

# SHOP MANUAL



## **GUIDANCE FOR REUSABLE PARTS**

### **LUBRICATED TRACKS (II)**



GUIDANCE FOR REUSABLE PARTS  
**KOMATSU**

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### **Application of this Guide**

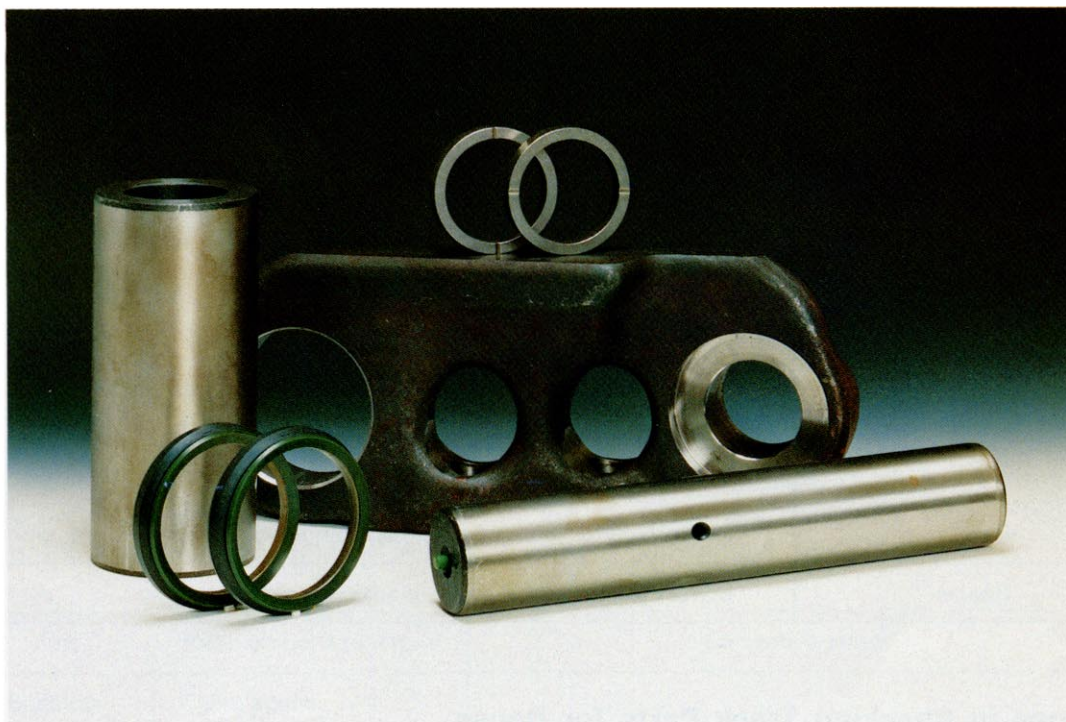
This Guidance for Reusable Parts Manual is applicable to the sealed & lubricated track fitted with F3 type seals.

# INTRODUCTION

This GUIDANCE FOR REUSABLE PARTS describes through photos the methods of checking track links, bushings, seals, spacers, pins, etc. for failures and the criteria for their reuse. It also gives fundamental information about various parts of sealed & lubricated tracks and the causes of their failures.

LUBRICATED TRACKS has already been issued under FORM NO. SEBG4090, but since it was issued, there have been further improvements in the seals for large equipment (W7 TYPE SEAL → F3 TYPE SEAL). For this reason, we have published a new Guidance for Reusable Parts Manual for sealed & lubricated track fitted with F3 type seals.

We hope that this guide will help you become familiar with the ways of correctly identifying the causes of failures and their repair. This will contribute to overall customer satisfaction through the reduction of customer's operating and repair costs and extension of the track life.



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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 sealed and lubricated track components.

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# FAILURE SIGNS AND DIAGNOSIS FOR REUSE

## Inspection Points for Parts Reuse Diagnosis

In order to correctly determine whether or not faulty parts can be reused, it is necessary to clean the track thoroughly before disassembling the track links. When disassembling the track links, check them for lube oil. When checking the following track parts, pay special attention to the inspection points indicated.

Part	Inspection point
Seal	Sealing surface for wear, damage, deterioration and roughness. Seal for deformation. Load ring for damage
Bushing	End surfaces for wear. R (at corners) for wear, cracks, breakage, corrosion, etc.
Link	Load ring for wear in its contacting surface with the line. Link for wear in its contacting surface with the bushing.
Pin	Pin surface for stepped wear, scraping, etc. Ends of pins for wear
Spacer	Spacer for corrosion, wear, cracks, breakage, etc.

## Precautions in Checking Track Parts for Reuse

- i) If there is no lube oil when the track is disassembled, the seals and bushings cannot be reused in an "Oil turn".
- ii) When inspecting seals and links, leave seals installed in links.
- iii) Always clean pins, bushings and spacers before inspecting them.
- iv) Take care in handling and storing seals and bushings so that their surfaces will not be impaired.
- v) Ordinarily, not all load rings need to be checked for wear of the external surface. Check only the rings whose seals were taken out of place just after the seals are re-installed on the links.

## Basic Judgement Categories

The judgement standards for reuse of disassembled parts are divided into the following three ranks according to the degree of damage.

Rank	Failure degree
<b>Use again</b>	The present track can be reused without functional problems by turning and using as a sealed & lubricated track. The present track failure will not cause secondary trouble.
<b>Use after reconditioning</b>	The present track can be reused for a while without functional problems by turning and using as a sealed & lubricated track. However, continued use of the track will make it unfit to perform as a sealed & lubricated track. Consequently, the track can be reused if reconditioned.
<b>Do not use again</b>	The present track cannot be reused because it is likely to cause troubles if used as a sealed & lubricated track.

\* To determine the degree of normal wear, refer to the maintenance standards in the applicable Shop Manual.

## Judgement Categories According to the Method of Turning

When reusing tracks, the judgement standards for reuse of parts obviously differ depending on whether an "oil turn" or a "grease turn" is used. With an "oil turn", because of the need for sealing the oil, the parts that are reused must have the same precision and surface condition as new parts, but for a "grease turn", this high degree is not needed. Therefore, even with the same condition of damage, the judgement will differ according to whether an "oil turn" is to be carried out or a "grease turn".

Any part that is reusable for an "oil turn" is also reusable for a "grease turn", and in many cases, parts which are not reusable with an "oil turn" can still be reused with a "grease turn". It may also be possible to make parts reusable by repairing them. However, there are also cases where the track cannot be used even for "grease turn", so it is necessary to be careful when making judgement.

## Precaution for Determining the Reusability of Parts

When either bushings or seals must be replaced with new ones, replace their mating parts with new ones at the same time. However, if the bushings are only very slightly worn on the end faces, the seals may be replaced without using new bushings.

Part	Rank of individual part	Corrective action
Bushing	<b>Use again</b>	Use the bushing and seal again as the same set.
Seal	<b>Use again</b>	
Bushing	<b>Use again</b>	Use the bushing again and replace the seal only.
Seal	<b>Do not use again</b>	
Bushing	<b>Do not use again</b>	Replace both the bushing and seal with new ones.
Seal	<b>Use again</b>	

## Standard for Reuse of Track Parts

To determine the reuse of track parts, refer to the standards below. When two or more failures occur at the same time, the reusability of the faulty parts should be determined with reference to the highest degree of seriousness of failure. [For example, when the reusability of two failures is judged to be "Use Again" and "Do not use again", give higher priority to "Do not use again" and its corrective action].

Part name	Type of failure	Failure degree for oil turn			Reusability as grease turn	
		Use again	Use after reconditioning	Do not use again		
Seal	1	Pressure of lube oil	Lube oil remains	—	No oil remains <b>1</b>	<b>Use again</b>
	2	Presence of wear tolerance when disassembling	Wear tolerance remains	—	Wear tolerance does not remain <b>2</b>	<b>Use again</b>
	3	Flaw on the sealing surface	Flaw outside from seal position, flaw at lip <b>3</b>	—	Slight flaws inside the sealing position <b>4</b>	<b>Use again 3</b> <b>Use after reconditioning 4</b>
	4	Wear on the external surface or flaw of the load ring	Slight wear, flaws <b>5</b>	—	Serious wear, flaws <b>6</b>	<b>Use again</b>
	5	Oil stuck to rear face of seal ring	No oil stuck	Oil stuck <b>7</b>		<b>Use again</b> <b>Use after reconditioning 7</b>
Bushing	★ 1	Presence of lube oil when disassembled.	Lube oil remains	—	No oil remains <b>8</b>	<b>Use again</b>
	2	Abnormality of seal groove on end surface	Wide and deep seal groove <b>9</b>	—	—	<b>Use again</b>
	3	Corrosion of end surface	Corrosion outside the seal position <b>10</b>	—	Slight corrosion inside the seal position <b>11</b>	<b>Use again</b>
	4	Flaw or damage on end surface	Fine scratches <b>12</b>	—	Slight damage, scores, etc. <b>13</b>	<b>Use again</b>
	5	Cracks on end surface	Hair crack, barely identified by visual inspection	—	Distinct cracks <b>14</b>	<b>Use again</b>
Spacer	1	Cracks, damage (breakage)	Slight damage <b>15</b>	—	Marked damage, cracks <b>16 &amp; 17</b>	<b>Use again 15</b> <b>Do not use again 16 &amp; 17</b>
	2	Wear on end surface	Oil groove remains on worn surface <b>18</b>	—	Oil groove is gone because of wear <b>19</b>	<b>Use again</b>
	3	Corrosion	Slight corrosion <b>20</b>	Marked corrosion <b>21</b>	—	<b>Use again</b>
	4	Scores, dents, etc. on end surface	Scores or dents on end surface <b>22</b>	—	—	<b>Use again</b>
	★ 5	Burrs on end surface	—	Burrs on end surface <b>23</b>	—	<b>Use again</b>

Note: Bold numbers refer to photos in the text.

Part name	Type of failure	Failure degree for oil turn			Reusability as grease turn	
		Use again	Use after reconditioning	Do not use again		
Link	1	Wear of contacting surface with the load ring or on the bottom of the counterbore	With seal in place link cannot be turned by hand	—	With seal in place link can be turned by hand	Use again
	2	Bore is stretched (stepped surface)	Bore is extended due to wear <b>24</b>	—	—	Use again
	3	Burrs at bore bottom	—	Burrs at bottom of a bore where a pin is forced in place <b>25</b>	—	Use again
Pin	1	Flaking in the external surface	—	—	Pin has flaked surface	Do not use again
	2	Wear of external surface	Chafing but not stepped wear <b>26</b>	—	Stepped wear on pin is 2 mm max. (difference in stepped surface) <b>27</b>	Use again
	★ 3	Corrosion of the external surface or adherence of carbide	—	Corroded external surface or adherence of carbide <b>28 &amp; 29</b>	—	Use again
	★ 4	Clogged hole	—	Hole clogged with foreign substance <b>30</b>	—	Use again
	★ 5	Sharp edges at the end	—	Sharp edges formed on the ends <b>31</b>	—	Use after reconditioning
	★ 6	Sharp edges at the vertical hole	—	Sharp edges formed on the vertical hole <b>32</b>	—	Use again
	★ 7	Protrusion around the hole into which the pin is forced.	—	Protrusion, burrs, etc. are around the hole for pin <b>33</b>	—	Use after reconditioning

Note: Bold numbers refer to photos in the text.

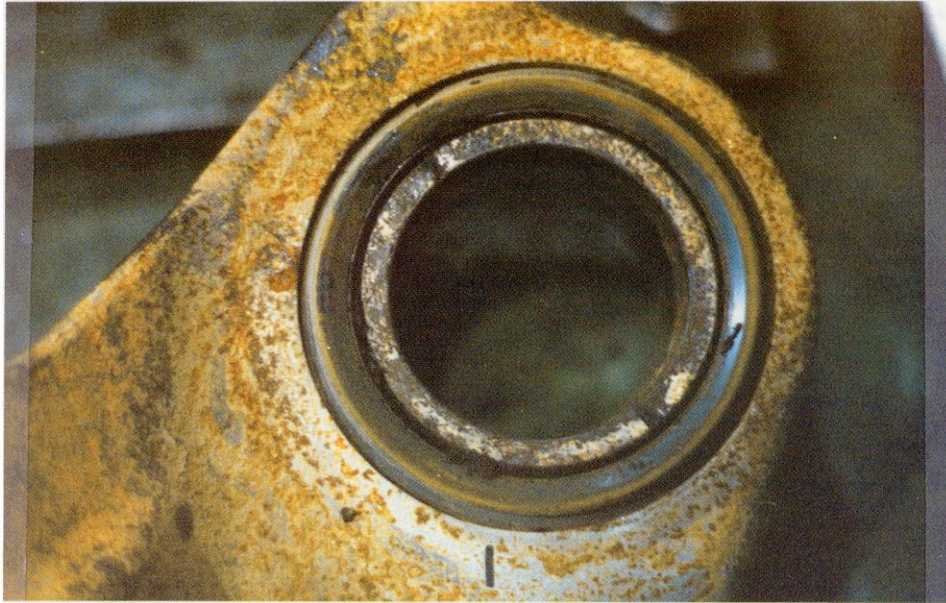
### Precautions When Judging Reusability of Parts

- i) Make judgement on the seals and links with the seal still fitted to the link.
- ii) As a rule, make judgement on pins, bushing, and spacers after washing these parts, but for items marked ★, the judgement should be made before cleaning.
- iii) The seal lip surface and bushing end face are extremely easy to scratch, so be very careful when handling or storing them.

## Failure Signs and Diagnosis for Reuse Seals

No Lube oil remains when a seal ass'y is disassembled

1



**DO NOT USE AGAIN**  
(Oil turn)

**USE AGAIN**  
(Grease turn)

### Failure Sign

Dirt or dust has already entered this seal ass'y, resulting in the damaged seal surface. If no oil is retained between the bushing and seal when the seal ass'y is disassembled, it cannot be reused for an "oil turn", even though it seems to have no failure.

No wear tolerance remains when part is disassembled

2



**DO NOT USE AGAIN**  
(Oil turn)

**USE AGAIN**  
(Grease turn)

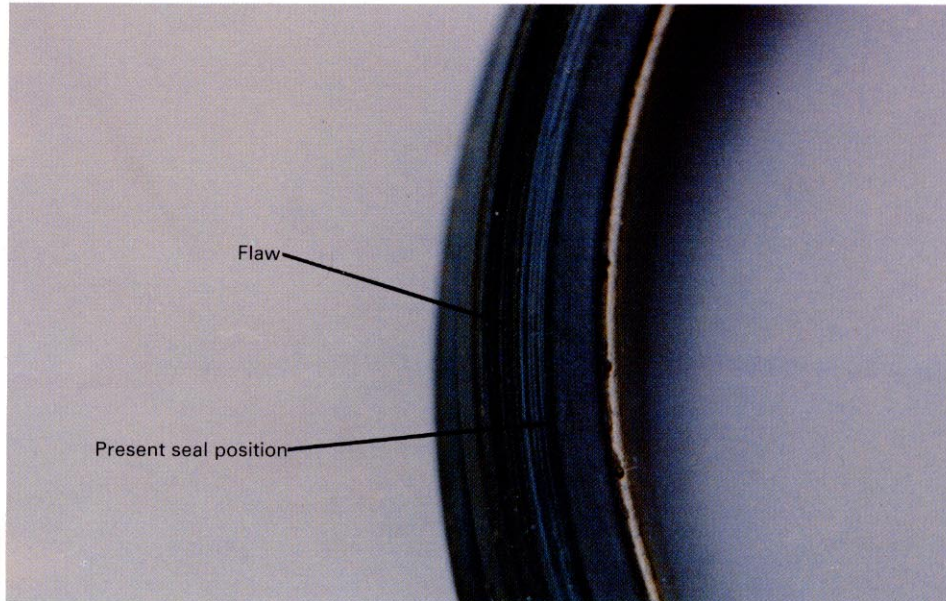
### Failure Sign

There is no wear tolerance remaining on the seal. Even if oil is remaining, it cannot be reused with an "oil turn".



**Flaw in the seal surface (slight flaw located outside the present seal position)**

**3**



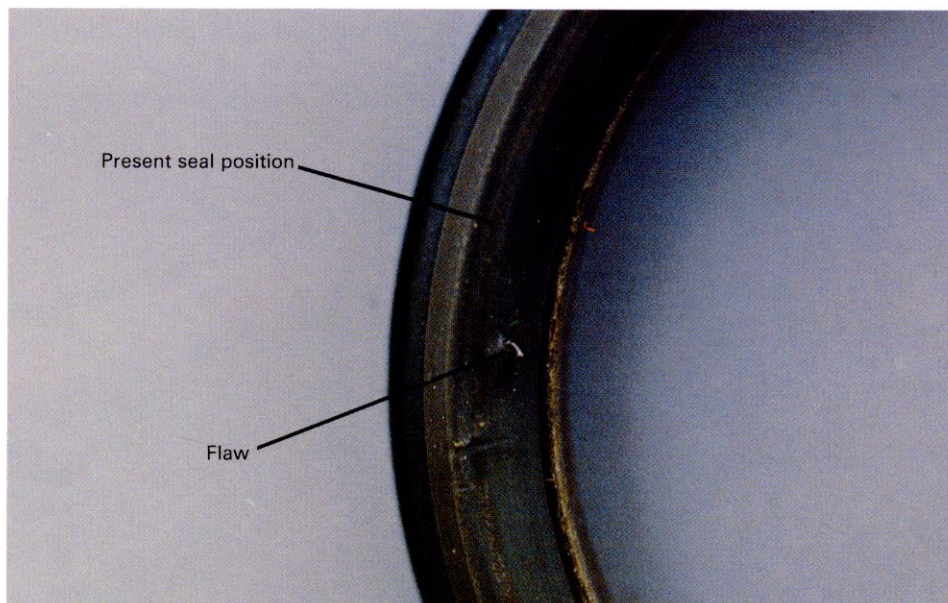
**USE AGAIN  
(Oil turn & Grease turn)**

**Failure Sign**

Chafing is on the seal lip but located outside the present seal position.

**Slight flaw in the seal surface  
(flaw located inside from the present seal position)**

**4**



**DO NOT USE AGAIN  
(Oil turn)**

**USE AFTER RECONDITIONING  
(Grease turn)**

**Failure Sign**

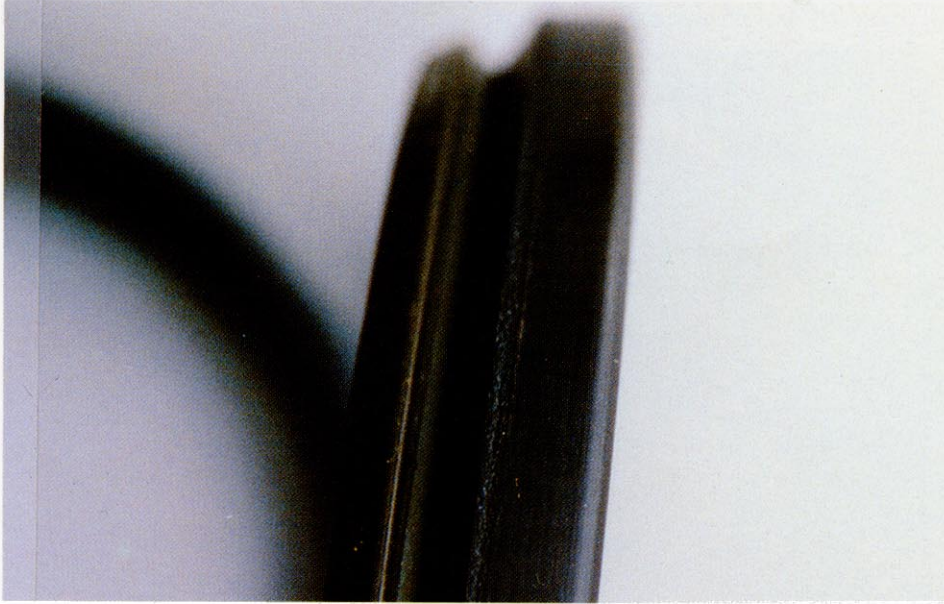
There is a flaw on the inside from the present seal position.

**Reconditioning Method**

If the metal particles are removed, it is possible to use it for a "grease turn".

**Slight wear on the external surface of a load ring**

**5**



**USE AGAIN**  
**(Oil turn & Grease turn)**

**Failure Sign**

There is slight wear on the outside circumference of the load ring. This amount of wear presents no problem.

**Serious damage to load ring**

**6**



**DO NOT USE AGAIN**  
**(Oil turn)**

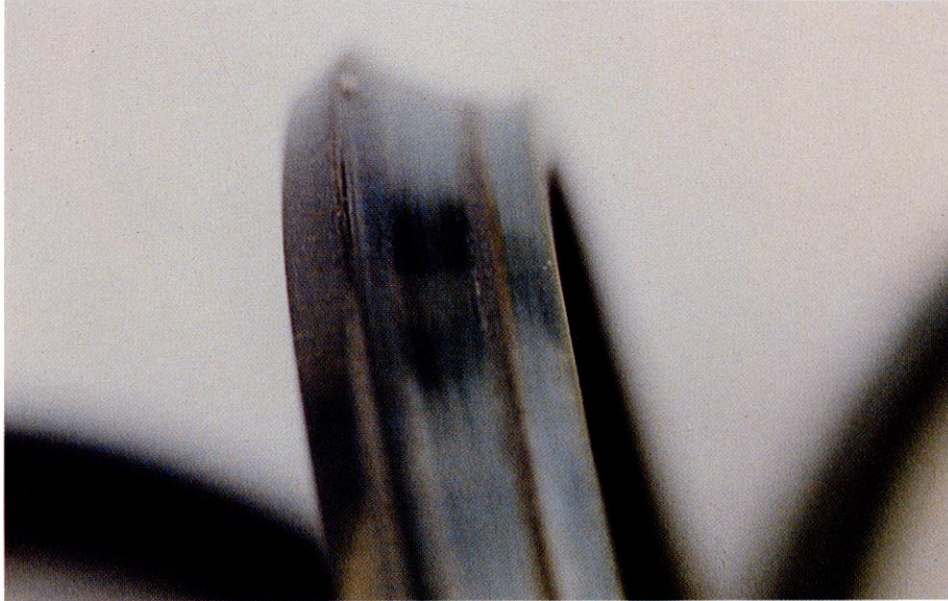
**USE AGAIN**  
**(Grease turn)**

**Failure Sign**

There is serious damage to the load ring. This cannot be used with an "oil turn". The same applies if there is any excessive wear.

**Small amount of oil stuck to rear face of seal ring**

**7**



**USE AFTER RECONDITIONING  
(Oil turn & Grease turn)**

**Failure Sign**

Oil is stuck to the contact portion of the seal and load ring, but this amount of oil presents no problem.

**Reconditioning Method**

If there is oil stuck to the rear face of the seal ring, wash in a clean fluid (triethane, etc.) until the condition is as shown in the photograph above.

When doing this, be careful not to scratch the seal. Furthermore, the seal is likely to deteriorate when cleaning fluid is used, so wash it quickly and wipe off all the cleaning fluid with a cloth after washing.

## Bushings

No oil remains on the bushing when disassembled

8



**DO NOT USE AGAIN**  
(Oil turn)

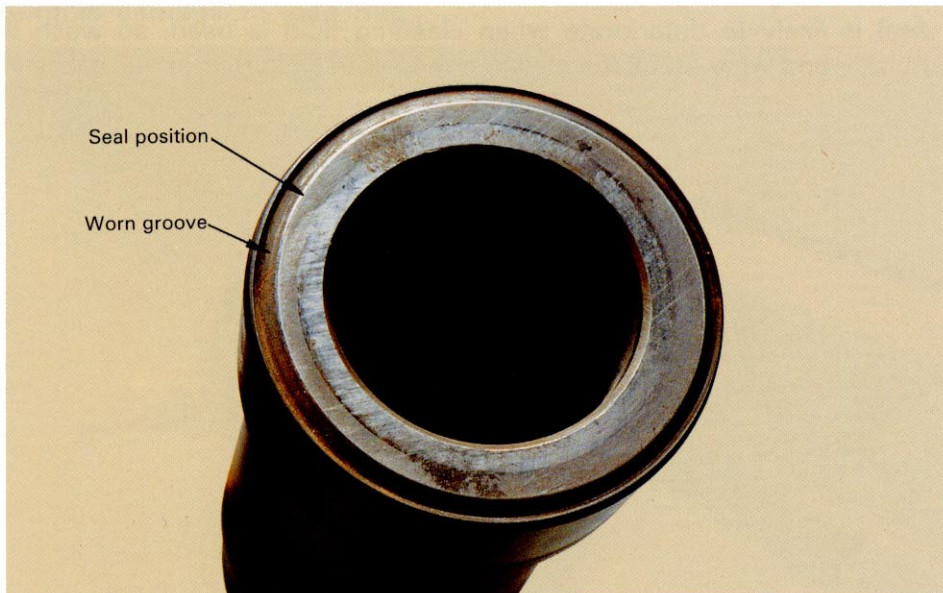
**USE AGAIN**  
(Grease turn)

### Failure Sign

Dirt and dust have already entered the bushing and caused flaws to its end surfaces. If the bushing has no oil left between the bushing and seal when disassembled, it cannot be reused in an "oil turn", even though it seems to be sound.

### Wide and deep worn groove

9



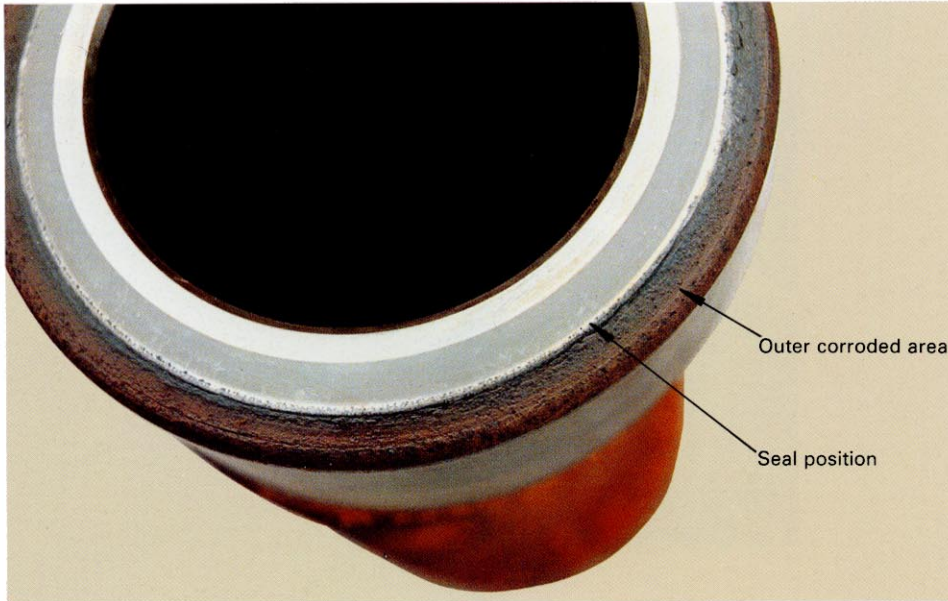
**USE AGAIN**  
(Oil turn & Grease turn)

### Failure Sign

Wide and deep worn grooves are on the bushing. The bushing can be reused in an "oil turn". Large worn grooves may occur depending on the type of soil. They are a form of ordinary wear.

**Corroded end surfaces  
(corroded areas are outside the present seal position)**

10



**USE AGAIN  
(Oil turn & Grease turn)**

**Failure Sign**

Corrosion have occurred on the end surfaces but the present seal position is inside the corroded areas. This is a form of ordinary corrosion.

**Corroded end surfaces  
(corroded areas are inside the present seal position)**

11



**DO NOT USE AGAIN  
(Oil turn)**

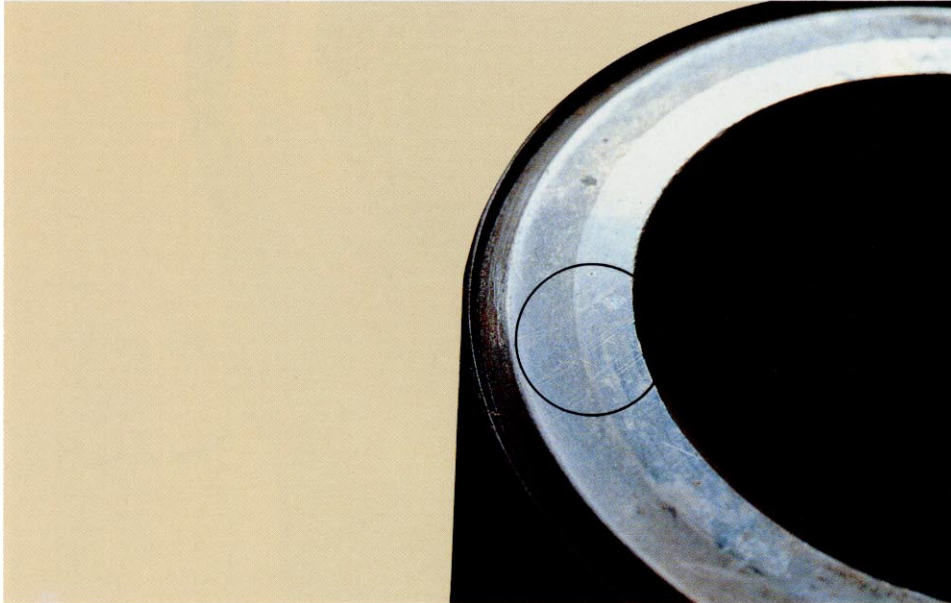
**USE AGAIN  
(Grease turn)**

**Failure Sign**

Corrosion are on the whole end surfaces. Corrosion located inside the seal position adversely affect the bushing. Thus, this bushing cannot be reused in an "oil turn".

**Scratches on the end surfaces (fine scuffing)**

**12**



**USE AGAIN**  
**(Oil turn & Grease turn)**

**Failure Sign**

Fine scuffing marks remain on the end surfaces. This flaw does not pose a special problem.

**Peeled end surfaces**

**13**



**DO NOT USE AGAIN**  
**(Oil turn)**

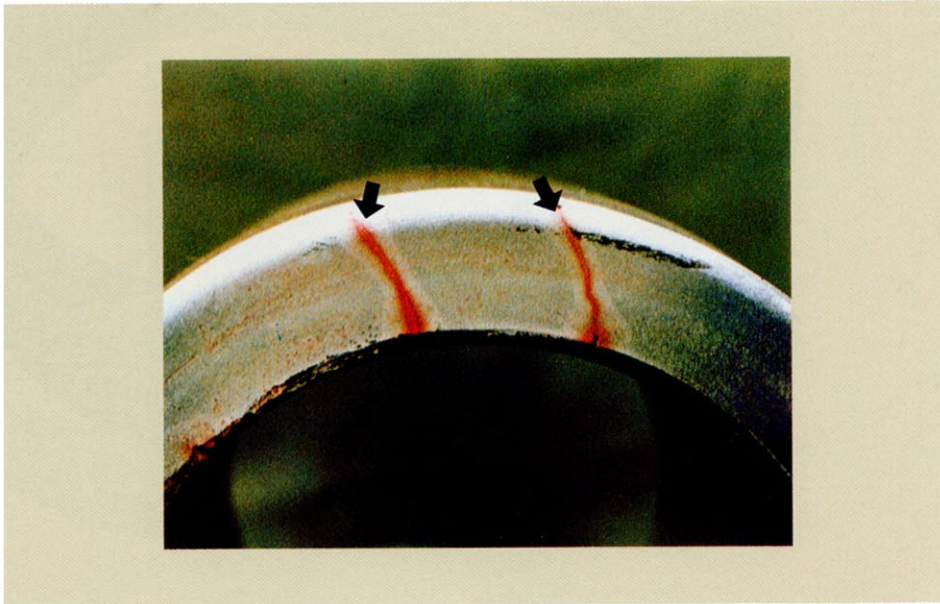
**USE AGAIN**  
**(Grease turn)**

**Failure Sign**

An end surface is partly peeled off.

**Cracks in the end surfaces (distinct cracks)**

**14**



**DO NOT USE AGAIN**  
(Oil turn)

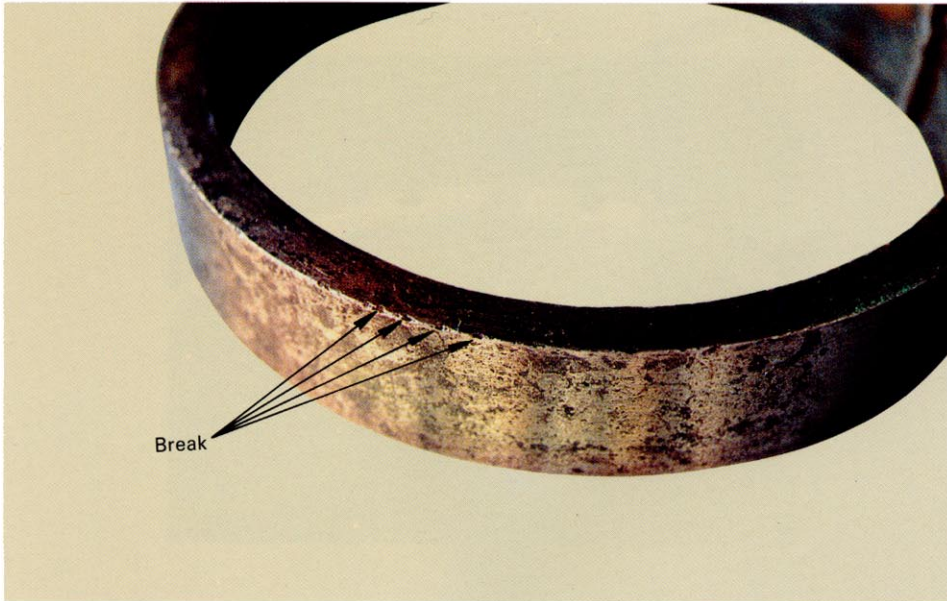
**USE AGAIN**  
(Grease turn)

**Failure Sign**

Distinct cracks are in the end surface.

**Spacers**  
**Breaks (slight)**

15



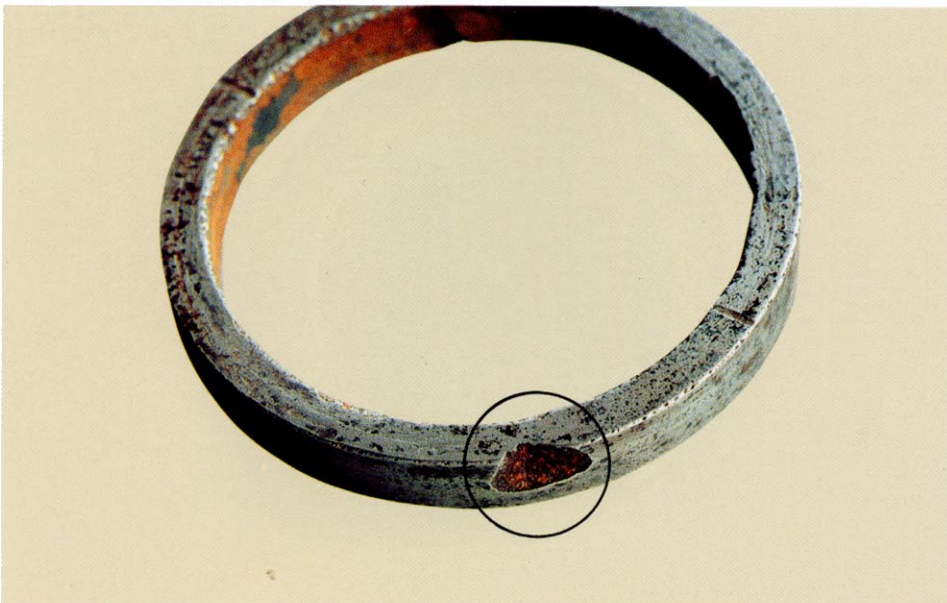
**USE AGAIN**  
**(Oil turn & Grease turn)**

**Failure Sign**

Slight degree of breaks have occurred at end surface corners.

**Break (large)**

16



**DO NOT USE AGAIN**  
**(Oil turn & Grease turn)**

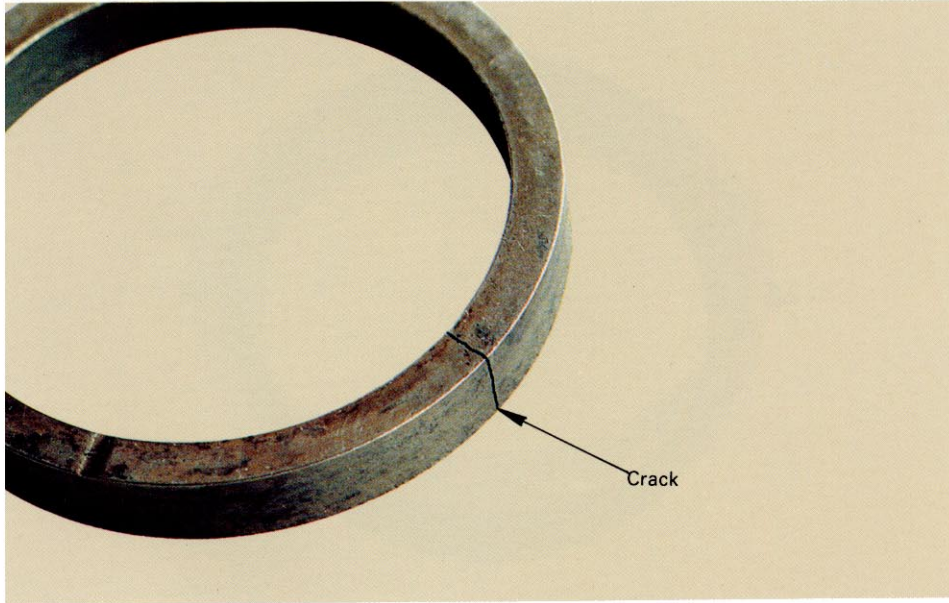
**Failure Sign**

Severe break has occurred at the end surface corner.



Crack

17



**DO NOT USE AGAIN**  
(Oil turn & Grease turn)

**Failure sign**

Distinct crack has occurred, making this spacer unusable.

**Wear of the end surface (but oil grooves still remain)**

18



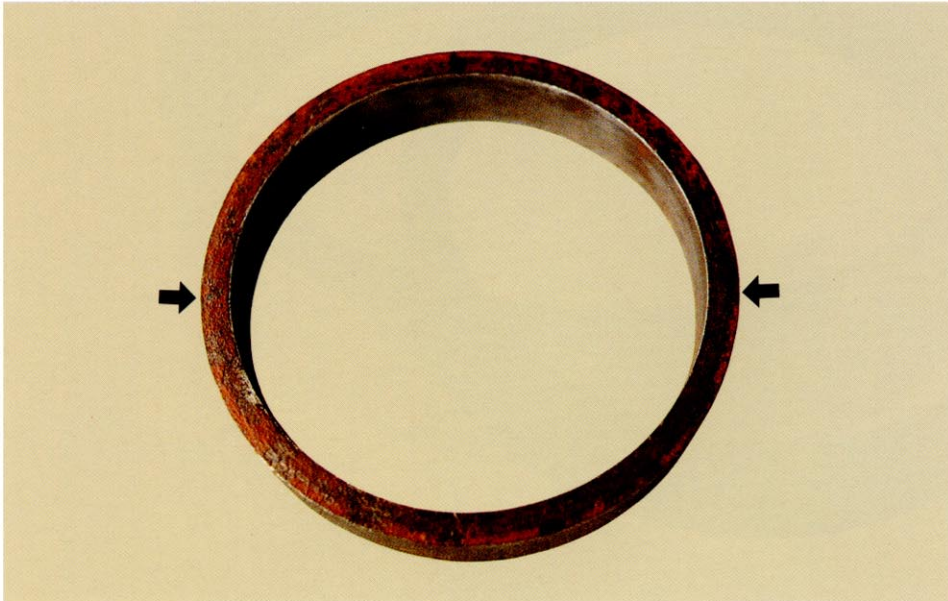
**USE AGAIN**  
(Oil turn & Grease turn)

**Failure sign**

Wear of the end surface is so slight that oil grooves still remain. This spacer can be reused in an "oil turn".

Wear of the end surface (oil grooves have been worn out)

19



**DO NOT USE AGAIN**  
(Oil turn)

**USE AGAIN**  
(Grease turn)

**Failure Sign**

Wear of the end surface has progressed so much that oil grooves have disappeared. This spacer cannot be reused in an "oil turn".

Corrosion (slight)

20



**USE AGAIN**  
(Oil turn & Grease turn)

**Failure Sign**

Slight corrosion have occurred on the end surface.

**Corrosion (large degree)**

21



**USE AFTER RECONDITIONING**  
(Oil turn)

**USE AGAIN**  
(Grease turn)

**Failure Sign**

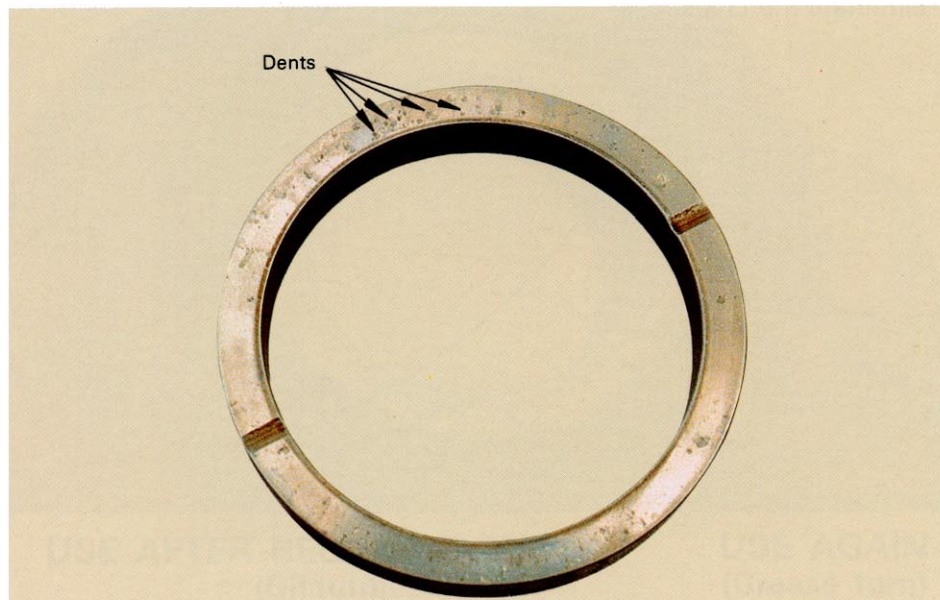
Corrosion have occurred on the whole end surface. This spacer cannot be reused in an "oil turn". To make this spacer reusable, take the following action.

**Reconditioning Method**

Remove the corrosion thoroughly from the surface with sandpaper and wash it to eliminate the chips.

**Dents on the end surface**

22



**USE AGAIN**  
(Oil turn & Grease turn)

**Failure Sign**

Dents are observed on the end surface. This spacer can be reused without reconditioning.

**Burrs on the end surface**

**23**



**USE AFTER RECONDITIONING**  
(Oil turn)

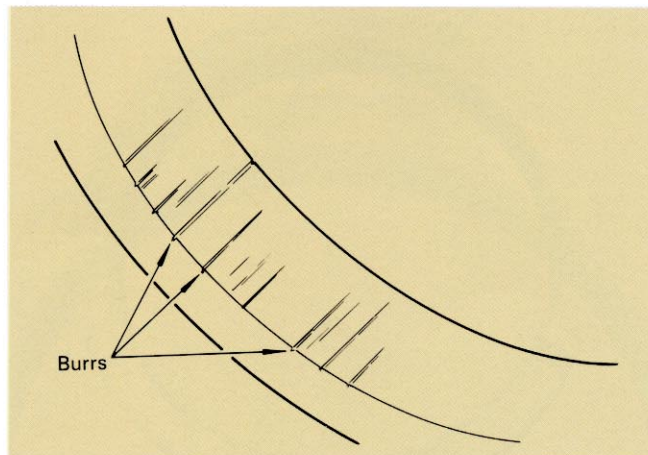
**USE AGAIN**  
(Grease turn)

**Failure Sign**

This spacer has burrs (due to scratches) on the I.D. side of the end surface. These scratches are caused by spacer scuffing due to the unsatisfactory centering of the link press jig at the link disassembly or by interference of the extrusion jig with the spacer due to excessive extension of the ram. A spacer left in this condition cannot be reused in an "oil turn". To make this spacer reusable, take the following action.

**Reconditioning Method**

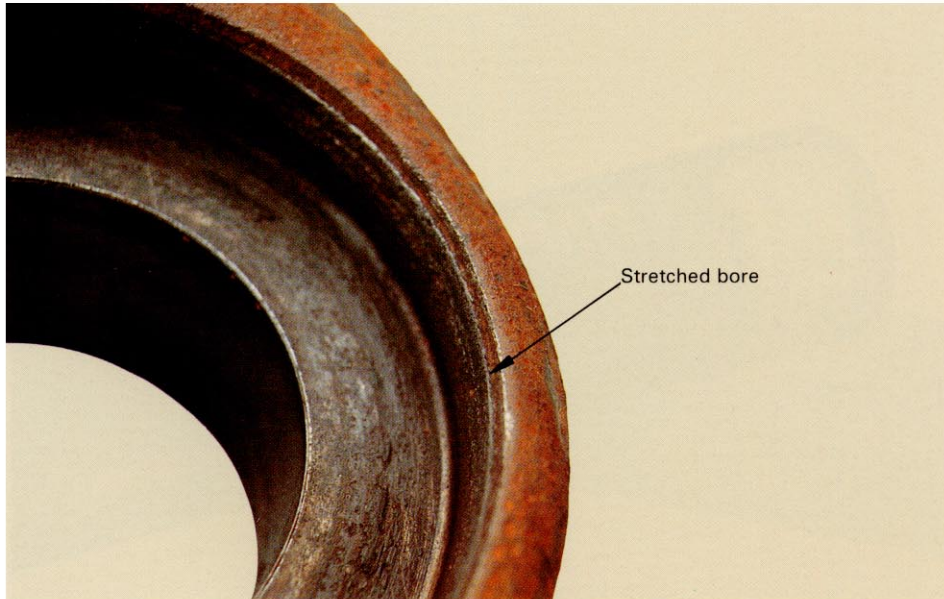
Remove the burrs on the end surfaces with an oil stone and wash it to eliminate the chips.



## Links

### Stretched (stepped) link bore

24



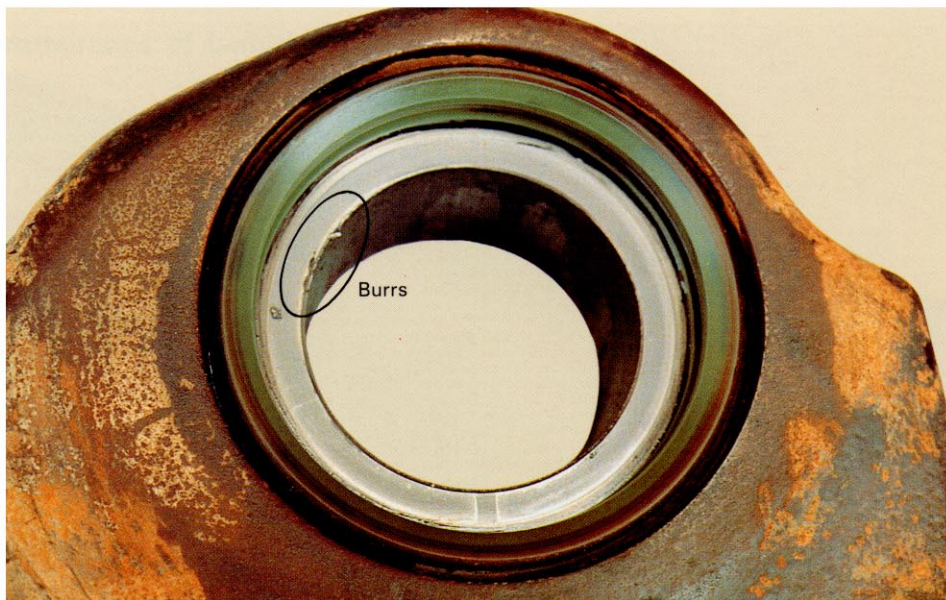
**USE AGAIN**  
(Oil turn & Grease turn)

#### Failure Sign

The link bore has been stretched (into a stepped condition) due to wear. This link can be reused without reconditioning.

### Burrs on the bore bottom

25



**USE AFTER RECONDITIONING**  
(Oil turn)

**USE AGAIN**  
(Grease turn)

#### Failure Sign

Burrs are observed on the bore bottom due to scratches. These burrs were formed during disassembly of the link.

#### Reconditioning Method

Chamfer the area having burrs with a portable grinder. Remove all chips from the link.

## Pins

### Wear of the external surface

(Chafing marks are observed but stepped wear is not observed)

26



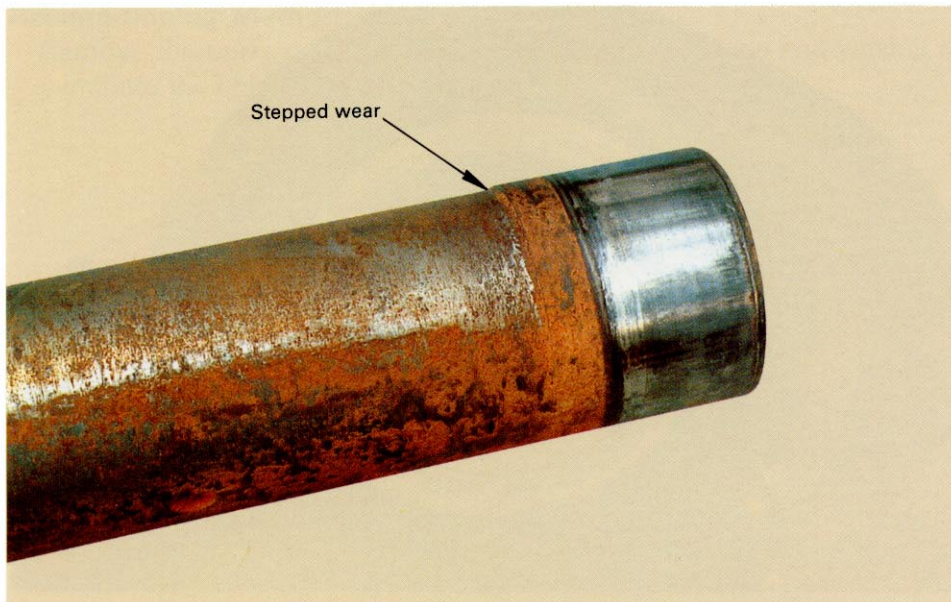
**USE AGAIN**  
(Oil turn & Grease turn)

#### Failure Sign

Chafing has occurred partially on the pin surface due to the partial shortage of oil on the surface. However, this pin can be reused without reconditioning.

### Wear of the external surface (stepped wear)

27



**DO NOT USE AGAIN**  
(Oil turn)

**USE AGAIN**  
(Grease turn)

#### Failure Sign

Shortage of oil on this pin has caused stepped wear to the external surface. This pin cannot be reused in an "oil turn". When differences in depth between the stepped surfaces are less than 2 mm, the pin can be reused in a "grease turn".

**Corrosion of the external surface**

28



**USE AFTER RECONDITIONING**  
(Oil turn)

**USE AGAIN**  
(Grease turn)

**Failure Sign**

Shortage of oil has caused corrosion on the external surface of the pin. However, no stepped wear is observed.

**Reconditioning Method**

Thoroughly remove corrosion from the surface with sandpaper and wash the pin to eliminate the chips.

**Adherence of carbide**

29



**USE AFTER RECONDITIONING**  
(Oil turn)

**USE AGAIN**  
(Grease turn)

**Failure Sign**

Shortage of oil. Residual oil has stuck on the pin as carbide.

**Reconditioning Method**

Wash the pin to eliminate the carbide.

**Clogged side hole**

30



**USE AFTER RECONDITIONING**  
(Oil turn)

**USE AGAIN**  
(Grease turn)

**Failure Sign**

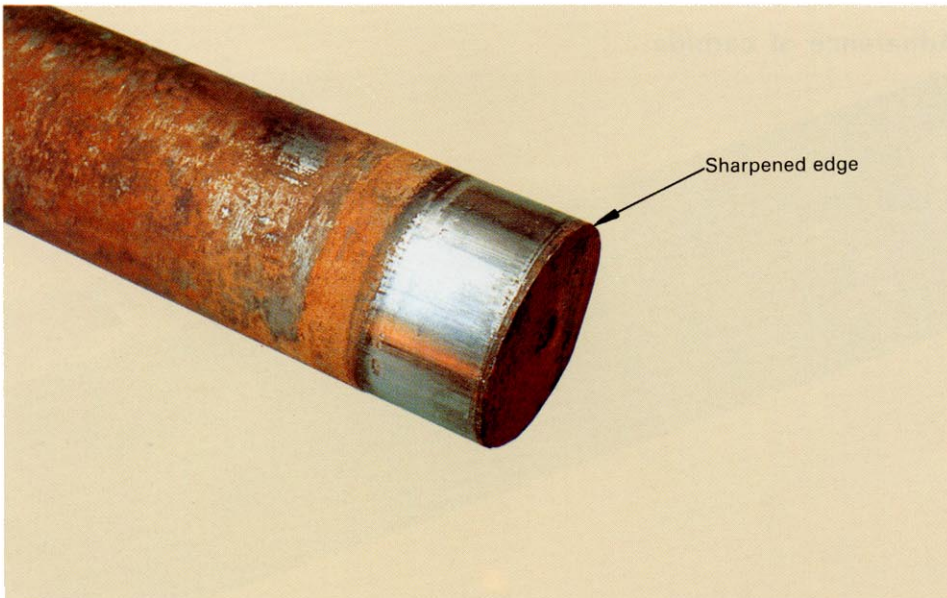
Dirt, mud, etc. have entered between the pin and bushing, resulting in a clogged side hole.

**Reconditioning Method**

Clean and wash the pin.

**Sharpened edge of the end surface**

31



**USE AFTER RECONDITIONING**  
(Oil turn & Grease turn)

**Failure Sign**

The pin end surface was scraped while the machine was traveling. As a result, the edge has become sharper.

**Reconditioning Method**

Chamfer the edge of the end surface with a grinder, and wash the pin to eliminate the chips.



**Sharpened edge of a vertical hole in the end surface**

32



**USE AFTER RECONDITIONING**  
(Oil turn)

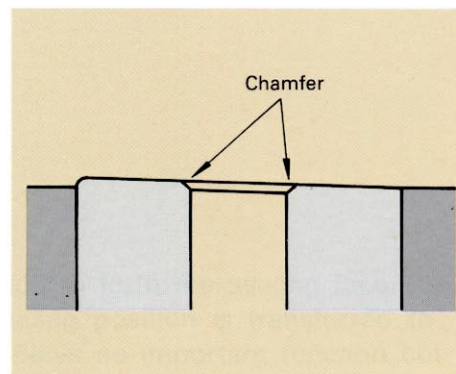
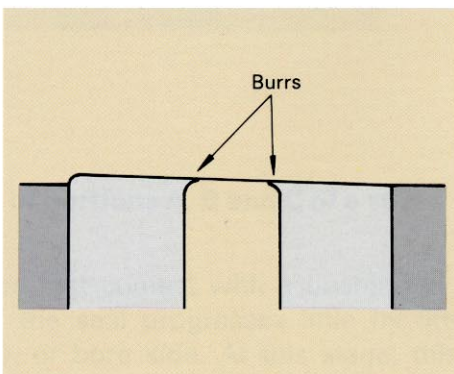
**USE AGAIN**  
(Grease turn)

**Failure Sign**

The pin end surface was scraped while the machine was traveling. As a result, the edge of a vertical hole in the end surface has become sharper. If the pin is used without reconditioning, the plug will be scraped by the edge when driving the plug into the hole.

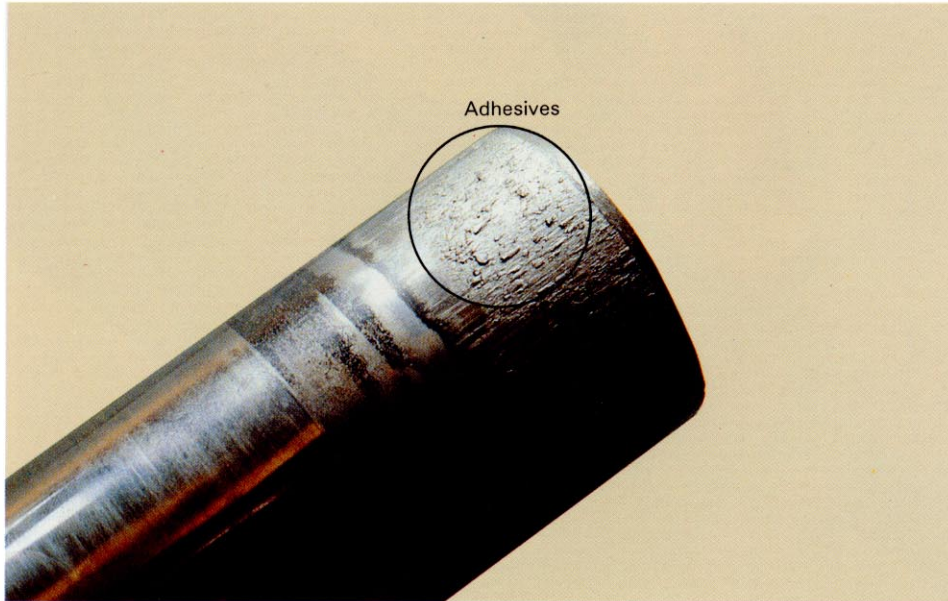
**Reconditioning Method**

Chamber the sharpened edge of the vertical hole with a portable grinder or hand drill. For best results, chamfering should be performed before disassembling the link. After disassembly, wash the pin to eliminate the chips.



## Protruded fitting portion of pin into a link

33



### **USE AFTER RECONDITIONING (Oil turn & Grease turn)**

#### **Failure Sign**

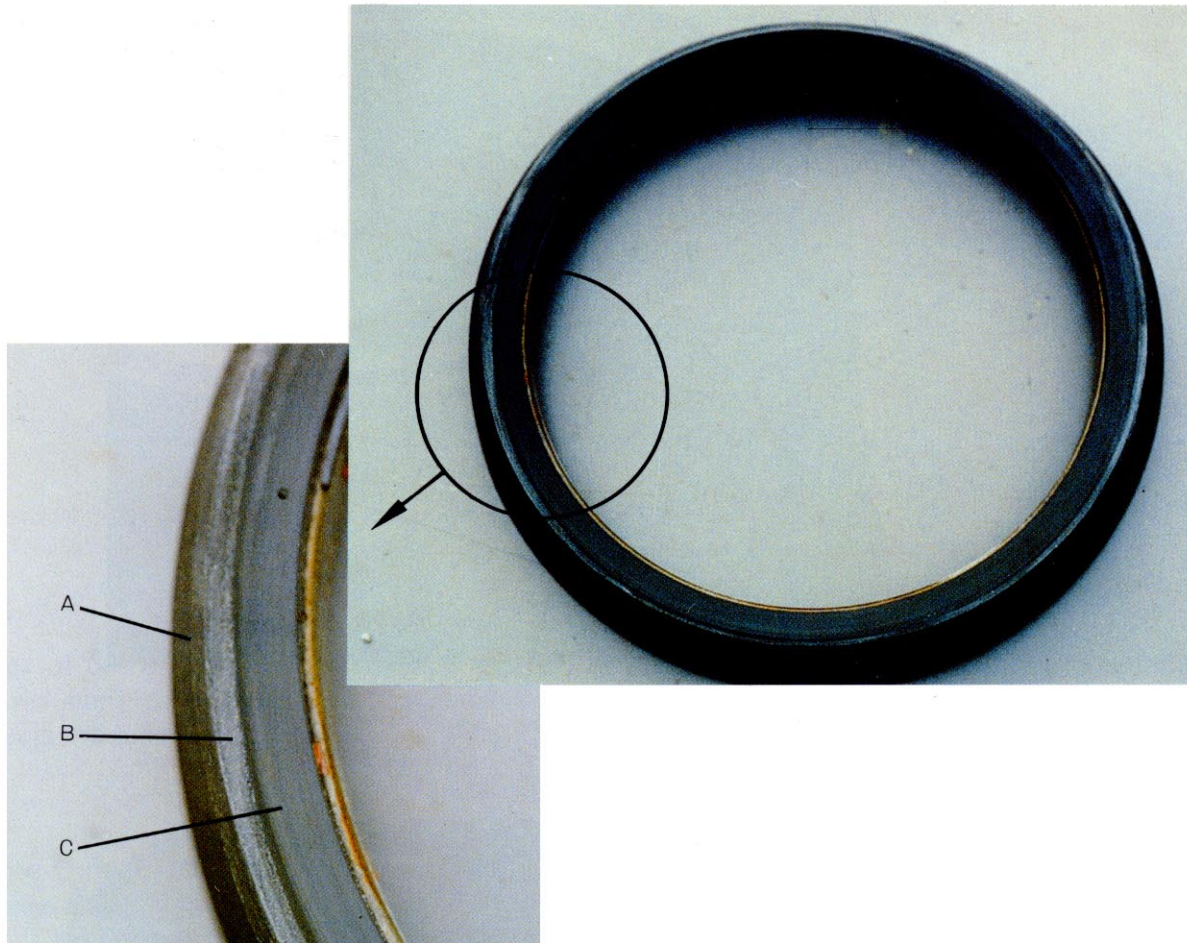
The fitting portion of the pin and a link are seized together with ridges. This seizure did not occur in operation. It can only occur during disassembly.

#### **Reconditioning Method**

Remove the protruding adhesives from the pin with a grinder. Then, finish the surface smooth with sandpaper and wash it to eliminate the chips.

# EXAMPLES OF FAILURE ANALYSES OF SEALED & LUBRICATED TRACK

## Seal



### Description of portions A, B and C of a seal

#### Portion A:

A seal makes first contact with a bushing in this portion to form the sealing face. As the wear of the seal progresses little by little, the sealing position is transferred toward the I.D. or bore side. At this stage, this portion plays no important function but makes it difficult for dust particles to enter the seal. This portion has become brown.

#### Portion B:

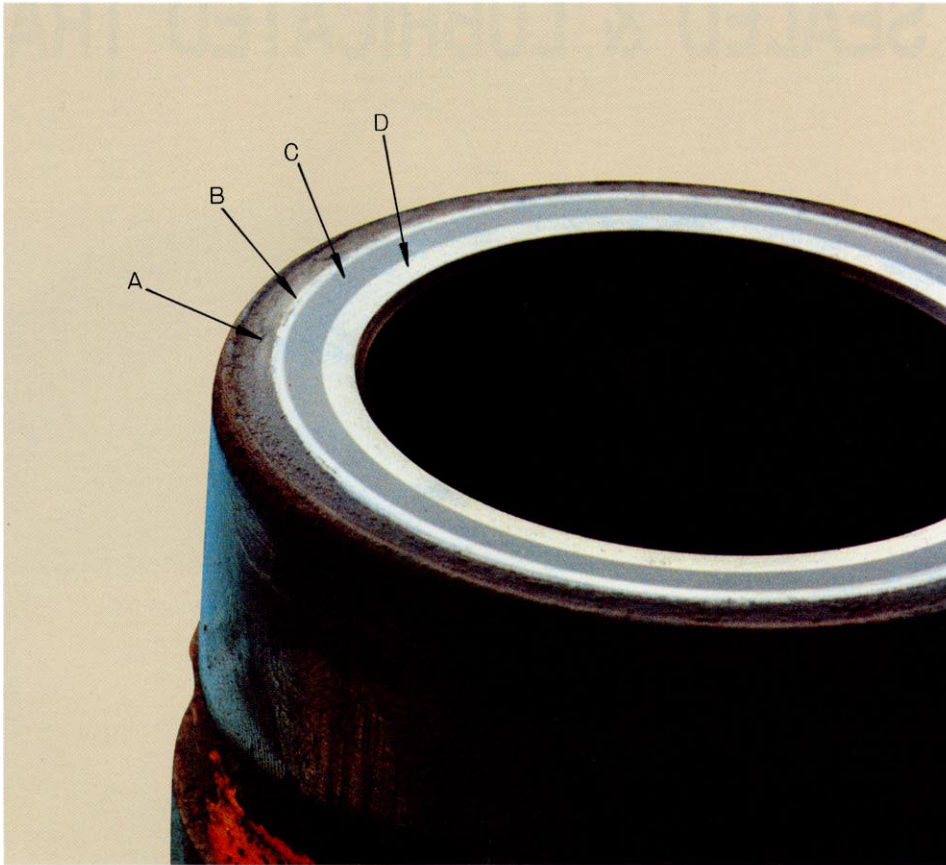
Portion B is now used as the sealing position. It is easily discriminated because of its shines white color. A seal that has flaws in this portion as well as in the further inner surface cannot be reused in an "oil turn".

#### Portion C:

This is the inner slant face of the seal. Its color is similar to that of a new seal. After an "oil turn" the sealing position is gradually shifted toward this portion.

**Note:** Determination of reusability of seals should be made with the seals still installed in the link.

## Bushing



### Description of portions A, B, C and D

#### Portion A:

This portion is worn with sand, gravel, etc. and has been corroded. Deep worn grooves may sometimes be formed depending on the type of soil. Originally, a seal is in contact with this portion to form the sealing face. As wear continues on the sealing face, the sealing position moves toward the inside dia. (bore). At present, this portion has been worn with sand, gravel, etc. and is corroded.

#### Portion B:

The present seal position. This portion is easily discriminated because of its shines white color. A bushing that has flaws or corroded areas in this surface or the inner surface (portions B and C) cannot be reused in an "oil turn".

#### Portion C:

A portion inside the seal position. After an "oil turn", the seal position gradually moves into this portion.

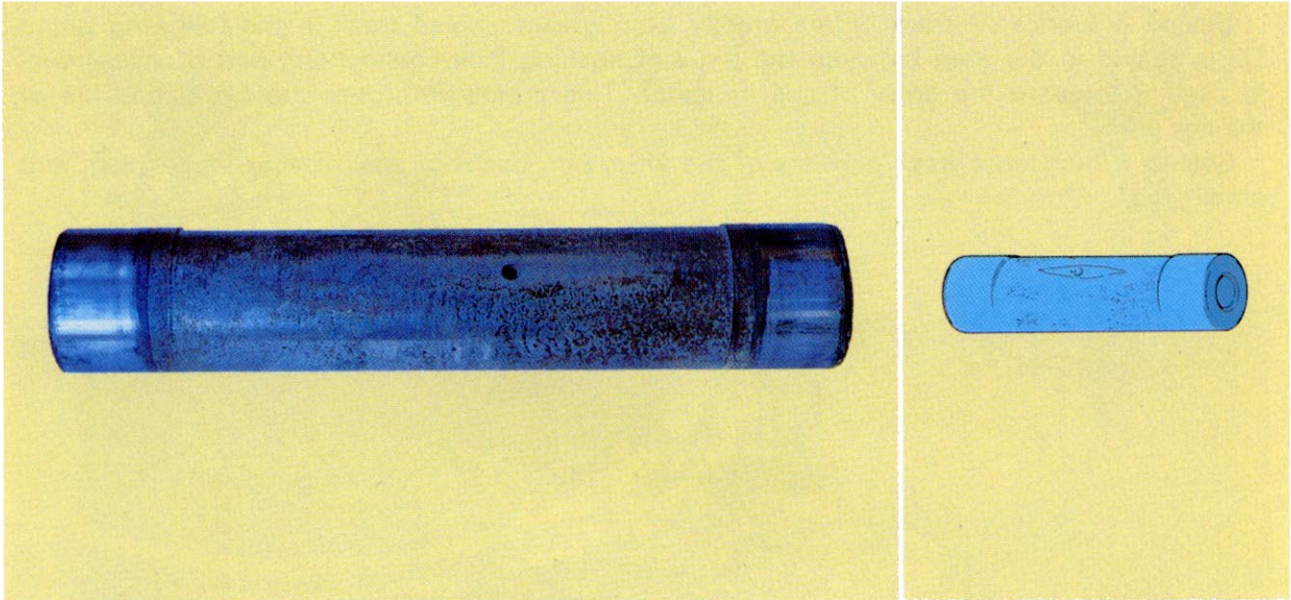
#### Portion D:

This portion comes into contact with a spacer and shines white.

**Note:** Handle bushings with extra care because their end surfaces are easily damaged.

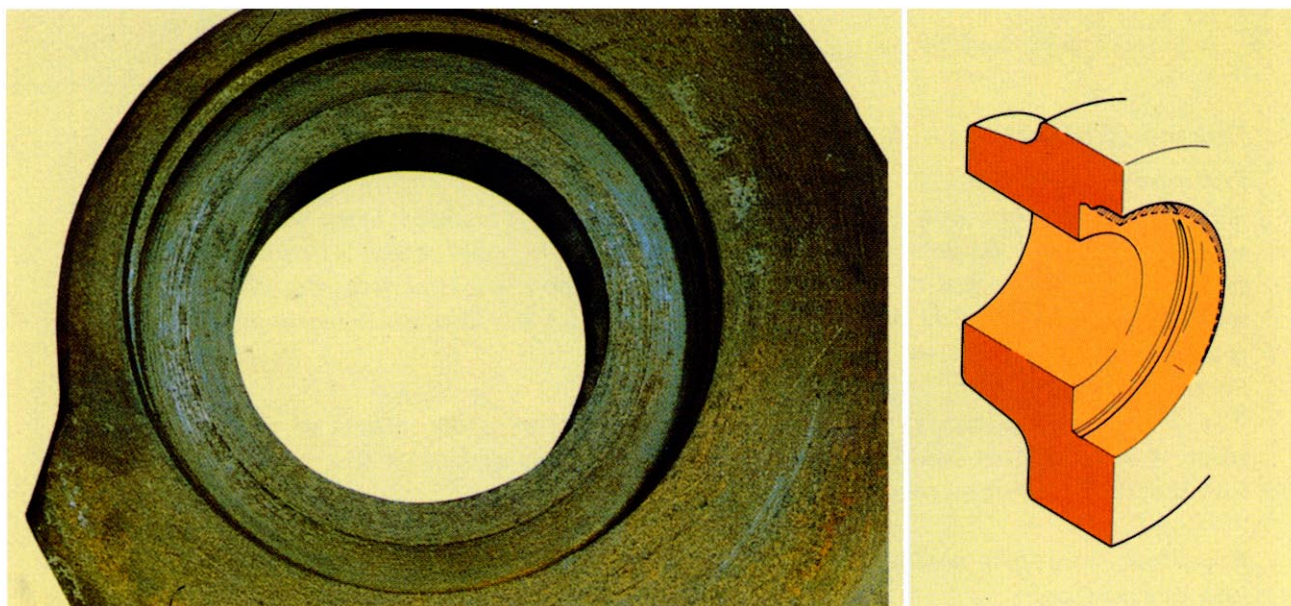
## Pin

Wear of pins and bushings (internal surfaces) is accelerated if water leaks in from the seals. In this pin, uneven wear is observed on the external surface. Corrosion of the pin surface has also been accelerated.



## Link

Lack of oil or intrusion of sand and gravel has accelerated the wear of the link counterbore. The resultant pitch extension has caused an excessive wear on the surface where the link contacts the bushing.

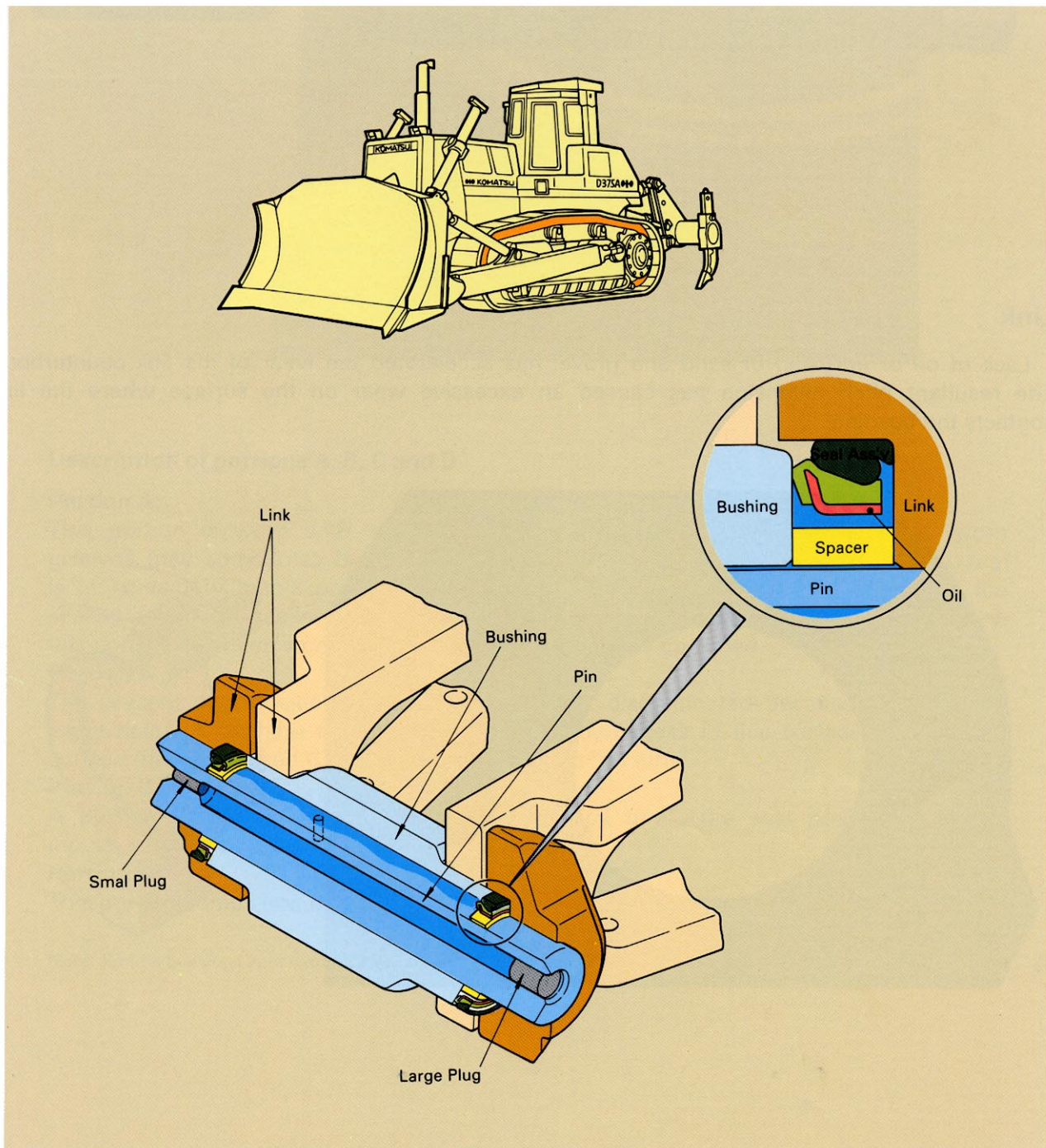


# CONSTRUCTION AND FUNCTION

## Structure of the Sealed & Lubricated Track

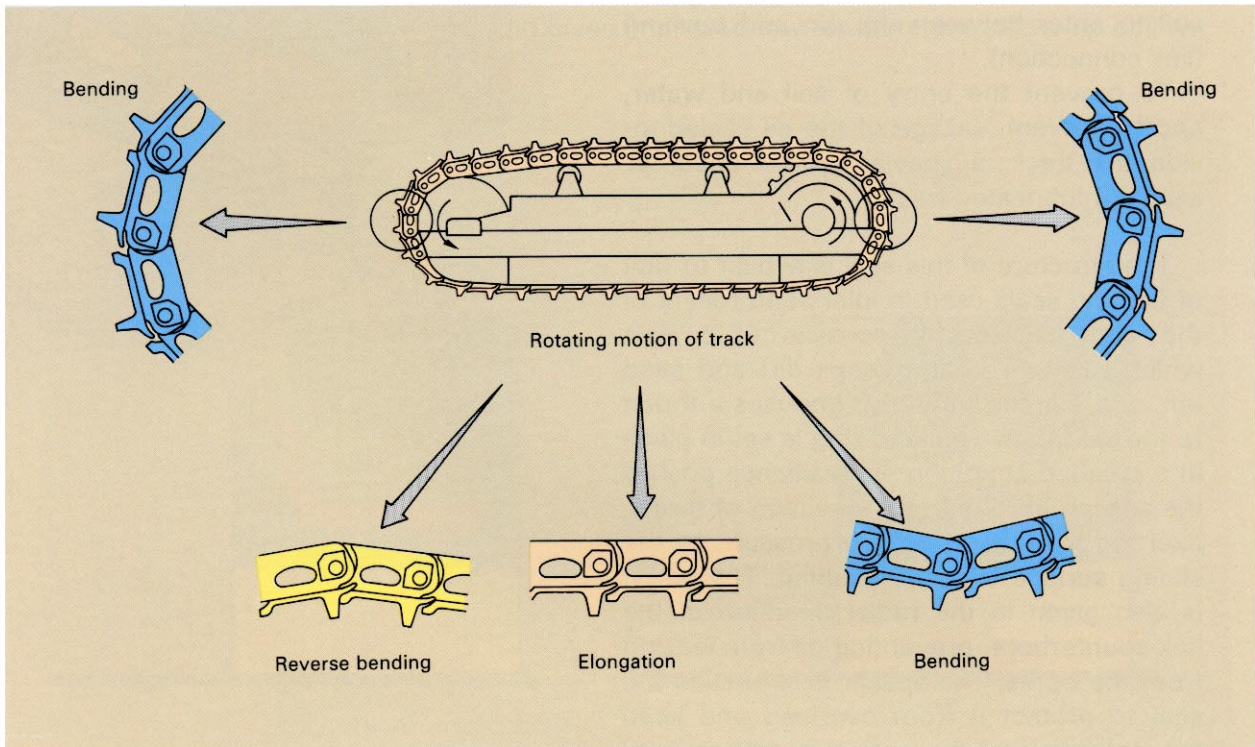
Sealed & lubricated track differs greatly from grease sealed track in the following point. Oil is sealed in the area between the pin and bushing (link connection), and a special seal is used to prevent the entry of soil or water. This greatly improves the elongation life of the link pitch.

Sealed & lubricated track consists of the links, pin, bushing, seal, spacer, large plug, and small plug.

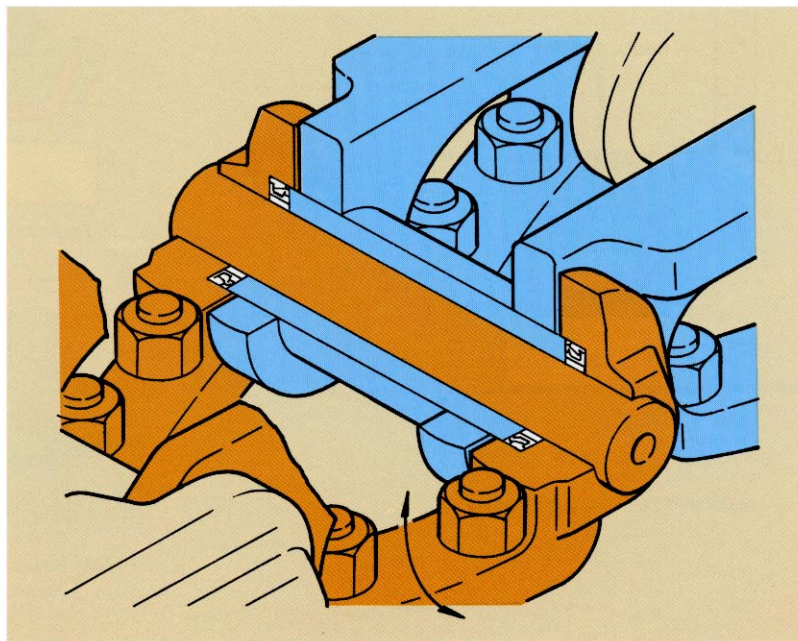


## Function of Seal Portion

When the machine is traveling, the rotating motion causes violent bending and elongation of the link, and depending on the condition of the road surface, there may also be reverse bending.



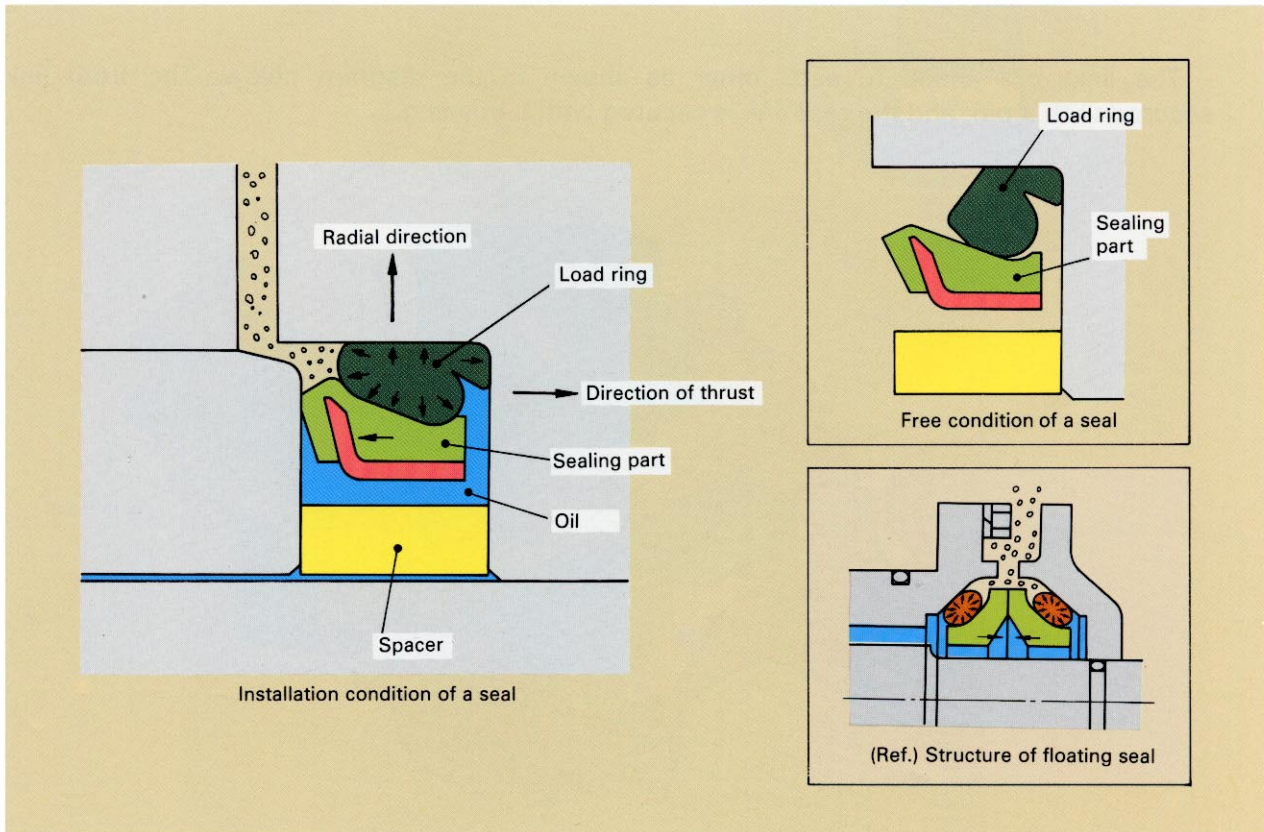
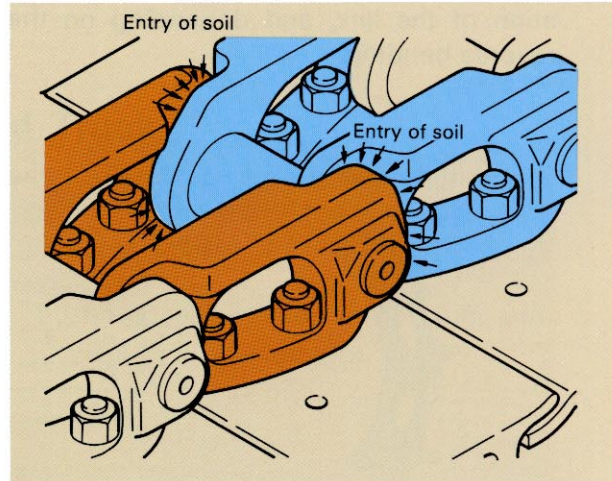
The links are joined to each other as shown in the diagram below. The front link is secured with a pin, and the rear link is secured with a bushing.



The track parts are always subjected to the effects of soil or water, but in addition to this, the bending and sliding motion creates a condition where it is always easy for soil to enter between the pin and bushing (link connection).

To prevent the entry of soil and water, and to prevent leakage of the oil sealed inside the track, a special seal is used for sealed & lubricated track.

The structure of this seal is similar to that of floating seals used in idlers and rollers of the undercarriage. It consists of a part which seals oil in and keeps dirt and sand out, and a load ring which imposes a thrust to the said part. The load ring is set in place in a crushed condition. Its resilience pushes the sealing portion in the direction of thrust, exerting the proper surface pressure on the sliding surface with the bushing. The thrust is also given in the radial direction of the link counterbore, preventing oil from leaking from the bores. The spacer is set inside the seal to protect it from overload and keep the deflection of the seal at a proper level while the machine is traveling.

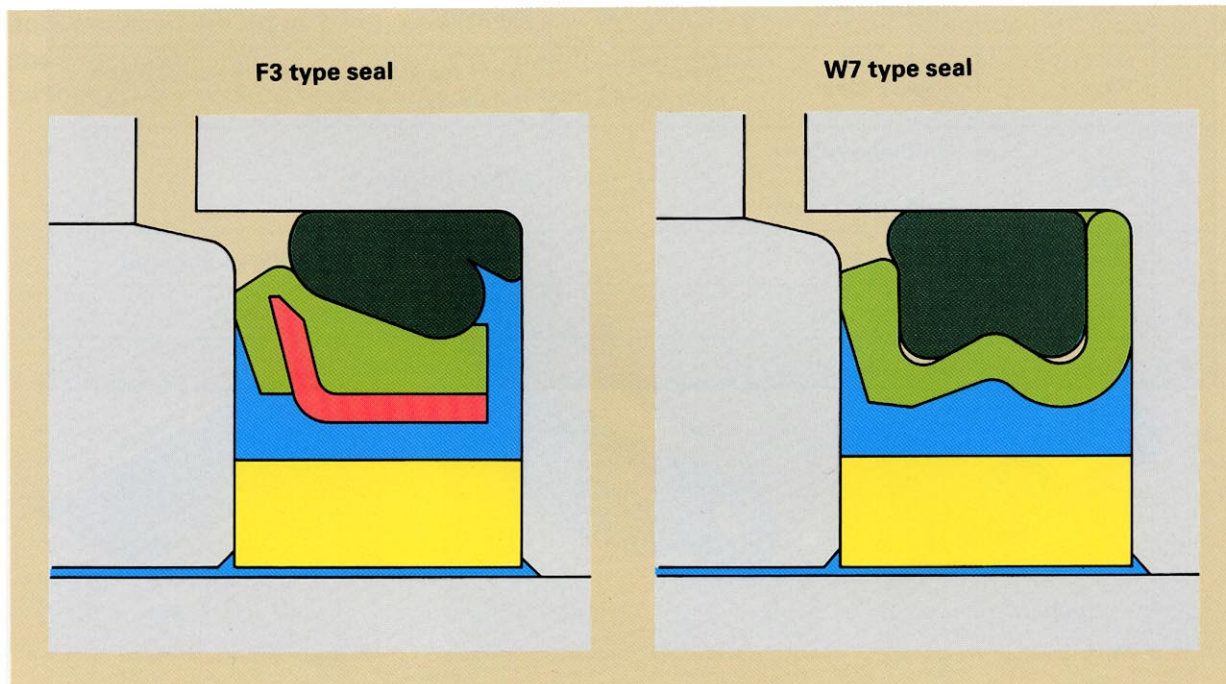




## Features of F3 Type Seal

The following three points have been modified to give improved wear life and low temperature follow-up compared with the W7 type seal.

- ① Increased stability of seal lip (prevention of drooping of the seal lip by use of metal ring) gives extended wear tolerance.
- ② The shape of the load ring gives improved sealing follow-up ability.
- ③ The change in quality of the load ring gives improved low-temperature follow-up ability.



## Materials and Heat Treatment

Since track parts are used under very severe operating conditions, their materials and heat treatment should meet high-grade specifications.

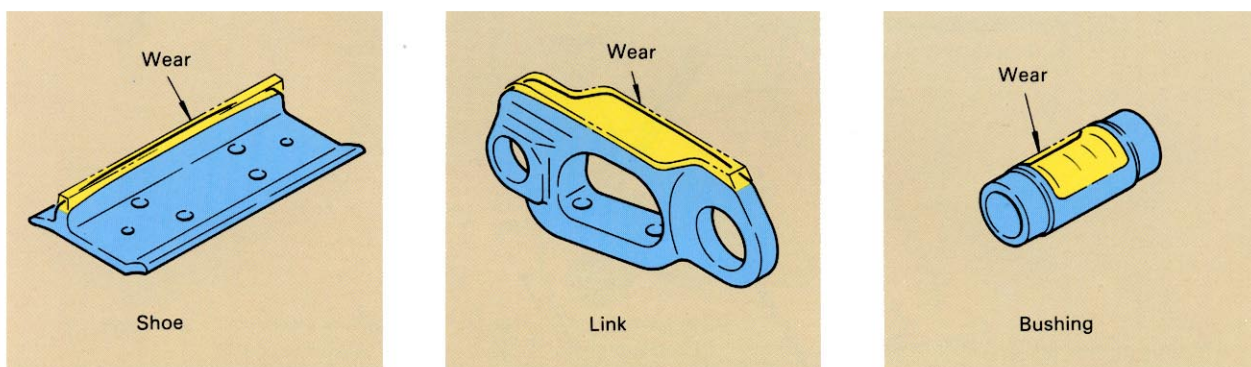
	Part	Material	Heat treatment	Purpose
1	Link	Special steel	Induction hardening	Wear resistance, impact resistance and durability
2	Bushing	Special steel	Carburizing	Wear resistance, impact resistance and durability
3	Pin	Special steel	Water hardening	Wear resistance, impact resistance and durability
4	Seal	Urethane rubber + Cold rolled steel	—	Wear resistance
5	Load ring	Nitrile rubber	—	Wear resistance and elastic strength
6	Spacer	Sintered iron	—	Wear resistance and oiliness
7	Plug	Urethane rubber	—	Wear resistance

# Progress of Wear and Rebuilding of Track

## Progress of Wear

The undercarriage components are in direct contact with the soil, and this means that undercarriage parts are subjected to marked wear and deterioration. The wear of the undercarriage progresses proportionally in accordance with the amount of time the machine is used, but the degree of progress of wear differs greatly according to the soil conditions and operating conditions at the jobsite.

Therefore, it is important to watch the progress of wear closely and to carry out repairs and replacement in a planned fashion. In particular, pay careful attention to [wear of the shoe grouser], [wear of the link tread], and [wear of the outside diameter of the bushing], which directly affect the function of the track.



In this way, the speed of progress of the wear differs greatly according to the soil quality, but the same applies to the speed of wear between parts such as links and bushings. On some types of soil, the progress of wear of the link tread is marked, but the wear of the outside diameter of the bushing is not so marked; or there may be soil where only wear of the shoe grouser progresses, but there is little wear of the link tread.

With sealed & lubricated track, while there is oil between the pin and bushing, the seal functions normally and completely prevents the entry of soil. When there is no more oil, this function is lost, and [link pitch elongation] starts.

## Rebuilding Track

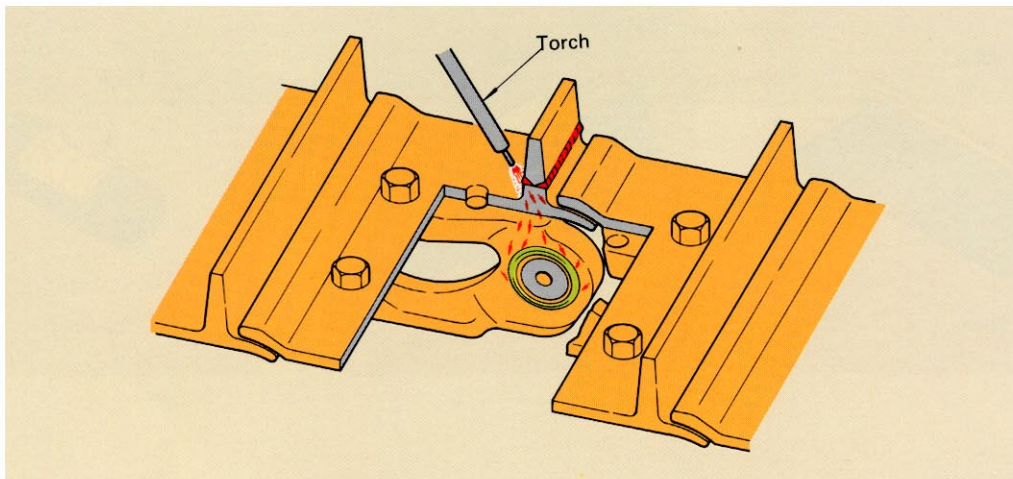
To make the most effective use of the life of the sealed and lubricated track, it is rebuilt in the same way as the conventional dry-type track. The main points are [rebuilding with shoe lug], [building up metal on link tread], and [turning bushing]. However, the method is slightly different from the conventional dry type, so care is needed.

### i) Rebuilding with shoe lug

Care is needed when welding the lug material to the shoe grouser while the shoe is installed to the link assembly.

(The same care is needed when welding the lug at the time of delivery of swamp shoes.)

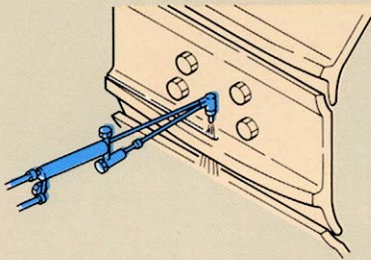
If the grouser portion is shaped using gas cutting and lug welding is carried out continuously for one shoe, the heat will be concentrated in one place. This will mean that the seal will be subjected to high temperature and may deteriorate, so it is necessary to consider carefully the procedure to follow.



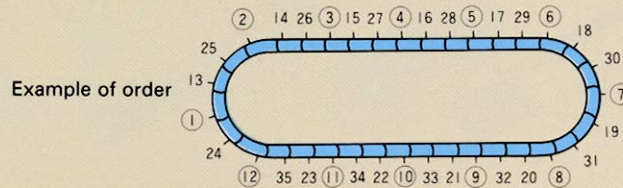
• **Example of method of dissipating heat**

To prevent the heat from concentrating at the seal at one place, divide the processes for rebuilding the lug into several parts, and carry out the work on every 2nd or 3rd shoe.

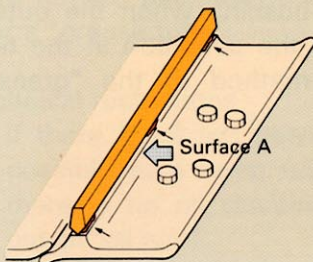
Example: Process 1 Reshaping grouser with gas cutting



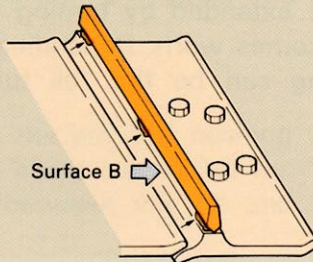
★ To prevent the heat from concentrating at one place, carry out this process for every 2nd or 3rd shoe.



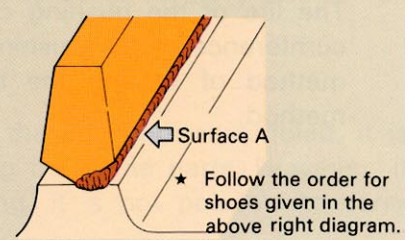
Process 2 Temporary adding of lug (surface A)



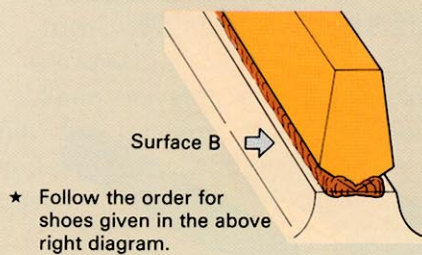
Process 3 Temporary adding of lug (surface B)



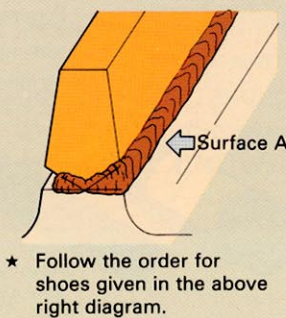
Process 4 Welding first layer of surface A



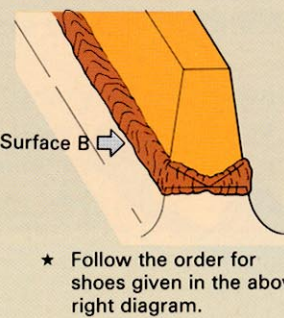
Process 5 Final fitting of first layer of surface B



Process 6 Final fitting of second layer of surface A

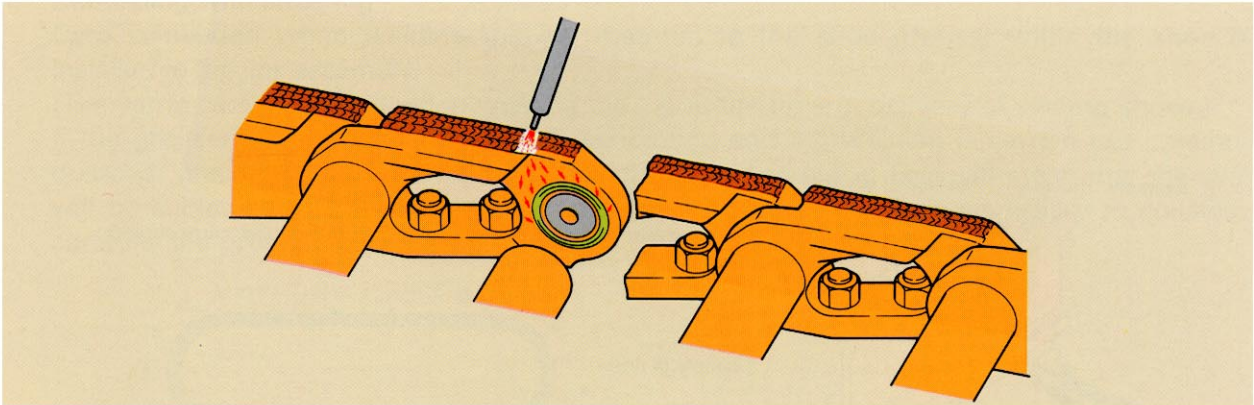


Process 7 Final fitting of second layer of surface B



ii) Building up metal on link tread

It is impossible to avoid the heat when building up the metal on the tread with the link as an assembly, so the seal cannot be reused. Furthermore, the oil inside the pin must be completely removed before starting to build up the metal on the tread surface.



If it is necessary to both build up the metal on the link tread and turn the bushing, choose one of the following methods according to the condition.

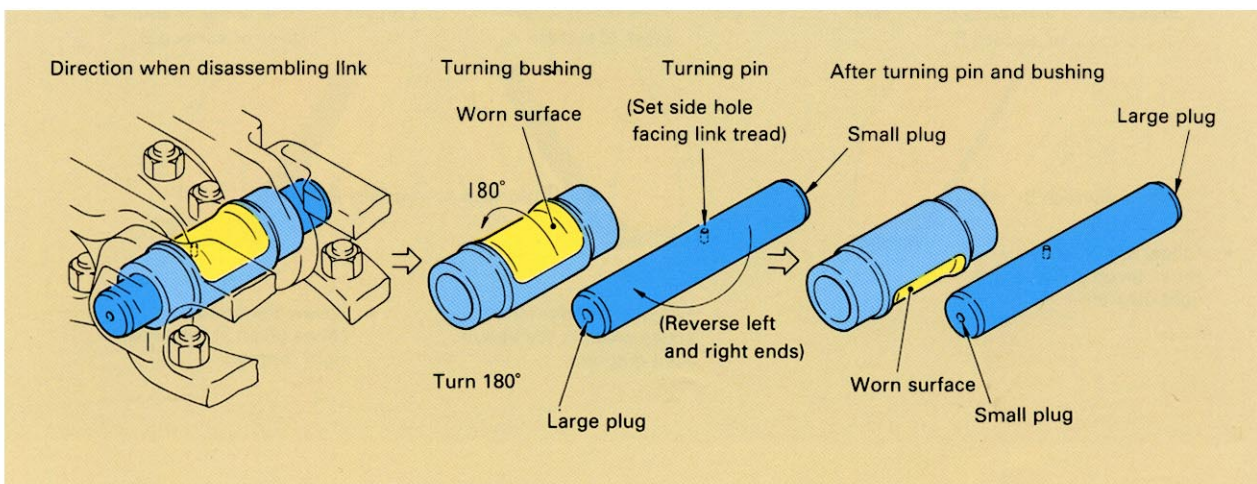
- ① After building up the metal on the tread surface with the link as an assembly, disassemble and replace all the seals when turning the bushing.
- ② After disassembling the link, remove the seal, then build up the metal with the link as an individual part, and reuse the seals when turning the bushing.

iii) Turning the bushing

The life of the bushing can be extended by turning the bushing when the outside circumference of the bushing becomes worn. Depending on the condition at the time, the method of turning the bushing can be the "oil turn" method or the "grease turn" method.

Oil turn

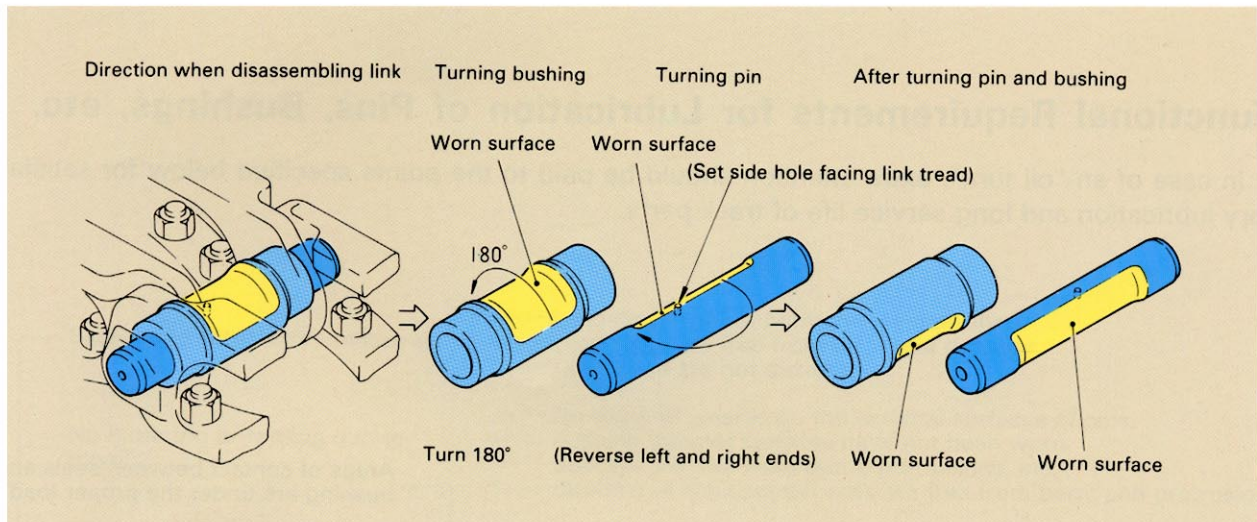
With this method of turning, the pin and bushing are turned and reassembled and the assembly is filled with oil. Be careful to assemble the pin so that the side hole (branch hole) is on the link tread side in the same way as before turning.



## Grease turn

With this method of turning, the pin and bushing are turned and reassembled, but instead of the assembly being filled with oil, the area between the pin and bushing is filled with grease.

Be careful to assemble the pin so that the side hole (branch hole) is on the link tread side in the same way as before turning.



## Points to Remember When Turning Bushing

When the wear of the outside circumference of the bushing progresses and the bushing is to be turned, bear the following points in mind and decide whether to carry out an "oil turn" or a "grease turn".

### i) Technical restrictions

- ① If there is oil left between the pin and bushing when the link is disassembled, it is possible as a basic rule to carry out an "oil turn" using the same parts. However, if there is no oil remaining between the pin and bushing, it is not possible to carry out an "oil turn".

Once all the oil has been lost, scratches are made on the contact surface of the bushing and seal, so even if it is refilled with oil, the ability to seal the oil has already been lost.

- ② When assembling the link to carry out an "oil turn", it is necessary to control the dimensions strictly. It is also necessary to handle the parts carefully.

### ii) Economic restrictions

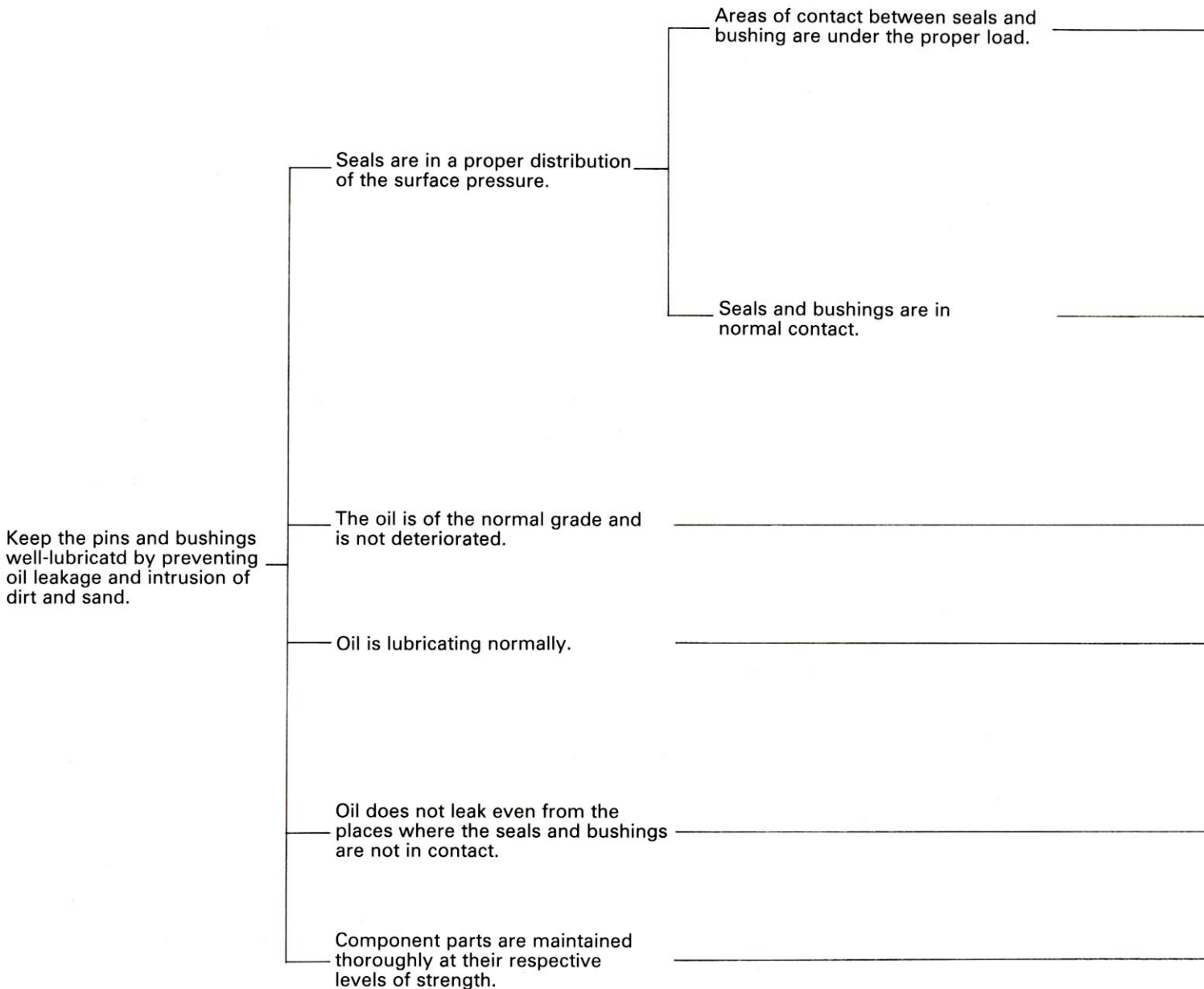
Compared with the "grease turn", the cost of replacement parts is greater for the "oil turn", and the turning operation also takes longer, so there are economic restrictions.

When carrying out the turning operation, it is not enough simply to pay attention to the pin and bushing. It is also necessary to consider the wear balance of the link tread and shoe grouser and to select a rebuilding method that will lead to an overall reduction in costs.

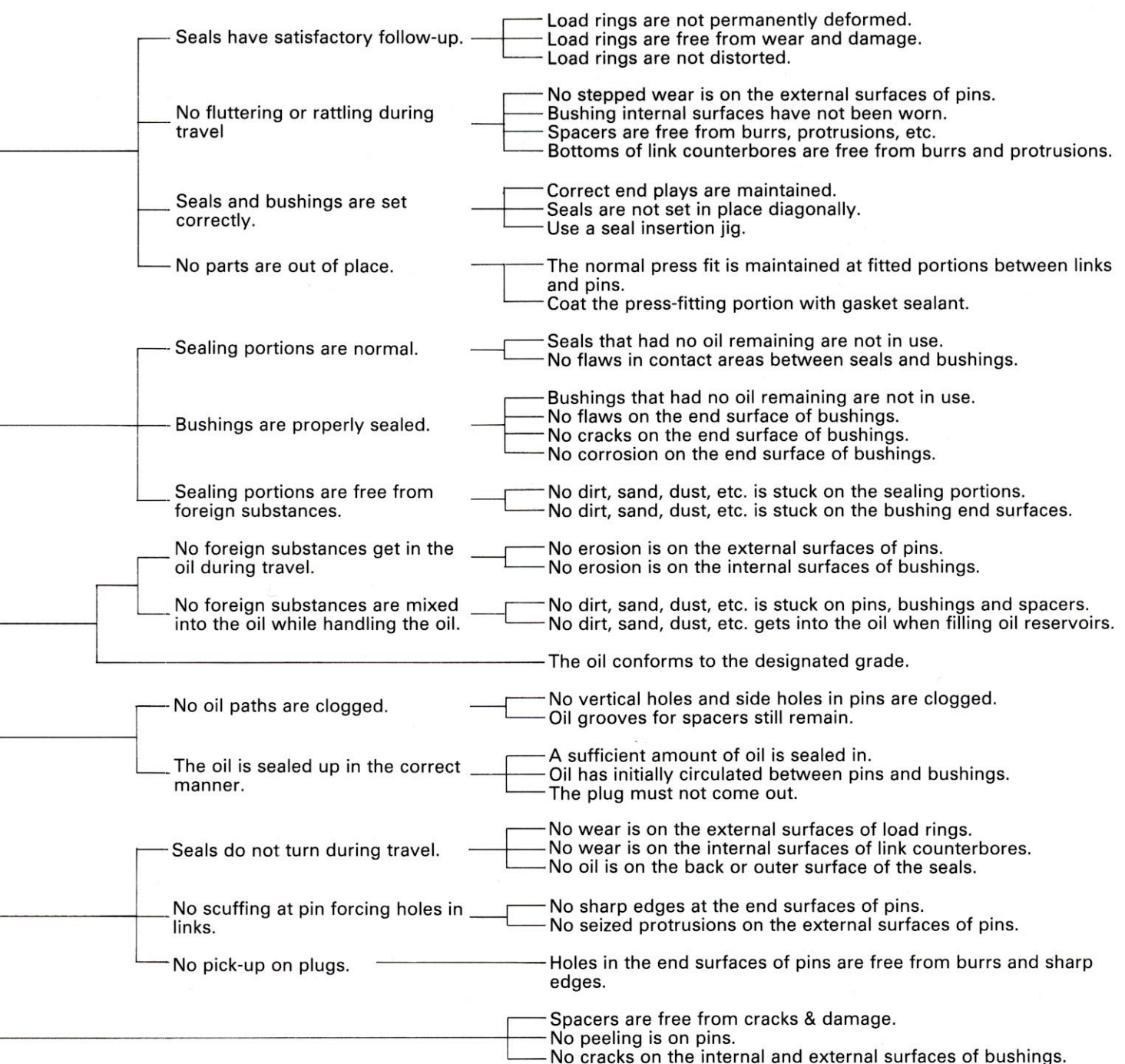
# TECHNICAL POINTS REQUIRED FOR AN "OIL TURN"

## Functional Requirements for Lubrication of Pins, Bushings, etc.

In case of an "oil turn", extra attention should be paid to the points specified below for satisfactory lubrication and long service life of track parts.

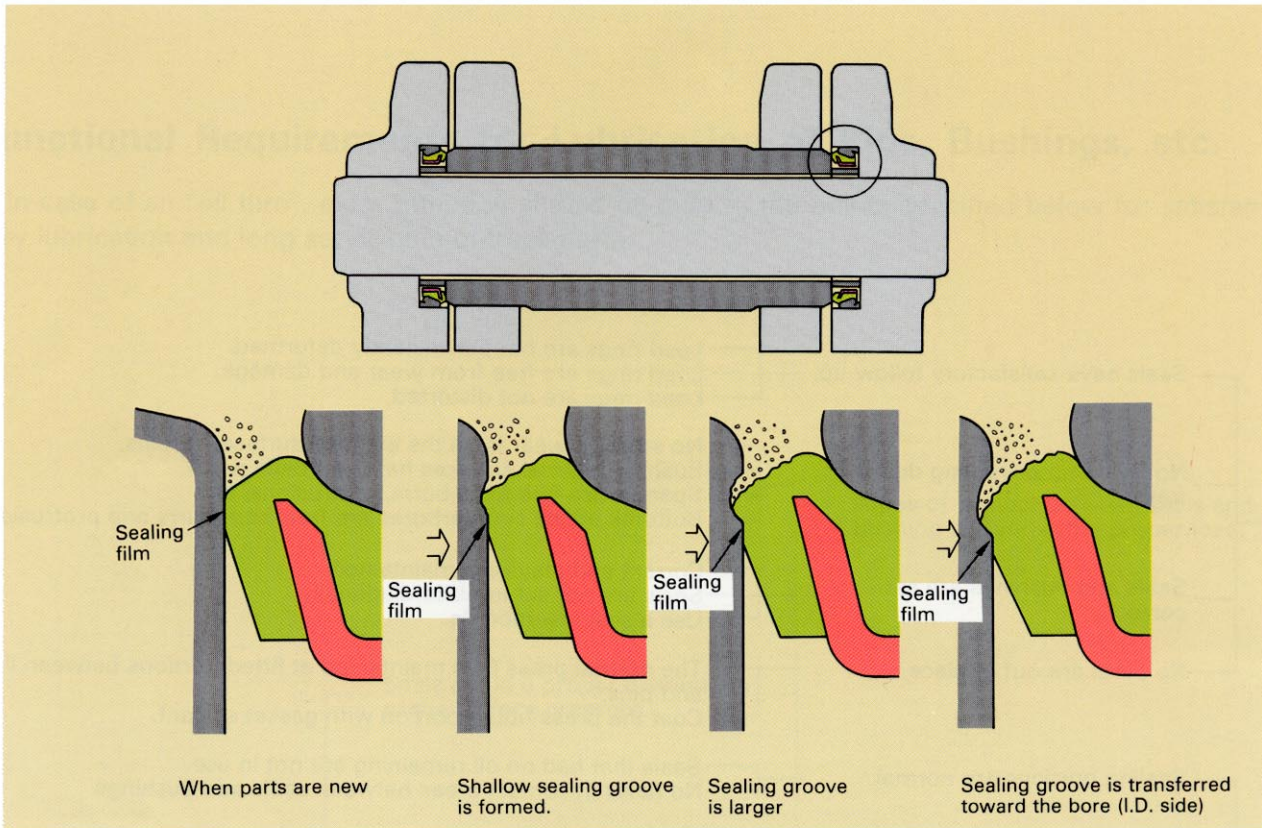






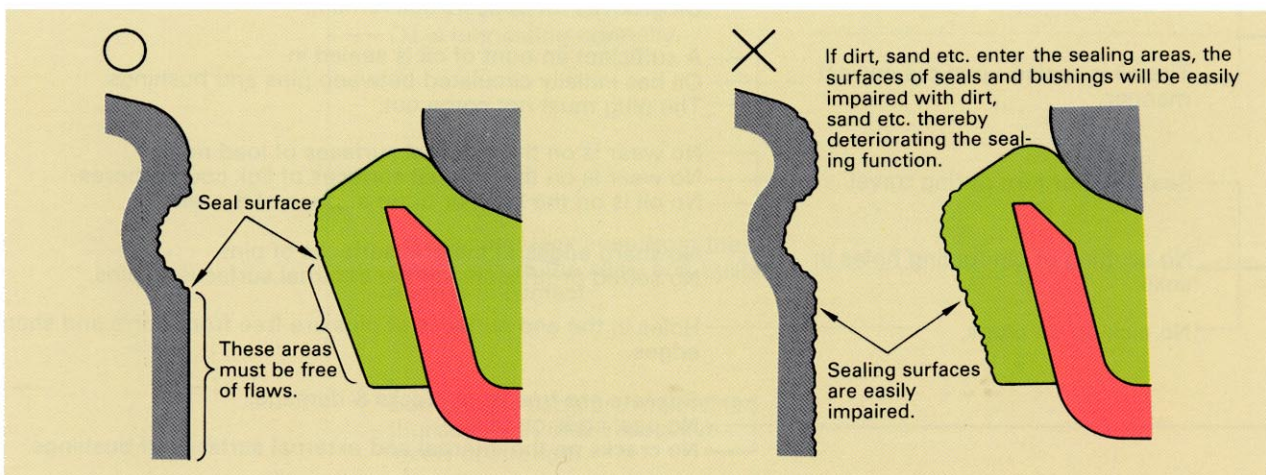
## Precautions for the Sealing Mechanism

In the areas of contact between seals and bushings, wearing grooves are gradually formed by the following mechanism.



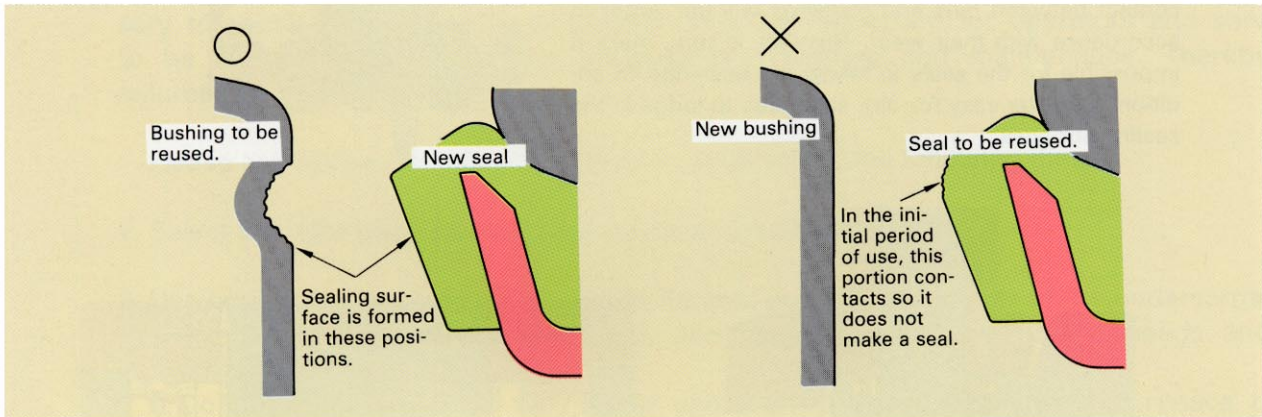
As shown above, the area of contact between a seal and a bushing gradually shifts toward the bore (I.D. side), forming a sealing film to seal off dirt, sand, oil, etc. This sealing film is formed inside this sealing groove. Such sealing function is feasible only with bushing surfaces finished to high accuracy and a flawless sealing portion.

The sealing film is formed only by adding the oil in the normal manner. If the addition of oil is interrupted for a while for some reason, the surfaces of both the seal and bushing will be impaired with dirt, sand, dust, etc. Then, if the addition of oil is continued, no sealing films can be formed.



In case of an "oil turn", if a link is disassembled, the sealing film formed with the seal and bushing will be broken. If the bushing is turned and the link is reassembled, the seal lip will be set in a sealing groove in the mating bushing. Thereby, the sealing film will be formed again. In one machine, all bushing sealing grooves are formed in the same manner. Consequently, the same seals and bushings need not be matched again when resetting seals and bushings.

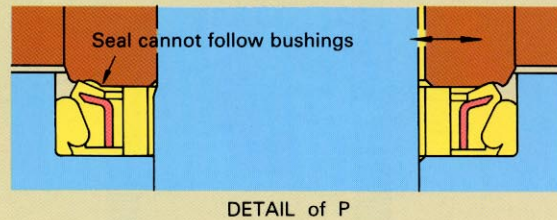
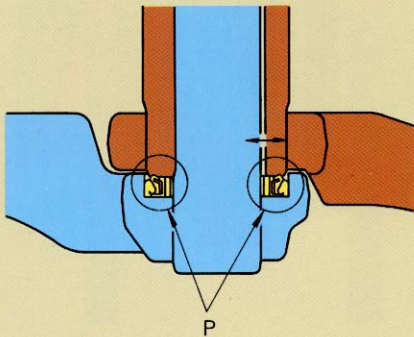
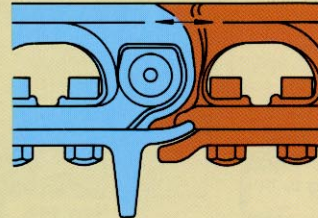
When replacing bushings with new ones when reassembling links, it is necessary to replace the mating seals with new ones at the same time. When replacing seals, on the other hand, bushings need not be replaced at the same time, if no abnormalities are found.



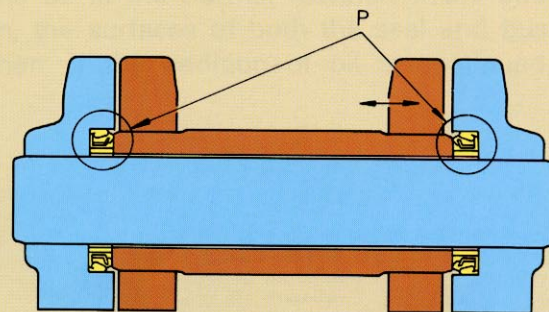
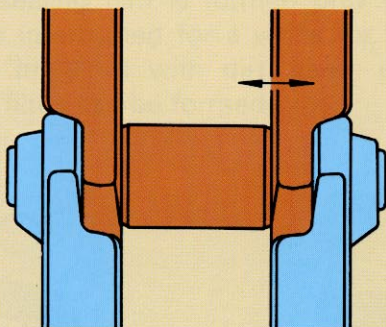
## Precautions for Track Link Movement During Travel

While a machine is traveling, the link connections move in various ways. The sealing portions are subjected to various forces in these movements. Consequently, if unevenly worn pins and bushings are installed in an "oil turn", the free play in the radial direction will be larger, making the sealing portions more likely to leak oil.

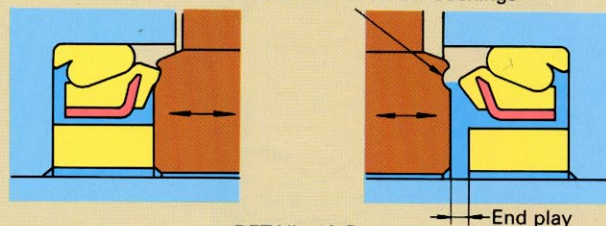
During travel, the link connections repeat the longitudinal and vertical movements. When the areas of contact between pins and bushings will get larger in accordance with their wear. This will, in turn, make it impossible for the seals to follow the bushings. In addition, it will be easy for dirt, sand, etc. to lodge in the sealing surfaces.



If an end play larger than specified is allowed when reassembling a link, the free play in the direction of thrust will be larger, making the sealing portion more likely to leak oil.



During travel, the sealing portion is subject to force in the direction of thrust and the bushing moves laterally by the amount of end play. If this end play exceeds the specified level, the seal will not be able to follow the bushing. As a result, the oil will be more likely to leak and sand, dirt, mud, water, etc. will be more likely to infiltrate in the sealing portion.



# PREVENTIVE MAINTENANCE

In order to prevent breakdowns and operate the machines at full efficiency, it is necessary to check their operating conditions. It is also important for operators and servicemen to be familiar with the correct methods of operating and maintenance. Thereby, most failures can be prevented.

Please call the customer's and operator's attention to the following items.

1. Select the right track shoes for the working conditions.
2. Use correct operating practices for the longest possible service life of the undercarriage.
  - a. Avoid sudden starts, acceleration, and stops, unnecessarily high speeds and sharp turns.
  - b. Do not allow shoes to slip during operation. If shoes begin to slip, reduce the load until slipping stops.
  - c. Do not impose load on one side of the machine only for a long time.
    - Travel straight away wherever possible. If turns are necessary, try to make an equal number of left and right turns. Make the turning radius as large as possible.
    - On a slope, operate a machine along to the inclination of the slope. Do not operate the machine across the slope.
    - When stopping the machine on a slope, keep it facing toward the top of the slope.
  - d. Avoid travelling over boulders or other big objects unless absolutely necessary.
  - e. Always park or stop on level ground.
3. Key points of daily inspections for the longest possible service life of the undercarriage.
  - a. Check the track for proper tension.
  - b. Check the front idler for proper adjustment.
  - c. Check link pitch for excessive elongation.
  - d. Check bolts and nuts for loosening.
  - e. Check front idlers and rollers for oil leakage.
  - f. Check the undercarriage unit for freedom from dirt and mud.
  - g. Check for cracked track parts.
4. Earlier than scheduled inspections and repairs will reduce repair costs.

