



# **RUBBER TRACKS**

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***TYPES OF DAMAGE  
DURING OPERATIONS***

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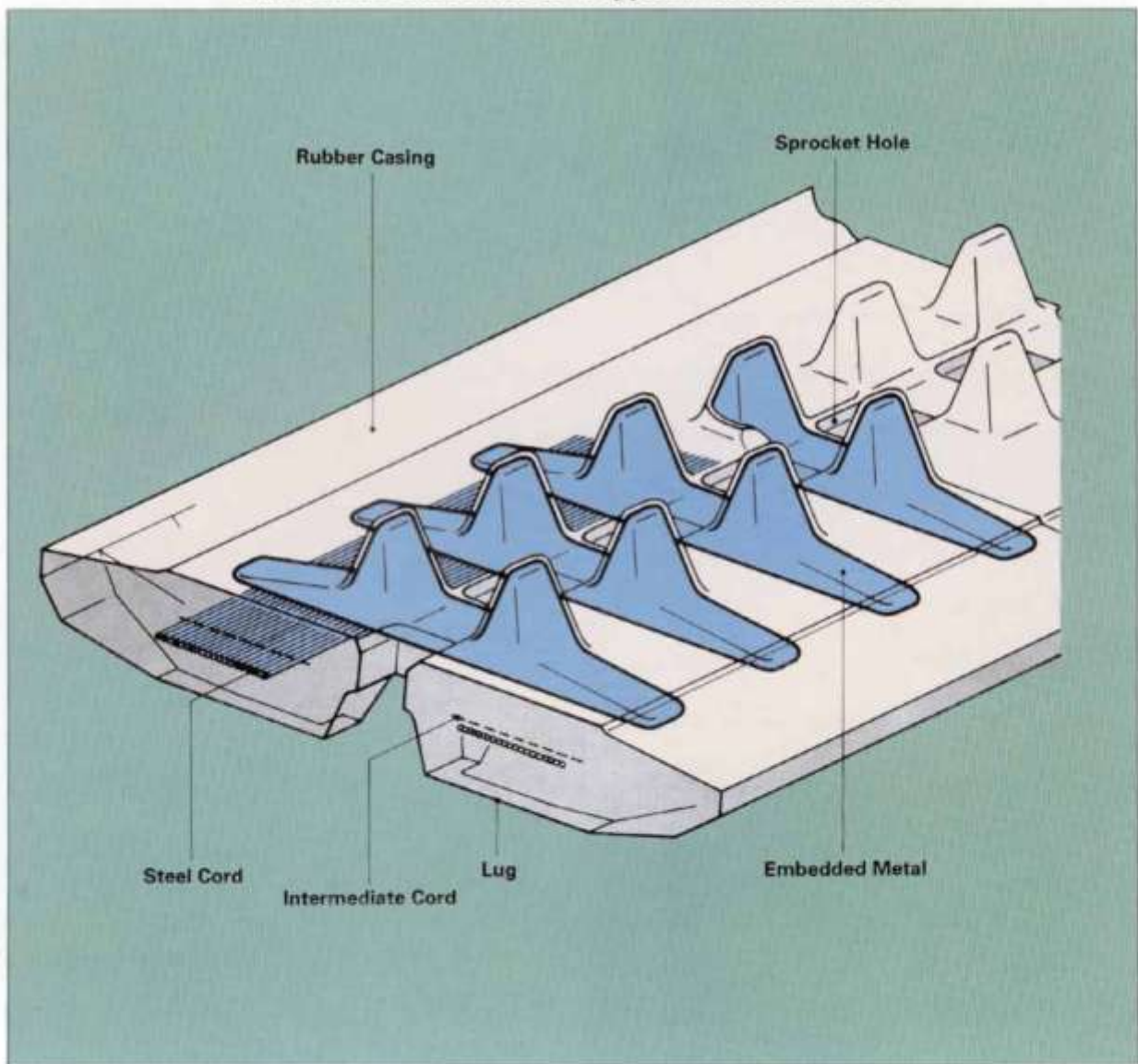
# 1 INTRODUCTION

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Rubber tracks are being used for various applications under a wide variety of operating conditions in the world. During a rubber track's service life, various types of damage might occur. Some of them do not affect continued usage of the rubber tracks, however, others cause fatal damage to the rubber tracks, requiring their replacement.

This manual will show actual examples of different types of damage illustrated by pictures to describe the causes and recommend prevention to extend the service life of rubber tracks.

**The basic structure of a typical Rubber track**



## 2 TYPES OF DAMAGE

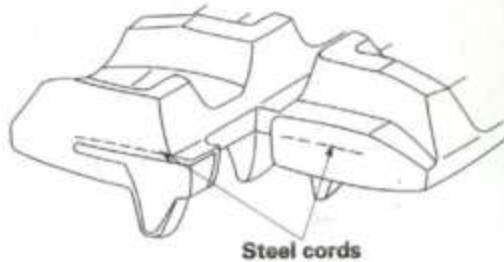
### (1) Cut of steel cords

**\* Damage**

Embedded steel cords are cut off

**\* Replacement**

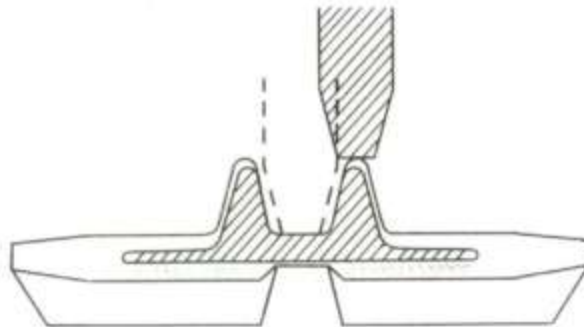
Replacement is required



**A. Causes of the damage**

When applied to rubber tracks under the following circumstances, tension in excess of the breaking strength of the embedded steel cords causes steel cords to be cut:

- (a) When the rubber track is detracking, the idler or sprocket rides on the projections of the embedded metal. (see the sketch below)



- (b) When the rubber track is detracked, projections of rubber tracks get stuck between the frame of the undercarriage.
- (c) The rubber track is clogged with stones or foreign obstacles.

Furthermore, when moisture invades through a cut on the lug side rubber surface, the embedded steel cords will corrode. The deterioration of the design strength may lead to breaking off of the steel cords.

**B. Prevention**

The following preventions should be taken to minimize the risk of this damage:

- (a) Periodical checking on site of the recommended tension level.
- (b) Avoiding quick turns on bumpy and rocky fields.
- (c) Making machine operators carefully drive as to avoid having stones and other articles clog to the rubber tracks.
- (d) Driving over sharp objects in the fields is to be avoided. If such is impossible, making turns while driving over such objects is to be avoided at the least.

## (2) Abrasion of embedded metals

### \* Damage

In proportion to the service time, embedded metals are gradually abraded.

### \* Replacement

Replacement is required when the width of the embedded metals ( $D_1$ ) becomes 67% of their original width ( $D$ ).



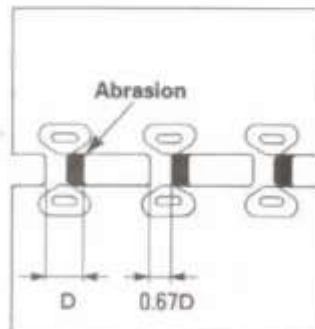
### A. Causes of the damage

When track rollers roll over embedded metals, and sprocket and idler gears with them, abrasion of embedded metals is inevitable. The following cases sometimes accelerate their abrasion:

- Sprocket configuration does not correspond with the design of the embedded metals.
- Rubber tracks are driven with an extraordinary heavy load on them.
- Rubber tracks are used on sandy fields.

### B. Prevention

As long as rubber tracks are used under normal operating conditions, abnormal abrasion is unlikely to occur. The level of abrasion should be carefully checked when the machines are mainly operated for towing and dozing works which generate a heavy load for rubber tracks, and when they are operated under a sandy field condition for a long time.



### (3) Separation of embedded metals due to external forces

#### \* Damage

Extraordinary outer forces applied to embedded metals cause their separation from the rubber track's body.

#### \* Replacement

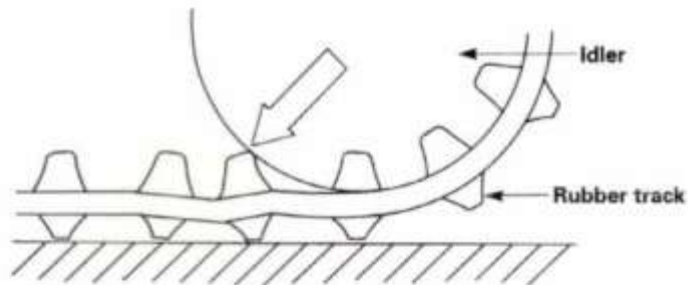
Even a partial separation of embedded metals requires replacement of the complete track.



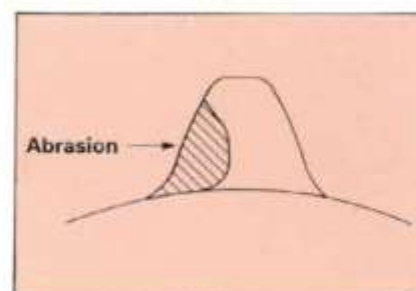
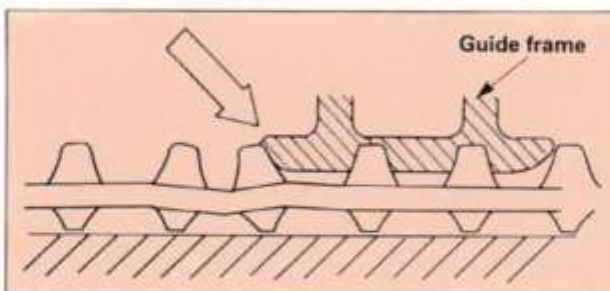
#### A. Causes of the damage

Embedded metals are adhered between the steel cords and the rubber body. The following cases generate external forces greater than the adhesion strength, causing separation of the embedded metals.

- (a) When the idler continues riding on projections of embedded metals, embedded metals might peel off finally.



- (b) When a rubber track is detracked, it becomes stuck between the guide frame or the undercarriage frame, causing the separation of embedded metals.



- (c) Abnormally abraded sprockets as sketched above will pull embedded metals out.

#### B. Prevention

Similar to the prevention against the cut of steel cords:

- (a) Recommended tension level should be periodically maintained.  
(b) Quick turns on bumpy and rocky fields should be avoided.  
(c) If abnormal abrasion of sprockets is observed, they should be immediately replaced.

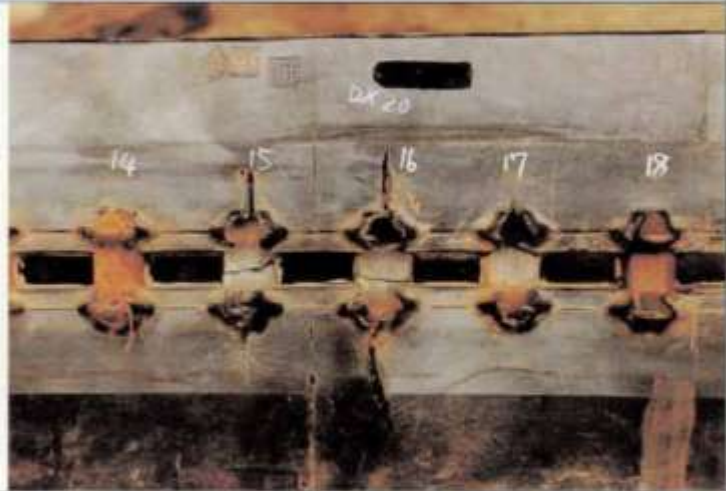
#### (4) Separation of embedded metals due to corrosion

**\* Damage**

Due to corrosion of embedded metals, the adhesion to the rubber body deteriorates, resulting in complete separation.

**\* Replacement**

Even a partial separation of embedded metals requires a complete rubber track replacement.



#### A. Causes of the damage

Embedded metals are adhered to the rubber body. The following operating conditions cause embedded metals to corrode, causing deterioration of the adhesion, and finally resulting in separation of the embedded metals from the rubber body :

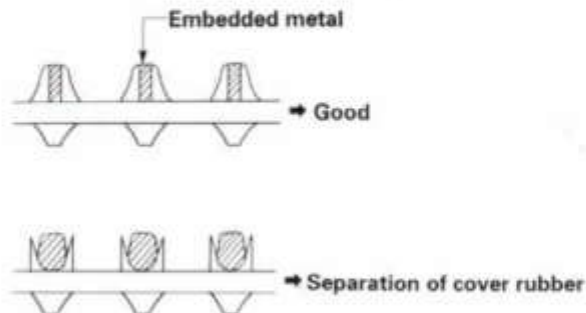
- (a) Excessively salty fields, like the sea shore
- (b) Strongly acidic or alkali containing terrains
- (c) Compost spread grounds

In case of an outside running arrangement track rollers gradually abrade the rubber surface at track roller side, ending in exposure of the embedded metals. Consequently the embedded metals will corrode resulting in their separation from the rubber body.

#### B. Prevention

If rubber tracks are used under such field conditions as described under A-(a) (b) (c), they should be washed with plenty of water. After being completely dried, they should be stored properly.

When the cover rubber is separated from the embedded the metal projections and the metals in the rubber body become loose, it is time to consider replacement of the rubber track.



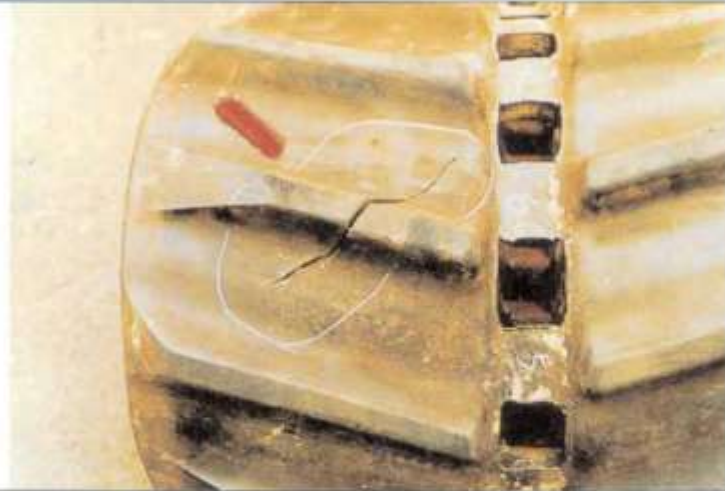
## (5) Cut on lug side rubber

### \* Damage

Cut on lug side rubber often occurs as one of the most typical failure modes.

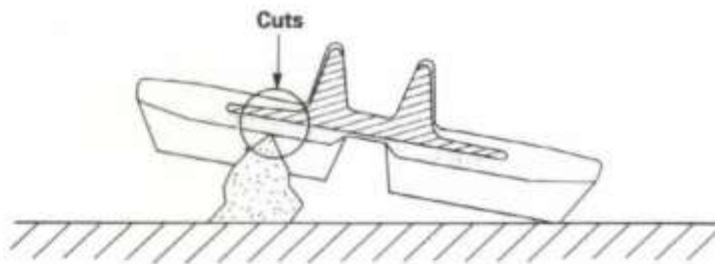
### \* Replacement

When a cut on the lug side rubber reaches the embedded steel cords, it should be immediately repaired in accordance with our repair manual.



### A. Cause of the damage

When rubber tracks drive over projections or sharp stones in the fields, the concentrated forces applied cause cuts on the lug side rubber surface. In case of making turns on projections, the lug side rubber surface will have an even higher chance to be cut. If the cuts run through the embedded steel cords, it might result in the steel cords breakage due to their corrosion. It is highly recommended to repair the cuts with cold vulcanization rubber as soon as they are observed.



### B. Prevention

Machine operators are requested to drive with great attention to the ground's surface especially in terrains of the following type:

- \* Construction sites
- \* Demolition sites
- \* Pathes covered with rocks and woods
- \* Concrete ridges
- \* Stumpy fields

When operating on terrains as mentioned above, high speed drive, quick turns and overloadings should be avoided.

## (6) Cracks of the lug side rubber due to fatigue

### \* Damage

Small cracks around the root of the lug as a result from operation fatigue.

### \* Replacement

When the cracks reach so deep that they expose the steel cords, whole track replacement is required.



Fatigue crack



Ozone crack

### A. Cause of the damage

Because of wound stress applied to rubber tracks around the undercarriage parts during operation, the fatigue especially causes cracks on the lug side rubber surface. Once the cracks occur, they gradually deteriorate with even small external injuries.

Also when operating near seashores or under cold temperatures, rubber tracks are more likely to suffer from ozone cracks.

### B. Prevention

Rubber tracks are designed with special rubber compounds as to prevent cracks due to fatigue. However, external injuries on the lug side rubber sometimes cause more chance of cracking. Machine operators should take good care when driving, so as not to cause external injuries to the lug side rubber. In order to minimize the occurrence of ozone cracks, attention should be paid to the following instructions for maintenance:

- \* Avoid exposing stored tracks to direct sun light
- \* Avoid exposing stored tracks to direct rain and snow fall
- \* Store tracks in well ventilated warehouses
- \* Use the tracks at least once a month

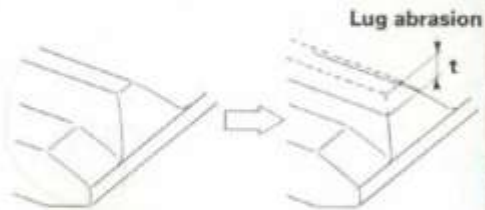
## (7) Lug abrasion

### \* Damage

As its service time proceeds, the lug side inevitably undergoes abrasion.

### \* Replacement

No replacement is required.



### A. Causes of the damage

Lug abrasion is more or less inevitable. Even if lug abrasion is proceeding, the rubber track can be used. However, as the traction performance deteriorates accordingly, it is highly recommended to replace the abraded tracks with new ones when the lug height becomes less than 5 mm.

### B. Prevention

In order to prevent the rubber track from abnormal or premature abrasion, following operating conditions should be avoided:

- \* Making quick and repeated turns on concrete and asphalt roads
- \* Driving up and down mountain paths with slippage
- \* Making frequent turns on paths covered with rocks and wood

## (8) Cracks and cuts on the lug side rubber at the edges of the embedded metals

### \* Damage

Sometimes cracks and cuts on the lug side rubber at the edges of the embedded metals can be observed.

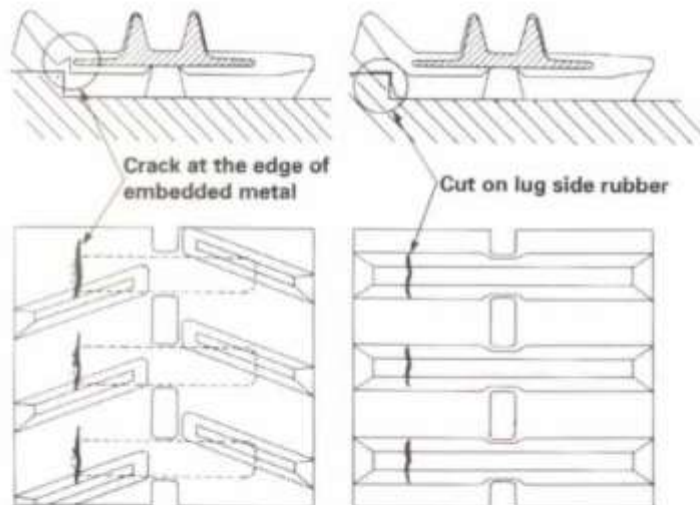
### \* Replacement

Basically, no replacement is required unless the cuts on the lug side rubber are discovered all around the edges of the embedded metals, as this will result a complete cut off.



### A. Causes of the damage

When rubber tracks drive over sharp projections, intensive stress is applied to the lug side rubber surface, especially at the edges of embedded metals, causing cracks and cuts in the area around the embedded metals.



### B. Prevention

To avoid intensive stress applied to the lug root where metals are embedded, machine operators are requested to avoid driving over stumps and ridges.

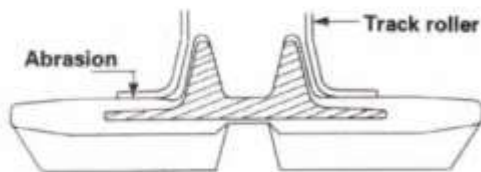
## (9) Abrasion of the track roller side rubber surface

### \* Damage

The rubber surface on which track rollers run is gradually abraded. It will end in the exposure of the embedded metals.

### \* Replacement

It is recommended to replace the rubber track when more than half of the embedded metals are completely exposed.



### A. Causes of the damage

The abrasion of the track roller side rubber surface occurs because of sand and gravel being clogged between the rubber and the outside running track rollers. The stress pushes such sand and gravel to the inner side of the rubber track to cause the abrasion in the end.

The level of abrasion is highly dependent on terrain conditions. A higher level of abrasion will occur when the rubber tracks are operated at fields covered with many stones and gravel. Small stones hardened with mud, stuck to the track rollers increase the abrasion level. After an extended period of abrasion, it will be more likely for exposed embedded metals to catch moisture through the inside steel cords, which can cause breakage of steel cords and separation of the metals from the rubber body.

### B. Prevention

After operation in wet fields containing many small stones, please wash off the mud that is stuck to the track rollers completely. When operating on gravel paths and stony grounds, machines should be driven slowly and the turning radius should be big enough to prevent stones and gravel from getting stuck to the track roller side rubber.

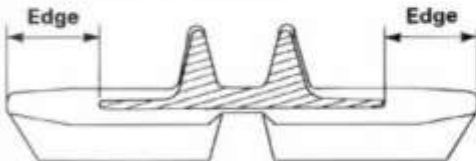
## (10) Cuts on the edges of track roller side rubber

### \* Damage

Both edges of rubber track have no special reinforcements. It sometimes occurs during operation they are cut or torn off.

### \* Replacement

In such case, the rubber track does not have to be replaced.

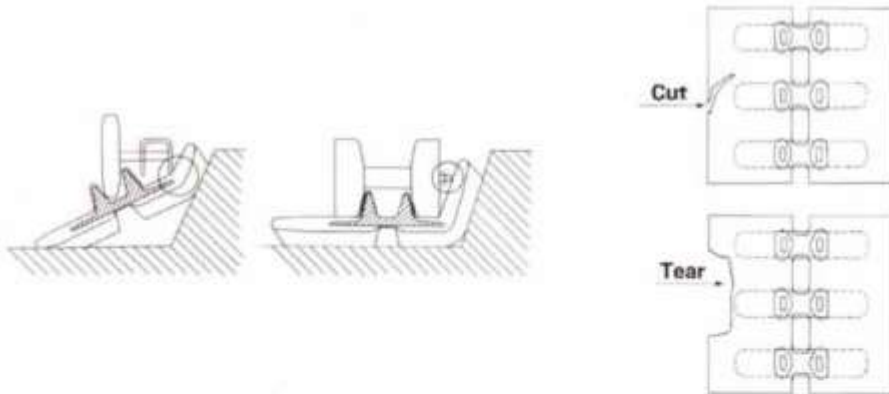


### A. Causes of the damage

This damage is caused by objects on the field or by interference with the machine frame :

(1) In case of damage by objects on the operating ground

The edges of rubber track are often deformed largely due to a bumpy ground surface, stones and other objects, which cause intensive stress on the edges resulting in the damage. Especially, when a machine drives over concrete ridges, this type of damage easily occurs.



(2) In case of damage by interference with the machine frame

If a machine continues operating with rubber tracks being detracked, the rubber tracks may get caught up in the machine frame or undercarriage parts resulting in damage. Furthermore, when a machine travels along side slopes, the rubber tracks are deformed so much that they come into contact with the machine frame and undercarriage parts, which causes cutting, gouging and rubbing of rubber tracks in the end.

### B. Prevention

When travelling, a machine operator should be careful not to drive over any projections on the ground. He should also prevent rubber tracks from coming into contact with concrete walls, ditches and ridges. If rubber tracks are detracked, the machine should be stopped immediately for retracking.

Please note that the descriptions above are subject to change without prior notice for product improvement.  
The descriptions above are as of June 2007.

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