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METHOD OF EXTRUDING METAL CONTAINERS

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Fig. 1.

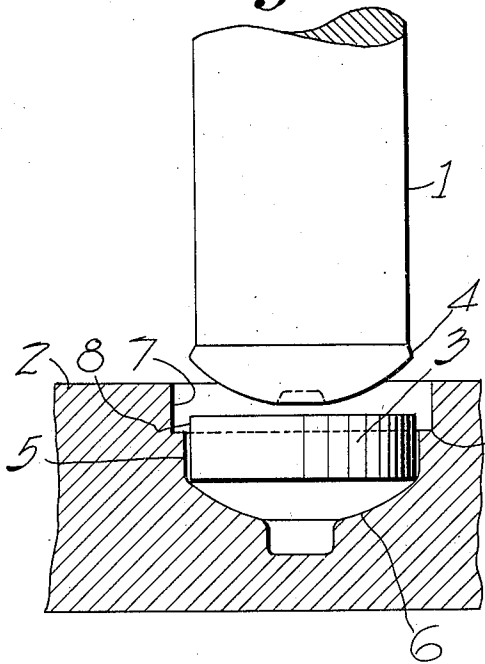


Fig. 2.

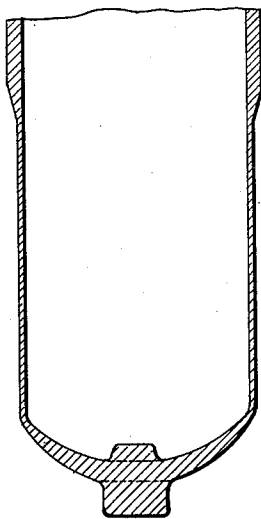
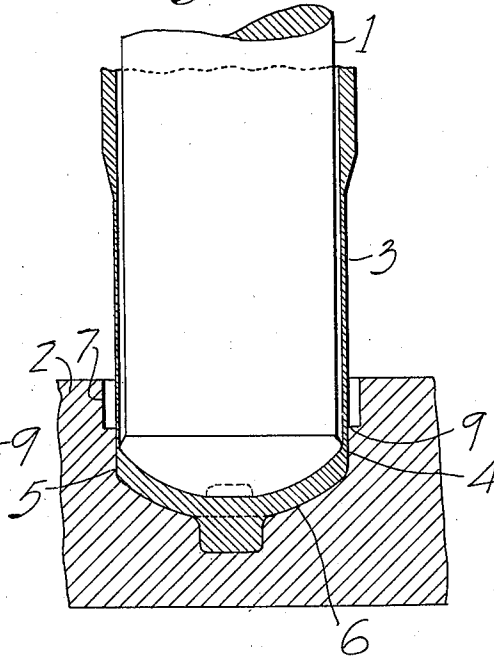


Fig. 3.

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METHOD OF EXTRUDING METAL CONTAINERS

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3 Claims. (Cl. 207—10)

My invention relates to thin walled tubes and the method of production thereof, from soft metals, such as aluminum, lead, zinc and tin. It relates particularly to the provision of a method for producing a thin walled tube with a wall of variable thickness, so that one portion thereof has walls of sufficient thickness for threading without extending this thickness throughout the length of the tube. By this method thin walled containers with a threaded closure, and with or without a dispensing nozzle widely used in the field of refill containers as a part of many forms of apparatus, can be easily and economically produced by one operation.

The primary object of this invention is to provide a method of producing thin walled tubes, a wall at the open end of which is thickened in order, for example, to permit the formation of threads thereon.

Another object is to provide a method of producing, from a flat disc blank and in a single operation, a tube the body portion of which is thin walled and the end portion of which is relatively thick walled, with a section having a graduated wall thickness between and joining the thick and thin walled sections.

A particular object of the invention is the provision of a collapsible tube with a thickened end wall to permit threading to take a closure, the balance of the wall being thin enough to be easily collapsed and without a shoulder or sharp corners at the junction between the sections of different thickness. This and other objects and advantages will be more fully understood upon reference to the following description taken in conjunction with the accompanying drawing in which:

Fig. 1 is a vertical cross sectional view showing a punch and die assembly adapted to express a blank positioned in the die; Fig. 2 is a cross sectional view similar to Fig. 1, the parts being in the position occupied at the end of the die-expressing operation and just before the punch is raised for removal of the finished tube; and Fig. 3 is a longitudinal sectional view of the finished tube showing the variation in wall thickness produced in accordance with the present invention.

Referring to the drawing wherein like reference numerals have been used throughout to denote like parts, the extruding or die-expressing apparatus consists in its general organization of a punch 1 and a die 2 in which is positioned a circular slug or blank 3. The punch and the die are suitably mounted in a press of the type which is well known in the art and which need not be

illustrated or described here since it forms no part of the present invention.

The punch 1 is preferably, although not necessarily, formed with a slightly enlarged end portion 4. The die is recessed at 5 to receive the blank 3, and the bottom of the recess is usually designed so as to form a dispensing nozzle on the end of the tube during the forming and extrusion operation as indicated at 6. An essential feature of the die as adapted to the performance of my improved method is the counterbored portion 7. This counterbored portion 7 is of appreciably larger diameter than the blank-receiving portion 5.

It will be noted that the blank 3 is of such a thickness with respect to the depth of the portion 5 or blank-receiving recess that it extends upwardly for a slight distance into the counterbored portion 7 of the die as at 8. This gives a greater clearance between the periphery of the blank and the wall of the counterbored portion 7 of the die than the clearance between the periphery of the blank and the recess 5. It is this differential which makes it possible to produce by a single extruding or die-expressing operation my improved product which consists of a tube of varying wall thickness. It will of course be understood that it would be possible to make a tube having more than two thicknesses throughout its length by increasing the number of counterbored portions or steps in the die recess. Furthermore the shoulder 9 between the two portions of the die recess 5 and 7 may be formed with relatively sharp corners or may be rounded off as desired, as the benefits of my invention are realized wherever the diameter of the recess in the die is variable. That is to say, a die recess of varying diameter will produce in accordance with my invention a tube of varying wall thickness, and any cooperating punch and die structure which produces this result is considered to fall within the purview of my invention.

The initial action is substantially one of forming followed by extrusion. The operation is carried out as follows: A circular blank of soft metal, such as aluminum, lead, zinc or tin, is placed in the die recess 5. The punch 1 is caused to descend, forcing the metal of the blank 3 at first laterally and then upwardly to form a tubular article with a wall thickness varying in accordance with the clearance differential between the punch 1 and the portions 5 and 7 of the die recess. The thickness of the metal being extruded changes as the end portion 4 of the punch approaches the shoulder 9, and after the end of

the punch passes the shoulder & the wall thickness becomes constant and the extrusion proceeds to completion in the usual manner.

The use of a punch having an enlarged end as at 4 is not an essential part of the present invention but is adopted as a matter of convenience in order to reduce the amount of friction between the punch and the die. The method is operative if a punch of a uniform diameter throughout is employed. As the invention may be practiced otherwise than as specifically shown and described, I do not desire to be limited except as defined in the appended claims.

I claim:

1. The method of producing, in a single operation, a tubular metal article having a varying wall thickness and having a constant internal diameter throughout a substantial portion of its length, which comprises placing a metal blank within a die cavity open at one end and at least substantially closed at the other end, said cavity having a portion adjacent the open end with a diameter substantially equal to the largest external diameter of said tubular article and having a portion disposed inwardly therefrom with a uniform diameter substantially equal to a smaller external diameter of said tubular article and having a shoulder between the two said portions, said blank having a maximum diameter not greater than that of the said portion of the cavity of smaller diameter and being disposed in said portion and having sufficient depth to extend outwardly past said shoulder into the portion of the cavity of larger diameter, applying pressure to the outwardly disposed surface of said blank through the open end of said cavity by means of a punch having near its pressure-applying end a diameter substantially equal to the internal diameter of said tubular article, and continuing to apply pressure by moving said punch into said die cavity to first force metal in excess of that required to fill said inner portion of the cavity toward the wall of the larger outer portion of the cavity and outwardly along said wall in a direction opposite to the direction of movement of the punch, thereby extruding a thickened wall portion of said tubular article between the punch and the wall of the larger portion of the cavity, and to secondly extrude a tapered wall portion of said tubular article integral with the thickened wall portion through the narrowing orifice between the punch and the shoulder in the die cavity and to then extrude a thinner wall portion of said tubular article integral with said tapered wall portion, the movement of the extruded metal being in a direction opposite to the direction of movement of the punch with re-

spect to the die throughout all stages of the process.

2. The method of producing, in a single operation, a tubular article having differing wall thicknesses and having a constant internal diameter throughout a substantial portion of its length, which comprises inserting a metal blank in a cylindrical die cavity open at one end, the die having adjacent the said open end a concentric recess of greater diameter than the cavity and having a shoulder between the said cavity and the said recess, the said blank having a maximum diameter not greater than that of said cylindrical cavity and having a thickness greater than the depth of the cavity and extending outwardly from the cavity into the recessed portion of the die, applying pressure to the transverse surface of said blank disposed in the recessed portion of the die with a punch to cause a substantially lateral flow into said recess of a portion of the metal of said blank followed by an outward flow of metal along the wall of the recess, thereby extruding a thickened wall portion with maximum external dimensions determined by said recess, and continuing to apply pressure by moving said punch past said shoulder and into said die cavity to extrude a tapered wall portion integral with said thickened wall portion and to then extrude a further portion of the metal of the blank from said die cavity and through the recess, thereby forming a thinner wall portion integrally united with said tapered wall portion and having external dimensions determined by said cylindrical cavity.

3. The method of producing a tubular metal article having a substantially uniform internal diameter and differing wall thicknesses, which comprises inserting a metal blank in a cylindrical die cavity open at one end and having adjacent said open end a concentric portion of larger diameter than said cavity and separated therefrom by a shoulder, said blank having a diameter no larger than that of said cavity but having sufficient depth to extend outwardly past said shoulder, and applying pressure to said blank by moving a punch progressively through said open end, past said shoulder, and into the die cavity, thereby extruding metal outwardly in tubular form and in a direction opposite to the direction of movement of the punch, the extruded metal having a thickness determined by the distance between the punch and the nearest part of the die, which decreases as the punch passes the shoulder and thus produces a portion with tapering wall thickness.

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