Sept. 17, 1929. C. HAMMER 1,728,274

METHOD AND APPARATUS FOR MAKING CAPS

Filed March 30, 1927 2 Sheets-Sheet 1

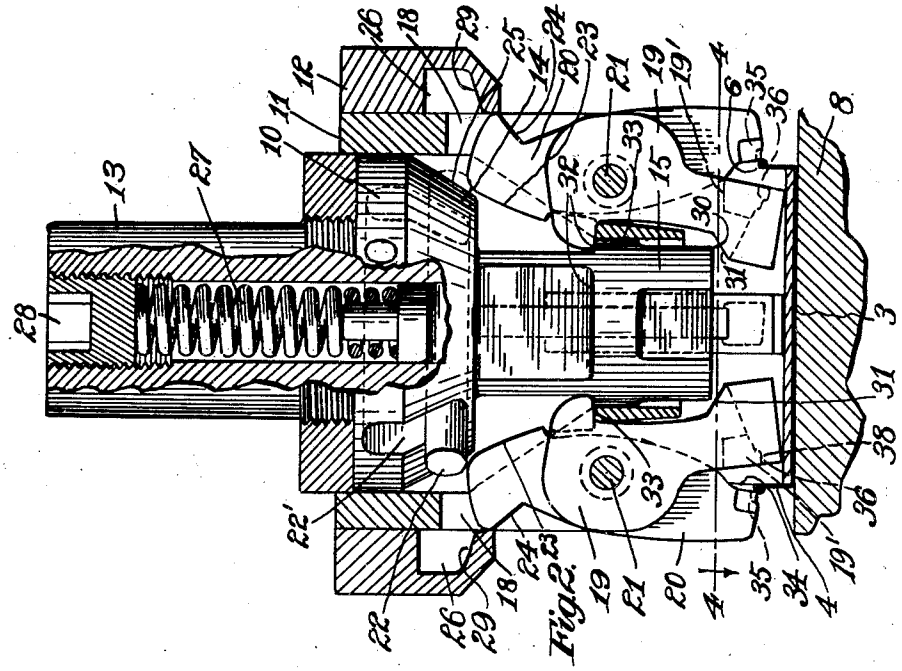


Fig. 2.

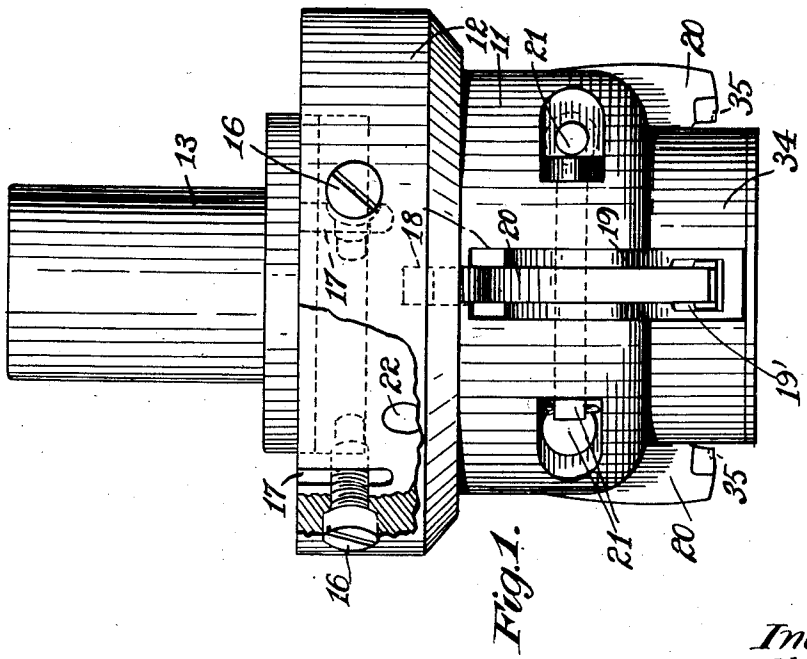


Fig. 1.

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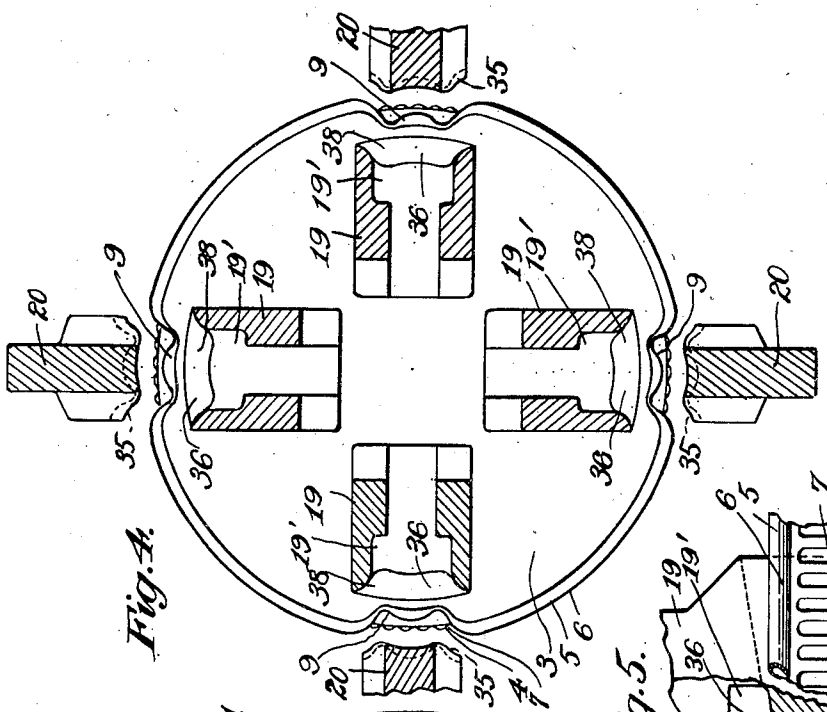


Fig. 4.

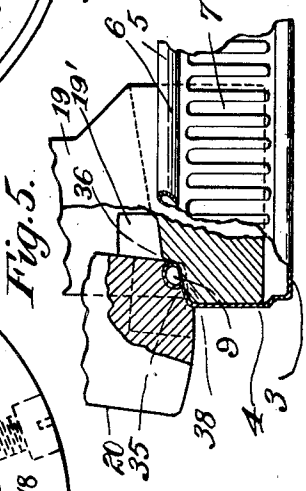


Fig. 5.

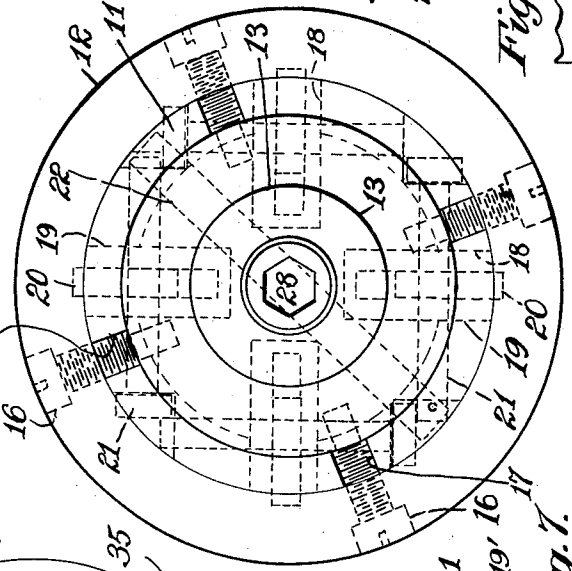


Fig. 3.

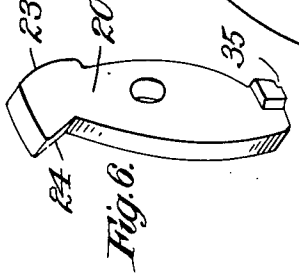


Fig. 6.

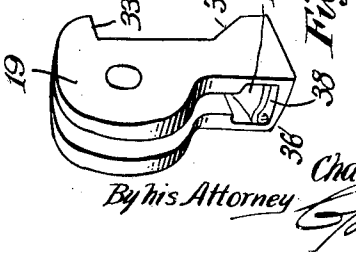


Fig. 7.

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Patented Sept. 17, 1929 1,728,274

UNITED STATES PATENT OFFICE

CHARLES HAMMER, OF HOLLIS COURT BOULEVARD, NEW YORK, ASSIGNOR TO AMERICAN METAL CAP COMPANY, OF BROOKLYN, NEW YORK, A CORPORATION OF NEW YORK

METHOD AND APPARATUS FOR MAKING CAPS

Application filed March 30, 1927. Serial No. 179,472.

This invention relates to the manufacture of metal caps or closures, commonly designated in the trade as "lug caps", for use on glass bottles or containers, an object of the invention being to provide a method and apparatus for forming caps with a plurality of lug-formed projections having a concaved or arc-shaped inner face substantially conforming to the curvature of the container whereby such lugs have greater holding efficiency and take up greater variations in the container threads or lugs and will engage or grip the glass threads of a container without the scratching or cutting thereof.

A further object of the invention is the provision of a method and apparatus for the manufacture of metal caps in which such caps will be provided with a beaded or curled lower edge which edge is utilized at intervals to form a plurality of arc-shaped lugs, the arc of which is less than the arc of the major portion of the bead of the cap whereby the inner edge of such lugs will conform to the general curvature of the container thereby avoiding those objections heretofore present with lug caps in which the inner edges or faces of such lugs were straight.

A form of cap which may be manufactured by this method and apparatus is illustrated and described in my co-pending application, Serial No. 149,022 filed November 18, 1926, (Patent No. 1,647,517, dated November 1, 1927) wherein the advantages of this form of cap are pointed out.

In the drawings accompanying and forming a part of this specification, Fig. 1 is a side view of a form of machine or die carrying member which may be used to form the concaved lugs of this improved cap, parts thereof being broken away more clearly to illustrate the structure; Fig. 2 is a vertical sectional view thereof; Fig. 3 is a top view, parts thereof being shown in dotted lines; Fig. 4 is a cross-sectional view taken on line 4—4, Fig. 2; Fig. 5 illustrates a cap partly broken away in position and being operated upon by the dies or jaws which are shown partly in section; and Figs. 6 and 7 are views illustrating the dies or jaws.

Similar characters of reference indicate corresponding parts in the several figures of the drawings.

Before explaining in detail the present improvement and mode of operation thereof, I desire to have it understood that the invention is not limited to the details of construction and arrangement of parts which are illustrated in the accompanying drawings, since the invention is capable of other embodiments, and that the phraseology which I employ is for the purpose of description and not of limitation.

In the manufacture of the improved caps, a flat blank of sheet metal or tin is first stamped out into the hat-shaped form shown in Fig. 5 and which comprises a top 3, a skirt 4 and an outwardly extending flange 5. The outwardly extending flange 5 is then subjected to rotary inward pressure to form it into a coiled or beaded edge 6, while the skirt of this blank is provided with suitable corrugations 7.

The formation of this beaded or coiled edge and corrugations is usually done by subjecting the blank to suitable forming tools, as by supporting the blank upon a suitable chuck and rotating and revolving this chuck around a companion forming tool.

This beaded blank is then suitably supported in position on a table or bed 8 of a punch press in which is mounted the die carrying means for forming the concaved or arc-shaped lugs 9. This die carrying means comprises a plurality of relatively movable members 10, 11 and 12, the members 10 and 12 being suitably connected for up and down movement relative to the member 11. The member 10 comprises a shank 13 for attachment to the plunger of the press and a cone shaped head 14 having a downwardly projecting portion or stem 15. Surrounding this member 13 below the shank thereof is the member 11 comprising a die or jaw carrying sleeve. Encircling this sleeve is the member 12 comprising a ring secured to the inner member 13 by suitable bolts 16, the sleeve being provided with slots 17 to permit the movement of the bolts therein. The sleeve is also provided with a series of slots 18 according to the number of concaved lugs that are to be

formed in the bead of the cap, four thereof being shown. In each of these slots is mounted for swinging or oscillatory movement a pair of jaw carrying dies 19 and 20 mounted on a suitable pivot 21 passing horizontally through the sleeve 11.

The jaw 19 comprises a slotted member having an enlarged recess 19′ at its lower end—and this jaw, properly speaking, comprises the die. A companion jaw 20 is located in the slot of the jaw 19 and, properly speaking, comprises the punch. But for convenience herein these two jaws or jaw members will be referred to as the dies, or die members, or die carrying jaws.

The head 14 is provided with a long slot 22′ through which a pin 22 extends and projects into openings in the sleeve. This pin serves as a key to hold the sleeve 11, carrying the jaws, in alinement with the inner member 10 during the movement of the latter. When downward pressure is applied on the shank 13, this pin rides in slot 22′ of the inner member 10 and by means of this key 22 and the bolts 16, the three members 10, 11 and 12 are held in assembled relation.

Each jaw 20 is provided with a pair of inclined or cam faced portions 23 and 24, the face 23 being engaged by the beveled or cam faced portion 25 of the head 14 of the inner member 10, so that downward movement thereof thereby shifts the die carrying portion of the jaw 20 inwardly toward the center of the cap, this inward movement being permitted by the ring 12 which is provided with a recess 26 into which the part 24 projects, the ring 12 being shiftable together with the head 14 of the inner member 10. On the reverse or upward movement of the parts which is effected by means of a coil spring 27 located between a threaded block 28 in the shank and the bottom wall of the shank, the die carrying portion of the jaw 20 is forced outwardly away from the curled edge of the cap by a cam-shaped portion 29 of the ring engaging the cam face 24 of the jaw. The movement of the other jaw 19 toward and from the jaw 20 is obtained by cam face 30 at the lower end of the stem engaging an inclined or cam face portion 31 of the jaw 19, thereby forcing this jaw toward the lower part of the jaw 20, the reverse movement of this jaw 19 being obtained by a projection 32 carried by the stem 15 engaging a projection 33 of the jaw 19.

Thus on the downward movement of the cone shaped head, the ring or sleeve 12 moving therewith, and both of these parts moving relatively to the jaw carrying sleeve 11, the beveled portion 25 of the head engaging the cam face 23 of the jaw 20 moves the lower end of the jaw radially inward toward the center of the cap and simultaneously therewith the cam face 30 of the stem 15 engaging the cam face 31 of the companion jaw 19, swings this outward and away from the center of the cap, at which time these two jaws cooperate to form the lugs in the bead of the cap. On the upward movement of the head by means of the spring 27, the cam face 29 of the ring cooperating with the cam face 24 of the outer jaw 20, and the projection 32 of the stem 15 cooperating with the projection or lug 33 of the jaw 19, shifts these jaws in the opposite direction to that just described, or away from the bead of the cap.

The caps may, of course, be fed to the jaws in any suitable way, the lower portion 34 of the sleeve 11 carrying the jaws being of the proper shape and diameter to receive the cap and hold it in position on the bed 8 of the machine for the operation of the jaws.

The lower ends of the jaws are suitably shaped, as at 35 and 36, to exert pressure upon the bead radially inward, thereby to form the arc-shaped lugs with a concaved inner face. Thus as the head 14 of inner member 10 is moved downward by the press, the lower ends of the jaws are shifted toward each other to engage the bead of the cap, the inner jaw 19 supporting the bead at its under side while the outer jaw 20 exerts a radial inward pressure thereupon to transform this portion of the bead into a tubular concaved or arc-shaped lug, the arc of which is less than that of the major portion of the bead and substantially conforms to the general contour of the glass container upon which the cap is to be used.

As the lug is formed, the under side thereof is forced against the inclined or tapered bottom wall 38 of the recessed portion 19′ of the jaw 19, this taper extending transversely of the jaw so that the under or thread engaging wall of the lug is inclined or tapered substantially to correspond with the inclination of the glass thread or lug of the container.

Thus, according to the number of pairs of jaws in the jaw carrying member, two or more lugs are simultaneously formed from the bead of the cap each having a concaved inner face substantially conforming to the contour of the glass container.

The corrugations in the skirt not only form a means for gripping the cap in the handling thereof but act as a reinforcing means to stiffen both the flange and the lug. The edge of the skirt is also strengthened by the bead or coil which as shown is outwardly and upwardly rolled to form a reinforced edge and this bead not only gives a pleasing appearance to the cap but it prevents cutting of the hands of the user and also provides a sanitary cap in that the raw edge is sealed and protected against corrosion and acids and the action of the elements. The bead is also particularly useful in strengthening the flange and the lug itself while providing means for forming the lugs therefrom at the lower edge of the

skirt whereby they have increased strength and holding efficiency.

Thus it will be seen that at a plurality of places, four in the form of cap shown herein, this reinforcing bead or curled edge is radially pressed or inset inwardly toward the center of the cap to form inwardly extending lugs, which on the inside are curved or concaved lengthwise thereof, that is circumferentially between the ends of these lugs, to conform substantially to the curvature of the glass container and to the general curvature of the bead, the curvature, however, being somewhat less than that of the bead but sufficient considering the short length of the lugs to conform to the general curvature of the glass container. This inwardly pressing and curvature of the lug is obtained by insetting or pressing the bead radially inward without materially deforming it while exerting a greater pressure at the opposite ends of the lug and at the same time somewhat flattening these ends of the lug with the result that the lug is tubular in cross section at its center, which tubular formation also extends toward the ends so that the under side or the thread engaging face of the lug is of round or curved or beveled formation while the lug is also curved lengthwise thereof along its inner edge forming an arc somewhat less than that formed by the major part of the beaded edge.

When the jaw is formed with the inclined or tapered surface 38, the underside of the lug in the direction of its length is inclined or tapered accordingly, so that the tail end of the cap lug as it is turned onto a jar or bottle is somewhat closer to the top of the cap than the front end of the lug so that this under or thread engaging wall of the lug substantially conforms to the inclination of the glass thread and will engage under the glass thread throughout its entire length with its curved or concaved inner face conforming to the curvature of the glass container. The curved formation of the lugs crosswise thereof also assists in preventing any cutting or scratching of the glass thread.

From the foregoing it will be observed that the lug is formed by pressure exerted upon the bead of the skirt sufficient to press this bead inwardly the desired extent without, however, materially deforming the lug between its ends while the ends of this crescent shaped lug are pressed inwardly to a greater extent. Thus the pressure on the lug is greater at spaced points than intermediate such points or ends of the crescent, and owing to the tapering bottom wall 38 of the die recess 19′ it may also be said that the vertical or transverse pressure on the lug is greater at the deeper end of the recess 19′ than at the other end. In other words, a part of the cap bead is inset from the rest of the bead but in such manner that the inner face of the inset part is concaved instead of straight while the lug retains its tubular formation between its ends so that it is also of curved formation crosswise thereof. The radial inward pressure on the lugs also exerts a pressure transversely thereof particularly at the ends of the lug to deform the ends of the lug and this pressure is sufficient to cause the under wall of the lug to conform to the inclined or tapered wall 38 of the jaw so that an improved form of locking lug is obtained, tubular in cross section and curved in the direction of its length and also curved in cross section with a tapering thread engaging face in the direction of its length.

By having the lug of tubular formation the lug is not only strengthened, this being materially assisted by the corrugations above the lug which may run from adjacent to the top of the lug toward the top of the cap, but the cap can be made of relatively thin sheet metal or of any other suitable material and yet have sufficient strength and resistance to resist any strain that may be placed upon the cap in the handling thereof.

From the foregoing it will be observed that this improved lug engages the glass threads practically throughout the entire length of the tapered face of the lug while conforming to the general curvature of the glass container under the thread and that it has no sharp straight cutting edge for engagement with the glass container so that there is no liability of the thread being cut or marked and that further, owing to the tubular formation of the lug, it has a certain resilient or spring action so that when turned on to the thread of the container it will compensate for any inequalities or variations at the underside of the thread, in other words, it can be applied with a cushioning effect.

The cap turns on very easily and with a gradual gripping effect without any cutting or marking of the glass container or thread and although it can be turned off easily, yet it grips the thread effectively so that the cap will not jar off in the ordinary handling of the container while the cap is firmly drawn down to insure a tight seal between the liner and the mouth or upper edge of the container.

It is to be understood that by describing in detail herein any particular form, structure or arrangement, it is not intended to limit the invention beyond the terms of the several claims or the requirements of the prior art.

Having thus explained the nature of my said invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made, or all of the modes of its use, I claim:

1. The method of manufacturing a closure cap which consists in subjecting a previously formed hat shaped blank provided with a beaded edge to radial pressure simultane-

ously at a plurality of equally-spaced points around the beaded edge to form in the bead a plurality of arc shaped lugs with concaved inner faces.

2. The method of manufacturing a closure cap which consists in subjecting a previously formed hat shaped blank provided with a beaded edge to radial pressure simultaneously at a plurality of equally-spaced points around the beaded edge to form in the bead a plurality of arc shaped tubular lugs with concaved inner faces.

3. The method of manufacturing a closure cap which consists in subjecting a previously formed hat shaped blank provided with a beaded edge to radial pressure simultaneously at a plurality of equally-spaced points around the beaded edge to form in the bead a plurality of arc shaped lugs with concaved inner faces and inclined under faces.

4. The method of manufacturing a closure cap which consists in subjecting a previously formed hat shaped blank provided with a beaded edge to radial pressure simultaneously at a plurality of equally-spaced points around the beaded edge to form in the bead a plurality of arc shaped tubular lugs with concaved inner faces and inclined under faces.

5. The method of manufacturing a closure cap which consists in subjecting a previously formed hat shaped blank provided with a beaded edge to radial pressure between a pair of die-carrying jaws both radially shiftable toward and from each other and having arc-shaped lug forming means to form in the bead an arc shaped lug with a concaved inner face, said radial pressure being greater at spaced points than intermediate such points.

6. The method of manufacturing a closure cap which consists in subjecting a previously formed hat shaped blank provided with a beaded edge to radial pressure between a pair of die-carrying jaws both radially shiftable toward and from each other and having arc-shaped lug forming means to form in the bead an arc shaped tubular lug with a concaved inner face, said radial pressure being greater at spaced points than intermediate such points.

7. The method of manufacturing a closure cap which consists in subjecting a previously formed hat shaped blank provided with a beaded edge to radial pressure between a pair of die-carrying jaws both radially shiftable toward and from each other and having arc-shaped lug forming means to form in the bead an arc shaped tubular lug with a concaved inner face and an inclined under face, said radial pressure being greater at spaced points than intermediate such points.

8. The method of manufacturing a closure cap which consists in supporting in fixed position a previously formed hat shaped blank provided with a beaded edge and subjecting such beaded edge to radial pressure simultaneously at a plurality of equally-spaced points around the beaded edge to form in the bead a plurality of arc shaped lugs with concaved inner faces.

9. The method of manufacturing a closure cap which consists in supporting in a fixed position a previously formed hat shaped blank provided with a beaded edge and subjecting such beaded edge to radial pressure simultaneously at a plurality of equally-spaced points around the beaded edge to form in the bead a plurality of arc shaped tubular lugs with concaved inner faces and inclined under faces.

10. The method of manufacturing a closure cap which consists in subjecting a previously formed hat shaped blank provided with a beaded edge to radial pressure simultaneously at a plurality of equally-spaced points and exerting said radial pressure by pressure operating transversely thereto, to form in the bead an arc shaped tubular lug with a concaved inner face having an inclined under face.

11. The method of manufacturing a closure cap which consists in subjecting a previously formed hat shaped blank provided with a beaded edge to radial pressure between a pair of swinging die carrying jaws, one comprising a die and the other a punch, to form in the bead an arc shaped tubular lug with a concaved inner face having an inclined under face, said radial pressure being greater at spaced points than intermediate such points.

12. The method of manufacturing a closure cap which consists in suitably supporting between a pair of swinging dies a previously formed hat shaped blank provided with a beaded edge and subjecting such beaded edge to a punching operation radially inward, greater at spaced points than intermediate such points, to form in the bead an arc shaped lug with a concaved inner face.

13. The method of manufacturing a closure cap which consists in subjecting the beaded edge of a hat shaped blank simultaneously at a plurality of equally-spaced points to radial pressure to form in the bead an arc shaped lug with a concaved inner face.

14. The method of manufacturing a closure cap which consists in subjecting the beaded edge of a hat shaped blank to a punching radial pressure between a pair of radially movable means to form in such bead an arc shaped lug with a concaved inner face, such punching pressure being greater at spaced points than intermediate such points, whereby the lug has a tubular formation.

15. A cap lug forming apparatus comprising a plurality of pairs of co-operating swinging jaws circularly located, each pair comprising one a die and the other a punch, and means for shifting said jaws toward and from each other, each pair of said jaws con-

structed to form an arc-shaped lug having a concaved inner face on the inside of the skirt of a container cap.

16. A cap lug forming apparatus comprising a plurality of pairs of co-operating swinging jaws circularly located, each pair comprising one a die and the other a punch, and means for shifting said jaws toward and from each other, each pair of said jaws constructed to form a tubular arc-shaped lug having a concaved inner face on the inside of the skirt of a container cap.

17. A cap lug forming apparatus comprising a pair of swinging jaws, one a die and the other a punch, a sleeve pivotally supporting said jaws and means carried by said sleeve for shifting said jaws toward and from each other, each of said jaws constructed to form an arc shaped lug having a concaved inner face.

18. A cap lug forming apparatus comprising a pair of swinging jaws, one a die and the other a punch, a sleeve pivotally supporting said jaws, means located exteriorly and interiorly of said sleeve for shifting said jaws toward and from each other, each of said jaws being constructed to form an arc shaped lug having a concaved inner face.

19. A cap lug forming apparatus comprising a pair of swinging jaws, one a die and the other a punch, a sleeve pivotally supporting said jaws, said jaws having cam formed portions and reciprocating means carried by said sleeve having cam formed portions cooperating with the cam portions of the jaws for shifting said jaws toward and from each other, each of said jaws being constructed to form an arc shaped lug having a concaved inner face.

20. A cap lug forming apparatus comprising a pair of swinging jaws having cam faces and one a die and the other a punch, a sleeve pivotally supporting said jaws, a reciprocating member carried interiorly of said sleeve and having a plurality of cam formed portions cooperating with the cam formed portions of the jaws, a ring carried exteriorly of said sleeve and having a cam formed portion cooperating with the cam formed portion of a jaw thereby to shift said jaws toward and from each other, each of said jaws being constructed to form an arc shaped lug having a concaved inner face.

21. A cap lug forming apparatus comprising a pair of swinging jaws, one a die and the other a punch, a sleeve pivotally supporting said jaws, a reciprocating member located interiorly of said sleeve and having means cooperating with said jaws thereby to move one of them in one direction and the other in the opposite direction, and a ring located exteriorly of said sleeve and having means cooperating with one of said jaws to move it in one direction, each of said jaws being constructed to form an arc shaped lug having a concaved inner face.

22. A cap lug forming apparatus comprising a pair of swinging jaws, one a die and the other a punch, a sleeve for pivotally supporting said jaws, a reciprocating member located interiorly of said sleeve, means for guiding the member relatively to said sleeve, means carried by said member for shifting the jaws, a spring for returning said member to its normal position, and a ring located exteriorly of said sleeve and connected with said reciprocating member for movement therewith and having means cooperating with one of the jaws for shifting it, said sleeve having means for receiving a cap, each of said jaws being constructed to form an arc shaped lug having a concaved inner face.

23. A cap lug forming apparatus comprising a pair of swinging jaws, one a die and the other a punch, means for supporting said jaws for shiftable movement, and means for shifting said jaws toward and from each other and comprising a plurality of relatively movable members, each of said jaws being constructed to form an arc-shaped lug having a concaved inner face.

24. A cap lug forming apparatus comprising a pair of swinging jaws, one a die and the other a punch, means for supporting said jaws for shiftable movement, and means for shifting said jaws toward and from each other and comprising a plurality of relatively movable members comprising a sleeve, a ring, one movable relatively to the other and one pivotally carrying said jaws, and a reciprocating member located interiorly of said sleeve and connected with the ring, each of said jaws being constructed to form an arc-shaped lug having a concaved inner face.

25. A cap lug forming means comprising a plurality of pairs of co-operating swinging jaws circularly located and means for shifting said jaws toward and from each other, each pair of said jaws comprising one a die and the other a punch having an arc shaped face for forming an arc shaped lug having a concaved inner face on the bead of a metal cap.

26. A cap lug forming means comprising a plurality of pairs of co-operating swinging jaws circularly located and means for shifting said jaws toward and from each other, each pair of said jaws comprising one a recessed die and the other a punch projecting into said recess and having an arc shaped face for forming an arc shaped lug having an inner concaved face on the bead of a metal cap.

27. A cap lug forming means comprising a pair of swinging jaws and means for shifting said jaws toward and from each other, said jaws comprising one a recessed die the bottom wall of which recess is tapered, and the other a punch projecting into said recess

and having an arc shaped face for forming an arc shaped lug having a concaved face and a tapered under face on the bead of a metal cap.

28. A cap lug forming means comprising a pair of swinging jaws pivotally connected one within the other, one a recessed die having a tapered bottom wall and the other a punch adapted to project into said recess and having an arc shaped face to form an arc shaped tubular lug having a concaved inner face and a tapered under face.

29. A cap lug forming apparatus comprising a pair of co-operating swinging jaws, one a die and the other a punch, and plunger-operated means for shifting said jaws toward and from each other, each of said jaws being constructed to form a container holding lug on the inside of the skirt of a container cap.

30. A cap lug forming apparatus comprising a pair of co-operating swinging jaws, one a die and the other a punch, a sleeve pivotally supporting said jaws, and plunger-operated means carried by said sleeve for shifting said jaws toward and from each other, each of said jaws being constructed to form a container-holding lug on the inside of the skirt of a container cap.

31. A cap lug forming apparatus comprising a plurality of pairs of co-operating swinging jaws circularly located, each pair comprising one a die and the other a punch, and means operating transversely to the path of movement of said jaws for shifting said jaws toward and from each other, each of said jaws being constructed to form an arc-shaped, container-holding lug on the inside of the skirt of a container cap.

Signed at room 1822 Park Row Bldg., New York, N. Y., this 29th day of March, 1927.

CHARLES HAMMER.