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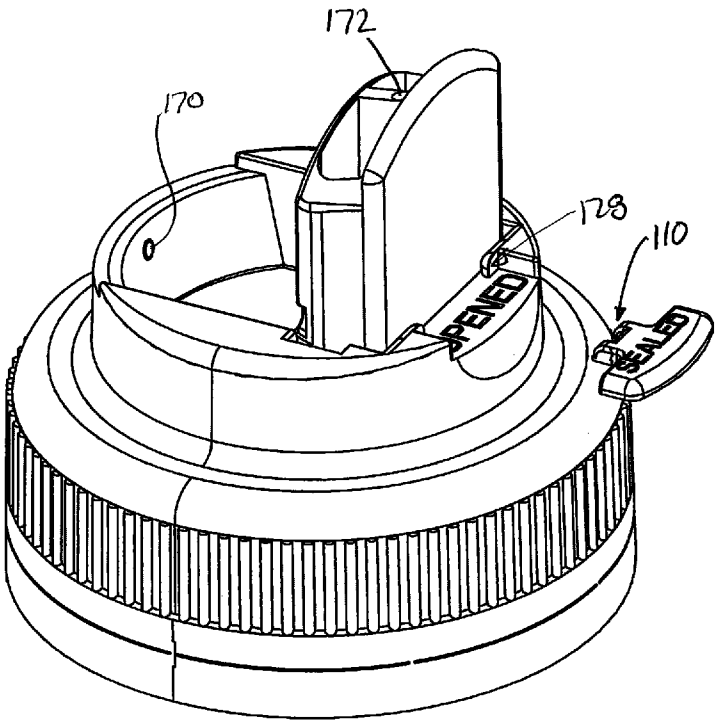
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(54) Title: TAMPER-EVIDENT CLOSURE VALVE




(57) Abstract: A closure opens and closes by a user-actuated rotation of a spout-like valve element about a transverse axis to expose a channel of the valve element to an aperture in the body. The rotation severs a tamper-evidencing projection from the valve element .

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# TAMPER-EVIDENT CLOSURE VALVE

## CROSS-REFERENCE TO RELATED APPLICATION

**[0001]** Benefit is claimed of US patent application 60/744,947, entitled "TAMPER-EVIDENT CLOSURE VALVE", and filed April 17, 2006, the disclosure of which is incorporated by reference in its entirety herein as if set forth at length.

## BACKGROUND OF THE INVENTION

**[0002]** The invention relates to closures. More particularly, the invention relates to tamper-evident screw and snap cap closures for bottles and the like.

**[0003]** A well-developed art exists regarding tamper-evident screw cap closures. A typical screw cap closure is molded of a plastic material (e.g., polypropylene, low density polypropylene (LDPE), or high density polyethylene (HDPE)). The closure body typically comprises an internally threaded sidewall portion. A bottom of the sidewall forms a tamper-evident ring. There may be an interrupted or otherwise weakened connection between the ring and adjacent portion of the sidewall. At the upper end of the sidewall main portion, a web may close the closure. Alternatively, any of a number of forms of open valve seat may be formed to which a separate valve element (e.g., a poppet) is movably mounted to open and close the closure.

**[0004]** The closure may be installed to a threaded neck of the bottle by screwing/threading. The screwing may flex/stretch the ring over the bottle external threads. Upon unscrewing of the closure, however, the tensile strength of the connection may be insufficient to draw the ring back over the bottle threads, thereby rupturing the connection and leaving the ring on the bottle. Even upon reinstallation of the remaining portion of the closure, the severed connection provides clear evidence that the closure has previously been opened.

## SUMMARY OF THE INVENTION

**[0005]** One aspect of the invention involves a closure that opens and closes by a user-actuated rotation of a spout-like valve element about a transverse axis to expose a channel of the valve element to an aperture in the body. The rotation severs a tamper-evidencing projection from the valve element.

**[0006]** The details of one or more embodiments of the invention are set forth in the accompanying drawings and the description below. Other features, objects, and advantages of the invention will be apparent from the description and drawings, and from the claims.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0007]** FIG. 1 is a view of a toggle bottle closure in an initial closed condition.

**[0008]** FIG. 2 is a top view of the closure of FIG. 1.

**[0009]** FIG. 3 is a side view of the closure of FIG. 1.

**[0010]** FIG. 4 is a front view of the closure of FIG. 1.

**[0011]** FIG. 5 is a central vertical sectional view of the closure of FIG. 1, taken along line 5-5 of FIG. 2 and showing a bottle body in broken line.

**[0012]** FIG. 6 is an offset vertical sectional view of the closure of FIG. 1, taken along line 6-6 of FIG. 2.

**[0013]** FIG. 7 is an exploded view of the closure of FIG. 1.

**[0014]** FIG. 8 is an offset sectional view of the closure of FIG. 1 in an opened condition.

**[0015]** FIG. 9 is a view of the opened closure of FIG. 8.

**[0016]** Like reference numbers and designations in the various drawings indicate like elements.

DETAILED DESCRIPTION

**[0017]** FIG. 1 shows a container (bottle) 20 as an assembly of a bottle body 22 and a closure assembly 24. The bottle body 22 (FIG. 5) includes a sidewall 28 extending upward from a bottom or base 30. The exemplary sidewall 28 extends to a shoulder 32. A neck 34 extends above the shoulder to a rim 36 defining a mouth opening. The neck 34 includes an externally threaded portion 38 below the rim 36.

**[0018]** The bottle interior may contain a liquid beverage. The exemplary body 22 and closure 24 have a common central vertical/longitudinal axis 500 (FIG. 1). The exemplary closure 24 is the assembly of a first (main) piece 40 and a second piece 42. As is discussed further below, the exemplary first piece 40 forms a closure body and the exemplary second piece 42 forms a valve element which may be articulated relative to the closure body 40 to open and close the bottle. An exemplary articulation is a relative rotation about a pivot axis 502 transverse to the axis 500.

**[0019]** An exemplary bottle body 22 is of any conventional or yet-developed type and may be unitarily molded from a plastic (e.g., HDPE). The exemplary closure body 40 may similarly be unitarily molded (e.g., of HDPE or MDPE). The valve element 42 may similarly be molded (e.g., of polypropylene). An overcap (not shown - e.g., functioning as a dust cover), if any, may also be similarly molded, advantageously of transparent material. The exemplary closure body 40 includes a sidewall 44 extending upward from a lower rim 48 to a shoulder 50. The shoulder 50 extends to an upwardly projecting boss 52 which defines a compartment (e.g., a well) 54 (FIG. 5) for mounting and receiving the valve element 42. A lower portion 56 of the sidewall 44 forms a tamper evident ring having radially inward projections/protrusions 58 captured below an annular rib 60 of

the bottle below the externally threaded portion 38. Scoring 62 may frangibly separate the ring 56 from a remainder of the sidewall which bears an internal thread 64 for engaging the bottle external thread. Once the closure body 40 is screwed onto the bottle, unscrewing would be resisted by engagement of the projections 58 and the rib 60, severing connections 66 and causing the ring to separate from the remainder of the body 40 to evidence tampering. Alternatively to the illustrated ring 56, the means for evidencing tampering by attempted removal of the body 40 may involve a tear-off/pull-off feature (e.g., a finger-gripable tab to tear off the ring). Such a tear-off ring may be particularly relevant to a snap-on (rather than screw-on) closure body. Once the ring is torn off, retention of the remainder of the closure may be compromised.

**[0020]** Additional tamper evidencing means are provided for evidencing opening and/or attempted opening of the closure rather than removal and/or attempted removal of the closure body from the bottle. Exemplary means comprise a severable tab 80 (FIG. 1) of the valve element 42. The exemplary valve element 42 forms a spout having a channel 82 (FIG. 6) extending from an inlet opening/port 84 to an outlet opening/port 88. For strength, the exemplary spout includes a longitudinal dividing wall 90 (FIG. 5) splitting the channel in two. A seat portion 100 along a base of the compartment 54 of the boss 52 includes a port/opening 102. In the closed condition, the port 102 is blocked/sealed by a blocking portion 103 of the valve element.

**[0021]** To unblock/unseal the port 102, the valve element 42 is rotated (clockwise as viewed in FIGS. 5 and 6) about the axis 502 to bring the inlet port 84 into alignment/communication with the port 102. The tab 80, however, resists this rotation and opening. In the example, an attempted rotation will cause an underside 104 of the tab 80 to bear against the floor/base 106

of a tab-receiving recess 108 in an aft rim portion of the boss 52. To allow the opening, a frangible connection 110 (FIG. 5) of the tab 80 to a main portion of the valve element must be severed. One tab removal method involves directly engaging the tab. For example, an aft thumb groove/recess 120 in the side of the boss 52 may provide thumbnail/fingernail access to the underside 104 to pry the tab upward (e.g., rotating the tab counterclockwise as viewed in FIG. 5) about the connection 110 to deform/break the connection 110 and proceed to the open condition of FIGS. 8 and 9. In the open condition, the port 84 is in alignment/communication with the port 102 to permit dispensing of the drink along a flowpath 504 exiting the outlet port 88.

**[0022]** An alternative involves rotating the main portion of the valve element/spout. For example, a similar forward thumb groove/recess 122 may allow access to an underside 124 of a forward extreme (e.g., a lip) of an upper wall of the spout to rotate the spout so that engagement between the tab 80 and base 106 severs the connection 110. The boss may include a pair of retaining walls 128 on either side of the connection 110 so that such a rotation of the spout does not pull the tab 80 down into the well 54 and potentially, pry/snap the spout out of engagement with the boss 52.

**[0023]** To guide rotation about the axis 502, the valve element 42 includes integrally molded pivot/axle stubs 130 (FIG. 7) which are received in complementary journal recesses 132 of the compartment 54 of the boss 52. Upper areas of the recesses 132 may be sufficiently open and the stubs 130 appropriately shaped to allow a snap-in installation to the closed condition of the valve element after the valve element and body are molded.

**[0024]** In the exemplary embodiment, the base 106 includes integrally molded indicia 140 to indicate that the closure has

been opened. Exemplary indicia include a word such as "opened" or an appropriate pictogram or other graphic. Similarly, to highlight the tamper evident feature, the upper surface of the tab 80 may bear indicia 142. This indicia may, for example, include a word such as "sealed" or an appropriate graphic.

**[0025]** Once the spout has been opened, the exemplary spout is re-closable by a reverse rotation. With the tab 80 already severed, further means may be provided to retain the spout in its closed orientation for further opening. For example, a detent mechanism may be provided by cooperating features 170 and 172 (FIG. 9) on the boss 52 and valve element 42, respectively. Exemplary features are a convex bump and a concave recess, respectively. The bump 170 is located on the inboard surface of the forward wall of the well 54 and the recess 172 is located along a forward edge of the dividing wall/web 90.

**[0026]** One or more embodiments of the present invention have been described. Nevertheless, it will be understood that various modifications may be made without departing from the spirit and scope of the invention. For example, when implemented as a reengineering of an existing closure and/or for use with an existing bottle body, details of the existing closure or bottle body may influence or dictate details of the particular implementation. Accordingly, other embodiments are within the scope of the following claims.

CLAIMS

What is claimed is:

1. A bottle closure (24) comprising:

a body (40) having a mounting feature (64) for mounting to a bottle; and

a valve element (42) rotatable about a transverse axis (502) between a closed condition and an opened condition and comprising:

an inlet (84);

an outlet (88); and

means (80) for evidencing at least one of an opening or attempted opening of the valve element.

2. The closure of claim 1 wherein:

the body consists essentially of a first unitary molding; and

the valve element consists essentially of a second unitary molding.

3. The closure of claim 2 wherein:

the means comprises a tab opposite the outlet and connected to a main portion of the valve element by a severable connection (110).

4. The closure of claim 1 wherein:

the valve element comprises axle stubs (130) mated to bearing pockets (132) of the body to guide the rotation about the transverse axis.

5. The closure of claim 4 wherein:

the bearing pockets are at opposite sides of a well (54) in the body; and

a port (102) in a base of the well aligns with the inlet in the opened condition and is blocked in the closed condition.

6. A method for using a bottle closure comprising:

severing a tamper-evidencing projection from the valve element;

rotating a spout about a transverse axis relative to a closure body in which the spout is mounted; and

dispensing liquid from the bottle.

7. The method of claim 6 wherein

the rotating is a user-actuated rotation which causes the severing.

8. The method of claim 6 wherein

the rotating exposes a channel of the valve element to an aperture in the body.

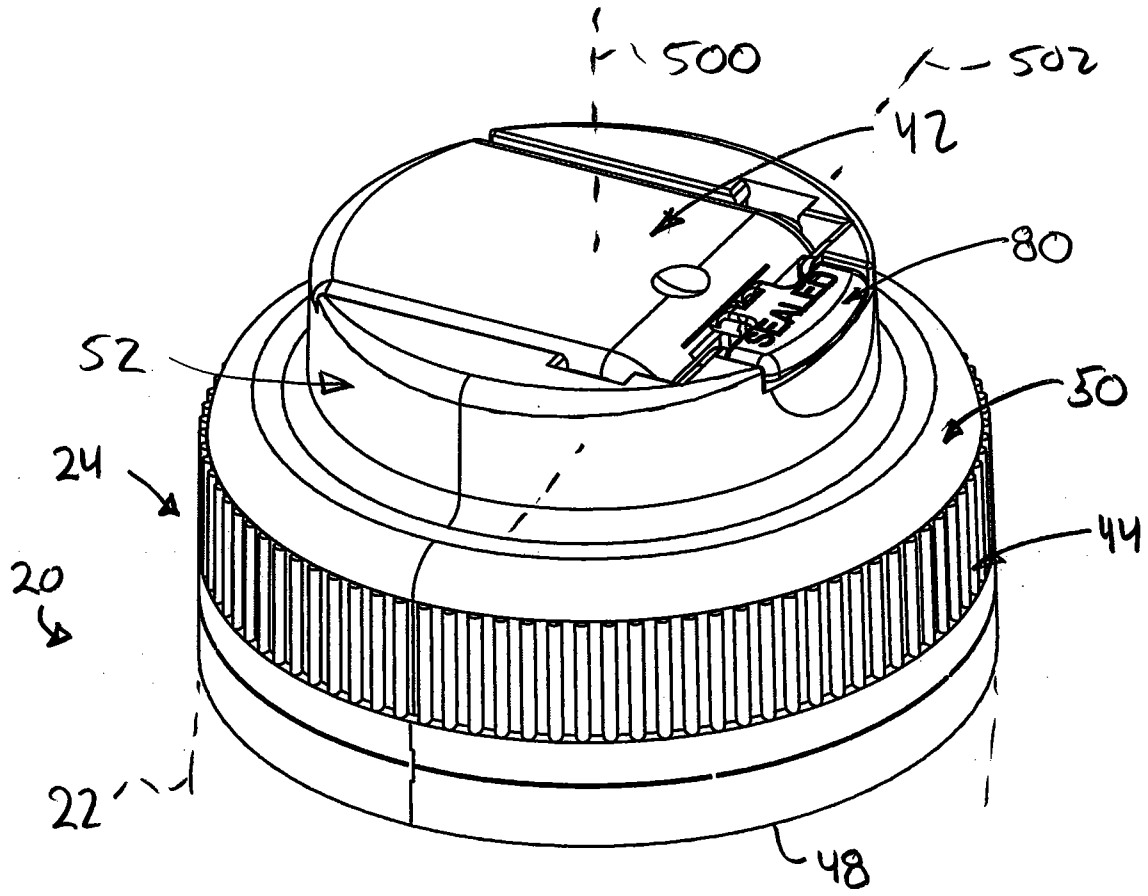



FIG. 1

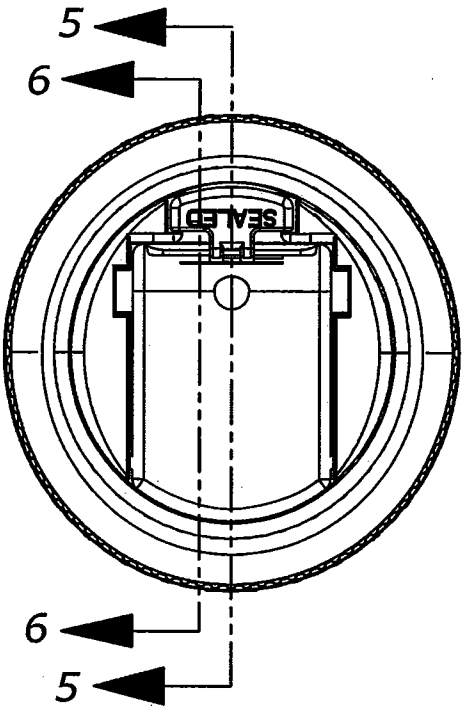



FIG. 2

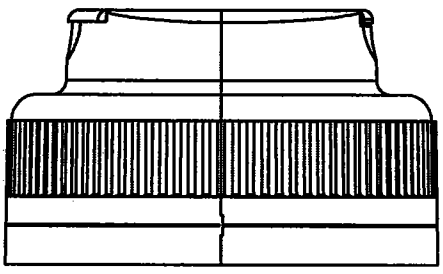


FIG. 3

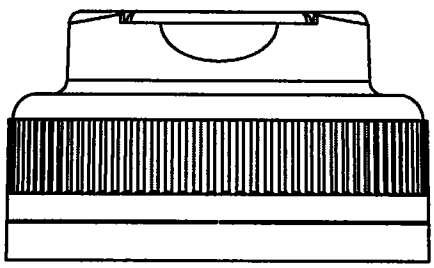


FIG. 4

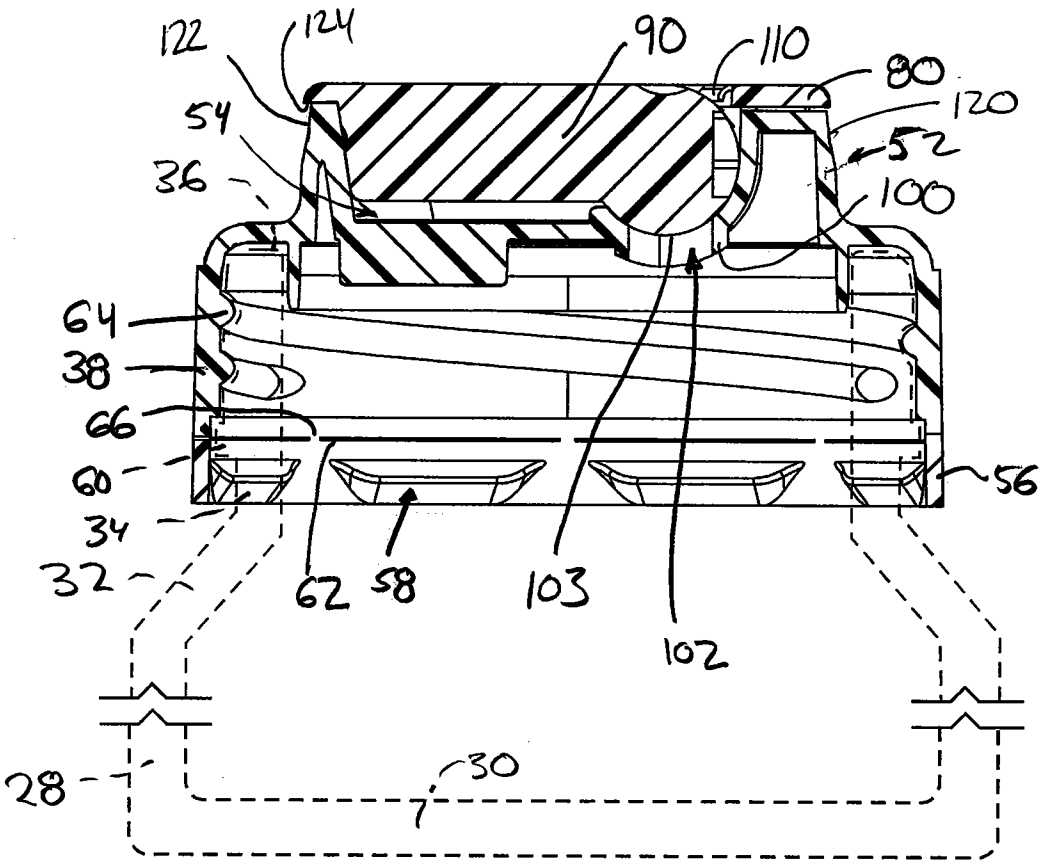

122
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90
110
80
120
54
52
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100
64
38
66
60
56
34
32
62
58
103
102
28
30

FIG. 5

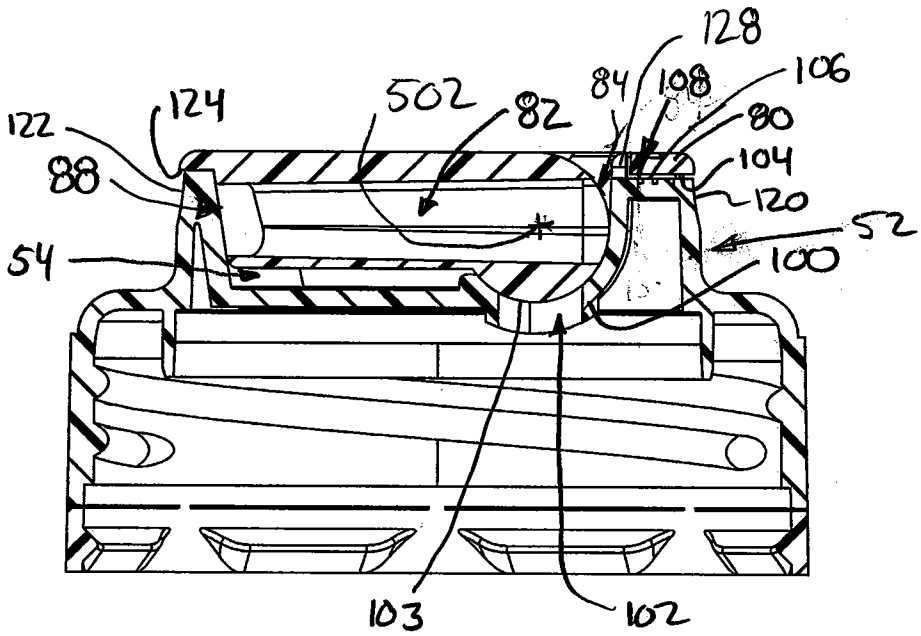

128
84
108
106
502
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122
124
80
88
104
120
52
54
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103
102

FIG. 6

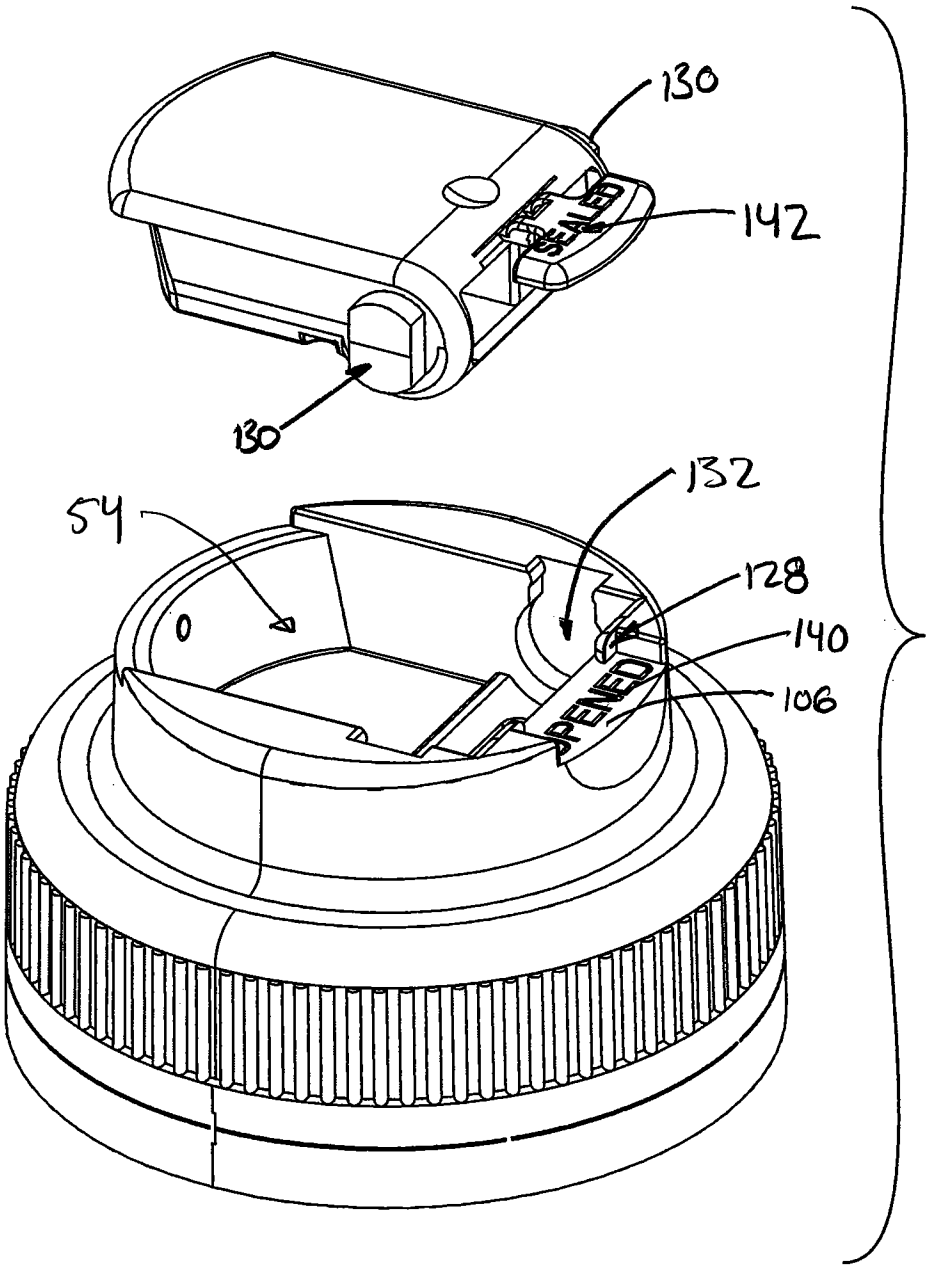



FIG. 7

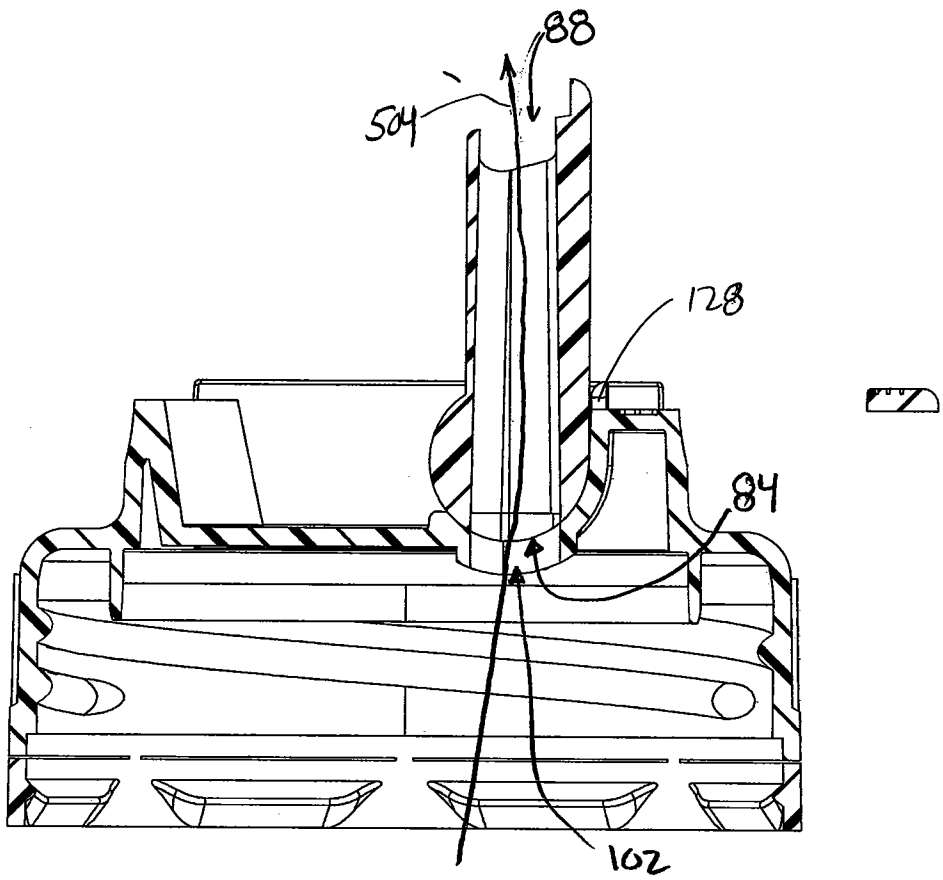



FIG. 8

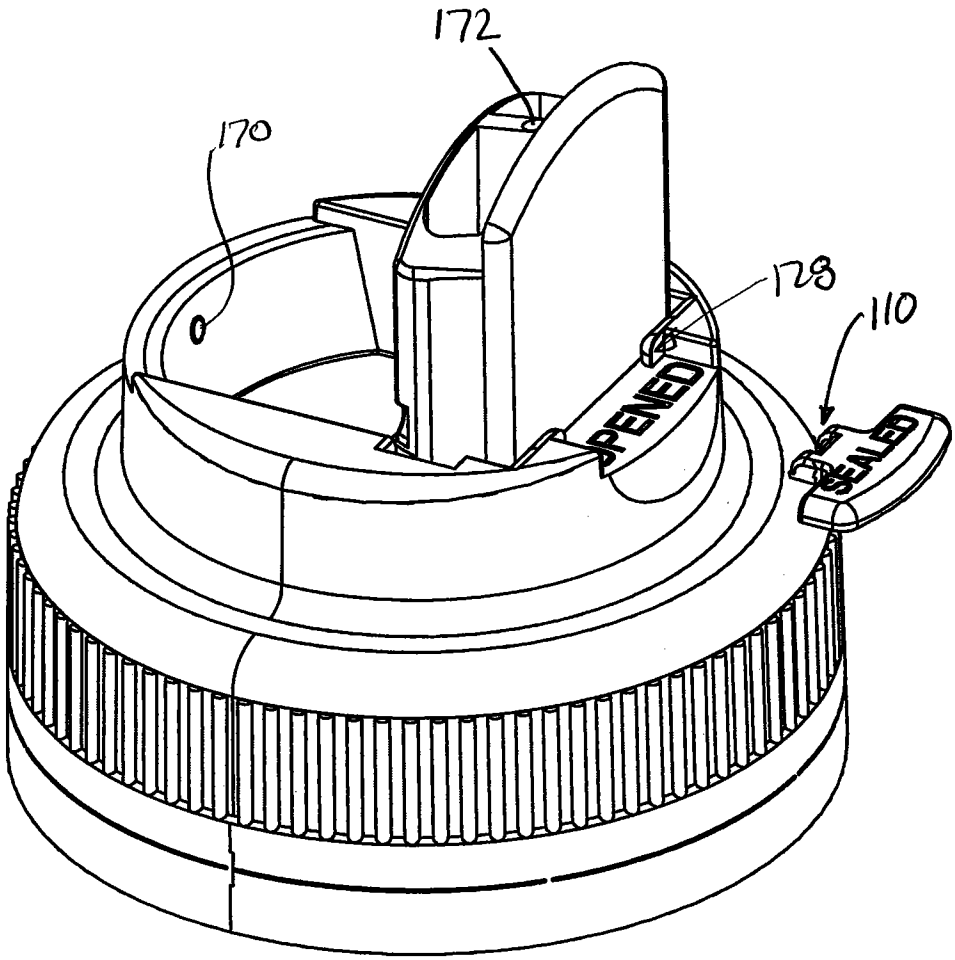



FIG. 9