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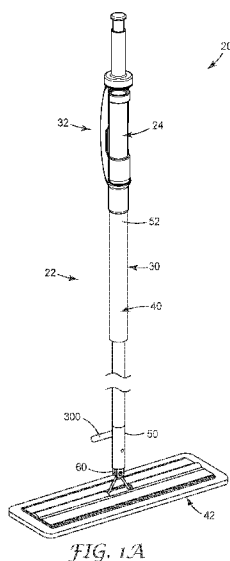
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(54) **Title:** LIQUID DISPENSING CLEANING SYSTEM AND METHODS OF USE



(57) **Abstract:** A cleaning system including a lower unit, a liquid dispense assembly, and a reservoir unit. The lower unit includes a shaft defining an interior passage. The liquid dispense assembly is connected to the shaft and includes a housing and a drainage tube. The housing forms an open chamber. The drainage tube is carried by the housing. The reservoir unit includes a bottle and a cap. The reservoir unit is selectively retained within the chamber. The system is operable between closed and dispensing states. In the closed state, the drainage tube is displaced from the cap. In the dispensing state, a portion of the drainage tube passes through the cap for delivering liquid from the bottle to the interior passage. In some embodiments, the cap includes a bifurcating valve, and the drainage tube includes an insertion segment configured to repeatedly slide through the bifurcating valve in a non-destructive manner.



LIQUID DISPENSING CLEANING SYSTEM AND METHODS OF USE

Background

The present disclosure relates to mops or similar cleaning implements. More particularly, it relates to manually operable, liquid dispensing mops.

Mop assemblies of the type used for applying liquids (e.g., water, cleaning solutions, floor wax, disinfectants, etc.) to a floor surface commonly include a mop head, a handle by which the mop head can be manually moved along the surface, and a reservoir containing the liquid. The reservoir is usually connected to a nozzle or dispensing tube situated near the mop head so that liquid can be deposited onto the mop head or onto the floor surface at a position close to the mop head to facilitate application or spreading of the liquid over the floor surface. The flow of liquid from the reservoir is typically controlled by a valve, which is normally closed to stop the flow of liquid through the valve, but can be opened to allow liquid from the reservoir to flow through the valve. The valve is generally actuated by the operator in order to permit dispensing of the liquid at a time and place desired for optimal liquid usage efficiency. One advantage of such liquid dispensing mop assemblies is that there is no need for the mop operator to apply the liquid to the surface in a separate step; instead, it can be done as part of the mopping operation, thereby increasing the efficiency of the mopping process.

In many conventional liquid dispensing mop assemblies, the reservoir is disposed on or adjacent the handle, typically low on the handle just above the mop head. Although this makes for convenient location of the reservoir, it increases the weight and bulkiness of the mop assembly, making it more difficult and tiring to use since the weight of the reservoir (and contained liquid) is located a relatively large distance from the handle pivot point that must be overcome by a greater user-applied moment or stress when swinging or pushing the mop during normal use. Some mop assemblies attempt to avoid these problems by separating the reservoir from the mop handle so that the reservoir does not have to be moved back and forth with the handle during the mopping process; however, such systems can be cumbersome and awkward to manipulate as the connection between the dispensing tube and the reservoir can interfere with use of the mop.

Other concerns with conventional liquid dispensing mop assemblies relate to re-filling of a depleted reservoir. With some designs, the reservoir is a permanent structure of the mop itself.

In many instances, it can be difficult for a user to quickly re-fill the permanent reservoir without spillage. Conversely, other constructions provide the reservoir in the form of a container apart from the mop itself, with the mop having brackets or other structures for removably receiving the container. A depleted container can readily be replaced with a new container of liquid, but accidental spillage may invariably occur. Moreover, the mechanisms affording operator control over the dispensing of liquid are not ergonomically correct or convenient, and/or can be quite complex and thus costly.

In light of the above, a need exists for improved liquid dispensing cleaning systems, such as liquid dispensing mops.

Summary

Some aspects of the present disclosure are directed toward a cleaning system. The cleaning system include a lower unit, a liquid dispense assembly, and a reservoir unit. The lower unit includes a shaft and media holder. The shaft defines a first end, a second end opposite the first end, and an interior passage open to the first end. The media holder is connected to the shaft adjacent the second end. The liquid dispense assembly is connected to the first end and includes a housing and a drainage tube. The housing forms an open chamber. The drainage tube is carried by the housing. The reservoir unit includes a bottle and a cap. The bottle is adapted to contain a liquid and terminates at an open end. The cap covers the open end. The system is configured to provide a loaded arrangement in which the reservoir unit is selectively retained within the chamber. Further, the system is configured to be manually operable in the loaded arrangement between a closed state and a dispensing state. In the closed state, the drainage tube is displaced from the cap. In the dispensing state, a portion of the drainage tube passes through the cap for delivering liquid from the bottle to the interior passage. With this construction, the reservoir unit is easily assembled to and removed from the liquid dispense assembly. Further, the mechanisms by which an operator can selectively dispense liquid from the reservoir unit are straightforward and easy to operate. In some embodiments, the liquid dispense assembly includes a plunger for operator-prompted dispensing of liquid, with the plunger arranged to be actuated by a pressing force applied by an operator's hand otherwise grasping the housing. In other embodiments, the cap includes or carries a valve, such as a bifurcating valve, and the drainage tube includes an insertion segment configured to repeatedly slide through the bifurcating valve in a non-destructive manner.

Other aspects of the present disclosure are directed toward a liquid dispense assembly for use with a mop apparatus. The liquid dispense assembly includes a housing, a plunger, a drainage tube, and a hub. The housing defines a leading section, an intermediate section, and a trailing section. The intermediate section forms an open chamber for selectively receiving a reservoir unit. The leading section defines an interior passageway open to an end of the housing and terminating at an orifice opposite the end. The plunger is slidably coupled to the trailing section. The drainage tube is attached to the orifice and defines a lumen open to the chamber and the interior passageway. Further, the drainage tube includes an insertion section for selectively interfacing with a reservoir unit. The hub is slidably disposed about the drainage tube. With this construction, the liquid dispense assembly can be assembled to a shaft of a mop apparatus, and provides an ergonomically convenient mechanism for manually-prompted liquid dispensing. In some embodiments, the liquid dispense assembly further includes a spring biasing the hub in a direction of the trailing section.

Yet other aspects of the present disclosure are directed toward a method of cleaning. The method includes loading a reservoir unit into a liquid dispense assembly of a mop apparatus. The reservoir unit includes a bottle containing a liquid and a cap covering an open end of the bottle. A plunger of the liquid dispense assembly is then depressed to cause a drainage tube of the liquid dispense assembly to pass through the cap. Commensurate with the step of depressing, the drainage tube is open to an interior passage of a shaft of the mop apparatus so as to dispense liquid from the bottle onto a surface to be cleaned. In some embodiments, an entirety of the reservoir unit moves relative to the drainage tube with the step of depressing the plunger.

Brief Description of the Drawings

FIG. 1A is a perspective view of a cleaning system in accordance with principles of the present disclosure, including a reservoir unit loaded to liquid dispense assembly;

FIG. 1B is a perspective view of the cleaning system of FIG. 1A and illustrating the reservoir unit apart from the liquid dispense assembly;

FIG. 2 is a perspective, exploded view of a liquid dispense assembly useful with the system of FIG. 1A;

FIG. 3 is a longitudinal, cross-sectional view of a housing useful with the liquid dispense assembly of FIG. 2;

FIG. 4 is a cross-sectional view of the housing of FIG. 3, taken along the line 4-4;

FIG. 5 is a cross-sectional view of the housing of FIG. 3, taken along the line 5-5;

FIG. 6 is an enlarged perspective view of a drainage tube useful with the liquid dispense assembly of FIG. 2;

FIG. 7 is an exploded perspective view of the drainage tube of FIG. 6;

FIG. 8 is a longitudinal cross-sectional view of the drainage tube of FIG. 6;

FIG. 9 is a longitudinal cross-sectional view of a portion of the liquid dispense assembly of FIG. 3, illustrating assembly of a plunger to the housing;

FIG. 10A is an enlarged perspective view of a hub useful with the liquid dispense assembly of FIG. 2;

FIG. 10B is an end view of the hub of FIG. 10A;

FIG. 10C is a cross-sectional view of the hub of FIG. 10B, taken along the line 10C-10C;

FIG. 11 is a longitudinal cross-sectional view of a portion of the liquid dispense assembly of FIG. 3, illustrating assembly of the drainage tube of FIG. 6 and a biasing assembly to the housing of FIG. 3;

FIG. 12 is an enlarged longitudinal cross-sectional view of a portion of a reservoir unit useful with the cleaning system of FIG. 1A;

FIG. 13A is a longitudinal cross-sectional view of a portion of the cleaning system of FIG. 1A, illustrating a closed state of the cleaning system;

FIG. 13B is an enlarged cross-sectional view of a portion of the view of FIG. 13A; and

FIG. 14 is a longitudinal cross-sectional view of a portion of the cleaning system of FIG. 1A, illustrating a dispensing state of the cleaning system.

Detailed Description

One embodiment of a cleaning system 20 in accordance with principles of the present disclosure is shown in FIGS. 1A and 1B. The cleaning system 20 includes a cleaning apparatus (e.g., a mop apparatus) 22 and a reservoir unit 24. In general terms, the reservoir unit 24 contains a volume of liquid and is selectively or removably received by the mop apparatus 22. As a point of reference, FIG. 1A depicts the reservoir unit 24 mounted to the mop apparatus 22 in a loaded arrangement of the system 20, whereas in the unloaded arrangement of FIG. 1B, the reservoir unit 24 is removed from the mop apparatus 22. In addition to facilitating selective mounting of the reservoir unit 24, the mop apparatus 22 includes various features that promote user-prompted

dispensing of liquid from the reservoir unit 24 onto the surface to be cleaned as described in greater detail below.

The mop apparatus 22 generally includes a lower unit 30 and a liquid dispense assembly 32. The lower unit 30 is assembled to the liquid dispense assembly 32, and includes or carries various implements for cleaning. The liquid dispense assembly 32, in turn, is configured to receive the reservoir unit 24, and includes components operable for dispensing liquid from the reservoir unit 24 to the lower unit 30. In some embodiments, the liquid dispense assembly 32 is formed apart from and assembled to the lower unit 30; alternatively, portions of the lower unit 30 and the liquid dispense assembly 32 can be integrally formed.

The lower unit 30 can assume a variety of forms generally appropriate for a desired end-use application; the present disclosure is not limited to the exemplary formats reflected in the drawings. The lower unit 30 can include a shaft 40 and a media holder 42. The shaft 40 is configured for coupling to (or is integrally formed with one more components of) the liquid dispense assembly 32, and forms an interior passage (hidden in the views of FIGS. 1A and 1B). In some embodiments, the shaft 40 can be akin to a hollow tube. Regardless, the interior passage serves as conduit for directing liquid from the liquid dispense assembly 32. The shaft 40 can alternatively be viewed as a mop handle of the apparatus 22. As used herein, the term “mop handle” has its commonly understood definition: an elongated member having a first, proximal or lower end 50 adjacent the media holder 42, and a second, distal or upper end 52 opposite the first end 50. In some embodiments, the shaft 40 can have an aspect ratio (i.e., length to width ratio) of about 10:1 or greater. For many hand-held implements, a typical cross-section width dimension of the shaft 40 is in the range of about 0.75 inch to about 1.5 inch (about 18 mm to about 38 mm). Similarly, the shaft 40 can have a length of about 20 inches to 60 inches or more depending on the intended utility of the mop apparatus 22. The shaft 40 can be of a set length or can be adjustable in length (e.g., the shaft 40 can have a telescoping configuration).

The media holder 42 is the portion of the mop apparatus 22 (or similar cleaning apparatus) adapted to receive, support or carry a cleaning media (not shown), and can assume a wide variety of forms. The media holder 42 can be, for example, a mop head in the form of a substantially flat or platen media holder, but may be any other suitable structure. The media holder 42 can be adapted to receive any cleaning media format such as woven or nonwoven fabric or paper media as used in so-called flat mops; braided, twisted or woven textile strings or

stripes of fabric as used in so-called string or strip mops; squeegees and various brush-like materials useful for scrubbing floors and other surfaces.

The media holder 42 can be connected to the shaft 40 at or adjacent the first end 50 in various manners. For example, FIGS. 1A and 1B depict one exemplary connection in the form of a coupling joint 60 that may provide a fixed union, thereby holding the media holder 42 in a fixed orientation with respect to the shaft 40. In other embodiments, a swiveling and/or pivoting union can be provided, thereby permitting the media holder 42 to remain attached to the shaft 40 yet assume more than one orientation with respect to the shaft 40.

As evidenced by the above descriptions, the cleaning systems of the present disclosure are not limited to any particular end use cleaning format. It is to be understood that descriptions of the present disclosure in terms of a mop is for convenience and ease of understanding of the description. It is fully contemplated by the inventor that the scope of the present disclosure is not limited to use with a floor mop, but applies to other implements useful for cleaning surfaces or spreading or otherwise applying liquids to a surface including cleaning tools or systems intended for use, for example, on floors, walls, sinks, toilets, windows, etc. In other words, the term “mop” is used herein to refer to any implement that includes a cleaning material fastened to a handle that can be used to clean any surface.

One embodiment of the liquid dispense assembly 32 is shown in greater detail in FIG. 2, and includes a housing 70 and a drainage tube 72. The housing 70 is configured to selectively receive and retain the reservoir unit 24 (FIG. 1B). The drainage tube 72 is carried by the housing 70, and is configured to selectively interface with the reservoir unit 24 in a manner that permits or prevents the flow of liquid from the reservoir unit 24 as described below. In this regard, the fluid dispense assembly 32 includes one or more additional components that facilitate operator-prompted control over the drainage tube 72/reservoir unit 24 interface, for example a plunger 74 and a biasing assembly 76 as described in greater detail below.

The housing 70 includes or defines a leading section 80, an intermediate section 82, and a trailing section 84. In general terms, the leading section 80 is configured for assembly to the shaft 40 (FIG. 1A), and supports the drainage tube 72. The intermediate section 82 extends between the leading and trailing sections 80, 84, and forms or defines an open chamber 86 sized to selectively receive the reservoir unit 24 (FIG. 1B). The trailing section 84 provides a convenient handling surface for a user, and is optionally configured to retain the plunger 74 (where provided). The housing 70 can be an integrally formed body in some embodiments;

alternatively, one or more of the sections 80-84 can be separately formed and subsequently assembled (e.g., the trailing section 84 can be a grip body formed apart from the intermediate section 82).

In certain respects, geometry features associated with the housing 70 are selected in accordance with the geometries of one or more other components connected to the housing 70. With this in mind, and with additional reference to FIG. 3, the leading section 80 forms or defines a neck 90 and a collar 92. The neck 90 is configured for assembly to the shaft 40 (FIG. 1B), whereas the collar 92 is configured to maintain the drainage tube 72 and the optional biasing assembly 76.

The neck 90 has a generally tubular construction, and defines an interior passageway 100. The neck 90 is sized and shaped for assembly to the shaft 40 (FIG. 1B), and can incorporate various features that facilitate a liquid-tight connection. For example, an outer diameter of the neck 90 can correspond with a diameter of the passage (not shown) formed by the shaft 40 such that the housing 70 is assembled to the shaft 40 via insertion of the neck 90 into the shaft passage. The neck 90 can include one or more channels or grooves 102 each adapted to receive an O-ring (not shown), thereby promoting a secure, leak-proof engagement between the neck 90 and an inner surface of the shaft 40. The neck 90 can optionally further include or more additional features that promote fastened connection between the shaft 40 and the housing 70, such as a slot 104 adapted to receive a snap ring or similar attachment component. The neck 90 can be configured for attachment to the shaft 40 in a wide variety of other manners (e.g., friction fit, mechanical fastener, adhesive, welding, etc.). In yet other embodiments, the housing 70 (or at least the leading section 84) can be integrally formed with the shaft 40. Regardless, the interior passageway 100 of the neck 90 is fluidly open or connected to the passage of the shaft 40.

The collar 92 can assume various forms, and generally includes or defines a floor 110 and an outer wall 112. The floor 110 is formed at a transition between the neck 90 and the collar 92, and defines a central orifice 114 that is open to the interior passageway 100. A size and shape of the orifice 114 is configured for receiving a portion of the drainage tube 72 (FIG. 2) as described below. As best shown in FIG. 4, one or more optional air bleed holes 116 are defined through a thickness of the floor 110 at locations radially spaced from the central orifice 114. The air bleed holes 116 are open to the interior passageway 100 (FIG. 3), and promote pressure equalization during a liquid dispensing operation as well as drainage of any liquid that may accumulate within the collar 92 due to imperfect sealing with drainage tube 72. Returning to

FIGS. 2 and 3, the outer wall 112 projects from the floor 110 to form a cavity 118 within which the biasing assembly 76 is received. In this regard, the outer wall 112 is optionally shaped as a right cylinder, defining a diameter sized to slidably receive a component of the biasing assembly 76 as described below. Alternatively, the outer wall 112 can have other constructions that may or may not circumferentially enclose the cavity 118.

The intermediate section 82 includes a side wall 130 and a funnel 132 that combine to at least partially define the chamber 86. The funnel 132 serves as a transition between the side wall 130 and the leading section 80. A shape of an inner surface 134 of the side wall 130 generally corresponds with a shape of the reservoir unit 24 (FIG. 1B), such that the reservoir unit 24 can be generally retained against the inner surface 134. With additional reference to FIG. 5, the side wall 130 terminates at opposing edges 136, 138. As shown, the edges 136, 138 are laterally spaced from one another, creating a gap or opening 140 (referenced generally in FIG. 5) to the chamber 86. In other words, the chamber 86 is open-sided, with a size and shape of the gap 140 selected to allow easy insertion and removal of the reservoir unit 24. In some embodiments, geometry of the inner surface 134 approximates a semi-circle as shown, although other shapes are also acceptable. As identified in FIG. 2, a lateral projection 142 is formed along a length of each of the edges 136, 138, and provides an opening for placement of an operator's finger(s) when attempting to remove the reservoir unit 24 from the chamber 86. Other constructions are also acceptable (e.g., a hole or notch in the side wall 130). In other embodiments, edges 136, 138 can be uniform along an entirety of the intermediate section 82.

The funnel 132 tapers in diameter from the side wall 130 to the collar 92, defining a continuous surface commensurate with that of the outer wall 112. Thus, in some embodiments, the chamber 86 is circumferentially enclosed along the funnel 132 (as compared to the open construction of the chamber 86 along the side wall 130). As described below, the tapering shape of the funnel 132 serves to guide insertion of the reservoir unit 24 (FIG. 1B) into the collar 92.

With specific reference to FIGS. 2 and 3, the trailing section 84 is configured to receive the plunger 74, and includes or defines a ring 150 and a grip 152. A channel 154 extends through the trailing section 84, and is open to the chamber 86. The ring 150 and the grip 152 can thus be annular bodies, with an outer diameter of the grip 152 being less than that of the ring 150 (and of a shape defined by the side wall 130). With this construction, a shoulder 156 is established opposite a terminal end 158 of the grip 152. The grip 152 is sized and shaped for ergonomic handling by a palm of operator's hand in some embodiments, although other configurations are

equally acceptable. As generally reflected by FIG. 3, the trailing section 84 can be separately formed and assembled to the intermediate section 82; alternatively, the housing 70 can be an integral, homogenous body.

The housing 70 can optionally include or incorporate additional features conducive to operator handling. For example, and as identified in FIGS. 2 and 5, a series of optional ribs 159 can project from the side wall 130 to provide increased strength while reducing the amount of material.

Returning to FIG. 2, the drainage tube 72 is generally configured for mounting within the leading section 80 of the housing 70, and to selectively interface with the reservoir unit 24 (FIG. 1B) when disposed within the chamber 86. One embodiment of the drainage tube 72 is shown in greater detail in FIG. 6, and includes or defines a first end 160 opposite a second end 162, and a lumen 164. The lumen 164 extends through the drainage tube 72, and is open to the first and second ends 160, 162. In some embodiments, the drainage tube 72 includes an insertion segment 170 otherwise terminating at the first end 160. The insertion segment 170 can assume various constructions appropriate for interfacing with a corresponding component of the reservoir unit 24. In some embodiments, for example, the insertion segment 170 includes a plurality of spaced apart, circumferentially arranged splines 172, adjacent ones of which are separated by a slot 174. The splines 172 (and corresponding slots 174) extend longitudinally (i.e., parallel to a central longitudinal axis of the drainage tube 72), and are adapted, in some embodiments, for slidable insertion into and retraction from a valve structure such as a bifurcating valve allowing air to enter between the splines 172 (i.e., via the slots 174). Other constructions are also envisioned, commensurate a valve or other self-sealing configuration provided with the reservoir unit 24.

Other optional features provided with the drainage tube 72 can be selected to promote assembly with the housing 70 (FIG. 2) and/or to interface with the biasing assembly 76 (FIG. 2). For example, the drainage tube 72 can include a flange 180, a guide segment 182 and a mounting segment 184. The insertion segment 170 projects from the flange 180, with an outer diameter of the flange 180 being greater than an outer diameter collectively defined by the splines 172. The guide segment 182 extends from the flange 180 in a direction opposite the insertion segment 170, and is generally configured to interface with a component of the biasing assembly 76 as described below. The guide segment 182 can be cylindrical in shape, optionally having an outer diameter less than the diameter of the flange 180. The mounting segment 184 terminates at the second end 162 and is sized and shaped for mounted assembly to the housing 70 as described

below. For example, the mounting segment 184 can be cylindrical in shape, having a stepped reduction in outer diameter to generate a rim 186 for reasons made clear below. The drainage tube 72 can be assembled to the housing 70 in a wide variety of manners, such that the drainage tube 72 can incorporate other constructions differing from the mounting segment 184 as shown.

The drainage tube 72 can be an integral, homogenous body. Alternatively, the drainage tube 72 can be formed by two (or more) separate components, such as shown in FIG. 7. More particularly, the drainage tube 72 is optionally generated by assembly of a head member 190 and a base member 192. The head member 190 includes or forms the insertion segment 170, the flange 180, and a coupling body 194 forming exterior threads 196. The base member 192 includes or forms the guide segment 182 and the mounting segment 184, and forms an interiorly threaded surface 198. The head member 190 is assembled to the base member 192 via threaded engagement between the coupling body 194 and the interiorly threaded surface 198. Regardless, the lumen 164 is continuous through the drainage tube 72 as further reflected by FIG. 8.

Returning to FIG. 2, the plunger 74 is generally configured to facilitate user-actuated dispensing of liquid from the reservoir unit 24 (FIG. 1B), and can assume a variety of forms. In some embodiments, the plunger 74 includes a shaft 200, a capture body 202 and a button 204. The shaft 200 is sized to be slidably received within the channel 154 (referenced generally in FIG. 2) of the housing trailing section 84 (e.g., an outer dimension of the shaft 200 is less than a diameter of the channel 154), and has a length greater than a length of the channel 154. The capture body 202 and the button 204 are attached to opposite ends of the shaft 200 and present an enlarged diameter such that once assembled to the housing 70, the plunger 74 cannot inadvertently be removed (i.e., the capture body 202 and the button 204 cannot pass through the channel 154). For example, and as shown in FIG. 9, longitudinal sliding movement of the plunger 74 relative to the housing 70 is constrained by the capture body 202 contacting the shoulder 156, and by the button 204 contacting the terminal end 158. In some embodiments, the button 204 (and/or the capture body 202) is formed apart from the shaft 200. Assembly of the plunger 74 to the housing 70 entails insertion of the shaft 200 through the channel 154, followed by assembly of the button 204 to the shaft 200. A wide variety of other mounting configurations are equally acceptable.

Returning to FIG. 2, the optional biasing assembly 76 can assume a variety of forms and in some embodiments includes a hub 210 and a spring 212. One exemplary construction of the hub 210 is shown in FIGS. 10A-10C, and includes a hub body 220 and a platform 222. The hub

body 220 has an annular shape, extending between opposing, first and second ends 224, 226. The platform 222 is located intermediate the opposing ends 224, 226, and is perpendicular to a central axis of the hub body 220. As identified in FIG. 10C, the platform 222 defines opposing, first and second faces 230, 232. A central opening 234 is formed through a thickness of the platform 222, and is sized to co-axially receive a portion of the drainage tube 72 (FIG. 2). Further, drainage holes 236 are optionally formed through a thickness of the platform 222 at locations radially spaced from the central opening 234 for reasons made clear below. Regardless, the platform 222 combines with the hub body 220 to define a capture region 238 for receiving the spring 212 (FIG. 2). The hub body 220 further forms a central bore 240 between the first end 224 and the first face 230 of the platform 222. The bore 240 is fluidly open to the central opening 234 (as well as the drainage holes 236 where provided). The bore 240 has a stepped diameter, defining a shelf 242 intermediate the platform 222 and the first end 224. A diameter of the bore 240 between the shelf 242 and the first end 224 corresponds with a component of the reservoir unit 24 (FIG. 1B), with a geometry of the shelf 242 and the reservoir unit component (e.g., a cap) selected in tandem such that the reservoir unit 24 can be placed into the bore 240 in abutting contact with the shelf 242. A diameter of the bore 240 between the shelf 242 and the platform 222 is selected to slidably accommodate corresponding features of the drainage tube 72, including the optional flange 180 (FIG. 7) as described below.

Returning to FIG. 2, the spring 212 can assume a variety of forms appropriate for interfacing with the hub 210 as described below. In some embodiments, the spring 212 is a helically wound compression spring. Other configurations are also acceptable, and in some embodiments the spring 212 can be replaced with any other biasing member or mechanism format.

Mounting of the drainage tube 72 and the biasing assembly 76 to the housing 70 is shown in FIG. 11. The drainage tube 72 is attached to the housing collar 92, locating the insertion segment 170 away from the floor 110. For example, the mounting segment 184 can be press-fit into the orifice 114, establishing a fixed relationship (e.g., the drainage tube 72 does not move relative to the housing 70). Other mounting configurations are equally acceptable that may or may not entail a fixed arrangement. Regardless, the drainage tube lumen 164 is fluidly open to the interior passageway 100. The hub 210 is slidably disposed over the drainage tube 72, including the guide segment 182 of the drainage tube 72 being received within the central opening 234 of the platform 222. As shown, a diameter of the central opening 234 is less than a

diameter of the flange 180. Upon final assembly, then, the hub 210 is arranged such that the first face 230 of the platform 222 selectively contacts or abuts the flange 180. Further, the insertion segment 170 is located within the bore 240 of the hub 210, with the hub body 220 being radially spaced from the insertion segment 170 (e.g., the insertion segment 170 and the flange 180 freely slide relative to the hub 210 within the bore 240). The spring 212 is captured between the floor 110 and the second face 232 of the platform 222, and biases the hub 210 away from the floor 110 to the arrangement of FIG. 11. As a point of reference, FIG. 11 reflects a normal or “closed” state of the liquid dispense assembly 32. In the closed state, the spring 212 biases the hub 210 such that platform 222 abuts the flange 180; because the drainage tube 72 (and thus the flange 180) is spatially fixed relative to the floor 110, a static interface is established, preventing the hub 210 from moving beyond (or upwardly relative to the orientation FIG. 11). When a force is applied to the hub 210 sufficient to overcome a biasing force of the spring 212, the hub 210 is caused to move toward the floor 110 for reasons made clear below. Upon removal of this force, the spring 212 biases the hub 210 back to the closed state of FIG. 11. As shown, the shelf 242 is displaced away (i.e., above relative to the orientation of FIG. 11) from the insertion segment 170 of the drainage tube 72 in the closed state.

Returning to FIG. 1B, the reservoir unit 24 generally includes a bottle 250 and a cap 252. The bottle 250 defines an internal volume for containing a liquid, and terminates at an open end or orifice 254 (referenced generally) that is covered by the cap 252 as shown in FIG. 12. The cap 252 effectively defines a face 256 that closes the open end 254. The face 256 can have a self-sealing or self-closing attribute, whereby a body can be inserted through the face 256 and following subsequent removal of the body, the face 256 (or other component associated with the face 256) self-seals or self-closes. For example, the face 256 can carry or form or be open to a valve structure (not shown). In some embodiments the valve is of a type known to those of skill in the art as bifurcating valve. A bottle cap containing a bifurcating valve may be obtained from Liquid Molding Systems, Inc., Midland, Mich. As a point of reference, while bifurcating valves are sometimes employed to permit flow in response to an external pressure, such as squeezing of the bottle 250, and to prevent fluid flow absent such pressure, operation of the liquid dispense assemblies of the present disclosure is premised upon passing a body through the bifurcating valve (as opposed to squeezing the bottle 250). Other valve constructions are also acceptable. In other embodiments, the face 256 can be or include a self-sealing or self-closing membrane or material layer(s). Though not shown, the cap 252 can optionally include a lid that may be

attached to the cap 252 by a hinge, for example, to prevent unexpected flow of liquid through the face 256 during periods of non-use.

The bottle 250 can assume various shapes and sizes, and in some embodiments is constructed to exhibit at least some longitudinal rigidity (e.g., the bottle 250 will not overtly deform when subjected to the external forces described below). While the bottle 250 may have a substantially rigid construction, in other embodiments the bottle 250 can be constructed to deform in response to a squeezing force. In yet other embodiments, the bottle 250 can be entirely deformable (e.g., akin to a bag or pouch), with the reservoir unit 24 further including one more outer containers that surround the bottle 250 and provide some level of longitudinal rigidity (e.g., a bag-in-a-box design). Further, the reservoir unit 24 may comprise more than one chamber, thereby permitting the contents of multiple chambers to react, combine or mix prior to or during dispensing. The liquid contained by the reservoir unit 24 can be any format desired. Non-limiting examples of liquids useful with the present disclosure include water, water-based cleaning solutions, other liquid cleaning solutions, floor wax, etc. Further, cleaning systems of the present disclosure can include two (or more) of the reservoir units 24 each containing the same or a different liquid; optionally, the system also include a carrier for additional reservoir units such as holder adapted to carry one or more reservoir units and to be worn on the body of the operator.

As mentioned above, FIG. 1B illustrates the reservoir unit 24 apart or disassembled from the mop apparatus 22. The reservoir unit 24 can easily be loaded into the chamber 86 in multiple fashions by an operator via insertion through the gap 140 (FIG. 5). For example, the reservoir unit 24 is manipulated to first locate a trailing end of the bottle 250 against the capture body 202 of the plunger 74 and then allowed to slip the cap 252 on the shelf 242. It will be recalled that in the normal (or closed) state of FIG. 13A, the spring 212 biases the hub 210 away from the floor 110, including the shelf 242 being displaced away from the insertion segment 170. Thus, during loading of the reservoir unit 24 (in which the cap 252 is engaged with or abuts against the shelf 242), the insertion segment 170 of the drainage tube 72 does not interface with the cap 252, and no liquid is released or dispensed from the reservoir unit 24.

The loaded arrangement of the cleaning system 20 (with the reservoir unit 24 loaded into the liquid dispense assembly 32) is shown in FIGS. 13A and 13B, and reflects a closed or “normal” state. For ease of illustration, the lower unit 30 (FIG. 1A) is omitted from the views. The reservoir unit 24 is fully loaded into the chamber 86, including the cap 252 engaged with the shelf 242 of the hub 210. The spring 212 biases the hub 210 to the arrangement shown, with the

hub 210, in turn, locating the cap 252 longitudinally away from the drainage tube 72. That is to say, in the closed state, the insertion segment 170 does not interface with the cap 252 such that the seal provided by the cap face 256 remains intact, preventing release of liquid from the reservoir unit 24. It should be noted that in the view of FIG. 13A, the plunger 74 is arranged such that capture body 202 is in contact with the bottle 250. This may naturally occur where the plunger shaft 200 can freely slide relative to the grip 152 and the liquid dispense assembly 32 is held in an upright fashion (e.g., the orientation of FIG. 13A); under these circumstances, the plunger 74 may self-articulate into the arrangement of FIG. 13A under the force of gravity. However, so long as no external forces are placed onto the plunger 74 (e.g., so long as the operator does not exert an overt pressing force onto the plunger button 204), a biasing force of the spring 212 is sufficient to maintain the closed or normal state under the combined weight of the reservoir unit 24 and the plunger 74. In other words, absent an overt action by the operator, the liquid dispense assembly 32 remains in the closed state and liquid is not released from the reservoir unit 24.

To dispense liquid from the reservoir unit 24, the operator applies a manual force onto the plunger 74 in a direction of the reservoir unit 24 (represented by the arrow “D” in FIG. 13A) while keeping the housing 70 relatively stationary. For example, while handling the housing 70, the operator can hold the grip 152 in the palm of a single hand and apply a pressing force on to the plunger button 204 with the thumb of the single hand in an ergonomically convenient fashion. Other techniques for applying a manual force on to the plunger 74 are also acceptable. Regardless, the force placed on to the plunger 74 is transferred on to the reservoir unit 24 and in turn on to the hub 210 (due to a longitudinal rigidity of the bottle 250). Once the applied force overcomes a bias of the spring 212, the hub 210 and the reservoir unit 24 are caused to move in tandem in a direction of the floor 110, including the hub 210 sliding relative to the drainage tube 72. A spring force of the spring 212 is selected such that an adult human applying the pressing force solely with his/her thumb can readily overcome the bias of the spring 212 in some embodiments. Regardless, the reservoir unit 24 is caused to move relative to the housing 70 and the drainage tube 72 to the dispensing state of FIG. 14.

As the liquid dispense assembly 32 is transitioned from the closed state (FIG. 13B) to the dispense state (FIG. 14), the drainage tube 72 is caused to interface with the reservoir unit 24. More particularly, the insertion segment 170 passes through the cap 252 (and in particular the sealed or valved face 256) such that in the dispense state of FIG. 14, the drainage tube lumen 164

is fluidly open to an interior of the bottle 250. Liquid contained in the bottle 250 will flow (e.g., due to forces of gravity) through the drainage tube lumen 164 and into the interior passageway 100. Air is allowed to flow into the bottle 250 via the slots 174 (FIG. 6) along the insertion segment 170 of the drainage tube 72 while liquid passes through the drainage tube lumen 164. It will be recalled that the interior passageway 100 is fluidly connected to one or more other conduits or passages (such as an interior passage of the shaft 42 (FIG. 1A)), delivering the so dispensed liquid to an outlet or exit orifice of the mop apparatus 22. When the operator desires to discontinue the dispensing of liquid, the pressing force applied to the plunger 74 (FIG. 13A) is released; the spring 212 then biases the hub 210 back to the closed state, including the insertion segment 170 being withdrawn from the cap 252. With removal of the insertion segment 170, the cap 252, and in particular the valved or self-sealing face 256, closes or seals the bottle 250. With embodiments in which the cap 252 includes or carries a bifurcating valve, the optional splined construction of the insertion segment 170 (e.g., as shown in FIG. 6) readily slides into and out of interfacing contact with the bifurcating valve in a non-destructive manner, allowing an operator to repeatedly transition between the closed and dispensing states with the bifurcating valve consistently returning to a sealed condition upon withdrawal of the insertion segment 170; further, the optional splines 172 (FIG. 6) effect a fluid tight seal with a perimeter of the bifurcating valve such that liquid will not overtly flow between the insertion segment 170 and the bifurcating valve perimeter in the dispensing state. Pressure potentially generated between the shelf 242 and the floor 110 as the reservoir unit 24 is transitioned from the closed state (FIG. 13B) to the dispensing state (FIG. 14) is relieved via the air bleed holes 116 (referenced generally) in the floor 110 and the drainage holes 236 in the platform 222. Further any excess liquid can drain through the holes 236, 116 and into the interior passageway 100.

The liquid dispense assemblies of the present disclosure can assume other formats akin to above explanations but incorporating various modifications. For example, while operation of the liquid dispense assembly 32 in transitioning between the closed and dispensing states has been described as moving or sliding an entirety of the reservoir unit 24 relative to the drainage tube 72, in other embodiments the liquid dispense assembly can be configured such that the drainage tube 72 is caused to move relative to the reservoir unit 24 in response to an operator-applied force, selectively bringing the insertion segment 170 into and out of engagement with the cap 252. In some embodiments, such as the example of FIGS. 13B and 14, the fluid dispense assembly 32 is configured such that the operator-applied actuation force (e.g., pressing force

applied to the button 204 as described above) is applied in-line with a central axis of the shaft 40 (FIG. 1A) for ease of operation.

Returning to FIGS. 1A and 1B, the mop apparatuses of the present disclosure can be configured to dispense or distribute liquid delivered by the liquid dispense assembly 32 in various manners. For example, in one non-limiting embodiment, an interior passage of the shaft 40 is fluidly connected to a spout 300 arranged to deposit the so-delivered liquid onto the surface to be cleaned in close proximity to the media holder 42. Other exit or dispensing orifice constructions are equally acceptable.

The cleaning systems, mop apparatus, liquid dispense assemblies and methods of the present disclosure present a marked improvement over previous designs. Individual containers of cleaning solution or other liquids are easily assembled to and removed from the mop apparatus. An operator is afforded the ability to easily dispense a volume of liquid in a controlled fashion by a simple, ergonomically-corrected pressing force applied to a plunger at the handling end of the mop apparatus.

Although the present disclosure has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes can be made in form and detail without departing from the spirit and scope of the present disclosure.

What is claimed is:

1. A cleaning system comprising:
 - a lower unit including:
 - a shaft defining a first end, a second end opposite the first end, and an interior passage open to the first end,
 - a media holder connected to the shaft adjacent the second end;
 - a liquid dispense assembly connected to the first end and including:
 - a housing forming an open chamber,
 - a drainage tube carried by the housing; and
 - a reservoir unit including:
 - a bottle adapted to contain a liquid and terminating at an open end,
 - a cap covering the open end;

wherein the system is configured to provide a loaded arrangement in which the reservoir unit is selectively retained within the chamber;

and further wherein the system is manually operable in the loaded arrangement between:

 - a closed state in which the drainage tube is displaced from the cap, and
 - a dispensing state in which a portion of the drainage tube passes through the cap for delivering liquid from the bottle to the interior passage.
2. The cleaning system of claim 1, wherein the housing defines a leading section, an intermediate section, and a trailing section, wherein the open chamber is formed by the intermediate section, and further wherein the leading section is configured for assembly to the shaft.
3. The cleaning system of claim 2, wherein the drainage tube is disposed within the leading section.
4. The cleaning system of claim 3, wherein the liquid dispense assembly further includes a plunger slidably coupled to the trailing section for articulating the reservoir unit relative to the drainage tube in transitioning between the closed and dispensing states.

5. The cleaning system of claim 4, wherein upon final assembly, an axis along which the plunger articulates relative to the housing is in-line with a longitudinal axis of the shaft.
6. The cleaning system of claim 3, wherein the leading section defines an orifice that is fluidly open to the interior passage upon connection of the handle assembly to the lower unit, and further wherein the drainage tube extends from the orifice.
7. The cleaning system of claim 3, wherein the drainage tube is fixed to the housing and remains stationary relative to the housing as the system transitions between the closed and dispensing states.
8. The cleaning system of claim 3, wherein the drainage tube includes an insertion segment configured to pass through a face of the cap.
9. The cleaning system of claim 8, wherein the face includes a bifurcating valve, and further wherein the insertion segment is configured to selectively pass through the bifurcating valve.
10. The cleaning system of claim 8, wherein the insertion segment includes a plurality of circumferentially arranged splines.
11. The cleaning system of claim 3, wherein the liquid dispense assembly further includes:
a hub located within the leading section and slidably disposed about the drainage tube;
and
a spring biasing the hub in a direction of the intermediate section to define the closed state.
12. The cleaning system of claim 11, wherein the hub includes a shelf arranged to abuttingly engage the cap in the loaded arrangement.
13. The cleaning system of claim 12, wherein the hub further includes a platform defining a central passageway sized to slidably receive the drainage tube and a plurality of bleed holes radially spaced from the central passageway.

14. The cleaning system of claim 1, wherein the system is configured such that an entirety of the reservoir unit slides relative to the housing in transitioning between the dispensing and closed states.
15. The cleaning system of claim 1, further comprising a dispensing outlet fluidly connected to the interior passage opposite the first end for dispensing liquid from the system in the dispensing state.
16. The cleaning system of claim 1, wherein the media holder is a mop head.
17. A liquid dispense assembly for use with a mop apparatus, the liquid dispense assembly comprising:
- a housing defining a leading section, an intermediate section, and a trailing section, wherein:
 - the intermediate section forms an open chamber for selectively receiving a reservoir unit,
 - the leading section forms an interior passageway open to an end of the housing and terminating at an orifice opposite the end;
 - a plunger slidably coupled to the trailing section;
 - a drainage tube attached to the orifice and defining a lumen open to the chamber and the interior passageway, the drainage tube defining an insertion section for selectively interfacing with a reservoir unit; and
 - a hub slidably disposed about the drainage tube.
18. The liquid dispense assembly of claim 17, further comprising a spring biasing the hub in a direction of the trailing section.
19. The liquid dispense assembly of claim 17, wherein the hub further includes a platform, and further wherein the drainage tube includes a flange selectively bearing against the platform.

20. The liquid dispense assembly of claim 17, wherein the insertion section includes a plurality of circumferentially arranged splines.
21. A method of cleaning comprising:
loading a first reservoir unit into a liquid dispense assembly of a mop apparatus, the reservoir unit including a bottle containing a liquid and a cap covering an open end of the bottle; and
depressing a plunger of the liquid dispense assembly to cause a drainage tube of the liquid dispense assembly to pass through the cap, the drainage tube being fluidly open to an interior passage of a shaft of the mop apparatus to dispense liquid from the bottle onto a surface to be cleaned.
22. The method of claim 21, wherein the step of depressing the plunger includes moving an entirety of the reservoir unit relative to the drainage tube.
23. The method of claim 21, further comprising:
releasing the plunger, including the liquid dispense assembly self-transitioning the reservoir unit away from the drainage tube.
24. The method of claim 21, further comprising:
removing the first reservoir unit from the mop apparatus; and
loading a second reservoir unit into the liquid dispense assembly of the mop apparatus.

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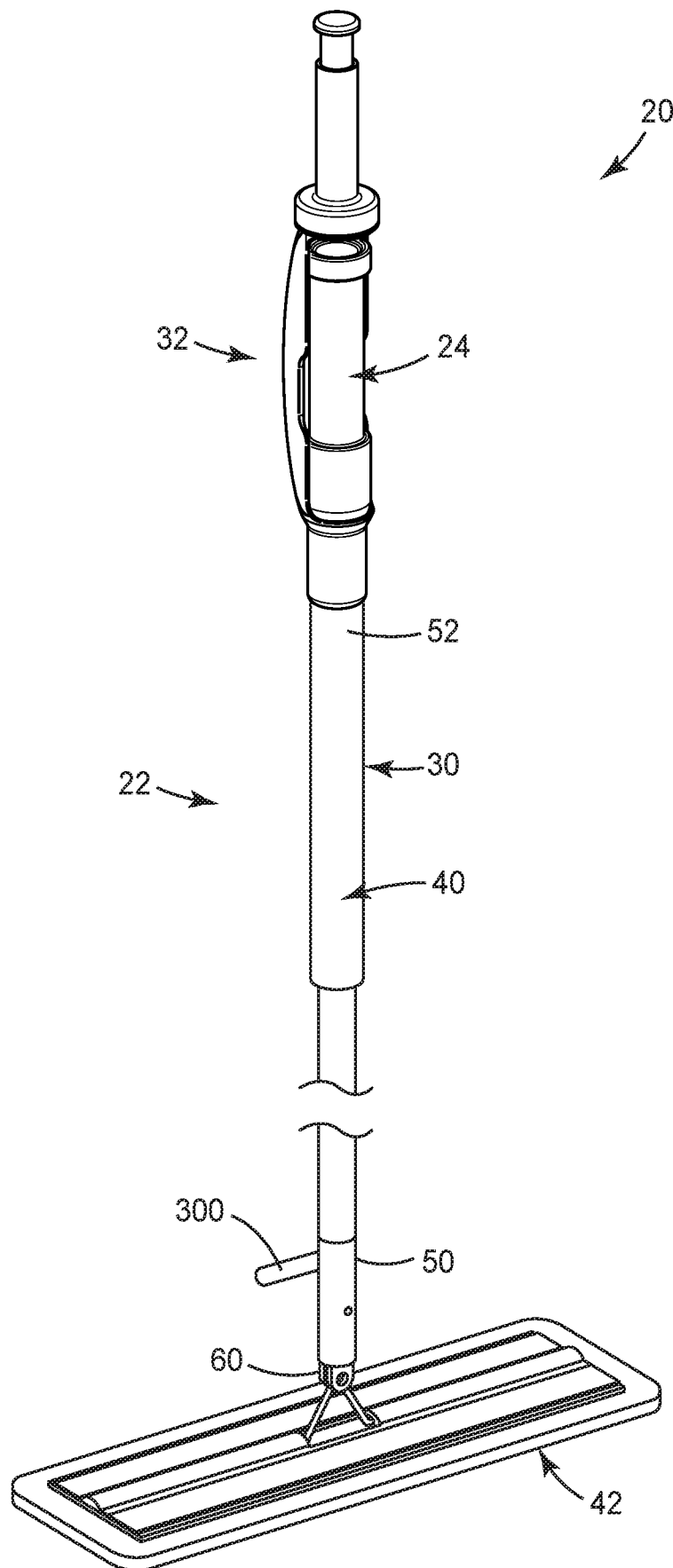


FIG. 1A

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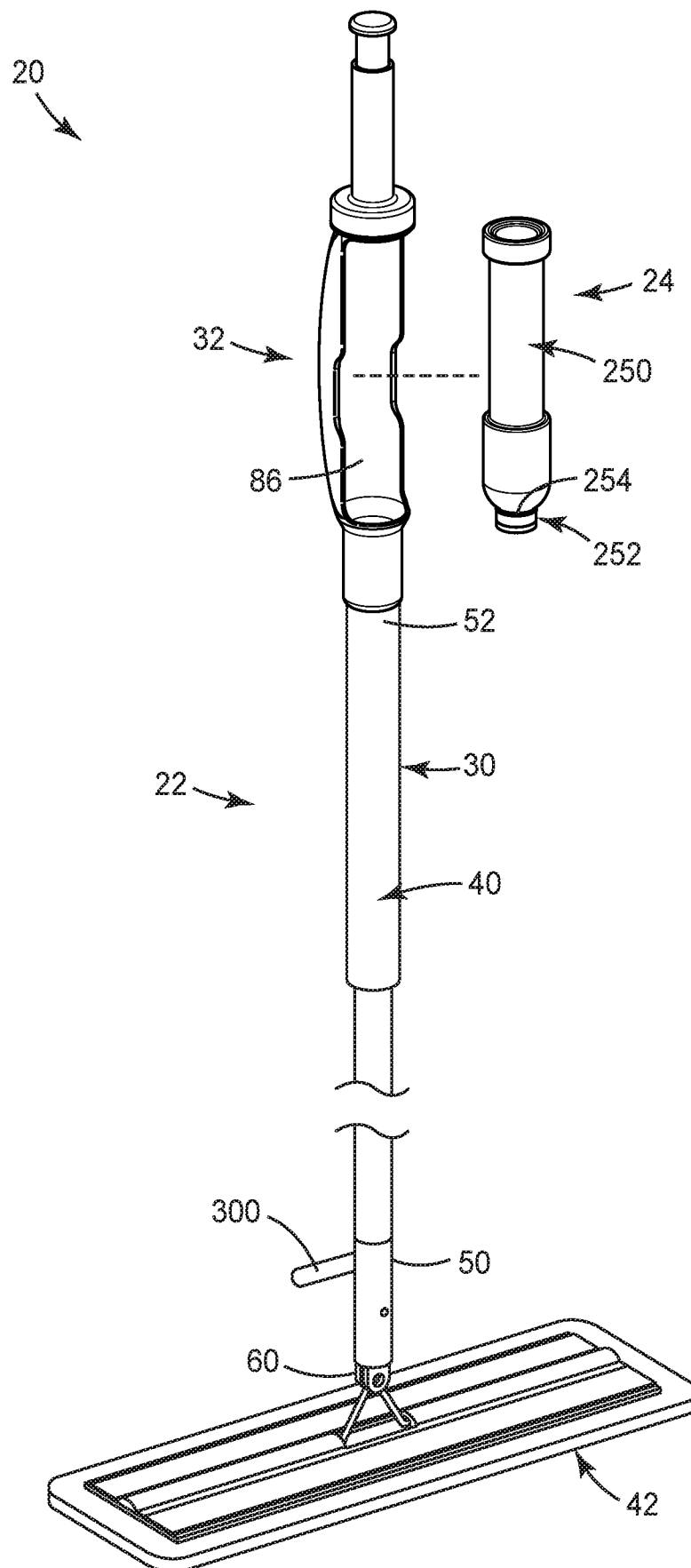


FIG. 1B

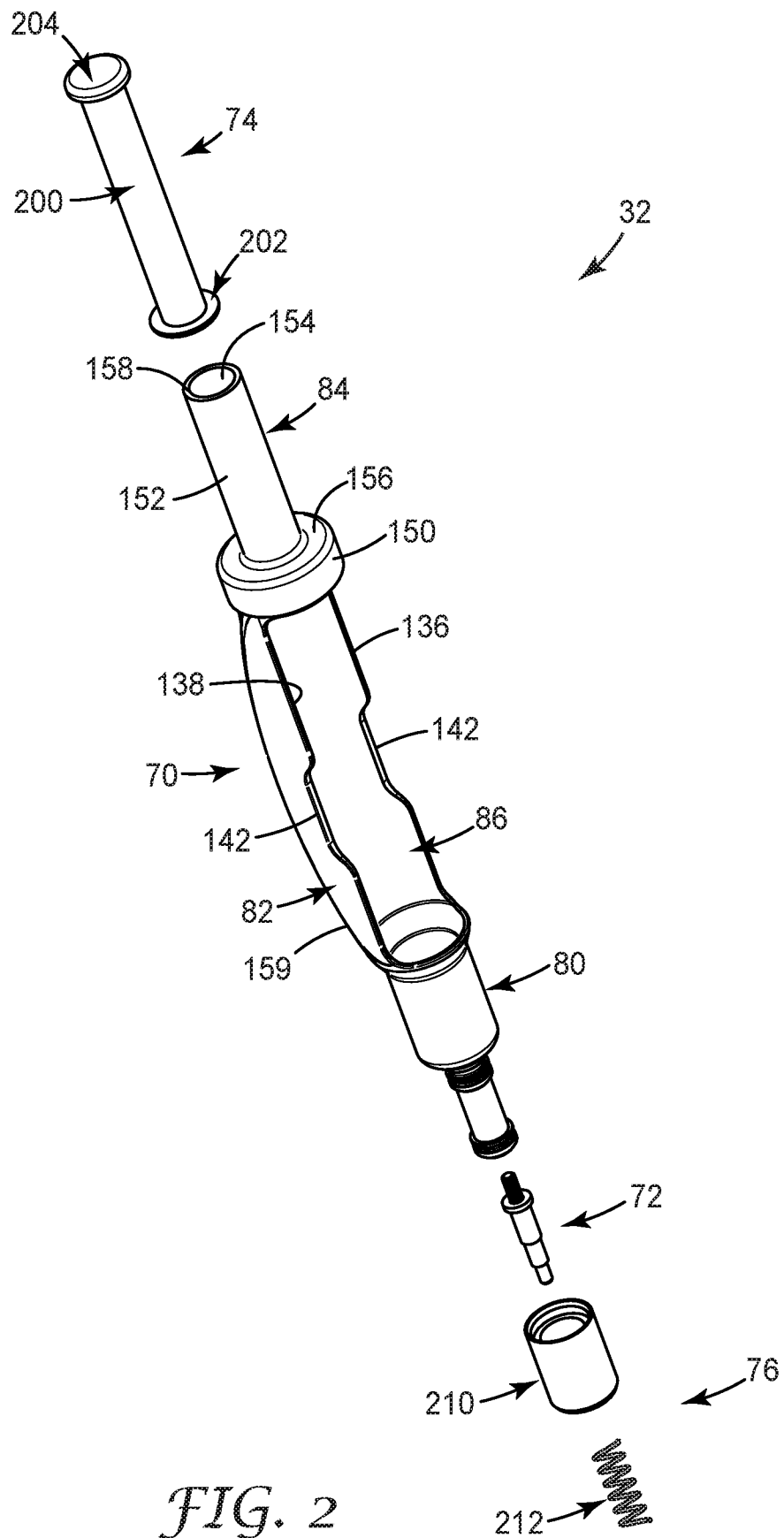


FIG. 2

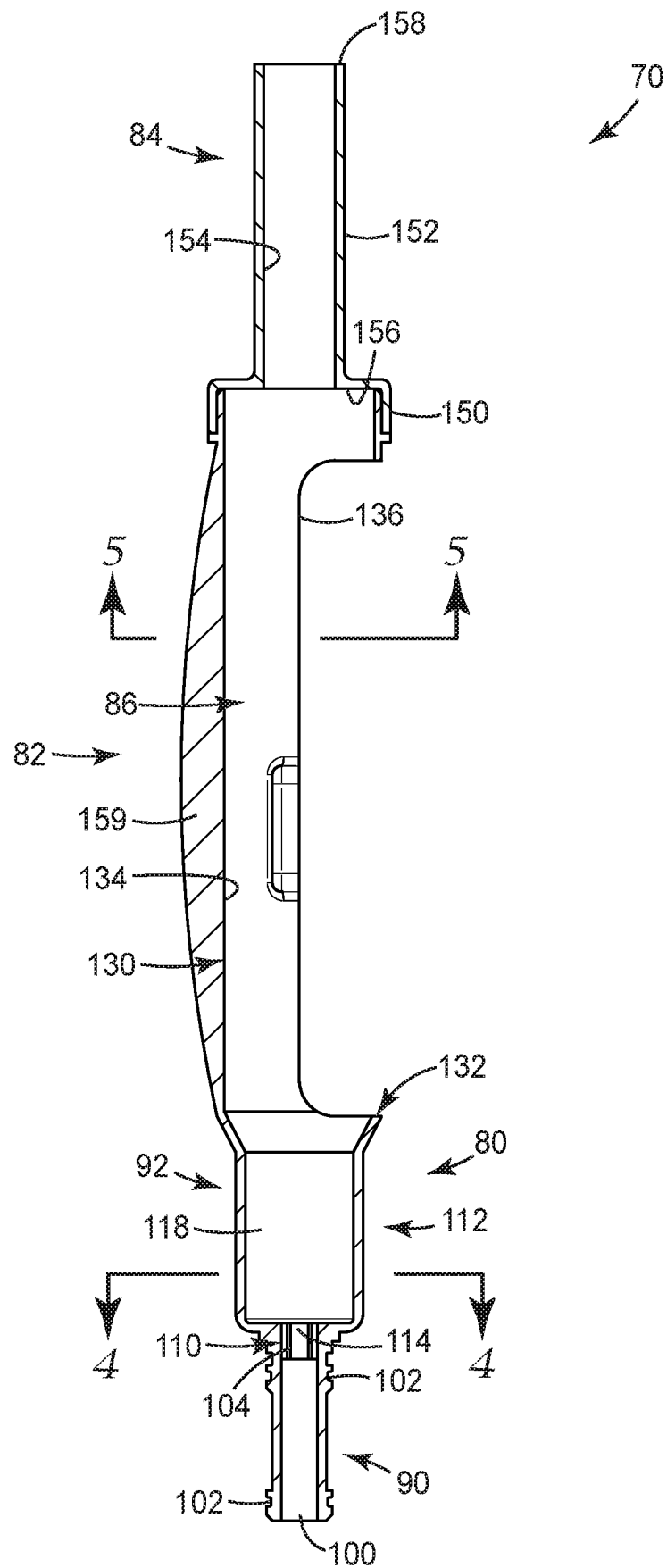


FIG. 3

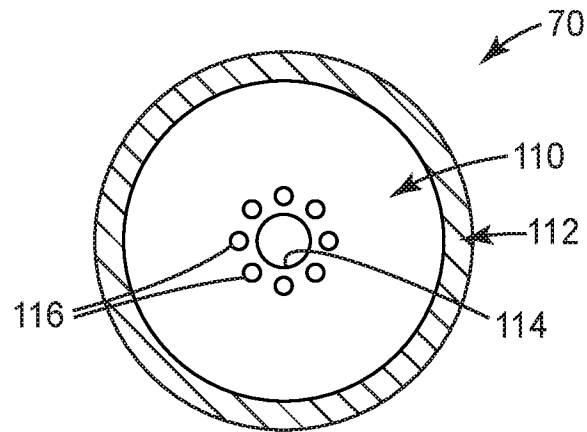


FIG. 4

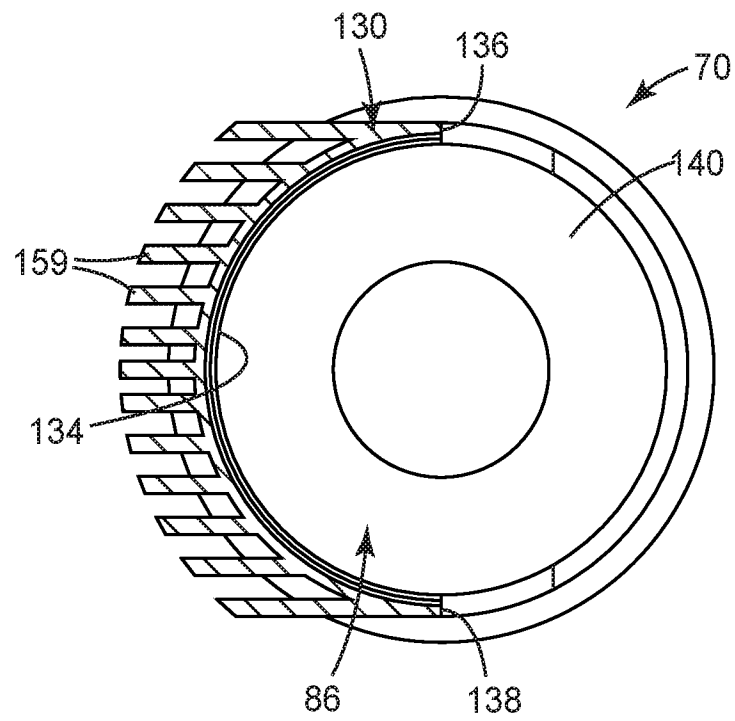
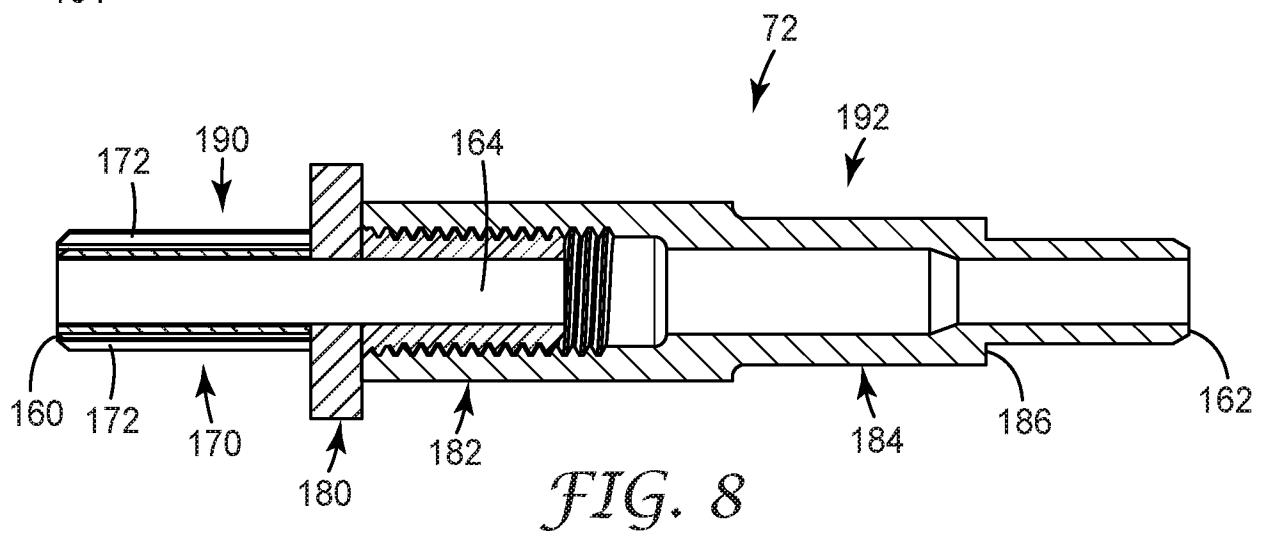
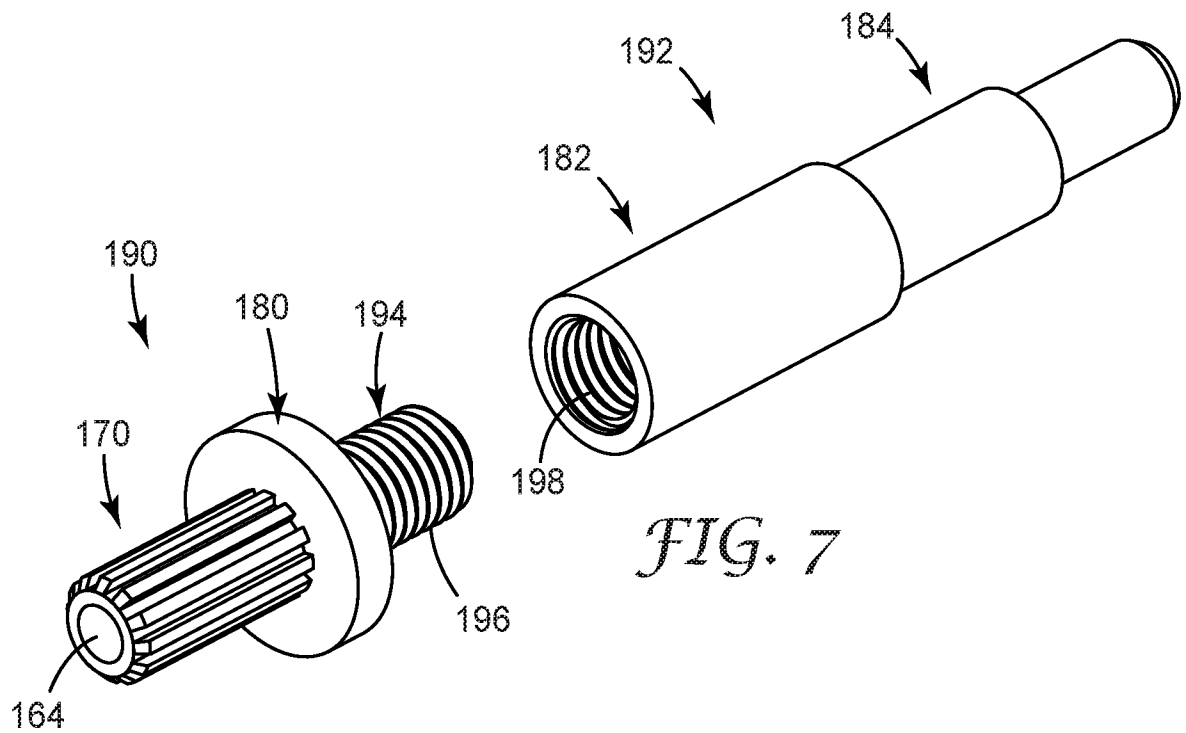
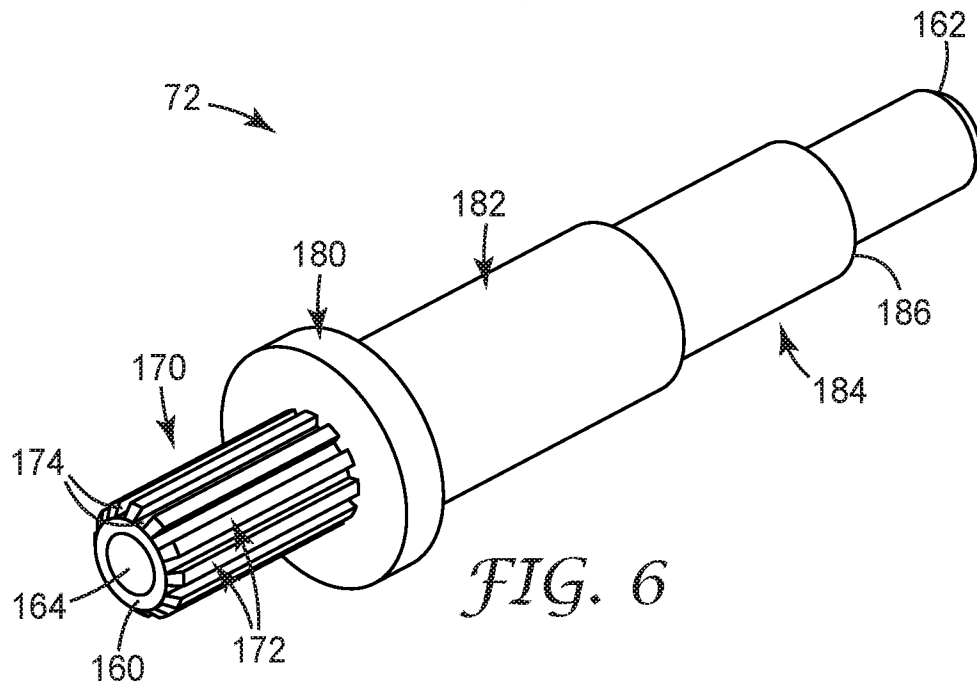


FIG. 5

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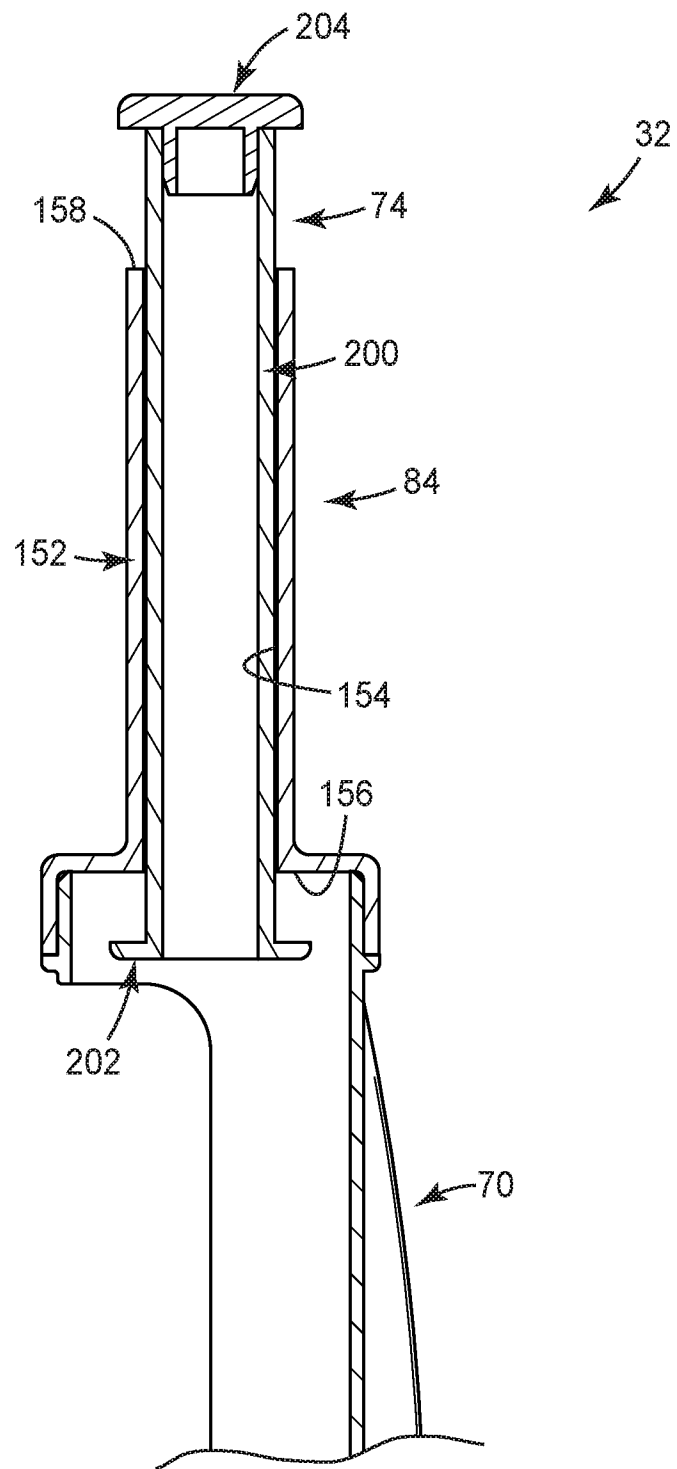


FIG. 9

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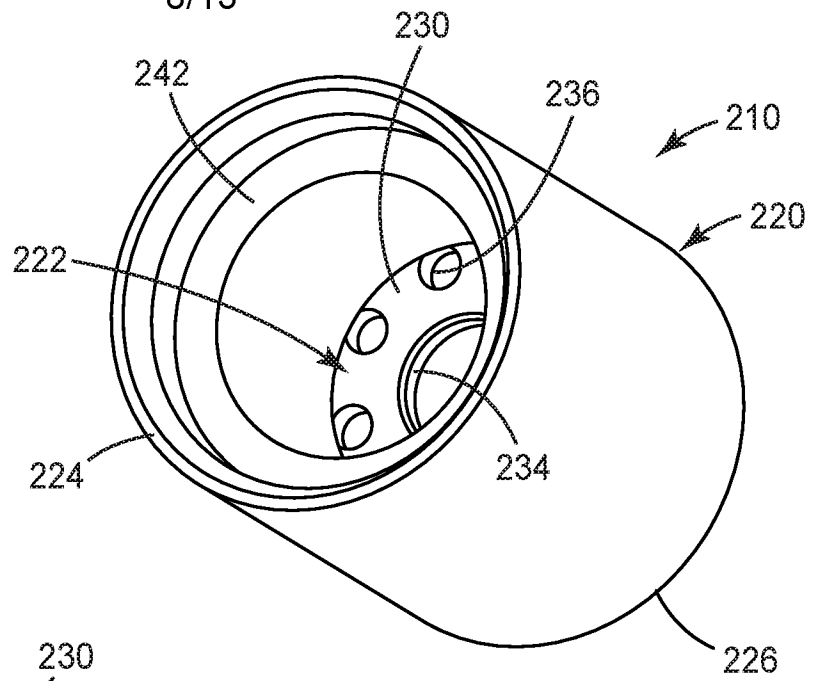


FIG. 10A

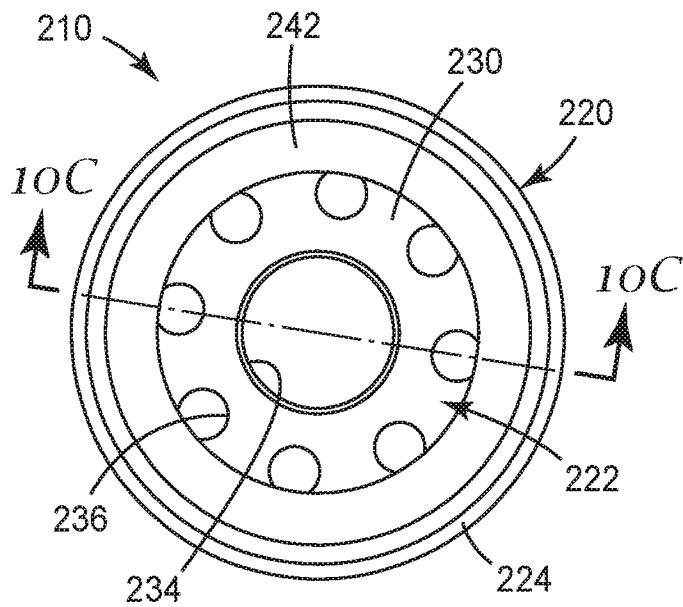


FIG. 10B

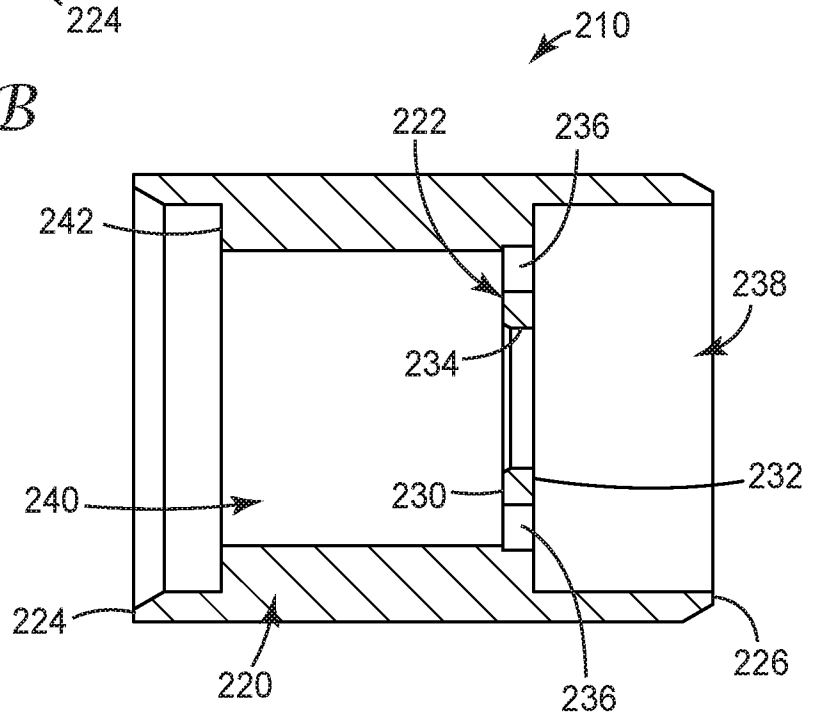


FIG. 10C

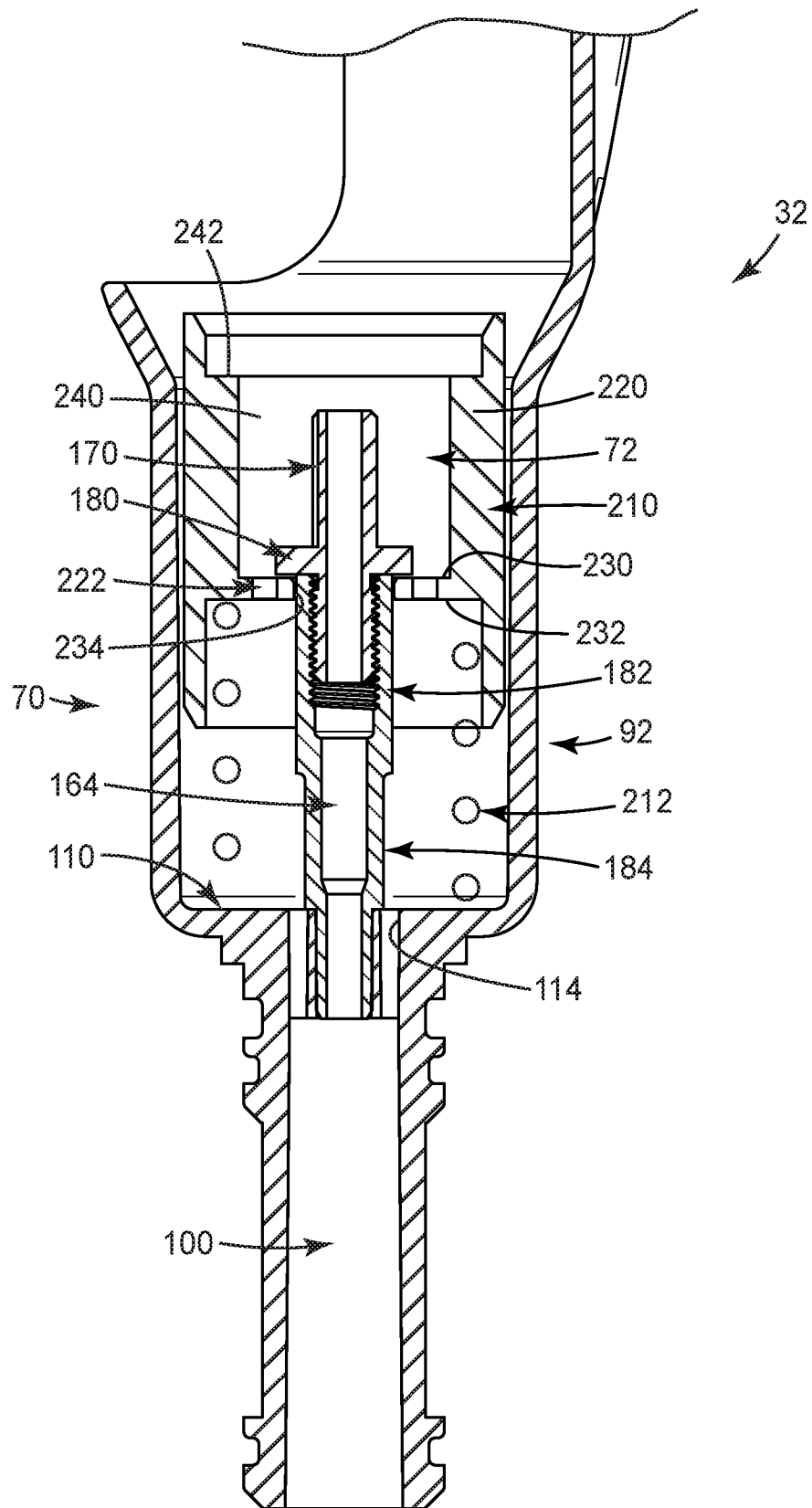


FIG. 11

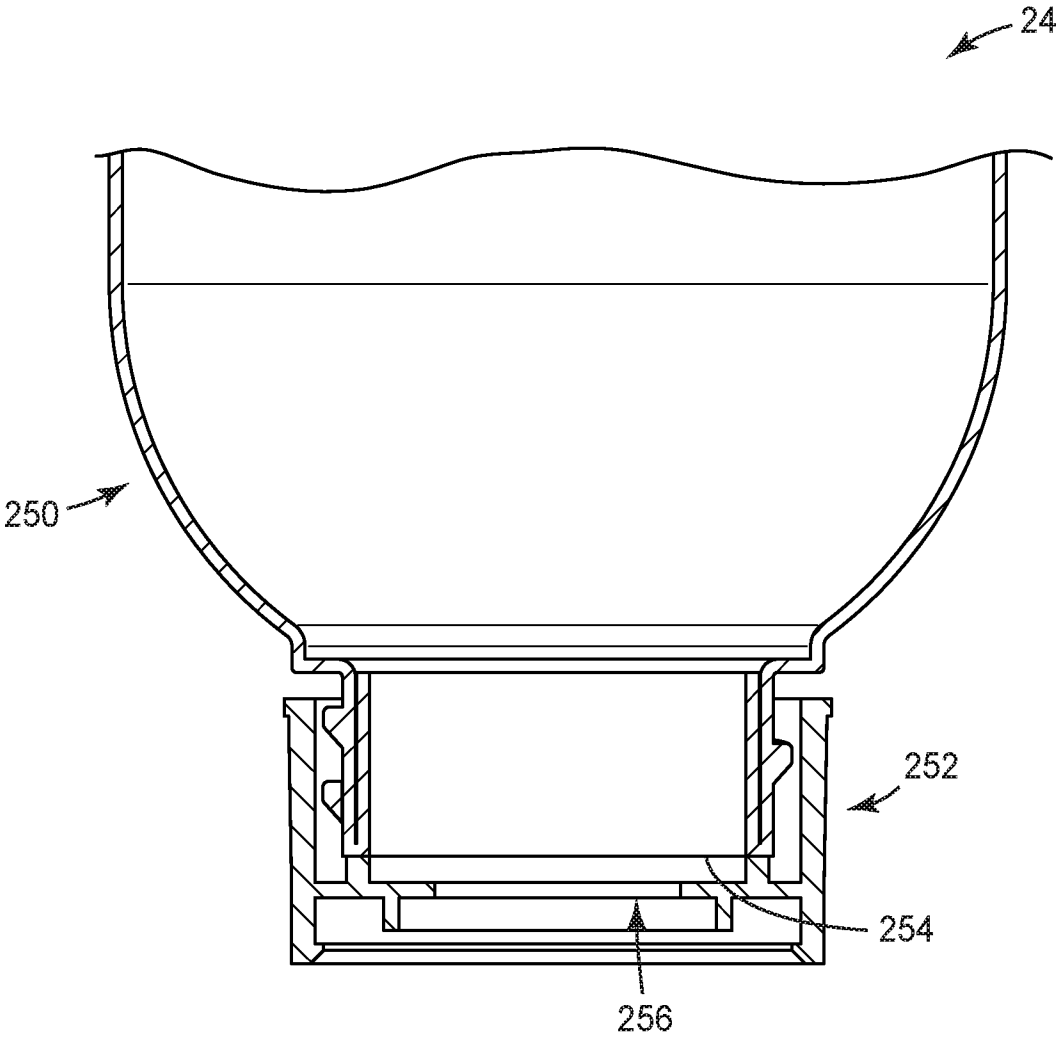


FIG. 12

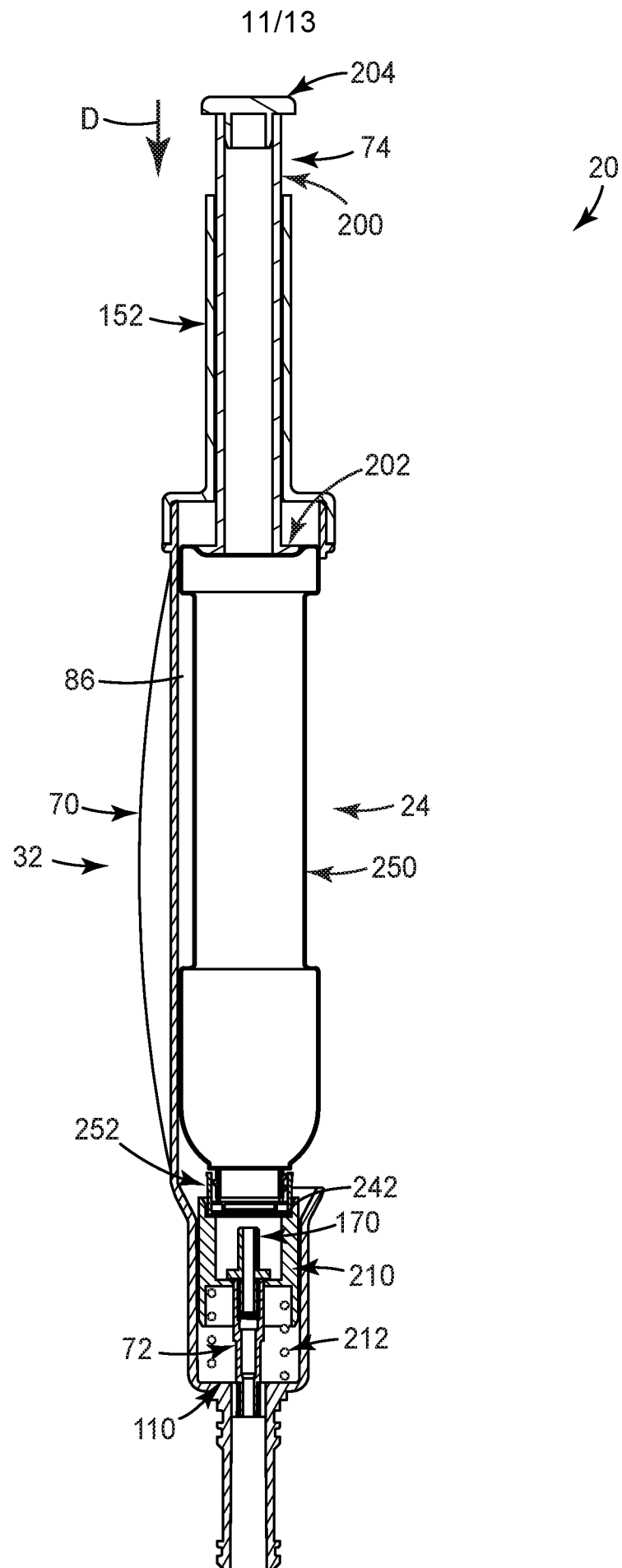


FIG. 13A

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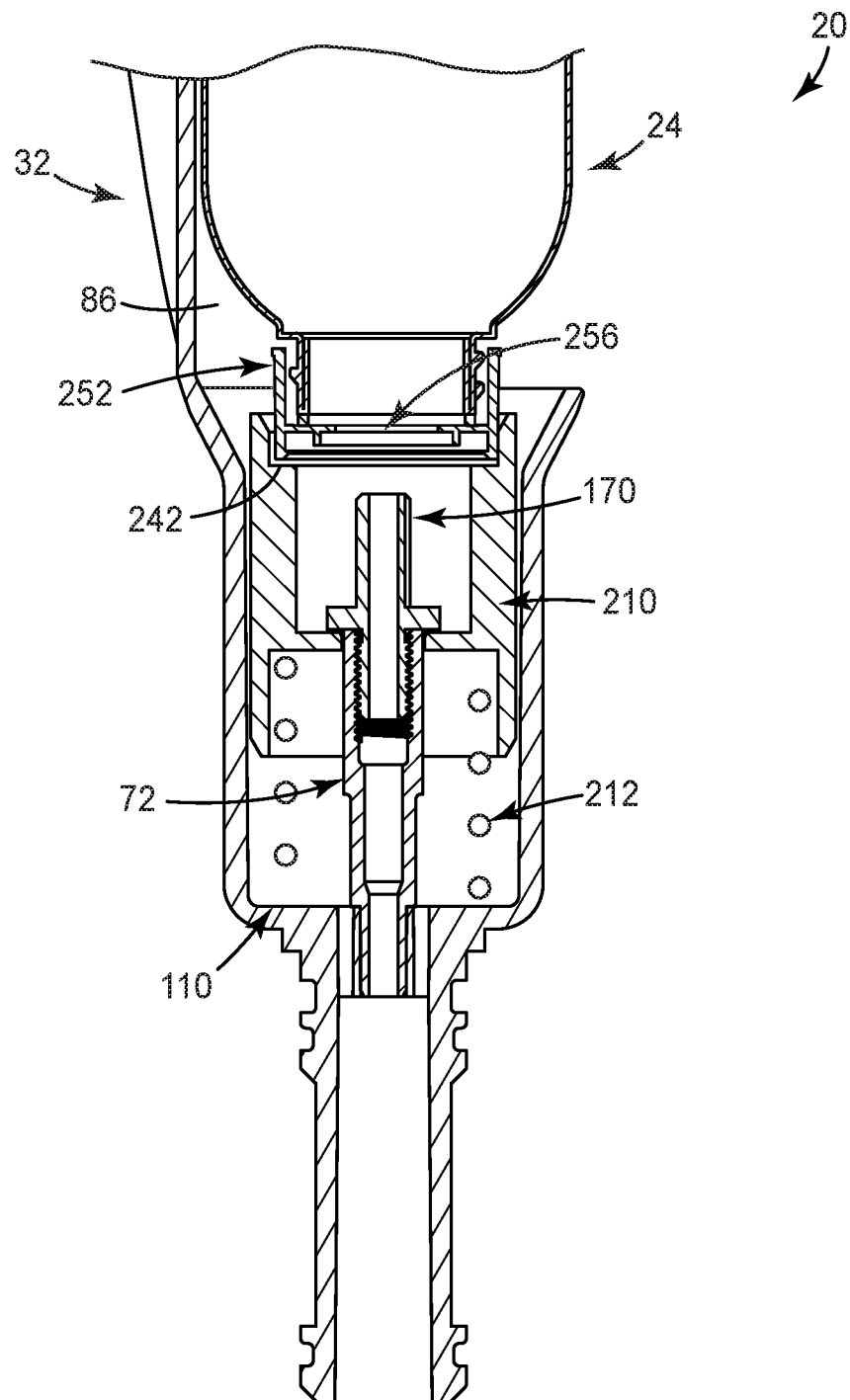


FIG. 13B

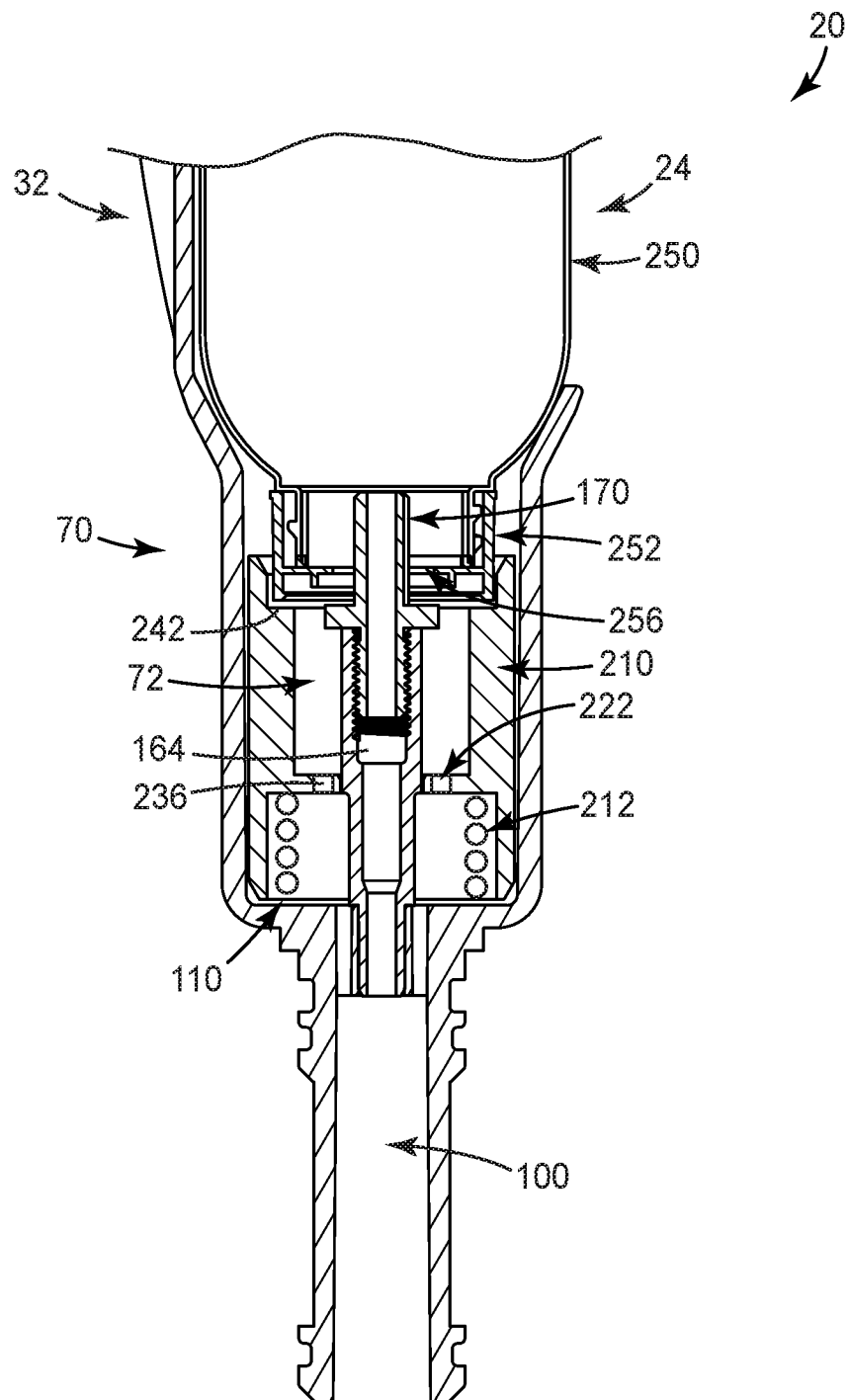


FIG. 14

A. CLASSIFICATION OF SUBJECT MATTER**A47L 13/22(2006.01)i, A47L 13/30(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A47L 13/22; A47L 13/30; A47L 1/08; A47L 9/06; B43M 11/06; A46B 11/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & keywords: liquid dispensing, cleaning system, reservoir, shaft, media holder, housing, drainage tube, bottle**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2006-0280546 A1 (JOHN J. DYER) 14 December 2006 See paragraphs [0028]-[0038], [0046]-[0061], claims 1, 21, 26 and figure 7C.	21-24
Y		1-20
Y	US 2003-0180083 A1 (MICHAEL J. HALL et al.) 25 September 2003 See paragraph [0115] and figure 8A.	1-20
A	US 2004-0071490 A1 (PETER S. VOSBIKIAN et al.) 15 April 2004 See paragraphs [0024]-[0030] and figure 1.	1-24
A	US 6663306 B2 (THE PROCTER & GAMBLE COMPANY) 16 December 2003 See claim 1 and figure 8A.	1-24
A	US 2004-0139572 A1 (DAVID KISELA et al.) 22 July 2004 See paragraphs [0036]-[0040] and figure 2.	1-24



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

28 April 2016 (28.04.2016)

Date of mailing of the international search report

29 April 2016 (29.04.2016)

Name and mailing address of the ISA/KR

International Application Division

Korean Intellectual Property Office

189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea

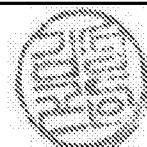


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Information on patent family members

International application No.

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