

CONTAINERS WITH SEVERABLE CLOSURES

FIELD OF THE INVENTION

[0001] The present invention relates to containers with severable closures. More particularly the present invention relates to containers where the severable closures are used for opening and closing of the containers between uses.

BACKGROUND OF THE INVENTION

[0002] Small dose containers are utilized in various applications, and such containers assume various structures. The substances to be contained in the containers and the way these substances are to be dispensed will often determine the shape, structure and the materials used to produce the containers. These containers are used for personal care products such as lotions and ointments, and oral care products such as toothpastes, mouthwashes, and gum treatment medications. These containers may also be used for medical products such as eye drops and ointments, skin ointments, and a range of antiseptics and antibacterials. Additionally, there are industrial uses such as for adhesives and specialty lubricants. Because of the various application uses, small dose containers come in various shapes and sizes, and a range of materials are used to make the containers. Various processes are also utilized to make the containers. These include thermoforming or injection molding the complete containers and separately applying a closure after filling. In some cases, parts of the container can be separately made and then combined in a later step to make the container.

[0003] Shapes for containers where the container and closure are molded in a single process step are illustrated by US D471,628 and US D460,175. These references show both a single container and a series of attached containers that are ready for bottom filling. The series of containers are attached at a midpoint. The closures are an integral part of the containers. A related structure for containers is shown in US D556,321. In each of these references, the closures can be removed from the containers by a twisting the closures to sever them from the containers and thereby open each of the containers.

[0004] As discussed earlier, different materials are used for different containers. The material that is optimum for the preservation of the contained product may not be optimum for the container structure and for the easy severing of the closure to open the container. The reverse

may also be true. Thus, in some instances the body of the container will have to be comprised of a material different from that of the closure and the nozzle from which the closure is to be severed. In addition, since the closure, nozzle and container shoulder will have to undergo a torque (e.g., twisting) force, these components may need a structural strength that is not needed by the container body. These needs may require the use of different materials and materials of different thicknesses. Additional processing steps may also be needed. In these cases, preservation of the product and the integrity of the containers while forming the containers are a primary concern.

[0005] The present invention addresses one or more of the foregoing issues.

BRIEF SUMMARY OF THE INVENTION

[0006] In one embodiment, the invention is directed to a container comprising a body having a cavity for containing a product. The container also comprises a nozzle, and a break-off closure that seals a dispensing orifice of the nozzle, the dispensing orifice being exposed upon the break-off closure being severed from the nozzle. The body, the nozzle and the break-off closure can be formed of the same or different materials. When of the same materials, the body, the nozzle and the break-off closure will be formed in a single molding step. When of differing materials, the body, the nozzle and the break-off closure will be formed in two or more steps with the body being formed separately from the nozzle and the break-off closure (with or without the shoulder).

[0007] The body can be a laminate or other structure while the nozzle and the break-off closure can be separately formed and bonded to the body. In the alternative, the body can be a laminate or other structure while the nozzle and the break-off closure can be compression molded to the body in a single step which both forms the nozzle and the break-off closure and bonds them to the laminate body.

[0008] In another embodiment, the invention is directed to a method to decrease the torque required to sever a closure from a nozzle of a container comprised of a high density polyethylene comprising: adding an inorganic additive to the high density polyethylene to form a mixture of the high density polyethylene and the inorganic additive; and forming at least the nozzle and the closure of the container with the mixture of the high density polyethylene and the inorganic additive.

[0009] In yet another embodiment, the invention is directed to a container comprising: a body having a cavity for containing a product; a unitary dispensing body coupled to the body, the

unitary dispensing body comprising a nozzle and a break-off closure that seals a dispensing orifice of the nozzle, the dispensing orifice being exposed upon the break-off closure being severed from the nozzle; and the unitary dispensing body formed of a mixture comprising a high density polyethylene and an inorganic additive.

[0010] In still another embodiment, the invention is directed to a dispensing body for a container comprising: a nozzle; a break-off closure sealing a dispensing orifice of the nozzle, the dispensing orifice being exposed upon the break-off closure being severed from the nozzle; and the nozzle and the break-off closure unitarily formed of a mixture comprising a high density polyethylene and an inorganic additive.

[0011] Further areas of applicability of the present invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while indicating the preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The present invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

[0013] Figure 1 is a perspective view of a plurality of containers attached to each other at body portions of the containers and at closures of the containers;

[0014] Figure 2 is a perspective view of an exemplary container according to an embodiment of the present invention;

[0015] Figure 3 is a perspective view of the container of Figure 2 with the closure having been removed from the container; and

[0016] Figure 4 is a cross-sectional view of the container of Figure 2 along line 4-4; and

DETAILED DESCRIPTION OF THE INVENTION

[0017] The following description of the preferred embodiment(s) is merely exemplary in nature and is in no way intended to limit the invention, its application, or uses.

[0018] The description of illustrative embodiments according to principles of the present invention is intended to be read in connection with the accompanying drawings, which are to be considered part of the entire written description. In the description of the exemplary embodiments of the invention disclosed herein, any reference to direction or orientation is

merely intended for convenience of description and is not intended in any way to limit the scope of the present invention. Relative terms such as “lower,” “upper,” “horizontal,” “vertical,” “above,” “below,” “up,” “down,” “left,” “right,” “top,” “bottom,” “front” and “rear” as well as derivatives thereof (e.g., “horizontally,” “downwardly,” “upwardly,” etc.) should be construed to refer to the orientation as then described or as shown in the drawing under discussion. These relative terms are for convenience of description only and do not require that the apparatus be constructed or operated in a particular orientation unless explicitly indicated as such. Terms such as “attached,” “affixed,” “connected,” “coupled,” “interconnected,” “secured” and similar refer to a relationship wherein structures are secured or attached to one another either directly or indirectly through intervening structures, as well as both movable or rigid attachments or relationships, unless expressly described otherwise. Moreover, the features and benefits of the invention are described by reference to the exemplary embodiments illustrated herein. Accordingly, the invention expressly should not be limited to such exemplary embodiments, even if indicated as being preferred. The discussion herein describes and illustrates some possible non-limiting combinations of features that may exist alone or in other combinations of features. The scope of the invention is defined by the claims appended hereto.

[0019] Referring first to FIG. 1, an exemplary container 10 according an embodiment of the present invention is illustrated in a multipack detachable array. In the embodiment as shown, each of the containers 10 is in the form of a tube. That is, the container 10 has a generally round cross-section and is sealed at a lower end by, for example, a crimp seal 11 after the container 10 is filled with the desired product/substance. Of course, the container 10 could take on other structures and shapes in accordance with the principles of the present invention. The container 10 generally comprises a body 18, a shoulder 12, a nozzle 16, and a break-off closure 14. In some embodiments, the shoulder 12, the nozzle 16, and the break-off closure 14 may form a unitary dispensing body 40. The body 18 and the unitary dispensing body 40 are coupled together to form the container 10. In alternate embodiments, the unitary dispensing body 40 may comprise only the nozzle 16 and the break-off closure 14, with the shoulder 12 being formed separately, as part of the body 18, or being omitted all together. In some embodiments, the body 18 may include a cavity for containing personal care products such as lotions and ointments, and oral care products such as toothpastes, mouthwashes, and gum treatment medications

[0020] In the exemplified embodiment, the shoulder 12 is provided at and extends upward from an upper portion of the body 18. The nozzle 16 is provided at and extends upward from an upper portion of the shoulder 12. The break-off closure 14 is provided at and extends upward from an upper end of the nozzle 16.

[0021] In some embodiments, the shoulder 12, the break-off closure 14, and the nozzle 16 are formed onto and coupled to the body 18 by compression molding. The body 18, which is open at each of its upper and lower ends, is first fitted into a mold for compression molding. The mold piece that is to form the shoulder 12, the break-off closure 14, and the nozzle 16, is then fitted over an upper end of the body 18. Hot plastic is then injected into the mold piece to simultaneously: (1) integrally and unitarily form the shoulder 12, the nozzle 16 and the closure 14 as the unitary dispensing body 40; and (2) couple the unitary dispensing body 40 to the upper end of the body 18. As a result, the body 18 (and thus the container 10) is sealed at the upper end while remaining open at the lower end for filling with the desired substance/product. Once the product cavity 41 (Fig. 4) is filled with the desired substance/product, the lower end is sealed via the crimp 11 or other means.

[0022] In other embodiments, the unitary dispensing body 40 can be separately molded and then molded or otherwise coupled to the body 18. Such a technique would be used where compression molding is either not possible or not as efficient or effective of a coupling technique.

[0023] Irrespective of how the body 18 is made and/or how the unitary dispensing body 40 is coupled thereto, the present invention forms the unitary dispensing body 40 (which includes at least the break-off closure 14 and the nozzle 16, and optionally inclusive of the shoulder 12) as a single unitary molded structure in which the break-off closure 14 can be easily severed from the nozzle 16 by torquing the break-off closure 14 relative to the nozzle 16 (or by applying another manual force). The present invention achieves a balance between easy severance of the break-off closure 14 from the nozzle 16 and creating the unitary dispensing body 40 with sufficient structural integrity so as to be capable of withstanding handling forces before and during the torquing of the break-off closure 14 to sever the break-off closure 14 from the nozzle 16. To do this, the present invention utilizes a mixture of a high density polyethylene and a solid inorganic additive. The high density polyethylene has a high impact strength and toughness and also provides good structural integrity. However, it has been discovered that the use of a high

density polyethylene alone to form the unitary dispensing body 40 requires a torque to remove the closure that exceeds the torquing strength of many users. Thus, forming the unitary dispensing body 40 of a high density polyethylene alone was deemed inadequate. Certain existing containers are formed using low density polyethylene. However, it has been discovered that high density polyethylene provides stronger properties and aesthetics as compared to low density polyethylene. In addition, high density polyethylene is stiffer than lower density polyethylene.

[0024] In one embodiment, the solution was found to be the addition of the solid inorganic additive to the high density polyethylene to form a mixture. The addition of the solid inorganic additive to the high density polyethylene enhances the flexural modulus and hardness of the high density polyethylene, and lowers the torque required to sever the closure 14 from the nozzle 16 by about 10 to about 20 percent, as compared to the torque required to remove the closure 14 from the nozzle 16 when the unitary dispensing body 40 is formed solely of the high density polyethylene and without the solid inorganic additive.

[0025] In one suitable embodiment, the inorganic additive is added in an amount of about 3 percent to about 21 percent by weight of the mixture of the high density polyethylene and the inorganic additive. In a more particular embodiment, the inorganic additive is added in an amount of about 9 percent to about 18 percent by weight of the mixture of the high density polyethylene and the inorganic additive.

[0026] The formation of the unitary dispensing body 40 from the mixture of the high density polyethylene and the inorganic additive reduces the torquing force required to sever the break-off closure 14 from the nozzle 16 to a level that is feasible to most potential users of the container 10. The container 10, in certain embodiments, may have a nominal wall thickness of about 0.130mm. The wall thickness varies for different parts of the container parts.

[0027] One suitable high density polyethylene that can be used to form the desired mixture is one with a low tensile modulus, such as one with a tensile modulus of about 800 to 900 MPa and with a low tensile impact strength. Of course, high density polyethylenes can be used as desired. One suitable inorganic additive is calcium carbonate. However, other inorganic solid additives also can be used, including without limitation, one or more of silicas, silicates, aluminas, aluminosilicates, titanias, clays, talcs, glass fibers, mica, barite and other inorganic substances that would be inert with regard to the contents of the high density polyethylene filled containers.

The inorganic additive preferably is in a particle size range of about 1 micron to about 100 micron, and usually about 60 micron to 100 micron. The particle size is governed to a large extent by the size of the entrance gate on the molding equipment because the inorganic additive passes through the mold entrance gate along with the high density polyethylene during injection of the mixture into the mold used to form the unitary dispensing body 40. In addition, the particle size may not be too close in size to the wall thickness.

[0028] In one embodiment, the unitary dispensing body 40 was formed with a mixture of the high density polyethylene and calcium carbonate, wherein the calcium carbonate was added at concentration of about 15 percent by weight of the mixture. In such an embodiment, the use of the mixture of the high density polyethylene and calcium carbonate reduced the required torqueing force from about 15.5 Ncm to about 13.5 Ncm. Moreover, as the concentration of the calcium carbonate in the mixture was increased, the amount of torque required to sever the break-off closure 14 from the nozzle 16 decreased further. However, if the torque that is needed to sever the closure is further reduced, a point is reached where the break-off closure 14 may become severed unintentionally, such as solely through handling.

[0029] In certain embodiments, the inorganic additive can be added directly to the high density polyethylene. In other embodiments, however, the inorganic additive may be added to the high density polyethylene as a mixture with a polyethylene resin, such as a linear low density polyethylene resin. Adding the inorganic additive to the high density polyethylene as a previously formed mixture of the inorganic additive and the linear low density polyethylene resin results in an ease in blending the inorganic additive into the high density polyethylene. In one such embodiment, the mixture of the inorganic additive and the linear low density polyethylene contains from about 10 percent to about 60 percent by weight of the inorganic additive. The content, of course, can be adjusted to get the proper amount of inorganic additive into the final mixture of the high density polyethylene and the inorganic additive.

[0030] Still referring to FIG. 1, the break-off closure 14 comprises a cylindrical portion 42 and a pair of wings 17a, 17b extending radially outward from the cylindrical portion 42. The pair of wings 17a, 17b protrude from the cylindrical portion 42 to provide the user with a mechanism to more effectively grip the break-off closure 14 to sever it from the nozzle 16 by twisting. The pair of wings 17a, 17b also make it is possible for a user to apply more torque to the break-off closure 14 to sever it from the nozzle 16 to expose the dispensing orifice 43 of the nozzle 16 so

that the product/substance within the product cavity 41 of the body 18 can be dispensed from the container 10.

[0031] As shown in FIG. 1, a plurality of the containers 10 can be provided in an interconnected manner to collectively form a multipack of the containers 10. The wings 17a, 17b of each container 10 are attached to one another as depicted to provide the containers 10 in a detachable array for easier handling. The containers 10 are optionally also attached to one another along the bodies 18. In some instances, depending on the size of the containers 10, an interconnection at the break-off closures 14 will be sufficient to retain the containers 10 in the detachable array. However, for larger versions of the containers 10, the additional attachment at the bodies 18 may be useful. In one embodiment, each of the bodies 18 of the containers 10 may be provided with an attachment band 15 having a pair of wings 19a, 19b protruding radially outward therefrom. The pair of wings 19a, 19b on the bodies 18 are detachably coupled to one another as illustrated to provide a more stable array of the containers 10.

[0032] Referring now to FIGS. 2-4 concurrently, the structural detail of the container 10 will be discussed in greater detail. In FIG. 2, the container 10 is illustrated separated from the detachable array of FIG. 1, and wherein the break-off closure 14 is still connected to the nozzle 16 so as to seal the dispensing orifice 43. In FIG. 3, the break-off closure 14 has been severed from the nozzle 16 by a twisting motion, thereby exposing the dispensing orifice 43 of the nozzle 16 so that product/substance within the product cavity 41 of the body 18 can be dispensed from the container 10. In FIG. 4, the break-off closure 14 has been inverted and replaced atop the nozzle 16 so as to re-seal the dispensing orifice 43. It is understood that in the embodiment shown in FIG. 4, the break-off closure 14 may be used to re-seal the dispensing orifice 43, however, in other embodiments, the break-off closure 14 may be a one-time break-off closure such that it may not be used to re-seal the dispensing orifice.

[0033] When the container 10 is in its originally assembled state, as shown in FIG. 2, a lower edge 44 of the break-off closure 14 is connected to a top edge 45 of the nozzle 16. A pre-weakened area 46 is formed at the juncture of the lower edge 44 of the break-off closure 14 and the top edge 45 of the nozzle 16 to facilitate severance of the break-off closure 14 from the nozzle 16. The pre-weakened area 46 can be a perforated area, a scored area, or an area of reduced cross-section. Of course, in other embodiments, a pre-weakened area does not have to

be included as the formation of the unitary dispensing body 40 from the mixture of the high density polyethylene and the inorganic additive provides sufficient ease in severability.

[0034] The top edge 47 of the break-off closure 14 comprises a nozzle cavity 48 having an opening 13 for receiving the nozzle 16 once the break-off closure 14 has been severed from the nozzle 16 and the break-off closure 14 has been inverted and placed over the nozzle 16 (as shown in FIG. 4). The nozzle 16 is slidably inserted into to the nozzle cavity 48 via the opening 13.

[0035] As can be seen best from a combination of FIGS. 2 and 4, the pre-weakened area 46 intersects a dispensing conduit 49 of the nozzle 16. As a result, when the break-off closure 14 is severed from the nozzle 16 along the pre-weakened area 46, the dispensing conduit 43 is exposed.

[0036] The present invention sets out structures, methods, and materials to improve the use of small dose containers and in particular the structure and materials for the closure, nozzle and shoulder of such containers. It has been found that there are materials that have the structural stability needed for the handling of containers and for the severing of closures from the containers to open the containers. This particularly is the case where the closure is formed integral with the nozzle and in many instances integral with the shoulder and nozzle of the container. The shoulder, nozzle and closure then are of a unitary structure having been molded in a single step.

[0037] As used throughout, ranges are used as shorthand for describing each and every value that is within the range. Any value within the range can be selected as the terminus of the range. In addition, all references cited herein are hereby incorporated by referenced in their entireties. In the event of a conflict in a definition in the present disclosure and that of a cited reference, the present disclosure controls.

[0038] While the foregoing description and drawings represent the exemplary embodiments of the present invention, it will be understood that various additions, modifications and substitutions may be made therein without departing from the spirit and scope of the present invention as defined in the accompanying claims. In particular, it will be clear to those skilled in the art that the present invention may be embodied in other specific forms, structures, arrangements, proportions, sizes, and with other elements, materials, and components, without departing from the spirit or essential characteristics thereof. One skilled in the art will appreciate that the

invention may be used with many modifications of structure, arrangement, proportions, sizes, materials, and components and otherwise, used in the practice of the invention, which are particularly adapted to specific environments and operative requirements without departing from the principles of the present invention. The presently disclosed embodiments are therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being defined by the appended claims, and not limited to the foregoing description or embodiments.

CLAIMS

WHAT IS CLAIMED IS:

1. A container comprising:
 - a body having a cavity for containing a product;
 - a nozzle; and
 - a break-off closure that seals a dispensing orifice of the nozzle, the dispensing orifice being exposed upon the break-off closure being severed from the nozzle;
 - wherein the break-off closure formed of a mixture comprising a high density polyethylene and an inorganic additive.
2. The container according to claim 1 wherein the inorganic additive has a concentration of about 3 percent to about 21 percent by weight of the mixture comprising the high density polyethylene and the inorganic additive.
3. The container according to any one of claims 1 to 2 wherein the container further comprises a shoulder.
4. The container according to any one of claims 1 to 3 wherein the break-off closure comprises a bottom edge coupled to a top edge of the nozzle to seal the dispensing orifice.
5. The container according to claim 4 wherein the break-off closure comprises a top edge comprising a nozzle cavity having an opening for receiving the nozzle once the break-off closure has been severed from the nozzle and the break-off closure is placed over the nozzle.
6. The container according to any one of claims 1 to 5 wherein the container comprises a pre-weakened area defining a top edge of the nozzle and a bottom edge of the break-off closure.
7. The container according to claim 6 wherein the pre-weakened area intersects a dispensing conduit of the nozzle.
8. The container according to any one of claims 1 to 7 wherein the mixture comprises an amount of the inorganic additive that decreases the torque required to sever the closure from the nozzle by about 10 to 20 percent in comparison to the torque required to sever a closure from a nozzle formed of the high density polyethylene and not containing the inorganic additive.

9. The container according to any one of claims 1 to 8 wherein the nozzle and the break-off closure are simultaneously formed and coupled to the body by compression molding.
10. The container according to any one of claims 1 to 8 wherein the container further comprises an oral care product contained within the cavity, and the nozzle and the break-off closure are formed as a unitary piece.
11. The container according to any one of claims 1 to 10 wherein the break-off closure comprises a cylindrical portion and a pair of wings extending radially outward from the cylindrical portion.
12. The container according to any one of claims 1 to 11 wherein the inorganic additive is in a concentration of about 9 percent to about 18 percent by weight of the mixture comprising the high density polyethylene and the inorganic additive.
13. The container according to any one of claims 1 to 12 wherein the inorganic additive is added to the high density polyethylene as a mixture of the inorganic additive and a linear low density polyethylene.
14. The container according to any one of claims 1 to 13 wherein the inorganic additive is a calcium carbonate.
15. A method to decrease the torque required to sever a closure from a nozzle of a container comprised of a high density polyethylene comprising:
 - adding an inorganic additive to the high density polyethylene to form a mixture of the high density polyethylene and the inorganic additive; and
 - forming at least the nozzle and the closure of the container with the mixture of the high density polyethylene and the inorganic additive.
16. The method according to claim 15 wherein the inorganic additive is in a concentration of about 3 percent to about 21 percent by weight of the mixture of the high density polyethylene and the inorganic additive.
17. The method according to claim 16 wherein the inorganic additive is in a concentration of about 9 percent to about 18 percent by weight of the mixture of the high density polyethylene and the inorganic additive.
18. The method according to claim 15 wherein the inorganic additive is added to the high density polyethylene as a mixture of the inorganic additive and a linear low density polyethylene.

19. The method according to claim 15 wherein the inorganic additive is a calcium carbonate.
20. The method according to claim 15 wherein the torque required to sever the closure from the nozzle is about 13.5 Ncm while the torque required to sever a similar closure from a similar nozzle formed of the high density polyethylene not containing the inorganic additive is about 15.5 Ncm.
21. The method according to claim 15 wherein the container comprises a shoulder, the shoulder and the neck having a substantially uniform wall thickness of about 0.130mm.
22. A dispensing body for a container comprising:
 - a nozzle;
 - a break-off closure sealing a dispensing orifice of the nozzle, the dispensing orifice being exposed upon the break-off closure being severed from the nozzle; and
 - the nozzle and the break-off closure unitarily formed of a mixture comprising a high density polyethylene and an inorganic additive.
23. The dispensing body according to claim 22 wherein the inorganic additive has a concentration of about 3 percent to about 21 percent by weight of the mixture comprising the high density polyethylene and the inorganic additive.
24. The dispensing body according to any one of claims 22 to 23 wherein the unitary dispensing body further comprises a shoulder.
25. The dispensing body according to any one of claims 22 to 24 wherein the break-off closure comprises a bottom edge coupled to a top edge of the nozzle to seal the dispensing orifice.
26. The dispensing body according to claim 25 wherein the break-off closure comprises a top edge comprising a nozzle cavity having an opening for receiving the nozzle once the break-off closure has been severed from the nozzle and the break-off closure is placed over the nozzle.
27. The dispensing body according to any one of claims 22 to 26 wherein the unitary dispensing body comprises a pre-weakened area defining a top edge of the nozzle and a bottom edge of the break-off closure.
28. The dispensing body according to claim 27 wherein the pre-weakened area intersects a dispensing conduit of the nozzle.

29. The dispensing body according to any one of claims 22 to 28 wherein the mixture comprising the high density polyethylene and the inorganic additive comprises an amount of the inorganic additive that decreases the torque required to sever the closure from the nozzle by about 10 to 20 percent in comparison to the torque required to sever a closure from a nozzle of a similar unitary dispensing body formed of the high density polyethylene and not containing the inorganic additive.
30. The dispensing body according to any one of claims 22 to 29 wherein the break-off closure comprises a cylindrical portion and a pair of wings extending radially outward from the cylindrical portion.
31. The dispensing body according to any one of claims 22 to 30 wherein the inorganic additive is in a concentration of about 9 percent to about 18 percent by weight of the mixture comprising the high density polyethylene and the inorganic additive.
32. The dispensing body according to any one of claims 22 to 31 wherein the inorganic additive is added to the high density polyethylene as a mixture of the inorganic additive and a linear low density polyethylene.
33. The dispensing body according to any one of claims 22 to 32 wherein the inorganic additive is a calcium carbonate.