United States Patent [19]

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[11] **3,770,156**

[45] **Nov. 6, 1973**

[54] **TAMPER PROOF CLOSURE**

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

[22] Filed: **Nov. 26, 1971**

[21] Appl. No.: **202,705**

Related U.S. Application Data

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

[52] **U.S. Cl.** **215/41,** 215/42, 215/45, 220/60, 215/7

[51] **Int. Cl.** **B65d 55/02**

[58] **Field of Search** 215/41, 45, 42, 95, 215/96, 40, 7; 150/5; 220/60

[56] **References Cited**

UNITED STATES PATENTS

2,987,206	6/1961	Grussen	215/7
3,532,244	10/1970	Yates	215/41
2,669,369	2/1954	Towns	215/95

FOREIGN PATENTS OR APPLICATIONS

301,564	10/1965	Netherlands	220/60

Primary Examiner—George T. Hall
Attorney—Ronald L. Engel et al.

[57] **ABSTRACT**

A tamper proof closure for use on an open end container body includes a flexible peripheral outer leg in which are provided a plurality of centrally positioned slots, with a continuous bead at one end portion. A bead projecting inwardly from the outer leg has a cam follower surface functioning only during the engagement of the container body and the closure which assures easy engagement, while an abutment surface insures against disengagement. Disengagement can be achieved but cutting the continuous bead so that the outer leg can be pivoted out of locking engagement with the container. After the bead is cut, the closure can still be used for hermetically sealing the container on a reusable basis.

10 Claims, 8 Drawing Figures

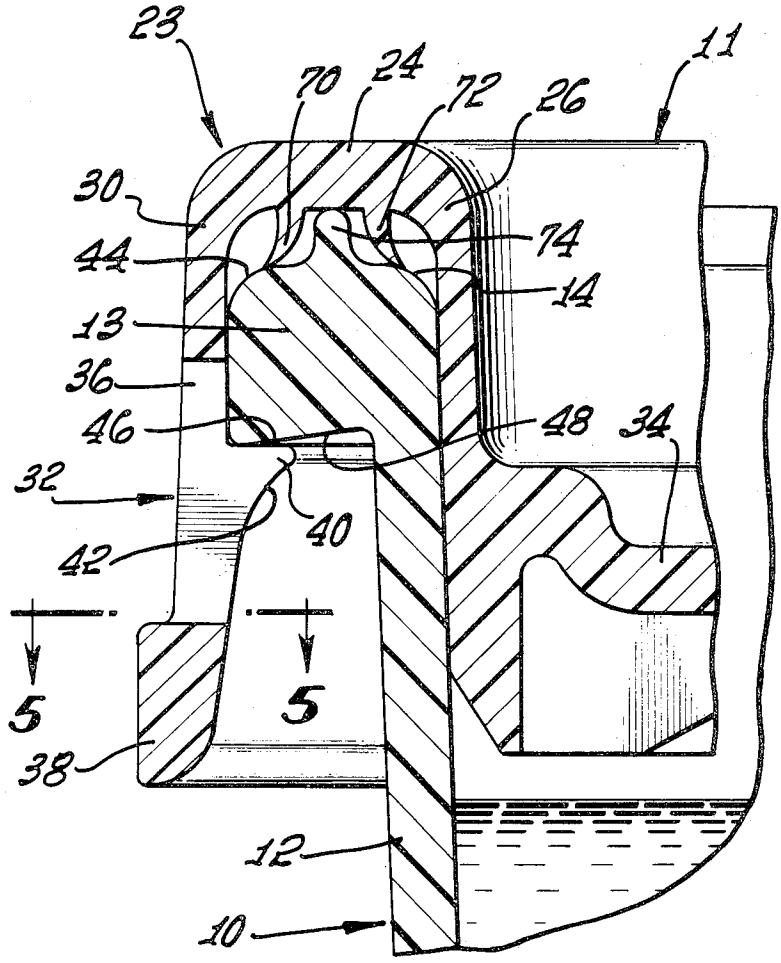


FIG. 1.

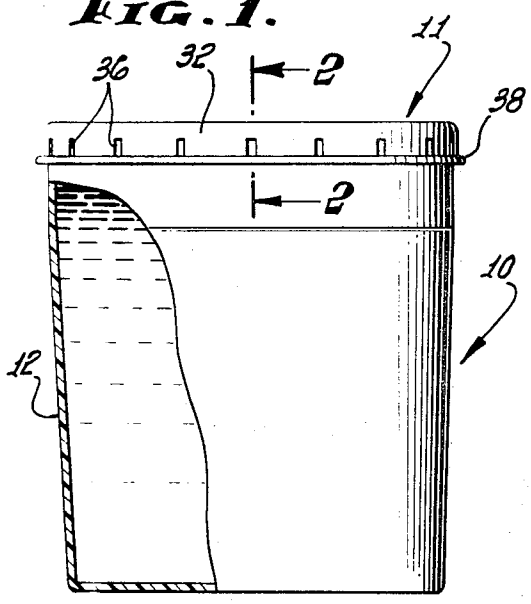


FIG. 2.

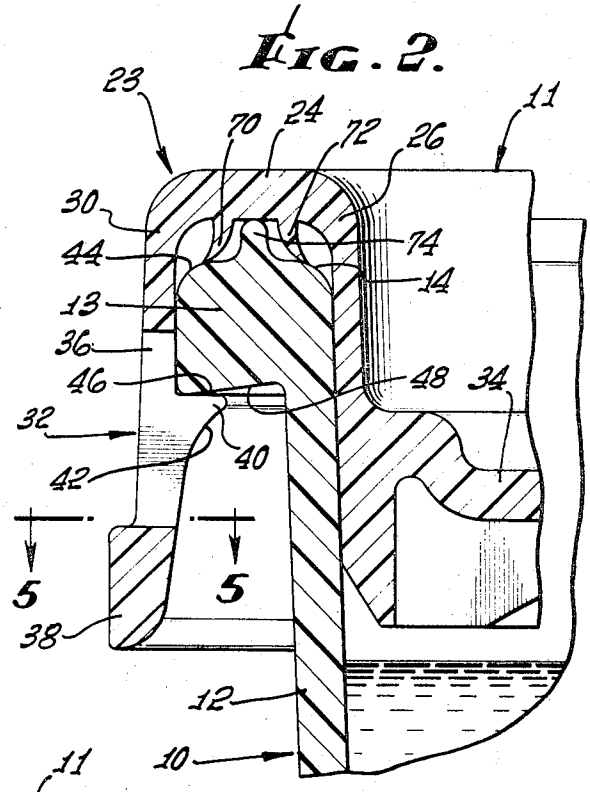


FIG. 3.

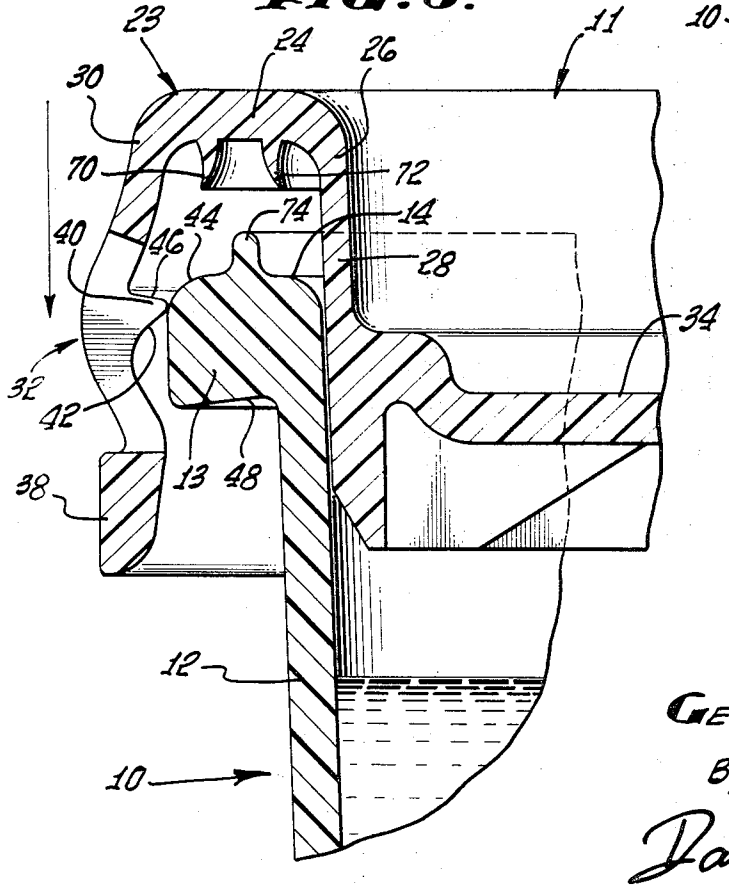
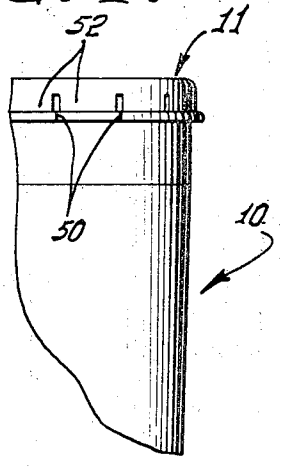


FIG. 4.



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FIG. 5.

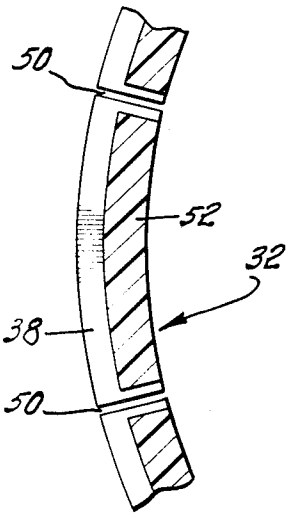


FIG. 6.

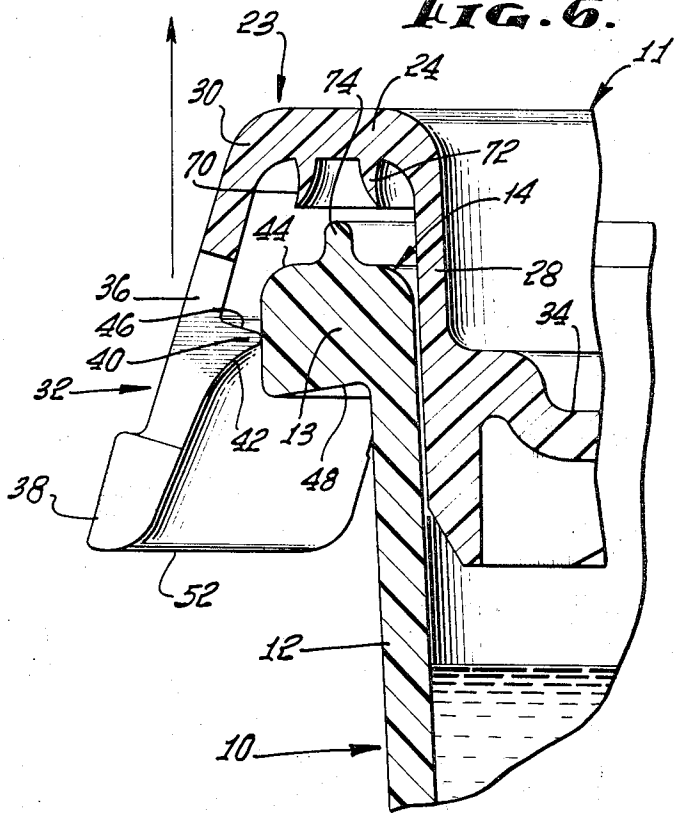


FIG. 8.

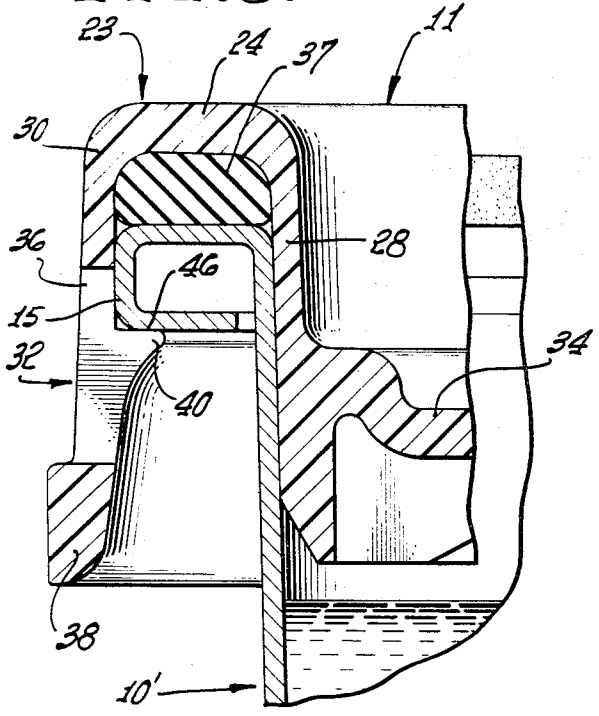
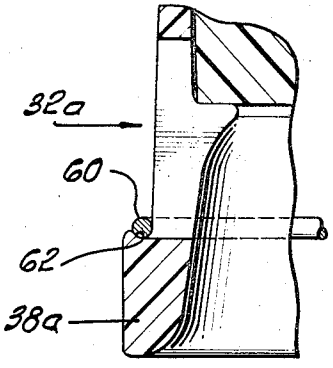


FIG. 7.



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TAMPER PROOF CLOSURE

This is a continuation, of application Ser. No. 883,694, filed Dec. 10, 1969, now abandoned.

CROSS REFERENCE

This is a continuation-in-part of applicant's co-pending applications Ser. No. 781,556, filed Dec. 5, 1968, now U.S. Pat. No. 3,499,574 and Ser. No. 791,933, filed Jan. 17, 1969, entitled, respectively, Resilient Closure Having Retaining Means and Seal for Resealable Bucket Closure, now U.S. Pat. No. 3,532,244.

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to the container closure art, and, more particularly, to a tamper proof reusable closure suitable for use with synthetic resin, metal, or class container bodies.

2. Description of the Prior Art

Although there has been considerable interest in the adaptation of synthetic resins to containers and particularly shipping containers, the substitution of a resin for metal in the manufacture of such objects has encountered an appreciable number of problems. Certain resins are soft and pliable, and, when containers are made of such material, it is difficult to provide a closure which will remain in a tight sealing engagement with the container when it is subjected to rough handling. On the other hand, closures made of more rigid synthetic resins tend to be brittle and are easily broken when roughly handled.

It has been proposed that synthetic resin closures be reinforced with metal in order to provide the required degree of stiffness and a more permanent seal, as evidenced by applicant's co-pending U.S. Pat. Application Ser. No. 598,471, filed Dec. 1, 1966. U.S. Pat. No. 3,446,391 features a one-piece molded synthetic resin closure including a depressed center section and a peripheral inverted U-shaped channel, with an annular groove formed on the inner wall of the outer leg of the U-shaped channel, the groove being adapted to lockingly engage an annular bead formed in the rim portion of a container body.

Various metal closure designs have been known for many years, for example, U.S. Pat. Nos. 2,339,343 and 2,977,019. Efforts to use such design technology for synthetic resin containers and closures, however, have encountered much difficulty because of basic material characteristic differences.

In addition to basic design problems, other problems have presented themselves which even the metal closures, as disclosed in the two above-identified patents, have been unable to solve. There has been a vast increase in the shipment of relatively expensive products, while at the same time there also has been an increase in pilferage of these products during their transportation and delivery. For example, it appears to be a widespread custom for workers in certain transportation modes to remove portions of a shipment which they handle. Thus, it would seem highly desirable to have a simply constructed and inexpensive tamper proof enclosure which could be used with synthetic resin, glass, or metal containers in order to reduce or eliminate the above-mentioned pilferage.

SUMMARY OF THE INVENTION

In accordance with the present invention, the above-mentioned problems have been solved by a unique apparatus and method. The apparatus takes the form of a closure comprising a center section and a peripheral channel having an inverted generally U-shaped cross section including a base portion from which an inner leg and a flexible outer leg depend, with the lower end of the outer leg being free. The peripheral channel is formed integrally with the center section, and a projecting bead is provided on the otuer leg extending toward the inner leg, the bead being spaced apart from the free end of the outer leg and comprising a cam follower surface and an abutment surface. A plurality of apertures are provided in the outer leg about the periphery thereof, with the outer leg being continuous along its free end, whereby the open end of the container body is receivable between the inner and outer legs and is lockingly engageable thereby. The continuous free end of the outer leg is severable to form, in conjunction with the plurality of apertures, a plurality of pivotable tabs for facilitating disengagement of the closure from the container body.

The inventive method involves the use of the foregoing closure by placing the closure over the open end of the container body and causing relative movement to occur such that the closure approaches the container body. The rim of the container body is received within the peripheral channel such that the cam follower surface slidably engages the rim causing the outer leg to flex to a bowed position relative to the inner leg, such relative movement being continued until the abutment surface on the projecting bead and the corresponding abutment surface on the container body rim are positioned so that the outer leg snaps into a locking position relative to the container rim and into a generally parallel position relative to the inner leg.

The method further may involve the step of cutting through the continuous free end of the outer leg in at least one location so that the outer leg takes the form of a plurality of pivotable tabs and disengaging the closure from the container body by pivoting at least one of the said tabs to move the abutment surface on the projecting bead out of engagement with the corresponding abutment surface on the container body rim and by causing relative movement between the closure and container body away from one another. Further, the method may involve the steps of replacing the closure over the open end of the container body with the above-described closure operation re-occurring, except that the severed free end of the outer leg is not restrained from outward movement.

It is a primary object of the present invention to provide a new and improved closure which is tamper proof when applied to a container.

Another object of the present invention is to provide a closure which cannot be moved from a container without making readily noticeable alterations to the closure.

A further object of the present invention is to provide a closure which can be readily applied by hand and can be easily removed by hand with the help of a simple cutting tool.

Still another object of the present invention is to provide a closure made of synthetic resin which can be

used for a container made of metal, synthetic resin, or glass.

Yet another object of the present invention is to provide a new and improved container closure which is simple in construction and inexpensive to manufacture in any size.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view partially broken away of an engaged closure and container body;

FIG. 2 is an enlarged longitudinal sectional view taken along line 2—2 of FIG. 1;

FIG. 3 is a longitudinal sectional view similar to that shown in FIG. 2, illustrating the position of the outer leg of the closure when the closure and container body are being engaged;

FIG. 4 is a partial side view similar to that shown in FIG. 1, illustrating cuts made in the outer leg of the closure;

FIG. 5 is a partial sectional view taken along line 5—5 of FIG. 2 and also illustrates cuts made in the outer leg;

FIG. 6 is a longitudinal sectional view similar to that shown in FIGS. 2 and 3 but illustrating the outer leg after cuts have been made when the closure and container body are being disengaged;

FIG. 7 is a partial longitudinal sectional view of another embodiment of the end portion of the outer leg and illustrating the use of a retainer means; and

FIG. 8 is a longitudinal sectional view illustrating another embodiment of a sealing means and the rim of a metal container body.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the drawings, a container body **10** and a closure **11** are illustrated in FIG. **1.** The container body is a type of vessel commonly referred to as a bucket or pail and may be used to contain an assortment of materials. Container body **10** is preferably constructed of a synthetic resin material, such as high density polyethylene, but other suitable resins, metals, or glasses may be employed. Inasmuch as some resins are relatively inert, the container body is one capable of being utilized to contain a wide assortment of both liquid and powdered material. The closure **11** is formed of a synthetic resin material (herein-after referred to as "plastic") and, although disclosed as a closure usable with a container body of the same material, the closure is capable of also being used on a container body constructed of other materials such as the already mentioned synthetic resins, metals, glasses, and the like.

The container body **10** comprises a side wall structure **12** which in the present instance is cylindrical but which under appropriate circumstances may be square, rectangular, or other cross-sectional shape.

The side wall structure terminates in a rim **14** (see FIG. **2**) provided with a bead **13** which extends preferably in an outward direction away from the interior of the container. Although a solid bead **13** is shown as a preferable construction when the container is formed of plastic, the bead could be a rolled bead **15,** as shown in FIG. **8,** should the container be one constructed of metal.

The closure **11** is preferably formed from a suitable semi-rigid plastic having strength sufficient to withstand the abuses to which a shipping container is subjected in normal use. Linear, high-density polyethylene-copolymer is an especially suitable plastic material, although other plastics of the polyolefin or petrochemical family may be employed. An especially preferred plastic 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). Where the latter preferred polyethylene is employed in producing an injection-molded closure, the melt index preferably lies between 4.0 and 25.0. Of course, as will be obvious to those skilled in the art, the closure member may be constructed or fabricated from various other suitable materials and by a variety of manufacturing processes, such as injection molding.

A peripheral channel **23** having an inverted, generally U-shaped cross section is provided about the closure **11.** The U-shaped channel **23** has a base portion **24** which is attached to an end portion **26** of an inner leg **38** and to an end portion **30** of an outer flexible leg **32.** As is readily seen, the inner leg **28,** the base portion **24,** and the outer leg **32** are integral and formed in a single molding operation which also integrally forms with the peripheral channel **23** a center portion **34.**

As seen in FIGS. **1** and **2,** the outer leg **32** has a plurality of apertures, such as slots **36,** spaced along the annular length of the outer leg **32.** As is noted, the slots **36** occupy what may be termed as the central portion of the outer leg **32,** leaving the already mentioned end portion **30** which is connected to the base portion **24** and an opposite end portion **38** which takes the form of a continuous ring of material shaped as a bead, as shown. It is to be understood that the closure **11** may be molded entirely as an integral unit with the slot **36** formed during the molding operation so that the end portion **38** of the outer leg **32** is integral with the remainder of the closure **11.**

Referring to FIG. **2,** the outer leg **32** includes a projection, such as a bead **40,** which extends in an inward direction toward the inner leg **28.** The bead **40** functions as part of a locking device which in conjunction with the bead **13** of the container **10** enables the closure **11** and the container **10** to form a tamper proof hermetic seal. The bead **40** has two surfaces, a first surface **42** functioning as a cam follower, while an upper surface **44** of the bead **13** functions as the cam. The second surface of the bead **40** forms an abutment surface **46** which cooperates with a corresponding and complementary lower surface **48** of the bead **13** to cause the locking engagement of the container and the closure.

Referring now to FIG. **3,** there is illustrated the position the outer leg **32** assumes during the process of engaging the closure and the container. It is noted that during the process of engaging relative movement between the container and the closure is such as to bring the two together which in the usual case will mean that the closure **11** is being placed over the bead **13** so that the bead is received between the inner and outer legs **28** and **32.** The cam surface **44** of the bead **13** will engage the cam follower surface **42** of the bead **40** causing the bead **40,** and thereby the outer leg **32,** to be pushed outwardly where the outer leg assumes a bowed position. The bowed position of the outer leg occurs because the bead **13** is a much thicker and therefore stronger section than the outer leg **32,** and the bead **13** is baced by the inner leg **28** and the center portion **34**

of the closure supplying the greater strength than that exhibited by the outer leg. Because the base portion **24** is made of a thicker gauge of material than the outer leg, the outer leg will pivot about its end portion **30.** Similarly, the bead at the end portion **38** has a somewhat thicker cross section than the remainder of the outer leg and is devoid of the slots **36** causing the center portion of the outer leg to pivot also about its end portion **38.**

Once the bead **13** moves past the bead **40,** the outer leg **32** will spring or snap back to a position which places it roughly parallel to the inner leg **28,** as shown in FIG. **2.** The parallel position of the outer leg backs the closure and the container into engagement due to the contact by the abutment surface **46** of the bead **40** and the abutment surface **48** of the bead **13.** It has been found that a closure and container with proper tolerances cannot be separated without noticeably damaging the closure **11** (or, of course, damaging the container **10**). The outer leg **32** will not assume its bowed FIG. **3** position because the abutment surface **46** will not function as a cam follower surface for the bead **13,** as did the surface **42.** Instead, the force of separation is transmitted from the abutment surface **46** to the abutment surface **38** in a direction essentially perpendicular to those surfaces or generally vertical in the embodiment shown in FIG **2**; there are no components of forces acting in a lateral or horizontal direction as viewed in FIG. **2.** Thus, the material within the container **10** is safe from pilferage of the kind where only a small portion of the contents of a number of containers is removed from the closures being replaced so that from an outward appearance there is no indication that a theft of contents has occurred. The closure **11** cannot be removed without readily noticeable alterations to the closure or the container.

To remove the closure **11** a user merely positions a sharp cutting tool, such as a knife, within one of the slots **36** and cuts through the bead at the end portion **38,** as shown in FIGS. **4** and **5** where the cut is designated **50.** The user then proceeds to position the cutting tool in consecutive slots **36** and makes a series of cuts through the bead at the end **38** so that the outer leg defined between two adjacent slots and corresponding cuts forms tabs **52** (see FIGS. **4** and **6**) which are pivotable about the end portion **30** of the outer leg **32.**

The user may then easily pivot the tabs **52,** as shown in FIG. **6,** by pulling the end portion **38** outwardly with the fingertips so as to move the abutment surface **46** out of abutting engagement with the abutment surface **48,** thus allowing easy disengagement of the container **10** from the closure **11.** It would of course be readily apparent to the user when he first receives the closed container if the bead at the end portion **38** had been cut to allow theft of the contents.

After the user has cut the continuous bead at the end portion **38,** removed the closure **11,** and then removed a portion of the contents of the container **10,** he may replace the closure and still achieve a hermetic seal because the tabs **52,** which are pivotable about the end portion **30,** have a "memory." That is, when the user releases the tabs **52,** they will spring back to roughly parallel position with the inner leg **28** so that the abutment surface **46** can once again come into engagement with the abutment surface **48.** Once again, if a separating force is applied to the container and closure in a direction which is generally parallel to the longitudinal axis of the container (that is, in a vertical direction as shown in FIGS. **1–4**), then the force will be transmitted through the abutment surfaces generally perpendicularly thereto without a lateral or horizontal component. It is only when the end portion **38** is pulled in an outward direction, causing the tab **52** to pivot outwardly, can a separation or disengagement of the closure and container occur.

Hence, the advantage of having a tamper proof closure is achieved without any corresponding disadvantages to the user.

If it is necessary to insure that the tabs **52** will not be pivoted inadvertently and cause spillage, such as during rough handling of the container and closure, then a retaining means, such as a wire ring **60** (see FIG. **7**), can be used in conjunction with a modified embodiment of an outer leg **32*a*** where the end portion **38*a*** of the outer leg has a peripheral groove **62** for receiving the wire ring **60.** It is to be noted, of course, that the wire ring need not be used until after a user has cut the end portion **38*a*** since until the end portion is cut the wire ring **60** would be redundant; however, the wire ring **60** could be used as a safety factor.

To assure that a fluid-tight seal is obtained when the closure is applied to the container, there is included in the FIG. **2** embodiment a pair of flexible flanges **70** and **72** which may be tapered from the base portion **24** toward the flange ends. The flanges are molded from the same material as the closure and at the same time, but the flanges are made of a thin enough gauge so that they are capable of flexing. As a precaution, an annular ridge **74** is located above the bead **13** and made integral therewith. The ridge **74** is of a height somewhat less than the length of the flexible flanges **70** and **72.** The ridge **74** is positioned to fit between the flexible flanges **70** and **72** and serves as a limiting spacer to prevent the bead **13** from such close contact with the base portion **24** so as to damage the flanges **70** and **72** by either crushing or pancaking them.

Another embodiment of a seal is shown in FIG. **8** which includes a substantially annular sealing gasket **37.** The gasket **37** may take the form of a separate resilient ring capable of being located in the spacing defined between the base portion **24,** the legs **28** and **32,** and the rolled rim **15** of the container **10'**. Additionally, a flowed-in type gasket (not shown) of material soft enough to be formed to spread around and between the mating surfaces of the rolled rim **14** and the peripheral channel **23** may be used. It is to be understood that various embodiments, such as exemplified by the FIG. **8** embodiment, are equivalent to that disclosed herein and within the scope of the appended claims.

I claim:

1. A tamper proof closure adapted for application to an open end container body and comprising:

a center section;

a peripheral channel having an inverted generally U-shaped cross section and including a base portion from which an inner leg and a flexible outer leg depend, with the lower end of the outer leg being free, the peripheral channel being formed integrally with the center section;

a projecting bead on the outer leg and extending toward the inner leg, the bead being spaced apart from the free end of the outer leg and comprising a cam follower surface and an abutment surface;

a plurality of apertures being provided in the outer leg about the periphery thereof, with the outer leg being continuous along its free end; and

the continuous free end of the outer leg being severable to form, in conjunction with the plurality of apertures, a plurality of pivotable tabs,

whereby the open end of the container body is receivable between the inner and outer legs and is lockingly engageable there-by.

2. A tamper proof closure adapted for application to an open end container body, the open end container body comprising a cylindrical side wall portion, a bottom wall portion formed integrally therewith, and said side wall portion having an annular ridge projection extending outwardly around the periphery of the open end, said annular ridge projection having the lower disposed surface substantially perpendicular to the cylindrical side wall portion, said tamper proof closure comprising:

a center section;

a peripheral channel having an inverted generally U-shaped cross section and including a base portion from which an inner leg and a flexible outer leg depend, with the lower end of the outer leg being free, the peripheral channel being formed integrally with the center section;

a projecting bead on the outer leg and extending toward the inner leg, the bead being spaced apart from the free end of the outer leg to form an annular tool receiving recess below said bead and around the periphery of the free end of the outer leg, said bead comprising a cam follower surface and an abutment surface, said abutment surface being essentially flat and substantially perpendicular to the outer leg and said cam follower surface being formed at an angle to said outer leg;

a plurality of apertures being provided in the outer leg about the periphery thereof, with the outer leg being continuous along its free end; and

the continuous free end of the outer leg being severable in form, in conjunction with the plurality of apertures, a plurality of pivotable tabs;

sealing means positioned on the lower surface of said base portion of said peripheral channel, said sealing means for sealably engaging with the upper surface of the periphery of the open end of the container body to form an air and liquid tight seal,

whereby the open end of the cylindrical side wall portion of the container body is receivable between the inner and outer legs and the lower disposed surface of the annular ridge projection, is lockingly engaged by the abutment surface on the projecting bead and whereby a tool may be inserted into said tool receiving recess to sever said pivotable tabs to remove said closure.

3. A closure, as claimed in claim **2,** wherein the outer leg is movable between a first position, wherein it is disposed generally parallel to the inner leg, and a second position, wherein it is generally outwardly bowed relative to the inner leg.

4. A closure, as claimed in claim **3,** and further comprising means for normally retaining the pivotable tabs in a position corresponding substantially to the first position of the outer leg.

5. A closure, as claimed in claim **2,** wherein the center section and the peripheral channel are annular.

6. A closure, as claimed in claim **2,** wherein said sealing means comprises an annular compressable O-ring positioned within said peripheral channel.

7. A closure, as claimed in claim **2,** wherein said sealing means comprises flexible annular finger protrusions formed integrally with the lower surface of said base portion of said peripheral channel and extending essentially perpendicularly from said base portion.

8. A closure, as claimed in claim **2,** wherein the continuous free end of the outer leg is thickened relative to the other portions thereof.

9. A closure, as claimed in claim **2,** which is fabricated from plastic.

10. A closure, as claimed in claim **4,** wherein said means for manually retaining the pivotable tabs comprises a continuous annular ring integrally formed to the lower edge of the free end of said outer leg.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 3,770,156

DATED : November 6, 1973

INVENTOR(S) : George Yates, Jr.

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Abstract, line 10, "but" should read ---by---.

Column 3, line 47, "(herein-after" should read ---(hereinafter---.

Column 4, line 20, "38" should read ---28---.

Column 4, line 67, "baced" should read ---braced---.

Column 5, line 62, "to roughly" should read ---to a roughly---.

Signed and Sealed this

twenty-sixth Day of *August 1975*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks

Disclaimer

3,770,156.—*George Yates, Jr.*, Glendale, Calif. TAMPER PROOF CLOSURE. Patent dated Nov. 6, 1973. Disclaimer filed June 30, 1975, by the assignee, *Growth International Industries Corp.*

Hereby enters this disclaimer to claim 1 of said patent.

[*Official Gazette September 2, 1975.*]