Sept. 21, 1965 E. T. ALDINGTON 3,207,830

METHOD OF MAKING A REINFORCED CONTAINER CLOSURE

Original Filed Aug. 24, 1959

Fig. 1

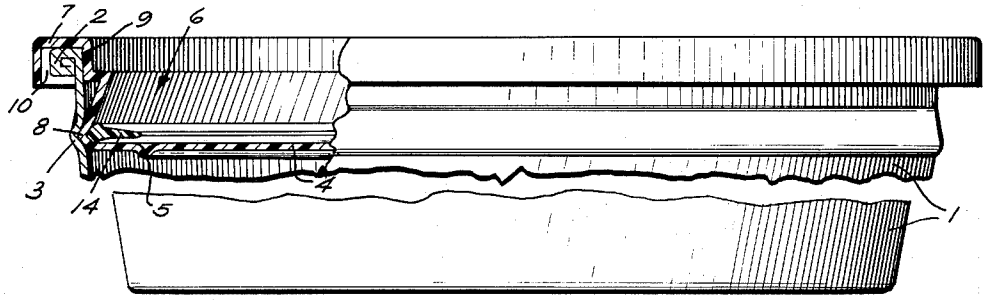


Fig. 2

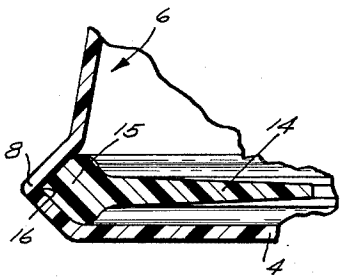


Fig. 3

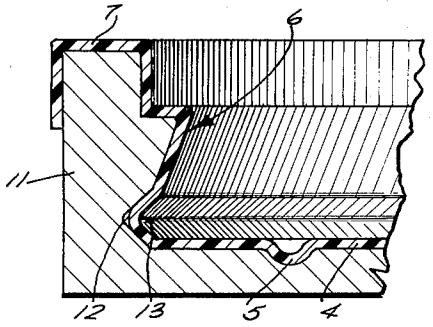


Fig. 4

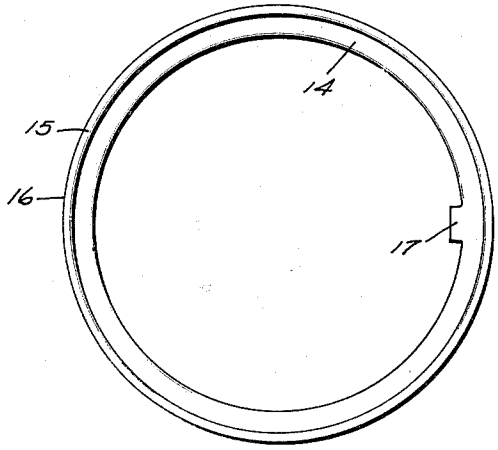
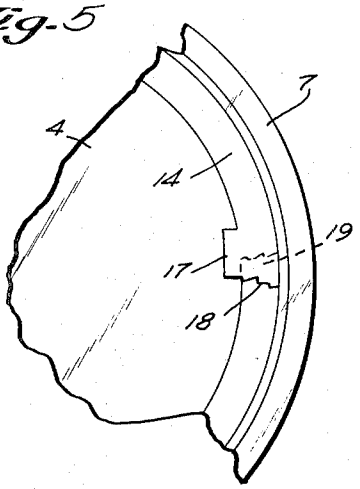


Fig. 5



INVENTOR.

Elmer T. Aldington

BY

Hill Sherman Meroni Gross & Simpson

ATTORNEYS

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3,207,830

METHOD OF MAKING A REINFORCED CONTAINER CLOSURE

Elmer T. Aldington, Potsdam, N.Y., assignor to American Can Company, New York, N.Y., a corporation of New Jersey

Original application Aug. 24, 1959, Ser. No. 835,654, now Patent No. 3,109,575, dated Nov. 5, 1963. Divided and this application Aug. 20, 1963, Ser. No. 303,326

6 Claims. (Cl. 264—242)

The instant application is a division of my copending application entitled "Reinforced Container Closure and Method of Making the Same," filed August 24, 1959, Serial No. 835,654, now Patent No. 3,109,575, which in turn is a continuation-in-part of my application entitled "Reinforced Container Closure and Method of Making Same," filed November 27, 1956, Serial No. 624,585, now abandoned.

This invention relates to improvements in a method of making a reinforced container closure, and more particularly to a method of making a closure of the so-called "coverall" type which is inserted within the mouth of a container and has a formation to overlie and cover the rim bead of the container, the cover seating within a groove formed below the rim bead inside the container to thus establish a seal and maintain the contents of the container pure and clean until consumption thereof, although the invention may have other uses and purposes as will be apparent to one skilled in the art.

Covers made by the practice of the instant invention are most frequently used with relatively thin-walled plastic containers, relatively thick insulated plastic containers, and heavy duty or semi-heavy duty paper containers for the packaging of various comestibles such as ice cream, potato salad, cottage cheese, and hot or cold liquids. While many and various types of covers for such containers have been developed, it has now been found preferable to utilize a transparent thermoplastic cover through which the contents of the container are visible.

Considerable difficulty has been experienced in the past in the making of such thermoplastic covers. It is necessary that the covers be easily applied initially, easily removed from the container without spilling the contents of the container, and easily replaced on the container in the event all of the contents are not consumed at the first usage, and it is desired to store the remainder in the refrigerator. Insofar as the packager of the comestible is concerned, whether it be a manufacturer or a retailer, both the container and the cover are single use items, wherefore economy in the manufacture of the cover is of prime importance. This becomes aggravated by the fact that permissible economy does not allow extremely fine tolerances in the making of the containers, particularly if they are made of paper, and the cover must be capable of accommodating itself to the various container dimensions occurring within the relatively wide tolerance range.

Heretofore, thermoplastic covers have been molded in various ways, but when made economically thin they do not possess sufficient strength and rigidity for ready forceful application to the container either by hand or mechanical means. Such covers also frequently became distorted prior to cooling, or during storage depending upon climatic conditions, and ultimately presented an ill fit when applied to a container. In most instances, covers of this type possess an annular sealing bead and retension and leakproofness are mainly obtained by a compression fit of that sealing bead within a groove formed in the container, and the necessary compression to establish a tight fit in the seating groove must be provided by the cover itself which at the same time must also

compensate for manufacturing variances in the container size. Certain types of molding used heretofore resulted in the cover being thinnest at the seating bead, and it was economically unsound to increase the thickness of the material used at that point. Further, in the mere molding of a thin thermoplastic cover in an economical manner, that cover cannot be provided with a bead having a sharp external profile, since the molding process requires the use of a small radius causing a bending or curvature in the external portion of the sealing bead. Such a radius formation frequently resulted in a loose fit with the container especially with the containers that ran a trifle large or out of round during manufacture.

With the foregoing in mind, it is an important object of the instant invention to provide a method of making a thermoplastic container cover which may be formed of extremely thin material, and providing that cover with added reinforcing means to strengthen the cover to receive compressive forces several times what the cover would otherwise stand without buckling.

Also an object of this invention is the provision of a method of making a thermoplastic container cover of relatively thin material and adding a frangible reinforcing ring to that cover in such a manner that it cannot be removed from the cover without the breakage of the ring.

Also a feature of the invention is the provision of a method of making a thermoplastic container cover, including the steps of molding a coverall type of cover and during that process adding and firmly joining reinforcing means to the cover.

It is also a feature of this invention to provide a method of making a thermoplastic coverall type of container cover including the steps of molding the cover of relatively thin material while the material is in a softened condition, and then shrinking the material around reinforcing means to strengthen the cover.

Still another object of the invention is the provision of a method of molding a thermoplastic coverall type of container cover of thin material and reinforcing the cover by shrinking the material during the molding process onto a frangible reinforcing ring and utilizing that reinforcing ring to complete the shaping of the cover material.

While some of the more salient features, characteristics and advantages of the instant invention have been above pointed out, others will become apparent from the following disclosures taken in conjunction with the accompanying drawing, in which:

FIGURE 1 is a fragmentary elevational view, with parts broken away and parts shown in vertical section, illustrating a reinforced container closure made by a process embodying principles of the instant invention, in operative association with a container;

FIGURE 2 is a fragmentary enlarged vertical sectional view, this figure being an enlargement of the left-hand portion of the cover only as seen in FIGURE 1;

FIGURE 3 is a fragmentary vertical sectional view illustrating an initial step in the process of forming the cover;

FIGURE 4 is a plan view of the reinforcing element alone, prior to association with the cover; and

FIGURE 5 is a fragmentary plan view of the reinforcing element and cover assembly illustrating the first step in removal of the cover from a container.

As shown on the drawing:

In FIGURE 1, a cover made by the instant method is shown in operative association with a container 1 which may be made of thin plastic material, heavy paper or the like, or other satisfactory material, the relative illustrated thicknesses of the cover and the paper being merely for the purpose of adequate illustration, since in most cases the cover itself will be much thinner than the wall of the container.

The container itself is generally frusto-conical in shape and is provided with a body part sloping outwardly toward the mouth of the container and terminating in an outwardly turned annular rim bead 2 circumscribing the container mouth. A short distance below the rim bead the container wall is provided with an inwardly open annular bead formation 3 to provide a seating groove for the intimate reception of a portion of the cover to effectively seal in the contents of the container.

The illustrated cover per se is preferably molded in one piece from a suitable thermoplastic material, a number of such materials being satisfactory for this purpose, among which is polystyrene film.

The finished cover comprises a diaphragm 4 which is preferably substantially flat except for an annular groove 5 adjacent the radially outward portion of the cover, which permits the central portion of the cover to readily expand in keeping with the expansion of the container contents or in the event of an over-filled container. Outside the groove 5 the diaphragm 4 joins an upstanding annular wall portion generally indicated by numeral 6 which in turn merges in an outer annular top portion 7 in the form of an inverted channel which overlies the rim bead 2 of the container forming a downwardly opening groove for the reception of that rim bead 2. Near the diaphragm 4, the wall portion 6 of the cover is deviated so as to form a sharp annular seating bead 8 defining a junction between the wall 6 and the diaphragm 4. When the cover is placed on the container, the seating bead 8 is snapped into the annular groove 3 in the container wall, and the inner part of the channel formation 7 also contacts the inner wall of the container as indicated at 9 in FIGURE 1 to provide another point of sealing contact. As also illustrated in FIGURE 1, the channel portion 7 of the cover is preferably wider than the container rim bead so its depending outer wall of the formation 7 is spaced from the rim bead annually therearound as indicated at 10 to facilitate ultimate removal of the cover. Should the container rim bead be pinched or firmly gripped by both sides of the formation 7, difficulty would be experienced in the removal of the cover without spilling liquid contents.

In the practice of the instant method, a sheet of the thermoplastic cover material is heated in any suitable manner until it is softened. The heated sheet is then disposed over the face of a suitable mold or die 11, and by a sudden differential in air pressure, partial vacuum on the inside of the sheet, or compressed air acting against the outside of the sheet, as may be desired, the sheet is forced into the mold, made to follow the contours of the mold and in general shape the cover as above described. Such a procedure produces a definite curvature both outside and inside the sealing bead of the cover, as indicated at 12 and 13 respectively in FIGURE 3. In many cases the cover will be thinnest between the curves 12 and 13. To overcome the adverse effects of that thinness at that particular location by increasing the thickness of the film is economically impractical.

To stop the present method at that point and endeavor to use the molded sheet alone as a cover for the container would result in extreme difficulty in applying the cover. Due to the flexibility of the cover, it would be tedious and objectionably laborious to force it alone into positive engagement over the open mouth end of the container and insure adequate compensation for manufacturing variances in container size, and also effect a positive seal with the seating groove 3 in the container wall, as well as firm contact at the point 9 between the cover and the container wall.

In the present instance, such difficulties are eliminated by associating an ecomonical reinforcing ring 14 with the cover. This ring may be injection molded or suitably formed from a themoplastic material that may be the same material as the cover, but the ring is preferably thicker than the cover diaphragm 4, and is frangible.

The ring is preferably molded or formed in one integral piece and, as best seen in FIGURE 2, the ring is provided with a thickened outer rim 15 which slopes in both directions toward a sharp bounding edge 16. The ring is also provided with an inwardly extending tab 17 beneath which the user may insert a knife blade, his thumb nail, or some other instrumentality and by a quick upward pressure fracture the ring. While intact, the reinforcing ring is sufficiently strong to give more than adequate stength to the cover when joined therewith, but at the same time it is also flexible. The initial application of the cover forcefully over the container will cause a bellying or upward distortion of the ring due to a slight diametral reduction in its outside diameter, and this results in increasing the sealing effect of the cover with the container.

While it is possible, due to the resiliency of the cover to snap the ring in position after the cover is completely formed, in accordance with the instant method it it better to associate the ring with the cover during the forming operation of the cover. Therefore, immediately after the heated thermoplastic film is forced into the open die 11, the ring, having previously been formed is put in position inside the cover. At that time, the cover may be approximately .035 inch over its normal diameter, and when the cover cools it actually shrinks onto the ring thereby causing a firm union between the ring and the cover and effectively distorting the cover to provide the sharp sealing bead 8, and the objectionable curvatures at 12 and 13 are immediately eliminated. The thinness of the material at the sharp edge 8 is compensated for by the ring, and the ring also maintains the diaphragm 4 of the cover substantially flat during cooling.

The sharp sealing bead is extremely desirable in that it affords far better retention and sealing with the seating groove 3 in the container wall than did such sealing beads heretofore known with a definite curvature. Better compensation is thus obtained for the wide tolerance range in the size of containers.

When the closure assembly, the cover and the ring, is put to use it is a simple expedient to force the closure assembly into the mouth end of the container, either by hand or by suitable mechanical means, the ring providing more than adequate strength for such forcing on of the cover and the cover is not distorted or injured sufficiently to cause a bad fit. The assembly will immediately compensate for variances inside of the container, and there will be a positive and effective sealing of the sharp bead 8 into the seating groove of the container, and there will be definite contact of the cover with the inside of the lip of the container as indicated at 9 in FIGURE 1. Should an attempt be made to remove the entire assembly by hand, such procedure may be objectionably difficult by virture of the tight engagement between the cover assembly and the container. It is therefore a simple expedient to insert some implement beneath the tab 17 of the ring and by quickly pulling upwardly fracture the ring as indicated at 18 in FIGURE 5. Usually such fracture of the ring results in an overlapping of the marginal portions adjacent the fracture as at 19 in FIGURE 5, and thus the over-all diameter of the ring is reduced, faciliating removal of the cover since the effectiveness of the ring is then gone.

The practice of the instant method results in a highly economical cover assembly, it being a simple expedient to place the heated thermoplastic sheet over the open die, force it into the die, apply the ring and complete the shaping of the cover by way of the ring as the cover cools. This procedure permits the cover to be made of material just thick enough to resist skirt fracture during handling but it need not be made of thicker material owing to the strength imparted to it by the reinforcing ring.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. The method of making a reinforced container closure, including the steps of

hot shaping a cover of thermoplastic material, said cover comprising a diaphragm and an upstanding skirt therearound,

placing a reinforcing ring adjacent the junction of the skirt and diaphragm, and

shrinking the cover to the ring.

2. The method of making a reinforced container closure, including the steps of

hot shaping a cover of thermoplastic material, said cover being dished and having an inwardly hollow annular seating bead formed about a small radius,

placing a reinforcing ring having a relatively sharp bounding edge inside said seating bead while said cover is still hot, and

shrinking the cover on the ring in a manner to sharpen the external profile of said bead over the sharp edge of the ring.

3. The method of making a reinforced container closure, including the steps of

hot shaping a cover comprising a diaphragm with an upstanding skirt therearound,

inserting a reinforcing ring of heavier material inside inside said skirt adjacent said diaphragm while the cover is still hot, and

shrinking the cover on the ring whereby the ring distorts the cover to define an annular seating bead and holds the diaphragm flat while cooling.

4. The method of making a reinforced container closure, including the steps of

shaping a heated sheet of thermoplastic material into a container cover comprising a diaphragm with a skirt

therearound and a rounded junction between the skirt and diaphragm,

placing a reinforcing ring having a sharp bounding edge inside said skirt at said junction, and

shrinking said cover over said ring to shape said junction into an externally sharp seating bead.

5. The method of making a reinforced container closure, including the steps of

shaping a heated sheet of thermoplastic material into a container cover comprising a diaphragm with a skirt therearound and a rounded junction between the skirt and diaphragm, and

uniting a frangible reinforcing ring having a sharp bounding edge with said cover by shrinking said cover around said ring and simultaneously shaping said rounded junction into an externally sharp bead over the edge of said ring.

6. The method of making a container closure including the steps of

placing a reinforcing ring having a sharp bounding edge into a hot shaped cover having a diaphragm and a skirt therearound at the junction of the skirt and diaphragm, and

shrinking the cover to said ring and shaping said junction to an externally relatively sharp bead over the edge of said ring.

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ALEXANDER H. BRODMERKEL, *Primary Examiner.*

ALFRED L. LEAVITT, *Examiner.*