

Feb. 4, 1969

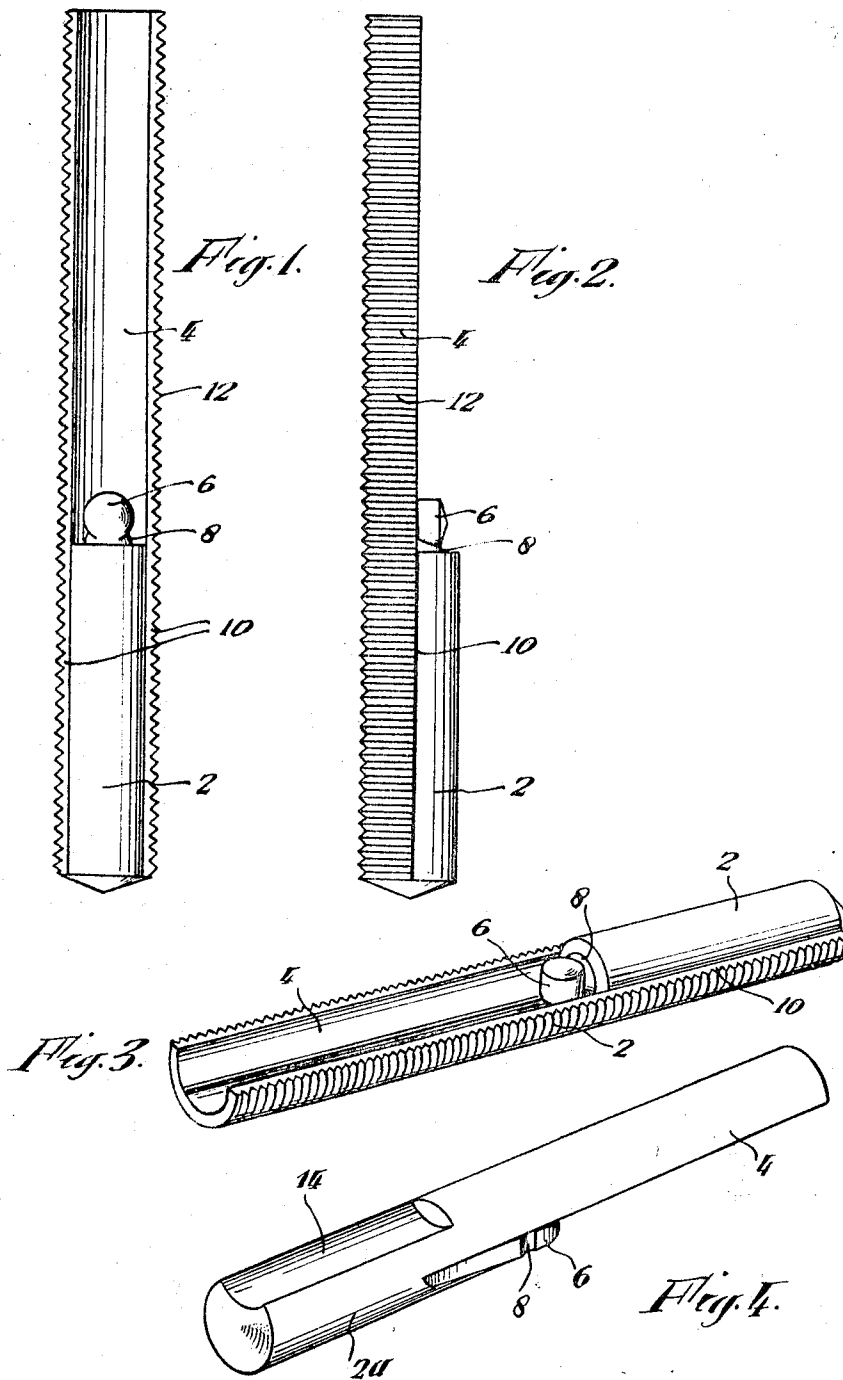
A. LEGG

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Filed Oct. 4, 1966

Sheet 1 of 2



Feb. 4, 1969

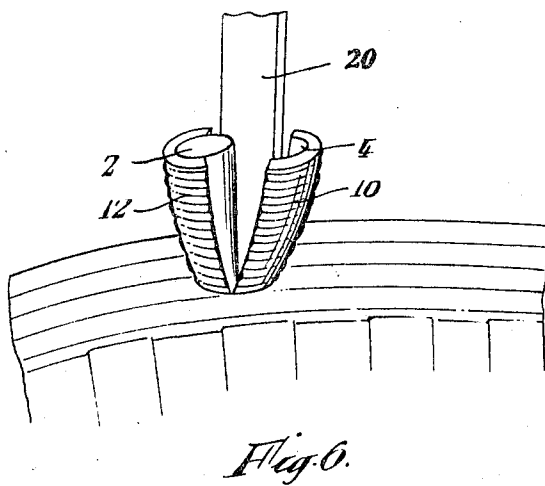
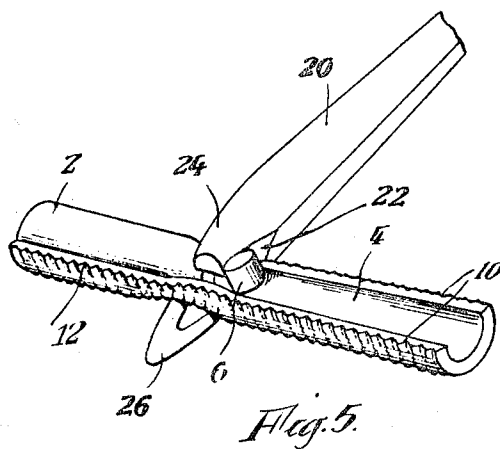
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Sheet 2 of 2



1

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8 Claims

## ABSTRACT OF THE DISCLOSURE

The specification describes a tyre plug that is insertable from the exterior, it being gripped by an insertion tool intermediate its length and folded upon itself about the gripped region. On opposite sides of the fold the plug has a relatively thick body portion and a relatively thin-walled part that will lie against the body portion periphery.

This invention relates to resilient plugs for such purposes as the repair of outer or tubeless tyres.

In the use of resilient plugs for these purposes, a puncture hole is first reamed to give it an approximately circular cross-section and, after the application of adhesive, the plug inserted into the reamed hole by means of a mandrel or other suitable tool. Particularly where tubeless tyres are concerned, it is desirable to arrange that the plug can be inserted without removing the tyre from its hub.

Where a plug is inserted from the interior it may be given a mushroom-form head that assists both the adhesive bonding and the mechanical keying of the plug to the tyre but it may be difficult to provide adequate mechanical keying of the plug when the plug must be inserted from the exterior and the head must itself be forced through the hole to be plugged. Also, the introduction of a plug from the exterior may make it difficult or impossible to ensure that the adjacent surface of the tyre is free from foreign matter so as to produce a good bond for the adhesive.

According to the present invention, there is provided a resilient plug of elongate form and comprising longitudinally opposed parts of different cross-sectional shape, one part defining a main body element and the other part having a relatively thin wall whereby the plug can be folded at a region intermediate its length and the thin-wall part arranged to lie against at least a portion of the periphery of the body element, the plug being grippable at said region of folding for insertion in said folded state into an aperture to be plugged.

By use of such a plug construction it is possible to arrange that, at the region of the fold, there is a thickening of the material cross-section. Such a thickening may arise wholly or in part from the additive effects of the two juxtaposed portions of the plug at either side of the fold and the lateral deformations imposed on these by the fold. Also, due to the softening of the surface layers of the plugs by the application of adhesive, the force applied during withdrawal of the gripping means or mandrel after the plug has "broken through" the inner end of a hole may tend to increase the thickness of the material cross-section projecting into the interior of the tyre. Thus, since the thin-walled part of the plug keeps the plug folded after withdrawal of the tool, there is an enlarged head at the tyre inner surface helping to retain the plug in place and assisting in its sealing action.

A plug according to the invention may have, in its intermediate region, a cross-sectional area between those of the body element and the thin-walled part so that the maximum cross-sectional area, when the plug is entering

2

the aperture, may be only slightly greater than the combined cross-sectional area of the body element and the thin-walled part. Whether or not this is done, the point of fold can have its location predetermined by forming a waisted portion as a location for the gripping means at the required position in the region of the junction between the body element and the thin-walled part.

One embodiment of the invention will be more particularly described with reference to the accompanying drawing wherein:

FIGS. 1 and 2 show a plug according to the invention in mutually perpendicular elevation views,

FIG. 3 shows the plug of FIGS. 1 and 2 in a perspective view,

FIG. 4 shows a modified form of plug according to the invention,

FIGS. 5 and 6 illustrate a plug according to the invention being gripped by an insertion tool or mandrel and being inserted in a folded state into a tyre wall by the tool.

Referring to the drawing, the plug is moulded from latex rubber and comprises two main longitudinally opposed parts, namely, a body element 2 and a thin-walled part 4. In an intermediate region at the junction of these two parts, a pip 6 is formed and is joined to the body element by a portion 8 defining a waist between the body element and the pip. The total cross-sectional area of the material in this region is intermediate those of the parts 2, 4.

As will be seen more clearly from FIG. 3, the body element has a generally circular cross-section but on its periphery a pair of diametrically opposed shoulders 10 are formed to produce a depressed, i.e. smaller radius, peripheral region. The wall thickness of the part 4 is similar to the depth of the shoulders and its peripheral extent is similar to the peripheral distance between the shoulders so that it can substantially fill the depressed region of the body element between the shoulders. Circumferential ribbing 12 is provided along the length of the plug so that when the parts are overlaid, the whole of the exposed circumferential surface exhibits the ribbed pattern with the object of providing an improved grip when the plug has been inserted in an aperture.

For insertion of the plug, a gripping tool or mandrel 20 has a recess 22 between a nose 24 and a tongue 26, the nose projecting forwardly beyond the open end of the recess. As FIG. 5 shows, the plug is engaged in the recess by its waisted portion 8 and, after adhesive has been applied at least to the ribbed surface of the plug, the plug is pushed into the aperture to be filled with the parts 2, 4 doubled over (FIG. 6). Because of the location of the tool on the portion 8, the pip 6 and body element will lie on opposite sides of the fold so that there is a thickening of the total cross-section at this region. The plug is inserted until the folded end projects from the remote side of the aperture and when the mandrel is then withdrawn the projecting end is pulled against the surface surrounding the aperture.

At the other end of the aperture, any exposed length of the two parts 2, 4 can be trimmed flush with the surface being plugged and it will be appreciated that, because of this, the relative length of the two parts will not normally be critical. Similarly, the peripheral width of the thin-walled part can, if desired, be greater than the peripheral distance between the shoulders 10 so that the part 4 overlaps the shoulders when the plug is folded. As further modifications in certain circumstances it may be preferred to continue the ribbed pattern around the complete circumference of the body portion or, alternatively, to omit the pattern from the plug outer surface both on the body element 2 and the thin-walled part 4.

As will be apparent from the foregoing description,

3

the cross-sectional form of the folded plug will be similar to that of the body element. While it is preferred to use a circular or otherwise generally rounded cross-section for the body portion to minimise the possibility of leaving a leakage path past the plug, the thin-walled part can take other forms than the semi-circular shape shown since it will in any case easily be deformed to lie against the surface of the body element.

FIG. 4 shows a modified plug in which the body element 2a is not circular in cross-section but has a concave arcuate portion 14. The portion 14 is circumferentially co-incident with the thin-wall part 4 so that the part 4 folds against a convex region of the element 2a and leaves the portion 14 unobstructed. This form of plug is particularly intended for use in proximity to another, circular plug when the portion 14 will form a more secure seal against the curved side of said other plug than would a circular body element. This embodiment of the invention illustrates the omission of the circumferential grooves referred to above and it will also be noted that shoulders are not provided on the body element.

What I claim and desire to secure by Letters Patent is:

1. A resilient plug of elongate form and having, in combination, two longitudinally opposed parts of different cross-sectional shapes, a first of said two parts defining a relatively thick section main body element and a second of said parts having a relatively thin wall whereby the plug can be folded at a region intermediate its length and the thin-walled part arranged to lie against at least a portion of the periphery of the body element, engagement means being provided on the plug at said region of folding to permit the plug to be there gripped for insertion and retention in said folded state in an aperture to be plugged.

2. A plug according to claim 1 further characterised in that the intermediate region of the plug has a cross-sectional area between those of the body element and the thin-walled part.

3. A plug according to claim 1 further characterised

4

in that a protuberance is provided at said intermediate region and a waist portion of lesser cross-sectional area joins said protuberance to an inner end of the body portion, said waist portion forming an engagement for gripping means during the insertion of the plug.

4. A plug according to claim 1 further characterised in that the body element has a generally circular cross-section.

5. A plug according to claim 1 further characterised in that transverse ribbing is provided on at least a part of the outer surface of the folded plug.

6. A plug according to claim 1 further characterised in that the body portion cross-sectional form has a depressed peripheral region and a pair of spaced peripheral shoulders defining the boundaries of said region, the thin-walled part of the plug having a thickness similar to the depth of said shoulders and being foldable against the body portion during insertion so as to overlie said depressed peripheral region.

7. A plug according to claim 6 further characterised in that transverse ribs are provided on a part of the plug outer surface, said ribs terminating at said shoulders and clear of the depressed peripheral region.

8. A plug according to claim 1 further characterised in that the body portion cross-section has a concave arcuate portion being located on the body portion to be circumferentially co-incident with the unfolded thin-walled part.

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