July 30, 1963 G. W. TODD 3,099,364

CLOSURE FOR SHIPPING CONTAINERS

Filed Oct. 16, 1961 3 Sheets-Sheet 1

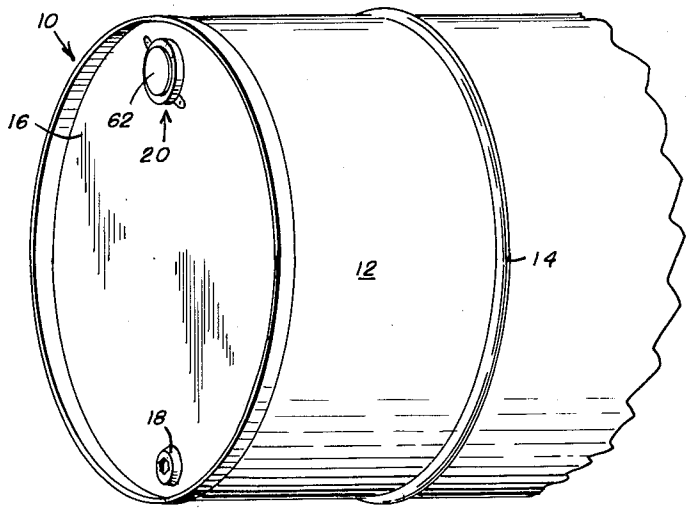


FIG. 1

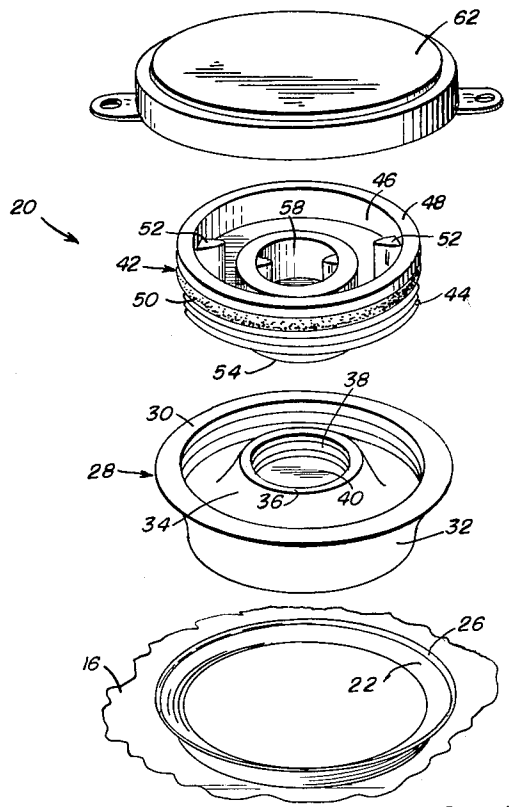


FIG. 2

INVENTOR

GEORGE W. TODD

BY Beale and Jones

ATTORNEYS

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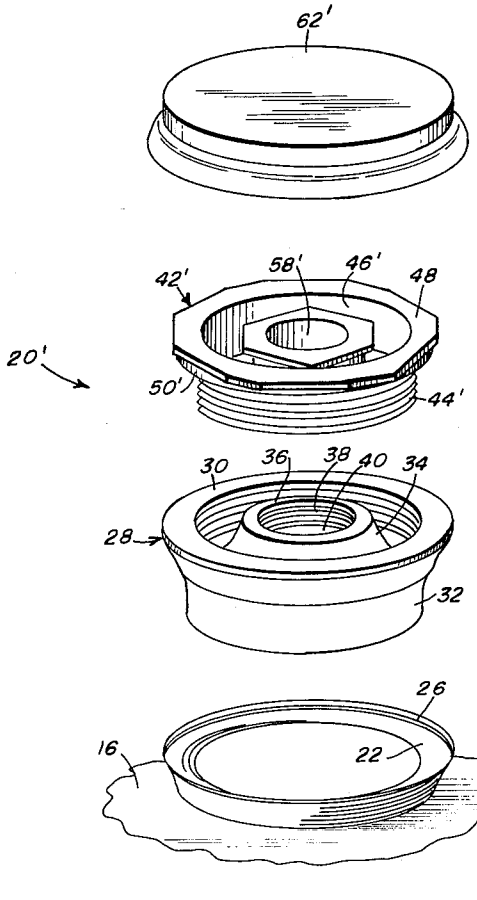


FIG. 2a

INVENTOR

GEORGE W. TODD

BY Beale & Jones

ATTORNEYS

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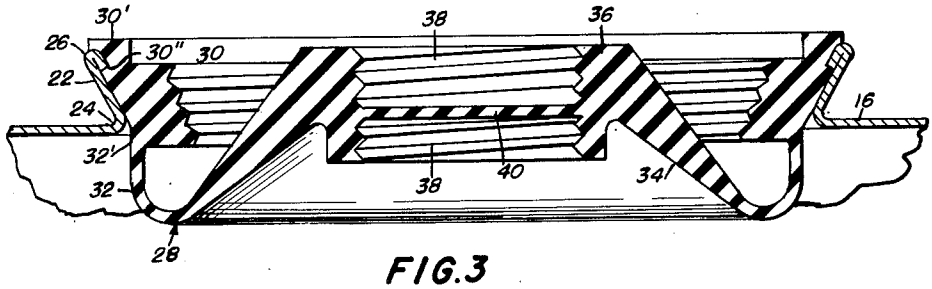


FIG. 3

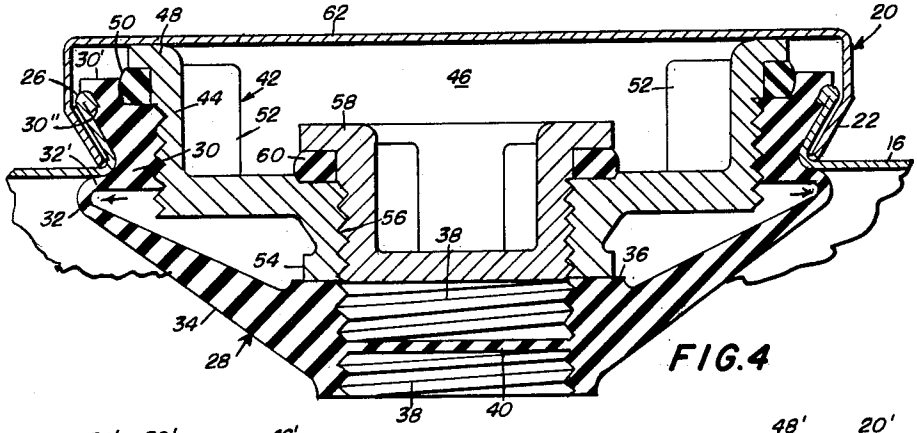


FIG. 4

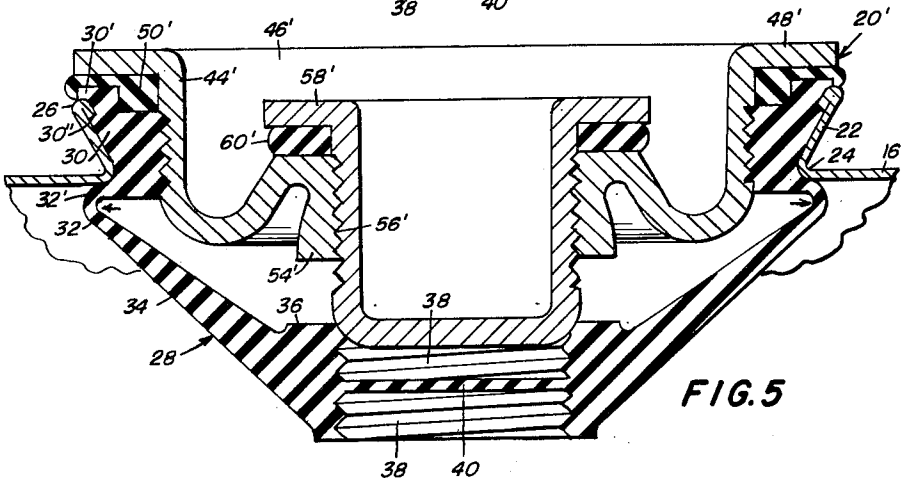


FIG. 5

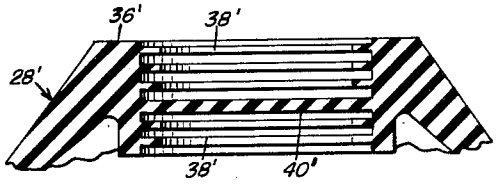


FIG. 6

INVENTOR

GEORGE W. TODD

BY Beale and Jones

ATTORNEYS

United States Patent Office

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3,099,364

CLOSURE FOR SHIPPING CONTAINERS

George W. Todd, 4 Wiltshire Place, Bronxville 8, N.Y.

Filed Oct. 16, 1961, Ser. No. 145,508
11 Claims. (Cl. 220—24.5)

This invention relates to an improved closure, a plug or plug assembly, for shipping containers, particularly barrels or drums and principally but not exclusively steel barrels or drums.

This application is a continuation-in-part of my copending application Serial No. 100,834, filed April 5, 1961, and now abandoned.

This type of container is used in great numbers for the shipment and storage of an infinite variety of products particularly liquid products, and it is with containers for the shipment and storage of liquid products that we are chiefly concerned. Specifically, this invention relates to a closure which requires a minimum of preparation in or of the container for its installation and which provides a sturdy, positive and dependable seal for the opening.

Shipping containers of the type with which we are chiefly concerned are regularly provided with two openings, a vent opening and a filling or bung opening, with closure means. The vent opening is almost always located in the head of the container and the bung opening is located as desired by the user but usually in the head. These openings usually consist of two principal parts (*a*) an annular fitting called a flange welded or mechanically trapped or crimped into the metal wall of the container, said fitting having interior threads, and (*b*) an exteriorly threaded plug element engaging the annular fitting by means of the threads. The closure is finally sealed by means of a gasket. While this type of threaded structure has proved to be sturdy, positive and dependable it is expensive because in addition to the cost of the component parts themselves considerable expense is incurred in the setting of them and in testing and plugging them incidental to the completion of the container.

There has been a great need for a simple shipping container closure which can be effected without complicated and expensive preparation in and of the container, which is sufficiently sturdy, positive and dependable to withstand the rough usage encountered in commercial shipment and which may also be reused after the container is emptied and refilled. Because of its diminishing importance and because there are cheap and satisfactory substitutes for the threaded flange and plug vent opening the principal concern of this invention is the bung or fill opening but the type of plug or sealing element proposed for the fill opening is equally applicable to a vent opening.

The principal object of this invention is, therefore, to provide for shipping containers, particularly barrels or drums and principally but not exclusively steel barrels or drums, a sturdy, positively sealed and dependable closure means not requiring special complicated preparatory operations in the container.

It is the further object of this invention to provide a shipping container closure which is reusable.

It is the further object of this invention to provide a shipping container closure which utilizes certain standard plug elements presently available on the market.

It is the further object of this invention to provide a shipping container closure which is usable with a container liner or lining, for example a polyethylene or other flexible and separate liner or a vinyl, phenolic, epoxy, epoxy-phenolic, etc., integrally applied and cured lining, without damaging such liner or lining.

This invention embodies other novel features, details of construction and arrangement of parts which are hereinafter set forth in the specification and claims and illustrated in the accompanying drawings, wherein:

FIGURE 1 is a fragmentary perspective view of a shipping container, a barrel or drum, embodying the usual vent and bung openings of which the bung or fill opening is the principal concern of this invention;

FIGURE 2 is an enlarged perspective exploded view of the improved closure means used in conjunction with one form of standard plug element with its respective cap seal;

FIGURE 2*a* is an enlarged perspective exploded view similar to that in FIGURE 2 of the improved closure means used in conjunction with another form of standard plug element with its respective cap seal;

FIGURE 3 is an enlarged fragmentary sectional view of a prepared opening in a shipping container, details of which will be disclosed later, including the invention, without the plug element installed therein;

FIGURE 4 is an enlarged fragmentary sectional view of the complete closure shown in FIGURE 2 including (*a*) the prepared opening in the shipping container, (*b*) the invention itself forcefully expanded into the prepared opening, (*c*) one of the standard plugs that are readily available on the market; in this case a ¾"–2" combination plug although a plain 2" plug is also available and functions satisfactorily with the invention and, (*d*) the companion cap seal;

FIGURE 5 is an enlarged fragmentary sectional view of the closure shown in FIGURE 2*a* including (*a*) the prepared opening in the shipping container, (*b*) the invention itself forcefully expanded into the prepared opening, (*c*) another of the standard plugs that are readily available on the market, in this case a ¾"–2" combination plug. A plain 2" plug is also available and functions satisfactorily with the invention. In the illustration no cap seal is shown.

FIGURE 6 is a fragmentary sectional view of a modification of the bore construction in the sealing element of the invention.

Briefly, the invention has to do with a complete plug or plug assembly the closure means or element of which is so formed that it may be forcefully expanded into, not crimped onto, and tightly seal a prepared and unthreaded opening of somewhat greater diameter than that of a standard 2-inch threaded flange, round or circular in section, formed in the head or body of a shipping container. The closure means is a resilient generally cup-shaped sealing element having an interiorly threaded mouth and comprising a relatively flexible vertically directed circular wall and a relatively rigid convex-upward bottom wall, said generally cup-shaped sealing element depending into said opening with its mouth engaging about the margin of said opening; and a plug element exteriorly threaded and screwingly received into said threaded mouth and adapted, upon being screwed home, to flex said bottom wall into concave disposition thereby propping outward

said circular wall beneath said opening to prevent upward displacement of said sealing element.

Referring more specifically to the drawings, a shipping container embodying the invention is shown in part in FIGURE 1 and generally designated **10**. It comprises a cylindrical shell **12** having rolling hoops **14** and the end wall **16**. The end wall **16** is provided with the conventional vent **18** and the larger opening and closure **20** which this invention concerns.

FIGURES 2 and 2*a* disclose one form of readily prepared opening therefor. The only step necessary in preparing the container **10** for the closure **20** is the forming about the opening of an upwardly turned flange **22**. This flange, as illustrated, is turned outwardly from the wall at bend **24** (FIGURE 3) and provided with an inwardly reversely bent lip **26** (FIGURE 3) which will obviate the sharp metal edge otherwise present, strengthen the opening structure, and provide additional seating means for the resilient sealing element **28**. It is understood that the sealing element **28** is readily adaptable to flanges of varying design including those which project vertically and those with lips, hems, or folds of various sizes and shapes. Thus, the flange may be variously arranged so long as it provides a resistance to expansion of the sealing element with which it cooperates.

The flanged opening is shown rolled onto the end wall of the container. However, it will be understood that the opening of the invention could be made in the shell **12** of the container about half way between the rolling hoops **14** or elsewhere.

As shown in FIGURES 2, 2*a*, and 3, a generally cup-shaped sealing element **28** is provided. It includes a thickened interiorly threaded mouth **30**, the threads being tapered so that the diameter of the threaded mouth is less toward the inside of the container than toward the outside (FIG. 3). The cup-shaped element **28** additionally includes the generally vertically directed circular wall **32** which is relatively thin and the convex upward, generally cone-shaped bottom wall **34**, relatively thicker. As may be noted from FIGURES 2, 2*a*, and 3, the cup-shaped sealing element **28** is made from an integrally molded body of thermoplastic, preferably rubber or polyethylene. The flexibility of various parts depends on the material used and the thickness thereof. The thin vertical wall **32** is relatively flexible: the thicker bottom wall **34** relatively rigid.

As shown in FIGURE 3 especially, the outside surface of the mouth **30** of the sealing element is tapered outwardly upward to correspond to the incline of the annular flange **22**. Additionally, a surface of the mouth abuts the shoulder formed by the downturned lip **26** of the flange, which holds the sealing element from popping upwardly when first inserted, and is provided as shown with an annular collar portion **30'** so formed or contoured as to fold partially over the inward reversed lip **26** to (*a*) prevent the sealing element **28** from slipping or being forced into the container as an actuating plug **42** is entering and to (*b*) provide a means by which the sealing element **28** may be easily seized and pulled out of the opening subsequent to the removal of the actuating plug **42**, see FIG. 4.

The central portion of the bottom wall of the sealing element **28** is formed with a central axial thickened boss **36**. As shown, the boss **36** is formed with an axially threaded bore **38** extending toward the center of the boss from opposite directions and leaving a thin membrane **40**. This membrane of resilient material is frangible: it may be broken by a sharp instrument so that a faucet or the like can be screwed through the boss **36** from the outside to communicate with the inside of the container. While threading is the conventional means of accommodating the faucet it is not necessarily the only device suitable for this purpose, in fact one or more integrally formed fins **38'** or the like, see FIG. 6, continuous or broken, circular or spiral, may well be substituted for the threadings shown. The lower ends of the threads **38** or fins **38'** below the membrane **40** may be used to receive a faucet inserted therein before installation of the sealing element **28** for the purpose of carrying the faucet with the drum or container for later use.

A commercially available conventional type 2-inch plug element **42** is included in the structure. One form of plug element is shown in FIGURES 2 and 4 to comprise a cylinder **44** having a downward central recess **46** and an outwardly extending flange **48** about its top. An annular gasket **50** of resilient material is disposed under the flange. In the recess **46** the plug element is provided with a pair of inwardly directed opposed turning fins **52**, and the bottom portion of the plug has a downwardly extending shoe **54** which terminates downwardly in a flat surface. Through the cylinder extends a centrally threaded opening **56** aligned with the bore **38** of the sealing element. A conventional threaded ¾-inch plug **58** is received into the threaded opening in the 2-inch plug element, said ¾-inch plug being provided with an annular gasket **60** about the top thereof to seal the connection between the plug **58** and the cylinder **46**.

In operation, the cup-shaped sealing element **28** is inserted into the opening with its mouth **30** received in the flange **22**, the upper outer portion **30''** of the mouth **30** being disposed just under the turned-down lip **26** and having its top outer portion **30'** extending partially over the turned-down lip **26**. As shown in FIG. 3 the bottom wall of the cup-shaped element is convex upward. Next see FIG. 4, the plug element **42** is screwed into the taper-threaded mouth **30** of the cup-shaped sealing element **28**, the threads of the plug element sealingly engaging the taper threads of the sealing element. As the plug element **42** is turned home, the taper threads press the mouth **30** of the sealing element outwardly against the flange, particularly in the area of the bend **24**. Thus, a first seal is formed between the sealing element **28** and the flange **22**.

Also as the plug element is turned home, the bottom surface of shoe **54** drives the central boss **36** of the sealing element downward and flexes the bottom wall of the sealing element to concave disposition (FIG. 4). Because the cone-shaped annular portion of the bottom wall **34** is relatively stiff, it remains straight and as shown in FIG. 4 serves to prop outward the relatively flexible portion of the vertical wall **32** so that an annular portion **32'** thereof flattens, seating against the adjacent undersurface of the container wall **16** about the opening. This seating serves not only as a second seal to prevent fluid from leaking up between the flange **22** and the sealing element **28**, but also to prevent the upward displacement of sealing element out of the opening even under severest internal pressures.

After membrane **40** is ruptured, a faucet may be screwed or otherwise inserted into the ¾-inch plug opening **56** and through boss **36** to communicate with the inside of the container.

The plug element **42** shown in sectional FIG. 4 is a well-known commercially available plug. In FIG. 5 is shown a section of a slightly different plug element, see FIG. 2*a*, in which primed form of reference numbers designate corresponding parts to the plug element in the FIG. 4 embodiment. This second type of plug element is also commercially available. With the latter type plug element, the ¾-inch plug **58'** rather than shoe **54** engages the boss **36**.

The assemblies may be completed with the addition of protective caps or covers known in the trade as cap seals, shown in FIGURES 1, 2, 2*a*, and 4 but not shown in FIGURE 5, which are secured to the closure by crimping the downturned skirt of same inwardly about the upwardly inclined flange **22** of the closure shown. Tear strips are provided to strip off these conventional protective covers.

The device of the invention may be used with a con-

tainer liner disposed in the container with the neck of the liner disposed annularly between the flange 22 and the sealing element 28. So disposed, the liner neck is not subject to the cutting action of threads, only to the compression of the sealing element against the flange. Thus the liner is not damaged and may be reused.

In normal usage, a shipping container is subject to severe static and shock pressure both from inside and without. For this reason it is necessary that containers be provided with exceptionally firm and sturdy closure means. Up until now this means has been, as noted above, a screw-threaded flange expensively secured to a wall of the container and receiving a screw-threaded plug. There have been no comparatively inexpensive means meeting the strength requirements. Because the closure means of the present invention is able to withstand severe tests, and is inexpensive and possesses other advantages noted above, it is felt that it answers the long-felt need in the art.

While this invention has been shown in but a limited number of forms, it will be obvious to those skilled in the art that it is not so limited but is susceptible of various changes and modifications without departing from the spirit and scope of the claimed invention.

I claim:

1. A shipping container partly defined by a wall having an opening therein; a resilient, generally cup-shaped sealing element having an interiorly threaded mouth and comprising a relatively flexible generally vertically directed circular wall and a relatively rigid convex-upward bottom wall, said generally cup-shaped sealing element depending into said opening with its mouth engaging about the margin of said opening; and a plug element exteriorly threaded and screwingly received into said threaded mouth and adapted, upon being screwed home, to flex said bottom wall into concave disposition thereby propping outward said circular wall beneath said opening to form a seal therewith and to prevent upward displacement of said sealing element.

2. A shipping container partly defined by a wall having an opening with an outwardly upstanding flange thereabout; a resilient generally cup-shaped sealing element having an interiorly taper-threaded mouth and comprising a relatively flexible generally vertically directed circular wall and a relatively rigid convex-upward generally cone-shaped bottom wall, said generally cup-shaped sealing element depending into said opening with its mouth snugly engaging about said flange; and a plug element, exteriorly threaded and screwingly received into said taper-threaded mouth, whereby when said plug element is screwed home, it compressively engages said taper threads pressing said mouth outward into sealing engagement with said flange and it drives downward the central portion of said generally cone-shaped bottom wall, flexing said bottom wall into concave disposition thereby propping outward said circular wall and causing an annular portion thereof to flatten against the undersurface of said container wall about said opening in sealing engagement with said undersurface throughout its whole extent.

3. A shipping container as described in claim 2 wherein said sealing element comprises a single piece of molded thermoplastic and the relatively flexible portions are thinner than the relatively rigid portions.

4. A shipping container as described in claim 2 wherein the bottom wall of said sealing element has a central boss, said boss having an axial bore closed by a thin frangible membrane secured thereacross, said bore being adapted to receive and hold a fitting therein.

5. A shipping container as described in claim 4 wherein said sealing element including said boss and said membrane comprises a single piece of molded thermoplastic.

6. A shipping container as described in claim 4 wherein said plug element is formed with a central aperture in alignment with and of similar diameter to said axial bore whereby said membrane can be ruptured and a faucet can be inserted through said aperture and secured in said bore thereby to communicate with the interior of said container.

7. A shipping container as described in claim 6 wherein said central aperture of said plug element is threaded and said faucet is threadedly received therein.

8. A closure assembly for use with a shipping container partially defined by a wall having an opening therein comprising, a resilient generally cup-shaped sealing element having an interiorly threaded mouth and comprising a relatively flexible vertically directed circular wall and a relatively rigid convex-upward bottom wall, said generally cup-shaped sealing element being adapted to depend into said opening with its mouth being adapted to engage about the margin of said opening; and a plug element exteriorly threaded and screwingly received into said threaded mouth and adapted, upon being screwed home, to flex said bottom wall into concave disposition thereby propping outward said circular wall into a position adapted to engage beneath said opening to form a seal therewith and whereby said sealing element is prevented from upward displacement through said opening.

9. A closure assembly for use with a shipping container partially defined by a wall having an opening with an upstanding flange thereabout comprising, a resilient generally cup-shaped sealing element having an interiorly taper-threaded mouth and comprising a relatively flexible vertically directed circular wall and a relatively rigid convex-upward generally cone-shaped bottom wall, said generally cup-shaped sealing element being adapted to depend into said opening with its mouth snugly engaging about said flange; and a plug element, exteriorly threaded and screwingly received into said taper-threaded mouth, whereby when said plug element is screwed home, it compressively engages said tapered threads pressing said mouth outward into sealing engagement with said flange and it drives downward the central portion of said generally cone-shaped bottom wall, flexing said bottom wall into concave disposition thereby propping outward said circular wall and causing an annular portion thereof to flatten against the complete undersurface of said container wall about said opening in sealing engagement with said undersurface.

10. A shipping container partly defined by a wall having an opening therein and a flange associated therewith; a resilient, generally cup-shaped sealing element having an interiorly threaded mouth and comprising a relatively flexible generally vertically directed circular wall and a relatively rigid convex-upward bottom wall, said generally cup-shaped sealing element depending into said opening with its mouth engaging about said flange; and a plug element exteriorly threaded and screwingly received into said threaded mouth and adapted, upon being screwed home, to flex said bottom wall into concave disposition thereby propping outward an adjacent portion of said circular wall beneath said opening to form a seal therewith and to prevent upward displacement of said sealing element.

11. A closure assembly for use with a shipping container partially defined by a wall having an opening with an upstanding flange thereabout comprising, a resilient generally cup-shaped sealing element having an interiorly threaded mouth, a relatively rigid convex-upward generally cone-shaped bottom wall and an annular top portion for receiving a sealing means and for engagement with the top portion of said upstanding flange, said generally cup-shaped sealing element being adapted to depend into said opening with its mouth snugly engaging about said upstanding flange; and a plug element, exteriorly threaded and threadedly received into said threaded mouth and having a transversely extending top flange portion for sealing engagement with said annular top portion of said cup-shaped sealing element, whereby when said plug element is screwed home, it compressively engages said threads pressing said mouth outward into sealing engagement with said flange and it drives down-

ward the central portion of said generally cone-shaped bottom wall, flexing said bottom wall into concave disposition, thereby propping outward said circular wall and causing an annular portion thereof to flatten against the complete undersurface of said container wall about said opening in sealing engagement with said complete undersurface, said transversely extending flange portion on said plug contacting said annular top sealing portion of said cup-shaped member and holding it in sealing engagement with the adjacent portion of said upstanding flange.

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