

[54] LINERLESS CLOSURE

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[51] Int. Cl. B65d 53/00

[58] Field of Search 215/DIG. 1, 40

[56] References Cited

UNITED STATES PATENTS

3,001,658	9/1961	Herter.....	215/40 X
2,752,059	6/1956	Schneider	215/DIG. 1 UX
3,203,571	8/1965	Plunkett.....	215/DIG. 1 UX

3,568,871 3/1971 Livingstone..... 215/40

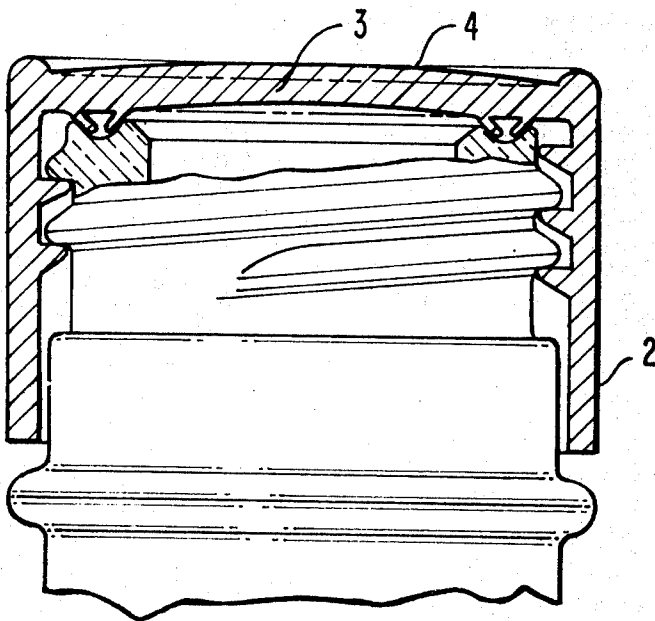
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[57] ABSTRACT

The present invention relates to a unique unitary linerless closure for closing containers whose neck is provided with a U-shaped groove in the top wall of the container neck, the U-shaped groove having sidewalls which slant outwardly and upwardly at an angle, the closure being provided with substantially circular radially spaced ribs depending from the lower surface of the top portion of the closure, the outer walls of the ribs slanting downwardly and inwardly at the same angle, said ribs being undercut by their inner walls and adapted to sealingly engage the groove when said closure is seated on said container neck.

6 Claims, 4 Drawing Figures



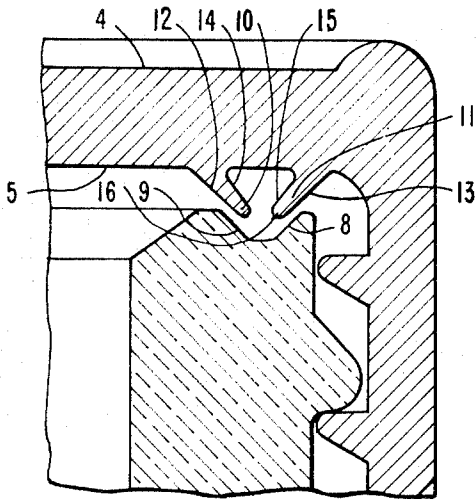


FIG.-1

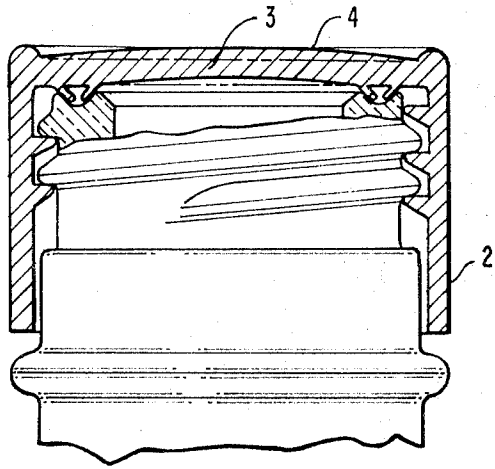


FIG.-2

FIG.-3

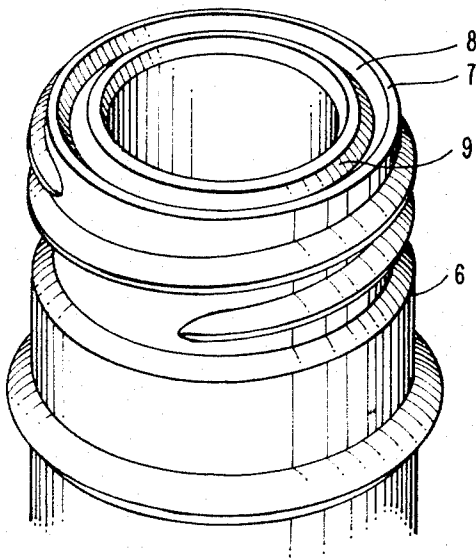
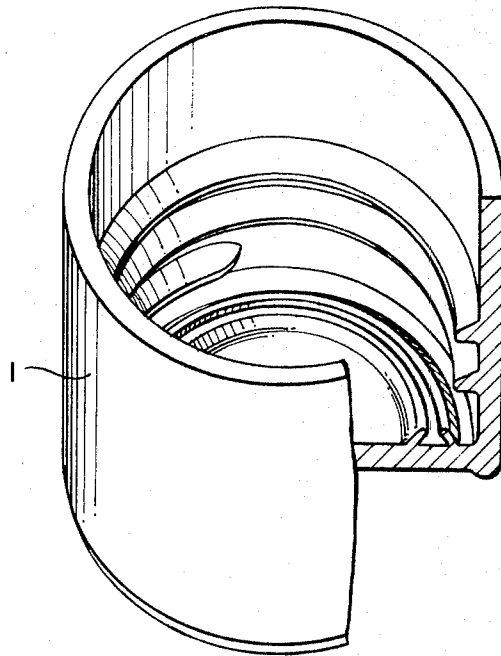


FIG.-4



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LINERLESS CLOSURE

BACKGROUND OF THE INVENTION

The present invention relates to container closures and more particularly to a unique unitary container closure and the combination of such closure with a container the neck of which is adapted to be sealingly engaged by the closure.

There has been a long standing need in the container industry for a linerless closure for containers which will provide an effective seal after repeated and continuous use. The ideal closure should be inexpensive, difficult to damage and provide allowances for stresses and strains which closures and containers undergo in shipment and storage and for expansion and contraction which occurs due to variations in climatic conditions during shipment, storage and use.

Expense in the manufacture of closures can be kept to a minimum by providing a closure of unitary construction as opposed to one wherein a sealing disk is enclosed by an outer capsule. In addition, the disk type closures have the inherent disadvantage that the disks frequently become dislodged from the capsule and are thus easily lost or damaged.

Many prior art closures are of unitary construction, recognizing the need for a unitary structure, but most have failed to maintain adequate sealing properties upon repeated and constant use. Frequently, their failure has been due to the lack of allowances for physical variations and particularly the failure to allow for some permanent deformation of the seal upon repeated opening and closing of the container. Other prior art closures, although somewhat effective, require adherence to rigid tolerances which increases their cost. The most common type of unitary closure is one wherein lips of varying configuration have been formed on the underside of a cap, such lips being designed to contact a portion of the neck of the container to which they are applied. Examples of this type of closure include Miller, U.S. Pat. No. 3,255,909, wherein a single lip contacts the upper surface of a container neck; Gibson, U.S. Pat. No. 3,232,470, wherein a bifurcated lip contacts the upper surface of the neck and overhangs the upper internal wall of the neck; Wandell, U.S. Pat. No. 3,107,022, wherein a lip contacts the internal upper edge of the neck in yet a different manner.

Another type of closure of unitary construction is a type characterized by the modification of the container neck to provide a structure which cooperates with lips depending from the closure. Examples of such prior art closures include: Powers, U.S. Pat. No. 1,989,527 and Kosar, U.S. Pat. No. 3,428,208. Other closures, such as Herter, U.S. Pat. No. 3,001,658 have recognized the need for modified lip and neck structures but have not provided a unitary closure structure.

SUMMARY OF THE INVENTION

The present invention is a unique unitary container closure and the combination of the closure with a container, the neck of which is adapted to sealingly cooperate with a pair of ribs formed on the underside of the closure when the closure is seated on the container neck. More particularly, the invention relates to a container neck provided with a groove in its upper surface which, when viewed in cross section, is U-shaped with the sidewalls of the U slanting outwardly and upwardly at an angle from the base of the U. The closure is pro-

vided with a pair of substantially circular, radially spaced ribs adapted to sealingly contact the sidewalls of the groove when the closure is seated on the container neck.

The closure may be seated on the neck, preferably by threads, but also by other known means which are within the spirit and scope of the present invention.

In the preferred embodiment, the outer walls of the ribs which depend from the lower side of the top portion of the closure are parallel to the sidewalls of the groove in the container neck in order to provide sealing contact between substantial surface areas of the ribs and groove. The ribs are preferably of greater vertical height than the depth of the groove. Each rib is slightly undercut by its inner wall to provide greater flexibility and insure better contact of its outer wall with the corresponding sidewall of the neck groove. In addition, the top portion of the closure is resiliently deformable to give added assurance that sealing contact can be maintained in spite of physical variations.

The present invention provides a closure which will reseal the container through repeated usages and one in which little deformation of the ribs is required to effect a good seal. Allowances have been made to assure its effectiveness is not impaired by physical variations in closure or container. Since the closure is of unitary structure, there is no danger of losing a sealing disk and since the sealing ribs are enclosed in the upper portion of the capsule, there is little or no danger of damaging such sealing ribs. The allowances which have been made in the present invention make it unnecessary for the manufacturer to maintain extremely high tolerances and thus make the present seal less expensive to manufacture.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be more fully understood by reference to the accompanying drawing showing the preferred embodiment of the invention:

FIG. 1 is an exploded fragmentary cross sectional view of the upper portion of the container neck and closure with the closure in an unseated position on neck.

FIG. 2 is a cross sectional view of the container neck and closure when the closure is seated on the neck.

FIG. 3 is a perspective view of the neck of the container showing the groove in the upper surface of the container neck.

FIG. 4 is a cutaway perspective view of the closure showing the integrally molded ribs in the closure.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The closure 1 of the present invention is made of plastic material preferably of polypropylene and is provided with a skirt portion 2 and a top portion 3, the top portion having an upper surface 4 and a lower surface 5.

The container neck 6 is preferably of glass and is provided with a threaded outer surface for seating the closure and a top surface 7. Materials other than glass may be used to form the container neck if they are at least as hard as the material used in the closure and known means other than threads may be provided to seat the closure on the container neck. The top surface 7 is provided with a groove defined by sidewalls 8 and 9 as shown in FIG. 1. The groove is substantially U-shaped

with sidewalls 8 and 9 slanting upwardly and outwardly at an angle from a line drawn vertically through the center of the base of the U. In the preferred embodiment, the angle between such a vertical line and the respective sidewalls is approximately 45°. The lower surface 5 of the top portion 3 of closure 1 is provided with a plurality of substantially circular ribs 10 and 11, each having outer walls 12 and 13 and inner walls 14 and 15. The ribs 10 and 11 are integrally formed with and depend from the lower surface 5 of the top portion 3.

The ribs 10 and 11 are radially spaced on the top portion 3 of the closure so that the midpoint between them is directly above the midpoint of the base of the U-shaped groove on the container neck when the closure is affixed to the neck.

The outer walls 12 and 13 slope downwardly and inwardly toward each other from the lower surface 5 of the top portion 3. In the preferred embodiment, the angle made by the intersection of the outer walls 12 and 13 with a line drawn vertical to the plane of the top portion is the same as the angle at which the sidewalls 8 and 9 intersect a vertical line. Thus, in the preferred embodiment, the outer walls 12 and 13 are parallel to the sidewalls 8 and 9 when the closure 1 is threaded onto the neck 6. By providing such parallel surfaces, it is possible for the closure to sealingly contact the groove along a plane and to effectively seal without substantial distortion of the sealing ribs. This provides for greater surface contact than found in seals having the respective sealing surfaces meet in a point-to-point relationship and avoids permanent deformation of the ribs.

The ribs 10 and 11 are made of a resilient material such as polypropylene so that if the angle of contact between the ribs and the sidewalls 8 and 9 varies due to physical variations, the ribs may be resiliently distorted to provide surface-to-surface contact when the closure is seated on the container neck. However, since distortion is normally not required to establish such a relationship, the ribs are not permanently distorted and thus do not lose their ability to provide a sealing contact with the sidewalls of the groove.

In the preferred embodiment, the vertical height of the sealing ribs 10 and 11 exceeds the vertical height of the groove in order to prevent the upper surface 7 of the neck 6 from contacting the lower surface 5 of the upper portion 3 of the closure. This feature assures that even if the sealing ribs were to become permanently distorted, the closure would still have sufficient room to move downwardly on the neck to allow for the distortion which had occurred in the ribs, and thus to effect a leak-proof seal between the respective surfaces.

The ribs 10 and 11 are also provided with inner surfaces 14 and 15 which respectively slant outwardly and upwardly from the ends of the ribs to the lower surface 5 of the upper portion 3. In the preferred embodiment the angle made by the intersection of inner surfaces 14 and 15 with a line drawn vertical to the plane of the top portion 4 is approximately 30°.

The sloping of the inner walls 14 and 15 defines a groove in the closure which undercuts the ribs, increasing the capability of the ribs to deform in response to pressure applied to the outer walls 12 and 13 by the sidewalls 8 and 9. The angle at which the inner walls extend outwardly and upwardly may be varied to provide different degrees of flexibility to the ribs for different

applications and still be within the purpose and scope of the invention.

The angle at which the outer walls 12 and 13 extend downwardly and inwardly may also be varied as may be the angle formed by the intersection of the outer walls 12 and 13 and the inner walls 14 and 15 as long as the relationship between the outer walls 12 and 13 and the sidewalls 8 and 9 is maintained.

In addition to varying the flexibility of the ribs, the undercutting groove also contains gases when the closure is applied to the neck. As the closure is seated on the neck and pressure applied to the ribs by the sidewalls, these gases are compressed forming a pressurized chamber within the ribs which prevents unnecessary deformation of the ribs and provides a pressurizing seal between the ribs and the container neck.

The ribs are also provided with rounded ends 16 in order to prevent damage to the ribs when they contact the groove in the neck or a foreign substance which sometimes lodges itself in the groove.

The top portion 3 of the closure is substantially flat prior to being seated on the container neck. It is sufficiently resiliently deformable, however, that when the closure is seated on the container neck by the application of torque or pressure, as the case may be, the top portion 3 domes upwardly as shown in FIG. 2. This doming provides sufficient built-in force to compensate for any physical variations which occur in the closure or container neck due to shipment, storage or variation in climatic conditions.

I claim:

1. In combination:

a container having a substantially U-shaped groove about the top surface thereof, said groove having opposite sidewalls slanting upwardly and outwardly from each other when viewed in cross-section; and, a linerless closure mounted on said container comprising a top portion having a peripherally depending skirt portion and a pair of concentric substantially circular ribs integral with and depending from said top portion, the outer walls of said ribs extending downwardly and inwardly towards each other in a direction that is substantially parallel with the respective sidewalls of said U-shaped groove to provide a sealing contact along a plane between said outer walls and said sidewalls, said closure mounted on said container in a manner such that the top portion of said closure does not contact the top surface of said container.

2. A closure as described and claimed in claim 1 wherein the vertical height of said ribs exceeds the vertical height of said groove.

3. A closure as described and claimed in claim 1 wherein said ribs are provided with inner walls which extend upwardly and outwardly at an angle less than an angle which is made by the outer walls with a line vertical to said top portion.

4. A closure as described and claimed in claim 3 wherein said ribs are provided with rounded lower ends.

5. A closure as described and claimed in claim 4 wherein said ribs are sufficiently deformable to permit sealing contact with the sidewalls of said groove where physical variations have occurred to said closure or container neck.

6. A unitary linerless closure as described and claimed in claim 1 wherein said top portion is resiliently deformable.

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