March 30, 1937. T. W. MULLEN 2,075,453

COMBINED BLOW-OUT PATCH AND PLUG

Filed Oct. 29, 1934

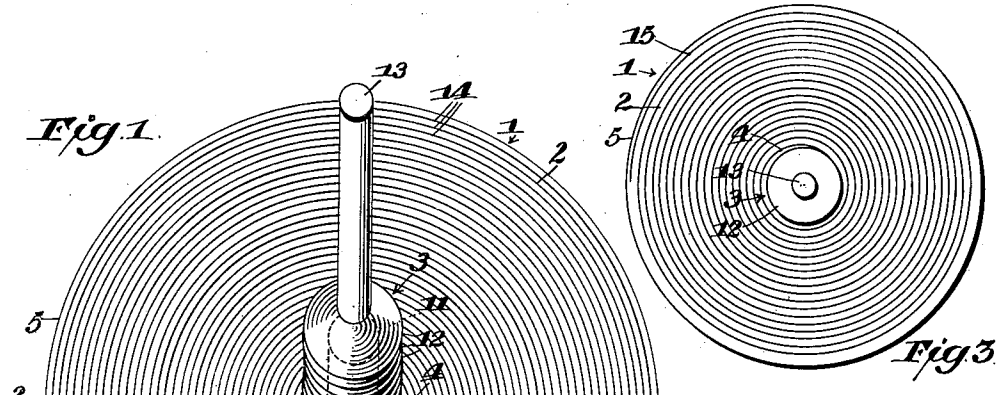


Fig. 1.

Fig. 3.

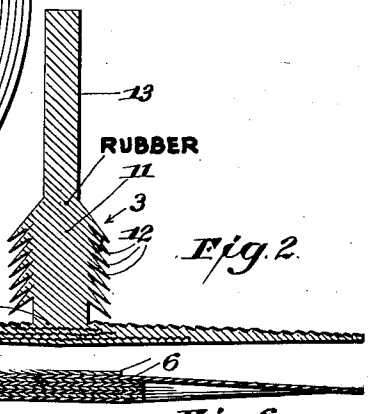


Fig. 2.

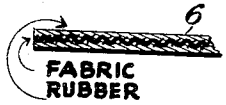


Fig. 7.

Fig. 6.

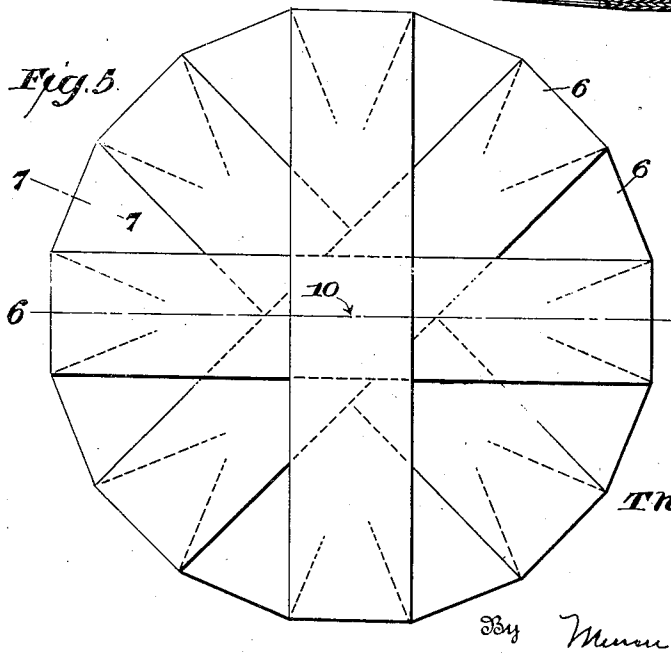


Fig. 5.

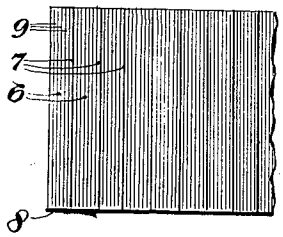


Fig. 4.

Inventor
Thomas W. Mullen.

By Munn, Anderson & Liddy
Attorneys

Patented Mar. 30, 1937 2,075,453

UNITED STATES PATENT OFFICE

2,075,453

COMBINED BLOW-OUT PATCH AND PLUG

Thomas W. Mullen, El Dorado, Ark., assignor to Bowes "Seal Fast" Corporation, Indianapolis, Ind., a corporation of Indiana

Application October 29, 1934, Serial No. 750,578

6 Claims. (Cl. 152—26)

This invention relates to improvements in tire casing repairing devices, and its objects are as follows:

First, to improve upon the patent to Thomas W. Mullen, 1,942,116 of January 2, 1934, for a Combined blow-out patch and plug by embodying a novel construction in the patch whereby it is rendered stronger than an ordinary patch of the same size as well as lighter, and further by embodying a novel construction in the plug whereby it is self-adaptable to a hole of irregular contour.

Second, to construct a round patch out of rectangular strips of rubber-impregnated fabric, said strips being piled upon each other on a common center and in different radial positions so as to build up a high place in the middle from whence the patch diminishes uniformly to a feather edge.

Third, to enable the original building up of a patch with absolutely no waste of material, the foregoing rectangular strips being cut off at regular distances from a sheet of a stock width and superimposed upon each other in building up the patch, thereby distinguishing from building up a patch out of a number of concentric discs of different diameters, the cutting out of which entails great marginal waste.

Fourth, to extend each of the strips to the full diametrical distance of the patch when building up the patch, the fact of none of the strips being laid in the same direction being responsible for the outward tapered cross section of the patch, said cross section being of greatest thickness and strength in the center, and from there tapering to the outside edge which is yieldable, stretchable and easily adaptable to the inside shape of the casing.

Fifth, to deform that surface of the patch which comes next to the casing, said deformation being of any style that will produce ridges for preventing the patch from slipping in the direction of the plug or, what is the same thing, slipping in the direction of the hole.

Sixth, to provide a multi-flanged plug which will not only seal off a hole of irregular contour as pointed out above, but will also fit tires of different thicknesses.

Other objects and advantages will appear in the following specification, reference being had to the accompanying drawing in which:

Figure 1 is a perspective view of the foregoing combined blow-out patch and plug.

Figure 2 is a cross section taken on the line 2—2 of Figure 1.

Figure 3 is a detail plan view illustrating a type of surface deformation different from that in Figure 1, the ridge in Figure 3 being of single spiral form whereas in Figure 1 the patch has a multiplicity of concentric ridges.

Figure 4 is a diagrammatic plan view of a section of rubber-impregnated fabric, illustrating how the rectangular strips from which the patch is built up, are cut off with the warp at equal distances from one end of the section.

Figure 5 is a plan view showing how these strips are laid upon each other in crisscross form in building up the patch.

Figure 6 is a cross section taken on the line 5—5 of Figure 4, principally showing how the strips build up a thick center from which the patch tapers to a feather edge.

Figure 7 is a detail cross section of a portion of one of the strips, especially illustrating the fabric and rubber.

The invention comprises the entire repairing device 1 which has been improved both as regards the patch 2 and plug 3. Each of these elements possesses what are regarded as important structural features peculiar to themselves, and in order that these may be fully understood the constructions are taken up in logical order.

In its finished form the patch 2 is round. This is thickest at its center 4 whence it tapers cross-sectionally in all radial directions to the feather edge 5. The manner of building up the patch is important. The foundation structure is shown in Figures 4, 5 and 6.

Strips 6 are cut off at equally measured distances 7 (Fig. 4) from an end of a sheet 8 of rubber-impregnated fabric. In cross section the fabric appears substantially as illustrated in Figure 7. There is a layer of material in the center and raw rubber on opposite sides. The parts, when produced, are of rectangular shape. This sheet may be of a stock width, or it may only be part of a larger sheet cut into sections. It is intended that the warp threads 9 shall run crosswise of the sheet 8 so that when the strips 6 are cut off the warp threads will run lengthwise of the strips.

These strips are then piled upon each other on a common center 10 (Fig. 5). The central overlaps form a thick center, and from there the amount of overlapping diminishes toward the margin of the patch, providing the tapering cross section and feather edge 5 previously described in connection with Figure 2. Each of the strips has warp threads running lengthwise of it. Each strip is, therefore, of equal strength as far as resistance to pull is concerned, and since each of the strips is laid in a different direction it follows that the finished patch will also be of uniform strength in all radial directions.

Naturally the greatest strength is concentrated at the center 4 where the patch is thickest. This thickened center is the result of laying the strips upon each other. The general plan of building up the patch is to lay two strips at right angles to each other. The third strip is then laid half way between the first two strips, and the fourth strip at right angles to the third strip, and so on

until a construction substantially as illustrated in Figure 5 has been arrived at. Eight strips are intended to be used for a patch of the particular size here contemplated, but for smaller or larger patches the number of strips will either be diminished or increased.

Upon subjecting the foundation in Figure 5 to heat and pressure in molding, the rubber flows together so that a perfectly uniform patch is produced. By uniform it is meant that the taper from the center **4** to the feather edge **5** is regular, the fabric part of the strips flattening out to some degree because they are capable of expanding sidewise (due to the weft being crosswise of the strips) until the whole becomes a well balanced, homogeneous mass. The resulting patch comprises what might be called a rubber envelope in which the fabric of the strips **6** are homogeneously incorporated. After the fusion of the rubber occurs the original identity of the strips is lost, they then merely being strips of fabric lying in crossed relationship and reinforcing the interior of the patch.

The second element of the device comprises the plug **3**. This has a solid central core **11**. The bottom of this core is integral with the patch center **4**, the two being made as one during molding. The core has a plurality of closely spaced flanges or umbrellas **12**. These, by preference, are downwardly directed in overlapping relationship, but it is conceivable that they may extend straight out. They are thickest at their places of connection with the core **11**, and from there taper to feather edges which impart considerable flexibility to the flanges.

These flanges are circular when viewed in plan, and their purpose is to seal off a hole of irregular contour. When pulling the plug into the hole by means of the pull stem **13** of diminished cross section some of the flanges **12** will fold up to a greater extent than others. There is no rule as to the specific shape the flanges shall take when in the hole, but they do adapt themselves to the hole and if the latter has a larger place at one side than on the other the flanges next to that place will reach out and fill in the place so that when the plug **3** is finally in position the hole will be filled as nearly perfectly as is possible. The main advantage of the plural-flanged plug is that it will seal off a hole of which the contour is irregular.

Another principle of the invention resides in one surface formation of the patch **2**. This formation actually goes with the description of the patch, but herein is set apart in order to lay emphasis on the interrupted surface. According to Figures 1 and 2 the interruptions comprise concentric ridges **14**. These ridges, whether of concentric, or other form, are cross-sectionally solid so that their bases are directly a part of the body of the patch **2**, the surface of the patch opposite to the ridges being perfectly level. If the patch were corrugated so that the edges on one side depended upon valleys on the other side the effect of pressing the flap against the casing upon inflation of the inner tube would be to flatten out the ridges and so destroy the anti-creeping function which is the very purpose of the ridges **14**. By virtue of their solid character the ridges are forced to bite into the casing under pressure so that each ridge forms its own matrix on the inner wall of the tire casing. This leaves little or no chance for the patch to slip or creep laterally. In Figure 3 there is only one ridge **15** of spiral form. Only two modifications in the form of surface-interruption are herein illustrated, but in practice it is intended to adopt any surface-interruption which will prevent the patch from slipping in the direction of the plug.

The roughened surface of the patch goes next to the interior of the tire casing, and even if uncoated with an adhesive (according to practice) will carry out its function of preventing the foregoing slippage to good effect. It is optional whether or not the roughened surface shall be coated with adhesive, and because of that the illustration of an adhesive has been omitted from the drawing.

The method of making the patch **2** is regarded as novel, and a patch made in accordance with the method does not require the addition of the plug **3**. The method is especially adapted to the making of a blow-out patch, and its steps, briefly repeating what has been stated already, are first, the cutting off of strips from a sheet of rubber-impregnated fabric with the warp of fabric, second the piling of the strips in crossed formation on a common center so that each extends in a different direction, and third to heat and compress the pile in a circular mold so as to unite the rubber by fusion.

I claim:—

1. A tire casing repairing device comprising a patch to lie against the inside of a casing, and a plug to occupy a hole in said casing, said plug having means to seal off irregularities in the contour of the hole.

2. A tire casing repairing device comprising a patch to lie against the inside of the casing, and a plug for a hole in the casing, said plug having a plurality of flexible and self-adaptable means for sealing off irregularities in the hole contour.

3. A tire casing repairing device comprising a patch to lie against the inside of the casing, and a plug for a hole in the casing, said plug having a plurality of flanges individually conformable to any irregular shape of the hole in the immediate vicinity of the flange whereby to substantially fill the hole.

4. A tire casing repairing device comprising a patch, a plug, the plug having a succession of closely spaced, overlapping flexible umbrella-like flanges which when contracted conform to the shape of a hole in a tire casing.

5. A tire casing repairing device comprising a patch to lie against the inside of the casing, and a plug for a hole in the casing, said plug having a plurality of closely spaced flanges, said flanges being of such thickness and flexibility as to be capable of folding in next to the plug when the plug is inserted in said hole.

6. A tire casing repairing device comprising a patch to lie against the inside of the casing, and a plug for a hole in the casing, said plug having a plurality of closely spaced, feather-edged flexible umbrella-like flanges in overlapping relationship, said patch having an interrupted surface adjacent to the plug, said surface being of a structure to maintain its cross-sectional shape under pressure so that it can be made to bite into the casing wall and prevent the patch from slipping.

THOMAS W. MULLEN.