United States Patent

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[54] SELF-CENTERING AND VENTING CLOSURE

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[73] Assignee: Growth International Industries Corp., Cleveland, Ohio

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[21] Appl. No.: 66,529

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 883,694, Dec. 10, 1969, abandoned.

[52] U.S. Cl. 215/41, 215/42, 215/40, 150/5, 220/60, 215/56

[51] Int. Cl. B65d 41/22

[58] Field of Search ..... 215/41, 56, 42, 40; 220/60, 220/44 R, 42 C; 150/5

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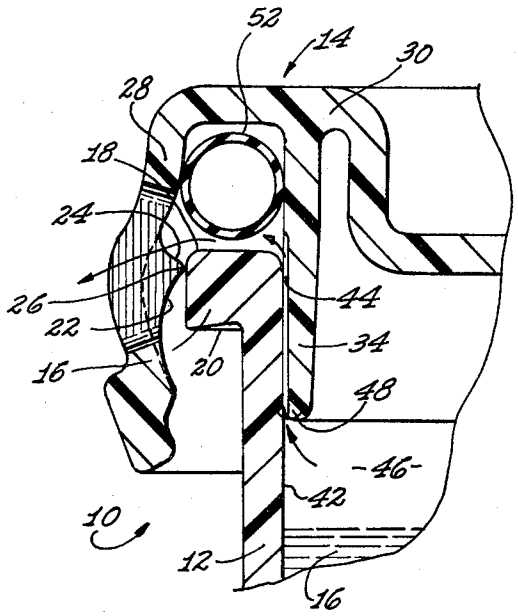
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[57] **ABSTRACT**

A closure having an outer annular leg to engage a bead about the rim of an open container body, an annular flexible sealing leg having spaced recesses to allow compressed gas to escape during the engagement of the closure to the container body and to provide a seal when the engagement is complete, an inner annular leg and a generally flat center portion to compensate for stresses during cooling of the molded closure and to act as a receptacle for a stacked container. The outer annular leg also has an end recess for self centering of the closure upon the container rim.

9 Claims, 5 Drawing Figures



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Fig. 1

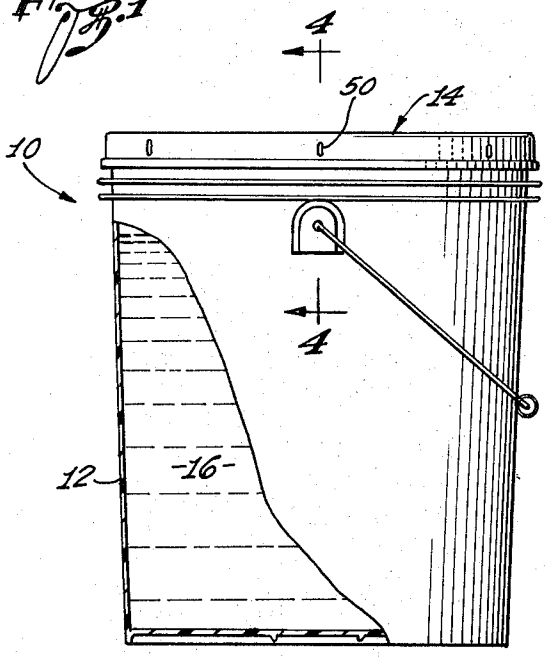


Fig. 3

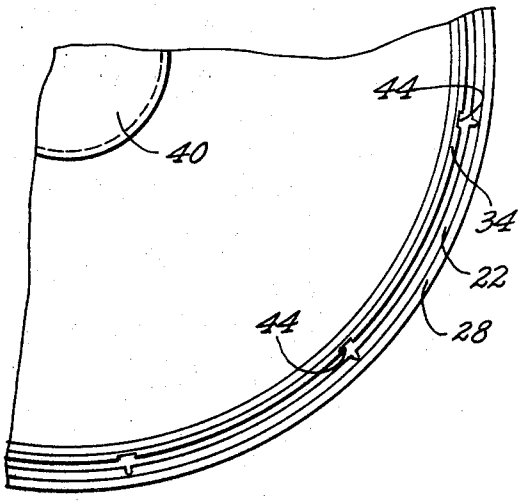
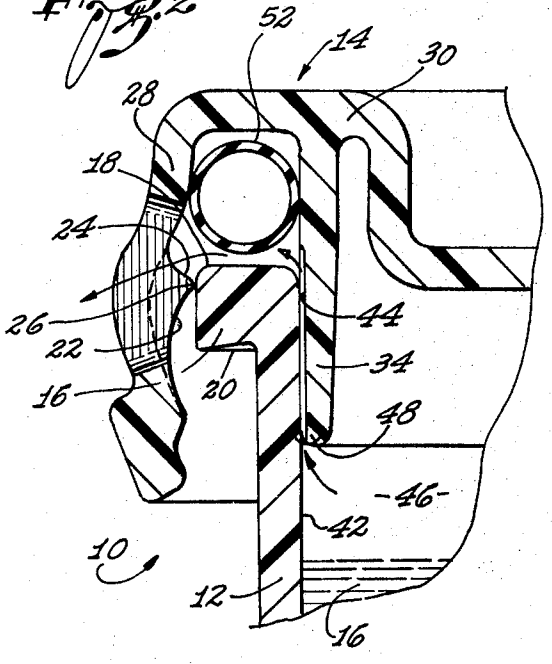


Fig. 2



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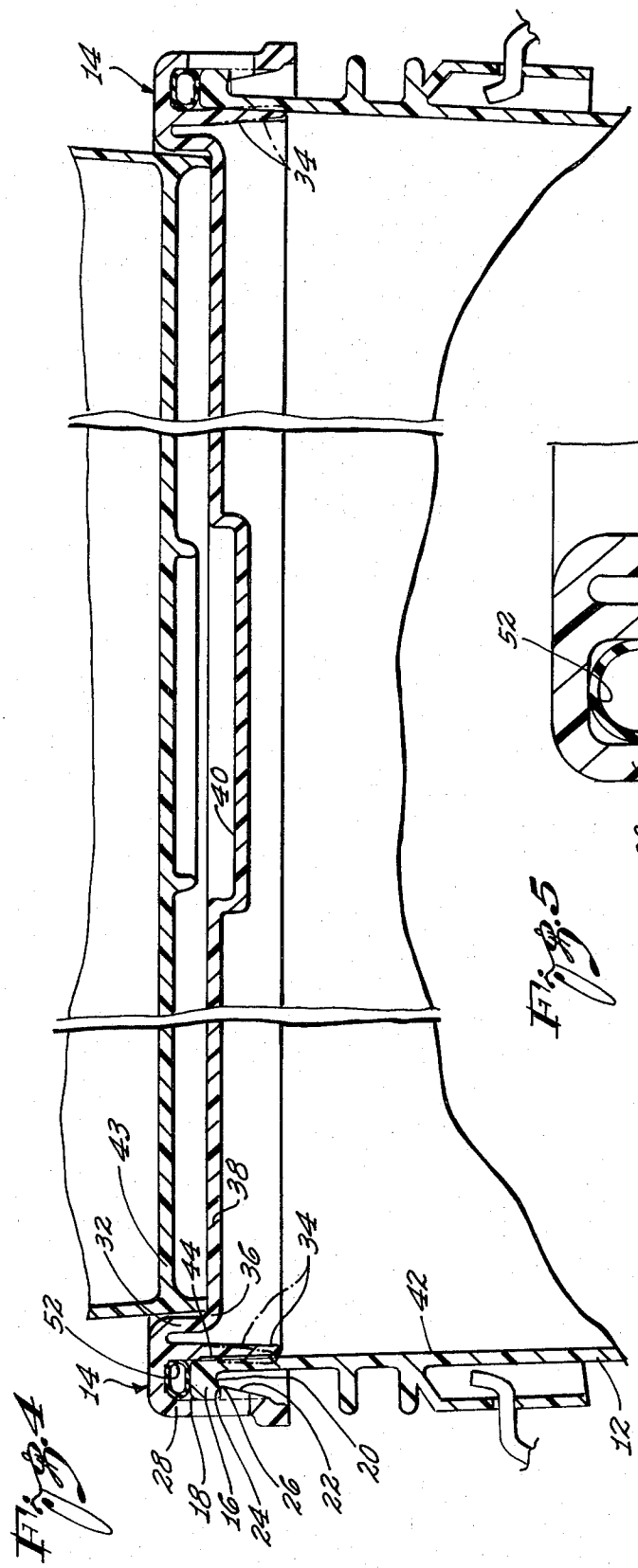


Fig. 4

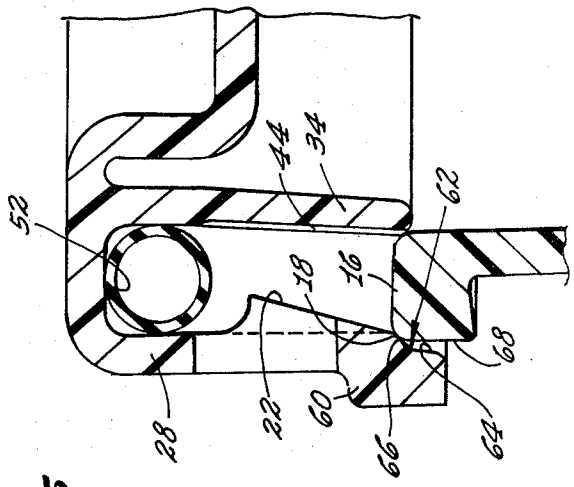


Fig. 5

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SELF-CENTERING AND VENTING CLOSURE

CROSS-REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of applicant's copending application, Ser. No. 883,694, filed Dec. 10, 1969, entitled "Tamper Proof Closure", now abandoned.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the container closure art and, more particularly, to a closure having a flexible sealing member, recesses for venting, a recess for self-centering on the container and a recess for providing a stable stacking base.

2. Description of the Prior Art

The use of synthetic resin closures and containers has increased rapidly within the last few years. This wider spread use has pointed out deficiencies in the prior art closure structure; to obviate the deficiencies further development was required. For example, there has always existed a sealing problem and the lack of an economical solution to the problem. Further, it had been found that when a closure was lockingly engaged to a container by machine, air in the space above the contents of the container became compressed causing the closure and/or container to bellow outwardly. Still further deficiency related to the difficulty of properly aligning a container and a closure to allow a machine to apply the engagement force. Finally, there was a stability problem for stacked, sealed containers when in storage and/or during transportation.

SUMMARY OF THE INVENTION

The present invention solves the above-mentioned problems by providing a tamper proof closure adapted to close an open end of a container body comprising a center portion; a peripheral channel connected to the center portion and having a base portion from which extends an outer annular leg, an inner annular leg, and an annular flexible sealing leg, the annular flexible sealing leg being positioned between the inner and the outer annular legs; and means connected to the peripheral channel adapted to lockingly engage the open end of the container body whereby the open end of the container body is receivable between the outer annular leg and the annular flexible sealing leg, and the annular flexible sealing leg is adapted to abut the end of said container body and flex to form at least a partial seal about the open end.

An object of the present invention is to provide a closure which is self-sealing.

Another object of the present invention is to provide a closure which allows compressed gas, such as air, to escape from the space in a container body above the contents within the container body when the closure is engaged to the container body.

Still another object of the present invention is to provide a closure which is self-centering on a container body to facilitate engagement of the closure to the container body, especially when the closure is handled by a machine during the engagement process.

Yet another object of the present invention is to provide a closure which will act as a receptacle for the bottom portion of another container so that stable stacking of a multiple number of sealed containers is achievable.

Another object of the present invention is to provide a container having all of the four above-mentioned features in a single closure embodiment.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevational view of a container body with a closure in locking engagement partially broken away to illustrate the contents of the container.

FIG. 2 is an enlarged elevational sectional view of a portion of a container body and a closure in a partially engaged position and featuring a gas escape route.

FIG. 3 is a bottom view of a portion of the closure of FIGS. 1 and 2.

FIG. 4 is an enlarged sectional view of the closure sealed to the container body taken along line 4—4 of FIG. 1 including an illustration of a bottom portion of another container body stacked upon the closure.

FIG. 5 is an enlarged elevational sectional view similar to that shown in FIG. 2 illustrating the self-centering feature of the closure.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

While the present invention is susceptible of various modifications and alternative constructions, an illustrative embodiment is shown in the drawings and will herein be described in detail. It should be understood, however, that it is not the intention to limit the invention to the particular form disclosed, but, on the contrary, the intention is to cover all modifications, equivalents, and alternative constructions falling within the spirit and scope of the invention as expressed in the appended claims.

Referring now to FIG. 1, there is illustrated a closed container **10** comprised of a container body **12** and a closure **14**. A liquid content **16** is within the container body **12**, though it is to be understood that the container may be used to enclose any suitable product whether liquid or solid. The container body and the closure are preferably constructed of a synthetic resin material, though metals or glasses may be selectively used. A suitable synthetic resin material is polyethylene having a density ranging between 0.941 and 0.965 grams per cubic centimeter (ASTM Test D–1505 –63T) and a melt index ranging between 0.1 and 25.0 (ASTM Test D–1238 –62T). When the latter-mentioned polyethylene is employed in producing an injection molded closure, the melt index preferably lies between 4.0 and 25.0. It is, of course, to be understood that the closure member may be constructed or fabricated from various other suitable materials and by any one of a variety of manufacturing processes.

As shown, the container body **12** is generally cylindrical having a slight taper of about 2 degrees. The closure **14** conforms to the container body.

Referring now to FIG. 4, there is illustrated in more detail the various portions of the closure and the locking engagement between the closure and the container body. About the open end of the container body is a bead **16** which extends in an outward direction away from the interior of the container. The bead includes a cam surface **18** and an abuttment surface **20** which act in conjunction with a cam follower surface **22** and an abuttment surface **24**, respectively, of the closure to cause the locking engagement of the closure and the container body. The cam follower surface **22** and the abuttment surface **24** are part of an inwardly extending bead **26** which in integral with an annular outer leg **28**. The outer leg is connected at one end to a base portion **30** from which an annular inner leg **32** and an annular flexible sealing leg **34** extend. The base portion, the outer annular leg, the inner annular leg, and the annular flexible sealing leg comprise a peripheral channel which receives the bead **16** of the container body between the outer leg and the sealing leg. Connected to the inner annular leg **32** at an end **36** which is opposite from the base portion is a center portion **38** of the closure. The center portion is generally flat except for a small central recess **40** which is provided to receive a ring **41** of material connected to a bottom portion **43** of a stacked container body.

In accordance with one of the important aspects of the present invention, provision is made for allowing the usually progressively compressed gas pocket formed above the contents of the container to escape during the closure engaging process. This prevents the closure and/or container body from bellowing outwardly and provides a generally more stable container. Referring now to FIGS. 2 and 3, the closure is partially engaged to the bead **16** of the container body. The term "partially engaged" is used to mean that the abuttment surface **24** of the bead **26** on the closure has not yet come in contact with the abuttment surface **20** of the bead **16**. Thus in FIG. 2 the cam surface **18** is shown to have forced the cam follower sur-

face 22 outwardly so as to cause the leg 28 to have a bowed or generally arcuate configuration. Meanwhile, the annular flexible sealing leg 34 abuts the interior surface 42 of the container body and is flexed thereby. Spaced along the flexible sealing leg is a plurality of recesses 44 which provide a passageway for the escape of gas or air within the spacing 46. It is to be understood that the liquid content 16 has a level slightly below the region to be occupied by the closure. When a machine is used to apply the engaging force to the closure, the machine applies the force equally around the peripheral channel. Gas occupying the space between the liquid content and the bead of the container body would ordinarily be progressively compressed as the closure and container body engaged. This causes an unnecessary stress on the container body and the closure. By providing the recesses 44 in the flexible leg extending from an end 48 of the flexible leg(which is opposite the end of the flexible sealing leg connected to the base portion 30) the compressed gas is allowed to escape upwardly along the interior surface 42 over the bead 16 and then through one of a plurality of apertures 50 (FIG. 1). As fully disclosed in the abovementioned copending application, the apertures are also provided to allow separation of the closure from the container.

It is noted in FIG. 4 that when the closure and the container body are in their locked, engaged position, the interior surface 42 of the container body extends beyond the recesses 44 so that the annular flexible sealing leg acts as a seal. This is so even though during the engagement process gas is allowed to escape. The sealing provided by the flexible sealing leg is enhanced because the sealing leg is of a guage sufficiently flexible to allow the leg to conform to the sloping interior surface of the container body. It is preferred that the closure be made of a material having a "memory", that is, any distortion of an element will establish a biasing force tending to return the element to its original position. Thus, the flexing of the sealing leg by the interior surface of the container body establishes a biasing force in the sealing leg attempting to return the sealing leg to its original position. (In FIG. 4, the original position is shown in phantom line while the flexed position is shown in solid line.) This biasing force increases the sealing abuttment between the sealing leg and the interior surface of the container body. In the fully engaged locking position, additional sealing is accomplished by providing a hollow O-ring seal 52 in the space between the bead 16 and the base portion 30. The O-ring is compressed when the closure and the container body are fully engaged to substantially fill the space and provide a hermetic seal.

In accordance with another major aspect of the present invention, the closure is constructed to allow stable stacking of one container upon another. This is achieved partially by venting the compressed gases so as to prevent the closure or the container body from bellowing outwardly under the increased pressure and partly by the structural form of the closure. Referring once again to FIG. 4, the inner annular leg 32 and the center portion 38 form a generally cylindrical receptacle to receive the bottom portion 43 of a container body which has been stacked upon the closure. The inner annular leg has a diametrical dimension slightly larger than the diameter of the bottom portion of the stacked container so that an abuttment retainer is achieved. The inner annular leg and center portion also provide a non-warped platform contributing to stable stacking of a large number of containers. This latter quality is achieved by the hinging or connection of the inner annular leg to the center portion and to the base portion. After forming the closure in a mold, the center portion will cool and shrink less than the peripheral channel. Thus the peripheral channel will tend to squeeze about the center portion while the center portion resists the movement. If there was no compensating structure, the center portion would become stressed causing warpage and a non-horizontal platform. By allowing the inner annular leg to move in response to the shrinkage forces, undue stresses are not introduced.

In accordance with still another important aspect of the present invention, provision is made for facilitating centering of the closure upon the open end of the container. This is important when the closure is engaged to the container body by machine. Most machines are designed to apply a closure force in a downward direction and cannot laterally orient the closure relative the container body. The present invention provides for the self centering of the closure on the container body. Referring now to FIG. 5, this is accomplished by a crooked end portion 60 of the outer annular leg 28 which forms an annular recess 62. The recess is formed of a generally vertical wall 64 extending from the end of the outer annular leg to a slanted wall 66 which is contiguous with the cam follower surface 22. The diametral dimension from one point on the wall 64 to a point 180° opposite is slightly larger than the diametral dimension of the surface 68 of the bead 16. Thus, if the closure is placed upon the container slightly off center, downward pressure upon the closure will tend to bring the slanted surface 66 into contact with the cam surface 18 of the bead 16. Of course, if this downward force is increased and continued, the annular outer leg 28 will tend to be moved outwardly as the cam surface 18 engages the cam follower surface 22. More succinctly, the slanted surface 66 acts as a funnel to guide the position of the closure relative the bead of the container body.

What is claimed is:

1. A tamper-proof closure adapted to close an open end of a container body comprising:

a center portion;

a peripheral channel comprising a base portion, an outer annular leg attached to an outer edge of said base portion and extending downwardly therefrom, an inner annular leg attached to an inner edge of said base portion and extending downwardly therefrom, said center portion being attached to a lower edge of said inner annular leg, and an annular flexible sealing leg attached to said base portion and extending downwardly therefrom, said annular flexible sealing leg being positioned between said inner and said outer annular legs, a plurality of openings spaced about said outer annular leg, a lower edge of said outer annular leg being continuous about said outer annular leg and said lower edge being severable at said plurality of openings to facilitate removal of said closure; and

means connected to said peripheral channel adapted to lockingly engage the open end of said container body whereby the open end of said container body is receivable between said outer annular leg and said annular flexible sealing leg and said annular flexible sealing leg is adapted to abut the end of said container body and flex to form at least a partial seal about said open end.

2. A closure as claimed in claim 1 wherein said annular flexible leg has a plurality of recessed portions extending from an end of said flexible leg toward said base portion and spaced about a surface of the flexible leg facing said outer annular leg whereby during the engagement of said closure and said container body compressed gas may escape along said recessed portion.

3. A closure as claimed in claim 2 wherein said center portion is connected to an end of said inner annular leg whereby said center portion and said inner annular leg form a receptacle to receive a bottom end of a stacked container body.

4. A closure as claimed in claim 1 wherein an end portion of said outer annular leg opposite said base portion is crooked to form a recess for facilitating the centering of said closure upon said open end of said container body.

5. A tamper-proof closure adapted to close an open end of a container body comprising:

a center portion;

a peripheral channel comprising a base portion, an outer annular leg attached to an outer edge of said base portion and extending downwardly therefrom; an inner annular leg attached to an inner edge of said base portion and extending downwardly therefrom, said center portion being

integrally formed to a lower edge of said inner annular leg, and an annular flexible sealing leg attached to said base portion and extending downwardly therefrom, said annular flexible sealing leg being positioned between said inner and said outer annular legs;

a projecting bead integral with said outer annular leg and extending toward said annular flexible sealing leg, said bead being spaced apart from an end of said outer annular leg opposite the base and said bead including a cam follower surface and an abutment surface; and

a plurality of openings spaced about said closure in said annular outer leg, an end portion of said outer annular leg opposite said base being continuous about said closure said end portion of said outer annular leg being severable at said plurality of openings to facilitate removal of said closure, whereby the open end of said container body is receivable between said outer annular leg and said annular flexible sealing leg and said annular flexible sealing leg is adapted to abut the end of said container body and flex to form at least a partial seal about said open end.

6. A closure as claimed in claim 5 wherein said annular flexible leg has a plurality of recessed portions extending from an end of said flexible leg toward said base portion and spaced about a surface of the flexible leg facing said outer annular leg whereby during the engagement of said closure and said container body compressed gas may escape along said recessed portion.

7. A closure as claimed in claim 6 wherein said center portion is connected to an end of said inner annular leg whereby said center portion and said inner annular leg form a receptacle to receive a bottom end of a stacked container body.

8. A closure as claimed in claim 7 wherein an end portion of said outer annular leg opposite said base portion is crooked to form a recess for facilitating the centering of said closure upon said open end of said container body.

9. A closure as claimed in claim 5 wherein an end portion of said outer annular leg opposite said base portion is crooked to form a recess for facilitating the centering of said closure upon said open end of said container body.

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