April 20, 1965 H. B. LITTLEFIELD 3,179,280

CLOSURE FOR CONTAINERS

Filed March 13, 1963

Fig. 1.

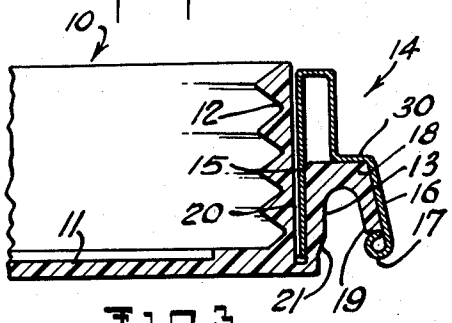


Fig. 2.

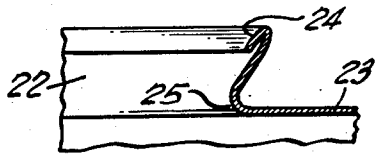


Fig. 3.

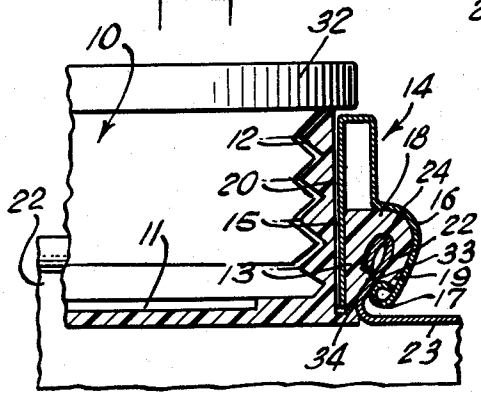


Fig. 4.

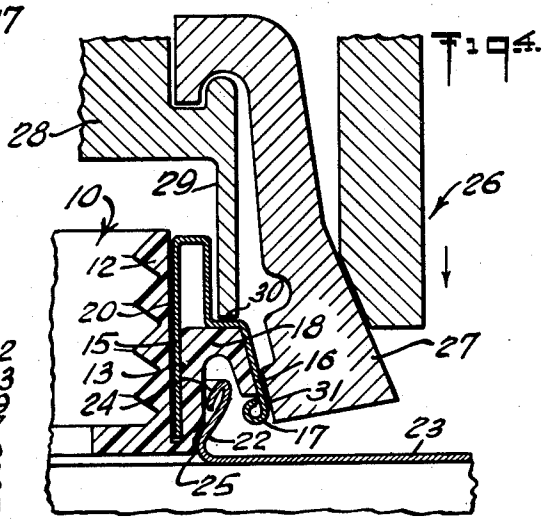
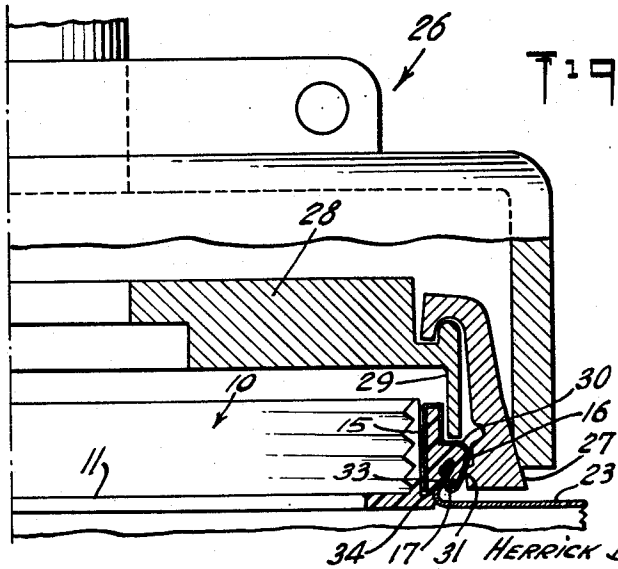


Fig. 5.



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CLOSURE FOR CONTAINERS

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The present invention relates to closures of the type employed with sheet metal cans, drums or the like which are widely used in the storage and transportation of liquid or semiliquid products ranging in character from relatively inert materials to strongly active chemicals and varying widely in other characteristics.

Known forms of such containers commonly have a filling and discharge orifice in an end wall defined by an outwardly extending annular collar. A threaded fitting, as a bushing, commonly of a suitable plastic, as polyethylene, or the like, is engaged with said collar and equipped with a threaded plug also of polyethylene. Devices of this general type are illustrated in U.S. patents to Shore 2,822,964; Keplinger 2,916,311 and Rieke 2,661,128 and 2,772,017.

Although known types of container closures are capable of confining some kinds of liquids or other kinds under some conditions, it appears that no single type is capable of effectively arresting leakage and also of preventing contamination of more sensitive kinds of chemical contents under all normal conditions.

In certain know types of sheet metal containers, for example, the peripheral rim of the orifice defining collar is folded or beaded inwardly against the inside surface of said collar thus leaving exposed a narrow edge of uncoated metal which as a practical matter is difficult if not impossible to coat effectively. Also, it has been found difficult to consistently apply a coating of lining material to effectively cover the entire inside surface of the collar. Accordingly, under some conditions, sufficient metal surface remains exposed to contaminate or adversely affect sensitive chemical contents which come in contact therewith, even though all other surfaces of the container are adequately provided with a protective lining, or the like.

In some forms of closures of the "crimp on" type where the collar is provided with a fitting of chemically inert material, commonly polyethylene, it initially includes a diaphragm which is later cut out or otherwise pierced or removed by a suitable tool. Where the drum or other container carries some highly sensitive chemical, for example, even the short duration contact of such a metal tool with a minor portion thereof is capable of impairing or adversely modifying the entire contents.

It has also been proposed to secure the polyethylene fitting in place on the collar by means of a metal ring applied while the fitting is reinforced with a screw type plug or stopper commonly also of polyethylene. Initially and while the plug is in place, a certain degree of sealing contact is effected between the fitting and the collar. However, when the reinforcing plug is removed, as for discharge of the container contents, the fitting yields under continued pressure from the ring; and sealing contact is thus impaired so that the contents of the container may thus be brought into contaminating contact with now exposed or accessible uncoated surfaces of the metal collar even though no actual leakage from the container occurs.

As a practical matter, under such circumstances it is almost essential for routine sealing that the clamping ring be applied in this type of closure only after the container has been filled.

An object of the present invention, accordingly, has been to provide a closure of the "crimp on" type for containers of the kind above indicated which can be readily

applied either before or after filling and wherein the fitting and the ring may be assembled by automatic devices as a step in manufacture prior to filling; which will not only minimize leakage of all types of liquids commonly stored or transported in the container and remain leak resistant under normal conditions of use but which will also prevent contaminating contact of the container contents with exposed or uncoated metal surfaces during filling, discharging, transport and storage; which by employing a fitting or bushing of polyethylene or the like, optionally in a relatively simple or open gasket form, renders unnecessary the use of a cutting tool or the like in gaining access to contents of the container and thereby avoids contamination of specially sensitive materials; and which will provide effective reinforcement for the polyethylene fitting both in those portions which commonly serve as a discharge spout, or as a connection for pipes, hose or other conduits and in sealing portions engaged between the collar and the inner wall of the clamping ring.

In general, a closure according to my invention comprises in combination an outwardly flared or tapered orifice defining collar of a metal container, a fitting preferably of a suitable plastic material, as polyethylene, either with or without a transverse closing diaphragm, mounted in said collar, and comprising in a single piece a base, an interiorly threaded annular wall and an outer wall, and a reinforcing and crimping or clinching ring providing an innner substantially cylindrical wall arranged with a lower edge portion engaged in said fitting between said walls thereof and embracing portions of said inner wall thereof, and a skirit portion overlapping said outer wall of the fitting and having an inwardly turned rim bearing against the outer tapered face of said collar of the container, and with lower end portions of said fitting being in effect wedged between said lower edge portion of the cylindrical wall of the ring and an opposed portion of said collar at approximately its line or zone of minimum inside diameter and closely adjacent to where it opens into the container.

To produce a closure as above described, the fitting and the ring are assembled with the cylindrical inner wall of the ring engaged between the inner and outer walls of the fitting. This assembly is positioned on the collar with the fitting extending into the collar opening and with the outer wall or skirt of the ring encircling an upper portion of the collar.

The arrangement of parts is such that when pressure is now applied to the skirt portion of the ring, the rim thereof is forced inwardly to engage the outer tapered face of the encircled collar.

Continued constricting pressure on the ring skirt causes the rim to follow the downwardly narrowing contour of the collar. The rim opening is thus constricted while the fitting is drawn down to a position in relation to the collar. Wherein portions thereof flow into and are wedged in the space between said inner cylindrical wall of the ring and adjacent inner surface portions of the collar. Thus, a lower portion of the fitting in effect is securely held in fixed compressed or compacted condition to provide a seal between the inner wall portion of the ring and an opposed portion of the collar wall which defines the narrowest part of the orifice opening. Thus, with portions of the fitting permanently secured in a rigid or unchanging condition between said opposed parts of the crimping ring, it is not necessary in order to maintain the resulting seal that the plug be in place when crimping is effected. The fitting being reinforced is therefore not free to change in dimensions or position when the plug is absent or is removed therefrom so that the initial sealing contact between collar and fitting is re-

tained under all subsequent normal conditions of use. Application of the ring and fitting assembly to the drum collar may be facilitated where the outer surface of the fitting is beveled inwardly at its lower end to form a tapered face which enters readily into the tapered lower portion of the collar approximately at its line of minimum diameter opening.

An embodiment of my invention is shown in the accompanying drawings wherein:

FIGURE 1 is a fragmentary view in radial section of an assembly of a crimping or clinching metal ring with a fitting or bushing of polyethylene or the like;

FIG. 2, a similar view of a portion of a flange or collar which defines the filling and discharge opening or orifice in a metal drum or like container;

FIG. 3, a similar view of a completed closure wherein the assembly of FIGURE 1 is operatively secured to the collar shown in FIG. 2;

FIG. 4, a similar view partly diagrammatic, illustrating steps in a method of producing the closure of FIG. 3. Thus while the assembly of FIG. 1 is initially engaged with the collar of FIG. 2, the outer wall of the crimping ring is operatively engaged with parts of a conventional crimping tool whereby the beaded rim of said ring is pressed inwardly into sliding and clinching engagement with the tapered outer face of the collar. This produces a force of which the lateral component constricts the rim opening while the vertical component draws the fitting downwardly; and

FIG. 5 is a similar view showing the positions and condition of the parts at the end of the crimping operation with the fitting sealed in the collar at the minimum diameter of the orifice opening and at a position closely adjacent to where said collar opens into the container; and intermediate portions of the fitting are seen wedged into the space between the inner wall of the ring and opposed surface portions of the collar; and the constricted rim in its end position clinches the parts in the operative sealing condition shown in FIG. 3.

Referring to the drawings, the assembly seen in FIG. 1 comprises an annular polyethylene fitting or bushing **10** which provides in a single piece a base **11**, an inner threaded wall **12** and an outer wall **13** separated from said inner wall by an annular recess **20**. The base **11** may include a closed diaphragm; or it may be formed with a bottom opening so that no cutting tool will be required to make an opening through the fitting for discharging the container contents. Said assembly also includes a crimping or clinching ring **14** of steel or other suitable metal having a substantially cylindrical inner wall **15** and an outer wall including a skirt **16** having a beaded inwardly turned rim **17**. A peripheral flange **18** extends laterally from outer wall **13** of the fitting and may include a lip **19**. The inner wall **15** of rim **14** is engaged in said substantially cylindrical recess **20** between said inner wall **12** and said outer wall **13** of the fitting which, as initially formed, includes a tapered zone **21** at its lower end.

To produce the closure of the invention in the form seen in FIG. 3, said assembly of ring and fitting is initially engaged with collar **22** of drum **23**, or the like, as seen in FIG. 4. As seen in FIG. 2, a collar **22** defines the filling and discharge opening of drum or container **23** and is flared or tapered in cross-sectional contour to provide in effect a tapered opening and is provided at its outer edge with a bead **24**. A lower end portion of collar **22** defines, approximately at **25**, the area or line of minimum diameter opening which is less than that of the opening across bead **24** of the collar **22**. By reason of its tapering zone at **21**, fitting **10** with ring **14** slips easily into its initial position in collar **22** wherein the taper surface **21** seats on a portion of the inner tapered face of flared collar **22**, as seen in FIG. 4.

With the parts so arranged, a crimping tool **26** of known conventional type is positioned with its die pieces **27** encircling and operatively engaging the outer wall or skirt **16** of ring **14**. Said dies **27** are supported on a head **28** provided with a depending flange **29** the bottom edge of which rests on a transversely disposed portion **30** of the ring **14**. This brings the presser face **31** of each die **27** in position to bear against a lower portion of skirt **16** opposite bead **17** which is turned inwardly at a level to engage the outer tapered surface of said collar at a level below bead **24** thereof, FIG. 5.

When, during operation of tool **26** in a known manner, dies **27** cause bead **17** to be pressed inwardly against said outer surface of the tapered collar, a downward component of the applied force develops as bead **17** slides on the tapered outer surface thereof. This has the effect of constricting the rim or bottom opening of skirt **16** while causing the fitting to be moved downwardly by the vertical component of the applied crimping pressure which forces the ring **14** and hence fitting **10** downwardly. This vertical movement of the ring is transmitted to a lower portion of the fitting in part through the bottom edge of the inner wall **15** of ring **14** which is seated in recess **20** between the inner and outer walls of the fitting and in part through the transverse portion **30** of said ring.

In connection with the above described downward displacement of fitting **10** from initial position as seen in FIG. 4 to final position as seen in FIG. 5, portions of the outer wall **13** thereof, as at **33**, FIG. 3 being retained against inward displacement by the rigid inner wall **15** of ring **14** flow outwardly into the space between said outer wall **13** of fitting **14** and opposed portions of the collar **22** to form in effect an annular shoulder opposed to bead **24** while lower parts of said outer wall **13** are compacted between said rigid inner wall **15** of ring **14** and said collar, as at **34**, and preferably along a line, as **25**, defining approximately the minimum diameter of the collar opening. Also, the compacted area at **34** is advantageously located as closely as practicable to the base of said collar so that the major part of the area of the interior surface thereof will thereby be effectively sealed off from the interior of the container. The described flowing and compacting of portions of the outer wall **13** of the fitting are effected with no other distortion or displacement of fitting **10** or of the ring **14**, regardless of the presence or absence of a plug, as **32** during the clinching operation.

It is contemplated that the resulting closure eleminates practically all danger of contamination of the container contents inasmuch as the collar is thereby effectively sealed off, whereas, in general, the collar provides the most frequent occurrences of exposed metal because of the great difficulty of coating its inner surfaces and of maintaining the effectiveness of such a coating and of maintaining adequate sealing.

It will be apparent from the foregoing description considered in connection with the drawings that the present invention, when embodied as indicated, produces, among other advantages, some of which have been noted, not only an effective leak resistant closure but especially one which also protects the confined liquids against contaminating contact with bare metal. This construction also permits the use of the same set of clinching or crimping dies for affixing fittings to drums formed from plates of different gauges or thicknesses, or to drums wherein the orifice collar may be slightly distorted from an accurately circular contour. A further advantage is that the crimping ring and the fitting as well as the polyethylene plug, if desired, may be economically and advantageously preassembled by the use of automatic equipment in manufacture thus reducing hand operations at the filling site. It is noted that the inner or cylindrical wall of the securing ring functions in cooperation with the skirt rim not only to retain the fitting in the drum collar but also to reinforce the threaded inner wall of said fitting to thereby more effectively accommodate pump hose, pipe, or the like, connections. Also, in such a structure, that zone of the orifice collar which receives the ultimate sustained

pressure from the constricted rim of the ring skirt is not deformed or distorted in the attaching procedure and is, by reason of its location approximately at the base and the narrowest diameter opening of the collar, the part which is strongest and least vulnerable to distortion both during formation of the orifice and collar and during subsequent operations including reconditioning if any of the drum and collar.

I claim:

1. A closure for a container having a filling and discharge opening, said closure including a collar extending from a wall thereof around said opening, a non-metallic fitting mounted in said collar and including a base portion, an inner wall and an outer wall separated therefrom by an annular recess, and a crimping ring arranged to secure said fitting to said collar, said ring having an inner substantially cylindrical wall arranged with a peripheral edge portion engaged in said recess of the fitting and an outer wall spaced from said inner wall of the ring and having a lower edge extending radially inwardly into embracing engagement with said collar, portions of said outer wall of the fitting being retained in compacted leak arresting condition between said cylindrical wall of the ring and said collar.

2. A closure device for a container having a filling and discharge opening including a collar which defines said opening, a non-metallic fitting mounted in said collar, and a crimping ring embracing portions of said collar and of said fitting to retain the latter in secure engagement with the collar, said fitting having an outer wall and an inner threaded wall extending axially beyond said outer wall, and said ring having a substantially cylindrical inner well arranged with a portion operatively engaged between opposed portions of said outer and inner walls of the fitting, portions of said inner wall of the ring extending axially beyond said outer wall of the fitting and being arranged and positioned to embrace and reinforce portions of said inner wall of the fitting.

3. A fitting for use with closures for liquid containers comprising an annulus of plastic material including a base, an inner wall and an outer wall integral therewith, and an annular recess coaxial with and arranged between said inner and outer walls and having an open end, said inner wall extending from the base axially beyond said outer wall and said open end of said recess, and said outer wall having a main portion co-extensive axially with said recess and an annular shoulder extending laterally therefrom and providing at its outer rim a peripheral lip extending at an angle to said shoulder and spaced from outer opposed surface portions of said outer wall.

4. A closure for containers wherein a wall thereof has a filling and discharge orifice, said closure including a collar defining said orifice and having a rim extending beyond said wall, a polyethylene fitting having a base and, integral therewith, an outer wall provided with a laterally extending peripheral flange and an internally threaded inner wall disposed with an end extending axially beyond said flange, said fitting being seated in said collar with peripheral portions thereof in compacted sealing contact with opposed portions of the collar at a level below said rim thereof, and a crimping ring comprising an inner wall and an outer wall, said inner wall having lower edge portions engaged in said fitting opposite said collar, and said outer wall embracing said flange and arranged with said edge portions directed inwardly and bearing against outer surface portions of said collar, whereby a portion of said fitting is held in compacted condition between said inner wall of the ring and the collar and in effective sealing contact therewith.

5. A closure device according to claim 4 and wherein said collar is flared outwardly and is of substantially frusto-conical cross-sectional contour between its base and its rim.

6. A closure device according to claim 4 and wherein said inner wall of the crimping ring is cylindrical and provides a substantially rigid reinforcement for the polyethylene fitting and a fixed stop for retaining portions of the fitting against endwise displacement and in compacted condition between said inner wall and said collar.

7. A closure for a container having a filling and discharge opening defined by an outwardly flared tapering collar, said closure including a fitting of polyethylene or the like engaged in said collar and extending from beyond the outer rim thereof inwardly to occupy substantially the entire depth thereof, and a metal crimping ring having a substantially cylindrical inner wall engaged coaxially in said fitting, and an outer wall having an inturned rim compressibly embracing said collar and cooperating therewith and with said inner wall to retain said fitting in compacted condition between said inner wall of the ring and said collar to effect operative sealing contact of the fitting with said collar approximately at a line in a plane closely adjacent to the plane in which the collar is joined to the container.

8. A closure for a container having a filling and discharge opening defined by an outwardly flared tapering collar, said closure including a fitting of polyethylene, or the like, engaged in said collar, and a metal ring having a substantially cylindrical inner wall which provides a rigid core engaged coaxially in said fitting to resist deformation of the fitting by inwardly directed forces applied thereto, said ring having an outer wall portion positioned to embrace said collar and arranged and adapted in cooperation therewith and with said core to retain said fitting in said collar with portions of said fitting in compacted condition between said core and said collar substantially at its line of minimum diameter opening.

9. A closure according to claim 8 and wherein the collar has an inturned beaded rim and a portion of said outer wall of the fitting extends laterally therefrom to provide an annular shoulder between said core and said collar and in opposed relation to said beaded rim.

10. A closure device for a container having a filling and discharge opening including a collar which defines said opening, a non-metallic fitting mounted in said opening and having an outer wall engaging said collar, an inner threaded wall extending axially beyond said outer wall, and an annular recess between said walls, and a crimping ring arranged to secure said fitting to said collar and having an outer wall and an inner wall arranged with a portion engaged in said annular recess and another portion extending axially beyond said recess and being substantially coextensive with said inner wall of the fitting whereby extended portions of said inner wall are protectively embraced by portions of the ring extending beyond said recess.

References Cited by the Examiner

UNITED STATES PATENTS

2,243,288	5/41	Schwartz	29—148.2
2,243,289	5/41	Schwartz	29—148.2
2,772,017	11/56	Rieke	285—203
2,916,311	12/59	Keplinger	285—202
2,989,208	6/61	Gibbs	220—27
3,080,182	3/63	Waldo	220—39
3,098,579	7/63	Wheaton	220—39

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