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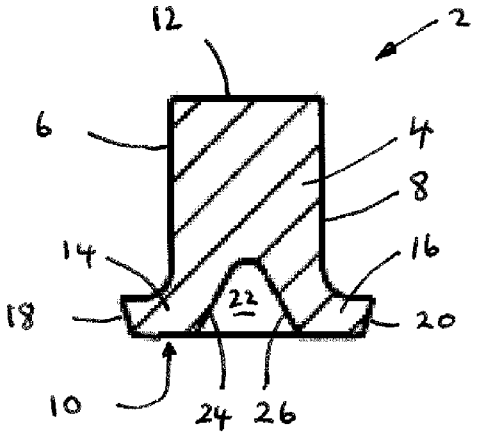
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(54) Title: RUN-FLAT DEVICE

FIGURE 1



(57) Abstract: A run flat device for fitting to the outer circumference of a wheel inside an inflatable tyre, is disclosed said device comprising a resilient substantially annular body (4) having a central axis, in which the annular body extends outwardly at an inner surface to form first and second tyre abutting members (14,16), an internal face (10) of the annular body (4) being provided with a recess (22) extending between the first and second tyre abutting members (14,16), the recess being substantially defined by planar inner surfaces (24,26) of the respective tyre abutting members (14,16), and the planar inner surfaces (24,26) being disposed at an angle to one another.

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Run-Flat Device

The present invention relates to a device for use with inflatable tyres mounted on vehicle wheels, fitted within a tyre that enables the wheel to run with a deflated tyre. Such devices are known as 'run-flat' devices.

Run flat devices are designed to resist the effects of sudden deflation when a tyre is punctured, such that the tyre does not become shredded or thrown off a wheel.

It is known to provide run-flat devices for wheels in which the run flat device is fitted within a tyre to a metal rim of a wheel. The run flat device is in the form of an annular body adapted to slip circumferentially on the metal rim when the tyre deflates and the tyre is brought into contact with an outer face of the annular body of the run flat device. This slippage allows the tyre to slip on the wheel rim whilst ensuring little or no slippage of the tyre relative to the outer circumference of the annular body of the run-flat device.

It is also known to provide arrangements in which when the tyre deflates and the run flat device acts to secure the sides of the tyre in position relative to the wheel.

The present invention relates to an improved form of this second arrangement.

According to a first aspect, the present invention comprises a run flat device for fitting to the outer circumference of a wheel inside an inflatable tyre, said device comprising a resilient substantially annular body having a central axis, in which the annular body extends outwardly at an inner surface to form first and second tyre abutting members, an internal face of the annular body being provided with a recess extending between the first and second tyre abutting members, the recess being substantially defined by planar inner surfaces of the respective tyre abutting members, and the planar inner surfaces being disposed at an angle to one another.

This has as an advantage that force directed inwardly towards the inner face of the annular body, as occurs in the event of a puncture or other loss of pressure in a wheel assembly, is displaced/transferred axially outwardly into the first and second tyre abutting members to ensure that the tyre wall is held between the wheel rim and the run flat device.

Preferably the recess is generally triangular in shape. This has as a further advantage that the recess is relatively convenient to form in the annular body allowing for increased ease of production of the annular body.

Preferably, the annular body is provided beyond the first and second tyre abutting members with first and second planar side surfaces. More preferably the first and second planar side surfaces are substantially parallel to one another.

Preferably the recess extends only a short way into the annular body, preferably less than half way.

Preferably, the substantially planar inner surfaces of the respective tyre abutting members are connected to one another by a curvilinear or arcuate surface.

Preferably, each of the substantially planar inner surfaces of the respective tyre abutting members is connected to the inner surface of the annular body by a curvilinear or arcuate surface.

Preferably the tyre abutting members are of corresponding section.

Preferably one or both of the tyre abutting members extend uninterrupted along a substantial part of a circumferential length of the annular body. More preferably, one or both of the tyre abutting members extend along the circumferential length of the body.

Preferably, the annular body comprises a split ring. Alternatively, the annular body comprises a plurality of arcuate segments. Preferably the annular body comprises three arcuate segments.

Preferably each of the plurality of segments are identical in shape.

Preferably a clamping means located between adjacent segments imparts to each segment a circumferential clamping force and an axial clamping

force to urge the segments circumferentially and axially towards each other.

According to a second aspect of the invention a wheel assembly comprises a wheel rim and an inflatable tyre, a run-flat device according to the first aspect of the invention fitted to the wheel rim and a lubricant provided between the run flat device and an inner surface of the tyre.

Preferably, the run flat device acts on deflation of the tyre to prevent relative movement of a periphery of the tyre with respect to the wheel rim.

According to a third aspect of the invention, a method of forming a wheel assembly comprises the steps of

providing a wheel having a rim and a rear rim portion, a front rim portion releasably securable to the rim, a run flat device in accordance with a first aspect of the invention, and a tyre having front and rear side walls;

locating the run flat device within the tyre;

urging the tyre and associated run flat device axially over the wheel rim; and

securing the front rim portion to the wheel rim.

The invention will now be described, by way of example only, in relation to the attached Figures, in which

Figure 1 shows a sectional view through a first embodiment of a run flat device in accordance with the present invention;

Figure 2 shows a sectional view through a second embodiment of a run flat device in accordance with the present invention, shown in position on a wheel assembly; and

Figure 3 shows a side view of a run flat device in accordance with the present invention.

Referring first to Figure 1, a run flat device 2 for fitting to the outer circumference of a wheel inside an inflatable tyre is shown. The run flat device 2 comprises a resilient substantially annular body 4 having a central axis. The annular body 4 can be seen to comprise an internal surface 10 and an outer surface 12. First and second planar side surfaces 6,8 extend from the outer surface 12 of the annular body 4 towards the inner surface 10. Conveniently the first and second side surfaces 6,8 are substantially parallel to one another.

The annular body 4 extends outwardly, at the lower ends of the first and second side surfaces 6,8 to form first and second tyre abutting members 14,16 at the inner surface 10. The first and second tyre abutting members 14,16 extend generally axially parallel to the central axis of the run flat member. The first and second tyre abutting members 14,16 are provided with end surfaces 18,20 which, in use abut an inner surface of a tyre wall.

A recess 22 is provided on the internal surface 10 of the annular body 4, disposed between first and second tyre abutting members 14,16. The recess 22 includes substantially planar inner surfaces 24,26 which can be seen to form first and second inner walls of the respective tyre abutting members 14,16. By 'substantially planar' it will be understood that, as illustrated, the inner surfaces 24,26 are planar along their respective lengths, but have non-planar transitional regions at their respective ends. It can be seen that the first and second inner walls of the respective tyre abutting members 14,16 extend radially outward of upper, outer surfaces of the tyre abutting members 14,16. In addition the planar inner surfaces 24,26 are disposed at an angle to one another, in the illustrated embodiment at an acute angle to one aonther.

Conveniently, the substantially planar inner surfaces 24,26 of the respective tyre abutting members 14,16 are connected by a curvilinear or arcuate surface. Similarly, each of the substantially planar inner surfaces 24,26 of the respective tyre abutting members 14,16 is connected to the inner surface 10 of the annular body 4 by a curvilinear or arcuate surface.

Thus, the recess 22 in Figure 1 is substantially triangular in section. This has as an advantage that the recess 22 is relatively convenient to form in production, for example the moulding, of the annular body. Conveniently, the recess 22 extends only a short way into the annular body, preferably less than half way from the inner surface 10 to the outer surface 12.

It can be seen that in this embodiment, the tyre abutting members 14,16 are of corresponding section. Conveniently one or both, preferably both, of the tyre abutting members 14,16 extend uninterrupted along a substantial part of a circumferential length of the annular body 4. Conveniently, one or both, preferably both, of the tyre abutting members 14,16 extend along the circumferential length of the body 4.

This has as an advantage that force directed inwardly towards the inner surface 10 of the annular body 4, as occurs in the event of a puncture or other loss of pressure in a wheel assembly, is displaced or transferred outwardly into the first and second tyre abutting members 14,16 to ensure that a tyre wall is held between a wheel rim and the run flat device 2. The construction of the tyre abutting members 14,16 is also such as to ensure that the force is directed into an adjacent tyre wall through end surfaces 18,20 and not to cause the tyre abutting members 14,16 to buckle or otherwise direct force other than into the tyre wall.

A second embodiment of a run flat device in accordance with the present invention is shown in Figure 2, located in position on a wheel assembly (shown in part). Similar parts will be referred to by similar reference numerals.

A run flat device 102 is provided comprising a substantially annular body 104 having a central axis 105. The annular body 104 is provided with a recess 122. Substantially planar inner surfaces 124,126 of

respective tyre abutting members 114,116 are disposed at an angle to one another and are connected by a curvilinear or arcuate surface. Again, by 'substantially planar' it will be understood that, as illustrated, the inner surfaces 124, 126 are planar along their respective lengths, but have non-planar transitional regions at their respective ends. However the angle of inclination is smaller than that of the previous embodiment such that the transitional curvilinear or arcuate surface connecting each of the planar inner surfaces 124,126 to one another is substantially larger than in the first embodiment. Nevertheless, again it will be noted that the shape of the recess 122 is one that is relatively convenient to form in the production, for example the moulding, of the annular body. In addition, the recess 122 again extends only a short way into the annular body 104, preferably less than half way from the inner surface to the outer surface 112.

The run flat device 102 is shown in position on a two piece bolt together wheel assembly 130 within a tyre 140 (only the walls 142 of the tyre are shown). The wheel assembly 130 comprises a wheel portion 132 and a rim portion 134. It will be understood that in the absence of the rim portion the tyre 140 with the run flat device 102 located within is fitted to the wheel portion 132. The wheel assembly 130 is then completed by securing the rim portion to the wheel portion. Conveniently an O-ring 136 is provided between the wheel portion 132 and the rim portion 134 to ensure there is no air leakage from within the tyre and wheel assembly. As may be seen from Figure 2, the recess 122 is conveniently located over

a valve 138 used to inflate and manage air pressure within the tyre and wheel assembly.

It will also be seen that in this arrangement, free ends of the tyre walls 142 are seated between a tyre abutting member 114,116 and a respective wheel rim) provided either as part of the wheel portion 132 or the rim portion 134.

In use, in the event of a puncture, leading to the tyre 140 deflating and being brought into contact with the outer face of the annular body 104 of the run flat device 102, force is directed radially inwardly into the run flat device. This inwardly directed force directed towards the inner face of the annular body 104 is transferred axially outwardly into the first and second tyre abutting members 114,116 to ensure that each of the tyre walls 142 is held between a respective wheel rim and the run flat device 102. It will be understood that this prevents relative movement between the tyre wall and the wheel.

In the illustrated embodiment the end surface 118,120 of each tyre abutting member 114,116 is shaped to seat on or against the tyre wall 142. However, in alternative embodiments the end surfaces 118,120 may be provided with a face provided at an angle such that in the event of force being applied, the tyre abutting member 114,116 is adapted to nip rather than clamp the tyre wall 142 relative to the wheel rim(s). In a further embodiment, the end surface 118,120 of the tyre abutting member 114,116 may be provided with a patterned surface, for example

ribbing, to aid in prevention of relative movement between the tyre wall 140 and the run flat device 102.

As may be seen from Figure 3, the annular body 104 is preferably formed as a split ring comprising a plurality of arcuate segments 150, for example three segments. Conveniently each of the segments 150 is of identical shape. Conveniently, a clamping means 160 located between adjacent segments 150 imparts to each a circumferential clamping force and an axial clamping force to urge the segments 150 circumferentially and axially towards one another. It will be understood that the invention functions with other numbers of arcuate segment.

It will also be understood that the invention may also be used with other wheel arrangements other than that shown. For example, it will be understood that the invention may equally be used with a three piece wheel construction, or other wheel construction, where the run flat device is capable of holding the tyre in position relative to the rotating wheel assembly.

CLAIMS

1 A run flat device for fitting to the outer circumference of a wheel inside an inflatable tyre, said device comprising a resilient substantially annular body having a central axis, in which the annular body extends outwardly at an inner surface to form first and second tyre abutting members, an internal face of the annular body being provided with a recess extending between the first and second tyre abutting members, the recess being substantially defined by planar inner surfaces of the respective tyre abutting members, the planar inner surfaces being disposed at an angle to one another.

2 A run flat device according to claim 1, in which the recess is generally triangular in shape.

3 A run flat device according to claim 1or claim 2, in which the annular body is provided beyond the first and second tyre abutting members with first and second planar side surfaces.

4 A run flat device according to claim 3, in which the first and second planar side surfaces are substantially parallel to one another.

5 A run flat device according to any previous claim, in which the recess extends only a short way into the annular body, preferably less than half way.

6 A run flat device according to any previous claim, in which the planar inner surfaces of the respective tyre abutting members are connected to one another by a curvilinear or arcuate surface.

7 A run flat device according to any previous claim, in which each of the planar inner surfaces of the respective tyre abutting members is connected to the inner surface of the annular body by a curvilinear or arcuate surface.

8 A run flat device according to any previous claim, in which the tyre abutting members are of corresponding section.

9 A run flat device according to any previous claim, in which one or both of the tyre abutting members extend uninterrupted along a substantial part of a circumferential length of the annular body.

10 A run flat device according to claim 8, in which, one or both of the tyre abutting members extend along the circumferential length of the body.

11 A run flat device according to any of claims 1 to 8, in which the annular body comprises a split ring.

12 A run flat device according to any of claims 1 to 8, in which the annular body comprises a plurality of arcuate segments.

13 A run flat device according to claim 12, in which the annular body comprises three arcuate segments.

14 A run flat device according to claim 12 or claim 13, in which each of the plurality of segments are identical in shape.

15 A run flat device according to any of claims 12 to 14, in which a clamping means located between adjacent segments imparts to each segment a circumferential clamping force and an axial clamping force to urge the segments circumferentially and axially towards each other.

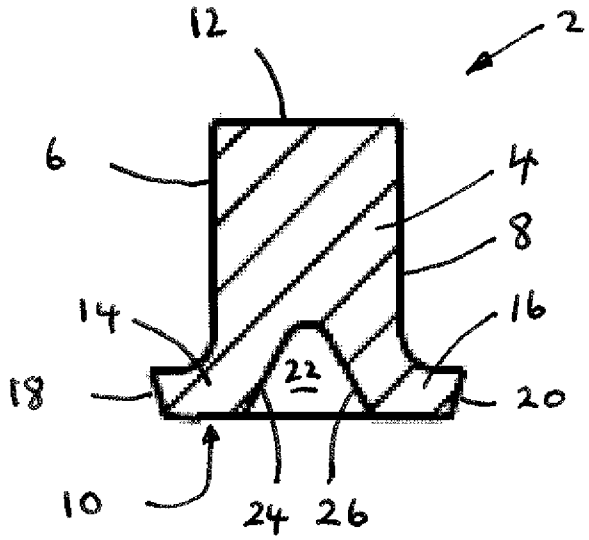
16 A method of forming a wheel assembly comprising the steps of providing a wheel having a rim and a rear rim portion, a front rim portion releasably securable to the rim, a run flat device in accordance with any of claims 1 to 15, and a tyre having front and rear side walls;
locating the run flat device within the tyre;
urging the tyre and associated run flat device axially over the wheel rim; and
securing the front rim portion to the wheel rim.

17 A run flat device substantially as described herein with reference to and as illustrated in either Figure 1 or Figure 2.

18 A wheel assembly substantially as described herein with reference to and as illustrated in the accompanying drawings.

19 A method of forming a wheel assembly substantially as described herein with reference to and as illustrated in the accompanying drawings.

FIGURE 1



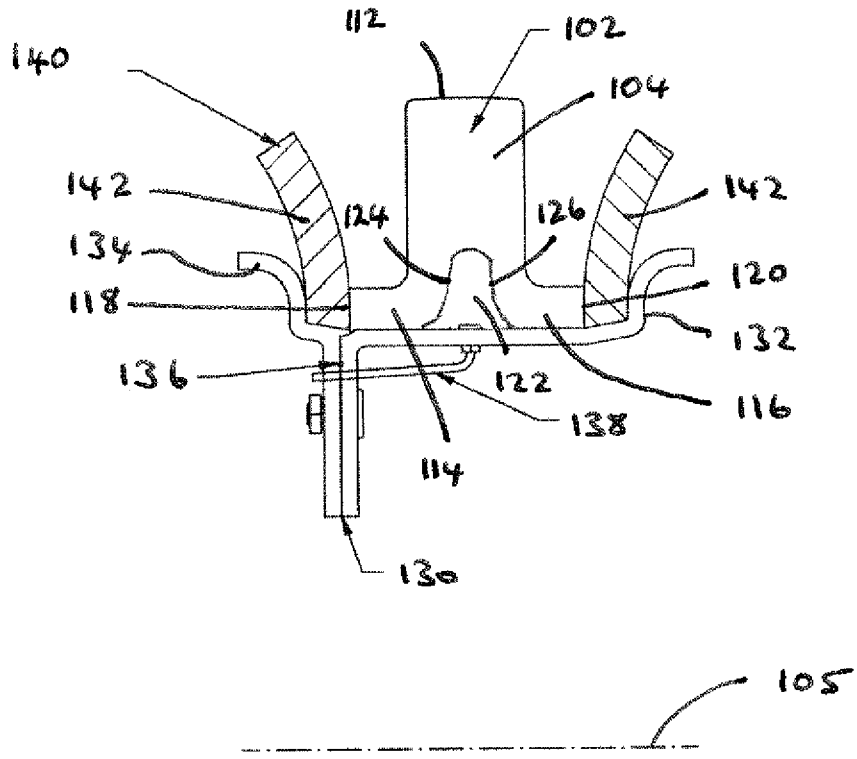


FIGURE 2

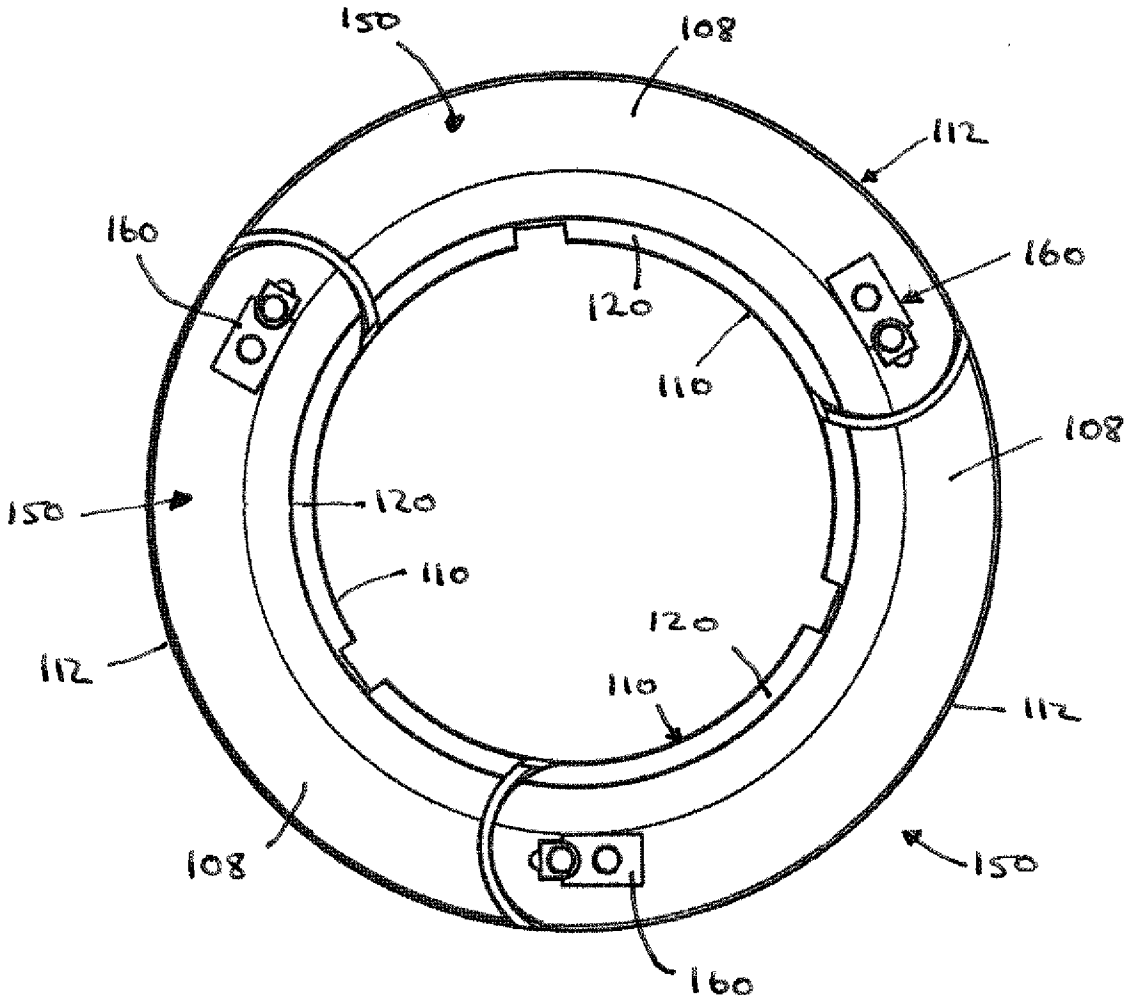

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Figure 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2014/051955

A. CLASSIFICATION OF SUBJECT MATTER
INV. B60C17/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
B60C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2013/021198 A1 (RUNFLAT HOLDINGS LTD [GB]; CHANDLER TREVOR [GB]) 14 February 2013 (2013-02-14) claims 1-26; figures 1-4	1,3-19
X	US 4 773 461 A (GOLDSTEIN A A; LANDERS S P) 27 September 1988 (1988-09-27) claims 1-11; figures 1-12	1-3, 6-10, 16-19
X	US 3 381 737 A (WILLIAM JOHNSON TILDEN) 7 May 1968 (1968-05-07) claims 1-16; figures 1-3	1-3, 5-10, 16-19
X	US 3 250 310 A (WILLIAM JOHNSON TILDEN) 10 May 1966 (1966-05-10) claims 1-5; figures 1-7	1-3, 5-10, 17-19

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2013021198 A1	14-02-2013	NONE	
US 4773461 A	27-09-1988	FR 2609667 A1	22-07-1988
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