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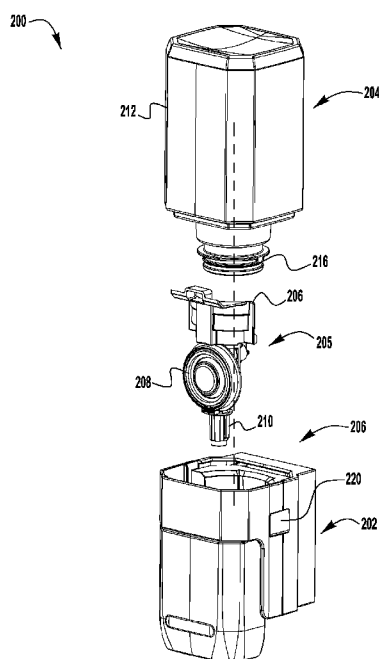


FIG. 2

(57) Abstract: Exemplary embodiments of fluid dispensers and refill units and methodologies for dispensing fluids are provided herein. An exemplary fluid dispenser includes a dispenser housing, a pump housing, a liquid pump chamber located within the pump housing, a liquid inlet valve, a liquid outlet valve and a pump lock secured to one of the pump housing and dispenser housing. The pump lock releasably secures the pump housing to the dispenser housing. A refill unit is also included. The refill unit includes a container, a cap and a container liquid outlet valve.



Dispensers, Refill Units, and Reusable/Replaceable Pump Assemblies**RELATED APPLICATIONS**

[0001] This application claims priority to, and the benefits of, U.S. Provisional Pat. App. No. 62/420927, titled DISPENSERS, REFILL UNITS, AND REUSABLE/REPLACEABLE PUMP ASSEMBLIES, filed on Nov. 11, 2016, which is incorporated herein in its entirety.

BACKGROUND

[0002] Liquid dispenser systems, such as liquid soap and sanitizer dispensers, provide a user with a predetermined amount of liquid upon actuation of the dispenser. In addition, it is sometimes desirable to dispense the liquid in the form of foam by, for example, injecting air into the liquid to create a foamy mixture of liquid and air bubbles by use of an air pump or air compressor. Many liquid and foam dispensers use non-collapsing containers. Non-collapsing containers must be vented when fluid is pumped out of the container or the container will collapse and/or prevent the pump from dispensing the fluid.

[0003] There are two common types of fluid dispensers. The first common type of fluid dispensers have a permanent pump and either a refillable container or a replaceable container. If a pump that is permanently attached to a dispenser clogs or fails, the dispenser is no longer in working order and the entire dispenser is replaced. The second common type of fluid dispenser utilizes a refill unit that includes a container and a pump. The container and the pump are replaced when the fluid in the container is used up. This eliminates the necessity for replacement of the dispenser when the pump clogs or fails. However, disposing of the container and pump after each use is costly and increases the amount of plastic that is disposed of in landfills.

SUMMARY

[0004] Exemplary embodiments of fluid dispensers and refill units and methodologies for dispensing fluids are provided herein. An exemplary fluid dispenser includes a dispenser housing, a pump housing, a liquid pump chamber located within the pump housing, a liquid inlet valve, a liquid outlet valve and a pump lock secured to one of the pump housing and dispenser housing. The pump lock releasably secures the pump housing to the dispenser housing. A refill unit is also included. The refill unit includes a container, a cap and a container liquid outlet valve.

[0005] Another exemplary fluid dispenser includes a housing, a refill unit, and a removable assembly. The dispenser includes a dispenser housing. The refill unit includes a container for holding a liquid. The container has a neck, and a cap is attached to the neck of the container. The cap includes an air vent comprising an air inlet and an air valve, and a liquid valve in fluid communication with the container. The liquid valve comprises a slit. The removable assembly is releasably secured to the dispenser housing. The removable assembly includes a receptacle for receiving the refill unit. The removable assembly includes an inlet conduit, a pump in fluid communication with the inlet conduit, an outlet in fluid communication with the pump, and a pump lock. The inlet conduit engages the liquid valve of the refill unit when the receptacle receives the refill unit, and the engagement between the inlet conduit and the liquid valve causes the liquid valve to maintain an open position. The refill unit is removable from the dispenser without removing the removable assembly. The removable assembly is removed from the dispenser by disengaging the pump lock.

[0006] Methodologies for providing a fluid dispenser are provided herein. An exemplary methodology includes inserting a pump into a housing of a dispenser. The pump has a pump housing, a pump chamber, an inlet, an outlet, and a pump lock on the pump housing. The pump lock releasably secures the pump to the dispenser. The methodology further includes inserting a refill unit of liquid into the dispenser. The refill unit having a lid and an outlet valve. The refill unit is inserted in the dispenser and the pump inlet causes the container outlet valve to open placing fluid in the container in fluid communications with the pump chamber. The methodology further includes removing the refill unit without removing the pump.

[0007] An exemplary refill unit includes a container with a cap, a vent valve and an outlet valve. The refill unit is inserted in the dispenser that includes a pump having an inlet conduit that causes the container outlet valve to open placing fluid in the container in fluid communications with a pump chamber located in the pump.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] Figure 1 is a cross-sectional view of an exemplary embodiment of a dispenser having a container refill unit and a reusable and replaceable pump;

[0009] Figure 2 is an exploded perspective view of another exemplary embodiment of a dispenser having a container refill unit and a reusable and replaceable pump;

[0010] Figure 2A is a cross-sectional view of a portion of a container refill unit, reusable and replaceable pump and installed in a dispenser.

[0011] Figure 3 is a cross-sectional view of an exemplary refill unit of a container refill unit;

[0012] Figure 4A is a partial perspective view of the exemplary container refill unit of Figure 3;

[0013] Figure 4B is an enlarged partial cross-sectional view of the exemplary container refill unit of Figure 3;

[0014] Figure 5A is a front perspective view of an exemplary reusable and replaceable pump;

[0015] Figure 5B is a rear perspective view of an exemplary receptacle and the exemplary reusable and replaceable pump of Figure 5B; and

[0016] Figure 6 is an exemplary methodology of providing a dispenser for dispensing fluid.

DETAILED DESCRIPTION

[0017] The Detailed Description merely describes exemplary embodiments of the invention and is not intended to limit the scope of the claims in any way. Indeed, the invention is broader than

and unlimited by the exemplary embodiments, and the terms used in the claims have their full ordinary meaning.

[0018] Figure 1 illustrates an exemplary dispenser 100 having a housing 102, a refill unit 104, a receptacle 106 for receiving the refill unit 104, a pump 108, and a dispenser outlet 110. Housing 102 is shown enclosing refill unit 104, however, in some embodiments, housing 102 only partially surrounds refill unit 104, in some embodiments, refill unit 104 is located at least partially above housing 102; and in some embodiments refill unit 104 is located on top of housing 102.

[0019] The pump 108 may be any type of pump, such as, for example, a piston pump, a dome pump, a tube pump, a rotary pump, a diaphragm pump; a sequentially activated diaphragm pump, a gear pump, or the like. In some exemplary embodiments, pump 108 is a liquid pump. In some exemplary embodiments, pump 108 may be a foam pump that includes a liquid pump portion and an air pump portion. In some exemplary embodiments, the dispenser 100 may include a foam cartridge 134. In certain exemplary embodiments, a liquid pump pumps liquid from the container into a mixing chamber (not shown) and the air pump pumps air into the mixing chamber (not shown) to mix with the liquid, and the liquid-air mixture travels through the foam cartridge 134 to create a rich foam.

[0020] Exemplary embodiments of foam pumps are shown and described in, U.S. 7,303,099 titled Stepped Pump Foam Dispenser; U.S. 8,002,150 titled Split Engagement Flange for Soap Piston; U.S. 8,091,739 titled Engagement Flange for Fluid Dispenser Pump Piston; U.S. 8,113,388 titled Engagement Flange for Removable Dispenser Cartridge; U.S. 8,272,539, Angled Slot Foam Dispenser; U.S. U.S. 8,272,540 titled Split Engagement Flange for Soap Dispenser Pump Piston; U.S. 8,464,912 titled Split Engagement Flange for Soap Dispenser Pump Piston; U.S. 8,360,286 titled Draw Back Push Pump; U.S. Provisional Pat. Serial No. 62/293,931 titled High Quality Non-Aerosol Hand Sanitizing Foam; U.S. Provisional Pat. Application Serial No. 62/257,008 Sequentially Activated Multi-Diaphragm Foam Pumps, Refill Units and Dispenser Systems; U.S. Pat. No. 8,172,555 titled Diaphragm Foam Pump; U.S. 2008/0,277,421 titled Gear Pump and Foam Dispenser, all of which are incorporated herein by reference in their entirety. The exemplary foam pumps may be converted to liquid pumps by removing the air components. Exemplary embodiments of foam cartridges 134 are shown and

described in U.S. Publication No. 2014/0367419 titled Foam Cartridges, Pump, Refill Units and Foam Dispensers Utilizing The Same, which is incorporated herein by reference in its entirety.

[0021] Assembly 105 includes pump 108, nozzle 110 and receptacle 106. The assembly 105 includes a pump lock 150 that releasably secures at least the pump 108, and typically the assembly 105, to the dispenser 100. Assembly 105 releasably mates with the refill unit 104. Refill unit 104 may be installed and removed as described in detail below. Accordingly, the exemplary system allows for the pump 108 to be selectively removed and replaced without the use of tools and also allows the refill unit that does not contain a pump to be removed and replaced without the use of tools and without removing the pump 108.

[0022] In various embodiments, the dispenser 100 is a “touch free” dispenser and includes an actuator 132 that activates the pump 108 to pump liquid from the container 112 of the refill unit 104 out of the nozzle 110 of the dispenser 100. Actuator 132 may include a sensor (not shown) to detect the presence of a person and circuitry (not shown) for causing the pump 108 to dispense a dose of fluid. Exemplary touch-free dispensers are shown and described in U.S. Pat. No. 7,837,066 titled Electronically Keyed Dispensing System And Related Methods Utilizing Near Field Response; U.S. Pat. No. 9,172,266 title Power Systems For Touch Free Dispensers and Refill Units Containing a Power Source; U.S. Pat. No. 7,909,209 titled Apparatus for Hands-Free Dispensing of a Measured Quantity of Material; U.S. Pat. No. 7,611,030 titled Apparatus for Hands-Free Dispensing of a Measured Quantity of Material; U.S. Pat. No. 7,621,426 titled Electronically Keyed Dispensing Systems and Related Methods Utilizing Near Field Response; and U.S. Pat. Pub. No. 8,960,498 titled Touch-Free Dispenser with Single Cell Operation and Battery Banking; all which are incorporated herein by reference.

[0023] In embodiments that include a touch-free dispenser, the dispenser 100 may include a power source (not shown), a sensor (not shown), a controller (not shown), and a motor (not shown). The power source is in electrical communication with and provides power to the sensor, controller, and motor. The power source may be an internal power source, such as, for example, one or more batteries or an external power source, such as, for example, solar cells, or a conventional 120 VAC power supply,

[0024] In some embodiments, the refill unit 104 includes a power source (not shown) that provides power to a rechargeable power source (not shown). Exemplary embodiments of refill

units with power supplies that provide power to a motor are shown and described in U.S. Publication No. 2014/0234140 titled Power Systems for Touch Free Dispensers and Refill Units Containing A Power Source, which is incorporated herein by reference in its entirety. The sensor (not shown) is configured to detect the presence of a user's hands near the dispenser 100 and to facilitate operation of the actuator 132 to automatically dispense the fluid from the container 112 of the refill unit 110 and out of the nozzle 110 of the dispenser 100. In an exemplary embodiment, the sensor (not shown) may be located along a bottom portion of the dispenser 100. However, the sensor can alternatively be installed at any of a variety of suitable locations, such as, for example, more proximate to a front end of the dispenser 100 or at a location separate from the dispenser 100. The sensor may be, for example, an infrared sensor, a microwave sensor, an ultrasonic wave sensor, or any of a variety of suitable alternative proximity sensors.

[0025] In various embodiments, the dispenser is a manual dispenser. In such embodiments, the actuator 132 may be an actuator that requires manual activation, such as, for example, a push bar, a foot pedal, a pushbutton, or the like. In some embodiments that require manual activation, a mechanical actuator is coupled to the pump 108 and, when a user engages the actuator, the pump causes fluid from the container 112 of the refill unit 104 to be pumped out of the nozzle 110 of the dispenser 100.

[0026] The exemplary dispenser 100 includes a housing 102 and an actuator 132. An assembly 105 is releasably secured to the dispenser 100. Assembly 105 includes a receptacle 106, a pump 108 and a dispenser outlet 110. The assembly 105 includes attachment and/or disconnection members that are used to attach/disconnect the assembly 105 to/from the housing 102. The attachment and/or disconnection members may be referred to herein as a pump lock 150.

[0027] In this exemplary embodiment, pump lock 150 is a quick-release mechanism. Other exemplary pump locks may 150 includes a pair of elastic arms (not shown) that engage a projection (not shown) on the pump 108. The pair of elastic arms may be spread outward to release the pump 108 from the dispenser housing 102. Other exemplary embodiments of pump lock 150 may have many different configurations, such as, for example, a strap that may be tightened around pump 108 or a part of assembly 105. In some embodiments, pump lock 150 is a latch, a lock mechanism, one or more straps, hook and loop (velcro®) fastener, a snap fit

connection, a ratchet, a thumbscrew, a threaded connection, a coupling, a quick release mechanism, or the like. In some embodiments pump lock 150 is a friction fit. In some embodiments, pump 108 slides downward into dispenser housing 102 and is held in place by a friction fit and one or more projections (not shown).

[0028] The pump lock 150 is used to secure the pump 108 and receptacle 106 to the dispenser housing 102 and hold pump 108 in place. Pump 108 remains secured to the dispenser housing 102 when refill unit 104 is removed from the dispenser housing 102 or a new refill unit 104 is installed in housing 102.

[0029] If the pump 108 fails, clogs, or for other reasons it is desirable to remove the pump 108, assembly 105 may be disconnected from the dispenser housing 102 by releasing the pump lock 150. In some embodiments, pump lock 150 is a friction fit pump lock and is released by a pull up feature (e.g., a tab that allows a user to grip the assembly and remove the assembly from the housing). In some embodiments, pump lock 150 is released by a push-in feature. In embodiments in which the pump lock 150 includes elastic arms, the assembly 105 may be released from the housing 102 by stretching the elastic arms or compressing a portion of the elastic arms. In alternative embodiments, one or more straps, hook and loop fastener, latches, catches or the like are loosened, or opened, to remove the assembly 105 from the housing 102.

[0030] The pump lock 150 may be, for example, disposed on the housing 102 or assembly 105. In some embodiments, the pump lock 150 is engaged by one or more release mechanisms secured to housing 102 and be configured to engage the pump lock 150 in order to attach and/or remove the assembly 105 to/from the housing 102.

[0031] Refill unit 104 is inserted in dispenser housing 102 and rests on receptacle 106. Refill unit 104 is held in place by one or more catches (not shown) that are secured to housing 102. Refill unit 104 is removed by releasing the one or more catches and lifting the refill unit 104 upward. In some embodiments, refill unit 104 may be removed from dispenser 100 by pulling forward after releasing the refill catch (not shown). In some embodiments, the refill unit 104 may be removed by sliding it out from the side. A new refill unit 104 full of fluid may be inserted into dispenser 100 by, for example, lowering it downward, by sliding it in from the front

of the dispenser 100, by sliding it in from the side of the dispenser 100, or the like depending on the configuration of the pump inlet 128 and the container outlet valve 120.

[0032] In some embodiments, the receptacle 106, pump 108, and dispenser outlet 110, may be two or more separate parts that are able to be coupled to each other and removed separately. The dispenser 100 is configured such that the pump 108 may be easily attached to and removed from the dispenser housing 102 in a “quick-release” fashion, which allows pumps 108 to be replaced in certain situations, such as, for example, if the pump is not working properly, becomes clogged, or has been used for a predetermined number of refill units 104.

[0033] The refill unit 104 includes a container 112 for holding a liquid and a cap 116. The container 112 may be made of, for example, polyethylene terephthalate (PET), PETE, LDPE, HDPE, plastic, thermoplastic, or the like. The liquid may be, for example, a soap, a sanitizer, a lotion, or the like. In various embodiments, the liquid may be a foamable liquid.

[0034] In addition, the container 112 has a neck 114, and the refill unit 104 has a cap 116 that is configured to attach to the neck 114 of the container 112. The cap 116 may attach to the neck 114 of the container 112 by any suitable means, such as, for example, a snap fit connection, a threaded connection, a welded connection, an adhesive connection, or the like. The refill unit 104 is configured to releasably attach to the receptacle 106 in a manner that allows the liquid of the container 112 to be pumped through the pump 108 and out of the dispenser 100 through the dispenser outlet 110.

[0035] In the exemplary embodiment, the cap 116 of the refill unit 104 also includes an air vent 118 and a liquid outlet valve 120. The air vent 118 includes an air inlet 122 and an air inlet valve 124. The air inlet valve 124 is a normally-closed valve, such that air entering the air inlet 122 is prohibited from entering the container 112 until the air inlet valve 124 transitions from the normally-closed position to an open position. The air vent 118 is configured such that, when a selected negative pressure is created in the container 112, the air inlet valve 124 allows air to enter the container 112 through the air inlet 122 and past the air inlet valve 124. The air inlet valve 124 may be, for example, a resilient valve, a mushroom valve, a poppet valve, a flapper valve, a duck bill valve, a slit valve, or the like. The air inlet vent valve 124 is selected with

properties that allow the container to vent without collapsing and prevent the fluid from leaking out.

[0036] The liquid outlet valve 120 is a normally-closed valve and in that state prohibits foreign matter from entering the container 112 and prevents fluid from flowing out of the container 112. In addition, the liquid outlet valve 120 is configured such that, when the refill unit 104 is attached to the receptacle 106, the liquid outlet valve 120 opens. Liquid outlet valve 120 may move into an open position by physical displacement of a valve component, by one or more components separating from one another, which allows liquid to flow into the pump 108 of the dispenser 100. The liquid outlet valve may be, for example, a resilient slit valve, duck bill valve, a resiliently biased valve, spring biased valve, or the like. In the case of a resilient slit valve, the valve may be opened by a projection or fluid conduit with a hollow passage that passes through the slit. The slit of the fluid outlet valve 120 seals around the projection preventing fluid from leaking out. In some embodiments, upon removal of refill unit 104 from receptacle 106, valve 120 closes and prevents any fluid remaining in the container 112 from draining out of container 112.

[0037] In the illustrated embodiment, the receptacle 106 includes a conduit 126 that is configured to engage and open the liquid outlet valve 120 of the refill unit 104 when the refill unit 104 is attached to the receptacle 106. Additionally, the conduit 126 has a conduit inlet 128 and a conduit outlet 130. When the refill unit 104 is attached to the receptacle 106, the conduit inlet 128 is in fluid communication with the interior of the container 112 of the refill unit 104, and the conduit outlet 130 is in fluid communication with the pump 108. The conduit 126 may take several forms, such as, for example, a cylindrical form, a cubical form, a conical form, or the like.

[0038] Figures 2-5B illustrate another exemplary system having a dispenser 200 that includes a housing 202, a receptacle 206 for receiving a refill unit 204, a refill unit 204, a pump 208, and an outlet 210. The receptacle 206 (or a portion thereof), the pump 208 and the outlet 210 may be part of an assembly 205. Assembly 205 includes pump locks 538 (Figure 5B) that are configured to releasably secure the assembly 205 to the housing 202 of the dispenser 200. The pump locks 538 may take any suitable form in order to releasably secure the assembly 205 to the housing 202, such as, for example, one or more projections, one or more recesses, one or more

latches, one or more catches, one or more straps, one or more hook and loop fasteners, one or more clamps, connectors or the like. In addition, any number of pump locks 538 may be used to releasably attach the assembly 205 to the housing 202, such as, for example, one attachment member, two attachment members, three attachment members, etc. In some embodiments, pump locks 538 provide a “friction fit” that prevents the pump 208 from lifting out of dispenser housing 202 when refill unit 204 is removed.

[0039] The receptacle 206 also includes a disconnection member, or release member, 546 (Figures 5A and 5B) for disconnecting the assembly 205 from the dispenser housing 202. The disconnection member 546 may take any suitable form that allows a user to readily remove the assembly 205 from the housing 202. In the illustrated embodiment, the disconnection member 546 includes an engagement element 548 that a user can engage to remove the assembly 205 from the housing 202. The engagement element 548 may take any suitable form that allows a user to engage and remove the assembly 205 from the housing 202. In the exemplary embodiment, a user engages engagement element 548 and lifts upward. Pump lock 538 provides a friction fit to hold assembly 205 in dispenser housing 202 unless a user desires to remove assembly 205.

[0040] While the illustrated embodiment shows the pump lock 538 and the disconnection member 546 being disposed on the portion of the receptacle 206, the pump locks 538 and/or the disconnection member 546 may be disposed anywhere on the assembly 205. In yet another embodiment, the pump locks 538 and/or the disconnection member 546 may be disposed on the housing 202 and be configured to engage the assembly 205 in order to attach and/or remove the assembly 205 to the housing 202. In alternative embodiments, the receptacle 206, pump 208, and outlet 210, may not be part of an assembly, but may be two or more separate parts that are able to be coupled to each other. The above-mentioned embodiments allow the dispenser 200 to be configured such that the pump 208 may be easily attached to and removed from the dispenser housing 202. This is beneficial because pumps 208 may need to be replaced in certain situations, such as, for example, periodically to prohibit bacteria from forming in the pump, if the pump fails or is not working properly, if the pump clogs, or if parts wear.

[0041] The refill unit 204 includes a container 212 for containing a liquid. The liquid may be, for example, soap, sanitizer, a lotion or the like. In various embodiments, the liquid may be a foamable liquid. Figures 3, 4A and 4B illustrate an exemplary refill unit 204 having a container 212 and a cap 216. The container 212 may be made out of, for example, polyethylene terephthalate (PET), PETE, LDPE, HDPE, plastic, thermoplastic, or the like. The container 212 has a neck 314, and the cap 216 is configured to attach to the neck 314. The cap 216 may attach to the neck 314 of the container 212 by any suitable means, such as, for example, a threaded connection, a snap-fit connection, a welded connection, an adhesive connection, or the like. In this exemplary embodiment, container 212 is a non-collapsing container. In some embodiments, container 212 is a collapsing container and venting is not required.

[0042] The cap 216 includes an air vent 318 and a liquid valve 320. The air vent valve 318 has an air inlet 322 and an air vent valve 324. The air vent valve 324 is in a normally-closed position (as shown in Figure 4B), such that air entering the air inlet 443 is prohibited from entering the container 212 until the air vent valve 324 opens or cracks. The air vent valve 324 is configured such that, when a negative pressure is created in the container 312, the air vent valve 324 opens and allows air to enter the container 312 through the air inlet 443 and past the air vent valve 324. Air may enter air inlet 443 through opening 441 or 442. The air vent valve 324 may be, for example, a wiper seal valve (as shown), a resilient valve, a mushroom valve, a poppet valve, a flapper valve, a duck bill valve, a slit valve, and the like. The air vent valve 124 is selected with properties that allow the container 212 to vent without collapsing and prevent the fluid from leaking out.

[0043] The liquid inlet valve 320 is a normally-closed pvalve to prohibit liquid from flowing out of and foreign matter from entering the container 212. In addition, the liquid inlet valve 320 is configured such that, when the refill unit 204 is attached to the receptacle 206, the liquid inlet valve 320 moves into an open position, which allows liquid to enter the pump 208 of the dispenser 200. The liquid valve 320 may be, for example, a resilient slit valve (as shown), a resilient valve, a mushroom valve, a poppet valve, a flapper valve, a duck bill valve, a slit valve, and the like. The liquid inlet valve 320 is selected with properties that allow the container 212 to be releasably placed in fluid communication with pump 208 without allowing fluid leaking out of container 212 when container 212 is not in fluid communications with pump 208.

[0044] Referring to Figures 4A and 4B, the liquid outlet valve 320 is a resilient member and includes a slit 421. Slit 421 is normally closed and prevents liquid from flowing out of container 212. Liquid outlet valve 320 includes an annular projection 432 and a projection 433 that form an annular groove 434 that fits around flange 435 of an aperture in cap 216. Valve 320 includes an extension 436 connected to a cylindrical portion 322. Cylindrical portion 322 fits into recess 440. In some embodiments cylindrical portion 322 includes an aperture 441 therethrough. In some embodiments, the cylindrical portion 322 fitting into cavity 440 is used for alignment of valve 320 and used to aid in inserting valve 320 into cap 216. An air passage 443, and aperture 444 allow air to flow into cavity 450. Air vent valve 324 is secured in cavity 450 and allows air to flow into container 216 when sufficient vacuum pressure builds up in container 212 as liquid flows out.

[0045] When refill 204 is connected to a pump (not shown) a conduit (not shown) is forced through slit 421 to provide fluid communication between the interior of container 212 and the pump. Slit 421 forms a seal around the conduit to prevent leaking. In some embodiments, the bottom of the valve member 320 seals against a surface of the pump (not shown). This configuration forms a sealed compartment, which further prevents liquid from leaking around the conduit. In addition, should any liquid leak around the conduit, it is contained in the compartment.

[0046] Figure 5A is a front prospective view of an exemplary embodiment of a reusable replaceable pump assembly 205. In this exemplary embodiment pump 208 is a liquid dome pump. However, as noted above, pump 208 may be any type of pump, such as, for example, those discussed above and or incorporated herein. Assembly 205 has a projection 540 that fits within a slot (not shown) in dispenser housing 202 and ensures proper alignment of pump 208.

[0047] Figure 5B is a rear prospective view of the exemplary pump assembly 205. Receptacle 206 includes a conduit 526 that is in fluid communication with the pump 208. The receptacle 206 is configured such that, when the refill unit 204 is attached to, or inserted in, the receptacle 206, the conduit 526 is in fluid communication with interior of the container 212 of the refill unit 204. That is, the conduit 526 is configured to engage the liquid valve 320 of the receptacle 204 and, when the conduit 526 engages the liquid valve 320, the liquid valve 320 moves into an open

position. As a result, the interior of the container 212 of the refill unit 204 is in fluid communication with the pump 208. Referring to Figures 4B and 5B, the conduit 526 has a cylindrical shape that engages with a liquid slit valve 320. When the refill unit 204 is attached to the receptacle 206, the conduit 526 contacts the liquid valve 320, which causes the slit of the valve 320 to open. When the valve 320 opens, the conduit 526 extends into the interior of the container 212. The conduit 526 may take any form that is able to open the liquid valve 320 when the refill unit 204 is attached to the receptacle 206. For example, the conduit 526 may take a cylindrical form, a cubical form, a conical form, or the like.

[0048] The refill unit 204 may attach to the dispenser 202 by any suitable manner, such as, for example, by a snap fit, a friction fit, gravity, or the like. In certain embodiments, refill unit 204 does not attach directly to receptacle 206. In some embodiments, the refill unit 204 is aligned on the receptacle 206 such projection 540 of the receptacle 206 mates with a surface of the refill unit 204 and the dispenser housing 202 at least partially supports the refill unit 204.

[0049] Referring to Figures 4A and 5B, in some embodiments, the refill unit 204 may include an alignment member 442 that is configured to engage an alignment element 544 of the receptacle 204. The alignment member 442 and the alignment element 544 may take any suitable form that allows the refill unit 204 to be aligned on the receptacle 206. The receptacle 206 may take any suitable form that allows the receptacle 206 to receive the refill unit 204, and allows the container 212 of the refill unit 204 to be in fluid communication with the pump 208 when the refill unit 204 is inserted in dispenser housing 202. There is a refill unit catch mechanism (not shown) that engages surface 337 of refill unit 204. Refill catch mechanism is disengaged by pushing in release mechanism 220. Accordingly, to install or remove refill unit 204 a user pushes in release mechanism 220 and inserts or removes refill unit 204. When the release mechanism 220 is released, the refill catch mechanism engages surface 337 to hold refill unit 204 in place.

[0050] The pump 208 is configured to pump liquid from the container 212 of the refill unit 204 and out of the outlet 210 of the dispenser 200. In the exemplary embodiment shown in Figures, the pump 208 is a dome pump. However, in alternative embodiments, the pump 208 may be, for example, a piston pump, a dome pump, a tube pump, a rotary pump, a diaphragm pump; a gear

pump, or the like. In various embodiments, the pump 208 may be a foam pump, such as, for example, an foam pump described, or incorporated, in the present application. In addition, the dispenser 200 may include a foam cartridge that is configured to create a rich foam, such as, for example, any foam cartridge described, or incorporated, in the present application.

[0051] Figure 6 is an exemplary methodology for providing a dispenser for dispensing fluid. The methodology begins at block 602. At block 604 a pump is inserted into a dispenser housing. At block 606 a refill unit is inserted into the dispenser. At block 608 the refill unit is removed from the dispenser while the pump remains in the dispenser and the methodology ends at block 610.

[0052] While various inventive aspects, concepts and features of the inventions may be described and illustrated herein as embodied in combination with exemplary embodiments, these various aspects, concepts and features may be used in many alternative embodiments, either individually or in various combinations and sub-combinations thereof. Unless expressly excluded herein, all such combinations and sub-combinations are intended to be within the scope of the present inventions. Still further, while various alternative embodiments as to the various aspects, concepts and features of the inventions--such as alternative materials, structures, configurations, methods, circuits, devices and components, software, hardware, control logic, alternatives as to form, fit and function, and so on--may be described herein, such descriptions are not intended to be a complete or exhaustive list of available alternative embodiments, whether presently known or later developed. Those skilled in the art may readily adopt one or more of the inventive aspects, concepts or features into additional embodiments and uses within the scope of the present inventions even if such embodiments are not expressly disclosed herein. Additionally, even though some features, concepts or aspects of the inventions may be described herein as being a preferred arrangement or method, such description is not intended to suggest that such feature is required or necessary unless expressly so stated. Still further, exemplary or representative values and ranges may be included to assist in understanding the present disclosure; however, such values and ranges are not to be construed in a limiting sense and are intended to be critical values or ranges only if so expressly stated. Moreover, while various aspects, features and concepts may be expressly identified herein as being inventive or forming part of an invention, such identification is not intended to be exclusive, but rather there may be

inventive aspects, concepts and features that are fully described herein without being expressly identified as such or as part of a specific invention. Descriptions of exemplary methods or processes are not limited to inclusion of all steps as being required in all cases, nor is the order that the steps are presented to be construed as required or necessary unless expressly so stated.

CLAIMS

1. A method of providing a fluid dispenser comprising:
inserting a pump into a housing of a dispenser;
the pump having a pump housing a pump chamber; an inlet; an outlet; and a pump lock,
wherein the pump lock releasably secures the pump to the dispenser;
inserting a refill unit of liquid into the dispenser;
the refill unit having a lid and a liquid outlet valve;
wherein when the refill unit is inserted in the dispenser the pump inlet causes the container outlet valve to open placing fluid in the container in fluid communications with the pump chamber; and
removing the refill unit without removing the pump.
2. The method of claim 1 further comprising removing the pump from the dispenser by disengaging the pump lock from the dispenser.
3. The method of claim 2 further comprising inserting a replacement pump into the dispenser.
4. The method of claim 3 further comprising inserting a replacement refill unit into the dispenser.
5. A fluid dispenser comprising:
a dispenser housing;
a pump housing;
a liquid pump chamber located within the pump housing;
a liquid inlet valve;
a liquid outlet valve
a pump lock secured to one of the pump housing and dispenser housing;
the pump lock releasably secures the pump housing to the dispenser housing; and

- a refill unit;
 - the refill unit including a container; a cap and a container liquid outlet valve.
- 6. The fluid dispenser of claim 5 wherein the container liquid outlet valve is a slit valve.
- 7. The fluid dispenser of claim 5 wherein the container liquid outlet valve is a slit valve and includes an alignment member offset from the center of the slit in the slit valve.
- 8. The fluid dispenser of claim 5 further comprising a release member for releasing the pump lock.
- 9. The fluid dispenser of claim 5 wherein the pump housing comprises a receptacle for receiving the refill unit.
- 10. The fluid dispenser of claim 9 wherein the receptacle at least partially surrounds perimeter of the cap on the refill unit.
- 11. The fluid dispenser of claim 9 wherein the receptacle surrounds less than about one half of the perimeter of the cap on the refill unit.
- 12. The fluid dispenser of claim 5 wherein the liquid inlet is in the form of a conduit.
- 13. The fluid dispenser of claim 12 wherein the conduit has an opening that faces upward.
- 14. A dispenser comprising:
 - a housing;
 - a refill unit having:
 - a container for holding a liquid, the container having a neck;
 - a cap configured to attach to the neck of the container, the cap having:
 - an air vent comprising an air inlet and an air valve;

a liquid valve in fluid communication with the container, where the liquid valve comprises a slit;

a removable assembly attached to the housing,

the removable assembly having:

a receptacle for receiving the refill unit;

an inlet conduit;

a pump in fluid communication with the inlet conduit;

an outlet in fluid communication with the pump; and

a pump lock;

wherein the inlet conduit engages the liquid valve of the refill unit when the receptacle receives the refill unit, and the engagement between the inlet conduit and the liquid valve causes the liquid valve to maintain an open position;

wherein the refill unit is removable from the dispenser without removing the removable assembly; and

wherein the removable assembly is removed from the dispenser by disengaging the pump lock.

15. The dispenser of claim 14, wherein the cap of the refill unit further comprises a resilient member, and the resilient member comprises the liquid valve and the air inlet of the air vent.

16. The dispenser of claim 14, wherein the air valve is made of a resilient material.

17. The dispenser of claim 14, wherein the pump is a dome pump.

18. The fluid dispenser of claim 14 wherein the receptacle at least partially surrounds perimeter of the cap on the refill unit.

19. The fluid dispenser of claim 18 wherein the receptacle surrounds less than about one half of the perimeter of the cap on the refill unit.

20. The fluid dispenser of claim 14 wherein the cap includes an aperture for receiving the liquid valve and a recess proximate the aperture and wherein the liquid valve includes an alignment member that is located within the recess.

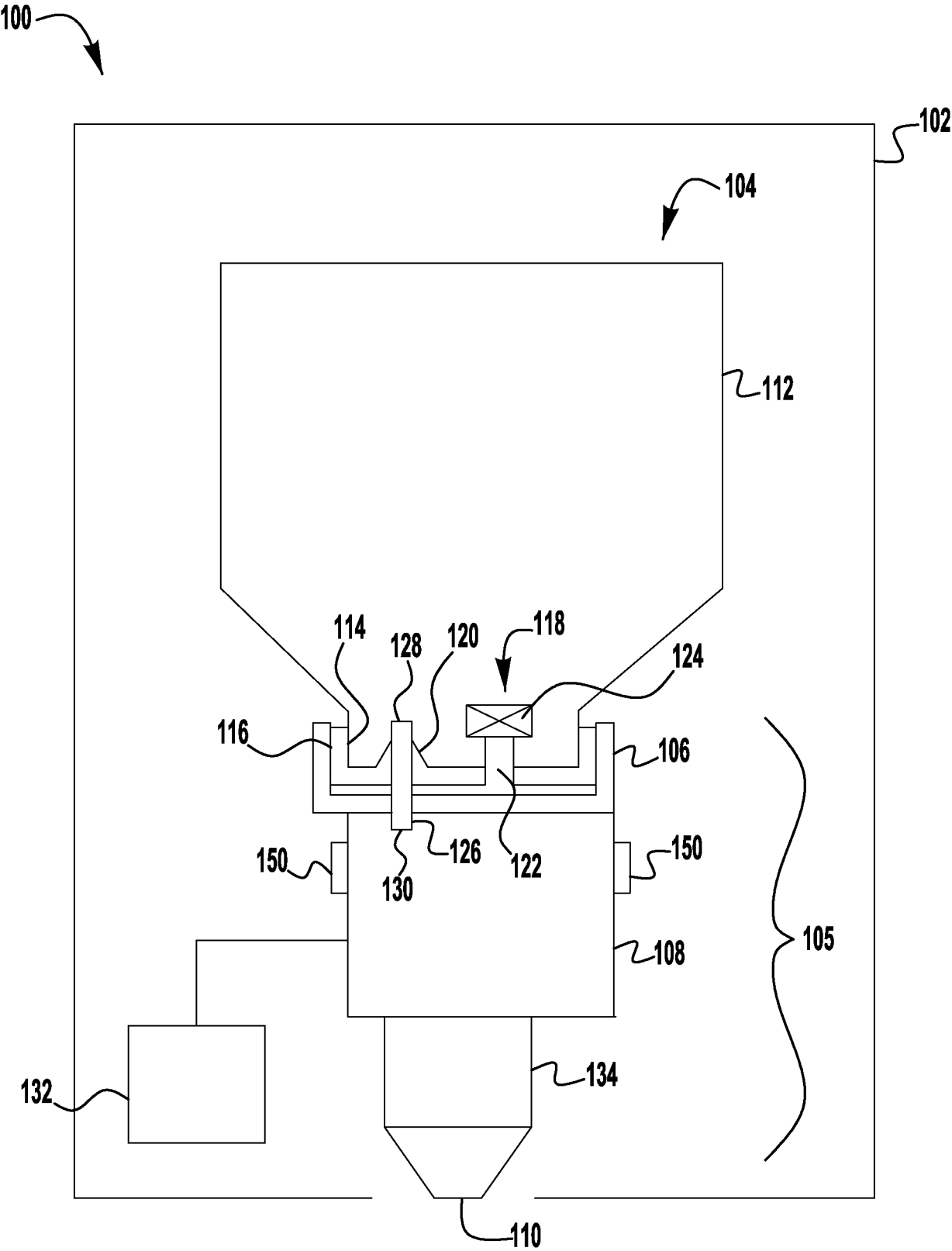


FIG. 1

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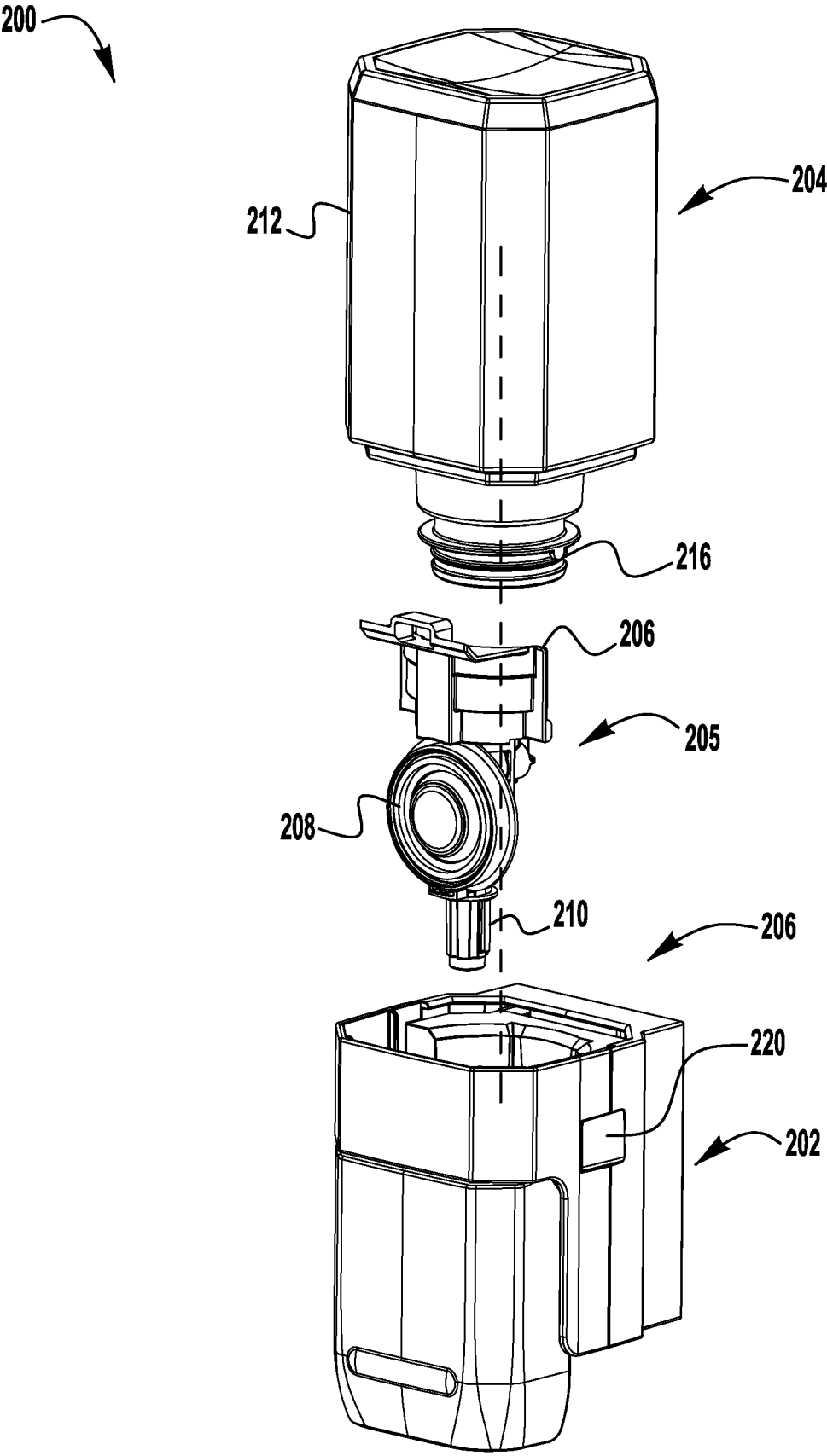


FIG. 2

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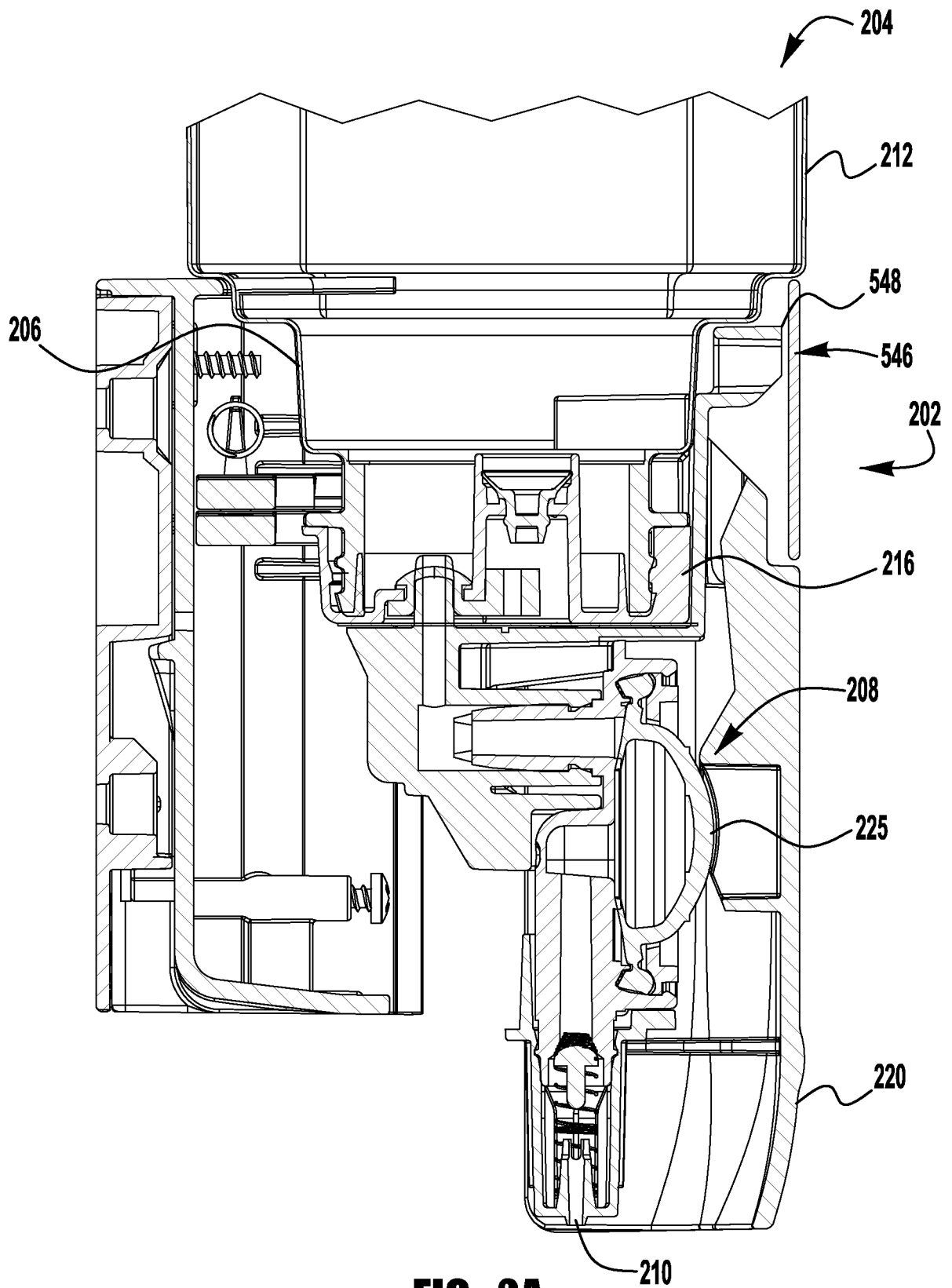


FIG. 2A

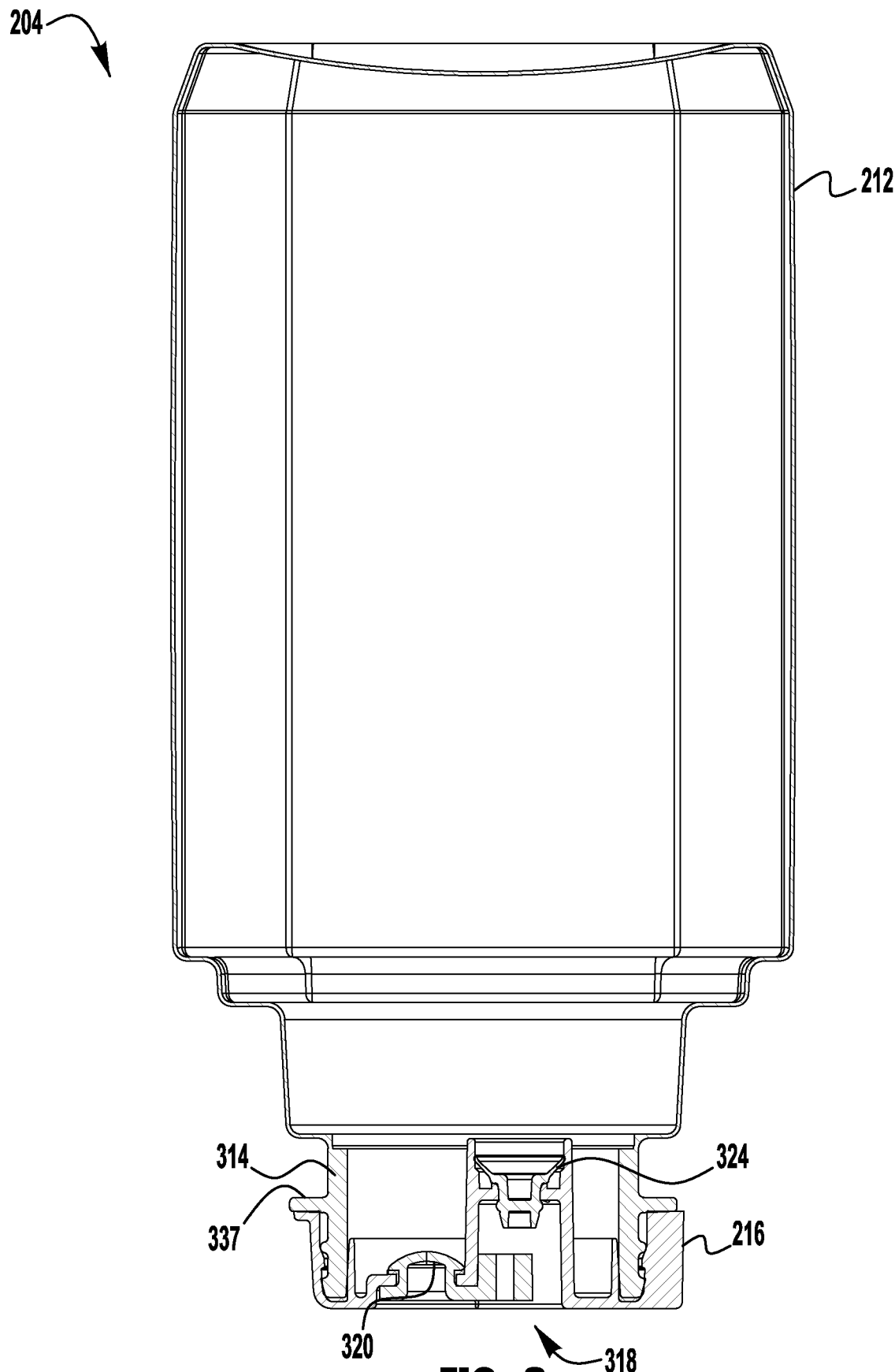


FIG. 3

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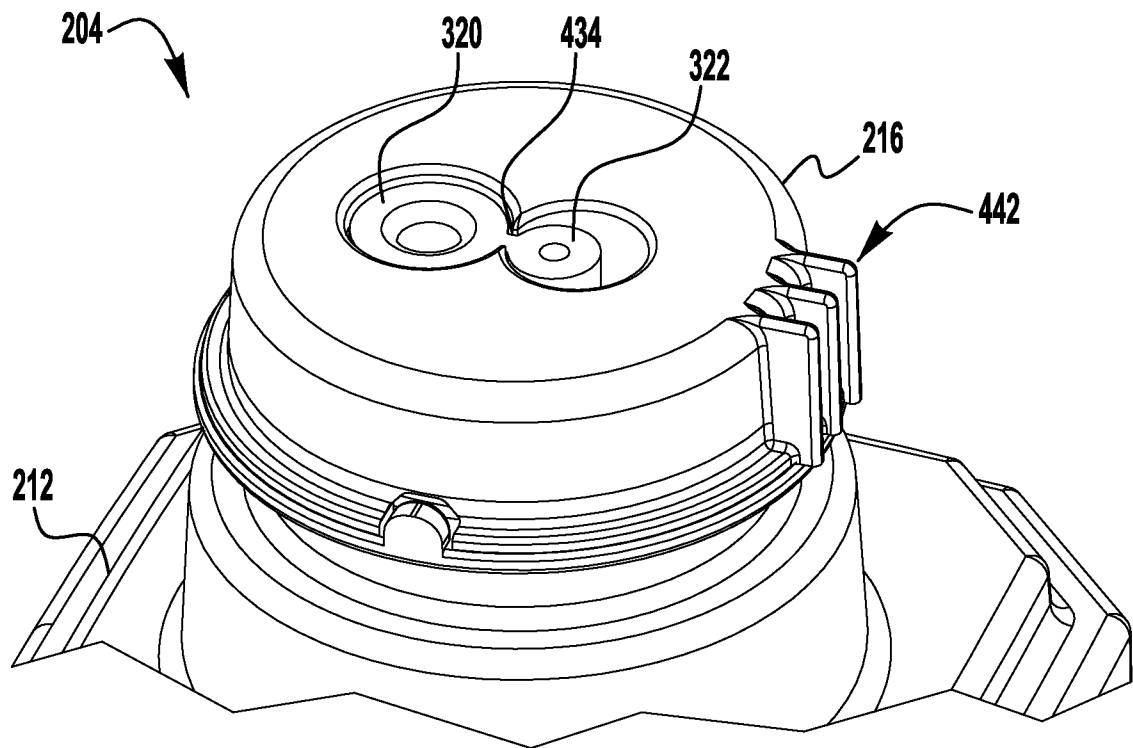


FIG. 4A

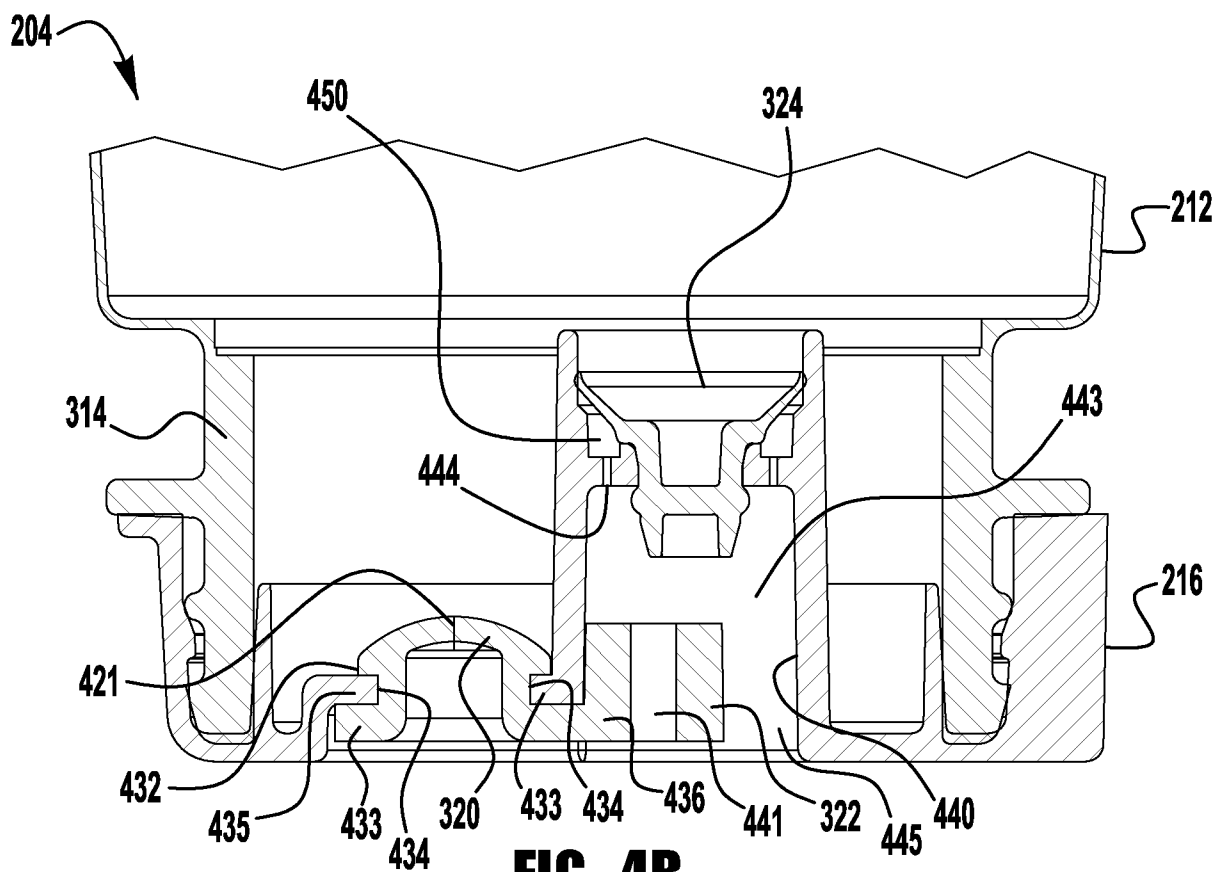
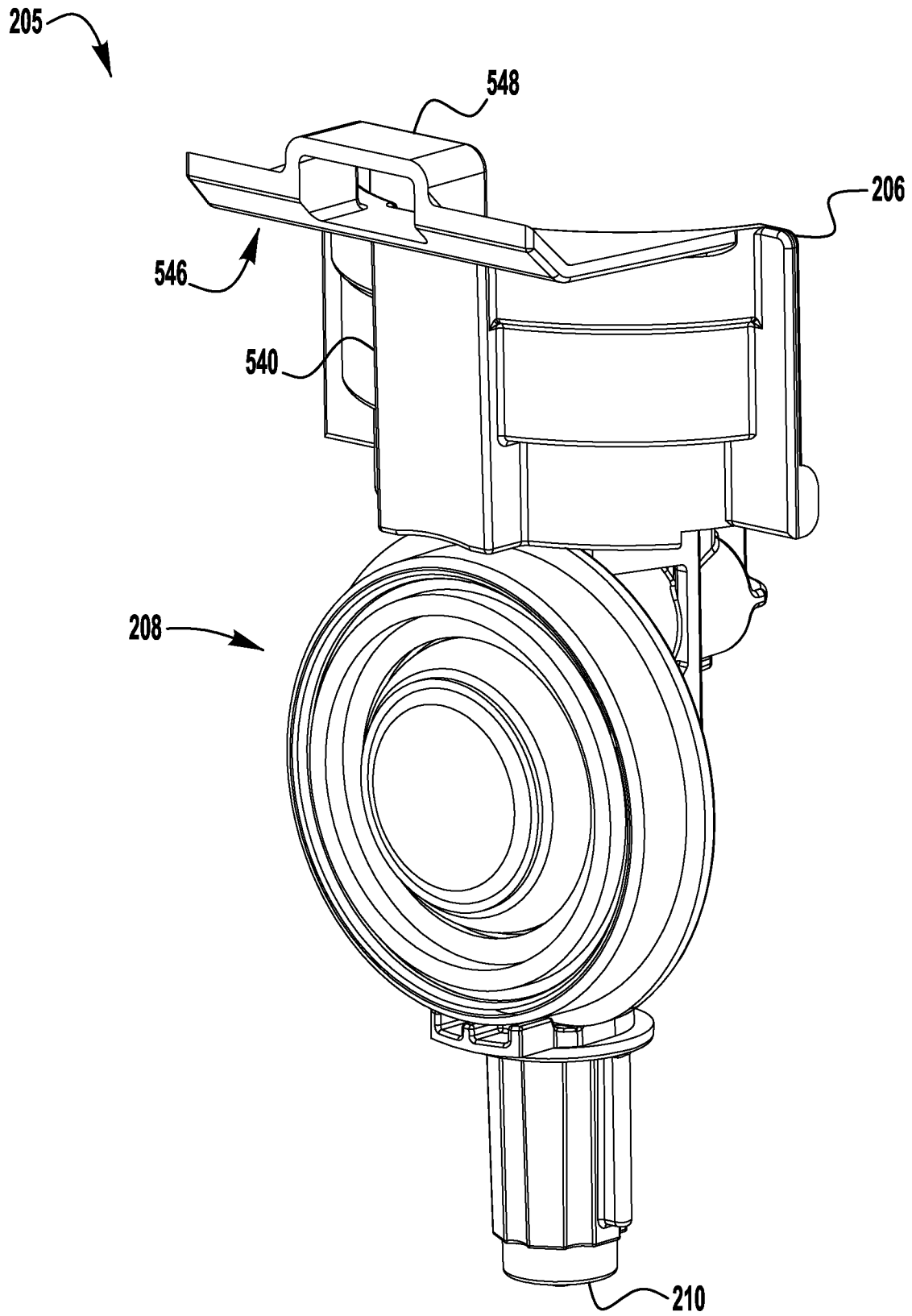


FIG. 4B

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**FIG. 5A**

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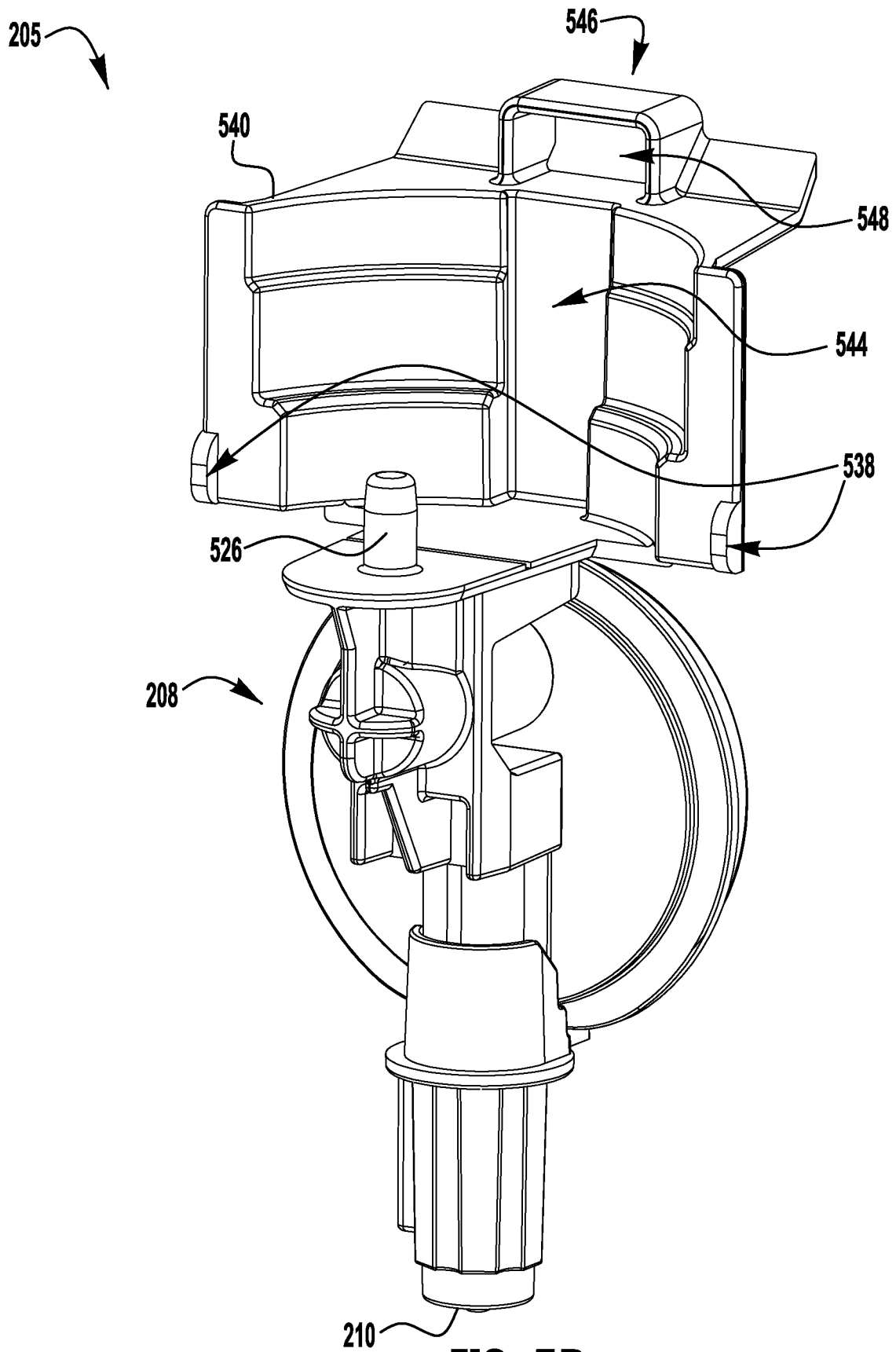
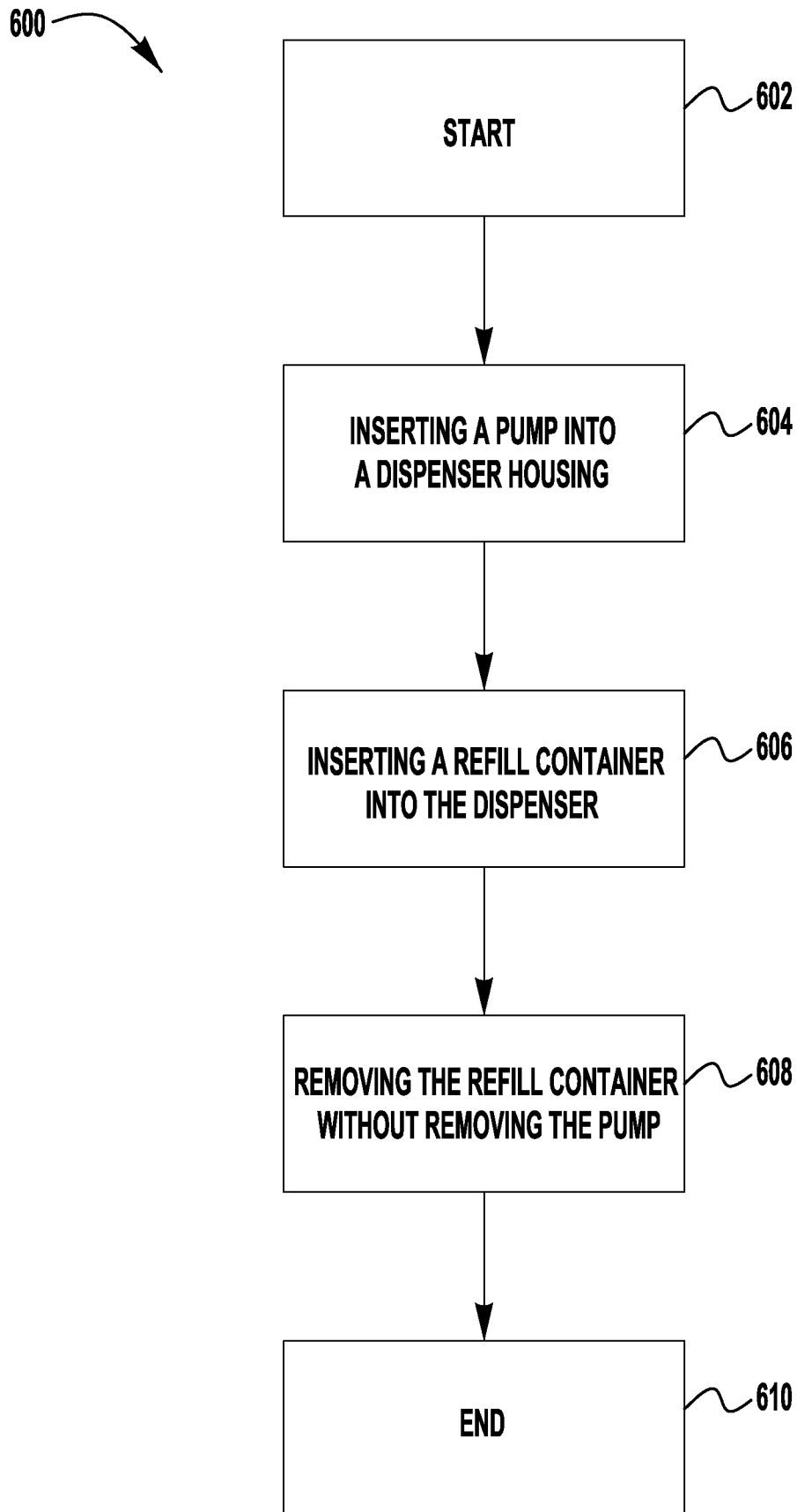


FIG. 5B

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**FIG. 6**

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2017/061013

A. CLASSIFICATION OF SUBJECT MATTER
 INV. A47K5/12
 ADD.

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)

A47K B65D A47L

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

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

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2010 013111 A (YOSHINO KOGYOSHO CO LTD) 21 January 2010 (2010-01-21) figures 1, 2	5,8,9
X	----- US 2011/017778 A1 (KADIKS FEDOR [NL] ET AL) 27 January 2011 (2011-01-27) figures 1, 5	1-20
A	----- US 6 328 543 B1 (BENECKE ARNOLD GEORGE [US]) 11 December 2001 (2001-12-11) figure 1	1,5-7, 14,20
X	----- US 2015/157176 A1 (MUDERLAK TODD JEFFREY [US] ET AL) 11 June 2015 (2015-06-11) figures 1, 7, 15, 16	1-6



Further documents are listed in the continuation of Box C.



See patent family annex.

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search

9 February 2018

Date of mailing of the international search report

23/02/2018

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Schikhof, Arnout

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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