

April 25, 1961

G. A. LYON

2,980,993

METHOD OF AND APPARATUS FOR FORMING FLANGED CASING BOTTOM

Filed Aug. 10, 1956

4 Sheets-Sheet 1

Fig. 2

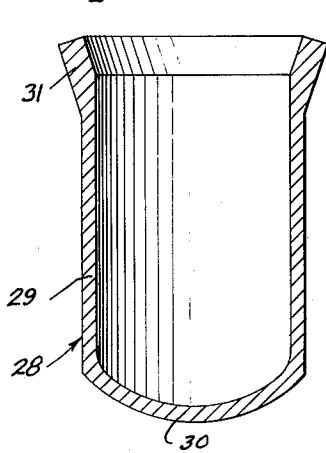


Fig. 3

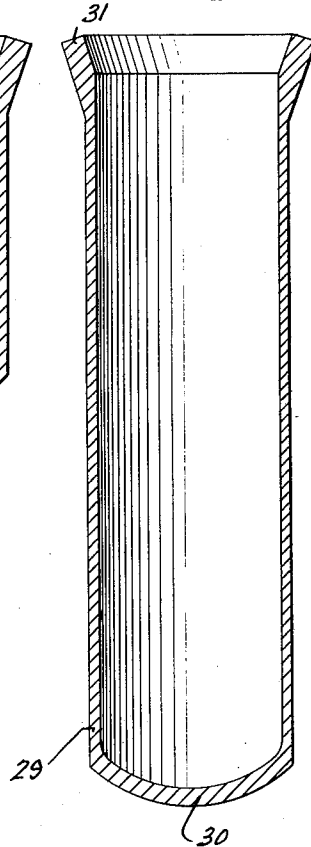


Fig. 4

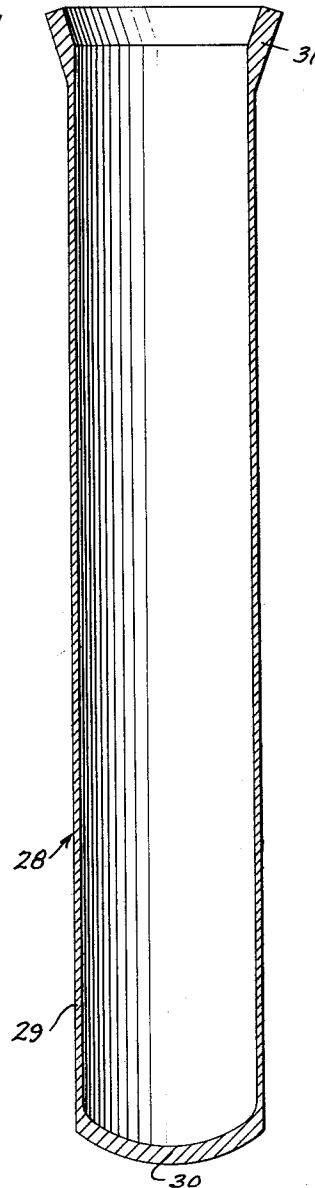
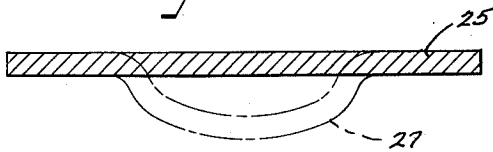


Fig. 1



Inventor

George Albert Lyon

Attorneys
Selt, Sherman, Merri, & Simpson

April 25, 1961

G. A. LYON

2,980,993

METHOD OF AND APPARATUS FOR FORMING FLANGED CASING BOTTOM

Filed Aug. 10, 1956

4 Sheets-Sheet 2

Fig. 5

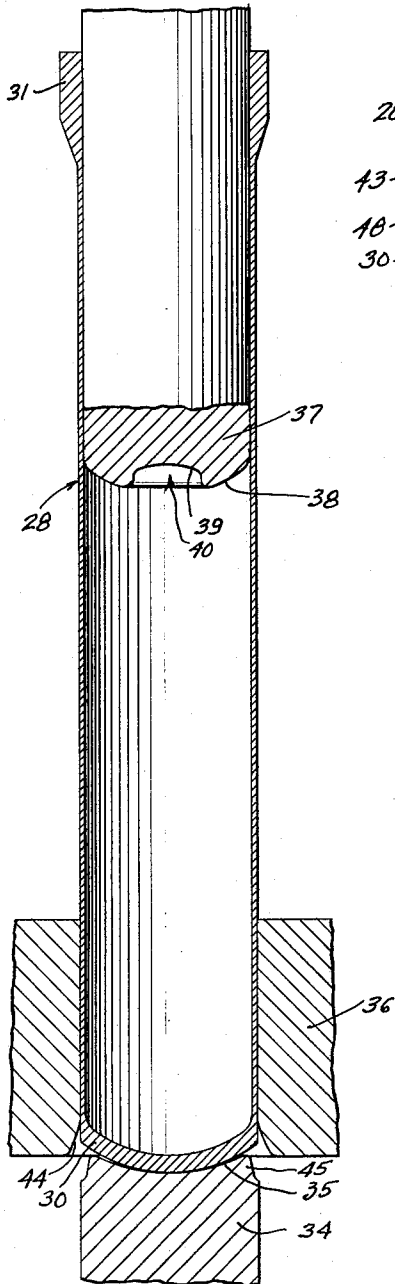


Fig. 8

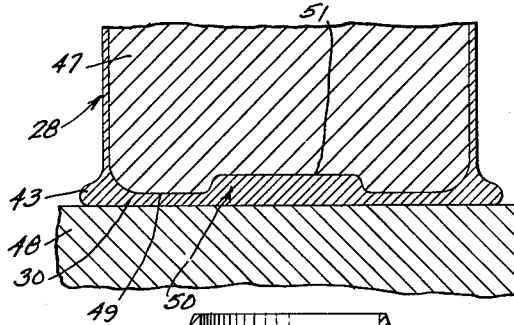
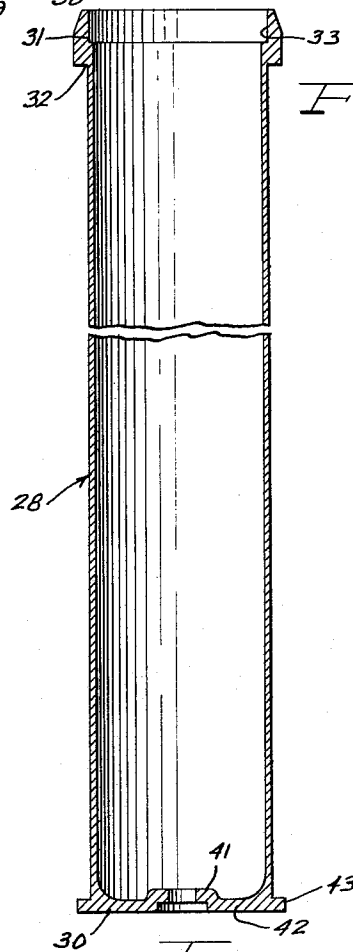


Fig. 9



Inventor
George Albert Lyon

By *Lee, Sherman, Mann, and Stanger* Attys

April 25, 1961

G. A. LYON

2,980,993

METHOD OF AND APPARATUS FOR FORMING FLANGED CASING BOTTOM

Filed Aug. 10, 1956

4 Sheets-Sheet 3

Fig. 6

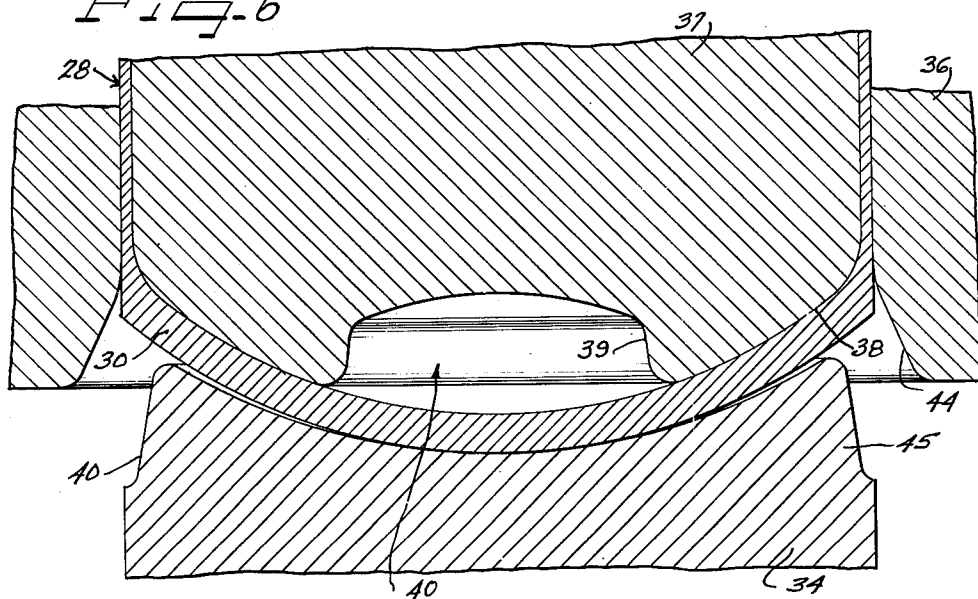
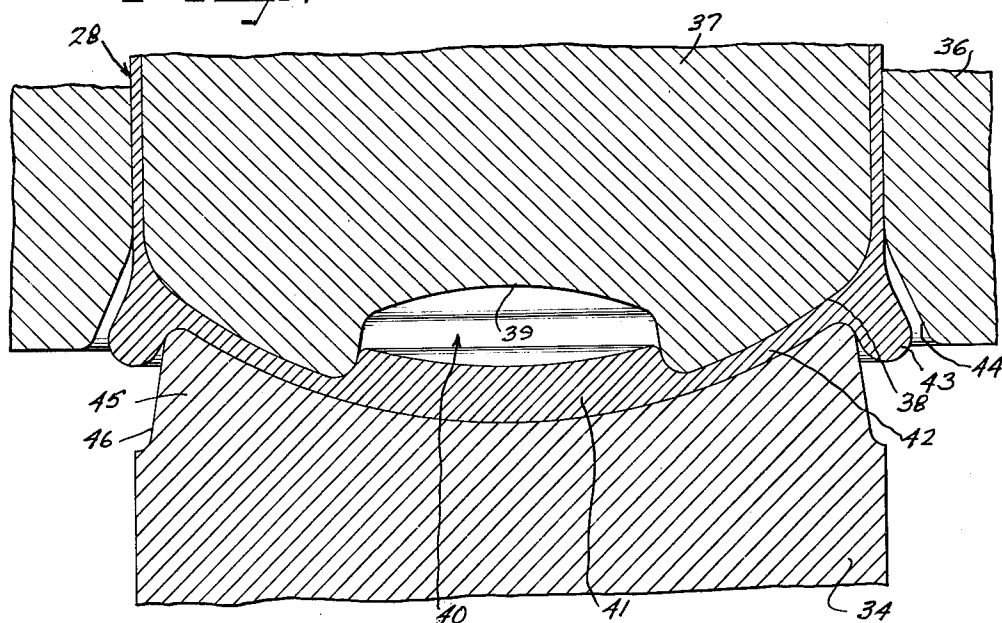


Fig. 7



Inventor

George Albert Lyon

By *Lill, Sherman, Merri, Chas & Simpson* Attys

April 25, 1961

G. A. LYON

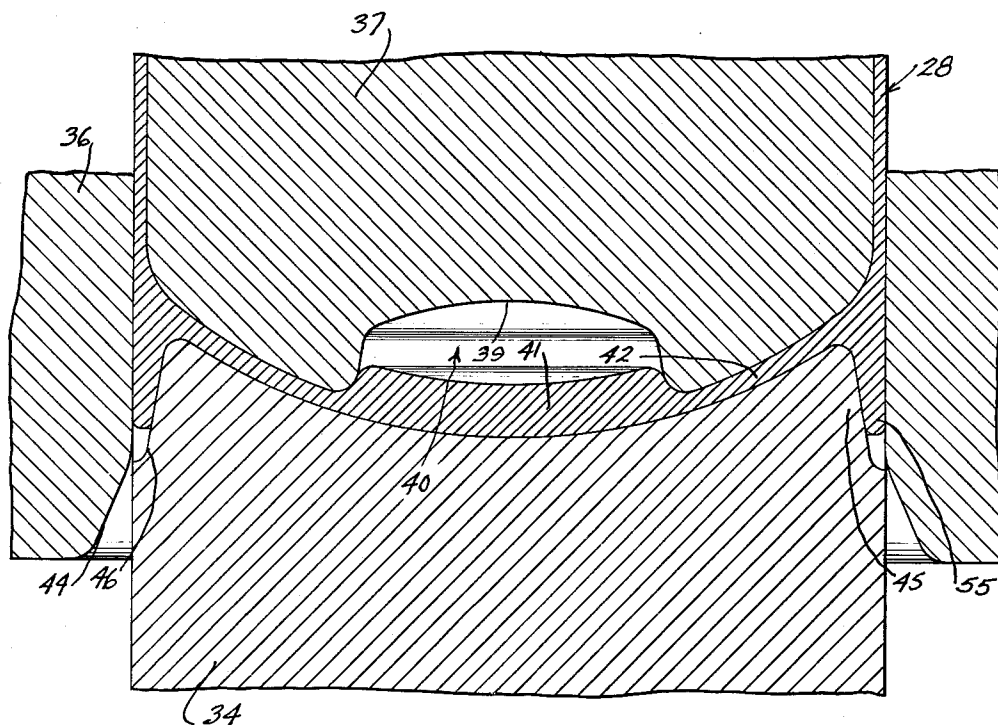
2,980,993

METHOD OF AND APPARATUS FOR FORMING FLANGED CASING BOTTOM

Filed Aug. 10, 1956

4 Sheets-Sheet 4

Fig. 10



Inventor

George Albert Lyon

Attys
Bill, Sherman, Merri, Lee & Simpson

1

2,980,993

METHOD OF AND APPARATUS FOR FORMING FLANGED CASING BOTTOM

George Albert Lyon, 13881 W. Chicago Blvd.,
Detroit 28, Mich.

Filed Aug. 10, 1956, Ser. No. 603,326

5 Claims. (Cl. 29—534)

This invention relates to a method of and apparatus for forming casings and more particularly to a method of forming the bottom of the casing and providing it with a flange or skirt beyond the normal confines of the casing.

This invention comprises a continuation-in-part of the subject matter of my pending application, Serial No. 260,673, filed December 8, 1951, now Patent No. 2,805,466, and also relates to an improvement on the disclosure of my issued patent, No. 2,360,354, issued October 17, 1944.

An object of this invention is to provide an improved method of and apparatus for forming the bottom of the casing and of providing such bottom with an annular flange or skirt extending beyond the normal confines from metal displaced radially during the forming of the bottom.

My invention advantageously lends itself for use with cold working and coining processes, but may be used equally as well in other processes, such as in hot forging.

It will be appreciated, however, that in the forming of casings or vessels for use in ammunition, it is important that the grain structure of the metal be properly oriented at the bottom of the casing so as to preclude fractures from occurring between the wall of the casing and its bottom during the use of the same.

The present invention provides an improved method of so forming the bottom of the casing that excess metal can be effectively displaced radially for use as a flange without disturbing the grain structure of the metal at the bottom of the casing.

According to the general features of this invention, there is provided in a method of forming the bottom of a casing having an annular wall the steps of externally backing up the periphery of the curved surface of the bottom, internally pressing against the curved surface of said bottom while pressure relieving a generally central area of the curved surface to flow the metal thereof axially away from the bottom and radially outwardly and inwardly of said annular wall to form an outwardly extending obliquely inclined thickened annular rib on the bottom at the intersection of the wall and a thickened button portion in the center of the bottom, and wiping said rib to form an annular skirt by radially inwardly displacing and axially outwardly elongating said rib thereby concentrically aligning the radial surface of the annular skirt with said annular wall.

According to still further features of the present invention there is provided an apparatus for forming a bottom of a casing having a cylindrical wall, means including a plunger and a forming member about the plunger having a flared wiping portion with said plunger and said forming member being movable with respect to one another, and die means including a vertically lower die member underlying the plunger having a forming wall, said forming head of reduced diameter being ing head of reduced diameter with respect to said plunger for co-action with the plunger and the flared portion

2

of the forming member, said plunger being adapted to press longitudinally downwardly from within the casing against the inside surface of the bottom while the bottom is backed up by the lower die member to displace metal from the bottom radially outwardly into a thickened bottom margin at its junction with the casing wall said forming head of reduced diameter being cooperable with the plunger in assisting in the displacement of the thickened margin beyond the exterior confines of the casing wall in the formation of a thickened annular rib, said flared wiping portion and said forming head being relatively movable with respect to one another so the wiping portion is passed over the thickened annular rib and the forming head for progressively elongating said obliquely inclined rib in an axial direction to form it into an annular skirt depending downwardly from said casing bottom in longitudinal alignment with the casing wall.

Other features of the invention relate to the provision of a novel die apparatus for effectively forming the displaced annular metal beyond the confines of the casing into the desired flange or skirt.

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

Figure 1 is an edge elevational view of a metal blank suitable for drawing a shell casing;

Figure 2 is a vertical sectional view of a casing cup following the first draw of the blank of Figure 1;

Figures 3 and 4 are longitudinal sectional views showing two consecutive further draws of the casing;

Figure 5 is a fragmentary view partly in section similar to Figure 4 but illustrating diagrammatically how a punch travels downwardly within the confines of the casing wall to act against the curved bottom of the casing for thickening the same at the center inside of a lower die structure;

Figure 6 is an enlarged fragmentary sectional view corresponding to the lower portion of Figure 5 and showing more clearly how the inner punch reacts against the lower die inside of a ring for thickening the casing bottom at its junction with the casing wall;

Figure 7 is a fragmentary cross-sectional view similar to Figure 6 showing diagrammatically a further step comprising moving the lower die member upwardly to thicken the center of the bottom and to further thin out the bottom wall so as to displace metal radially outwardly into an outwardly projecting annular bulge or rib;

Figure 8 is a fragmentary cross-sectional view diagrammatically showing how a punch and die can cooperate in flattening out the bottom of the casing as formed in Figures 6 and 7 so as to provide the casing bottom with a radially projecting flange;

Figure 9 is a fragmentary cross-sectional illustrating the completed casing similar to that shown in Figure 6 of my aforesaid co-pending application; and

Figure 10 is a fragmentary cross-sectional view illustrating diagrammatically a modification of the invention wherein after the casing bottom is formed as shown in Figure 7, it is acted upon by a wiping annular die to deflect the annular bulge downwardly into a depending skirt aligned with the wall of the casing.

As shown on the drawings:

The method of the present invention will be best understood in connection with a description of the several views shown in the drawings.

In drawing a metal shell casing according to the present invention, a metal blank 25 may be initially coined or used directly as a cut blank, depending on the final

shape of head desired. Preferably, the blank 25 is circular. If desired, it may be initially formed with a central concave-convex depression or embossment 27 which will serve as centering means when placing the blank into a drawing die.

The blank of Figure 1 is subjected to successive draws to progressively shape it into an elongated closed end tube or case as represented in Figures 2, 3 and 4, showing successive states of elongation of the casing.

Figure 2 depicts the first draw or cupping of the case, generally identified at 28. In this operation, the marginal portion of the blank 25 is turned axially and provides a tubular side wall 29. One end of the case is closed by a wall 30 providing a base or head, the case being open at the opposite end. The base wall 30 remains of substantially the same thickness as at the conclusion of the initial coining, while the marginal portion of the original blank is worked substantially thinner to afford the necessary elongation in the side wall 29. In the present instance, the base wall 30 is preferably concave-convex.

According to the present invention, the drawing of the case 28 is stopped short of the open end of the casing. As a result, a bead or collar 31 of the material of the side wall remains at the mouth of the cup following the first draw as shown in Figure 2. This collar 31 is retained in each of the succeeding draws, which may be two additional draws, as shown respectively in Figures 3 and 4, by which the cup of Figure 2 is substantially elongated to the ultimate length of casing desired, as shown in Figure 4.

It will be observed that throughout the drawing, the side wall 29 becomes successively thinner while the bottom wall 30 remains of substantially the same thickness and the mouth and collar 31 remains of substantially the same thickness or mass of material. To accommodate the drawing die mechanism the collar 31 flares radially outwardly.

The specific method and apparatus for forming the flaring collar is disclosed and claimed in my aforesaid co-pending application and does not, per se, constitute a part of the present invention. However, by virtue of the fact that the casing wall 29 has an outward bulge or collar 31 at its upper end, it is not feasible in the further forming of the bottom in the die structure to come downwardly over the casing wall by an annular die member.

Therefore, in accordance with the spirit of this invention, I propose to provide a method of and apparatus for forming whereby a punch can annularly travel inside of the wall 29 for performing preliminary metal displacement operations on the casing bottom 30 as shown in Figure 6 and additional die apparatus can be moved upwardly from the bottom of the casing to continue the forming of the bottom and the required annular flange or skirt thereon as shown in Figure 7.

I desire it understood, however, that the invention hereof is not necessarily limited to the particular shape of casing shown in my co-pending application, but can be used equally as well to provide flanges or skirts of different shapes, one of which is shown in Figure 10 as I shall describe more fully hereinafter.

Before proceeding with the description, I also desire to call attention to the fact that the die structure is more or less purposely illustrated diagrammatically in the accompanying drawings since any suitable press equipment and dies may be employed for working and deflecting the metal in the manner shown. Particularly good results can be obtained by the cold working and coining of the casing or vessel from cold rolled steel.

Proceeding further with the description, it will now be observed from Figures 5 and 6 the casing 28 is further processed in accordance with this invention. At the conclusion of the drawing of the casing 28, the collar 31 is swaged radially inwardly and preferably uniformly to

the general internal diameter of the casing which, as shown in Figure 5, is cylindrical. This still leaves a substantial thickness of material projecting uniformly radially about the mouth portion of the casing, affording an annular flange of substantial mass. The collar 31 can be machined as desired, for example, by squaring off a shoulder 32 (Figure 9) on the lower end of the collar 31 and by machining a rabbet groove 33 in the inner side of the collar.

As is shown in Figure 5, the casing 28 is set upon a lower die member 34 having a dished or head surface 35 to mate with the bottom wall or the curved base wall 30. Disposed around the casing 28 is a ring or forming member 36. Punch or plunger die member 37 is then urged downwardly into the interior of the casing 28 after the ring and lower die have been placed in position.

The punch 37 has a curved or rounded annular bottom portion 38 which is adapted to mate with a portion of the inner curved surface of the base wall 30. Centrally of the bottom portion 38 the punch 37 is flattened at 39 and has a central recess 40. The punch 37 is shown in preliminary engagement with the base wall 30 in Figure 6.

When the punch 37 is forced or urged against the base wall 30 backed up by the lower die 34 the base wall 30 is intermediately or centrally thickened at 41 (Figure 7) and the bottom wall 30 about the thickened portion 41 is thinned at 42 so as to displace metal radially outwardly into an outwardly projecting annular bulge or rib 43.

To facilitate forming of the rib 43 the ring 36 has a downwardly and outwardly flared portion 44 and the lower die member 34 has a reduced shank 45 of a smaller diameter than the die member 34. The shank has an outside annular surface 46 which is angled toward the central axis of the casing 28 (Figures 6 and 7).

Figure 8 illustrates diagrammatically how a punch 47 and a die 48 can cooperate in flattening out the bottom of the casing as formed in Figure 6 and 7 so as to provide the casing bottom with a radially projecting flange 43. To this end, it will be noted, the punch 47 has an flattened base portion 49 and a central recess 50 with a flattened bottom 51. The lower die member 48 is illustrated as being flattened so that it can cooperate with the punch 47 in flattening out the bottom casing wall 30.

Figure 9 illustrates the completed casing 28 after the bottom wall 30 has been flattened and provided with a central bore therein.

Figure 10 shows a modification of the present invention wherein after the casing bottom is formed as shown in Figure 7, the same reference numerals being again used where pertinent, it is acted upon by the annular wiping die or ring member 36 to deflect the annular bulge 43 (as shown in Figure 7) a downwardly elongated depending skirt 55 the outside surface of which is aligned with the wall of the casing.

The utilization of the wiping die 36 in the novel manner here employed is particularly advantageous since the wiping die may move freely of the collar 31. In the movement of the wiping die or ring 36, the flared portion 44 of the ring 36 cooperates with the reduced shank 45 on the lower die member 34 in deflecting the bulge into the depending skirt 55.

The casing described herein may be made from any suitable material such as steel of any appropriate grade or composition for the purpose intended. On the other hand, the casings may be made from brass or other metal or alloy.

Where steel is used, spheroidizing may be resorted to if necessary, but under appropriate circumstances the formation of the casings by coining and subsequent drawing may be accomplished without the spheroidizing treatment.

Between the various working steps on the several casings, suitable heat treatment may be employed as desired, such as annealing, normalizing and hardening.

It will be understood that modifications and variations

5

may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. A method of drawing metallic type casings, comprising initially cupping a metal blank from an at least marginally flat condition into an elongated tubular walled shell to a point short of the marginal extremity of the blank but turning said marginal extremity into a flaring mouthed undrawn collar, then drawing the tubular wall of the cupped blank to elongate the casing while maintaining said undrawn margin collar in the substantially original thickness of the same as turned into said flaring mouthed condition, thereafter substantially straightening said flaring mouthed collar longitudinally of said elongated tubular wall, pressing longitudinally downwardly from within the casing against the inside curved surface of the curved bottom, internally backing up the periphery of the internal curved surface of the curved bottom while pressing upwardly against the curved bottom from the exterior thereof and pressure relieving the internal central area of the curved surface to simultaneously flow the metal of the curved bottom radially outwardly of the cylindrical wall and then axially away from the curved bottom into a thickened annular rib extending radially and axially away from its junction with the casing wall while at the same time displacing the central area of the internal curved surface forming an internally located thickened button disposed at the central area of the curved bottom of the casing, and wiping said rib to form an annular skirt by radially inwardly displacing and axially downwardly elongating the rib thereby aligning the radial surface of the annular skirt with the casing wall.

2. In a method of forming the curved bottom of a casing having a cylindrical wall, the steps of backing up the periphery of the curved surface of the bottom from within the casing, pressing upwardly against the curved bottom from the exterior thereof while internally backing up the periphery of the internal curved surface of the curved bottom and pressure relieving the central area of the curved surface thereby displacing the metal of the curved bottom radially outwardly of the cylindrical wall and axially away from the curved bottom into a thickened annular rib extending radially and axially away from its junction with the casing wall while at the same time displacing the central area of the internal curved surface forming an internally located thickened button disposed at the central area of the curved bottom of the casing, and wiping said rib to form an annular skirt by radially inwardly displacing and axially outwardly elongating the annular rib concentrically aligning the radially outer surface of the annular rib with the cylindrical wall.

3. In an apparatus for forming the bottom of a casing having a cylindrical wall, means including a plunger die member having a centrally recessed plunger forming head and a forming member about said plunger die member having a flared lower wiping end with said plunger die member movable with respect thereto for pressing longitudinally downwardly from within the casing against the inside surface of the bottom to displace metal radially outwardly toward the flared lower end into a thickened bottom margin at its junction with the casing wall, and die means including a vertically movable lower die member underlying the plunger die member having a forming head of reduced diameter with respect to said recessed plunger forming head, the lower die member forming head having a concavely dished head surface and an outer generally axial surface flared away from the plunger die member and defining with said concavely dished head surface a metal displacing nose, said lower die member being movable for pressing upwardly against the bottom from the exterior thereof with the nose portion displacing the thickened margin beyond the exterior confines of the casing wall toward the flared lower end forming a thickened annular rib while the nose portion contemporaneously directs the thickened margin obliquely downwardly to-

6

ward the flared end, said flared wiping end being movable over said nose portion for progressively elongating the obliquely inclined rib in an axial direction to form it into an annular skirt depending downwardly from the casing bottom in longitudinal alignment with the casing wall.

4. In an apparatus for forming the bottom of a casing having a cylindrical wall, means including a plunger die member having a centrally recessed forming head and a forming member about said plunger die member having a flared lower wiping end with said plunger die member movable with respect thereto for pressing longitudinally from within the casing against the inside surface of the bottom to displace metal radially outwardly toward the flared lower end into a thickened bottom margin at its junction with the casing wall, and die means including a vertically movable lower die member underlying the plunger die member having a lower die member forming head of reduced diameter with respect to said recessed forming head, the lower die member forming head having a concavely dished surface and an outer generally axial surface flared away from the plunger die member and defining with said concavely dished surface a metal displacing nose portion, one of said die members being movable relative to the other of the die members to lap the die members thereby enabling the nose portion to displace the thickened margin beyond the exterior confines of the casing wall toward the flared lower end forming a thickened annular rib while the nose portion contemporaneously directs the thickened margin obliquely toward the flared end, said flared lower wiping end portion and said nose portion comprising means for progressively elongating said obliquely inclined rib in an axial direction to form it into an annular skirt depending away from said casing bottom in longitudinal alignment with the casing wall by said portions being movable relative to each other.

5. In an apparatus for forming a bottom of a casing having a cylindrical wall, means including a plunger and a forming member about the plunger having a flared wiping portion with said plunger and said forming member being movable with respect to one another, and die means including a vertically movable lower die member underlying the plunger having a forming head of reduced diameter with respect to said plunger for co-action with the plunger and the flared portion of the forming member, said plunger being adapted to press longitudinally downwardly from within the casing against the inside surface of the bottom while the bottom is backed up by the lower die member to displace metal from the bottom radially outwardly into a thickened bottom margin at its junction with the casing wall, said forming head of reduced diameter being cooperable with the plunger in assisting in the displacement of the thickened margin radially beyond the exterior confines of the casing wall in the formation of a thickened annular rib, said flared wiping portion and said forming head being relatively moveable and passed longitudinally of each other for progressively elongating said obliquely inclined thickened annular rib in an axial direction to form it into an annular skirt of reduced cross sectional thickness depending downwardly from said casing bottom in longitudinal alignment with the casing wall.

References Cited in the file of this patent

UNITED STATES PATENTS

202,363	Moore	Apr. 16, 1878
592,095	Mason	Oct. 19, 1897
651,884	Platz	June 19, 1900
1,623,059	Lammie	Apr. 5, 1927
1,984,751	McBride et al.	Dec. 18, 1934
2,668,345	Eckstein	Feb. 9, 1954
70 2,751,676	Kaul	June 26, 1956
2,805,466	Lyon	Sept. 10, 1957

FOREIGN PATENTS

700,207	Germany	Dec. 16, 1940
75 903,985	France	Oct. 23, 1945