



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
14.05.2008 Bulletin 2008/20

(51) Int Cl.:
B41J 2/175^(2006.01)

(21) Application number: **07122695.5**

(22) Date of filing: **10.01.2005**

(84) Designated Contracting States:
DE FR GB

(30) Priority: **09.01.2004 US 535277 P**
26.04.2004 US 565726 P
06.01.2005 US 31236

(62) Document number(s) of the earlier application(s) in accordance with Art. 76 EPC:
05700771.8 / 1 701 848

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Remarks:

This application was filed on 09-12-2007 as a divisional application to the application mentioned under INID code 62.

(54) **System and method for connecting an ink bottle to an ink reservoir of an ink jet printing system**

(57) An ink supply system (10 or 200) for an ink jet printer, comprising: an ink bottle (16 or 122) containing ink; an ink reservoir (12 or 212); and an ink bottle positioning member (36 or 232) configured to align said ink

bottle (16 or 122) in a pre-mated position with said ink reservoir (12 or 212), said ink bottle positioning member (36 or 232) configured to pivot with respect to said ink reservoir (12 or 212) in a first direction to said pre-mated position.

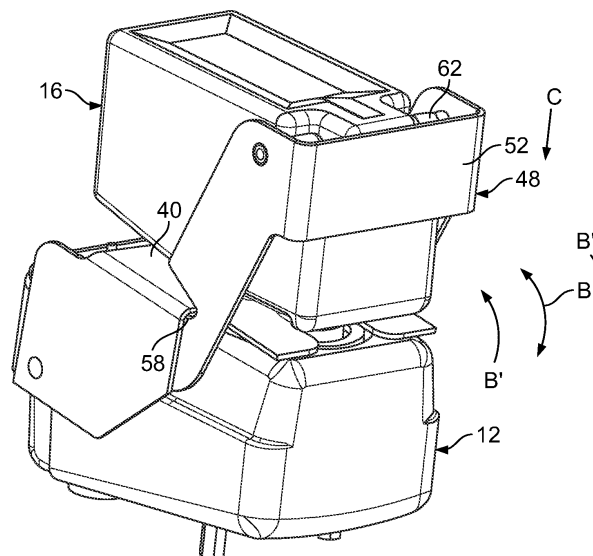


FIG. 7

Description

BACKGROUND OF THE INVENTION

[0001] Embodiments of the present invention generally relate to ink jet printing systems, and more particularly to an improved system and method for connecting an ink bottle to an ink reservoir of an ink jet printing system.

[0002] Typically, ink is supplied to ink jet printing systems through the use of disposable ink bottles. The ink bottles are mounted on ink reservoirs that include a mating feature that allows ink to pass from the ink bottles into the ink reservoirs. Each ink bottle retains a finite amount of ink, typically a pint or liter of ink. As the ink jet printing system is continually used, the ink within the ink bottles is drained. When the ink bottles are fully depleted, a new ink bottle replaces the depleted ink bottle.

[0003] When the ink bottle is replaced, excess ink may spill or leak within the ink jet printing system and/or on the operator. For example, when an operator grasps the ink bottle to replace it, the force applied may squeeze the ink bottle, thereby ejecting excess ink from the bottle. Ink spills produce a mess within the ink jet printing system, and possibly outside of the system (e.g., on the surrounding flooring) and on the operator.

[0004] Thus, a need exists for a more efficient system and method of interconnecting an ink bottle to an ink reservoir. Further, a need exists for a system and method of interconnecting and separating these components together with minimal ink leakage and mess.

SUMMARY OF THE INVENTION

[0005] According to the present invention there is provided an ink supply system for an ink jet printer, comprising: an ink bottle containing ink; an ink reservoir; and an ink bottle positioning member configured to align said ink bottle in a pre-mated position with said ink reservoir, said ink bottle positioning member configured to pivot with respect to said ink reservoir in a first direction to said pre-mated position.

BRIEF DESCRIPTION OF SEVERAL VIEWS OF THE DRAWINGS

[0006] Figure 1 illustrates an isometric exploded view of an ink bottle connection system according to an embodiment of the present invention.

[0007] Figure 2 illustrates an isometric view of an ink reservoir according to an embodiment of the present invention.

[0008] Figure 3 illustrates an isometric view of an ink filling cap according to an embodiment of the present invention.

[0009] Figure 4 illustrates an isometric view of an ink bottle according to an embodiment of the present invention.

[0010] Figure 5 illustrates a transverse cross-sectional

view of an ink bottle connection system during an ink bottle positioning stage, according to an embodiment of the present invention.

[0011] Figure 6 illustrates a transverse cross-sectional view of an ink bottle connection system at a fully mated position according to an embodiment of the present invention.

[0012] Figure 7 illustrates an isometric view of an ink bottle connection system at a fully mated position according to an embodiment of the present invention.

[0013] Figure 8 illustrates an isometric exploded view of a outlet cap according to an embodiment of the present invention.

[0014] Figure 9 illustrates an isometric view of an ink jet printing system according to an embodiment of the present invention.

[0015] Figure 10 illustrates an isometric top view of an ink bottle configured to be used with an ink jet printer, according to an embodiment of the present invention.

[0016] Figure 11 illustrates an isometric bottom view of the ink bottle, according to an embodiment of the present invention.

[0017] Figure 12 illustrates a front elevation view of the ink bottle, according to an embodiment of the present invention.

[0018] Figure 13 illustrates a rear elevation view of the ink bottle, according to an embodiment of the present invention.

[0019] Figure 14 illustrates a first lateral elevation view of the ink bottle, according to an embodiment of the present invention.

[0020] Figure 15 illustrates a second lateral elevation view of the ink bottle, according to an embodiment of the present invention.

[0021] Figure 16 illustrates a top plan view of the ink bottle, according to an embodiment of the present invention.

[0022] Figure 17 illustrates a bottom plan view of the ink bottle, according to an embodiment of the present invention.

[0023] Figure 18 illustrates an isometric view of an ink bottle connection system during an ink bottle positioning stage, according to an embodiment of the present invention.

[0024] Figure 19 illustrates an interior cross-sectional view of an ink bottle connection system during an ink bottle positioning stage, according to an embodiment of the present invention.

[0025] Figure 20 illustrates an isometric view of an ink bottle connection system at a fully mated position, according to an embodiment of the present invention.

[0026] Figure 21 illustrates an interior cross-sectional view of an ink bottle connection system at a fully mated position, according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0027] Figure 1 illustrates an isometric exploded view of an ink bottle connection system 10 according to an embodiment of the present invention. The system includes an ink reservoir 12, an insert receptacle 14, an ink bottle 16, and an outlet cap 96. As shown in Figure 1, the ink reservoir 12 includes a guide post 17 that mates with a receptacle (not shown) formed within a housing (not shown) of an ink jet printing system (not shown).

[0028] Figure 2 illustrates an isometric view of the ink reservoir 12 according to an embodiment of the present invention. The ink reservoir 12 includes a main body 18 defined by a base 20 that is integrally formed with lateral walls 22, a rear wall 24, a front wall 26, and a top wall 28. The walls 22, 24, 26, 28 define an interior cavity (not shown) configured to receive and retain ink. A suction return channel 30, a level sensing channel 32, and an ink filling passage 34 are formed through the top wall 28 and provide fluid conduits between the ink reservoir 12 and other components, such as an ink bottle (discussed below). The insert receptacle 14 is dimensioned to fit within the ink filling passage 34. Optionally, the insert receptacle 14 may be integrally formed with the ink reservoir 12 or the ink bottle 16.

[0029] An ink bottle positioning member 36 is positioned proximate the rear wall 24 of the ink reservoir 12. The ink bottle positioning bracket or member 36 includes lateral walls 38 integrally formed with an ink bottle guide wall 40. The lateral walls 38 include guide posts 42 that pivotally engage positioning member receptacles (not shown) formed in the lateral walls 22 of the ink reservoir 12, thereby allowing the ink bottle positioning member 36 to pivot or rotate relative to the ink reservoir 12 through an arcuate path defined by A. The ink bottle guide wall 40 includes a neck engaging groove 44 formed through a distal end 46 of the ink bottle guide wall 40.

[0030] An ink bottle securing member 48 is positioned proximate the front wall 26 of the ink reservoir 12. The ink bottle securing lever or member 48 includes lateral walls 50 integrally formed with a handle 52 that connects the lateral walls 50 together. The lateral walls 50 include pivotal guide posts 54 that are rotatably retained by receptacles (not shown) formed in the lateral walls 22 of the ink reservoir 12, thereby allowing the ink bottle securing member 48 to pivot relative to the ink reservoir 12 over an arcuate path defined by B. The proximal ends of the lateral walls 50 of the ink bottle securing member 38 also include cam-shaped bottle ejection members 56. When the ink bottle securing member 48 is pivoted in a non-engaged position as shown in Figure 2, the cam shaped bottle ejection members 56 extend above the guide posts 54 and edges 57 of the lateral walls 50. Notches 58 are also formed in the lateral walls 50. Pin cavities 60 are formed in distal ends 55 of the lateral walls 50. The pin cavities 60 are configured to receive and retain pins 62 that extend inwardly from distal interior surfaces 49 the lateral walls 50, and into a bottle engaging

area 64.

[0031] Alternatively, a locking cam member may be connected to the ink bottle securing member 48. The locking cam member may be configured to pivot through a range of motion that opposes that of the ink bottle securing member 48. The locking cam member may be used to securely lock the ink bottle 16 into place with respect to the ink reservoir 12.

[0032] Figure 3 illustrates an isometric view of the insert receptacle 14, which is configured to be received and retained by the ink filling passage 34. The insert receptacle 14 includes a generally cylindrical main body 66 that includes a base 68 integrally formed with a cylindrical wall 70, thereby defining an inner cavity 72 therebetween. The cylindrical main body 66 is formed to fit in a reciprocal opening formed in the top wall 28 (shown, e.g., in Figure 2) of the ink reservoir 12 (shown, e.g., in Figure 2). That is, the top wall 28 includes a recessed base portion surrounding an opening that supports the cylindrical main body 66 and base 68 of the insert receptacle 14. An ink drain 74 is formed through the cylindrical wall 70 and/or the base 68 and is configured to allow ink that is collected in the inner cavity 72 to drain into the ink reservoir 12 through the ink filling passage 34 (shown, e.g., in Figure 2). A probe 76 is positioned in the center of the base 68 and is generally perpendicular to the plane of the base 68. As shown in Figure 3, the probe 76 extends through the base 68. The probe 76 is a tube-like structure having an ink passage 78 that extends through the entire length of the probe 76. The probe 76 includes an inlet end, or ink bottle mating end 77 and an outlet end, or ink reservoir deposit end 79. The ink reservoir deposit end 79 is beveled in order to prevent ink from overflowing. For example, the ink reservoir deposit end 79 may be beveled, or scalloped, similar to the needle shown and described in greater detail in Figure 3 of United States Patent No. 4,831,389. Optionally, the insert receptacle 14 may include more than one ink drain 74.

[0033] Figure 4 illustrates an isometric view of the ink bottle 16, which is configured to contain and dispense ink. The ink bottle 16 includes a main body 80 defined by a base 82, lateral walls 84, a front wall 86, a rear wall 88, and a top wall 90. The front wall 86 includes curved pin sliding surfaces 87 formed on either side of a central block 89. An ink outlet 92 extends downwardly from the base 82. The ink outlet 92 includes a neck 94 having a channel (not shown) extending therethrough that is in fluid communication with the interior (not shown) of the ink bottle 16. The outlet cap 96 (shown in Figure 1) has an outlet positioned over at least a portion of the neck 94. As further discussed below, the outlet cap 96 is configured to mate with the ink bottle mating end 77 of the probe 76. That is, the outlet cap 96 fits within the inner cavity 72 of the insert receptacle 14 so that the outlet of the outlet cap 96 aligns with the ink passage 78. Thus, ink may pass from the ink bottle 16 through the outlet of the neck 94 and outlet cap 96 through the ink passage 78 of the probe 76, and into the ink reservoir 12.

[0034] Figure 5 illustrates a transverse cross-sectional view of an ink bottle connection system 10 during an ink bottle positioning stage. The ink bottle positioning member 36 has been pivoted in the direction of A' so that the ink bottle guide wall 40 is positioned over the top wall 28 of the ink reservoir 12. As shown in Figure 5, the neck 94 of the ink bottle 16 is positioned within the neck engaging groove 44. That is, the neck 94 is configured to be removably secured within the neck engaging groove 44. The neck engaging groove 44 is formed so that when the neck 94 is inserted into the neck engaging groove 44, the outlet cap 96 is aligned to mate with the insert receptacle 14, i.e., the ink bottle 16 is aligned to mate with the ink reservoir 12. The outlet cap 96 is not mated with the insert receptacle 14 at this stage because the bottle ejection members 56 abut the ink bottle guide wall 40, thereby supporting the ink bottle guide wall 40 in a pre-mated state over the top wall 28 of the ink reservoir 12. Thus, the outlet cap 96 is, in turn, supported in a pre-mated state.

[0035] Figures 6 and 7 illustrate the ink bottle connection system 10 at its fully mated position. As can best be seen in Figure 7, the ink bottle securing member 48 has been pivoted upwards in the direction of B'. Referring to Figures 6 and 7, as the ink bottle securing member 48 pivots upward in the direction of B', the bottle ejection members 56 recede from and disengage the ink bottle guide wall 40, thereby allowing the ink bottle 16 to move downwardly in the direction of C toward the top wall 28 of the ink reservoir 12. Consequently, the ink bottle 16 is mated with, or connects with, the ink reservoir 12 by way of the neck 94 and outlet cap 96 mating with the insert receptacle 14. As the ink bottle securing member 48 continues to travel upwardly in the direction of B', the outlet cap 96 further mates with the insert receptacle 14. The notches 58 of the ink bottle securing members 48 move into a straddling relationship with the ink bottle guide wall 40. Further, the pins 62 slide over the curved surfaces 87 (as shown in Figure 4), which are shaped to conform to the arcuate movement of the pins 62 in the directions defined by B. As the pins 62 slide over the curved surfaces 87, the pins exert a downward force on the ink bottle 16 causing the outlet cap 96 to fully mate with the insert receptacle 14. When the ink bottle 16 and ink reservoir 12 are in a fully mated position, the force exerted by the pins 62 in the direction of C assists in securely maintaining a connection between the ink bottle 16 and the ink reservoir 12.

[0036] In order to disengage the ink bottle 16 from the ink reservoir 12, the handle 52 is pulled down in the direction of B". As the handle 52 moves in the direction of B", the entire ink bottle securing member 48 moves in response thereto. Thus, the bottle ejection members 56 move upward and abut the ink bottle guide wall 40 causing the ink bottle guide wall 40 to move upward. As the ink bottle guide wall 40 moves upward, the outlet cap 96 is ejected from the insert receptacle 14 due to the fact that the ink bottle guide wall 40, which supports the ink

bottle 16, urges the ink bottle 16 upward.

[0037] Because the ink bottle 16 is removed without an operator grasping the ink bottle 16 itself, the ink bottle 16 is not squeezed. Thus, excess ink is not ejected from the ink bottle 16. Further, excess ink may collect in the inner cavity 72 (as shown in Figure 3) of the insert receptacle 14 and drain into the ink reservoir 12 through the ink drain 74 (as shown in Figure 3). Thus, embodiments of the present invention provide a system 10 and method of removing the ink bottle 16 from the reservoir 12 with a minimal amount of ink residue, spillage, and mess.

[0038] Figure 8 illustrates an isometric exploded view of an outlet cap 96 and a probe 76. For the sake of clarity, the main body 66 of the insert receptacle 14 is not shown. Referring to Figure 8 (and also to Figures 5 and 6), the outlet cap 96 includes a main cylindrical body 98 having an open end 100 that is configured to securely engage the neck 94 of the ink outlet 92, and a partially closed end 102 having a passage 104 formed therethrough. A washer-like diaphragm 106 having a passage 108 formed therethrough is positioned within a cavity formed within the cylindrical body 98. A split diaphragm 110 is positioned over the diaphragm 106 so that the diaphragm 106 is sandwiched between an upper surface of the interior of the cylindrical body 98 and the split diaphragm 110. A partial slit 112 is formed on the bottom face of the split diaphragm 110 between sides 111 and 113. The slit 112 may be a perforation or similar area of structural weakness. Preferably, the slit 112 does not fully extend through the diaphragm 110 except upon being engaged by a puncturing member. The outlet cap 96 may be attached to the neck 94 of the ink bottle 16 by various methods including clipping, crimping, screwing, bonding, and the like. For example, the outlet cap 96 may threadably or snapably engage a corresponding structure on the neck 94. The diaphragms 106 and 110 may be formed of an elastomeric material or various other resilient, liquid tight and gas tight materials. Alternatively, the outlet cap 96 may include only one of the diaphragms 106 or 110. Also, alternatively, the outlet cap 96 may include additional diaphragms 106 and 110. A further alternative embodiment of the ink bottle connection system 10 may include a puncturable diaphragm closure such as described in United States Patent No. 6,079,823, entitled "Ink Bottle with Puncturable Diaphragm Closure," which is hereby incorporated by reference in its entirety.

[0039] Each of the diaphragms 106 and 110 has a particular surface energy that is less than the surface tension of the ink contained within the ink bottle 16. Thus, droplets of ink are substantially prevented from leaking through the diaphragms 106 and 110. For example, the surface energy of the diaphragms 106 and 110 may be about 20 dyne/cm, while the surface tension of the ink is about 35 dyne/cm.

[0040] During a mating process between the outlet cap 96 and the insert receptacle 14, the ink bottle mating end 77 of the probe 76 passes through the passage 104 of the outlet cap 96. After passing through the passage 104,

the ink bottle mating end 77 slidably passes through the passage 108 of the diaphragm 106. The slidable engagement between the probe 76 and the opening 108 forms a liquid tight and gas tight seal due to the fact that the opening 108 has a smaller diameter than the diameter of the ink passage 78 of the probe 76. As the probe 76 slides through the opening 108, the diaphragm 106 clings to the outer surface of the probe 76, thereby sealingly engaging the probe 76.

[0041] As the probe 76 slides further into the outlet cap 96, the probe engages the split diaphragm 110. The split diaphragm 110 has a thin membrane on its outer surface, which is formed by an incomplete formation of the slit 112. As the probe 76 is urged into the slit 112, the slit 112 is punctured and tears along a distance that allows the probe 76 to fully pass through the slit 112. The remaining untorn portion of the slit 112 clings or conforms to the exterior of the probe 76, thereby providing a barrier against leaks. That is, the split diaphragm 110 clings to the outer surface of the probe 76, thereby sealingly engaging the probe 76. The probe 76 preferably passes through the diaphragm 110 a distance that allows a maximum amount of ink to pass from the ink bottle 16 into the probe 76. That is, the probe 76 is sized so to minimize the effects of damming within the ink bottle 16.

[0042] As the probe 76 is slidably disengaged from the outlet cap 96, the diaphragms 106 and 110 cling to the outer walls of the probe 76. The diaphragm 106 everts, or moves downward in the direction of D. The eversion of the diaphragm 106 causes excess fluid retained above and below the diaphragm 110 to be suctioned or funneled into a space between the diaphragm 106 and the diaphragm 110. After the probe 76 fully disengages from the outlet cap, the sides 111 and 113 of the diaphragm 110 snap back together due to the nature of the elastomeric material that forms the diaphragm 110, thereby closing the slit 112.

[0043] Any fluid remaining between the diaphragms 106 and 110 remains in place until the probe 76 disengages from the diaphragm 106. After full disengagement, the passage 108 acts as an orifice that ejects the remaining fluid into the probe 76 (and consequently, into the ink reservoir 12) as the diaphragm 106 snaps back into place against the diaphragm 110. Any additional fluid remaining in the ink bottle 16 remains in the ink bottle 16 because of the fluid tight and gas tight barrier formed by closing of the slit 112 of the diaphragm 110. Thus, the outlet cap 96 prevents fluid leaks and mess.

[0044] Figure 9 illustrates an isometric view of an ink jet printing system 114 according to an embodiment of the present invention. The system 114 includes a housing 116 that contains a printing chamber 118, a control unit 120, and ink bottle connection systems 10 and 10'. One of the ink bottle connection systems 10 may be used for supplying ink, while the other ink bottle connection system 10' may be used for supplying make-up fluid. The mating structures on the ink bottle connection systems 10 and 10' may be different. That is, the outlet caps 96

(discussed above) for the systems 10 and 10' may differ such that each may only mate with an insert receptacle 14 (discussed above) of its respective system 10 and 10'. Optionally, the outlet cap 96 of the system 10' may not mate with the insert receptacle 14 of the system 10, but the outlet cap 96 of the system 10 may mate with the insert receptacle 14 of the system 10', or vice versa.

[0045] Additionally, the system 114 may include brackets mounted in the interior of the housing 116 that mate with the ink bottles 16 and 16'. The brackets may assist in securing the ink bottles 16 and 16' within the housing 116. Further, the brackets may be keyed to accept only a certain type of ink bottle 16 or 16'.

[0046] Figures 10-17 illustrate an ink bottle 122 configured to be used with an ink jet printer, according to an embodiment of the present invention. The ink bottle 122 includes a main body 124 defined by a base 126, lateral walls 128, a front wall 130, a rear wall 132, and a top wall 134. The front wall 130 includes curved pin sliding surfaces 136 formed on either side of a central block 138. An ink outlet (not shown) extends downwardly from the base 126. The ink outlet includes a neck (not shown) having a channel (not shown) extending therethrough that is in fluid communication with the interior (not shown) of an ink bottle. The neck may be similar to the neck 94, shown, e.g., in Figure 4. A cap assembly 140 is disposed over the neck. As further discussed below, the cap assembly 140 is configured to mate with a probe of an insert receptacle, such as insert receptacle 14, shown, e.g., in Figure 3. Thus, ink may pass from the ink bottle 122 through the cap assembly 140, and into the ink reservoir.

[0047] The ink bottle 122 also includes a recess 142 located proximate the junction of a lateral wall 128, the top wall 134 and the rear wall 132. While the recess 142 is shown at the top of the ink bottle 122, the recess 142 may be located at various other positions of the ink bottle 122. For example, the recess 142 may be located on the top wall 134, or on the rear wall 132, or solely on one of the lateral walls 128. Additionally, more than one recess 142 may be formed on the ink bottle 122. The recess 142 acts as a locating feature that mates with a reciprocal protuberance formed on a housing bracket on an ink jet printing system. Optionally, the ink bottle 122 may include a protuberance that mates with a reciprocal recess formed in the housing bracket.

[0048] The cap assembly 140 includes a generally cylindrical main body 143 having a beveled tip 144 extending downwardly therefrom. An ink outlet passage 146 is formed at the distal end 148 of the beveled tip 144. The main body 143 also includes an upper circumferential ridge 150 extending outwardly therefrom, and a lower circumferential ridge 152 spaced apart from the upper circumferential ridge 150 and extending outwardly from the main body 143. The upper circumferential ridge 150 is located proximate the base 126 of the ink bottle 122, while the lower circumferential ridge 152 is distally located from the base 126.

[0049] The cap assembly 140 is shown in a closed

position. In order to allow ink to flow from the ink bottle 122 through the cap assembly 140, the cap assembly 140 is urged in the direction of arrow Y shown in Figure 11. As the cap assembly 140 is slid open in the direction of Y, an inner channel is opened and ink is allowed to pass through the ink outlet passage 146.

[0050] Figure 18 illustrates an isometric view of an ink bottle connection system 200 during an ink bottle positioning stage, according to an embodiment of the present invention. The system 200 includes the ink bottle 122 configured to be mated with an ink reservoir 212, similar to the embodiments discussed above. The ink bottle 122 is secured within a bracket 216 of an ink jet printing system. The bracket 216 includes lateral walls 217 integrally formed with a top wall 219 defining an interior cavity 215 therebetween. The top wall 219 includes a protuberance 221 that extends into the interior cavity 215. The ink bottle 122 is positioned within the interior cavity 215 such that the protuberance 221 is mated into the recess 142 (shown in Figure 10, for example). The mating of the protuberance 221 into the recess 142 ensures that appropriate ink bottles 122 are used with the system 200. In other words, if a particular ink bottle does not include a recess 142 that is configured to mate with the protuberance 221, that ink bottle cannot be secured within the interior cavity 215, and therefore, not used with the system 200.

[0051] Figure 19 illustrates an interior cross-sectional view of the ink bottle connection system 200 during an ink bottle positioning stage, according to an embodiment of the present invention. The cap assembly 140 includes a wiper seal 222 positioned at the distal end 148. Below the wiper seal 222 is an annular interference member 224 at full closure that is adapted to be the main pressure seal. An additional seal 226 is configured to wipe an inner lumen 228 and is a primary seal when the enclosure is fully opened and closed. An additional seal may be an interference member between the tip of the lumen and the internal cylinder of the closure tip. When the cap assembly 140 is urged open in the direction of arrow Y, ink is allowed passes from the ink bottle 122, through an ink channel 230 of cap assembly 140 and out the ink outlet passage 146. The ink then passes into the ink reservoir 212 by way of the insert receptacle 14.

[0052] Figure 20 illustrates an isometric view of the ink bottle connection system 200 at a fully mated position, according to an embodiment of the present invention. Figure 21 illustrates an interior cross-sectional view of the ink bottle connection system 200 at a fully mated position, according to an embodiment of the present invention. As shown in Figures 20 and 21, the ridges 150 and 152 are spaced a nominal distance apart to allow a loose sliding fit with a fork on the lift/plate of the opening/closing mechanism.

[0053] Referring to Figures 20 and 21, the ink bottle 122 is guided into position by the use of a guide 232 to assure proper location with regard to a lift plate 234 and to some extent the positioning of the closure axially with

respect to the probe. A spring member 236 is positioned below the probe assembly 231 in order to allow the bottle 122 to move vertically (with some nominal resistance less than the force required to disassemble the closure), and thereby allow any fitment tolerance in the engaging parts to be absorbed.

[0054] The system 200 shown in Figures 18-21 holds the bottle 122 rigid (in the bottle guide) and the cap assembly 140 is urged open and closed with respect to a probe 147 of the probe assembly 231. After the bottle 122 is inserted into the bottle guide 232 and the circumferential ridges 150 and 152 of the cap assembly 140 are correctly positioned above and below the lift plate 234, the lever 240 is raised to a point whereby the lift plate 234 is posed to urge the cap assembly 140 open by exerting force into at least one of the ridges 150 and 152. Thereafter, continuing to raise the lever 240 affords a sufficient clearance to exist between the lever 240 and lift plate 234, thereby allowing force to be exerted downward on the lift plate 234 by two finger-like protrusions extending from the lever 240. The downward force on the lift plate 234 is sufficient to quickly force the cap assembly 140 to open the ink outlet passage 146. As the lever 240 is further raised, two cylindrical pins 242 extending inwardly from the lever 240 slidably engage the pin sliding surfaces 136, thereby locking the lever 240 into position.

[0055] The cap assembly 140 may be spring loaded to maintain probe/wiper-seal engagement throughout its range of motion also to assist in closing the ink outlet passage 146 as the lift plate 234 moves upward as the lever 240 is lowered. The cap assembly 140, in general, opens and closes similar to caps found on, for example, sports drink bottles, shampoo bottles, and dishwashing fluid bottles. That is, the cap is urged outwardly from the main body to allow liquid to pass therethrough, and is pushed into the main body to sealingly close the ink outlet passage 146.

[0056] The cap assembly 140 may be configured to snapably close. The snap indicates to an operator that the cap assembly 140 is closed, such that ink cannot pass therethrough. Thus, the operator will know that the ink bottle 122 may be safely removed from the ink reservoir 212.

Claims

1. An ink supply system (10 or 200) for an ink jet printer, comprising: an ink bottle (16 or 122) containing ink; an ink reservoir (12 or 212); and an ink bottle positioning member (36 or 232) configured to align said ink bottle (16 or 122) in a pre-mated position with said ink reservoir (12 or 212), said ink bottle positioning member (36 or 232) configured to pivot with respect to said ink reservoir (12 or 212) in a first direction to said pre-mated position.

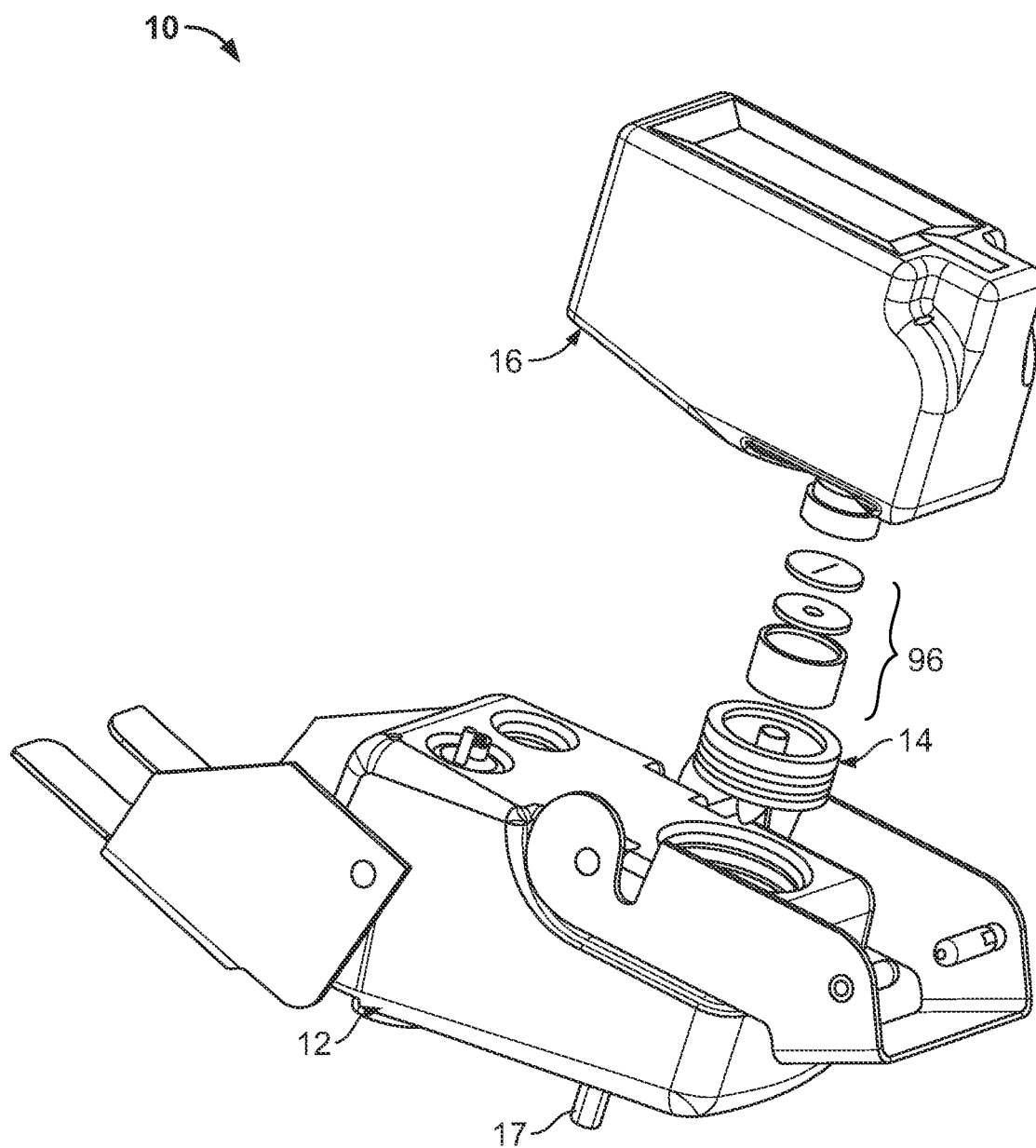


FIG. 1

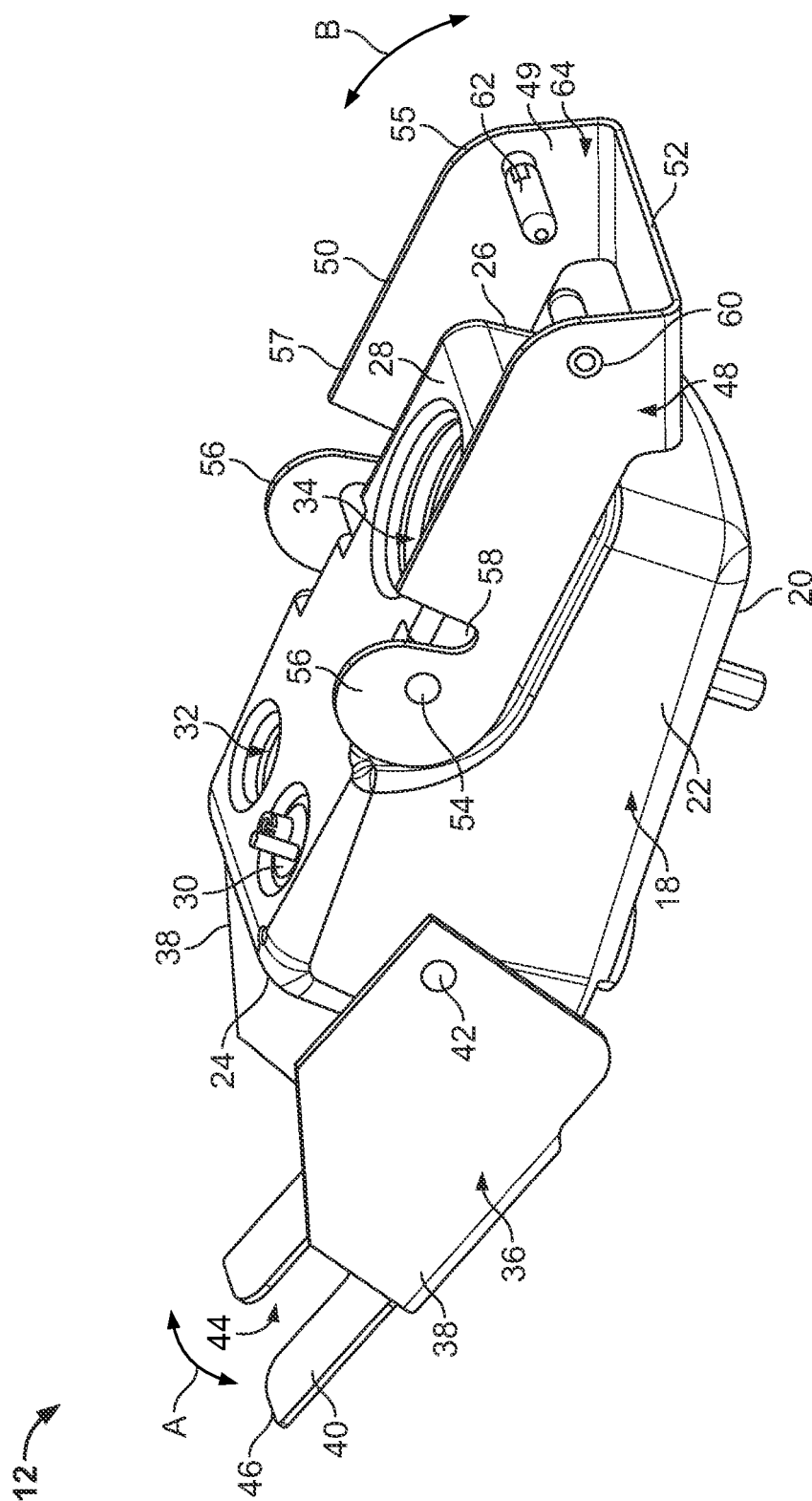


FIG. 2

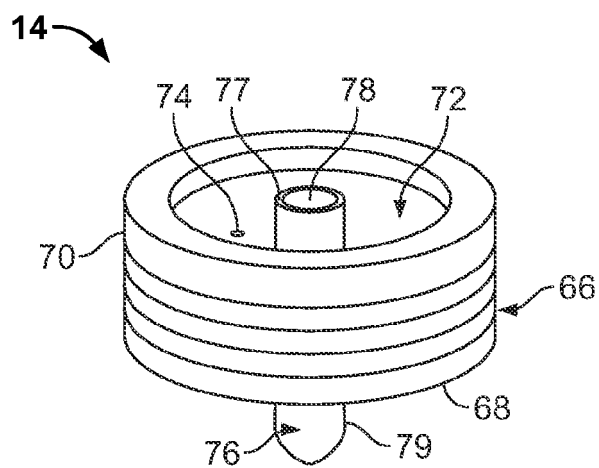


FIG. 3

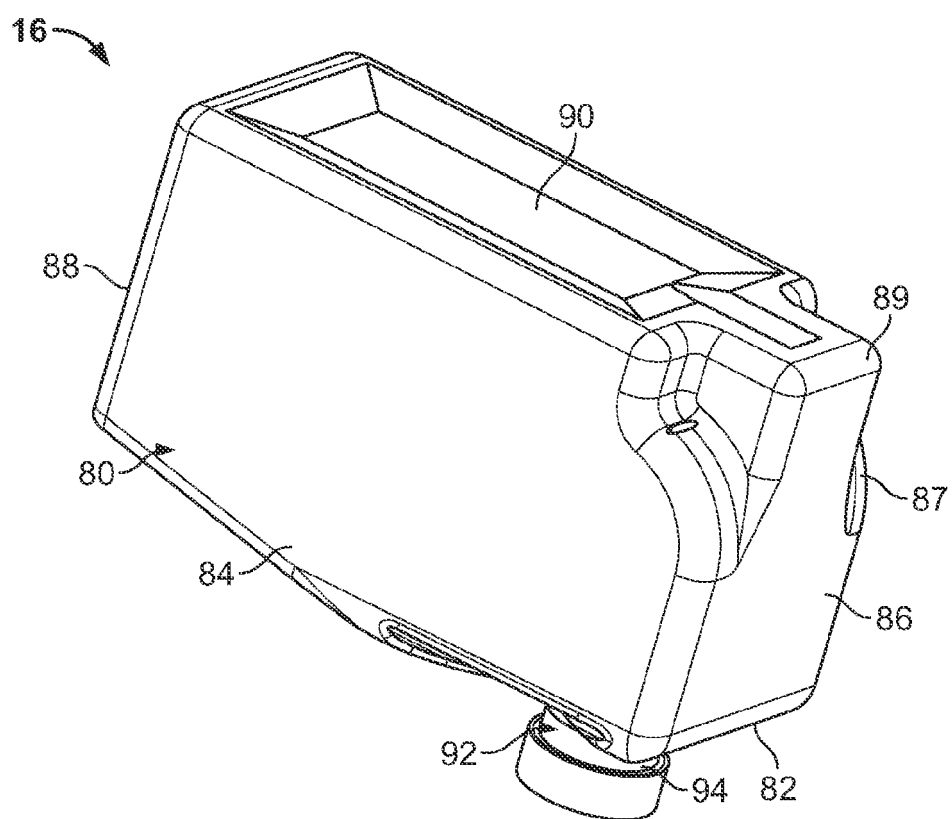


FIG. 4

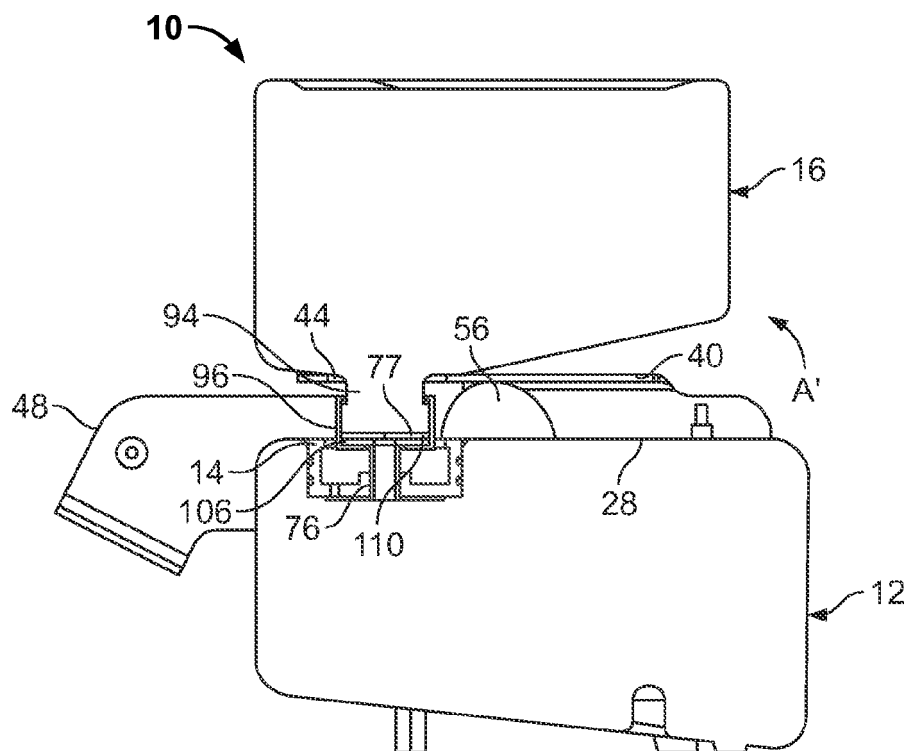


FIG. 5

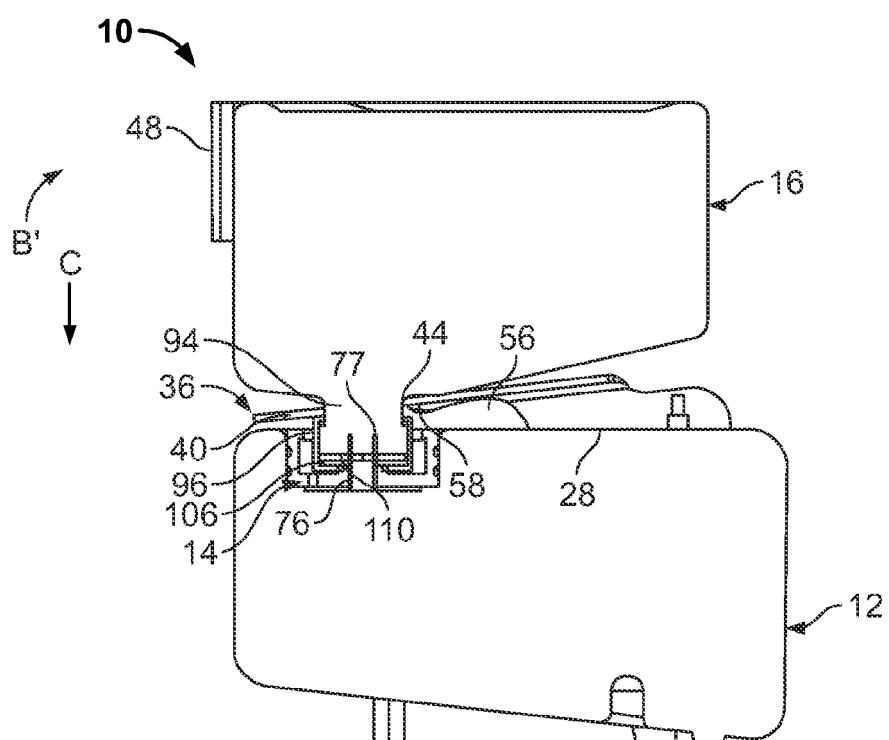


FIG. 6

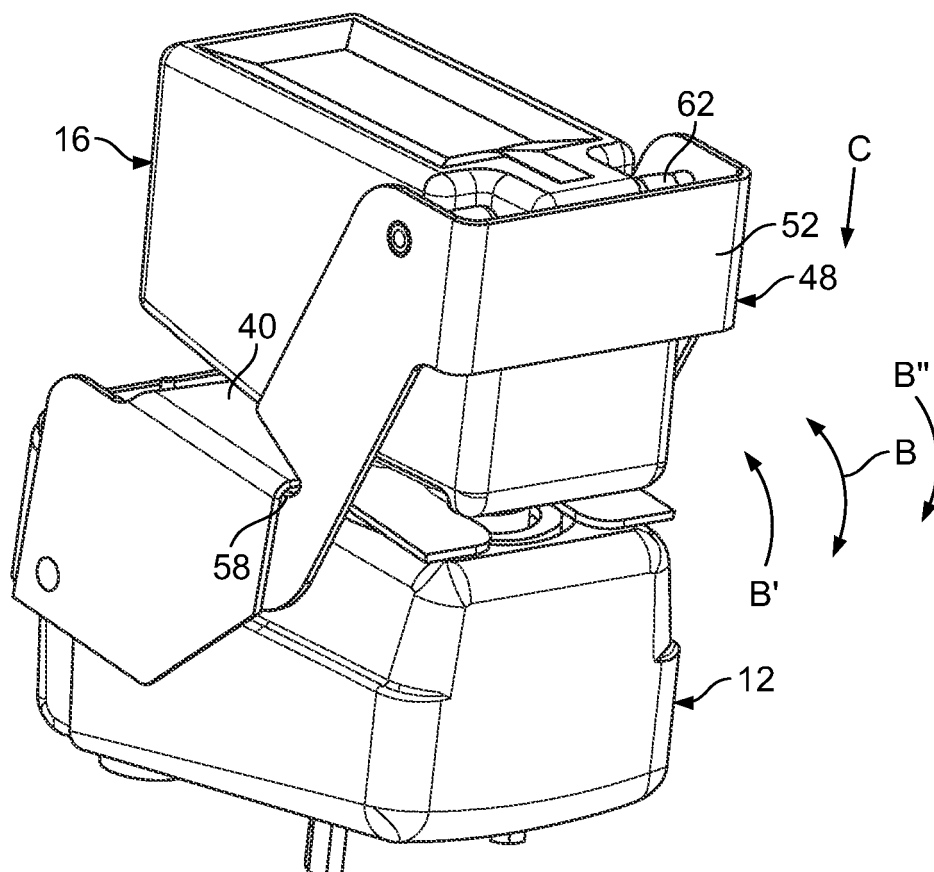


FIG. 7

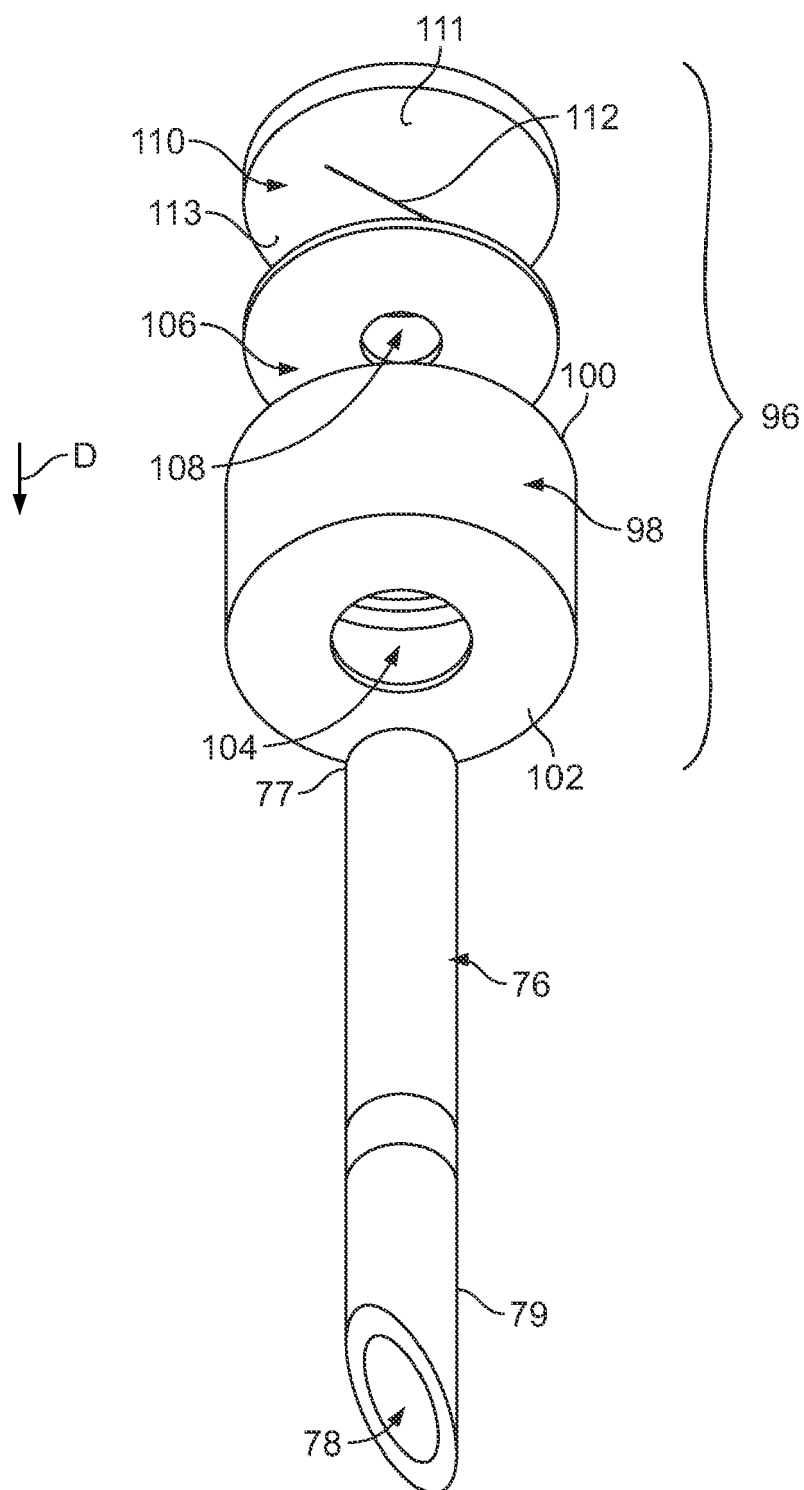


FIG. 8

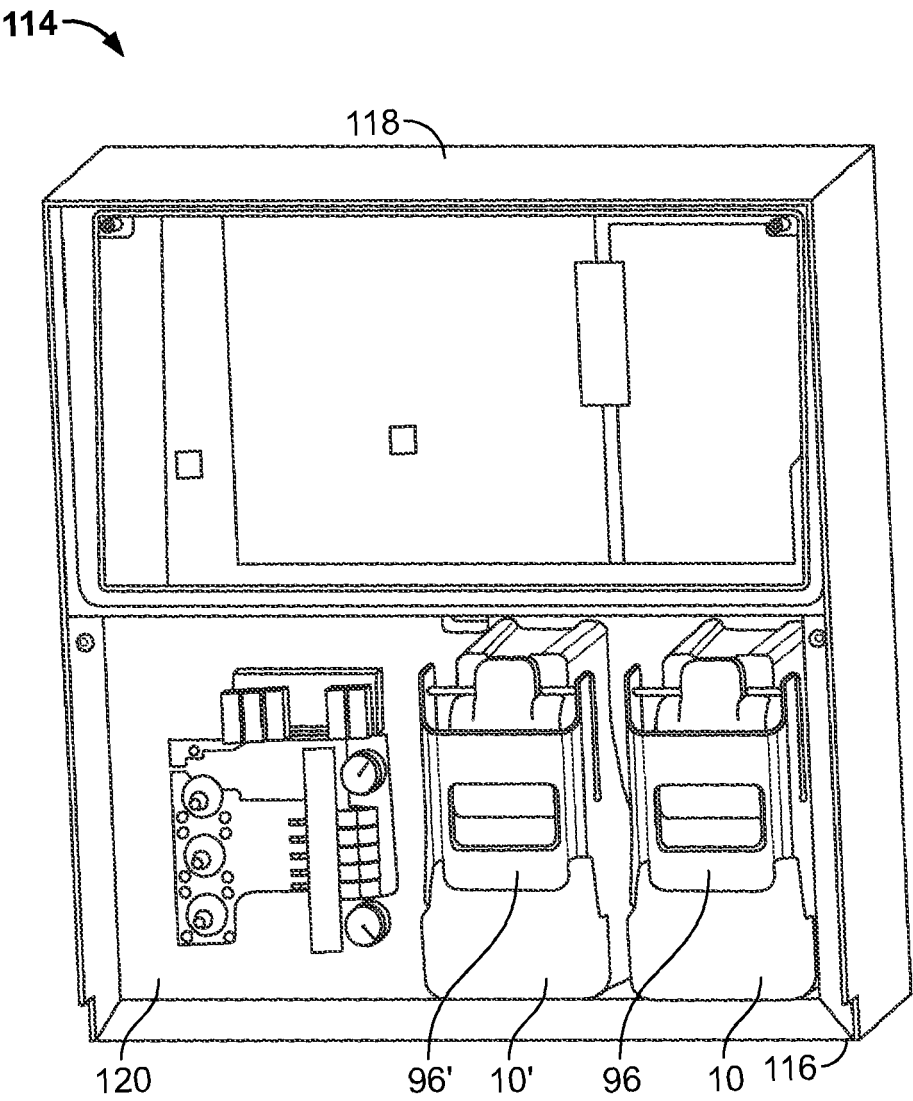


FIG. 9

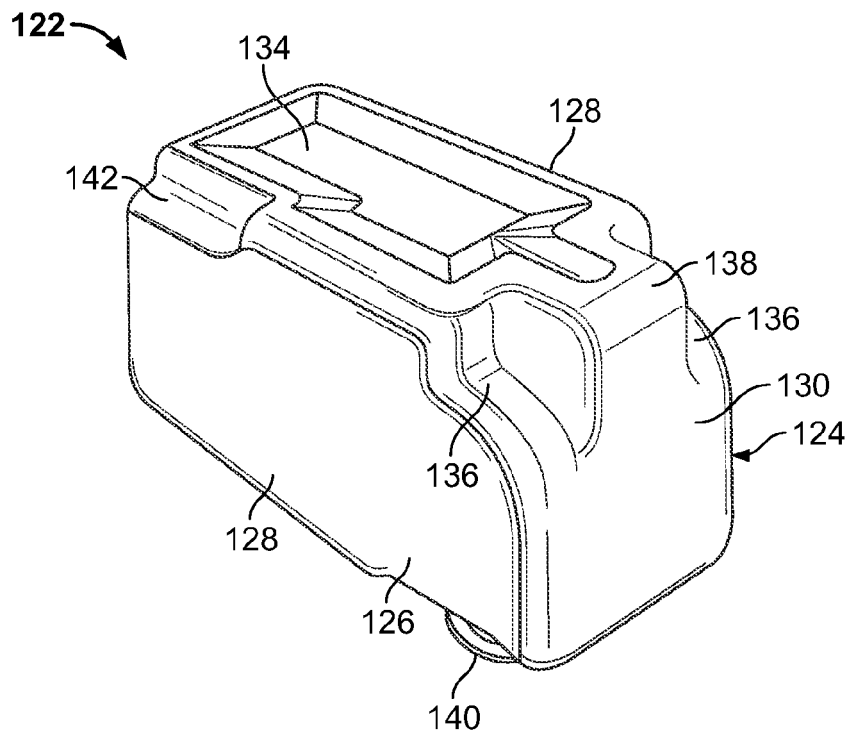


FIG. 10

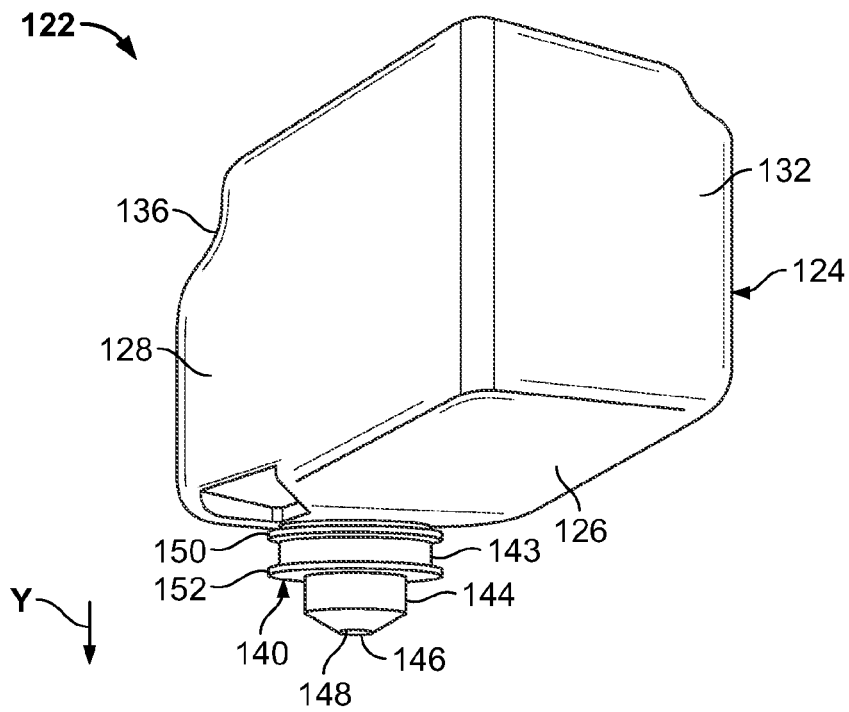


FIG. 11

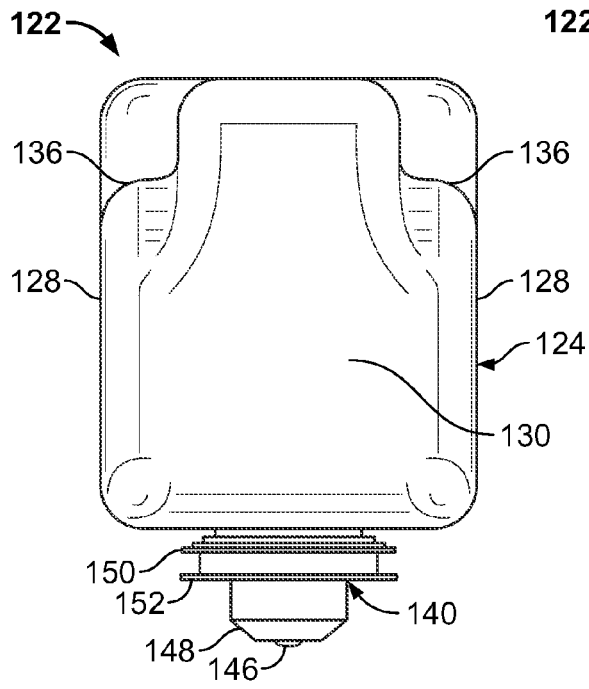


FIG. 12

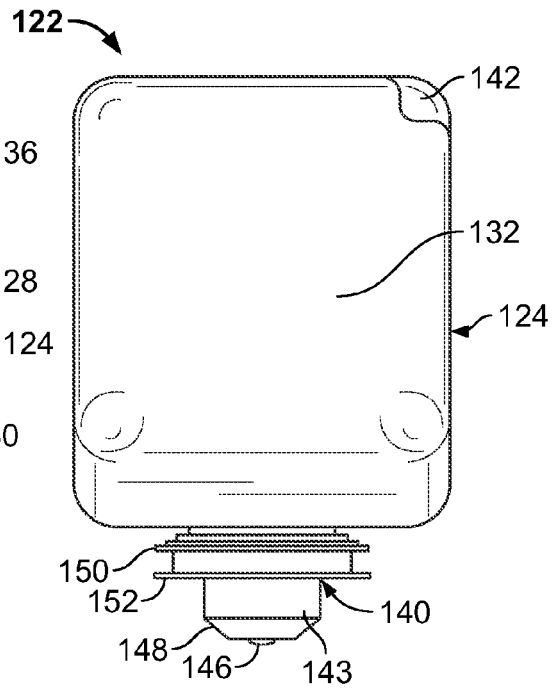


FIG. 13

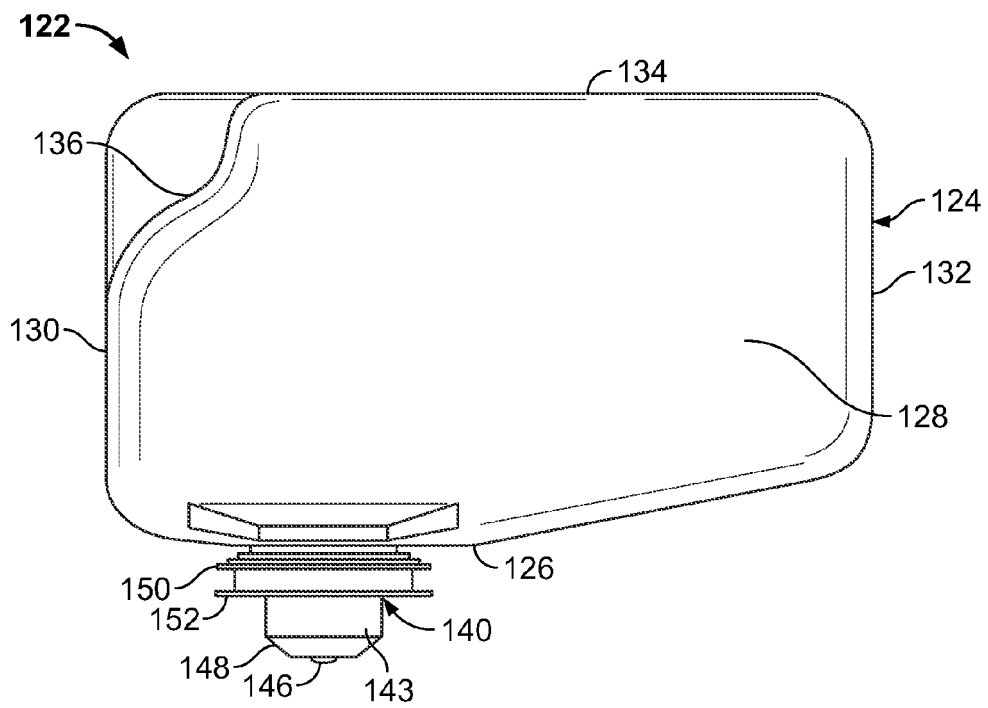


FIG. 14

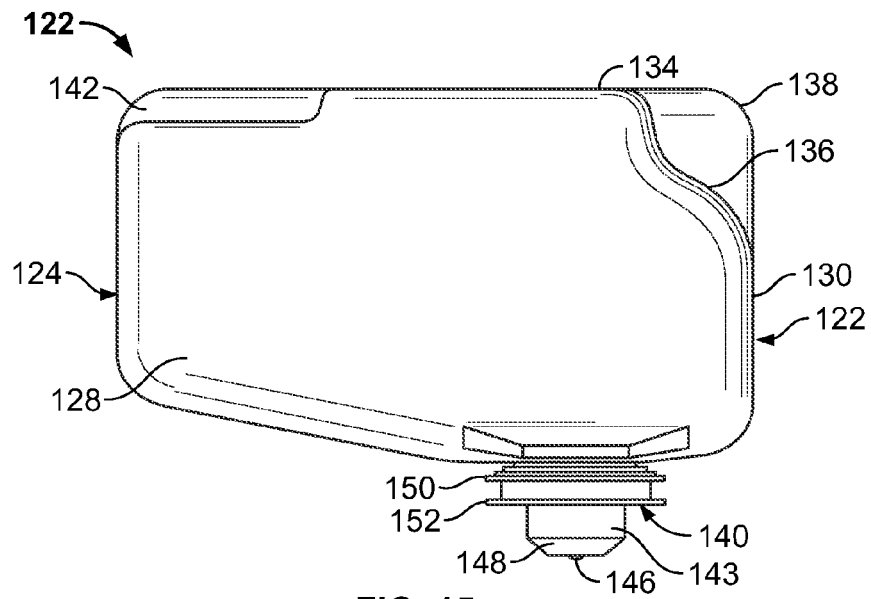


FIG. 15

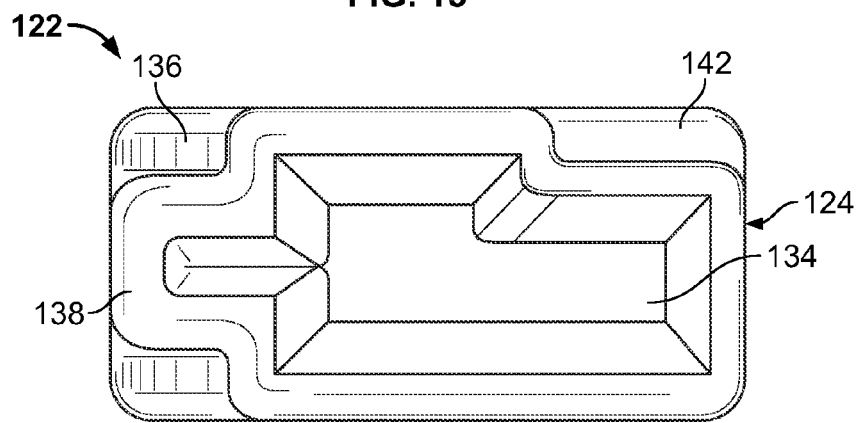


FIG. 16

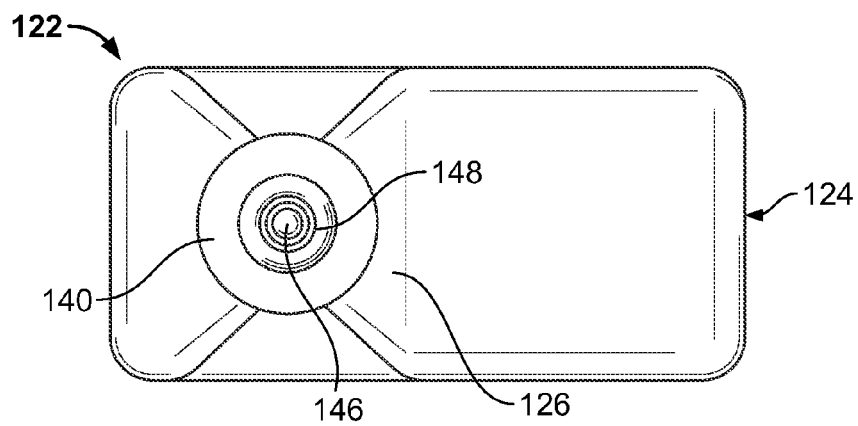


FIG. 17

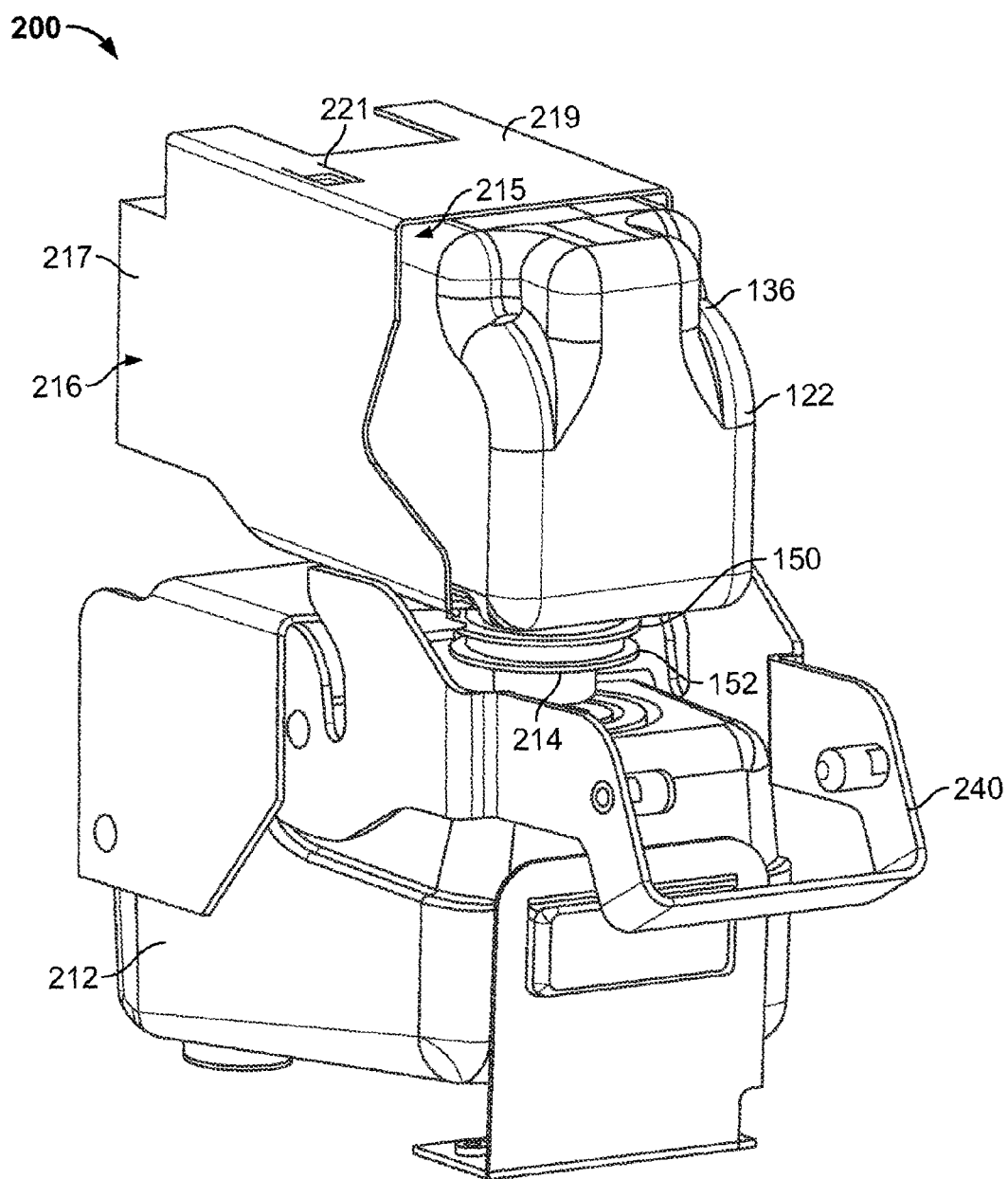


FIG. 18

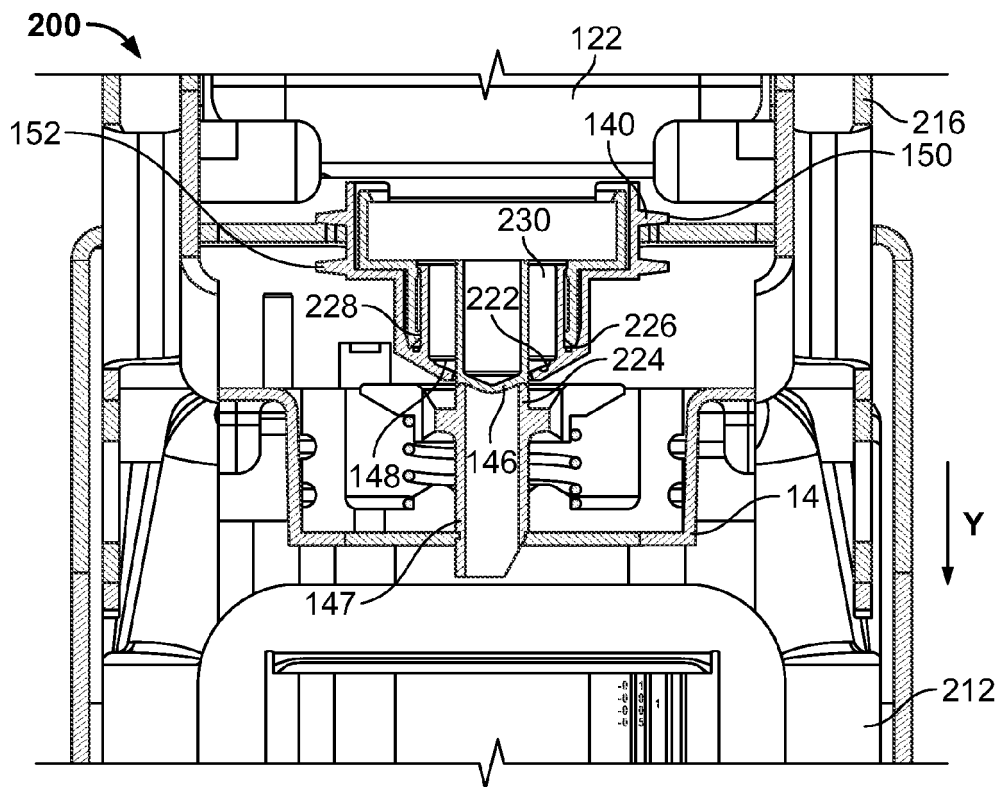


FIG. 19

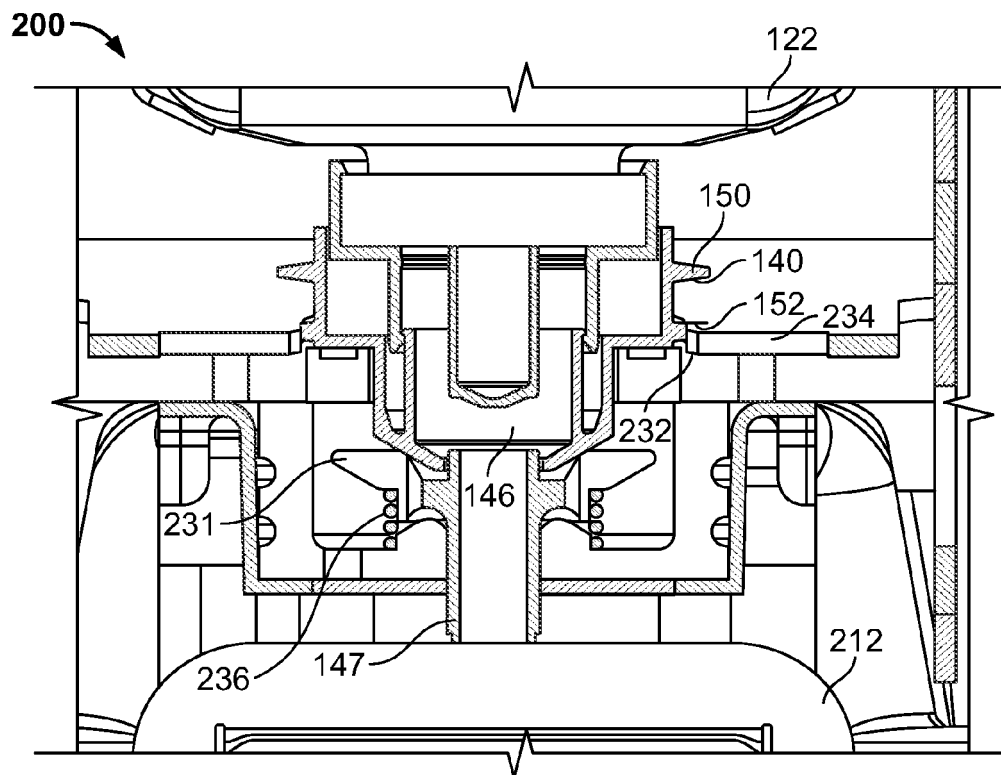


FIG. 21

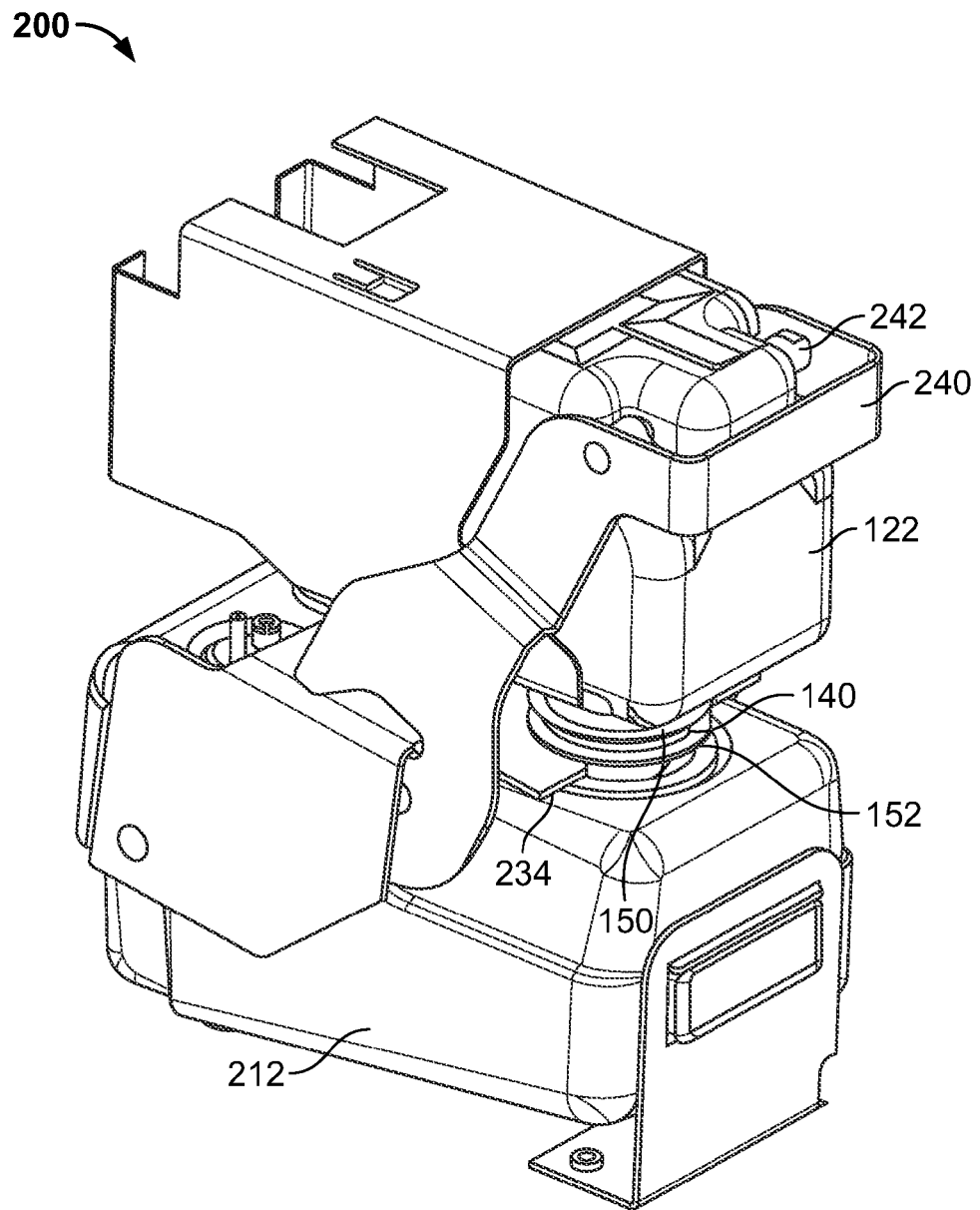


FIG. 20

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 4831389 A [0032]
- US 6079823 A [0038]