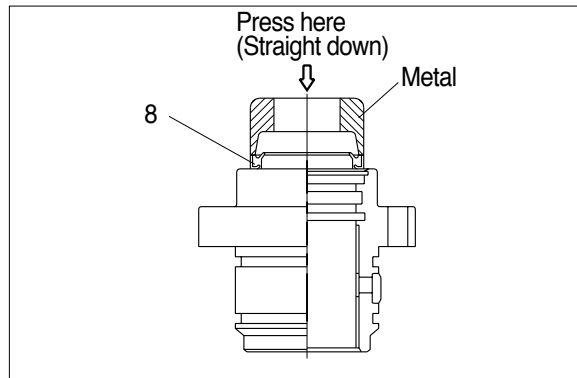
Coat the inner face of gland(3) with hydraulic oil.



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.

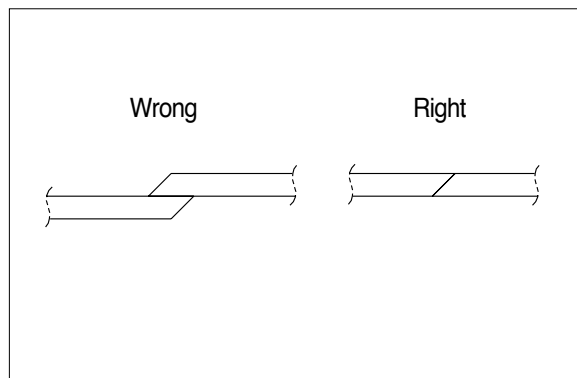
Fit snap ring(6) to the stop face.



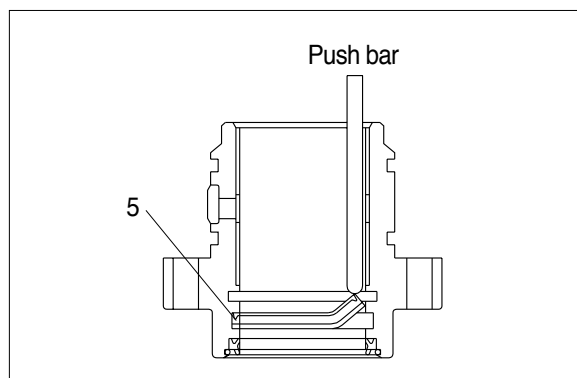
Fit back up ring(8), rod seal(7) and step seal(9) to corresponding grooves, in that order.

Coat each packing with hydraulic oil before fitting it.

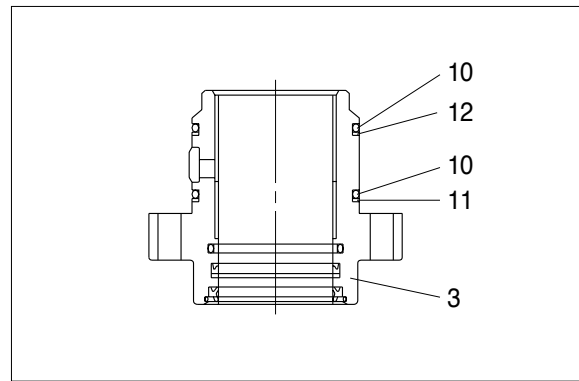
Insert the back up ring until one side of it is inserted into groove.



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.

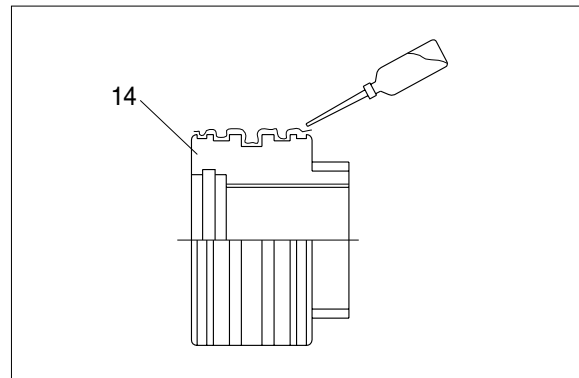


Fit back up ring(11,12) to gland(3).  
 Put the backup ring in the warm water of 30~50,C.  
 Fit O-rings(10) to gland(3).

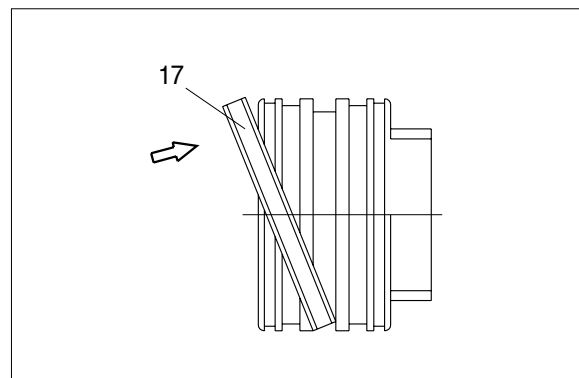


**(2) Assemble piston assembly**

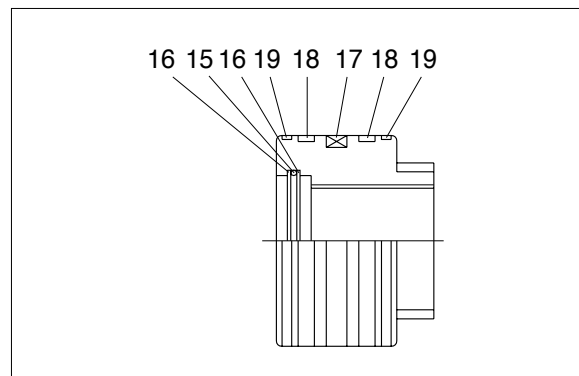
Check for scratches or rough surfaces.  
 If found smooth with an oil stone.  
 Coat the outer face of piston(14) with hydraulic oil.



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.



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

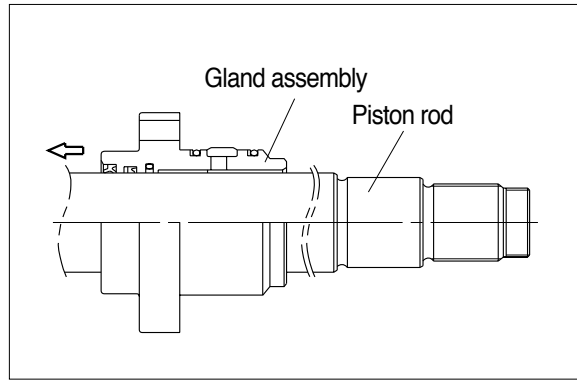


**(3) Install piston and cylinder head**

Fix the piston rod assembly to the work bench.

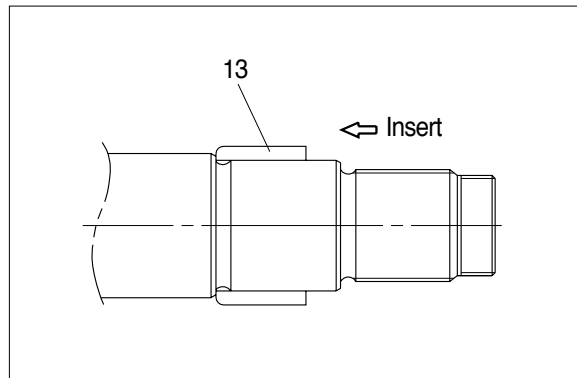
Apply hydraulic oil to the outer surface of piston rod(2), the inner surface of piston and cylinder head.

Insert cylinder head assembly to piston rod.



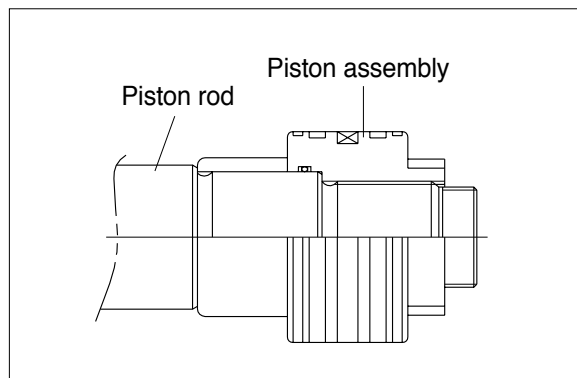
Insert cushion ring(13) to piston rod.

Note that cushion ring(13) has a direction in which it should be fitted.



Fit piston assembly to piston rod(2).

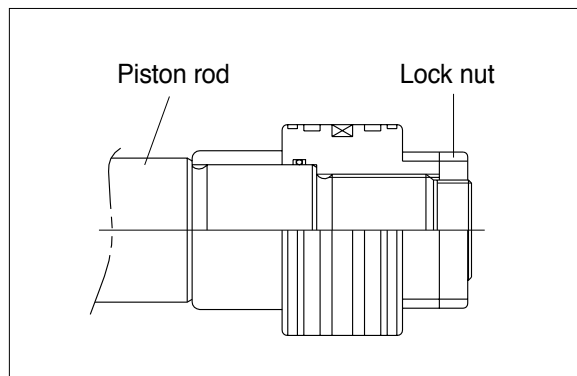
- Tightening torque :  $100 \pm 10 \text{ kgf} \cdot \text{m}$   
( $723 \pm 72.3 \text{ lbf} \cdot \text{ft}$ )



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

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.

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.

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.

