

Chapter 1*(Text completely revised)***CLASSIFICATION OF DAMAGE TO AIRCRAFT
TYRES AND TUBES****LIST OF CONTENTS**

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General

1. This chapter contains information to guide personnel in the classification for repair of defective aircraft tyres and tubes. The classification of normal tread wear is given in Vol. 1, Book 2, Sect. 2, Chap. 2, and instructions on the recording of the history of the tyre will be found in Vol. 2, Leaflet B.3. The summarized information in Table 1 is also issued in A.D.4586.

TYRES

Examination

2. Whenever tyres are removed from their wheels, they must be examined for tread cuts and splits, for chafing of the beads, for fractures on the inside of the casing caused by

cuts or concussion, and for the lifting or movement of any tyre material.

3. The interior examination of a large tyre can be facilitated by rolling it along the floor and observing the area that is flattened by contact with the ground; the fractures are thereby opened and thus are more easily discernible.

Classification for repair

4. Defective aircraft tyres may be (a) repairable at Unit, (b) repairable at factory, or (c) unrepairable (i.e. scrap). Various types of damage, together with their possible causes and appropriate disposal or repair instructions, are listed in Table 1 against the figure numbers that illustrate them.

Table 1
Classification for repair of defective aircraft tyres

Fig. No.	Types of damage	Possible cause	Disposal or repair instructions		
			Applicability	Category	
1	Scuff	Locked wheel	(a) Tyres up to 100 lb/in ² (b) Tyres over 100 lb/in ²	Factory Scrap	
2	Flat spot, scald or skid burn	Locked wheel	(a) Tread pattern remains (b) Tread pattern worn away (c) Casing cords damaged	Serviceable Factory Scrap	
3	Uneven tread wear	Incorrect pressure or misalignment	(a) Tread pattern remains (b) Tread pattern worn away (c) Worn on one side	Serviceable Factory Serviceable when tyre has been turned round on wheel	
4	Tread rubber cut or nail hole in casing (para. 6)	Flints and nails	(a) Tyres up to 100 lb/in ² (b) Tyres over 100 lb/in ²	Unit Factory	
5	Split in base of tread groove	Extension of cut by swivelling of aircraft	(a) Splits under 2 in. long, not more than two, at least 12 in. apart, in tyres up to 100 lb/in ² (b) Tyres over 100 lb/in ² , and splits over above limits	Unit Factory	
6	Open tread joint	Moulding defect	All tyres	Factory	
7	Tread fully worn	Normal wear	(a) Tyres up to 300 lb/in ² (b) Tyres over 300 lb/in ²	Factory Scrap	
8	Local swelling of rubber	Oil contamination	All tyres	Scrap	
9	Fracture of casing cords	Impact on small area	All tyres	Scrap	

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TABLE 1 (continued)

Fig. No.	Types of damage	Possible cause	Disposal or repair instructions	
			Applicability	Category
10	Blistering	Air trapped between outer cord ply and outer rubber	(a) Not more than two blisters, up to 1 in. diameter, in lower sidewall only (i.e. not above size marking), and not less than 1 ft. apart whether on one or both sides of the tyre (b) Sidewall blister up to 1½ in. diameter (c) Sidewall blister over 1½ in. diameter	Serviceable after the blisters have been punctured with an awl to release the trapped air Factory Scrap
11	Cracks in sidewall	Ageing, prolonged exposure, or faulty storage	(a) Cords not exposed (b) Cords exposed	Serviceable Factory
12	Sidewall flow splits	Moulding defect	(a) Cords not exposed (b) Cords exposed	Servicable Factory
13	Loaded while deflated	Loss of air	Damaged and apparently undamaged	Scrap
14	Rim chafing	Under-inflation or oil contamination	(a) Chafer cords undamaged (b) Chafer cords damaged	Serviceable Factory
15	Tyre lever damage	Incorrect use of levers	(a) Chafer cords undamaged (b) Chafer cords damaged (c) Cords below chafer damaged	Serviceable Factory Scrap
—	Inner liner damage (tubeless tyres only)	Impact on small area or oil contamination	(a) Nail holes (b) Any other damage	Serviceable Scrap
—	Structural damage from over-heating	Excessive brake temperatures	All tyres on wheels with fusible plugs that have melted	Scrap
—	Loose or lifting balance rubber	Manufacturing defect	All tyres	Serviceable when rubber has been secured

Limits of Unit repairs

5. The extent of repair that may be carried out at a Unit is generally restricted to repair of the tread rubber only. Where there would be a large number of such repairs, however, it is generally more economical to return the tyre to the factory for remoulding.

6. The repair categories for tyres with isolated cuts in the tread area are shown in Table 2 against various tyre pressure limitations.

7. Unit repair must not be attempted when the cord fabric of the tyre is damaged, except

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in emergency (para. 8) or when the damage has been caused by a nail or similar object. Nail holes are defined as clear penetrations of $\frac{1}{16}$ in. diameter or less, through any or all of the casing plies.

Emergency repairs

8. If an aircraft has tyres with cuts that are not confined to the rubber but penetrate the casing, it may return to base for renewal of the tyres provided that the conditions given in para. 9, 10 and 11 are met; the conditions are applicable to both single-tyred and multi-tyred undercarriages.

9. The concession is only permissible for those tyres (a) with inflation pressures that do not exceed 300 lb/in² and (b) with casing cuts that are confined to the tread area. Any cuts in the sidewall cords render the tyre unrepairable (scrap) and it must be renewed before the aircraft is flown.

10. The concessionary cuts must not penetrate more than the two top cord layers, and may not be more than $\frac{1}{2}$ in. long in the top cord layer. Further, the cuts must not be more than two in number and must be at least one foot apart around the circumference.

11. Before the aircraft returns to base, the cuts must be plugged with repair compound as stated in Chapter 3, and the tyre suitably marked to show the positions of the cuts when it arrives at base for repair classification.

Unrepairable tyres

12. Tyres that cannot be repaired must be marked SCRAP, in large white-painted letters, on both sidewalls; all other markings, except those giving tyre size, must be buffed off before disposal.

TUBES

Examination

13. Whenever tyres are removed from their wheels, their tubes must be examined for damage. Any damage to a tube should, where possible, be correlated with the corresponding damage to the tyre as this may not be readily apparent.

14. The valve should be examined for defective threads, and the core renewed. The reinforcing collar around the valve (A in fig. 17) sometimes appears to have separated from the valve stem but this is not detrimental unless leakage is evident at this point.

15. The base of the tube should be examined all round for thinning of the rubber caused by heat generated during normal braking operations; this thinning may be felt at the part of the tube that has been adjacent to the bead toes.

Limits of Unit repairs

16. Unit repairs to the tube rubber (Chap. 3) are permissible for damage that is less than 2 in. \times 2 in. in area, provided that the reinforcement at the valve will not be affected by the repair; if it will, the tube must be scrapped. Damaged valve threads may be rectified with a valve tool.

Unrepairable tubes

17. Any damage other than that stated in para. 16—such as excessive creasing (slight creasing is serviceable), tube thinning or stretching, or excessive bead toe chafing (fig. 16) or splitting—renders the tube scrap.

TABLE 2
Repair categories for tyres with tread cuts

Tyre pressure (lb/in ²)	Cuts in tread area			Remarks
	Rubber only	Rubber and casing		
Under 100	Unit	Nail holes only—Unit	Cuts other than nail holes—Factory	Emergency repairs (para. 8 to 11)
100 to 200	Factory			
200 to 300	Factory	Scrap		
Over 300	Factory	Scrap		

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REF	DESCRIPTION OF DAMAGE	POSSIBLE CAUSE	DISPOSAL
1	SCUFFED Localised wear resulting in abrasive damage to the tread casing	Wheel locking due to harsh braking	Factory when length of scuff does not exceed $\frac{1}{2}$ in. Beyond this scrap
2	FLATSPOT Localised wear of tread rubber only	A less severe form of the above	Factory
3	UNEVEN TREAD WEAR Excessive circumferential wear on any part of the tread profile	Misalignment, camber or incorrect inflation pressure	Factory
4	TREAD CUT DAMAGE Penetration of tread and casing by sharp object	Flints, nails, etc.	Repairable at Unit unless cuts are numerous or tyre is within limits given in WARNING
5	SPLITTING IN BASE OF GROOVE Circumferential split running in and parallel to pattern groove	Extension of a cut or swivelling of aircraft	Factory
6	OPEN TREAD JOIN Separation of tread at the join as distinct from a visible tread join	Inadequate knitting of tread joint surfaces during moulding	Factory
7	COVER WORN OUT	Service life of cover expended	Factory repair or scrap according to classification in A.P. 2337, Vol. 1, Book 2, Sect. 2, Chap. 2.
8	CONTAMINATION Localised swelling and softening of tread or wall rubber	Absorption of hydraulic fluids, oils, kerosine, etc.	Factory
9	CONCUSSION FAILURE Fracture of casing cords	Impact on objects	Scrap
10	AIR TRAPPING Tread blistering or bulging of sidewall or tread rubber	Air percolation or air trapping between tube and tyre during fitting. (Refer to correct inflation procedure)	Factory
11	SIDEWALL CRACKING Sidewall surface covered by a mass of small radial or circumferential cracks	Ageing, prolonged exposure to the weather, Incorrect storage	Examination as detailed in A.P. 2337
12	SIDEWALL SPLITS Shallow splits occurring on the sidewall rubber	Incomplete knitting of surfaces caused by folding during moulding	Should remain in service unless casing cords are exposed
13	NO VISIBLE DAMAGE	The cover has been subjected to load whilst deflated, and because of this its condition is suspect	Factory (in addition to marking called for in A.P. 2337, Vol. 2, Leaflet B.2) the cover to be additionally labelled to indicate that it has been subjected to load when deflated
14	RIM CHAFING Abrasion of fabric in area above wheel flange	Under inflation or contamination of the bead area by oils, etc.	Factory
15	TYRE LEVER DAMAGE Localised fracture of bead clinch fabric	Incorrect use of levers	Factory
16	BEAD TOE CHAFING Narrow circumferential areas of abrasion on the tube base corresponding to the bead toe position	Sharp bead toes, excessive movement of the bead	Scrap
17	THINNING AT BEAD TOE POSITION Narrow circumferential areas on the tube base at the bead toe position where the rubber thickness has been reduced. It is usually easily detected by feel. (Not illustrated)	Excessive transfer of brake heat to tube	Scrap

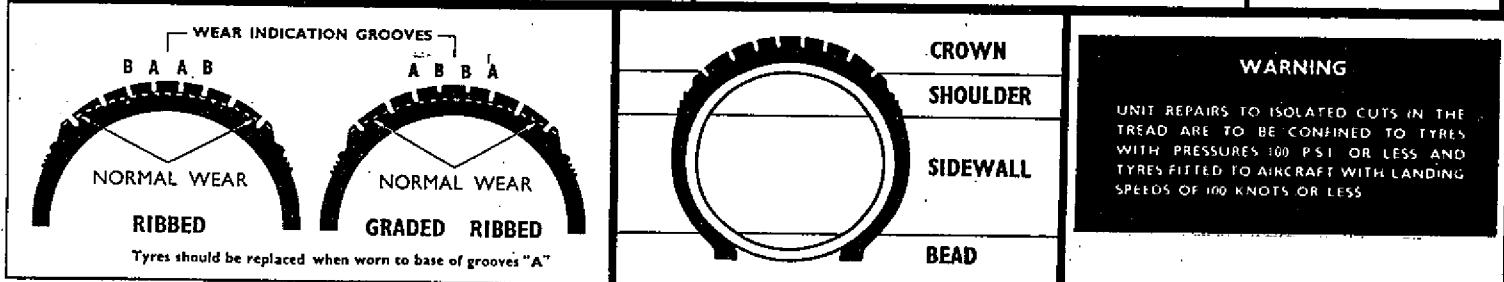


Table 2. Classification of unserviceable aircraft tyres

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(A.L. 51, Dec. 56)

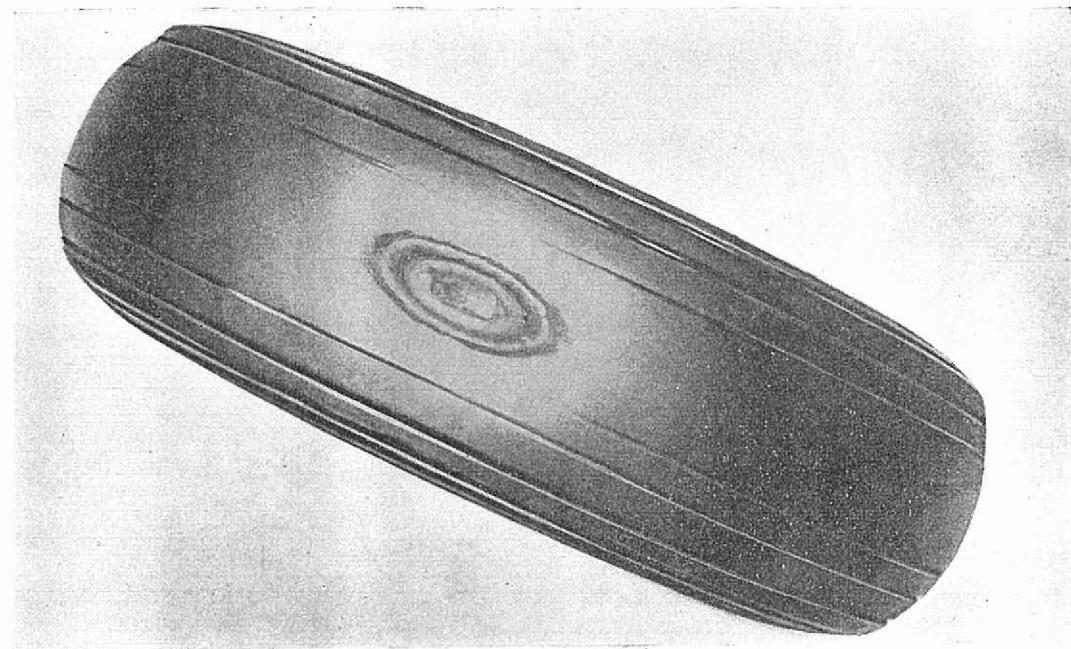


Fig. 1. A scuffed outer cover

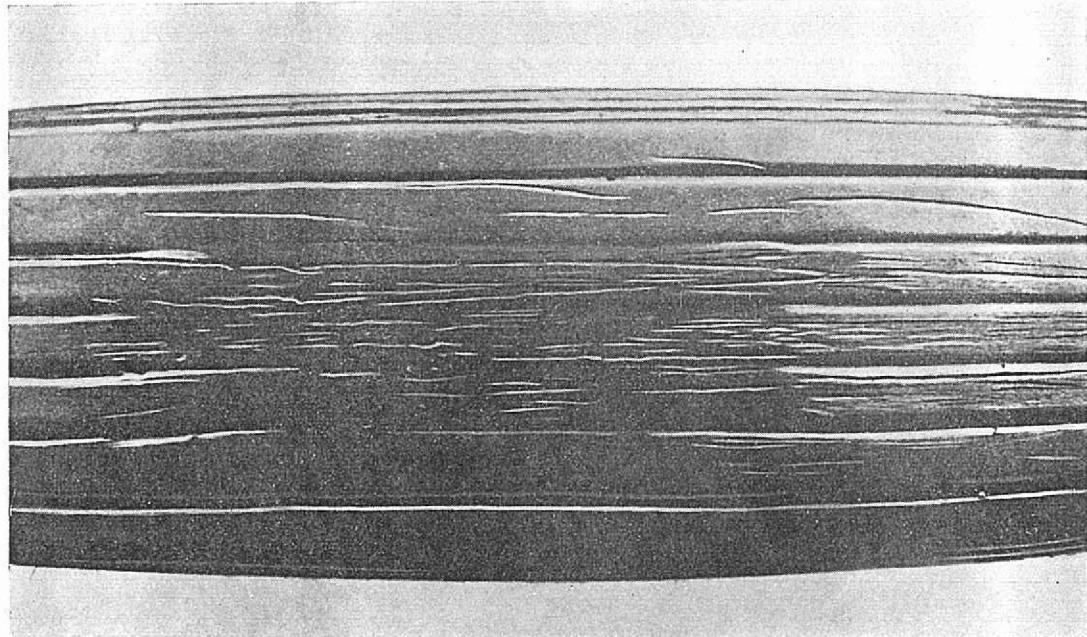


Fig. 2. A flatspot on a cover

(A.L.51, Dec. 56)

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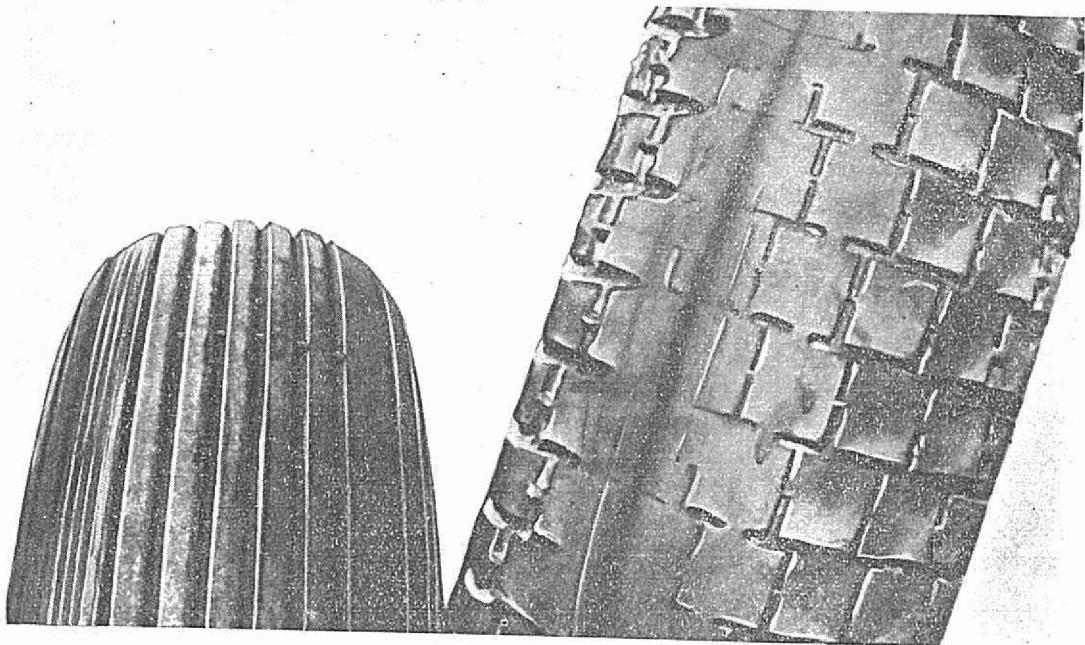


Fig. 3. Uneven tread wear

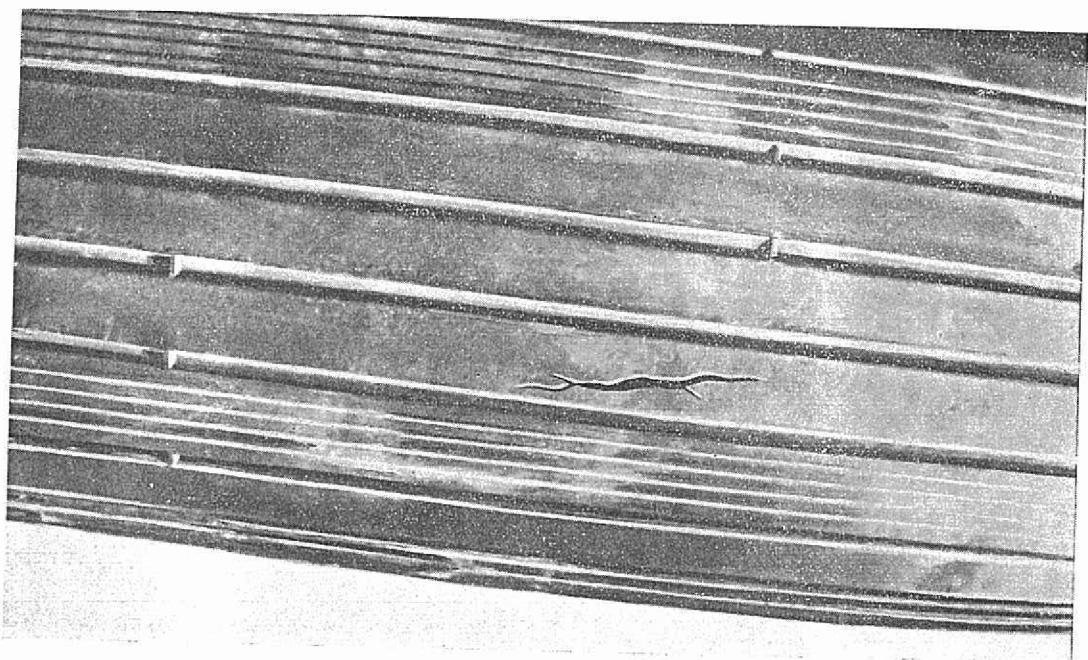


Fig. 4. Tread cut damage

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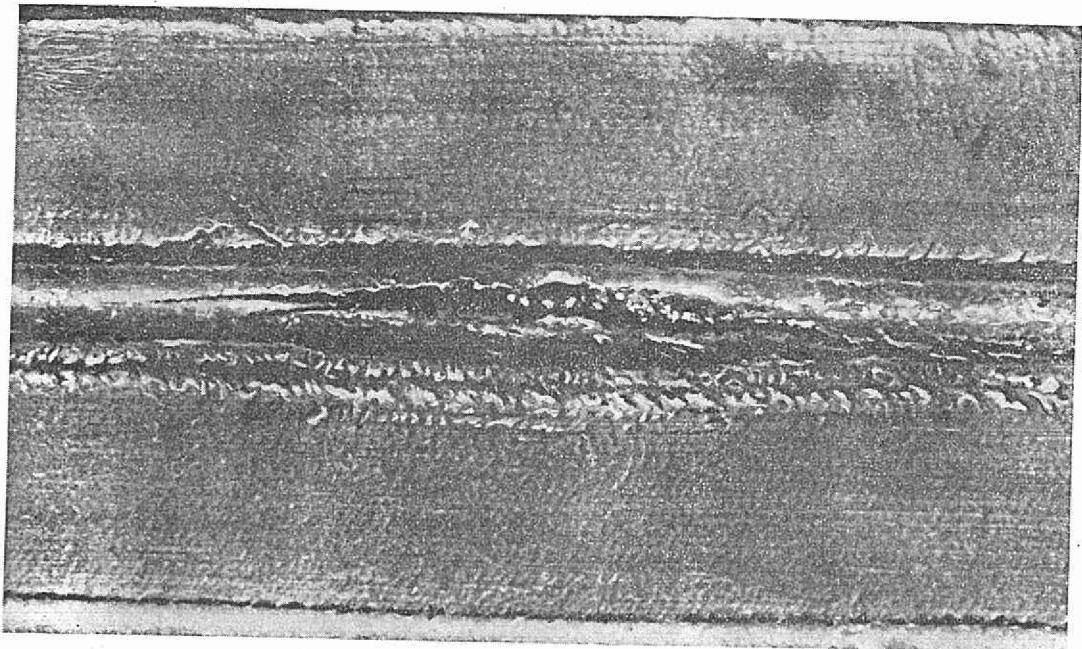


Fig. 5. Splitting in the base of a groove

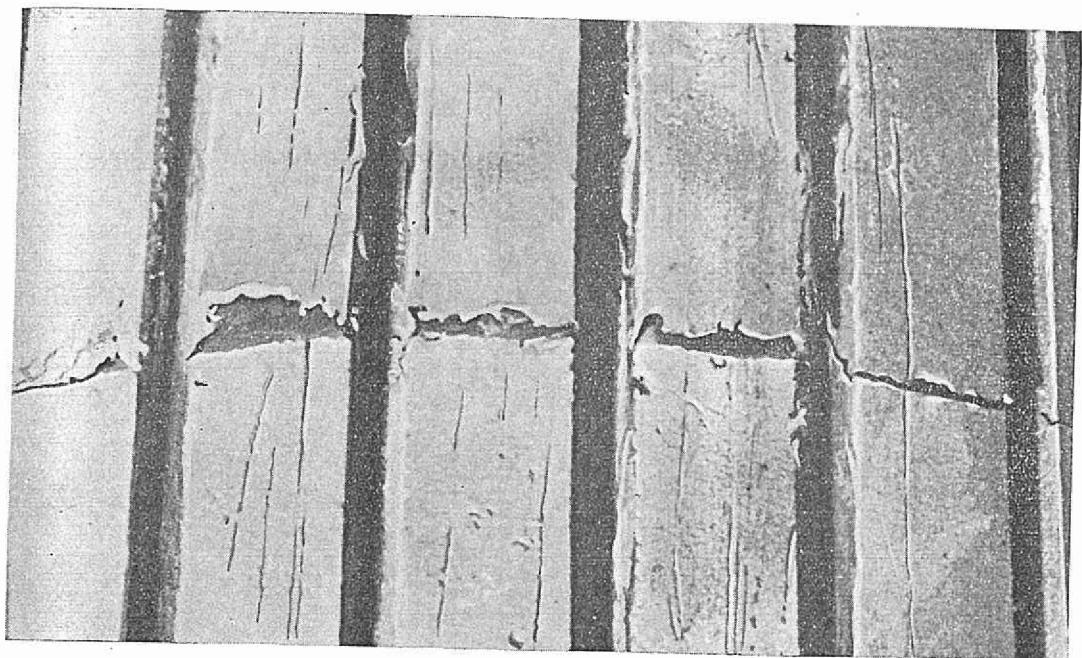


Fig. 6. An open tread join in a cover

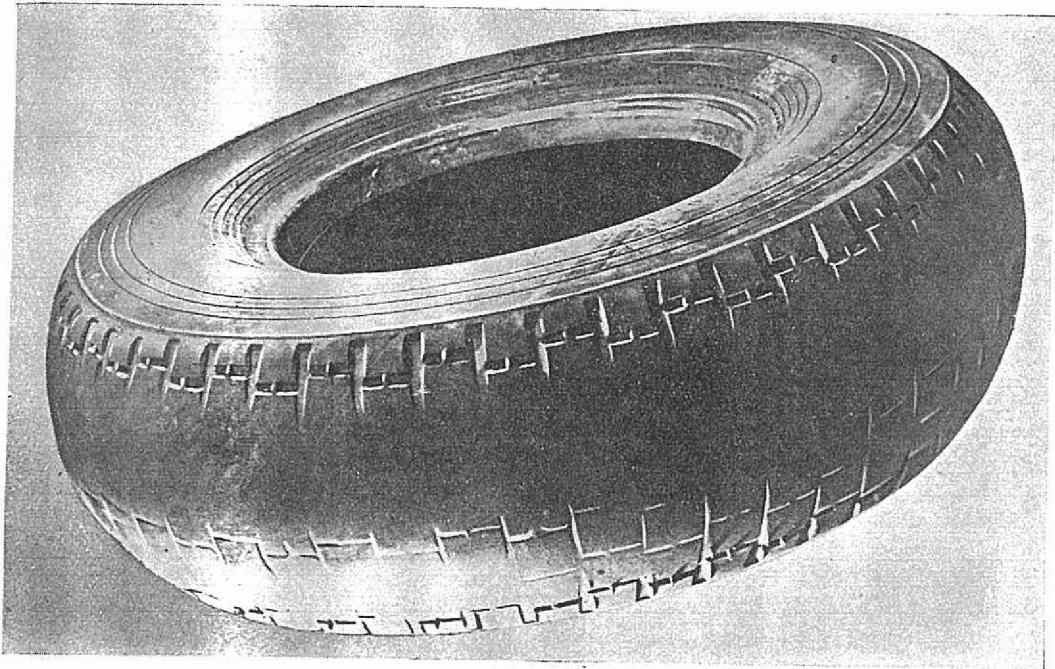


Fig. 7. A worn out cover



Fig. 8. Contamination of the rubber

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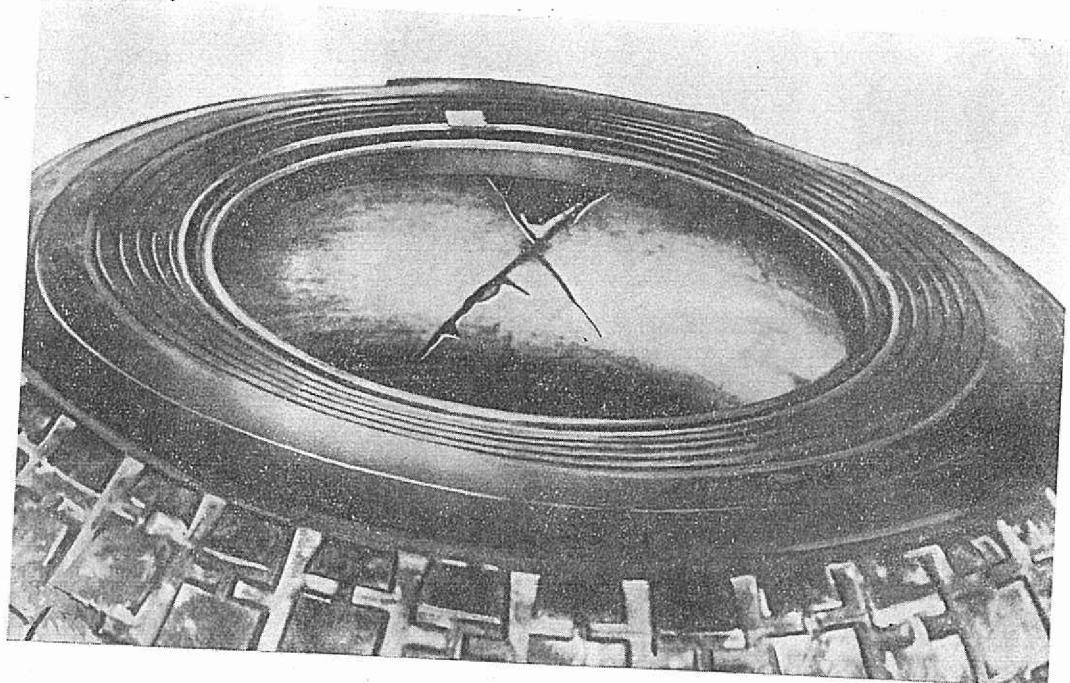


Fig. 9. Fracture of casing cords

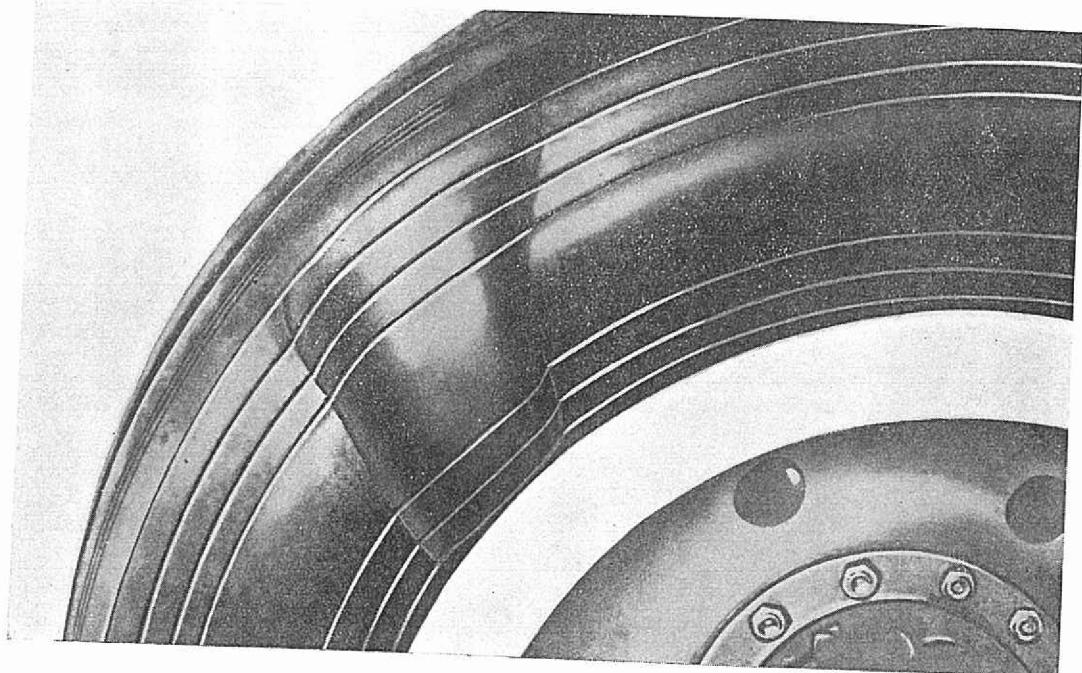


Fig. 10. Air trapped in cover

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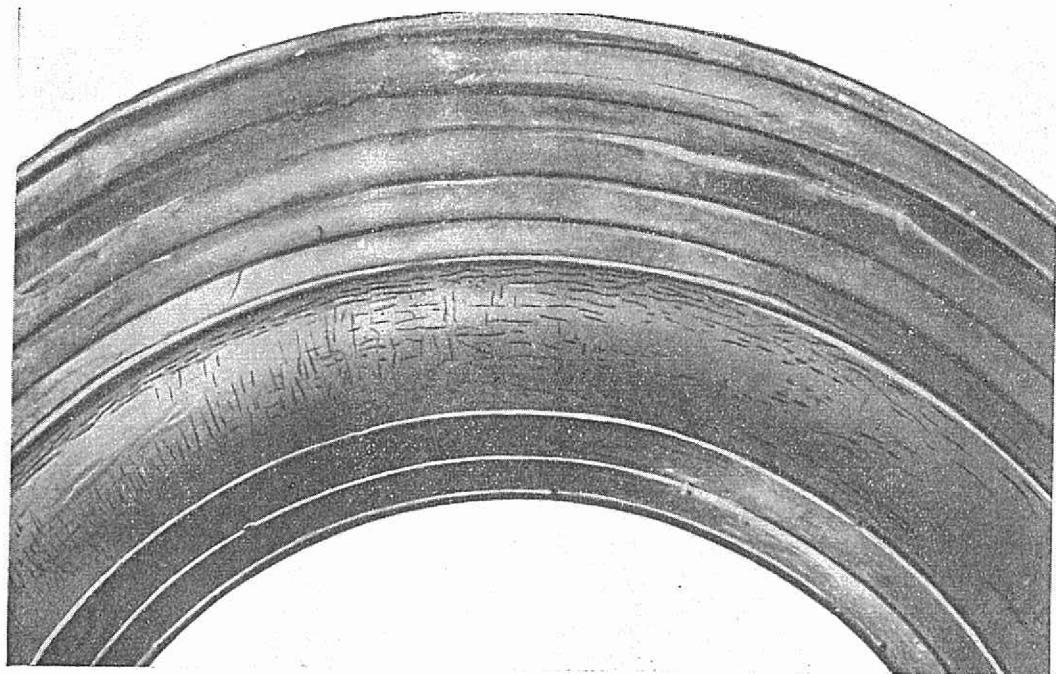


Fig. 11. Cracks in sidewall of cover

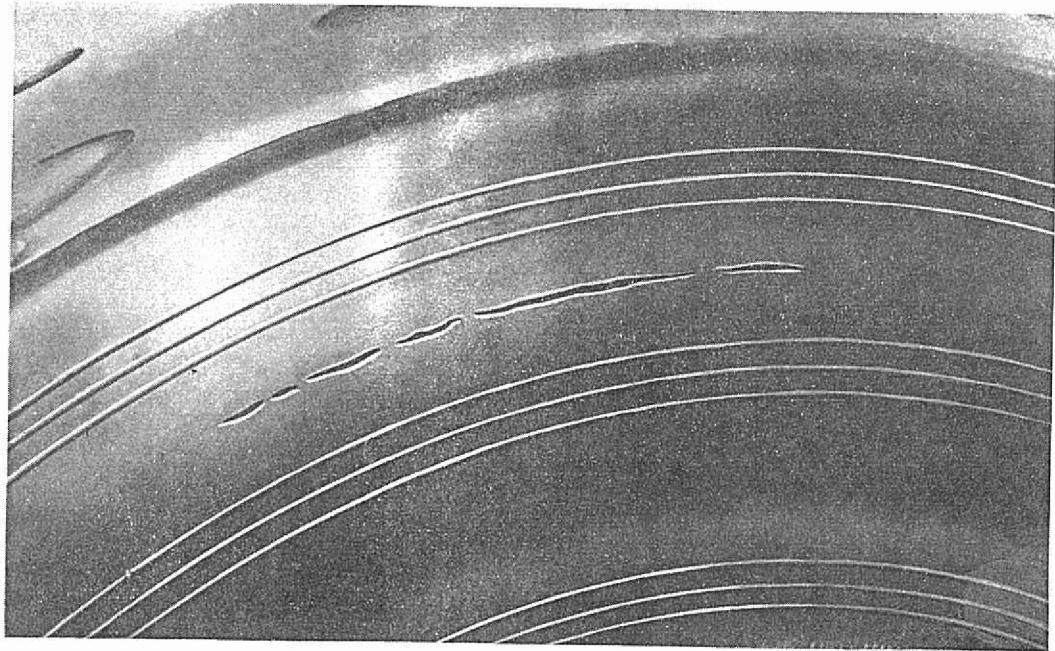


Fig. 12. Splits in sidewall of cover

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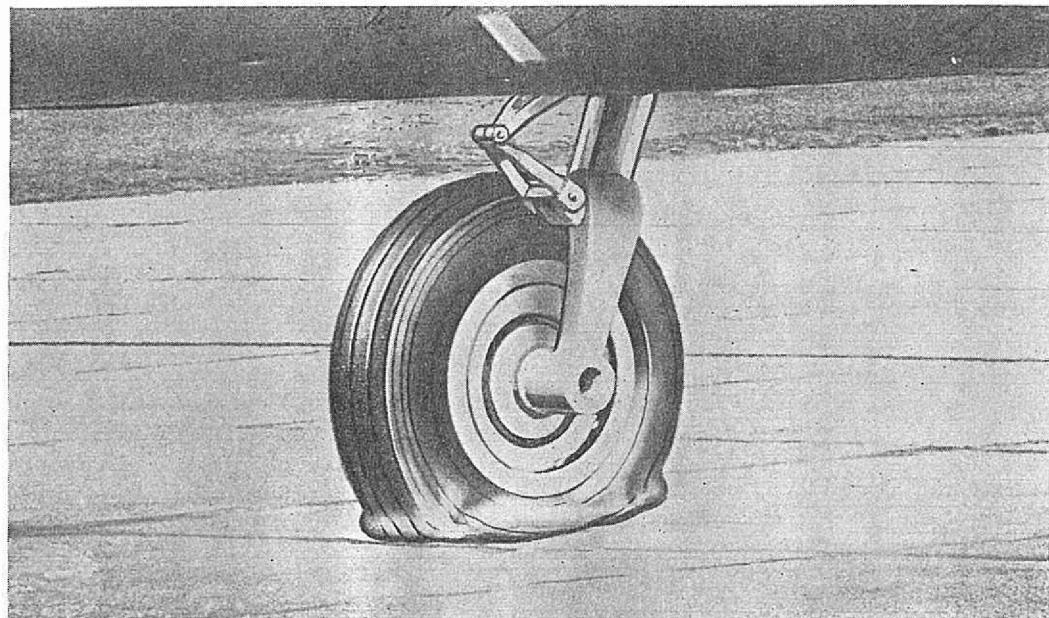


Fig. 13. Load on a deflated cover

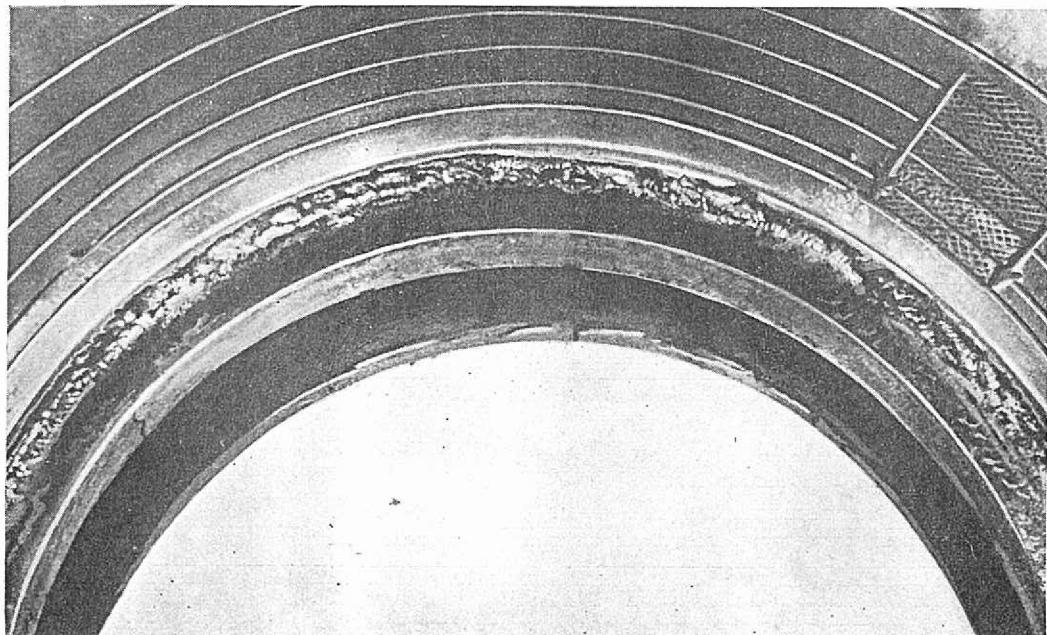


Fig. 14. Abrasion of rim fabric

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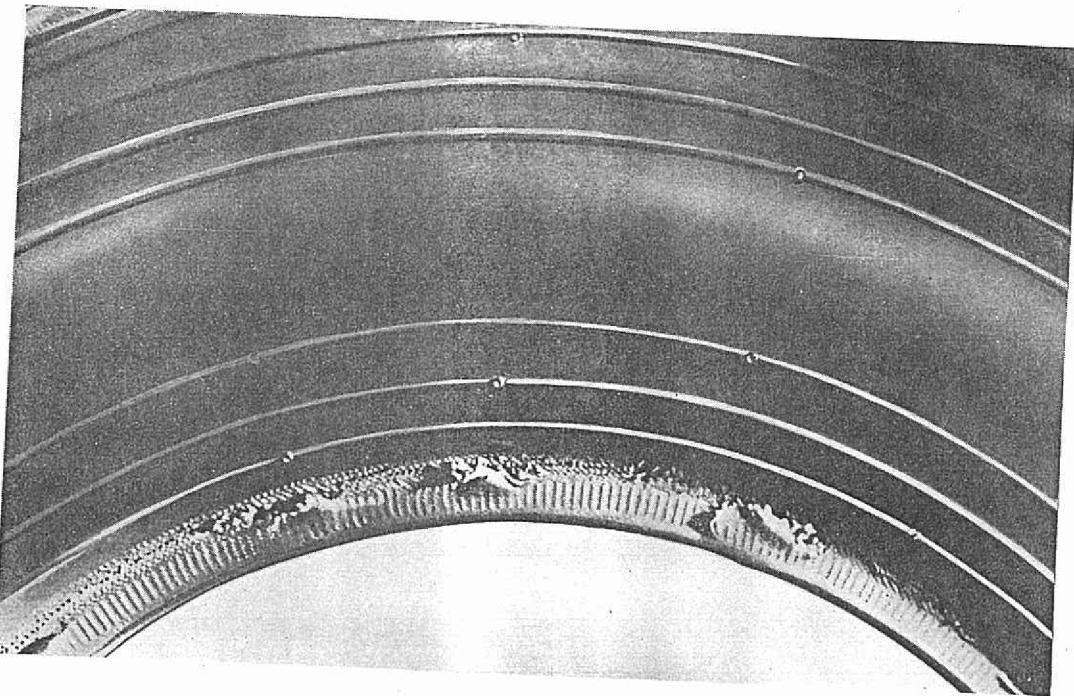


Fig. 15. Tyre lever damage

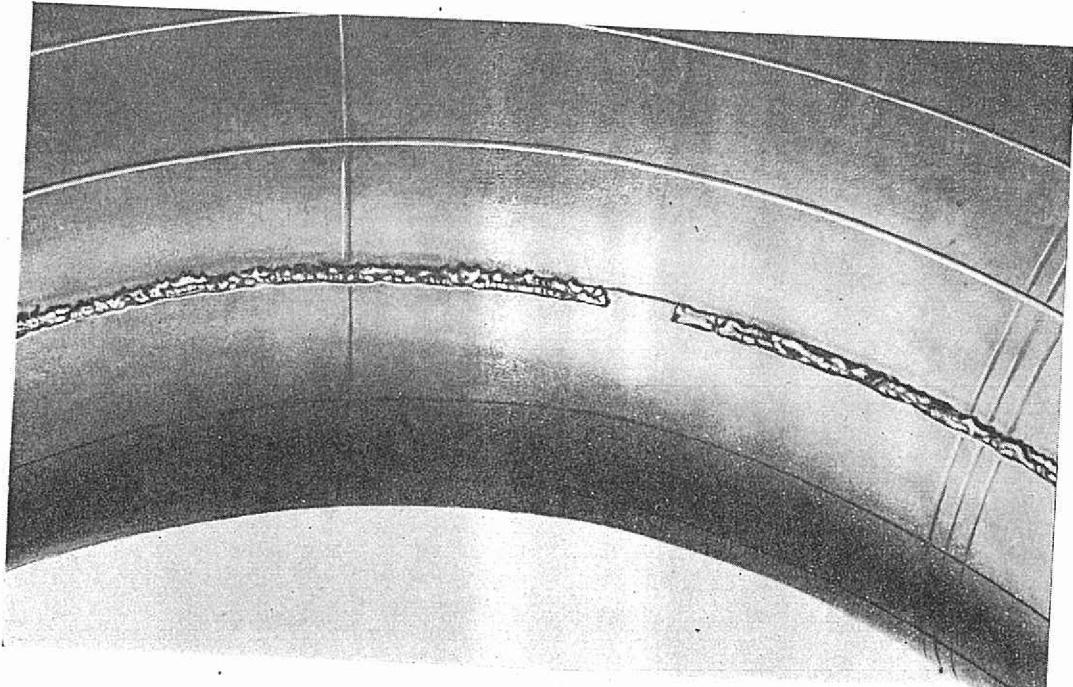


Fig. 16. Bead toe chafing on tube

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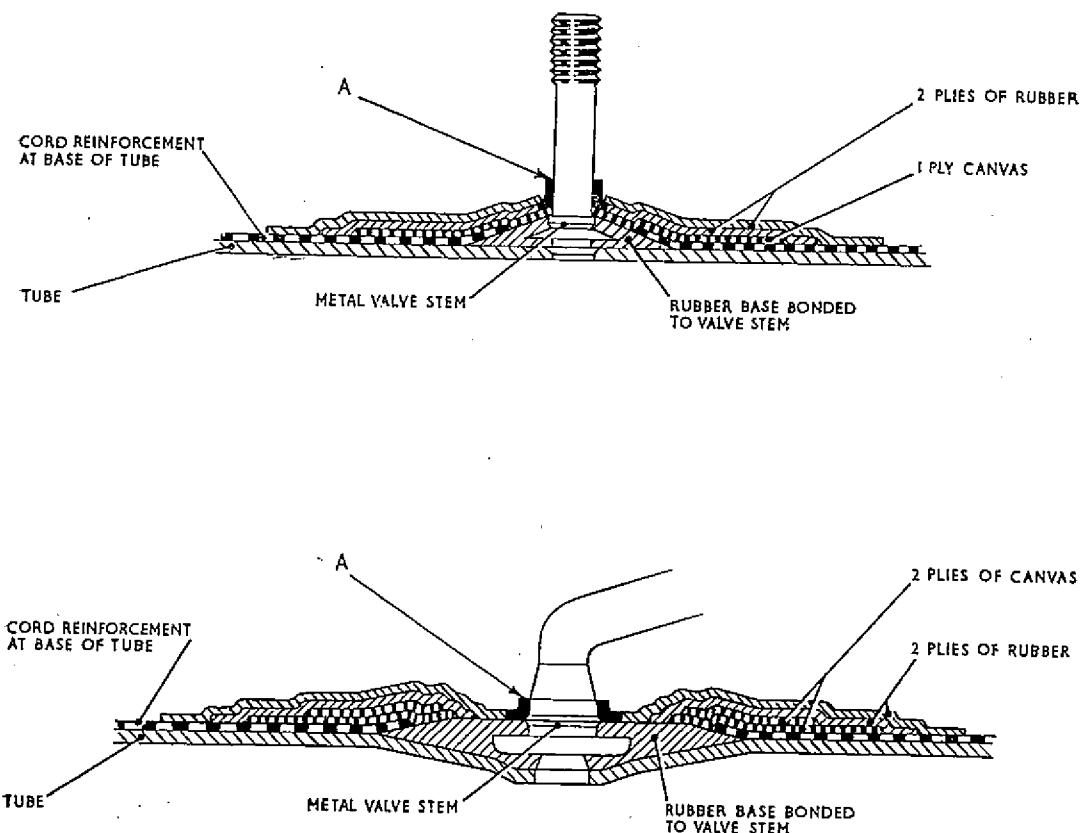


Fig. I7. Tube reinforcement at valve position

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