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(54) A METHOD OF TREATING A DEFLATED TYRE AND WHEEL ASSEMBLY TO PERMIT THE ASSEMBLY TO BE RUN DEFLATED

(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 a method of treating a deflated pneumatic tyre and wheel assembly to permit the assembly to be run with the tyre deflated.

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 regions of the interior surfaces of the tyre which come into contact are those close to but radially outwardly of the bead retaining flanges of the wheel rim which contact those regions close to but radially inwardly of the tread edges.

When these surfaces come into contact 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 parent invention a method of treating a deflated tyre and wheel assembly to permit the assembly to be run with the tyre deflated, the assembly comprising a wheel rim having a pair of annular tyre bead retaining flanges, a tyre mounted on the wheel rim and having a tread portion whose width is greater than the distance be-

tween the annular flanges, and means for preventing the tyre from being dislodged from the wheel rim when running deflated, comprises connecting the interior of the tyre and wheel assembly to a lubricant supply means and pressurising the supply means to transfer lubricant therefrom to the interior of the tyre and wheel assembly, whereby when the tyre and wheel assembly is run in a deflated condition the lubricant facilitates relative movement between contacting interior surfaces of the tyre.

The lubricant supply means may comprise a pressurized container, e.g. of the aerosol type, or it may comprise a mechanical pump for creating pressure to transfer lubricant. The container or pump may be provided with a tubular extension having a sharpened end and a hole in the side of the tube for conveying the lubricant to the interior of a tyre. Alternatively the container or pump may be provided with a connection for the tyre valve in order to permit a liquid lubricant to be injected through the valve.

The lubricant is preferably a flowable liquid lubricant of the kind described in our co-pending U.K. Patent Application No. 30033/70 (Serial No. 1,359,467) although solid lubricants such as graphite or French Chalk could be used if desired. The lubricant may be injected through the tyre valve, as mentioned above, or through a rupturable plug provided for that purpose in the tyre or the wheel rim, or even through the sidewall of the tyre if it is not desired to repair the tyre.

The rupturable plug in the tyre or the wheel rim may be for example a plug of rubber or plastics material which may re-seal if desired after perforation, or may remain obviously ruptured to make it clear that the lubricant has been injected. If desired the lubricant supply means may be adapted to leave a tell-tale marker in a

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hole in the rupturable plug or the tyre sidewall to show that it has been used, e.g. an elongated coloured plug. The rupturable plug may have a projecting stem portion containing a passage providing access to a rupturable membrane which preferably is formed of the same material as the remainder of the plug.

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10 If desired, particularly when the rupturable plug is located in the wheel rim the rupturable plug may be normally protected by a removable cap to prevent its being ruptured accidentally.

15 The means for preventing the tyre from being dislodged from the wheel rim when running deflated may be a non-decreasing diameter of the wheel rim between the annular flanges so that the wheel rim is without a well into which the tyre beads can fall. Alternatively or additionally, bead retaining means may be provided on the wheel rim to prevent at least one tyre bead from becoming dislodged from its seat. The bead retaining means may be any suitable device e.g. a bead spacer ring, removable studs or other projections on the wheel rim.

20 The tyre has preferably a relatively low aspect ratio, e.g. between 30 and 75% and preferably between 55 and 70% in order to lessen the difference between its ride heights when inflated and when deflated.

25 The lubricant injected into the tyre and wheel assembly serves to cover the interior surfaces of the tyre and substantially to reduce the amount of heat generated when the tyre is deflated by relative rubbing between these surfaces during running of the vehicle to which the tyre and wheel assembly is fitted. This enables the vehicle to be driven to a garage or elsewhere without the need for changing the wheel at the roadside and is of particular value in eliminating the need for a spare wheel to be carried on the vehicle.

30 The penetration of the tyre and wheel assembly may cause a permanent rupture of the tyre and wheel serving to prevent re-inflation of a tyre and wheel assembly for further inflated use, thus preventing a tyre already damaged by deflated running from being re-used.

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

40 The present invention may be used in conjunction with the inventions of our co-pending U.K. Patent Applications Nos. 30029/70, 30030/70 and 30031/70 (Serial Nos. 1,359,463, 1,359,464 and 1,359,465).

The invention will now be described in more detail, by way of example only, with reference to the accompanying drawings in which:—

Figure 1 shows in section a hand operated injector for lubricant; 70

Figure 2 shows in section a pressure operated injector; 75

Figure 3 shows in section an aerosol type injector, and

Figure 4 shows in section a portion of a wheel rim having a rupturable plug therein.

As shown in Figure 1 a hand operated injector for lubricant is in the form of a mechanical pump 1. The pump 1 comprises a barrel 2 having a piston 3 therein attached to a plunger 4 extending through a seal 5 at one end of the barrel. The opposite end of the barrel is closed except for a tube 6 which extends from the barrel 2. The tube 6 has a sharpened closed end 7 and an orifice 8 in its side. An adequate seal between the piston 3 and the barrel 2 is ensured by 'O' rings 9 on the piston. 80

In operation the pump is filled with a flowable liquid lubricant, the sharpened end of the tube is thrust through the rupturable plug in the tyre or rim if one is provided or alternatively the tube may be inserted through the tyre sidewall. Sufficient of the length of the tube 6 is inserted into the tyre interior to ensure that the orifice 8 is inside the tyre and the pump is then operated to inject lubricant into the tyre. 85 90 95 100

In the alternative arrangement shown in Figure 2 the barrel 2 contains a piston 3 but the plunger is omitted and replaced by a seating 12 for a cradle 10 for a pressurized cylinder 11. A pressure release pin 13 on the seating 12 is adapted to pierce the pressurized container when the cradle 10 for the latter is screwed firmly into the seating 12. Also, the opposite end of the barrel is provided with a connector 14 for a tyre valve, instead of the sharpened tube. 105 110 115

In operation in this case the barrel 2 is filled with a flowable liquid lubricant and the connector 14 is attached to the valve of the tyre. The cradle 10 for the pressurized cylinder 11 is screwed firmly against the seating 12 and the cylinder is thus pierced by the pin 13 and opened to the barrel 2. The pressure in the barrel behind the piston 3 then forces the piston along the barrel forcing the lubricant into the tyre through the tyre valve. 120 125

In the arrangement shown in Figure 3 an aerosol container 15 containing the lubricant is provided with a release valve 16 discharging into a metal tube 17 sharpened and closed at its free end 18 and provided with an orifice 19 in its side. 130

This device is used in a similar manner

to that shown in Figure 1 except that lubricant is forced through the tube 17 by opening the release valve 16 instead of operating a plunger.

5 Figure 4 illustrates a rupturable plug 20 which is fitted into a suitable hole in a wheel rim 21, adjacent a tyre bead retaining rim flange 22. The plug 20 consists of a mushroom head 23 which locates inside the tyre/wheel assembly and a stem portion 24 containing a passage 25, which is blocked by a rubber membrane 26 at its inner end.

10 In use a sharpened tube 27 attached to a suitable lubricant injector is inserted along the passage 25 and pushed through the membrane 26 to permit lubricant to be injected into the tyre/wheel assembly.

15 A protective cap may be provided for the plug 20 to protect the membrane 26 in normal usage.

WHAT WE CLAIM IS:—

1. A method of treating a deflated tyre and wheel assembly to permit the assembly to be run while deflated, the assembly comprising a wheel rim having a pair of annular tyre bead, retaining flanges, a tyre mounted on the wheel rim and having a tread portion whose width is greater than the distance between the annular flanges, and means for preventing the tyre from being dislodged from the wheel rim when running deflated, the method comprising connecting the interior of the tyre and wheel assembly to a lubricant supply means and pressurising the supply means to transfer lubricant therefrom to the interior of the tyre and wheel assembly, whereby when the tyre and wheel assembly is run in a deflated con-

dition the lubricant facilitates relative movement between contacting interior surfaces of the tyre.

2. A method according to claim 1 wherein the interior of the tyre and wheel assembly is connected to the lubricant supply means through a tubular extension on the supply means having a sharpened end which is pushed through the tyre to establish a flow path for lubricant between the interior of the tyre and wheel assembly and the supply means.

3. A method according to claim 1 wherein the interior of the tyre and wheel assembly is connected to the lubricant supply means through a rupturable plug located in the tyre or the wheel rim to establish a flow path for lubricant between the interior of the tyre and wheel assembly and the supply means.

4. A method according to claim 1 wherein the interior of the tyre and wheel assembly is connected to the lubricant supply means through a valve adapted to open to establish a flow path for lubricant between the interior of the tyre and wheel assembly and the supply means.

5. A method according to any one of claims 1 to 4 wherein the lubricant supply means is adapted to leave a tell-tale marker to show it has been used.

6. A method of treating a deflated tyre and wheel assembly substantially as hereinbefore described with reference to, and as illustrated in, any one of Figures 1 to 4 of the accompanying drawings.

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15 A protective cap may be provided for the plug 20 to protect the membrane 26 in normal usage.

WHAT WE CLAIM IS:—

1. A method of treating a deflated tyre and wheel assembly to permit the assembly to be run while deflated, the assembly comprising a wheel rim having a pair of annular tyre bead, retaining flanges, a tyre mounted on the wheel rim and having a tread portion whose width is greater than the distance between the annular flanges, and means for preventing the tyre from being dislodged from the wheel rim when running deflated, the method comprising connecting the interior of the tyre and wheel assembly to a lubricant supply means and pressurising the supply means to transfer lubricant therefrom to the interior of the tyre and wheel assembly, whereby when the tyre and wheel assembly is run in a deflated con-

dition the lubricant facilitates relative movement between contacting interior surfaces of the tyre.

2. A method according to claim 1 wherein the interior of the tyre and wheel assembly is connected to the lubricant supply means through a tubular extension on the supply means having a sharpened end which is pushed through the tyre to establish a flow path for lubricant between the interior of the tyre and wheel assembly and the supply means.

3. A method according to claim 1 wherein the interior of the tyre and wheel assembly is connected to the lubricant supply means through a rupturable plug located in the tyre or the wheel rim to establish a flow path for lubricant between the interior of the tyre and wheel assembly and the supply means.

4. A method according to claim 1 wherein the interior of the tyre and wheel assembly is connected to the lubricant supply means through a valve adapted to open to establish a flow path for lubricant between the interior of the tyre and wheel assembly and the supply means.

5. A method according to any one of claims 1 to 4 wherein the lubricant supply means is adapted to leave a tell-tale marker to show it has been used.

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