July 6, 1926.

H. S. REYNOLDS

1,591,184

CLOSURE FOR SHEET METAL CONTAINERS AND ART OF CONSTRUCTING THE SAME

Filed April 1, 1925

Fig. 1

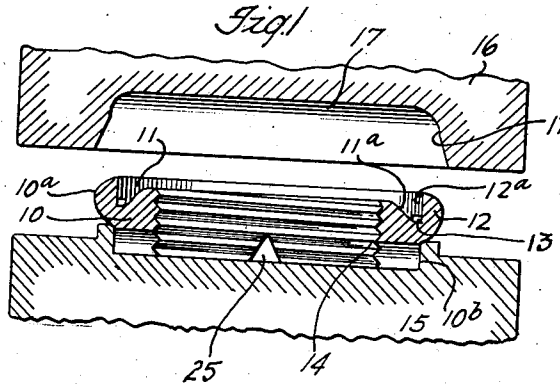


Fig. 3.

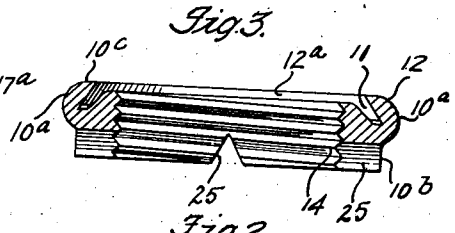


Fig. 2.

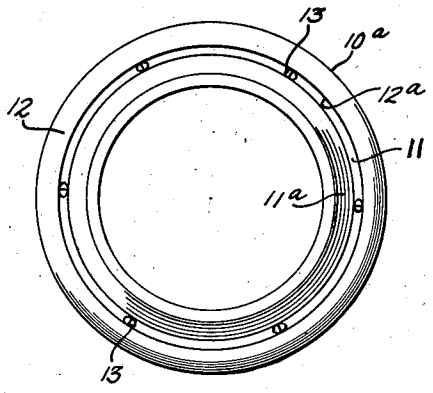


Fig. 4.

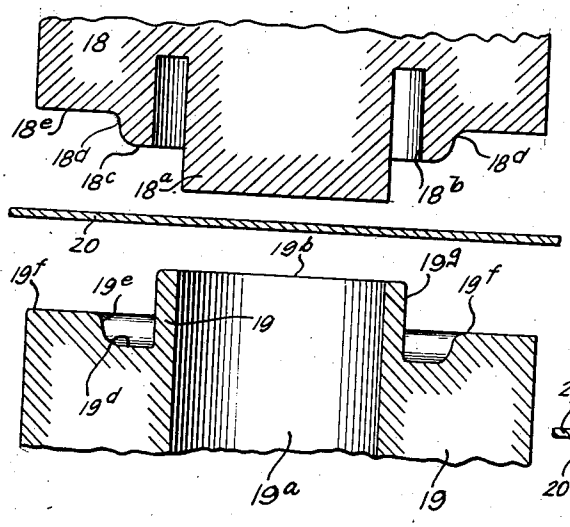


Fig. 5.

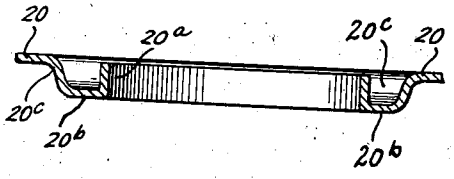


Fig. 6.

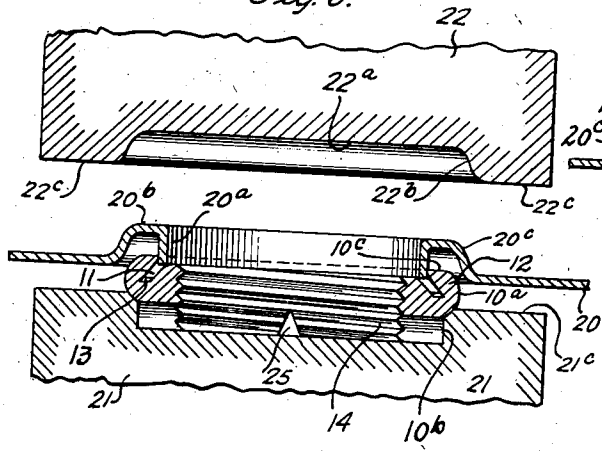
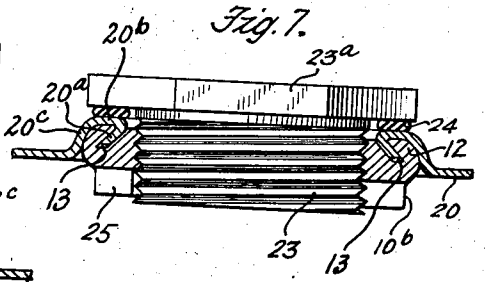


Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY S. REYNOLDS, OF NEW YORK, N. Y., ASSIGNOR TO MEURER STEEL BARREL COMPANY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

CLOSURE FOR SHEET-METAL CONTAINERS AND ART OF CONSTRUCTING THE SAME.

Application filed April 1, 1925. Serial No. 19,778.

This invention relates to closures for sheet metal containers such as steel barrels and an art of constructing such closures.

One of the objects of the invention is to provide a practical and efficient art of constructing a closure for sheet metal containers and the like, which is conveniently carried on with a minimum of steps and with inexpensive apparatus. Another object is to provide an art of the above nature whereby a sheet metal wall and a sput ring therefor may be joined so that they are rigidly and dependably interlocked against stresses tending to separate and loosen them. Another object is to provide an art of the above nature in the carrying on of which the metal of the parts joined is not weakened and unduly stressed by sharp bending or distortion. Another object is to provide a dependable fluid-tight closure construction for sheet metal containers, such as steel barrels, characterized by strength and ruggedness and capable of indefinitely withstanding the strains occasioned by rough handling and repeated usage of the barrel. Other objects will be in part obvious or in part pointed out hereinafter.

The invention accordingly consists in the features of construction, combinations of elements, arrangements of parts and in the several steps and relation and order of each of the same to one or more of the others, all as will be illustratively described herein, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which is shown one of the various possible embodiments of the mechanical features of this invention,

Figure 1 is a vertical section of a ring or sput positioned in a pair of dies about to operate thereon;

Figure 2 is a top plan view of the ring shown in Fig. 1;

Figure 3 is a vertical sectional view of the ring after being operated upon by the dies of Fig. 1;

Figure 4 shows in vertical section a pair of dies and a sheet metal member therebetween adapted to be operated upon thereby;

Figure 5 shows in section the sheet metal after operation thereon by the dies of Fig. 4;

Figure 6 shows in section the ring and sheet metal member positioned together in a pair of dies adapted to operate thereon, and

Figure 7 is a vertical section through the ring and sheet metal joined by the dies of Fig. 5, together with a sealing plug threaded into the ring.

Similar reference characters refer to similar parts throughout the several views of the drawing.

Referring now to the drawing in detail, there is shown in Figures 1 and 2 a metal ring 10 which is preferably substantially circular in shape and which is provided in its upper annular surface with a downwardly extending annular groove 11. The outer side walls 10^a of the ring 10 at the upper portion thereof, are preferably rounded outwardly substantially as shown, sloping from the upper edge downwardly and outwardly and thence curving inwardly, the lower portion 10^b of the ring having preferably an outer diameter smaller than the outer diameter of the rounded upper portion 10^a. The outer portion of the upper part of the ring comprises a substantially upright flange 12, having the outer rounded surface 10^a and an inner substantially vertical surface 12^a which forms the outer wall of the groove 11. The inner wall 11^a of the groove 11 is inclined, sloping outwardly toward its base. Preferably the flange 12 is slightly higher than the inner wall of the ring, the purpose of which will be later pointed out.

The shape of the metal ring 10, just described, makes possible its formation by drop-forging, and it is by this method that the ring is made. This forged steel ring is distinctly advantageous since a ring of forged steel is far stronger than and not as brittle as a ring formed of malleable iron or other types of castings. Moreover, being made of forged steel the ring is far less expensive to manufacture than one which, because of its shape must be made of malleable iron. In the base of the groove 11 are a plurality of spaced upwardly projecting teeth 13 for a purpose which will hereinafter be pointed out, these teeth being formed integrally with the ring in the forging process. After the ring has been formed as above described, it is interiorly threaded with heavy threads as indicated at 14, to receive a plug. Herein lies another advantage of this ring formed of forged steel, in

that threads formed in a forged steel member are far more durable and stronger than the threads on a member of malleable iron.

The ring 10, having been forged and threaded as above described, is placed in a supporting die 15 (see Fig. 1) which is recessed in its upper surface to receive the lower portion 10^b of the ring. Opposite the die 15 is a movable die 16 provided in its face with a recess 17 having inclined side walls 17^a. The die 17 is now forced downwardly toward the die 15, and the sloping wall 17^a strikes the curved outer surface 10^a of the flange 12, bending this flange inwardly until its inner surface 12^a, forming the outer wall of the groove 11, is substantially parallel to the inner wall 11^a of the groove. The ring after operation thereon by the die 16 is shown in Figure 3. The result of this operation is that the groove 11 is transformed into a downwardly and outwardly inclined groove, while the upper portion of the outer rounded surface 10^a of the flange 12 forms a substantially horizontal seat 10^c which is now the top surface of the flange 12.

Referring now to Figure 4, there is shown a sheet metal member 20 which represents the sheet metal wall of the container for which the closure is being constructed. This sheet metal wall is placed between a pair of dies 18 and 19. The die 18 is provided with a central cylindrical projection or punch 18^a and the die 19 is provided with a central cylindrical passage 19^a adapted to receive the projection 18^a. When the die 18 is moved downwardly, the edge of the punch 18^a, coacting with the edge 19^b of the passage 19^a, punches a circular opening in the sheet metal 20. Upon further movement of the die 18, the part 18^b thereof forces the sheet metal about the circular opening downwardly dragging it along the wall 19^g of the die member 19. This forms about the opening in the sheet metal an upstanding annular flange or rim 20^a (Fig. 5). The surface 19^d of the die 19 coacting with the surface 18^c of the die 18 forms from the sheet metal about the flange or rim 20^a a substantially horizontal part 20^b. The surface 19^e of the die member 19 with the coacting surface 18^d of the die member 18 form in the sheet metal a downwardly sloping part 20^c. The sheet metal exterior of the part 20^c is flattened and kept in the proper plane by the coaction of the surface 19^f of the die member 19 and the surface 18^e of the die member 18.

The edge of the flange or rim 20^a is of a contour substantially that of the inner edge of the mouth of the recess when formed as shown in Figure 3. The ring 10, formed as shown in Figure 3, is now placed, as shown in Figure 6, in a supporting die member 21 which is recessed to receive the lower portion 10^b of the ring. The sheet metal wall 20 is placed above the ring inverted with respect to its position shown in Figure 5 and with the lower edge of the rim 20^a in registry with the mouth of the recess 11. Opposite the die member 21 is a coacting die member 22 having formed in its face a substantially circular recess provided with a flat upper wall 22^a and a curved side wall 22^b. The die member 22 is now advanced toward the die member 21, and the surface 22^a thereof first strikes the horizontal part 20^b of the sheet metal, forcing the rim 20^a downwardly edgewise into the inclined groove 11. As the flange or rim 20^a is forced downwardly into the groove 11 its lower edge slides along the inner wall 11^a of the groove and the sheet metal thereof is stretched laterally, the lower mouth of the rim being enlarged by the wedging action of the inclined wall 11^a.

The die member 22 thus forces the rim 20^a downwardly into the groove 11 until the lower edge of the rim substantially reaches the base of the groove and interlocks with the projecting teeth 13, these teeth cutting into the edge of the rim. The surface 22^b of the die member 22 now comes into action against the inclined part 20^c of the sheet metal, wrapping this part snugly down over the rounded or inclined outer sides 10^a of the ring. The inward pressure of this surface 22^b also forces the flange 12 inwardly against the rim 20^a in the groove 11, securely clamping the rim 20^a in the groove and interlocking therewith. The surface 22^a adjacent its junction with the surface 22^b forces the sheet metal part 20^b downwardly against the surface 10^c, providing a substantially flat annular seat on the outer surface of the part 20^b surrounding the ring 10, and the combined downward and inward pressure upon the flange 12 brings its top surface to substantially a level with the inner portion of the ring, as shown in Figure 7. The coacting surfaces 22^c and 21^c of the die members 22 and 21 flatten the sheet metal about the part 20^c, maintaining this portion in its proper plane.

By the method described above, the ring 10 and the sheet metal wall 20 are rigidly and dependably interlocked against disengagement. Neither the metal of the ring nor the metal of the sheet metal wall is subjected to sharp or undue bending or distortion and the possibility of cracking or breaking the metal is thereby avoided. The teeth 13 interlocking with the edge of the flange or rim 20^a positively prevents turning of the ring relative to the sheet metal when the plug 23 (Fig. 7) is tightly and forcibly threaded thereinto.

Referring to Figure 7, there is shown the completed construction and the plug 23 in position therein, threaded into the threaded interior of the ring 10. The plug is provided with an outer lateral flange 23^a which overhangs the flat outer surface of the part

20[b] of the sheet metal. Between these parts may be inserted a packing ring 24. It will be seen that a positive and dependable fluid-tight closure is provided. When the plug 23 is threaded tightly into place its downward pressure upon the surface 20[b] tends to even more securely interlock the flange 12 with the rim 20[a] of the sheet metal. The seal between the flange 23[a] and the surface 20[b] positively prevents leakage not only between the plug and the ring, but between the ring and the sheet metal wall.

The bottom portion 10[b] of the ring extends inwardly below the plane of the sheet metal wall 20. In order that the contents of the container may be completely emptied through the ring 10, this lower portion 10[b] of the ring is preferably provided with a plurality of lateral grooves 25 which extend thereinto substantially to the plane of the wall 20. These grooves, as shown in Figure 1, are formed in the ring when it is drop-forged at the first step in its construction.

From the above, it will be seen that there is herein provided a construction and an art of making the construction which embody the features of this invention and attain the objects thereof, including many advantages of the greatest practical importance.

As many possible embodiments may be made of the mechanical features of the above invention, and as the art herein described might be varied in various parts, all without departing from the scope of the invention, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

I claim as my invention:

1. The herein described art of constructing a closure for sheet metal containers, which consists in forming a metal ring member having in its upper annular surface a downwardly extending annular groove and in a wall of said groove a plurality of spaced projecting teeth, forming in the sheet metal wall of the container an opening and an annular depending flange about said opening, the edge of said flange having a contour substantially that of the mouth of said groove, placing the edge of said flange and the mouth of said groove in registry, forcing said flange edgewise downwardly into said groove thereby forcing said flange into interlocking relation with said projecting teeth, and forcing a side wall of said groove toward the opposite side wall thereof to securely clamp said flange therein.

2. The herein described art of constructing a closure for sheet metal containers, which consists in forming a metal ring member having in its upper annular surface an annular downwardly extending groove outwardly inclined toward its base and a plurality of spaced teeth projecting upwardly from said base of said groove, forming in the sheet metal wall of the container an opening and an annular depending flange about said opening, the edge of said flange having a contour substantially that of the mouth of said groove, placing the edge of said flange and the mouth of said groove in substantial registry, forcing said flange downwardly edgewise into said inclined groove, the metal of the lower portion of said flange being stretched and the mouth of said flange being enlarged by the inclined inner wall of said grove and the lower edge of said flange interlocking with said spaced projecting teeth, and forcing the outer portion of said ring exterior of said groove inwardly and downwardly against said flange in said groove to clamp said flange therein.

3. The herein described art of constructing a closure for sheet metal containers, which consists in forming a metal ring having in its annular upper surface an annular groove, the inner side wall of said groove sloping outwardly toward the base thereof and the outer wall of said groove comprising a substantially upright flange having an inner substantially vertical surface, bending said flange inwardly to bring said last surface thereof into substantial parallelism with said inner sloping wall of said groove, forming in the sheet metal wall of said container an opening and an annular depending rim about said opening, the edge of said rim having a contour substantially that of the inner side of the mouth of said recess, placing the edge of said rim and the mouth of said recess in registry, forcing said rim downwardly into said groove along the inner sloping wall thereof, and bending said flange further downwardly and inwardly to grip said rim.

4. The herein described art of constructing a closure for sheet metal containers, which consists in forming a metal ring having in its annular upper surface an annular groove, the inner side wall of said groove sloping outwardly toward the base thereof and the outer wall of said groove comprising a substantially upright flange having an outer sloping surface and having an inner substantially vertical surface, bending said flange inwardly to bring said last surface thereof into substantial parallelism with said inner sloping wall of said groove, forming in the sheet metal wall of said container an opening and an annular depending rim about said opening, the edge of said rim having a contour substantially that of the inner side of the mouth of said groove, placing the edge of said rim and the mouth of said groove in registry, forcing said rim downwardly into said groove along the inner sloping wall thereof, bending said flange further downwardly and inwardly to grip said rim, and wrapping the sheet metal sur-

rounding said rim over the top of said flange and downwardly over said sloping outer surface thereof.

5. The herein described art of constructing a closure for sheet metal containers, which consists in forming a metal ring having in its annular upper surface an annular groove, the inner side wall of said groove sloping outwardly toward the base thereof and the outer wall of said groove comprising a substantially upright flange having an inner substantially vertical surface, bending said flange inwardly to bring said last surface thereof into substantial parallelism with said inner sloping wall of said groove, forming in the sheet metal wall of said container an opening and an annular depending rim about said opening, the edge of said rim having a contour substantially that of the inner side of the mouth of said groove, placing the edge of said rim and the mouth of said groove in registry, and then in one operation forcing said rim downwardly into said groove along the inner sloping wall thereof, bending said flange further downwardly and inwardly to grip said rim, and wrapping the sheet metal surrounding said rim over the top of said flange and downwardly.

6. The herein described art of constructing a closure for sheet metal containers, which consists in forming a metal ring having in its annular upper surface an annular groove, the base of said groove having a plurality of spaced upwardly projecting teeth, the inner side wall of said groove sloping outwardly toward the base thereof and the outer wall of said groove comprising a substantially upright flange having an inner substantially vertical surface, bending said flange inwardly to bring said last surface thereof into substantial parallelism with said inner sloping wall of said groove, forming in the sheet metal wall of said container an opening and an annular depending rim about said opening, the edge of said rim having a contour substantially that of the inner side of the mouth of said groove, placing the edge of said rim and the mouth of said groove in registry, forcing said rim downwardly into said groove along the inner sloping wall thereof, the lower edge of said rim interlocking with said projecting teeth in the base of said groove, and bending said flange further downwardly and inwardly to grip said rim.

7. In a closure for sheet metal containers, in combination, a metal ring having in its upper annular surface a downwardly extending annular groove, and a sheet metal wall having an opening therein and a depending flange about said opening resting in said annular groove, the sheet metal about said flange being wrapped downwardly over the upper portion of the outer side walls of said ring, said ring being interiorly threaded to receive a plug and projecting downwardly into the container beneath the plane of said sheet metal wall, the lower portion of said ring having lateral grooves extending thereinto substantially to said plane to permit emptying the entire contents of the container through said ring.

8. In a closure for sheet metal containers, in combination, a metal ring having in its annular upper surface a downwardly extending annular groove, the bottom portion of said groove being provided with a plurality of spaced projections formed integrally with said ring, and a sheet metal wall having an opening therein and an annular depending flange about said opening, said flange being forced downwardly into said groove and the edge of said flanges into interlocking engagement with said projections therein to lock said ring against turning relative to said sheet metal, the side walls of said groove clamping said flange and the sheet metal surrounding said flange being pressed snugly down against the upper surface of the portion of said ring exterior of said groove, said ring being interiorly threaded to receive a plug.

In testimony whereof, I have signed my name to this specification this 23rd day of March, 1925.

HENRY S. REYNOLDS.