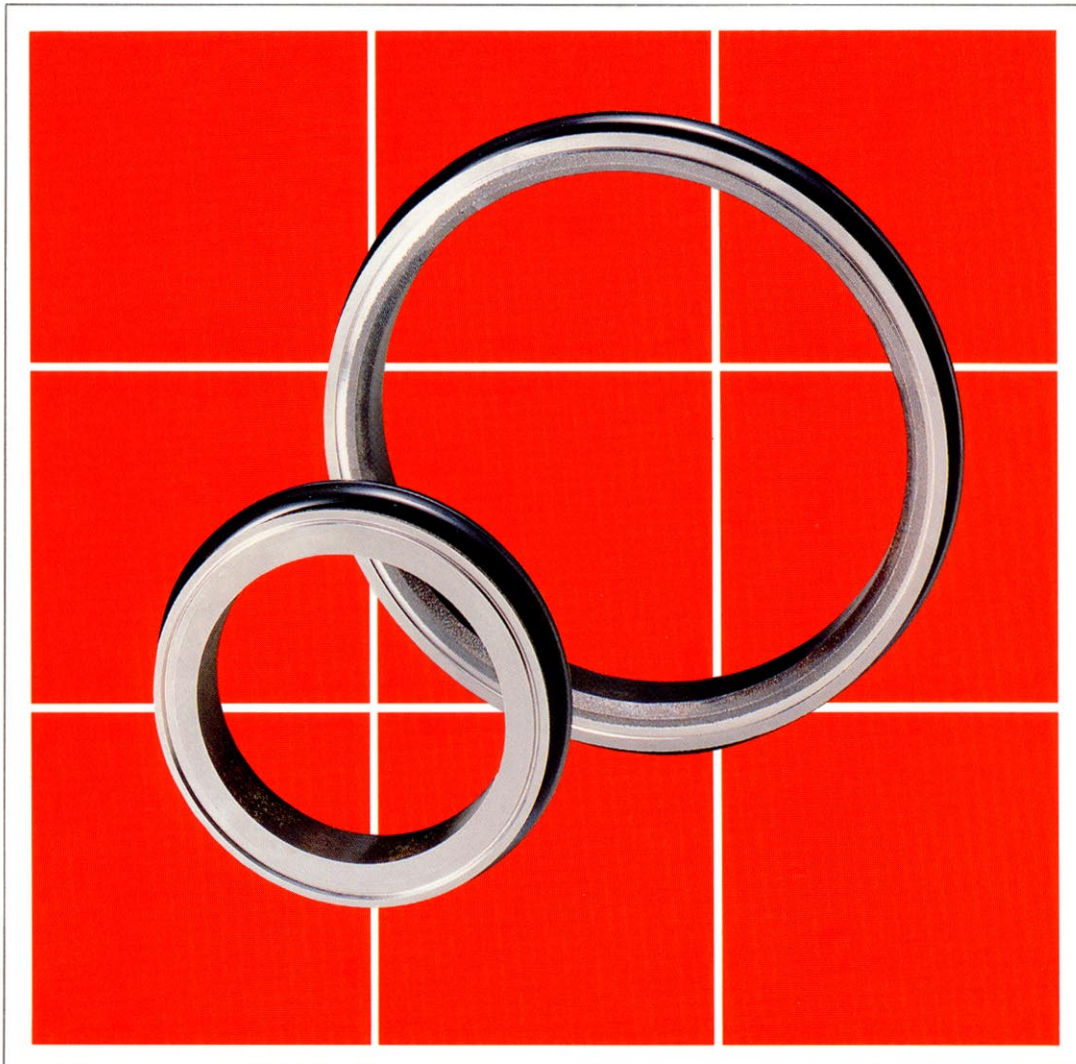


# SHOP MANUAL



## **GUIDANCE FOR REUSABLE PARTS**

# FLOATING SEAL



GUIDANCE FOR REUSABLE PARTS  
**KOMATSU**

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# INTRODUCTION

This Guidance for Reusable Parts shows through illustrations how to decide whether or not to reuse the floating seals in construction machines at the time of disassembly, repair and reassembly. It also gives general information and describes causes of defects of floating seals.

Floating seals prevent leakage of lubricant and entrance of foreign matter, such as muddy water.

A floating seal is generally found to be damaged when oil leaks from it, or when it is removed in order to repair another part.

It is extremely difficult to judge if a floating seal is reusable or not on the basis of the damage. It is almost always replaced at the time of repair without diagnosing the damage or considering the possibility of reuse.

This manual is a guide to reduce repair costs by proper reuse or replacement of parts and taking action to prevent reoccurrence of the same failure by grasping the correct cause of the damage.

We hope that this Guidance for Reusable Parts will be fully utilized for diagnosis and repair.



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Note: This publication is intended for guidance only and KOMATSU LTD. hereby expressly denies and excludes any representation, warranty or implied warranty for the reuse of floating seals.

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# FAILURE SIGNS AND DIAGNOSIS FOR REUSE

Reuse of parts depends not only on the extent, location, and type of damage, but also on the possibility that reuse of a damaged part may adversely affect machine performance.

Decide whether or not to reuse a part by finding the cause of the damage by considering the machine's history of periodic maintenance and operating conditions, by referring to the illustrations in this manual, and by using the know-how acquired through your long experience.

## Inspection Points for Parts Reuse Diagnosis

To make accurate judgement on reuse of a part, clean the part before inspection and pay special attention to the following points:

Part	Position	Check points
Seal ring	Sealing surface	<ul style="list-style-type: none"> <li>● Scratches, deformation</li> <li>● Degree of wear, uneven wear</li> <li>● Cracks</li> <li>● Peeling, pitting</li> </ul>
	O-ring contact surface	<ul style="list-style-type: none"> <li>● Scratches, pitting</li> <li>● Cracks</li> </ul>
	Collar portion	<ul style="list-style-type: none"> <li>● Cracks, chipping</li> </ul>
O-ring		<ul style="list-style-type: none"> <li>● Cracks at contact surface, traces of slipping</li> <li>● Cuts, deformation, fatigue</li> </ul>

## Standards for Failure Determination

Rank	Failure degree
Use again	Slight damage not affecting machine performance, and not likely to cause secondary damage.
Use after reconditioning	When machine can perform properly after reconditioning of part.
Do not use again	Heavy damage or expiration of the service life. If used, it would damage the machine.

- "Use after reconditioning" assumes that the reconditioning equipment, such as lapping equipment, is available. If not available, always replace the part because the finish of the sealing surface can not be judged accurately without the reconditioning equipment.
- If one seal ring is reusable but the other is not, replace both seal rings.



## Seal Ring

	Failure	Rank	Failure degree
Sealing surface	Wear	Use again	The degree of wear at the sealing surface is within the normal limit, shown on page 4.
		Do not use again	The degree of wear at the sealing surface exceeds the limit mentioned on page 4.
	Scratches, streaks	Use again	No scratch and streak is found.
		Use after reconditioning	If scratches are small and residual amount after reconditioning is within the limit shown on page 4, the parts can be reused.
		Do not use again	The parts exceeding the limit mentioned on page 4, cannot be reused.
	Cracks	Use again	No crack is found.
		Do not use again	Do not use again if cracked.
	Collar chipping	Use again	No collar chipping is found.
		Do not use again	Do not use again if collar is chipped, even though chip is small.
	Dis-coloration	Use again	No discoloration is found.
		Do not use again	Do not use again if any discoloration is found, because discoloration indicates reduction of hardness.
	Peeling, pitting	Use again	No peeling and pitting is found.
		Use after reconditioning	If peeling or pitting is slight and residual amount after reconditioning is within the limit shown on page 4, the parts can be reused.
		Do not use again	The parts exceeding the limit mentioned on page 4, cannot be reused.
	Cuts in the contact surface	Use again	No cutting is found.
		Use after reconditioning	Can be reused if residual amount after reconditioning is within the limit shown on page 4.
		Do not use again	The parts exceeding the limit mentioned on page 4, cannot be reused.
	Contact at both faces (for grooved seal)	Use again	<ul style="list-style-type: none"> <li>• Contact at one face</li> <li>• No oil is leaking and seals are reused as a pair.</li> </ul>
		Do not use again	If the above conditions are not met, the parts, cannot be reused.
	O-ring contact surface	Cracks	Use again
Do not use again			Do not use again if cracked.

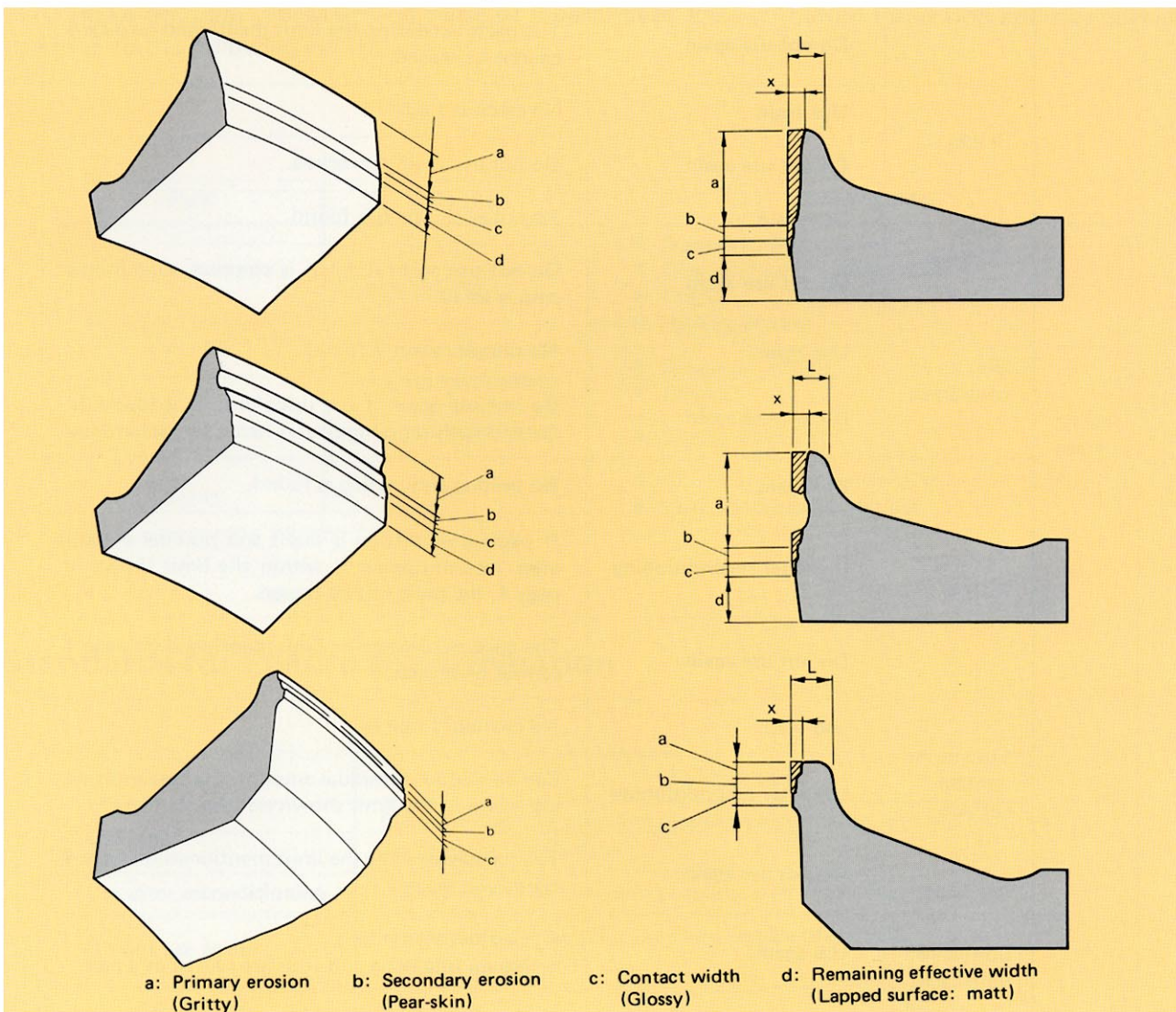


## O-Ring

Do not use again in any of the cases shown below.

Failure signs	Standards
Cracks	Do not use again if the O-ring is cracked.
Cuts	Do not use again if the O-ring is cut.
Traces of slipping	Do not use again if traces of slipping are perceived on the O-ring contact surface.

## Patterns and Standards of Seal Ring Normal Wear



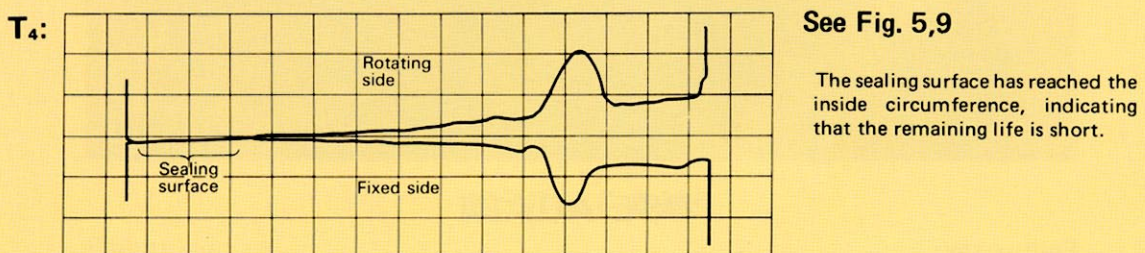
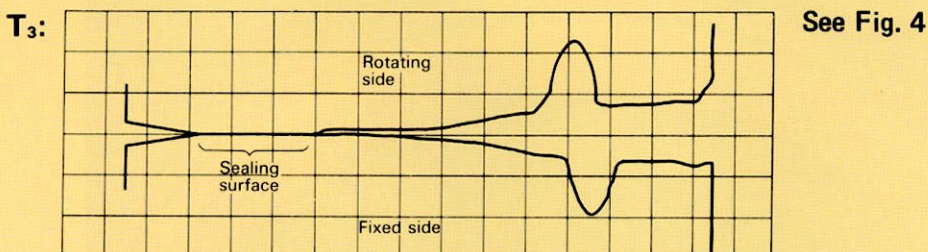
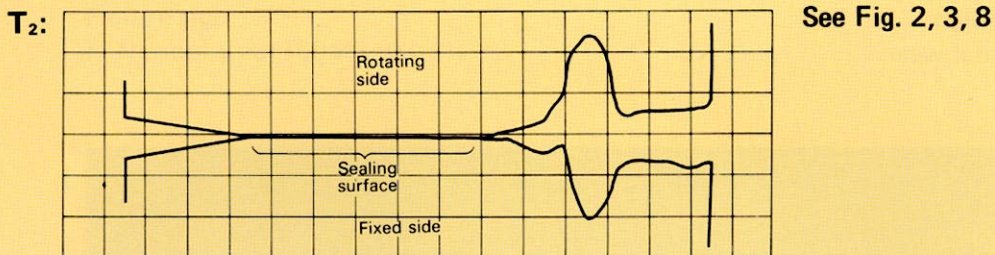
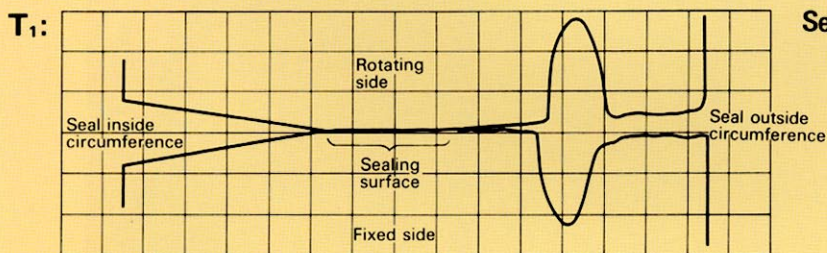
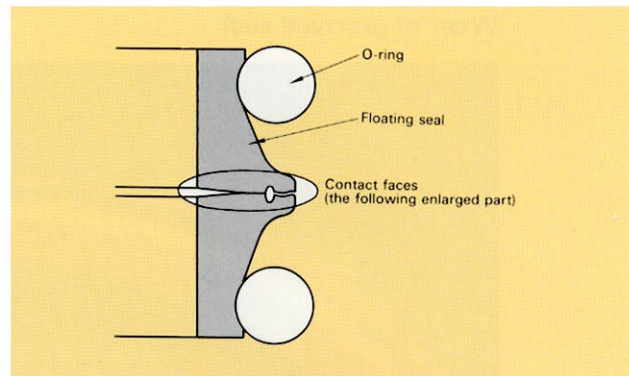
### Standards

- $X \leq \frac{1}{2}L$  [The collar thickness is more than  $\frac{1}{2}$  the original thickness.]
- At least the seal contact surface still exists.
- $C \geq 0.5 \text{ mm}$  [when the contact (glossy) surface reaches the seal inside circumference, the width of the glossy area is at least 0.5 mm.]



## Wear

- An example of wear in a grooved floating seal used in severe soil conditions is shown below.
- Wear depends on the operating conditions, but develops in the order of  $T_1 \rightarrow T_2 \rightarrow T_3 \rightarrow T_4$ , as shown below, resulting in movement of the sealing surface from outside to inside. In  $T_4$ , the sealing surface has reached the inside circumference, indicating that the remaining life of the seal is short.

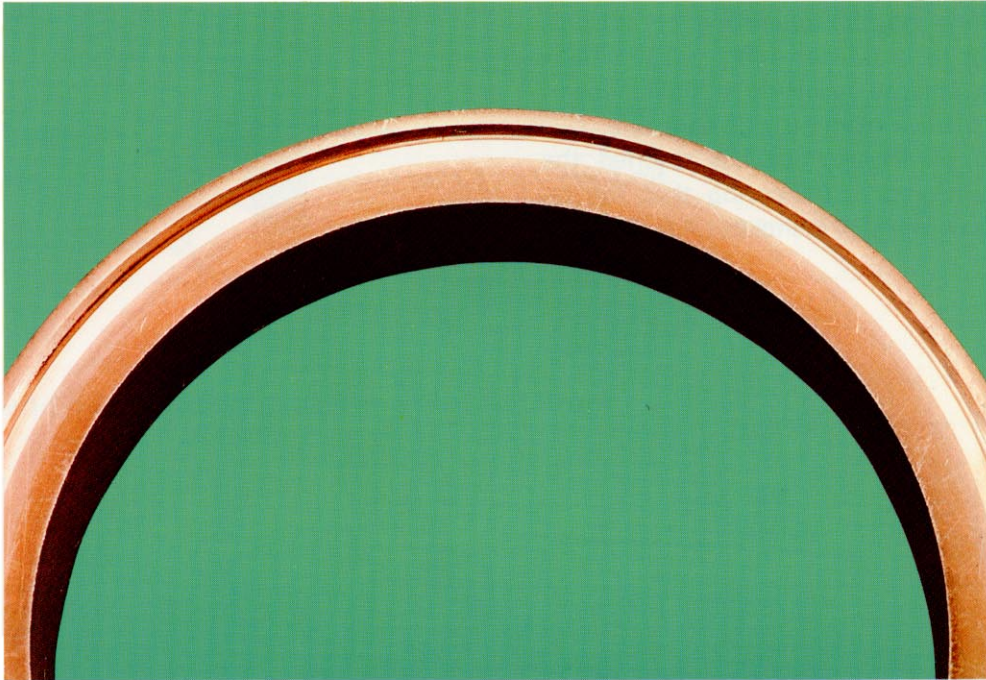




## Seal Ring

### Wear of grooved seal

1

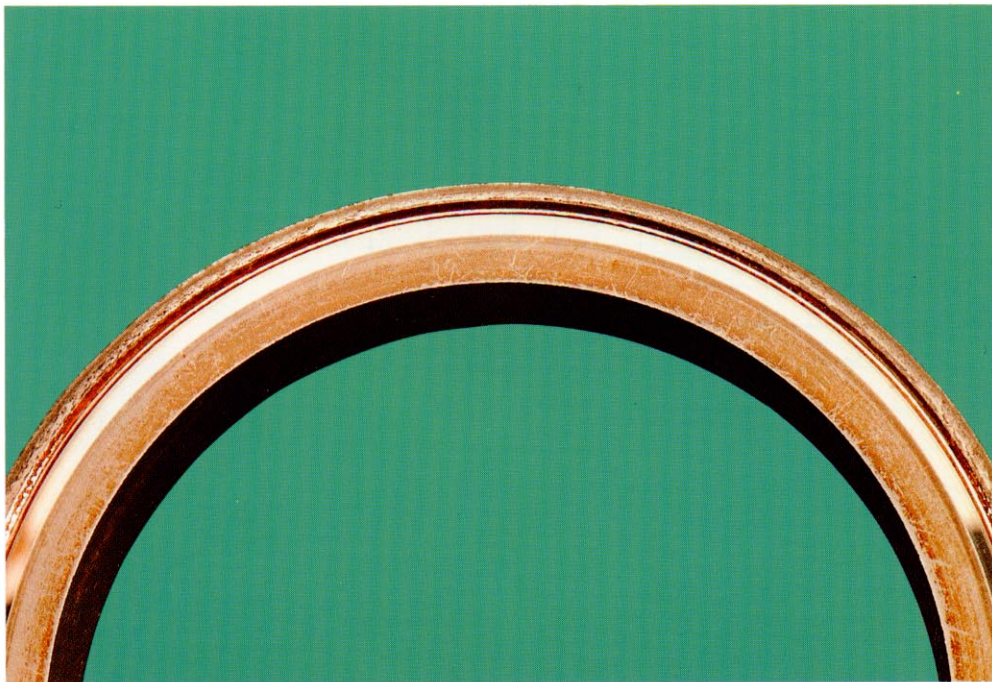


**USE AGAIN**

#### Failure sign

- Normal wear

2



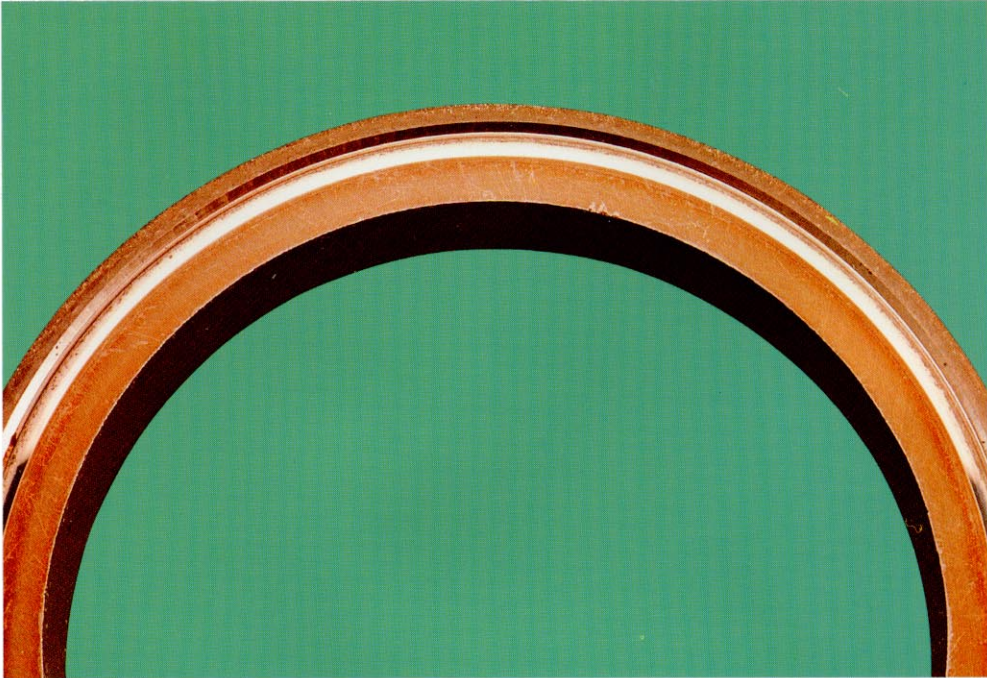
**USE AGAIN**

#### Failure sign

- Normal wear



3

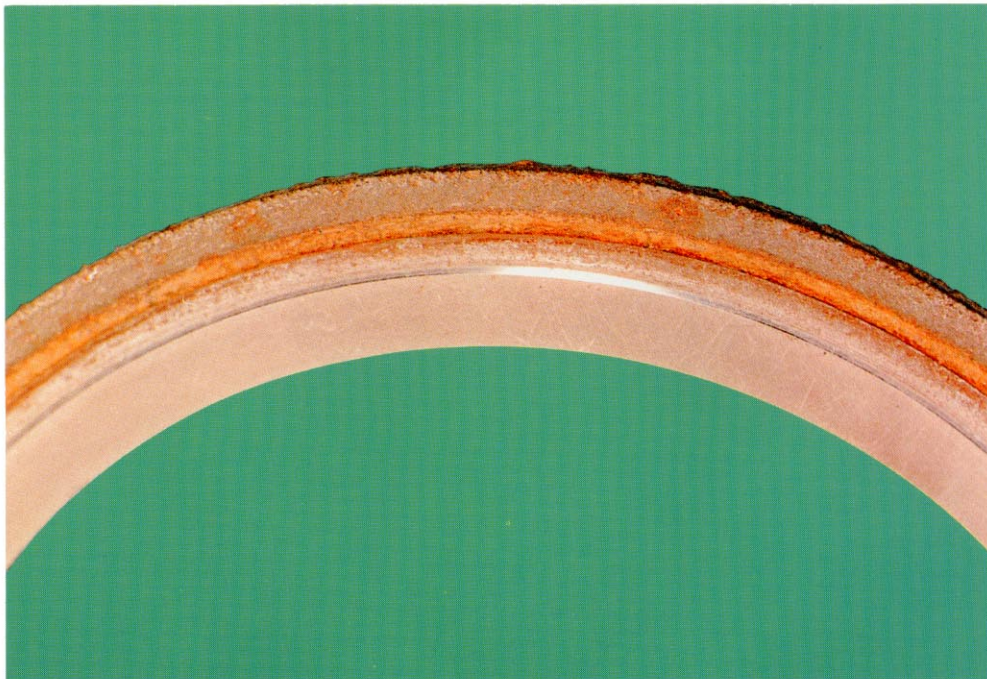


**USE AGAIN**

**Failure sign**

- Normal wear (Slight wear.)

4



**USE AGAIN**

**Failure sign**

- Normal wear (Some wear.)

**Remedy**

- Clean rust, soil and sand before reusing.
- Continue using the same mate of the seal ring.



5



**DO NOT USE AGAIN**

**Failure sign**

- Normal wear (Considerable wear.)

Note: The remaining life is short.

6



**DO NOT USE AGAIN**

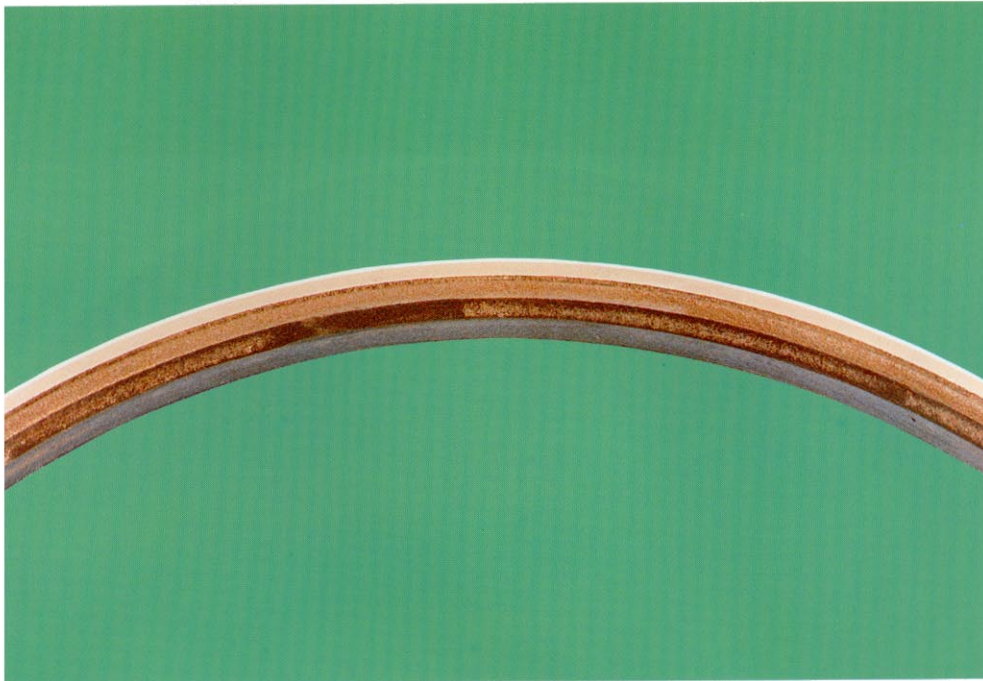
**Failure sign**

- Normal wear, however service life has reached its limit.



**Wear of stepped seal**

7

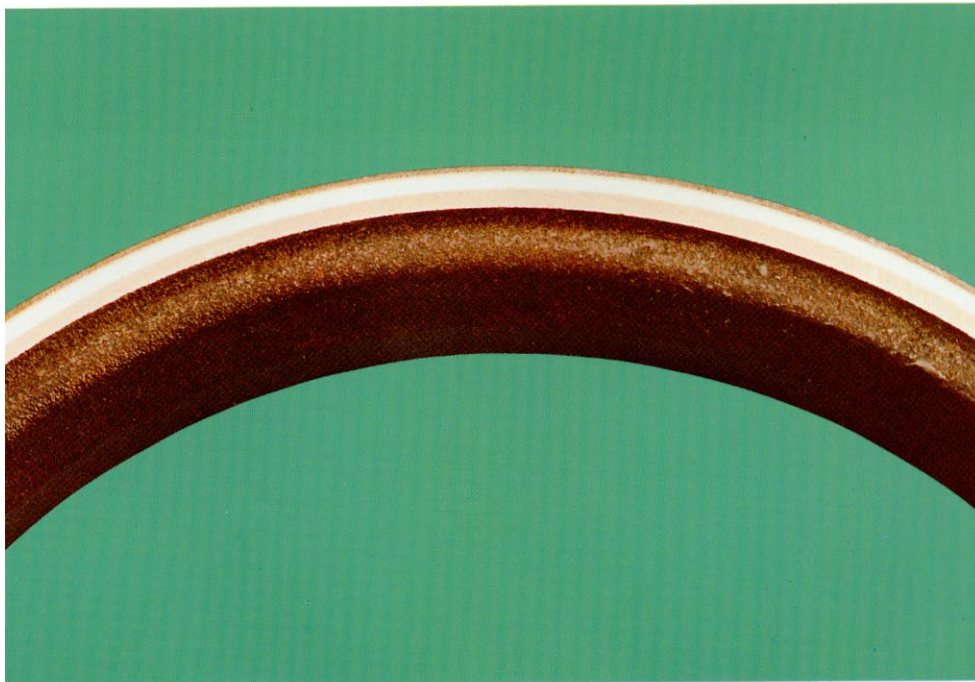


**USE AGAIN**

**Failure sign**

- Normal wear

8



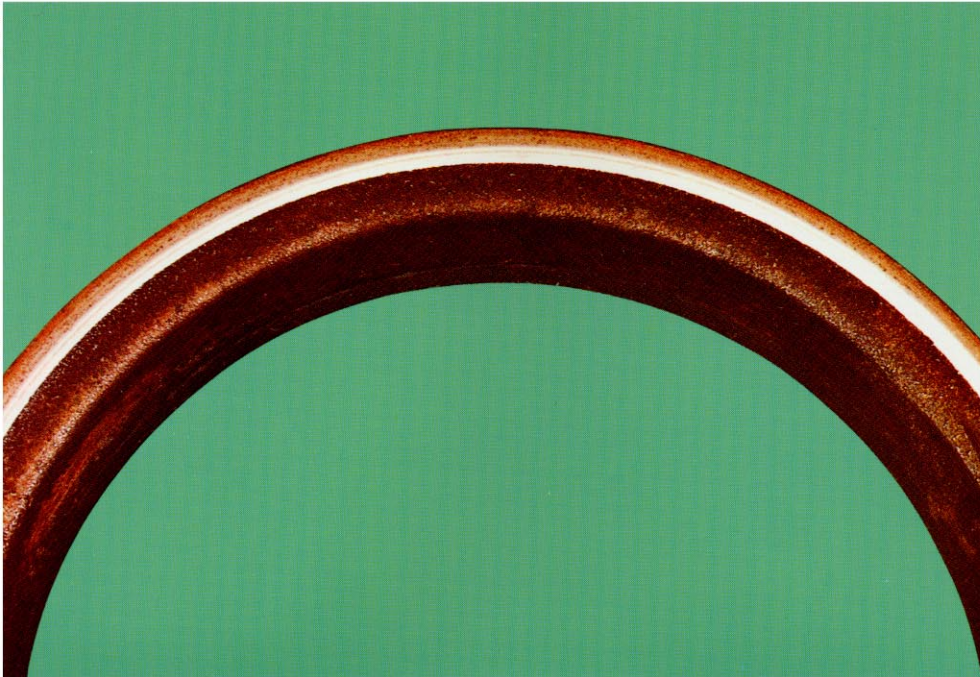
**USE AGAIN**

**Failure sign**

- Normal wear



9



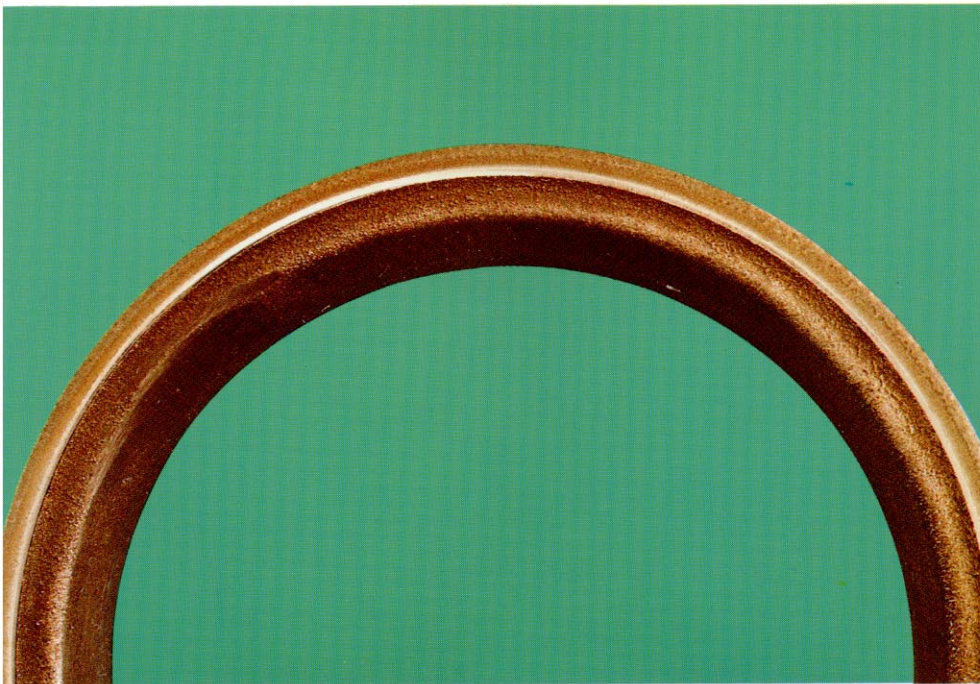
**DO NOT USE AGAIN**

**Failure sign**

- Normal wear (Considerable wear.)

Note: The remaining life is short.

10



**DO NOT USE AGAIN**

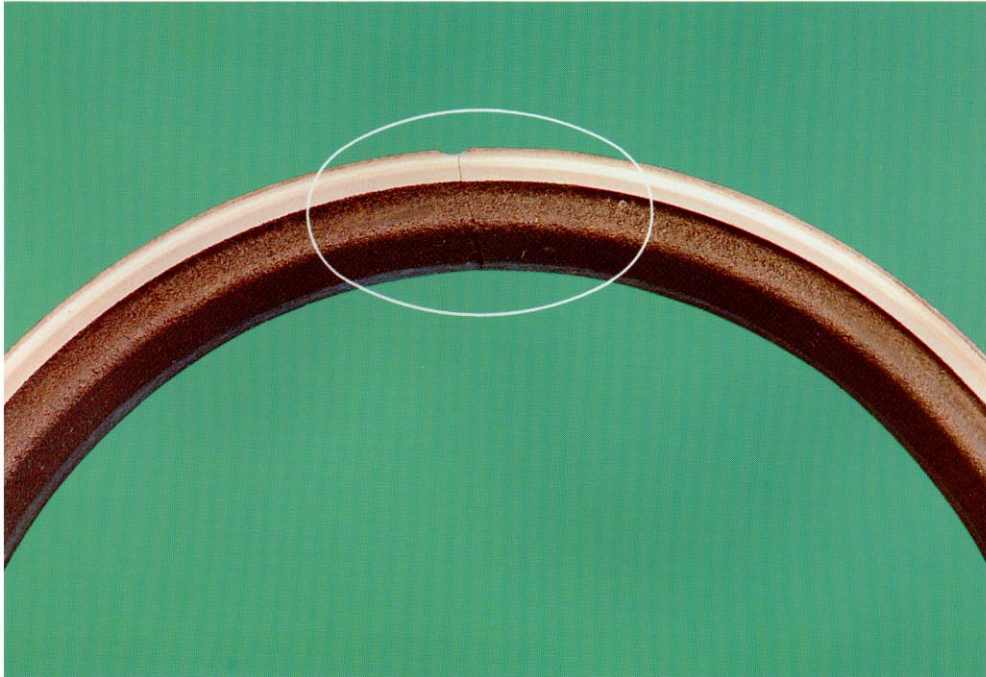
**Failure sign**

- Normal wear, however service life has reached its limit



**Cracks**

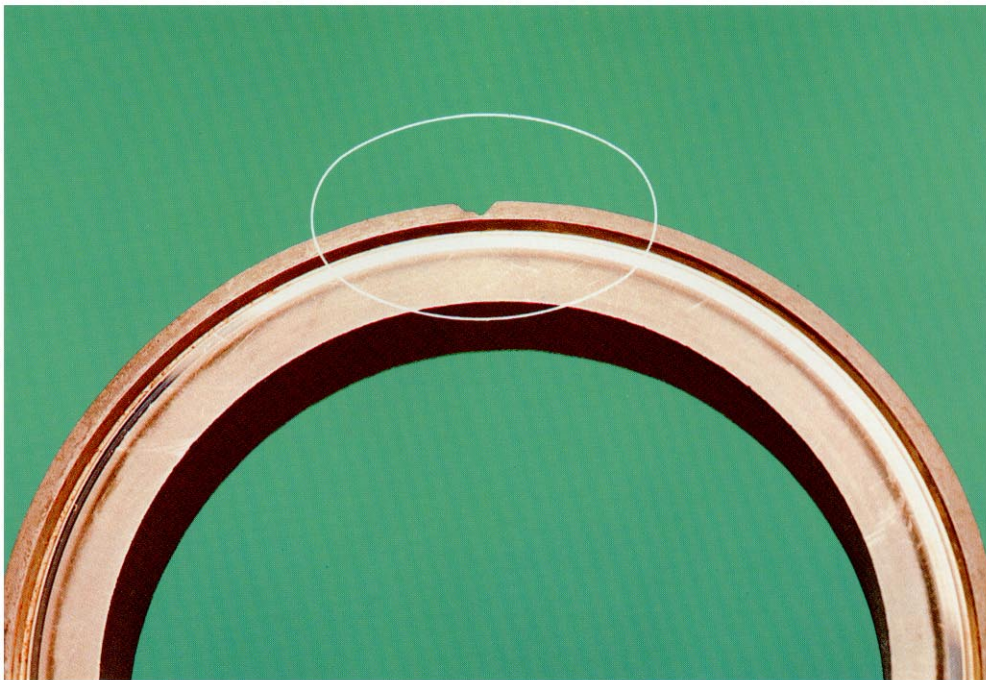
11



**DO NOT USE AGAIN**

**Collar chipping**

12



**DO NOT USE AGAIN**

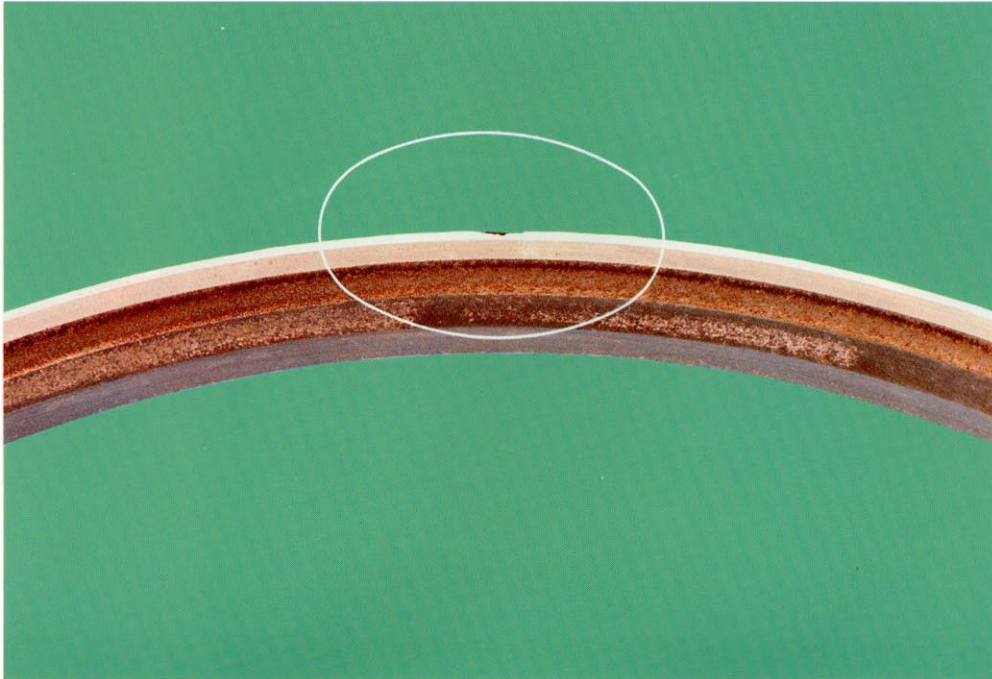
**Failure sign**

- Chipping (small)

**Cause**

- Chewing of stone or falling.

13

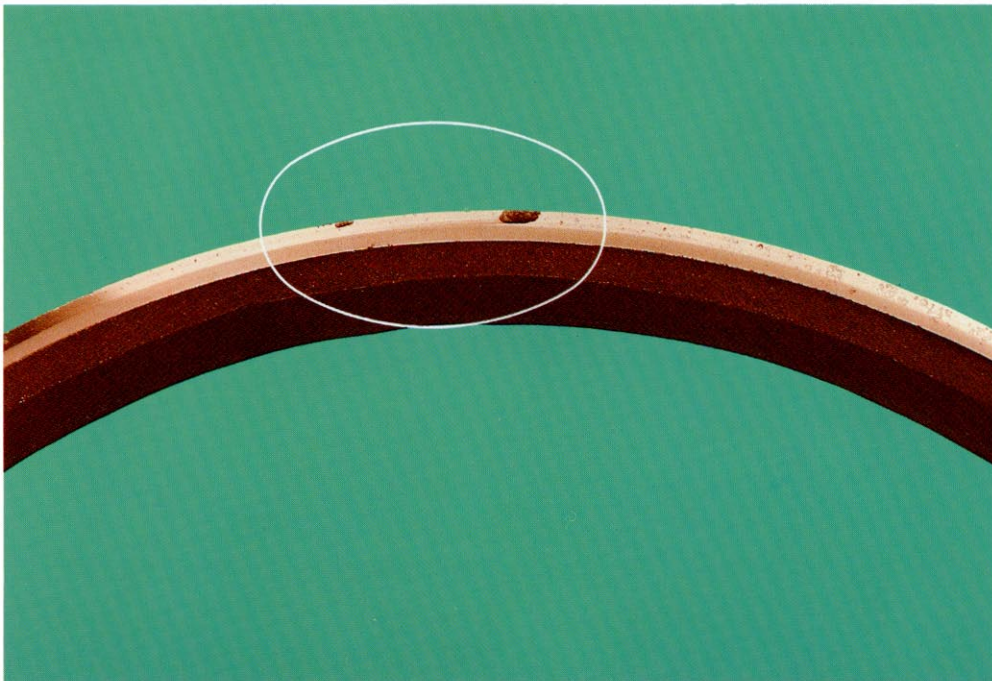


**DO NOT USE AGAIN**

Failure sign

- Chipping

14



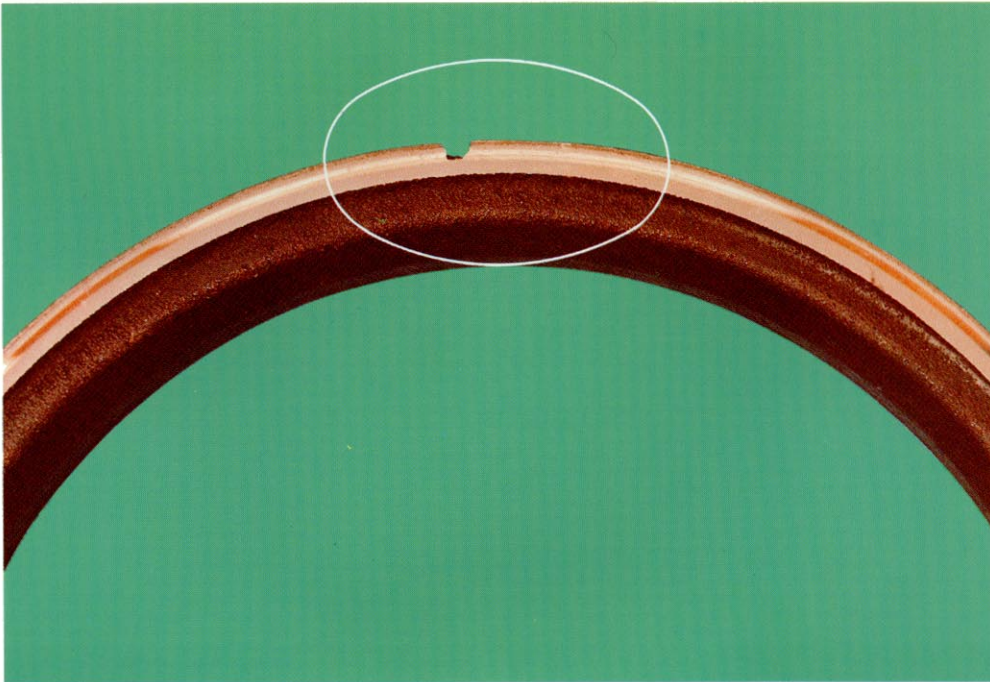
**DO NOT USE AGAIN**

Failure sign

- Surface layer chipping



15

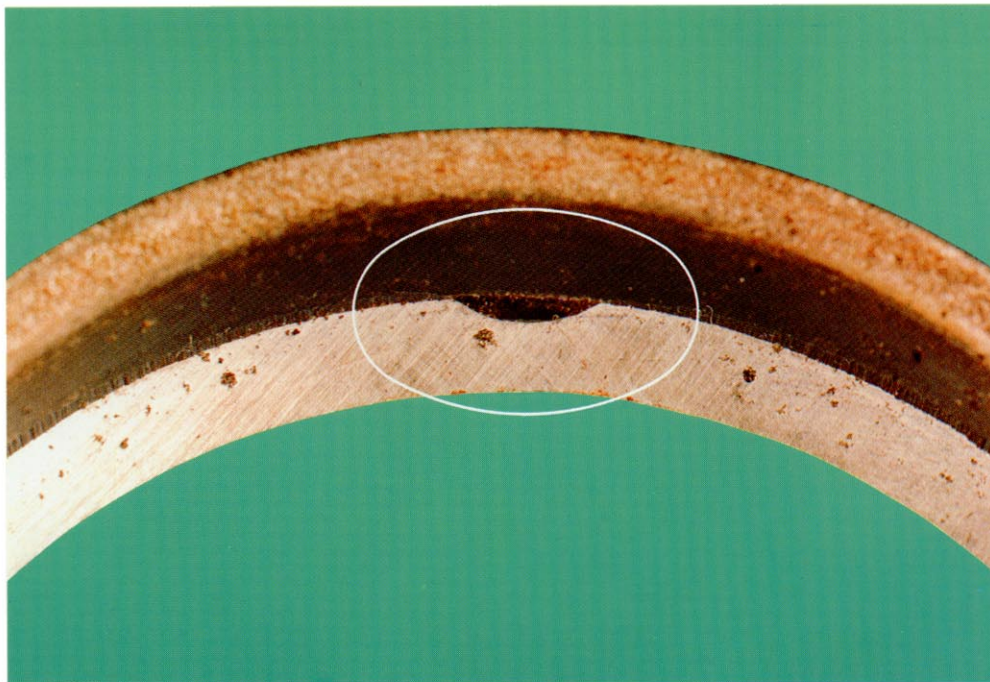


**DO NOT USE AGAIN**

**Failure sign**

- Chipping

16



**DO NOT USE AGAIN**

**Failure sign**

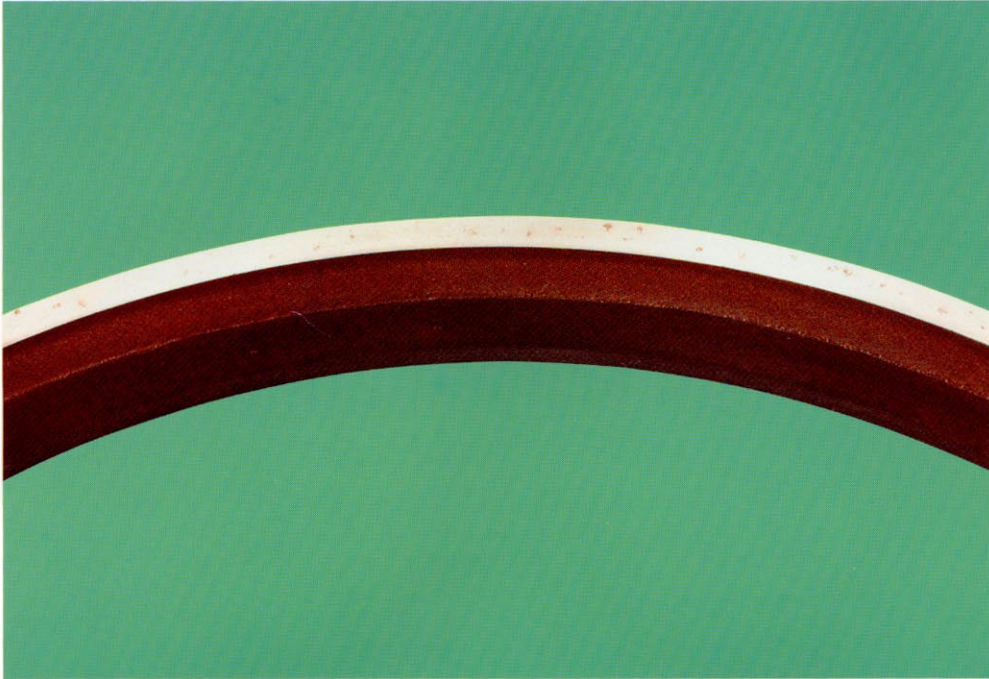
- Collar chipping

**Cause**

- Excessive surface pressure or lack of lubricant

**Peeling and/or Pitting**

17



**DO NOT USE AGAIN**

**Failure sign**

- Small peeling at spots

18



**DO NOT USE AGAIN**

**Failure sign**

- Small peeling at spots



19



**DO NOT USE AGAIN**

**Failure sign**

- Pitting

20



**DO NOT USE AGAIN**

**Failure sign**

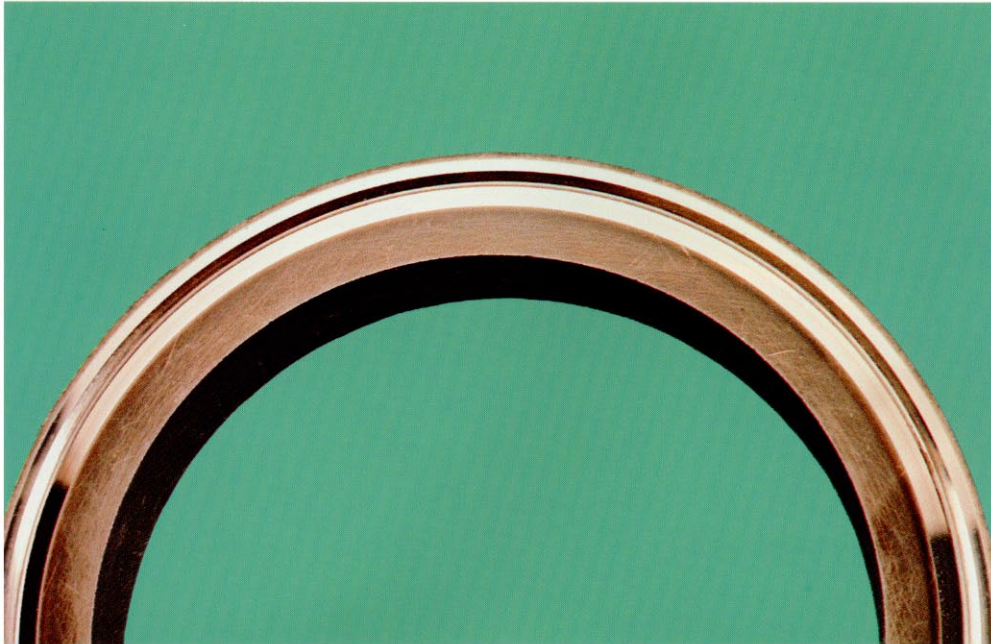
- Pitting caused by wear

**Cause**

- Relatively rough grains

**Both Faces Contact of Grooved Seal**

21



**USE AGAIN IF OIL IS NOT LEAKING  
DO NOT USE AGAIN IF OIL IS LEAKING**

**Remedy**

- Seals can be used as a pair if oil is not leaking.

**Straks**

22



**USE AGAIN AFTER RECONDITIONING**

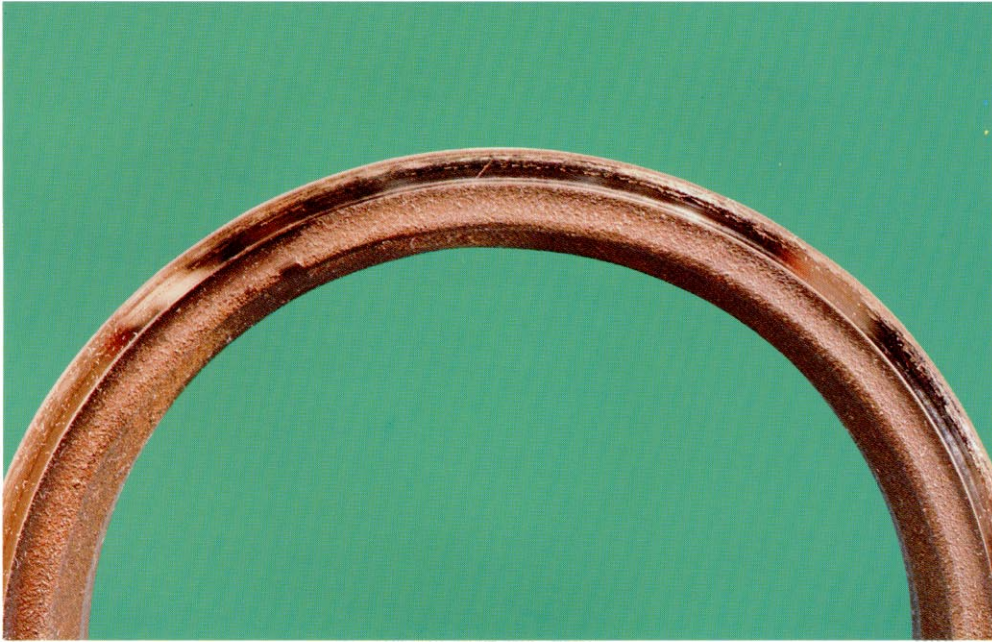
**Remedy**

- Lap before reuse.



Seizure

23



**DO NOT USE AGAIN**

24



**DO NOT USE AGAIN**



**Corrosion**

25



**USE AGAIN**

**Remedy**

- Remove rust with #100 sandpaper before reuse.

**O-Rings**

**Trace of slipping**

26



**DO NOT USE AGAIN**

**Failure sign**

- Slipping

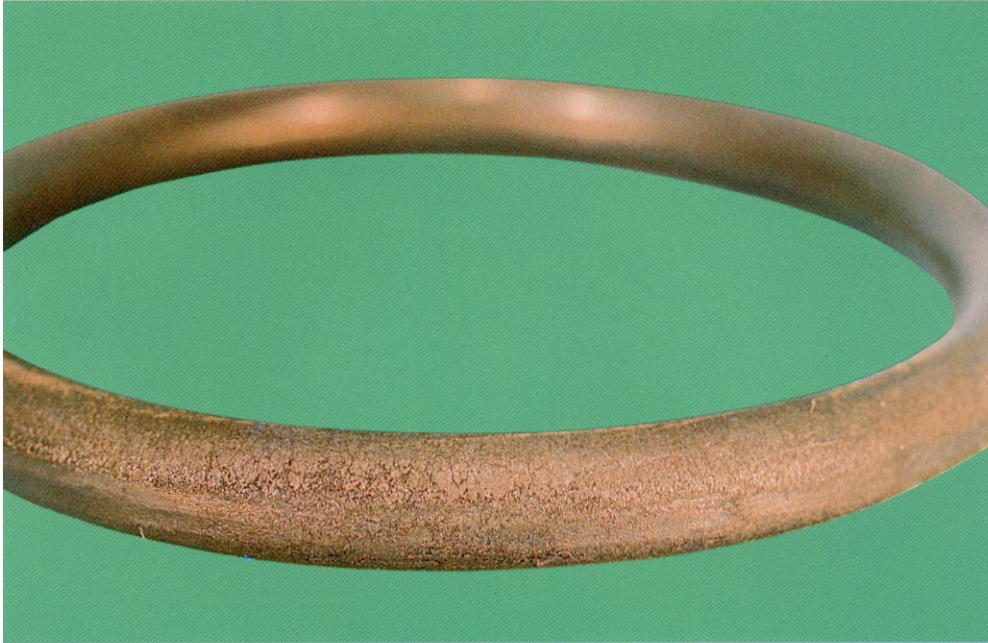
**Cause**

- Oil adhesion on O-ring surface or seizure of the sealing surface



**Cracks and discoloration**

27



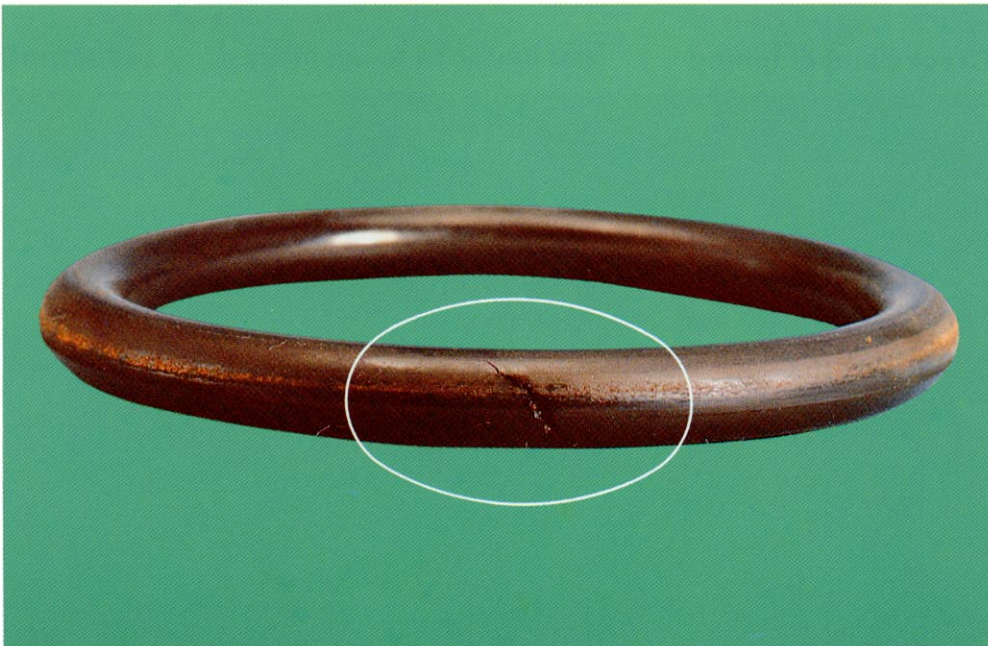
**DO NOT USE AGAIN**

**Cause**

- Secondary phenomenon caused by heat generated at the sealing surface or bearing surface.

**Cracks**

28



**DO NOT USE AGAIN**

**Cause**

- Stone or other sharp matter.



# REPRESENTATIVE FLOATING SEAL FAILURES

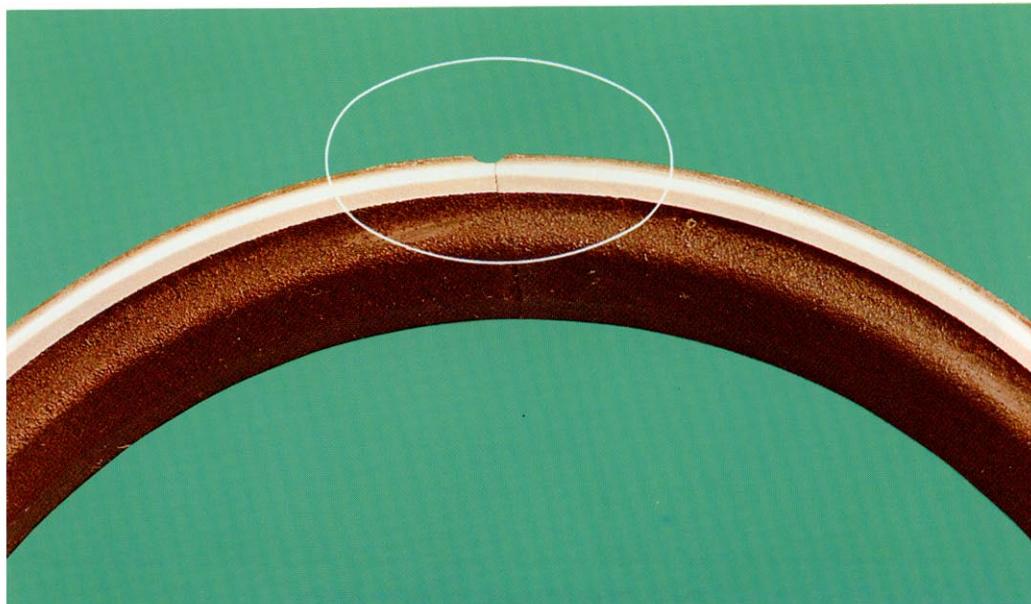
## Seal Ring Early wear



### Cause

- These are many  $\text{SiO}_2$  particles in soil.

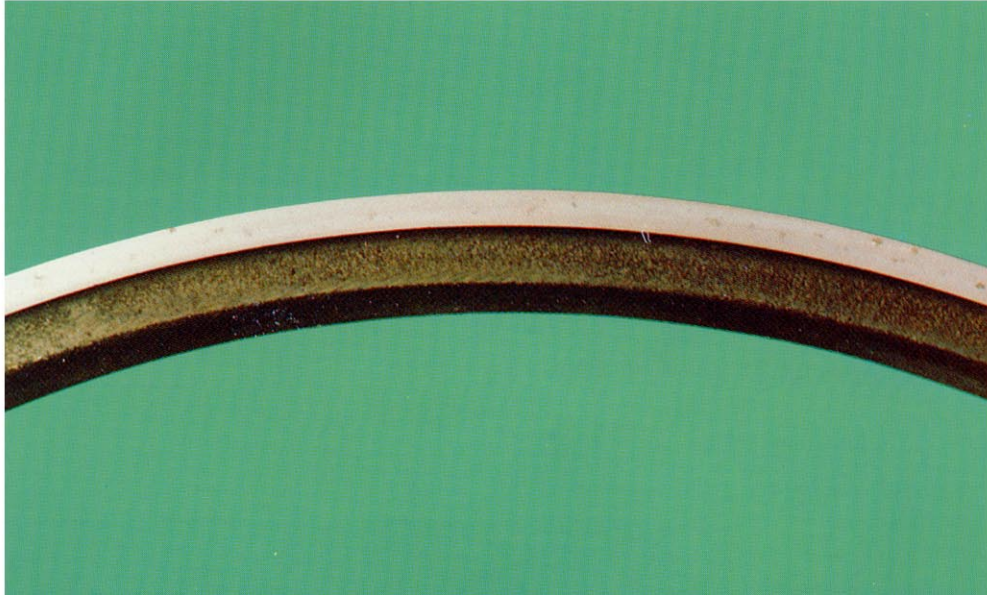
## Cracks and chipping



### Causes

- Soil adhesion where seal contacts O-ring, resulting in excessive surface pressure.
- Chewing of stones

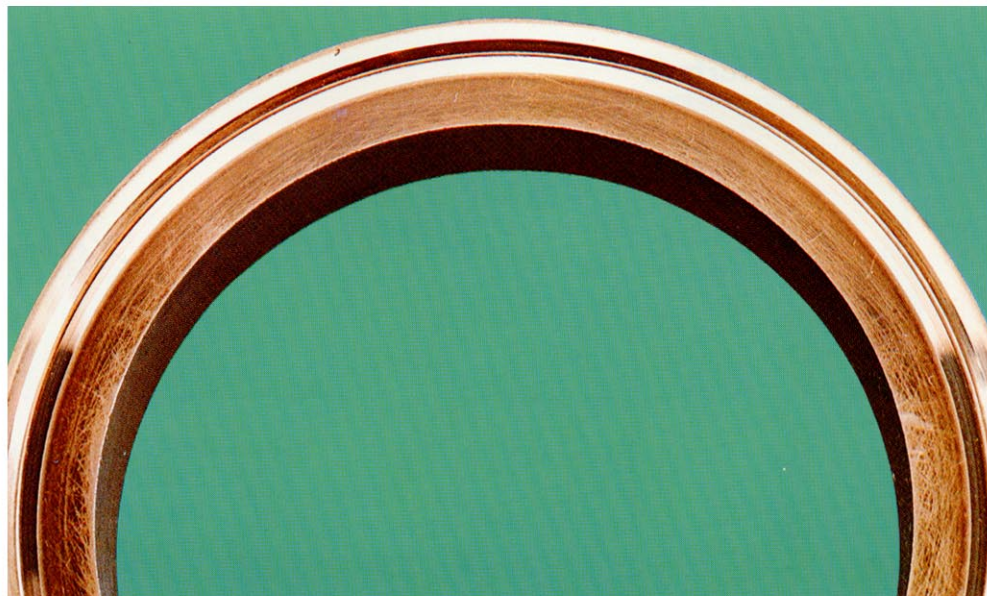
### Peeling and pitting



#### Cause

- Excessive surface pressure

### Contact at both surfaces of grooved seal

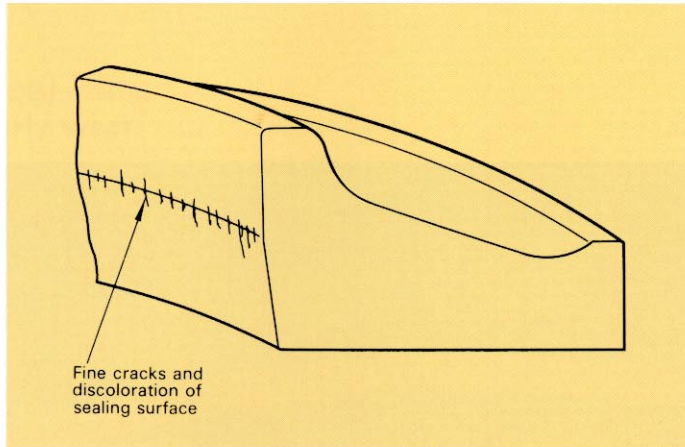


#### Cause

- Machining defect.



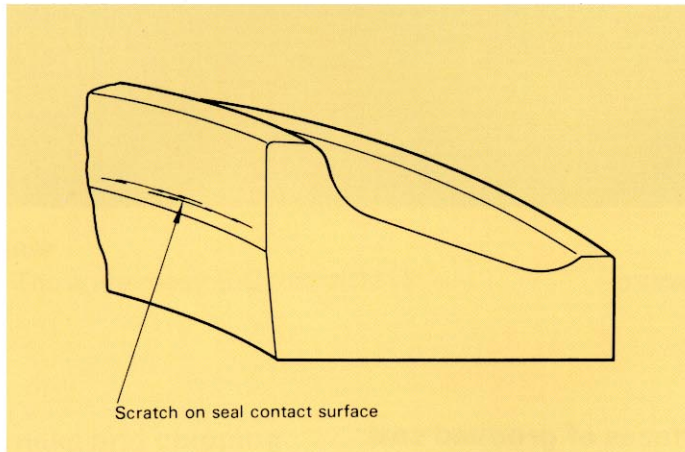
### Discoloration on Sealing Surface



#### Causes

- Sealing surface seizure caused by excessive surface pressure.
- Insufficient lubrication

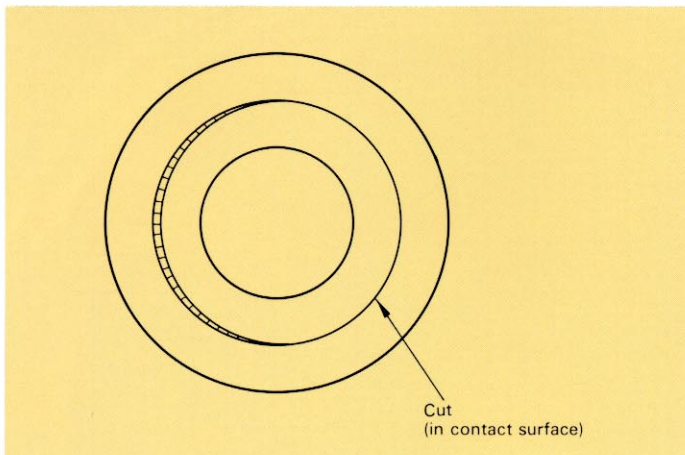
### Scratches or streaks on sealing surface



#### Cause

- Chewing of soil resulting in soil accumulation, causing the ring to get out of flush.

### Cut in contact surface



#### Causes

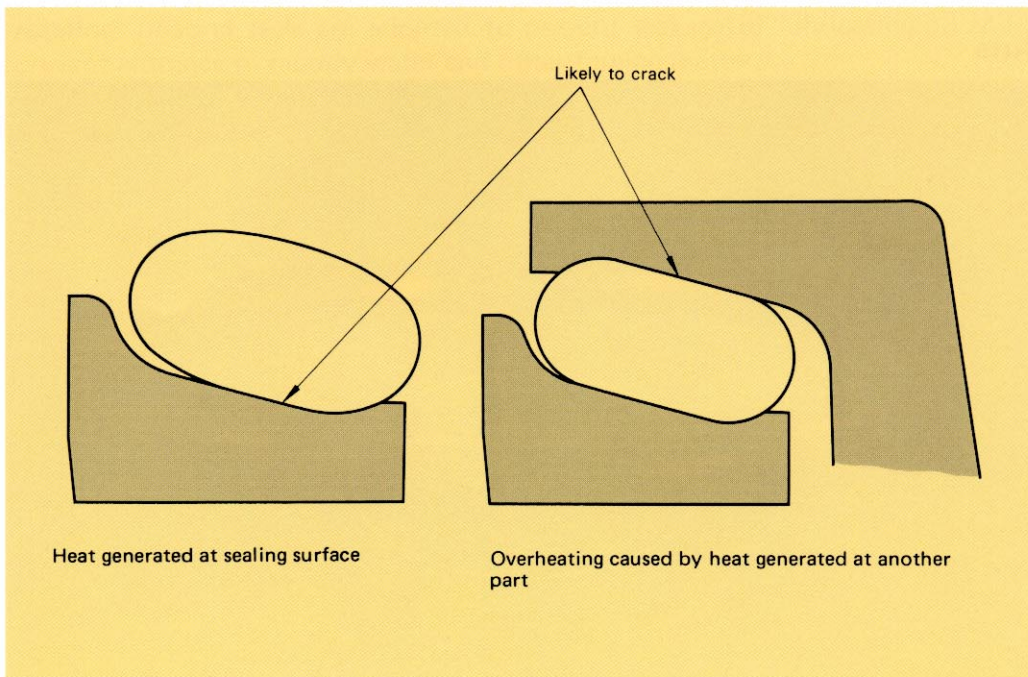
- Misalignment of both housing centers.
- Improper installation.

## O-ring Cracks



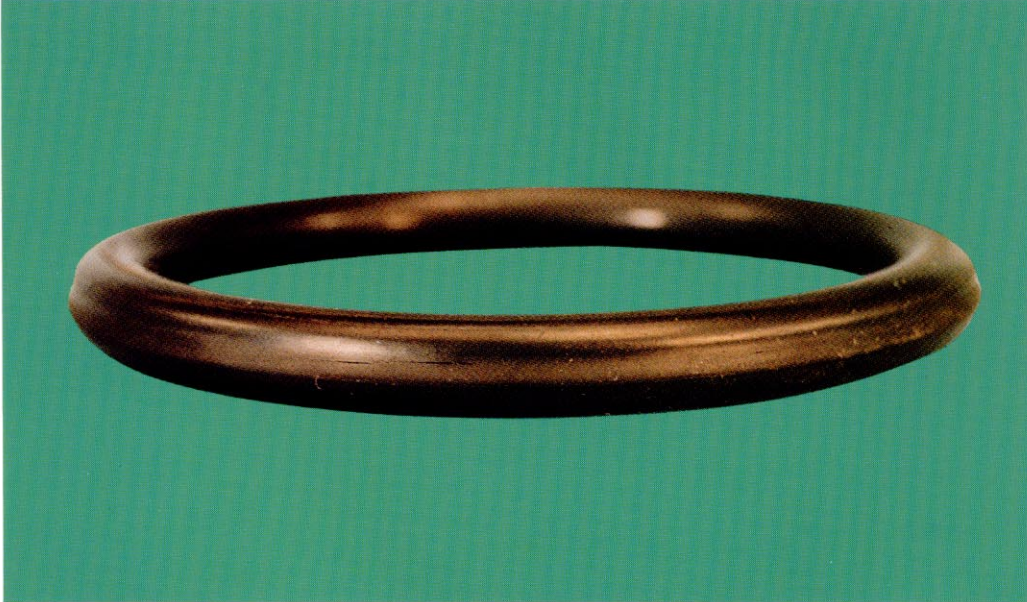
### Causes

- Heat generated at sealing surface by excessive surface pressure or insufficient lubrication
- Overheating caused by heat generated at other parts, such as bushing.





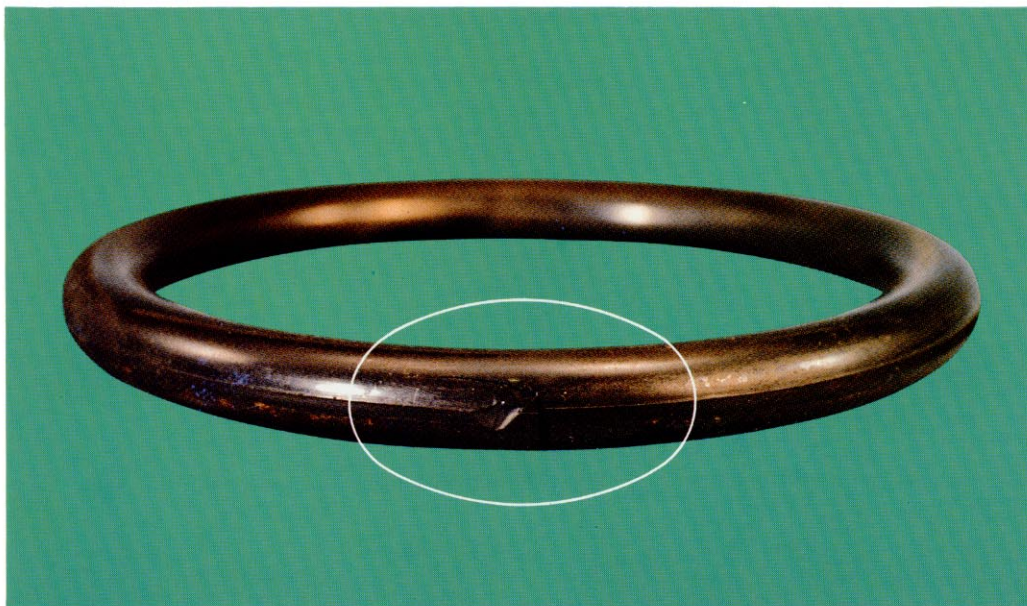
### Traces of slipping



#### Causes

- Slipping of O-ring caused by seizure at the sealing surface
- Slippery O-ring contact surface lacking sufficient roughness.
- Adhesion of oil or grease

### Cuts



#### Causes

- Adhesion of dry soil and seal rotation
- Chewing of sharp stones and rotation

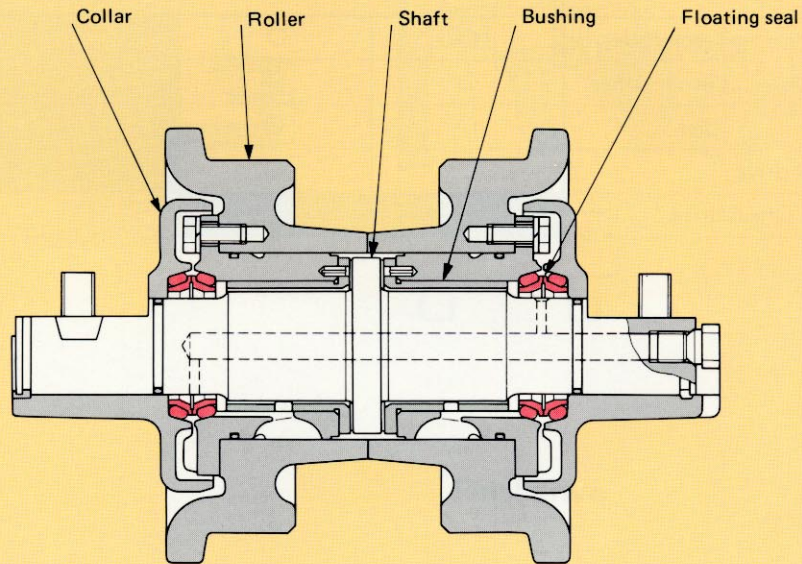


# BASICS

## Construction and Function

### Track rollers

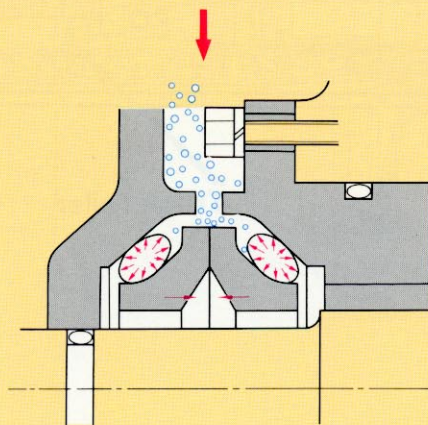
Track roller sectional drawing



Since the track roller is usually covered with muddy water and/or soil while rotating, floating seals are adopted to prevent leakage of lubricating oil and to prevent entrance of muddy water and other foreign matter.

The floating seal consists of two O-rings and two metal seal rings. O-rings are squeezed with a twist. Because of the elasticity of the O-ring, the metal seal rings are thrust towards the shaft so that a pressure of 3.5 to 6 kg/cm<sup>2</sup> acts at the sliding contact surface of the seal.

Structure of Floating Seal

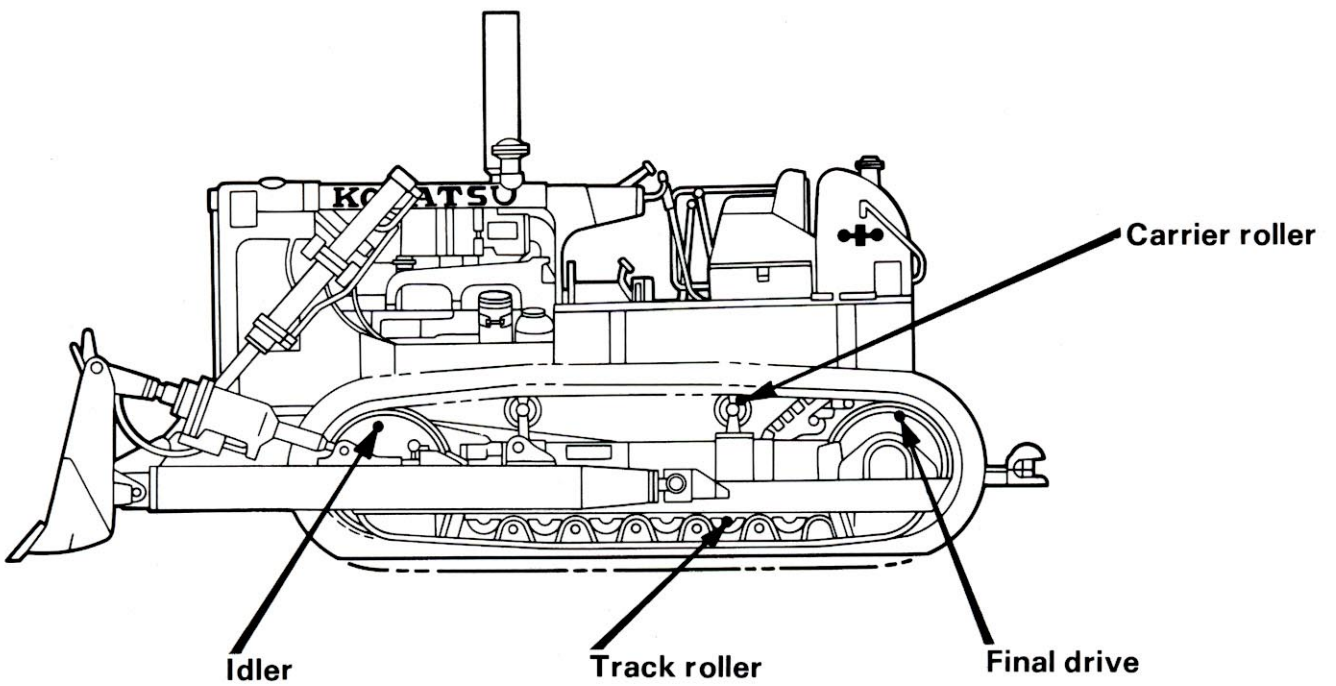




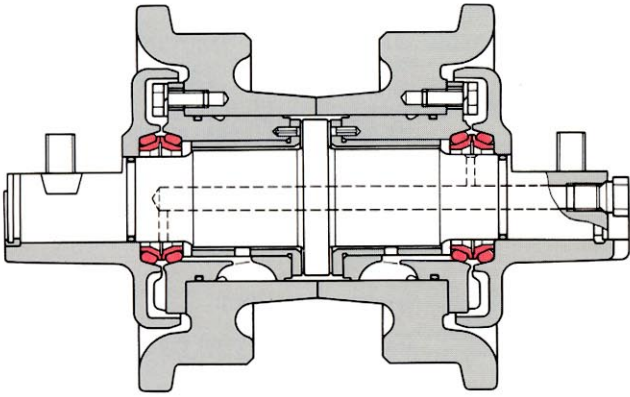
## Examples of Use

Places where the floating seals are used.

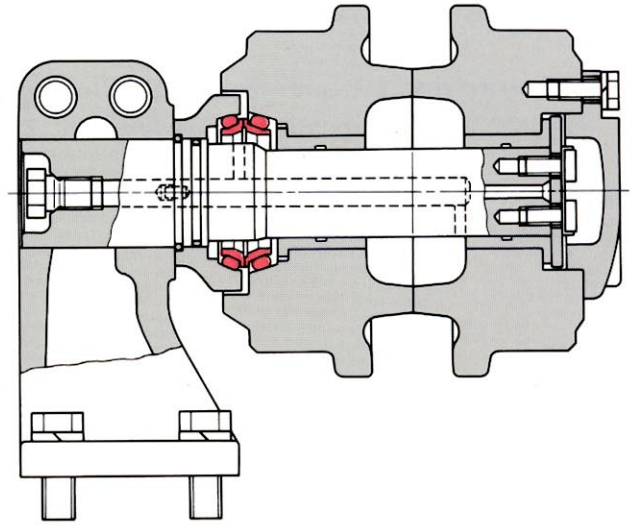
Unit \ Machine type		Bulldozer	Hydraulic excavator	Dump truck	Motor scraper
Under carriage	Track roller	○	○		
	Carrier roller	○	○		
	Idler	○	○		
Final drive		○	○		
Rear wheel drive				○	○



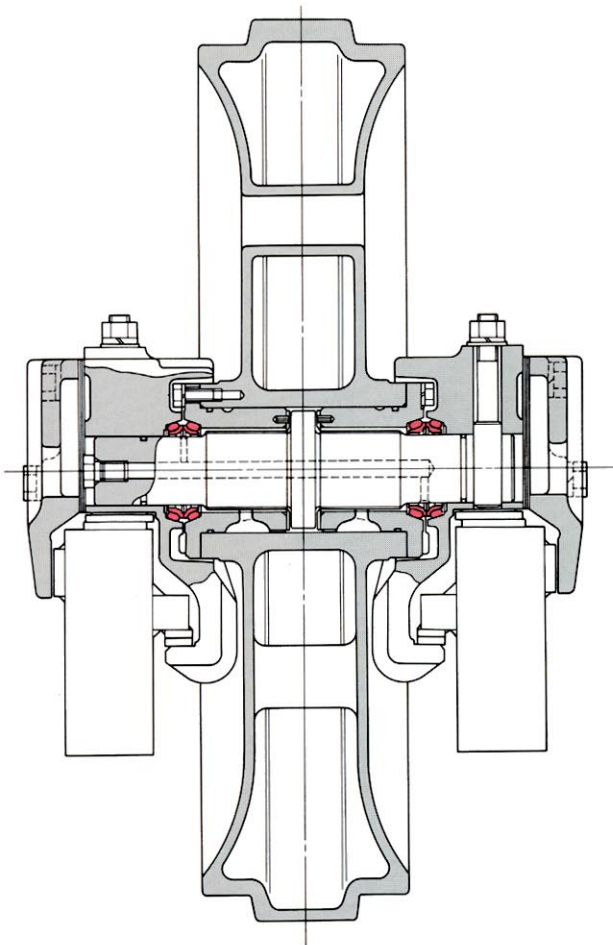
**Track roller**



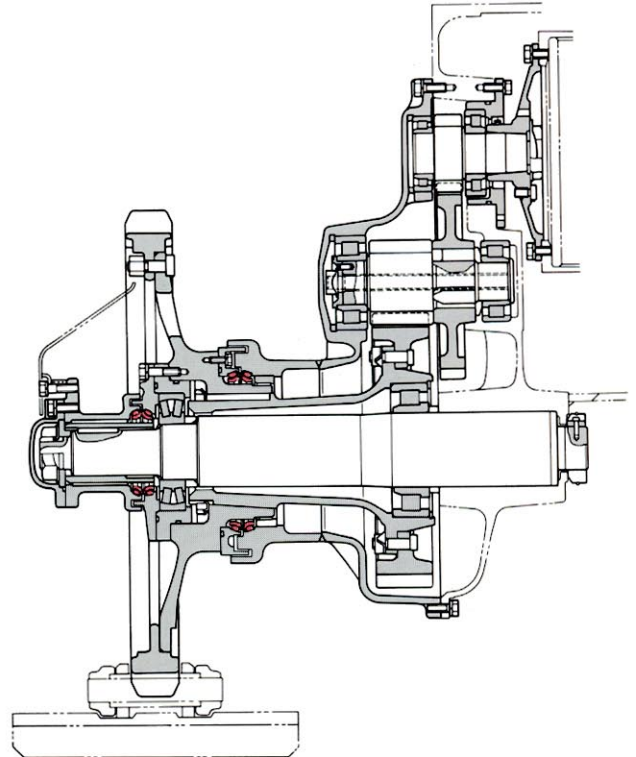
**Carrier roller**



**Idler**

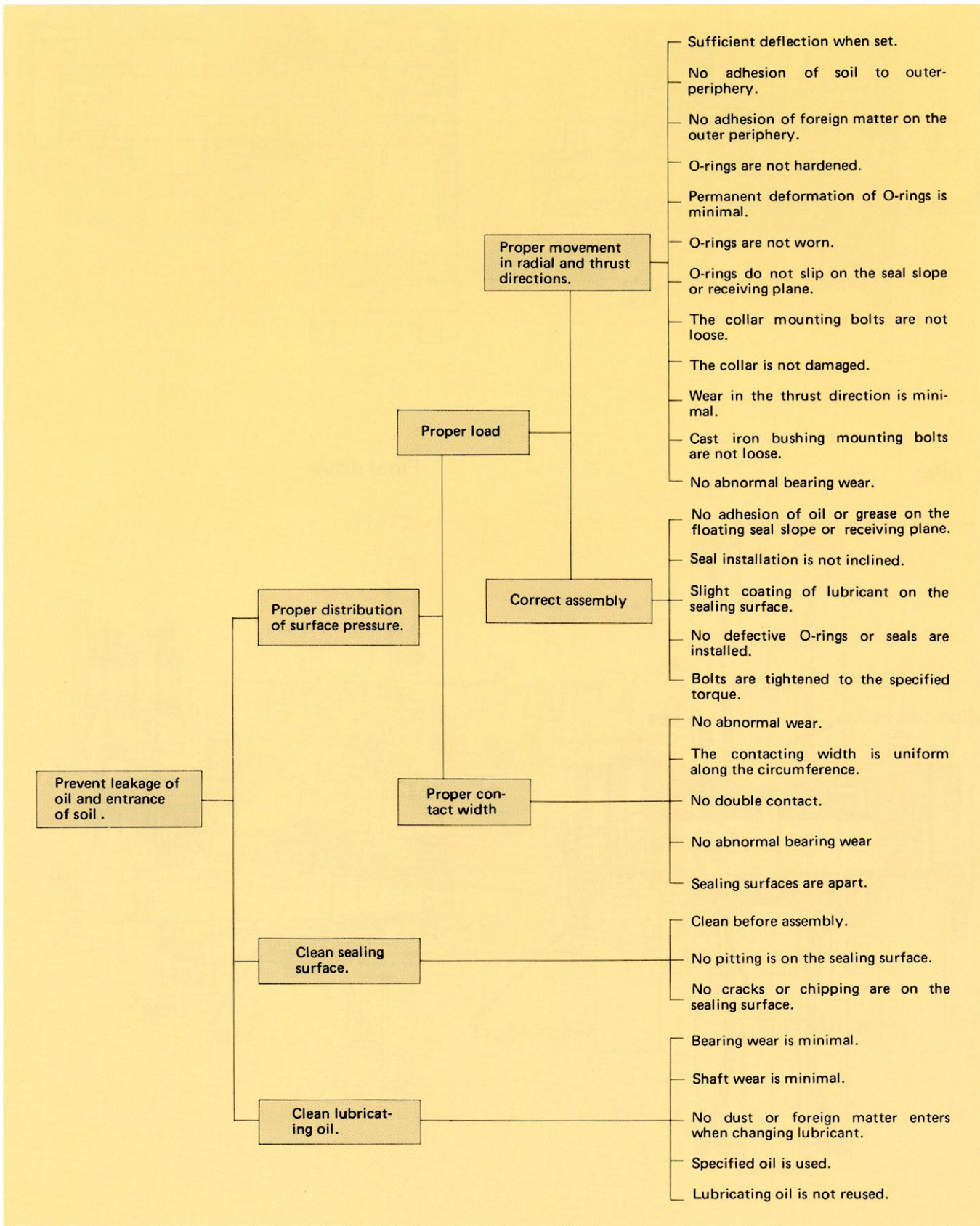


**Final drive**





## Floating seal functional diagram



## Material

Special cast iron and rubber are used for the floating seal. Seal rings are heat-treated to increase resistance to wear and heat. Ultra-fine finishing ensures that the sliding contact surface is airtight.

The rubber is different subject to ambient temperature where machine is used.

# PREVENTIVE MAINTENANCE

Always be aware of the machine condition, especially leakage, oil consumption, and heat generation, in order to maximize performance by preventing machine failure before it develops.

The maintenance described in the operation manual will prevent most failures, but advise customers of the following matters:

- Always inspect for oil leaks before operating machine
- Use genuine Komatsu lubricants and observe the specified replacement intervals.
- For oil supply and replacement at rollers in the undercarriage, use the following tool:

Tool name: Lubricator

Part number: 791-646-8002



\* See the Service Tool Guide for the tool handling procedure.



