

1359 464

PATENT SPECIFICATION

(11) 1359 464

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 B7C 3B12 3B9
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(54) IMPROVEMENTS IN OR RELATING TO PNEUMATIC TYRES

(71) We, DUNLOP HOLDINGS LIMITED (formerly The Dunlop Company Limited), a British Company of Dunlop House, Ryder Street, St. James's, London S.W.1., do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to pneumatic tyres. When a pneumatic tyre is punctured, loss of air can occur to the extent that opposite interior walls of the tyre come into contact with high localised pressure and the tyre adjacent to the contact patch is severely flexed and buckled. This creates very high stresses in the rubber and the reinforcing materials within the tyre and can lead to tyre failure, e.g. by fatigue, in particular, since there are flexing movements in the tyre of very great amplitude which are repeated during each rotation of the tyre.

25 According to the present invention there is provided a pneumatic tyre having in the radially outer region of each of the sidewalls an annular layer of soft rubber having a hardness of 45° B.S.I. or softer.

30 If desired the modulus of elasticity of the rubber may also be low e.g. less than 450 lbs./square inch measured at 300% extension but rubbers of considerably higher modulus may also be used.

35 Each sidewall of the tyre is considered, in this specification, to be that portion of a tyre which extends from the edge of the tread which forms the limit of the ground contacting surface to the position on the tyre corresponding to the radially outer limit of the flange of a wheel rim for which the tyre is designed.

40 The radially outer region of each of the tyre sidewalls, adjacent to the tread, at which the annular layer of soft rubber is located may extend from the edge of the tread which forms the limit of the ground contacting surface, radially inwardly to the mid-sidewall region i.e. that region of the tyre of maximum axial width measured on the inflated tyre, though the radially outer region may be smaller and lying between the above-mentioned limits.

50 The layer of soft rubber is preferably located substantially radially outwardly of a point lying radially outwardly of the mid-sidewall by an amount of $\frac{1}{4}$ of the total sectional height of the inflated tyre measured from the bead base to the peak of the crown of the tyre tread.

55 The maximum thickness of the annular layer of soft rubber is preferably not less than 1 mm and may lie between 1 mm and the total thickness of rubber down to the topping compound on the reinforcing cords of the tyre.

60 The annular soft rubber layer may be located axially outwardly or axially inwardly of the carcass sidewall i.e. in the latter case on the inner linear side. In either case the radially outer regions of each of the sidewalls of the tyre should preferably be devoid of grooves or any other such pattern features which may lead to concentration of stresses during severe flexing.

65 In a tyre in accordance with the invention, the provision of the soft rubber layer serves to reduce the very high stresses in the rubber and the reinforcing material within the tyre under deflated running conditions, compared with tyres having no such layer, by the distribution of the strains in the structure. Thus an early structural failure can be avoided and a deflated tyre according to the invention may be driven an increased distance compared with a conventional tyre not in accordance with the invention, without serious damage, a replacement tyre and wheel assembly eventually being fitted.

70 This invention is applicable in particular to tyres having carcasses of radial cords but can be applied to carcasses of cross-bias cords. Since the tyre is designed to be run safely under deflated conditions the aspect ratio of the tyre is preferably low, e.g. between 30 and 75 per cent and particularly between 55 and 75.

[Price 25p]

Price 33p

and 70 per cent and the width of the tread of the tyre is preferably greater than the width between the bead heels when the tyre is mounted on a wheel rim for which it is designed and inflated to its normal working pressure.

The present invention may be used in conjunction with the inventions of our co-pending Patent Applications numbers 30,033/70 (Serial No. 1,359,467); 30,034/70 (Serial No. 1,359,468); 30,027/70 (Serial No. 1,359,461); 30,028/70 (Serial No. 1,359,462); and 30,029/70 (Serial No. 1,359,463).

The tyre may be used in tyre and wheel assemblies in which the tyre can be removed from the rim e.g. where the rim is a split rim or, alternatively, in assemblies in which the tyre is not removable from the rim, i.e. the two form a permanent assembly, for example, when the rim is swaged over the tyre beads after assembly of the tyre and rim.

Several examples of the invention will now be described by way of example only with reference to the accompanying drawings in which:—

Figure 1 shows in section a sidewall of a tyre having thereon a veneer of soft rubber in the radially outer region;

Figure 2 shows in section a sidewall of a tyre having a layer of thicker soft rubber in the radially outer region;

Figure 3 shows in section a sidewall of a tyre having thereon a thin layer of soft rubber inside the carcass in the radially outer sidewall region;

Figure 4 shows in section a sidewall of a tyre having a thicker layer of soft rubber inside the carcass in the radially outer sidewall region.

As shown in Figure 1, a radial ply tyre having a nominal section width of 185 mm, rim diameter of 13 ins and a 60% aspect ratio consists of a carcass 1, containing a textile radial cord reinforcing ply and bead rings, several breaker layers 2, tread rubber 3 and on each side of the tyre, sidewall rubber 4 and a chafer strip 5.

The tread rubber 3 is of a usual type and has a hardness in the range 63 to 73 B.S.I. whereas the sidewall rubber is softer having a hardness in the range 53° to 57° B.S.I.

In the radially outer region of each sidewall of the tyre is positioned a thin layer 6 of soft rubber having a hardness of 43° B.S.I. and a modulus at 300% extension of 800 lbs/in². The layer of soft rubber extends from a point positioned $\frac{1}{4}$ of the radial sectional height (H) of the tyre radially outwardly of the mid-sidewall to a point high on the tyre shoulder and has a maximum thickness of 1 mm.

In the example shown in Figure 2 the tyre is of similar construction to that shown in Figure 1 except that a layer 7 of the soft rubber replaces substantially all the sidewall

rubber radially outwardly of a point positioned $\frac{1}{4}$ of the section height (H) of the tyre radially outwardly of the mid-sidewall.

In the example shown in Figure 3 the tyre is again of similar construction to that shown in Figure 1 except that a layer 8 of the soft rubber having a maximum thickness of 1 mm. is located axially inwardly of the carcass plies. The layer 8 extends radially outwardly to beneath the tread edge from a point lying between the mid-sidewall and a point positioned $\frac{1}{4}$ of the section height of the tyre radially outwardly of the mid-sidewall.

In the example shown in Figure 4 the tyre is similar to that shown in Figure 3 except that a thicker layer 9 of the soft rubber is provided axially inwardly of the carcass plies. The layer 9 has a maximum thickness equal to the thickness of sidewall rubber 4 at the mid-sidewall and extends from the mid-sidewall to a region beneath the tread edge.

An example of a soft rubber suitable for use in the invention is given in the table below, all amounts of ingredients being given parts by weight

TABLE

Natural rubber	50	
Neoprene WRT	50	
Lampblack	20	
HAF black	10	95
Light Cal.Mag.	2	
Pine Tar	3	
Coumarone Indene resin	3	
Zinc Oxide	4	
Insoluble sulphur	2	100
MBTS	0.7	
Nonox ZA (Registered Trade Mark)	1.25	
BLE 25	1.75	

This rubber has a hardness of 40° to 43° B.S.I.

The soft rubber used in the tyres of this invention is preferably a rubber which is resistant to flex cracking, particularly at temperatures of the order of 100°C. to 140°C.

WHAT WE CLAIM IS:—

1. A pneumatic tyre having in the radially outer region of each of the sidewalls an annular layer of soft rubber having a hardness of 45° B.S.I. or softer.

2. A pneumatic tyre according to claim 1 in which the layer of soft rubber is located substantially radially outwardly of a point lying radially outwardly of the mid-sidewall by an amount of $\frac{1}{4}$ of the total sectional height of the inflated tyre measured from the bead base to the peak of the crown of the tyre tread.

3. A pneumatic tyre according to claim 1 or 2 in which the maximum thickness of the annular layer of soft rubber is not less than 1 mm.



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The tread rubber 3 is of a usual type and has a hardness in the range 63 to 73 B.S.I. whereas the sidewall rubber is softer having a hardness in the range 53° to 57° B.S.I.

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2. A pneumatic tyre according to claim 1 in which the layer of soft rubber is located substantially radially outwardly of a point lying radially outwardly of the mid-sidewall by an amount of $\frac{1}{4}$ of the total sectional height of the inflated tyre measured from the bead base to the peak of the crown of the tyre tread.

3. A pneumatic tyre according to claim 1 or 2 in which the maximum thickness of the annular layer of soft rubber is not less than 1 mm.



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4. A pneumatic tyre according to claim 1,
2 or 3 in which the annular layer of soft
rubber is located axially outwardly of the
carcass sidewall.
- 5 5. A pneumatic tyre according to claim 1,
2 or 3 in which the annular layer of soft
rubber is located axially inwardly of the car-
cass sidewall.
- 10 6. A pneumatic tyre according to any one
of the preceding claims having an aspect
ratio between 30% and 75%.
7. A pneumatic tyre according to claim 6
in which the aspect ratio is between 55%
and 70%.
- 15 8. A pneumatic tyre according to any one
of the preceding claims in which the width of
the tread of the tyre is greater than the width
between the bead heels when the tyre is
mounted on a wheel rim for which it is
designed and inflated to its normal working 20
pressure.
9. A pneumatic tyre according to any one
of the preceding claims in which the soft
rubber is resistant to flex cracking at tem-
peratures in the range 100°C. to 140°C. 25
10. A pneumatic tyre substantially as des-
cribed herein with reference to and as illus-
trated in Figure 1 or 2 of the accompanying
drawings.
11. A pneumatic tyre substantially as des- 30
cribed herein with reference to and as illus-
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R. I. G. MCKAY,
Agent for the Applicants.

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