

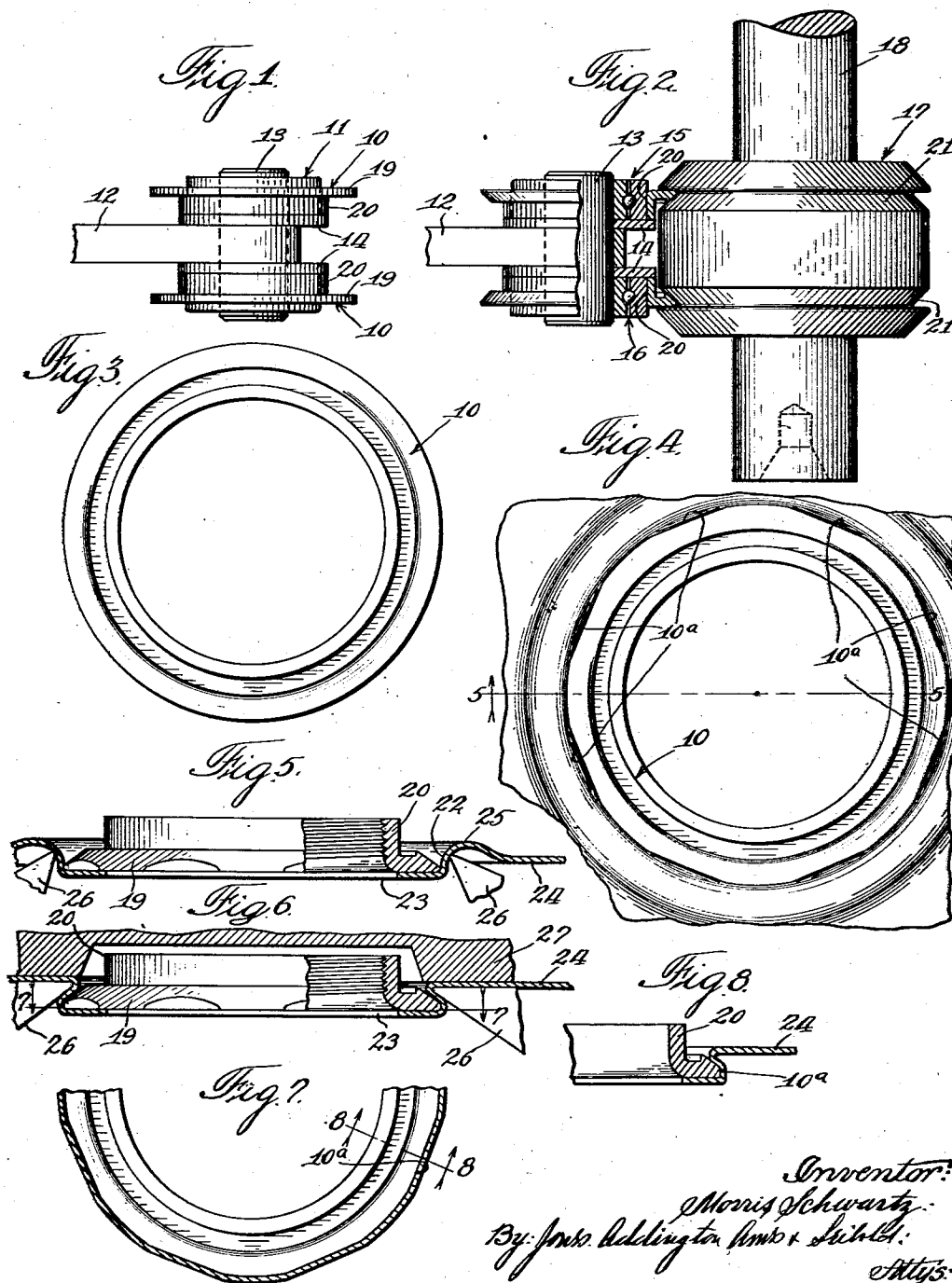
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METHOD OF FORMING BUSHING STRUCTURES

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METHOD OF FORMING BUSHING
STRUCTURES

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This invention relates to the method of forming a bushing structure, and has special reference to the method of forming a bushing structure as employed particularly in the construction of metallic barrels and other containers such as are used for storing or 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 or connecting means formed preferably of sheet metal for association with a socket formed of sheet metal, the socket being produced from the barrel wall or other supporting body with which it is employed.

The socket with which the connecting means 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 initially either polygonal or circular in contour and having straight or vertically extending side walls. The bushing structure, in a completed state, has a polygonal contour, and the taper of the opposite edges when viewed together in cross section converges inwardly relatively to the outwardly formed socket. The initially 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 connecting means for receiving in a removable relation therewith a bung or stopper, the connecting means being preferably formed of sheet material in the following manner: Forming a flanged collar preferably from a strip of continuously fed sheet metal stock in any usual manner and in displacing the material outlining the peripheral edge of the flange so that the edges have a tapered relation with the main body portion. In other words, the material of the flange is so displaced that, when viewed in cross section, the edges of the flange converge in an inwardly direction toward the collar. Thus the usual straight edge of the flange is tapered and given a substantial surface over which the material of the socket may be formed to secure the bushing in position.

Many advantages flow from the use of a sheet metal construction formed in the manner outlined above. There is a decided saving in the cost of the bushing structure over that bushing of the solid type formed, for example, of malleable iron, which latter is one of the cheapest of ma-

terials in practical use today. Such a construction is shown in the Henry Schwartz Patent No. 1,822,114, granted September 8, 1931, from which the present construction has been developed. The depth of the socket or embossing of the barrel head stock is reduced considerably, there being approximately a reduction of 35%. This is a material factor in the use of the usual barrel material since ordinarily such stock will not stand a deep draw.

Likewise the present construction is an improvement over that construction shown in the Sol Schwartz Patent No. 1,961,712, issued June 5, 1934, which, although showing a sheet metal bushing, shows a channel construction in which the converging edges are bent over from the stock material. There is likewise a reduction of approximately 35% in the depth of the socket in the barrel head stock of the present invention over that of the above mentioned Schwartz Patent No. 1,961,712. In this latter noted patent it will be found that at least two thicknesses of material are necessitated at the converging edges because of these edges being bent over developing a substantial radius at the peripheral edge. Further, in the corners of the octagon shown, the thickness is perhaps greater than at the straight-away edges.

In the present construction the edge, in practice, can be substantially without radius or as sharp as desired so that less material of the barrel head than has been ordinarily employed in the edging of the above inventions may extend farther over the tapered edges of the present construction.

As will herein be more particularly pointed out, there is a uniform taper on the peripheral edge completely around the flange since the tapered edge may preferably be displaced by a rolling or spinning operation. This peripheral edge, which is initially circular, is trimmed to provide a substantially polygonal shape, although it is not necessary to use polygonally shaped forming jaws to operate the side walls of the socket thereagainst. As a matter of fact, it has been found desirable to use circular jaws so that when the operator inserts the flanges, he need not gauge the barrel head in order that the individual octagon or polygonal jaws register with each polygonal edge.

It has been found to be easier to draw the metal adjacent the socket in the barrel head over the present converging circular surfaces than over the usual converging polygonal edges since the latter have sharp projecting joints. The

socket is preferably formed of the same polygonal shape as the trimmed edges of the flange to register therewith, although it is not necessary to have polygonally disposed jaws on the forming dies since circular jaws may effectively urge the walls of the socket against the inwardly converging edges in such a manner as to prevent rotation therebetween.

A still further advantage of the present bushing construction resides in the fact that the diameter of the flange may be held true. It has been found in the usual formation of bushing structures, such for example as those of the patents above listed, that a tolerance of from .010 to .020 of an inch is necessitated, whereas, in the present construction very little tolerance, if any, is necessary, the edges being spun or rolled to the correct diameter.

Other objects and advantages 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 accompanying drawing, when taken together with the following description, in which

Figure 1 is a plan view of an arbor having mounted thereon flanged collars in an initial state in readiness for the displacing operation;

Fig. 2 is a view similar to Fig. 1 showing a portion thereof in section, and further showing a plan view of a roller for displacing the peripheral edge of the flange extending from the collar;

Fig. 3 is a plan view of the connecting means after being operated upon by the roller of Fig. 2;

Fig. 4 is a view similar to Fig. 3 showing a completed connecting means inserted into a socket formed in a fragmentary portion of the barrel head;

Fig. 5 is a central vertical sectional view taken on the line 5—5 of Fig. 4 showing the connecting means in an initial position for assembly in the socket;

Fig. 6 is a view similar to Fig. 5 showing the connecting means assembled in the socket;

Fig. 7 is a sectional view taken on the line 7—7 of Fig. 6; and

Fig. 8 is a fragmentary sectional view taken on the line 8—8 of Fig. 7.

Referring now more particularly to the drawing, a flanged collar 10 comprising a flange 19 extending from a cylindrical collar 20, is formed in any usual manner such, for example, as by feeding a strip of sheet material through punch and die mechanisms where the sheet is first cupped and thereafter a central portion thereof perforated and the peripheral flange thereof cut to the size and circular shape desired. This flanged collar is thereafter disposed on an arbor 11 along with one or more flanged collars, the number of such members to be operated upon depending upon the quantity of production desired. In the present illustration, the arbor 11 comprises an arm 12 extending from a suitable support, a stud shaft 13 being secured in an aperture at one end and extending on opposite sides thereof. A pair of washers 14 are mounted on the stud shaft adjacent to the arm 12 for holding roller bearings 15 and 16 in a spaced relation, the inner ring of the roller assemblies having a forced fit on the stud shaft 13 to prevent displacement outwardly of the stud shaft.

The flanged collars 10 are disposed on the roller bearings, the washers 14 extending a short distance beyond the peripheral edge of the roller bearings to position the flanged collars to be

operated upon by a driving roller 17. The driving roller 17, in turn, comprises a rotatable shaft 18 which, besides being rotatable, is rockable or tiltable in a direction to and from the flange holder. In the present illustration the driving roller has an enlarged head capable of acting upon two flanged collars. It is, of course, apparent that any number of flanged collars may be acted upon by such a head since a correct number of grooves 21 accurately spaced may be formed in a head of sufficient length.

Initially, the flanged collars 10 are provided with straight edges when they are cut from sheet metal, that is, the edges are formed at right angles to the surface of the material by a vertical movement of the die, the flanged collars being mounted in that condition on the flange holder. The driving roller 17 is thereafter rocked or pivoted from an idling position while rotating into engagement with the flange 19 extending from the collar 20. The head of the driving roller is provided with peripheral substantially V-shaped grooves 21, one leg of the V being straight to engage the flat surface of the flange, and the other leg of the V being angularly disposed to engage the edge of the flange.

The head of the driving roller being rotated and the shaft 18 of the roller being urged in a direction against the flange, the material of the edge of the flange is displaced into a V-shape to correspond with the shape of the groove of the driving roller. The perpendicular or straight edge of the groove of the driving roller head acts as a backing member for one face of the flange and prevents displacement of the edge of the flange in that direction, the displaced material being urged in the opposite direction so that the cross section of the flanged collar will disclose the edges as converging in a direction toward the collar. This rolling operation, which is in effect a mechanical spinning operation, closes the grain of the metal and provides a hardened surface.

Referring now more particularly to Fig. 3, a top plan of the flanged collar as operated upon by the driving roller is produced, there being a uniform, converging circular surface at the periphery of the flange. The edge of the converging circular surface is thereafter trimmed at 10^a by suitable dies to provide a polygonal shape.

Referring now more particularly to Figs. 4 and 5, a socket 22 is formed outwardly from the material surrounding a hole 23 in a barrel head or blank 24, the barrel head blank first having a hole cut therein and the material surrounding the hole formed outwardly into the socket. A surplus of material preferably in the form of an annular bead 25 is preferably formed at the base of the socket 22 or at the inner section of the socket with the barrel head. The peripheral contour of the socket or the contour of the side walls bounding the socket is preferably formed polygonally of the same shape as that of the substantially polygonal contour of the flange of the collar. The flanged collar is thereafter dropped into the socket and the barrel head is then placed on a die member which preferably comprises a series of segments 26 of circular shape pivotally mounted on a supporting structure, the segments preferably extending the full width of the flange.

Referring now more particularly to Fig. 6, a punch member 27 has been brought down on the bead 25 of the barrel head member 24, the segments having been pivoted to a changed position, and the side walls of the socket 22 are crimped inwardly and the material of the beaded

portion 25 used up so that the side walls of the socket converge to engage the tapered edges of the bushing to hold the bushing in a secure assembled relation therein.

5 In previous forms of bushing constructions which have been disclosed in the patents above noted, it is necessary to provide a substantial
10 depth of embossing in the barrel head stock and the present invention materially reduces the necessary depth of the embossing or socket which is very desirable since, in the first place, barrel
15 stock will ordinarily not stand the deep draw. By having a uniform circular taper on the edge of the flange, there is no danger of fracturing the barrel stock material at the corners, and it is not
20 necessary to provide segmental jaw members of polygonal shape since it is preferable to use segmental members of circular shape. This obviates the necessity for gauging the barrel head so
25 that the individual octagonal jaws register with each octagonal edge. Then again, it is easier to draw metal over the arcuate edge than over a polygonal edge because of the sharp projecting corners of the latter.

30 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
35 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
35 which consists in forming a flange on and at substantially right angles to the axis of a cylindrical collar, and in upsetting the material of the flange about the periphery thereof to produce out
40 of a single thickness of said material inwardly converging edges when viewed in cross-section.

2. The method of forming a bushing structure
45 which consists in forming a flange of circular contour on and at substantially right angles to the axis of a cylindrical collar, and in upsetting the material of the flange about the periphery thereof to produce out of a single thickness of

said material inwardly converging edges when viewed in cross-section.

3. The method of forming a bushing structure which consists in forming a flange of circular
5 contour on and at substantially right angles to the axis of a cylindrical collar, in displacing the material of the flange about the periphery thereof to produce inwardly converging edges when
10 viewed in cross-section, and in trimming the flange to produce a non-circular periphery.

4. The method of forming a bushing structure which consists in forming a flange of circular
15 contour on and at substantially right angles to the axis of a cylindrical collar, in rolling the periphery of the flange to displace the material thereat to produce inwardly converging edges
20 when viewed in cross-section, and in trimming the flange to produce a non-circular periphery.

5. The method of forming a bushing structure which consists in forming a flange on and at sub-
25 stantially right angles to the axis of a cylindrical collar, in backing up one face of the flange, and in displacing the material of the flange about the periphery thereof in a direction away from the backed-up face to produce inwardly converging
30 edges when viewed in cross-section.

6. The method of forming a bushing structure which consists in forming a flange of circular
35 contour on and at substantially right angles to the axis of a cylindrical collar, in backing up one face of the flange, and in rolling the periphery of the flange to displace the material thereat in a
40 direction away from the backed-up face to produce inwardly converging edges when viewed in cross-section.

7. The method of forming a bushing structure which consists in forming a flange of circular
45 contour on and at substantially right angles to the axis of a cylindrical collar, in backing up one face of the flange, in rolling the periphery of the flange to displace the material thereat in a direction away from the backed-up face to produce
50 inwardly converging edges when viewed in cross-section, and in trimming the flange to produce a non-circular periphery.

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