United States Patent

[11] 3,620,862

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[33] **Germany**
[31] **P 15 86 209.6**

[54] **METHOD OF MAKING CONTAINER CLOSURE**
3 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **156/69,** 156/198, 156/566, 156/583
[51] **Int. Cl.** **B29d 31/00**
[50] **Field of Search** 156/198, 203–210, 69, 215–218; 229/66

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Primary Examiner—Samuel W. Engle
Attorney—Karl F. Ross

ABSTRACT: To close a container having an open mouth, a mass of synthetic resin is adhesively bonded to this mouth and/or positively interlocked therewith to form a seal with or without the aid of a separate cap also engaged by this mass. A flexible element may be projectingly imbedded in the mass to aid in the removal of the seal.

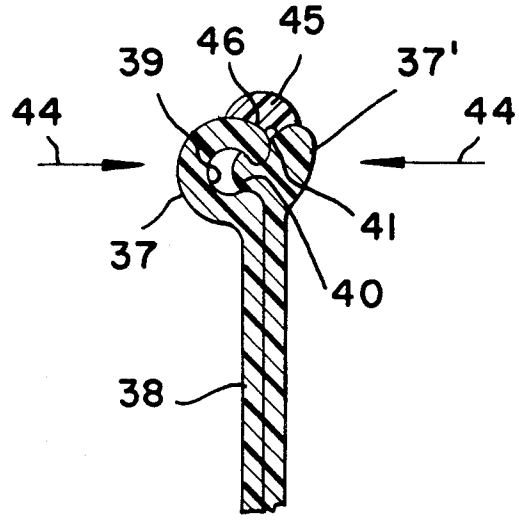


FIG. 1

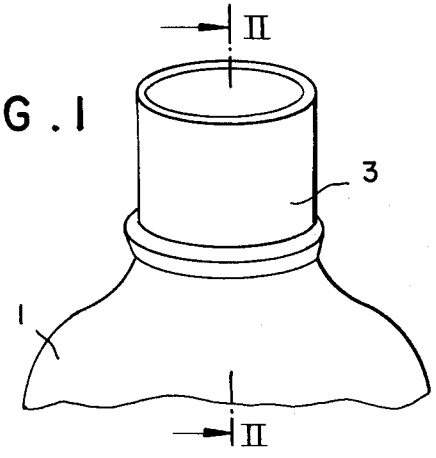


FIG. 2

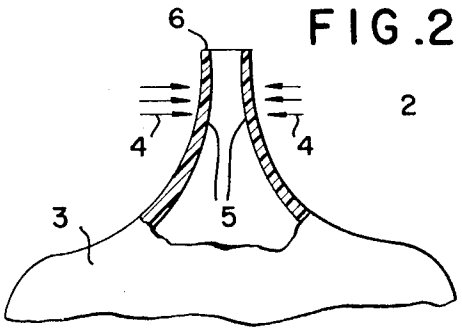


FIG. 3

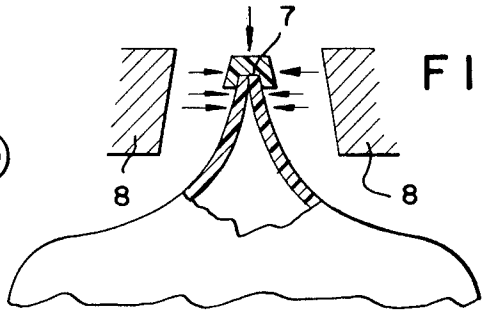


FIG. 4

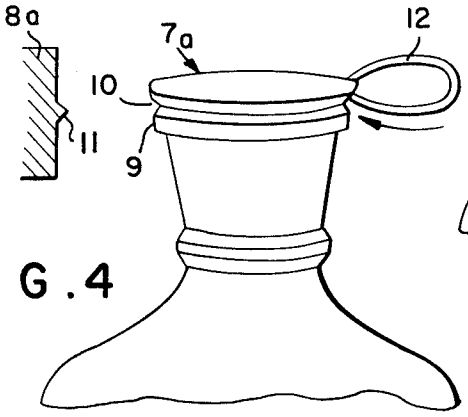


FIG. 5

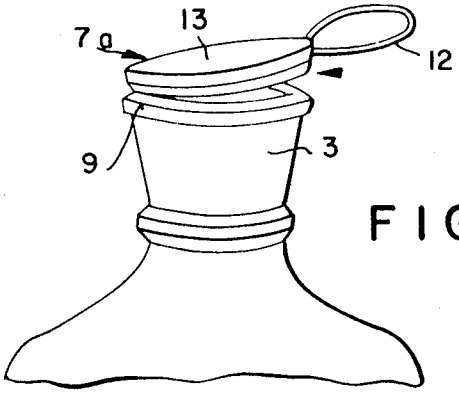


FIG. 6

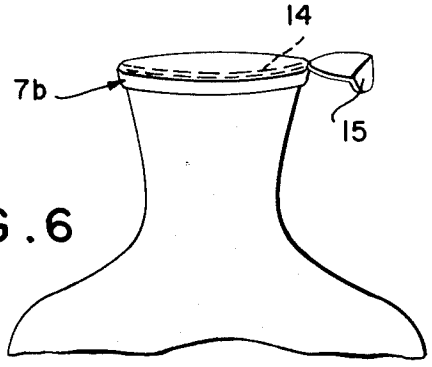
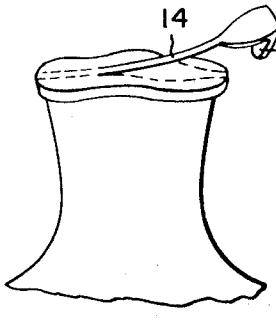


FIG. 7



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FIG. 8

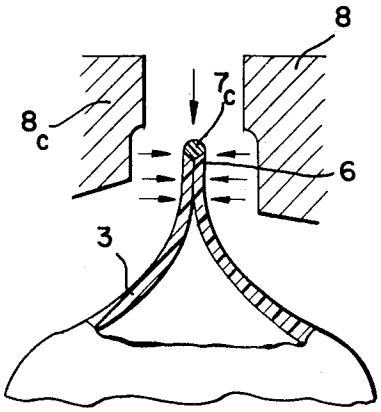


FIG. 9

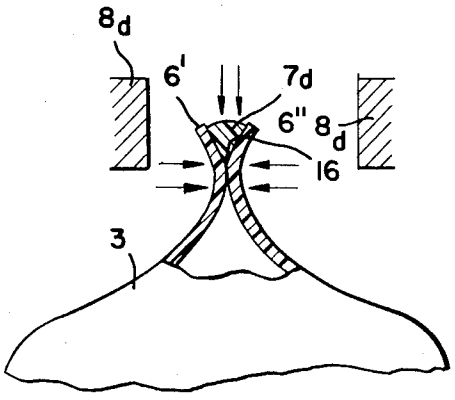
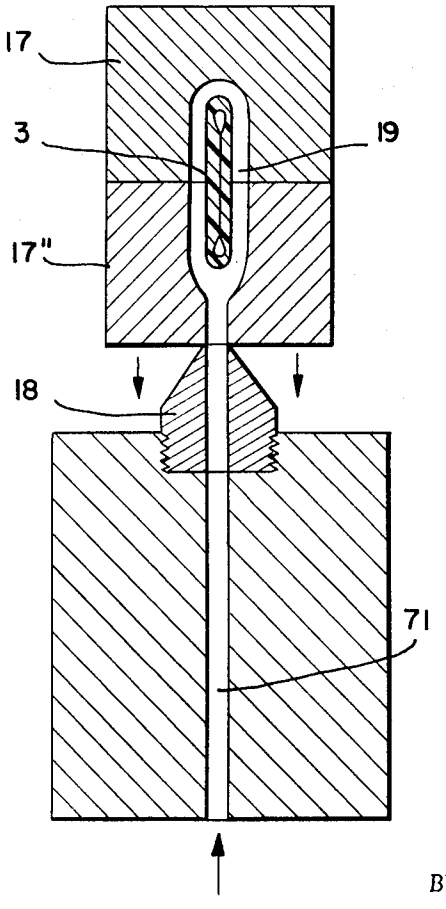


FIG. 10

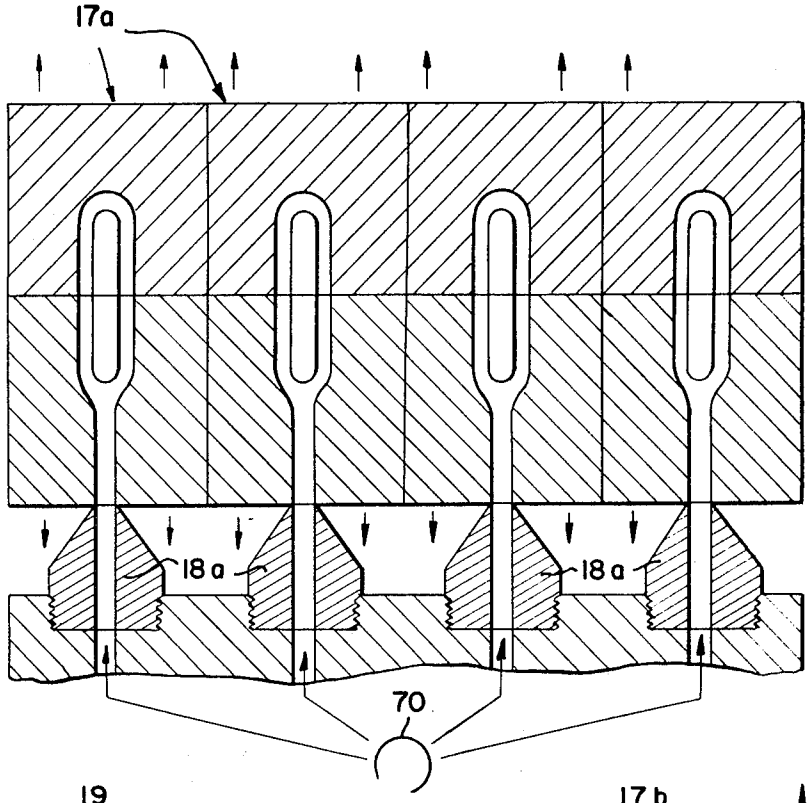


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FIG. 11



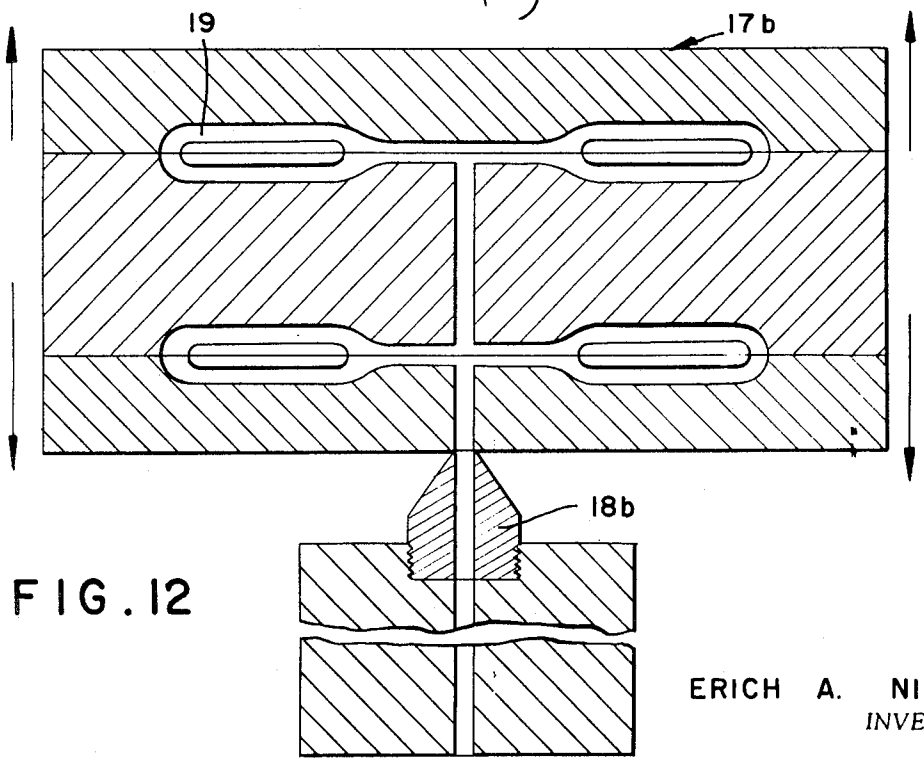


FIG. 12

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FIG. 13

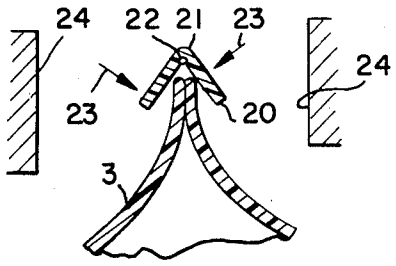


FIG. 14

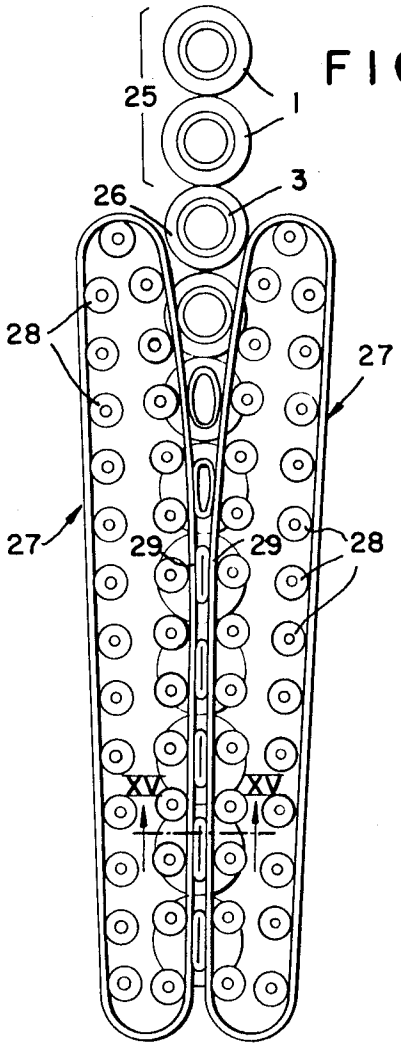
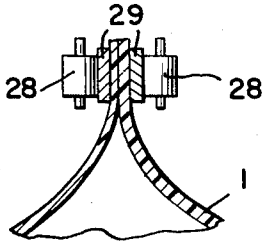


FIG. 15



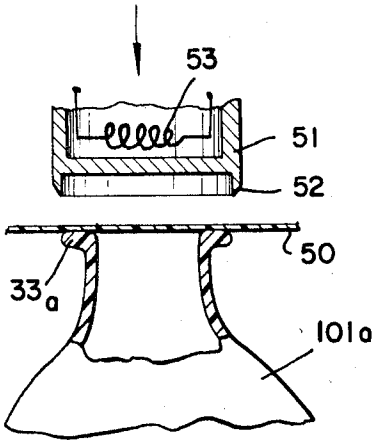
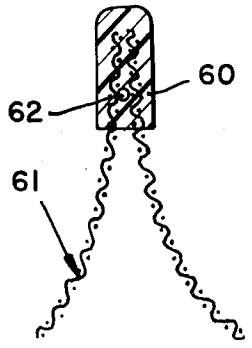


FIG. 21

FIG. 22



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FIG. 16

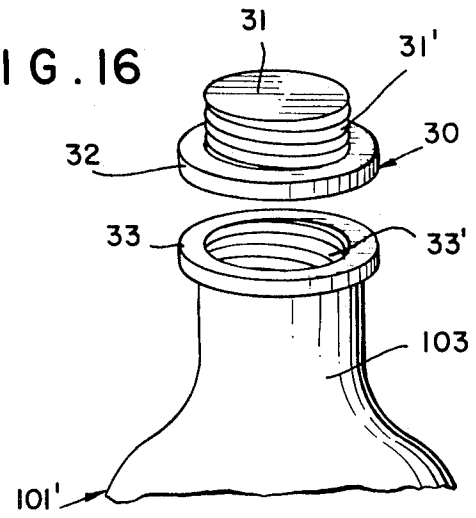


FIG. 17

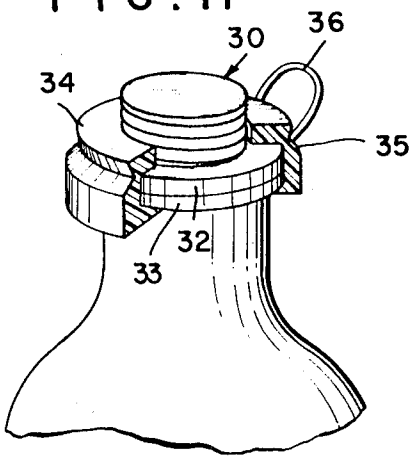
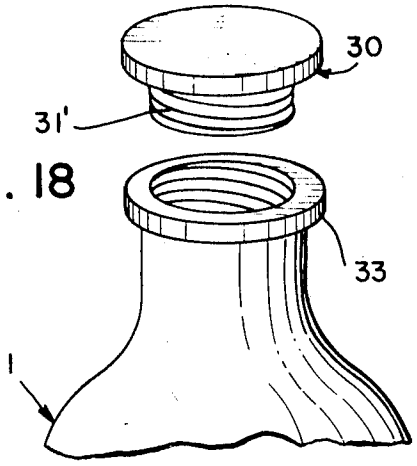


FIG. 18



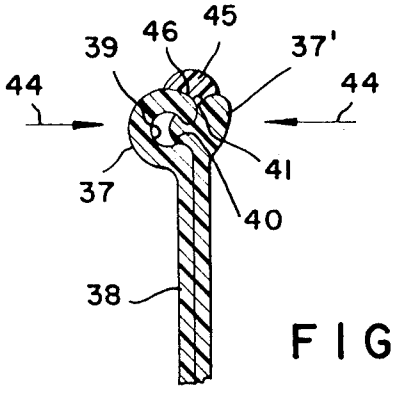
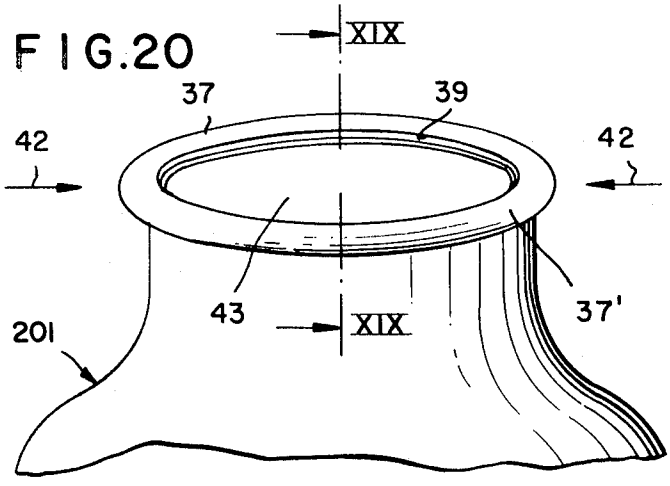


FIG. 19

FIG. 20



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METHOD OF MAKING CONTAINER CLOSURE

My present invention relates to a destructible closure for an open-mouthed container and to a method of making such closure.

The general object of this invention is to provide a method of providing a frangible seal for such a container capable of withstanding rough handling without damage to the seal. More specifically, my intention aims at providing a fluidtight seal of this nature which, while being of relatively simple construction, is not susceptible to loosening or cracking and will therefore effectively guard the contents of the container against contact with the surrounding atmosphere if, according to a preferred field of use, the seal is employed on plastic bottles for the storage of milk or other perishable fluids.

In accordance with my present invention, such a frangible seal is reduced by applying a mass of synthetic resin in a tacky condition and/or in mechanically interlocking relationship to the container mouth and thereafter allowing the mass to harden forming a fluidtight joint along the entire periphery of its mouth. The resinous mass may be applied in a semifluid state, e.g., within an injection or compression mold or as a partly cured plastic film, strip or the like which, upon emerging from an extruder nozzle, is placed in contact with the container mouth and rendered sufficiently tacky for adhesive bonding thereto by the application of heat and pressure.

If the container consists of deformable e.g., elastomeric) material, at least in the region of its mouth, the neck portion of the container may be flattened preparatorily to the application of the resinous bonding agent, with formation of a pair of closely adjoining edges upon or around which the resin may be deposited as an elongate bead. It is also possible to form the seal by folding a resinous foil about the adjoining container edges. In a particularly advantageous embodiment, the adjoining edges are provided with mating formations, such as a rib and a groove, for releasable interlocking prior to application of the seal and, if desired, after rupture of the seal for temporary closure of the container.

If the container is not deformable, or if a flattening of its neck portion is to be avoided for other reasons, the circular, oval or otherwise shaped container mouth may be spanned by an extruded resin foil or strip to be bonded thereto by heat and pressure, the foil being then trimmed along the outline of the mouth. A sturdier seal, however, is obtained in such instances by the use of a solid cap overlying the container mouth, this cap being locked onto the container body by the aforementioned resinous mass. The cap may be provided with an outwardly directed boss which, after rupture of the seal and inversion of the cap, can be inserted into the container as a removable plug.

In order to facilitate the rupture of the seal along a predetermined parting line, a flexible element such as a wire or thread may be imbedded in the plastic mass before the hardening thereof, this element having an outwardly projecting end by which it can be pulled through the seal at the desired location. Thus, in the case of a flattened container mouth clamped shut by the resinous mass, the flexible element or ripcord may lie in the plane of contact of the two adjoining edges and may even extend partly below the seal between these edges, thus within the mouth, so as to cut completely across the resin layer upon being pulled out. Alternatively, or additionally, I may score the outer periphery of the seal at the level of the rim of the container mouth, as by forming a peripheral indentation in a plastic band encircling the container mouth at its rim, whereby the seal is caused to rupture at that level upon being pried open by a suitable tool; advantageously, a handle member may be imbedded for this purposed in a top portion of the seal separated by the peripheral indentation from the encircling band, and an associated closure cap are provided with coextensive peripheral flanges capable of being joined together by mechanical clamping; the seal may be formed by the casting of a clamping ring of dissimilar material about these flanges with avoidance of fusion-bonding at the joint.

The practice of my invention is not limited to containers of plastic or other polymeric material (e.g., rubber); in fact, the container need not even be solid but may consist, for instance, of fabric woven from natural or synthetic fibers, as in the case of a burlap bag. In that instance a plastic bonding agent, in a tacky or semifluid state is allowed to penetrate the interstices of the fabric along the open edge of the bag preparatorily to the formation of the seal. Again, a ripcord may be used to simplify the task of reopening the bag.

The above and other features of my invention will be described in greater detail with reference to the accompanying drawing in which:

FIG. 1 is a perspective view of part of a plastic container in the region of its neck;

FIG. 2 is a cross-sectional view of the container after a partial flattening of its neck, taken on the line II—II of FIG. 1;

FIG. 3 is a view similar to FIG. 2 showing the neck completely flattened and illustrating the formation of a seal therearound;

FIG. 4 is a perspective view similar to FIG. 1 showing a modified seal;

FIG. 5 is another perspective view of the container of FIG. 4 in the process of removal of the seal;

FIG. 6 is a further perspective view of a sealed container neck with an imbedded ripcord;

FIG. 7 is a view similar to FIG. 5 showing the rupture of the seal by means of the ripcord;

FIG. 8 is a view similar to FIG. 3, illustrating the formation of a modified seal;

FIG. 9 is another view similar to FIG. 3, showing a further modification;

FIG. 10 is a cross-sectional view of a mold for making a plastic container with flattened neck adapted to be sealed by the method illustrated in the preceding figures;

FIGS. 11 and 12 are views similar to FIG. 10, showing two different kinds of multiple molds for making such containers;

FIG. 13 is a further view similar to FIG. 3 illustrating the formation of yet another seal;

FIG. 14 is a somewhat diagrammatical view of a device for flattening the necks of a series of containers preparatorily to sealing;

FIG. 15 is a cross-sectional detail view taken on the line XV—XV of FIG. 14;

FIGS. 16–18 are perspective views showing another mode of sealing a container in accordance with this invention, FIG. 16 representing the container prior to sealing, FIG. 17 indicating the completed seal (partly broken away) and FIG. 18 depicting the assembly after rupture of the seal;

FIG. 19 is a cross-sectional view, taken on the line XIX—XIX of FIG. 20, of still another seal according to the invention;

FIG. 20 shows the container mouth of FIG. 19 in an open state prior to application of the seal of FIG. 19 or following removal thereof;

FIG. 21 is a fragmentary sectional view of a container similar to that of FIG. 16 in the process of seal formation according to a further embodiment; and

FIG. 22 is a view similar to FIG. 3, showing the application of the invention to a fabric bag.

In FIGS. 1–3 I have shown a container 1 in the form of a plastic bottle having a neck 3 which terminates at 6 in an open mouth of originally circular or elliptic cross section. The neck 3 is deformable and, in accordance with an aspect of my invention, is flattened by the application of lateral pressure (arrows 4, FIG. 2) to a region 2 whereby the confronting inner neck surfaces 5 are brought into contact with each other. This deformation of the neck may be carried out manually or automatically, e.g., by a pair of endless conveyor members as described hereinafter with reference to FIGS. 14 and 15. Next, a resinous mass is applied to the closed lips of the container mouth in the form of a bead 7 which, upon hardening, prevents these lips from returning to their open position shown in FIG. 1. The bead 7 may be molded around the mouth

6 or applied to it by extrusion; in order to ensure the proper adhesion of the resinous material of the bead to that of the bottle, a pair of pistons 8 are brought to bear upon the flanks of the bead until a warm object is established. The pistons 8 may be heated (e.g., electrically, as illustrated in FIG. 2) to insure that the plastic sealing material reaches the necessary degree of fluidity along it contact surfaces with the container mouth 3.

FIGS. 4 and 5 illustrate a modified bead 7*a* produced by pistons 8*a* (only one shown) which have sharply profiled ribs 11 for forming a peripheral indentation 10 in an annular band portion 9 of the seal, this indentation establishing a weakened zone facilitating separation of a lid portion 13 (FIG. 5) from the band 9. In order to facilitate the breaking of the seal along the score line 10, a handle with a looped end 12 may be partly imbedded in the lid 13. Upon such removal, the neck 3 of the container elastically reexpands together with the residual band portion 9 of the seal so that its contents may be decanted.

The seal, or at least its lid portion 13, may be distinctively colored to designate different contents of the bottle.

As illustrated in FIGS. 6 and 7, a bead 7*b* may be molded around a ripcord 14 ending outwardly projecting tab 15 which again could be distinctively colored or could bear indicia identifying quality or origin.

The ripcord 14 (e.g., a textile thread or a wire) may be allowed to sag slightly below the lip portion of the seal 7*b* in the interior of the container mouth so as to cut clean across the seal on being pulled upwardly as illustrated in FIG. 7.

In FIG. 8 I have shown a plastic bead 7*c* of reduced width overlying the lips of the container mouth 6 without extending downwardly along the outer neck surface to form an encircling band as in the preceding Figures. Suitably shaped pistons 8*c* may be used to provide the necessary lateral and downward pressure, as indicated onto the neck portion 3 of the container.

As shown in FIG. 9, the lips 6', 6'' of the container mouth may be spread apart above a line of contact 16 to form an upwardly diverging wedge-shaped gap receiving a bead 7*d*. Pistons 8*d* serve to compact the bead 7*d* between the lips 6', 6'' in bonded relationship therewith.

A ripcord 14 (FIGS. 6 and 7) may again be used in the embodiments of FIGS. 8 and 9 to dislodge the bead 7*c* or 7*d*.

FIG. 10 illustrates an injection mold for forming a seal of the aforedescribed type, here more specifically the bead 7 of FIG. 3, about the flattened neck 3 of a container by an injection process. Two separable mold halves 17', 17'' define an oblong cavity 19 around the neck 3 which may be held in its flattened state by suitably shaped channels formed in the mold halves at the bottom of the cavity. A nozzle 18, which may be equipped with the usual control valves (not shown), serves to inject the plastic material into the cavity 19, this material being delivered to the nozzle from a compression chamber, indicated diagrammatically at 70 in FIG. 11, via a supply channel 71. Cavity 19 may have an extension (not visible) to accommodate a loop 12 or a tab 15 (FIG. 5–7) on a wire or thread to be imbedded in the plastic mass.

As diagrammed in FIG. 11, a plurality of such molds 17*a* may be operated concurrently via respective injection nozzles 18*a* to form a corresponding number of seals around associated container mouths. FIG. 12 illustrates an alternate arrangement wherein a plurality of cavities 19 are formed in a multiple mold 17*b* and are supplied through a common nozzle 18*b*. Other types of molds, e.g., with cavities arranged in several planes, may of course also be used.

If desired, the container to be sealed may be preshaped with a flattened mouth whose normally closed lips may subsequently be opened by lateral pressure, e.g., as described hereinafter with reference to FIGS. 19 and 20.

In FIG. 13 I show an extruded foil 20 of resinous material folded longitudinally to straddle the flattened mouth of container neck 3 in the manner of a gabled roof; the cross section of this foil is reduced at its vertex 21 to accommodate a ripcord 22. Arrows 23 indicate the bonding pressure to be exerted by a pair of preferably heated clamp jaws or pistons 24.

FIGS. 14 and 15 illustrate a pair of endless conveyor members 27 serving to deform the necks of a series of containers 1 delivered by a supply station 25. The conveyor members 27 include belts 29 engaged by two closed horizontal arrays of rollers 28, some or all of which may be driven, the inner reaches of these belts forming a converging gap 26 within which the container necks are flattened. Means for sealing the container mouth, e.g., as described in connection with FIGS. 2–4, 8, 9 and 13, may be positioned anywhere along the terminal part of the conveyor path just above the belts 29.

The roller-type conveyor members shown in FIGS. 14 and 15 are, of course, representative of a wide variety of transport means for the continuous or intermittent advance of successive containers through a narrowing gap. The rollers or other conveyor elements may also perform directly the pressure-bonding of a foil or bead of resinous sealing material onto the lips of the container mouth.

FIGS. 16–18 represent the case of a container 101 made of nondeformable material such as metal or glass. The neck 103 of this container terminates in an annular flange 33 at the level of its mouth, this flange being coextensive with a flange 32 on a cap 30 having an upstanding boss 31. In forming the seal according to my invention, a plastic ring 34 is molded around the two adjoining flanges 32, 33 and, advantageously, is shaped with an outer peripheral groove 35 to define a weakened annular zone along which the top of the seal may be separated from its bottom portion as previously described; a loop 36, anchored to the cap 30 as shown in FIG. 17, assists in lifting the cap off the container mouth with destruction of the seal.

The boss 31 is dimensioned to fit as a plug into the open container mouth and, for more effective temporary closure, may be provided with the male threads 31' mating with female threads 33' in neck 103. Other complementary formations, such as bayonet lugs, may be employed in place of the threads 31', 33''.

Particularly with the arrangement illustrated in FIG. 17, in which the plastic mass 34 positively engages the container mouth and its cap after hardening, an adhesive bond between this mass and the container and/or the cap is not required. This case is therefore typical of a situation in which the seal and the container are made from dissimilar materials which do not fuse into a homogeneous junction. Again, if desired, a ripcord may be used in lieu of the scoring or indentation 35 in the embodiment of FIGS. 16–18.

FIGS. 19 and 20 show a container 201 of deformable (e.g., plastic) material having a neck 38 which terminates in an annular flange composed of two semicircular or semielliptical lips 37 and 27'. Lip 37 is formed, on its inner surface confronting the lip 37', with a continuous groove 39 adapted to receive a tenon-shaped rib 40 on the opposite lip 37' when the two lips are brought into interlocking engagement as shown in FIG. 19. Upon the initial filling of the container, an elongate bead 45 of resinous material is deposited in a trough 46 formed by these lips (and resembling the gap illustrated in FIG. 9) to seal the container in the manner described above, advantageously with imbedding of a ripcord 41 having a loose end (not shown) projecting from the mass. After the seal is broken, lateral pressure along the line of contact between lips 37 and 37' (arrows 42, FIG. 20) separates these lips to open the container mouth 43. Thereafter, this mouth may be temporarily reclosed, albeit not in a completely fluidtight manner, by pressure in a transverse direction (arrows 44, FIG. 19) to reengage the interlocking formations 39 and 40. Thus, the container 201 may be a milk bottle delivered sealed to a customer to insure freedom from contamination, the unsealed and partly emptied bottle being then provisionally reclosed in the manner described for further storage in, say, a refrigerator.

FIG. 21 shows the formation of a simpler seal according to the invention on a nondeformable container 101*a*. A foil or strip 50 of plastic material, having a width at least equal to the diameter of container flange 33*a*, is deposited atop this flange

so as to span the container opening and is then bonded thereto by a descending plunger **51** having a peripheral cutting edge **52** to trim the strip into a disk coextensive with the flange.

An electric heater has been indicated schematically at **53**. The strip **50** may be delivered to the pressing station **51** directly from an extruder or a pair of calendering rollers of, preferably, adjustable clearance to permit changes in foil thickness.

FIG. **22** shows the upper part of a textile bag **61** whose mouth is sealed in accordance with my invention by a seam **60** of plastic material penetrating the interstices of the fabric on both sides of the mouth. A ripcord **62** is shown imbedded in the sealing mass **60** for the purpose of breaking the seal and opening the bag.

The resinous material used to form the seal of my invention may be any thermoplastic or thermosetting polymer having the mechanical and thermal characteristics required under the particular conditions of use. Naturally, my invention is not limited to the specific embodiments described and illustrated but may be practiced in different modifications or adaptations without departing from the spirit and scope of the appended claims.

I claim:

1. A method of providing a destructible closure for a container having an open mouth at the end of a neck portion of deformable material, said mouth being provided with confronting interengageable formations, comprising the steps of flattening said neck portion below said mouth with releasable interlocking of said formations along a line of contact and creation of an upwardly diverging gap at said mouth above said line, and maintaining the shape of the flattened neck portion by applying a mass of a hardenable synthetic resin to said gap and allowing said mass to harden.

2. A method as defined in claim **1** wherein said neck portion is flattened by progressively deforming same between two converging conveyor members entraining the container.

3. A method as defined in claim **1** the resinous mass is adhered to said mouth by the application of heat and pressure.

* * * * *