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## (54) A VEHICLE WHEEL HAVING A RIM

(71) We, CONTINENTAL GUMMI-WERKE AKTIENGESELLSCHAFT, of Continental-Haus/ Postfach 169, 3000 Hannover, Germany (Fed Rep), a German body corporate, do 5 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 The present invention relates to a vehicle wheel having a rim, capable of receiving a tubeless pneumatic tyre, said rim comprising a drop-centre rim portion and tyre bead retaining rim flanges.

15 A firm pressure-tight abutment of the tyre beads with their inside surfaces—seen in a radial direction—against the associated seat surfaces of the wheel rim is the first and main condition for the sealing of tubeless pneumatic tyres. To ensure this to the desired extent, the seat surfaces are generally formed conically having an outwardly rising angle of cone, so that the beads, forced apart on mounting of the tyre and in the 20 operating state pressed against the wheel flanges, have to push themselves on an inclined plane. The high surface pressure originating from the deformation of the elastomeric bead material beneath the tensile reinforcing plies, besides the necessary sealing at the same time, ensures the tight fit of the tyre on the rim against all normal mechanical stresses. With the introduction of higher driving speeds it has been found, 25 however, that the tyre beads can be locally lifted off by laterally impacting powerful thrust forces, so that tyres subjected thereto suddenly suffer considerable loss of air and in extreme cases are even thrown off the 30 wheel completely. According to a known proposal (German Auslegeschrift 1,605,549) such dangerous operational states are prevented by adding an enlargement to the seat surface of the tyre beads which is conical in a reversed direction of pitch. Since this 35 enlargement proceeds directly from the obtuse apex of the cone of the seat surface corresponding to its smallest diameter, it progressively resists the deviation move- 40 ments of the beads in the direction towards the drop-rim portion and thereby also prevents large quantities of air from escaping. According to an alternative proposal (German Gebrauchsmuster No. 7,407,030) moreover several radial stops are provided in the 45 region of the jacket surface of the cone rising in the direction towards the drop-rim portion so as to secure the tyre beads by positive locking.

Whilst in known vehicle wheels sufficient safeguards are provided against dangerous losses of air and the pneumatic tyre being thrown off the wheel, all embodiments have the inherent disadvantage of difficult mounting or assembly. Since the beads at the beginning of the mounting of a tyre, frequently caused by long storage periods, are still relatively close together and are not easily brought into contact with their seat surfaces on the rim with sealing contact, the build-up of an internal pressure is extremely difficult and may be performed mostly only with the aid of special equipment using cumbersome working methods. On the other hand, it is an object of the 50 present invention to combine a novel design and configuration of the wheel rim providing a high degree of safeguard against casting off the pneumatic tyres with simplified assembly conditions in a favourable compromise solution. Even if this solution is based on the peculiarities of tubeless pneumatic tyres, the invention is not limited in any way exclusively thereon and its use in connection with vehicle wheels having pneumatic tyres with inner tubes is not technically insignificant or 55 at all impossible.

According to the present invention there is provided a vehicle wheel having a rim, said rim comprising a centre drop-rim portion and tyre bead retaining rim flanges, in which the rim, in its two edge regions between the drop-rim portion and the tyre bead retaining rim flanges, is divided into an 60 axially outwardly, tapering, axially outer cone surface and an axially inwardly tapering, axially inner cone surface.

In accordance with an embodiment of the 65 70 75 80 85 90 95

present invention, the angle of the inner cone surface relative to a line parallel to the wheel axis is larger by a multiple than the angle of the outer cone surface to that line. In such embodiment, the angle of the inner cone surface relative to a line parallel to the wheel axis is preferably from 6° to 15°, more preferably 10° to 12°, whereas the angle of the outer cone surface relative to that line is preferably from 1° to 3°, more preferably 2°.

In deviation from the known double-coned rim shapes of concave cross-section, the invention introduces a double-coned convex outline of the edge regions of the rim between the drop-rim portion and the tyre bead retaining flanges. This causes an inclined surface to remain on both sides of the drop-rim portion which is favourable for mounting and the first introductory inflation of the tyre having an angle of cone rising outwards whilst on the other hand the actual seating and sealing surface adjacent thereto imparts to the tyre beads an amazingly tight fit. Owing to the angle of cone of the sealing surface, the beads with increasing surface pressure progressively resist any inward movement, so that despite facilitated assembly or mounting conditions, an unexpected degree of safety against cast-off even under the most difficult lateral shock loads is obtained and even the danger of excessive losses of air or leakages is substantially excluded.

The invention will be further illustrated, by way of example, with reference to the accompanying drawings in which:

Fig. 1 is a cross-section through a part of a pneumatically tyred vehicle wheel; and  
Fig. 2 is a detail of Fig. 1 also in cross-section on an enlarged scale.

The drawing is limited to reproducing the necessary features for understanding the invention, for which reason, for example, the actual vehicle wheel is indicated only by the cross-sectional view of a rim 3 in place of a complete wheel body. The rim 3 is made in known manner of steel sheet, light metal or the like, having a centre drop-rim portion 31 and tyre bead retaining rim flanges 32 forming the outer stops for the tyre beads 14, and the rim receives a pneumatic tyre 4. The pneumatic tyre 4, in the embodiment shown, is a tubeless tyre having a belt 41 embedded in the region of the tread strip and textile reinforcing plies 43 passing between the beads 14 and looped around core rings 42 in the beads. A valve, not further shown, is inserted in the rim 3 for blowing compressed air into the tyre.

The rim 3, in its two edge regions between the drop-rim portion 31 and the tyre bead retaining rim flanges 32, is divided into an axially outwardly tapering, axially outer cone surface A and an axially inwardly tapering, axially inner cone surface B, whereby the angle  $\alpha$  of the cone surface A relative to a line parallel to the wheel axis as shown by the chain-dotted line I—I is from 1° to 3°, preferably 2°, the angle  $\beta$  of the cone surface BB to that line on the other hand amounts to from 6° to 15°, preferably 10° to 12°. The cone surface A includes the seat surface for the tyre bead 14 and extends therebeyond in the direction towards the drop-rim portion 31, so that the mutual base line corresponding to the maximum diameter of the abutting cone surfaces extends in accordance with the line II—II shown in chain-dotted lines at the side of the beads within the tyre cross-section.

#### WHAT WE CLAIM IS:—

1. A vehicle wheel having a rim, said rim comprising a centre drop-rim portion and bead retaining rim flanges, in which the rim, in its two edge regions between the drop-rim portion and the tyre bead retaining rim flanges, is divided into an axially outwardly tapering, axially outer cone surface and an axially inwardly tapering, axially inner cone surface.

2. A vehicle wheel having a rim as claimed in claim 1, in which the angle of the inner cone surface relative to a line parallel to the wheel axis is larger by a multiple than the angle of the outer cone surface to that line.

3. A vehicle wheel having a rim as claimed in claim 2, in which the angle of the inner cone surface relative to a line parallel to the wheel axis is from 6° to 15° whereas the angle of the outer cone surface relative to that line is from 1° to 3°.

4. A vehicle wheel having a rim as claimed in claim 3, in which the angle of the inner cone surface is from 10° to 12°, whereas the angle of the outer cone surface is 2°.

5. A vehicle wheel having a rim, substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

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