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(54) **VALVED CAP FOR CONTAINER**

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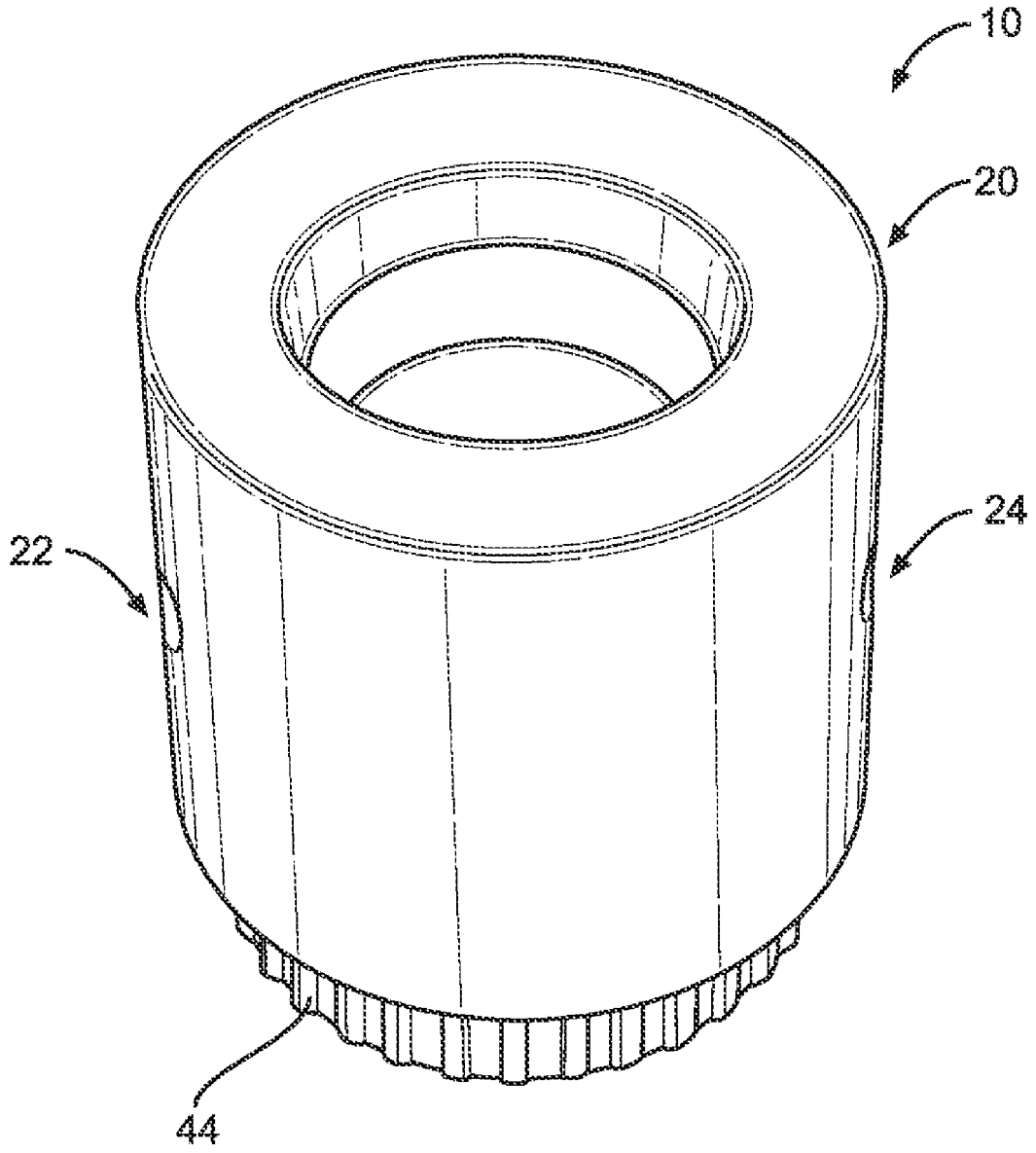
(57) **ABSTRACT**

A cap on a bottle is selectively opened to permit passage of liquid to and from the chamber and closed to prevent passage of liquid. The cap has a collar that threads onto the bottle's mouth and a shroud that moves relative to the collar by applying a longitudinal force to the shroud's shoulder. By applying the force, the shroud moves longitudinally toward the bottle. In some embodiments, a valve is thereby rotated to unblock a throat so that liquid may pass from the opening defined by the shoulder to the chamber in the receptacle. In other embodiments, a dome is thereby displaced longitudinally to unblock the throat so that liquid may pass through.



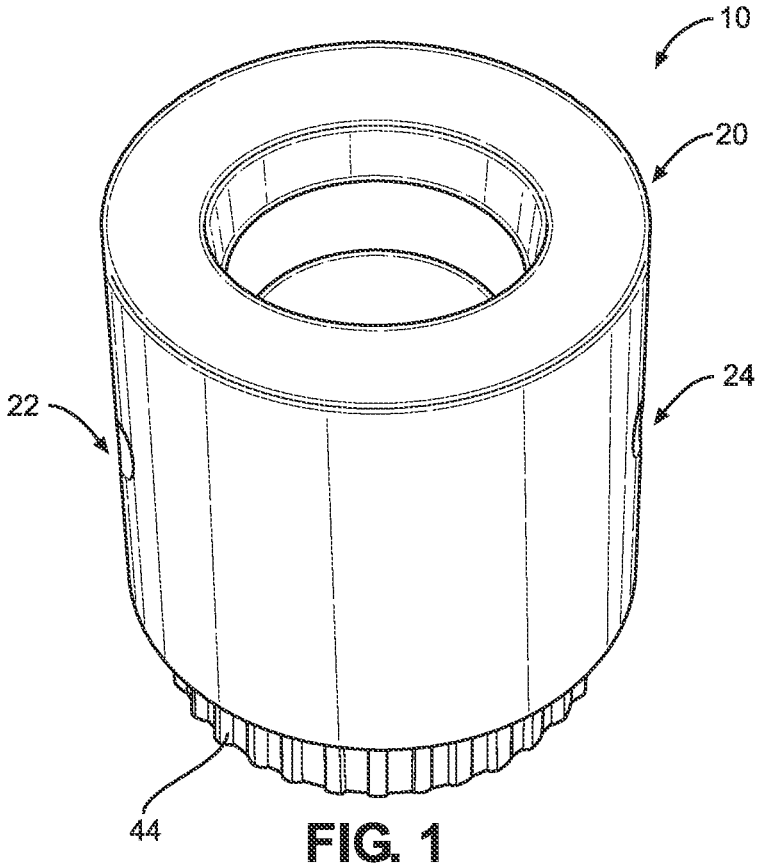


FIG. 1

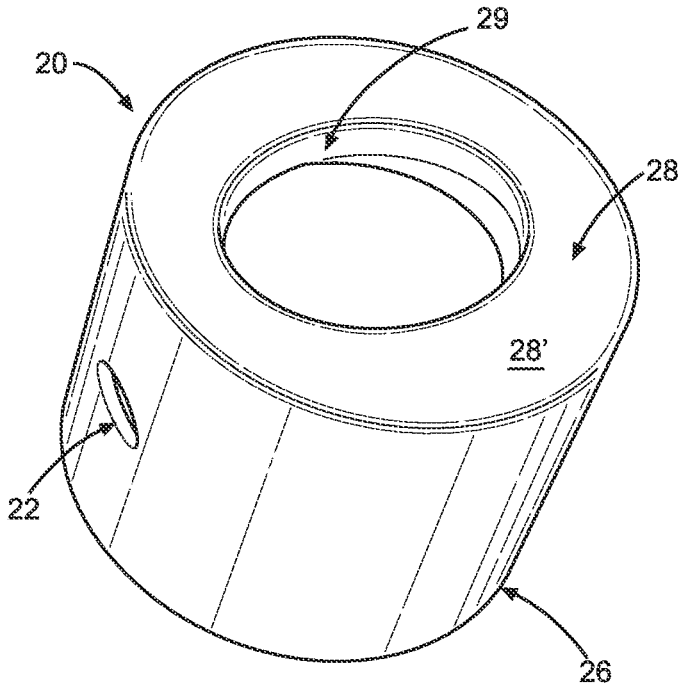


FIG. 2

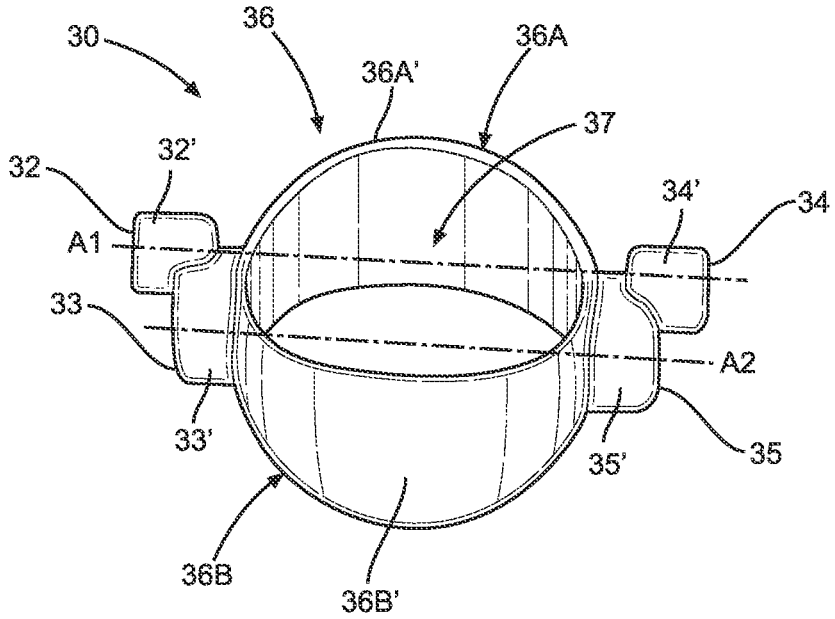

30
36
36A
36A'
37
32
32'
34'
34
A1
33
A2
33'
35'
35
36B
36B'

FIG. 3

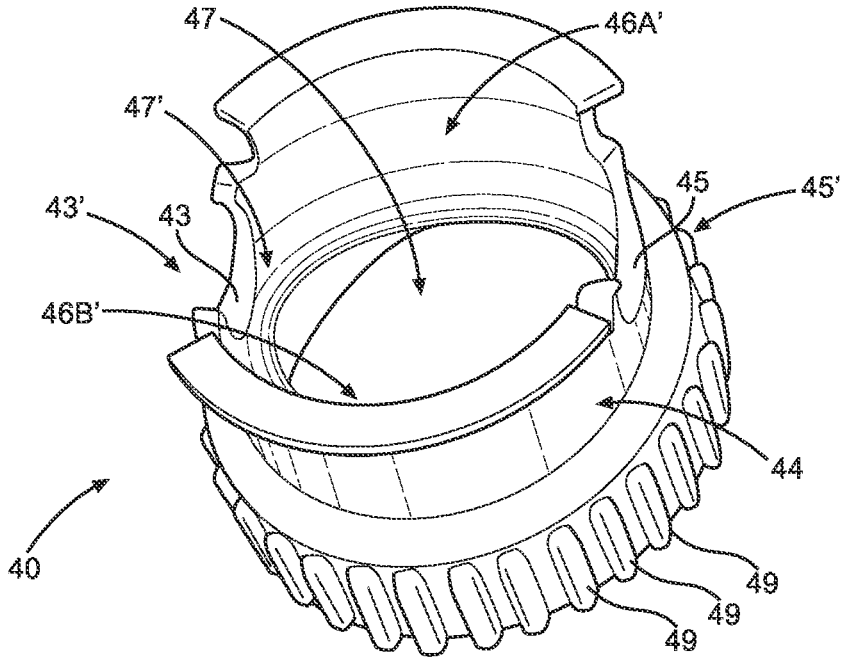

47
46A'
47'
45
45'
43'
43
46B'
44
40
49
49
49

FIG. 4

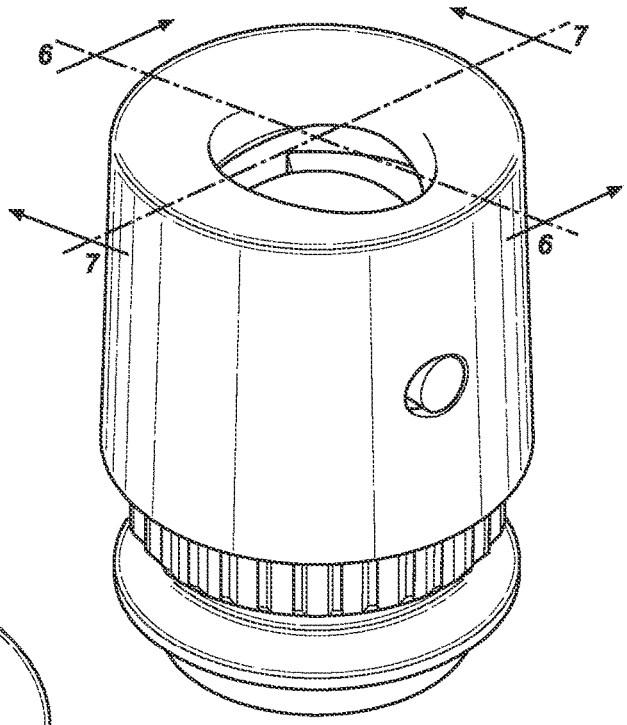


FIG. 5

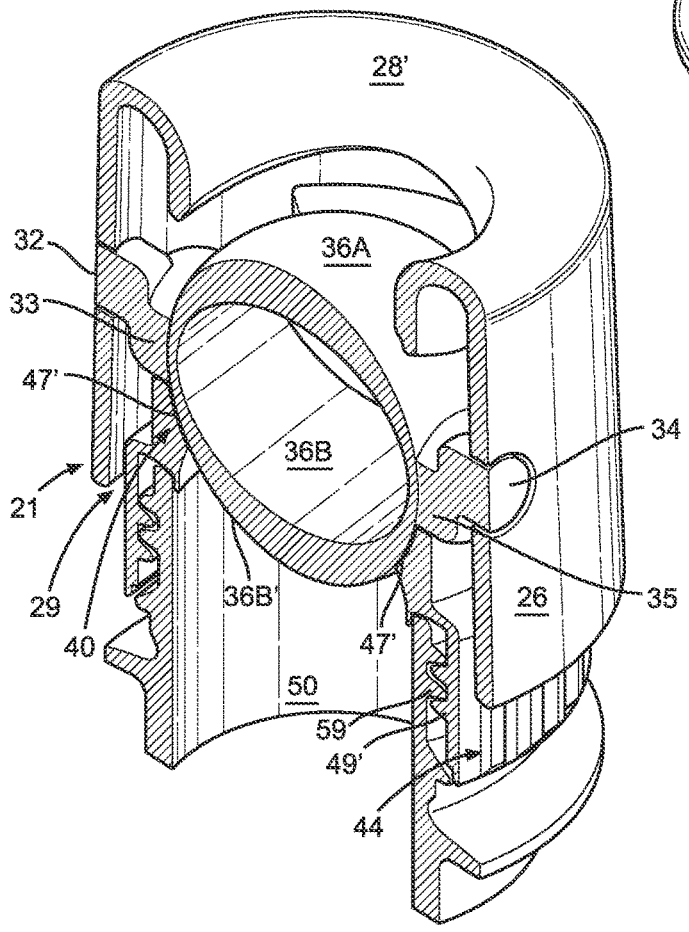


FIG. 6

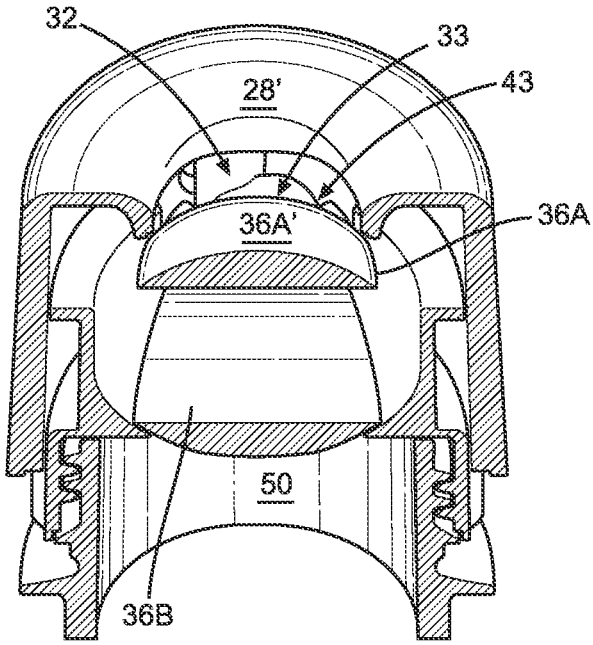


FIG. 7

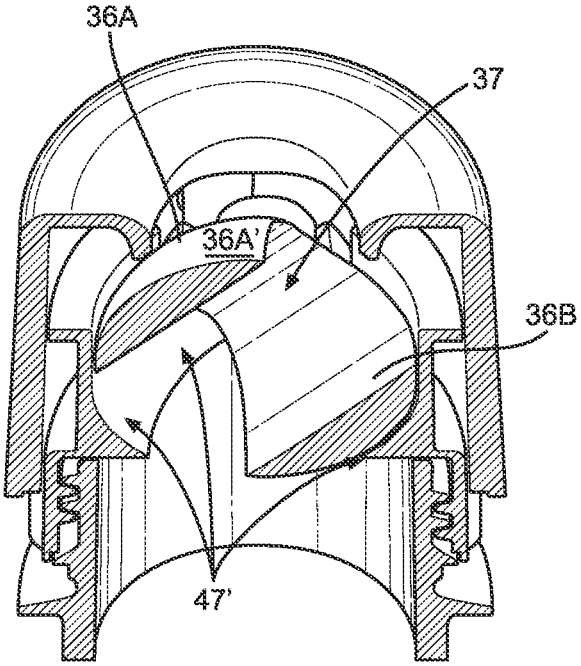


FIG. 8

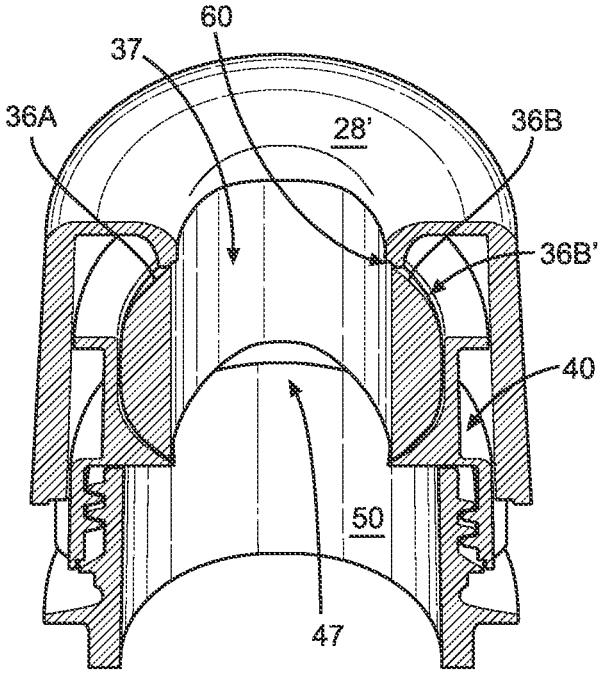


FIG. 9

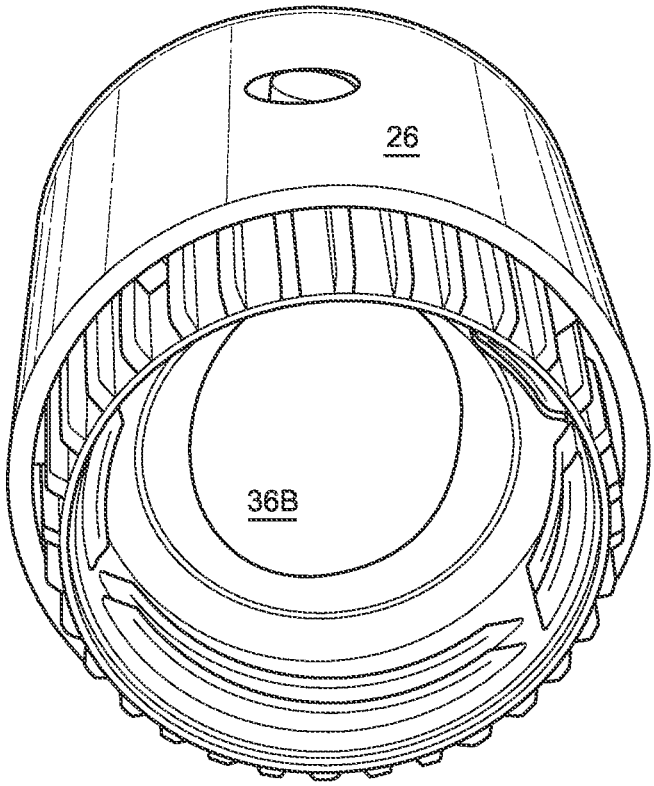


FIG. 10

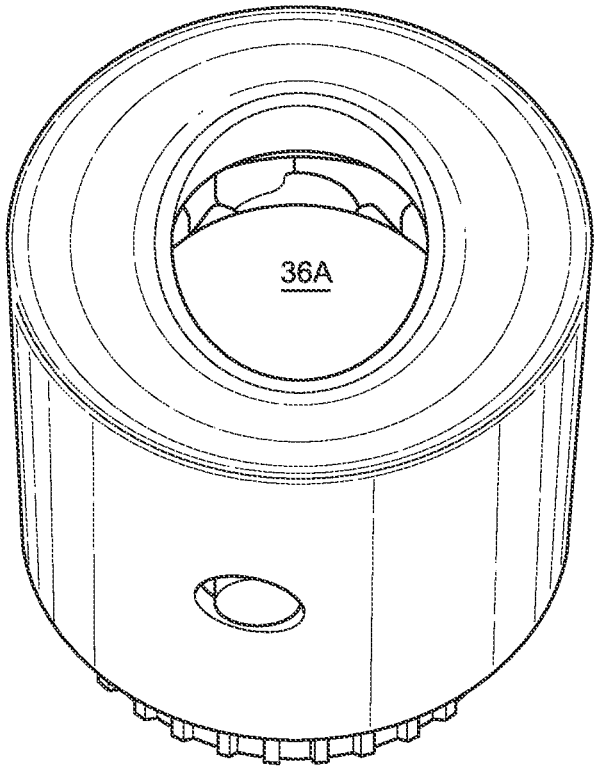


FIG. 11

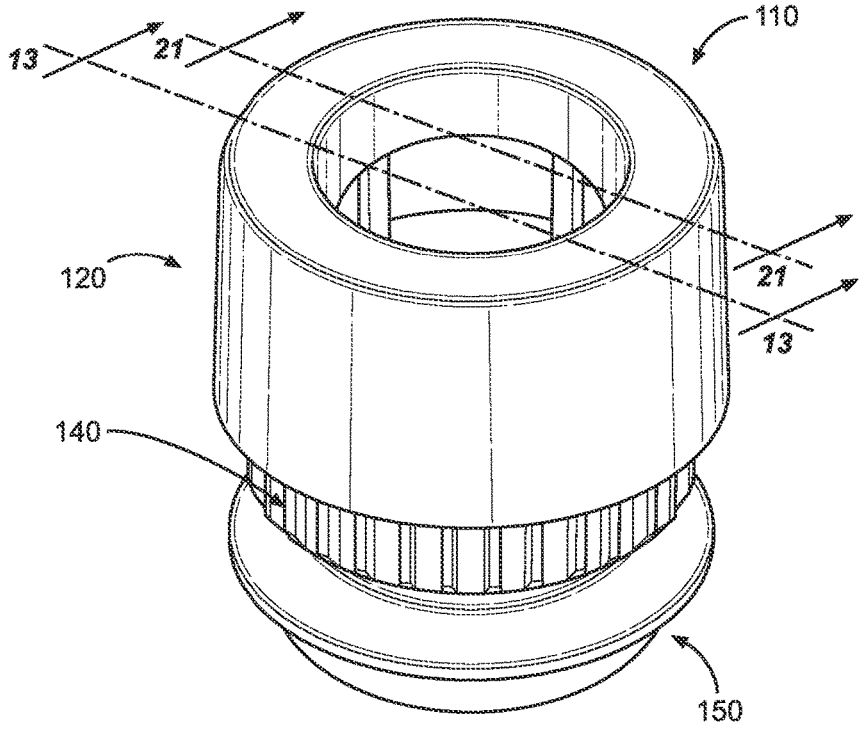

110
13
21
120
21
13
140
150

FIG. 12

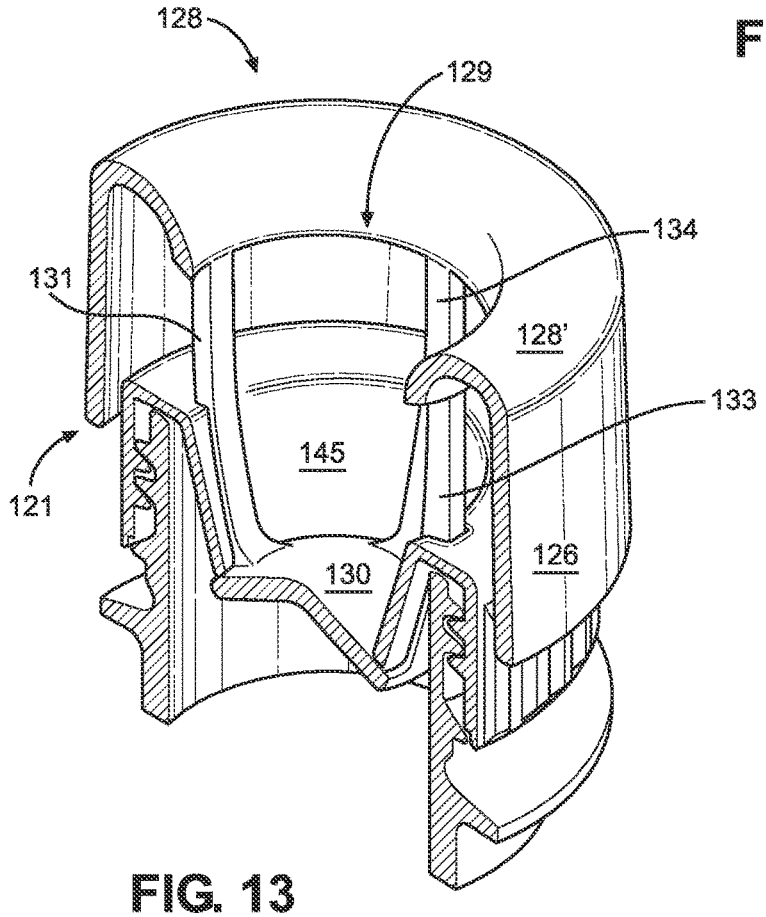

128
129
134
131
128'
133
145
121
126
130

FIG. 13

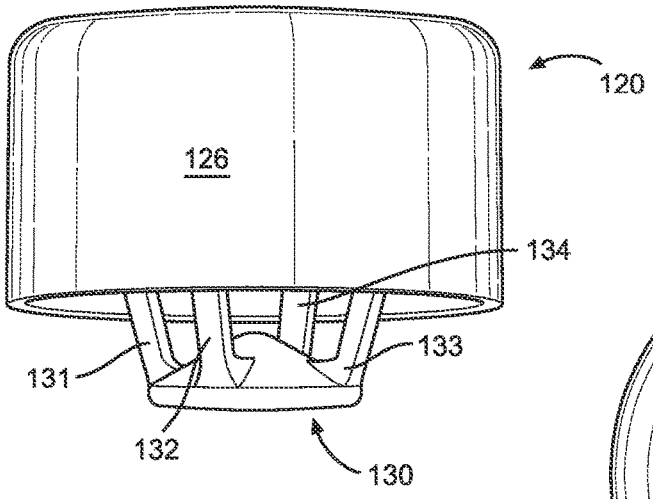


FIG. 14

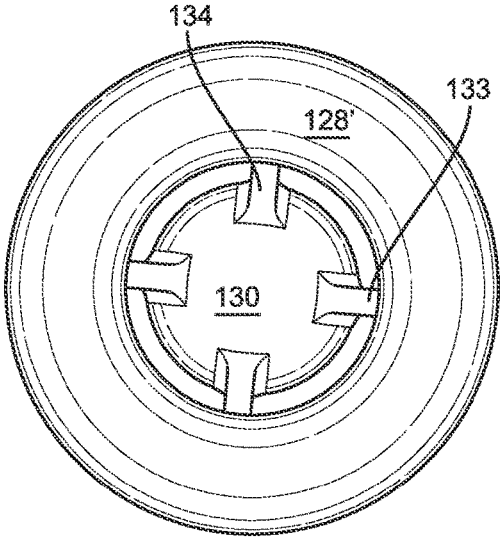


FIG. 15

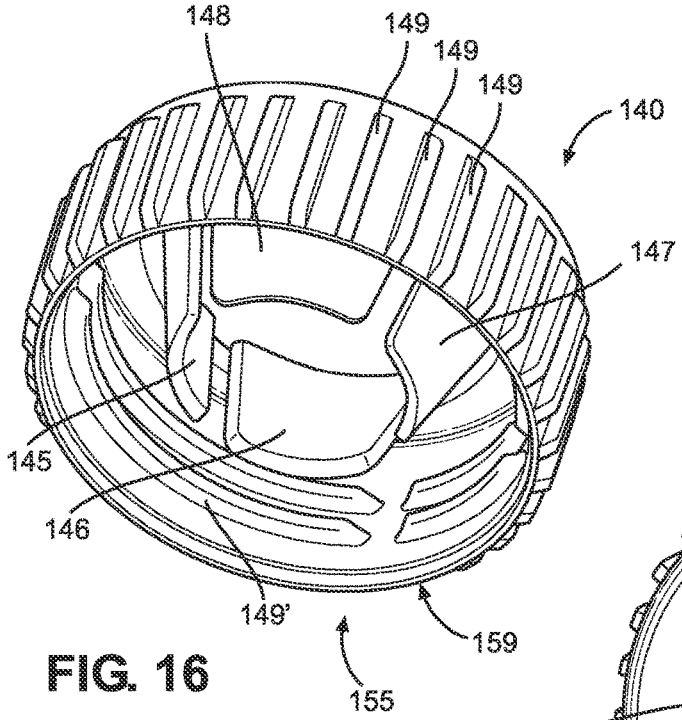


FIG. 16

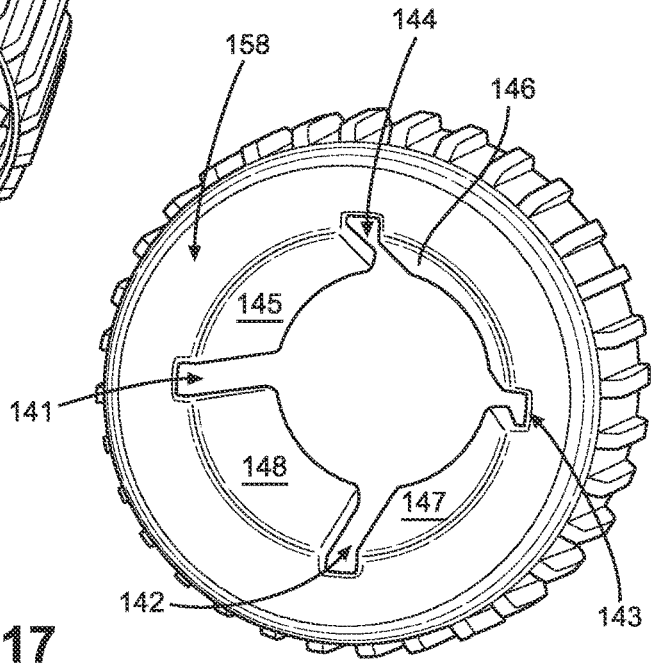


FIG. 17

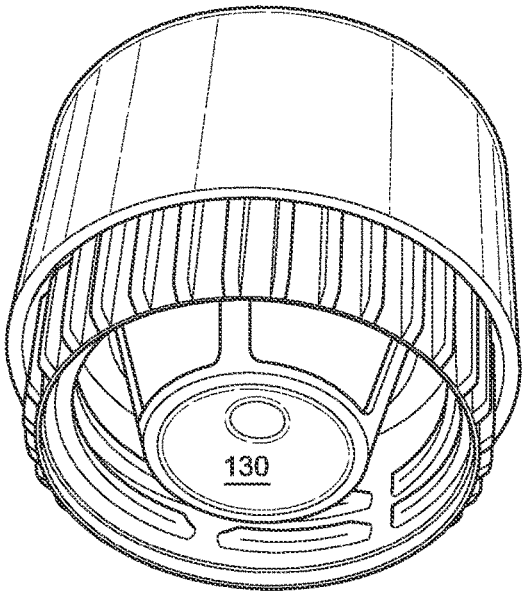


FIG. 18

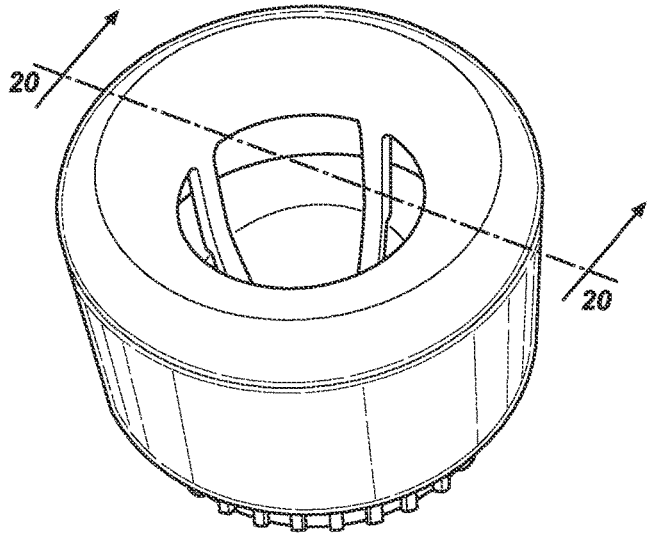


FIG. 19

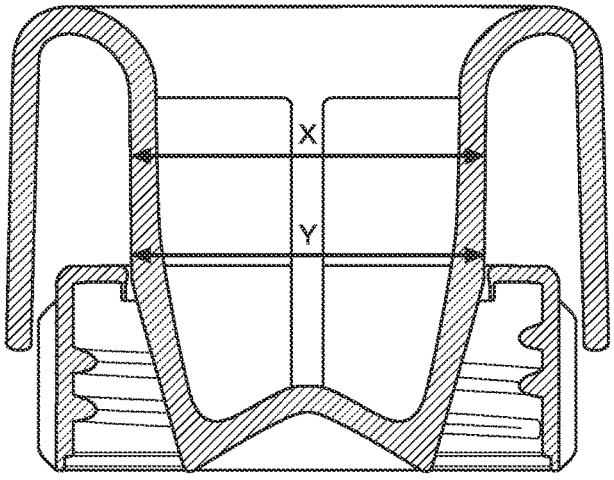


FIG. 20

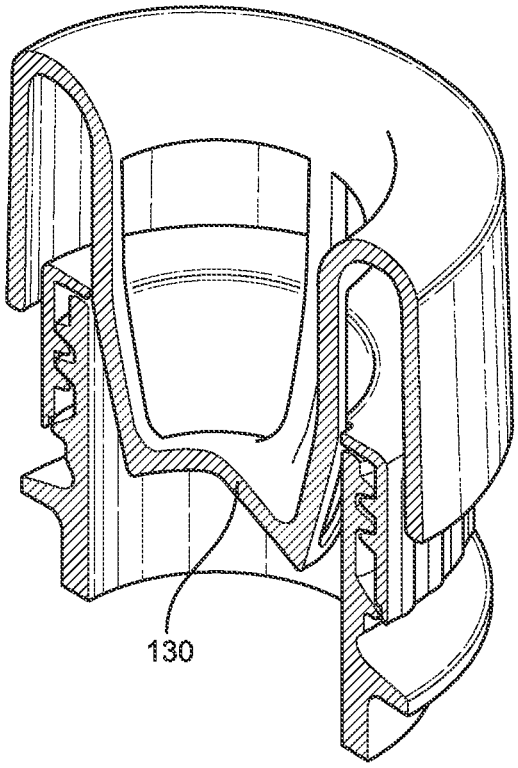


FIG. 21

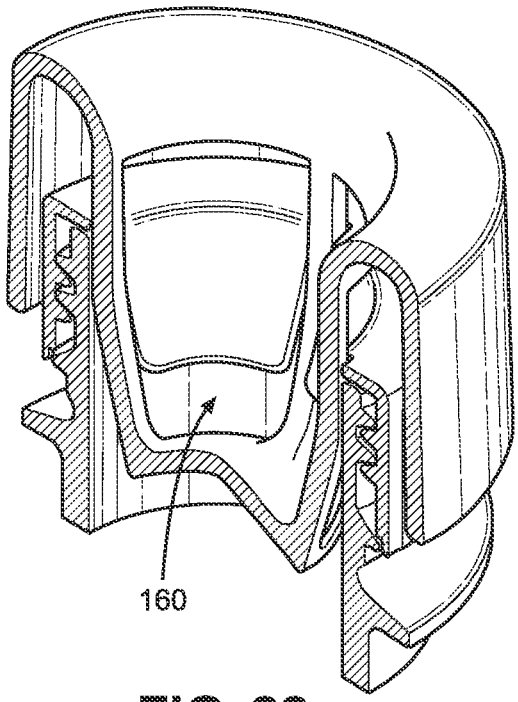


FIG. 22

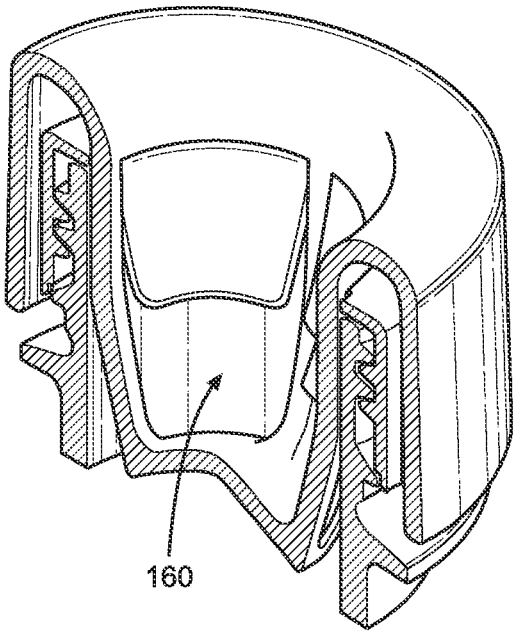


FIG. 23

VALVED CAP FOR CONTAINER

BACKGROUND OF THE INVENTION

[0001] The invention relates generally to a cap for a container, and more particularly to a cap that has a valve that, in one position, permits the passage of liquid, and in another position prevents the passage of liquid, through the cap between the exterior of the container and the interior of the container.

[0002] It is well known that humans commonly wish to expel saliva and other liquid contents from their mouths. For example, it is common for dental patients to expel into a sink or cup the water, saliva and toothpaste mixture that results from an ordinary dental cleaning. In another example, it is common for those chewing tobacco or other substances to spit out the saliva that is produced by the body when powdered tobacco, such as "snuff," or leaf tobacco is placed in the mouth. Some of the tobacco/saliva mixture is consumed by the tobacco user, but much of the mixture is typically ejected from the mouth by the user.

[0003] When a person is using tobacco and expects to spit frequently, it is common for him or her to plan to be in an area where the mixture can be ejected onto the ground (e.g., on the dirt or grass of a baseball field). As an alternative, the user may carry a receptacle into which the liquid can be ejected. A disposable paper or plastic cup is a common receptacle for tobacco users, because such cups can be discarded rather than requiring cleaning of a substance that others find objectionable. However, disposable cups are easily spilled, creating a mess due to the large volume of the collected liquid.

[0004] Because of the risk of spilling the contents of disposable cups, disposable plastic bottles, such as those that contain water or soda, are commonly used instead. Such bottles have a replaceable lid that can be returned immediately after spitting into the chamber of the bottle, thereby preventing spilling even if the bottle falls over. However, two hands are required to remove and replace a lid on such a bottle. People who chew tobacco while working, driving or engaging in any task that requires both hands will not normally stop to remove and replace the bottle lid to spit.

[0005] Therefore the need exists for a device that forms a receptacle for liquid that is expelled from the human mouth that does not require both hands to operate.

SUMMARY OF THE INVENTION

[0006] Disclosed herein is a cap for removably mounting to a receptacle that has a chamber. The cap comprises a shroud having a sidewall that extends from a shoulder near a first shroud end to an opposite second shroud end. The shoulder defines an opening to a passage that extends longitudinally through the shroud from the first shroud end to the second shroud end. A cradle has a substantially cylindrical collar configured for attachment to the receptacle and defining at least one throat therethrough. The cradle is mounted at least partially in the shroud. The shroud is configured for movement relative to the cradle, which is accomplished by applying a longitudinal force to the shroud. This force moves the cap between a closed configuration, in which the at least one throat is at least partially blocked to the flow of liquid, and an open configuration, in which the at least one throat is not blocked and liquid may flow through the longitudinal passage between the opening and the chamber.

[0007] In some embodiments a valve is disposed adjacent the throat of the cradle within the longitudinal passage of the shroud. The valve is configured for rotation relative to the cradle by applying a longitudinal force to the shroud. In some embodiments, the valve has a first axis of rotation relative to the shroud and a second axis of rotation relative to the cradle. The first and second axes are substantially parallel. In some embodiments, the valve has a yoke with at least one yoke section that is selectively disposed in the throat of the cradle in the closed configuration.

[0008] In some embodiments, at least first and second legs extend longitudinally from the shroud to a dome with gaps therebetween. This defines first and second passages between the shoulder, the legs and the dome. At least first and second funnel ramps may extend from the cradle and define at least first and second slots therebetween into which the first and second legs are disposed. The funnel ramps may define the throat, and the dome may be selectively disposed over the throat in the closed position, and spaced from the throat in the open position. In some embodiments, the legs may be deformed when the shroud is moved from the closed position to the open position, thereby biasing the cap to the closed position.

[0009] Disclosed herein is a cap removably mounted to a receptacle that has a chamber. The cap comprises a shroud having a sidewall that extends from a shoulder near a first shroud end to an opposite second shroud end. The shoulder defines an opening to a passage that extends longitudinally through the shroud from the first shroud end to the second shroud end. A cradle has a substantially cylindrical collar attached to the receptacle and defines at least one throat therethrough. The cradle is mounted at least partially in the shroud and the shroud is configured for movement relative to the cradle by applying a longitudinal force to the shroud. A valve mounts to the cradle adjacent the at least one throat and in the longitudinal passage of the shroud. The valve is rotatably mounted to the cradle and configured to move between a closed configuration, in which the throat is at least partially blocked by a section of the valve, and an open configuration, in which the throat is not blocked.

[0010] In some embodiments, the valve has at least a first axle with a first axis of rotation relative to the shroud and at least a second axle with a second axis of rotation relative to the cradle. The first and second axes are substantially parallel, the at least first axle rotatably mounts to the shroud and the at least second axle rotatably mounts to the cradle. In some embodiments, the valve has a yoke with at least one yoke section that is the section of the valve that is selectively disposed in the throat of the cradle in the closed configuration.

[0011] Disclosed herein is a cap removably mounted to a receptacle that has a chamber. The cap comprises a shroud having a sidewall that extends from a shoulder near a first shroud end to an opposite second shroud end. The shoulder defines an opening to a passage that extends longitudinally through the shroud from the first shroud end to the second shroud end. At least first and second legs extend longitudinally from the shroud to a dome with gaps therebetween, thereby defining first and second passages between the shoulder, the legs and the dome. A cradle has a substantially cylindrical collar attached to the receptacle and at least first

and second funnel ramps defining at least first and second slots therebetween into which the first and second legs are disposed. The funnel ramps define a throat. The cradle mounts at least partially in the shroud. The cap permits relative longitudinal movement between the shroud and the cradle by a longitudinal force applied to the shoulder. This moves the shroud relative to the cradle to selectively dispose the dome over the throat to a closed position, in which liquid is blocked from passing through the throat, and removing the dome from the throat to an open position in which liquid is permitted to pass through the throat. In some embodiments, the legs are deformed when the shroud is moved from the closed position to the open position, thereby biasing the cap to the closed position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] FIG. **1** is a view in perspective illustrating an embodiment of the present invention.

[0013] FIG. **2** is a view in perspective illustrating a shroud component of the embodiment of FIG. **1**.

[0014] FIG. **3** is a view in perspective illustrating a valve component of the embodiment of FIG. **1**.

[0015] FIG. **4** is a view in perspective illustrating a cradle component of the embodiment of FIG. **1**.

[0016] FIG. **5** is a view in perspective illustrating the embodiment of FIG. **1**.

[0017] FIG. **6** is a section view in perspective illustrating the embodiment of FIG. **5** through the line **6-6**.

[0018] FIG. **7** is a section view in perspective illustrating the embodiment of FIG. **5** through the line **7-7** in a first, closed, position.

[0019] FIG. **8** is a section view in perspective illustrating the embodiment of FIG. **5** through the line **7-7** in a second, intermediate, position.

[0020] FIG. **9** is a section view in perspective illustrating the embodiment of FIG. **5** through the line **7-7** in a third, open, position.

[0021] FIG. **10** is a bottom view in perspective illustrating the embodiment of FIG. **5** with the bottle removed.

[0022] FIG. **11** is a top view in perspective illustrating the embodiment of FIG. **5** with the bottle removed.

[0023] FIG. **12** is a view in perspective illustrating a second embodiment of the present invention.

[0024] FIG. **13** is a section view in perspective illustrating the embodiment of FIG. **12** through the line **13-13**.

[0025] FIG. **14** is a side view illustrating a shroud component of the embodiment of FIG. **12**.

[0026] FIG. **15** is a top view illustrating the shroud of FIG. **14**.

[0027] FIG. **16** is a view in perspective illustrating a cradle component of the embodiment of FIG. **12**.

[0028] FIG. **17** is a top view illustrating the cradle of FIG. **16**.

[0029] FIG. **18** is a bottom view in perspective illustrating the embodiment of FIG. **12** with the bottle removed.

[0030] FIG. **19** is a top view in perspective illustrating the embodiment of FIG. **12** with the bottle removed.

[0031] FIG. **20** is a side view in section illustrating the embodiment of FIG. **19** through the line **20-20**.

[0032] FIG. **21** is a section view in perspective illustrating the embodiment of FIG. **12** through the line **21-21** in a first, closed, position.

[0033] FIG. **22** is a section view in perspective illustrating the embodiment of FIG. **12** through the line **21-21** in a second, intermediate, position.

[0034] FIG. **23** is a section view in perspective illustrating the embodiment of FIG. **12** through the line **21-21** in a third, open, position.

[0035] In describing the preferred embodiment of the invention which is illustrated in the drawings, specific terminology will be resorted to for the sake of clarity. However, it is not intended that the invention be limited to the specific term so selected and it is to be understood that each specific term includes all technical equivalents which operate in a similar manner to accomplish a similar purpose. For example, the word connected or terms similar thereto are often used. They are not limited to direct connection, but include connection through other elements where such connection is recognized as being equivalent by those skilled in the art.

DETAILED DESCRIPTION OF THE INVENTION

[0036] Embodiments of the present invention are shown in the illustrations. The components of a first cap **10** are shown in an assembled state in FIGS. **1** and **5**, among others, and separately in FIGS. **2-4**. The cap **10** has three main components: a shroud **20**, a valve **30** and a cradle **40**, and these components may be formed of plastic, metal, glass, ceramic or any other suitable material. These components may be manufactured separately and then assembled as described and shown herein or as understood by a person of ordinary skill, or they may be manufactured assembled, such as by **3**-D printing. In the assembled cap **10**, the components may move relative to one another to dispose the cap **10** in, or between, one of two extreme positions. In one extreme position the cap **10** is open and fluid may pass therethrough. In another extreme position the cap **10** is closed and fluid may not pass therethrough, or there is substantial resistance to fluid passing through. As the cap **10** transitions from one extreme position to the other extreme position, the components of the cap **10** are in various stages of permitting and restricting fluid from passing through.

[0037] In some embodiments, the cap **10** is threaded onto the corresponding threads of a mouth of a conventional bottle, such as a plastic water bottle or a plastic soda bottle, and thus the fluid that passes through the cap **10** may flow into the chamber of the conventional bottle. The cap **10** may be threaded onto any receptacle, and is not limited to those discussed herein. Furthermore, the cap may be attached to a receptacle using fasteners other than threads, such as a bayonet structure and others. It is contemplated that the receptacle that is fastened to the cap **10** has a chamber that may communicate with the exterior of the receptacle through a mouth or other opening structure to which the cap **10** may attach.

[0038] The shroud **20** has a substantially cylindrically-shaped sidewall **26** with apertures **22** and **24** formed in opposite circumferential sides of the sidewall **26**. The shape of the apertures **22** and **24** may be circular or elongated, such as an oval or ellipse. An abutment end **28** defines one longitudinal end of the shroud **20** and has an opening **29** formed inside of a shoulder **28'**. The shoulder **28'** extends around the end of the sidewall **26**, and is preferably smooth

and relatively wide, such as the width of a human lip. The shoulder **28'** may be between about one-eighth and about one-half inches wide.

[0039] The bottle end **21** of the sidewall **26** opposite the abutment end **28** (see FIG. **6**) defines the opposite end of the opening **29** that passes through the shroud **20** and may be the shroud end that is closer to a bottle to which the cap **10** is attached. The sidewall **26** may have a thickness at the end **21** that is substantially less than the width of the shoulder **28'**, and the thickness may be about one-sixteenth of an inch. The diameter of the shroud **20** may be one and one-half inches. These dimensions are examples of contemplated dimensions of a cap **10** used on a conventional water or soda bottle, and are not limiting. A person having ordinary skill will understand that a cap designed for a different bottle or receptacle may be much larger or much smaller.

[0040] The valve **30** has coaxial axles **32** and **34** protruding from opposite longitudinal ends of a yoke **36**. The axles **32** and **34** preferably have cylindrical outer surfaces **32'** and **34'**, respectively, and may extend, in an operable configuration, through the apertures **22** and **24**, respectively. The surfaces **32'** and **34'** may seat against the portions of the sidewall **26** that define the apertures **22** and **24**. An axis Al, defined by the cylindrical outer surfaces **32'** and **34'**, extends through the axles **32** and **34**.

[0041] Two other coaxial axles **33** and **35**, which have cylindrical outer surfaces **33'** and **35'**, respectively, protrude from opposite longitudinal ends of the yoke **36** adjacent the axles **32** and **34**. An axis A**2** defined by the cylindrical outer surfaces **33'** and **35'** is substantially parallel to the axis Al and is offset radially therefrom.

[0042] The yoke **36** is made up of two yoke sections **36**a and **36**b with an aperture **37** defined therebetween. The aperture **37** is large enough to permit liquid to pass through, and in some embodiments may be between **0.5** to **1.0** inches wide. The yoke sections **36**a and **36**b have outer surfaces **36***a'* and **36***b'* that may be spherical and face outwardly from the aperture **37**. The outer surfaces **36***a'* and **36***b'* are coaxial with the axis A**2**.

[0043] The cradle **40** has two bearing surfaces **43** and **45** defining voids **43'** and **45'** that are formed in a substantially cylindrical collar **44**. The surfaces **43** and **45** may be circular cylindrical (or at least a portion of a circular cylinder) and coaxial with one another. The collar **44** may be a circular cylinder that is substantially coaxial with the axis of the sidewall **26** when the cap **10** is fully assembled. Radially outwardly extending ribs **49** are formed around the exterior of the collar **44** to facilitate and improve the grip of a human user rotating the collar **44** while threading onto the bottle **50**. Radially-inwardly extending threads **49'** may be formed near one end of the collar **44** and configured to receive the outwardly-extending threads **59** on the mouth of a common water or soda bottle **50** (see FIG. **6** — only a portion of the water or soda bottle is shown). Any other fastener to attach to any other container is contemplated to substitute for the threads.

[0044] The interior of the central portion of the collar **44** includes a throat **47** defined by a cradle void surface **47'** at the lower end (in the orientation of FIG. **4**) of the opposing first and second surfaces **46***a'* and **46***b'*. The cradle void surface **47'** extends entirely around the collar **44** and defines the throat **47** that forms the passage through the cradle **40**. The first surface **46***a'* may have a spherical contour similar to the contour of the spherical surface **36***a'*.

[0045] The second surface **46***b'* may have a spherical contour similar to the contour of the spherical surface **36***b'*. The first and second surfaces **46***a'* and **46***b'* may be coaxial with the surfaces **43** and **45**.

[0046] When the cap **10** is assembled, as shown in FIGS. **1**, **5** and **6**, the valve **30** is inserted in the shroud **20** until the axles **32** and **34** are inserted in the apertures **22** and **24**, respectively. Next, the cradle **40** may be inserted until the axles **33** and **35** are inserted in the voids **43'** and **45'**, respectively. In this configuration, at least a portion of the valve **30**, such as the yoke **36**, is disposed in or near the throat **47** with the axles **33** and **35** resting in the voids **43'** and **45'**, respectively. The cylindrical surfaces **33'** and **35'** seat against the bearing surfaces **43** and **45**, respectively, and are able to move relative thereto. The surface **36***a'* is disposed in a sealing relationship with the surface **46***a'* and the surface **36***b'* is disposed in a sealing relationship with the surface **46***b'*. Because of these sealing relationships, no liquid may pass through a gap between the surfaces **36***a'* and **46***a'*, nor may liquid pass through a gap between the surfaces **36***b'* and **46***b'*. When any surface is in a sealing relationship with another surface, no liquid may pass therebetween. In an alternative embodiment, a very small amount of liquid my pass slowly through these gaps so as to effectively prevent substantial liquid passage.

[0047] Because of the cooperation between the coaxial cylindrical surfaces **33'** and **35'** with the coaxial cylindrical surfaces **43** and **45**, the valve **30** may rotate about the axis A**2** of the cylindrical surfaces **33'** and **35'** while the surfaces **46***a'* and **46***b'* maintain their radial proximity with the surfaces **36***a'* and **36***b'*, respectively. The surfaces **46***a'* and **46***b'* are also coaxial with the cylindrical surfaces **33'** and **35'** when the valve **30** is mounted in the cradle **40**. Thus, when the valve **30** rotates about the axis A**2** of the cylindrical surfaces **33'** and **35'**, the spherical surfaces **36***a'* and **36***b'* are not extended radially outwardly or inwardly from the axis of rotation. This permits the spherical surfaces **36***a'* and **36***b'* to rotate relative to the spherical surfaces **46***a'* and **46***b'* without significant resistance while maintaining the same relative radial positions and sealing relationships.

[0048] The cap **10** thus has components that move relative to one another. The shroud **20** may move longitudinally relative to the valve **30** and the cradle **40**, and the valve **30** may rotate relative to the cradle **40** and the shroud **20**. The fully assembled cap **10** is in a "resting configuration" when no substantial external forces are applied to the cap **10**, and this is preferably when the cap is in the "closed" position or configuration, which is shown in FIGS. **6** and **7**. The cap maintains the resting configuration due to a coil spring, leaf spring, or another bias (not shown), which may include gravity, tending to position the valve **30** relative to the cradle **40** to close off any passage(s) through the aperture **29**. In order to move to the open configuration, a force must be applied that overcomes the bias.

[0049] As shown in FIGS. **6**, **7** and **10**, in the closed configuration the valve **30** is disposed in the cradle **40** with the yoke section outer surface **36***b'* seating in a sealing relationship against the cradle void surface **47'**. In this configuration, the yoke section **36**b obstructs the throat **47** by the surface **36***b'* sealingly seating against the cradle void surface **47'**, thereby preventing any liquid, and possibly any gas, from passing through the throat **47**, and therefore the cap **10**. Thus, any liquid in the bottle **50** may not flow through the cap **10** and out of the bottle in the closed

configuration. In an alternative, a small amount of liquid may pass slowly through the cap **10** due to an imperfect seal.

[0050] In order to move the cap from the closed configuration shown in FIG. **7** to the open configuration shown in FIG. **9**, the valve **30** must be rotated about **90** degrees relative to the cradle **40**. In order to do this, the shroud **20** is first moved longitudinally relative to the cradle **40**, such as by applying a longitudinal force to the shoulder **28'** toward the collar **40**. In a contemplated scenario, this may be accomplished by a human user pressing his lip against the shoulder **28'** while holding the bottle **50**, to which the cap **10** is attached, in one hand. This may be carried out by an action similar to a human user raising such a bottle to his or her lips to drink, but without taking in any liquid, and by pressing the shoulder **28'** against the lower lip with a greater force than he or she would press the mouth of the bottle against the lower lip to seal against leakage when drinking.

[0051] This longitudinal force applied by the user is transferred from the shoulder **28'** of the shroud **20** to the axles **32** and **34**. Because the axis A1 of the axles **32** and **34** is disposed radially from the axis A2 of the axles **33** and **35** (with is radially outwardly of the longitudinal axis of the shroud **20**), the longitudinal force applied to the shroud **20** is transferred to the axles **32** and **34**, which applies a torque to the valve **30** about the axis A2. A sufficient torque causes the valve **30** to rotate about the axis A2 of the axles **33** and **35** as the shroud **20** is displaced longitudinally toward the bottle **50**. This torque moves the axles **32** and **34** along an arcuate path around the axis A2 and rotates the axles **33** and **35** within the bearing surfaces **43** and **45**. Upon the application to the shroud **20** of a sufficient longitudinal force, the shroud **20** moves longitudinally toward the bottle **50** and rotates the valve **30** sufficiently to move the yoke section **36**b at least partially out of registration with the cradle void surface **47'** to the position shown in FIG. **8**. In the FIG. **8** configuration, the axis of the aperture **37** has rotated sufficiently to open a passage so that liquid on one side of the cap **10** may pass through the throat **47**.

[0052] Upon the continued application of a sufficient longitudinal force to the shoulder **28'**, the rotation of the valve **30** continues until the valve **30** reaches the position shown in FIG. **9**, which is the open configuration. In the open configuration, the shroud **20** has been moved longitudinally sufficiently to rotate the valve **30** to the position shown, which may be at the rotational limit of the valve **30**. In this position, one edge of each of the yoke sections **36**a and **36** seats against the inside edge of the shoulder **28'** to create a juncture **60** that is preferably a sealing relationship that prevents any liquid from passing between the valve **30** and the shroud **20**. Instead, all liquid that enters the opening **29** passes through the valve aperture **37**, the throat **47** and into the chamber of the bottle **50**.

[0053] Once access is gained by the user to the chamber of the bottle **50**, the user may expel his or her saliva mixture or other liquid through the aligned aperture **37** and throat **47**. After this expulsion, the user may release the longitudinal force he or she had been applying to the shoulder **28'** by lifting his or her lip from the shoulder **28'** while still holding the bottle in one hand. This removal or sufficient decrease of the longitudinal force causes the reverse rotation of the valve **30**, which may be biased in this direction by a torsion or leaf spring disposed between the valve **30** and the shroud **20**, or the valve **30** and the cradle **40**. This rotation of the valve **30** continues until it moves the cap **10** through the configuration shown in FIG. **8** back to the closed configuration, as shown in FIG. **7**. In the closed configuration, the liquid just placed in the bottle, along with any other liquid in the bottle, will not flow out of the bottle. This is because the cap **10** is sealed in the closed configuration, and will not leak even if the bottle falls over, because the yoke section **36**b seals against the cradle void surface **47'** all around the throat **47**. This seals the contents of the bottle from passing through the cap **10**. When the bottle is full or use is no longer needed, the entire structure may be discarded, the cap may be removed (to be cleaned) and the bottle discarded, or both the cap and the bottle may be cleaned and re-used.

[0054] The apertures **22** and **24** may be elongated to permit the arcuate movement of the axles **32** and **34** about the axis A2 of the axles **33** and **35**. Thus, when the shroud **20** is displaced longitudinally from the position shown in FIG. **7** and the axis Al of the axles **32** and **34** is driven by the shroud **20** along an arcuate path about the axis A2, the elongated apertures **22** and **24** accommodate the lateral component of arcuate movement of the axles **32** and **34**.

[0055] A second embodiment of the present invention is shown in FIGS. **12-23** in a cap **110** with two main components: a shroud **120** and a cradle **140**. These components may be formed of plastic, metal, glass, ceramic or any other suitable material. The components are shown separately in FIGS. **14-17** and fully assembled in FIGS. **12** and **18-20**. A bottle **150** is shown in an operable attachment position in some of the illustrations. As with the embodiment described above, any suitable container may substitute for the bottle **150**.

[0056] The shroud **120** has a substantially cylindrical sidewall **126** with a shoulder **128'** at a first longitudinal end **128**. An opening **129** through the first end **128** extends between the sides of the circumferential shoulder **128'**. A second longitudinal end **121** defines the opposite end of the sidewall **126** and the opening **129** that passes through the sidewall **126**. Four legs **131**, **132**, **133** and **134** extend from near the first end **128**, in the opening **129**, of the shroud **120** longitudinally toward and past the second end **121**, defining gaps therebetween that form a passage for liquid through the shroud **120**. The legs **131-134** attach to a dome **130** at the lower end, in the orientation of FIG. **14**.

[0057] The cradle **140** has a substantially cylindrical collar **155** with threads **149'** extending radially inwardly and ribs **149** extending radially outwardly. The slots **141**, **142**, **143** and **144** are defined by the edges of the funnel ramps **145**, **146**, **147** and **148**, and the slots **141-143** receive the legs **131-134** when the cap **110** is assembled. The funnel ramps **145-148** extend from attachment at one longitudinal end **158** of the cradle **140** toward the opposite longitudinal end **159**, which end **159** defines a throat that accepts the threaded mouth of the bottle **150** or any other receptacle. The funnel ramps **145-148** extend from the cradle in the manner of cantilevers.

[0058] When assembled in an operable configuration, as shown in FIGS. **12-13** and **18-23**, the shroud **120** is positioned around the cradle **140**, and the cradle may be attached to a bottle **150**. When no forces are applied to the cap **110**, the cap **110** may be in the closed position in which the dome **130** is in a sealing relationship with the ends of the ramps **145-148** farthest from the shoulder **128'**, the legs **131-134** are in a sealing relationship with the sides of the ramps

145-148 and the edge of the shoulder **128'** that defines the opening **129** is in a sealing relationship with the longitudinal end **158** of the cradle **145**.

[0059] The shroud **120** may slide longitudinally relative to the cradle **140** by the legs **131-134** moving within the slots **141-144** of the cradle **140**. This may be as a result of a longitudinal force being applied by a user's lip to the shoulder **128'** in the direction of the cradle **140** while holding the exterior of the bottle **150** in one hand, as described above for the embodiment shown in FIGS. **1-11**. The force applied to the shroud **120** displaces the shroud **120** longitudinally from the closed position shown in FIG. **21** toward the intermediate position shown in FIG. **22**.

[0060] During the displacement from the closed position, the legs **131-134** slide in the slots **141-144**, respectively, and the radially outwardly facing surfaces of the legs may slide against the radially inwardly facing surfaces of the slots. The legs **131-134** may have radially outwardly facing surfaces that are slightly wider at one end than the opposite. For example, the illustration of FIG. **20** (showing the closed position) indicates two widths, X and Y, between opposing outwardly facing surfaces of the legs **131-134**. In one embodiment, the dimension X is greater than the dimension Y. Thus, when the shroud **120** is displaced downwardly in the orientation of FIG. **20**, the legs **131-134** are forced by the movement relative to the structures that define the slots **141-144** to bend slightly inwardly, thereby functioning as leaf springs that tend to force the shroud **120** to the closed position of FIG. **21** when all forces are removed from the cap **110**. Alternatively, X may be equal to Y and a coil or other spring may be inserted between the shroud **120** and the cradle **140**, as will be understood by the person of ordinary skill, in order to bias the components of the cap **110** to the closed configuration.

[0061] With the embodiment shown in FIGS. **12-23**, the shroud **120** may be moved from the closed position shown in FIG. **21** to the intermediate position of FIG. **22**. In the closed position, the dome **130** is pressed against the ramps **145-148** and all contacting surfaces form sealing relationships to prevent liquid from passing through the cap. Upon movement to the intermediate position of FIG. **22**, gaps **160** are formed that permit some liquid to pass through the cap **110**. When the shroud **120** is moved to the open position of FIG. **23**, the gaps **160** are sufficiently large that significant amounts of liquid may pass through the cap **110**. Thus, a user whose lip is already on the shoulder **128'** may expel a liquid mixture through the opening **129**, through the gaps **160**, and into the bottle **150** chamber.

[0062] After expulsion of liquid from the mouth into the chamber, the user may release the longitudinal force applied against the shroud **120**, at which time the bias tends to move the shroud **120** back to the closed position shown in FIG. **21**. Thus, the user may open and close the cap **110** to permit liquid to pass through by simply raising the arm holding the receptacle, pressing the shroud against the lip with light pressure, and then releasing the longitudinal force. This permits one-handed use of the receptacle into which the user expels the liquid.

[0063] This detailed description in connection with the drawings is intended principally as a description of the presently preferred embodiments of the invention, and is not intended to represent the only form in which the present invention may be constructed or utilized. The description sets forth the designs, functions, means, and methods of implementing the invention in connection with the illustrated embodiments. It is to be understood, however, that the same or equivalent functions and features may be accomplished by different embodiments that are also intended to be encompassed within the spirit and scope of the invention and that various modifications may be adopted without departing from the invention or scope of the following claims.

1. A cap for removably mounting to a receptacle that has a chamber, the cap comprising:

(a) a shroud having a sidewall that extends from a shoulder near a first shroud end to an opposite second shroud end, the shoulder defining an opening to a passage that extends longitudinally through the shroud from the first shroud end to the second shroud end; and

(b) a cradle having a substantially cylindrical collar configured for attachment to the receptacle and defining at least one throat therethrough, the cradle being mounted at least partially in the shroud;

wherein the shroud is configured for movement relative to the cradle by applying a longitudinal force to the shroud and thereby moving between a closed configuration, in which the at least one throat is at least partially blocked to the flow of liquid, and an open configuration, in which the at least one throat is not blocked and liquid may flow through the longitudinal passage between the opening and the chamber.

2. The cap in accordance with claim **1**, further comprising a valve disposed adjacent the throat of the cradle within the longitudinal passage of the shroud, wherein the valve is configured for rotation relative to the cradle by applying a longitudinal force to the shroud.

3. The cap in accordance with claim **2**, wherein the valve has a first axis of rotation relative to the shroud and a second axis of rotation relative to the cradle, wherein the first and second axes are substantially parallel.

4. The cap in accordance with claim **2**, wherein the valve has a yoke with at least one yoke section that is selectively disposed in the throat of the cradle in the closed configuration.

5. The cap in accordance with claim **1**, further comprising:

(a) at least first and second legs extending longitudinally from the shroud to a dome with gaps therebetween, thereby defining first and second passages between the shoulder, the legs and the dome;

(b) at least first and second funnel ramps extending from the cradle and defining at least first and second slots therebetween into which the first and second legs are disposed, the funnel ramps defining the throat, wherein the dome is selectively disposed over the throat in the closed position, and the dome is spaced from the throat in the open position.

6. The cap in accordance with claim **5**, wherein the legs are deformed when the shroud is moved from the closed position to the open position, thereby biasing the cap to the closed position.

7. A cap removably mounted to a receptacle that has a chamber, the cap comprising:

(a) a shroud having a sidewall that extends from a shoulder near a first shroud end to an opposite second shroud end, the shoulder defining an opening to a passage that extends longitudinally through the shroud from the first shroud end to the second shroud end;

(b) a cradle having a substantially cylindrical collar attached to the receptacle and defining at least one

throat therethrough, the cradle being mounted at least partially in the shroud, wherein the shroud is configured for movement relative to the cradle by applying a longitudinal force to the shroud; and

(c) a valve mounted to the cradle adjacent the at least one throat and in the longitudinal passage of the shroud, wherein the valve is rotatably mounted to the cradle and configured to move between a closed configuration, in which the throat is at least partially blocked by a section of the valve, and an open configuration, in which the throat is not blocked.

8. The cap in accordance with claim **7**, wherein the valve has at least a first axle with a first axis of rotation relative to the shroud and at least a second axle with a second axis of rotation relative to the cradle, wherein the first and second axes are substantially parallel, the at least first axle rotatably mounts to the shroud and the at least second axle rotatably mounts to the cradle.

9. The cap in accordance with claim **7**, wherein the valve has a yoke with at least one yoke section that is the section of the valve that is selectively disposed in the throat of the cradle in the closed configuration.

10. A cap removably mounted to a receptacle that has a chamber, the cap comprising:

(a) a shroud having a sidewall that extends from a shoulder near a first shroud end to an opposite second shroud end, the shoulder defining an opening to a passage that extends longitudinally through the shroud from the first shroud end to the second shroud end;

(b) at least first and second legs extending longitudinally from the shroud to a dome with gaps therebetween, thereby defining first and second passages between the shoulder, the legs and the dome;

(c) a cradle having a substantially cylindrical collar attached to the receptacle and at least first and second funnel ramps defining at least first and second slots therebetween into which the first and second legs are disposed, the funnel ramps defining a throat, wherein the cradle mounts at least partially in the shroud and permits relative longitudinal movement between the shroud and the cradle by a longitudinal force applied to the shoulder, thereby moving the shroud relative to the cradle to selectively dispose the dome over the throat to a closed position, in which liquid is blocked from passing through the throat, and removing the dome from the throat to an open position in which liquid is permitted to pass through the throat.

11. The cap in accordance with claim **10**, wherein the legs are deformed when the shroud is moved from the closed position to the open position, thereby biasing the cap to the closed position.

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