(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 3 081 312 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
19.10.2016 Bulletin 2016/42

(21) Application number: **15164004.2**

(22) Date of filing: **17.04.2015**

(51) Int Cl.:
B05B 11/00 *(2006.01)* ***A47K 5/12*** *(2006.01)*
B65D 49/00 *(2006.01)* *B05B 15/00* *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME
Designated Validation States:
MA

(71) Applicant: **OP-Hygiene IP GmbH**
4704 Niederbipp (CH)

(72) Inventor: **Ophardt, Heiner**
4422 Arisdorf (CH)

(74) Representative: **Grünecker Patent- und Rechtsanwälte**
PartG mbB
Leopoldstraße 4
80802 München (DE)

(54) FLUID DISPENSER WITH ONE USE PUMP

(57) A fluid dispenser is disclosed, including a reservoir containing fluid to be dispensed; a replaceable pump assembly comprising a pump and a dip tube removably coupled together; and a locking member coupled to the dip tube. While in a pumping configuration, with the dip tube inserted into the reservoir, the pump is operable to draw the fluid from the reservoir through the dip tube and dispense the fluid from a pump outlet. The locking member is configured to engage with the reservoir to prevent the dip tube from being extracted from the reservoir. If a sufficient force is applied attempting to move the pump away from the dip tube, with the dip tube locked within the reservoir, the pump and the dip tube are configured to separate and assume an uncoupled condition. The construction prevents the pump assembly from being reused, to reduce the risk of contamination.

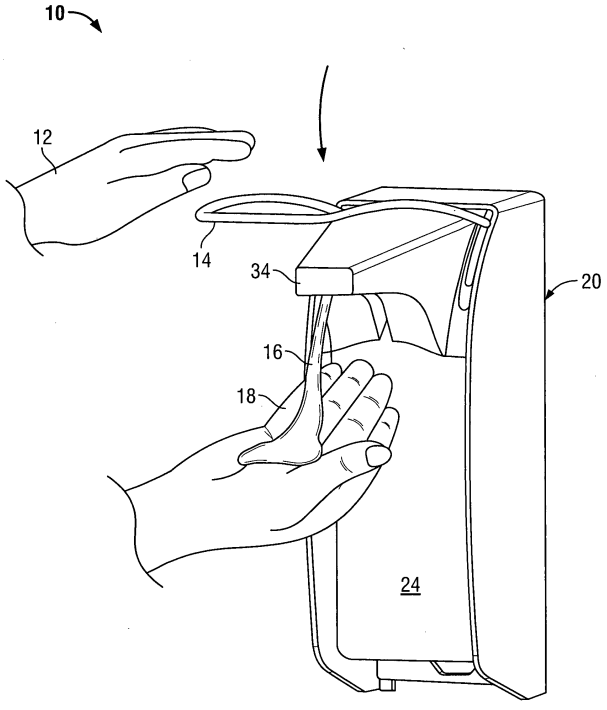

FIG. 1

EP 3 081 312 A1

Description

Field of the Invention

[0001] This invention relates to fluid dispensers that have replaceable, single use pumps and, more particularly, to a fluid dispenser with a pump assembly having a feed or dip tube that is prevented from being extracted from a fluid reservoir, to thereby prevent reuse of the pump assembly and reservoir.

Background of the Invention

[0002] Various fluid dispensers are known with pump assemblies that are intended to be replaced regularly, to help prevent contamination. However, such previously known devices suffer the disadvantage that users may choose to reuse the same pump assembly in spite of the manufacturer's instructions to the contrary, and thereby increase the risk of contamination.

Summary of the Invention

[0003] To at least partially overcome some of the disadvantages of previously known devices, the invention provides a fluid dispenser with a replaceable pump assembly that incorporates a locking member configured to prevent reuse of the replaceable pump assembly.

[0004] In particular, the present invention provides a fluid dispenser with a fluid reservoir and a pump assembly, the pump assembly including a pump and a feed , as for example, a dip tube that are removably coupled together. The tube is insertable into the reservoir for communication with fluid contained therein, and the pump is operable to draw the fluid from the reservoir through the tube, and dispense the fluid from a pump outlet. A locking member is coupled to the tube, and is configured to engage internally with the reservoir to prevent the tube from being extracted from the reservoir. The locking member may, for example, include one or more elongated fingers that, when in a locking configuration, extend radially outward from the dip tube, such that a distal end of the fingers engages with a stopping surface within the reservoir to prevent extraction of the tube. Preferably, the fingers can be deflected radially inward toward the tube to permit insertion of the locking member into the reservoir, and are biased to adopt the locking configuration once fully inserted into the reservoir.

[0005] The fluid dispenser is designed to prevent the pump assembly from being improperly reused. In particular, once the fluid within the reservoir has been depleted, reuse of the pump assembly requires the reservoir to be refilled or replaced, both of which generally require the reservoir to be separated from the pump assembly. However, the locking member prevents the reservoir from being separated from the tube, as described above. Furthermore, the pump and the tube are configured to uncouple when pulled apart with a force that is less than the force that would be required to fracture the locking member, or to uncouple the locking member from the tube. This ensures that any attempt to forcibly detach the reservoir from the pump assembly merely results in the uncoupling of the pump from the tube, with the tube remaining within the reservoir. The separation of the tube from the pump prevents the pump from being reused, since the tube is required to place the pump in communication with the fluid within a reservoir.

[0006] Preferably, the pump is configured to become mechanically inoperative upon detachment of the tube. This may be achieved, for example, by providing the pump with a structurally weakened section that is configured to fracture under a force that is less than the force required to uncouple the pump and the tube, but greater than the forces normally encountered during operation of the pump. This further ensures that the pump is not reused.

[0007] Preferably, the locking member is configured to substantially block an outlet opening of the reservoir, to impede refilling of the reservoir and/or the insertion of an additional dip tube therein. This helps to ensure that the reservoir is not improperly reused.

[0008] Accordingly, in one aspect, the present invention resides in a fluid dispenser, comprising: a reservoir containing fluid to be dispensed, the reservoir having an outlet opening, a pump assembly comprising a pump and a dip tube in a coupled condition, the dip tube comprising an elongate hollow tube with a passageway therethrough from a tube inlet at a first end of the tube to a tube outlet at a second end of the tube, the pump having a pump inlet and a pump outlet, the pump and dip tube removably coupled together in the coupled condition with the second end of the tube and the pump inlet coupled together, while the pump and dip tube are in the coupled condition and a force is applied to the pump attempting to move the pump inlet away from tube outlet longitudinally of the dip tube, the pump and dip tube remain in the coupled condition unless the force exceeds a threshold in which case the pump inlet and the tube outlet are separated and assume an uncoupled condition, with the pump assembly having the pump and dip tube in the coupled condition, the dip tube is insertable into the reservoir with the first end of the dip tube to pass through the outlet opening and the dip tube moved inwardly into the reservoir into a pumping configuration in which the pump outlet is external of the reservoir and the dip tube extends into the reservoir to place the tube inlet of the dip tube into communication with the fluid in the reservoir, with the pump assembly having the pump and dip tube in the coupled condition and being located relative the reservoir in the pumping configuration, the pump is operable to draw the fluid from the reservoir through the dip tube and dispense the fluid from the pump outlet, a locking member coupled to the dip tube, with the pump assembly having the pump and dip tube in the coupled condition and being located relative the reservoir in the pumping configuration, the locking member and the reservoir engaging internally

within the reservoir to prevent the dip tube from being extracted from the reservoir through the outlet opening under the force applied to the pump attempting to move the pump inlet away from tube outlet longitudinally of the dip tube.

[0009] In another aspect, the present invention resides in a pump assembly for dispensing fluid from a reservoir, comprising: a hollow dip tube for insertion into the reservoir through an outlet opening, the hollow dip tube having a first open end for communication with the fluid in the reservoir, and a second open end spaced from the first open end; a locking member coupled to the hollow dip tube and configured to prevent the hollow dip tube from being extracted from the reservoir through the outlet opening; and a pump coupled to the second end of the hollow dip tube, the pump being operable to draw the fluid from the reservoir through the hollow dip tube, and dispense the fluid from a discharge outlet.

[0010] In a further aspect, the present invention resides in a feed or dip tube for use in conjunction with a pump for dispensing fluid from a reservoir, comprising: a hollow tube body configured to be at least partially contained within the reservoir, the hollow tube body having a first open end for communication with the fluid in the reservoir, and a second open end for coupling to the pump; and a locking member coupled to the hollow tube body and configured to prevent the hollow tube body from being extracted from the reservoir through an outlet opening.

[0011] In a still further aspect, the present invention resides in a method of assembling a fluid dispenser, comprising: providing a hollow feed or dip tube having a first open end and a second open end; coupling a pump to the second end of the hollow dip tube; coupling a locking member to the hollow dip tube; and inserting the hollow dip tube, including the locking member coupled thereto, into a fluid reservoir through an outlet opening of the fluid reservoir; wherein the locking member is configured to prevent the hollow dip tube from being extracted from the reservoir through the outlet opening.

Brief Description of the Drawings

[0012] Further aspects and advantages of the invention will appear from the following description taken together with the accompanying drawings, in which:

Figure 1 is a perspective view of a fluid dispenser in accordance with a first embodiment of the invention schematically shown as being manually used by a user to dispense hand soap;

Figure 2 is a perspective view of the fluid dispenser of Figure 1, with a fluid reservoir removed and a pump assembly including a dip tube being manually held by a user for insertion or removal;

Figure 3 is a schematic, partially cut-away cross-sectional side view of the dispenser of Figure 1, with the pump assembly coupled to the housing and a fluid reservoir separate from the pump assembly and housing prior to being coupled to the pump assembly and housing;

Figure 4 is a schematic, partially cut-away cross-sectional side view similar to Figure 3 but with the fluid reservoir in an intermediate position in the process of being coupled to the pump assembly and housing;

Figure 5 is a schematic, partially cut-away cross-sectional side view similar to Figure 3 but with the fluid reservoir fully coupled to the pump assembly and supported on the housing in a condition for pumping;

Figure 6 is a schematic, partially cut-away cross-sectional side view similar to Figure 5 but after the fluid reservoir has been uncoupled and removed from the pump assembly and the housing, and showing the reservoir in cross-section with the dip tube within the reservoir;

Figure 7 is a side view of the fluid reservoir and the pump assembly of the dispenser of Figure 1 aligned ready for insertion of a locking member on the dip tube into the reservoir;

Figure 8 is a side view the same as Figure 7 but with the locking member partially inserted into the reservoir;

Figure 9 is a side view the same as Figure 7 but with the locking member inserted into the reservoir and the pump assembly and the reservoir in a condition for pumping;

Figure 10 is a side view the same as Figure 9 but with the reservoir being drawn downwardly relative the pump assembly and the reservoir from the condition of Figure 9;

Figure 11 is a side view similar to Figure 10 but with the reservoir being moved downwardly relative the reservoir and the pump to an uncoupled condition after having been coupled to the pump assembly;

Figure 12 is a schematic, cross-sectional side view of a fluid reservoir and a pump assembly similar to that shown in Figure 10 in accordance with a second embodiment of the invention, in a condition for pumping;

Figure 13 is a schematic, cross-sectional side view of a fluid reservoir and a pump assembly as shown in Figure 12 but with the reservoir removed from the pump assembly;

Figure 14 is a schematic, cross-sectional side view of a fluid reservoir and a pump assembly similar to that shown in Figure 10 in accordance with a third embodiment of the invention;

Figure 15 is a perspective view of a dip tube and a locking member in accordance with a fourth embodiment of the invention; and

Figure 16 is a schematic, cross-sectional side view of a fluid reservoir and a pump assembly similar to that shown in Figure 10 in accordance with a fifth embodiment of the invention.

Detailed Description of the Drawings

[0013] Reference is made first to Figure 1 which illustrates a first embodiment of a fluid dispenser 10 adapted to be secured to a wall (not shown), and configured for manual activation as by a user using one hand 12 to urge a lever 14 downwardly so as to dispense fluid 16 onto the user's other hand 18. The fluid dispenser 10 is similar to that disclosed in U.S. Patent No. 7,748,573 to Ophardt et al., issued July 6, 2010 which is incorporated herein by reference.

[0014] The fluid dispenser 10 includes a housing 20, a pump assembly 22, and a fluid reservoir 24. The housing 20 is best shown in Figure 2 as having a back plate 26, spaced side walls 28 and 30, and an upper plate 32 defining an interior space therebetween sized for receiving the fluid reservoir 24 therein. A nozzle shield 34 is moveably coupled to the upper plate 32 to permit movement between a raised open position as shown in Figure 2, wherein the pump assembly 22 can be inserted or removed from the housing 20, and a closed position as shown in Figure 1. The upper plate 32 defines a central slot 38 adapted for removably coupling with a collar region 40 of the pump assembly 22. A support member 36 is attached to the back wall 26, for supporting the fluid reservoir 24 when held within the housing 20.

[0015] The pump assembly 22 is best shown in Figure 2 as including a pump 42 and a dip tube 44. The pump assembly 22 is adapted to be removably coupled to the upper plate 32 for dispensing fluid from the fluid reservoir 24. The internal structure of the pump 42 is best shown in Figure 9. The pump 42 includes a piston chamber forming body 46 and a piston forming element 48. The piston chamber forming body 46 is fixed to the housing 20 against movement through the coupling of the collar region 40 to the upper plate 32. The piston chamber forming body 46 carries and defines a piston chamber 50 and a dip tube coupling element 52 coaxially about a vertical axis 98. The piston forming element 48 is mounted to the piston chamber forming body 46 for relative vertical movement, with a piston 54 of the piston forming element 48 coaxially slidable within piston chamber 50. The piston 54 is biased upwardly by spring 56 disposed within the piston chamber 50 between the piston chamber 50 and the piston 54. Depression of the lever 14 moves the piston forming element 48 downwardly relative to the piston chamber forming body 46 against the bias of the spring 56.

[0016] The piston forming element 48 includes a hollow spout tube 58 that extends from the piston 54 to a pump outlet 60. The piston 54 sits snuggly within the piston chamber 50, and is provided with a one way outlet duckbill valve 62 which permits fluid to flow upwardly into the piston 54 from the piston chamber 50, and prevents fluid from flowing out of the piston 54 into the piston chamber 50.

[0017] The piston chamber 50 defines a cylindrical cavity within which the piston 54 is reciprocally coaxially slidable between a retracted position and an extended position to discharge fluid from the reservoir 24 out the pump outlet 60. A one-way inlet duckbill valve 64 sits between the piston chamber 50 and the dip tube coupling element 52, and permits fluid to flow upwardly into the piston chamber 50 from the dip tube coupling element 52, and prevents fluid from flowing out of the piston chamber 50 into the dip tube coupling element 52.

[0018] A liquid compartment 51 is defined within the piston chamber 50 between the lower end of piston 54 carrying the one-way outlet duckbill valve 62 and the lower end of the piston chamber 50 carrying the one-way inlet duckbill valve 64. The volume of the liquid compartment 51 varies as the piston 54 moves between the retracted position and the extended position.

[0019] The dip tube coupling element 52 is adapted for coupling to the dip tube 44, to place the pump 42 in fluid communication with the dip tube 44. The dip tube coupling element 52 is formed as a hollow tube extending downwardly from the piston chamber 50, and sized to fit in a sealed, friction fixed engagement within an outlet end 68 of the dip tube 44 such that friction holds the dip tube coupling element 52 and the dip tube 44 together in a coupled state against disengagement.

[0020] The dip tube 44 is formed as an elongated hollow tube that extends downwardly along a longitudinal axis 98 from the outlet end 68 to an inlet end 66 positioned toward the bottom of the fluid reservoir 24 for drawing fluid 16 therefrom.

[0021] When in the pumping configuration shown in Figures 5 and 9, with the pump outlet 60 external to the reservoir 24 and the inlet end 66 of the dip tube 44 in communication with fluid 16 in the reservoir 24, the pump assembly 22 is operated in a retraction stroke by depressing the lever 14, which causes the piston 54 to slide downwardly from the extended position toward the retracted position within the piston chamber 50. The movement of the piston 54 towards the retracted position reduces the volume of the liquid compartment 51, pressurizing the fluid 16 in the liquid compartment 51, forcing the fluid 16 upwards through the duckbill valve 62 through the hollow spout tube 58 and out the pump outlet 60.

[0022] When the lever 14 is released, in a withdrawal stroke the spring 56 pushes the piston 54 back up to its extended position. The movement of the piston 54 towards the extended position increases the volume of the liquid compartment 51, reducing the pressure within the liquid compartment 51, which draws fluid 16 into the liquid compartment 51 from the reservoir 24 via the dip tube 44 and dip tube coupling element 52 through the valve 64. Thus, in a cycle of operation involving a retraction stroke and a withdrawal stroke, fluid is drawn from the reservoir 24 and dispensed out the pump outlet 60.

[0023] To reduce the risk of contamination, the pump assembly 22 and the fluid reservoir 24 are intended to be disposed of and replaced once the fluid 16 contained within the fluid reservoir 24 has been depleted. To prevent the pump assembly 22 and the fluid reservoir 24

from being reused, a locking member 70 is provided which is best shown in Figures 2 and 3. The locking member 70 is coupled to the dip tube 44.

[0024] As best seen in Figures 2 and 3, the locking member 70 includes an annular ring 72 which is fixed to and surrounds the dip tube 44. Two elongated fingers 74 and 76 extend from the annular ring 72 from a lower proximal first end 78 to an upper distal second end 80. The upper distal second end 80 is provided with an upwardly directed stop surface 82. Each finger 74 and 76 extends radially outwardly as they extend axially upwardly such that the upper distal second end 80 is a greater radial distance from the dip tube 44 than the lower proximal first end 78.

[0025] The fluid reservoir 24 is a hollow thin walled container formed with a circumferential side wall, closed at a lower end by a bottom wall and at an upper end by a top wall 23. As best shown in Figure 9, the top wall 23 has an upwardly directed reservoir opening 86 at an upper end of an upwardly extending cylindrical neck 25 disposed about a vertical reservoir axis. The cylindrical neck 25 is supported and merges at its lower end into a radially outwardly extending top wall flange 29 generally normal to the reservoir axis which extends radially outwardly from the neck 25 to merge with a cylindrical downwardly extending annular wall 27 whose lower end merges outwardly and downwardly into the side wall. The interior surface of the top wall flange 29 provides an axially inwardly, that is, downwardly directed stopping shoulder 84. The stopping shoulder 84 is an inwardly, downwardly facing flat surface that surrounds the reservoir opening 86 within the reservoir 24.

[0026] The locking member 70 is coupled to the dip tube 44 such that as the dip tube 44 is inserted through the opening 86 of the fluid reservoir 24 into the fluid reservoir 24, the locking member 70 is also inserted through the opening 86 of the fluid reservoir 24 into the fluid reservoir 24 in a manner as shown by the sequence illustrated in succession in respect of the entire dispenser 10 by Figures 3, 4 and 5 and also shown in cross-section with reference to the pump assembly 22 and reservoir 24 in Figures 7, 8 and 9. Once the dip tube 44 with the locking member 70 are within the reservoir 24 as seen in Figure 5 and also in Figures 9, 10 and 11, the removal of the dip tube 44 and the locking member 70 is prevented by engagement of the locking member 70 with the reservoir 24.

[0027] Figures 9 and 10 show conditions when the pump assembly 22 is fixed to the housing 20 against axial movement and the pump assembly 22 is coupled to the dip tube 44 with the dip tube 44 and the locking member 70 is within the reservoir 24. Figures 5 and 9 illustrate a pumping configuration in which the reservoir 24 is supported on the support member 36 of the housing 20. From the condition of Figures 5 and 9, if a user may try to remove the reservoir 24 from the pump assembly 22, the user manipulates the reservoir 24 to draw it forwardly off the support member 36 of the housing 20 and then applies forces to the reservoir 24 to draw the reservoir 24 downwardly such that the reservoir 24 will move from the condition of Figure 9, in which the locking member 70 is not in engagement with the reservoir 24, to the condition of Figure 10, in which the locking member 70 engages the reservoir 24 and prevents removal of the dip tube 44 from the fluid reservoir 24. In the condition of Figure 10 once sufficiently great axially directed forces are applied to the reservoir 24 drawing the reservoir 24 and the pump assembly 22 axially apart to overcome the frictional engagement of the dip tube 44 and the dip tube coupling element 52, then the dip tube 44 disengages from the dip tube coupling element 52; and the pump 42 is separated from the reservoir 24 with the dip tube 44 and the locking member 70 to remain within the reservoir 24 as seen in Figure 11 as well as Figure 6.

[0028] When the dip tube 44 and the locking member 70 are disposed inside the fluid reservoir 24 the upwardly directed stop surface 82 of each finger 74 and 76 is directed into opposition with the stopping shoulder 84 of the fluid reservoir 24, such that engagement of the stop surfaces 82 with the stopping shoulder 84 prevents the locking member 70, and the dip tube 44 coupled thereto, from being extracted from the reservoir 24 through the reservoir opening 86 as best seen in Figure 10.

[0029] To ensure that the locking member 70 is unable to slide axially downwardly relative dip tube 44, and conversely the dip tube 44 is unable to slide upwardly relative the locking member 70, the dip tube 44 is provided with a radially outwardly extending annular boss 81 carrying a catch shoulder 88 which extends radially outward from the dip tube 44 and is directed axially upwardly or outwardly toward the outlet end 68 of the dip tube 44, in opposition to an axially downwardly or inwardly directed catching shoulder 90 of the annular ring 72. Engagement of the catch shoulder 88 with the catching shoulder 90 prevents the dip tube 44 from sliding through the annular ring 72 and out the reservoir opening 86.

[0030] The dip tube coupling element 52 and the dip tube 44 are held together by friction, and are configured to uncouple upon application of a sufficient force pulling the dip tube 44 axially downwardly away from the pump 42. The degree of force required is selected to be less than the force that would be required to fracture the locking member 70, or to otherwise detach the locking member 70 from the dip tube 44. This ensures that any attempt to forcibly detach the pump 42 from the reservoir 24 will result in the uncoupling of the dip tube 44 from the pump 42, as shown in Figures 6 and 11. With the dip tube 44 removed from the pump 42 as seen in Figures 6 and 11, the pump 42 can no longer be used to pump fluid 16 from a reservoir 24. In particular, the dip tube 44 is required to place the pump 42 in communication with fluid 16 contained within a fluid reservoir 24. As such, the uncoupling of the pump 42 from the dip tube 44 prevents the pump assembly 22 from being reused. To continue using the fluid dispenser 10 once the fluid 16 within the reservoir 24 has been depleted, it is necessary to replace the pump

assembly 22 with a new pump assembly 22 including a dip tube 44. This reduces the risk of contamination which might otherwise occur if the pump assembly 22 was reused.

[0031] The locking member 70 is adapted to permit the dip tube 44 to be inserted through the reservoir opening 86 into the reservoir 24 while the locking member 70 is coupled to the dip tube 44. In particular, the fingers 74 and 76 are resiliently deformable having an inherent bias to assume an unbiased condition as seen in Figures 2, 3, 6, 7, 9, 10 and 11. When the fingers 74 and 76 are deflected from their unbiased condition their inherent bias biases them to return to the unbiased condition. Each of the fingers 74 and 76 have a radially outwardly directed cam surface 93 that angles radially outwardly as it extends axially upwardly. Each cam surface 93 is adapted to engage with a radially inwardly directed camming surface 94 formed by the lip of the reservoir opening 86 and the interior of the cylindrical neck 25 as seen in Figure 7, so as to deflect the fingers 74 and 76 radially inward toward the dip tube 44 when the dip tube 44 is being inserted by the inlet end 66 first into the reservoir 24 through the reservoir opening 86 as seen in Figure 8. This inward deflection of the fingers 74 and 76 permits the locking member 70 to pass through the reservoir opening 86 and into the reservoir 24, as best shown in Figures 4 and 8. Once fully inserted within the reservoir 24, the fingers 74 and 76 deflect under their inherent bias to move radially outward from the dip tube 44 to their inherent unbiased condition assuming the locking configuration as shown in Figure 9 and 10, wherein the stop surfaces 82 of the fingers 74 and 76 are positioned in opposition to the stopping shoulder 84, for locking the dip tube 44 within the reservoir 24. Since the stop surfaces 82 of the fingers 74 and 76 are spaced a distance greater than a diameter of the reservoir opening 86, the dip tube 44 is prevented from being extracted from the reservoir 24 through the reservoir opening 86. The relative orientations of the fingers 74 and 76 and the stopping shoulder 84, with the fingers 74 and 76 extending radially outwardly as they extend axially upwardly toward the outlet end 68 of the dip tube 44, and with the stopping shoulder 84 forming a flat, inwardly facing surface, are selected so that when the reservoir 24 is drawn axially away from the pump 42, the engagement of the fingers 74 and 76 with the stopping shoulder 84 urges the stop surfaces 82 of the fingers 74 and 76 to slide radially outwardly away from the reservoir opening 86 and thus to resist movement of the fingers 74 and 76 radially inward toward the dip tube 44.

[0032] When the locking member 70 is within the reservoir 24 and the dip tube 44 is coupled to the pump 42 as shown in Figures 5, 9 and 10, the relative size and location of the reservoir opening 86, the pump 42, the dip tube 44, and the stopping shoulder 84 prevent manual access to the locking member 70 as, for example, to prevent a user from manually deflecting the fingers 74 and 76 within the reservoir 24 to extract the dip tube 44. As seen Figure 11, preferably when the dip tube 44 is within the reservoir 24, with the locking member 70 engaging with the stopping shoulder 84 to prevent extraction of the dip tube 44, the outlet end 68 of the dip tube 44 does not extend outwardly beyond the reservoir opening 86, as can be advantageous to prevent a user from engaging the dip tube 44 through the reservoir opening 86 or attempting to couple the dip tube 44 with the pump 42.

[0033] As seen in Figure 8, during insertion, an annular space 91 between the radially inwardly directed surface of the cylindrical neck 25 of the reservoir 24 and the radially outwardly directed surface of the piston chamber forming body 46 is sufficient to permit the fingers 74 and 76 when deflected to pass axially therethrough. Preferably, the relative diameters of the cylindrical neck 25 of the reservoir 24 and the radially outwardly directed surface of the piston chamber forming body 46 are selected to minimize the annular space 91 yet permit the fingers 74 and 76 to pass there through.

[0034] When the locking member 70 is within the reservoir 24 and the dip tube 44 is uncoupled to the pump 42 as shown in Figures 6 and 11, the relative size and configuration of the dip tube 44, the locking member 70 and the reservoir 24 and its reservoir opening 86, cylindrical neck 25, and stopping shoulder 84 are preferably selected to the prevent manual access to the dip tube 44 or to the locking member 70 as, for example, to prevent a user from manually deflecting the fingers 74 and 76 within the reservoir 24 to extract the dip tube 44.

[0035] A second embodiment of the invention is illustrated in Figures 12 and 13, wherein like numerals are used to represent like components. The embodiment of the invention shown in Figures 12 and 13 is identical to the first embodiment shown in Figure 10 but for five exceptions.

[0036] A first exception is that the dip tube 44 and the dip tube coupling element 52 are fixed together against disengagement.

[0037] A second exception is that the pump 42 is provided with a frangible or weakened region 96 which is configured to fracture when the pump 42 is pulled axially away from the reservoir 24. In particular, the piston chamber 50 has an annular weakened region 96 that extends around the entire circumference of the piston chamber 50. The weakened region 96 is configured to fracture when the pump 42 is pulled axially away from the reservoir 24 from the condition of Figure 12 to the condition of Figure 13. With the piston chamber 50 fractured as shown in Figure 13, the pump 42 is no longer able to create the buildup of pressure required to force fluid 16 up through the duckbill valve 62 and out the pump outlet 60. This further ensures that the pump 42 cannot be reused and, for example, would prevent a user from attaching a new dip tube 44 to a previously used pump 42 to reuse the pump 42.

[0038] A third exception is that the fingers 74 and 76 carry at their distal second ends 80 a radially outwardly extending foot 99 which carry the stop surface 82 dis-

posed in a plane parallel to the stopping shoulder 84 of the top wall 23 of the reservoir 24. As seen in Figure 13, each foot 99 provides for enhanced engagement with the stopping shoulder 84 to prevent relative axial movement and engagement between a radially outwardly directed surface 97 of the foot 99 with a radially inwardly directed surface of the cylindrical downwardly extending annular wall 27 of the reservoir 24 to limit radial outward movement of the foot 99.

[0039] A fourth exception is that the diameter of the reservoir opening 86 and the neck 25 of the reservoir 24 is increased to facilitate the modified fingers 74 and 76, with each having a foot 99, to be inserted into the reservoir 24.

[0040] A fifth exception is that the radially outwardly extending annular boss 81 on the dip tube 44 is enlarged to extend farther outwardly radially from the dip tube 44 and to carry as a radially outwardly directed surface an angled annular cam surface 83 that extends axially upwardly as it extends radially outwardly. The annular cam surface 83 merges upwardly with the cam surfaces 93 of the fingers 74 and 76. Like the cam surfaces 93, the annular cam surface 83 serves to assist during insertion of the dip tube 44 through the reservoir opening 86 in locating the dip tube 44 centered within the reservoir opening 86 by engaging the radially inwardly directed camming surface 94 formed by the lip of the reservoir opening 86 and the interior of the cylindrical neck 25.

[0041] A third embodiment of the invention is illustrated in Figure 14, wherein like reference numerals are used to denote like components. The embodiment shown in Figure 14 is identical to the embodiment shown in Figures 1 to 11, with the exception that the duckbill valve 64 is carried on the outlet end 68 of the dip tube 44 rather than on the piston chamber forming body 46. In the embodiment shown in Figure 14, when the outlet end 68 of the dip tube 44 is removed from the dip tube coupling element 52 the duckbill valve 64 is also removed, rendering the pump 42 inoperative upon uncoupling of the dip tube 44 from the pump 42.

[0042] Figure 15 depicts a dip tube 44 and locking member 70 in accordance with a fourth embodiment of the invention, wherein like reference numerals are used to represent like components. The dip tube 44 and locking member 70 as shown in Figure 15 are identical to those shown in Figure 12, with the exception that the locking member 70 is provided with more than two fingers, namely, with a plurality of fingers 74a-74i spaced circumferentially from each other about the annular ring 72. This construction of the locking member 70 helps to ensure that the reservoir 24 is not reused. In particular, because the plurality of fingers 74a-74i extend radially outward from the dip tube 44 in all directions, they act to substantially block the reservoir opening 86, for example, serving to impede any attempts to refill the reservoir 24 with fluid, or to insert a further dip tube 44 into the reservoir 24. The locking member 70 is furthermore configured to continue blocking the reservoir opening 86 both while the pump 42 is coupled to the reservoir 24 and after the pump 42 is uncoupled from the dip tube 44.

[0043] A fifth embodiment of the invention is shown in Figure 16, wherein like numerals are used to denote like components. The embodiment shown in Figure 16 is most similar to the embodiment shown in Figure 14, however, in Figure 16, the reservoir 24 and pump assembly 22 are configured to dispense fluid 16 while in an inverted orientation as shown in Figure 16, with the reservoir opening 86 facing downwards. To accommodate inversion of the reservoir 24, the piston chamber forming body 46 is adapted to sealingly engage with the reservoir opening 86 so as to prevent the fluid 16 from leaking out of the reservoir 24 while inverted. In particular, the neck 25 of the reservoir 24 is threaded, and the piston chamber forming body 46 is provided with a threaded sleeve 104 for sealingly engaging with the threaded neck 25. The pump 42 is configured such that the pump outlet 60 extends directly downward from the piston 54, for dispensing the fluid 16 downwardly while in the inverted orientation. Since the reservoir 24 is inverted, the fluid 16 pools around the pump 42, and a shortened feed tube replaces the dip tube of the first embodiment to place the pump 42 in communication with the fluid 16. Accordingly, the pump assembly 22 is not provided with a dip tube.

[0044] In Figure 16, the body 46 has a cylindrical tube 106 open at an inner axial end. The locking member 70 is shown as integrally including a cap portion 108 and the fingers 74 and 76. The cap portion 108 has a cylindrical wall 109 forming the feed tube and an end wall 110 carrying the one-way inlet duckbill valve 64. The fingers 74 and 76 extend from their proximal first ends 78 secured to the cylindrical tube 106 radially outwardly and axially outwardly to their second ends 80.

[0045] The cylindrical wall 109 of the feed tube of the cap portion 108 is disposed coaxially outwardly of the tube 106 in frictional engagement. If, after the threaded sleeve 104 has been disengaged from the threaded neck 25, the body 46 is drawn axially outwardly from the reservoir 24, the fingers 74 and 76 engage with the stopping shoulder 84 of the reservoir 24. When sufficient forces are applied to the body 46, the forces will overcome the frictional engagement of the cap portion 108 of the locking member 70 and the tube 106, disengaging the locking member 70 from the tube 106 and, in so doing, removing the inlet duckbill valve 64 from the tube 106 rendering the pump assembly as remaining on the body 46 inoperative.

[0046] The fingers 74 and 76 of locking member 70 in Figure 16 are shown slightly shorter in axial length than in the other embodiments having a dip tube 44 however, and the locking member 70 and its fingers 74 and 76 function similarly as in the other embodiments to prevent the pump 42 from being removed from the reservoir opening 86 through engagement of the stop surface 82 of the locking member 70 with the stopping shoulder 84 of the reservoir 24.

[0047] Preferably, the fluid dispenser 10 of the present

invention is used to dispense a hand cleaner such as hand soap or hand sanitizer. It is to be appreciated, however, that the fluid dispenser 10 could alternatively be used to dispense any desired fluid 16, such as hand cream, hair gel, toothpaste, food products or the like.

[0048] The pump assembly 22 and reservoir 24 are intended to be disposed of and replaced after each use. Preferably, the pump assembly 22 and reservoir 24 are formed from relatively inexpensive materials, such as plastics, although any suitable materials could be used. Since the pump assembly 22 and the reservoir 24 are intended to be replaced after use to dispense the fluid within the reservoir 24 but once, it is not necessary for the pump assembly 22 or the reservoir 24 to be constructed so as to withstand long periods of wear, or cleaning procedures such as autoclaving.

[0049] It is to be appreciated that the invention is not limited to the particular embodiments that have been described. For example, any locking member 70 construction that functions to prevent extraction of the dip tube 44 could be used, and not just the particular construction that has been illustrated. The locking member 70 may, for example, be integrally formed with the dip tube 44.

[0050] The preferred embodiments of Figures 1 to 15 illustrate a dispenser 10 in which the pump assembly 22 is first coupled to the housing 20, as seen in Figure 3 and the reservoir 24, then coupled to the pump assembly 22 and the housing 20. The reservoir opening 86 of the reservoir 24 is not sealably engaged to the pump assembly 22. The pump assembly 22 is coupled to the reservoir 24 as in the condition shown in Figure 9 as well as Figure 5. With the pump assembly 22 coupled to the reservoir 24 as in the condition shown in Figure 9 they, in effect, together form a removable cartridge 100 which can be removed from the dispenser 10 by pivoting the nozzle shield 34 to a raised position and sliding the cartridge 100, comprising both the pump assembly 22 and the reservoir 24 forwardly. Similarly, such a cartridge 100 comprising the pump assembly 22 coupled to the reservoir 24, can be inserted into the dispenser 10 while the nozzle shield 34 is in a raised position. The cartridge 100 comprising the pump assembly 22 is coupled to the reservoir 24 as in the condition shown in Figure 9 may be modified to provide a secondary mechanism for coupling the reservoir 24 to the pump assembly 22, such as a threaded collar carried on the piston chamber forming body 46 which removably engages with a thread on the neck 25 of the reservoir 24. Nevertheless, in such a modification while the secondary mechanism is disengaged, the locking member 70 will continue to serve the function of preventing removal of the dip tube 44 and locking member 70 from within the reservoir 24.

[0051] While the preferred embodiments have been illustrated as employing one particular form of piston pump 42, it is to be appreciated that many other possible types of pumps 42 could be used instead. For example, the invention could be used in association with the pumps 42 described and illustrated in United States Patent No. 5,489,044 to Ophardt; United States Patent No. 7,984,825 to Ophardt et al.; and United States Patent No. 8,684,236 to Ophardt, which are incorporated herein by reference.

[0052] It will be understood that, although various features of the invention have been described with respect to one or another of the embodiments of the invention, the various features and embodiments of the invention may be combined or used in conjunction with other features and embodiments of the invention as described and illustrated herein.

[0053] Although this disclosure has described and illustrated certain preferred embodiments of the invention, it is to be understood that the invention is not restricted to these particular embodiments. Rather, the invention includes all embodiments which are functional or mechanical equivalents of the specific embodiments and features that have been described and illustrated herein. For a definition of the invention, reference is made to the following claims.

Claims

1. A pump assembly for dispensing fluid from a reservoir, comprising:

   a feed tube for insertion into the reservoir through an outlet opening, the tube having a first open end for communication with the fluid in the reservoir, and a second open end spaced from the first open end;
   a locking member coupled to the tube and configured, after the tube has been inserted into the reservoir, to prevent the tube from being extracted from the reservoir through the outlet opening; and
   a pump removably coupled to the second end of the hollow dip tube, the pump being operable to draw the fluid from the reservoir through the hollow dip tube, and dispense the fluid from a discharge outlet.

2. The pump assembly according to claim 1, wherein the pump is configured such that after the tube has been inserted into the reservoir, the pump detaches from the second end of the tube upon separation of the pump from the reservoir.

3. The pump assembly according to claim 1 or 2, wherein the pump is configured to become inoperative upon uncoupling of the pump from the tube.

4. The pump assembly according to any one of claims 1 to 3 wherein:

   the locking member includes an annular ring and a plurality of resilient elongate finger members,

the annular ring extending circumferentially about the tube,
the annular ring coupled to the tube to prevent axial outward movement of the tube relative the annular ring,
each finger member having a first end and a distal second end,
the first end of each finger member fixed to the tube at a circumferentially spaced location from other of the finger members,
the finger member having an inherent bias to assume an unbiased condition in which the finger member extends from the first end relative the tube radially outwardly and axially outwardly to the distal second end,
the finger member deflectable against its inherent bias to a biased condition in which the finger member is moved radially inwardly toward the tube.

5. A fluid dispenser, comprising a pump assembly as claimed in any one of claims 1 to 3, in combination with:

a reservoir containing fluid to be dispensed, the reservoir having an outlet opening,
the pump having a pump inlet and a pump outlet,
the pump and the tube removably coupled together in the coupled condition with the second end of the tube and the pump inlet coupled together,
while the pump and the tube are in the coupled condition and a force is applied to the pump attempting to move the pump inlet away from tube outlet longitudinally of the tube, the pump and the tube remain in the coupled condition unless the force exceeds a threshold in which case the pump inlet and the tube outlet are separated and assume an uncoupled condition,
with the pump assembly having the pump and the tube in the coupled condition, the tube is insertable into the reservoir with the first end of the tube to pass through the outlet opening and the tube moved inwardly into the reservoir into a pumping configuration in which the pump outlet is external of the reservoir and the tube extends into the reservoir to place the tube inlet of the dip tube into communication with the fluid in the reservoir,
with the pump assembly having the pump and the tube in the coupled condition and being located relative the reservoir in the pumping configuration, the pump is operable to draw the fluid from the reservoir through the tube and dispense the fluid from the pump outlet,
with the pump assembly having the pump and the tube in the coupled condition and being located relative the reservoir in the pumping configuration, the locking member and the reservoir engaging internally within the reservoir to prevent the tube from being extracted from the reservoir through the outlet opening under the force applied to the pump attempting to move the pump inlet away from tube outlet longitudinally of the tube.

6. The fluid dispenser according to claim 5 wherein:

the reservoir carries inwardly from the outlet opening an inwardly directed stopping shoulder about the outlet opening,
the locking member having a stop surface,
wherein when the tube is in the reservoir the stop surface is directed outwardly into opposition with the inwardly directed stopping shoulder and engagement between the stop surface and the stopping shoulder prevents the tube from being extracted from the reservoir through the outlet opening under the force applied.

7. The fluid dispenser according to claim 6, wherein the locking member is configured to permit insertion of the tube into the reservoir through the outlet opening by passing the first end of dip tube through the outlet opening.

8. The fluid dispenser according to claim 6 or 7, wherein:

the locking member comprises at least one resilient elongate finger member having a first end and a distal second end,
the first end fixed to the tube,
the second end carrying the stop surface,
the finger member having an inherent bias to assume an unbiased condition in which the finger member extends from the first end relative the tube radially outwardly and axially outwardly to the distal second end,
the finger member deflectable against its inherent bias to a biased condition in which the finger member is moved radially inwardly toward the tube,
the dip tube is insertable into the reservoir through the outlet opening with the finger member biased to the biased condition, wherein with the finger member inside the reservoir inwardly of the stopping shoulder under the inherent bias of the finger member, the finger member moves toward the unbiased condition presenting the stop surface in opposition to the stopping shoulder for engagement to prevent extraction of the tube from the reservoir.

9. The fluid dispenser according to claim 8 wherein:

a cam surface is provided on the finger member spaced from the first end toward the distal second end,
on insertion of the dip tube into the reservoir through the outlet opening, radially inwardly directed camming surfaces on the outlet opening engage with the cam surface on the finger member to deflect the finger member from the unbiased condition to the biased condition.

10. The fluid dispenser according to claim 8 or 9, wherein the tube is disposed about a longitudinal axis,
the locking member comprises a plurality of said resilient elongate finger members disposed spaced circumferentially about the tube.

11. The fluid dispenser according to any one of claims 8 to 10 wherein the locking member comprises an annular ring extending circumferentially about the tube,
the first end of each finger member is fixed to the annular ring.

12. The fluid dispenser according to claim 11 wherein the tube carries a catch shoulder which extends radially outwardly from the tube and is directed axially outwardly toward the tube outlet of the tube,
the annular ring having an axially inwardly directed catching shoulder in opposition to the axially outwardly catch shoulder,
engagement between the catch shoulder and the catching shoulder preventing axial outward movement of the tube relative the locking member.

13. The fluid dispenser according to any one of claims 8 to 12 wherein when the locking member and the reservoir engaging internally within the reservoir preventing the tube from being extracted from the reservoir through the outlet opening, the first end of the tube does not extend outwardly beyond the outlet opening.

14. The fluid dispenser according to any one of claims 8 to 13 wherein the pump is configured to become inoperative upon detachment of the pump inlet from the tube outlet of the dip tube.

15. The pump assembly of claim 4 wherein the tube is insertable into a reservoir through an outlet opening of the reservoir with the finger members biased to the biased condition, wherein with the finger member inside the reservoir inwardly of the outlet under the inherent bias of the finger members, the finger members move toward the unbiased condition presenting the distal second end as a stop surface in opposition to a stopping shoulder inside the reservoir for engagement to prevent extraction of the tube from the reservoir.

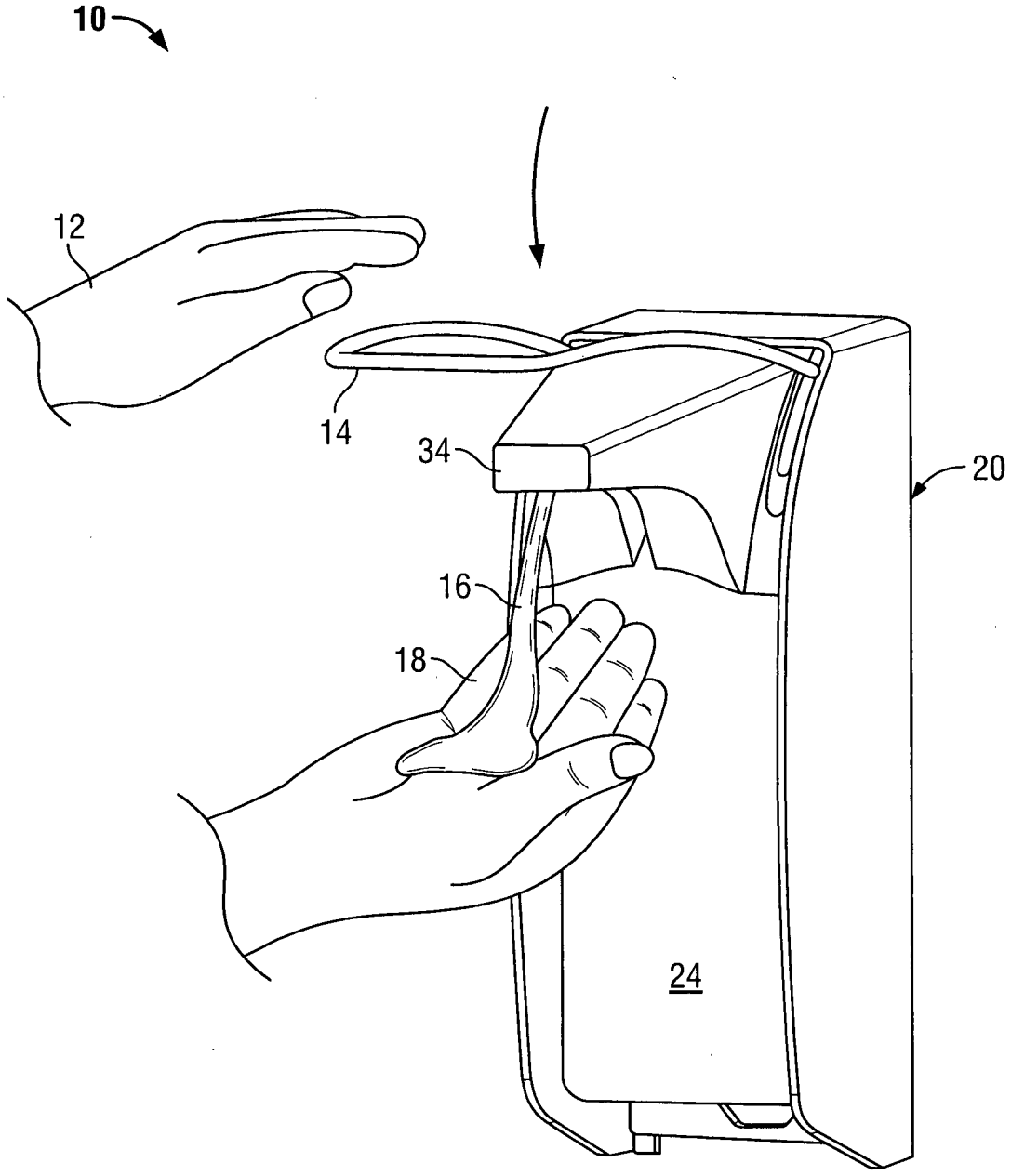

FIG. 1

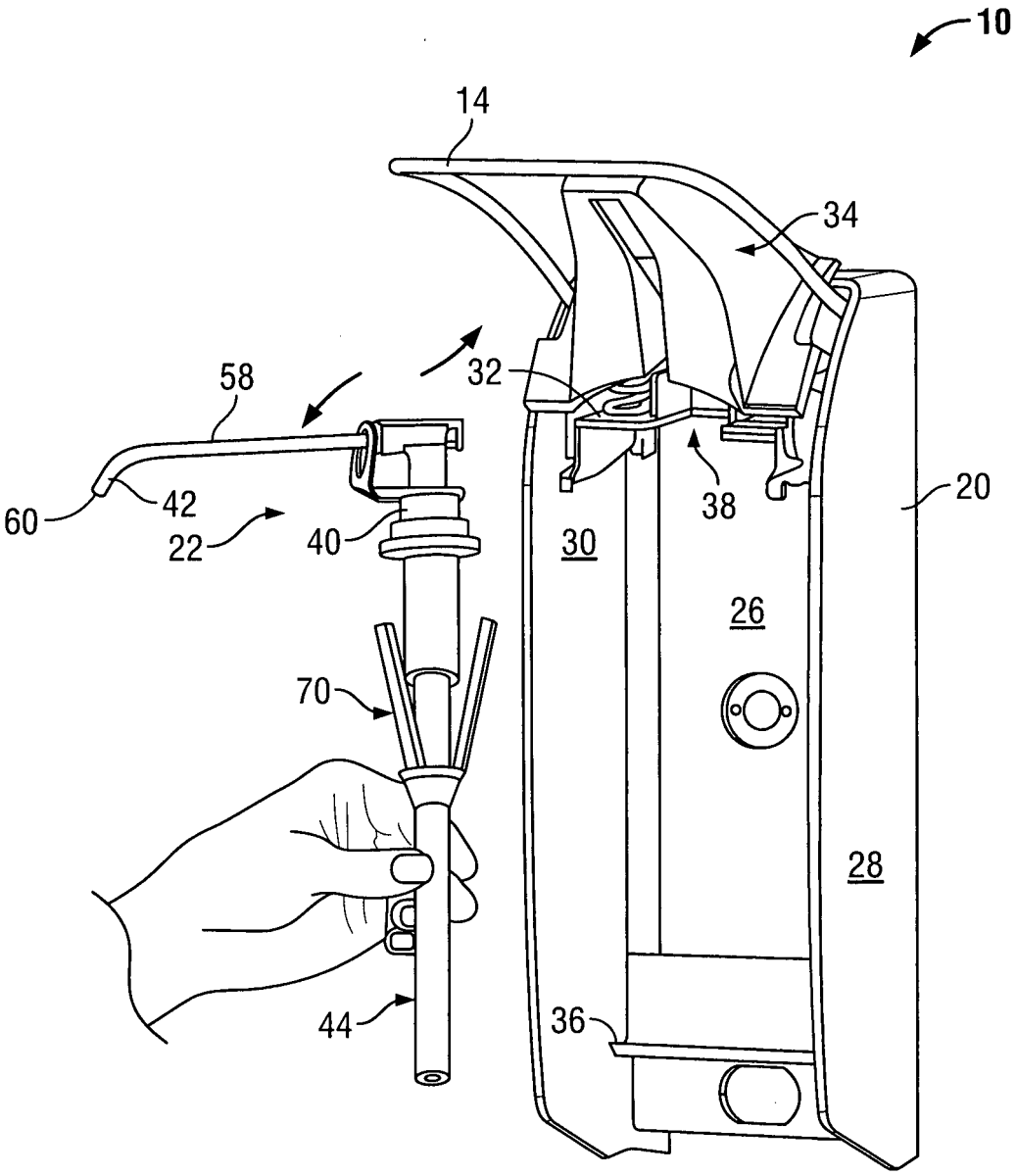

FIG. 2

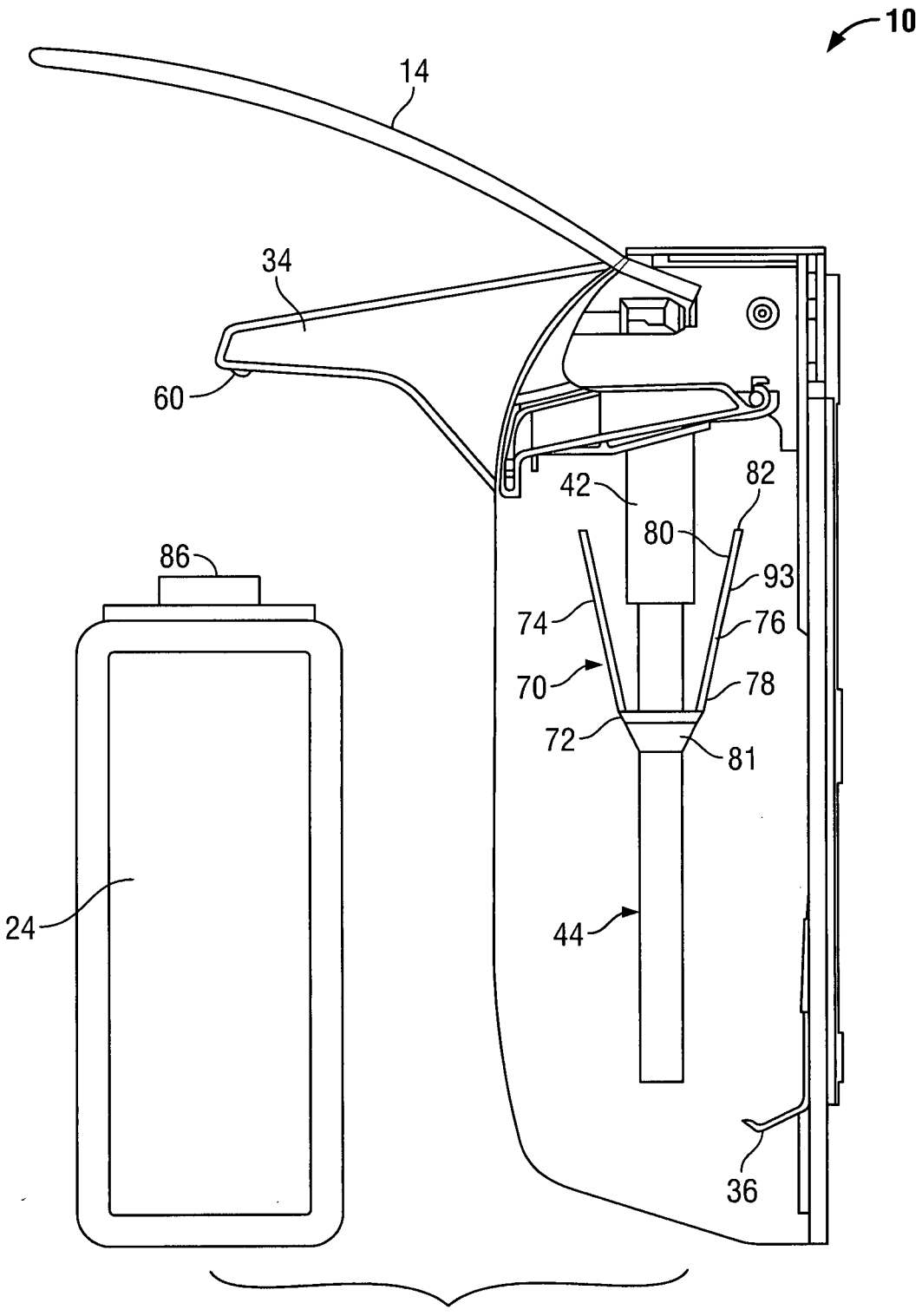

FIG. 3

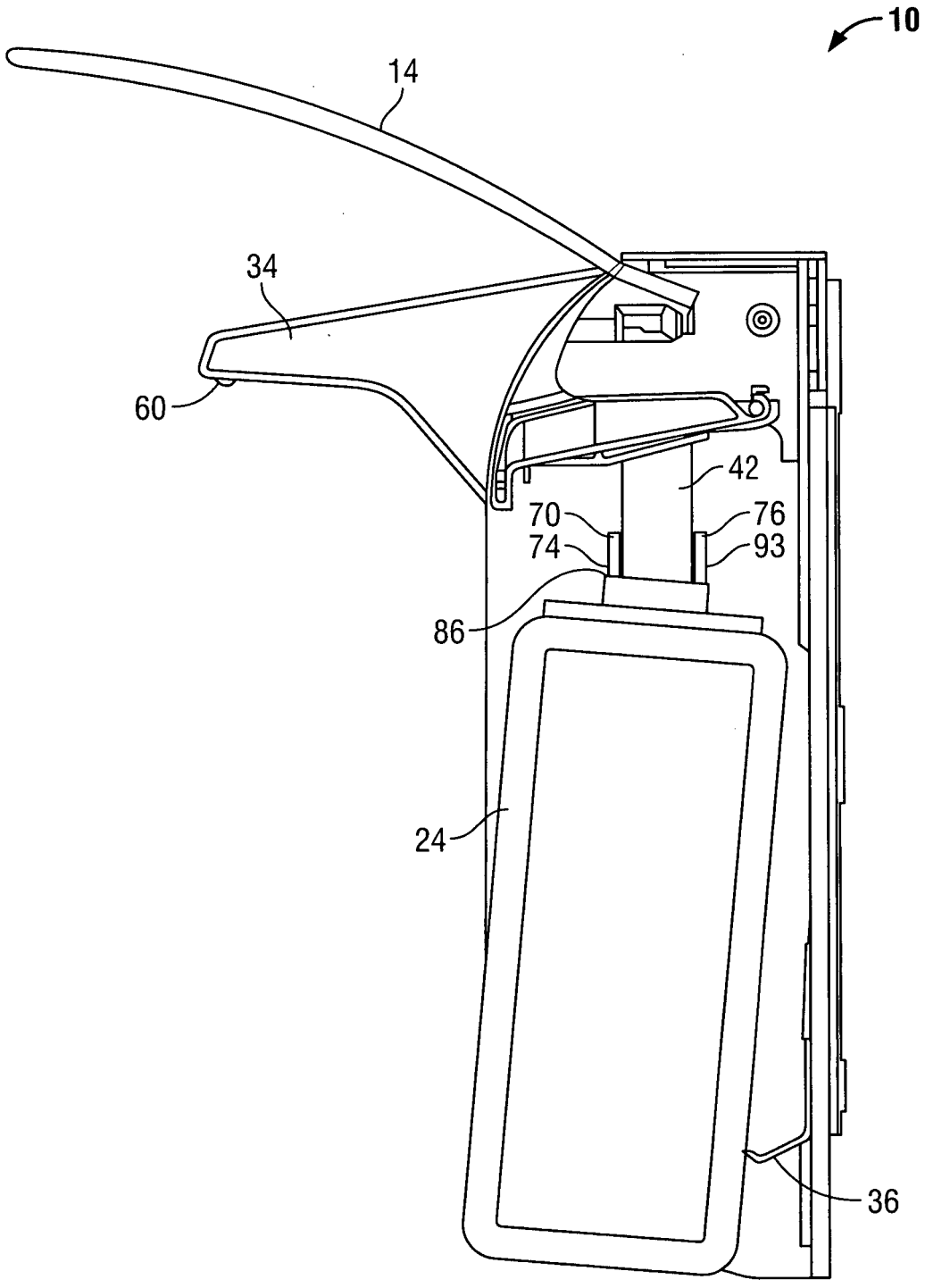

FIG. 4

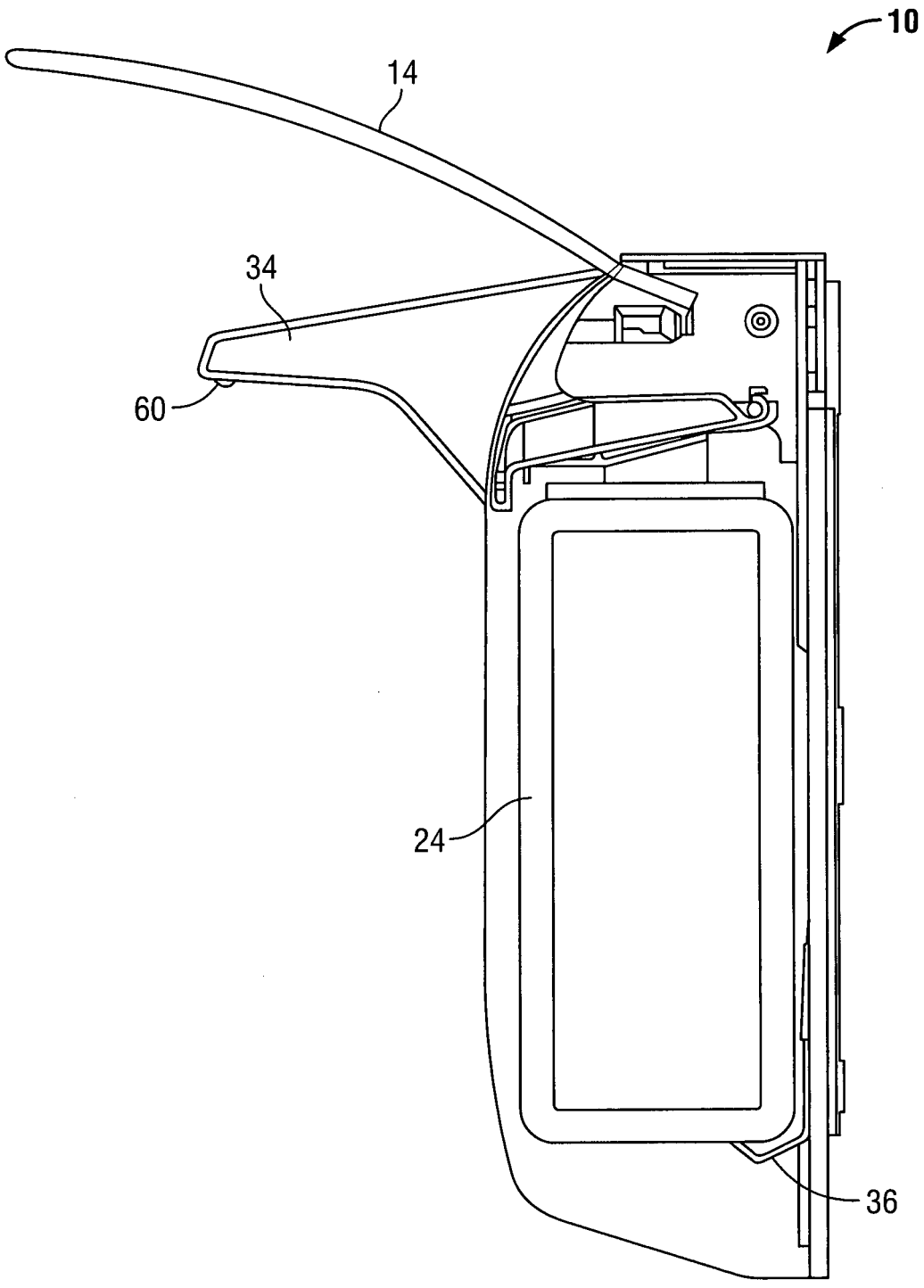

FIG. 5

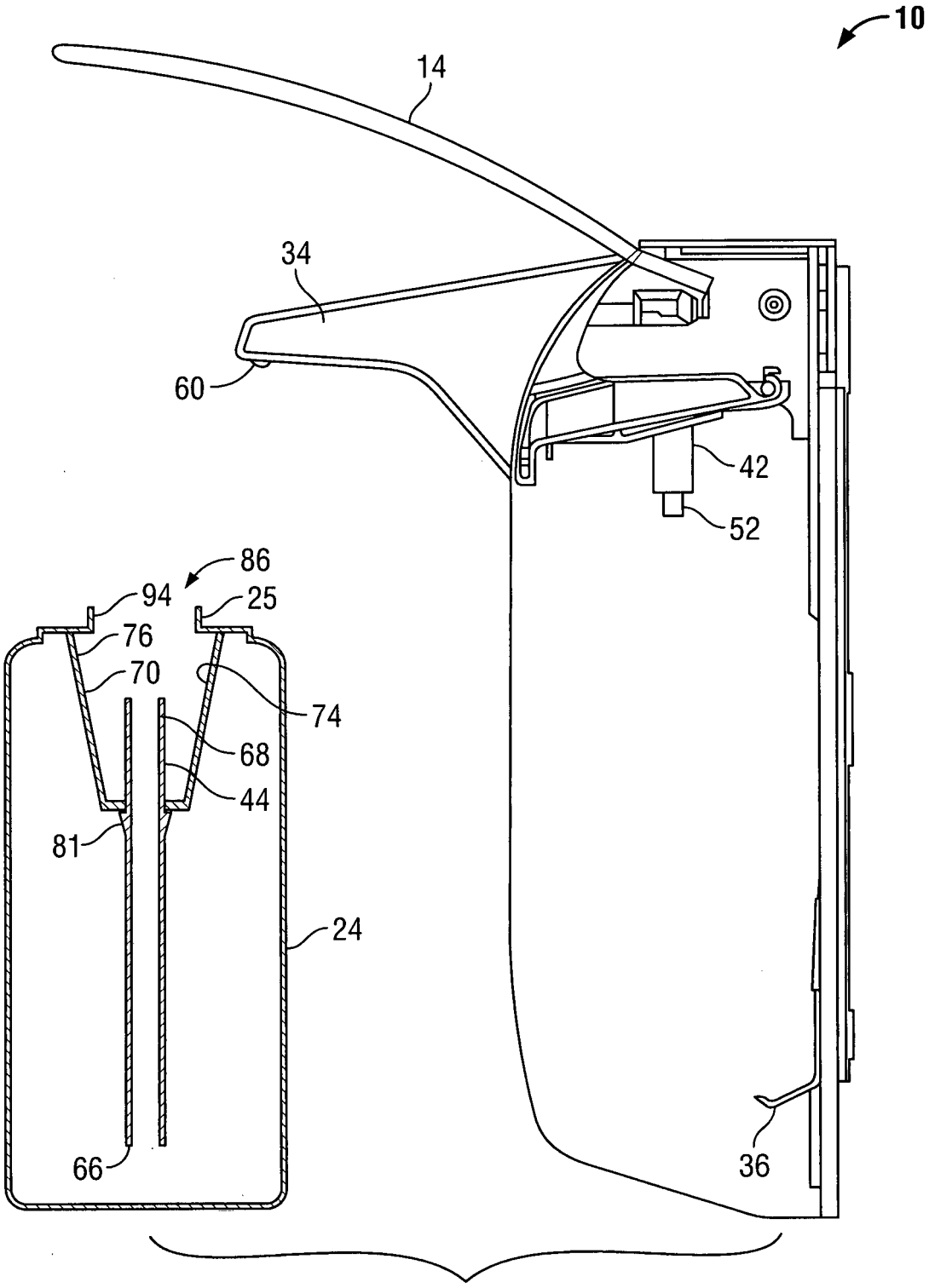

FIG. 6

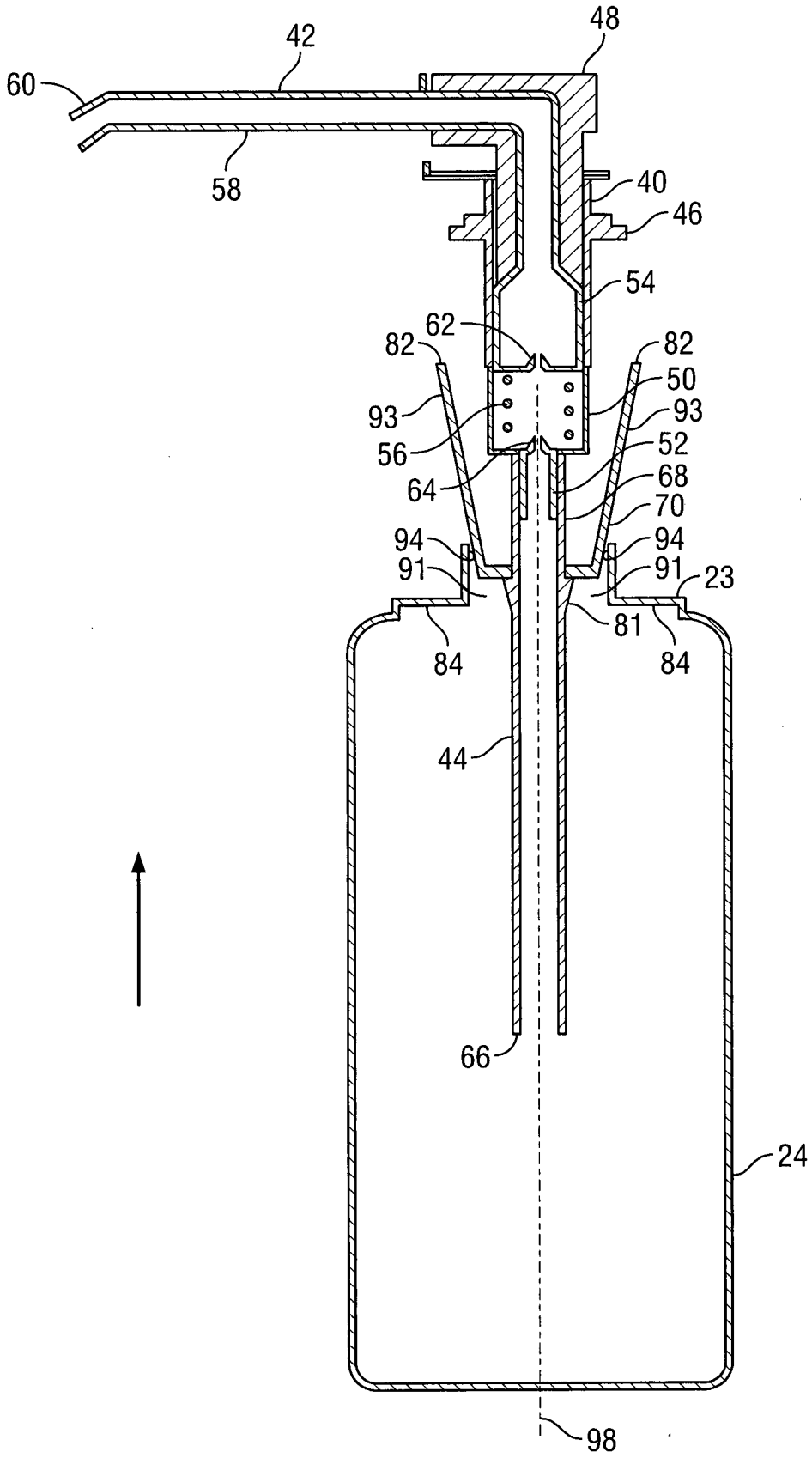
60
42
48
58
40
46
54
62
82
82
50
93
93
56
52
64
68
70
94
94
91
91
23
81
84
84
44
66
24
98

FIG. 7

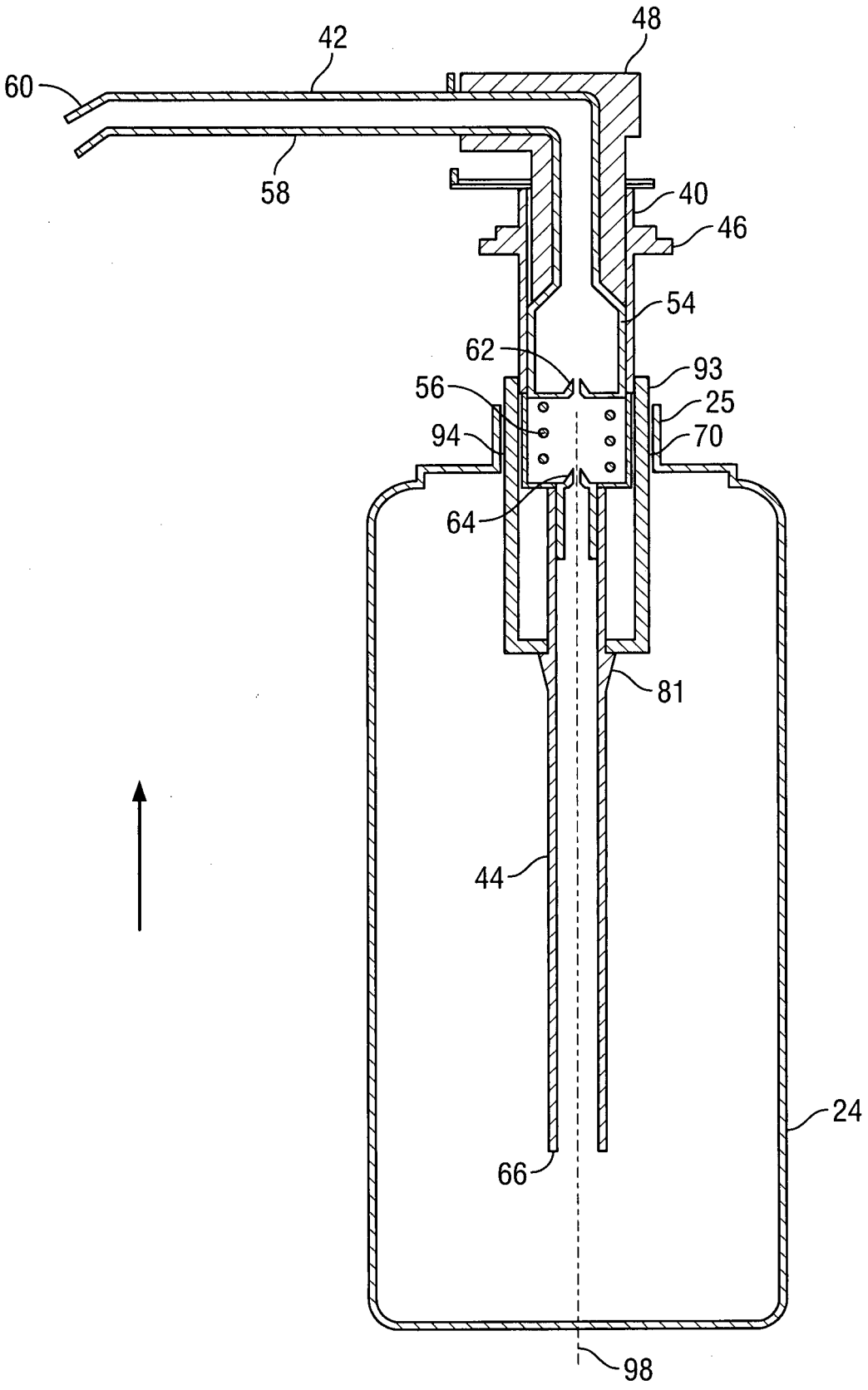

FIG. 8

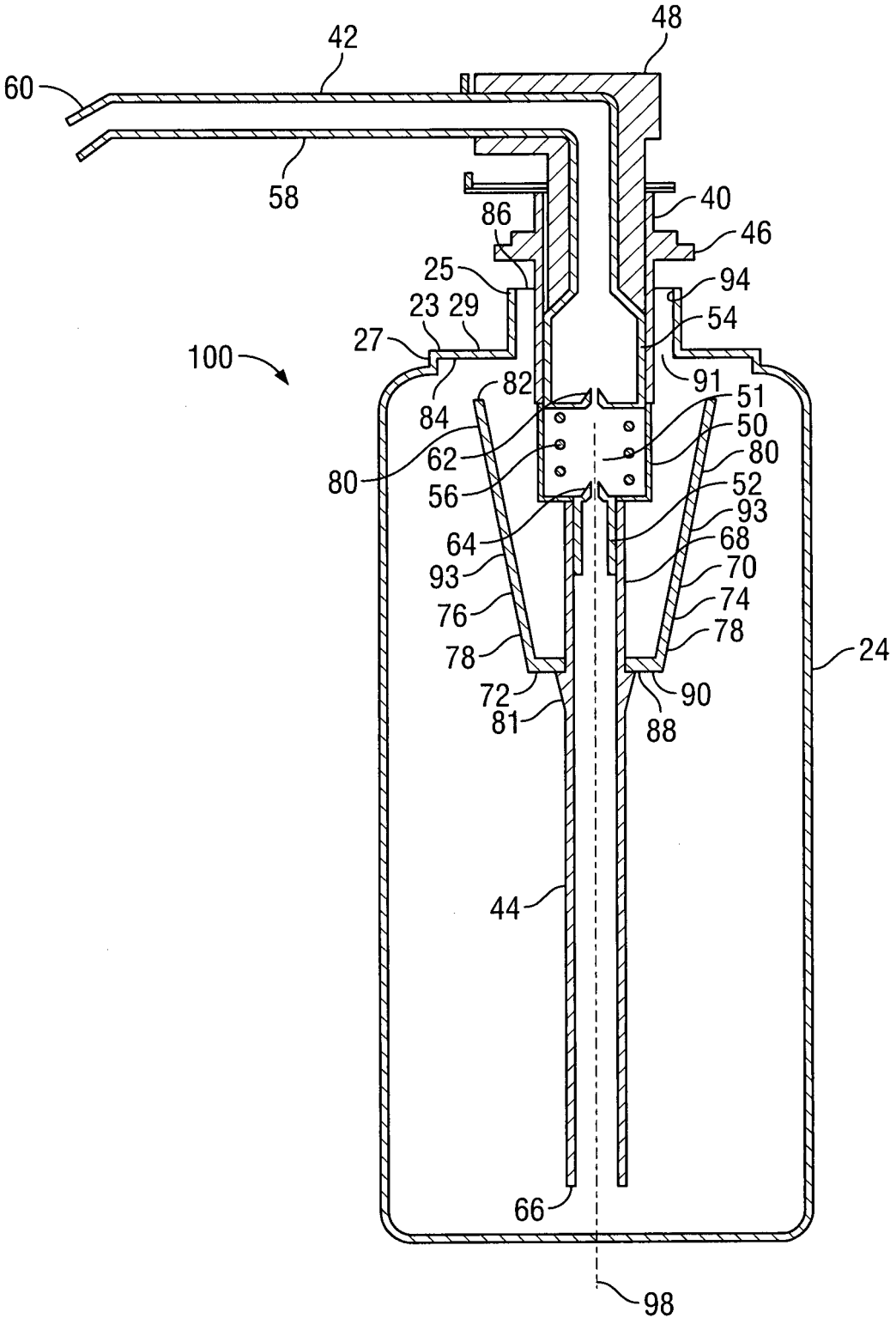
60
42
48
58
86
40
46
25
94
23 29
54
27
100
91
82
51
84
50
62
80
80
56
52
93
64
68
93
70
76
74
78
78
24
72
90
81
88
44
66
98

FIG. 9

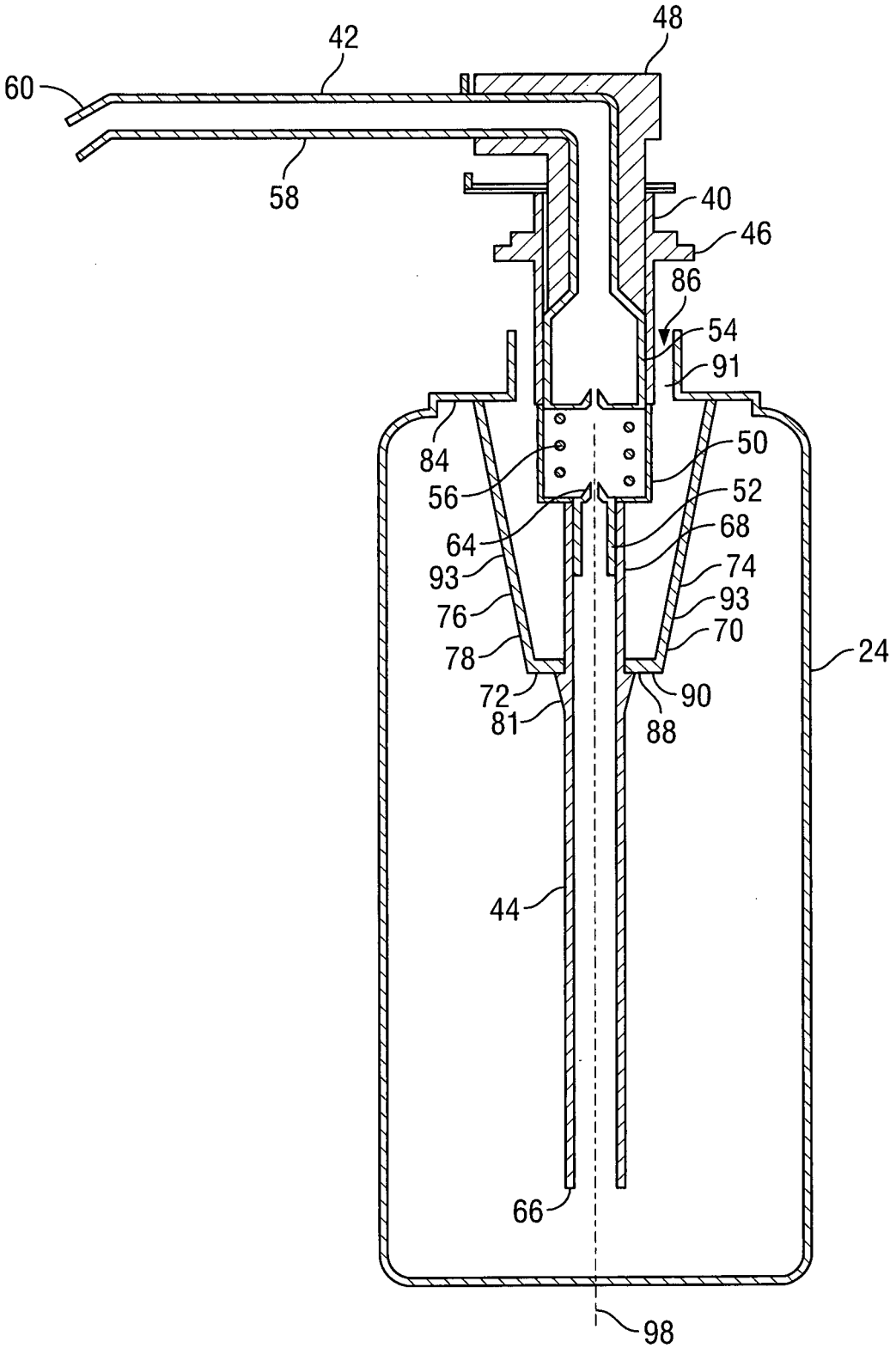
48
42
60
58
40
46
86
54
91
84
50
56
52
64
68
93
74
93
76
70
78
24
72
90
81
88
44
66
98

FIG. 10

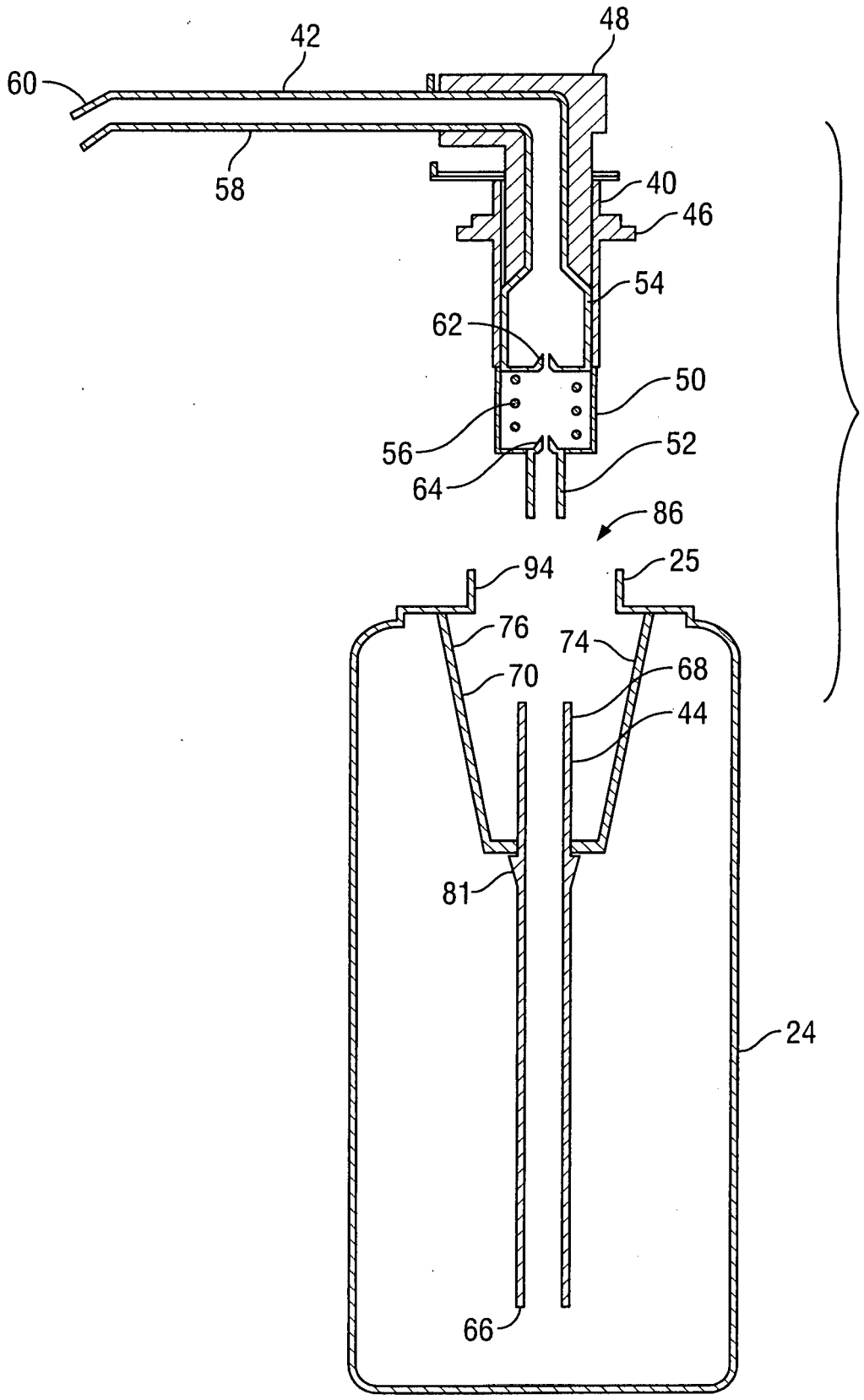

FIG. 11

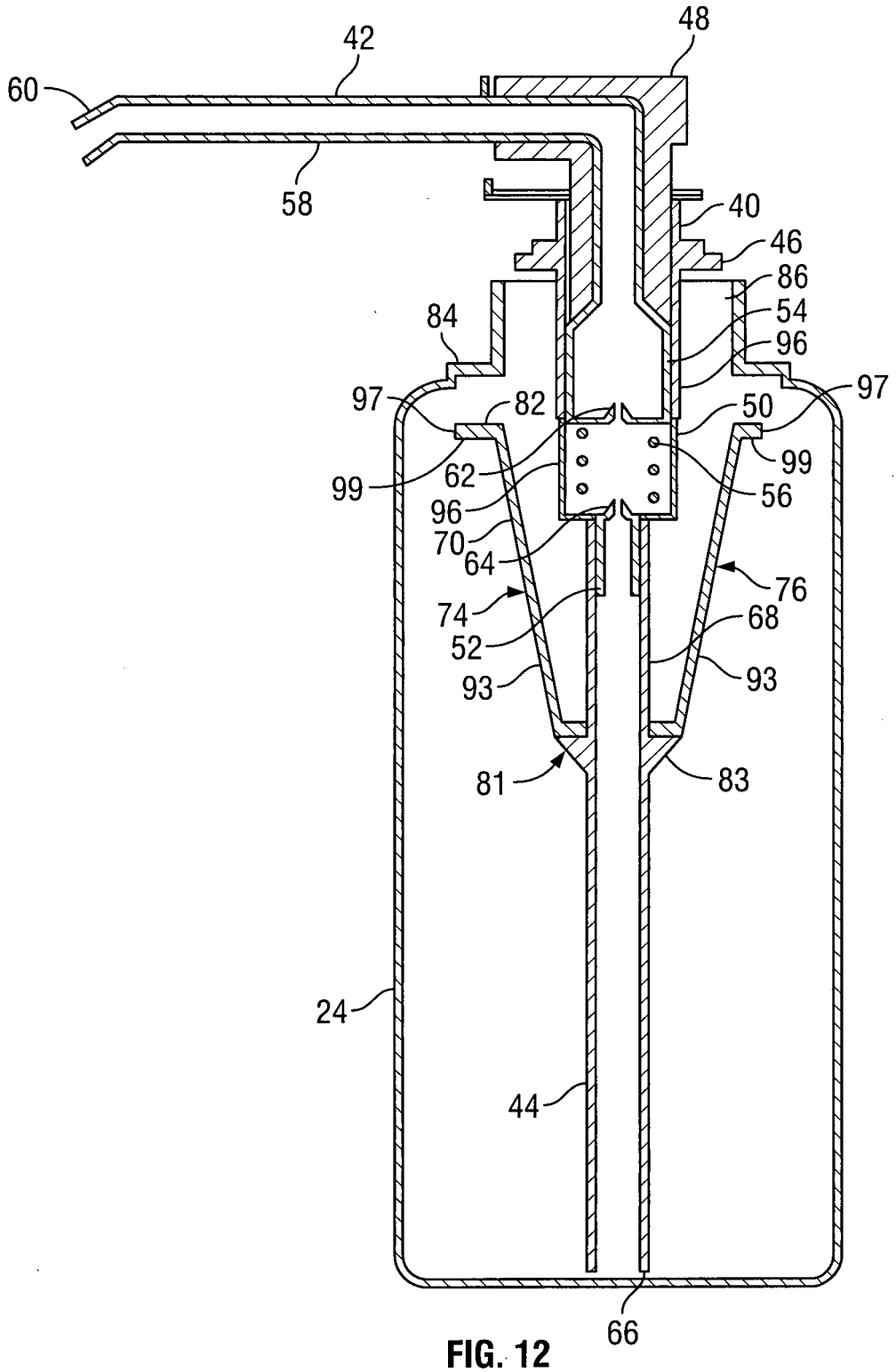
42
48
60
58
40
46
86
54
84
96
97
97
82
50
99
62
99
56
96
70
64
76
74
68
52
93
93
81
83
24
44
66

FIG. 12

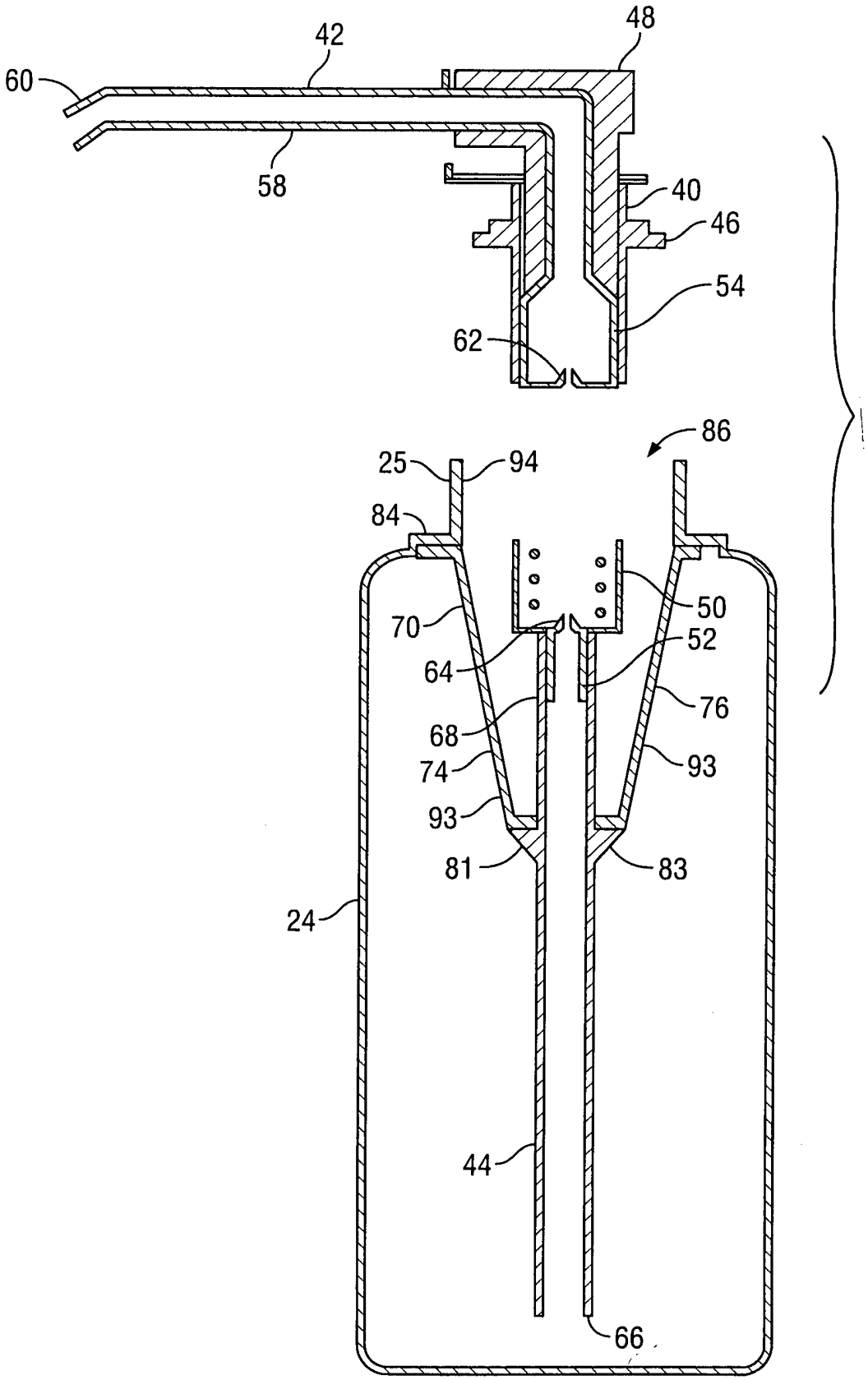
60
42
48
58
40
46
54
62
86
25
94
84
50
70
52
64
76
68
93
74
93
81
83
24
44
66

FIG. 13

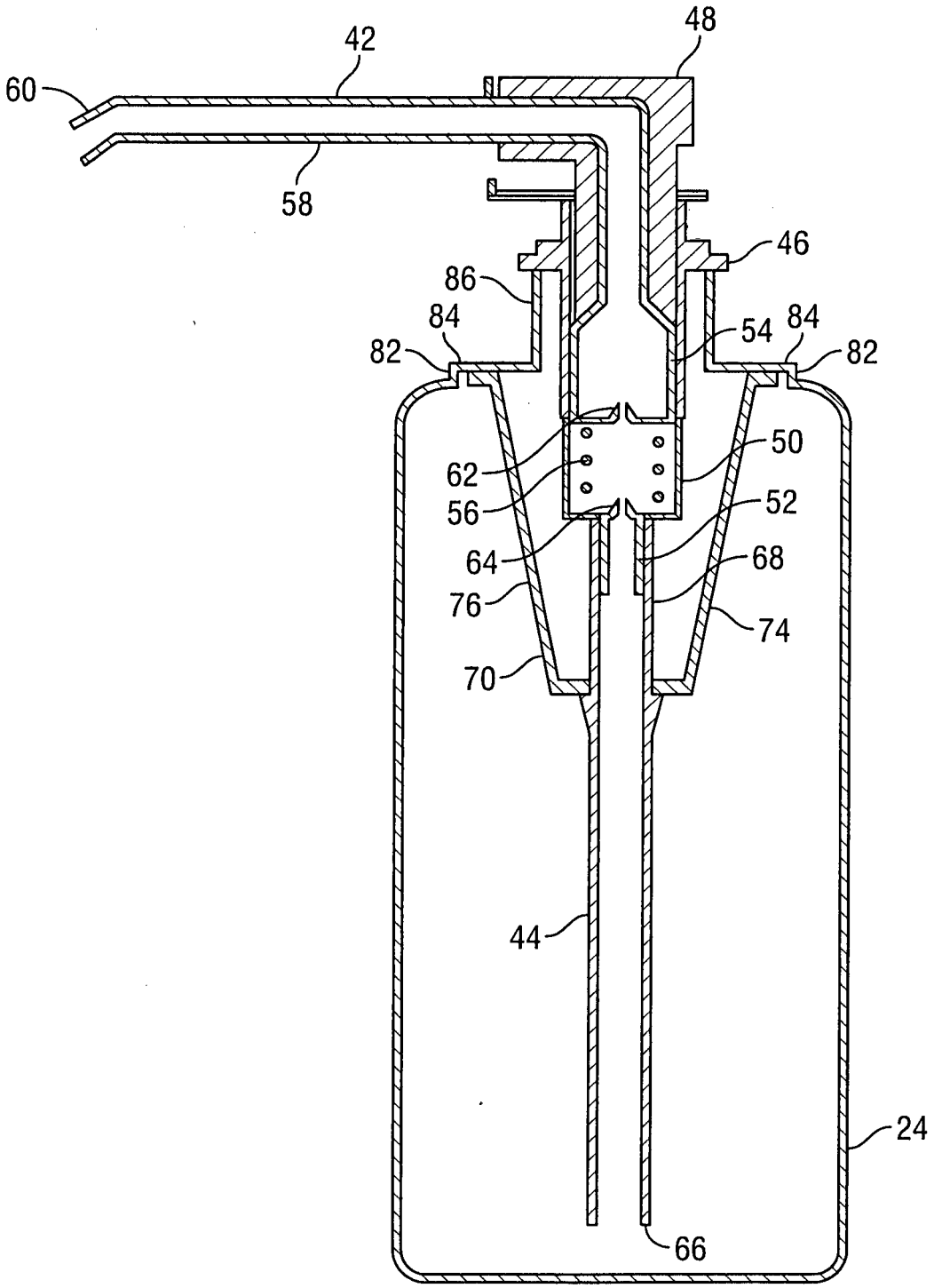

FIG. 14

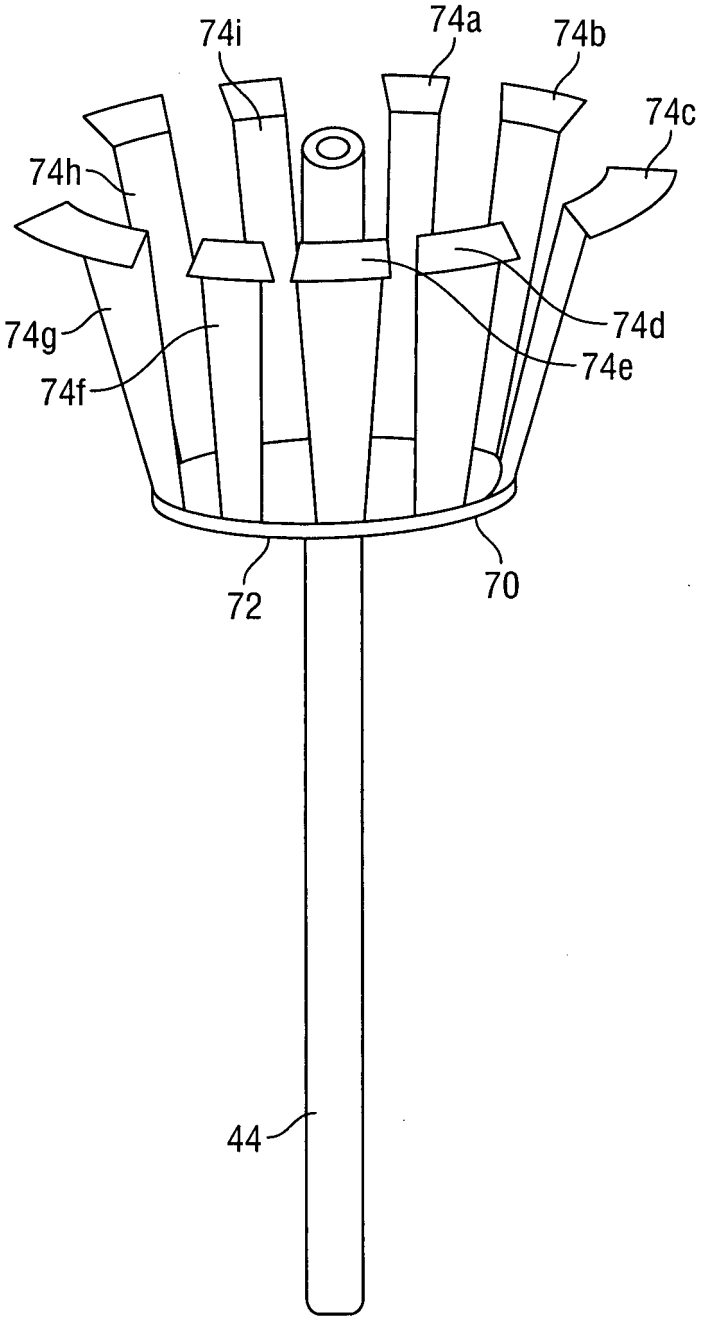

FIG. 15

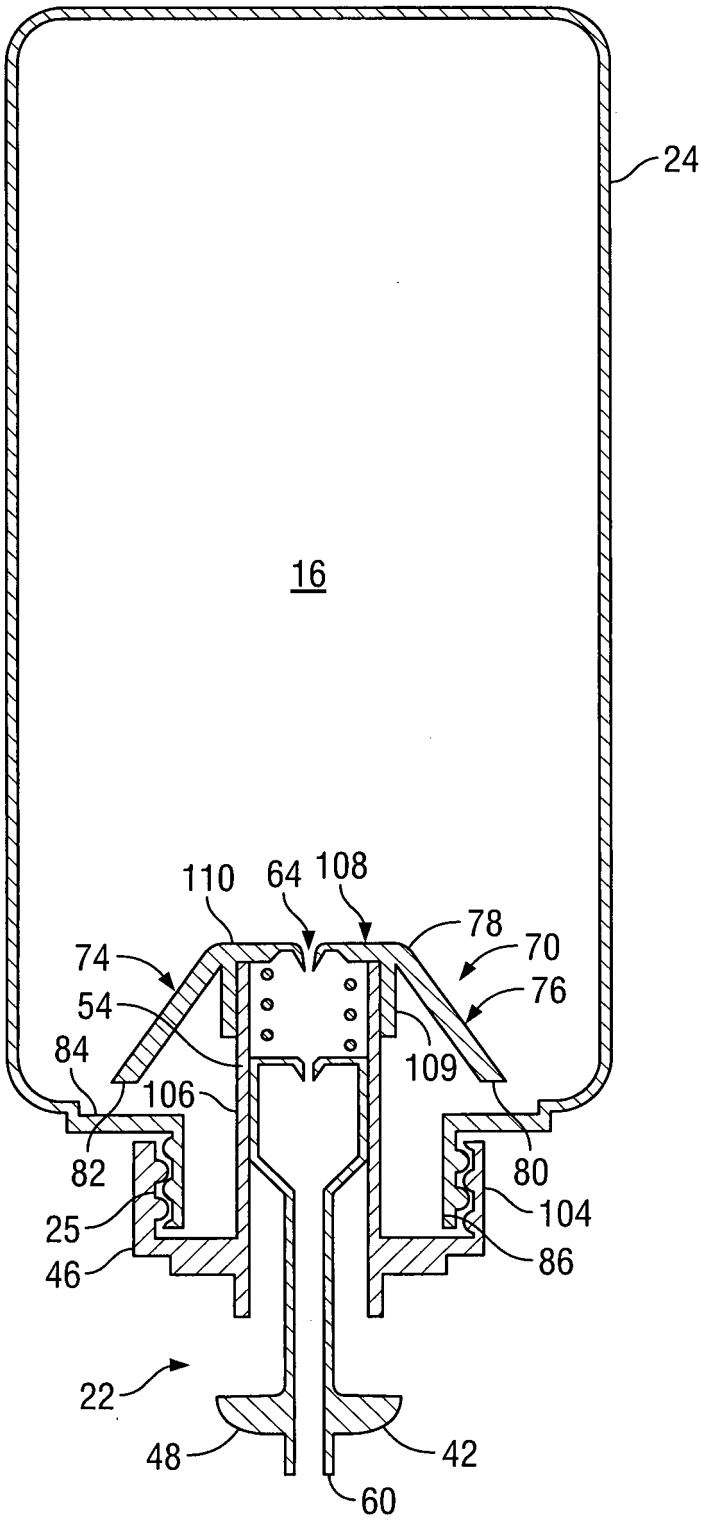
24
16
110
64
108
78
70
74
76
54
109
84
106
82
80
25
104
46
86
22
48
42
60

FIG. 16

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 15 16 4004

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 3 129 854 A (BOEHM JOHN F ET AL) 21 April 1964 (1964-04-21) * figures 4, 5 *	1,2,4,5, 15	INV. B05B11/00 A47K5/12 B65D49/00
A	US 2008/164286 A1 (GARCIA FIRMIN [FR] ET AL) 10 July 2008 (2008-07-10) * figure 1 *	1-15	ADD. B05B15/00
A	DE 10 2007 018349 B3 (MALHOTRA GAURAV [DE]) 30 April 2008 (2008-04-30) * figure 1 *	1-15	

TECHNICAL FIELDS SEARCHED (IPC)

B05B
B65D
A47K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 October 2015	Schork, Willi

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 15 16 4004

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

09-10-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 3129854 A	21-04-1964	NONE	
US 2008164286 A1	10-07-2008	BR PI0519569 A2	27-01-2009
		CN 101087662 A	12-12-2007
		EP 1841539 A1	10-10-2007
		ES 2318583 T3	01-05-2009
		FR 2880001 A1	30-06-2006
		JP 2008525076 A	17-07-2008
		US 2008164286 A1	10-07-2008
		WO 2006070148 A1	06-07-2006
DE 102007018349 B3	30-04-2008	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 7748573 B, Ophardt **[0013]**
- US 5489044 A, Ophardt **[0051]**
- US 7984825 B, Ophardt **[0051]**
- US 8684236 B, Ophardt **[0051]**