June 6, 1939. J. H. FRIDÉN 2,160,963

COLLAPSIBLE CONTAINER

Filed April 30, 1936

Fig:1.

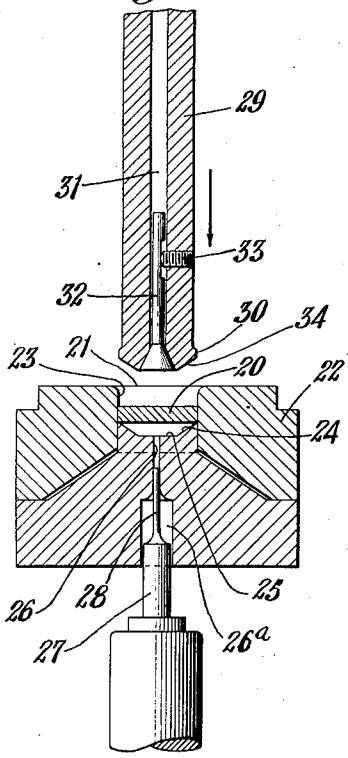


Fig:2.

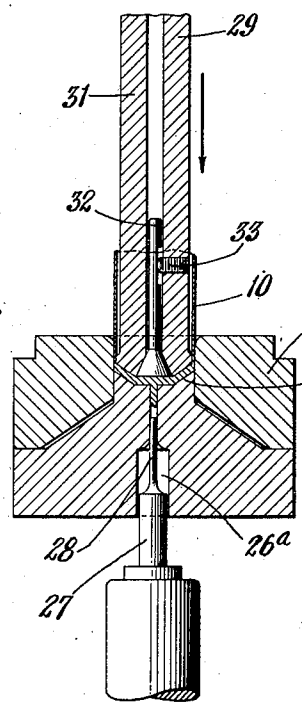


Fig:3.

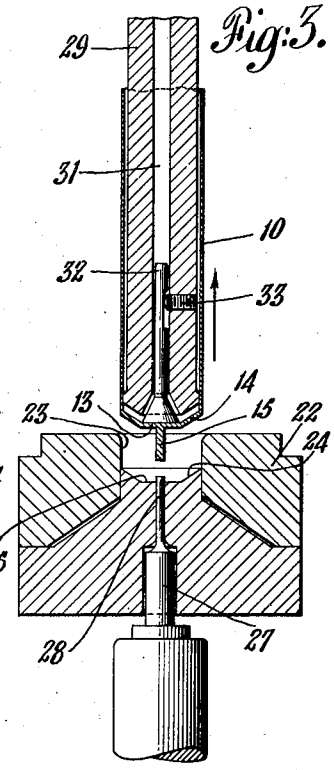


Fig:4.

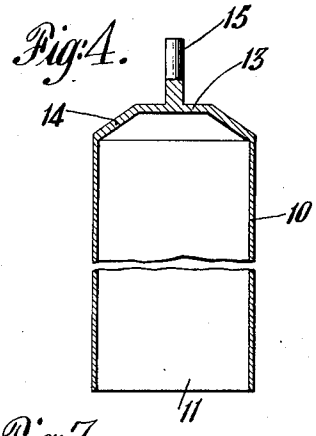


Fig:5.

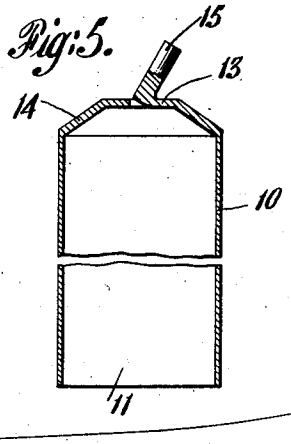


Fig:6.

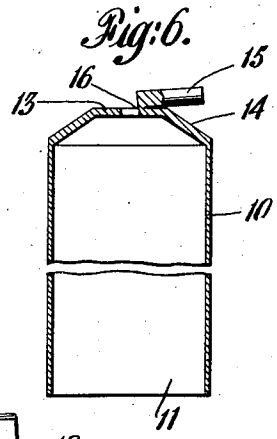
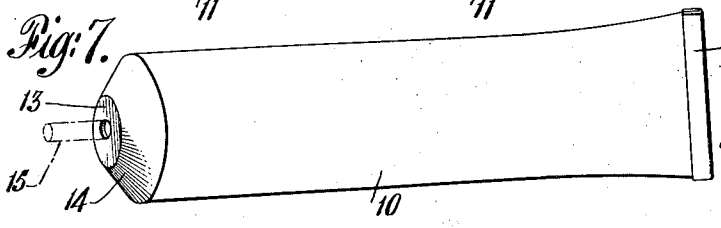


Fig:7.



INVENTOR
John H. Fridén
BY
H. C. Wiseman
ATTORNEY

Patented June 6, 1939

2,160,963

UNITED STATES PATENT OFFICE

2,160,963

COLLAPSIBLE CONTAINER

John H. Fridén, Maplewood, N. J., assignor to The Sun Tube Corporation, Hillside, N. J., a corporation of New Jersey

Application April 30, 1936, Serial No. 77,136

9 Claims. (Cl. 220—27)

This invention relates to an improved form of collapsible container, particularly suited for the packaging of liquids, such as hair tonics, shampoos, rinses and the like. An important object of the invention has been to provide a non-refillable container that is attractive, inexpensive, light, non-bulky, sanitary and easily disposed of when empty. The invention also involves a novel method by which the improved container may be produced.

In fulfilling the foregoing object, the invention provides a thin-walled, metal container formed by the extrusion of tin, lead, zinc, aluminum or other metal of readily extrudable character. One end of the container, through which its contents are intended to be discharged, is sealed by an integral portion of the metal that may be readily removed or punctured when the contents are to be used. A special construction is provided at this end to facilitate the production of a small discharge opening without the use of any tool or implement. The arrangement is such that the aperture produced is relatively fine so that none of the liquid contents will be spilled and no appreciable evaporation loss will take place so long as the contents are completely used up within a reasonable time after the package is opened. To discharge the contents the tube may either be shaken in an inverted position or the walls may simply be squeezed together to squirt out the liquid. The opposite end of the container may be wide open until it is filled and it may then be closed in any convenient way, as by folding and crimping or applying a clip, as is common in the packaging of tooth pastes and the like.

Other objects and advantages of the invention will appear from the detailed description of an illustrative form of container and method of making the same which will now be given in conjunction with the accompanying drawing, in which:

Figures 1, 2 and 3 are schematic views illustrating in vertical section the die and punch used in producing the improved tube, the punch being indicated in different stages of its operation.

Figure 4 is an enlarged, longitudinal section through the end of a tube embodying the invention.

Figures 5 and 6 are views similar to Figure 4, showing the aperture partially and more completely formed, respectively, and

Figure 7 is a perspective view of a finished tube with the aperture forming stem indicated in dot and dash lines.

Referring now to Figures 4 to 7 of the drawing, the preferred form of the container will first be explained. It has a side wall 10, preferably cylindrical, formed of thin metal of a thickness comparable with that of the wall of an ordinary collapsible tube. Any readily extrudable metal or mixture or alloy of metals may be employed so long as the inner surface of the tube will not affect the intended contents. The end 11 of the tube is wide open until it has been filled through this end, after which the wall is preferably simply pinched together and folded several times and crimped to provide a thoroughly liquid-tight seal. This type of closure, indicated at 12 in Figure 7, is well known and need not be explained in further detail.

The opposite end of the tube is completely closed by metal integral with the side wall. The disc-like closure preferably has a flat, central portion 13 and a sloping portion 14 extending downwardly and outwardly toward the side wall. However, this may be varied, if desired. Preferably the thickness of the metal in the closure will be somewhat greater than in the wall 10 to lend greater stiffness to the end of the tube. At the center of the portion 13 a small stem or projection 15 extends in an axial direction. This projection is preferably, though not necessarily, cylindrical in cross-section and of a diameter several times greater than the thickness of the metal of portion 13. The purpose of the projection is to enable the formation of a small aperture through the portion 13 without the use of any implement. For this purpose the stem 15 is simply rocked back and forth a few times and it will be found that the metal of the portion 13 will shear right around the base of the stem. The metal will first give way at one side of the stem, as shown in Figure 5, and then the aperture is made larger as the stem is folded over into the position of Figure 6. It will be clear that the desired result would not be achieved if the stem 15 were made too slender in proportion to the thickness of portion 13 since then the shear would take place at the base of the stem, through its own cross-section, rather than around the stem, through the metal of the closure. Accordingly, the diameter of the stem should be somewhat greater than the thickness of portion 13 and preferably several times this thickness. At the same time it should not be too large as then the discharge opening would be made larger than desired. To facilitate formation of the aperture in the way mentioned, the portion 13 may, if desired, be made slightly thinner than the

portion 14. The latter will in that case supply the desired stiffness to the end of the tube.

The stem 15 need not be completely removed from the tube if it should be desired to use only a part of the contents when the tube is first opened. A partial seal may be effected by restoring the stem to its axial position after a desired part of the contents has been removed. This may be done several times before the stem becomes completely severed. As indicated at 16, in Fig. 6, a narrow neck of metal still unites the stem with the tube when the stem is first bent over and this will stand several bendings before it snaps. In fact, however, the opening provided by the stem may be so small that little loss by evaporation will ordinarily take place within a reasonable time even though no effort is made to seal the opening after it has once been made. A relatively quick discharge may be effected, when desired, by squeezing the tube even though the opening is quite small.

Referring now to Figures 1 to 3, there is illustrated several stages in the preferred mode of production of the improved tube. In general the method consists in applying adequate pressure to an extrudable slug of material by means of a blunt-ended punch while the plug is in a suitable die. The die has a small axial opening at its center to permit a portion of the metal to be extruded downwardly in line with the punch. At the same time a suitable clearance is provided between the punch and the slug receiving recess of the die so that the major portion of the metal of the slug will be extruded upwardly along the punch. There is a combination, therefore, of two different types of extrusion effected by the blunt ended punch.

In carrying out the process a slug 20 of suitable size is deposited in the recess 21 of a die 22. The wall 23 of the recess is preferably formed with a slight taper inwardly toward the bottom while the bottom of the die has an annular sloping portion 24 surrounding a central, flat portion 25. This corresponds with the shape desired at the top of the finished tube. At the center of the flat portion 25 of the die bottom there is provided a small aperture 26 of a diameter equal to that of the stem 15 of the finished tube. This aperture extends completely through the die but its lower portion is preferably enlarged considerably, as indicated at 26a. The slender portion of the aperture need only be slightly deeper than the length of the desired stem 15. A plunger 27 operating within the enlarged portion 26a of the die aperture has a slender extrusion 28 fitting snugly within the lower portion of the slender section of the aperture. Any suitable means, of a character known in the art, may be provided for shifting the plunger axially within the die aperture.

During the extrusion operation the plunger will remain in the position indicated in Figures 1 and 2. At this time the top of the reduced portion 28 of the plunger forms a bottom to the die aperture against which the extruded metal will be forced and beyond which the metal cannot flow. The position of the plunger will, therefore, determine the length of the stem 15. If desired, its normal position may be made adjustable to vary the length of the stem. On completion of the extrusion operation the plunger is forced upwardly in the aperture to assist in ejecting the stem and tube from the die.

A punch 29 directly above the recess 21 is moved axially into the recess with suitable force and rapidity to cause the metal of the slug 20 to be extruded. The diameter of the enlarged end 30 of the punch is slightly smaller than the diameter of the recess 21 so that the metal of the slug will not only be extruded downwardly into the aperture 26 but will also be extruded around the punch, through the passage between the punch and the wall 23, to form the wall 10 of the tube. Any suitable mechanism well known in extrusion presses may be employed for operating the punch. This mechanism will preferably include some means, also well known, for swinging the punch from its position in axial alinement with the die recess into a position enabling the discharge of the tube into a suitable channel for delivery to a conveyor, or the like. The punch is preferably formed with an axial opening 31 through which air may be blown to remove the tube from the punch at the appropriate time. A valve or closure member 32 serves to close the lower end of the punch during the extrusion operation, thus preventing accidental extrusion of metal into the air passage. A set-screw 33 limits the outward movement of the closure. It will be understood that the operation of the plunger 27 will be suitably timed to coincide with the withdrawal of the punch from the die and air will be blown through the punch as it is carried into the proper discharge position.

Should it be desired to make the central portion 13 at the end of the tube thinner than the portion 14, this may be done by forming the conical surface 34 on the punch at a slightly greater angle than the surface 24 of the die so that the passage between them will converge slightly toward the bottom.

The tubes formed by the extrusion operation will be of somewhat irregular form at their open ends but otherwise will be in completely finished condition. The only operation, therefore, actually required to produce a finished tube is the removal of a small section or ring at the open end of the tube. This may be done, in a manner well known in the art, by mounting the tube on a rotating spindle and bringing a cutting edge against the tube at the appropriate point. If desired, the tube may be decorated with any chosen design and for this purpose any of the well known coating and printing devices or machines used in the production of collapsible tubes for tooth paste and the like may be utilized.

While a preferred form of tube and a preferred method of producing the same have been described in considerable detail, it will be understood that various changes may be made in both the tube and the method without departing from the principles and scope of the invention. It will be understood that the terms and expressions used herein have been employed as terms of description and not of limitation.

What I claim is:

1. A collapsible metal container comprising a seamless tubular side wall and an integral end closure including an outer frusto-conical shoulder portion, a continuous, readily shearable central portion substantially in a plane perpendicular to the axis of the tube, and a member integral with and projecting from said central portion, said end closure and member being constructed and arranged to enable said member to shear said central portion and remove a part thereof at the base of said member to permit discharge of the container contents without using an opening implement.

2. A one piece collapsible metal container having one end closed by an integral, continuous end wall, and a slender stem integral with said end wall on the outer face thereof, the cross-sectional area of said stem being substantially less than the area of said wall, and the construction being such that upon rocking said stem back and forth an opening will be formed at its base through said wall.

3. A non-refillable liquid container comprising a collapsible integral extruded metal tube having a readily shearable closure wall, and means carried by said wall for shearing the same and removing a portion thereof to produce a dispensing opening therethrough, said means comprising a stem that is substantially solid at its inner end and integral with said wall of the tube, the cross-sectional area of said stem being substantially less than the area of said wall and being sufficient in relation to the thickness of said wall to bring about shearing of the wall rather than the stem in the course of rocking the latter back and forth.

4. A collapsible container having one end closed by an integral, readily shearable end wall, and a slender stem integral with said end wall and projecting at substantially right angles therefrom, said stem being substantially solid at its inner end, the cross-sectional area of said stem being substantially less than the area of said end wall and being sufficient in relation to the thickness of said wall to bring about shearing of the wall rather than the stem and the removal of a portion of the wall at the base of the stem in the course of rocking the latter back and forth.

5. A thin metal collapsible container having one end closed by an integral, readily shearable end wall, and a slender stem integral with said end wall and projecting therefrom, the end wall extending laterally from the base of said stem, and said stem being readily tiltable by the finger and being sufficiently rigid and solid to cause shearing of said end wall at the base of the stem rather than the stem and the removal of a portion of said wall at the base of the stem upon rocking the latter back and forth a few times.

6. A collapsible container having a readily shearable closure wall, and a member projecting outwardly from said closure wall for shearing the same to produce a dispensing opening therethrough, said member being integral with said wall and sufficiently rigid and solid to bring about shearing of said wall at the base of said member rather than the member and the removal of a portion of the wall at the point of connection of the member with the wall upon rocking the meber back and forth.

7. A non-refillable liquid container comprising a metal tube having integral side and end walls, one of said walls having a readily shearable section, and a stem integral with said section and projecting therefrom for producing an opening therethrough, said stem being substantially solid at its inner end and having a cross-sectional area substantially less than the area of said section and being readily rockable back and forth to shear the metal of said section at the base of said stem and remove a portion thereof.

8. A collapsible container having integrally extruded side and end walls forming a tube with an integral closure at one end, a continuous end wall portion being flexible and readily shearable, and a member integral with said end wall portion projecting from the outer face thereof, the cross-sectional area of the part of said member integral with said end wall portion being substantially less than the area of said portion, said member being constructed and arranged to shear said portion upon manipulation of the member and thus provide a discharge opening.

9. A non-refillable liquid container comprising a collapsible metal tube having a readily shearable wall area, and substantially perpendicular, lever-like means carried by said wall area and anchored thereto at its inner end, said means being substantially solid at its inner end, the substantially solid portion of said means in conjunction with said wall area constituting an imperforate wall portion, said means serving to shear said wall area at the base of said means to produce a dispensing opening.

JOHN H. FRIDÉN.