CLOSURE FOR VACUUM-INSULATED CONTAINERS

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This invention relates to closures for the open mouth or neck of containers and particularly to closures for vacuum-insulated bottles or containers, and to containers embodying such closures.

Hereinafter, vacuum-insulated bottles have been closed by means of a solid cork, rubber, or like stopper which is inserted into the open mouth or neck of the inner flask of the bottle, and a cap, which may function as a cup, is then placed over the stoppered end of the vacuum-insulated flask and makes a slip or threaded connection with the shoulder section of the case which encloses and protects the flask.

One well-known manufacturer of vacuum-insulated containers is now marketing such containers in which the shoulder section which surrounds the open end of the flask has an inwardly-extending annular flange, the inner edge of which overlies the open end of the neck of the flask surrounding the opening therein and is sealed thereto by a resilient gasket. From its inner edge, the annular flange extends upwardly and outwardly to form an annular pouring lip which terminates in an outwardly-rolled, overhanging bead. The present invention provides a closure which is especially adapted for vacuum-insulated bottles in which the shoulder section of the casing is provided with a pouring lip as just described, or any other form of pouring lip or the like having an annular bead or edge over which the closure may snap, in that it not only provides an effective stopper for the open mouth or neck of the flask but also a cap portion to fit over the annular pouring lip and to make an effective seal therewith.

A further and important feature of the present invention is that the closure and seal for the open end of the flask and the pouring lip is hollow and may take the form of a container or receptacle. Thus, the space within the hollow closure of the invention may be used as a dead air space for attaining greater heat insulation in the closure, or it may be filled with suitable insulating material to increase the heat insulation characteristics of the closure, in which case the closure or cover for the space need not be readily removable; or the container or receptacle may be used to carry sugar, cream, salt, pepper, and the like, for use with the contents of the flask, or a seasoning, flavoring or sweetening agent for other articles of food which it is expected will be eaten along with the contents of the flask. In this latter case the closure or cover for the receptacle should be readily removable to permit access.

More particularly, the present invention contemplates a closure for the open mouth or neck of containers which is made of some resilient and leak-resistant material, such as polyethylene, natural or synthetic rubber compounds, polyvinyl copolymers, or other suitable synthetic plastic material, and which includes a hollow stopper portion to be inserted into and effectively stopper the open mouth or neck of the container and which has an annular flange extending outwardly from the upper part of the stopper section which overlies and may be pressed down over the end of the container surrounding the open mouth thereof, which, in the type of vacuum-insulated bottle referred to above, is the outer edge of the pouring lip of the shoulder section of the casing for the vacuum-insulated flask. The hollow stopper portion, at the side of the annular flange remote from the stopper section, preferably has an opening which is closed by a suitable closure or cover so that access may be had to the space within the hollow portion for the insertion of insulation material, or to permit the stopper portion not only to perform its usual function of acting as a heat-insulating stopper for the open mouth or neck of the vacuum-insulated flask, but also to function as a container for carrying seasoning, flavoring, sweetening, etc., agents.

The annular flange which overlies the end of the container surrounding the open mouth thereof terminates in a downwardly-extending peripheral rim which is provided on its inner side with an annular bead to insure that the cap portion which overlies the end of the container, and comprises the annular flange and its integral peripheral rim, will make a good seal with the end of the container surrounding its open mouth. When the container is a vacuum-insulated bottle having a pouring lip terminating in an overhanging peripheral bead, and the peripheral rim of the closure is pressed down over such bead, it will, due to the resilient material from which the closure is made, expand, and, after the annular bead on the peripheral rim has completely passed over the bead at the outer edge of the pouring lip, the annular bead on the peripheral rim will snap back behind the bead on the pouring lip to hold the underside of the annular flange and the immediately adjoining portion of the peripheral rim tight against the top and outer edge of the bead of the pouring lip, thereby making an effective seal with the pouring lip at these points, as well as maintaining it in a sanitary condition.

Since the material from which the closure of the invention is made is a locally-distortable material, such as polyethylene, or the like, the closure may be readily removed by pressing upwardly with one's finger against the lower edge of the peripheral rim at any place and then gradually peeling it off the bead circumferentially thereof.

To facilitate such locally lifting of the closure from the end of the container, the lower, free edge of the peripheral rim is provided with an outwardly-extending portion, which may be in the form of a tab or flange, which provides a more extended surface for engagement by one's finger.

The invention will be further described in connection with the accompanying drawings which illustrate various forms which the closure may take. However, it is to be understood that such further illustration and description is merely by way of exemplification and the invention is not limited thereby; the scope of the invention being set forth in the subjoined claims.

In the drawings:
Fig. 1 is a vertical sectional view of the upper portion of a vacuum-insulated bottle embodying the closure of the present invention,
Fig. 2 is a vertical sectional view, on a larger scale, of the closure shown in Fig. 1, with the space within the hollow stopper portion shown filled with a heat-insulating material,
Fig. 3 is a vertical sectional view of a closure generally similar to that shown in Fig. 2 but having a pull-thread closure for the opening in the stopper portion,
Fig. 4 is a vertical sectional view of a closure of a still different form,
Fig. 5 is a vertical sectional view of a closure similar to that shown in Fig. 2 but provided with peripheral sealing ribs on the outer wall surface of the stopper portion,
Fig. 6 is a vertical sectional view of a stopper similar
to that shown in Fig. 2 in which the wall of the stopper portion is outwardly convex, and

Fig. 7 is a vertical sectional view of a stopper similar to that shown in Fig. 2 having an enlarged receptacle for receiving a flavoring, seasonings, or sweetening, etc., agent, and having a readily-removable cover.

Now to the drawings and first to Figs. 1 and 2, the closure of the invention is shown as adapted for use with a vacuum-insulated container of the kind referred to above. The container comprises a conventional double-walled vacuum flask 1 which is mounted within and protected by an outer casing 2. The flask 1 has the usual open-ended filler neck 3, the inner end of which is cylindrical and is adapted to receive a stopper.

The casing 2 includes a shoulder section 4 which is screw-threaded onto the upper end of the cylindrical body portion. The shoulder section includes an inwardly-extending circumferential flange 5 which overlies the outer end of the filling neck 3 surrounding the open mouth thereof. A resilient sealing gasket 6 is interposed between the flange 5 and the outer end of the neck, so that when the shoulder section is screwed onto the cylindrical body section of the container, a fluid-tight connection will be made between the end of the neck and the flange. Beyond the circumferential flange 5 the shoulder section flares outwardly and upwardly to form a pouring lip 7. The upper or free edge of the pouring lip is beaded over to provide an overhanging edge 8. The shoulder section 4 is formed with a thread 9 just above the cylindrical body portion to receive the usual cap C which may also function as a cup to receive liquid contents of the flask.

The closure for the vacuum-insulated container is made of a suitable resilient, locally-distortable material, such as polyethylene, natural or synthetic rubber compounds, polypropylene, or other suitable synthetic plastic material. It comprises a hollow, frusto-conical stopper portion 10, which is adapted to fit within and effectively stopper the open end portion of the neck 3 of the inner flask. At the same time, the peripheral rim 12 is distorted outwardly sufficient to permit the annular bead 13 thereof to snap over the overhanging bead 8 at the outer edge of the pouring lip. This retains the stopper portion 10 in place and prevents it from popping out of the neck of the flask 11 when the flask is filled with hot liquids as frequently happens when plain corks or stoppers are used for closing the neck of the flask. The distance between the annular bead 13 and the flange 11 is such that as soon as the bead 13 passes over the overhanging beaded edge 8, it snaps in under the beaded edge 8 and holds the flange 11 tightly against the outer free edge of the pouring lip at that place. The remainder of the stopper portion not only makes an effective and insulated seal with the open mouth of the neck of the inner flask, but the flange 11 and peripheral rim 12 make an effective and sanitary seal or cover for the pouring lip.

In order to facilitate the placing of the closure onto the end of the container and particularly to facilitate the snapping of the annular bead 13 over the overhanging beaded edge 8 of the pouring lip 7, the side of the bead adjacent the free edge of the peripheral rim 12 and the adjacent portion of that rim form a frusto-conical projection 14 which directs the circumferential flange 5 towards the free edge of the rim 12. The entrance angle of this portion should be between 25 and 60 degrees, and preferably between 30 and 35 degrees. Such a wide angle avoids, in the manufacturing process, having the snap-on band of the closure catch and facilitates the snapping of the closure onto the bead 8. When it is desired to remove the closure from the container, one’s thumb may be pressed against the free edge of the peripheral rim 12 at any place and the rim forced upwardly and outwardly until the annular bead 13 passes over the overhanging beaded edge of the pouring lip at that place. The remainder of the flange 11 and rim 12 may then be removed by peeling them circumferentially from the edge of the pouring lip, much in the same manner that an automobile tire casing is removed from the tire rim. The resiliency and local distortability of the material from which the closure is made readily permits such action. Once the flange 11 and rim 12 have been peeled from the pouring lip, the stopper portion may be pulled from the mouth of the neck to permit removal of the contents of the inner flask.

For reinforcement, and also to provide a broader surface for engagement by one’s thumb, the outer edge of the peripheral rim 12 terminates in an outwardly-extending circumferential flange 15, which may have a radial dimension of between about one-sixteenth and one-eighth of an inch. The flexing of the peripheral rim 12, during removal of the closure, requires that it be made of reasonable thickness, but in order to assure the desired degree of flexibility the thickness should be held to a practical minimum. I have found that a thickness of between 0.01 and 0.05 inch, depending upon the particular material from which the closure is made, is adequate to withstand the flexing and yet thin enough to assure the necessary flexibility. The upper or outer edge of the wall of the hollow stopper portion 10 extends radially outwardly as at 16 and then upwardly in a generally axial direction, as at 17, to join with the inner periphery of the annular flange 11. The outwardly-extending wall 17 is undercut for reasons later to be described.

The snap-in type receives a forwardly formed by the hollow stopper portion 10 is closed by a closure or cover 18 of the snap-in type having an annular rib 19 on the under or inner side thereof. The outer wall of the rib 19 diverges outwardly at approximately the same angle as the angle of undercut of the wall 17. Also, the depth of the rib is approximately equal to the distance between the planes of outer face of the wall 16 and the outer face of the flange 11, so that when the cover 18 is snapped into
place, the outer wall of the rib or flange 19 will make a tight fit with the undercut wall 17, and the inner or free edge of the rib 19 will engage the wall 16, thereby effectively closing the receptacles formed by the hollow stopper portion. The outer edge 20 of the cover or closure 18 bears upon the inner edge portion of annular flange 11, thereby further facilitating the effectiveness of the closure in sealing the space within the hollow stopper portion.

The wall 17 is undercut at an angle of between 15° and 45°, depending upon the particular material from which the closure is made. In this form of the invention the closure or cover 18 may form a more or less permanent air and water-tight seal with the main closure and the space within the hollow stopper portion used as a dead-air, insulating space. The greater the angle of undercut of the wall 17 and of the outer wall of rib 19, the greater would be the general strength of the seal between these parts. However, in order to permit ready insertion of the closure or cover 18, the angle of undercut of the wall 17 and of the outer surface of the rib 19 should not exceed about 45°. It should not be less than about 15°, since a lesser angle would not provide an effective seal.

The closure shown in Fig. 2 is identical with the closure of Fig. 1 except that the space within the hollow stopper portion has been filled with insulating material or a heat-insulator prior to sealing the cover 18 in place.

In the closure shown in Fig. 3 the space within the hollow stopper portion is intended to be used as a receptacle for seasoning, flavoring, sweetening, etc., agents, and the closure or cover 18 is adapted for easy removal; otherwise the closure generally is the same as that shown in Fig. 2, and like parts are identified with the same reference characters primed. In this form of the invention, the wall 17 which surrounds the opening into the receptacle formed by the hollow stopper portion is of generally-cylindrical form and is formed with an internal screw thread 21. The outer periphery of the rib 19 which extends inwardly from the closure or cover 18 is likewise of generally-cylindrical form and is provided with an external thread complementary to the thread 21 of the wall 17.

The wall portion 17 extends above the annular flange 11 to provide an annular rib 22 at the inner periphery of the flange 11; and the outer edge portion 20 extends downwardly to form a peripheral rim 23. The peripheral rim 23 and the rib 19 form an annular groove to receive the inside closure or cover 18 when screwed into the opening surrounded by the wall 17 and rib 22.

The closure or cover 18 has a diametrical, outwardly-extending projection 24 which forms a handle or operating member which facilitates the screwing and unscrewing of the closure or cover 18 into and from the opening into the receptacle formed by the hollow stopper portion.

The longitudinal dimension of the rib 19 is slightly less than the distance between the plane of the outer surface of the wall 16 and the plane of the free edge of the rib 22; and the longitudinal dimension of the rim 23 is not greater than the longitudinal dimension of the rib 22. Thus, when the closure or cover 18 is screwed into place to close the receptacle formed by the hollow stopper, the undersurface of the outer edge portion 20 of the closure or cover 18 will be brought into tight sealing engagement with the edge of the rib 22.

Since the closure or cover 18 is readily removable, the space within the hollow stopper portion 19 provides a receptacle for seasoning, flavoring, sweetening, or the like, agents.

Referring now to Fig. 4, the hollow stopper portion 30 which forms the open end portion of the neck of the inner vacuum flask comprises a frusto-conical portion 31 having a closed end, and a cylindrical portion 32. The wall of the frusto-conical portion should diverge towards the free end of the stopper portion at an angle of from 15 to 40 degrees.

At the upper or outer end of the cylindrical portion 32, the wall extends outwardly substantially at a right angle to the cylindrical wall portion 32, as at 33, and then longitudinally again as at 34. An annular flange 35, similar to the annular flange 11 of Figs. 1 and 2, extends outwardly from the upper or outer edge of the wall 34 and terminates in a downwardly-extending peripheral rim 36 having an internal bead 37 approximately midway of its length. The side of the bead remote from the flange 35 forms a frusto-conical surface 38. Thus, the annular flange 35, peripheral rim 36, bead 37 and conical surface 38 are substantially the same as the corresponding parts of Figs. 1 and 2, and they perform the same functions.

In this form of the invention, the internal surface of the longitudinally-extending wall is provided with a circumferential, semi-circular groove 39 to receive a correspondingly-shaped portion of a closure or cover for the receptacle formed by the hollow stopper portion.

The closure or cover 40 for the space within the hollow stopper portion has a downwardly and outwardly-extending peripheral rib 41. This rib is of partially-circular contour, and is formed on the same radius as the groove 39. Thus, when the closure or cover 40 is forced into the opening surrounded by the wall 34, the peripheral rib 41 will snap into the groove 39 and effectively seal the space within the hollow stopper portion.

The stopper 40 is provided with an integrally-formed peripheral flange 42 which overlies the inner peripheral portion of the annular flange 35.

The closure or cover 40 of this form of the invention is intended to be permanently sealed to the main closure, this being accomplished by the engagement of the peripheral rib 41 in the groove 39.

When the closure of this form of the invention is applied to a container such as the vacuum flask previously referred to, with the hollow stopper portion 30 received in the neck of the inner flask, the cylindrical wall portion 32 makes a seal at the lip of the vacuum flask, rather than farther inwardly, as, for example, the closures previously described. The wider angle of the frusto-conical portion facilitates its entry into the neck of the vacuum flask and also assures the seal being made at the lip thereof.

Fig. 5 shows a form of the closure of the invention which is the same in all respects as the closure of Figs. 1 and 2 except that the hollow stopper portion is provided with a series of annular sealing ribs 50 spaced longitudinally along its exterior surface. Other parts of the closure of this form of the invention are identified with the same reference characters as used in Figs. 1 and 2, with the exponent a.

When the stopper portion 10 of this form of the invention is forced into the filling neck of a vacuum flask, the pressure between the inner surface of the neck of the flask and the external surface of the stopper portion causes a compressive force to be exerted on the sealing ribs, which, together with the natural resiliency of the material from which ribs are formed, causes a very effective seal to be made between the stopper portion and the neck of the vacuum flask.

The sealing ribs permit the angle of the side walls of the hollow stopper portion 10 to be reduced moderately and the effecting of the seal between the inner wall of the neck of the vacuum flask farther inwardly from the open end of the neck. Also, if there are any local irregularities in the inner surface of the neck wall of the vacuum flask the sealing ribs will distort to a greater extent than a plain conical surface and provide a more effective seal.

In Fig. 6 there is shown a form of closure which is identical in all respects with the closure of Figs. 1 and 2, except that the side wall of the hollow stopper portion
is bulged outwardly, as at 60, and the inner or free end wall of the stopper portion is bulged, as at 61. Other parts shown in this figure are identified with the same reference characters as used in Figs. 1 and 2, with the exponent b.

When the longitudinal wall of the stopper portion is bulged outwardly, as shown, and the stopper portion is forced into the open filling neck of a vacuum flask, the wall of the stopper portion will have to be distorted to generally frusto-conical form. This will result in the wall of the stopper portion exerting a greater outward force against the inner wall or neck of the flask. Consequently, greater sealing effect will be obtained.

While a slight distortion of the longitudinal wall of the stopper portion to obtain a greater sealing effect is desirable, as explained above, any distortion of the inner or end wall of the stopper portion due to the high temperature of liquids within the flask is undesirable. Such distortion can be eliminated or substantially reduced by bulging the inner or end wall of the stopper as shown, or, instead of the bulge extending outwardly, the bulge might be reversed and extend into the space within the stopper portion.

Where the space within the hollow stopper portion is to be used as a receptacle for sweetening, flavoring, seasoning, etc., agents, it may be made larger than where the space is to be used only for insulating purposes. This can be attained in the manner shown in Fig. 7. Referring thereto, the closure comprises a hollow frusto-conical portion 10° generally similar to the hollow stopper portion of the closure of Figs. 1 and 2. An annular flange 11° extends outwardly from the upper part of the wall forming the hollow stopper portion and terminates in a depending rim 12° having an annular rib 13° on its inner surface, with a frusto-conical surface at the side thereof remote from the flange 11°, and an outwardly-extending flange 15° at the free edge of the rim 12°, all as in Figs. 1 and 2, and for the same purposes. However, instead of the wall forming the longitudinal side of the stopper terminally at its juncture with the annular flange 11°, as in Figs. 1 and 2, the wall, in this form of the invention, extends beyond the annular flange 11° for a substantial distance, as at 70. This wall 70 encloses a space which is a continuation of the space within the hollow stopper portion, so that a substantially-enlarged receptacle is provided for the carrying of salt, pepper, cream, sugar, and the like.

The upper edge of the wall 70 is formed with an outwardly-extending bead 70°. The opening at the outer end of the wall 70 is closable by a cover 71 having a depending peripheral rim 72 formed with an inwardly-extending bead 73 intermediate the length of its inner surface. The side of the bead 73 remote from the cover 71 and the adjacent part of the free edge of the rim 72 is formed with a frusto-conical surface 74 which diverges towards the free edge of the rim 72.

The cover 71 is applied to and removed from the open-headed edge of the wall 70 in the same manner in which the main closure for the container is applied to and removed from the beaded edge of the shoulder section of the container, both as described in connection with the form of the invention illustrated in Figs. 1 and 2.

To facilitate removal of the cover 71, the lower edge of the peripheral rim 72 may have an outwardly-extending flange 75, similar to the flange 15° of the main closure for the container.

In the forms of closure shown in Figs. 1, 2, 4, 5 and 6, the space within the hollow stopper portion is provided essentially for heat-insulating purposes, and the space in any of those closures may be filled with any suitable heat-insulating material, or the space in any of them may be left unfilled and used as a dead-air, heat-insulating space. However, if desired, the closures or covers for the spaces in those forms of the invention could be removed by inserting a thin member under the edge portion of the closure or cover for the space within the hollow stopper portion and prying the cover out. It is to be understood that various changes may be made in the details of construction of the various forms of closures illustrated without departing from the spirit of the invention or sacrificing any of the advantages thereof.

I claim:
1. A closure for an open mouth of a container comprising a unitary body of resilient and locally-distortable material including a hollow stopper portion, an upper wall connected to the upper or outer end of the hollow stopper portion, an annular flange extending outwardly in a generally-horizontal direction and then in a generally-longitudinal direction away from the stopper portion, an annular flange extending generally horizontally-outwardly from the upper or outer edge of said longitudinally-extending portion and adapted to overlie the end of the container surrounding the open mouth thereof, a peripheral rim depending from the outer edge of the annular flange and spaced from said longitudinally-extending portion to provide an annular groove to receive the edge of the container surrounding the open mouth thereof, an annular bead extending inwardly from the inner surface of said peripheral rim intermediate the longitudinal length thereof, the side of the bead adjacent the free edge of the peripheral rim forming a generally frusto-conical portion diverging in the direction of the free edge of the peripheral rim to facilitate the insertion of the edge of the container surrounding the open mouth into said groove, the hollow stopper having an opening surrounded by said longitudinally-extending portion leading to the interior of the stopper, and a closure for said opening.
2. A closure as defined in claim 1 in which an annular rib protrudes from the inner portion of said annular flange at the side thereof remote from the stopper portion, the closure for the opening in the stopper portion having a screw-threaded connection with said portion, and said screw-threaded closure overlies and makes a sealing contact with the free edge of said rib.
3. A closure as defined in claim 1 in which the peripheral rim has an outwardly-extending, substantially-horizontal flange at the free edge thereof.
4. A closure as defined in claim 1 in which the stopper portion includes a cylindrical part adjacent said annular flange and a frusto-conical portion therebetween which converges towards the free end of the stopper.
5. A closure as defined in claim 4 in which the side wall of the frusto-conical portion of the stopper portion converges towards the free end of the stopper portion at an angle of from 12° to 25°.
6. A vacuum-insulated container comprising a vacuum-insulated flask having a neck provided with an open mouth at the end thereof, a casing enclosing said flask, the upper end of said casing including a section fitting said neck and terminating in an outwardly and upwardly-extending pouring lip having an overhanging upper edge, a combined stopper for said open mouth and sealing cap for the pouring lip comprising a unitary body of resilient and locally-distortable material including a hollow stopper portion closely fitting within the open end portion of said neck, an annular flange extending outwardly from an upper part of the stopper portion and overlying the open end of said neck and the pouring lip, a peripheral rim depending from the outer edge of said annular flange and surrounding the upper edge portion of said pouring lip, and an annular bead extending inwardly from the inner surface of the peripheral rim intermediate the length thereof, said stopper portion engaging beneath the overhanging upper edge of the pouring lip, the distance between the portion of said bead which engages the overhanging upper edge of the pouring lip and the annular flange being such that a downward force is exerted on the outer edge portion of said annular flange such as to
hold it closely against the upper surface of the outer edge of the pouring lip, the side of the bead adjacent the free edge of the peripheral rim forming a generally frusto-conical portion diverging in the direction of the free edge of the peripheral rim to facilitate movement of the free edge of the pouring lip past said bead to a position therebehind, the hollow stopper portion having an opening leading to the interior thereof, said combined stopper and sealing cap having a flange surrounding the opening leading to the interior of the hollow stopper portion, and a closure for said opening.

7. A closure for an open mouth of a container comprising a unitary body of resilient and locally-distortable material including a hollow stopper portion having an opening at its outer end leading to the interior thereof, a wall above and forming a continuation of the wall of the stopper portion extending first outwardly from the stopper portion, then in a direction generally longitudinally of the stopper portion and away therefrom, then outwardly again and then generally longitudinally of the stopper portion in a direction towards the stopper, said two generally longitudinally-extending portions and the second outwardly-extending portion forming a recess for receiving an open mouth of a container, and a closure, said closure having a flange portion extending into the space defined by said first longitudinally-extending wall portion, said flange portion and said first longitudinally-extending wall portions having interengaging portions to removably retain said closure in its closing position.

8. A closure as defined in claim 7 in which the closure for the space defined by said first longitudinally-extending wall portion makes a sealing contact with said first outwardly-extending wall portion.

9. A closure as defined in claim 7 in which the closure for the space defined by said first longitudinally-extending wall portion has an outer peripheral edge portion which overlies the outer edge of said first longitudinally-extending wall portion.

10. A closure as defined in claim 7 in which the closure for the space defined by said first longitudinally-extending wall portion has a screw-threaded connection with said wall portion.

11. A closure as defined in claim 7 in which the inner wall of said first longitudinally-extending wall portion is undercut and said flange of the closure for the space defined by said wall portion is conformed to fit said undercut portion.

12. A closure as defined in claim 11 in which said first longitudinally-extending wall portion is undercut at an angle of between 15° and 45°.

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