Dec. 15, 1953 G. A. LYON 2,662,499

APPARATUS FOR MAKING WHEEL COVERS

Filed June 21, 1949

3 Sheets-Sheet 1

Fig. 1

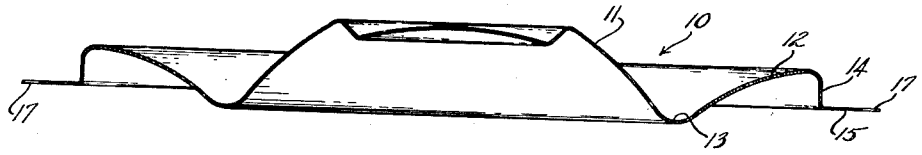


Fig. 2

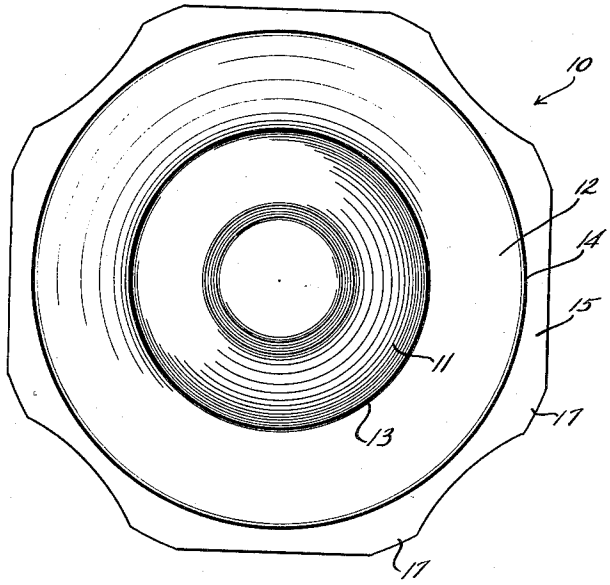
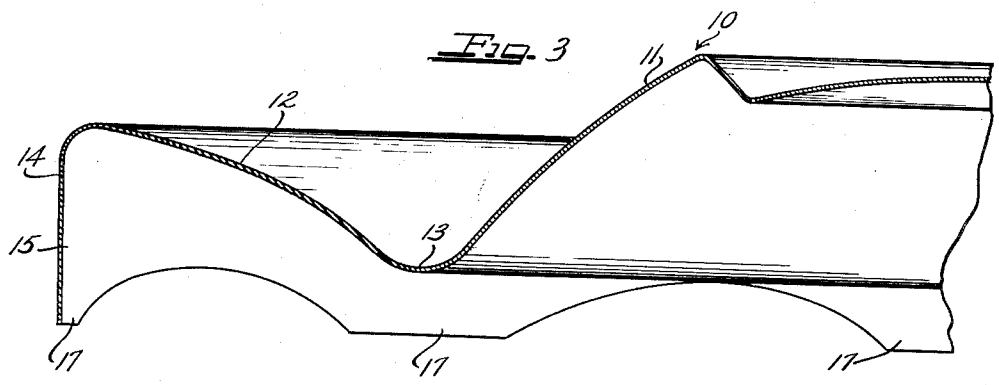


Fig. 3



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Fig. 4

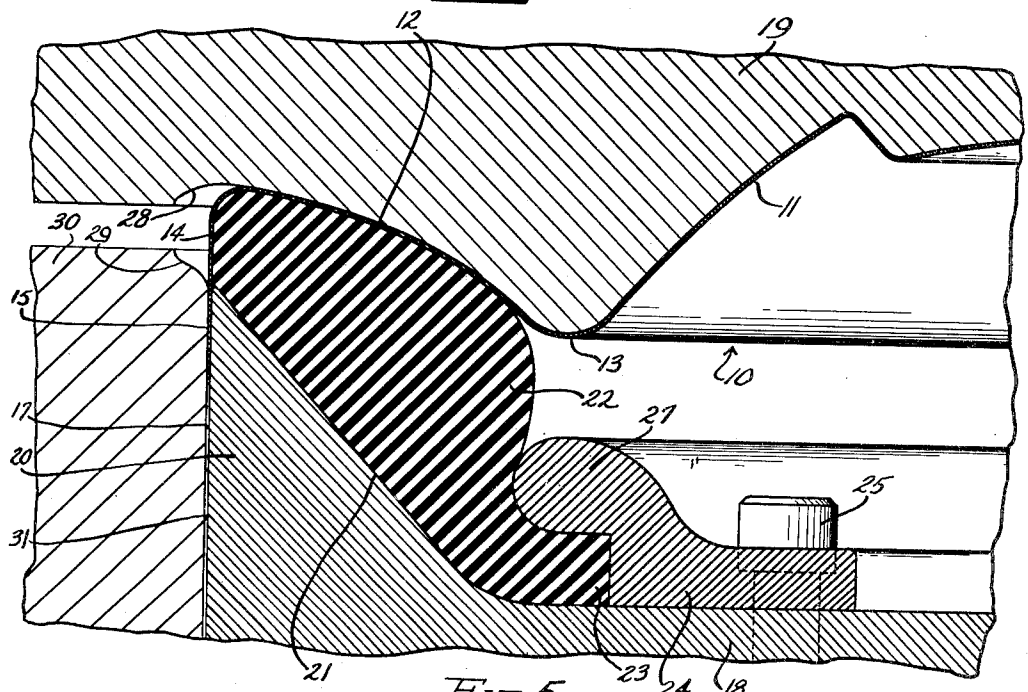
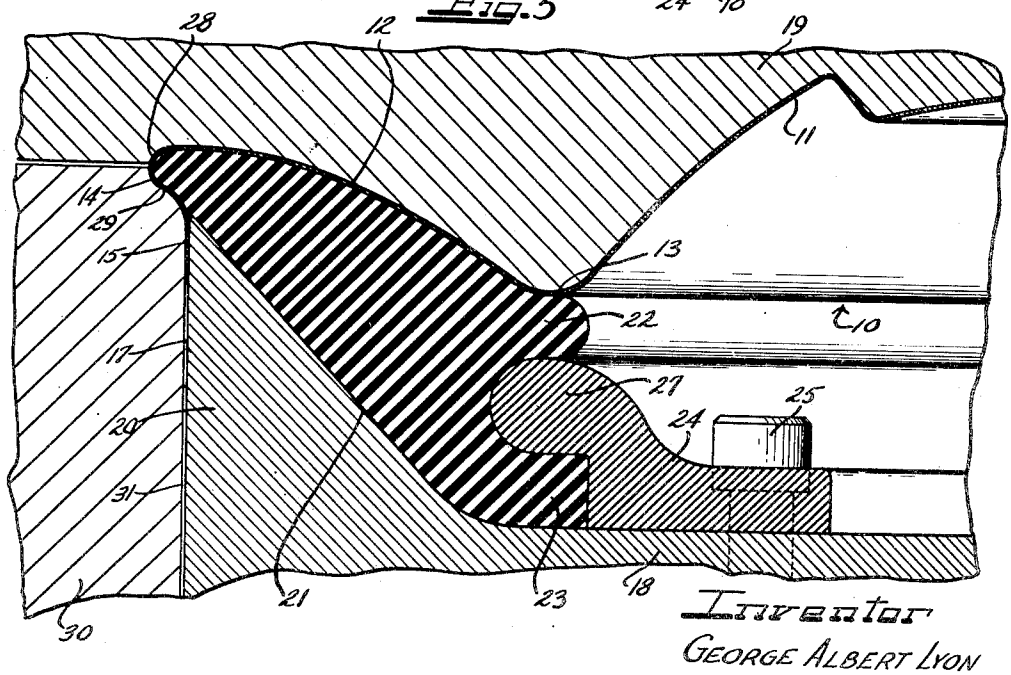


Fig. 5



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Fig. 7

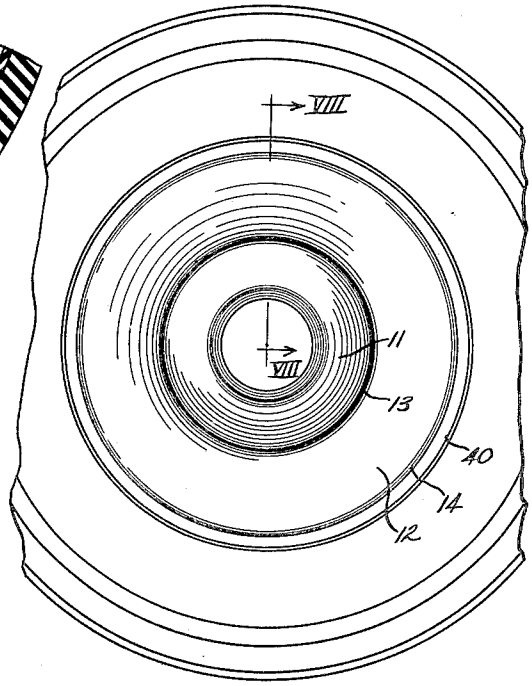


Fig. 8

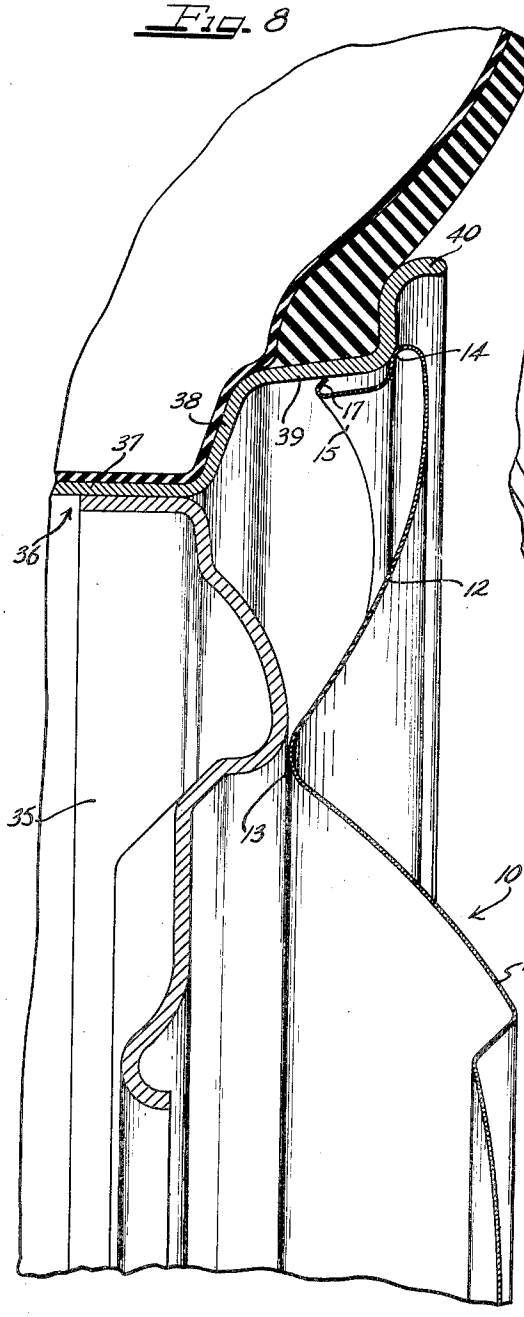
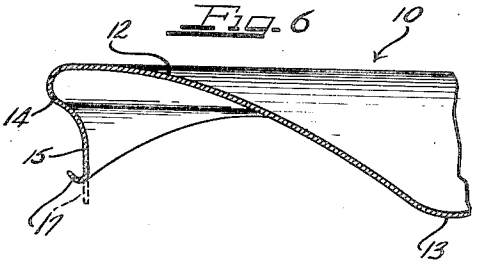


Fig. 6



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APPARATUS FOR MAKING WHEEL COVERS

George Albert Lyon, Detroit, Mich.

Application June 21, 1949, Serial No. 100,368

1 Claim. (Cl. 113—44)

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The present invention relates to improvements in an apparatus for making wheel covers and more particularly wheel covers of the kind that are adapted for use to protectively and ornamentally cover the outer side of automobile wheels.

An important object of the present invention is to provide an improved apparatus for making vehicle wheel covers.

A further object of the invention is to provide an improved apparatus for simply and efficiently forming a bulged configuration in the marginal portion of a full disk wheel cover.

According to the general features of the present invention there is provided an apparatus for making vehicle wheel covers, a rigid supporting block, a resiliently pliable annulus of rubber-type material carried by said block and providing the sole support for a wheel cover blank having a generally channel-shaped formation with which the supporting surfaces of the annulus are substantially complementary, and forming die means having complementary formation to the upper surface of the cover member and a cover margin receiving groove formation adjacent to and opening toward a marginal portion of the cover and the periphery of the supporting annulus, said die means being operable to press the cover against the supporting annulus to deflect the supporting annulus toward said forming groove to drive the cover marginal portion bulgingly into said forming groove.

According to other general features of the invention the supporting block and the die means include generally convergently related surfaces generally converging toward the forming groove in order to facilitate deflection of the material of the annulus into the forming groove.

According to still other general features of the invention means are provided for restraining deflection of the supporting annulus to any substantial extent away from the forming groove, but affording a small clearance with respect to the die means in the fully compressed condition of the die means whereby to afford a small pressure relief clearance for the inner margin of the annulus.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of a preferred embodiment thereof taken in conjunction with the accompanying drawings in which:

Figure 1 is a diametrical sectional view through a full disk cover blank adapted to be further processed according to the present invention;

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Figure 2 is a top plan view of the blank;

Figure 3 is a fragmentary enlarged radial sectional view through the blank showing the same after a further step in the formation thereof;

Figure 4 is a fragmentary vertical sectional detail view through the apparatus for further shaping the cover blank and showing the blank according to Figure 3 in the apparatus ready for further processing;

Figure 5 is a sectional detail view similar to Figure 4, but showing the apparatus in the relative functional relationship assumed upon completion of the marginal bulging of the cover blank;

Figure 6 is a radial marginal sectional view through the cover blank as it appears following the operation of Figure 5 and disclosing the final formation of a portion of the blank to complete the wheel cover;

Figure 7 is a side elevational view of a vehicle wheel assembly showing the completed cover in position on the wheel; and

Figure 8 is an enlarged radial sectional view taken substantially on line VIII—VIII of Figure 7.

As shown on the drawings:

In the manufacture of the type of full disk wheel cover which is constructed to cover substantially the entire outer side of a vehicle wheel such as an automobile wheel and engage in self-retaining relation with the tire rim, an especial problem has existed in the formation of the marginal portions of the cover and it is to the solution of this problem that the present invention is particularly directed. To this end, a cover blank 10 is first drawn, or stamped from a sheet metal blank to the form shown in Figures 1 and 2. This comprises a crown portion 11 and an annular portion 12 surrounding the crown portion and joined therewith in one piece by an inwardly directed annular rib juncture 13. In the present instance the annular portion is of generally convex concave, or curved cross-section. The margin of the blank is provided with an angular flange formation including a generally cylindrical flange portion 14 and a flat flange extremity portion 15, the latter being formed at predetermined intervals, herein shown as six in number with truncated corner portions 17. Thereafter, the flange extremity portion 15 is bent into substantially cylindrical rearwardly extending concentricity with the flange portion 14, as shown in Figure 3.

In the completed cover it is desirable to have a marginal portion that will extend radially outwardly beyond and in concealing relation to the

inturned marginal flange portion. For this purpose the generally cylindrical flange portion 14, which is adjacent to the annular cover portion 12, is bulged uniformly radially outwardly substantially beyond the cylindrical diameter of the inner flange portion 15 and the flange extremities 17.

According to the present invention bulging of the flange portion 14 is effected by pressing a resiliently deflectable forming member which is preferably in the form of a rubber-like annulus uniformly radially outwardly into the reentrant corner defined between the annular cover portion 12 and the flange 14, while holding the flange portion 15 to its original diameter. In accomplishing this result, the rubber-like annulus is squeezed while confined against substantial movement in any direction except radially outwardly against the flange portion 14, but with limited pressure relief movement of the annulus radially inwardly so as to avoid blocking and at least overheating from excessive pressure. The pressure on the annulus is applied between opposed surfaces converging generally toward the point of application of useful pressure at the inner side of the flange portion 14 of the cover blank adjacent the juncture thereof with the annular cover portion 12.

The novel apparatus for carrying out the foregoing method is shown in Figures 4 and 5 and comprises relatively reciprocable opposed members 18 and 19, either or both of which may be reciprocably movable relative to the other. In the present instance the member 18 comprises a die block or anvil which is stationary and may be mounted on a press bed. On the upper margin of the lower stationary member 18 is provided a pressure ridge 20 having an outer diameter substantially equal to the inner diameter of the flange 15 of the cover blank so as to fit within the cover flange substantially as shown in Figure 4. At its inner side, the pressure ridge 20 is formed with a diagonal pressure face 21 merging at its lower end with the upper face of the pressure block 18.

Mounted on the pressure face 21 is a forming annulus 22 which is preferably formed from rubber or synthetic rubber, or equivalent material having the characteristic of resilient deflectability, but non-compressibility. That is, like water it substantially resists compression, but will tend to escape by substantial flowing action from the pressure applied thereto. A lower radially inwardly extending attachment flange 23 on the resiliently yieldable annulus is engaged by hold down flange annulus 24 which may be secured removably to the inner upper surface of the pressure block 18 by means of bolts 25. Actual hold down, or clamping of the attachment flange 23 is effected by a flange portion 27 which where it opposes the body of the resilient annulus 22 is of rounded configuration, being preferably of substantially bulbous cross-section.

The structure and the relationship of the resiliently yieldable annulus 22 is such that it fits within the reentrant marginal corner portion of the cover blank 10 and against the inner face of the cover annular portion 12 and in assembly of the cover blank with the resilient annulus preparatory to the forming operation serves as the sole support for the cover blank in the apparatus. For this purpose the outer periphery of the resilient annulus is preferably formed cylindrically concentric with the periphery of the pressure ridge 20 and extends to a substantial

height above the peak of the pressure ridge. The upper surface of the resilient annulus is preferably formed substantially complementary to the inner surface of the annular cover portion 12. Hence, in the assembled condition, the resilient annulus fits fairly closely within the engaged portion of the cover blank.

The upper pressure member 19 is preferably contoured complementary to the configuration of the cover blank 10 and thus engages the crown portion 11 and the annular portion 12 as well as the juncture rib 13 of the cover blank snugly when placed in engagement with the cover blank. Thereby these portions of the cover blank are held against deformation incident to further forming of the cover blank in the apparatus.

In order to accommodate bulging of the flange portion 14 of the cover blank and to form the bulged portion to preferred contour radius, the pressure member, or block 19 is formed with a bulge forming groove 28 immediately adjacent to the marginal external corner of the cover blank. By preference, however, the groove 28 is only partial with respect to the completed bulge desired and a companion groove 29 is provided in a rigid forming ring 30 which surrounds the pressure ridge 20 and projects thereabove sufficiently to provide for the forming groove 29. In order to accommodate the flange portion 15 of the cover blank between the upper part of the pressure ridge 20 and the adjacent portion of the forming ring 30, a space 31 is provided therebetween in which the flange 15 extends during the forming operation and within which the flange 15 is held to its original cylindrical diameter while nevertheless permitting the flange to move freely axially.

In operation, relative axial movement of the pressure block members 18 and 19 is effected, as for example, by driving the member 19 toward the member 18 to thereby place the resilient forming annulus 22 under compression between the pressure ridge 20 and the opposing surface of the annular cover portion 12 as backed up by the complementary surface of the pressure block 19. By reason of the cover contour, and more especially the contour of the annular cover portion 12 which faces on its inner surface generally axially inwardly and radially outwardly and is disposed generally convergent at the radially outer side with respect to the pressure surface 21 of the pressure ridge, the resilient forming annulus 22 is resiliently deflected toward the cover blank flange 14 as the pressure is applied to the forming annulus. As a result, the cover flange 14 is bulged outwardly by the force of the deflected outer marginal portion of the forming annulus. Bulging deflection of the cover blank continues until the blank has been shaped firmly and uniformly into the forming grooves 28 and 29 to assume the desired contour of the bulge substantially as shown in Figure 5.

During the pressing operation, the securing flange 27 provides an inner marginal backing for the forming annulus 22 and resists substantial deflection radially inwardly of the annulus under the pressure so that maximum forming pressure is exerted radially outwardly by the forming annulus to effect the bulging deformation of the cover margin. Since the retaining flange 27 is of rounded contour the resilient forming annulus is safe from any cutting damage by exertion of pressure against the retaining flange.

For pressure relief a limited inner peripheral portion of the resilient forming annulus 22 is

permitted to deflect radially inwardly between the top of the retaining flange 27 and the rib 13 of the cover blank affording a predetermined pressure relief gap. Through this arrangement, extreme accuracy in the volume of the resilient forming ring 22 is unnecessary because pressure relief from blocking pressure is afforded in the gap between the rib 13 and the flange 27. Furthermore, over-heating due to overcompression of the resilient forming annulus is thereby avoided.

Among the advantages of using a resilient forming annulus for forming the peripheral bulge in the cover resides, of course, the fact that upon releasing the forming pressure upon the annulus it immediately resiliently resumes its original shape and thus automatically withdraws from the bulge so that the now additionally formed cover blank can be lifted away from the annulus. This method of forming the bulge also has the salient advantage of low cost from the standpoint of die manufacture since substantial dimensional tolerance in the form of the resilient annulus is permitted because it conforms to the shape of the rigid metal dies during the pressing operation and thus need not be very accurately shaped to begin with, but only need be shaped to approximate complementary form of the inside shape of the cover blank portions 12 and 14. The original dimensions of the resilient annulus are preferably at least slightly undersize rather than oversize in order to facilitate placement and removal of the cover blank. Wear is a negligible factor with respect to the resilient annulus itself, and wear upon the cooperating metallic die members is also reduced because of the facility of the resilient annulus to conform itself to any imperfections in the forming surfaces of the rigid die members. The simplicity of the one piece resilient annulus as a forming die element is also an important die cost factor.

After the cover blank 10 has been formed with the peripheral bulge and is removed from the resilient forming annulus, the corner portions 17 are turned generally radially and axially outwardly from the dash outline position to the full line position as shown in Figure 6 to provide cover retaining fingers and the cover is ready for application to a vehicle wheel. Any appropriate finish may be afforded for the outer, exposed side of the cover such as a natural polish, or plating, or any appropriate color finish, or any combination of finishes preferred.

As shown in Figures 7 and 8, a wheel to which the finished cover 10 may be applied comprises a load-sustaining body portion 35 and a tire rim 36, the latter being of the multi-flanged drop-center type including a base flange 37 to which the load-sustaining body portion 35 is attached, an outer side flange 38, an intermediate flange 39 and a terminal flange structure 40. The outside diameter of the cover terminal flange 15 is slightly less than the inside diameter of the intermediate flange 39 of the tire rim, while the outside diameter of the peripheral bulge provided by the bulged flange 14 is substantially greater than the inside diameter of the terminal flange in the tire rim. The outside diameter of a circle described by the turned out terminal corners 17 is somewhat greater than the inside diameter of the intermediate flange 39. As a result, when the cover is centered with respect to the outer side of the wheel, the terminal corner portions 17 engage against the shoulder providing a juncture between the intermediate flange 39 and the terminal flange 40 and as the cover is pressed

axially inwardly, the terminal portions 17 ride inwardly along the surface of the intermediate flange 39 and flex the flange 15 radially inwardly whereby a strong radially outwardly gripping action of the terminals 17 against the intermediate flange 39 effects a wedging biting engagement which is effective to retain the cover on the wheel in service. Since the peripheral bulge 14 overlies the juncture shoulder between the adjacent flanges of the tire rim, it effectively conceals the gap between the flange 15 and the intermediate flange 39 of the tire rim. In addition, the peripheral bulge affords a strong marginal reinforcement for the cover and rendering the radially protruding portion of the margin substantially rigid and enhancing the resilient flexibility of the marginal retaining flange 15. The bulge also affords a convenient pry-off rib between which the adjacent shoulder on the tire rim the pry-off tool can be conveniently interposed to pry the cover free from the wheel when required, the resilience of the retaining flange 15 making such pry-off feasible.

I claim as my invention:

In apparatus for making wheel covers, a circular stationary member facing upwardly and having a peripheral upwardly projecting annular ridge provided with a cylindrical radially outwardly facing face and a radially and axially inwardly sloping inner face merging with an upwardly facing surface of said member at the base of said sloping inner face, a resilient annulus having the characteristics of rubber having a surface complementary to and lying against said inner face, said annulus having a body portion of substantial thickness projecting upwardly above the peak of said ridge and tapering radially inwardly and then dropping axially downwardly to a radially inwardly extending flange substantially thinner than the height of said body, an annular hold-down flange member secured to said upwardly facing member radially inwardly of said annulus flange and having a radially outwardly extending flange portion upwardly offset relative to said upwardly facing member and clampingly engaging said annulus flange, said flange portion being of bulbous cross-section opposing the radially inner side of said annulus body and with the annulus body rising to a substantial height thereabove, a pressure member reciprocably overlying said upwardly facing member having an annular portion opposing the body of said annulus and with the surface of said annular portion sloping inwardly and merging with an annular downwardly projecting rib opposing said bulbous holddown flange portion so that when said pressure member is thrust downwardly against said annulus said annulus body is squeezed to flow radially outwardly beyond the peak of said ridge while a radially inner portion of the annulus body flows radially inwardly over said bulbous holddown flange portion and under said pressure member rib, said pressure member having a portion thereof extending radially outwardly beyond said annulus and defining a downwardly opening annular forming groove of limited radially outwardly extent, and a holding member adapted to clamp against said cylindrical surface of said ridge, a cylindrical flange on a cover member resting upon said annulus, said holding member having an upwardly opening groove of limited radial extent and substantially complementary to said groove in the pressure member for receiving a portion of said cover flange pressed thereinto by displacement of the annulus as an in-

cident to pressure applied thereagainst by said pressure member.

GEORGE ALBERT LYON.

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