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(72) Inventors TOM FRENCH, REGINALD HAROLD EDWARDS
and LESLIE VERNON POWELL

(19)



(54) IMPROVEMENTS IN OR RELATING TO PNEUMATIC TYRE AND WHEEL ASSEMBLIES

(71) We, DUNLOP 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 tyre and wheel assemblies to pneumatic tyres, and to wheels.

Upon partial or complete deflation of a pneumatic tyre mounted on a wheel during the running of a vehicle opposite surfaces in the interior 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 interior surfaces which normally come into contact are the interior surfaces of the tyre close to but radially outwardly of the bead retaining flanges of the wheel rim which contact the interior surfaces of the tyre close to but radially inwardly of the tread edges.

When the 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 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 a pneumatic tyre and wheel assembly comprises a wheel rim having a pair of annular tyre bead retaining flanges, a tyre having a pair of sidewalls terminating in tyre beads and mounted upon the wheel rim to define an inflation chamber, means for preventing the tyre from being dislodged from the wheel rim when running deflated, and enclosing means for a lubricating material for the

interior surfaces of the tyre, which enclosing means is capable of automatically releasing lubricating material onto the interior surfaces of the tyre when the assembly is used with the tyre deflated to facilitate relative movement between contacting interior surfaces of the tyre.

The invention also provides a pneumatic tyre having attached to an interior surface an enclosing means for a lubricating material for the interior surfaces of the tyre, said enclosing means being capable, in use of the tyre, of automatically releasing said lubricating material into the interior of the tyre upon deflation of the tyre.

The invention also provides a wheel for a pneumatic tyre having a rim which carries an enclosing means for a lubricating material for the interior surfaces of the tyre, said enclosing means being capable, in use of the tyre on the rim, of automatically releasing lubricating material into the interior of the tyre upon deflation of the tyre.

The enclosing means may comprise pressure responsive means for releasing the lubricating material from the enclosing means when the pressure in the inflation chamber falls below a predetermined value, temperature responsive means for releasing the lubricating material from the enclosing means when the temperature in the inflation chamber exceeds a predetermined value or impact responsive means for releasing the lubricating material from the enclosing means upon impact with or abrasion by the interior surfaces of the deflated tyre.

When the enclosing means comprises impact responsive means for releasing the lubricating material it is preferred that it should be positioned on or adjacent to at least one of the interior surfaces of the tyre which come into contact when the tyre is running deflated. Generally the enclosing means is positioned on or adjacent to

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a lower sidewall region of the tyre interior immediately radially outwardly of the associated flange, or on or adjacent to a region of the tyre interior radially inwardly of one of the tread edges.

5 The enclosing means may comprise a rupturable membrane, e.g. of plastics material, which can be ruptured to release the lubricating material upon impact or abrasion by the interior surfaces of the tyre in the event of substantial loss of inflation pressure or deflation.

10 The enclosing means may also comprise a container with a screwed-on cap adapted gradually to be unscrewed step-by-step by rubbing contact with the interior surfaces of the tyre and wheel assembly during rotation of the assembly with the tyre deflated as the cap passes through the ground-to-tyre contact patch.

20 Alternatively the container may have a cap or projection from the cap which is subject to rupturing by impact or abrasion to cause release of the lubricating material, for example the cap or projection can be of a material subject to fatigue failure to release the lubricating material after several cycles of deflection, e.g. about 100 cycles of deflection, the deflection being caused by intermittent contact of the cap or projection with the interior surfaces of the tyre and wheel assembly.

25 The enclosing means may also take the form of a pressurizable container attached to the wheel, radially inwardly or radially outwardly of the rim. The lubricating material may be released from such a container by means of a valve sensitive to loss of tyre inflation pressure or by rupture of a suitable membrane.

40 In further embodiments the enclosing means may take the form of a sachet or tube or may comprise encapsulating resin or plastics which can be in the form of small capsules each enclosing a lubricating material or can be in the form of a foam in which the lubricating material is trapped.

45 The means for preventing the tyre from being dislodged from the wheel rim may comprise a saddle i.e. a raised member separate from or forming part of the rim, located between the tyre beads and extending radially outwardly from the wheel rim. Preferably at least a part of the enclosing means is located between the saddle and the tyre so as to be trapped between the saddle and the interior surface of a deflection portion of the tyre and thereby ruptured to release the lubricating material when the assembly is used with the tyre deflated.

60 The means for preventing the tyre from being dislodged from the wheel rim when running deflated may also comprise a substantially non-decreasing diameter of the wheel rim between the flanges thereof such

that the wheel rim is without a well into which the tyre beads can fall. For example the wheel rim may be formed initially with a well, to permit mounting of a tyre thereon, which well is subsequently closed by axial compression, or may comprise a flat base rim which is divisible to permit mounting of a tyre thereon. The means for preventing the tyre from being dislodged from the wheel rim when running deflated may also comprise tyre bead retaining means for maintaining at least one tyre bead in position against the associated flange of the wheel rim. If desired the tyre bead retaining means may be combined with an enclosing means for lubricating material, e.g. the bead retaining means may consist of a container for lubricating material of a width which fits closely between the tyre beads.

70 In the pneumatic tyre and wheel assembly of this invention, the tyre preferably has a tread width which is greater than the axial distance between the flanges of the wheel rim. Similarly the tyre preferably has a relatively low aspect ratio e.g. between 30 and 75% and preferably between 55 and 70%.

85 A number of examples of the invention will now be described, by way of example only and, with reference to the accompanying drawings in which:

90 Figure 1 is a sectional view of a tyre mounted on a wheel rim, a band being provided on the inner surface of the tyre tread which band carries containers for lubricating material;

100 Figure 2 is a similar view in which the tyre contains a ring which is trapped in the rim and carries containers for lubricating material;

105 Figure 3 is a similar view in which the tyre contains containers for lubricating material which are arranged on the inner surface of each lower sidewall region of the tyre;

110 Figure 4 is a similar view in which interior surfaces of a tyre have layers of encapsulated lubricating material adhered thereto;

115 Figure 5 is a similar view in which there is mounted on a wheel rim base within the inflation chamber a resilient ring carrying, at spaced intervals, suitably shaped projections of resin foam containing lubricating material trapped therein;

120 Figure 6 is a perspective view of the resilient ring of Figure 5;

125 Figure 7 is a sectional view of a tyre and rim in which a container for lubricating material is provided on the radially inner surface of the rim base;

Figure 8 is a similar view in which a pressure rupturable tube is provided within the inflation chamber on a wheel rim base;

Figure 9 is a diagrammatic sectional side view of a tyre and wheel rim in which a

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in which the enclosing means comprises a sachet or tube.

19. A pneumatic tyre and wheel assembly according to any one of claims 1 to 9 in which the enclosing means comprises an encapsulating resin or plastics in the form of small capsules which, in use, enclose the lubricating material.

20. A pneumatic tyre and wheel assembly according to any one of claims 1 to 9 in which the enclosing means comprises an encapsulating resin or plastics in the form of a foam in which, in use, the lubricating material is trapped.

21. A pneumatic tyre and wheel assembly according to any one of the preceding claims in which the enclosing means is positioned on or adjacent to at least one of the interior surfaces of the tyre which come into contact when the tyre is running deflated.

22. A pneumatic tyre and wheel assembly according to claim 21 in which the enclosing means is positioned on or adjacent to a lower sidewall region of the tyre interior immediately radially outwardly of the associated flange, or on or adjacent to a region of the tyre interior radially inwardly of one of the tread edges.

22. A pneumatic tyre and wheel assembly according to claim 2 in which at least a part of the enclosing means is located between the saddle and the tyre so as to be trapped between the saddle and the interior surface of a deflected portion of the tyre and thereby ruptured to release the lubricating material when the assembly is used with the tyre deflated.

24. A pneumatic tyre and wheel assembly substantially as described herein with reference to, and as illustrated in, any one of Figures 1—11 of the accompanying drawings.

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

26. A pneumatic tyre having attached to an interior surface an enclosing means for a lubricating material for the interior surfaces of the tyre, said enclosing means being capable, in use of the tyre, of automatically releasing said lubricating material into the interior of the tyre upon deflation of the tyre.

27. A pneumatic tyre according to claim 26 in which the enclosing means is positioned on or near at least one of the interior surfaces of the tyre which come into contact with each other when the tyre is deflated under load.

28. A pneumatic tyre according to claim 27 in which the enclosing means is posi-

tioned on an interior surface of the tyre in a lower sidewall region.

29. A pneumatic tyre according to claim 27 or 28 in which the enclosing means is positioned on an interior surface of the tyre radially inwardly of one of the tread edges.

30. A pneumatic tyre according to any one of claims 26 to 29 in which the enclosing means is a rupturable sachet.

31. A pneumatic tyre according to any one of claims 26 to 29 in which the enclosing means is an encapsulating resin or plastic in the form of small capsules which, in use, enclose the lubricating material.

32. A pneumatic tyre substantially as described herein with reference to, and as illustrated in, Figures 3 or 4 of the accompanying drawings.

33. A wheel for a pneumatic tyre having a rim which carries an enclosing means for a lubricating material for the interior surfaces of the tyre, said enclosing means being capable, in use of the tyre on the rim, of automatically releasing lubricating material into the interior of the tyre upon deflation of the tyre.

34. A wheel according to claim 33 in which the enclosing means comprises a container mounted on the radially inner surface of the wheel rim and provided with an outlet passing through the wheel rim.

35. A wheel according to claim 33 in which the enclosing means is carried on the radially outer surface of the wheel rim.

36. A wheel according to claim 33, 34 or 35 in which the enclosing means comprises pressure responsive means for releasing lubricating material from the enclosing means.

37. A wheel according to claim 33, 34 or 35 in which the enclosing means comprises impact responsive means actuable by impact or abrasion to release the lubricating material from the enclosing means.

38. A wheel according to claim 37 in which the enclosing means comprises a rupturable sachet or tube for the lubricating material.

39. A wheel according to any one of claims 33 to 37 in which the enclosing means comprises a pressurizable container.

40. A wheel according to any one of claims 33 to 39 in which the enclosing means also serves as a tyre bead retaining means capable of maintaining at least one tyre bead in position on a bead seat.

41. A wheel according to claim 33 substantially as described herewith with reference to, and as illustrated in, any one of Figures 2, 5, 6, 7, 8, 9, 10 or 11 of the accompanying drawings.

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

pressurizable container for lubricating material is mounted on the radially inner surface of the rim base and a tube containing rupturable diaphragms extends through the rim base into the tyre interior;

Figure 10 is a diagrammatic sectional side view of a tyre and wheel rim in which a pair of containers are mounted on the wheel rim base and linked together;

Figure 11 is a similar view in which an inner air bag and separate container for lubricating material are located inside a tyre, and

Figure 12 is a sectional view of a tyre on a wheel rim in which sachets for lubricating material are mounted on a saddle support.

In the example shown in Figure 1, a tyre 1 is mounted on a flat-base rim 2 formed by an axially compressed well-based wheel rim.

On the inner surface of the tread region of the tyre is positioned a band 3 carrying containers 4 for lubricating material which are located above the beads of the tyre so that if the tyre deflates the containers 4 will be trapped between the contacting internal surfaces of the tyre and the lubricating material therein released. The band 3 may be made of e.g. ABS or on ABS/PVC blend and can be e.g. $\frac{1}{4}$ mm thick. The containers 4 may be made of plastics material e.g. PVC or of thin soft rubber.

The containers 4 illustrated in Figure 1 are confined to the edges of the ring 3 but, if desired, the containers may take the form of ribs extending across the whole width of the band.

In the example shown in Figure 2 a resilient but stiff annular ring 5 is trapped by its radially inner edge in the crimp 6 of the axially compressed wheel rim 2. The ring 5 carries a series of containers 7 for lubricating material which are held into the interior of the tyre 1 against a lower sidewall where they will be trapped and burst if the tyre deflates.

In an alternative arrangement (not shown) to that shown in Figure 2 the ring 5 may be U-shaped in section, with the base of the U disposed on the rim base. Two sets of containers for lubricating material can then be provided, one on each arm of the U so that there is a set of containers against both sidewalls of the tyre.

In the example shown in Figure 3 strings of containers 8 for lubricating material are held against the lower sidewalls of the tyre interior, by means of adhesive strips 9, in a position where they will be trapped and burst if the tyre is run in a deflated condition.

In the example shown in Figure 4 the lubricating material is retained within small capsules 10 of encapsulating material, a layer 11 of these small capsules being adhered to suitable inner surfaces of the tyre

cover e.g. the crown or lower sidewall regions. The encapsulating material may be e.g. a modified polyester resin as described hereinafter with reference to Figure 5.

In the example shown in Figure 5 a resilient retaining band 12 is positioned on the rim base, the band holding at spaced intervals suitably shaped mouldings 13 of a rigid foam-like structure which contains encapsulated lubricating material. The mouldings 13 are of a size and shape to cause them to be broken away and crushed if the tyre is run in a deflated condition.

The mouldings 13 may, for example, be made by intimately mixing 100 parts by weight of a polyester resin with 300 parts of a lubricating fluid and adding a peroxide catalyst to rapidly cross-link the polyester. The resultant material consists of fine globular particles of lubricating material retained in a matrix of polyester.

The retaining band 12 with a plurality of mouldings 13 in position is shown in Figure 6.

In an alternative arrangement to that shown in Figures 5 and 6 the retaining band may be an extrusion suitably shaped to be trapped by the crimp in the axially compressed rim 2, the extrusion, for example, engaging slots in the mouldings of the rigid foam-like structure.

In a further alternative arrangement to that shown in Figures 5 and 6 the mouldings 13 may be replaced by rigid thin-shell vacuum formed plastics vessels. These vessels may have a preformed fracture line and will be positioned where they are broken by the tyre if it is run in a deflated condition.

In the example shown in Figure 7 a plurality of containers 14 for lubricating material are positioned on the radially inner side of the rim base. The containers communicate with the inflation chamber of the tyre by means of a hole 15 in the rim base in which a neck 16 on the container 14 fits in sealing engagement. The neck 16 of the chamber is sealed by a plunger 17 whose radially inner end has a tapered flange 18 to seal with a seating on the container neck. The plunger also has a small projecting ring 19 positioned immediately radially outwardly of the container neck 16.

In this case on running of the tyre in a deflated state the plunger 17 is forced into the neck 16, and the ring 19 passes through the neck preventing resealing by the plunger.

In an alternative arrangement containers may be arranged around the rim as in Figure 7 but can be sealed from the tyre inflation chamber by breakable diaphragms. Furthermore the containers for lubricating material may be pressurized.

In the example shown in Figure 8 a sealed container 20 is located and, if necessary, ad-

hered to the base of the wheel rim within the tyre. The container 20 may be a complete toroid or may be a segment thereof, and is conveniently made of a plastics material such as flexible PVC film.

In the upper face of the container 20 are incorporated a series of weak zones 21 which will rupture at predetermined strain. A valve 22 is provided for injection of air into the container 20.

The container 20 is fitted and completely filled with lubricating fluid and after the tyre has been inflated a calculated quantity of air is injected into the container 20. The quantity of air injected into the container 20 is sufficient that if the tyre deflates to below a predetermined pressure e.g. below 20% of normal inflation pressure, the container 20 will be expanded to an extent which will cause its rupture. If it is desired to deflate the tyre for some purpose rupture of the container 20 can be prevented by opening the valve 22.

In the example shown in Figure 9 a container for lubricating material 23 is provided on the radially inner surface of the rim base and has a flexible tube 24 attached thereto and extending through the rim base into the interior of the inflation chamber. The tube 24 extends from the container circumferentially along the rim base in one direction and is held along the rim in a position where it will be compressed when the tyre is flattened. The tube 24 contains a number of breakable bulkheads 25 of e.g. plastics material which will break in turn to release the lubricating material if the tyre rim is run in a deflated condition. A single impact, however, will not be sufficient to break all the bulkheads and release the lubricating material.

In an alternative arrangement to that shown in Figure 9 the container is provided with tubes similar to the tube 24 extending from the container in both circumferential directions along the rim base and in a further alternative the container is positioned within the inflation chamber in a well in the rim.

In the example shown in Figure 10 a number of pairs of cylinders 26 and 27 are positioned on the rim base. The cylinders 26 and 27 are linked by a passage 28 containing liquid lubricating material, the cylinder 26 containing a plunger 29 and a diaphragm spring 30 and the cylinder 27 containing a plunger 31 incorporating a rupturable diaphragm 32. When the plunger 29 is struck by the tyre the plunger 31 is raised and when the plunger 31 is struck by the tyre the diaphragm 32 is ruptured releasing the lubricating material into the inflation chamber. If, after the plunger 29 is struck, the plunger 31 is not struck, as in the case of a single impact the plungers return to

their original positions under the influence of the diaphragm spring 30. In this position the plunger 31 cannot be struck by the tyre.

In the example shown in Figure 11 a two part moulded bladder 33 is positioned on the radially outer surface of the rim base. In the radially inner part 34 of the bladders is compressed air and in the radially outer part 35 of the bladder is a lubricating material. Under normal conditions the compressed air in the part 34 does not distend the bladder owing to the opposing tyre pressure but if the tyre is deflated the bladder 33 is distended so that the outer part 35 becomes subject to the mechanical action of the tyre. The combined effects of distention and the contact with the tyre rupture the outer part 35 of the bladder releasing the lubricating material.

In an alternative arrangement (not shown) the two part bladder may extend around the rim for the entire circumference thereof, functioning in a similar manner to the bladder illustrated.

In the example shown in Figure 12 a saddle support 36 (shown schematically) is positioned inside the tyre and rim assembly, the saddle serving to hold the beads 37 of the tyre against the rim flanges 38 and to hold a burstable sachet or tube of lubricating material 39 in a position where the tyre, when flattened (as shown) bursts the sachet 39, releasing the lubricating material.

It will be appreciated that in many of the examples described above using a container for lubricating material a suitably shaped moulding of foamed resin of the type described with particular reference to Figure 5 could be used.

An advantage of the embodiments of the invention which relate to an enclosing means capable of releasing its contents only after a full revolution or number of revolutions of the flattened tyre as opposed to the enclosing means immediately releasing the lubricating material on a single impact is that release of contents do not take place prematurely due to a single or a few isolated severe deflections of a fully inflated tyre.

The lubricating material within the enclosing means may be of liquid form, as described in our co-pending U.K. Patent Application No. 30033/70 (Serial No. 1,359,467).

However, the lubricating material may in some cases be of solid form e.g. powdered graphite or French Chalk.

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

The present invention may be used in conjunction with the inventions of our co-pending Patent Application Nos. 30028/70 (Serial No. 1,359,462), 30029/70 (Serial No. 1,359,463), 30030/70 (Serial No. 1,359,464), and 30031/70 (Serial No. 1,359,465).

It will be appreciated that in many of the examples described above using individual containers or other enclosing means for lubricating material it is necessary to ensure an even weight distribution about the wheel to avoid unbalance. This is preferably done by distributing two or more containers in suitable positions on the wheel to ensure balance.

WHAT WE CLAIM IS:—

1. A pneumatic tyre and wheel assembly comprising, a wheel rim having a pair of annular tyre bead retaining flanges, a tyre having a pair of sidewalls terminating in tyre beads and mounted upon the wheel rim to define an inflation chamber, means for preventing the tyre from being dislodged from the wheel rim when running deflated, and enclosing means for a lubricating material for the interior surfaces of the tyre, which enclosing means is capable of automatically releasing lubricating material onto the interior surfaces of the tyre when the assembly is used with the tyre deflated to facilitate relative movement between contacting interior surfaces of the tyre.

2. A pneumatic tyre and wheel assembly as claimed in claim 1 in which the means for preventing the tyre from being dislodged from the wheel rim comprises a saddle located between the tyre beads and extending radially outwardly from the wheel rim.

3. A pneumatic tyre and wheel assembly as claimed in claim 1 or claim 2 in which the means for preventing the tyre from being dislodged from the wheel rim when running deflated comprises a substantially non-decreasing diameter of the wheel rim between the flanges thereof such that the wheel rim is without a well into which the tyre beads can fall.

4. A pneumatic tyre and wheel assembly as claimed in claim 3 in which the wheel rim is divisible to permit mounting of a tyre thereon.

5. A pneumatic tyre and wheel assembly as claimed in claim 3 in which the wheel rim is formed initially with a well to permit mounting of a tyre thereon, the well being subsequently closed by axial compression.

6. A pneumatic tyre and wheel assembly as claimed in any one of the preceding claims in which the means for preventing the tyre from being dislodged from the wheel rim comprises tyre bead retaining means for maintaining at least one tyre bead in position against the associated flange.

7. A pneumatic tyre and wheel assembly

as claimed in any one of the preceding claims in which the tyre has a tread width which is greater than the axial distance between the flanges of the wheel rim.

8. A pneumatic tyre and wheel assembly according to any one of the preceding claims in which the tyre has an aspect ratio of between 30% and 75%.

9. A pneumatic tyre and wheel assembly according to claim 8 in which the tyre has an aspect ratio of between 55% and 70%.

10. A pneumatic tyre and wheel assembly according to any one of the preceding claims in which the enclosing means comprises a pressurisable container.

11. A pneumatic tyre and wheel assembly according to any one of the preceding claims in which the enclosing means comprises a container with a screwed-on cap adapted to be unscrewed step by step by rubbing contact with the interior surfaces of the tyre and wheel assembly during rotation of the assembly with the tyre deflated as the cap passes through the ground-to-tyre contact patch.

12. A pneumatic tyre and wheel assembly according to any one of claims 1 to 10 in which the enclosing means comprises pressure responsive means for releasing the lubricating material from the enclosing means when the pressure in the inflation chamber falls below a predetermined value.

13. A pneumatic tyre and wheel assembly according to any one of claims 1 to 10 in which the enclosing means comprises temperature responsive means for releasing the lubricating material from the enclosing means when the temperature in the inflation chamber exceeds a predetermined value.

14. A pneumatic tyre and wheel assembly according to any one of claims 1 to 10 in which the enclosing means comprises impact responsive means for releasing the lubricating material from the enclosing means upon impact with or abrasion by the interior surfaces of the deflated tyre.

15. A pneumatic tyre and wheel assembly according to claim 14 in which the enclosing means comprises a container having a cap or projection from the cap which is subject to rupturing by impact or abrasion to cause release of the lubricating material.

16. A pneumatic tyre and wheel assembly according to claim 15 in which the cap or projection from the cap is of a material subject to fatigue failure to release the lubricating material after several cycles of deflection of the tyre.

17. A pneumatic tyre and wheel assembly according to claim 14 in which the enclosing means comprises a rupturable membrane.

18. A pneumatic tyre and wheel assembly according to any one of claims 1 to 9



The present invention may be used in conjunction with the inventions of our co-pending Patent Application Nos. 30028/70 (Serial No. 1,359,462), 30029/70 (Serial No. 1,359,463), 30030/70 (Serial No. 1,359,464), and 30031/70 (Serial No. 1,359,465).

It will be appreciated that in many of the examples described above using individual containers or other enclosing means for lubricating material it is necessary to ensure an even weight distribution about the wheel to avoid unbalance. This is preferably done by distributing two or more containers in suitable positions on the wheel to ensure balance.

WHAT WE CLAIM IS:—

1. A pneumatic tyre and wheel assembly comprising, a wheel rim having a pair of annular tyre bead retaining flanges, a tyre having a pair of sidewalls terminating in tyre beads and mounted upon the wheel rim to define an inflation chamber, means for preventing the tyre from being dislodged from the wheel rim when running deflated, and enclosing means for a lubricating material for the interior surfaces of the tyre, which enclosing means is capable of automatically releasing lubricating material onto the interior surfaces of the tyre when the assembly is used with the tyre deflated to facilitate relative movement between contacting interior surfaces of the tyre.

2. A pneumatic tyre and wheel assembly as claimed in claim 1 in which the means for preventing the tyre from being dislodged from the wheel rim comprises a saddle located between the tyre beads and extending radially outwardly from the wheel rim.

3. A pneumatic tyre and wheel assembly as claimed in claim 1 or claim 2 in which the means for preventing the tyre from being dislodged from the wheel rim when running deflated comprises a substantially non-decreasing diameter of the wheel rim between the flanges thereof such that the wheel rim is without a well into which the tyre beads can fall.

4. A pneumatic tyre and wheel assembly as claimed in claim 3 in which the wheel rim is divisible to permit mounting of a tyre thereon.

5. A pneumatic tyre and wheel assembly as claimed in claim 3 in which the wheel rim is formed initially with a well to permit mounting of a tyre thereon, the well being subsequently closed by axial compression.

6. A pneumatic tyre and wheel assembly as claimed in any one of the preceding claims in which the means for preventing the tyre from being dislodged from the wheel rim comprises tyre bead retaining means for maintaining at least one tyre bead in position against the associated flange.

7. A pneumatic tyre and wheel assembly

as claimed in any one of the preceding claims in which the tyre has a tread width which is greater than the axial distance between the flanges of the wheel rim.

8. A pneumatic tyre and wheel assembly according to any one of the preceding claims in which the tyre has an aspect ratio of between 30% and 75%.

9. A pneumatic tyre and wheel assembly according to claim 8 in which the tyre has an aspect ratio of between 55% and 70%.

10. A pneumatic tyre and wheel assembly according to any one of the preceding claims in which the enclosing means comprises a pressurisable container.

11. A pneumatic tyre and wheel assembly according to any one of the preceding claims in which the enclosing means comprises a container with a screwed-on cap adapted to be unscrewed step by step by rubbing contact with the interior surfaces of the tyre and wheel assembly during rotation of the assembly with the tyre deflated as the cap passes through the ground-to-tyre contact patch.

12. A pneumatic tyre and wheel assembly according to any one of claims 1 to 10 in which the enclosing means comprises pressure responsive means for releasing the lubricating material from the enclosing means when the pressure in the inflation chamber falls below a predetermined value.

13. A pneumatic tyre and wheel assembly according to any one of claims 1 to 10 in which the enclosing means comprises temperature responsive means for releasing the lubricating material from the enclosing means when the temperature in the inflation chamber exceeds a predetermined value.

14. A pneumatic tyre and wheel assembly according to any one of claims 1 to 10 in which the enclosing means comprises impact responsive means for releasing the lubricating material from the enclosing means upon impact with or abrasion by the interior surfaces of the deflated tyre.

15. A pneumatic tyre and wheel assembly according to claim 14 in which the enclosing means comprises a container having a cap or projection from the cap which is subject to rupturing by impact or abrasion to cause release of the lubricating material.

16. A pneumatic tyre and wheel assembly according to claim 15 in which the cap or projection from the cap is of a material subject to fatigue failure to release the lubricating material after several cycles of deflection of the tyre.

17. A pneumatic tyre and wheel assembly according to claim 14 in which the enclosing means comprises a rupturable membrane.

18. A pneumatic tyre and wheel assembly according to any one of claims 1 to 9