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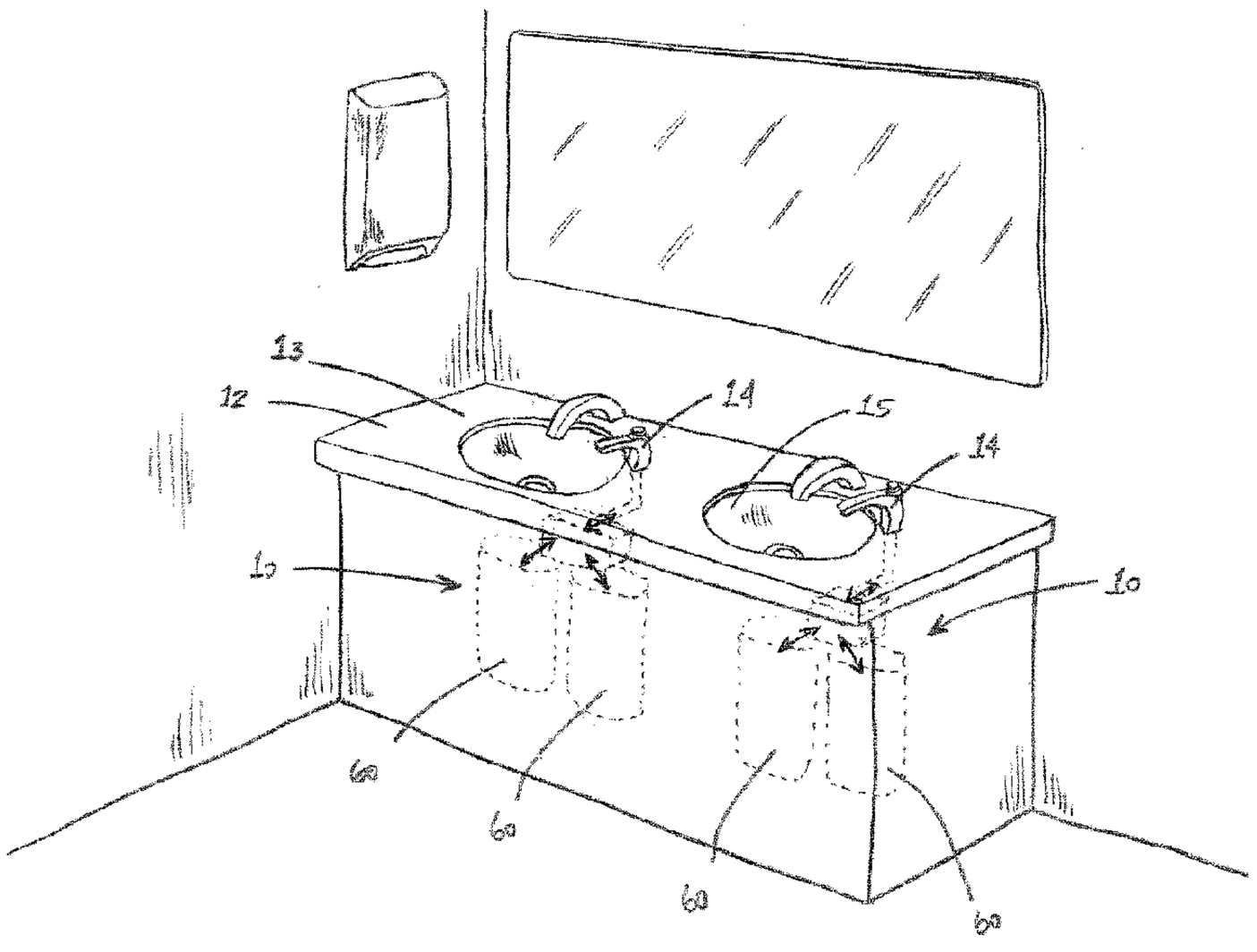

(57) Abrégé/Abstract:
A fluid dispensing system, fluid reservoir, refill container for refilling the fluid reservoir, and method of refilling the fluid reservoir are provided. The fluid dispensing system includes a refill connection port or nozzle to which a refill container is connected when refilling the fluid reservoir. The fluid reservoir includes a piston head and an actuator for moving the piston head in a first direction and in a second direction. When the piston head is moved in the first direction, the fluid within the fluid reservoir is pressurized, causing the fluid to be dispensed through an outlet of the fluid reservoir. When the piston head is moved in the second direction, a vacuum is created within the fluid reservoir that draws fluid, from the refill container, into the fluid reservoir. The fluid dispensing system includes a valve to enable multiple refill containers to be coupled to the nozzle and/or the refill connection port.

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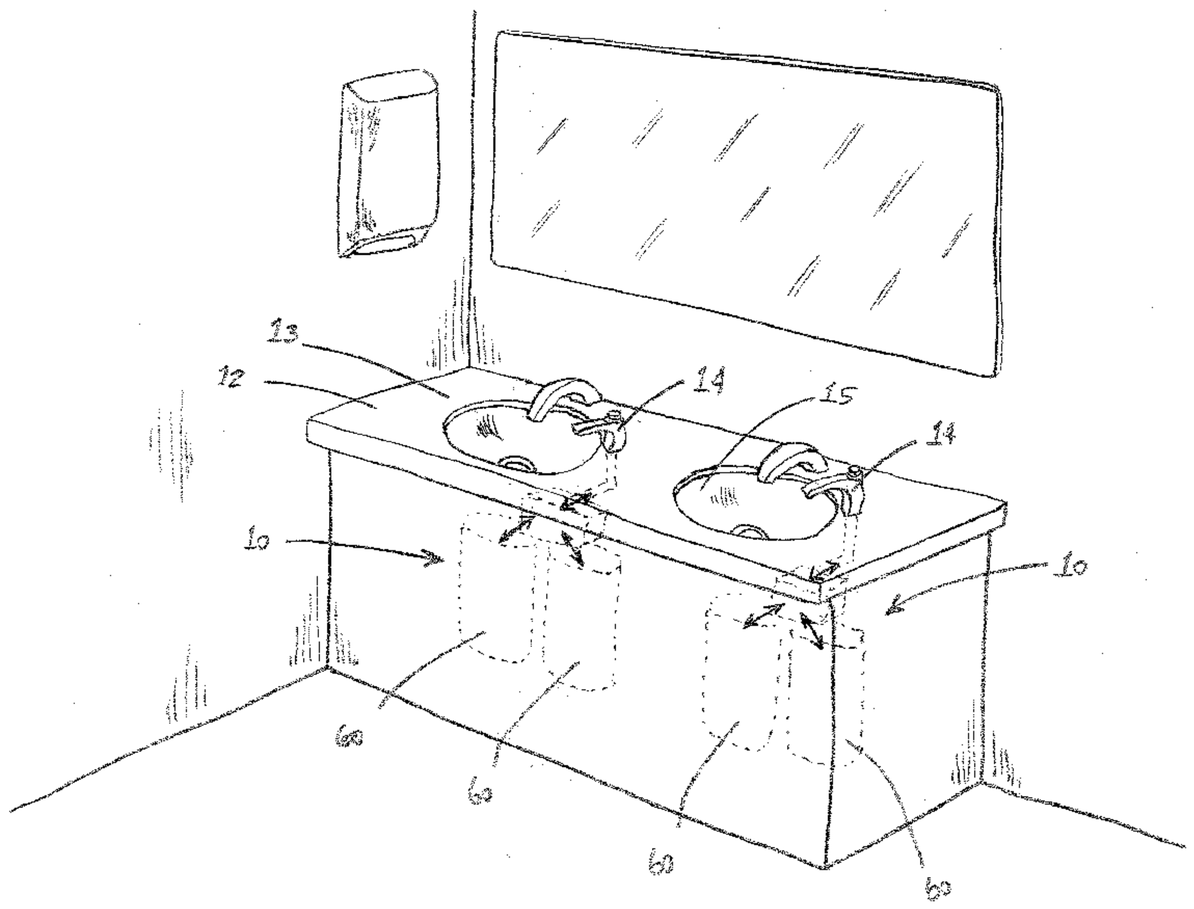

FIG. 1

(57) **Abstract**: A fluid dispensing system, fluid reservoir, refill container for refilling the fluid reservoir, and method of refilling the fluid reservoir are provided. The fluid dispensing system includes a refill connection port or nozzle to which a refill container is connected when refilling the fluid reservoir. The fluid reservoir includes a piston head and an actuator for moving the piston head in a first direction and in a second direction. When the piston head is moved in the first direction, the fluid within the fluid reservoir is pressurized, causing the fluid to be dispensed through an outlet of the fluid reservoir. When the piston head is moved in the second direction, a vacuum is created within the fluid reservoir that draws fluid, from the refill container, into the fluid reservoir. The fluid dispensing system includes a valve to enable multiple refill containers to be coupled to the nozzle and/or the refill connection port.

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PRODUCT DISPENSING SYSTEM

Related Applications

[0001]

Field of the Invention

[0002] The current invention relates generally to sanitary bulk soap dispensers and in particular to dispensing systems having multiple refill reservoirs and air-tight refill connections.

Background of the Invention

[0003] It is commonplace for publicly accessible facilities to provide soap dispensers in washrooms and other areas. Many dispensers have reservoirs that are open to the atmosphere. Such reservoirs are easily and inexpensively refilled from bulk soap stored in bottles or jugs. However, studies have shown that over time soap containers open to the atmosphere generate unsanitary bio-films. Soap used from these containers actually deposits germs onto the hands of the user during use. Even after cleaning the reservoir, remediation studies have determined that bio-films regenerate despite using strong oxidizers like bleach.

[0004] To overcome the detriments of open top dispensers, the reservoir in some dispensers is not refilled when the system is replenished. These systems are designed to receive disposable refill units produced in a sanitary environment. When empty of product, the whole reservoir is replaced along with the accompanying nozzle and pump. In this way, every part wetted by soap is disposed of when the dispenser is replenished. This greatly reduces and/or eliminates the germination of bio-films. However, determining how much soap is remaining in the reservoir, and when to replace it, can be difficult. If the reservoir is replaced before it is empty, then product is wasted. If the dispenser runs out of soap, then users are unable to clean their hands.

[0005] What is needed is a way of conveniently replenishing soap reservoirs without exposing the reservoir or the product to ambient air and without interrupting service or

running out of product. The embodiments of the invention described herein obviate the aforementioned problems.

Summary of thc Invention

[0006] In one embodiment of the subject invention, a fluid product dispensing system is provided that includes multiple reservoirs for holding fluid product, in which thc storage and delivery system is sealed from exposure to ambient air. The system may be replenished from a sealed sanitary refill container connected to a port fluidly connected to the dispensing system. When one of the multiple reservoirs is empty, the dispensing system is operable to automatically dispense product from another reservoir.

[0007] In one particular embodiment, the port for refilling the dispensing system is mounted to a fixture, along with a separately mounted nozzle used to dispense product.

[0008] In another embodiment of the dispensing system, the dispensing system is refilled through the dispensing nozzle.

In another embodiment, the present invention provides a fluid dispensing system, comprising:

a first fluid reservoir for storing fluid;

a second fluid reservoir for storing fluid;

a fixture for dispensing fluid from the first fluid reservoir and the second fluid reservoir and for replenishing the first fluid reservoir and the second fluid reservoir with fluid, the fixture comprising a refill connection port to which a refill container comprising fluid for replenishing at least one of the first fluid reservoir or the second fluid reservoir is selectively coupled; and

a valve, wherein:

the valve, while in a first state, establishes a fluid pathway between a nozzle of the fixture and the first fluid reservoir; and

the valvc, while in a second state, establishes a fluid pathway between the nozzle and the second fluid reservoir.

Brief Description of the Drawings

[0009] Fig. 1 depicts a fluid dispensing system according to the embodiments of the subject invention.

[00010] Fig. 2 is a cross sectional view of a fixture of the dispensing system according to the embodiments of the subject invention.

[00011] Fig. 3 is a cross sectional view of the fixture of the dispensing system shown in Fig. 2 attached to a refill unit, according to the embodiments of the subject invention.

[00012] Fig. 4 is a partial cross sectional view of the fixture depicted in Fig. 2, along with control system circuitry and a schematic representation of a control valve of the fluid dispensing system, according to the embodiments of the subject invention.

[00013] Fig. 5 is cross sectional view depicting multiple reservoirs of the fluid dispensing system, according to the embodiments of the subject invention.

[00014] Fig. 6 is a cross sectional view of another embodiment of the fixture of the dispensing system and a refill unit, according to the embodiments of the subject invention.

[00015] Fig. 7 is a front elevation view of a wall mounted dispenser, according to yet another embodiment of the subject invention.

[00016] Fig. 8 is a perspective view of a wall mounted dispenser showing multiple reservoirs of the fluid dispensing system depicted in Fig. 7.

Detailed Description

[00017] A product dispensing system, depicted in Fig. 1, dispenses a measured amount of fluid product according to the embodiments of the subject invention. In one exemplary instance, the dispensing system, shown generally at **10**, dispenses hand care products like soap, lotion or sanitizers, although other types of products may similarly be dispensed from the dispensing system.

[00018] In the embodiment depicted in Figs. 1 and 2, the dispensing system **10** includes a generally rigid fixture **14** having a product dispensing nozzle **16** received in an end **17** thereof. The fixture **14** may be mounted to a supporting structure **12**, like for example a countertop **13**, and positioned adjacent a source of clean water and a sink **15**. It is noted that the fixture **14** may be mounted to other types of supporting structures, like a wall or dispenser stand, discussed further below. In one embodiment, fixture **14** has a faucet-like configuration including a base **19** for mounting it to the supporting structure **12** and an outwardly extending cantilevered arm **22**. The nozzle **16** is positioned at the distal end of the arm **22**. Conduits **27** in the fixture **14** are fluidly connected to a source of product, i.e. reservoir **60**, that is designed to be replenished by way of the fixture **14**.

[00019] Internally the fixture **14** may be at least partially hollow comprising one or more generally concave parts that fasten together to form a fixture assembly. One or more fluid conduits **27** may be received in the hollow interior for protection against damage from direct contact. As such, the fixture **14** may be constructed from impact resistance plastic or corrosion resistant metal. Fasteners or other means of affixing the concave parts together, not shown, may be chosen with sound engineering judgment. Alternative embodiments are contemplated where the fixture **14** may be generally solid formed as a single piece; having fluid channels molded or machined directly therein. These and other fixture configurations are to be construed as falling within the scope of coverage of the embodiments described herein.

[00020] The one or more conduits **27** in the fixture **14** function both: to channel product to the nozzle **16** and to refill the reservoir **60**. In one particular embodiment, two fluid conduits **27a**, **27b** are provided. The first fluid conduit **27a** is connected at a first end to the nozzle **16** as mentioned above. The distal end of fluid conduit **27a** terminates at a manifold (reference Fig. 3), which may comprise a selectively engage-able valve **50**, to be discussed further below. The second fluid conduit **27b** similarly connects at one end to the manifold, but terminates at a refill connection port **25** mounted onto the fixture **14**.

[00021] With reference to Figs. 2 and 3, the refill connection port **25** provides a fluid tight inlet for connecting to a soap refill container **31**. When not in use, the connection port **25** may be closed off from exposure to the atmosphere. In one embodiment, the connection port **25** comprises a quick connect fitting. In this way, fluid flow through the connection port **25** is established only when the mating connector **37** from the soap refill container **31** is connected to it. Alternatively, the connection port **25** may be sealed by a cap secured via threads, not shown in the figures. Still any type of connection port **25** may be used that eliminates or substantially prevents exposure to the air.

[00022] The soap refill container **31** stores a predetermined quantity of fluid product in a reservoir area **32**. In one particular embodiment, the volume in the reservoir area **32** may be substantially equivalent to the storage capacity of one of the dispensing system reservoirs **60**. In this way, no product is left over or wasted when the dispensing system **10** is refilled. However, other volumes of refill storage area **32** may be used without limiting the scope of coverage of the embodiments described herein.

[00023] The refill container **31**, referred to as refill bag **31a**, may be constructed from pliable plastic material. In this way, as material flows out of the bag **31a**, the walls of the container will collapse making it easy to dispose of once emptied of product. An outlet connection fitting **33** may be incorporated into the refill bag **31a**. The fitting **33** may be affixed to an aperture formed in the bag **31a** via any process known in the art, as long as a fluid tight seal is ensured. A hose **35** may extend from the outlet fitting **33**. A second connection fitting **37** may be affixed to the hose **35** at its distal end for establishing fluid flow with the connection port **25**. It follows that the second connection fitting **37** may also be a quick connect fitting that mates with the connection port **25**. However, any type of fittings may be used as is necessary to provide a connection that does not expose the fluid product to the air.

[00024] With continue reference to Fig. 3, a validation key or tag may be implemented between refill container **31** and dispensing system **10** for validating the contents of the refill container **31**. In one particular embodiment, connection fitting **37** includes an electronic key **40**. The key **40** may comprise a RFID (Radio Frequency Identification) tag, which may be either passive or active. A corresponding interrogator **42** may be positioned proximal to the connection port **25**. Accordingly, when the connection fitting **37** is brought near or installed onto the connection port **25**, the interrogator **42** will automatically "ping" the electronic key **40** to verify that the correct refill container is being used. If the incorrect refill container is connected to the dispensing system **10**, the control system will not initiate the refilling sequence. Depending on the range, i.e. strength, of the RFID signals, it is contemplated that the interrogator **42** may be mounted onto a circuit board located in the system controller or elsewhere in the dispensing system **10**. Skilled artisans will appreciate that other forms of tagging, i.e. verification, may be used, like for example keyed mechanical fittings or optical sensor systems. Still, any manner of ensuring that the dispensing system **10** works only with the proper refill container **31** may be chosen as is consistent for use with the embodiments of the subject invention.

[00025] With reference now to Figs. 4 and 5, conduits **27** are connected to a valve, shown schematically at **50**. The valve **50** functions to direct fluid to and from multiple fluid storage reservoirs **60**, shown in Fig. 5. While the valve **50** is schematically depicted as a solenoid activated directional valve, it is to be construed that any type of valve mechanism may be used that switches fluid flow to the nozzle **16** from between the multiple reservoirs **60**. In the current embodiment, the dispensing system **10** employs two reservoirs **60a**, **60b**. However, persons of skill in the art will recognize the application to three or more fluid storage reservoirs. It is noted that multiple reservoirs function to provide a constant supply of fluid product. Stated differently, the inclusion of multiple reservoirs means that one reservoir supplies fluid product while the other reservoir remains available for serviced, i.e. to be refilled with product.

[00026] From the aforementioned description and the accompanying figures, it can be seen that, in one state, valve **50** establishes a fluid pathway from the output of reservoir **60a** to the nozzle **16**. At the same time, valve **50** also establishes a fluid pathway between the connection port **25** and the second reservoir **60b**. When reservoir **60a** has been emptied of fluid product, the control system **70** will shift valve **50** to the second state, i.e. second

position, whereby fluid reservoir **60b** will be fluidly connected to the nozzle **16** and reservoir **60a** will be in fluid communication with connection port **25**.

[00027] With continue reference to Fig. 5, each of the fluid reservoirs **60** may comprise a generally elongate and cylindrical canister **61**, although any geometric configuration may be selected with good judgment. Canister **61** defines a fluid tight, internal region having a volume V. In the current embodiment, each of the respective canisters **61** have the same volume V, but canisters having different volumes may be employed as well. By way of example, volume V may range from 100 milliliters up to several liters of fluid product. However, canisters **61** having a broader range of volumes may also be used.

[00028] Each canister **61** may include a piston head **63**. The piston head **63** is constructed having an outer diameter, or other geometric configuration as may be the case, that closely matches the inner diameter of the canister **61**. Grooves **64** may be formed on the perimeter of the piston head **63** for receiving sealing material **65**, like for example an O-ring. However, it is noted that certain fluid products may inherently possess a viscosity that does not require the use of O-rings or any sealing material to be used between the piston head **63** and canister wall. In any instance, it will be appreciated that the whole dispensing system **10** is sealed from exposure to ambient air.

[00029] The canisters **61** include an outlet **66**. The outlet **66** may reside at one end of the canister **61;** preferably the top. Tubes **67** may extend from the outlet **66** to respective ports of the valve **50**. Of course, tubes **67** are connected to their respective inlet and outlet in a fluid tight manner so as to prevent exposure to the atmosphere. Any manner of connecting the tubes **67** may be chosen including but not limited sealed connection fittings.

[00030] Still referencing Fig. 5, to expel fluid product from the reservoirs **60**, i.e. canisters **61**, each respective piston head **63** is connected to an actuator **80**. While Fig. 5 depicts two different actuators **80**, i.e. one for each canister, it does so only for illustrative purposes. Ideally, dispensing system **10** will use the same type of actuator **80** in both (or all) reservoirs **60**. Examples of actuators include, but are not limited to: pneumatic pressure and vacuum sources, mechanical ballscrews, electric motors or coil springs. Still, other types of actuators may be used to displace the piston head **63**.

[00031] The actuator **80** is generally capable of driving the piston in first and second directions. That is to say that the actuator **80** is functional both to push the piston head **63** in

the direction of the outlet **66**, and to draw the piston head **63** away from the outlet **66**. Skilled artisans will immediately understand that driving the piston head **63** in the direction of the outlet **66** will pressurize the product in the canister **61**. It follows that incremental advancement of the piston head **63** results in metered dispensing of the fluid product. When actuated in the opposite direction, the piston head **63** will conversely create a vacuum. In one embodiment, engaging the actuator **80** to move the piston head **63** away from the outlet **66** is used to automatically refill the canister **61** with product, as explained below.

[00032] With reference again to Fig. 4, dispensing system **10** includes a control system **70** comprising one or more electronic circuits **71** for controlling the sequence of operation of the dispensing system **10**. The electronic circuitry **71** may reside on a printed circuit board and received in a suitable enclosure, not shown. An electrical power supply, also not shown, may be provided to power the electronic circuits **71**. In one embodiment, electrical power for the control system **70** may comprise mains power supplied from the facility in which the dispensing system **10** is installed. Alternatively, onboard power may be provided in the form of one or more batteries, also not shown.

[00033] The electronic circuitry **71** of the control system **70** may comprise digital electronic circuitry **72** designed to receive and process data relating to operation of the dispensing system **10**. In particular, the digital electronic circuitry **72** functions to receive input signals from the electronic validation key and onboard sensors **90**. Such circuitry may utilize analog-to-digital converters. In one embodiment, the digital electronic circuitry **72** may comprise one or more logic processors **73**, which may be programmable. Accordingly, circuitry **72** may further include electronic data storage **75** or memory **75**.

[00034] The digital electronic circuitry **72** also functions to output signals used to control operation of the dispensing system **10**, like for example operation of the valve **50** and activation of the actuators **80**, which may include one or more electric motors **82**. The output signals may therefore comprise low voltage DC signals and/or AC signals. Whatever the configuration, persons of skill in the art will understand the use and implementation of a wide array of circuitry as may be necessary for controlling operation of the dispensing system **10**.

[00035] With reference again to Fig. 5, sensors **90** may be incorporated into the reservoirs **60** for determining the amount of fluid product remaining in each canister **61**. The types of sensors used may include: limit switches, pressure sensors, encoders, or non-contact

proximity sensors, like for example Hall-effect sensors. However, persons of skill in the art will understand that other types of sensors may be used. In determining how much fluid is remaining in the reservoirs **60**, the sensors **90** may be configured to directly sense the presence or absence of fluid. Alternatively, the sensors **90** may be configured to detect the location of the piston head **63** and subsequently correlate position of the piston head to the amount of product remaining in the canisters **61**. In still another embodiment, sensors may detect how much product remains by detecting activation or position of the actuators **80**. These and other methods are to be construed as falling within the scope of coverage of the embodiments described herein.

[00036] In one particular embodiment, sensors **91** may also be incorporated into the fixture **14**. These sensors **91** are used to detect motion for hands-free activation of the dispensing system **10**. The sensors **91** may comprise one or more IR emitters and detectors. The emitter-detector pairs may be oriented in any manner to ensure consistent activation in a particular region under the nozzle **16**.

[00037] With reference again to Figs. 1 through 5, one embodiment of operating the dispensing system **10** will now be described. Upon initial activation or reset of the control system **70**, a default reservoir (for discussion purposes fluid reservoir **60a**) may be predetermined, i.e. programmed, from which to begin dispensing fluid product. When the dispensing system **10** is activated by the user, via sensors **91**, the control system **70** will check to see if there is product in the canister **61a** by reading the output of sensor **90a**. If fluid product is present, the control system **70** will output a signal to actuator **80a** to drive piston head **63a** forward for dispensing a metered amount of fluid product. As long as sensor **90a** continues to indicate that fluid product is present, control system **70** will engage actuator **80a** with every activation of the sensors **91**. When the signal from sensor **90a** indicates that the canister **61a** is empty, the control system **70** will then begin drawing fluid product from reservoir **60b** by shifting the valve **50** to its alternate state. Additionally, control system **70** will output a signal to turn on an indicator for signaling to service personnel that maintenance is required. In one embodiment, the indicator may be an indicator light **94** positioned on the fixture **14**. Alternatively, the indicator may be audible in nature. Moreover, the indicator may be a wireless signal sent to a network monitored by service personnel. Still, any manner of signaling that the dispensing system **10** requires service may be chosen.

[00038] During the refill cycle, service personnel may attach the connection fitting **37** from a refill container **31** to the connection port **25** of the fixture **14**. The control system **70** will check the signal received by the interrogator **42** to ensure that the correct refill unit has been installed. Upon verification, the control system **10** will output a signal to the actuator of the canister that is signaling "empty." The actuator will then draw the piston head away from the outlet **66** creating a vacuum that refills the canister.

[00039] With reference now to Fig. 6, an alternate embodiment of the dispensing system **10** is illustrated. In this embodiment, the dispensing system **10** uses the nozzle **16** both to dispense product and to refill the reservoirs **60**. Accordingly, the fixture **14** contains a single conduit **27a**. When it is required to refill the reservoirs, the connection fitting **37** of the refill container **31** is connected to the nozzle **16**. The interrogator **42** similarly verifies that a proper refill container **31** is being used. In this instance, it may be necessary to cycle valve **50** so that the fluid pathway is connected to the appropriate reservoir **60**, namely the reservoir empty of product. Subsequently, the control system **70** engages the appropriate actuator **80** to create a vacuum thereby drawing fluid product into the reservoir. After the refill cycle has been completed, the control system **70** will switch valve **50** back to its previous state so that fluid product may continue to be dispensed from the other reservoir.

[00040] In the current embodiment, the connection fitting **37** may be configured with a bleed port **38**. To ensure that no fluid product that has been exposed to ambient air is drawn back into the reservoirs **60**, a purge cycle may be programmed into the control system **70**. During the purge cycle, the control system **70** may drive the appropriate actuator **80** forward to bleed out fluid product residing at the nozzle **16** that may have been exposed to the air. It follows that when the fitting **37** is connected to the nozzle **16**, fluid product will flow through the bleed port **38**. Subsequently, the control system **70** will automatically engage the actuator in the opposite direction to draw fluid from the refill container **31** into the empty reservoir. Skilled artisans will comprehend that the connection fitting **37** may be designed to include one or more valves, which may be a check valves **39**, to prevent leakage of fluid product through the bleed port **38** during the refill process.

[00041] Referencing Figs. 7 and 8, the aforementioned embodiments have been directed to a counter mounted dispensing system. In these embodiments, the fixture and reservoir are separately mounted. However, alternate embodiments are contemplated where the components of the dispensing system **10** are contained in a single enclosure **11**. In one

particular embodiment, reservoirs **60a**, **60b**, valve **50**, control system **70** and nozzle **16** are all contained in a single enclosure **11**. As illustrated by the figures, the enclosure **11** may be a wall mounted enclosure. The multiple reservoirs received within the enclosure may function in the same manner as that described above. Refilling of the dispensing system **10** may be accomplished through the nozzle **16**, or alternatively by way of a separately provided connection port, not shown in Figs 7 and 8.

[00042] Having illustrated and described the principles of the multi-reservoir dispensing system in one or more embodiments, it should be readily apparent to those skilled in the art that the invention can be modified in arrangement and detail without departing from such principles.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A fluid dispensing system, comprising:

a first fluid reservoir for storing fluid;

a second fluid reservoir for storing fluid;

a fixture for dispensing fluid from the first fluid reservoir and the second fluid reservoir and for replenishing the first fluid reservoir and the second fluid reservoir with fluid, the fixture comprising a refill connection port to which a refill container comprising fluid for replenishing at least one of the first fluid reservoir or the second fluid reservoir is selectively coupled; and

a valve, wherein:

the valve, while in a first state, establishes a fluid pathway between a nozzle of the fixture and the first fluid reservoir; and

the valve, while in a second state, establishes a fluid pathway between the nozzle and the second fluid reservoir.

2. The fluid dispensing system of claim 1, wherein:

no fluid pathway exists between the nozzle and the first fluid reservoir while the valve is in the second state; and

no fluid pathway exists between the nozzle and the second fluid reservoir while the valve is in the first state.

3. The fluid dispensing system of claim 1, wherein at least one of the first fluid reservoir and the second fluid reservoir comprises:

a canister for storing fluid;

a piston head; and

an actuator configured to drive the piston head in a first direction and a second direction.

4. The fluid dispensing system of claim 3, wherein:

the piston head pressurizes fluid stored within the canister when driven in the first direction to dispense fluid from the canister; and

the piston head creates a vacuum within the canister when driven in the second direction to draw fluid into the canister.

5. The fluid dispensing system of claim 1, wherein:

the valve, while in the first state, establishes a fluid pathway between the refill connection port and the second fluid reservoir; and

the valve, while in the second state, establishes a fluid pathway between the refill connection port and the first fluid reservoir.

6. The fluid dispensing system of claim 1, comprising an interrogator for verifying the refill container prior to replenishing the at least one of the first fluid reservoir or the second fluid reservoir.

7. The fluid dispensing system of claim 1, the fixture comprising an indicator for notifying service personnel that maintenance is requested.

8. The fluid dispensing system of claim 3, comprising:

an interrogator for verifying the refill container prior to replenishing the at least one of the first fluid reservoir or the second fluid reservoir; and

a control system configured to output a signal to the actuator responsive to the interrogator verifying the refill container, the signal triggering the actuator to drive the piston head to create a vacuum that replenishes the at least one of the first fluid reservoir or the second fluid reservoir using the refill container.

9. A fluid dispensing system, comprising:

a first fluid reservoir for storing fluid;

a second fluid reservoir for storing fluid;

a fixture for dispensing fluid from the first fluid reservoir and the second fluid reservoir and for replenishing the first fluid reservoir and the second fluid reservoir with fluid; and

a valve, wherein:

the valve, while in a first state, establishes a fluid pathway between a nozzle of the fixture and the first fluid reservoir;

the valve, while in a second state, establishes a fluid pathway between the nozzle and the second fluid reservoir; and

the nozzle of the fixture is configured to receive a connection fitting of a refill container comprising fluid for replenishing at least one of the first fluid reservoir and the second fluid reservoir.

10. The fluid dispensing system of claim 9, wherein:

no fluid pathway exists between the nozzle and the first fluid reservoir while the valve is in the second state; and

no fluid pathway exists between the nozzle and the second fluid reservoir while the valve is in the first state.

11. The fluid dispensing system of claim 9, wherein at least one of the first fluid reservoir and the second fluid reservoir comprises:

a canister for storing fluid;

a piston head; and

an actuator configured to drive the piston head in a first direction and a second direction.

12. The fluid dispensing system of claim 11, comprising:

an interrogator for verifying the refill container prior to replenishing the at least one of the first fluid reservoir or the second fluid reservoir; and

a control system configured to output a signal to the actuator responsive to the interrogator verifying the refill container, the signal triggering the actuator to drive the

piston head to create a vacuum that replenishes the at least one of the first fluid reservoir or the second fluid reservoir using the refill container.

13. The fluid dispensing system of claim 11, wherein:

the piston head pressurizes fluid stored within the canister when driven in the first direction to dispense fluid from the canister; and

the piston head creates a vacuum within the canister when driven in the second direction to draw fluid into the canister.

14. The fluid dispensing system of claim 9, comprising an interrogator for verifying the refill container prior to replenishing the at least one of the first fluid reservoir or the second fluid reservoir.

15. The fluid dispensing system of claim 9, the fixture comprising an indicator for notifying service personnel that maintenance is requested.

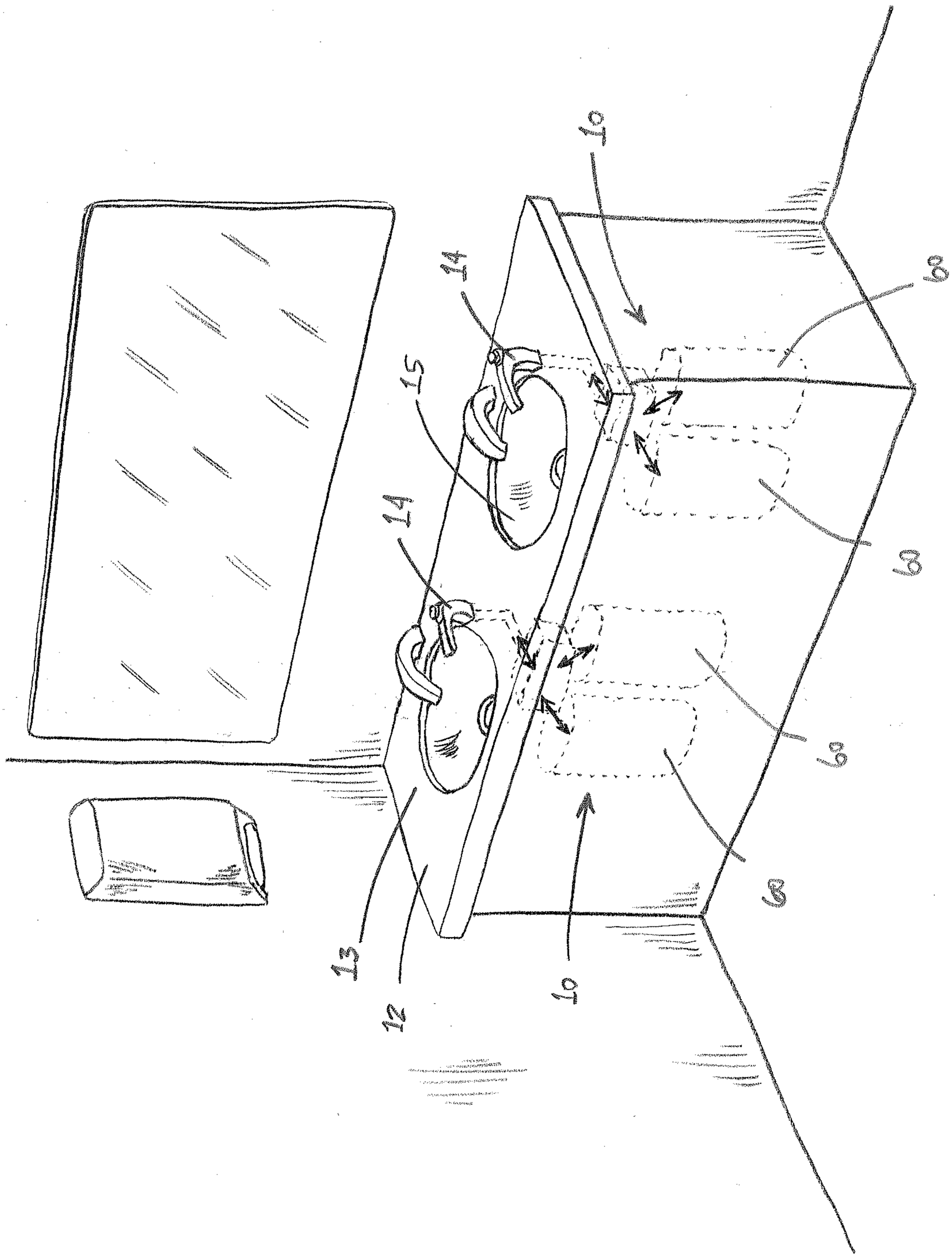


FIG. 1

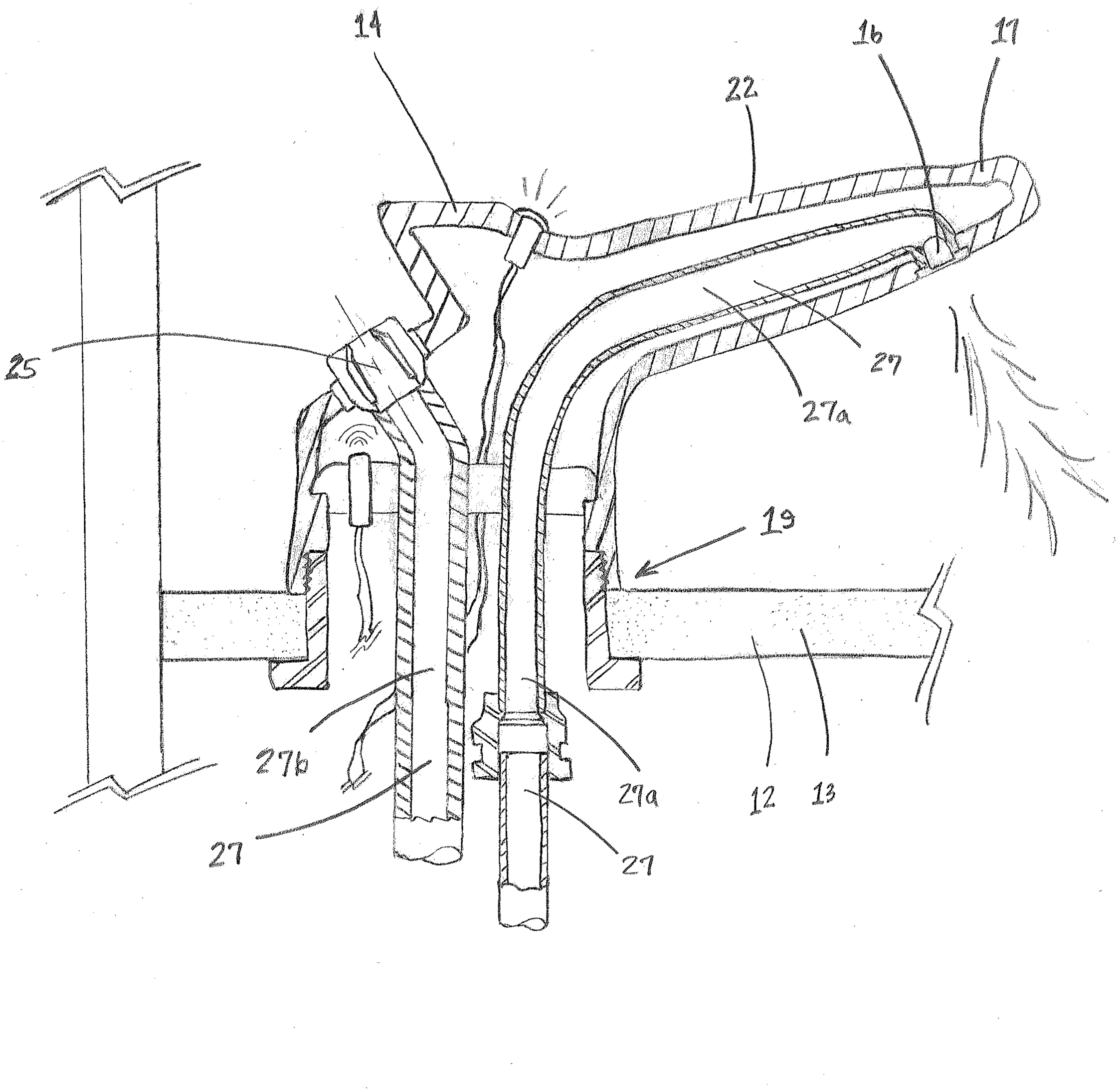
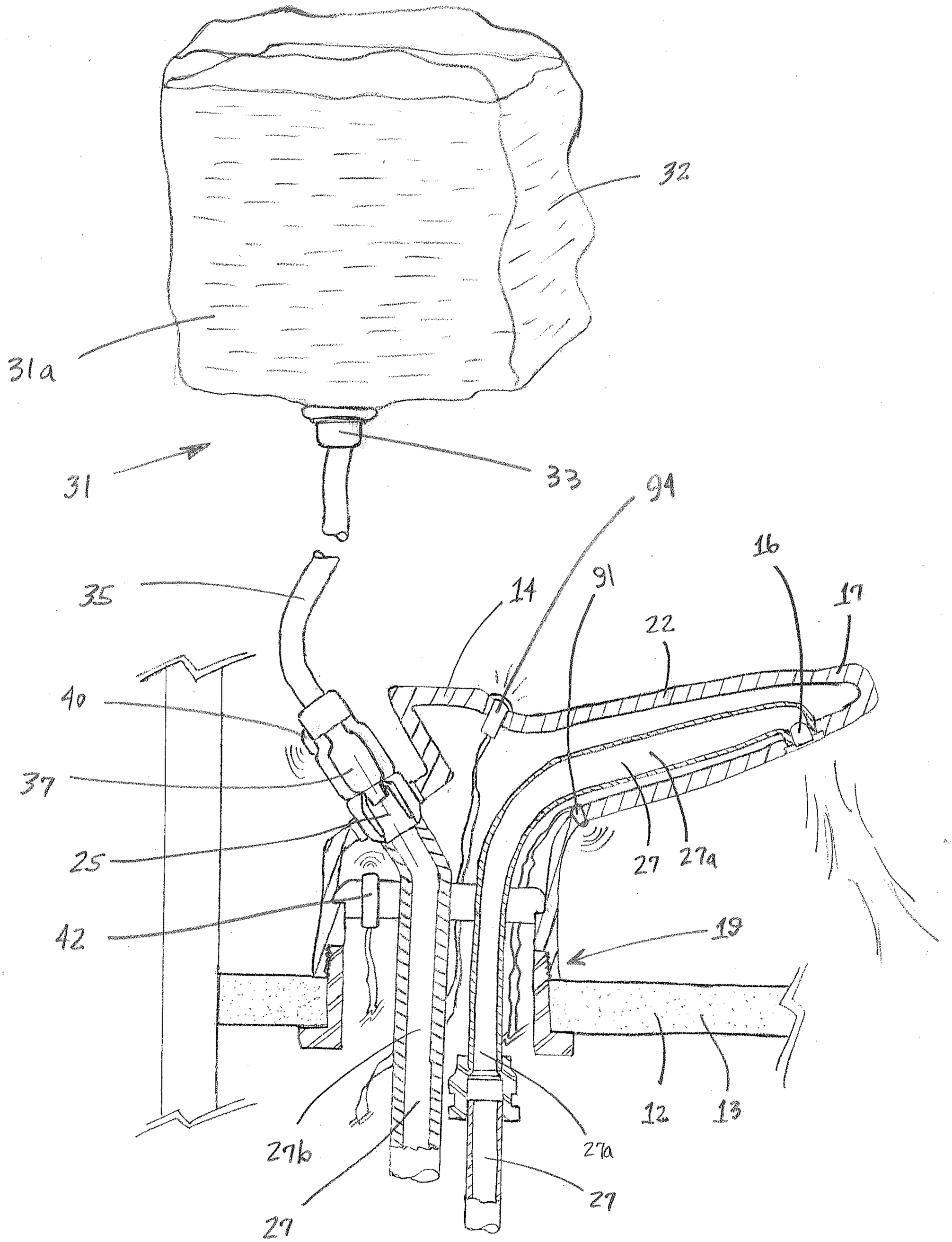


FIG. 2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27a
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27b
27a
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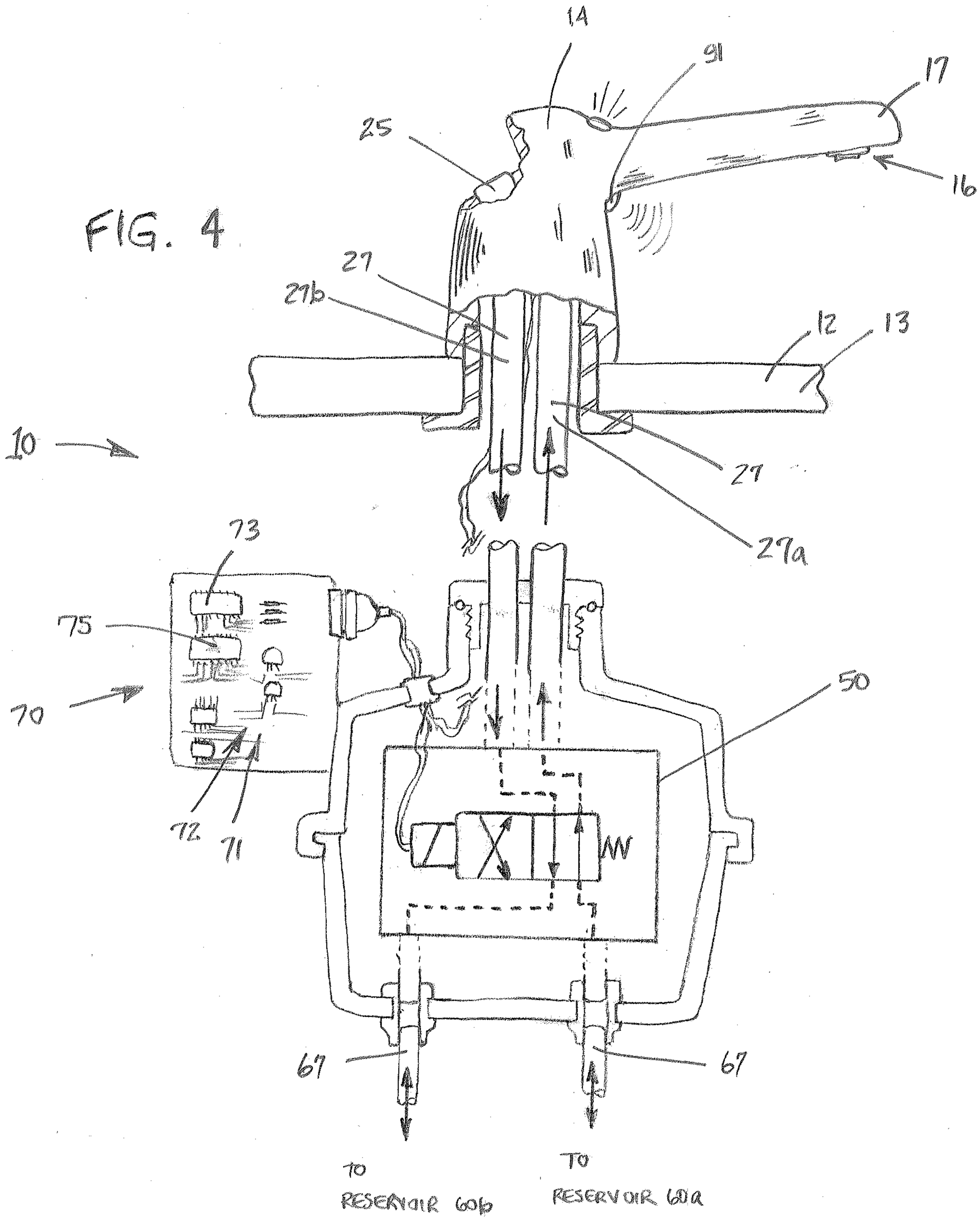
FIG. 3

FIG. 4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TO
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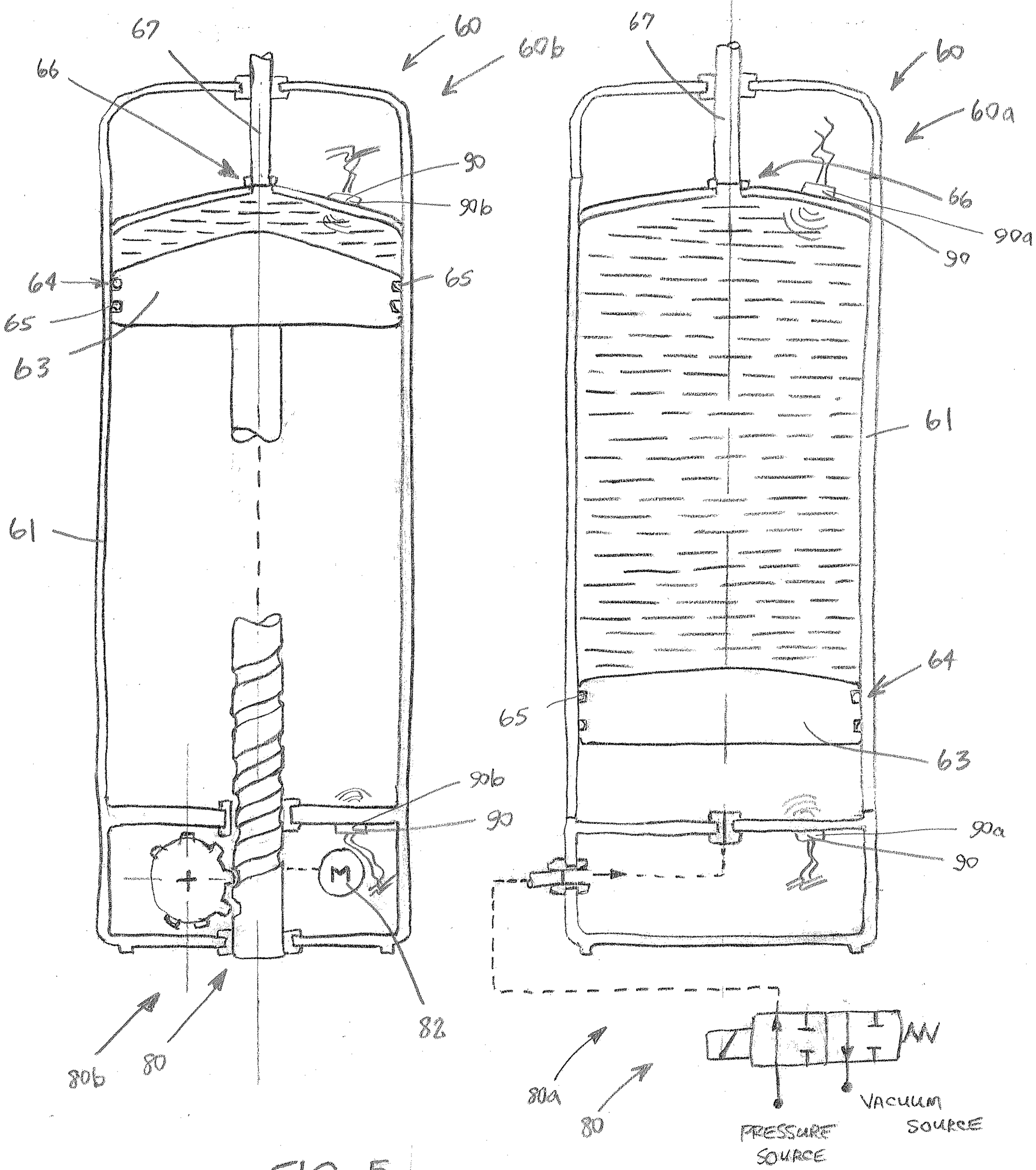
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67
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60a
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90a
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65
63
90a
90
80a
80
W
VACUUM SOURCE
PRESSURE SOURCE

FIG. 5

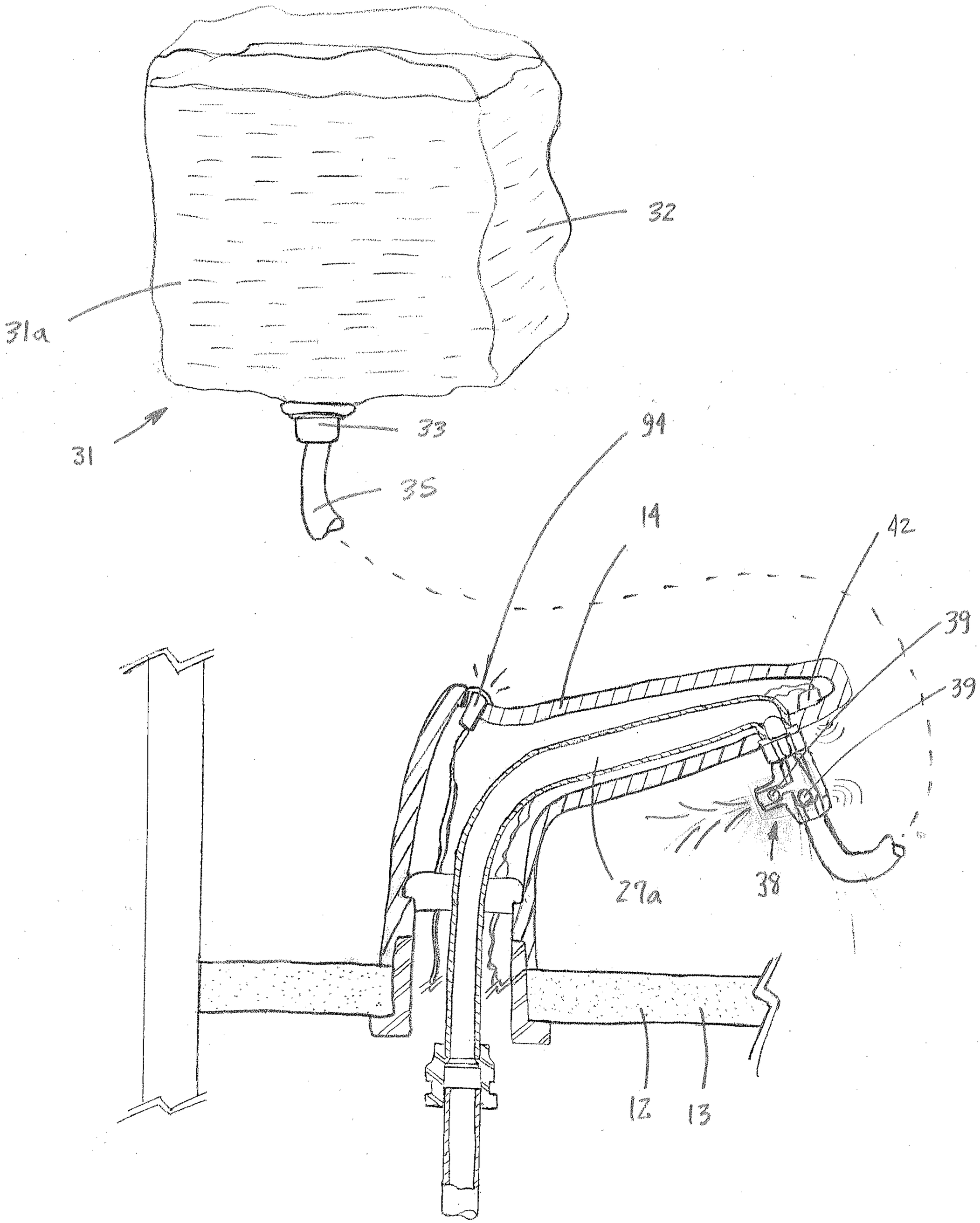


FIG. 6

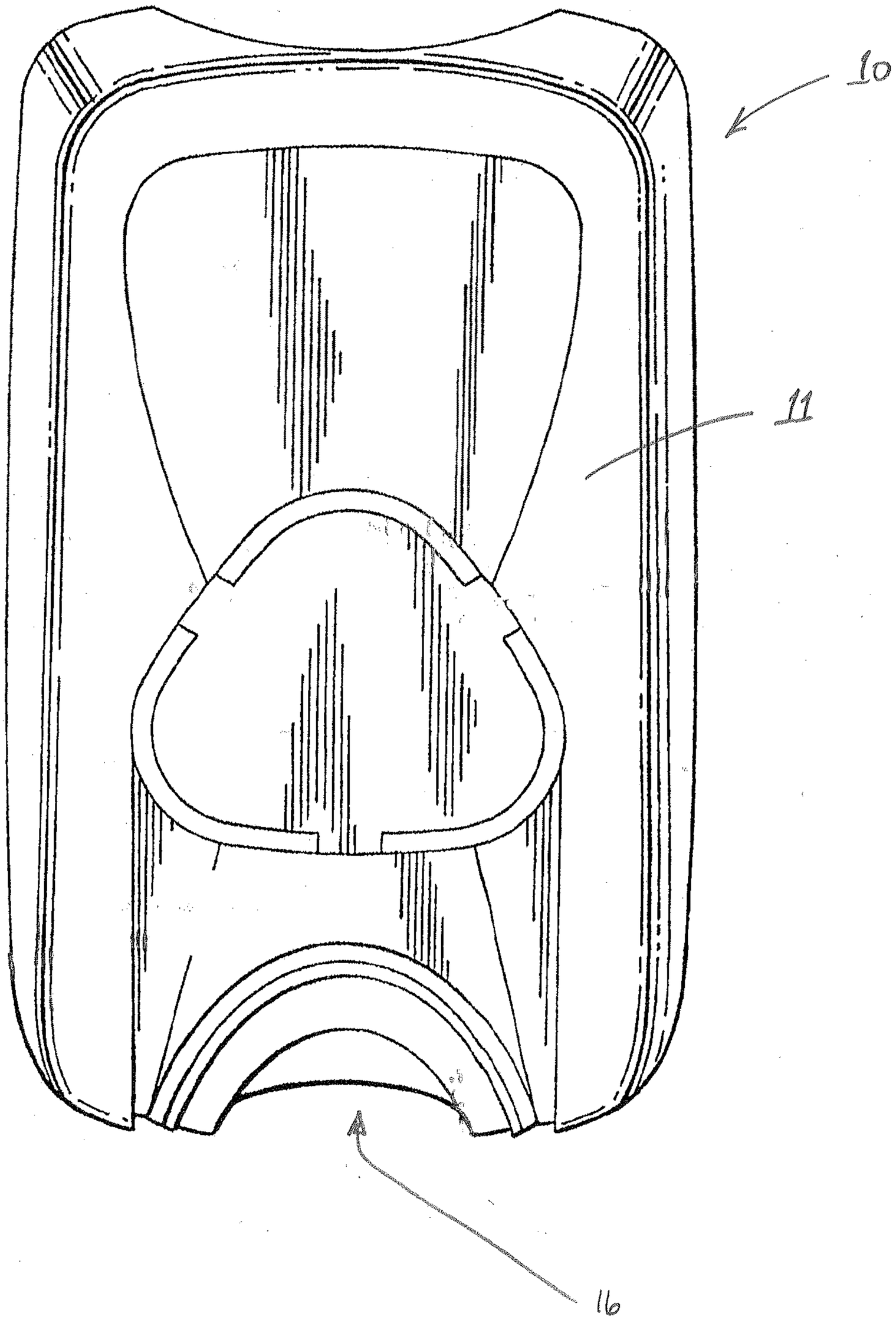


FIG. 7

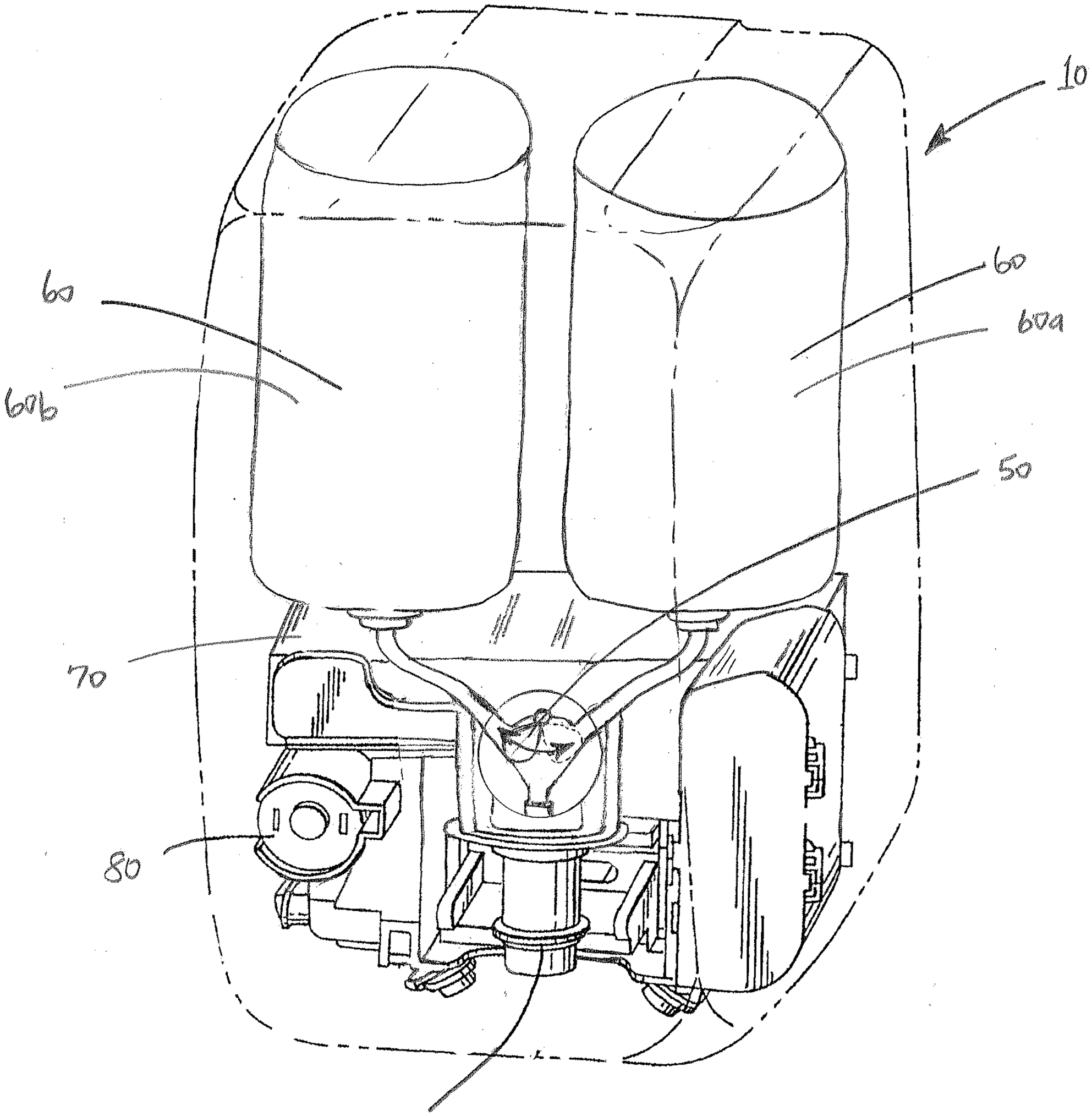
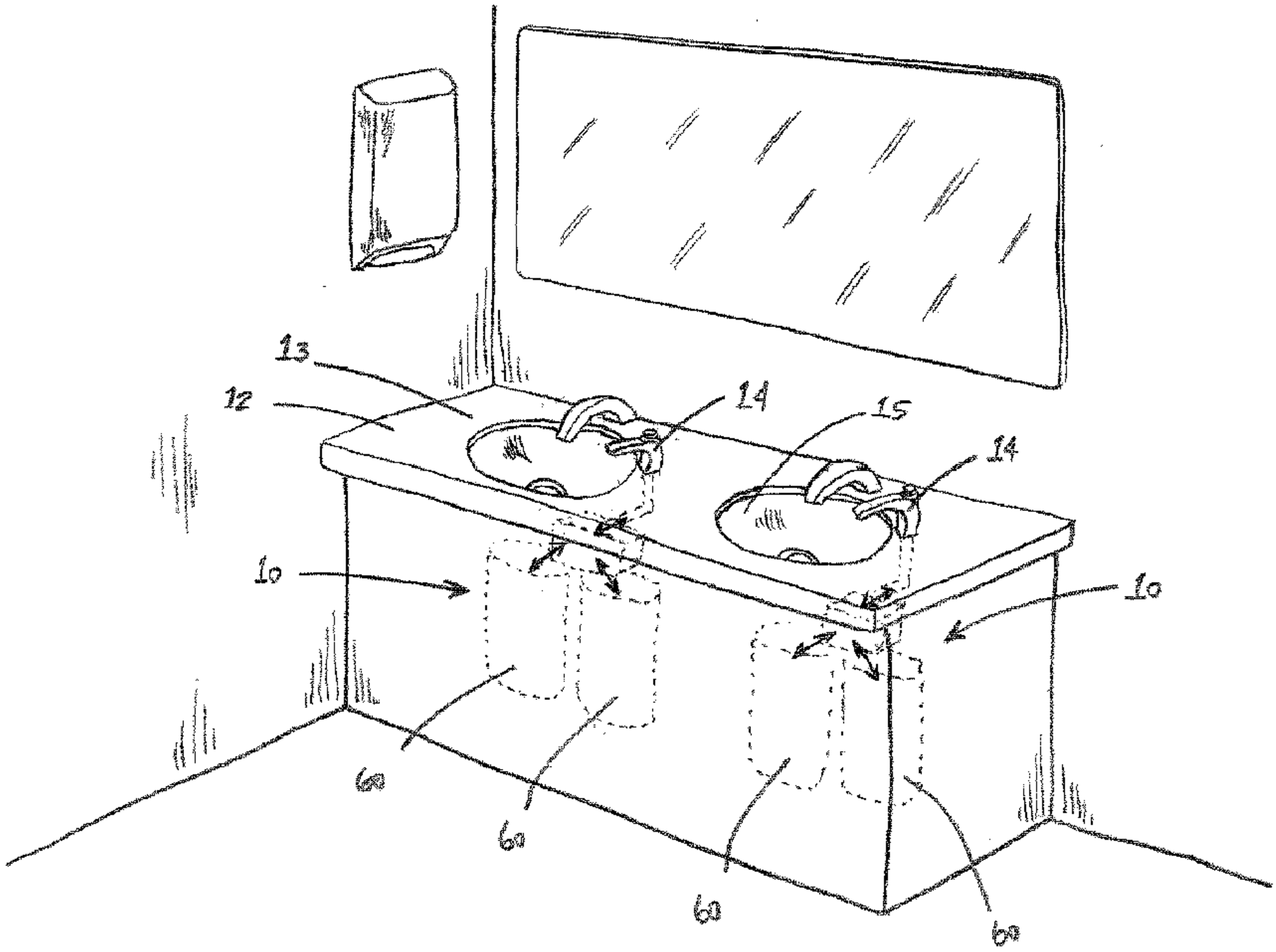


FIG. 8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