



US 20060273060A1

(19) **United States**(12) **Patent Application Publication**  
**Fricke**(10) **Pub. No.: US 2006/0273060 A1**(43) **Pub. Date: Dec. 7, 2006**(54) **REVERSIBLE VIAL CLOSURE****Publication Classification**(51) **Int. Cl.****B65D 50/02** (2006.01)**B65D 55/02** (2006.01)**B65D 41/00** (2006.01)**B65D 41/06** (2006.01)(52) **U.S. Cl.** ..... **215/222; 215/332; 215/321;**  
215/208(76) **Inventor: Mark Fricke, Newburgh, IN (US)**

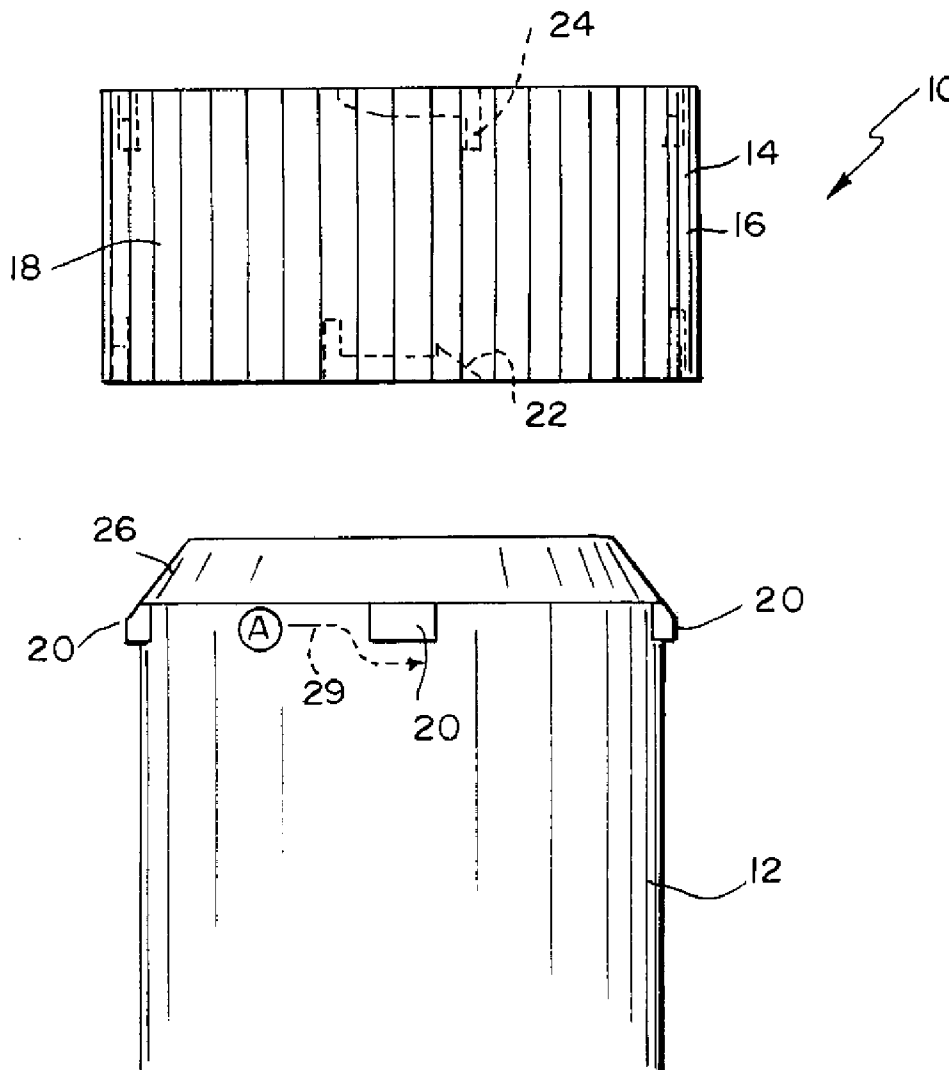
Correspondence Address:

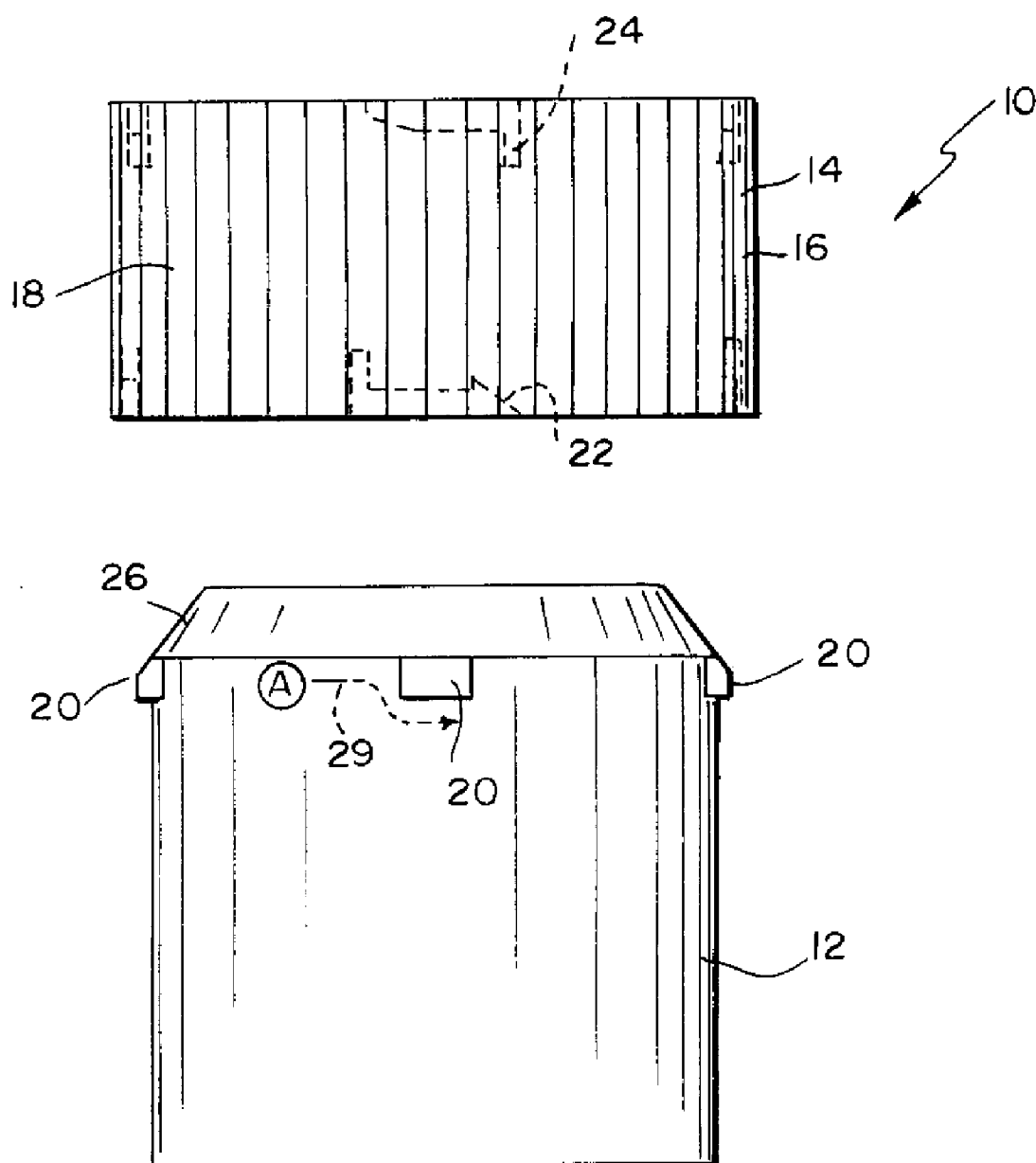
**BARNES & THORNBURG LLP**  
**11 SOUTH MERIDIAN**  
**INDIANAPOLIS, IN 46204 (US)**(21) **Appl. No.: 11/147,015**(22) **Filed: Jun. 6, 2005**

(57)

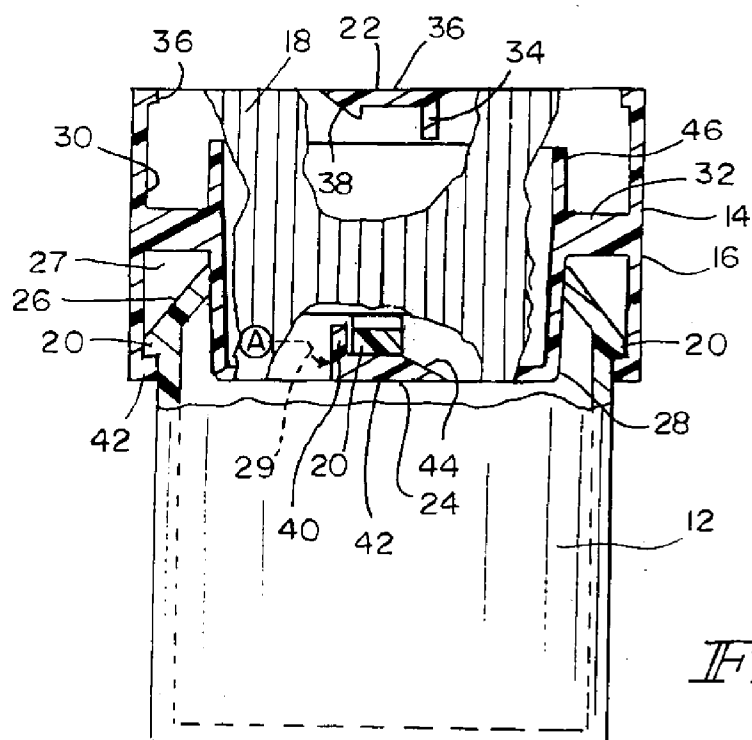
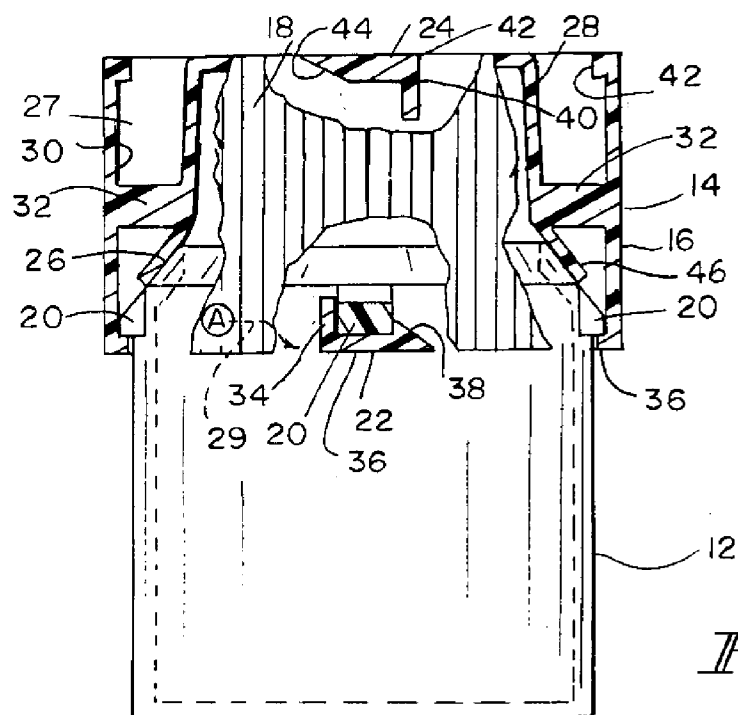
**ABSTRACT**

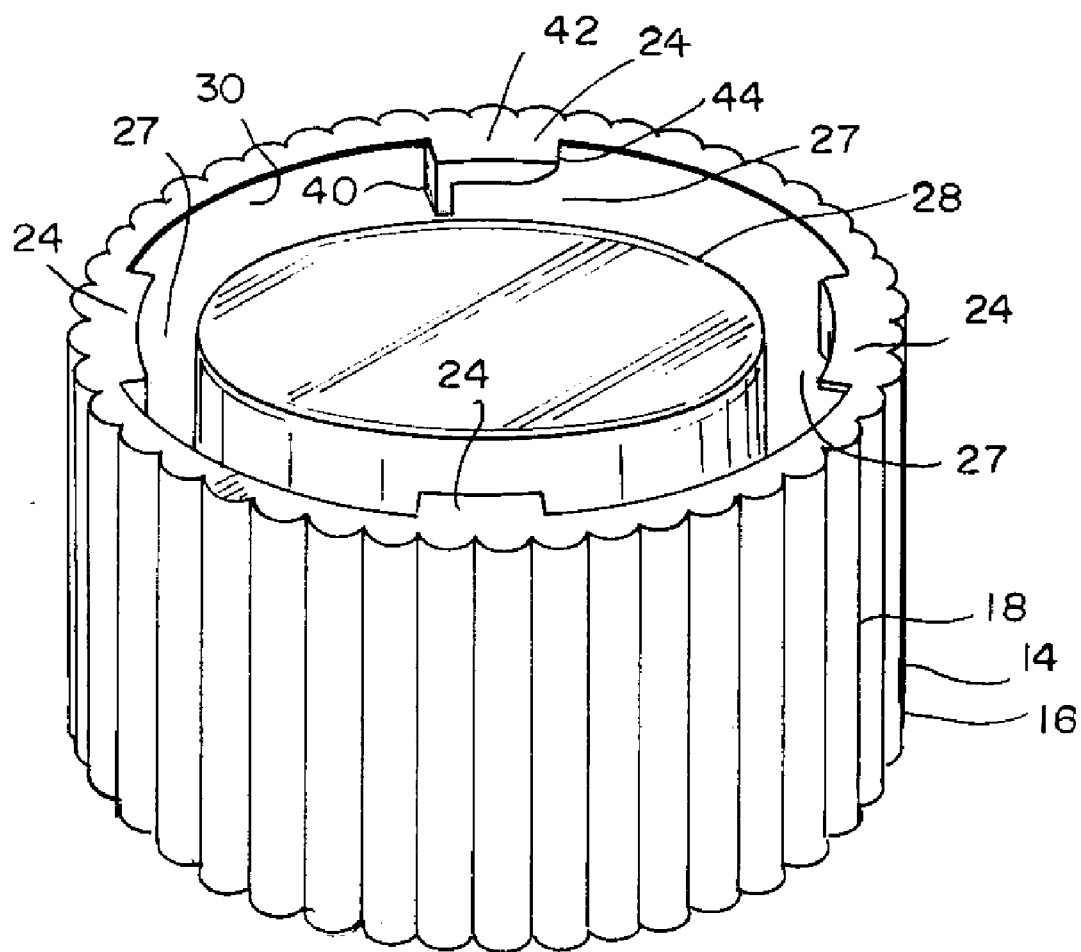
A cap is for a container having both a child-resistant and a non-child-resistant closing position. In the child-resistant position, tabs or latches projecting from the container are wedged between a resilient lip and tabs or latches projecting from an inner surface of the cap. In the non-child-resistant position, the tabs or latches projecting from the inner surface of the cap are wedged between a holding unit, such as a bowl-shaped cap cover, and tabs or latches projecting from the inner surface of the cap.



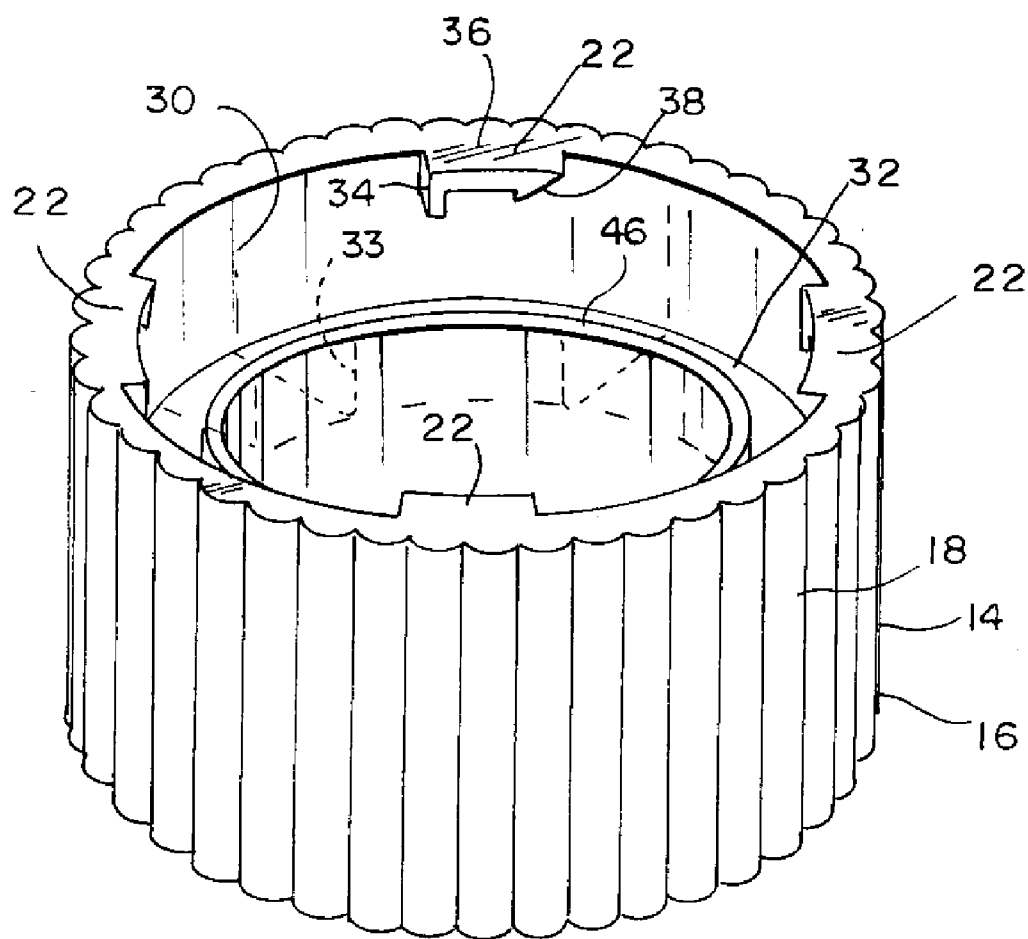


*FIG. 1*

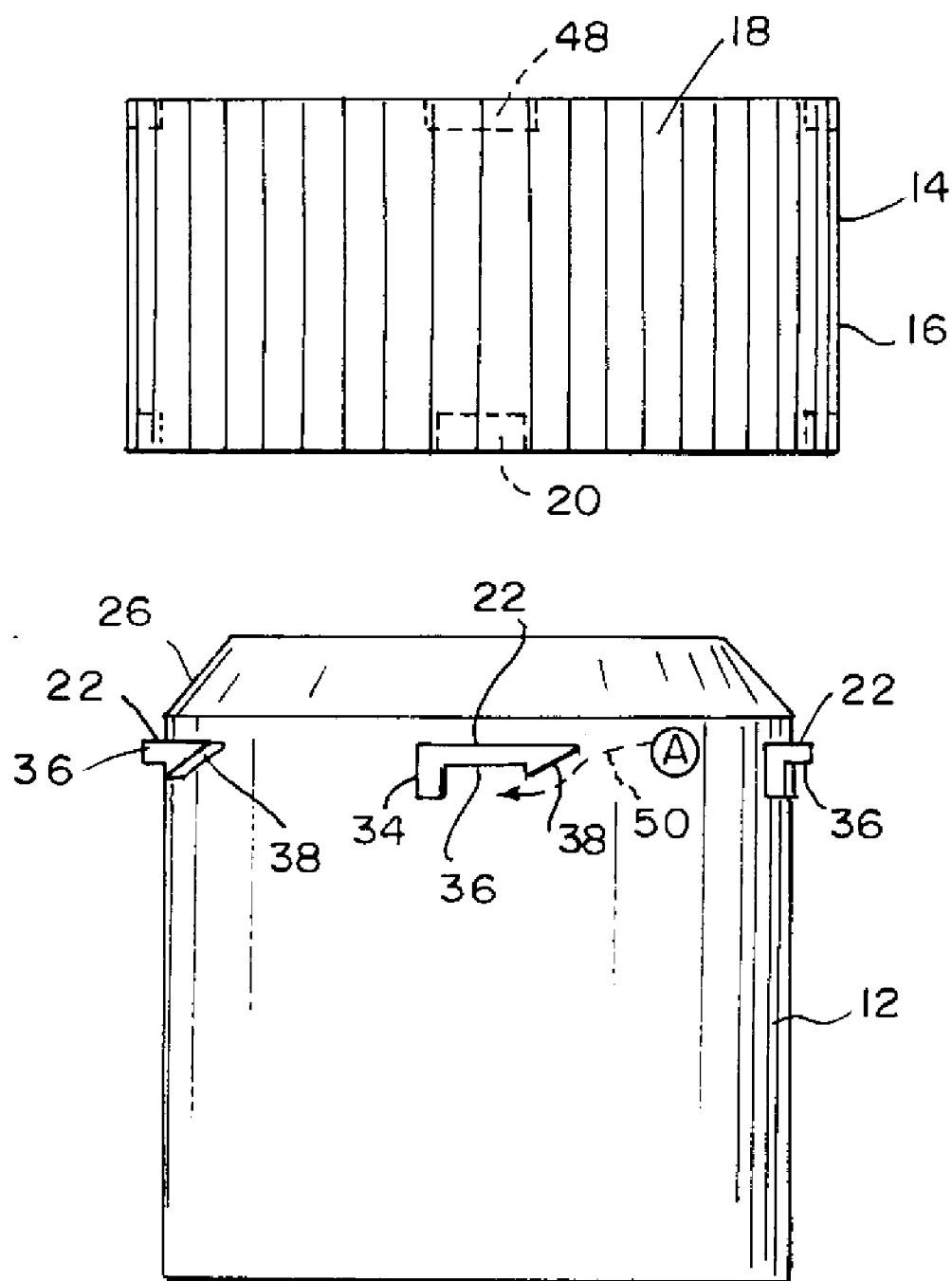




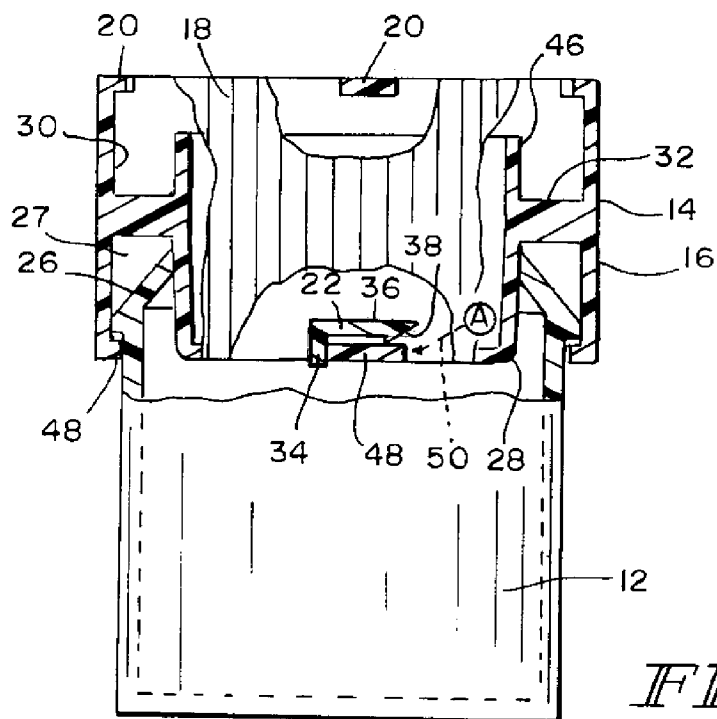
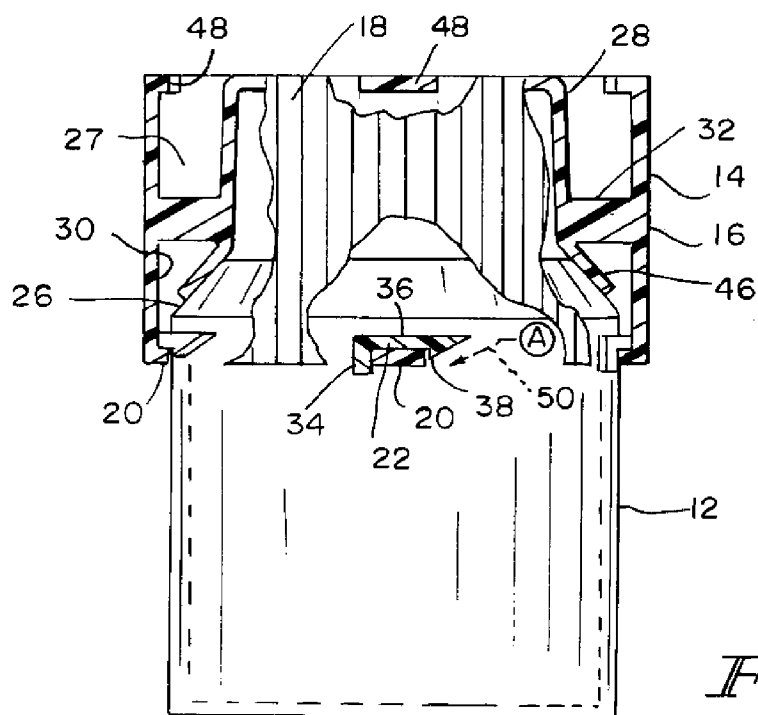
*FIG. 2A*

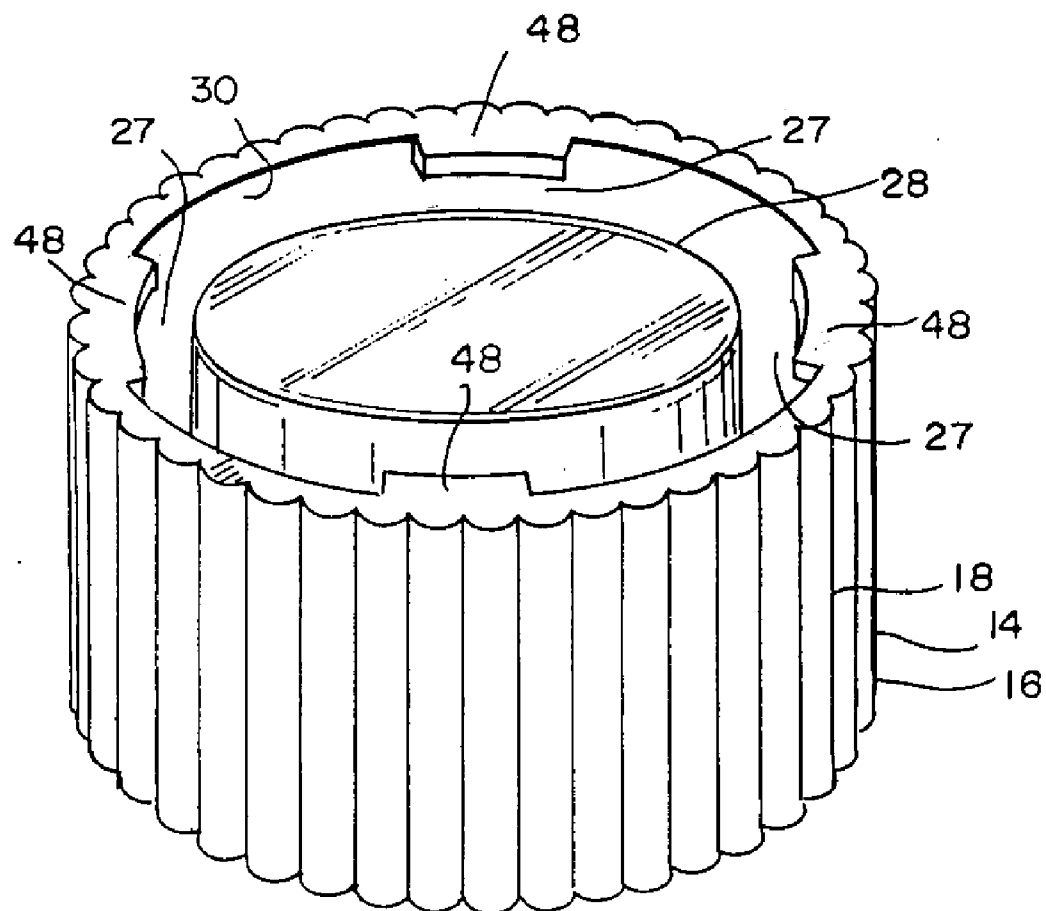


*FIG. 3A*

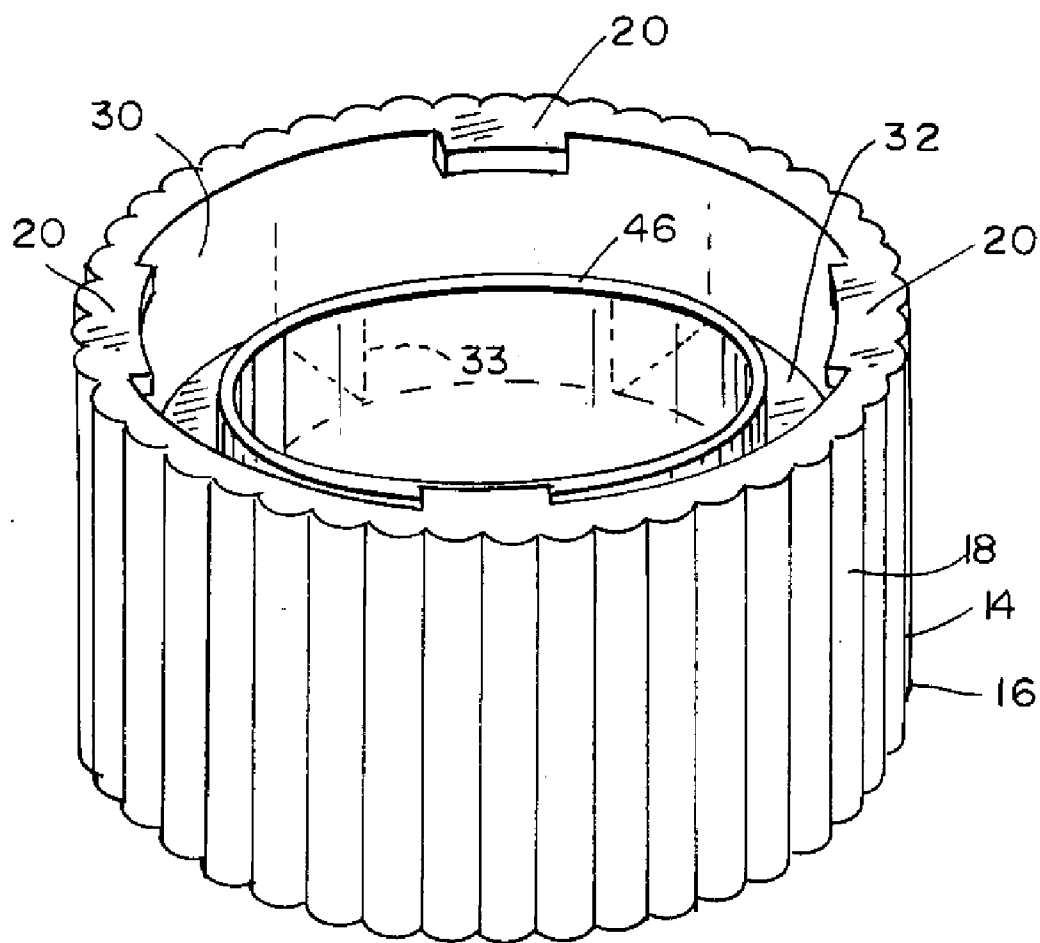


*FIG. 4*

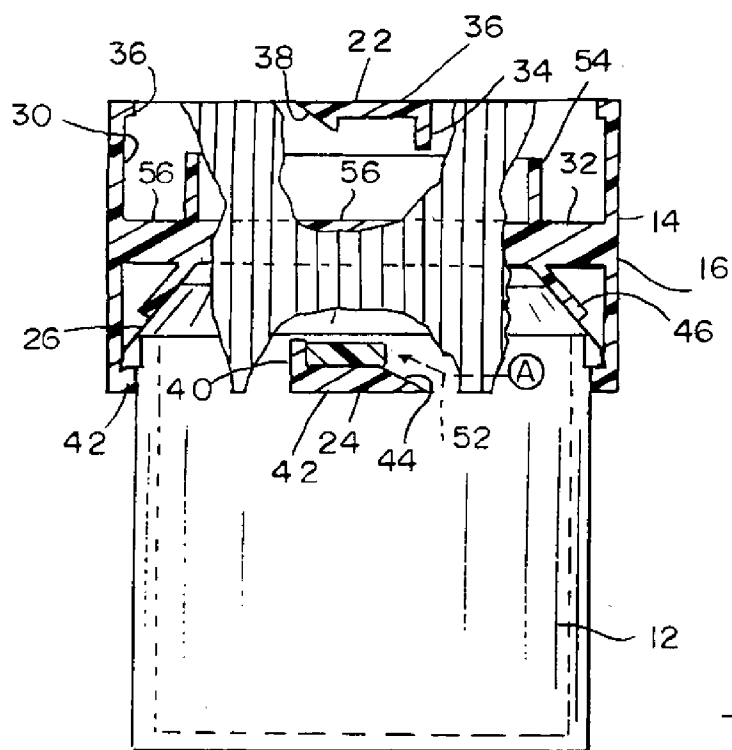
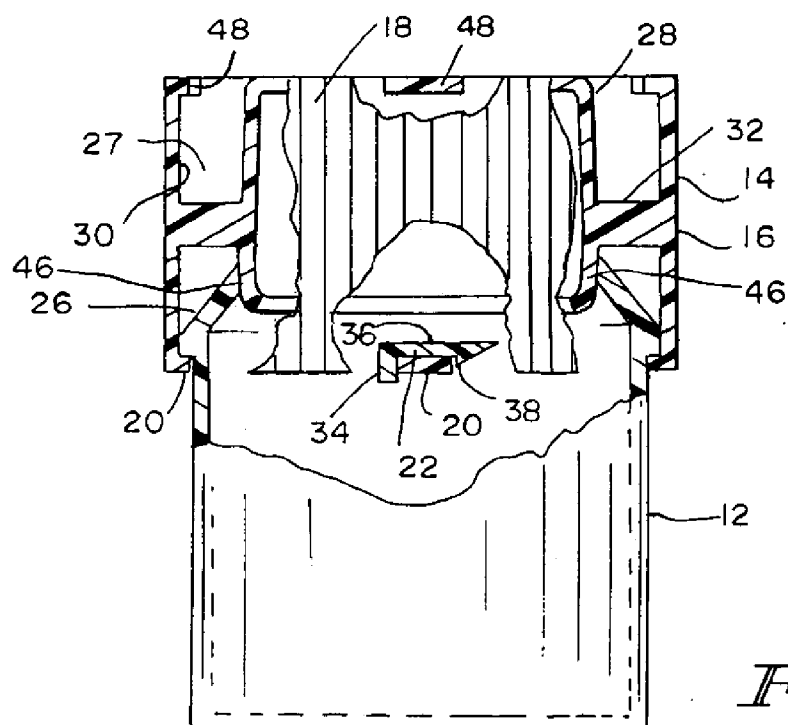




*FIG. 5A*



*FIG. 6A*



## REVERSIBLE VIAL CLOSURE

### FIELD OF THE INVENTION

[0001] The present invention relates to a reversible child-resistant closure. More particularly, the invention relates to a cap, which may be applied to vial or other container in both a child-resistant and a non-child-resistant manner.

### BACKGROUND INFORMATION

[0002] Many different types of vial closures are disclosed in the art. For example, U.S. Pat. No. 5,449,078, which is expressly incorporated herein in its entirety by reference thereto, describes the combination of a container and a safety cap therefor in which the safety cap has a closure plane and a circumferential outer skirt for engaging a container and has a circumferential resilient depending inner member. The container has a rigid wall having an end for engagement with the cap internally of the outer skirt. The wall is tapered from a smaller diameter portion adjacent the closure plane of the cap to a larger diameter portion remote from the closure plane of the cap. The tapered wall of the container engages internally the resilient inner member of the cap and the larger diameter portion of the wall is stated to expand the resilient inner member outwardly to provide a working seal of the container as well as a bias on the cap in a direction of removal of the cap. The combination also includes means disposed on the container remotely from the end of the rigid wall and cooperative means on the cap for preventing the cap from being removed from the container without depression of the cap on the container and rotation of the cap on the container.

[0003] While the child-resistant cap described in U.S. Pat. No. 5,449,078 may prevent children from accessing the contents of a vial or container, the cap may also present removal difficulties for an unintended subset of the population, including the elderly, that lack the strength and/or manual dexterity to remove the cap.

[0004] Accordingly, it is an aspect of the present invention to provide a reversible child-resistant closure, which may be applied to a vial or container in both a child-resistant and a non-child-resistant manner.

### SUMMARY

[0005] An example embodiment of the container system of the present invention includes a container and a cap configured to mate with the container in a first position, e.g., a child-resistant position, and a second position, e.g., a non-child-resistant position. The container includes a top end and a plurality of container projections. The cap includes a circumferential skirt and a resilient lip disposed within the cap and spaced apart from the circumferential skirt. A plurality of first cap projections are spaced along a first plane and project from an inner surface of the circumferential skirt. A plurality of second cap projections are spaced along a second plane and project from an inner surface of the circumferential skirt. In the child-resistant position each of the container projections are wedged between the resilient lip and one of the first cap projections. The container projections, resilient lip, and first cap projections are configured such that removal of the cap from the container requires that the cap and container be forced towards each other while rotating one of the cap and

container. In the non-child-resistant position each of the container projections are wedged between one of the second cap projections and a holding unit connected to the circumferential skirt. The second cap projections, container projections and holding unit are configured such that a predetermined threshold rotation force is necessary to remove the cap from the container. The holding unit lies between the second cap projections and the resilient lip.

[0006] In an example embodiment of the present invention, a container system includes: a container having a top end and a plurality of container projections; a cap configured to mate with the container in a child-resistant position and a non-child-resistant position, the cap including a circumferential skirt and a resilient lip disposed within the cap and at least partially spaced apart from the circumferential skirt; a plurality of first cap projections spaced along a first plane and projecting radially inwardly from an inner surface of the circumferential skirt; and a plurality of second cap projections spaced along a second plane and projecting radially inwardly from an inner surface of the circumferential skirt, the second plane spaced from the first plane, the resilient lip between the first and second cap projections. In the child-resistant position, each of the container projections are wedged between the resilient lip and one of the first cap projections, said container projections, resilient lip, and first cap projections configured such that removal of the cap from the container requires that the cap and container be forced towards each other during rotation of the cap and container relative to each other. In the non-child-resistant position, each of the container projections are wedged between one of the second cap projections and a holding unit connected to the circumferential skirt, said second cap projections, container projections and holding unit configured such that a predetermined threshold rotation force is necessary to remove the cap from the container, said holding unit lying between the second cap projections and the resilient lip.

[0007] The resilient lip may be configured to engage one of an outer surface, an inner surface and a top of the container in the child-resistant position.

[0008] The holding unit may include a cover disposed within the circumferential skirt and arranged to cover an opening of the container in both the child-resistant and non-child-resistant positions.

[0009] The cover may be bowl-shaped, and the resilient lip may form a lip of the bowl-shaped cover. The cover may be connected to the circumferential skirt adjacent the resilient lip.

[0010] The resilient lip may project from the cover.

[0011] Each of the first cap projections may include a first cap projection tab, each of the second cap projections may include a second cap projection tab, and each of the container projections may include a latch.

[0012] The first cap projection tabs and the second cap projection tabs may have different widths.

[0013] The latch may include a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, and a height of the stop portion and the sloped catch portion may be larger than that of the central portion. In the child-resistant position, each first cap

projection tab may be arranged between the stop portion and sloped catch portion of one of the latches.

[0014] The latch may include a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, and a height of the stop portion and the sloped catch portion larger than that of the central portion. In the non-child-resistant position, a longer one of the first cap projection tabs and the second cap projection tabs may each contact the sloped catch portion of one latch and may be too long to fit between the stop portion and the sloped catch portion of said latch.

[0015] Each of the first and second projections may include a latch, and each of the container projections may include a tab.

[0016] Each of the first projections may include a latch, each of the second projections may include a modified latch, and each of the container projections may include a tab. Each latch may include a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, and a height of the stop portion and the sloped catch portion may be larger than that of the central portion. In the child-resistant position, each tab may be located between the stop portion and sloped catch portion of one of the latches. Each modified latch may include a stop portion, a ramp portion, and a central portion between the stop portion and the ramp portion, and the ramp portion may include a sloped portion. The stop portion may be higher than the central portion and the ramp portion. In the non-child-resistant position, each tab may contact the central portion.

[0017] Each of the first projections may include a latch, each of the second projections may include a modified latch, and each of the container projections may include a tab. Each latch and modified latch may include a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, for both the latch and modified latch a height of the stop portion and the sloped catch portion may be larger than that of the central portion. The central portion of the modified latch may have a shorter length than that of the central portion of the latch. In the child-resistant position, each tab may be located between the stop portion and sloped catch portion of one latch, and in the non-child-resistant position, each tab may contact the sloped catch portion of one modified latch and may be too long to fit between the stop portion and the sloped catch portion of said modified latch.

[0018] In the non-child-resistant position, the top end of the container may be disposed in a circumferential channel at least partially defined by at least a portion of the circumferential skirt and at least a portion of the cover.

[0019] The container system may include a second resilient lip projecting from the cover in an opposite direction to the resilient lip.

[0020] The cap is integrally formed.

[0021] In an example embodiment of the present invention, a cap may be configured to mate with a container in child-resistant and non-child-resistant positions. The cap may include: a circumferential skirt and a resilient lip disposed within the cap and at least partially spaced apart from the circumferential skirt; a plurality of first cap pro-

jections spaced along a first plane and projecting radially inwardly from an inner surface of the circumferential skirt; a plurality of second cap projections spaced along a second plane and projecting radially inwardly from an inner surface of the circumferential skirt, the second plane spaced from the first plane, the resilient lip located between the first and second cap projections; a holding unit connected to the inner surface of the circumferential skirt and arranged between the second cap projections and the resilient lip; and a plurality of channels, each channel defined by at least a portion of the holding unit, one of the second cap projections, and at least a portion of the circumferential skirt.

[0022] The holding unit may include a cover disposed within the circumferential skirt and configured to cover an opening in a container in both the child-resistant and non-child-resistant positions.

[0023] The cover may be bowl-shaped, the resilient lip forming a lip of the bowl-shaped cover. The cover may be connected to the circumferential skirt adjacent the resilient lip.

[0024] The resilient lip may project from the cover.

[0025] Each of the first cap projections may include a first cap projection tab, each of the second cap projections may include a second cap projection tab, and each of the container projections may include a latch.

[0026] The first cap projection tabs and the second cap projection tabs may have different widths.

[0027] The latch may include a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, and a height of the stop portion and the sloped catch portion may be larger than that of the central portion. In the child-resistant position, each first cap projection tab may be located between the stop portion and sloped catch portion of one latch.

[0028] The latch may include a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, and a height of the stop portion and the sloped catch portion may be larger than that of the central portion. In the non-child-resistant position, a longer one of the first cap projection tabs and the second cap projection tabs may each contact the sloped catch portion of one latch and may be too long to fit between the stop portion and the sloped catch portion of said latch.

[0029] Each of the first and second projections may include a latch, and each of the container projections may include a tab.

[0030] Each of the first projections may include a latch, each of the second projections may include a modified latch, and each of the container projections may include a tab, each latch including a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion. A height of the stop portion and the sloped catch portion may be larger than that of the central portion. In the child-resistant position, each tab may be located between the stop portion and sloped catch portion of one latch. Each modified latch may include a stop portion, a ramp portion, and a central portion between the ramp portion and the stop portion, the ramp portion including a sloped portion. The stop portion may be higher than the central portion and the

ramp portion. In the non-child-resistant position, each tab may contact the central portion of one modified latch.

[0031] Each of the first projections may include a latch, each of the second projections may include a modified latch, and each of the container projections may include a tab, each latch and modified latch including a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion. A height of the stop portion and the sloped catch portion may be larger than that of the central portion, and the central portion of the modified latch may have a shorter length than that of the central portion of the latch. In the child-resistant position, each tab may be located between the stop portion and sloped catch portion of one latch, and in the non-child-resistant position, each tab may contact the sloped catch portion and may be too long to fit between the stop portion and the sloped catch portion of the modified latch.

[0032] The cap may include a second resilient lip projecting from the cover in an opposite direction to the resilient lip.

[0033] The cap may be integrally formed.

[0034] In accordance with an example embodiment of the present invention, container system includes: a container having a top end and a plurality of cap retaining means; a cap configured to mate with the container in a child-resistant position and a non-child-resistant position, the cap including a circumferential skirt and a resilient lip disposed within the cap and at least partially spaced apart from the circumferential skirt; a plurality of first container retaining means spaced along a first plane and projecting from an inner surface of the circumferential skirt; and a plurality of second container retaining means spaced along a second plane and projecting from an inner surface of the circumferential skirt, the second plane being spaced from the first plane, the resilient lip being between the first and second cap projections. In the child-resistant position, each of the cap retaining means are wedged between the resilient lip and one of the first container retaining means, said cap retaining means and first container retaining means being configured such that removal of the cap from the container requires that the cap and container be forced towards each other while rotating the cap and container relative to each other. In the non-child-resistant position, each of the cap retaining means are wedged between one of the second container retaining means and a holding unit connected to the circumferential skirt, said second container retaining means, cap retaining means and holding unit being configured such that a predetermined threshold rotation force is necessary to free the cap retaining means from its wedged position, said holding unit lying between the second container retaining means and the resilient lip.

[0035] In accordance with an example embodiment of the present invention, a method for closing a container with a cap having child-resistant and non-child-resistant positions may include: (a) disposing a top end of the container having a plurality of container projections within a circumferential skirt of the cap by passing each of the container projections between adjacent second cap projections projecting radially inwardly from the circumferential skirt, the cap including a resilient lip, disposed within the cap and at least partially spaced apart from the circumferential skirt, and a plurality of first cap projections spaced along a first plane and projecting

from an inner surface of the circumferential skirt, the second cap projections spaced along a second plane and projecting from an inner surface of the circumferential skirt, the second plane being spaced from the first plane, the resilient lip lying between the first and second cap projections; and (b) rotating the cap and container relative to each other so as to wedge each of the container projections between a holding unit and one of the second cap projections, said holding unit projecting inwardly from the circumferential skirt and lying between the resilient lip and the second cap projections.

[0036] The second cap projections may include one of tabs, modified latches, and latches. The modified latches each may include a sloped portion, stop portion and a central portion between the sloped portion and the stop portion, and the latches may each include a sloped catch portion, a stop portion, and a central portion between the stop portion and the sloped catch portion. The container projections may include one of tabs, modified latches, and latches.

[0037] The holding unit may include a cover disposed within the circumferential skirt and covering an opening in the container in both the child-resistant and non-child-resistant positions.

[0038] The cover may be bowl-shaped, the resilient lip forming a lip of the bowl-shaped cover, and the cover may be connected to the circumferential skirt adjacent the resilient lip.

[0039] Example embodiments of the present invention may be embodied in the form illustrated in the accompanying drawings. Attention is called to the fact, however, that the drawings are illustrative only. Variations are contemplated as being part of the present invention, limited only by the scope of the appended claims.

[0040] In the drawings, like elements are depicted by like reference numerals. The drawings are briefly described as follows.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0041] **FIG. 1** is a side view of an exemplary container system of the present invention.

[0042] **FIG. 2** is side view of the vial of **FIG. 1** and a partial side view and partial cross-sectional view of the cap of **FIG. 1** locked onto the vial in a child-resistant position.

[0043] **FIG. 2A** is a top perspective view of the cap of **FIG. 2**.

[0044] **FIG. 3** illustrates a side view of the vial of **FIG. 1** and a partial side view and partial cross-sectional view of the cap of **FIG. 1** inverted and locked onto the vial in a non-child-resistant position.

[0045] **FIG. 3A** is a top perspective view of the cap of **FIG. 3**.

[0046] **FIG. 4** is a side view of another exemplary embodiment of the container system of the present invention.

[0047] **FIG. 5** is side view of the vial of **FIG. 4** and a partial side view and partial cross-sectional view of the cap of **FIG. 4** locked onto the vial in a child-resistant position.

[0048] **FIG. 5A** is a top perspective view of the cap of **FIG. 5**.

[0049] FIG. 6 illustrates a side view of the vial of FIG. 4 and a partial side view and partial cross-sectional view of the cap of FIG. 4 locked onto the vial in a non-child-resistant position.

[0050] FIG. 6A is a top perspective view of the cap of FIG. 6.

[0051] FIG. 7 illustrates another exemplary embodiment of the container system of the present invention with an inwardly projecting resilient lip.

[0052] FIG. 8 illustrates another exemplary embodiment of the container system of the present invention with two resilient lips.

#### DETAILED DESCRIPTION

[0053] FIG. 1 is a side view of an exemplary container system 10 of the present invention including a container, e.g., vial 12, and mating cap 14. The cap 14 includes a circumferential skirt 16 having a ribbed exterior surface 18, which facilitates gripping and rotation of the cap 14. The vial 12 includes four tabs 20 (only three visible) which mate with camming latches 22, in a child-resistant position of the cap 14 (FIG. 2), and with modified latches 24, in a non-child-resistant position (FIG. 3). It should be understood that although four tabs 20 are mentioned any number of tabs 20 may be provided. The camming latches 22 and modified latches 24 project from an inner surface 30 of the circumferential skirt 16, and thus, are shown in ghost lines.

[0054] The cap 14 is locked onto the vial 12 in the child-resistant position by first rotating approximately 45 degrees clockwise from the position shown in FIG. 1, lowering the cap 14 onto the vial 12 such that a tapered top end 26 of the vial 12 is disposed within the circumferential skirt 16 and such that each camming latch 22 is between two tabs 20 (one of the tabs 20 is in the position labeled A, as seen in FIG. 2), and rotating the cap 14 by approximately 45 degrees in a counter clockwise direction. Note that the necessary degrees of rotation is dependent on the number and arrangement of latches 22 and 24 disposed in the vial 12. More or less than the four latches 22 and 24, and corresponding tabs 20, shown may be provided. The cap 14 is locked in a similar manner onto the vial 12 in the non-child-resistant position except the cap 14 is in an inverted or flipped position prior to disposing it over the top end 26 of the vial 12.

[0055] FIG. 2 illustrates a side view of the vial 12 and a partial side view and partial cross-sectional view of the cap 14, which is locked onto the vial 12 in the child-resistant position. The cap 14 includes a bowl-shaped cover 28 connected to the inner surface 30 of the cap 14 by a ring portion 32 of the cover 28, which projects inward from the cap 14 and outward from the cover 28. The circumferential skirt 16 is selectively torn away to expose each camming latch 22 and modified latch 24, which, project inward from the circumferential skirt 16. As such, the camming latch 22 and modified latch 24 are shown in a "floating" state. The circumferential skirt 16, which normally supports latches 22 and 24, has been torn away so as to expose the mating action of the tabs 20 and the camming latches 22 (FIG. 2) and the modified latches 24 (FIG. 3). The sides of the cap 14 are shown in cross-section. The transverse section taken is down the center of each of the latches 22 and 24. A top perspective

view of the cap 14 of FIG. 2 is illustrated in FIG. 2A, without the vial 12 for clarity.

[0056] The camming latch 22 includes a stop portion 34, a center detent portion 36, and a sloped catch portion 38. The modified latch 24 includes a stop portion 40, a flat center portion 42, and a ramp portion 44. In the child-resistant position illustrated in FIG. 2, as the cap 14 is rotated counter clockwise, the camming latch 22, initially in position A, slides along the path labeled 29 such that tab 20 slides up the sloped catch portion 38 and then falls into the center detent portion 36. A resilient lip 46 of the bowl-shaped cover 28 is bent as the tab 20 and top end 26 of vial 12 slides upward over the sloped catch portion 38 and applies a downward force on the vial 12 and tabs 20. The stop portion 34 prevents further rotation of the cap in the clockwise direction. The sloped catch portion 38 prevents rotation of the cap in the counterclockwise direction, i.e., prevents removal of the cap 14, unless the cap 14 and vial 12 are first pressed towards each other, further bending the resilient lip 46 and raising the tab 20 higher than the sloped catch portion 38. This extra step in removing the cap 14 adds effective child-resistance to the container system 10.

[0057] The cross-section of the cap 14 is taken down the center of the latches 22 and 24. Therefore, center detent portions 36 can be seen directly underneath the tabs 20 on either side of the cap 14. In contrast to sides of the cap 14, the vial 12 is not shown in cross-section, therefore, tabs 20 can be seen wrapping around either side of vial 12. Although not shown (given the cross-sectional presentation of the sides of the cap 14) stop portion 34 and sloped catch portion 38 surround or sandwich these side tabs 20, in an analogous manner as the fully shown camming latch 22 in the middle of the cap 14.

[0058] FIG. 3 illustrates a side view of the vial 12 and a partial side view and partial cross-sectional view of the cap 14, which is locked onto the vial 12 in the non-child-resistant position. The top end 26 of the vial sits in a channel 27 at least partially defined by the ring portion 32, the cover 28 and the circumferential skirt 16. The cap 14 is rotated from position A (in which the vial 12 is covered but the cap 14 is not locked) clockwise such that modified latch 24 (the center one for illustration purposes) slides along path 29 such that the flat central portion 42 sits under tab 20. The container system 10 is configured such that in this locked position the tabs 20 are held snugly between the modified latches 24 and the ring portion 32, which functions as a holding unit. Up and down movement of the cap 14 relative to the vial 12 is prevented in this locked position by the ring portion 32 and the modified latches 24, which sandwich the tabs 20 from the top and bottom. Unlike in the child-resistant position, however, rotation of the cap 14 is not prevented by a catch. Rather, rotation of the cap 14 may be accomplished by applying at least a predetermined level of rotating force to the cap 14 to overcome the friction between the flat center portions 42 of the modified latches 24 and the tabs 20 and between the top end 26 of the vial 12 and the ring portion 32.

[0059] A top perspective view of the cap 14 of FIG. 3 is illustrated in FIG. 3A, without the vial 12 for clarity. Ghost lines 33 are added to more clearly show the resilient lip 46 and the ring portion 32.

[0060] Alternatively, the container system 10 may further include an alternate projecting ring or other projection (not

shown) from the inner surface 30 of the circumferential skirt 16 between the cover 28 and the camming latches 22 to function as a holding unit. In which case, the tabs 20 would be held snugly and wedged between the modified latches 24 and said alternate projecting ring or other projection in the closed non-child-resistant position of the cap 14.

[0061] FIGS. 4 to 6 illustrate another exemplary embodiment of the container system 10 of the present invention. To the extent that parts or elements in FIGS. 1 to 3 match those in FIGS. 4 to 6, consistent numbering is maintained.

[0062] FIG. 4 is a side view of the container system 10. Four camming latches 22 are shown projecting from the vial 12. The camming latches 22 on either side of the vial 12 can be seen wrapping around the vial 12. The cap 14 includes four tabs 20 and four modified tabs 48, shown in ghost lines, each projecting from the inner surface 30 of the cap 14.

[0063] The cap 14 is locked onto the vial 12 in the child-resistant position by first rotating approximately 45 degrees counter clockwise from the position shown in FIG. 4, lowering the cap 14 onto the vial 12 such that the tapered top end 26 of the vial 12 is disposed within the circumferential skirt 16 and such that each tab 20 is between two camming latches 22 (one of the tabs 20 is in the position labeled A), and rotating the cap 14 by 45 degrees in a clockwise direction. The cap 14 is similarly locked onto the vial 12 in the non-child-resistant position except the cap 14 is first inverted or flipped prior to disposing it over the top end 26 of the vial 12. Note that the necessary degree of rotation for closure of the cap 14 is dependent on the number of camming latches 22 disposed on the surface of the vial and the number of corresponding tabs 20. More or less than four camming latches 22 and corresponding tabs 20 may be provided.

[0064] FIG. 5 illustrates a side view of the vial 12 and a partial side view and partial cross-sectional view of the cap 14 of FIG. 4, which is locked onto the vial 12 in the child-resistant position. The circumferential skirt 16 is selectively torn away to expose each of the tabs 20 and modified tabs 48, which project inward from the circumferential skirt 16. As such, the tabs 20 and modified tabs 48 are shown in a "floating" state. The circumferential skirt 16, which normally supports tabs 20 and modified tabs 48, has been torn away so as to expose the mating action of the camming latch 22 with the tabs 20 (FIG. 5) and modified tabs (FIG. 6). As in FIGS. 2 to 4, the sides of the cap 14 are shown in cross-section. The transverse section taken is down the center of each of the tabs 20 and modified tabs 48. A top perspective view of the cap 14 of FIG. 5 is illustrated in FIG. 5A without the vial 12 for clarity.

[0065] As seen in FIG. 5, rotation of the cap 14 forces tabs 20 to slide along path 50 downward along the sloped catch portions 38 and under the center detent portions 36. Further, rotation of the cap 14 forces the top end 26 of the vial 12 against the resilient lip 46 causing the lip 46 to bend, thus creating a downward bias on vial 12 and forcing camming latches 22 against tabs 20. The stop portion 34 of the camming latch 22 prevents further counter clockwise rotation of the cap 14. Further, the sloped catch portion 38 prevents rotation of the cap 14 in the clockwise direction, i.e., opening of the cap, unless the cap 14 and the vial 12 are first forced towards each other, further bending resilient lip 46, so as to lower, and thus, clear the sloped catch portion 38.

[0066] FIG. 6 illustrates a side view of the vial 12 and a partial side view and partial cross-sectional view of the cap 14 of FIG. 4, which is locked onto the vial 12 in the non-child-resistant position. A top perspective view of the cap 14 of FIG. 6 is illustrated in FIG. 6A without the vial 12 for clarity. Ghost lines 33 are used to more clearly show the outlines of the resilient lip 46 and the ring 32, which is hidden behind the resilient lip 46 from this perspective. As seen in FIG. 6, the top end 26 of the vial sits in a chamber 27 at least partially defined by the ring portion 32, the cover 28 and the circumferential skirt 16. The cap 14 is rotated from position A (in which the vial 12 is covered but the cap 14 is not locked) clockwise such that modified tabs 48 slides down the sloped catch portion 38 and, at least partially, under the center detent portion 36. The modified tabs 48 are too wide to fit between the stop portion 34 and the center detent portion 36. However, the container system 10 is configured such that in this locked position the modified tabs 48 are held snugly between the camming latches 22 and the ring portion 32. Up and down movement of the cap 14 relative to the vial 12 is prevented by the camming latches 22 and the ring portion 32, which sandwich the modified tabs 48 from the top and bottom. Unlike in the child-resistant position, however, rotation of the cap 14 is not prevented by the sloped catch portion 38 because, as indicated above, each of the modified tabs 48 is too wide to fit between the stop portion 34 and the sloped catch portion 38 of each camming latch 22. Rather, rotation of the cap 14 may be accomplished by applying at least a predetermined level of rotating force to the cap 14 to overcome the friction between the sloped catch portion 38 and the modified tab 20 and between the top end 26 of the vial 12 and the ring portion 32.

[0067] FIG. 7 illustrates another exemplary embodiment of the container system 10 of the present invention, identical to the embodiment of FIGS. 4 to 6, except for the configuration of the resilient lip 46. The resilient lip 46 projects further inwards and is configured to be disposed inside the top end 26 of the vial 12. Further, as in the embodiment of FIGS. 4 to 6, the resilient lip 46 is configured to maintain a downward bias on top end 26 of vial 12 when bent. Alternatively, the position of the tabs and latches may be swapped as in FIGS. 1 to 3, i.e., the latches 22 and/or 24 may project inwardly from the circumferential skirt 16 and the tabs 20 or 48 may project outwardly from the vial 12.

[0068] In another exemplary embodiment of the present invention, the resilient lip 46 may be configured, e.g., L-shaped, to engage a top edge of the vial 12.

[0069] FIG. 8 illustrates another exemplary embodiment of the container system 10 of the present invention. FIG. 8 is a side view of the vial 12 and a partial side view and partial cross-sectional view of the cap 14, which is locked onto the vial 12 in the non-child-resistant position. The circumferential skirt 16 is selectively torn away to expose each of the camming latches 22 and modified latches 24, which project inward from the circumferential skirt 16. As such, the camming latches 22 and modified latches 24 are shown in a "floating" state. The circumferential skirt 16, which normally supports the camming latches 22 and modified latches 24, has been torn away so as to expose the camming latches 22 and the mating action of the modified latches 24 and tabs 20. The sides of the cap 14 are shown in

cross-section. The transverse section taken is down the center of the side camming latches 22 and modified latches 24.

[0070] The cap 14 includes a central cover 56 dividing the circumferential skirt 16 down the center. Top and bottom resilient lips 46 and 54 project in opposite directions from the central cover 56. On one side of the central cover 56 the camming latches 22 project inwardly from the circumferential skirt 16 and on the opposite side of the central cover 56 the modified latches 24 project inwardly from the circumferential skirt 16.

[0071] Clockwise rotation of the cap 14 forces tabs 20 to slide upward along the ramp portion 38 and over the flat center portion 42, along the path labeled 52. The rotation of the cap 14 forces the top end 26 of the vial 12 against the resilient lip 46 causing the lip 46 to bend, creating a downward vial 12 bias. The stop portion 34 of the camming latch 22 prevents further clockwise rotation of the cap 14. Further, the friction between the resilient lip 46 and the top end 26 of the vial 12 and between the modified latch 24 and the tab 20 resists rotation of the cap 14 in the counterclockwise direction, i.e., opening of the cap. However, the container system 10 is configured such that application of a threshold rotation force to the cap 14 overcomes this friction. In the child-resistant position (with the cap 14 inverted) the configuration and locking action of the cap 14 is identical to that of FIG. 2. Rotation of the cap 14 forces tab 20 over sloped catch portion 38 and down over center detent portion 36, fixing tab 20 between stop portion 34 and sloped catch portion 38. In this locked position rotation of the cap 14 in one direction is prevented by stop portion 34 and rotation of the cap 14 in the opposite direction may only be accomplished by squeezing the cap 14 and the vial 12 towards each other, so as to raise the tab 20 relative to the camming latch 22, while rotating the cap 14.

[0072] Alternatively, the modified latches 24 may have the same configuration as the camming latches 22 but have a shorter center detent portion 36. Further, the position of the tabs and latches may be swapped as in FIG. 4, i.e., the latches may project inwardly from the circumferential skirt 16 and the tabs may project outwardly from the vial 12.

[0073] Cap 14, in all of the embodiments detailed above, may be integrally formed and made from a plastic, e.g., high density polyethylene (HDPE), low density polyethylene (LDPE), and polypropylene. Further, in all of the exemplary embodiments above a larger or smaller number of latches and corresponding tabs may be used.

[0074] As many apparently widely different embodiments of the present invention may be made without departing from the spirit and scope thereof, it is to be understood that the present invention is not limited to the specific embodiments thereof except as defined in the appended claims.

What is claimed is:

1. A container system, comprising:

a container having a top end and a plurality of container projections;

a cap configured to mate with the container in a child-resistant position and a non-child-resistant position, the cap including a circumferential skirt and a resilient lip

disposed within the cap and at least partially spaced apart from the circumferential skirt;

- a plurality of first cap projections spaced along a first plane and projecting radially inwardly from an inner surface of the circumferential skirt; and
- a plurality of second cap projections spaced along a second plane and projecting radially inwardly from an inner surface of the circumferential skirt, the second plane spaced from the first plane, the resilient lip between the first and second cap projections;

wherein in the child-resistant position, each of the container projections are wedged between the resilient lip and one of the first cap projections, said container projections, resilient lip, and first cap projections configured such that removal of the cap from the container requires that the cap and container be forced towards each other during rotation of the cap and container relative to each other;

wherein in the non-child-resistant position, each of the container projections are wedged between one of the second cap projections and a holding unit connected to the circumferential skirt, said second cap projections, container projections and holding unit configured such that a predetermined threshold rotation force is necessary to remove the cap from the container, said holding unit lying between the second cap projections and the resilient lip.

2. The container system of claim 1, wherein the resilient lip is configured to engage one of an outer surface, an inner surface and a top of the container in the child-resistant position.

3. The container system of claim 1, wherein the holding unit includes a cover disposed within the circumferential skirt and arranged to cover an opening of the container in both the child-resistant and non-child-resistant positions.

4. The container system of claim 3, wherein the cover is bowl-shaped, the resilient lip forming a lip of the bowl-shaped cover, the cover connected to the circumferential skirt adjacent the resilient lip.

5. The container system of claim 3, wherein the resilient lip projects from the cover.

6. The container system of claim 1, wherein each of the first cap projections includes a first cap projection tab, each of the second cap projections includes a second cap projection tab, and each of the container projections includes a latch.

7. The container system of claim 6, wherein the first cap projection tabs and the second cap projection tabs have different widths.

8. The container system of claim 6, wherein the latch includes a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, a height of the stop portion and the sloped catch portion larger than that of the central portion, in the child-resistant position, each first cap projection tab arranged between the stop portion and sloped catch portion of one of the latches.

9. The container system of claim 7, wherein the latch includes a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, a height of the stop portion and the sloped catch portion larger than that of the central portion, in the non-

child-resistant position, a longer one of the first cap projection tabs and the second cap projection tabs each contacting the sloped catch portion of one latch and being too long to fit between the stop portion and the sloped catch portion of said latch.

10. The container system of claim 1, wherein each of the first and second projections includes a latch and each of the container projections includes a tab.

11. The container system of claim 1, wherein each of the first projections includes a latch, each of the second projections includes a modified latch, and each of the container projections includes a tab, each latch including a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, a height of the stop portion and the sloped catch portion larger than that of the central portion, in the child-resistant position, each tab located between the stop portion and sloped catch portion of one of the latches, each modified latch including a stop portion, a ramp portion, and a central portion between the stop portion and the ramp portion, said ramp portion including a sloped portion, the stop portion higher than the central portion and the ramp portion, in the non-child-resistant position, each tab contacting the central portion.

12. The container system of claim 1, wherein each of the first projections includes a latch, each of the second projections includes a modified latch, and each of the container projections includes a tab, each latch and modified latch including a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, for both the latch and modified latch a height of the stop portion and the sloped catch portion larger than that of the central portion, the central portion of the modified latch having a shorter length than that of the central portion of the latch, in the child-resistant position, each tab located between the stop portion and sloped catch portion of one latch, in the non-child-resistant position, each tab contacting the sloped catch portion of one modified latch and being too long to fit between the stop portion and the sloped catch portion of said modified latch.

13. The container system of claim 3, wherein in the non-child-resistant position, the top end of the container is disposed in a circumferential channel at least partially defined by at least a portion of the circumferential skirt and at least a portion of the cover.

14. The container system of claim 3, further comprising a second resilient lip projecting from the cover in an opposite direction to the resilient lip.

15. The container system of claim 1, wherein the cap is integrally formed.

16. A cap configured to mate with a container in child-resistant and non-child-resistant positions comprising:

- a circumferential skirt and a resilient lip disposed within the cap and at least partially spaced apart from the circumferential skirt;

- a plurality of first cap projections spaced along a first plane and projecting radially inwardly from an inner surface of the circumferential skirt;

- a plurality of second cap projections spaced along a second plane and projecting radially inwardly from an inner surface of the circumferential skirt, the second plane spaced from the first plane, the resilient lip located between the first and second cap projections;

- a holding unit connected to the inner surface of the circumferential skirt and arranged between the second cap projections and the resilient lip; and

- a plurality of channels, each channel defined by at least a portion of the holding unit, one of the second cap projections, and at least a portion of the circumferential skirt.

17. The cap of claim 16, wherein the holding unit includes a cover disposed within the circumferential skirt and configured to cover an opening in a container in both the child-resistant and non-child-resistant positions.

18. The cap of claim 17, wherein the cover is bowl-shaped, the resilient lip forming a lip of the bowl-shaped cover, the cover connected to the circumferential skirt adjacent the resilient lip.

19. The cap of claim 17, wherein the resilient lip projects from the cover.

20. The cap of claim 16, wherein each of the first cap projections includes a first cap projection tab, each of the second cap projections includes a second cap projection tab, and each of the container projections includes a latch.

21. The cap of claim 20, wherein the first cap projection tabs and the second cap projection tabs have different widths.

22. The cap of claim 20, wherein the latch includes a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, a height of the stop portion and the sloped catch portion larger than that of the central portion, in the child-resistant position, each first cap projection tab located between the stop portion and sloped catch portion of one latch.

23. The cap of claim 20, wherein the latch includes a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, a height of the stop portion and the sloped catch portion larger than that of the central portion, in the non-child-resistant position, a longer one of the first cap projection tabs and the second cap projection tabs each contacting the sloped catch portion of one latch and being too long to fit between the stop portion and the sloped catch portion of said latch.

24. The cap of claim 16, wherein each of the first and second projections includes a latch and each of the container projections includes a tab.

25. The cap of claim 16, wherein each of the first projections includes a latch, each of the second projections includes a modified latch, and each of the container projections includes a tab, each latch including a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, a height of the stop portion and the sloped catch portion larger than that of the central portion, in the child-resistant position, each tab located between the stop portion and sloped catch portion of one latch, each modified latch including a stop portion, a ramp portion, and a central portion between the ramp portion and the stop portion, the ramp portion including a sloped portion, the stop portion higher than the central portion and the ramp portion, in the non-child-resistant position, each tab contacting the central portion of one modified latch.

26. The cap of claim 16, wherein each of the first projections includes a latch, each of the second projections includes a modified latch, and each of the container projections includes a tab, each latch and modified latch including a sloped catch portion, a stop portion, and a central portion between the sloped catch portion and the stop portion, a

height of the stop portion and the sloped catch portion larger than that of the central portion, the central portion of the modified latch having a shorter length than that of the central portion of the latch, in the child-resistant position, each tab located between the stop portion and sloped catch portion of one latch, in the non-child-resistant position, each tab contacting the sloped catch portion and being too long to fit between the stop portion and the sloped catch portion of the modified latch.

27. The cap of claim 17, further comprising a second resilient lip projecting from the cover in an opposite direction to the resilient lip.

28. The cap of claim 16, wherein the cap is integrally formed.

29. A container system, comprising:

a container having a top end and a plurality of cap retaining means;

a cap configured to mate with the container in a child-resistant position and a non-child-resistant position, the cap including a circumferential skirt and a resilient lip disposed within the cap and at least partially spaced apart from the circumferential skirt;

a plurality of first container retaining means spaced along a first plane and projecting from an inner surface of the circumferential skirt; and

a plurality of second container retaining means spaced along a second plane and projecting from an inner surface of the circumferential skirt, the second plane being spaced from the first plane, the resilient lip being between the first and second cap projections;

wherein in the child-resistant position, each of the cap retaining means is wedged between the resilient lip and one of the first container retaining means, said cap retaining means and first container retaining means being configured such that removal of the cap from the container requires that the cap and container be forced towards each other while rotating the cap and container relative to each other;

wherein in the non-child-resistant position, each of the cap retaining means is wedged between one of the second container retaining means and a holding unit connected to the circumferential skirt, said second container retaining means, cap retaining means and holding unit being configured such that a predeter-

mined threshold rotation force is necessary to free the cap retaining means from its wedged position, said holding unit lying between the second container retaining means and the resilient lip.

30. A method for closing a container with a cap having child-resistant and non-child-resistant positions, comprising the steps of:

(a) disposing a top end of the container having a plurality of container projections within a circumferential skirt of the cap by passing each of the container projections between adjacent second cap projections projecting radially inwardly from the circumferential skirt, the cap including a resilient lip, disposed within the cap and at least partially spaced apart from the circumferential skirt, and a plurality of first cap projections spaced along a first plane and projecting from an inner surface of the circumferential skirt, the second cap projections spaced along a second plane and projecting from an inner surface of the circumferential skirt, the second plane being spaced from the first plane, the resilient lip lying between the first and second cap projections; and

(b) rotating the cap and container relative to each other so as to wedge each of the container projections between a holding unit and one of the second cap projections, said holding unit projecting inwardly from the circumferential skirt and lying between the resilient lip and the second cap projections.

31. The method of claim 30, wherein the second cap projections include one of tabs, modified latches, and latches, the modified latches each include a sloped portion, stop portion and a central portion between the sloped portion and the stop portion, the latches each include a sloped catch portion, a stop portion, and a central portion between the stop portion and the sloped catch portion, the container projections include one of tabs, modified latches, and latches.

32. The method of claim 30, wherein the holding unit includes a cover disposed within the circumferential skirt and covering an opening in the container in both the child-resistant and non-child-resistant positions.

33. The method of claim 32, wherein the cover is bowl-shaped, the resilient lip forming a lip of the bowl-shaped cover, the cover connected to the circumferential skirt adjacent the resilient lip.

\* \* \* \* \*