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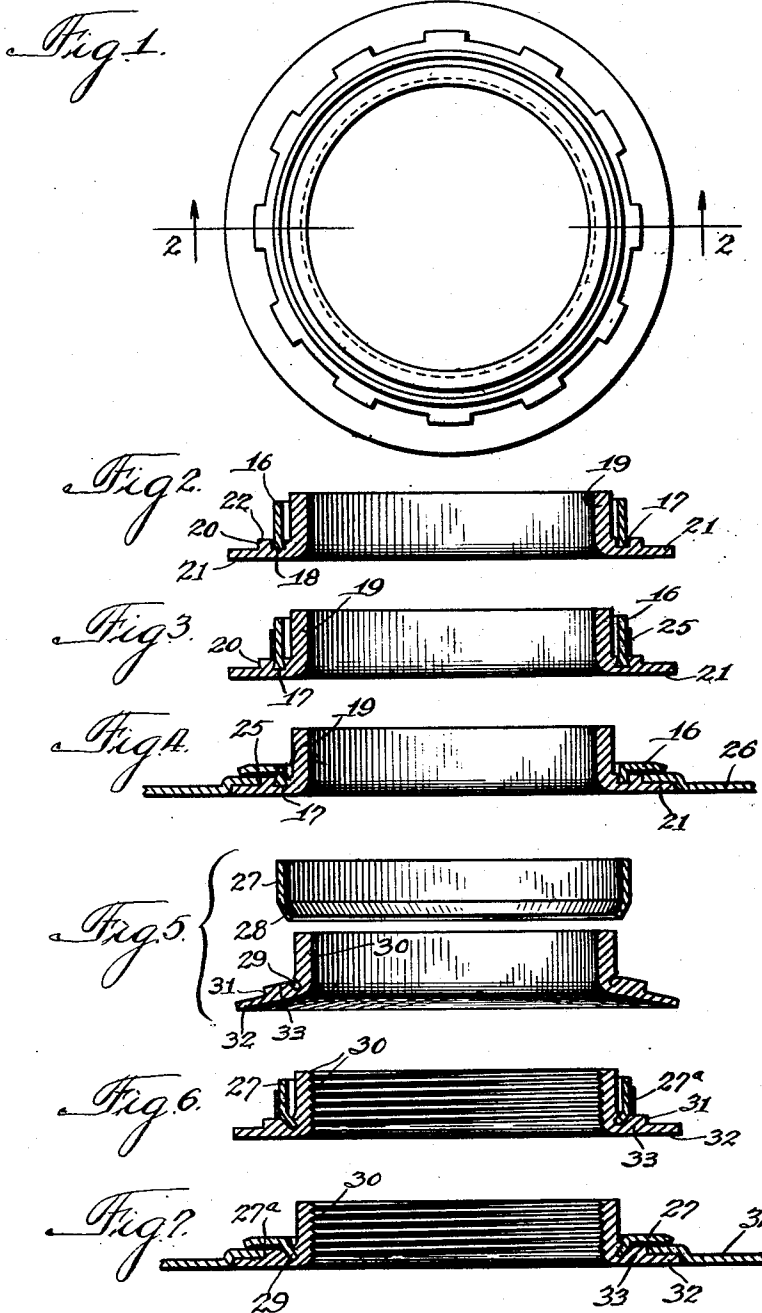
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2,243,288

METHOD OF FORMING BUSHING STRUCTURES

Filed March 16, 1939

2 Sheets-Sheet 1



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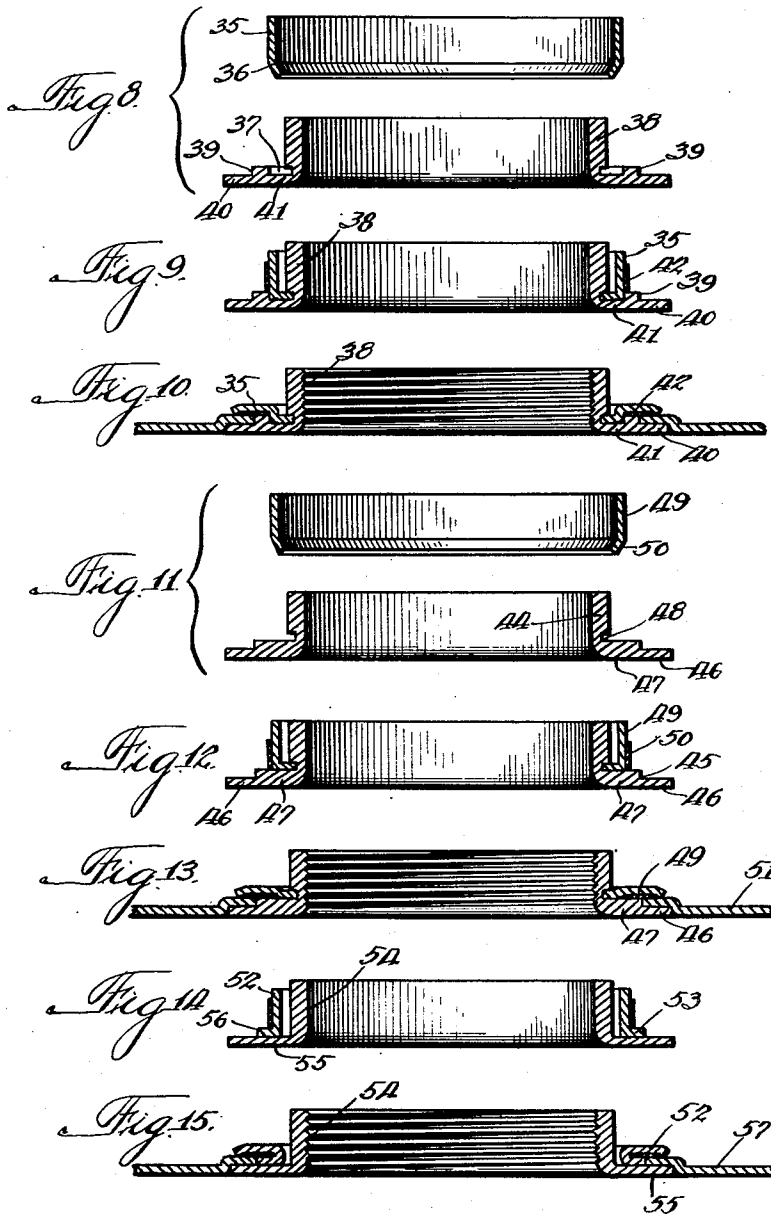
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METHOD OF FORMING BUSHING
STRUCTURES

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This invention relates to a method of forming a bushing structure and has special reference to the method of clamping a connecting means in a hole in the wall of a sheet metal container used for shipping or storing liquids or semi-liquids, the connecting means detachably receiving a bung or other closure.

More particularly, this invention relates to the method of forming a bushing structure for a sheet metal container which consists in fixedly securing a clamping ring about a cylindrical collar having an angularly extending flange, the side walls of the ring and the collar lying in substantially parallel planes, in inserting the ring and the collar through an aperture in a wall of the sheet metal container to a position such that the flange rests on one side of the container wall, and in clamping the ring against the other side of the wall.

Sheet metal containers as used commercially today for storing or shipping oils, alcohol and the like, are formed of as inexpensive a steel as their manufacture will permit for ordinary use and because of the inexpensive character of the steel the sheet material will not permit of very substantial drawing or forming operations. Bushing structures heretofore employed in connection with such sheet metal containers have required a substantial depth of draw in the wall or barrel head of the sheet metal container where such bushing structures include a connecting means in clamped engagement therewith.

The welding of a connecting member to a sheet metal container has various disadvantages and a primary disadvantage is that of producing a scale which when dropped into the liquid or semi-liquid in the container ordinarily contaminates the latter for its purposes of use. Therefore, a clamped type of bushing structure or one in which a forming operation is performed on the barrel head or wall of the barrel to hold the connecting means in clamped engagement therewith is preferably employed. Since the type of material ordinarily used for barrels, as above stated, does not permit substantial forming and drawing operations, it is desirable that the latter operations be dispensed with as far as possible in order to provide a leak-proof connection between the barrel and the connecting member.

The present invention has for one of its objects to produce a bushing structure in which the connecting means for receiving the bung or closure is operated upon by these forming and drawing operations rather than the wall or barrel head

of the sheet metal structure in order that a minimum of mechanical operations is necessitated on the comparatively inexpensive material of the sheet metal container. Since the connecting means forms a relatively small portion of the quantity of material going into the make-up of the sheet metal container, it is possible to use a material of a relatively better grade out of which the connecting means may be formed so that the connecting means may be operated upon without substantial danger of destroying the utility thereof.

Since the forming operations heretofore necessitated in clamping or holding the connecting means in position in the sheet metal container necessitate a better grade of material than is ordinarily used in order that danger of leakage from cracks in the material about the formed portions be minimized, the present invention minimizes the forming operations necessary in the material of the sheet metal container by operating upon the connecting member which may be economically formed of a better grade of material. In this manner of construction a substantial number of defective or so-called "leakers" resulting in the use of the usual barrel stock under the drawing and forming operations previously used is obviated by reason of transferring those operations upon the better grade material of the connecting member.

In view of the above, it is contemplated in the present application to employ a clamping ring which is fixedly secured in a channel in a flange extending angularly from a cylindrical collar, the side walls of the ring initially lying in a substantially parallel plane with the side wall of the collar for insertion through an aperture in a wall of the sheet metal container to a position such that the flange rests on one side of the container wall, whereafter the extending portion of the clamping ring is clamped against the other side of the container wall. The clamping of the flange and ring members of the connecting member against opposite sides of the wall of the container holds the connecting member against axial displacement from the container wall and in order to prevent relative rotation therebetween, the thickness of a marginal portion of the flange is reduced to form a shoulder having a scalloped, polygonal or other non-circular periphery at the juncture of the reduced and enlarged portions thereof with the shoulder engaging the periphery of an aperture of like contour in the wall of the container.

One of the objects of this invention is to pro-

vide a method for forming a bushing structure of the character indicated above in which the material of the sheet metal container is not subjected to the usual strains accompanying the clamping of the connecting member thereto.

It is also an object of this invention to provide a method of forming a bushing structure for a sheet metal container of the character indicated above which is comparatively inexpensive to use and which will afford an efficient bushing structure.

Other objects and advantages of this invention will hereinafter be more particularly pointed out and for a more complete understanding of the characteristic features of this invention, reference may now be had to the following description when taken together with the accompanying drawings, in which latter:

Figure 1 is a plan view in elevation of the connecting member in an initial position of assembly of the clamping ring in the channel of the flange extending angularly from the cylindrical collar in accordance with the method of the present invention;

Fig. 2 is a central sectional view of Fig. 1;

Fig. 3 is a central sectional view similar to Fig. 2 after the completion of a succeeding step in the method of the present invention, the material surrounding the channel having been displaced to secure the ring in position with respect to the flange;

Fig. 4 is a central sectional view similar to Fig. 3 after the completion of the step of inserting the connecting ring through an aperture in the wall of the container with the clamping ring bent into engagement with the side wall of the container;

Fig. 5 is a central sectional view of an initial step of forming a bushing structure incorporating the method of this invention, the view showing the clamping ring and flanged collar ready for assembly;

Fig. 6 is a central sectional view showing the assembled positions of the clamping ring and flanged collar of Fig. 5;

Fig. 7 is a central sectional view after the completion of the final step of inserting the connecting member of Fig. 6 through an aperture in the wall of a container with the clamping ring bent into engagement with the side wall of the container;

Fig. 8 is a central sectional view of an initial step of forming a bushing structure in accordance with the teachings of the present invention, the view showing the clamping ring and flanged collar in position for assembly;

Fig. 9 is a central sectional view after the completion of the assembly of the clamping ring of Fig. 8 on the flanged collar thereof;

Fig. 10 is a central sectional view after completion of the final step in the assembly of the connecting member of Fig. 9 to the wall of a container;

Fig. 11 is a view of an initial step of forming a bushing structure embodying the features of this invention, the clamping ring being shown in position for assembly on the flanged collar;

Fig. 12 is a central sectional view after the completion of the step of assembling the clamping ring of Fig. 11 on the flanged collar thereof;

Fig. 13 is a central sectional view after the completion of the final step in clamping the connecting member of Fig. 12 in an aperture in the wall of a sheet metal container;

Fig. 14 is a central sectional view of an ini-

tial step of forming a bushing structure embodying the features of this invention showing the disposition of a clamping ring on a flange extending angularly from a cylindrical collar; and

Fig. 15 is a central sectional view after the completion of the final step of assembling the connecting member of Fig. 14 in an aperture extending through the wall of a sheet metal container.

Referring now to the drawings, and more particularly to Figs. 1 to 4, inclusive thereof, the method incorporating the features of this invention as disclosed therein consists in the upsetting of one end of a clamping ring 16, the clamping ring being preferably cut from a steel tube, although, of course, the ring may be formed from a strip of sheet metal and wrapped around a mandril to form a cylinder.

The upset end 17 of the clamping ring 16 is disposed in an annular groove or channel 18 cut in the flange extending angularly from the cylindrical collar 19. A marginal portion of the flange is reduced in thickness to form a shoulder 20 at the juncture of the reduced portion 21 and enlarged portion 22 of the flange. The peripheral contour of the shoulder 20 is non-circular, and, as shown in the drawings, is preferably scalloped to provide ridges and valleys 23 and 24 for purposes which will hereinafter be more fully apparent. When the term "non-circular" is employed herein and in the claims, it is understood that it refers to such configurations as are not true circles including polygons, ovals, scallops and the like. The reduced portion 21 is preferably provided by a punch and die mechanism although it may be otherwise formed as desired.

After the insertion of the upset portion 17 in the channel 18, the material of the enlarged portion 22 of the flange is displaced preferably by a punch and die mechanism to envelop the upset portion and thus to secure fixedly the clamping ring with respect to the flange. The channel is initially of a width to receive the greatest width of the upset portion and after the material bounding the channel is displaced to envelop the upset portion, a wedge-shaped connection is afforded which will prevent displacement of the clamping ring 16 from the flange.

A gasket 25 is preferably disposed about the clamping ring 16, the width of the gasket preferably extending in the plane of the collar. The collar 19 and the ring 16 are thereafter inserted through an aperture in the wall 26 of the sheet metal container to a position such that the reduced portion 21 of the flange engages one side of the wall 26 of the container. The periphery of the aperture is the same in size and shape as that of the periphery of the shoulder 20 and, in the specific example shown, the periphery of the aperture is scalloped to provide ridges and valleys corresponding to the ridges and valleys 23 and 24, respectively, of the shoulder 20.

The engagement of the scalloped peripheries of the aperture and shoulder prevent relative rotation between the connecting member and the wall of the container. In order to prevent axial displacement of the connecting member from the wall of the container, the clamping ring 16, carrying therewith the gasket 25, is bent over against the other side of the wall of the container opposite to that side engaged by the reduced marginal portion 21 of the flange with the gasket sealing the engaging edges of the

shoulder 26 and the material bounding the aperture of the wall.

Referring now more particularly to Figs. 5, 6, and 7, the method of forming a bushing structure for a sheet metal container incorporating the features of the present invention as shown therein consists in offsetting one end of a clamping ring 27 to provide a tapered portion 28 extending radially inwardly of the ring. The clamping ring is formed preferably by cutting the ring from a steel tube, or it may be formed by wrapping a strip of sheet steel about an arbor. The tapered portion 28 is disposed in an annular groove or channel 29 cut in the flange extending angularly from a cylindrical collar 30 preferably at the juncture thereof with the collar, the flange and cylindrical collar being preferably integrally formed from a tube of sheet steel.

A marginal portion of the flange extending angularly from the cylindrical collar 30 is reduced in thickness as by means of a punch and die mechanism or like means to form a shoulder 31 at the juncture of the reduced portion 32 and enlarged portion 33 of the flange. The shoulder 31 is preferably of a non-circular periphery for purposes which will hereinafter be more fully apparent and, as contemplated, may be of polygonal or scalloped configuration.

After the offset or tapered portion 28 of the ring is disposed in the channel 29, the angularity of the flange is changed to force the side walls of the channel against the engaged or tapered portion of the clamping ring to hold the ring against displacement from the flange. The angle formed by the flange and collar is preferably obtuse and force is exerted against the flange to bend the same into an angle approximating a right angle with the wall of the collar. The bending movement is, of course, along the line of least resistance which, in the present instance, is the channel 29. The side walls of the channel, therefore, are forced toward each other and thereby against the opposite walls of the tapered portion 28. The completion of this step is shown in Figure 6 of the drawings, the side walls of the ring 27 lying in a substantially parallel plane with the side wall of the collar 30.

The assembled ring and collar 27 and 30 respectively are inserted through an aperture in the wall 34 of a sheet metal container to a position such that the reduced portion 32 of the flange rests on one side of the container wall 34. The periphery of the aperture in the container wall 34 is preferably of the same size and shape as that of the shoulder 31 and in the instance of the present disclosure the respective peripheries are scalloped and the scalloped peripheries engage to prevent relative rotation between the connecting member and the wall of the barrel. In order to prevent axial displacement of the connecting member from the container wall, the extending portion 27 of the ring, carrying therewith a gasket 27a disposed therearound, is bent into clamping engagement with the other side of the wall of the container opposite to that side engaged by the reduced portion 32 of the flange with the gasket sealing the engaging edges of the shoulder 31 and the material bounding the aperture of the wall.

Referring now more particularly to Figs. 8, 9, and 10 of the drawings, the method of forming a bushing structure for a sheet metal container incorporating the features of the present invention as disclosed therein consists in offset-

ting one end of a clamping ring 35 to provide a tapered portion 36 thereon, the clamping ring being preferably formed by cutting a tube of sheet steel or by bending a strip of sheet metal into circular form. The end of the tapered portion 36 is disposed in a channel 37 of a flange extending angularly from a cylindrical collar 38, the channel being cut in the flange and extending to undercut the outer periphery of the collar 38. A marginal portion of the flange is reduced in thickness as by means of a punch and die mechanism to form a shoulder 39 at the juncture of the reduced portion 40 and the enlarged portion 41, the shoulder being preferably non-circular as, for example, having a scalloped periphery as shown in Fig. 1.

After the end of the tapered portion 36 of the ring 35 is disposed in the channel 37, the angularity of the tapered portion is changed preferably by pressure exerted on the outer end of the collar to effect a forced engagement of the tapered portion with the walls of the channel, the undercut portion of the collar assisting in fixing the ring 35 against displacement. Initially the smallest diameter of the tapered portion 36 is of a diameter that will pass over the collar 38 and the change in the angularity of the tapered portion reduces this diameter to seat in the undercut portion of the collar, the external diameter of the ring being substantially the same as the largest diameter of the channel to have a forced engagement therewith.

A gasket 42 is disposed about the clamping ring 35 with the width thereof preferably extending in the direction of the wall of the ring. The assembled ring and collar 35 and 38, respectively, carrying the gasket 42 therewith, are thereafter inserted through an aperture in the wall 43 of a sheet metal container to a position such that the reduced portion 40 of the flange rests on one side of the wall. The periphery of the aperture is of substantially the same size and shape as that of the non-circular shoulder 39 so that an engagement is had therebetween and by reason of the non-circular engagement thereof, the connecting member and the wall are prevented from relative rotation. In order to prevent axial displacement of the connecting member from the wall, the extending portion of the ring 35 is bent radially outwardly against the other side of the wall 43 of the sheet metal container opposite to that side in engagement with the reduced marginal portion of the flange with the gasket 42 sealing the engaged faces of the flange and collar at the meeting edges thereof.

Referring now more particularly to Figs. 11 to 13, inclusive of the drawings the method of forming a bushing structure incorporating the features of this invention as disclosed therein consists in reducing the thickness of a marginal portion of a flange extending angularly from a cylindrical collar 44 to form a shoulder 45 at the juncture of a reduced portion 46 and enlarged portion 47, the shoulder being preferably of non-circular peripheral contour for purposes which will hereinafter be more fully apparent. A channel 48 is cut in the cylindrical collar 44 on the outside wall thereof so that one wall of the channel is co-extensive with one face of the enlarged portion 47 of the flange.

One end of a clamping ring 49 is offset in a direction radially inwardly thereof to provide a tapered portion 50, the inner diameter of the tapered portion being such as to permit the cy-

lindrical collar 44 to freely pass therethrough. After inserting the collar 44 through the opening of the ring so that the end of the tapered portion rests on the face of the enlarged portion 47 of the flange in alignment with the channel 48, the angularity of the tapered portion 50 is changed by pressure exerted on the other end of the ring to force the tapered portion into the channel by a reduction of the diameter of the offset portion of the ring. The ring 49 thus seats on the flange with the initially formed tapered portion now extending preferably at substantially right angles to the walls of the ring 49.

A gasket 50 is disposed about the ring 49 with the width thereof lying in the plane of the wall and the assembled ring and collar are inserted through an aperture in the wall 51 of a sheet metal container to a position such that the reduced marginal portion 46 of the flange rests against one side of the container wall. The aperture of the sheet metal wall is preferably of the same non-circular peripheral contour and of the same diameter as that of the shoulder 45 so that engagement is had therebetween to prevent relative rotation between the connecting member and the container wall. In order to prevent axial displacement of the connecting member from the container wall, the extending portion of the ring 49 is bent radially outwardly against the other side of the container wall 51 opposite to that side engaged by the reduced portion 46 of the flange with the gasket 50 sealing the engaged edges of the wall 51 and the shoulder 45.

Referring now more particularly to Figs. 14 and 15 of the drawings, in containers where a welding operation is not objectionable, a method of forming a bushing structure for a sheet metal container embodying the features of this invention is disclosed which consists in fixedly securing a clamping ring 52 having a radially extending flange 53 thereon about a cylindrical collar 54 having an angularly extending flange 55. The flange 53 of the clamping ring 52 rests on the flange 55 extending from the cylindrical collar 54, the flange 53 being shorter than the flange 55 to provide a shoulder 56. The side walls of the ring and the collar lie in substantially parallel planes and the flange 53 is preferably welded to one face of the flange 55 in order to secure a fixed assembled relation therebetween. The outer periphery of the flange 56 is preferably non-circular and may be in the form of a polygon or may have scalloped edges as desired.

The assembled clamping ring and collar are inserted through an opening in the wall 57 of a sheet metal container to a position such that the extending portion of the flange 55 engages one side of the wall 57. The aperture at the wall 57 is preferably of the same size and shape as the shoulder 56 of the flange 53 of the clamping ring so that engagement is had therebetween and relative rotation between the connecting member and the container wall is prevented. In order to prevent axial displacement of the connecting member from the container wall 57, the flange 52, carrying therewith a gasket 52a, is bent over into engagement with the other side of the wall of the container opposite to that side engaged by the flange 55 with the gasket sealing the engaged edges of the shoulder 56 and the wall 57.

While several embodiments of this invention are 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 only to be limited by the scope of the prior art and the appended claims.

I claim:

1. The method of forming a bushing structure for a sheet metal container which consists in forming an outwardly extending flange member on a cylindrical collar member, in reducing the thickness of a marginal portion of the flange member to form a shoulder having a non-circular periphery at the juncture of the reduced and enlarged portions thereof, in cutting a channel in one of said members and an undercut in the other of said members, in fixedly securing one end of a clamping ring in said channel and undercut, the side walls of said ring and said collar lying in substantially parallel planes, in inserting said ring and said collar through a non-circular aperture in a wall of the sheet metal container to a position such that the reduced marginal portion of the flange rests on one side of the container wall and the non-circular peripheries of the shoulder and the aperture engage, and in clamping the extending portion of the ring against the other side of the wall.

2. The method of forming a bushing structure for a sheet metal container which consists in cutting a channel in a flange extending angularly from a cylindrical collar, in upsetting one end of a clamping ring, in disposing the upset portion of the clamping ring in said channel with the side walls of the ring lying in a substantially parallel plane with the side wall of the collar, in displacing the material of said flange bounding said channel to envelop said upset portion, in inserting said ring and said collar through an aperture in a wall of the sheet metal container to a position such that the flange rests on one side of the container wall, and in clamping the extending portion of the ring against the other side of the wall.

3. The method of forming a bushing structure for a sheet metal container which consists in reducing the thickness of a marginal portion of a flange extending angularly from a cylindrical collar to form a shoulder having a non-circular periphery at the juncture of the reduced and enlarged portions thereof, in cutting a channel in the enlarged portion of the flange, in upsetting one end of a clamping ring, in disposing the upset portion of the clamping ring in said channel with the side walls of the ring lying in a substantially parallel plane with the side wall of the collar, in displacing the material of said flange bounding said channel to envelop said upset portion, in inserting said ring and said collar through a non-circular aperture in a wall of the sheet metal container to a position such that the reduced portion of the flange rests on one side of the container wall and the non-circular peripheries of the aperture and shoulder engage, and in clamping the extending portion of the ring against the other side of the wall.

4. The method of forming a bushing structure for a sheet metal container which consists in cutting a channel in a flange extending angularly from a cylindrical collar, in disposing a portion of a clamping ring in said channel with the side walls of the ring lying in a substantially parallel plane with the side wall of the collar, in changing the angle of the flange to force the side walls of the channel against the engaged portion of the ring, in inserting said ring and said collar through

an aperture in a wall of the sheet metal container to a position such that the flange rests on one side of the container wall, and in clamping the extending portion of the ring against the other side of the wall.

5. The method of forming a bushing structure for a sheet metal container which consists in reducing the thickness of a marginal portion of a flange extending angularly from a cylindrical collar to form a shoulder having a non-circular periphery at the juncture of the reduced and enlarged portions thereof, in cutting a channel in the enlarged portion of the flange, in disposing a portion of a clamping ring in said channel with the side walls of the ring lying in a substantially parallel plane with the side wall of the collar, in changing the angle of the flange to force the side walls of the channel against the engaged portion of the ring, in inserting said ring and said collar through a non-circular aperture in a wall of the sheet metal container to a position such that the reduced portion of the flange rests on one side of the container wall and the non-circular peripheries of the aperture and shoulder engage, and in clamping the extending portion of the ring against the other side of the wall.

6. The method of forming a bushing structure for a sheet metal container which consists in cutting a channel in a cylindrical collar so that one wall of said channel is co-extensive with one face of a flange extending angularly from said collar, in offsetting one end of a clamping ring to provide a tapered portion thereon, in disposing the end of said tapered portion of said ring in alignment with said channel, in changing the angularity of said tapered portion to force engagement thereof in said channel with the side walls of the ring lying in a substantially parallel plane with the side wall of the collar, in inserting said ring and said collar through an aperture in a wall of the sheet metal container to a position such that the flange rests on one side of the container wall, and in clamping the extending portion of the ring against the other side of the wall.

7. The method of forming a bushing structure for a sheet metal container which consists in reducing the thickness of a marginal portion of a flange extending angularly from a cylindrical collar to form a shoulder having a non-circular periphery at the juncture of the reduced and enlarged portions thereof, in cutting a channel in the cylindrical collar so that one wall of said channel is co-extensive with one face of the enlarged portion of the flange, in offsetting one end of a clamping ring to provide a tapered portion

thereon, in disposing the end of the tapered portion of said ring in said channel, in changing the angularity of the tapered portion to force engagement thereof in said channel with the side walls of the ring lying in a substantially parallel plane with the side wall of the collar, in inserting said ring and said collar through a non-circular aperture in a wall of the sheet metal container to a position such that the reduced portion of the flange rests on one side of the container wall and the non-circular peripheries of the aperture and shoulder engage, and in clamping the extending portion of the ring against the other side of the wall.

8. The method of forming a bushing structure for a sheet metal container which consists in cutting a channel in a flange extending angularly from a cylindrical collar, the channel extending to undercut said collar, in offsetting one end of a clamping ring to provide a tapered portion thereon, in disposing the end of said tapered portion of said ring in said channel, in changing the angularity of said tapered portion for forced engagement in said channel with the side walls of the ring lying in a substantially parallel plane with the side wall of the collar, in inserting said ring and said collar through an aperture in a wall of the sheet metal container to a position such that the flange rests on one side of the wall, and in clamping the ring against the other side of the wall.

9. The method of forming a bushing structure for a sheet metal container which consists in reducing the thickness of a marginal portion of a flange extending angularly from a cylindrical collar to form a shoulder having a non-circular periphery at the juncture of the reduced and enlarged portions thereof, in cutting a channel in the enlarged portion of the flange, the channel extending to undercut the collar, in offsetting one end of a clamping ring to provide a tapered portion thereon, in disposing the end of a tapered portion of said ring in said channel, in changing the angularity of the tapered portion to force engagement thereof in said channel with the side walls of the ring lying in a substantially parallel plane with the side wall of the collar, in inserting said ring and said collar through a non-circular aperture in a wall of the sheet metal container to a position such that the reduced portion of the flange rests on one side of the container wall and the non-circular peripheries of the aperture and shoulder engage, and in clamping the ring against the other side of the wall.

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