June 5, 1934. S. SCHWARTZ 1,961,712

BUSHING STRUCTURE AND METHOD OF FORMING SAME

Filed Sept. 23, 1929 3 Sheets-Sheet 1

Fig. 1

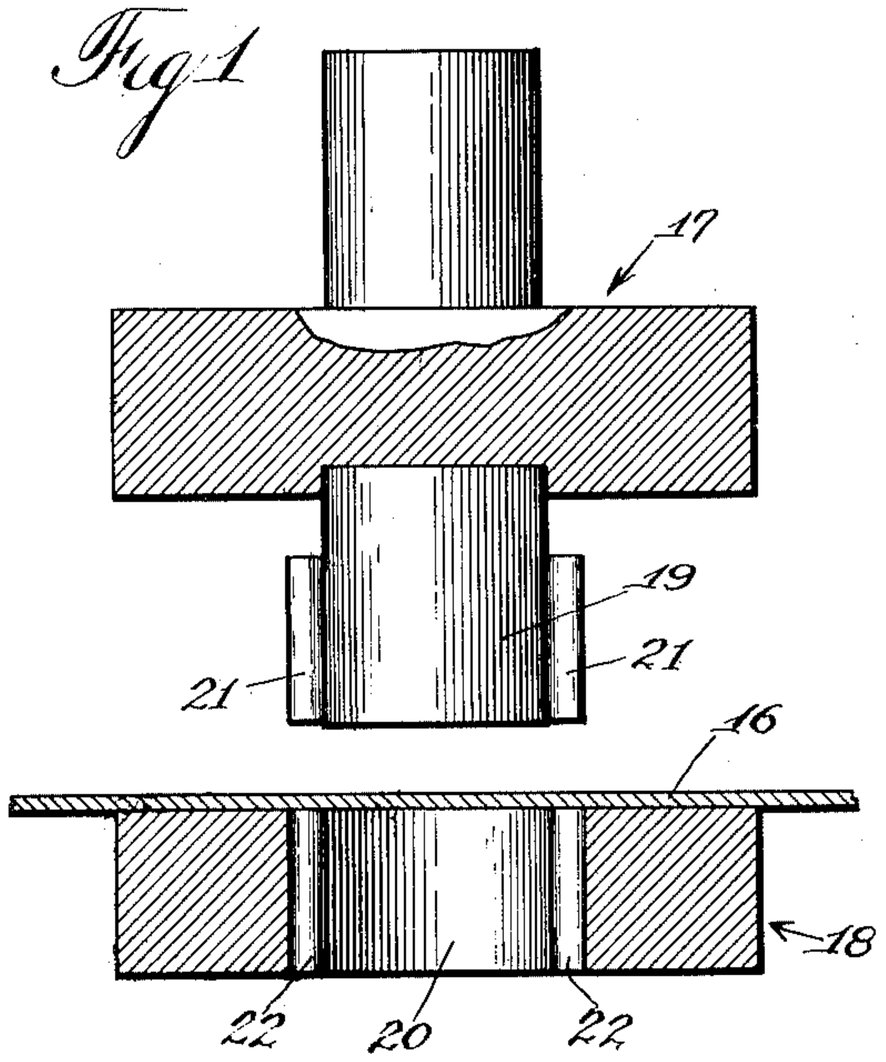


Fig. 3

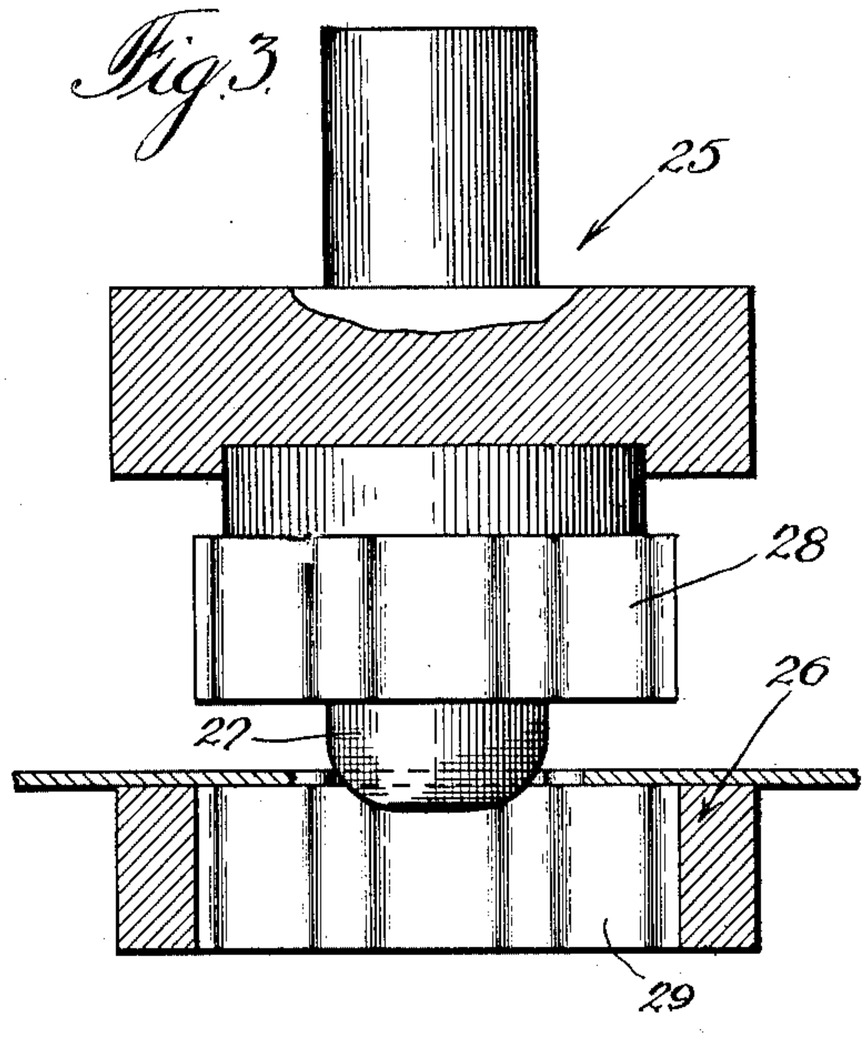


Fig. 2.

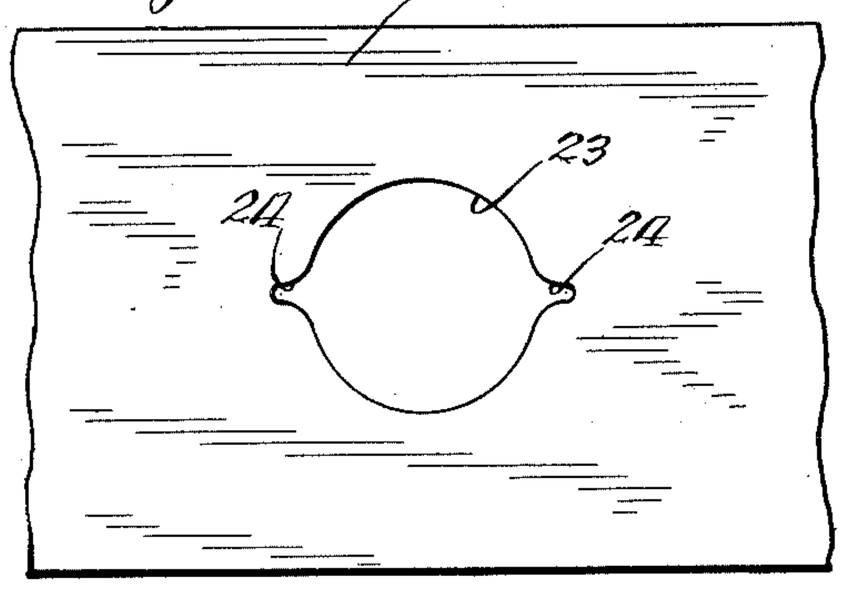
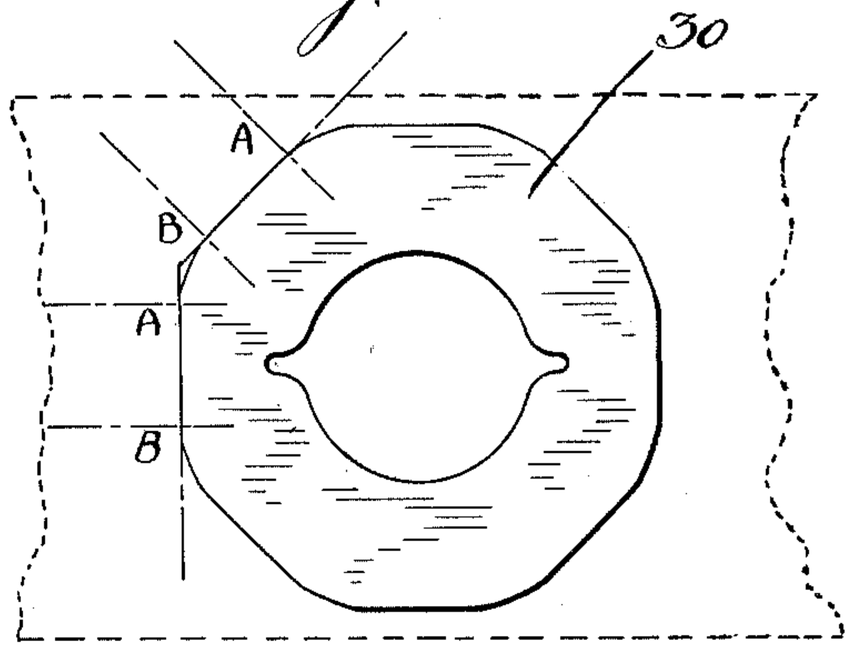


Fig. 4.



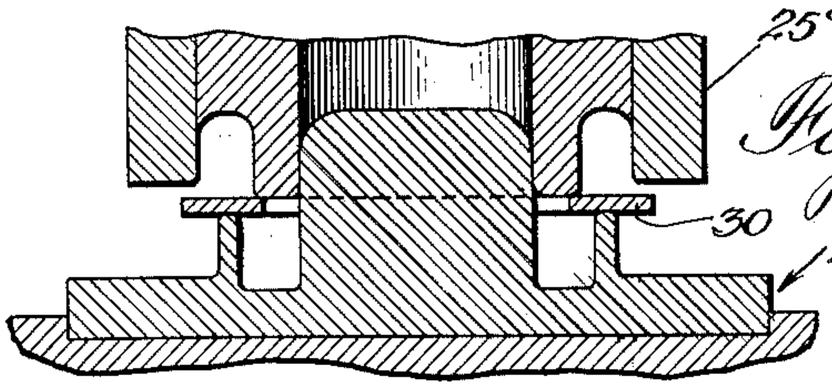


Fig. 5.

Witness
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BUSHING STRUCTURE AND METHOD OF FORMING SAME

Filed Sept. 23, 1929 3 Sheets-Sheet 2

Fig 6.

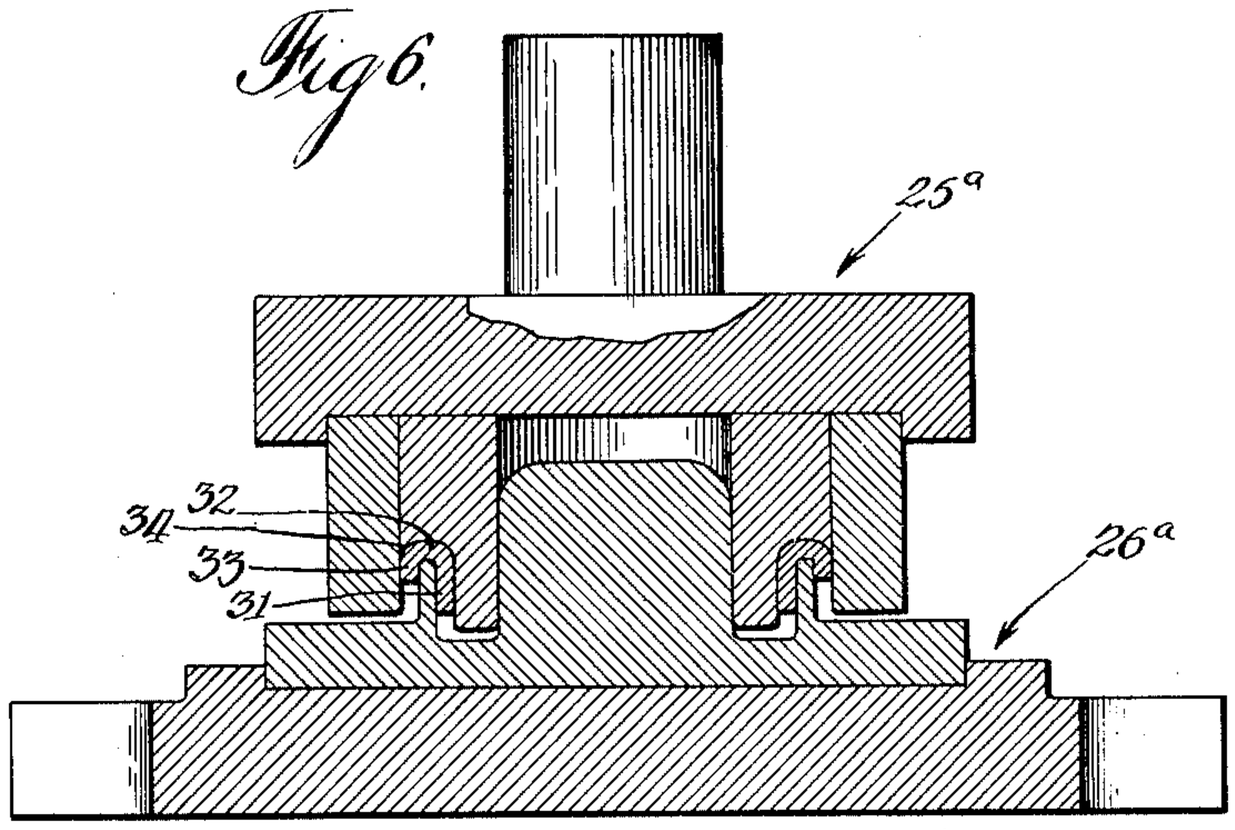

Fig 7.

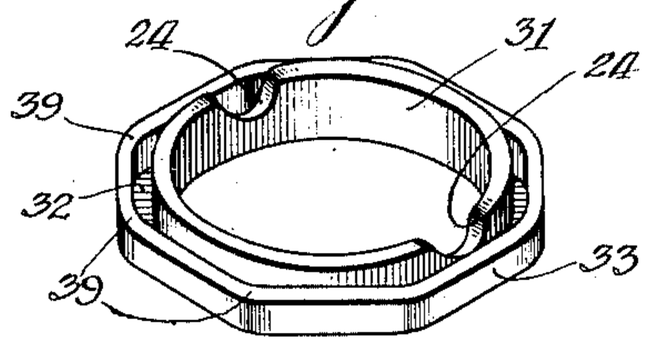

Fig 10.

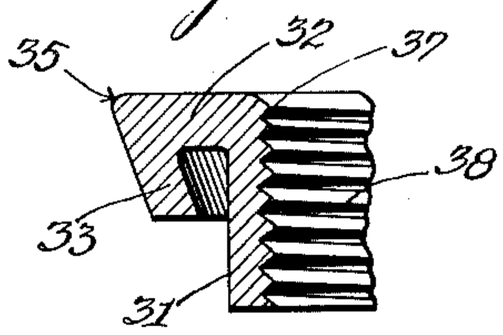

Fig 9.

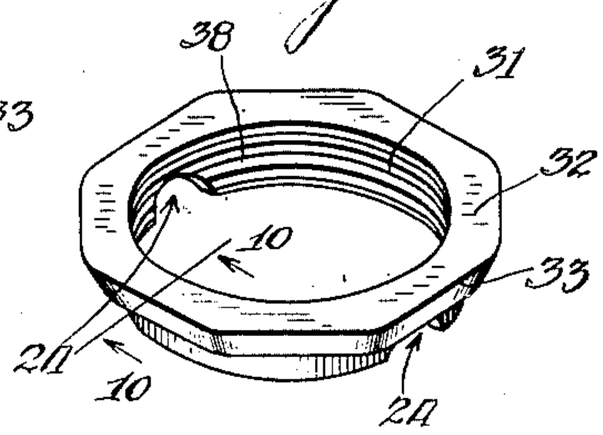

Fig 8

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BUSHING STRUCTURE AND METHOD OF FORMING SAME

Filed Sept. 23, 1929 3 Sheets-Sheet 3

Fig. 11

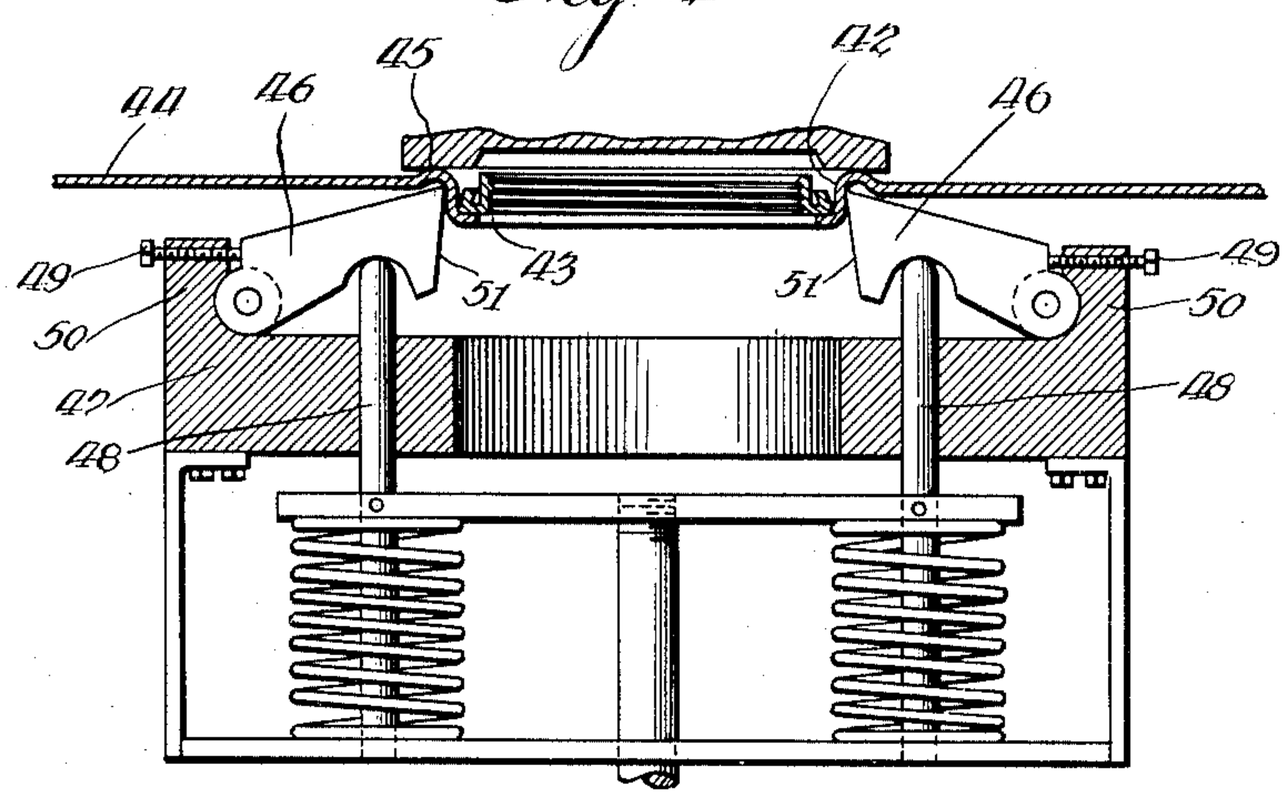

Fig. 12.

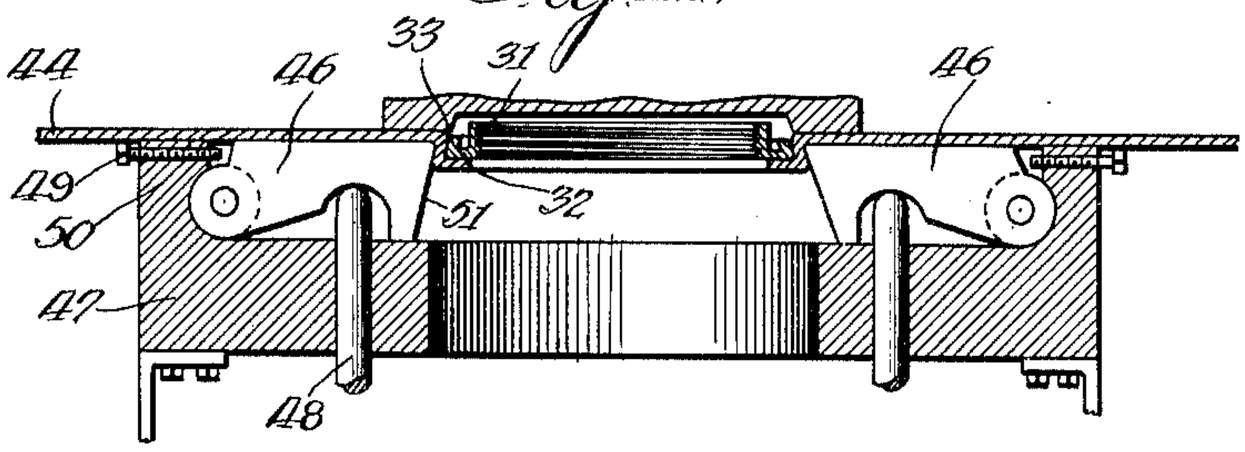

Fig. 13.

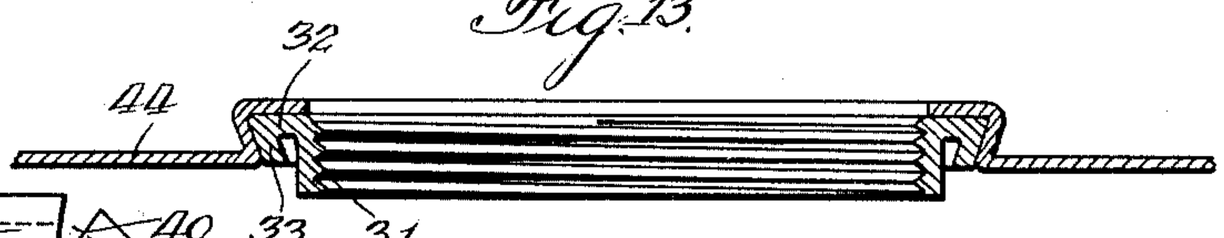

Fig. 14.

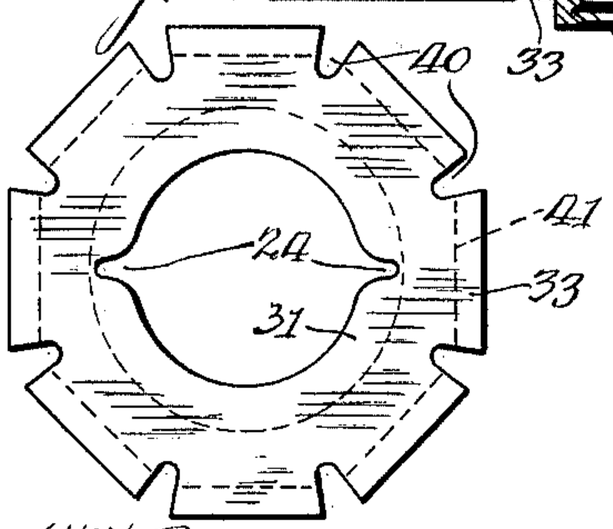

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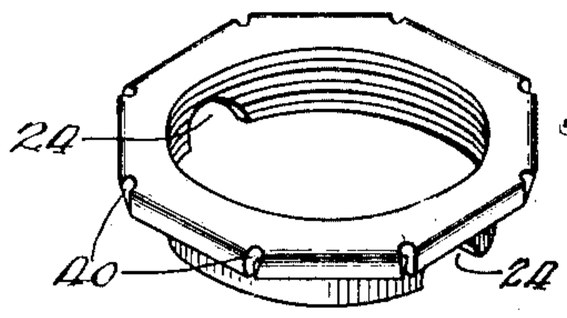
Fig. 15.



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Patented June 5, 1934

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UNITED STATES PATENT OFFICE

1,961,712

BUSHING STRUCTURE AND METHOD OF FORMING SAME

Sol Schwartz, Chicago, Ill.

Application September 23, 1929, Serial No. 394,400

8 Claims. (Cl. 285—49)

This invention relates to a bushing structure and the method of forming the same, and has special reference to a bushing structure as employed particularly in the construction of metallic barrels and other containers such as are used for storing or for shipping oils or other liquids or semi-liquids, the bushing structure being adapted to receive a bung or other stopper means in a fluid-tight relation.

More particularly, this invention relates to a bushing structure comprising a main body portion for receiving a bung formed of a single sheet of a comparatively thick material for association with a socket formed of a comparatively thin sheet of material, the socket being produced from the barrel wall or other supporting body with which it is to be employed.

The socket with which the bushing of the present invention is to be associated is formed outwardly from the material surrounding a hole in a supporting wall of the barrel or other container, the socket being polygonal in contour and, initially, having straight or vertically extending side walls. The bushing, in a completed state, has a polygonal contour and the taper of two edges when viewed together in cross section converge inwardly relatively to the outwardly formed socket. The vertically extending side walls of the socket are formed by suitable dies against the converging edges of the bushing to hold the latter against displacement.

The present invention contemplates the provision of a bushing for receiving in a removable relation therewith a bung or stopper, the bushing being preferably formed of sheet material in the following manner: Cutting a hole in a strip of continuously fed sheet metal stock; centering the hole and cutting a substantially ring-shaped blank therearound axially thereof having a substantially polygonal outer contour; forming said blank into a member of a substantial channel-shaped cross section; and finally in forcing the outer edges of said bushing into a tapered relation with the main body portion such that any two outer edge portions, when viewed together in cross section, converge in the direction of the inner edge portion.

Many advantages flow from the use of sheet metal in the manner outlined above. There is a decided saving in the cost of the bushing over a bushing of the solid type formed, for example, of malleable iron, which latter is perhaps the cheapest of materials at all practicable for use. Again, in the assembly of the bushing in the socket formed in a barrel or other container, there can be no distortion of the inner edge or bung receiving portion of the channel-shaped bushing, notwithstanding pressure being applied to the converging outer edge portions. Further, in the same connection, the forming of the side walls of the socket by suitable dies against the converging edges of the bushing to hold the latter against displacement may be done with a maximum of efficiency as may be shown more clearly with reference to the bushing of the solid type wherein the outer and inner edges are not separated but are filled in solid therebetween.

In the operation of closing the side walls of the socket against the converging edges of the bushing of the solid type, the jaw members of the dies may only be operated into position against the converging edges and not therebeyond, whereafter because of the resilience of the material, the socket may spring away somewhat, although for all practical purposes the bushing is held against displacement. Again, it will be apparent with the use of this bushing of the solid type that there is very little, if any at all, give or elasticity in the bushing and that if the dies are not properly adjusted the faces of the forming members or jaws thereof may be broken down in trying to perform a forcing action beyond the edges of the bushing.

In the device of the open type, that is, of the present invention, the outer edge portion of the channel-shaped bushing is in no way connected directly with the inner edge portion of the channel excepting for the connection of the body portion therebetween at the bases thereof. In this manner, a movement of the forming dies to urge the side walls of a socket against the converging outer edge of the bushing may be permitted, notwithstanding the fact that the dies may be imperfectly adjusted within, of course, certain limits. In this manner there will be no breaking down of the faces of the forming dies since the walls against which they operate may give to a great degree, for example, as if being pivoted at the bases thereof. Further, the resilience of the material of the bushing permits the converging edges thereof to spring back somewhat after the forming dies have operated the socket into a fixed relation thereagainst, thereby to overtake any spring in the material of the socket whereby to provide a maximum coherence against displacement. It is, of course, natural that the bushing be of substantially heavier stock than the material of the barrel or other container with which it is associated. Therefore, the tendency to return to a normal position after being

distorted therefrom in the bushing is much greater than that tendency to return to a normal position by the material of the socket, all of which makes it apparent that there will be a greater coherence between the bushing of the open type and the socket than that obtained between the bushing of the solid type and the socket.

One of the objects of this invention is to provide a bushing of the character indicated above which will obtain a maximum of efficiency in coherence when employed in a socket of a metallic barrel or other container.

Another object of this invention is to provide a method of forming a bushing structure of the type hereinbefore mentioned.

A further object of this invention is to provide a bushing of the type noted above which may be formed of sheet material.

A still further object of this invention is to provide a bushing of the type hereinbefore noted which will be simple and inexpensive to manufacture and which will be durable.

Other objects and advantages will hereinafter be recited and for a better understanding of the nature, characteristics and scope of this invention reference may be had to the accompanying drawings and the following description, in which latter:

Figure 1 is an elevational view partially in section of a punch and die mechanism showing a strip of material being fed thereto;

Fig. 2 is a top plan view of the strip of material after being operated upon by the die mechanism of Figure 1;

Fig. 3 is a view similar to Figure 1 of a second punch and die mechanism for operating upon the strip shown in Fig. 2;

Fig. 4 is a plan view of the blank cut from the strip after being fed through the punch and die mechanism of Fig. 3;

Fig. 5 is a central sectional view of a portion of a punch and die mechanism with the blank of Fig. 4 shown in an initial position therein;

Fig. 6 is a complete view of the die mechanism shown in Fig. 5 with the blank formed into a channel-shaped member;

Fig. 7 is a perspective view of the channel-shaped member after being operated upon by the punch and dies of Fig. 6;

Fig. 8 is still another punch and die mechanism showing the channel member of Fig. 7 formed into a bushing having the outer edges thereof forced into a tapered relation with the main body portion such that two outer edges, when viewed together in cross section, converge;

Fig. 9 is a perspective view of the completed bushing;

Fig. 10 is an enlarged detail sectional view taken on the line 10—10 of Fig. 9;

Fig. 11 is a sectional view of a punch and die mechanism showing the bushing of Fig. 9 inserted in a socket formed in a supporting wall of a barrel or other container and an initial position of the dies for operating thereon;

Fig. 12 is a view of the punch and die mechanism shown in Fig. 11 in a changed or final position with the bushing held against displacement in the socket;

Fig. 13 is an enlarged view of the bushing structure as embodied in a container wall;

Fig. 14 is a top plan view of a blank of a modified form; and

Fig. 15 is a perspective view of the blank shown in Fig. 14 in a completed bushing.

Referring now to the drawings and more particularly to Figures 1 to 10 thereof, a strip of material 16 is fed between the punch and die mechanism 17 and 18, respectively. The material of this strip is preferably steel, although it is apparent that other materials of like strength and characteristics may be used in place thereof without departing from the spirit of the invention. The punch 17 has a cylindrical member 19 extending therefrom to cooperate with a cylindrical aperture 20 in the die 18. The cylindrical aperture 20 has a pair of diametrically opposed ears 21 to cooperate with similarly disposed grooves 22 in the die 18, these members cooperating to cut a hole 23 of the shape indicated in Fig. 2 of the drawings. It is to be understood that various types of holes may be cut in the strip 16 since there may be provided various types of bungs or stoppers for engagement therewith.

The strip of material 16 is continuously fed between the punch and die members of Figure 1, which punch member 17 has a reciprocating movement as the strip is continuously fed thereto. After the hole 23 is cut into the strip, the strip is fed forwardly to a second punch and die member 25 and 26, respectively, wherein a centering member 27 projecting from the die 25 aligns the hole 23 axially of the substantially polygonally-shaped member 28, although it may be desirable in some instances that the hole be eccentrically disposed. The member 28 of the punch 25 cooperates with a similarly shaped aperture 29 in the die 26 to form a substantially polygonally-shaped blank 30, the particular blank being shown in Fig. 4. It will be noted with reference to Fig. 4 that an eight-sided figure is presented, the sides comprising straight lines A—B joined together by an arc. Therefore, in the formation of the blank the straight sides do not meet to form an angle, but the sides are joined by an arc to relieve a corner being formed for a purpose as will subsequently be more fully described.

The blank 30 is next placed in a third punch and die mechanism 25*a* and 26*a*, respectively, where a member of a channel shape, when one side is viewed in cross section, is formed. It will be noted that the inner edge portion or flange 31 extends a substantially greater distance outwardly of the main body portion 32 than does the outer edge portion or cylindrical collar 33. The particular reason for adapting this construction is that a certain number of threads are required in order to pass a certain test and this comparatively great depth is not required at the outer edge portion or flange 33. It will be noted that the slots 24 in the forming operation provided by the dies of Fig. 6 have been enlarged considerably into substantial cut-away portions to provide an outlet for oil when the oil in the tank gets low in order that a proper drainage may be had in the barrel. The cut-away portions, at the lowermost point thereof, intercept a plane beyond the inner surface of the wall of the container in order to provide this proper drainage.

The channel-shaped member shown in Fig. 7 is next disposed in the forming punch and die of Fig. 8 wherein the outer flange 33 of the channel shaped member, shown in Fig. 7, is forced into a tapered relation with the main body portion 32 such that the outer two edges, when viewed together in Fig. 8, converge in the direction of the inner edge portion or cylindrical collar 31. The taper is preferably about 20 degrees from the perpendicular. In providing the converging edges, the material of the bushing is upset and it will be noted that the point of bend in the channel-

shaped member, indicated at 34 in Fig. 6, is now a very sharp bend 35 where the material has been forced to flow outwardly by the punch member 36 of Fig. 8. Also the inner portion or the junction of the cylindrical collar 31 and the body portion 32, which is shown as having a great radius of bend in Fig. 6, is shown as being filled out, the metal flowing in that direction also. Thus, from a sheet of material of uniform thickness, the upsetting performed by the dies of Fig. 8, provides for a greater cross sectional area at the angles indicated at 35 in Fig. 10 than at the material immediate adjacent angles of the polygonal periphery. This construction provides a maximum gripping surface for a given depth of flange which is very desirable. The bushing thus formed is provided with threads 38 internally of the cylindrical collar 31.

It has previously been mentioned that the polygonal-shaped sides of the blank shown in Fig. 4 are joined preferably by arcs thus cutting off the corners of a perfectly formed polygon, the arcs intercepting and joining adjacent straight edges. When these edge portions are formed into channel-shaped members, it will be apparent that a surplus of material would be obtained at the points 39 indicated in Fig. 7 of the drawings thus providing an uneven depth to the flange 33 of a very ragged appearance. However, by relieving the corners this surplus of material is not built up at the corners 39 thus leaving a perfectly flat edge.

Referring now more particularly to Figures 14 and 15, a second embodiment of this invention is shown, wherein, in place of relieving the corners formed by the adjacent sides of the polygon, notches 40 are provided. The material between the notches is bent over as at 40 to form the converging edges 33 and the cylindrical collar 31 is turned up both in the same manner and with the same punch and die mechanism as previously described with reference to the blank shown in Fig. 4. The completed bushing is shown in Fig. 15, the notches 24 being enlarged in the same manner to provide for the drainage of oil. It will be apparent that a greater elasticity of the converging edges will be obtained in this latter embodiment than in the former embodiment. In some instances this added elasticity in the bushing may be desirable, although it is to be understood that the previously described embodiment is the preferred form and that a substantial resilience is obtained therein.

In assembling either of the bushings just described into association with an opening formed in a metallic barrel or other container, the bushing is set in an inverted position in a socket 42 formed outwardly from the material surrounding a hole 43 in a barrel head blank, the barrel head blank first having a hole cut therein and the material surrounding the hole formed outwardly into a socket. A surplus of material preferably in the form of an annular bead 45 is preferably formed at the base of the socket or at the intersection of the socket with the barrel head. The barrel head is then placed on a die member preferably comprising a series of segments 46 pivotally mounted on a supporting structure 47, one segment for each side of the polygonally sided flange. The segment 46 preferably extends the full width of the flange and is held in a raised position by means of the spring pressed plungers 48, which latter extend through and are supported by the supporting structure 47. In order to limit the upward movement of the segment 46 an adjustable screw member 49 is threaded in a vertically extended portion 40 extending above the surface of the supporting member 47.

The segment 46 is provided with a tapered engaging face 51 forming an acute angle with the upper surface thereof.

Referring now to Fig. 12 of the drawings it will be noted that the punch member has been brought down on the barrel head member 44 and that the segments 46 have been pivoted to such a position that the diameter between opposite edge portions of the engaging face is smaller than the diameter between the corresponding upper edge portions of the engaging face in Fig. 11. By reason of the taper of the engaging face 51 the side walls of the socket 42 are crimped inwardly and the material of the beaded portion 45 is used up so that the side walls of the socket converge to engage the tapered edges 33 of the bushing and to hold the bushing in a secure assembled relation therein.

As hereinbefore stated, by referring to Fig. 12 it will be noted that the converging edge 33 is spaced from the internally threaded cylindrical collar 31 and it is connected therewith only through the body portion 32. This provides that an accurate adjustment of the segments 46 need not be provided, within certain limits, and that the material of the side walls of the socket, in the tendency of the walls to spring back to an initial position, do not break away from the converging edges of the bushing since the bushing itself would have a tendency, because of its great thickness, to spring back a still further distance thereby tending to provide a greater bond between the two than were the converging edge 33 solid against the threaded portion 31. Further, an accidental distortion of the converging edge 33 would not affect the threaded portion 31 whereby the latter would always be in proper form to receive a bung in threaded engagement therewith. It has been known in other models of the solid type that the inner threaded portion was distorted in such a manner that a bung or stopper could not be threaded therein. This could not happen in the device of the instant application.

As a result of the present invention a bushing structure is provided whereby a close engagement to prevent displacement of the bushing may be had between a bushing and a socket of a metallic container. This structure, aside from being more efficient with reference to the construction thereof, is also less expensive to manufacture. Further, the forming dies for assembling the bushing into the container need not be in mechanically perfect adjustment since there is a resilience in the material of each of the elements entering into the construction to take up the deficiency in the adjustment. The bushing of this structure may be formed of sheet metal of varying thicknesses.

While but a single embodiment of this invention is herein shown and described, it is to be understood that various modifications thereof may be apparent to those skilled in the art without departing from the spirit and scope of this invention and, therefore, the same is to be limited only by the scope of the prior art and the appended claims.

I claim:

1. A bushing structure for metallic barrels and the like having a socket formed in a wall thereof, comprising a resilient sheet metal main body portion having flanges formed integrally on the outer and inner edges thereof, said outer flange having a converging edge and a non-circular

peripheral contour, the wall of said socket being similarly converged and contoured for forced engagement with the outer surface of said outer flange to prevent displacement of said bushing structure therefrom, said inner flange defining an aperture through said bushing for receiving a plug.

2. A bushing structure for metallic barrels and the like having a socket formed in a wall thereof, comprising a ring-like body portion formed of resilient sheet metal having integrally formed outer and inner flanges, said outer flange having a converging edge and a non-circular peripheral contour, the wall of said socket being similarly converged and contoured for forced engagement with the outer surface of said outer flange to prevent displacement of said bushing structure therefrom, said inner flange being adapted to receive a plug.

3. A bushing structure for metallic barrels and the like having a socket formed in a wall thereof, comprising a substantially channel-shaped member formed of resilient sheet metal having a non-circular peripheral outer contour and an outer edge portion converging toward the inner edge portion of said channel-shaped member, the wall of said socket being similarly converged and contoured for forced engagement with the outer surface of said outer edge portion to prevent displacement of said bushing structure therefrom, said inner edge portion being adapted to receive a plug.

4. A bushing structure for metallic barrels and the like having a socket formed in a wall thereof, comprising a cylindrical collar formed of resilient sheet metal having an integrally formed flange extending outwardly therefrom, and an integrally formed peripheral flange on said first mentioned flange of a non-circular contour having an edge converging in a longitudinal direction toward said collar, the wall of said socket being similarly converged and contoured for forced engagement with the outer surface of said edge of said peripheral flange to prevent displacement of said bushing structure therefrom.

5. A bushing structure for metallic barrels and the like having a socket formed in a wall thereof, said bushing structure being formed from a sheet metal blank which has been shaped to constitute an annular-like member having a body portion that is channel-like in cross section, the inner wall of said channel being circular and internally threaded to receive a threaded plug and the outer wall of said channel being resilient and having a polygonal periphery wherein the material contained at the angles is of substantially greater cross sectional area than the material intermediate adjacent angles of the polygonal periphery, the wall of said socket having forced engagement with the outer surface of said outer wall of said channel to prevent displacement of said bushing structure therefrom.

6. A bushing structure for metallic barrels and the like having a socket formed in a wall thereof, said bushing structure consisting of an annular-like member formed from sheet metal and having a body portion that is channel-like in cross section, the inner channel wall being circular and internally threaded to receive a threaded plug and the outer wall of said channel being resilient and having a non-circular periphery and converging toward the inner channel wall, the wall of said socket being similarly converged and contoured for forced engagement with the outer surface of said converged outer wall to prevent displacement of said bushing structure therefrom.

7. A bushing structure for metallic barrels and the like having a socket formed in a wall thereof, comprising a cylindrical collar formed of resilient sheet metal having an integrally formed flange extending outwardly therefrom, and an integrally formed peripheral flange on said first mentioned flange of a non-circular contour having a downwardly extending edge, the wall of said socket being similarly contoured and formed for forced engagement with the outer surface of said downwardly extending edge to prevent displacement of said bushing structure therefrom.

8. A bushing structure for a metallic barrel and the like having a socket formed in a wall thereof, comprising an annular-like resilient sheet metal member, the body portion of which is channel-like in cross section, the inner wall of said channel being internally threaded to receive a plug and the outer wall of said channel being polygonal in shape and converging toward the inner channel wall, the wall of said socket being polygonal and similarly converged for forced engagement with the outer surface of said outer wall to prevent displacement of said bushing structure.

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