



US 20070164027A1

(19) **United States**(12) **Patent Application Publication****Auer**(10) **Pub. No.: US 2007/0164027 A1**(43) **Pub. Date: Jul. 19, 2007**(54) **REMOVABLE AND REUSABLE CONTAINER
CLOSURE WITH STIFFENING RING****Related U.S. Application Data**

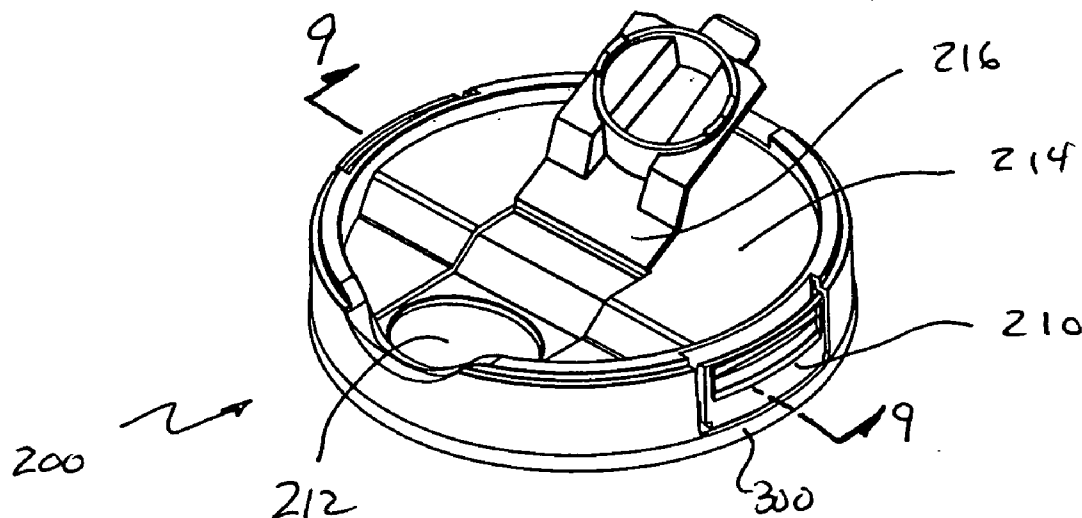
(60) Provisional application No. 60/722,105, filed on Sep. 30, 2005.

(75) Inventor: **Robert Auer**, East Stroudsburg, PA
(US)**Publication Classification**(51) **Int. Cl.****B65D 41/16** (2006.01)**B65D 51/16** (2006.01)**B65D 51/18** (2006.01)(52) **U.S. Cl.** **220/254.3; 220/784; 220/367.1**

Correspondence Address:

DRINKER BIDDLE & REATH**ATTN: INTELLECTUAL PROPERTY GROUP****ONE LOGAN SQUARE****18TH AND CHERRY STREETS****PHILADELPHIA, PA 19103-6996 (US)**(57) **ABSTRACT**

A closure is provided for removably attached to the lip of a container. The closure includes a top preferably having at least on locking levers connected to the top with an elastically deformable hinge. The locking levers operate to releasably secure the closure to the container. The closure also includes a skirt with portions of the skirt located on opposite sides of the locking lever. A strap is located below the locking lever and defines a continuous ring around the base of the closure, thereby stiffening the closure.

(73) Assignee: **Stull Technologies, Inc.**(21) Appl. No.: **11/528,050**(22) Filed: **Sep. 26, 2006**

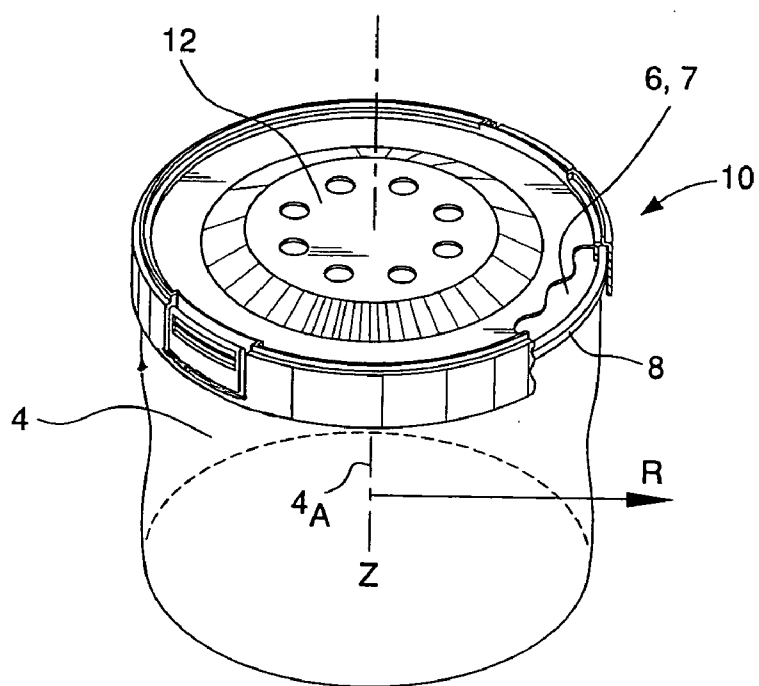


FIG. 1

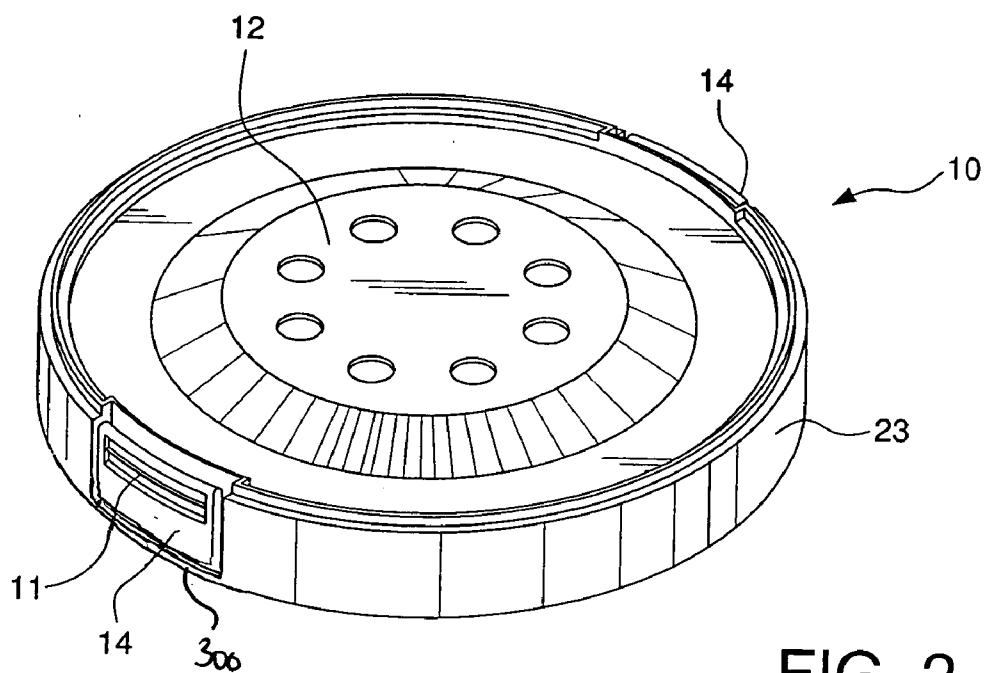


FIG. 2

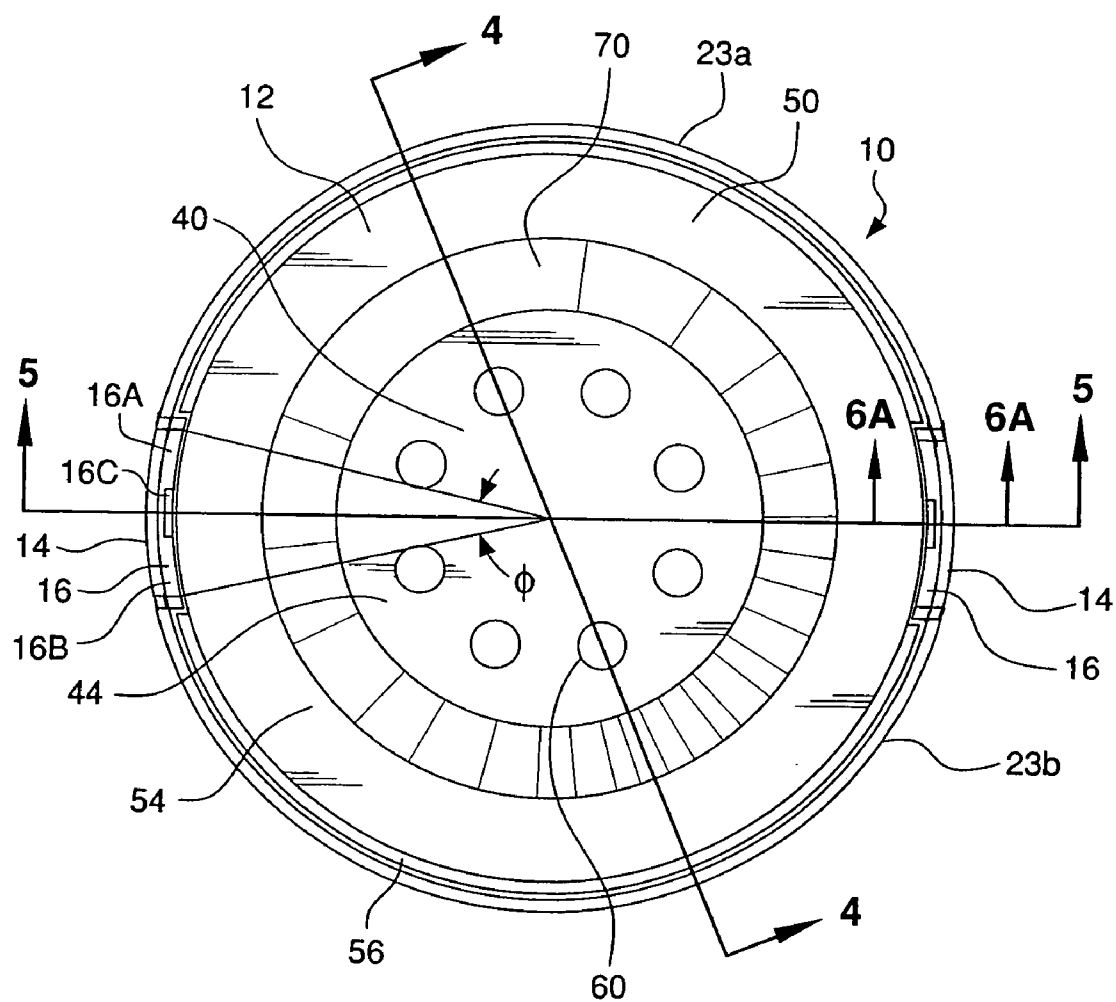
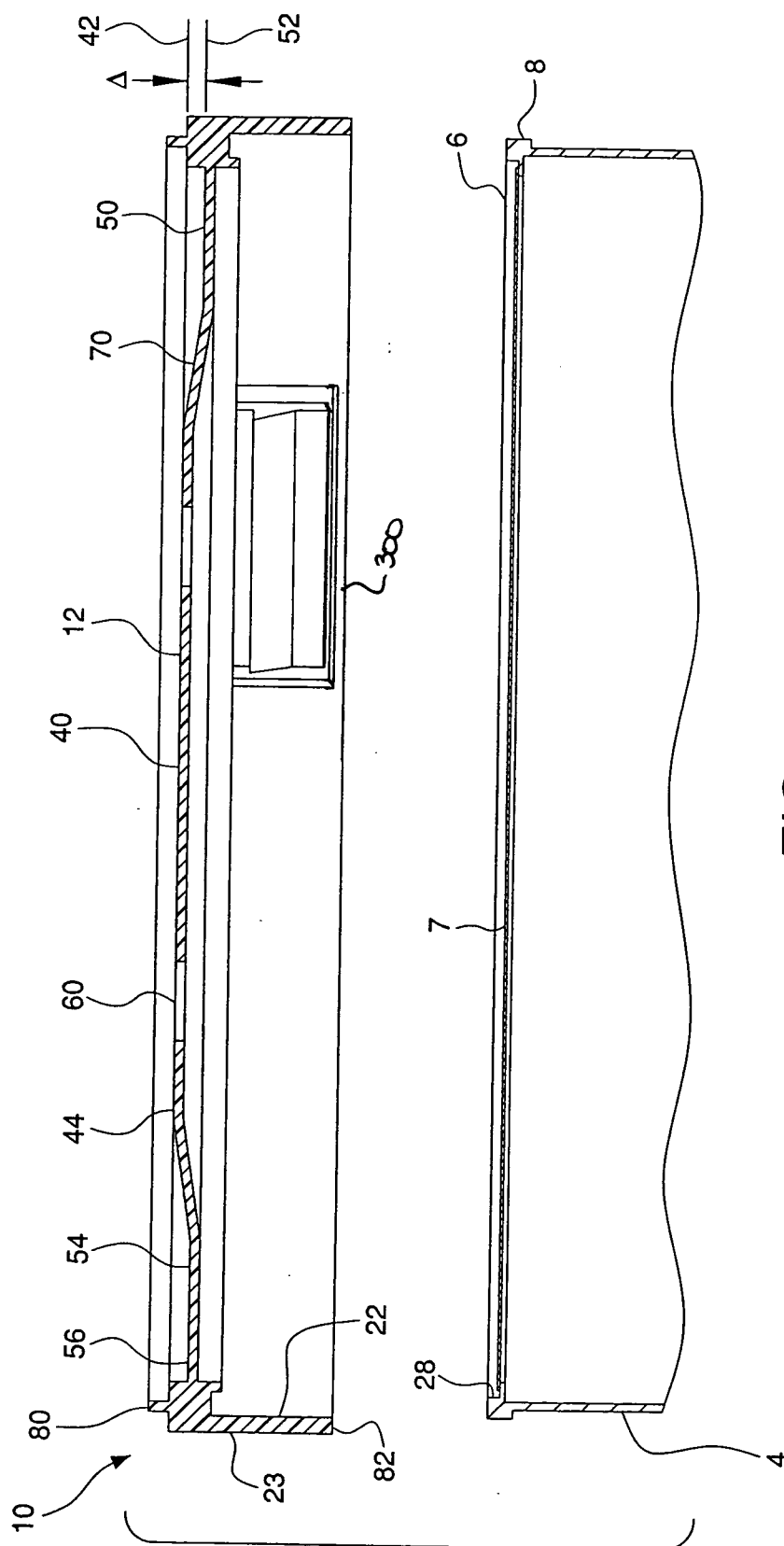


FIG. 3



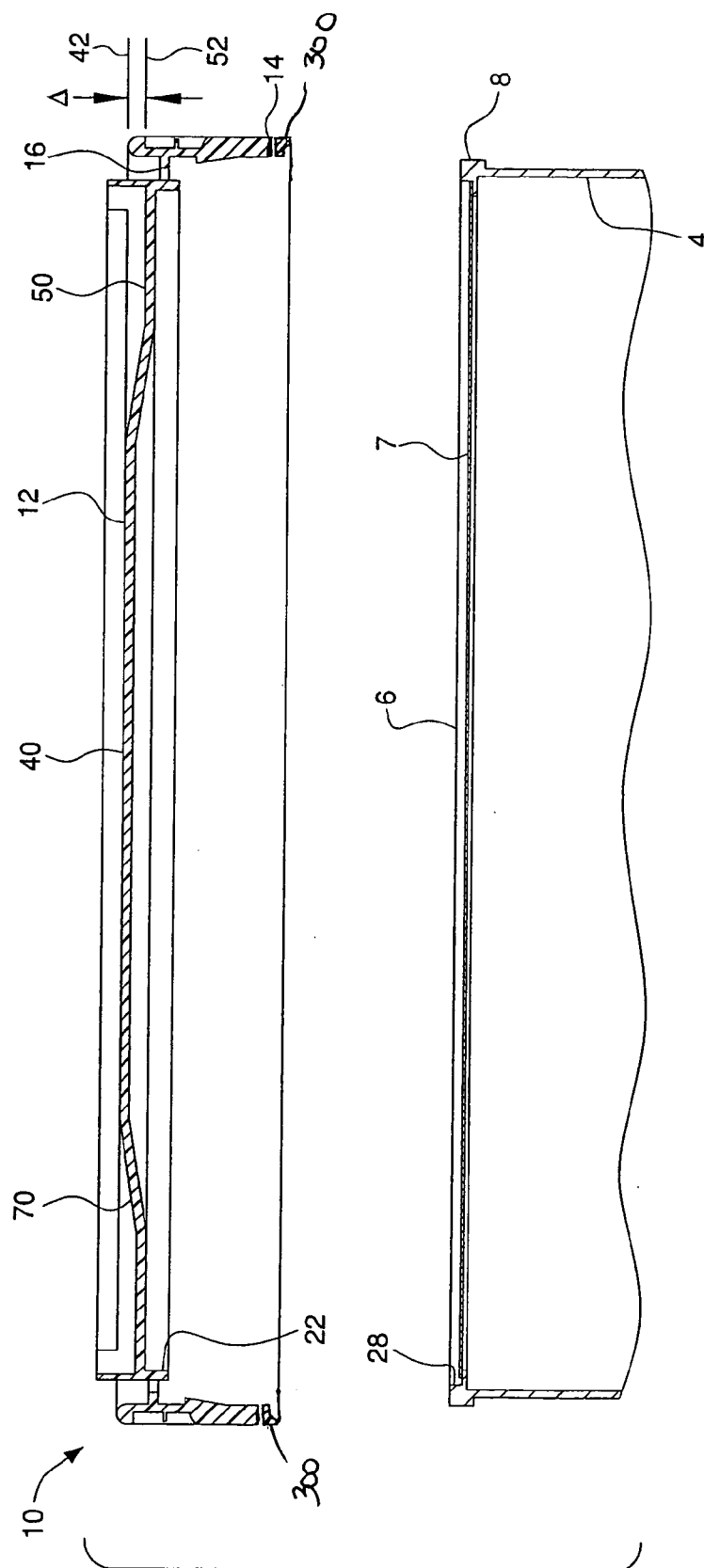


FIG. 5

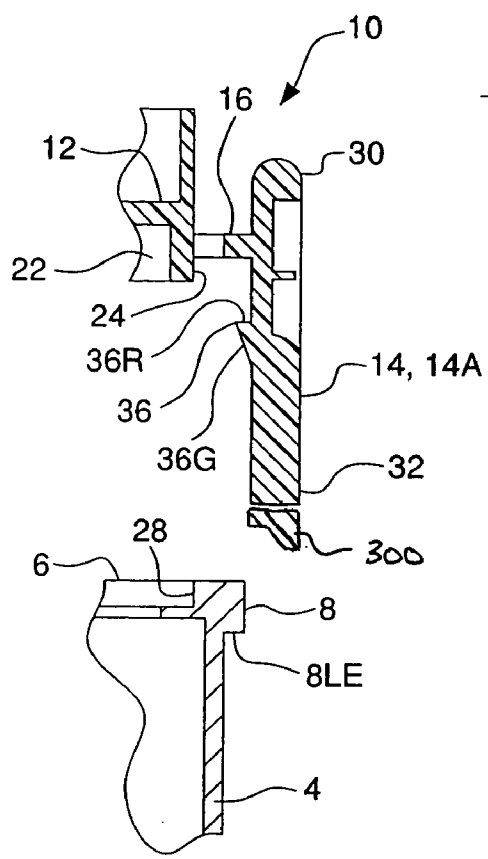


FIG. 6A

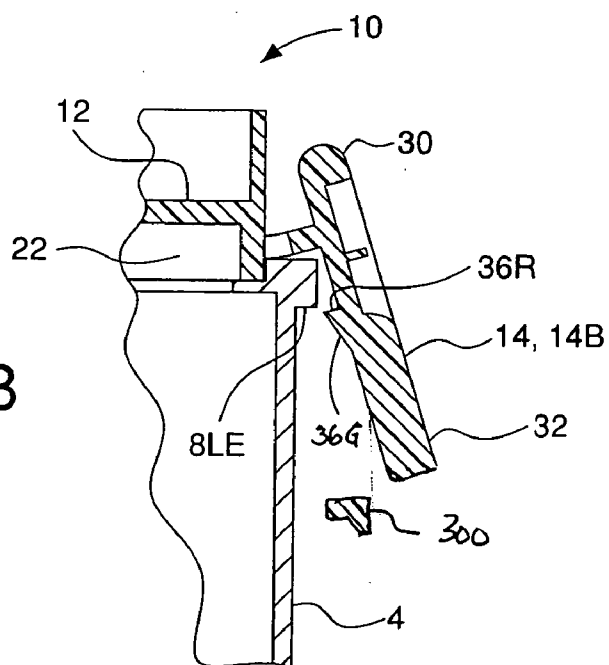


FIG. 6B

Fig. 7

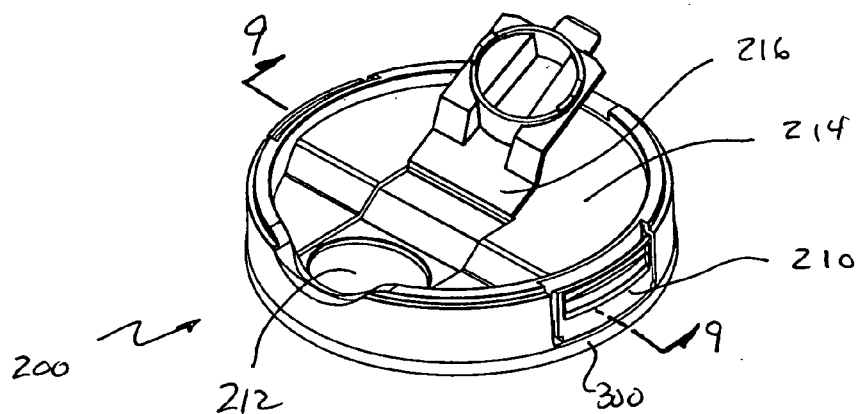


Fig. 8

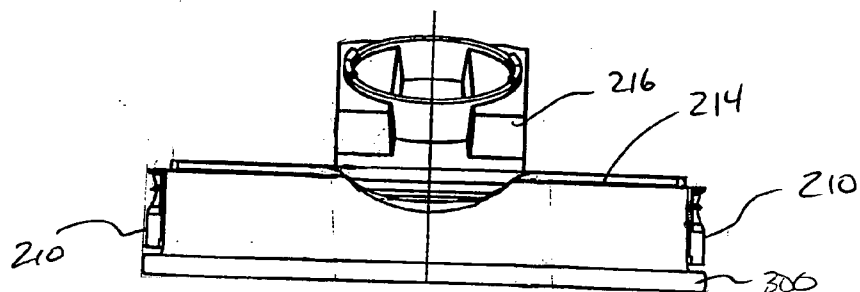


Fig. 9

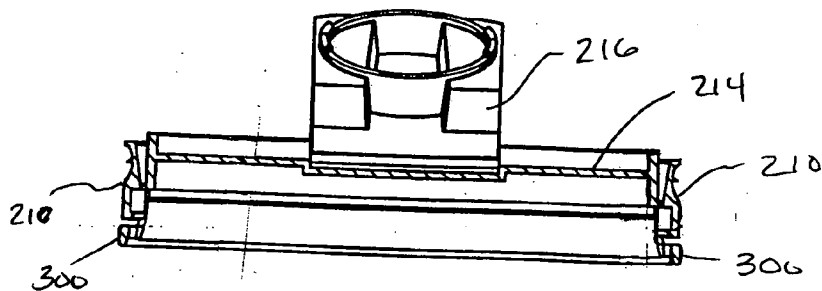
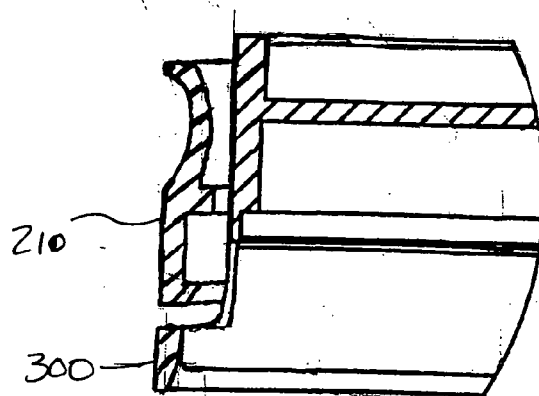


Fig. 10



REMOVABLE AND REUSABLE CONTAINER CLOSURE WITH STIFFENING RING

RELATED APPLICATION

[0001] This application is related to and claims priority from U.S. Provisional Application No. 60/722,105 filed Sep. 30, 2005, the disclosure of which is incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[0002] The present invention relates generally to removable closures for containers, and more particularly, to removable and reusable closures for use with microwavable containers.

BACKGROUND OF THE INVENTION

[0003] It is known to provide a microwavable food container with a lid to be secured to the container during the microwave heating process. The lid functions to reduce the potential for contents of the container spilling or boiling over during the heating process.

[0004] Many existing lid designs have deficiencies in that they tend to deform during microwave heating. As such, the contents can boil over during cooking or spill when the user attempts to remove the container from the microwave.

[0005] It would be desirable to provide a lid having features which further reduce potential spilling or boiling over of the container contents during the microwave heating process.

SUMMARY OF THE INVENTION

[0006] In one aspect, the invention is a closure for a container having an upper end and a lip proximate to the upper end. The closure includes a top and a skirt connected to the peripheral edge of the top. The skirt has an upper edge and a lower edge. At least one locking lever is provided and includes an inwardly projecting locking wedge. An elastically deformable hinge connects the locking lever to the top. The hinge permits pivotal movement of the locking lever between a latched position and an unlatched position. The locking wedge is adapted to releasably engage the container lip in the latched position and disengage the container lip in the unlatched position. The skirt is separated into skirt portions located on each side of a locking lever. A strap is located below the locking lever and attached to the skirt portions so as to form a substantially complete ring around the bottom of the closure.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] For the purpose of illustrating the invention, there is shown in the drawings forms that are presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and constructions particularly shown.

[0008] FIG. 1 is a perspective view of a container closure according to a first preferred embodiment of the present invention, shown installed on a container.

[0009] FIG. 2 is a perspective view of the closure of FIG. 1 shown removed from the container.

[0010] FIG. 3 is a top plan view of the closure of FIG. 1.

[0011] FIG. 4 is a cross-sectional view of the closure and upper portion of the container of FIG. 1, taken along line 4-4 of FIG. 3, with the closure shown separated from the container.

[0012] FIG. 5 is a cross-sectional view of the closure and upper portion of the container of FIG. 1, taken along line 5-5 of FIG. 3, with the closure shown separated from the container.

[0013] FIG. 6A is the enlarged detail view of a locking lever of the closure of FIG. 1, taken along line 6A-6A of FIG. 3, with the closure shown separated from the container and showing the locking lever rotated into a latched position.

[0014] FIG. 6B is an enlarged detail view of a locking lever of FIG. 6A, with the closure shown connected to the container and showing the locking lever rotated into an unlatched position.

[0015] FIG. 7 is an isometric view of an alternate closure that includes a spout.

[0016] FIG. 8 is a front view of the closure of FIG. 7.

[0017] FIG. 9 is a cross-sectional view of the closure of FIG. 7 taken along lines 9-9.

[0018] FIG. 10 is an enlarged view of the cross-section of FIG. 9 illustrating the connecting strap.

DETAILED DESCRIPTION OF THE DRAWINGS

[0019] Referring now to the drawings wherein like reference numerals identify like elements, components and sub-assemblies, FIG. 1 depicts a container 4 in combination with a closure 10 according to an embodiment of the present invention. The container 4 has an upper end 6 having an open mouth. Preferably, the open mouth is provided with a conventional frangible or removable seal 7, which may be removed by a user to expose contents (not shown) of the container 4. One example of a removable seal is a peel-off film that is sealed to the rim of other edge of the container. With the seal 7 removed, the closure 10 may be attached to the upper end 6 during heating of the container contents to reduce potential for spillage or boiling over of the contents, while allowing heated gases generated during the heating process to escape from the container.

[0020] The container 4 may be of any size or shape and may be fabricated from any one of a variety of materials. Preferably, the container 4 contains food products which are heated in a microwave oven prior to consumption. Therefore, the container 4 is preferably fabricated from a material suitable for storage of food products and for microwave use. The container 4 includes a raised lip 8, or similar structure proximate to its upper end 6. The raised lip 8 may be disposed directly adjacent the upper end 6 of the container 4 or in close proximity thereto. For example, should the container 4 employ a threaded end, the raised lip 8 may be disposed above or below the threaded connection. Furthermore, while the container 4 and closure 10 are illustrated as each having a substantially circular cross-section, it will be appreciated that the teachings of the invention are applicable to a variety of other cross-sectional shapes including, for example, elliptical or polygonal shapes. The following description and alternate embodiments of the invention are not intended to describe all closure/container combinations, but are merely illustrative of how the teachings of the

present invention may be employed in the context of a variety of container configurations.

[0021] For the purposes of defining direction and/or angular orientation, it will be useful to define a cylindrical coordinate system, wherein a Z-axis is coincident with a longitudinal axis 4_A of the container 4. Displacement in, or spatial orientation relative to, the Z-axis is referred to as “axial” displacement or position, while displacement or spatial orientation along a radius R from the Z-axis will be referred to in terms of “radial” displacement or position.

[0022] One closure or lid that is useful in combination with the present invention is described in co-pending U.S. patent application Ser. No. 11/075,788, which is incorporated herein by reference in its entirety. A brief description of that closure follows.

[0023] With reference initially to FIGS. 1-3, the closure 10 includes a top 12, at least one, and preferably two or more locking levers 14 disposed radially outboard of the top 12, and an elastically deformable hinge 16 (best seen in FIG. 3) connecting the top 12 and each of the locking levers 14. The hinge 16 includes at least one and preferable two circumferentially spaced apart webs 16A, 16B which help to stabilize the locking levers 14 for providing controlled locking of the closure to the container 4. The use of two (or more) webs for each locking lever 14 helps to dissipate or reduce the heat that passes to the locking lever 14. The webs 16A, 16B are separated by a hole or slot 16C. Providing slot 16C makes the hinge 16 more flexible, and reduces the amount of force required to move the locking levers 14. Stated otherwise, the slots 16C allow the locking levers 14 to extend through a larger arc, while reducing the amount of force required to move the locking levers 14 compared to the amount of force which would be required if the hinge 16 had a continuous web.

[0024] In the described embodiment, the top 12 includes a sealing ring or plug seal 22, which provides a seal between the top 12 and the container lip 8 when the closure 10 is installed on the container 4. Alternatively, sufficient sealing between the top 12 and container lip 8 could be provided by the hinge 16 and the locking levers 14 such that the sealing ring 22 could be omitted. That is, if the locking levers 14 develop a sufficiently robust connection between the closure 10 and the container 4, an adequate seal could be realized between a lower side of the top 12 and an upper extent of the lip 8. The closure 10 includes a skirt 23, preferably formed by multiple skirt segments 23a, 23b located on opposite sides of the locking levers. The skirt 23 is preferably connected to a periphery of the top 12.

[0025] With particular reference to FIGS. 3 and 4, one embodiment of the closure is illustrated which includes a venting features. The top 12 has a first portion 40 and a second portion 50. Preferably, the first and second portions 40 and 50 are both substantially planar, defining a first plane 42 and a second plane 52, respectively. The first and second planes 42, 52 are non-coincident. Preferably, the first and second planes 42, 52 are substantially parallel, and are displaced from one another by a displacement or offset A (see FIG. 4). In the embodiment illustrated, the first portion 40 has an outer extent 44, and the second portion 50 has an inner extent 54 and an outer extent 56. Furthermore, in the embodiment illustrated, the first and second portions 40, 50 are concentric, with the second portion 50 surrounding the

first portion 40. The second portion outer extent 56 preferably connects to the skirt 23. It should be readily apparent that, although the first and second portions are planar in the illustrated embodiment, it is contemplated that the portions may be curvilinear or other contoured shape.

[0026] A transition section 70 is preferably provided between the first and second portions 40, 50. The transition section 70 connects the first portion outer extent 44 to the second portion inner extent 54. The transition section 70 may be shaped in various ways, including a frustoconical shape as illustrated.

[0027] At least one vent hole 60, and preferably a plurality of vent holes 60 are provided in the first portion 40. The total vent area provided by the vent holes is not critical, with satisfactory performance being realized with the total vent area ranging widely, including a range from about 0.05 square inches up to about 0.50 square inches. As discussed herein below, the vent holes 60 operate to relieve gas pressure within the container 4 and closure 10 generated during the heating process.

[0028] With particular reference now to FIG. 4, the skirt 23 has a first, upper edge 80 and a second, lower edge 82. The upper edge 80 preferably defines an upper plane and is included for stackability. As illustrated, the first plane 42 defined by the first portion 40 is preferably near the upper edge 80, while the second plane 52 defined by the second portion 50 is intermediate the upper edge 80 and lower edge 82. The first plane 42 could be substantially coincident with the upper edge 80, or could lie slightly below the upper edge 80.

[0029] With continued reference to FIG. 4 along with FIG. 6A, the sealing ring 22 is illustrated to have a first, upper end which connects to an underside surface of the top 12. When assembled with the container 4, the sealing ring 22 projects toward the upper end 6. A portion of the sealing ring 22 defines a sealing surface 24 adapted to detachably mate or contact with an interior surface 28 of the container lip 8. In the illustrated embodiment, the sealing surface 24 and interior surface 28 lie along substantially parallel planes. However, alternatively the contact surfaces 24, 28 could be formed to lie along planes that are at an acute angle with respect to one another to provide an interference fit and enhance sealing between the sealing surface 24 and the interior surface 28.

[0030] Referring to FIGS. 3 and 5, at least one and preferably two or more locking levers 14 are disposed about the periphery of the top 12. Preferably, if there are two levers, the levers 14 are positioned to be substantially diametrically opposed about the circumference (i.e., spaced approximately one-hundred and eighty degrees apart). However, alternatively, the levers 14 may be spaced in unequal increments depending upon the particular application.

[0031] The locking levers 14 may have any of a number of various shapes. For example the locking levers 14 may have a shape in the circumferential direction that is either linear or arcuate depending upon the desired top configuration. With reference to FIG. 3, a top view of a locking lever 14 shows the curvature or arcuate shape of the lever 14 conforming to the circumferential periphery of the skirt 23. When employed with a circular closure 10, each locking lever 14 preferably has an arc length extending over an

included angle ϕ . The included angle ϕ is preferably in the range of about 10 to about 15 degrees.

[0032] With reference now to FIGS. 6A and 6B, each locking lever 14 includes actuation and lower locking arms, 30 and 32, respectively. The actuation arm 30 extends in one direction (upwardly, as illustrated) from the deformable hinge 16, while the lower locking arm 32 generally extends in the opposing direction, (downwardly, as illustrated) from the hinge 16. The deformable hinge 16 is located between or intermediate the actuation and lower locking arms 30, 32 and provides a pivotal connection about which each locking lever 14 may pivot.

[0033] Each locking lever 14 includes a locking wedge 36. The wedge 36 includes a sloped guide surface 36G and a retaining surface 36R. The wedge 36 is sized, shaped, and positioned on the locking lever 14 to releaseably engage the container lip 8 when the closure 10 is installed on the container 4 and to secure the closure 10 to the container 4.

[0034] Operation of the latching levers 14 to attach the closure 10 to and to detach the closure 10 from the container 4 is now described with particular reference to FIGS. 6A and 6B. The description is applicable to the specific embodiment shown in the figures, however, the fundamentals generally apply to the alternate embodiments as well. Initially, the closure 10 of the present invention is aligned with the upper end 6 of the container 4 such that the lower locking arms 32 and sealing ring 22 are adjacent the container lip 8. The closure 10 then is pressed axially downward against the container lip 8 such that the guide surfaces 36G of the locking wedges 36 ride over an external surface of the lip 8. The deformable hinge 16 facilitates displacement of the lower locking arms 32 of the levers 14 from a latched position 14A into an unlatched position 14B, as each locking wedge 36 passes the container lip 8. More specifically, the axial displacement of the closure 10 effects radial displacement of the lower locking arms 32 until the vertex of the wedge 36 passes the lower edge 8LE of the container lip 8. Once the vertex of each wedge 36 passes the container lip 8, the inherent memory of the deformable hinge 16 causes the locking wedges 36 to displace radially inwardly, back into the latched position 14A, toward the principle Z-axis of the container 4. More specifically, the elasticity of the deformable hinge 16 rotates the levers 14 into the latched position 14A to cause the locking wedges 36 to engage the container lip 8. The guide surfaces 36G facilitate engagement of the closure 10 without the requirement to align the sealing surfaces 24, 28 or actuate the locking levers 14. That is, the guide surfaces 36G are sloped downward and away from the lower locking arm 32 to facilitate self-actuation of the locking lever 14. Thus, engagement of the closure 10 to the container 4 may be performed by one hand.

[0035] Disengagement of the closure 10 is effected by pressing the actuation arms 30 of the locking levers 14 radially inwardly to pivot the lower locking arms 32 into the unlatched position 14B. The radially inward displacement of the actuation arms 30 causes the locking arms 32 to disengage from the container lip 8. Movement of the levers 14 into the unlatched position 14B can generally be performed with the thumb and forefinger of the same hand, while the container 4 is held in the other hand. With the locking wedges 14 disengaged from the container lip 8, the closure 10 may be axially separated from the container 4.

[0036] Referring again to FIG. 2, the locking levers 14 preferably include a textured surface 11, such as a series of protrusions or dimples, that provide a gripping surface for the user's fingers. The textured surface 11 assists in inhibiting the user's fingers from slipping off the levers as they actuate the levers 14.

[0037] The closure 10 is preferably manufactured as an integral, unitary structure from a polymeric material. That is, the top 12, locking levers 14, and deformable hinges 16 are preferably fabricated as a single unit to form a unitary structure. Polypropylene is a particularly preferred material. Preferably, a conventional, low-cost fabrication technique, such as injection molding, is used to fabricate the closure 10.

[0038] In use, the container 4 is preferably provided to the consumer/user with the closure 10 attached (see FIG. 1). When the user is ready to heat the contents of container 4, the user first removes the closure 10, and then removes the seal 7, creating an open mouth at the container upper end 6. The closure 10 is then re-installed on the container 4, and the assembly of the container and closure is placed in a microwave oven for heating. During the heating process, gases within the container expand. Without the vent holes 60, the gases within the container could pressurize the interior of the container 4 to such a level as to disengage the closure 10 from the container 4. Additionally, without sufficient heat dissipation, the temperature of the lid can rise, creating a potentially hazardous condition when the user attempts to remove the product from the microwave. Furthermore, with the closure 10 disengaged, the potential for boiling over or other spillage of container contents both during and after the heating process is increased. Thus, the vent holes 60 assist in maintaining engagement of the closure 10 with the container 4 during heating process. With the closure 10 engaged with the container 4, the potential for spillage or boiling over of the contents being heated is reduced.

[0039] Furthermore, locating the vent holes 60 in the first portion 40 of the top 12 also reduces potential for spillage and boiling over of the contents while being heated. With the first portion 40 displaced from and elevated above the second portion 50, the contents of the container 4 have farther to travel to reach the vent holes 60. The elevated position of the vent holes 60 reduces the probability of contents escaping through the vent holes. Also, locating the vent holes 60 centrally reduces the potential for spillage. If the vent holes 60 were positioned toward the periphery of the top 12, a relatively minor tilting of the container 4 and closure 10 would result in overflow of the contents through the vent holes 60, while with the vent holes 60 positioned centrally, a more pronounced tilting of the container 4 and closure 10 is required for the contents to overflow through the vent holes 60. Moreover, placement of the holes near the center provides a chimney effect directing the pressure and heat in a single direction and away from the actuation arms. This minimizes temperature increase in the arms.

[0040] Referring to FIGS. 7-10, another embodiment of a closure cap 200 is shown. The closure has two flexible locking levers 210 located on the sides of the skirt, 180 degrees across from each other. A drinking spout 212 is formed in the top 214 and includes a spout lid 216 that is hinged to the top and removable seals the spout 212.

[0041] In both embodiments illustrated in FIGS. 1-10, straps 300 are located under the flexible locking levers, at or

near the base of the skirt. The straps **300** are attached to the skirt side portions together so as to form an integral connection. The straps create, in combination with the skirt, a continuous 360° type of belt around the entire base of the closure. The connecting straps add strength and structure to the closure by creating rigid circumferential continuity in the closure. The location of the straps below the locking lever does not interfere with the operation of the lever or the placement of the closure on the container.

[0042] In one embodiment of the invention, the strap has a height of approximately 0.100 inches, and a radial thickness of about 0.05 inches. This provides sufficient strength for a closure having a diameter of approximately 2.8 inches.

[0043] The straps insure that the skirt side walls do not spread apart under pressure. They also keep the inside plug seal from being distorted when external or internal pressures are applied, by keeping the sides from rising up.

[0044] Further, a variety of other modifications to the embodiments will be apparent to those skilled in the art from the disclosure provided herein. Thus, the present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification, as indicating the scope of the invention.

What is claimed is:

1. A closure for removable attachment to a container, the container including an opening and a lip, the closure comprising:

- a top defining a cover and having a peripheral edge;
- at least one locking lever including an upper actuation arm and lower locking arm, the lower locking arm having an inwardly projecting locking wedge, the locking wedge having an inclined retention surface defining a locking angle;
- a deformable hinge connecting the top to the locking lever, the hinge attaching to the locking lever at an intermediate location between the upper and lower arms and providing a fulcrum about which each of the locking levers can pivot, the locking levers operative to releasably engage the container lip by radial displacement

ment of the actuation arms to engage and disengage the locking wedges from the lip;

- a plug seal extending downwards from the top radially inward from the locking levers, a sealing surface of the plug seal adapted to contact a sealing surface on the inside of the container lip when the closure is engaged with the container;
 - a skirt attached to the peripheral edge of the top and extending downward from the top, the skirt having an upper edge and a lower edge, the skirt comprising skirt portions located on opposite sides of the locking lever; and
 - a strap located below the locking lever and connecting the lower edges of the skirt portions, the strap forming in combination with the skirt portions a continuous band around a bottom of the closure for providing stiffening of the closure.
2. The closure of claim 1 wherein there are two locking levers on opposite sides of the top.
 3. The closure of claim 1 wherein there are a plurality of vent holes located in the top.
 4. The closure of claim 1, further comprising a container for containing a microwavable food product, the container having a container lip, the closure being removably engaged with the container lip.
 5. The closure of claim 1, wherein the hinge includes at least two webs, each web separated from each other web by a slot.
 6. The closure according to claim 1 wherein each of the locking wedges has a guide surface defining a lead angle, the lead angle being within a range of between about eight degrees to about thirty degrees, the guide surface acting in combination with a container lip to facilitate engagement of the locking wedges by radial displacement of the lower locking arm.
 7. The closure according to claim 1 wherein the cap includes a spout for passing container contents and a hinged cover plate integrally formed in combination with the cover.
 8. The closure according to claim 1 wherein the top, deformable hinge and locking lever are integrally formed from injection molded thermoplastic.

* * * * *