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DISPENSER CLOSURE

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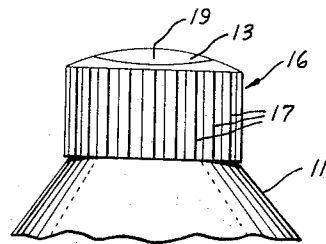
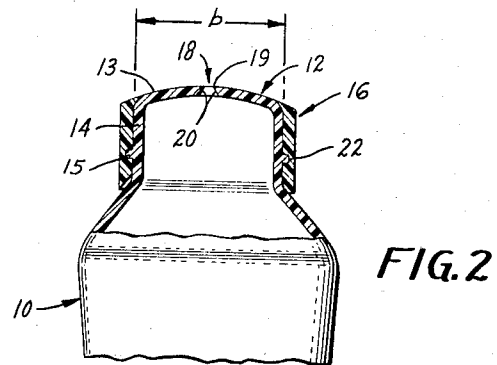
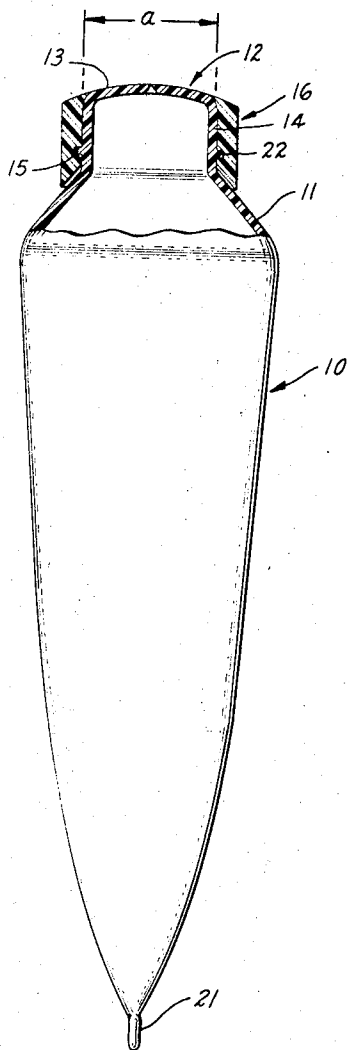
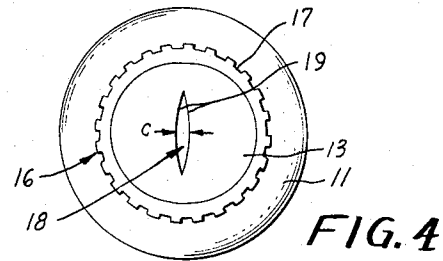
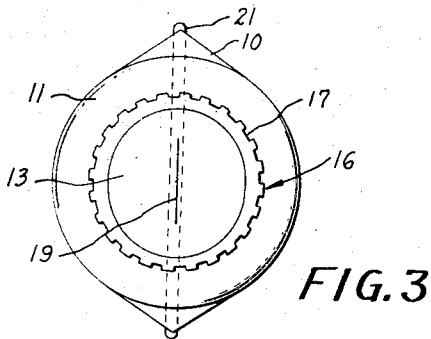


FIG. 1

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1

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DISPENSER CLOSURE

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The present invention relates to containers and the like and, more particularly, to dispensing closures therefor.

Containers for dispensing liquids, pastes and finely divided solids are well known in the art. It is desirable to provide such containers with closures which seal the containers to prevent leakage therefrom as well as to protect the contents thereof from contamination. Such closures are most desirably attached to the container, even when the closure is in an open position, so that the possibility of misplacing the closure or a part thereof is minimized or eliminated. Containers which have such closures attached to them are generally known, and are often quite satisfactory from many viewpoints. It is not uncommon, however, for such closures to be relatively costly to manufacture due to the number of operations involved and/or the number or complexity of their component parts. Moreover, in many of the prior art containers a tight seal is not readily attained between the closure and the main body or material-containing portion of the container, sometimes necessitating the use of gaskets or other auxiliary sealing devices if a satisfactory container is to be provided. Moreover, many prior art closures do not utilize a positive closing action or employ relatively complicated structures to provide such positive closing action.

Accordingly, it is an object of this invention to provide a novel container closure of relatively simple construction which may utilize positive closing action to control the discharge of materials therethrough.

It is also an object to provide such a container closure which is comprised of a minimum number of relatively simple components which are readily fabricated and assembled.

Another object is to provide such a container closure wherein the components may be fabricated relatively economically by injection molding techniques in a minimum number of steps and thereafter assembled to provide a highly effective assembly.

A further object is to provide a container including such a closure in an assembly comprising only two components, which are both adapted to injection molding techniques.

A still further object is to provide such a container having a closure device which is simple, neat, convenient to operate and is capable of being opened and closed in a positive manner.

Other objects and advantages will be readily apparent from the following detailed specification and the attached drawing wherein:

FIGURE 1 is a side elevational view of a container embodying the present invention with a portion thereof in section and with the closure in closed position;

FIGURE 2 is a fragmentary side elevational view in partial section similar to FIGURE 1 and with the closure in its normally open position;

FIGURE 3 is a plan view of the container in the position shown in FIGURE 1;

FIGURE 4 is a plan view of the container in the position shown in FIGURE 2; and

FIGURE 5 is a fragmentary side elevational view of the container of FIGURES 1-4 with the closure in the position shown in FIGURES 1 and 3.

It has now been found that the foregoing and related objects may be readily attained with a container closure comprising a resiliently deformable, generally cup-shaped

2

member having a top wall and a side wall, and a relatively rigid collar rotatably mounted on the exterior of the cup-shaped member so that a side wall portion thereof slidably bears against the outer surface of the side wall of the cup-shaped member. The inner contour of the collar side wall portion defines a generally elliptical aperture having a peripheral length which substantially conforms or equals the peripheral length of the cooperating outer surface of the cup-shaped member as taken in a plane transaxial or perpendicular to the axis thereof.

A dispensing aperture is symmetrically positioned in the top wall of the cup-shaped member and, in its normally open position, has a double convex cross section providing substantially symmetrical, arcuate sides defined by a common chord which intersects to provide sharp corners at the ends of the long dimension of the aperture, the aperture thus having the shape of a marquise-shaped gem. The wide dimension of the aperture, i.e., the dimension along a line at right angles to the length of the aperture at which the distance between the arcuate sides in open position is greatest, is no greater than the difference between the dimension of the cup-shaped member cooperating outer surface to which the wide dimension is parallel and the minor axis of the elliptical aperture. The collar is rotatable from a position wherein its major axis is in substantial alignment with the wide dimension of the dispensing aperture to provide an open position therefor, to one wherein the minor axis of the inner contour is substantially aligned with the wide dimension so as to bias the material of the top wall and thereby the aperture into a closed position. Interengaging means are provided on the collar and the cup-shaped member to prevent inadvertent relative axial movement thereof, thus maintaining the parts in assembly. Thus, the closure is comprised of only two components with the cup-shaped member being made of resiliently deformable material and being provided with a normally open aperture through its top wall. The other component is a relatively rigid collar providing an aperture which closely conforms in its internal curvature to the length of the outer curvature of the cooperating side wall portion of the cup-shaped member. Axial ridges are desirably provided on the outer wall of the collar to provide a good gripping surface for manual rotation of the collar. In addition, the means for mutual engagement to lock the components against inadvertent relative axial movement are simply provided by an annular bead projecting from the side wall of one component, preferably the cup-shaped member, engageable with a mating annular depression provided in the side wall of the other component, preferably the collar. The adaptability of an injection molding technique to the fabrication of the cup-shaped member is further enhanced by forming the aperture therethrough in a normally open position. Although it would be rather difficult to effectively mold the aperture in the top wall in a normally closed position, an aperture in a normally open position is quite easily obtained by providing a suitably shaped projection on the mold. By molding the aperture in the top wall rather than by cutting or otherwise creating it in a subsequent operation, the economy of the manufacture is increased by avoiding at least one additional step.

Although it is possible to separately form the closure and the main body of material-containing portion of the container and then to attach them, as by threaded portions on each part or by solvent or heat sealing, it can also be seen that the entire container may be composed of only two simple components. This can be achieved merely by forming the main body portion integrally with the cup-shaped member, such as in injection-molding apparatus. A container having an elongated, generally cylindrical body portion, such as that which is commonly used for

toothpaste, is readily fabricated in this way. Utilization of such a two-component container requires only closing of the aperture, desirably achieved by assembly with the collar, filling of the main body portion with the desired material, and sealing of the opening and the opposite end of the body portion. Such an integrally-formed container has many advantages. It is, of course, a most simple and economical article to manufacture because of the relatively few steps necessary. By forming the cup-shaped member and the main body as a unitary member, the number of locations at which leakage or contamination can occur are minimized.

In addition, both parts are advantageously fabricated of the same resiliently deformable material, which inherently makes opening and closing of the aperture possible, in addition to providing a main body portion which is a collapsible container from which material therein can be manually expressed.

To assemble the two parts of the closure or the container, as the case may be, the collar may be simply aligned over the cup-shaped member and forced downwardly over the latter until interengagement of the locking means occurs. The resiliently of the cup-shaped portion allows it to deform sufficiently so that such assembly is a simple matter. A tighter and substantially permanent assembly is also possible. This is achieved by providing a projection annular ring on the side wall of the cup-shaped member, and a mating depression on the inside wall of the collar, which should be fabricated of a rigid thermoplastic. The dimensions of the ring and the depression should vary by no more than a few thousandths of an inch. The collar is heated to a temperature at which the plastic softens and, while still flexible, is placed over the cup-shaped member and annular ring. Upon cooling, the collar becomes rigidly locked against axial movement from the cup-shaped member.

The shape of the cup-shaped member in transaxial cross section should be either circular or elliptical. The circular shape is advantageous in that it is simpler and more economical to fabricate. In any case, the peripheral length of the outside wall should closely conform to the peripheral length of the inner aperture of the collar so that the cup-shaped member can be resiliently deformed to take the shape of the inner contour, without the creation of unsightly and unsanitary gaps between the inner member and the collar in any position.

When the cup-shaped member is elliptical, the aperture will be in its normally open position when the major and minor axes of the cup-shaped member and the collar are aligned, since no deformative forces are created. Rotation of the collar through an angle of 90 degrees in either direction tends to align the major axes with the minor axes. The resiliently deformable cup-shaped member is deformed along its major axis due to the force brought to bear by the minor axis of the rigid collar. Since the aperture in the top wall of the cup-shaped member is positioned with its wide dimension parallel to the major axis of the ellipse of the resilient cup-shaped member, the deformation of the cup-shaped member along its major axis tends to close the aperture and to thereby seal the container.

When the cup-shaped member is circular, forces are brought to bear upon it by the rigid elliptical collar in all positions. In the position where the minor axis of the collar is aligned with the wide dimension of the aperture, the aperture is biased into its closed position. Rotation of the collar through 90 degrees from this position aligns its minor axis with the long dimension of the aperture. This not only opens the aperture, but it has the added advantage, over the situation wherein the resilient member is elliptical, of bringing positive opening forces to bear. Thus, the minor axis of the rigid collar tends to pinch the cup-shaped member in a direction parallel to the long dimension of the aperture, forcing the corners of the aperture together and the sides apart, to a more open position than

that at which the aperture is molded. The aperture is returned to its original closed position by a 90 degree turn of the collar.

As mentioned above, the marquise-shaped, double convex aperture is molded in a normally open position in the top wall of the cup-shaped member. It is necessary that sharp corners be provided at the ends of the long dimension of the aperture so that a perfectly tight seal is obtained when the aperture is pressed into closed position. Although the surfaces defining the aperture can be formed normal to a flat upper surface of the top wall, or, independent of the curvature of the upper surface, in such a manner that they will mate over their entire area when the closure is closed, it is most advantageous to form relatively sharp upper edges by beveling the aperture surfaces to form angles of less than 90 degrees with the upper surface. Closing a device having such edges quickly and neatly terminates the effluent stream therefrom, while the beveled surfaces serve to force material near the point of exit back into the container.

An additional advantage in forming the aperture in a normally open position and through an internal member, and biasing it into closed position with an external collar, is that by forming the aperture with a wide dimension which is less than the difference between the length of the minor axis of the ellipse of the collar and the dimension of the cross section of the cup-shaped member to which the wide dimension is parallel, it is possible to create a significant positive closing force without the need for complex auxiliary means. Such a dimensional difference will cause the aperture to close before the collar is fully rotated to its position of maximum closing force, thus creating a positive force when the collar is fully rotated. If the closure is to be capable of a positive closing force, it is most beneficial to form the top wall of the cup-shaped member with a slightly arcuate, or dome-shaped configuration. With such a configuration, the positive force will not tend to push the edges of the aperture past one another, and out of engagement, as would be the case if the top wall were flat. The dome-shaped top wall will allow lateral movement under positive force, and will thereby tend to avoid misalignment of the abutting edges.

As long as the collar is made of a relatively rigid material and the cup-shaped member is made of a resiliently deformable material, the choice of the particular materials out of which the components are fabricated is not critical. Thus, the collar may be produced from metal, glass, plastic, etc. From the standpoint of economy and ease of fabrication, it is probably best to make the collar out of a thermoplastic. Such materials include polystyrenes, polyolefins, polyamides, acetals, etc. Fluorocarbons are particularly advantageously employed in this application because of their generally low coefficients of friction of their surfaces which facilitate rotation of the collar between the open and closed dispensing aperture positions. Although not preferred because of the need for compression molding, thermosetting materials such as the phenolics and the melamines also can be used.

The choice of the material out of which the cup-shaped member, and preferably also the main body portion of the container is fabricated will depend largely upon the material to be contained therein since the container must be substantially resistant to attack thereby. In all cases, however, the cup-shaped member must be composed of a resiliently deformable material. Although natural and synthetic rubbers of various varieties can be employed, the preferred compositions will be resinous thermoplastic materials or rubber-reinforced resinous thermoplastic materials. Exemplary of such resins are polyethylene, polypropylene, polyvinyls, impact styrenes, etc.

Referring now in detail to the attached drawing, a container embodying the present invention includes an integrally formed main component having an elongated body portion 10, and intermediate inwardly tapering shoulder portion 11 and the cup-shaped member of the closure generally designated by the numeral 12. The cup-

5

shaped member 12 has a slightly arcuate or dome-shaped top wall portion 13 and a side wall portion 14 intersecting with the shoulder portion 11 and having a circumferential annular bead 15. At the opposite end, the wall of the body portion 10 is sealed together as indicated by the deformed portion 21.

Slidably rotatable on the cup-shaped member 12 is a relatively rigid collar generally designated by the numeral 16 with a multiplicity of axial ribs or corrugations 17 spaced about the exterior periphery thereof to facilitate gripping. The collar 16 and cup-shaped member 12 are held in axial engagement by the seating of the bead 15 in an annular groove 22 in the inner surface of the collar 16. As can best be seen in FIGURE 4, a marquise-shaped, or double convex, aperture 18 is provided in the top wall 13. FIGURE 2 best illustrates the beveled inwardly tapering surfaces 20 defining the aperture 18 and providing relatively sharp upper edges 19.

As best seen in FIGURE 4, the collar 16 has an aperture of substantially elliptical configuration, and the cup-shaped member 12 has an elliptical transaxial cross section so that the cooperating bearing surfaces of both members are elliptical. The major axes of the ellipses of both the collar 16 and the cup-shaped member 12 are aligned in FIGURES 2 and 4 wherein the dispensing aperture 18 is open. In this position, the cup-shaped member 12 is not deformed and the marquise-shaped aperture 18, which is disposed with its long dimension at right angles to the major axis of the elliptical cross section of member 12, is in its normally open position. When so disposed, the distance between sections of the side wall 14, diametrically opposed along the major axis of the elliptical cross section, is a maximum value, designated by the letter *b* in FIGURE 2.

As shown in FIGURES 1a and 3, the collar 16 has been rotated through an angle of 90 degrees from its position in FIGURES 2 and 4. In this rotated position, the minor axis of the elliptical aperture of the collar 16 is in alignment with the major axis of the elliptical cross-section of member 12. The reduced dimension of the aperture in the relatively rigid collar 16, shown in the sectional view in FIGURE 1, inwardly deforms the side wall 14 of member 12 and presses the edges 19 into contact to close the dispensing aperture 18. The distance between sections of the side wall 14, diametrically opposed along what would be the major axis of the elliptical cross section in normal position, is now at a minimum value, designated by the letter *a* in FIGURE 1. The difference between dimensions *a* and *b* which represent the lengths of the minor and major axes respectively of the elliptical aperture of collar 16, equals the width of the dispensing aperture 18, designated by the letter *c* in FIGURE 4. Accordingly, rotation of collar 16 to the position shown in FIGURES 1 and 3 urges edges 19 into precise abutment and rotation of the collar 16, 90 degrees in either direction from that position returns the dispensing aperture 18 to its open position depicted in FIGURES 2 and 4.

Thus, it can be seen that the present invention provides a container closure of relatively simple construction which is convenient and efficient in operation. The component parts of the closure are suitably interengaged so as to prevent inadvertent misplacement. The components are few in number, simple in design and readily fabricated of relatively inexpensive materials so as to make manufacture of the closure an easy and economical matter. The design of the closure is such that it is suitably formed with an integral main body portion, providing a cheap, efficient and convenient container for liquids, pastes and finely divided solid materials.

Having thus described the invention, I claim:

1. A container closure comprising a resiliently deform-

6

able cup-shaped member having a top wall and a side wall, and a relatively rigid collar rotatably mounted on the exterior of said cup-shaped member with a side wall portion slidably bearing against the outer surfaces of said side wall of said cup-shaped member, said collar side wall portion defining a generally elliptical aperture having a peripheral length substantially equal to the peripheral length of the cooperating outer surface of said cup-shaped member, said top wall having therein a symmetrically positioned dispensing aperture of generally double convex cross section in the open position and providing substantially symmetrical, arcuate sides defined by a common chord so as to intersect in sharp corners at the ends of the long dimension of said aperture, the wide dimension of said aperture in the open position being no greater than the difference between the dimension of said cup-shaped member cooperating outer surface to which said wide dimension is parallel and the minor axis of said elliptical aperture, said collar being rotatable from a position wherein the major axis of said aperture is substantially aligned with said wide dimension to provide the open position of said aperture to a position wherein said minor axis of said elliptical aperture is substantially aligned with said wide dimension to deform the material of said top wall and close said dispensing aperture, said collar and cup-shaped member having interengaging means substantially preventing inadvertent relative axial movement thereof.

2. The closure in accordance with claim 1 wherein said cup-shaped member has a generally elliptical transaxial cross section, the outer contour of said side wall substantially conforming to said elliptical aperture of said collar and said wide dimension of said dispensing aperture being parallel to the major axis of said elliptical transaxial cross section.

3. The closure in accordance with claim 1 wherein said cup-shaped member has a generally circular transaxial cross section.

4. The closure in accordance with claim 1 wherein said cup-shaped member is at one end of a resilient, collapsible, generally cylindrical body member.

5. The closure in accordance with claim 4 wherein said body member and said closure are disengageably coupled.

6. The closure in accordance with claim 4 wherein said body member and said closure are integrally formed.

7. The closure in accordance with claim 1 wherein said wide dimension is less than said difference between said dimension of said cup-shaped member cooperating outer surface to which said wide dimension is parallel and said minor axis of said elliptical aperture.

8. The closure in accordance with claim 1 wherein the two surfaces of the top wall defining said aperture are beveled to provide angles between said surfaces and the portion of the upper surface of said top wall adjacent thereto which are less than 90 degrees, whereby upon closing said closure the effluent stream therefrom is quickly and neatly terminated with material near the point of exit being forced away from said upper surface.

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