

[54] COMPOSITE CLOSURE

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[51] Int. Cl. B65g 67/02

[58] Field of Search 215/40, 46 R, 46 A

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[57] ABSTRACT

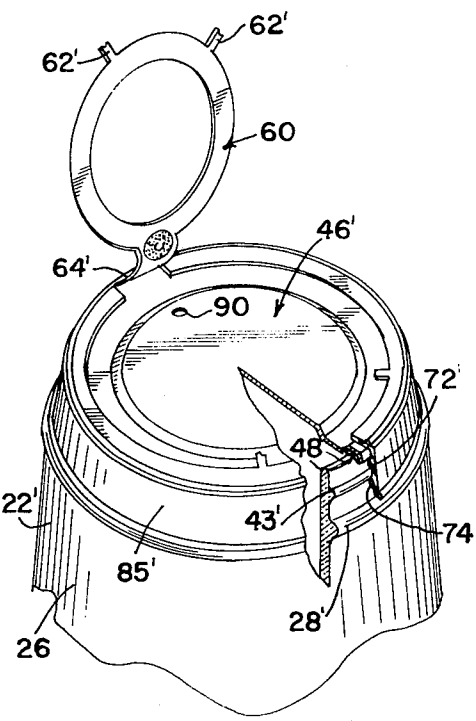
The disclosure relates to improvements in closures

comprising a dependent skirt which encircles a container neck, and which include a pull tab attached to the skirt for removal of the closure.

Preferred embodiments disclosed relate to a composite closure consisting of a flexible, resilient plastic fitment, and a gasketed rigid closure panel. The fitment has a perforate top and dependent skirt. The closure panel is retained within the skirt. A lifting ring in the top of the flexible plastic fitment is joined to marginal portions of the fitment top by breakable bridging portions and by a substantially unbreakable integral hinge portion attached directly to a portion of the skirt. Once breakable bridging portions are broken, the semi-detached ring serves to alert shoppers that the closure has been previously tampered with or removed. The exterior face of a downwardly extending skirt of the plastic fitment is substantially straight, and the interior face includes detent means for engaging the neck of the container. The closure includes means, responsive to the lifting of the ring, for breaking a vacuum within the container before the detent means begins to clear cooperating elements on the neck.

In a preferred embodiment, the closure also includes special positioning of the detent means so that no detent means are positioned on either side of the plastic fitment at a quarter circle from the hinge.

6 Claims, 9 Drawing Figures



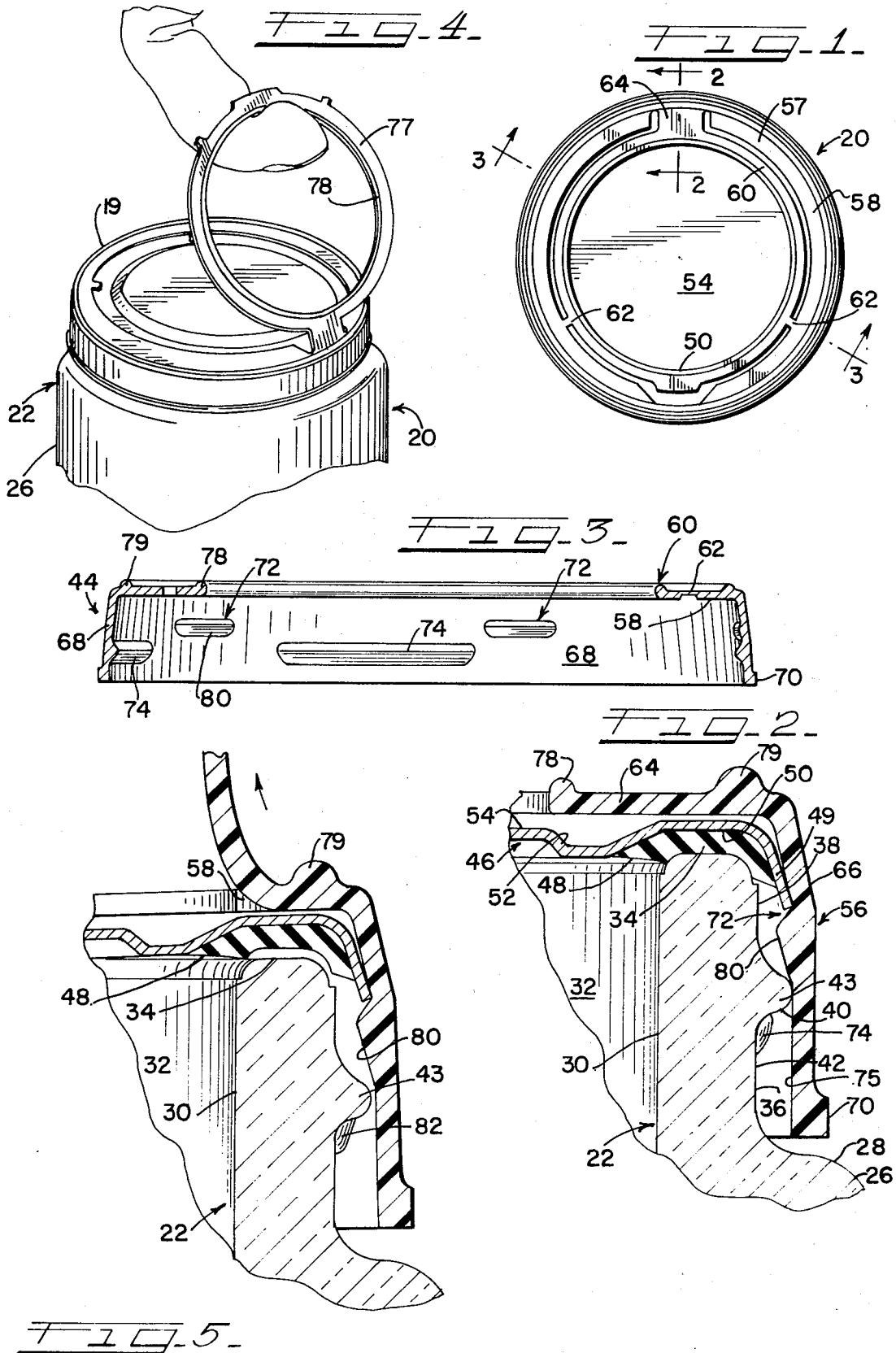


FIG. 6.

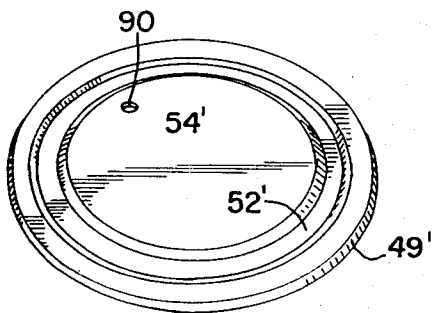


FIG. 7.

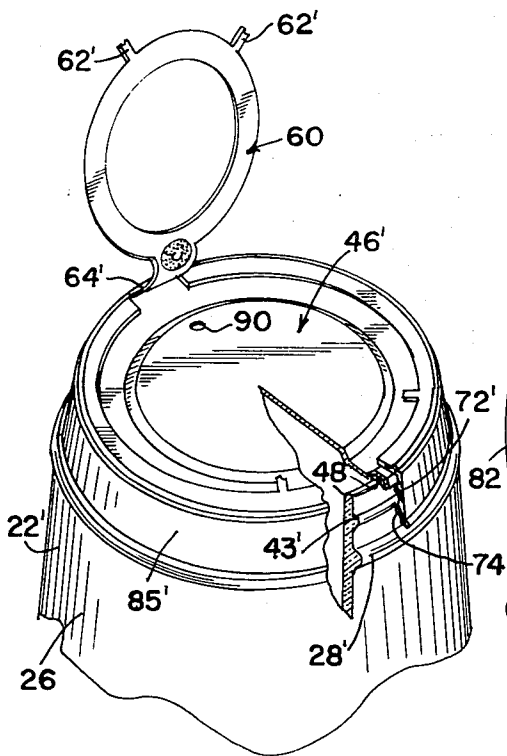
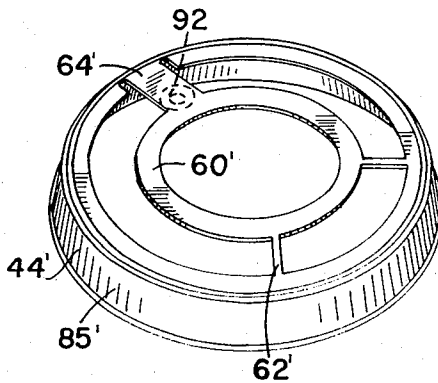


FIG. 9.

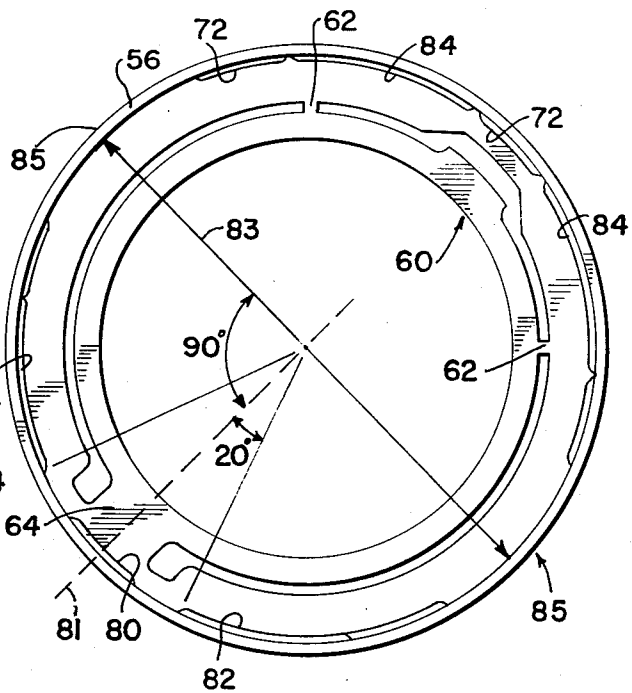


FIG. 8.

COMPOSITE CLOSURE

This invention relates to container packages in general, and in a preferred embodiment, it is directed to a dual-purpose tamper-proof composite closure for use on a container to form a package. This preferred composite closure consists of an outer flexible plastic fitment and an inner rigid closure panel. This invention may be considered an advance with respect to the composite closure disclosed in U.S. Pat. No. 3,460,701.

The rigid closure panel of this invention may be formed from metal, and unlike the composite closure disclosed in the previously cited patent, the closure panel need have no appreciable skirt dependent therefrom.

It has been observed in the course of the utilization of the composite closure heretofore disclosed in U.S. Pat. No. 3,460,701 that the force required to remove the closure must be great enough to release the detent means by which fitment is retained on the neck of the container, and simultaneously break the vacuum by lifting of the inner rigid closure panel from the neck. One approach to making closure removal easier is disclosed in copending patent application Ser. No. 31,650 filed Apr. 24, 1970 by Powalowski and Westfall, said application being owned by a common assignee with the present application. This approach involves providing means for sequentially releasing said detent means and breaking said vacuum by automatically releasing the detents before breaking the vacuum. In the previously filed application, a composite closure is disclosed in which the axially directed forces exerted through the pull tab initially begin the release of the fitment-retaining detent means, and subsequently transmit the axially directed forces to the rigid inner closure member to break the vacuum seal.

Another problem which has been discovered to be inherent in the operation of such two-piece, pull tab closures in which generally axially directed pull-off forces are transmitted to a neck-encircling dependent skirt, is the tendency for the skirt to bow radially inwardly at both sides of the skirt about a quarter circle in either direction from the base of the tab, thus making continued separation difficult, once separation is started.

It is an object of this invention to provide improvements whereby composite closures of this general type are more easily and conveniently removed when desired.

It is a general object of the composite closures improved by the present invention to provide a package which, though reclosable, provides an automatic tamper-warning when the inner seal is first opened. It is an object to provide the art with a composite closure which is extremely difficult, if not impossible, to remove by any means which avoid giving the tamper-warning. It is a further object of this invention to provide a composite closure having a tamper-warning, lifting or removable ring thereon, which ring also serves to permit normal removal of the closure without the aid of tools or the like. It is another object of this invention to provide a new and improved composite closure which is inexpensively manufactured, easily assembled and applied. It is another object to provide such a closure which includes a stacking ring which not only functions as a shock absorbing means to prevent loss of the seal

should the package be subjected to accidental impact, but which moreover assists, to a very high degree, in the stabilization of an article stacked on a like article. It is an important object of this invention to provide means responsive to the lifting of the removal ring for breaking a vacuum seal within the container prior to disengagement of cooperating detent elements which retain the closure on the neck of the container. It is another important object of this invention to provide improved cooperating detent means which greatly facilitate continued separation of the closure from the neck of the container once the separation of the fitment from neck detents has been initiated.

Other objects of this invention will become apparent upon consideration of the following description and the accompanying drawings wherein like reference characters refer to like parts.

The invention is described in general, and in particular in connection with several preferred embodiments hereinafter with the aid of the drawings:

FIG. 1 is a plan view of a composite closure in accordance with this invention;

FIG. 2 is an enlarged fragmentary cross-sectional view taken approximately along the line 2—2 of FIG. 1;

FIG. 3 is a cross-sectional view taken approximately along the line 3—3 of FIG. 1;

FIG. 4 is a fragmentary perspective view illustrating the operation of the closure of this invention;

FIG. 5 is an enlarged cross-sectional view similar to that of FIG. 2 showing the relative position of elements shortly after the vacuum has broken;

FIG. 6 is a perspective view of an alternative construction of the metal closure panel;

FIG. 7 is a perspective view of the composite closure utilizing the panel illustrated in FIG. 6;

FIG. 8 is an enlarged fragmentary perspective, partially sectioned view of the alternative embodiment of FIGS. 6 and 7; and

FIG. 9 is a bottom view of a preferred fitment.

A first preferred embodiment is described hereinafter in connection with FIGS. 1 through 5, and a second preferred embodiment is described with the aid of FIGS. 6 through 8. FIG. 9 is provided to illustrate highly advantageous off-set positioning of upper and lower detent lugs around the circumference of the closure which can be used with either of the foregoing embodiments.

In accordance with this invention, a package generally indicated at 20, comprises a glass container generally indicated at 22 and a composite closure generally indicated at 24.

In the illustrated embodiment, container 22 includes a relatively large product-enclosing portion 26, a shoulder portion 28 and a relatively short cylindrical neck 30 providing mouth 32 through which access to the contents of the product-enclosing portion 26 can be gained. Neck 30 has a top seal finish 34 which provides a seat for the sealing means which will be described hereinafter. The outer surface 36 of neck 30 includes relatively long side finish 38, inwardly necking surface 40, and relatively narrow diameter neck portion 42. Flange 43 extends radially outwardly from the entire circumference of narrow portion 42. In the illustrated embodiment, surface 40 converges downwardly and inwardly and this configuration is a preferred configura-

tion. However, surface 40 may alternatively extend substantially perpendicularly from narrow portion 42.

Composite closure 24 includes outer flexible, resilient plastic fitment generally indicated at 44, and relatively rigid closure panel 46 which includes bonded sealing gasket 48.

Rigid closure panel 46 has the general configuration of a relatively flat disc but includes downwardly extending peripheral portion 49 which encircles end 34 and a small portion of side finish 38 on neck 30. It will be appreciated from a consideration of the enlarged cross-sectional view (e.g., FIG. 2) that closure panel 46 is shaped at its periphery, and in the region immediately adjacent to its downwardly extending peripheral portion 49, to provide a downwardly opening concave gasket channel 50, and upwardly opening concave portion 52 adjacent, and immediately inwardly of channel 50, and central, generally flat portion 54.

Flexible gasket 48 is preferably permanently bonded to closure member 46 within downwardly opening concave channel 50 thereof. It will be appreciated from the enlarged cross-sectional view that, when a container in accordance with this invention is assembled, gasket channel 50 mates with end finish 34, and the lower surface of gasket 48 takes on the shape of end finish 34 to provide a reliable hermetic seal. Thus, rigid closure panel 46 has the general appearance, as indicated hereinbefore, of a generally flat disc, and gasket 48 lines the recess of concave portion 50. When the container 20 is vacuum sealed, atmospheric pressure on rigid panel 46 urges gasket 48 even more firmly against end finish 34.

It will be appreciated from the description following, that when like containers 24 are stacked on top of one another, panel 46 provides a seating function. Structures in flexible fitment 44 provide the full mechanical equivalent of stacking rings. However, depending on the particular configuration of the bottom of bottle 22, upwardly opening concave portion 52 of panel 46 may function in part as an annular stacking groove.

Plastic fitment 44 includes substantially cylindrical skirt portion 56 depending from a top panel, generally indicated at 57. Panel 57 comprises inwardly extending fragmentary planar flange portion 58, and lifting ring 60 which are joined by a plurality of readily breakable bridging portions 62, 62. It will be appreciated from a consideration of FIG. 1 that the only direct connection in the horizontal plane, i.e., the plane of panel 57, between lifting ring 60 and flange 58, are bridging portions 62, 62, and that lifting ring 50 is also directly connected to dependent skirt 56 by relatively wide band 64. Band 64 is an integral hinge due to the flexible character of fitment 44.

Skirt 56 includes a smooth outer face 66 and, in cross section, as seen in FIGS. 2 and 3, has a relatively thin portion 68, and a thickened end portion or collar bead 70. Dependent skirt 56 also includes a number of co-planar upper bead means, or lugs 72 extending radially inwardly from wall 68, and a plurality of co-planar lower bead means, or lugs 74 which also extend radially inwardly from wall 68.

As used herein, the terms "upper," and "lower," refer to the relative position of elements when the container is in its assembled condition and is standing upright.

Thus, only the inner surface 75 of fitment collar 56 is shaped for mating with structures on container neck 30, and with downwardly extending peripheral portion 49 of rigid closure panel 46. Upper lugs 72 are positioned on wall 68 to engage peripheral portion 49 of closure panel 46 and to secure closure panel 46 adjacent end panel 57. Lower lugs 74 are positioned to engage radially outwardly extending flange 43 of neck 30 and thus secure fitment 44 to neck 30. The relative position of lugs 72, 74 around the circle of fitment 44 is an important part of the present invention, and the relative positioning will be discussed more fully hereinafter with the aid of FIG. 9.

Lifting ring 60 includes relatively flat, thin portion 77 and thickened central bead-like portion 78. Fitment top panel 57 also includes upwardly extending bead or boss 79 at its periphery. It will be appreciated from the following description that thickened central portion 78 not only serves to structurally reinforce lifting ring 60, but moreover serves to prevent cutting of fingers when pulling ring.

Composite closure 24 is assembled by inserting rigid panel 46 into plastic fitment 44 and snapping it in place above detent lugs 72. Thereafter it is extremely difficult to separate these members, and rigid panel 46 remains with fitment 44 whenever closure 24 is removed. Package 20 is assembled by snapping closure 24 in place on neck 30, whereby lower detent lugs 74 engage bead 43. It will be appreciated that a lug 74 is shown in cross section in FIG. 8, whereas in FIG. 2 and FIG. 5, only a tapered end portion of lugs 74, and 82 respectively, are visible in perspective in the background. In FIGS. 2 and 5 most of lugs 74, and 82, respectively are obscured from view by neck 30. This positioning is further explained with the aid of FIG. 9.

Referring now to FIG. 9, it will be appreciated that the respective and relative angular positions of hinge 64, upper lugs 72, and lower lugs 74 are particularly important with respect to the operation of the embodiment of the invention described in FIGS. 1-3. However, these relative angular positions can be used to advantage in the embodiment described hereinafter in connection with FIGS. 6, 7, 8. Thus one of the upper lugs 72, hereinafter referred to as hinge lug 80, is substantially centered with respect to the center line 81 of hinge 64 and lug 80 extends around skirt wall 68 through substantially the same arc which encloses hinge 64. In the illustrated embodiments, lower detents 74 include lugs 82, 82 and an opposite pair of lugs 84, 84. Lugs 82 are those lower lugs 74 which are closest to hinge-lug 80. Lugs 82 are angularly spaced apart from hinge-lug 80 by a substantial arc. In the illustrated embodiment the bead-retaining portions of lower lugs 82 do not begin within an arc which is about 20° from the center line 81 of bridge 64. It will be noted that lower lugs 82 do not overlap hinge-lug 80.

Diameter line 83 is shown at right angles with center line 81. The second pair of lower lugs 74 are those lower lugs 84, 84, which are more or less diametrically opposite lugs 82, 82, respectively. It will be noted that lugs 82 are circumferentially spaced apart from lugs 84. In the illustrated embodiment, the centers of respective lugs 82 are more than a quarter circle arc away from the center of the respective nearest lug 84. In the illustration of FIG. 9, diameter line 83 is shown substan-

tially at right angles with respect to center line 81. Thus, in the illustrated embodiment, circumferentially adjacent respective lugs 82, 84 are positioned to begin approximately 40° on opposite respective sides of line 83. Thus the side regions 85 of skirt 56 are completely free of neck-engaging detent lugs 74 such as lugs 82, 82, 84, 84. However, the sides may be free of detents 74 in accordance with this invention for a greater or smaller arc than that illustrated. It is preferred, however, that the detent free arc extend at least about 20° on either side of line 83. In addition to the upper hinge-lug 80, several other upper lugs 72 are more or less randomly positioned around the circumference of skirt 56.

A second preferred embodiment is illustrated in FIGS. 6, 7 and 8. In these illustrations many of the elements and structures are obviously substantially identical to those described hereinbefore, and these substantially identical elements will be identified with primed numbers corresponding to those used to reference previously described elements and structures.

Flat central portion 54' of metal closure panel 46' includes relatively small perforation 90 near its periphery. Perforation 90 is positioned to lie radially inwardly of sealing gasket 48 below either hinge 64' or lift ring 60' (See FIG. 7). Adhesive 92 seals a portion of the lower face of hinge 64' or lift ring 60 to the upper surface of flat portion 54' in a zone completely surrounding perforation 90, providing a hermetic seal around perforation 90.

OPERATION

Operation of the embodiment described in FIGS. 1-3 will be described with the aid of FIGS. 4-5 and operation of the embodiment described in FIGS. 6-7 is further described in FIG. 8, and in the discussion below relating to FIG. 8.

When, in accordance with the use of this invention, lifting ring 60 is disconnected from planar flange portion 58 by breaking of bridging portion 62, 62 (See FIG. 4), hinge 64 can transmit axially directed forces directly to skirt 56. As perhaps best appreciated from a consideration of FIG. 5, the direction in which force is applied, when lifting ring 60 is substantially perpendicular to end panel 57 of package 20, is substantially parallel to the elongated (axial) dimension of skirt 56. It will be appreciated that the initial forces which are thus supplied will be concentrated at hinge-lug 80 which is positioned centered with hinge 64. It will be further appreciated that the initial lifting forces, because of the flexible quality of the fitment 44, will cause skirt 56, in the immediate region of hinge 64, and hinge-lug 80, to flex upwardly even though fitment-retaining lugs 82 remain engaged below neck flange 43. This concentration of lifting forces at that portion of metal closure 46 which engages hinge-lug 80 tends to peel the relatively stiff closure panel 46, and more specifically gasket 48, bonded to panel 46, away from end finish 34 (See FIG. 5). It is noted that a small clearance between planar flange portion 58 of plastic fitment 44, and opposing portion of metal closure panel 46 comes advantageously into play during this phase of the lifting operation. It should be emphasized that it is not essential to provide such clearance, and flange portion 58 can bear against closure panel 46, if desired. If the clearance is provided, the closure panel 46 can be

peeled upwardly slightly before those portions of rigid closure panel 46 above lugs 82 actually engage fitment top panel 58. Not until rigid closure panel 46 engages fitment top panel 58, above lugs 82, are the axially upward lifting forces exerted through hinge 64, transmitted both through closure panel 46 and through dependent skirt 56 to fitment-retaining lugs 82. Prior to this, however, the vacuum is broken. Hence, as a consequence of the described cooperative structural and physical property relationships of the elements of this invention, bonded gasket 48 is lifted slightly from end finish 34 to break the vacuum within sealed package 20 prior to substantial urging of plastic fitment-retaining lugs 82 over fitment-retaining flange 43. As a result, substantially all the initially exerted axial forces are applied to breaking the vacuum, and once the vacuum is broken, only those axial forces necessary to ease fitment-retaining lugs 82, 84 over neck flange 43 need be applied.

The operation of the embodiment shown in FIGS. 6-7 is illustrated in FIG. 8. When, in accordance with the use of this preferred embodiment of this invention, lifting ring 60' is disconnected from planar flange portion 48' by breaking of bridging portions 62', 62' (See FIG. 8) hinge 64' is peeled away from flat central portion 54' of metal closure panel 46'. As bridging portion 64' is peeled away, adhesive 92 separates, thus opening perforation 90 and breaking the vacuum. In the embodiment illustrated in FIGS. 6-7, it is also apparent, therefore, that the embodiment provides means for breaking the vacuum which are responsive to lifting of ring 60' prior to urging of fitment-retaining lugs 74' around fitment-retaining flange 43'.

Thus, both of the preferred embodiments described hereinbefore include means, responsive to the lifting of ring 60, 60' for releasing the vacuum within sealed package 20, 20' before closure-retaining lugs 74, 74' are moved over cooperating closure-retaining neck flange 43, 43'.

As indicated above, preferred embodiments of the invention do not include fitment-retaining lugs 74 along the sides 85 of the fitment 44. By "sides" of the circular fitment is meant those portions along the circumference of the fitment, e.g., 90° arcs, which are most distant from a center line 81 of fitment 44 drawn through hinge 64. Thus, this feature is provided, preferably, with either of the embodiments disclosed in FIGS. 1-3 and in FIG. 8.

It is not intended that the invention be limited by any theories. However, the elimination of fitment-retaining lugs at the sides of the fitment 44 in accordance with this invention is believed to be particularly advantageous during the removal of composite closure 24 at that state of separation after fitment-retaining lugs 74 are initially eased around fitment-retaining bead 43. It has been observed that the initial peeling of composite closure 24 from end finish 34, with the inherent tendency of fitment 44 to flex, causes the side portion 85 of skirt 56 to be urged radially inwardly. It has been discovered that this radially inward urging of the side portions 85 of skirt 56, caused inordinate binding of any detents provided at the sides, caused bottom extremes to tend to cup around bead 43, and thus cause a combination of factors working against easy removal of closure 24. Thus, elimination of fitment-retaining lugs

74 from the side region 85 of skirt 44 greatly facilitates the continued peeling of composite closure 24 from neck 30. During the final stages of removal of composite closure 24, therefore, the closure is not necessarily moved axially, but tends to be moved radially during disengagement of the last fitment-retaining lugs 84 from flange 43. Another possible explanation for the greatly improved performance of the preferred closures of this invention is that elimination of the side neck-engaging detents from skirt 56 may permit the bottom sides of the skirt to flex inwardly move easily during the initial axial pull, thus better allowing that portion of the skirt 56, especially near bottom bead 70 and adjacent the tab hinge 64 to flex outwardly and be more readily flexed upwardly to break the seal in the embodiment of FIGS. 1-4, and then be eased over flange 43.

It will be appreciated from a consideration of FIGS. 1, 2, 3 and 5 that the peripheral flange 58 of plastic fitment 44 overlays a peripheral portion 50 of closure panel 46, and that bead 78 overlays the inner extreme of upwardly opening recess 52. Thus, in the illustrated preferred embodiment, boss or bead 79 defines an outer limit of a complex stacking ring association of elements which is actually a combination of the two members, namely fitment 44 and closure panel 46. Thus outer boss 79 of plastic fitment 44 acts in cooperation with upwardly opening, concave recess 52 in closure panel 46 and radially inward bead 78 to define a composite annular stacking groove. Thus a mating bottom (not shown) of a like package can rest in, and be stabilized by, the composite stacking ring described hereinbefore.

In the embodiment illustrated in FIGS. 6-8 vacuum release opening 90 is shown off-center with respect to closure panel 46. It is to be understood that such positioning is not essential. For example opening 90 and the cooperating area on fitment 44 can be centered with respect to metal closure panel 90. The latter positioning has a substantial advantage in that it would not require that panel 46 and plastic fitment 44 be in any specific angular alignment.

Plastic bridging portions 62 are preferably narrow, as illustrated, to facilitate breaking, and to facilitate the flexing of panel 57 so that narrow portion 58 of lift ring 60 can reside within depression 52 to provide some shock absorbing function when a plurality of packages of this invention are in stacked configuration.

As indicated in the drawings, it is preferred that skirt 68 and bead 70 extend downwardly to close proximity with shoulder portion 28 or an equivalent structure on container 22, so that fingers cannot get under the edge.

We claim:

1. A press-on, pull-off closure for maintaining a vacuum in a container whereby the closure and container provide a package which is readily opened by a consumer without the use of tools, said closure having a generally cylindrical depending skirt portion which is adapted to extend down around a neck of said container, said skirt including first detent means for releasably securing said closure to said neck, said skirt having attached thereto a lift element comprising a tab means and a hinge attaching said tab means to said skirt, said lift element being adapted for lifting of same by said consumer, for lifting said closure from said con-

tainer, which closure includes vacuum release means responsive to said lifting of said lift element for breaking said vacuum within the container prior to substantial release of said first detent means from said neck.

2. The closure of claim 1 which comprises a flexible, resilient plastic fitment and a rigid, disc-shaped gasketed closure panel, wherein said fitment has a perforate end panel with said skirt depended therefrom, wherein said perforate end panel includes said lift means, wherein said tab means is releasably attached to other portions of said end panel by at least one readily frangible bridge, and wherein said closure panel is retained within said skirt adjacent said end panel by second detent means extending radially inwardly from said skirt.

3. The closure of claim 2 wherein said closure panel is shaped to include a shallow, upwardly opening, concentric depression, and wherein said fitment includes a pair of slightly elevated concentric beads respectively adjacent the radially outward and radially inward extreme of said depression, wherein said depression and said beads are cooperatively disposed as a composite stacking ring.

4. A package comprising in combination a container, and a composite closure; said container including enlarged product-enclosing portion, a shoulder portion, and a neck portion, the neck portion having a top seal finish, and having a continuous outwardly extending neck bead around the entire circumference thereof; said composite closure including a substantially disc-shaped rigid closure panel member, and a flexible outer neck-engaging fitment, said relatively rigid closure member having means for forming a compression seal adjacent to the periphery thereof by which said closure member sealingly engages said top seal finish of said neck, said rigid closure member having an outer periphery extending radially outwardly of said compression seal, said flexible outer fitment including a perforate end panel and a skirt depending from said end panel, said skirt having pull tab means attached at one axial end thereof by a flexible hinge, said dependent skirt including an inwardly directed fitment-retaining first bead means for engaging said neck bead and for retaining said fitment on said neck, said dependent skirt also including closure panel retaining second bead means between said first bead means and said perforate end panel, said second bead means being in the form of a plurality of second lugs intermittently disposed around said neck, one of said second lugs being a hinge-lug positioned concentrically with said hinge, said first bead means being in the form of a plurality of first lugs, wherein respective first lugs are positioned spaced apart from said hinge-lug a sufficient distance whereby the skirt, in response to axially directed forces transmitted through said hinge, can flex upwardly a sufficient distance to move said hinge-lug against an opposing portion of said outer periphery and lift a portion of closure panel member from said top seal finish to break the seal before the first bead means is moved axially upwardly over said neck bead.

5. A package comprising in combination a container, and a composite closure member; said container including an enlarged product-enclosing portion, a shoulder portion, and a neck portion, the neck portion having a rounded end finish thereof, and having a con-

tinuous outwardly extending neck bead around the entire circumference thereof; said composite closure member having a substantially disc-shaped rigid closure panel member and a flexible outer neck-engaging fitment, the relatively rigid closure member having means for forming a compression seal adjacent the periphery thereof by which said closure member sealingly engages the end of said neck, said rigid closure member having an extended peripheral portion which extends radially outwardly of said compression seal; said closure panel member having a perforation passing therethrough radially inwardly of said compression seal; said flexible fitment including a perforate flexible end panel and a skirt dependent therefrom, said end panel comprising a lift element including a tab means and a hinge attaching said tab means to said skirt, said composite closure including means for hermetically sealing a portion of said lift element to said

closure panel member in a zone surrounding said perforation for hermetically sealing the perforation, said fitment including at least one frangible bridge means for releasably connecting said tab means to a portion of said perforate end panel.

6. A press-on, pull-off closure for containers having a neck and continuous circumferential bead means extending radially outwardly from said neck, said closure comprising a flexible cap having a depending skirt portion which is adapted to extend down around said neck of said container, said cap having tab means attached to said skirt portion by a hinge, which skirt portion includes detent means for engaging said continuous circumferential bead means, and wherein said skirt portion is free of said detent means at both sides of said skirt portion with respect to a center line drawn through the hinge.

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