

PATENT SPECIFICATION

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(72) Inventor TOM FRENCH

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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:—

This invention relates to pneumatic tyres. Upon partial or complete deflation of a pneumatic tyre mounted on a wheel during the running of a vehicle opposite parts of the interior surface of the tyre and wheel assembly come into contact with one another under more or less load according to whether or not the deflation is complete; the parts or regions of the interior surface of the tyre which come into contact are those regions of the interior surface of the tyre close to but radially outwardly of the wheel rim flanges which contact those parts or regions close to but radially inwardly of the tread edges.

When these surfaces come into contact considerable heat is generated within the rubber and textile components of the tyre and very rapid structural failure ensues. It has been discovered that the major source of the heat generated is caused by the relative movement of the parts of the surfaces in contact and under load and the temperature rise is particularly marked because of the high coefficient of friction of dry rubber to dry rubber.

According to the present invention there is provided a pneumatic tyre comprising a tread and two sidewalls each terminating in a tyre bead, the tread having a width greater than the axial distance between the tyre bead heels when the tyre is mounted on a wheel rim for which it is designed and inflated to its normal working pressure, the tyre having on or adjacent to a part of the internal surface thereof which comes into contact with a further part of the internal surface of the tyre when the tyre is used in a deflated condition, recessed portions in which a liquid

or solid lubricating material can be held so that said surface parts when brought into contact by partial or complete deflation of the tyre can be lubricated during rotation of the tyre under load.

The recessed portions may comprise spaces formed between smoothly rounded humps moulded onto the said part or parts of the internal surface or they may comprise spaces formed between a network of ribs which ribs can be inclined in different directions one to another, preferably with a plurality of the spaces interconnecting. Alternatively, the recessed portions each may comprise a pore formed within the internal surface of the tyre, the pores communicating with the said surface to supply lubricating material from the pores to the surface in particular when said parts of the surface are brought into contact under substantial pressure.

In a further alternative the recessed portions may comprise a network of grooves formed in the internal surface of the tyre.

In all of the instances referred to for each pair of mutually contacting surface parts the recessed portions may be formed in only one of the said contacting parts of the internal surface. Alternatively both contacting parts of the internal surface may be provided with recessed portions.

Particular parts of the internal surface of the tyre which may be provided with recessed portions are, for example, those parts of the interior surface of the tyre close to but radially outwardly of the wheel rim flange contacting regions of the tyre and/or those close to but radially inwardly of the tread edges.

In all of the instances referred to the lubricating material can be retained within the recesses, even under extreme pressure loadings between contacting parts of the internal surface of a loaded, deflated tyre, and, during the relative rubbing action between the loaded parts of the surface, during rotation of the tyre, the lubricating material is smeared onto the surface between

[Price 25p]

Price 33p

the recesses to maintain a continuous layer of lubricating material between contacting parts of the surface.

5 The effect of the lubricating material is to ensure that the coefficient of friction of opposed parts of the surface in rubbing contact is very low and that little heat is generated. The vehicle on which the tyre and wheel are mounted is thus enabled
10 safely to travel substantial distances, e.g. 10 or more miles, at a reasonable speed, e.g. 30 m.p.h.

The invention is preferably utilised in conjunction with flowable liquid lubricants as described in our co-pending U.K. Patent Application No. 30033/70 (Serial No. 1,359,467), for example, water based solutions of Teepol, (Registered Trade Mark) or mixtures of water with glycerine with or
20 without a defoaming agent and a gelling agent, or dispersions of graphite.

This invention is applicable in particular to tyres having a breaker assembly beneath their tread and having carcasses of radial
25 cords but can be applied to carcasses of cross-ply cords. Since the tyre is designed to be run under deflated conditions it preferably has a relatively low aspect ratio e.g. between 30 per cent and 75 per cent, and
30 more preferably between 55 per cent and 70 per cent.

The invention may be utilised in conjunction with the inventions described in our co-pending U.K. Patent Application Nos. 30027/70 (Serial No. 1,359,461), 30028/70
35 (Serial No. 1,359,462), 30030/70 (Serial No. 1,359,464) and 30031/70 (Serial No. 1,359,465).

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

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:—
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Figure 1 is a schematic sectional perspective view of a tyre and wheel assembly;

Figures 2 to 6 are sectional views showing various forms of recessed portions, and

55 Figure 7 is a plan view showing a possible groove arrangement for a tyre in accordance with the invention.

As shown in Figure 1 a tyre 1 having a tread and two sidewalls each terminating in a tyre bead and mounted on a wheel rim 2 is provided with a criss-cross pattern of grooves 3 in those parts A, B, C and D of the interior surface of the tyre which will come into contact if the tyre is deflated and
60 placed under load.

Figures 2 to 6 show various forms of recessed portions which can be used for the parts A, B, C and D, of the tyre interior surface.

Figure 2 illustrates in profile an alternative form of recessed portions consisting of a plurality of closely-spaced parallel grooves 4 separated by smooth humps 5. The grooves 4 are orientated circumferentially or radially in the tyre on the parts A, B, C and D of the surface.

In the alternative form of recessed portions shown in Figure 3 are provided a series of channels 6 each containing a rib 7. The channels are arranged circumferentially in the tyre.

In the alternative form of recessed portions shown in Figure 4 a series of small blind holes or pores 8 are provided in the interior surface of the tyre.

The alternative shown in Figure 5 is similar to that of Figure 2 except that the smooth humps 9 are more closely spaced than those in Figure 2 and the grooves 10 between the humps are correspondingly narrower.

The alternative form of recessed portions shown in Figure 6 provides a number of smoothly rounded ridges 12 on a flat surface. The ridges are orientated circumferentially with respect to the tyre.

Figure 7 shows in plan view a groove arrangement alternative to that shown in Figure 1 on the parts A, B, C and D of the tyre interior surface. A series of laterally disposed grooves 14 are provided in the interior surface 13 of the tyre, side grooves 15 branching from the grooves 14 are also provided, the side grooves 15 extending circumferentially with respect to the tyre. The positions of the side grooves 15 on adjacent lateral grooves 14 are staggered with respect to one another.

WHAT WE CLAIM IS:—

1. A pneumatic tyre comprising a tread and two sidewalls each terminating in a tyre bead, the tread having a width greater than the axial distance 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 tyre having on or adjacent to a part of the internal surface thereof which comes into contact with a further part of the internal surface of the tyre when the tyre is used in a deflated condition, recessed portions in which a liquid or solid lubricating material can be held so that said surface parts when brought into contact by partial or complete deflation of the tyre can be lubricated during rotation of the tyre under load.

2. A pneumatic tyre according to claim 1 comprising a breaker assembly beneath the tread thereof.



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10 safely to travel substantial distances, e.g. 10 or more miles, at a reasonable speed, e.g. 30 m.p.h.

15 The invention is preferably utilised in conjunction with flowable liquid lubricants as described in our co-pending U.K. Patent Application No. 30033/70 (Serial No. 1,359,467), for example, water based solutions of Teepol, (Registered Trade Mark) or mixtures of water with glycerine with or
20 without a defoaming agent and a gelling agent, or dispersions of graphite.

This invention is applicable in particular to tyres having a breaker assembly beneath their tread and having carcasses of radial
25 cords but can be applied to carcasses of cross-ply cords. Since the tyre is designed to be run under deflated conditions it preferably has a relatively low aspect ratio e.g. between 30 per cent and 75 per cent, and
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45 over the tyre beads after assembly of the tyre and rim.

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105 positions of the side grooves 15 on adjacent lateral grooves 14 are staggered with respect to one another.

WHAT WE CLAIM IS:—

110 1. A pneumatic tyre comprising a tread and two sidewalls each terminating in a tyre bead, the tread having a width greater than the axial distance 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 tyre having on or adjacent to a part of the internal surface thereof which comes into contact with a further part of the internal surface of the tyre when the tyre is used in a deflated condition, recessed portions in which a liquid or solid lubricating material can be held so that said surface parts when brought into contact by partial or complete deflation of the tyre can be lubricated during rotation of the tyre under load.

125 2. A pneumatic tyre according to claim 1 comprising a breaker assembly beneath the tread thereof.
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3. A pneumatic tyre according to claim 2 comprising a carcass reinforcement of radial cords.

5 4. A pneumatic tyre according to claim 1, 2 or 3 having an aspect ratio of between 30% and 75%.

10 5. A pneumatic tyre according to claim 4 having an aspect ratio of between 55% and 70%.

15 6. A pneumatic tyre according to any one of the preceding claims in which recessed portions are formed in both of the said surface parts.

20 7. A pneumatic tyre according to any one of the preceding claims in which recessed portions are provided in those parts of the interior surface of the tyre close to but radially-outwardly of the rim flange contacting regions of the tyre and/or those parts of the interior surface of the tyre close to but radially inwardly of the treat edges.

25 8. A pneumatic tyre according to any one of the preceding claims in which the recessed portions comprise spaces formed between smoothly rounded humps moulded on to the internal surface of the tyre.

9. A pneumatic tyre according to any

one of claims 1 to 7 in which the recessed portions comprise spaces formed between a network or ribs.

10. A pneumatic tyre according to any one of claims 1 to 7 in which the recessed portions each comprise a pore formed within the internal surface of the tyre, the pores communicating with the said surface to supply lubricating material from the pores to the surface, in particular when said parts of the surface are brought into contact under substantial pressure.

11. A pneumatic tyre according to any one of claims 1 to 7 in which the recessed portions comprise a network of grooves formed in the internal surface of the tyre.

12. A pneumatic tyre substantially as described herein with reference to, and as illustrated in, Figure 1 of the accompanying drawings.

13. A pneumatic tyre substantially as described herein with reference to, and as illustrated in, any one of Figures 2 to 7 of the accompanying drawings.

R. I. G. MCKAY,
Agent for the Applicants.

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