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DEVICE FOR SECURING THE FILLER NECK OF A CONTAINER LINER TO THE CONTAINER

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8 Claims. (Cl. 220-63)

This invention relates to container closures and, more particularly, to closures for plastic drum liners.

As the production of new kinds and greater amounts of liquid chemicals has increased the shipment of liquid chemicals has increased to a great degree. A large amount of such chemicals are being and have been shipped in the past in drums or carboy-type packages, the majority being shipped in 55 gallon drums lined with inert lining material. Linings, particularly those composed of thermoplastic film, have grown in use because of their inexpensiveness, flexibility and inertness. However, one heretofore unsatisfactorily solved problem with regard to a drum or other container lined with a flexible material such as thermoplastic, is that when subjected to sudden mechanical shock, the neck and spout of the liner have a tendency to withdraw into the drum or other outer package. The prospective user of chemicals from the container must then attempt to fish the dispensing assembly from its withdrawn position, pulling it outwardly through the proper hole in the outer pack or drum wall. Needless to say, this process is frustrating and not always successful, and leads to wastage of chemicals and dissatisfaction with the containers.

It is, therefore, an object of the present invention to provide a securing device that will prevent the neck of a flexible liner from being accidentally withdrawn within the associated container when the container is subjected to mechanical shock.

Another object of the invention is to provide a securing device that establishes an effective seal between a flexible drum liner and the associated drum adjacent the periphery of the dispensing neck of said liner.

Yet another object of this invention is to provide a securing device for a drum liner that adapts the exteriorly threaded neck of said liner to be closed by an exteriorly threaded plug.

A still further object of the present invention is to provide a drum lined with a flexible liner retained in place so as to make the drum liner capable of withstanding a drop of the drum from a height of four feet, full of water, without bursting, leaking or withdrawing into the barrel.

These and other objects of this invention will be more fully set forth in the following detailed description in which specific reference is made to the attached drawing wherein embodiments of the invention are set forth, not to limit the scope of the invention, but so that the principles thereof might be clearly and more easily understood.

In the drawing:

FIGURE 1 is a perspective view of a drum having a liner secured by a device embodying characteristics of the invention. The drum is shown partially broken away to expose the details of a preferred liner;

FIGURE 2 is a top plan view of the securing device shown in FIGURE 1;

FIGURE 3 is a sectional view taken along line 3-3 of FIGURE 2; and

FIGURE 4 is a fragmentary perspective view of a modified form of the securing device.

As shown in the illustrative embodiment in FIGURE 1 a container or drum 10 has a liner 12 preferably composed of somewhat flexible thermoplastic material and arranged within the container so that the side wall 14 of

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the liner is resiliently urged into engagement with the side wall 16 of the container 10 and the liner extends between close adjacency with the container top 18 and bottom (not shown). The close fit of the liner within the container is preferred because it effectively prevents liner failure due to vibration between the liner and container during shipment. As shown, the means resiliently urging the liner side wall into engagement with the drum side wall include a plurality of generally parallel, longitudinally extending scallops or flutes 20 arranged around a majority of the surface of the liner side wall 14. These flutes 20 not only allow the liner to contract radially to fit within the barrel or container, but provide means to stiffen the liner in the longitudinal direction so that its collapse, when only partially full of liquid chemical, will be effectively precluded. The liner 12 is preferably formed, as by blow molding, so that the liner side wall 14, top 22 and bottom (not shown) constitute an integral, seamless unit having an integral filler neck 24. As best shown in FIGURES 1 and 3, the filler neck 24 is generally, but not necessarily, formed at the top of the liner 12 and protrudes through an opening in the container top, which, in the case of a barrel or drum, may be the conventional bung hole 26.

The liner 12 is preferably placed in the drum 10 or other like container before the drum top or head 18 is secured in place. With the liner disclosed herein, and as more fully set forth in the commonly assigned copending application Serial No. 270,915, filed April 5, 1963, the flutes 20 act as strengthening ribs to retain the shape of the flexible liner 12 as shown in FIGURE 1, regardless of the fullness or emptiness of the lined barrel. In addition, the flutes permit the liner side wall to contract radially inwardly when the liner is placed in a barrel having a slightly smaller inner diameter than the greater diameter of the liner. When preferably associated with one another in the above-mentioned manner, the resilient nature of the thermoplastic liner causes the fluted side wall 14 to be resiliently urged into vibration-resisting contact with the barrel side wall 16 as more fully discussed in the above-mentioned commonly assigned application.

The liner 12, in order to be sufficiently resilient and flexible, though inexpensive and resistant to damage by mechanical shock and chemical attack, is preferably composed of a thermoplastic as suggested by the examples of polyethylene; polypropylene; irradiated polyethylene, i.e., irradiated to an extent of 2×10^6 rad. to 20×10^6 rad.; polyvinyl chloride; Saran, e.g., vinylidene chloride-acrylonitrile copolymer (80:20) or vinylidene chloride-vinyl chloride (85:15); rubber hydrochloride; Dacron, e.g., polyethylene terephthalate; nylon, e.g., polymeric hexamethylene adipamide and polymeric epsilon caprolactam; polyvinyl fluoride and the like.

As shown, the integrally formed neck 24 on the liner protrudes through the barrel opening 26 and is preferably only slightly smaller in diameter than the opening 26. Closure receiving means, such as exterior threads 28, are formed on the neck 24 adjacent the outer extent of the neck. It can be easily appreciated that, were a closure cap placed on the neck 24 having a diameter smaller than or only slightly larger than the opening 26, a sudden or violent mechanical jarring of the container 10, such as might result by the container being unskillfully tumbled from a transporting truck to the ground, the neck 24, together with its closure, might be pushed into the container and become wedged therein or damaged. It is this type of shortcoming that has caused the Interstate Commerce Commission to withhold approval of the use of many prior flexibly lined containers in interstate commerce, thereby greatly retarding the use of flexibly lined barrels in interstate commerce. To determine whether

to approve or not approve a particular barrel type for use in interstate trade, the I.C.C. has devised the so-called "drop test" in which the drum or barrel is filled with water and dropped from a height of four feet. In order to be approved, a barrel when so dropped must not have been so damaged as to leak or begin to separate at the seams thereof. Prior flexibly lined barrels have not been able to withstand this test because either they were necessarily "removable head" drums so that the liner which would collapse as the liquid contents were used could be retrieved from the empty drum, or else their spout closures would retract into the barrel and become damaged during the drop test so as to allow leakage. As noted above, this happening would be less likely with the present liner than with liners heretofore used because the vertical flutes 20 make collapsing of the liner quite difficult. However, it would still be a possibility were it not for the use of a novel retaining member having the characteristics as discussed hereinbelow.

As best shown in FIGURE 3, the closure assembly 30 threadably received on the liner neck 24 includes a securing adapter 32 preferably, but not necessarily, formed from a plastic material that is somewhat more rigid than that of the liner. The primarily desirable properties of the plastic composing the adapter 32 include moldability (as conventional by injection molding techniques), dimensional stability, resistance to breakage, especially to that resulting from sudden application of mechanical force or jarring. Therefore, the adapter 32 is preferably not composed of a thermosetting plastic but a composition such as that suggested by the examples including rigid polyethylene; nylon; ABS terpolymer, i.e., acrylonitrile-butadiene-styrene terpolymer; Delrin, i.e., polyoxymethylene and the like, is preferred.

As shown, the adapter 32 is generally cylindrical although it may have any conventional knurling means on the outer periphery thereof to facilitate tightening and includes means such as interior threads 34 on the outer, annular, substantially vertically extending portion 35 thereof for engaging the exterior threads 28. The circumferential periphery is greater in diameter than the diameter of the drum opening 26 and may include a plurality of ear-like members 36 radially extending a substantial distance therefrom adjacent the lower surface of the adapter vertical annular portion 35 so as to make the effective diameter of the adapter substantially greater than that of the opening 26. It can be seen that when the adapter is threadably advanced on the neck 24 to the position in FIGURE 3 that the lower surface 38 of the adapter, as defined by the lower extent of the portion 35 and the ears 36, coacts with the liner top 22 to C-clamp the drum top 18 into sealing engagement with the adapter lower surface 38. This clamping action also constitutes a rigid annular connection between that adapter and drum top that effectively precludes the adapter, and, therefore, the liner neck threadably secured thereto, from being able to be accidentally forced into the drum or container as through a direct mechanical shock accidentally applied to the adapter by dropping the drum on its head.

As shown, the adapter 32 further includes an annular portion 40 integrally formed with and extending radially inwardly from the upper end of the vertically annular portion 35 so as to bridge the upper extent of the lining neck 24. At the radially inner extent of the annular portion 40 an integral downwardly extending annular adapter portion 42 is formed so that the adapter as thus far described resembles an annulus having an inverted U-shaped cross section with a plurality of ears extending radially from one of the legs of the U. Suitable closure plug receiving means, such as internal threads 44, are formed on the radially inner surface of the vertically annular portion 42 and a thin frangible disk-like membrane 46 can be provided integrally with the lower end of the portion 42 bridging the gap within the annulus as to define a seal

to prevent withdrawal of fluid from the lined drum without breaking the seal.

Preferably, an additional seal in the form of a V-shaped annular portion 48 extends downwardly from the lower surface of the annulus portion 40 of the adapter 32. The V-shaped seal 48 is arranged to contact the upper edge 50 of the liner neck 24 so that when the preferably more rigid adapter 32 is threaded down on the neck the V-shaped portion 48 cuts into the upper surface 50 of the neck to provide a permanent seal between the adapter and the interior of the liner.

The closure assembly is completed by a conventional barrel plug 52 having exterior threads to threadably engage the interior adapter threads 44 and a non-circularly shaped recess 54 to receive a plug tightening and loosening tool. Although the plug 52 is preferably formed from the same material as the adapter so that all expansion problems are avoided, it is within the purview of this invention that the exteriorly threaded plug 52 be formed from a different material, plastic, metallic or the like, than the adapter.

An enlarged fragmentary perspective view of the adapter 32 is shown in FIGURE 4 to illustrate that the downwardly extending inner annular portion 42 of the adapter may be molded so that it initially extends both downwardly and radially inwardly. Due to this downward-inward extension the adapter 32 is easily threadably assembled to the liner neck without having to allow for slight variations in thicknesses of the liner necks and widths of the adapter gaps among individual parts. It can easily be understood that when the plug 52 is threaded into the assembly 30 that it will force the portion 42 into the less inward and more vertical extension, as shown in FIGURE 3.

It should be apparent that the improved closure assembly, as presented herein, in conjunction with the convolution stiffened drum liner, may be profitably associated not only with the metal or fiberboard tight head drums preferred, but also with any other carboy-like package in which a flexible, relatively inner container is disposed within a protective outer container for shipment and storage. Additionally, it should be realized that the use of a convolution stiffened, radially expandable, flexible liner, together with the novel closure assembly, is preferred because the anti-collapsing properties of this type of liner cooperate with the novel closure assembly in securing the liner and its filler neck in proper orientation within the outer container, but that the closure assembly as disclosed herein can be advantageously associated with any other type of barrel or container liner which has a filler neck which protrudes through an opening in the barrel or container wherein it is desirable to seal the neck with respect to the container and the closure and to prevent the filler neck from accidentally being withdrawn into the container.

It should now occur to one skilled in the art that although specific embodiments of the invention have been shown and thoroughly discussed to illustrate the principles of the invention, many modifications may be worked on the embodiments shown but that the modifications will not depart from the principles of the invention as disclosed herein. Therefore, the extent of the invention disclosed herein is limited only by the spirit and scope of the following claims.

I claim:

1. A device for securing the filler neck of a container liner to the periphery of an opening in the container through which the filler neck protrudes comprising a first means circumferentially engaging said filler neck and a second means integrally radially extending outwardly from said first means, said second means having a radial extent substantially greater than the diameter of said container opening and said second means engaging the outer surface of said container adjacent the periphery of said opening, wherein said first means comprises an interiorly threaded annulus threadably engaging said filler neck and

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extending coaxially with said filler neck; and said second means comprises a plurality of ears secured to said annulus adjacent the end thereof most closely adjacent the juncture between said filler neck and said container.

2. A device for securing the filler neck of a container liner to the periphery of an opening in the container through which the filler neck protrudes comprising a first means circumferentially engaging said filler neck and a second means integrally radially extending outwardly from said first means, said second means having a radial extent substantially greater than the diameter of said container opening and said second means engaging the outer surface of said container adjacent the periphery of said opening, said first means comprises an interiorly threaded annulus threadably engaging said filler neck and extending coaxially with said filler neck; and said second means comprises a plurality of ears secured to said annulus adjacent the end thereof most closely adjacent the juncture between said filler neck and said container; said device additionally comprising a second annulus extending radially inwardly from said interiorly threaded annulus, said second annulus being integrally joined to said first annulus adjacent the end thereof furthest from the juncture between said filler neck and said container, said second annulus having a lower annular surface; means defining a seal having a generally V-shaped cross section integrally extending from said second annulus lower surface and being arranged thereon to sealingly engage the outer end of said filler neck.

3. A device as set forth in claim 2 additionally comprising a third annular portion integrally extending downwardly from the inner extent of said second annulus, said third annular portion being generally coaxial with said first and second annuli, said third annular portion having means arranged thereon to receive a closure plug to removably sealingly close the opening defined within said portion.

4. A device as set forth in claim 3 wherein said device including the last-mentioned downwardly extending annular portion is composed of a somewhat flexible thermoplastic material, said annular portion also extending inwardly as to define a frusto-conic section, said device being thereby more easily assembled to a liner neck of slightly irregular thickness; the lower, lesser diameter end of said annular portion being radially expandable into greater engagement with the liner neck in response to the insertion of a generally cylindrical closure plug within the opening through said portion.

5. A device as set forth in claim 3 additionally including an integral, disk-like frangible seal within said down-

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wardly extending annular portion adjacent the lower end thereof, said frangible seal being arranged to completely block the opening through said downwardly extending annular portion.

6. A device as set forth in claim 3 additionally including a generally cylindrical closure plug threadably received within said downwardly extending annular portion, said closure plug having a non-circular recess therein for receiving a plug inserting and removing tool.

7. A device as set forth in claim 3 wherein said first, second and third annuli comprise an integral adapter, said adapter being composed of a moldable, dimensionally stable, slightly flexible thermoplastic chosen from the group consisting of rigid polyethylene, nylon, acrylonitrile-butadiene-styrene terpolymer and polyoxymethylene.

8. A container comprising: a tight head drum having an opening through one head thereof, a flexible, integrally molded thermoplastic liner disposed within said drum, a filler neck integrally molded on the drum liner and projecting outwardly through said head opening; closure assembly receiving means formed on the filler neck adjacent the outer extent thereof; a closure assembly secured on said filler neck; the closure assembly including means sealingly and securingly engaging said filler neck; means extending radially from said assembly near the end thereof most closely adjacent said drum head, said radially extending means engaging the drum head adjacent the periphery of the opening therethrough as to effectively prevent the accidental withdrawal of the filler neck through said opening, means removably receiving a closure plug, said liner and said closure assembly each being composed of a thermoplastic material; the material composing said liner being substantially softer and more flexible than that composing said closure assembly whereby the sealing and securing means on said closure assembly are adapted to deform said filler neck into greater sealing engagement therewith.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

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January 26, 1965

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It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

In the grant, lines 2 and 3, and line 12, and in the heading to the printed specification, lines 5 and 6, for "The Greig Bros. Cooperage Corporation", each occurrence, read -- The Greif Bros. Cooperage Corporation --.

Signed and sealed this 16th day of August 1966.

(SEAL)

Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents