US009821127B2

(12) **United States Patent**
Barber et al.

(10) **Patent No.: US 9,821,127 B2**
(45) **Date of Patent: Nov. 21, 2017**

(54) **CHILD-RESISTANT CLOSURE SYSTEMS FOR CONTAINERS**

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(73) Assignee: **TAPTANGO, LLC**, Richmond, VA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 31 days.

(21) Appl. No.: **14/846,914**

(22) Filed: **Sep. 7, 2015**

(65) **Prior Publication Data**

US 2015/0374934 A1 Dec. 31, 2015

Related U.S. Application Data

(63) Continuation of application No. 14/216,639, filed on Mar. 17, 2014, now abandoned.
(Continued)

(51) **Int. Cl.**
B67B 1/00 (2006.01)
A61M 11/00 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***A61M 11/006*** (2014.02); ***A61M 15/0025*** (2014.02); ***A61M 15/08*** (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC .. A61M 15/00; A61M 15/0025; A61M 15/08; A61M 15/009; A61M 2205/27;
(Continued)

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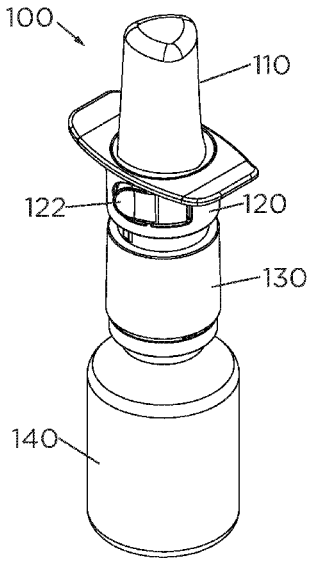
Primary Examiner — Patrick M Buechner
(74) *Attorney, Agent, or Firm* — Patent Law of Virginia, PLLC; Brian J. Teague

(57) **ABSTRACT**

A child-resistant closure system for a container comprises a protective cap, a dispensing tip, and a cylindrical base. The dispensing tip includes a pair of buttons adapted to control whether the dispensing tip is in a locked condition so as to prevent actuation or an unlocked condition so as to permit actuation, via the shoulders, of a sprayer pump unit that is partially contained within the dispensing tip. The cylindrical base has a pair of spaced apart upwardly extending legs. In an locked condition of the dispensing tip, the upwardly extending legs are not aligned with slots defined in a horizontal circumferential portion of the dispensing tip such that downward movement of the dispensing tip in relation to the base is blocked by the upwardly extending legs to prohibit actuation of the sprayer pump unit and to lock the dispensing tip.

6 Claims, 14 Drawing Sheets



Related U.S. Application Data

(60) Provisional application No. 61/801,831, filed on Mar. 15, 2013.

(51) **Int. Cl.**

A61M 15/08	(2006.01)
B05B 11/00	(2006.01)
A61M 15/00	(2006.01)

(52) **U.S. Cl.**

CPC ***B05B 11/3049*** (2013.01); ***B05B 11/3059*** (2013.01); *A61M 15/009* (2013.01); *A61M 2205/276* (2013.01)

(58) **Field of Classification Search**

CPC A61M 2205/276; B05B 11/3049; B05B 11/3059; B05B 11/306

USPC 222/153.13

See application file for complete search history.

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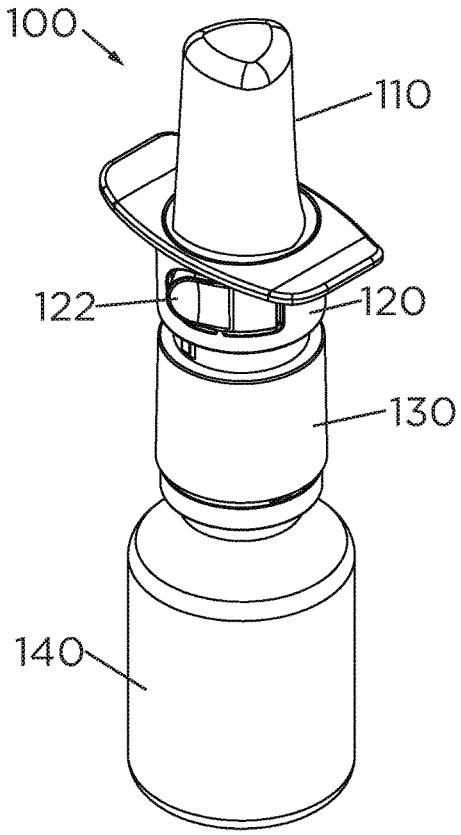
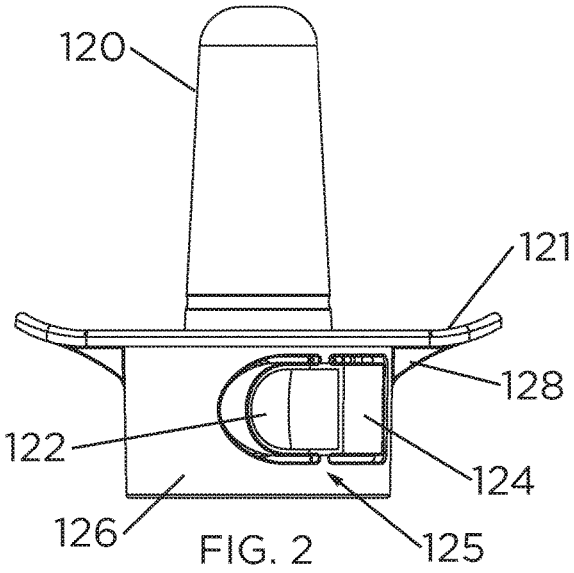


FIG. 1



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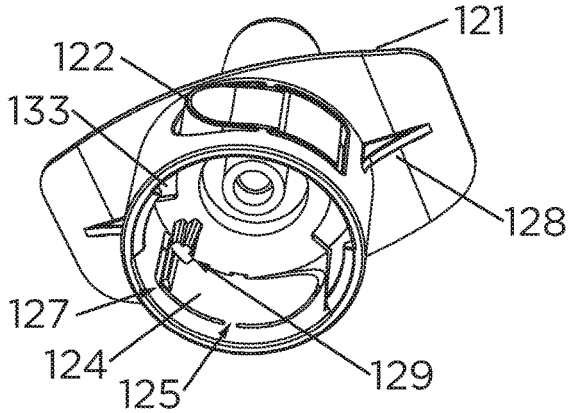

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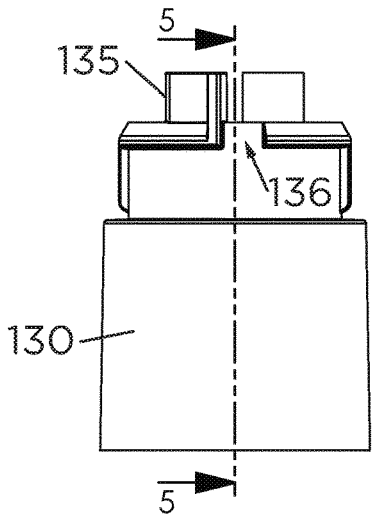

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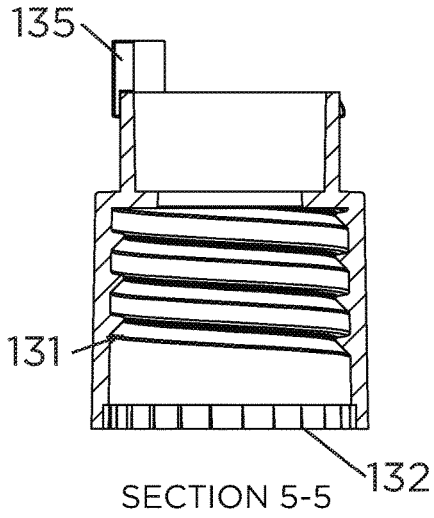
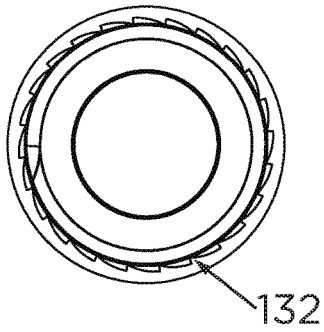


FIG. 5



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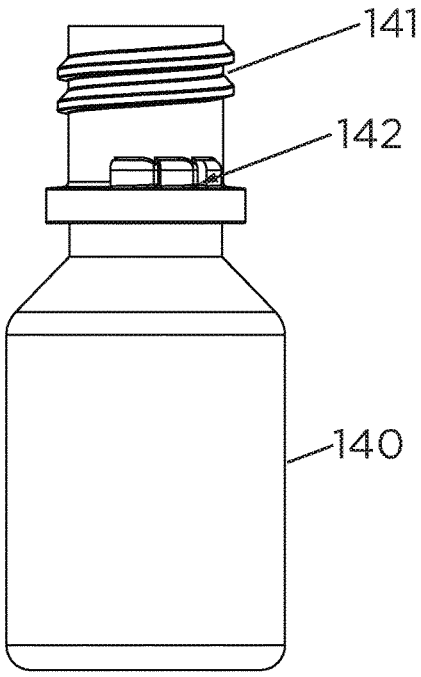

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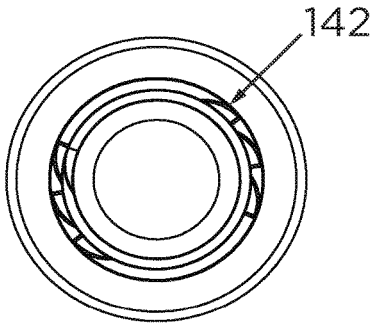

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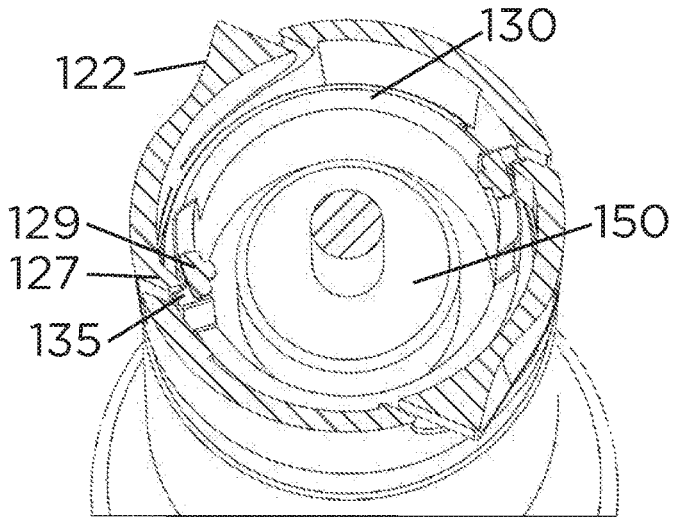

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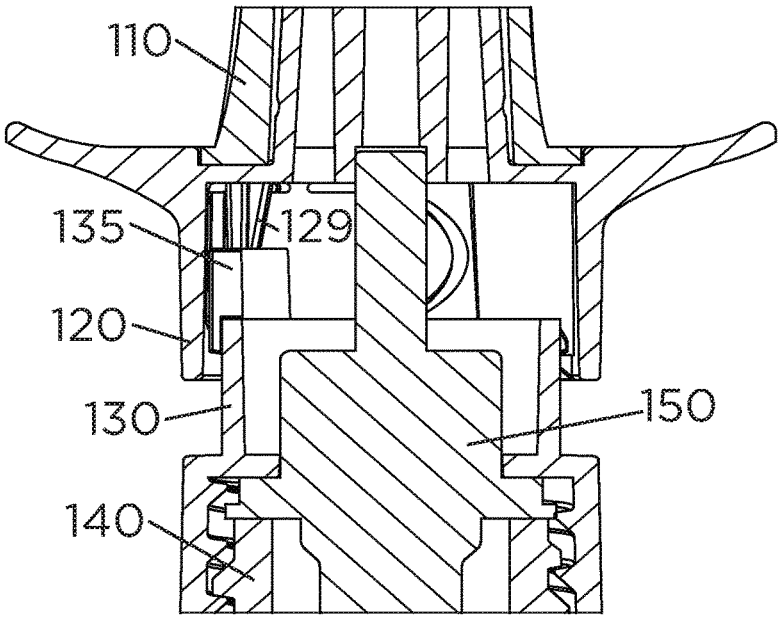

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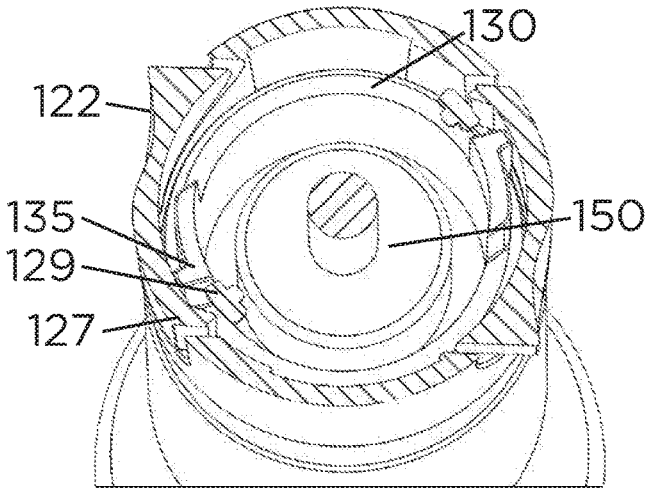
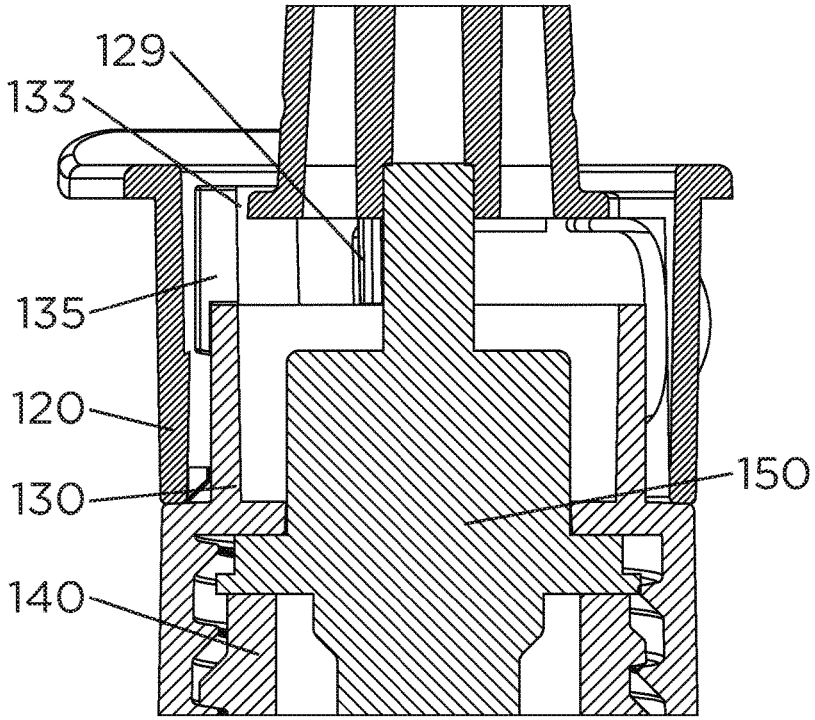


FIG. 9A



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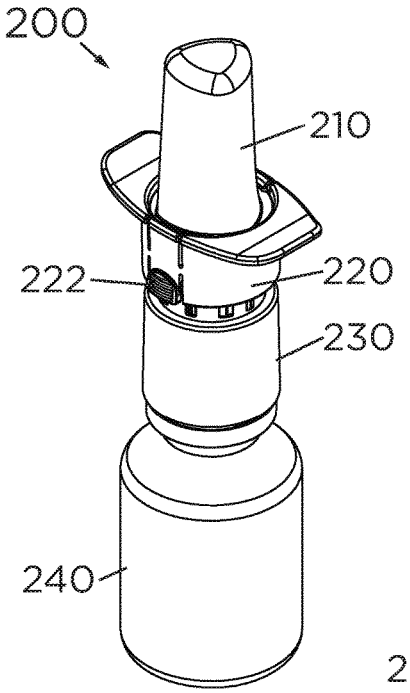

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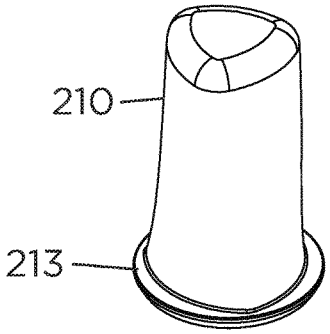

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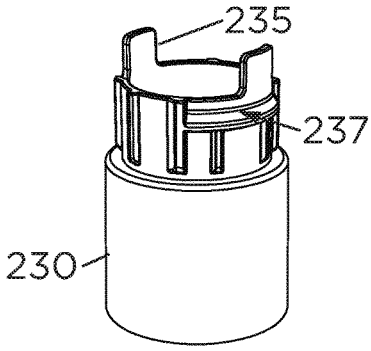

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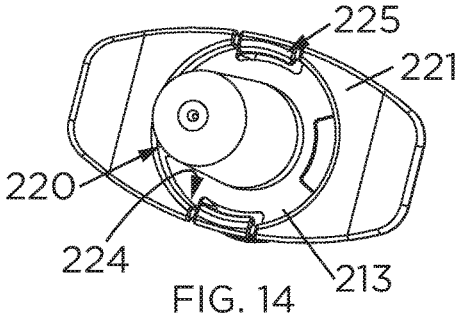

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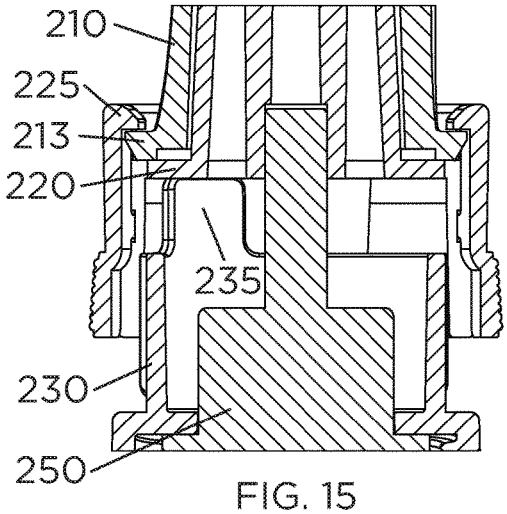

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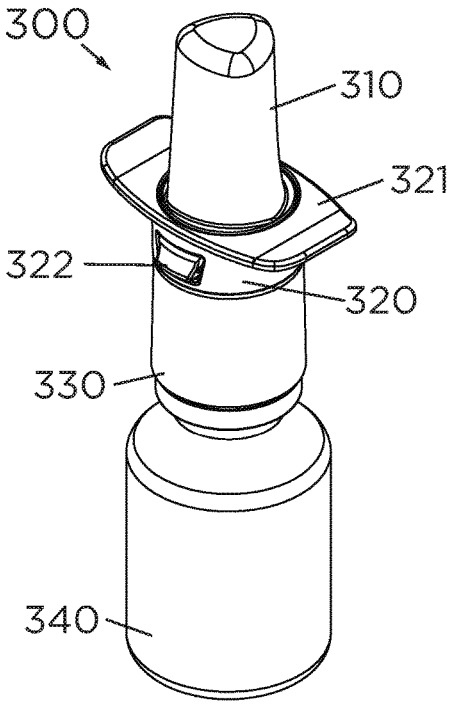

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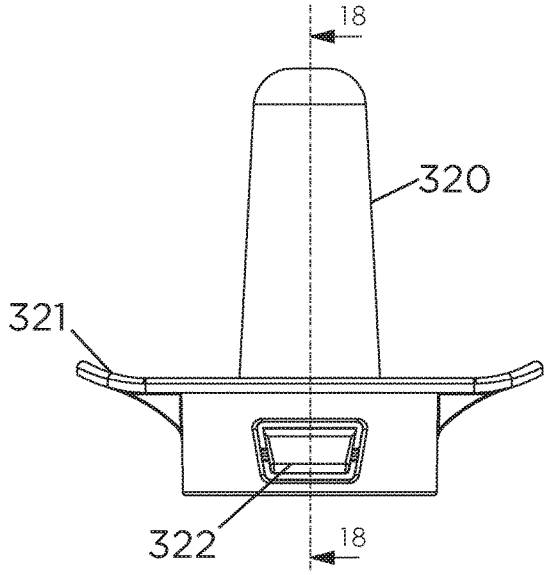

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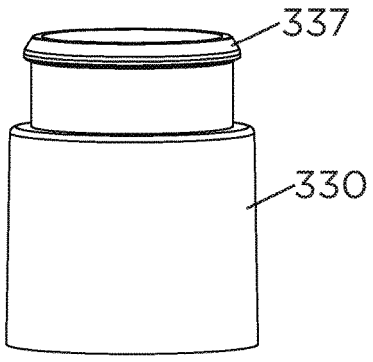

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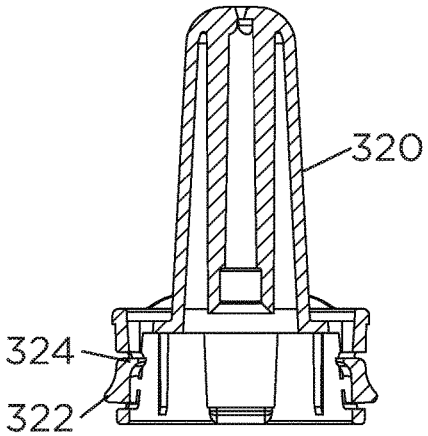
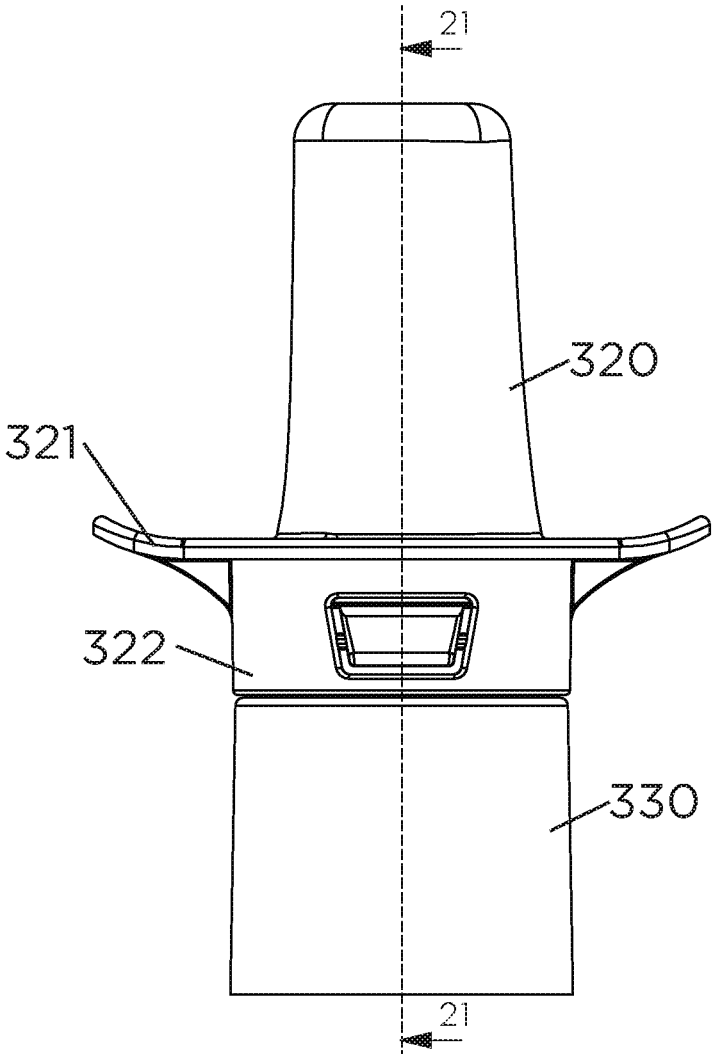


SECTION 18-18

FIG. 18



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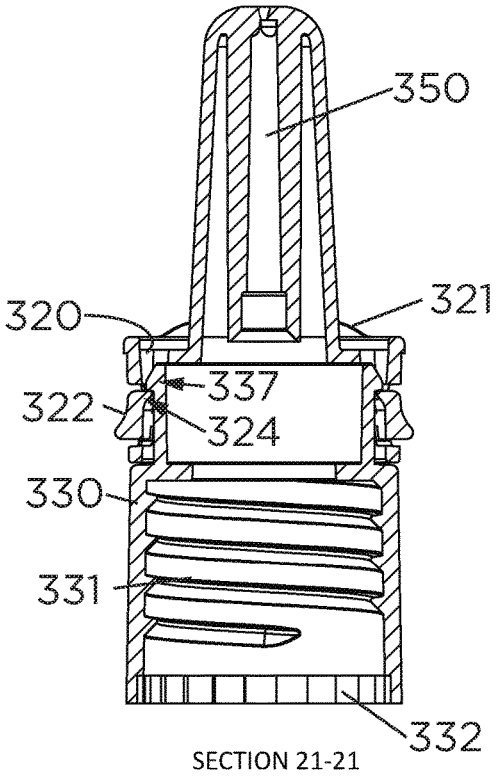
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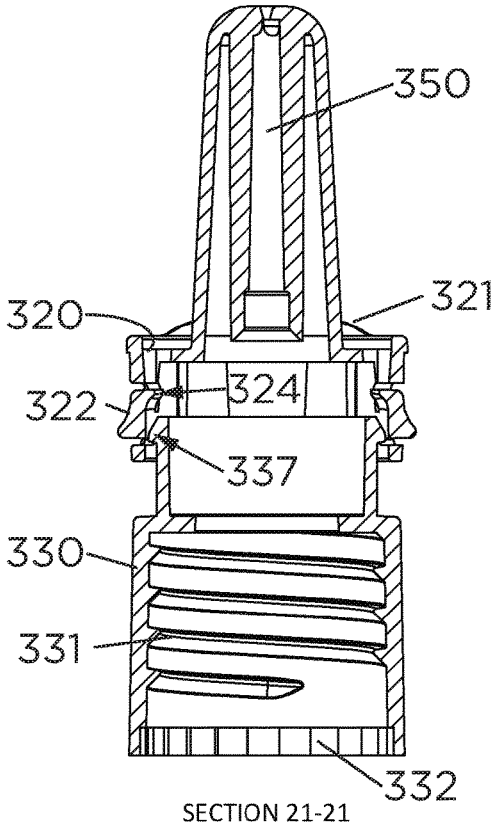
SECTION 21-21

FIG. 21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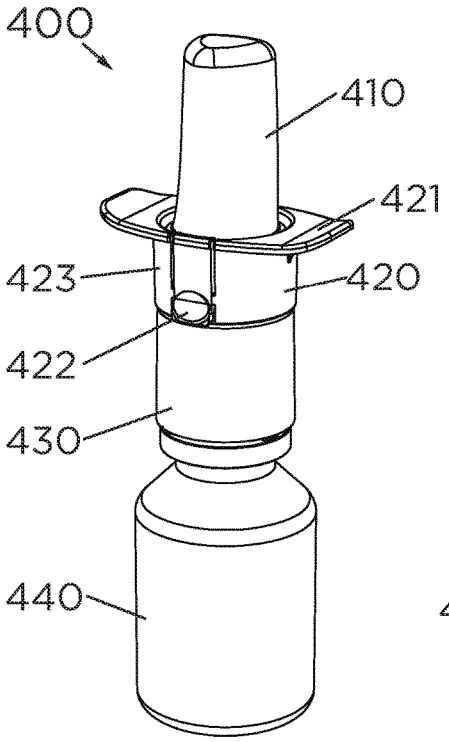
SECTION 21-21

FIG. 22



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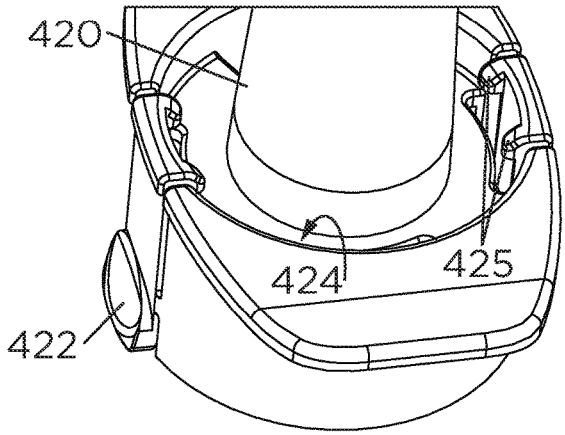

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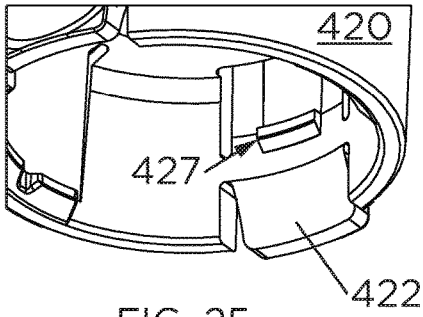

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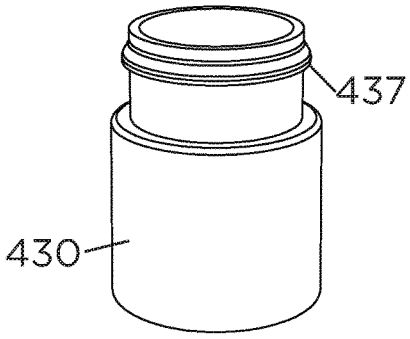

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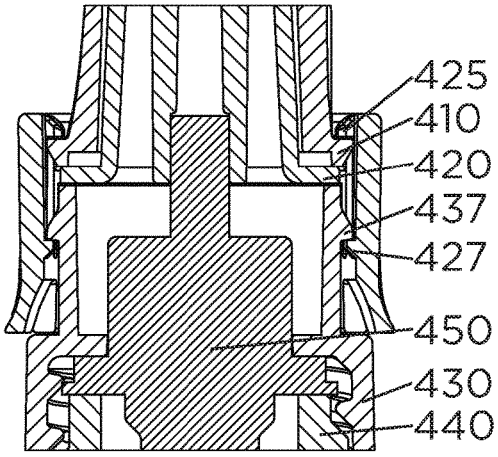

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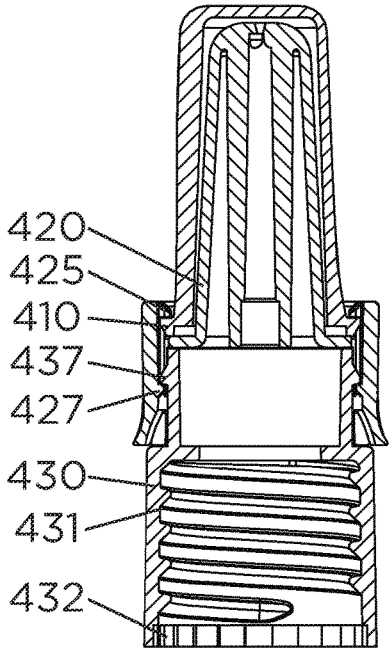

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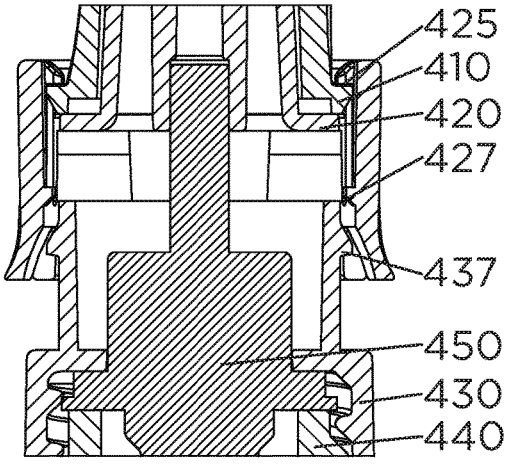

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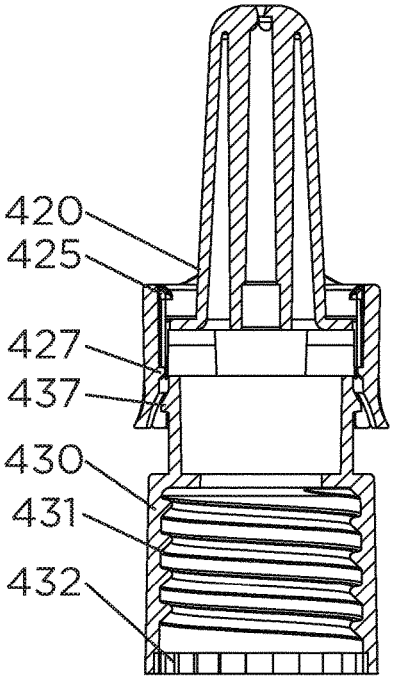

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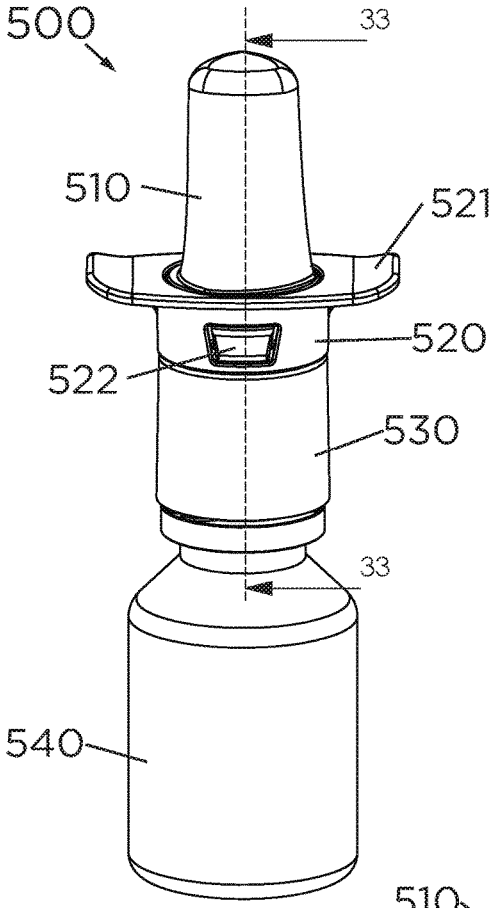
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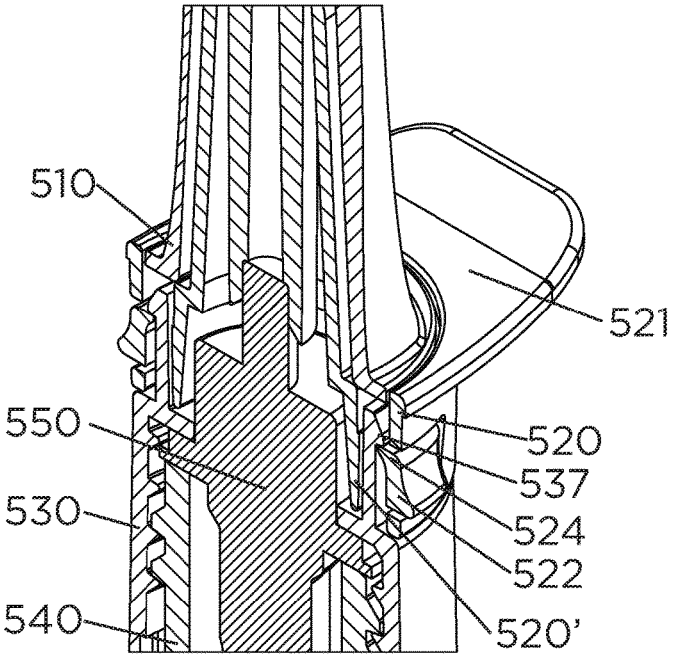
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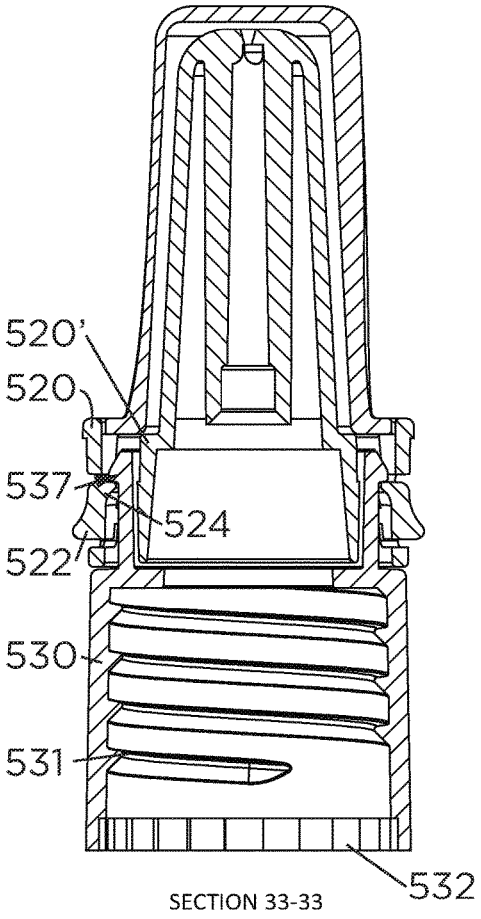
FIG. 32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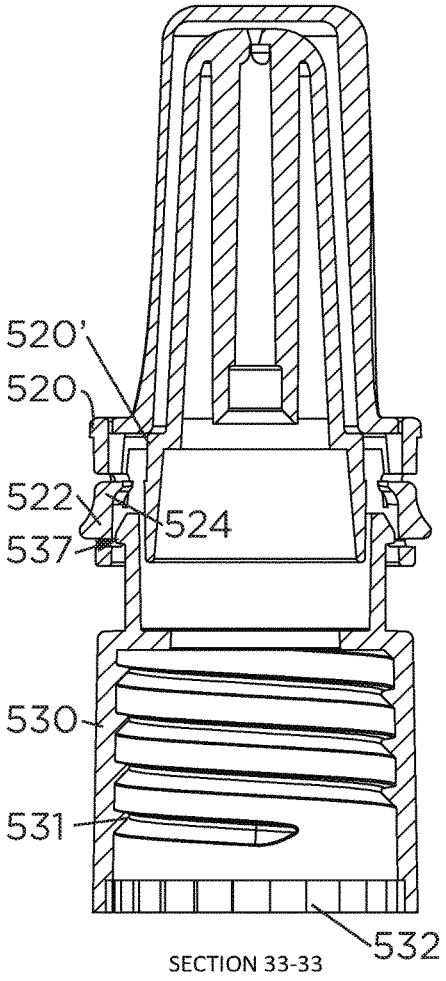
SECTION 33-33

FIG. 33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SECTION 33-33

FIG. 34

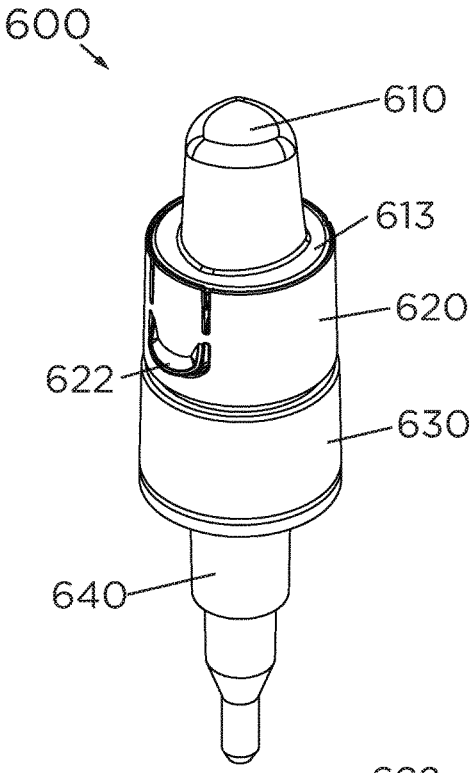

FIG. 35

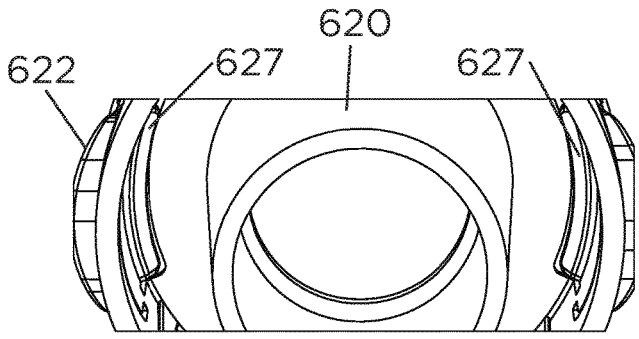

FIG. 37

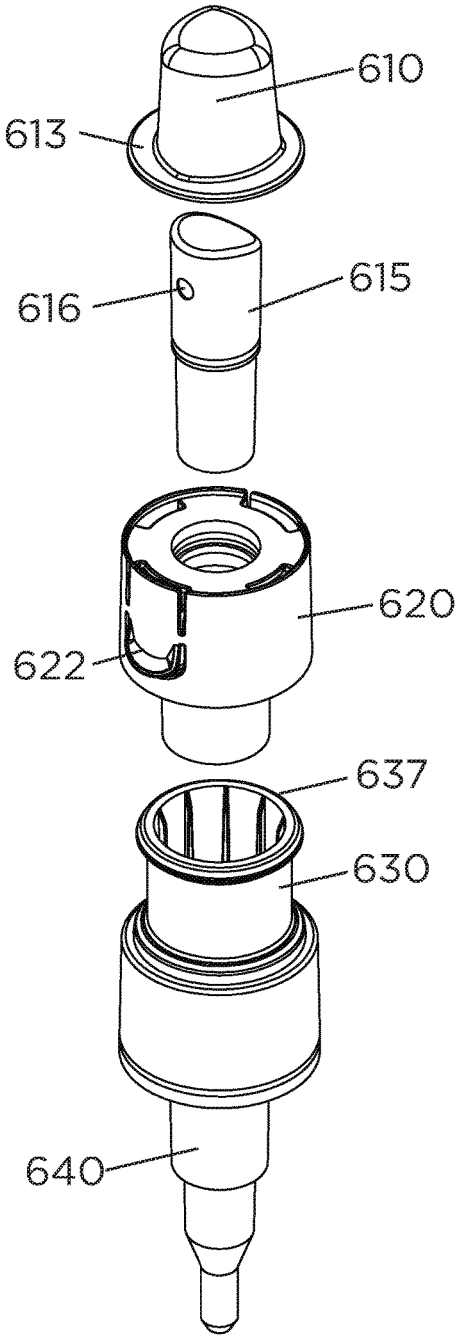
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FIG. 36

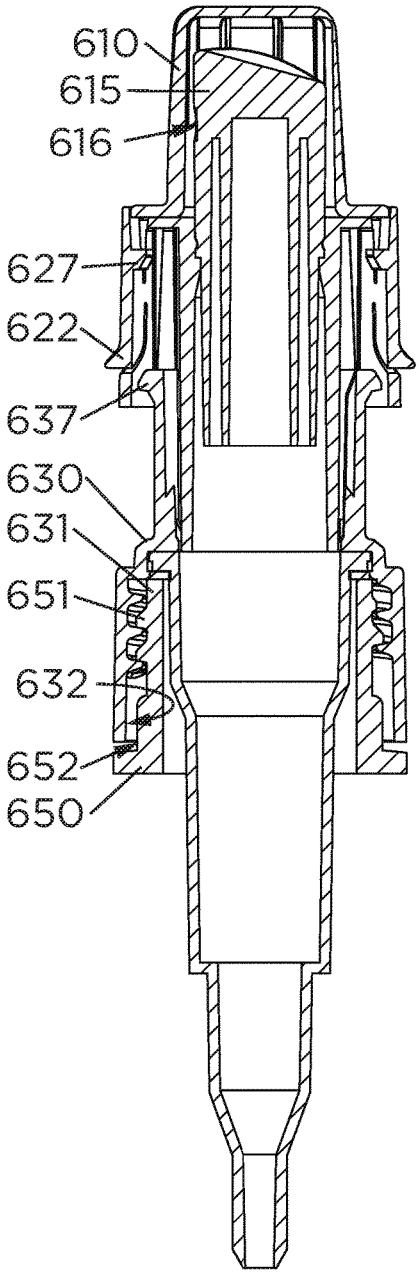
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FIG. 38

CHILD-RESISTANT CLOSURE SYSTEMS FOR CONTAINERS

CROSS-REFERENCE TO RELATED APPLICATION

The present application is a continuation of and claims priority to U.S. patent application Ser. No. 14/216,639, filed Mar. 17, 2014, which in turn claims the benefit under 35 U.S.C. §119(e) of U.S. Provisional Patent Application No. 61/801,831 to the inventors, filed Mar. 15, 2013, the entire contents of which are hereby incorporated by reference herein.

BACKGROUND

1. Field

Example embodiments in general relate to child-resistant closure systems for containers.

2. Related Art

The Consumer Product Safety Commission ("CPSC") proposed a rule in early 2012 to require child-resistant ("CR") packaging for any over-the-counter or prescription product containing the equivalent of 0.08 milligrams or more of an imidazoline, a class of drugs that includes tetrahydrozoline, naphazoline, oxymetazoline, and xylometazoline, in a single package. Imidazolines are a family of drugs that are vasoconstrictors indicated for nasal congestion and/or ophthalmic irritation. Products containing imidazolines can cause serious adverse reactions, such as central nervous system ("CNS") depression, decreased heart rate, and depressed ventilation in children treated with these drugs or who accidentally ingest them. Based on the scientific data, the CPSC has preliminarily found that availability of 0.08 milligrams or more of an imidazoline in a single package, by reason of its packaging, is such that special packaging is required to protect children under 5 years old from serious personal injury or illness due to handling, using, or ingesting such a substance. The CPSC has taken this action under the Poison Prevention Packaging Act of 1970.

Accordingly, as it is expected that this rule will become law, manufacturers will be required to develop child-resistant closure (CRC) systems for their nasal pump sprayers and eye-dropper dispenser products (such as Visine®), as each of these products contain the equivalent of 0.08 milligrams or more of an imidazoline. In doing so, one goal is to ensure that the newly developed dispensers are robust enough to prevent children five years old and under from being able to inadvertently open the bottle to use or ingest the contents, while still being "senior friendly" to mature adults.

Moreover, the same child-resistant principals as to be applied to nasal sprayers and eye-dropper (squeeze) bottles so as to comply with impending CR packaging regulations, could also be made applicable to other fields of fluid dispenser/packaging. For example, little or no thought has be given to developing CRC systems for consumer fluid pump dispensers having a viscosity generally higher than that of water or water-based medicinal fluids, such as those dispensers holding lotions, shampoos, baby oils, and paints.

SUMMARY

An example embodiment is directed to a child-resistant closure system for a pump sprayer. The system includes a protective cap, a dispensing tip configured to receive the cap thereon, a lower end of the dispensing tip including a pair of finger-depressing shoulders in opposite relation to one another, each shoulder extending horizontally outward from the dispensing tip, with a cylindrical portion provided beneath the shoulders to serve as a bottom end of the dispensing tip, the cylindrical portion including a pair of buttons spaced 180° apart on a vertical facing of the cylindrical portion, the buttons adapted to control whether the dispensing tip is in a locked or unlocked condition so as to permit actuation, via the shoulders, of a sprayer pump unit that is partially contained within the dispensing tip, each button including an undercut formed on a back face thereof within the interior of the dispensing tip, and a cylindrical base having its upper end secured to the dispensing tip and its lower end configured to be secured to a dispenser bottle which contains fluid, the dispensing tip and base housing the sprayer pump unit therein which is actuated by depressing the shoulders on the dispensing tip once the dispensing tip is in an unlocked condition, the base top end including a circular thread formed around its circumference on an external surface thereof. In a locked condition of the dispensing tip, the undercuts on the back faces of the buttons engage an underside of the circular thread on the base to prohibit actuation of the sprayer pump unit and to lock the dispensing tip. To achieve an unlocked condition of the dispensing tip to permit actuation of the sprayer pump unit via depressing the shoulders, the buttons are pressed simultaneously to deflect the undercuts outward and away from the circular thread on the base, permitting the dispensing tip to move upward to a home dispensing position under a force applied to the dispensing tip from a spring in the sprayer pump unit.

BRIEF DESCRIPTION OF THE DRAWINGS

Example embodiments will become more fully understood from the detailed description given herein below and the accompanying drawing, wherein like elements are represented by like reference numerals, which are given by way of illustration only and thus are not limitative of the example embodiments herein.

FIG. **1** is a front view of a child-resistant closure system for a pump sprayer according to an example embodiment.

FIG. **2** is a front view of a dispensing tip according to the system of FIG. **1**.

FIG. **3** is a bottom perspective view of the dispensing tip according to the system of FIG. **1**.

FIG. **4** is a side view of a base according to the system of FIG. **1**.

FIG. **5** is a sectional view **5-5** taken from FIG. **4**

FIG. **6** is a bottom perspective view of the base shown in FIG. **4**.

FIG. **7** is a dispensing bottle usable with the system of FIG. **1**.

FIG. **8** is a top view of the bottle shown in FIG. **7**.

FIG. **9** is a portion of a cross-cut of the dispensing tip in the xz-plane to show positions of the base legs and buttons in a locked position.

FIG. **9**A is a portion of a cross-cut of the dispensing tip in the xz-plane to show positions of the base legs and buttons in an unlocked position.

FIG. **10** is a portion of a sectional view of the system taken in the xy-plane to show a locked position.

FIG. **10**A is a portion of a sectional view of the system taken in the xy-plane to show an unlocked position.

FIG. **11** is a perspective view of a child-resistant closure system for a pump sprayer according to another example embodiment.

FIG. **12** is a perspective view of a cap according to the system of FIG. **11**.

FIG. **13** is a perspective view of a base according to the system of FIG. **11**.

FIG. **14** is a perspective view of a dispensing tip according to the system of FIG. **11**.

FIG. **15** is a portion of a sectional view of the system taken in the yz-plane to show a locked position.

FIG. **16** is a perspective view of a child-resistant closure system for a pump sprayer according to another example embodiment.

FIG. **17** is a front view of a dispensing tip according to the system of FIG. **16**.

FIG. **18** is a sectional view **18-18** taken from FIG. **17**.

FIG. **19** is a front view of a base according to the system of FIG. **16**.

FIG. **20** is a front view of the dispensing cap and base of the system in FIG. **16**.

FIG. **21** is a sectional view **21-21** taken from FIG. **20** to show a locked position.

FIG. **22** is a sectional view **21-21** taken from FIG. **20** to show an unlocked position.

FIG. **23** is a perspective view of a child-resistant closure system for a pump sprayer according to another example embodiment.

FIG. **24** is a partial side perspective view of a dispensing tip according to the system of FIG. **23**.

FIG. **25** is a partial bottom perspective view of the dispenser tip of FIG. **24**.

FIG. **26** is a front view of a base according to the system of FIG. **23**.

FIG. **27** is a portion of a sectional view of the system taken in the xz-plane to show a locked position.

FIG. **28** is sectional view of the cap, dispenser tip and base taken in the xz-plane to show a locked position.

FIG. **29** is a portion of a sectional view of the system taken in the xz-plane to show an unlocked position.

FIG. **30** is sectional view of the dispenser tip and base taken in the xz-plane to show an unlocked position.

FIG. **31** is a front view of a child-resistant closure system for a pump sprayer according to another example embodiment.

FIG. **32** is a portion of a sectional view of the system taken in the xz-plane to show a locked position.

FIG. **33** is a sectional view **33-33** taken from FIG. **31** to show a locked position.

FIG. **34** is a sectional view **33-33** taken from FIG. **31** to show an unlocked position.

FIG. **35** is a perspective view of a child-resistant closure system for a pump assembly according to another example embodiment.

FIG. **36** is an exploded view of the system of FIG. **35**.

FIG. **37** is a partial bottom perspective view of the dispenser of FIG. **35**.

FIG. **38** is a sectional view of the system taken in the xy-plane to show an unlocked position with the cap installed.

DETAILED DESCRIPTION

FIG. **1** is a front view of a child-resistant closure system for a pump sprayer according to an example embodiment. The child-resistant closure (CRC) system **100** includes a cap **110**, a dispensing tip **120** and a base **130**. Each of the cap **110**, dispensing tip **120** and base **130** may be injection molded or extruded or otherwise formed of a suitable plastic material, as is known. The cap **110** is 3-sided to minimize rolling and avoid losing the cap **110**. The base **130** has interior grooves or threads for coupling it to a threaded member on dispenser bottle **140** which holds the medicinal fluid therein. The base **130** and dispensing tip **120** also partially enclose a sprayer pump unit **150** (not shown) which partly extends into the dispenser bottle **140** interior.

In an example, the CRC system **100** described here and child-resistant based embodiments to be described hereafter may be applicable, but not limited to: single or multi-dose dispensers such as nasal sprayers, ocular sprayers, dermal sprayers, misters, aerators, airless dispensers, air-use dispensers, spouted and non-spouted pump assemblies, and the like. The containers or dispensers foreseeable have applications in the healthcare, home and garden, beauty and food and beverage industries, thus the embodiments described herein are applicable to dispensers or containers configured for, but not limited to dispensing nasal medicine, sunscreens, food products, paints and protectants, deodorants, insect repellants, sealed breath fresheners, ear medicine, dermal medicine, lotions, fragrances, air fresheners, spray starches, oxygen, insecticides, fungicides, herbicides, rodenticides, spray oils, talcs, and spray food stuffs. Further, the CRC systems can be varied in size and applied as a platform to handle any desired viscosity of fluid.

FIG. **2** is a front view of a dispensing tip according to the system of FIG. **1**, and FIG. **3** is a bottom perspective view of the dispensing tip according to the system of FIG. **1**. Dispensing tip **120** includes a pair of spaced, dished buttons **122** on a collar **126** that permit locking and unlocking of the dispensing tip **120** for rotation thereof to allow dispensing via a pair of shoulders **121**, which are used to depress the sprayer pump unit **150** within (not shown) under finger pressure, as is known. A button **122** is provided on either side of collar **126** and includes a relief **124** separated by a hinge **125** that acts as a cam when the button **122** is actuated by the user. A ramp **127** is positioned on the back side of each relief **124**; this interfaces with an upstanding leg **135** that is formed on either side atop of base **130**, as to be shown hereafter. A pair of internal catches **129** within dispensing tip **120** also come into contact with the legs **135** of the base **130** in a locked condition, locking out the dispensing tip **120**. A pair of spaced apart slots **133** are defined in the dispensing tip **120**.

FIG. **4** is a side view of the base, FIG. **5** a sectional **5-5** taken from FIG. **4** of the base, FIG. **6** is a bottom perspective view of the base, FIG. **7** is a dispenser bottle usable with the system of FIG. **1**, and FIG. **8** is a top view of the bottle shown in FIG. **12**. Referring to FIGS. **4-8**, the base **130** includes a pair of upstanding legs **135** in spaced relation on a top surface thereof, and includes a series of grooved internal threads **131** for coupling with a dispenser bottle **140**. There is also a vertical clearing **136** adjacent each leg that is formed into base **130** that permits product dispensing. Additionally, an anti-back off feature has been added to both the dispenser bottle **140** and base **130**. The base **130** is formed with internal threads **131**, and serrated teeth **132** at its bottom skirt. Upon full seating of the base **130** to the bottle **140**, the downward force of application will push the bottom skirt of the base **130** over formed teeth **142** in the bottle **140**, providing a secure method of application where tampering to remove the base **130** would be evident and would eliminate accidental removal.

FIG. **9** is a portion of a cross-cut of the dispensing tip in the xz-plane to show positions of the base legs and buttons

in a locked position, FIG. **9**A shows the portion of FIG. **9** in an unlocked position, FIG. **10** is a portion of a sectional view of the system taken in the xy-plane to show a locked position, and FIG. **10**A shows the portion of FIG. **10** in an unlocked position. Referring to FIGS. **9**, **9**A, **10** and **10**A, basic operations are described. The cap **110** is retained simply by an undercut on the dispensing tip **120**. All that is required to remove cap **110** is a vertical pull.

FIG. **10** shows a locked condition with the leg **135** of the base **130** held by catch **129**; FIG. **9** shows this in another orientation and additionally shows the tab **127** on the dispenser tip engaged with leg **135**. Both horizontal dished buttons **122** on dispensing tip **120** are to be simultaneously depressed in order to release the dispensing mechanism. Depressing the buttons cants the ramps **127** outward via hinges **125**, which releases the upstanding legs **135** on the base **130**, allowing each leg **135** to turn and release from its corresponding catch **129**. The dispensing tip **120** pivots 30° on center axis and aligns with the vertical clearing **136** on the base **130**, which allows for product dispensing.

Although the embodiment shown in FIGS. **1-10** describes a base **130** having two legs that is twist to unlock, in which the dispenser tip **120** locks out actuation of a sprayer pump unit, the exact same embodiment can be accomplished with a dispenser **120** having two buttons, but actuating a single leg **135**. The functions of locking and unlocking described above with a single leg having the same construction as leg **135** would accomplish the same goal of locking out dispensing, as the leg **135** would extend all the way to catch **129**. The other side would by legless, but the interlock would still require simultaneous two-button interaction for child-resistant purposes.

FIG. **11** is a perspective view of a child-resistant closure system for a pump sprayer according to another example embodiment, and FIG. **12** is a perspective view of a cap according to the system of FIG. **11**. Referring to FIGS. **11** and **12**, the child-resistant closure (CRC) system **200** includes a cap **210**, a dispensing tip **220** and a base **230**. Each of the cap **210**, dispensing tip **220** and base **230** may be injection molded or extruded or otherwise formed of a suitable plastic material, as is known. The cap **210** is 3-sided to minimize rolling and avoid losing the cap **210** and includes a lower rim **223**.

The dispensing tip **220** includes two raised ribbed buttons **222** on opposite sides thereof that control whether the dispensing tip **220** is in a locked or unlocked condition so as to permit actuation of the sprayer pump unit **250** (not shown). The base **230** has interior grooves or threads for coupling it to a threaded member on dispenser bottle **240** which holds the medicinal fluid therein. The base **230** and dispensing tip **220** also partially enclose a sprayer pump unit **250** (not shown) which partly extends into the dispenser bottle **240** interior.

FIG. **13** is a perspective view of a base according to the system of FIG. **11**. The base **230** includes a pair of upstanding legs **235** in spaced relation on a top surface thereof, and includes a series of grooved internal threads (not shown) for coupling with a dispenser bottle **240**. There is also a horizontal groove **237** outside each leg **235** to facilitate dispenser tip **220** rotation around the base **230** when rotating to an unlocked state to permit dispensing. The base **230** and dispenser bottle **240** have serrations similar to that shown in FIGS. **5-8**; in other words, an anti-back off feature is included. The base **230** is formed with internal threads and serrated teeth at its bottom skirt. Upon full seating of the base **230** to the bottle **240**, the downward force of application pushes the bottom skirt of the base **230** over formed teeth in the bottle **240**, providing a secure method of application where tampering to remove the base **230** would be evident and would eliminate accidental removal.

FIG. **14** is a perspective view of a dispensing tip according to the system of FIG. **11**. The dispenser tip **220** includes shoulders **221** that is the finger-depressing surface for actuating the internal sprayer pump unit **250**. The center between the shoulders **221** has a circular downward cutout **224** in which the rim **213** of the cap **210** can seat in. The upper ends of the buttons **222** includes catches **225** that clamp onto the rim **213** of the cap **210** seated in the circular cutout **224** to fixedly retain the cap **210**.

FIG. **15** is a portion of a sectional view of the system taken in the yz-plane to show a locked position. In operation, both raised ribbed buttons **222** on dispensing tip to be depressed in order to release the top cap **210**. Actuation is achieved through depression of the buttons **220** that twist the arms at the midpoint releasing the catches **225** that are slightly elevated from the cap deck of the dispensing tip **220**. The cap **210** can then be removed.

However, the system **200** is still locked (as shown in FIG. **15**) and will not dispense. To operate, the dispensing tip **200** needs to be rotated 30° to release the sprayer pump unit **250**. The dispensing tip **220** is locked by the two vertical legs **235** that protrude from top surface of the base **230**. When the dispensing tip **220** is rotated, reliefs (not shown in FIG. **15**) cut though the dispensing tip **220** to allow the legs **235** to pass through on the dispensing stroke.

FIG. **16** is a perspective view of a child-resistant closure system for a pump sprayer according to another example embodiment, FIG. **17** is a front view of a dispensing tip according to the system of FIG. **16**, FIG. **18** is a sectional view **18-18** taken from FIG. **17**, and FIG. **19** is a front view of a base according to the system of FIG. **16**. Referring to FIGS. **16-19**, the child-resistant closure (CRC) system **300** includes a cap **310**, a dispensing tip **320** and a base **330**. Each of the cap **310**, dispensing tip **320** and base **330** may be injection molded or extruded or otherwise formed of a suitable plastic material, as is known. The cap **310** is 3-sided to minimize rolling and avoid losing the cap **310**.

The dispensing tip **320** includes a pair of finger-depressing shoulders **321** in opposite relation thereto (180 degrees apart), as well as two buttons **322** on opposite sides of a cylindrical portion of the dispenser tip **320** below the shoulders **321** that control whether the dispensing tip **320** is in a locked or unlocked condition so as to permit actuation of the sprayer pump unit **350** (not shown) via the shoulders **321**. An undercut **324** is formed on the back side of each button **322**, the undercuts **324** are configured to interface and engage a single circular thread **337** at the top of a base **330**. The base **330** has interior grooves or threads for coupling it to a threaded member on dispenser bottle **340** which holds the medicinal fluid therein. The base **330** and dispensing tip **320** also partially enclose a sprayer pump unit **350** (not shown) which partly extends into the dispenser bottle **340** interior.

FIG. **20** is a front view of the dispensing tip and base of the system in FIG. **16**, FIG. **21** is a sectional view **21-21** taken from FIG. **20** to show a locked position, and FIG. **22** is a sectional view **21-21** taken from FIG. **20** to show an unlocked position. Referring to FIGS. **20-22**, in the **21-21** views the cap **310** is shown removed. This is because in this embodiment the cap **310** is not locked; it can be removed from the dispensing tip **320** by simply pulling upward. With the dispensing tip **320** in place, dispensing actuation is locked out. Specifically, the dispensing tip **320** is retained by the two undercuts **324**, each undercut **324** located on the

back face of two buttons **322** 180° apart on the dispensing tip **320**. The undercuts **324** engage with the underside of continuous, circular thread **337** at the top of the base **330**, as shown in the locked configuration of FIG. **21**. When engaging, the undercuts **324** will initially deflect outwards until they pass the thread **337**, where after they will snap back to vertical and engage the underside of thread **337** of base **330**, as shown.

To release the dispensing tip **320**, the buttons **332** on the dispensing tip **320** must be pressed simultaneously, causing the undercuts **324** to once again deflect outwards. The dispensing tip **320** will move vertically (by force of the spring in the sprayer pump unit **350**, shown obscured by the dispensing tip **320**) to the home dispensing position. This is shown in FIG. **22**. With the dispensing tip **320** now released, the sprayer pump unit **350** is now free to dispense a single dose via pressing down using one's fingers on the shoulders **321**, as is known. For each dose, the dispensing tip **320** must be released.

FIGS. **21** and **22** also show the internal threads **331** and serrations **332** on the inside of the base **330**. As previously shown in FIGS. **5-8**, an anti-back off feature is added to both the bottle **340** and base **330**. Upon full seating of the base **330** to the bottle **340**, the downward force of application will push the bottom skirt of the bottle (containing serrations **332**) over the formed teeth in the bottle **340**, providing a secure method of application where tampering to remove the base **330** would be evident and would eliminate accidental removal thereof

FIG. **23** is a perspective view of a child-resistant closure system for a pump sprayer according to another example embodiment, FIG. **24** is a partial side perspective view of a dispensing tip according to the system of FIG. **23**, FIG. **25** is a partial bottom perspective view of the dispenser tip of FIG. **24**, and FIG. **26** is a front view of a base according to the system of FIG. **23**. Referring to FIGS. **23-26**, the child-resistant closure (CRC) system **400** includes a cap **410**, a dispensing tip **420** and a base **430**. Each of the cap **410**, dispensing tip **420** and base **430** may be injection molded or extruded or otherwise formed of a suitable plastic material, as is known. The cap **410** is 3-sided to minimize rolling and avoid losing the cap **410**.

The dispensing tip **420** includes two levers **422** on opposite sides thereof that control whether the dispensing tip **420** is in a locked or unlocked condition so as to permit actuation of the sprayer pump unit **450** (not shown). A pair of slits or reliefs **424** are formed on either side of each lever **422** to provide flexibility. The dispensing tip **420** includes finger-depressing shoulders **421** which serve to engage the internal pump sprayer unit (not shown). Centrally located between the shoulders **421** is a circular recessed cutout **424** for receiving the rim of the cap **410** so that the cap **410** may be seated therein. As shown in FIGS. **24** and **25**, each lever **422** includes two undercuts, on set on the top end of the lever **422**, another undercut on a back side thereof. There is a top set of undercuts **425** that is designed to engage the rim of the cap **410** to secure the cap **410** into the recessed cutout **424** to lock out operation of the dispenser tip **420**. There is a lower undercut **427** that engages a horizontal single thread rim **437** on the upper end of base **430** which also locks out actuator operation. Accordingly, user action on the levers **422** control the action of the undercuts **425**, **427**.

The base **430** has interior grooves or threads for coupling it to a threaded member on dispenser bottle **440** which holds the medicinal fluid therein. The base **430** and dispensing tip **420** also partially enclose a sprayer pump unit **450** (not shown) which partly extends into the dispenser bottle **440** interior.

FIG. **27** is a portion of a sectional view of the system taken in the xz-plane to show a locked position, FIG. **28** is sectional view of the cap, dispenser tip and base taken in the xz-plane to show a locked position, FIG. **29** is a portion of a sectional view of the system taken in the xz-plane to show an unlocked position, and FIG. **30** is sectional view of the dispenser tip and base taken in the xz-plane to show an unlocked position. FIGS. **27-30** should be generally referred to for the following discussion.

With the cap **410** in place seated in cutout **424** and the dispenser **420** depressed, dispenser actuation is locked out. Specifically, the cap **410** is retained by the top undercuts **425** on the end of levers **422** that act as the release/retention mechanism. The undercuts **425** engage with the topside of the cap **410** to hold it in place. When engaging, the levers **422** will deflect outwards until the undercuts **425** pass the platform of the cap **410**, where they will snap back to vertical and engage.

The same lever **422** controls the lockout of the dispensing tip **420**. There is a second set of undercuts **427**, each on the back side of its corresponding lever within the interior of dispenser **420**, that provides the platform for the thread retention of horizontal thread rim **437** on base **430**. When engaging, the levers **422** will deflect outwards until the undercuts **427** pass the horizontal thread **437**, where they will snap back to vertical and engage.

To release the cap **410**/dispensing tip **420**, the levers **422** on the dispensing tip **420** must be pressed simultaneously, causing the levers **422** to once again deflect outwards. The dispensing tip **420** will pop up to dispensing mode (under spring pressure of the internal sprayer pump unit **450**) and the cap **410** can be drawn up and off of the dispenser tip **420**. With the cap **410** having been removed (as shown in FIG. **30**), the shoulders **421** can now be depressed to actuate the sprayer pump unit **450** to dispense a single dose. For each subsequent dose, the act of simultaneously depressing the levers **422** must be repeated to release the dispensing tip **420**.

FIGS. **28** and **30** also show the internal threads **431** and serrations **432** on the inside of the base **430**. As previously shown in FIGS. **5-8**, an anti-back off feature is added to both the bottle **440** and base **430**. Upon full seating of the base **430** to the bottle **440**, the downward force of application will push the bottom skirt of the bottle (containing serrations **432**) over the formed teeth in the bottle **440**, providing a secure method of application where tampering to remove the base **430** would be evident and would eliminate accidental removal thereof

FIG. **31** is a front view of a child-resistant closure system for a pump sprayer according to another example embodiment. The child-resistant closure (CRC) system **500** is essentially identical to that described above regarding system **300** in FIGS. **16-22**. However, unlike system **300**, the dispenser tip **520** in system **500** has a double walled construction to increase strength and robustness of the dispenser tip **520**, with an outer dispenser cap **520** and an inner wall **520'**. As such, the following figures are provided merely to review operation for locked and unlocked conditions of the system.

FIG. **32** is a portion of a sectional view of the system taken in the xz-plane to show a locked position, FIG. **33** is a sectional view **33-33** taken from FIG. **31** to show a locked position, and FIG. **34** is a sectional view **33-33** taken from FIG. **31** to show an unlocked position. Referring to FIGS.

32-34, in the 33-33 view of FIG. 34, the cap 510 is shown removed. This is because in this embodiment the cap 510 is not locked; it can be removed from the dispensing tip 520 by simply pulling upward. With the dispensing tip 520 in place, dispensing actuation is locked out. Specifically, the dispensing tip 520 is retained by the two undercuts 524 on the back face of two buttons 522 180° apart on the base 520. The undercuts 524 engage with the underside of continuous horizontal thread 537 on the base 530, as shown in the locked configuration of FIG. 33. When engaging, the undercuts 524 will initially deflect outwards until they pass the thread 537, where after they will snap back to vertical and engage the underside of thread 537 of base 550, as shown.

To release the dispensing tip 520, the buttons 522 on the dispensing tip 520 must be pressed simultaneously, causing the undercuts 524 to once again deflect outwards. The dispensing tip 520 will move vertically (by force of a spring in the sprayer pump unit 550) to the home dispensing position. This vertical movement is shown in FIG. 34. With the dispensing tip 520 now released, the sprayer pump unit 550 is now free to dispense a single dose. For each dose, the dispensing tip 520 must be released by simultaneously pressing buttons 522.

FIGS. 33 and 34 also show the internal threads 531 and serrations 532 on the inside of the base 530. As previously shown in FIGS. 5-8, an anti-back off feature is added to both the bottle 540 and base 530. Upon full seating of the base 530 to the bottle 540, the downward force of application will push the bottom skirt of the bottle (containing serrations 532) over the formed teeth in the bottle 540, providing a secure method of application where tampering to remove the base 530 would be evident and would eliminate accidental removal thereof

FIG. 35 is a perspective view of a child-resistant closure system for a pump assembly according to another example embodiment FIG. 36 is an exploded view of the system of FIG. 35, and FIG. 37 is a partial bottom perspective view of the dispenser of FIG. 35. System 600 differs from the previous embodiments in that CR is provided for a spray pump, with a spray head 615 and nozzle 616. Additionally, the cap 610 serves no part in the child resistance, it can be pulled off at any time.

System 600 includes cap 610, having a flat rim 613 to be seated in dispenser 620, a pump head 615 with nozzle 616, base 630, and tank 640 with or without fluid therein. The dispenser 620 includes a button 622 that actuates similar to the button described in system 400, as it includes a pair of undercuts 627, each on a back side of a corresponding button 622 for engaging the single thread 637 at the top of base 630.

FIG. 38 is a sectional view of the system taken in the xy-plane to show an unlocked position with the cap installed. The cap 610 is not locked in this embodiment and is removed by simply pulling upward. FIG. 38 shows the thread 637 disengaged from the undercuts 627 on the back of buttons 622; the dispenser is released and unlocked. However, assuming the dispenser 620 and cap in place, the pump head 615 is locked out. Specifically, the dispenser 620 is retained by the two undercuts 627 on the back face of two buttons 622 on the dispenser 620 that are 60° apart. The undercuts 627 engage with the underside of continuous horizontal thread 637 at the top of the base 630. When engaging, the undercuts 627 will deflect outwards until the undercuts 627 pass the thread 637 where they will snap back to vertical and engage.

To release the dispenser, the buttons 612 must be pressed simultaneously, causing the undercuts 627 to once again deflect outwards and the dispenser 620 will move vertically (by force of the spring in the pump head 615) to the home dispensing position. With the dispenser 620 released, the pump head 615 is now free to dispense one dose.

The example embodiments being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as departure from the example embodiments, and all such modifications as would be obvious to one skilled in the art are intended to be included herein.

We claim:

1. A child-resistant closure system for a container, comprising:

a protective cap;

a dispensing tip configured to receive the cap thereon, a lower end of the dispensing tip including a pair of finger-depressing shoulders in opposite relation to one another, each shoulder extending horizontally outward from a horizontal circumferential portion of the dispensing tip, a pair of spaced apart slots defined in the horizontal circumferential portion of the dispensing tip, a cylindrical portion provided beneath the shoulders to serve as a bottom end of the dispensing tip, the cylindrical portion including a pair of buttons spaced 180° apart on a vertical facing of the cylindrical portion, the buttons adapted to control whether the dispensing tip is in a locked condition so as to prevent actuation or an unlocked condition so as to permit actuation, via the shoulders, of a sprayer pump unit that is partially contained within the dispensing tip;

a cylindrical base having its upper end secured to the dispensing tip and its lower end configured to be secured to a dispenser bottle which contains fluid, the dispensing tip and base housing the sprayer pump unit therein which is actuated by depressing the shoulders on the dispensing tip once the dispensing tip is in an unlocked condition, the base top end including a circular ridge formed partly around its circumference on an external surface thereof and a pair of spaced apart upwardly extending legs;

wherein the dispensing tip is selectively rotatable relative to the base between a locked condition and an unlocked condition;

wherein, in the locked condition of the dispensing tip, the upwardly extending legs are not aligned with the slots defined in the horizontal circumferential portion of the dispensing tip such that downward movement of the dispensing tip in relation to the base is blocked by the upwardly extending legs to prohibit actuation of the sprayer pump unit and to lock the dispensing tip; and

wherein, in the unlocked condition of the dispensing tip, the upwardly extending legs are aligned with the slots defined in the horizontal circumferential portion of the dispensing tip such that downward movement of the dispensing tip in relation to the base is not blocked and such that each of the upwardly extending legs protrudes through a corresponding one of the slots defined in the horizontal circumferential portion of the dispensing tip when the dispensing tip moves downward in relation to the base.

2. The child-resistant closure system of claim 1, wherein the dispensing tip further includes a pair of spaced apart protrusions within the cylindrical portion, each of the protrusions being aligned with a corresponding one of the upwardly extending legs when the dispensing tip is in the locked condition such that the protrusions contact the upwardly extending legs when downward movement of the

dispensing tip in relation to the base is attempted to block such downward movement of the dispensing tip in relation to the base.

3. The child-resistant closure system of claim **1**, wherein, to achieve an unlocked condition of the dispensing tip to permit actuation of the sprayer pump unit via depressing the shoulders, the buttons are pressed simultaneously to permit rotation of the dispensing tip relative to the base from the locked condition to the unlocked condition.

4. The child-resistant closure system of claim **3**, wherein each button comprises a first end and second end separated by a vertical hinge, such that depressing the first end inward causes the second end to pivot outward;

wherein each button comprises a vertical protrusion on an internal side of the second end;

wherein the vertical protrusion of each button engages with a respective one of the upwardly extending legs when the respective first end is not depressed, thereby preventing rotation of the dispensing tip relative to the base from the locked condition to the unlocked condition; and

wherein the vertical protrusion of each button disengages from a respective one of the upwardly extending legs when the respective first end is depressed, thereby allowing rotation of the dispensing tip relative to the base from the locked condition to the unlocked condition.

5. The child-resistant closure system of claim **4**, wherein each upwardly extending leg comprises an outwardly projecting vertical protrusion; and

wherein the outwardly projecting vertical protrusion of each upwardly extending leg engages the vertical protrusion of a respective one of the buttons when the respective first end is not depressed.

6. The child-resistant closure system of claim **4**, wherein spaced apart gaps are defined in the circular ridge formed partly around the circumference of the top end of the base, each of the gaps being aligned with the vertical protrusion of a respective one of the buttons when the dispensing tip is in the unlocked condition, thereby allowing the dispensing tip to move downward in relation to the base.

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