METHOD AND DEVICE FOR A CHILD RESISTANT DROPPER CLOSURE

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ABSTRACT

An apparatus includes a closure plane having an annular opening, a circumferentially depending outer skirt having on a radially inward side a plurality of first child-resistant engaging arrangements, and a circumferentially depending inner member arranged parallel to, and radially inward from, the circumferentially depending outer skirt. A dropper is provided which includes a bulb and pipette arranged in the annular opening of the closure plane, the pipette extending axially from the closure plane in a first direction of the outer skirt, the bulb forming an airtight seal with the pipette. A container is provided which includes a base and a sidewall. The sidewall extends circumferentially from the base and an edge of the sidewall away from the base forms a container neck. The container neck includes on an outward side a plurality of second child-resistant engaging arrangements. The closure is molded from one piece. Each of the first child-resistant engaging arrangements is adapted to engage with a corresponding second child-resistant engaging arrangement on the container neck. The circumferentially depending inner member is adapted to engage the container neck to bias the closure into an open position. A closure is provided which includes a closure plane having an annular opening, a circumferentially depending outer skirt having on a radially inward side a plurality of evenly spaced lugs, and a circumferentially depending inner member arranged parallel to, and radially inward from, the circumferentially depending outer skirt. Each of the lugs is adapted to engage with a corresponding bayonet on a container neck, the corresponding bayonet having a notch configured to accept the lug.
METHOD AND DEVICE FOR A CHILD RESISTANT DROPPER CLOSURE

FIELD OF THE INVENTION

[0001] The present invention generally regards packages and containers. More particularly, the present invention regards a method and device for providing a child resistant closure on a dropper container.

BACKGROUND INFORMATION

[0002] Droppers have been used to measure and deliver fluids of various types, including medicines and chemicals. Droppers may include a bulb and pipette, which together form an airtight combination. Squeezing the bulb causes the volume of the bulb and pipette combination to decrease. When the free end of the pipette is immersed in a fluid while the bulb is depressed, releasing the bulb causes the bulb to return to a normal shape. This release causes the volume of the bulb and pipette combination to increase, which in turn draws fluid up into the pipette. Droppers may be incorporated in a closure for a container, making a dropper assembly, thereby reducing the possibility that the dropper will be misplaced while also increasing the convenience of using the dropper.

[0003] Child resistant closures have been developed to prevent children from accessing materials which may be harmful to them. A few examples of child resistant closures are described with respect to the following patents.

[0004] U.S. Pat. No. 4,383,618 to Dougherty describes a container with a safety cap to prevent children from having access to products in the container. The container may contain a liquid and may include a dropper assembly.

[0005] U.S. Pat. No. 4,768,682 to Friedrich describes a child-resistant dropper closure container combination. The combination includes a push-and-twist child-resistant closure assembly in which the resilient material of the dropper element provides a biasing force to engage the child-resistant closure elements.

[0006] U.S. Pat. No. 5,092,477 to Johnson, Jr. et al. describes a tamper-indicating and child-resisting closure. The closure includes an outer cap which has a transparent end wall with a tamper-sensing liner. The closure also includes a coaxial inner cap.

[0007] U.S. Pat. No. 5,154,702 to Foyil describes a variable dosage dropper system which includes an annular overcap housing which completely encloses the cap and bulb. The annular overcap housing provides tamper-resistant protection and has a locking collar at its lower end to secure the cap within the housing. The system resists undesired opening of the container by children.

[0008] U.S. Pat. No. 5,316,161 to Gargione describes a two-piece child-resistant closure having an inner cap and an outer cap. The inner cap is normally biased into engagement with the outer cap for screwing the closure onto the container, but the outer cap and inner cap become disengaged when the outer cap is turned in a direction to remove the closure from the container. Cooperating rigid fingers and teeth are provided on the inner and outer caps which engage when the outer cap is pushed downwardly to interconnect the inner and outer caps so that the closure can be removed from the container.

[0009] U.S. Patent Application Publication No. 2001/0002028 of Brecheisen et al. describes a finish for a container having bayonets and ramp provisions. Stops, detent ridges, and wedges provide tactile notification to a user as to where the lugs on a cooperant cap are vis-a-vis the catch portion and the top of the finish.

[0010] However, the above-mentioned references do not provide a child resistant dropper assembly in which the closure is molded from one piece. There is therefore a need for a child resistant dropper assembly which is molded from one piece and which does not use any part of the bulb or pipette in order to bias the closure toward the child resistant position.

SUMMARY

[0011] A one-piece child-resistant closure in combination with a dropper is provided which includes a bulb and pipette. Since the child-resistant closure is molded in one piece, no portion of the bulb and/or pipette is arranged to bias the closure and container into the child-resistant engagement position. The one-piece child-resistant closure is arranged to bias the closure toward the child-resistant position without a flexible biasing flange.

[0012] An apparatus is provided which includes a closure plane having an annular opening, a circumferentially depending outer skirt having on a radially inward side a plurality of first child-resistant engaging arrangements, and a circumferentially depending inner member arranged parallel to, and radially inward from, the circumferentially depending outer skirt. A dropper is provided which includes a bulb and pipette arranged in the annular opening of the closure plane, the pipette extending axially from the closure plane in a first direction of the outer skirt, the bulb forming an airtight seal with the pipette. A container is provided which includes a base and a sidewall. The sidewall extends circumferentially from the base and an edge of the sidewall away from the base forms a container neck. The container neck includes on an outward side a plurality of second child-resistant engaging arrangements. The closure is molded from one piece. Each of the first child-resistant engaging arrangements is adapted to engage with a corresponding second child-resistant engaging arrangement on the container neck. The circumferentially depending inner member is adapted to engage the container neck to bias the closure toward an open position, e.g., in a direction axially away from the container neck.

[0013] A closure is provided which includes a closure plane having an annular opening, a circumferentially depending outer skirt having on a radially inward side a plurality of evenly spaced lugs, e.g., rectangular lugs, and a circumferentially depending inner member arranged parallel to, and radially inward from, the circumferentially depending outer skirt. A dropper is provided which includes a bulb and pipette arranged in the annular opening of the closure plane. The pipette extends axially from the closure plane in a first direction of the outer skirt. The bulb forms an airtight seal with the pipette. The closure is molded from one piece. Each of the lugs is adapted to engage with a corresponding bayonet on a container neck. The corresponding bayonet has a notch, e.g., a rectangular notch, configured to accept the lug. The circumferentially depending inner member is adapted to engage the container neck to bias the closure toward an open position.
In an exemplary embodiment, a container is also provided which includes a base and a sidewall. The sidewall extends circumferentially from the base. An edge of the sidewall away from the base forms the container neck. The container neck includes an outward side the corresponding bayonets.

In an exemplary embodiment, the closure is arranged on the container. Each of the rectangular lugs engages the corresponding bayonet and the circumferentially depending inner member engages the container neck to bias the closure into the open position. The biasing of the closure causes each rectangular lug to be received in the rectangular notch of the corresponding bayonet.

In an exemplary embodiment, the bulb of the dropper assembly is molded together with the closure.

In an exemplary embodiment, the bulb and the closure are molded in a two-material molding machine.

In an exemplary embodiment, the bulb of the dropper assembly is molded separately from the closure and assembled with the closure and the pipette after molding.

In an exemplary embodiment, a method is for securing a dropper closure to a container is provided which includes providing a closure which is molded in one piece. The closure includes a closure plane having an annular opening and a circumferentially depending outer skirt having on a radially inward side a plurality of evenly spaced rectangular lugs. Each of the rectangular lugs is adapted to engage with a corresponding bayonet on a container neck. The corresponding bayonet has a rectangular notch configured to accept the rectangular lug. The closure also includes a circumferentially depending inner member arranged parallel to, and radially inward from, the circumferentially depending outer skirt. The circumferentially depending inner member is adapted to engage the container neck to bias the closure into an open position. A dropper is provided which includes a bulb and pipette arranged in the annular opening of the closure plane. The pipette extends axially from the closure plane in a first direction of the outer skirt. The bulb forms an airtight seal with the pipette. A container is provided which includes a base and a sidewall. The sidewall extends circumferentially from the base and an edge of the sidewall away from the base forms the container neck. The container neck includes an outward side the corresponding bayonets. The closure is pressed onto the container causing the circumferentially depending inner member to engage the container neck. The closure is rotated causing each rectangular lug to engage with the corresponding bayonet. The closure is locked in a child-resistant position by causing the rectangular lugs to be received in the rectangular notch of the corresponding bayonet.

A system is provided which includes a closure, a dropper, and a container which includes a base and a sidewall. The sidewall extends circumferentially from the base and an edge of the sidewall away from the base forms the container neck. The container neck includes an outward side corresponding bayonets.

**BRIEF DESCRIPTION OF THE DRAWINGS**

**FIG. 1** illustrates a view of the dropper assembly including a closure, bulb and pipette.

**FIG. 2** shows another view of the dropper assembly shown in **FIG. 1**.

**FIG. 3** shows a container configured to engage with the dropper assembly shown in **FIG. 1**.

**FIG. 4** shows a close-up view of one of the bayonets shown in **FIG. 3**.
FIG. 5 shows a sectional view of the dropper assembly shown in FIG. 1.

DETAILED DESCRIPTION

FIG. 1 shows dropper assembly 10 according to an exemplary embodiment of the present invention. Dropper assembly 10 includes bulb 11, pipette 12 and closure 13. Bulb 11 and pipette 12 may be referred to in combination as the dropper. Bulb 11 may be constructed of any appropriately flexible and elastic material, including, for example, rubber or soft plastic. Bulb 11 may be essentially axially symmetric and should form an interior space with an opening at one end. Bulb 11 may be depressed manually by squeezing between two fingers (e.g., thumb and index finger). The interior of bulb 11 is in communication with the interior of pipette 12.

Pipette 12 may be constructed of any appropriately rigid or semi-rigid material, including, for example, glass, hard plastic, etc. Pipette 12 should be essentially axially symmetric and should form an interior space with an opening at two ends. Pipette 12 should open at one end (mount side opening 14 shown in FIG. 2) into the interior of bulb 11 and should engage bulb 11. An airtight seal between bulb 11 and pipette 12 may be created by a friction fit in which bulb 11 surrounds pipette 12 and presses radially inwards on pipette 12. On the opposite side of pipette 12 from mount side opening 14 is delivery opening 15.

Bulb 11 fits into annular opening 16 of closure 13. Arranging bulb 11 in annular opening 16 while pipette 12 is engaged by bulb 11 may increase the radially inward pressure between bulb 11 and pipette 12. The increased pressure between bulb 11 and pipette 12 may therefore also increase the friction fit and improve the airtight seal between bulb 11 and pipette 12.

Closure 13 includes closure plane 17 and outer skirt 19. Outer skirt 19 extends from the outer circumference of closure plane 17 to bottom edge 22. Axially centered within closure plane 17 is annular opening 16. Closure 13 may be made of any appropriate rigid or semi-rigid material, including, for example, hard plastic.

FIG. 2 shows another view of dropper assembly 10. Mount side opening 14 and delivery opening 15 of pipette 12 are shown. Also shown is interior sidewall 21 of outer skirt 19 of closure 13. On interior sidewall 21 of outer skirt 19, adjacent to bottom edge 22, are arranged lugs 18, which may be rectangular. Lugs 18 are spaced evenly around the circumference of outer skirt 19. Shown in FIG. 2 are four rectangular lugs 18, however, more or fewer rectangular lugs 18 are possible. Also shown in FIG. 2 is inner depending member 20. Inner depending member 20 extends from closure plane 17 radially inward from outer skirt 19. Inner depending member 20 may or may not be attached directly to outer skirt 19. Inner depending member 20 may or may not be flexible towards outer skirt 19.

FIG. 3 shows container 30 having base 31 and sidewall 32. Container 31 may be constructed of any appropriate rigid or semi-rigid material, including, for example, hard plastic. Sidewall 32 extends circumferentially from base 31. Sidewall 32 includes container neck 33 at an edge opposite base 31. Container neck 33 defines opening 34 which accesses an interior of container 30. Within the interior of container 30 may be any type of liquid material. The liquid material in container 30 may be a chemical or a medicine which may be harmful to children, and therefore an adult may want to restrict the child’s access to the interior of container 30. Arranged around the circumference of container neck 33 are bayonets 35. Three bayonets 35 are shown in FIG. 3, and the spacing of bayonets 35 shown in FIG. 3 implies a fourth bayonet. The number of bayonets 35 correspond to the number of rectangular lugs 18 on closure 13 which is designed to be used with container 30, and therefore more or fewer bayonets 35 may be used.

FIG. 4 shows a close-up view of bayonet 35. Bayonet 35 includes ramp 40 which leads to rectangular notch 41. Rectangular notch 41 is configured to accept any of the rectangular lugs 18 arranged on a compatible closure 13. Bayonet 35 also includes stop 45 arranged to prevent the passage of rectangular lug 18. When rectangular lug 18 is received in rectangular notch 41, closure 13 is in a child resistant position with respect to container 30.

Operation of closure 13 and container 30 is described in the following. Closure 13 may be initially separated from container 30. Container 30 may contain a medicinal liquid. A quantity of the medicinal liquid may be extracted from container 30 by submerging the end of pipette 12, specifically delivery opening 15, in the liquid and depressing and releasing bulb 11. The quantity may be measured by gradations on the side of pipette 12, and may be regulated by the amount that bulb 11 is depressed and/or released. The medicinal liquid may be delivered in any appropriate manner (e.g., to a spoon, into food or drink, or directly into the mouth of the patient), by removing delivery opening 15 from the liquid, directing delivery opening 15 where the medicinal liquid is to be delivered, and depressing bulb 11. After delivery of the medicinal liquid, the user may want to replace closure 13 on container 30 and to secure closure 13 in a child resistant position.

To place closure 13 on container 30 in a child resistant position, the user may arrange closure 13 on top of container 30 so that pipette 12 extends through opening 34 of container 30. Outer skirt 19 of closure 13 has a larger radius than container neck 33 of container 30, and therefore bottom edge 22 of outer skirt 19 extends around the outside of container neck 33. Container neck 33 engages inner depending member 20 at an initial position. Rotation of closure 13 in a clockwise direction causes rectangular lugs 18 to engage ramps 40. Further rotation of closure 13 in a clockwise direction forces rectangular lugs 18 to move down ramp 40, causing closure plane 17 of closure 13 to move towards container neck 33. The movement of closure 13 towards a closing position with container 30 is opposed by the engagement of inner depending member 20 and container neck 33. The opposition against the movement of closure 13 by the engagement of inner depending member 20 and container neck 33 may be determined by a flexing of inner depending member 20 and/or container neck 33 into a secondary position. Container neck 33 may have a wider or narrower radius than inner depending member 20 and therefore container neck 33 may flex radially outwards or radially inwards. Likewise, inner depending member 20 may flex radially outwards or radially inwards.

The closure's biasing element may engage the container neck to lock the closure upon the container. The
biasing element may engage the container neck on the inside surface of the container neck and/or the outside surface of the container neck and/or the axial end of the container neck. If the contact is the container’s inside neck upper corner, then the biasing element may be in the liquid’s product. However, if the contact is on the container’s outside neck upper corner, the biasing element may contact the top surface of the container’s bayonet. Lugs. The container may include an extended tapered wall above the bayonet lugs for biasing the closure. There may be limited dimensional clearance to bias off the container’s outside top upper wall unless there is an extended tapered wall. Thus, alternative biasing arrangements may be provided to bias the closure axially away from the container to engage the child-resistant feature of the closure.

Continuing to rotate closure in a clockwise direction causes rectangular lugs to slide into rectangular notches. Stop prevents further rotation of closure by opposing the further movement of rectangular lugs. When rectangular lugs are nested in rectangular notches, closure is in a child resistant position with respect to container. An upward force on rectangular lugs is caused by the biasing of inner depending member and container neck, and lateral movement of rectangular lugs is prevented by stop and the backside of ramp.

Rotation of closure while in the child resistant position in either a clockwise or counterclockwise direction is opposed by stop and the backside of ramp, respectively. Therefore, in order to remove closure from container, a downward pressure, opposing the biasing caused by the engagement of inner depending member and container neck, is required. While applying a downward pressure to closure with respect to container, the downward pressure being of sufficient force for the top edge of rectangular lugs to pass below the bottom point of ramp, a simultaneous counterclockwise rotation to closure may be introduced in order to release closure from container.

Alternatively, bayonets may be oriented so that rotation of closure in a counterclockwise direction causes rectangular lugs to engage ramps. In this situation, the directions indicated for attaching and detaching closure from container are reversed, but are in all other respects identical. In other words, application of closure to container requires only a counterclockwise rotation, while deactivation of the child resistant feature and removal of closure from container requires a simultaneous downward pressure and clockwise rotation of closure with respect to container.

Closure may be constructed in a single injection molding process. Thereafter, bulb and pipette, which may be molded separately, may be assembled with closure to create dropper assembly. Alternatively closure and bulb may be produced in a two-shot injection molding in a two-material molding machine. Thereafter, pipette may be assembled with closure and bulb to make dropper assembly.

FIG. 5 shows a sectional view of dropper assembly shown in FIG. 1. Closure includes annular opening in closure plane. Closure also includes outer skirt having an inner depending member and rectangular lugs arranged near bottom edge of outer skirt. Pipette fits radially inside bulb with mount side opening of pipette opening into bulb. Pipette includes flange arranged to fit in receptacle of annular opening. Between annular opening and pipette is arranged contoured bulb section which is configured to provide an airtight, secure fit between pipette, bulb, and closure.

Certain of the foregoing features of the closure and/or the container may be similar to the arrangement described in U.S. Pat. No. 5,449,078 to Akers, which is expressly incorporated herein in its entirety by reference thereto.

The embodiment described above is exemplary in nature, and is not intended to limit the scope of the disclosure. For instance, instead of the child resistant closure described above involving a bayonet and cooperating rectangular lugs, an alternative child resistant closure arrangement or means may be provided.

What is claimed is:

1. An apparatus, comprising:
a closure including (a) a closure plane having an annular opening, (b) a circumferentially depending outer skirt having on a radially inward side a plurality of first child-resistant engaging arrangements, and (c) a circumferentially depending inner member arranged parallel to, and radially inward from, the circumferentially depending outer skirt;
a dropper including a bulb and a pipette arranged in the annular opening of the closure plane, the pipette extending axially from the closure plane in a first direction of the outer skirt, the bulb forming an airtight seal with the pipette; and
a container including a base and a sidewall, the sidewall extending circumferentially from the base, an edge of the sidewall away from the base forming a container neck, the container neck including on an outward side a plurality of second child-resistant engaging arrangements;
wherein the closure is molded from one piece;
wherein each of the first child-resistant engaging arrangements is adapted to engage with a corresponding second child-resistant engaging arrangement on the container neck; and
wherein the circumferentially depending inner member is adapted to engage the container neck to bias the closure toward an open position.

2. The apparatus according to claim 1, wherein the bulb and the pipette are arranged in the annular opening of the closure plane by at least one of a friction fit and an annular groove fitment.

3. A device, comprising:
a closure including (a) a closure plane having an annular opening, (b) a circumferentially depending outer skirt having on a radially inward side a plurality of evenly spaced lugs, and (c) a circumferentially depending inner member arranged parallel to, and radially inward from, the circumferentially depending outer skirt; and
a dropper including a bulb and a pipette arranged in the annular opening of the closure plane, the pipette extending axially from the closure plane in a first direction of the outer skirt, the bulb forming an airtight seal with the pipette;

wherein the closure is molded from one piece;

wherein each of the lugs is adapted to engage with a corresponding bayonet on a container neck, the corresponding bayonet having a notch configured to accept the lug; and

wherein the circumferentially depending inner member is adapted to engage the container neck to bias the closure toward an open position.

4. The device according to claim 3, further comprising a container including a base and a sidewall, the sidewall extending circumferentially from the base, an edge of the sidewall away from the base forming the container neck, the container neck including on an outward side the corresponding bayonets.

5. The device according to claim 4, wherein the container neck includes an extended tapered wall adapted to engage the circumferentially depending inner member of the closure.

6. The device according to claim 5, wherein the extended tapered wall is adapted to engage the circumferentially depending inner member on a radially inward side of the circumferentially depending inner member of the closure.

7. The device according to claim 5, wherein the extended tapered wall is adapted to engage the circumferentially depending inner member on a radially outward side of the circumferentially depending inner member of the closure.

8. The device according to claim 4, wherein the closure and the container are configured so that arranging the closure on the container causes:

- each of the lugs to engage the corresponding bayonet; and
- the circumferentially depending inner member to engage the container neck to bias the closure into an open position, the biasing of the closure causing each lug to be received in the notch of the corresponding bayonet.

9. The device according to claim 3, wherein the bulb of the dropper is molded together with the closure.

10. The device according to claim 9, wherein the bulb and the closure are molded in a two-material molding machine.

11. The device according to claim 3, wherein the bulb of the dropper is molded separately from the closure and assembled with the closure and the pipette after molding.

12. The device according to claim 3, wherein the lugs are rectangular, and wherein the notches are rectangular.

13. A method for securing a dropper closure to a container, the closure molded in one piece and including (a) a closure plane having an annular opening, (b) a circumferentially depending outer skirt having on a radially inward side a plurality of evenly spaced lugs, each of the lugs adapted to engage with a corresponding bayonet on a container neck, the corresponding bayonet having a notch configured to accept the lug, and (c) a circumferentially depending inner member arranged parallel to, and radially inward from, the circumferentially depending outer skirt, the circumferentially depending inner member adapted to engage the container neck to bias the closure into an open position, the closure including a dropper including a bulb and a pipette arranged in the annular opening of the closure plane, the pipette extending axially from the closure plane in a first direction of the outer skirt, the bulb forming an airtight seal with the pipette, the container including a base and a sidewall, the sidewall extending circumferentially from the base, an edge of the sidewall away from the base forming the container neck, the container neck including on an outward side the corresponding bayonets, comprising:

- pressing a closure onto a container causing the circumferentially depending inner member to engage the container neck;
- rotating the closure causing each lug to engage with the corresponding bayonet; and
- locking the closure in a child-resistant position by causing the lugs to be received in the notch of the corresponding bayonet.

14. A method for securing a dropper closure to a container, comprising:

- providing a closure which is molded in one piece which includes (a) a closure plane having an annular opening, (b) a circumferentially depending outer skirt having on a radially inward side a plurality of evenly spaced lugs, each of the lugs adapted to engage with a corresponding bayonet on a container neck, the corresponding bayonet having a notch configured to accept the lug, and (c) a circumferentially depending inner member arranged parallel to, and radially inward from, the circumferentially depending outer skirt, the circumferentially depending inner member adapted to engage the container neck to bias the closure toward an open position;

- providing a dropper including a bulb and a pipette arranged in the annular opening of the closure plane, the pipette extending axially from the closure plane in a first direction of the outer skirt, the bulb forming an airtight seal with the pipette;

- providing a container including a base and a sidewall, the sidewall extending circumferentially from the base, an edge of the sidewall away from the base forming the container neck, the container neck including on an outward side the corresponding bayonets;

- pressing the closure onto the container causing the circumferentially depending inner member to engage the container neck;

- rotating the closure causing each lug to engage with the corresponding bayonet; and

- locking the closure in a child-resistant position by causing the lugs to be received in the notch of the corresponding bayonet.