



(22) Date de dépôt/Filing Date: 1999/12/15

(41) Mise à la disp. pub./Open to Public Insp.: 2000/06/16

(45) Date de délivrance/Issue Date: 2007/11/13

(30) Priorité/Priority: 1998/12/16 (US09/212,642)

(51) Cl.Int./Int.Cl. *B05B 7/24* (2006.01),
B05B 15/04 (2006.01), *B67D 5/54* (2006.01)

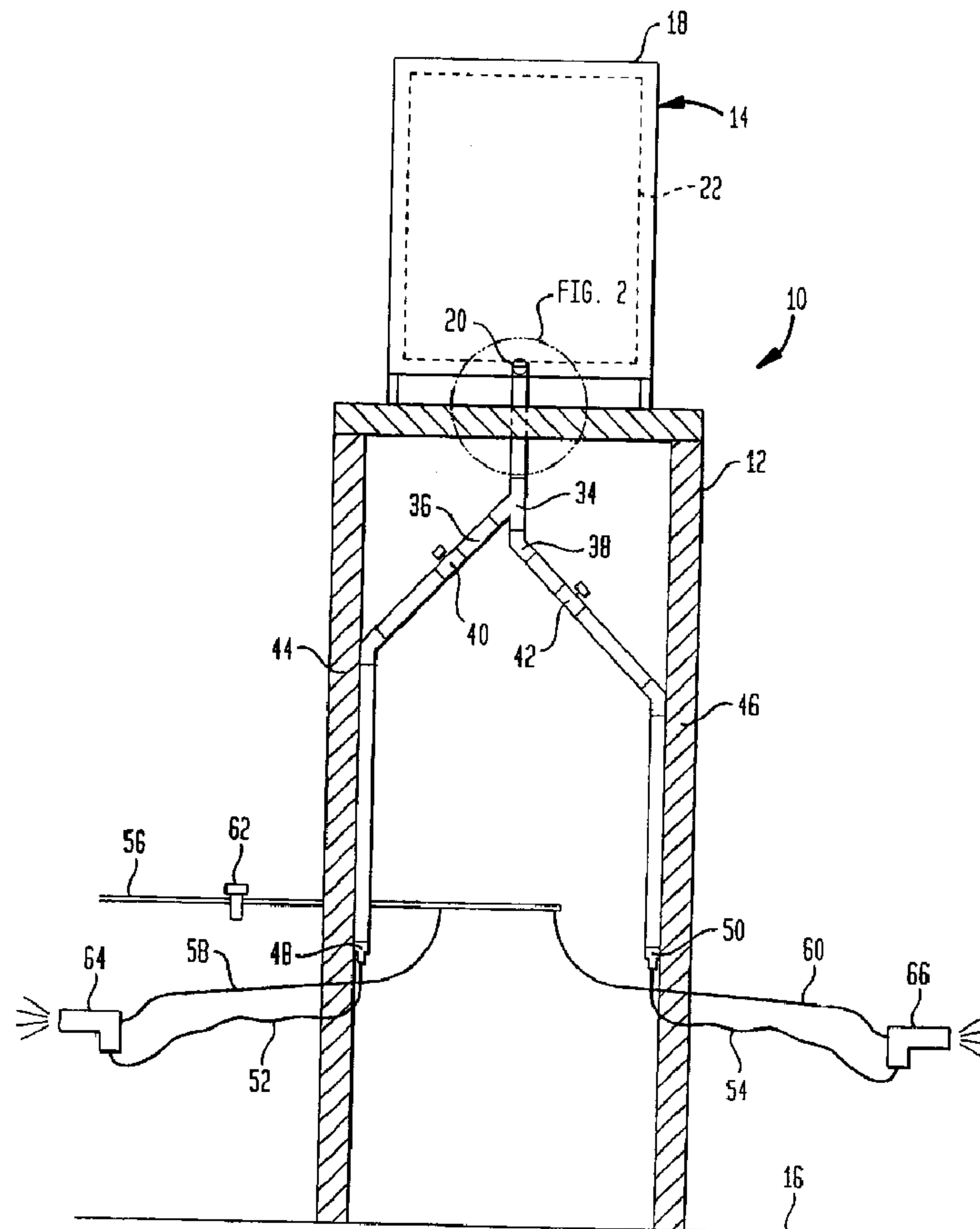
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(54) Titre : SYSTÈME DISTRIBUTEUR D'ADHESIF

(54) Title: ADHESIVE DISPENSING SYSTEM



(57) Abrégé/Abstract:

System and method for dispensing and applying an adhesive to a work piece are provided herein. One embodiment of such system comprises an apparatus for dispensing a liquid, which includes dispensing means for dispensing liquid, and supply means



(57) Abrégé(suite)/Abstract(continued):

for supplying the liquid to be dispensed. The supply means includes a hermetically-sealed, flexible bladder in which the liquid is disposed as well as a container for containing the flexible bladder. A hermetically-sealed coupling extends from the flexible bladder through the container and provides a hermetically-sealed conduit through which the liquid flows from the bladder. Elevating means are provided for elevating the supply means above the dispensing means. Supporting means are provided for supporting the hermetically-sealed coupling at the elevating means. First conveying means having a first flow path are connected to the supply means and extend to the dispensing means. Second conveying means having a second flow path which is narrower than the first flow path are connected thereto for conveying the flow of the liquid from the first flow path to the dispensing means. Air supply means are connected to the dispensing means. Finally, first control are means operatively associated with the dispensing means to control the dispensing of both the liquid and the air supply in a predetermined pattern.

ABSTRACT

System and method for dispensing and applying an adhesive to a work piece are provided herein. One embodiment of such system comprises an apparatus for dispensing a liquid, which includes dispensing means for dispensing liquid, and supply means for supplying the liquid to be dispensed. The supply means includes a hermetically-sealed, flexible bladder in which the liquid is disposed as well as a container for containing the flexible bladder. A hermetically-sealed coupling extends from the flexible bladder through the container and provides a hermetically-sealed conduit through which the liquid flows from the bladder. Elevating means are provided for elevating the supply means above the dispensing means. Supporting means are provided for supporting the hermetically-sealed coupling at the elevating means. First conveying means having a first flow path are connected to the supply means and extend to the dispensing means. Second conveying means having a second flow path which is narrower than the first flow path are connected thereto for conveying the flow of the liquid from the first flow path to the dispensing means. Air supply means are connected to the dispensing means. Finally, first control are means operatively associated with the dispensing means to control the dispensing of both the liquid and the air supply in a predetermined pattern.

(a) TITLE OF THE INVENTION

Adhesive Dispensing System

(b) TECHNICAL FIELD TO WHICH THE INVENTION RELATES

5 The present invention relates to apparatus systems for dispensing adhesives by gravity.

(c) BACKGROUND ART

10 Devices and systems are known to employ gravity feed to dispense liquid products. For example:

	<u>U.S. Patent No.</u>	<u>Inventor(s)</u>
	2,831,610	Dennie
	3,052,417	Daniel
	3,081,911	Scholle
15	3,554,256	Anderson
	3,895,742	Wulbern
	3,945,534	Ady
	4,020,975	Stauffer
	4,090,514	Hinck et al
20	4,551,139	Plaas et al
	4,603,793	Stern

25 U.S. Patent No. 2,831,610 to Dennie discloses a liquid dispensing container consisting of a carton in which a flexible bag is disposed, and which is secured to a nozzle from which the contents of the flexible bag can be dispensed.

30 U.S. Patent No. 3,052,417 to Daniel discloses a dispensing apparatus consisting of an elongated body into which detergent is gravity fed, and an inclined tubular arm connected to the body portion in communication therewith through which water is discharged from the body portion. The structure of the device is such that mixing of the concentrate (detergent) and water is accomplished subsequent

to the discharge from the instant spray device.

U.S. Patent No. 3,081,911 to Scholle discloses a drainage fitting for a collapsible container.

U.S. Patent No. 3,554,256 to Anderson discloses a
5 flexible intravenous container consisting of a sealed flexible bag in which intravenous fluid is contained for being gravity fed through an outlet connector.

U.S. Patent No. 3,895,742 to Wulbern discloses a
10 collapsible container consisting of a flexible membrane in which water may be carried. Straps extend along an exterior of the membrane to give it shape and support when the membrane is inflated with water. Water is dispensed through the hose substantially under gravity feed.

U.S. Patent No. 3,945,534 to Ady discloses a food
15 preparation and dispensing system consisting of an outer housing and an inner housing extending through an opening in the outer housing, and a food package arranged in the inner housing. A valve assembly is provided to control dispensing of the contents of the food package from the inner housing.

U.S. Patent No. 4,020,975 to Stauffer discloses a wall-
20 mountable dispensing device for bulk and encapsulated materials consisting of a cylindrical housing adapted telescopically to receive a cup in which a capsule is disposed. Threading of the housing along the cup expels
25 contents in the cup or contents in the capsule through a spout at a base of the cup.

U.S. Patent No. 4,090,514 to Hinck et al discloses a
pressure infusion device consisting of a pair of inflatable sheets which are foldable over a liquid-filled plastic bag,
30 the sheets being inflated to exert pressure on the bag and to expel the contents therefrom through an outlet of the bag.

U.S. Patent 4,551,139 to Plaas et al. discloses a method and apparatus for burned wound treatment consisting of a

container for the treating agent, a spray nozzle, a roller to urge the contents of the container to an outlet therefrom, and a pump unit to convey a pressurized flow of the agent from the container outlet to the spray nozzle. The
5 treating agent is isolated from ambient air.

U.S. Patent No. 4,603,791 to Stern discloses a coupling device for connecting a material outlet to a packing.

(d) DESCRIPTION OF THE INVENTION

10 There is thus a need for a hermetically-sealed riser system which permits water-based adhesive to flow under the effect of gravity to a dispensing device, e.g., a spray gun, where it is mixed with water to be atomized and produce a fine adhesive spray for application to a work piece. There
15 is also a need for an apparatus which is constructed from kit form easily and inexpensively, and obtains the advantages of kit construction, i.e., replacement parts are easily obtained and installed in the existing system.

A first aspect of the present invention may provide a
20 system for delivering fluids, e.g., a water-based adhesive, under the effect of gravity to a work surface.

A second aspect of the present invention may provide a system which delivers a water-based adhesive under low pressure to a work surface to be bonded.

25 A third aspect of the present invention may provide a system for delivery of a water-based adhesive such that a visual inspection can be made to determine the amount of adhesive remaining in the system.

A fourth aspect of the present invention may provide a
30 system to deliver a water-based adhesive to one or a plurality of spray stations without using pumps, regulators or pressure tanks to deploy the adhesive.

A fifth aspect of the present invention may provide a system to administer a water-based adhesive, wherein a container for the adhesive is elevated off a shop or factory floor, thereby providing additional space on the shop and/or
5 factory floor.

A sixth aspect of the present invention may provide a system for dispensing a water-based adhesive, wherein the system is easily retrofitted to existing manufacturing facilities.

10 A seventh aspect of the present invention may provide a system for dispensing a water-based adhesive, wherein the adhesive is segregated and hermetically-sealed from contaminants throughout the system until it is dispensed from a spray gun of the system.

15 An eighth aspect of the present invention may provide an adhesive dispensing system which dispenses a water-based adhesive, thereby reducing hazardous conditions in a manufacturing environment.

20 A ninth aspect of the present invention may provide a water-based adhesive dispensing system which is assembled from a kit so that it can be delivered to facilities at remote locations and be assembled relatively easily for mounting to a support or stanchion at the facility.

25 A tenth aspect of the present invention may provide an adhesive dispensing system with an accelerating means interposed in the adhesive line to increase the flow of the adhesive through the line to be dispensed under the force of gravity.

30 An eleventh aspect of the present invention may provide an adhesive dispensing system with gas venting means at the discharge conduit for the adhesive container to vent any gas which is trapped in the conduit where the conduit is branched to facilitate a uniform, continuous and reliable flow for dispensing of the adhesive.

A twelfth aspect of the present invention may provide an adhesive dispensing system with a means for bleeding gas from the adhesive line, particularly where the adhesive line is connected to the dispensing means for the system so that the
5 system can be primed.

A thirteenth aspect of the present invention may provide an adhesive dispensing system constructed of rigid and/or flexible piping to convey the adhesive while substantially reducing the effective frictional loss of the adhesive to the piping.

10 A fourteenth aspect of the present invention may provide an adhesive dispensing system with a closure means to secure an adhesive conduit and an adhesive container from exposure to possible contaminants or unwanted gas when either the container or the system riser is to be replaced.

15 A broad aspect of this invention provides an apparatus for dispensing adhesive. The apparatus includes dispensing means for dispensing adhesive. The dispensing means has regulating means for regulating a high pressure
air supply to the dispensing means, and positioning means
20 for positioning the high pressure air supply with respect to the adhesive. The apparatus includes actuating means for simultaneously actuating the dispensing of the adhesive and the high pressure air to form a predetermined spray pattern of the adhesive. A high pressure air supply means is connected to the
25 dispensing means. The high pressure air supply means includes control means for controlling the high pressure air supply. An adhesive supply means is connected
to the dispensing means. The adhesive supply means includes
a hermetically-sealed flexible bladder in which the adhesive is
30 disposed, a container for containing the flexible
bladder, a hermetically-sealed coupling extending from the

flexible bladder through the container and providing a hermetically-sealed conduit through which the adhesive is removed from the bladder, and venting means for venting gas from said hermetically-sealed conduit. Elevating means are provided for elevating the adhesive supply means. Bracing means brace the hermetically-sealed coupling at the elevating means. An adhesive delivery means is provided for delivering the adhesive from the hermetically-sealed coupling to the dispensing means. The adhesive delivery means has a hermetically-sealed, vertically-disposed, conduit which is constructed and arranged as a riser for delivery of the adhesive. The riser has a fixed piping having a first relatively-large flow path, a quick-disconnect coupling which is disposed between, and interconnects the hermetically-sealed coupling of the container and the fixed piping, indicator means in communication with the fixed piping to indicate the flow of adhesive, and first control means which are operatively associated with the fixed piping to control the flow of the adhesive through the fixed piping. The first control means includes a ball valve. Restricting means are connected to the fixed piping for restricting the passageway for the flow of the adhesive through the fixed piping. Flexible piping means are connected to the fixed piping downstream from the restricting means and are operatively associated with the dispensing means. The flexible piping means have a second flow path which is relatively narrower than the first flow path. Bleed means are connected to the flexible piping means for bleeding gas from the flexible piping downstream from the restricting means. Second control means are provided for simultaneously controlling the high pressure air and the adhesive to enable dispensing of the adhesive in a predetermined pattern. Finally, closure means are constructed and arranged for closing off the hermetically-

sealed coupling and the hermetically-sealed conduit when the coupling and the conduit are uncoupled from each other.

A second aspect of this invention provides an apparatus for dispensing a liquid. The apparatus includes dispensing means for dispensing a liquid, and supply means for supplying the liquid to be dispensed. The supply means includes a hermetically-sealed, flexible bladder in which the liquid is disposed, a container for containing the flexible bladder, and a hermetically-sealed coupling extending from the flexible bladder through the container and providing a hermetically-sealed conduit through which the liquid flows from the bladder. Elevating means are provided for elevating the supply means above the dispensing means. Supporting means are provided for supporting the hermetically-sealed coupling at the elevating means. First conveying means are provided having a first flow path which is connected to the supply means and which extend to the dispensing means. Second conveying means are provided having a second flow path which is narrower than the first flow path and which is connected thereto for conveying the flow of the liquid from the first flow path to the dispensing means. Air supply means are connected to the dispensing means. First control means are operatively associated with the dispensing means to control the dispensing of the liquid and the air supply in a predetermined pattern.

By a first variant of the second broad aspect of this invention, the dispensing means includes regulating means for regulating air supply to the dispensing means, positioning means for positioning the air supply with respect to the liquid, and actuating means for simultaneously actuating the dispensing of the liquid and the air supply to form a predetermined spray pattern of the liquid.

By a second variant of the second broad aspect of this invention and/or the first variant thereof, the air supply means is a high pressure air supply means having control means for controlling the high pressure air supply.

5 By a third variant of the second broad aspect of this invention and/or the first variant thereof, the air supply means comprises an air vent in communication with the coupling.

10 By a fourth variant of the second broad aspect of this invention and/or the above variants thereof, the container is rigid.

By a fifth variant of the second broad aspect of this invention and/or the above variants thereof, the apparatus further includes bleed means which are connected to the
15 first conveying means for bleeding gas from where the first conveying means is connected to the second conveying means. By a first variation thereof, the bleed means includes a valve in communication with the first conveying means.

20 By a sixth variant of the second broad aspect of this invention and/or the above variants thereof, the supporting means includes a brace member which is positioned beneath the hermetically-sealed coupling.

By a seventh variant of the second broad aspect of this invention and/or the above variants thereof, the elevating
25 means includes a platform having an upper surface at an elevation which is higher than the dispensing means.

By an eighth variant of the second broad aspect of this invention and/or the above variants thereof, the first conveying means includes a hermetically-sealed, vertically-
30 disposed conduit which is constructed and arranged as a riser for delivery of the liquid from the supply means to the dispensing means. By a first variation thereof, the riser includes piping, indicator means in communication with the piping to indicate the flow of liquid, second control

means which are operatively associated with the piping to control the flow of the liquid, the second control means including a ball valve, a quick-disconnect coupling disposed between, and interconnecting, the hermetically-sealed coupling of the container and the piping, and regulating means for regulating the flow of the liquid.

By a ninth variant of the second broad aspect of this invention and/or the above variants thereof, the second conveying means is flexible for mobility of the second flow path.

By a tenth variant of the second broad aspect of this invention and/or the above variants thereof, the apparatus further includes a fitting interconnecting the first conveying means with the second conveying means, the fitting having a passageway therein for permitting the flow of the liquid from the first flow path to the second flow path. By a first variation thereof, the passageway tapers in size to a diameter which is less than a diameter of the first flow path. By a second variation thereof, the fitting is threaded for connection to the first conveying means. By a third variation thereof, the apparatus further includes a cincture releasably to connect the fitting with the first conveying means.

By an eleventh variant of the second broad aspect of this invention and/or the above variants thereof, the apparatus further includes venting means which are connected to the first conveying means for venting gas from the first conveying means.

By a twelfth variant of the second broad aspect of this invention and/or the above variants thereof, the apparatus further includes a valve in communication with the hermetically-sealed conduit for venting gas from the hermetically-sealed coupling and the hermetically-sealed conduit.

By a thirteenth variant of the second broad aspect of this invention and/or the above variants thereof, the dispensing means comprises a spray gun.

5 By a fourteenth variant of the second broad aspect of this invention and/or the above variants thereof, the liquid comprises an adhesive.

By a fifteenth variant of the second broad aspect of this invention and/or the above variants thereof, the apparatus further includes closing means which are
10 constructed and arranged for closing off the supply means and the first conveying means from the atmosphere to prevent gas and contaminants from entering the supply means and the first conveying means when the supply means and the first conveying means are disconnected from each other.

15 A third broad aspect of this invention provides an apparatus for dispensing a liquid. The apparatus includes dispensing means for dispensing a liquid, and supply means for supplying the liquid to be dispensed. Elevating means are provided for elevating the supply means above the
20 dispensing means. First conveying means are provided having a first flow path which is connected to the supply means and which extends to the dispensing means. Second conveying means are provided having a second flow path which is narrower than the first flow path and which is connected
25 thereto for conveying the flow of the liquid from the first flow path to the dispensing means. Fitting means interconnect the first conveying means with the second conveying means. The fitting means have a passageway therein for permitting the flow of the liquid from the first flow
30 path to the second flow path. Cincture means are provided releasably to connect the fitting means with the first conveying means. Air supply means are connected to the dispensing means. Finally, first air control means are operatively associated with the dispensing means to control

the dispensing of the liquid and the air supply in a predetermined pattern.

A fourth broad aspect of this invention provides an apparatus for dispensing a liquid. The apparatus includes
5 dispensing means for dispensing a liquid, and supply means for supplying the liquid to be dispensed. Elevating means are provided for elevating the supply means above the dispensing means. First conveying means are provided having a first flow path which is connected to the supply means and
10 which extends to the dispensing means. Second conveying means are provided having a second flow path which is narrower than the first flow path and which is connected thereto for conveying the flow of the liquid from the first flow path to the dispensing means. Air supply means are
15 connected to the dispensing means. First control means are operatively associated with the dispensing means to control the dispensing of the liquid and the air supply in a predetermined pattern. Finally, closing means are constructed and arranged for closing off the supply means
20 and the first conveying means from the atmosphere to prevent gas and contaminants from entering the supply means and the first conveying means when the supply means and the first conveying means are disconnected from each other.

A fifth broad aspect of this invention provides an
25 apparatus for dispensing a liquid. The apparatus includes dispensing means for dispensing a liquid, and supply means for supplying the liquid to be dispensed. Elevating means are provided for elevating the supply means above the dispensing means. Conveying means are provided having a
30 first flow path which is connected to the supply means, and a second flow path which is narrower than the first flow path and which is connected thereto for conveying the flow of the liquid from the first flow path to the dispensing means. Air supply means are connected to the dispensing

means. Finally, first control means are operatively associated with the dispensing means to control the dispensing of the liquid and the air supply in a predetermined pattern.

5 A sixth broad aspect of this invention provides a method for dispensing an adhesive. The method includes the steps of supplying high pressure air to a dispensing means, by the first step of controlling the supply of the high pressure air, and regulating the supply of the high pressure air. The
10 next step involves supplying adhesives to the dispensing means, which includes the steps of hermetically-containing a supply of the adhesive in a flexible bladder, and hermetically-coupling the flexible bladder to the dispensing means. The next step involves elevating the supply of
15 adhesive above the dispensing means. The next step involves conveying the adhesive from the hermetically-sealed flexible bladder to the dispensing means, this step including the steps of venting gas from the flexible bladder from the hermetic coupling, and indicating the flow of adhesive from
20 the adhesive supply. The next step involves controlling the flow of adhesive from the adhesive supply. The next step involves reducing a flow path for the adhesive to the dispensing means. The next step involves bleeding gas from the flow path. The next step involves regulating the amount
25 of the adhesive to the dispensing means. The final step involves simultaneously dispensing the adhesive and the high pressure air to form a predetermined spray pattern of the adhesive.

30 A seventh broad aspect of this invention provides a method for dispensing a liquid. The method includes the steps of supplying high pressure air to a dispensing means, and supplying the liquid to the dispensing means through a flexible flow path. The step of supplying liquid includes the steps of containing the supply of the liquid, elevating

the supply of liquid above the dispensing means to provide a known pressure head of the liquid, conveying the liquid through a relatively-large flow path at a first relatively-low velocity to a first point below the elevation of the supply of the liquid to produce a constant pressure head, and conveying the liquid through a flexible flow path which is relatively narrower than the first flow path at a relatively-higher velocity. The next step involves bleeding gas from the liquid which is conveyed at a position downstream from where the relatively-large flow path meets the relatively-narrower flow path. The final step involves dispensing the liquid and the high pressure air to form a predetermined spray pattern of the liquid.

By a first variant of the seventh broad method aspect of the invention, the method involves the step of hermetically-containing and conveying the liquid.

By a second variant of the seventh broad method aspect of the invention and/or the first variant thereof, the method involves the step of simultaneously dispensing the liquid and the air.

By a third variant of the seventh broad method aspect of the invention and/or the above variants thereof, the step of supplying high pressure air includes the steps of controlling the supply of the high pressure air, and regulating the supply of the high pressure air.

By a fourth variant of the seventh broad method aspect of the invention and/or the above variants thereof, the method further includes the step of hermetically-coupling the contained supply of the liquid with the dispensing means.

By a fifth variant of the seventh broad method aspect of the invention and/or the above variants thereof, the method further involves the step of venting gas from the liquid being conveyed to the dispensing means.

By a sixth variant of the seventh broad method aspect of the invention and/or the above variants thereof, the method involves the step of using an adhesive as the liquid.

Thus, as noted above, an important feature of aspects of the present invention includes accelerating means which are interposed in the adhesive conduit to constrict the passageway and thereby to maintain the flow rate of the adhesive in a conduit of increased length under the effect of gravity.

Another important feature of aspects of the present invention calls for providing gas venting means which is interposed in the conduit between the adhesive container (or tote) and a position where the conduit is branched, so that any gas in the conduit can be vented for the flow of the adhesive from the tote to be smooth, continuous and uninterrupted.

According to another aspect of the present invention there is provided an adhesive dispensing system, an adhesive dispenser for spraying adhesive, a support platform having an upper surface, said upper surface being above said dispenser, a container disposed on said upper surface of said support platform, said container having an interior for containing an adhesive, piping connected to said container and to said dispenser such that said interior of said container is in communication with said dispenser, said piping enabling adhesive in said container to flow from said container by gravity, a reducer interposed in said piping between said container and said dispenser, said reducer adapted to increase the flow rate of the adhesive from said container, an air supply line connected to said dispenser to supply air to said dispenser so that adhesive flowing from said container is atomized as it is dispensed from said dispenser.

(e) DESCRIPTION OF THE FIGURES

In the accompanying drawings,

FIG. 1 is a partial cross-sectional view of an adhesive dispensing system according to one embodiment of an aspect of the present invention.

FIG. 2 is a view of a portion of the system shown in FIG. 1.

FIG. 3 is a flow chart of steps employed to carry out the method according to an embodiment of an aspect of the present invention.

FIG. 4 is a partial cross-sectional view of another embodiment of an adhesive dispensing system according to an aspect of the present invention.

FIG. 5 is a cross-sectional view of a reduction member for use with an embodiment of aspects of the present invention.

FIGS. 6 and 7 are partial views of another embodiment of an adhesive dispensing system according to an aspect of the present invention.

FIG. 8 is a flow chart of steps employed to carry out a method of other embodiments according to aspects of the present invention.

(f) AT LEAST ONE MODE FOR CARRYING OUT THE INVENTION

Referring to FIGS. 1 and 2, a dispensing system according to one embodiment of an aspect of the present invention is indicated generally at 10 and includes a support means, e.g., a platform 12 for supporting a container 14 off an underlying surface 16, e.g., a factory floor. The dispensing system 10 can be used with many different liquids, or liquid compositions, e.g., paints. It is well suited for dispensing a liquid adhesive and particularly, a water-based adhesive.

The container 14 consists of a cardboard shell 18 having a port 20 formed therein. A flexible hermetically sealed tote 22 or bladder is disposed in the container and is capable of storing from five (5) gallons to three hundred and thirty (330) gallons of a water based adhesive. The tote 22 is provided with a hermetically sealed valve 24 disposed near a bottom of the tote 22 to be in registration with the port 20 of the cardboard shell 18.

The valve 24 of the tote has a reciprocating valve stem which when depressed inward of the tote 22 provides a passageway for the adhesive to flow from inside the tote 22 out through the valve 24. When the valve stem 24 is pulled outward away from the tote 22, the passageway for the adhesive is secured and the adhesive is retained in the tote 22. Cutter valves or similar types of valves can also be used.

The valve 24 is connected to a quick disconnect coupling 26, which in turn can be connected to an elbow joint 28, so that piping

30 or a riser for the adhesive now extends downward toward the factory floor 16.

The piping 30 is part of the dispensing means, preferably fixed and rigid, and is formed with a substantially transparent hose portion 32 as an indicator means so that the amount and flow of the adhesive can be viewed from the exterior of the system 10. The piping 30 is hermetically sealed. The transparent portion can consist of a separate piece interposed along the piping 30 beneath the elbow joint 28. The piping 30 below the transparent portion 32, is then bifurcated at 34 into a first branch 36 and a second branch 38 for the flow of the adhesive. Each one of the corresponding branches 36,38 is also provided with a corresponding ball valve 40, 42.

As shown in FIG. 1, the branches 36,38 are led down legs 44,46 of the support platform 12 and can, if desired, be strapped to a corresponding one of the legs for additional support. The lower end of each one of the branches 36,38 is provided with a corresponding ball valve 48,50. Hoses 52,54 are connected to a corresponding one of the ball valves 48,50 and are each directed to a respective dispensing means, such as spray guns 64,66. The spray guns 64,66 simultaneously actuate the dispensing of adhesive and high pressure air to form a predetermined spray pattern of the adhesive.

Compressed air for the system is provided through a compressed air line 56. A control means (not shown) controls the flow of air through the line 56. The compressed air line 56 functions as a

manifold to which a pair of air hoses 58,60 are connected to deliver the compressed air to a respective one of the spray guns 64,66. Each one of the spray guns 64,66 also functions as a control means to control this simultaneous discharge of compressed air admixed with the adhesive.

5 An oil and water extractor 62 is interposed along the compressed air line 56. Regulators are used for atomizing air for the system.

A preferred construction of the system calls for the support platform 12 to be 10' to 16' off the underlying surface 16.

10 The provision of the transparent hose 32 is to permit a view of the level of the adhesive remaining in the pressure "head" of the system to provide the gravity feed force necessary for the invention.

The ball valves 40,42 operate as safety valves to restrict the flow of the adhesive if only one of the first branch 36 and second branch 38 is to be employed during an adhesive spraying operation.

15 The use of the oil and water extractor 62 prevents the interjection of contaminants into the system which would be detrimental to and most likely dilute the adhesive composition which is contained premixed in the tote 22. Contaminants such as oil and water in the compressed air detrimentally impact on the atomization of the adhesive when it is mixed with the compressed air for application to a surface to be bonded.

The tote 22 is disposable or can be reused after it has gone through the proper recycling procedures.

Preferable dimensions for each of the elements of the system are as follows: the quick disconnect coupling 26 preferably 2" PVC, and the transparent flexible hose is preferably a 2" nylon. The support platform 12 is preferably no less than 10' above the surface 16 and should be able to support as much 2,500 lbs., if the 2500 lb. tote 22 is being used. Steel or other similar alloys are preferred to construct the support platform 12. The piping 30 is preferably 2" PVC piping, Schedule 40 or 80. The ball (40 or 80) valves 48,50 are stainless steel or PVC ball valves with a 1/2" OD hose barb. The air hoses 58,60 are conventional air hoses, as are the HVLP (high volume, low pressure) spray guns 64,66. The air pressure is approximately 25-35 psi coming into the spray guns and is reduced to preferably 6-8 psi for the atomizing air to deploy the adhesive to a work piece. The adhesive hoses 52,54 are preferably 1/2" 1D nylon fluid hoses.

A flow chart for a method of steps to dispense a liquid or an adhesive according to the present invention is shown in **FIG. 3**. The method according to the present invention includes the steps of supplying 68 the high pressure air to the dispensing means and in doing so, controlling 70 and regulating 72 the supply of the high pressure air. The adhesive is then supplied 74, including the steps of hermetically containing 76 and hermetically coupling 78 the supply of the adhesive to the dispensing means. The supply of adhesive is elevated 80 so that during conveyance 82 of the

adhesive under the effect of gravity to the dispensing means, the flow of the adhesive is indicated 84 and accordingly controlled 86 as it travels through the piping system to the dispensing apparatus. The next step is to simultaneously control 88 the contact of the high pressure air with the adhesive so that the adhesive and high pressure air can be simultaneously dispensed 90 in a predetermined spray pattern.

FIGS. 4-8 are directed to additional embodiments of the adhesive dispensing system according to the present invention. Elements illustrated in **FIGS. 4-8** which correspond to the elements described above with respect to **FIGS. 1-3** have been designated by corresponding reference numerals increased by 200 and 300, respectively. The embodiments of **FIGS. 4-8** are designed for use in the same manner as the embodiment of **FIGS. 1-3**, unless otherwise stated.

FIGS. 4 and **5** disclose another embodiment of an adhesive dispensation system according to the present invention shown generally at 210. This embodiment incorporates additional features for controlling the flow of the adhesive from the tote 222. In particular, there is shown a reducer element at 92, 94, 96, 98 (92-98) interposed along the conveying means 230 preferably immediately after any one of the ball valves 240, 242, 248, 250. Each one of the reducers 92-98 is constructed to constrict the passageway of the conduit 236, 238 immediately after the adjacent ball valve 240, 242, 248, 250 to thereby impact upon the flow rate of the gravity fed adhesive as it proceeds to the dispensing means, i.e. the spray

guns 264,266. The reducers 92-98 facilitate the releasable connection of the spray gun 264,266 hoses to the riser conduits.

Referring in particular to **FIG. 5**, and using the reducer element (the "reducer") 92 by way of example, the reducer 92 is connected to the downstream end of the ball valve 240. The reducer 92 includes a sleeve portion 100 which is constructed and arranged to fit into a mouth portion 102 of the adjacent ball valve 240. The "fit" can be by friction or with complimentary threaded regions at the sleeve portion 100 and the mouth portion 102, respectively. In either construction, a hermetic seal is provided. A band 104 or cincture 104 is constructed and arranged to encircle an exterior of the mouth portion 102 to be tightened down to provide for a hermetic seal between the mouth portion 102 of the ball valve 240 and the sleeve portion 100 of the reducer 92. The cincture 104 can be used when there are no threads 101,103. The cincture 104 is preferably of plastic or alloy construction. An interior wall 105 of the sleeve portion 100 defines a passageway 107 for the sleeve portion 100. The interior wall 105 tapers inward to constrict a diameter of the passageway 107 to funnel the passageway for communication with a discharge port 106 for the sleeve portion 100. The discharge port 106 is in communication with the conduit 236 and thereafter, the adhesive hose 236. The hose 236 is threaded at 108 for connection to the hose 252 of adhesive gun 264, unless the ball valve 248 and reducer 96 are used.

With certain constructions, the reducers 96,98 include means for bleeding any gas in the system, which may occur when the

conduit 252 is being connected to the spray gun 264. The bleeding means prevent retention of gas in the line so that the flow of adhesive through the conduit is uniform and uninterrupted.

FIGS. 6 and 7 show still another embodiment of an adhesive dispensing system 310 according to the present invention. In this embodiment, the outlet 326 for the tote 322 is connected to a gas venting valve 110 for use with the adhesive dispensing system, particularly when the adhesive conduit is branched 334 to dispense adhesive to a plurality of stations. As shown in **FIGS. 6 and 7**, the valve 110 is in communication with the adhesive conduit 326. When the conduit outlet 326 is connected to a plurality of branches 336,338, there is the increased possibility of unwanted gas getting into the adhesive conduit and disrupting the smooth continuous flow and detrimentally impacting on the pressure of the adhesive. When the conduits 336,338 are first connected to the outlet valve of the tote, the valve 110 is opened for a few seconds to vent any gas that is in the adhesive conduit so that the flow of adhesive from the tote 322 will be smooth, uniform and uninterrupted.

Depending upon the position of the container 314 on the platform 312, it is preferred to provide for further support of the adhesive conduit 326 to compensate for the added weight of the valve 110. Therefore, a supporting member such as a brace 112 is disposed beneath the conduit 326 opposite the position of the valve 110.

In those instances where it is necessary to remove for replacement or repair one of the conduits 336,338, such can be

accomplished by removing the conduit via a quick disconnect coupling at 114,116 and then inserting closure means such as a plug 118, into the conduit and venting any remaining gases in that branch. The plug 118 will also prevent unwanted particulate matter from being introduced into the system.

The use of the accelerating means, such as those shown in **FIGS. 4** and **5**, for example the reducer 92 or 96, permits use of wide flexible hoses 352 to convey the adhesive to the dispensing means, without excess frictional loss.

In **FIG. 8**, there is disclosed the additional advantageous steps for facilitating the flow of adhesive through the adhesive conduit for being dispensed onto the work piece. As the adhesive is dispensed from the tote for being conveyed 82, unwanted gas can be vented or purged 120 from the adhesive conduit to provide for the uniform and uninterrupted flow of the adhesive from the tote for dispensing 90. As discussed above, where a plurality of branches are connected to the tote, there is the possibility that gas will become trapped at the connection which could provide for air pockets or bubbles during the dispensing of the adhesive. After the initial gas venting occurs, during the first connection of the tote 22,222,322 to one or a plurality of adhesive conduits, it is not necessary to further vent the line as it remains hermetically sealed and void of any additional gas. In the event that the adhesive lines, for example, 52,54 are removed from or replaced in the system, bleeding 124 of any gas in such lines is also carried out to ensure that the flow of adhesive is uniform and

uninterrupted when the adhesive lines are reconnected to the system.

The speed of the adhesive dispensed is accelerated 122 during the conveyance through the riser. As discussed above with reference to the reducer elements 92-98, the passageway 107 of the conduit is reduced in diameter thereby constricting or reducing the flow path and sustaining the flow rate of the adhesive through the conduit. The result is that the adhesive accelerates through the hoses 252,254 prior to being dispensed. Acceleration is contingent upon the length of the hoses. The reducers provide for use of wide flexible piping without frictional loss of the adhesive as it flows through the piping. The reducers also facilitate changing the fluid dispensing lines 252,254.

The construction of the cardboard shell 18,218,318 and the tote 22,222,322 can be as an integral unit. Alternatively, the container 14,214,314 can be manufactured of a rigid material without using the flexible tote 22,222,322 at an interior thereof. Where an individual rigid container is used, it is provided with an air valve to bleed gas from an interior of the container.

It will be understood that the embodiments described herein are merely exemplary and that a person skilled in the art may make many variations and modifications without departing from the spirit and scope of the invention. All such modification and variations are intended to be included within the scope of the invention as defined in the appended claims.

CLAIMS:

1. An apparatus for dispensing a liquid, comprising:
dispensing means for dispensing said liquid;
supply means for supplying said liquid to be dispensed,
said supply means comprising:
a hermetically-sealed, flexible bladder in
which said liquid is disposed;
a container for containing said flexible
bladder; and
a hermetically-sealed coupling extending from
said flexible bladder through said
container and providing a hermetically-
sealed conduit through which said liquid
flows from said bladder;
elevating means for elevating said supply means above
said dispensing means;
supporting means for supporting said hermetically-
sealed coupling at the elevating means;
first conveying means having a first flow path which is
connected to said supply means and which extends
to said dispensing means;
second conveying means having a second flow path which
is narrower than said first flow path and which is
connected thereto for conveying the flow of said
liquid from said first flow path to said
dispensing means;
air supply means which is connected to said dispensing
means; and
control means which is operatively associated with said
dispensing means to control the dispensing of said
liquid and said air supply means in a
predetermined pattern.

2. The apparatus according to claim 1, wherein said dispensing means comprises:

regulating means for regulating an air supply to said dispensing means;
positioning means for positioning said air supply with respect to said liquid; and
actuating means for simultaneously actuating the dispensing of said liquid and said air supply to form a predetermined spray pattern of the liquid.

3. The apparatus according to claim 1 or claim 2, wherein said air supply means comprises a high pressure air supply means having control means for controlling said high pressure air supply means.

4. The apparatus according to claim 1 or claim 2, wherein said air supply means comprises an air vent in communication with said coupling.

5. The apparatus according to any one of claims 1 to 4, wherein said container is rigid.

6. The apparatus according to any one of claims 1 to 5, further comprising:

bleed means which is connected to said first conveying means for bleeding gas from where said first conveying means is connected to said second conveying means.

7. The apparatus according to claim 6, wherein said bleed means comprises a valve in communication with said first conveying means.

8. The apparatus according to any one of claims 1 to 7, wherein said supporting means comprises a brace member which is positioned beneath said hermetically-sealed coupling.

9. The apparatus according to any one of claims 1 to 8, wherein said elevating means comprises a platform having an upper surface at an elevation which is higher than the elevation of said dispensing means.

10. The apparatus according to any one of claims 1 to 9, wherein said first conveying means comprises a hermetically-sealed, vertically-disposed conduit which is constructed and arranged as a riser for delivery of said liquid from said supply means to said dispensing means.

11. The apparatus according to claim 10, wherein said riser comprises:

piping;

indicator means in communication with said piping to indicate the flow of liquid;

second control means which is operatively associated with said piping to control the flow of the liquid, said second control means including a ball valve;

a quick-disconnect coupling disposed between, and interconnecting, said hermetically-sealed coupling of said container and said piping; and

regulating means for regulating the flow of said liquid.

12. The apparatus according to any one of claims 1 to 11, wherein said second conveying means is flexible for mobility of said second flow path.

13. The apparatus according to any one of claims 1 to 12, further comprising:

a fitting interconnecting said first conveying means with said second conveying means, said fitting having a passageway therein for permitting the flow of said liquid from said first flow path to said second flow path.

14. The apparatus according to claim 13, wherein said passageway tapers in size to a diameter which is less than a diameter of said first flow path.

15. The apparatus according to claim 13 or claim 14, wherein said fitting is threaded for connection to said first conveying means.

16. The apparatus according to claim 13, claim 14 or claim 15, further comprising:

a cincture releasably to connect said fitting with said first conveying means.

17. The apparatus according to any one of claims 1 to 16, further comprising:

venting means connected to said first conveying means for venting gas from said first conveying means.

18. The apparatus according to any one of claims 1 to 17, further comprising:

a valve in communication with said hermetically-sealed

conduit for venting gas from said hermetically-sealed coupling and said hermetically-sealed conduit.

19. The apparatus according to any one of claims 1 to 18, wherein said dispensing means comprises a spray gun.

20. The apparatus according to any one of claims 1 to 19, wherein said apparatus is configured to supply liquid adhesive.

21. The apparatus according to any one of claims 1 to 20, further comprising:

closing means which is constructed and arranged for closing off said supply means and said first conveying means from the atmosphere to prevent gas and contaminants from entering said supply means and said first conveying means when said supply means and said first conveying means are disconnected from each other.

22. An apparatus for dispensing a liquid, comprising:
dispensing means for dispensing liquid;
supply means for supplying said liquid to be dispensed;
elevating means for elevating said supply means above said dispensing means;
first conveying means having a first flow path which is connected to said supply means and which extends to said dispensing means;
second conveying means having a second flow path which is narrower than said first flow path and which is

connected thereto for conveying the flow of said liquid from said first flow path to said dispensing means;

fitting means interconnecting said first conveying means with said second conveying means, said fitting means having a passageway therein for permitting the flow of said liquid from said first flow path to said second flow path;

cincture means releasably to connect said fitting means with said first conveying means;

air supply means connected to said dispensing means;

and

air control means which is operatively associated with said dispensing means to control the dispensing of said liquid and said air supply means in a predetermined pattern.

23. An apparatus for dispensing a liquid, comprising:
- dispensing means for dispensing said liquid;
- supply means for supplying said liquid to be dispensed;
- elevating means for elevating said supply means above said dispensing means;
- first conveying means having a first flow path which is connected to said supply means and which extends to said dispensing means;
- second conveying means having a second flow path which is narrower than said first flow path and which is connected thereto for conveying the flow of said liquid from said first flow path to said dispensing means;
- air supply means which is connected to said dispensing means;
- control means which is operatively associated

with said dispensing means to control the dispensing of said liquid and said air supply means in a predetermined pattern; and closing means which is constructed and arranged for closing off said supply means and said first conveying means from the atmosphere to prevent gas and contaminants from entering said supply means and said first conveying means when said supply means and said first conveying means are disconnected from each other.

24. An apparatus for dispensing a liquid, comprising:
dispensing means for dispensing said liquid;
supply means for supplying said liquid to be dispensed;
elevating means for elevating said supply means above said dispensing means;
conveying means having a first flow path which is connected to said supply means, and a second flow path which is narrower than said first flow path and which is connected thereto for conveying the flow of said liquid from said first flow path to said dispensing means;
air supply means which is connected to said dispensing means; and
control means which is operatively associated with said dispensing means to control the dispensing of said liquid and said air supply means in a predetermined pattern.
25. An apparatus for dispensing adhesive, comprising:
dispensing means for dispensing adhesive, said dispensing means comprising:
regulating means for regulating a supply of

high pressure air to said dispensing means; and

position means for positioning said supply of high pressure air with respect to said adhesive;

actuating means for simultaneously actuating the dispensing of said adhesive and said high pressure air to form a predetermined spray pattern of said adhesive;

high pressure air supply means which is connected to said dispensing means, said high pressure air supply means comprising:

control means for controlling said supply of high pressure air;

adhesive supply means connected to said dispensing means, said adhesive supply means comprising:

a hermetically-sealed flexible bladder in which the adhesive is disposed;

a container for containing said flexible bladder;

a hermetically-sealed coupling extending from said flexible bladder through said container and providing a hermetically-sealed conduit through which said adhesive is removed from said bladder; and

venting means for venting gas from said hermetically-sealed conduit;

elevating means for elevating said adhesive supply

means;

bracing means for bracing said hermetically-sealed
coupling at said elevating means;

adhesive delivery means for delivering said adhesive
from said hermetically-sealed coupling to said
dispensing means, said adhesive delivery means
comprising:

a hermetically-sealed, vertically-disposed,
conduit which is constructed and
arranged as a riser for delivery of said
adhesive, said riser comprising:

a fixed piping having a first flow
path;

a quick-disconnect coupling which
is disposed between, and which
interconnects said
hermetically-sealed coupling
of said container and said
fixed piping;

indicator means which is in
communication with said fixed
piping to indicate the flow of
adhesive; and

first control means which is
operatively associated with
said fixed piping to control
the flow of said adhesive
through said fixed piping,
said first control means
comprising a ball valve;

restricting means which is connected to said fixed
piping for restricting a passageway for the flow
of said adhesive through said fixed piping;

flexible piping means which is connected to said fixed piping downstream from said restricting means and which is operatively associated with said dispensing means, said flexible piping means having a second flow path which is relatively narrower than said first flow path;

bleed means which is connected to said flexible piping means for bleeding gas from said flexible piping downstream from said restricting means;

second control means for controlling simultaneously said high pressure air and said adhesive to enable dispensing of said adhesive in a predetermined pattern; and

closure means which is constructed and arranged for closing off said hermetically-sealed coupling and said hermetically-sealed conduit when said coupling and said conduit are uncoupled from each other.

26. A method for dispensing liquid, said method comprising the steps of:

supplying high pressure air to a dispensing means;

supplying said liquid to said dispensing means through a flexible flow path, said step of supplying said liquid comprising containing the supply of said liquid, elevating the supply of said liquid above said dispensing means to provide a known pressure head of said liquid, conveying said liquid through a first flow path at a first velocity to a first point below the elevation of said liquid to produce a constant pressure head, and conveying said liquid through a flexible flow path which is narrower than said first flow path

at a velocity which is higher than the velocity through said first flow path;
bleeding gas from said liquid which has been conveyed to a position which is downstream from where said flow path meets said flexible flow path; and dispensing said liquid and said high pressure air to form a predetermined spray pattern of said liquid.

27. The method according to claim 26, including the step of hermetically containing and conveying said liquid.

28. The method according to claim 26 or claim 27, further comprising the step of simultaneously dispensing said liquid and said air.

29. The method according to any one of claims 26 to 28, wherein the step of supplying high pressure air comprises the steps of:

controlling the supply of said high pressure air; and regulating the supply of said high pressure air.

30. The method according to any one of claims 26 to 29, wherein said step of supplying said liquid to said dispensing means further includes the steps of:

indicating a flow of said liquid from said supply of said liquid;

controlling the flow of said liquid; and

regulating the amount of said liquid to said dispensing means.

31. The method according to any one of claims 26 to 30, further comprising the step of:

hermetically coupling the contained supply of said liquid with said dispensing means.

32. The method according to claim 31, further comprising the step of:

venting gas from said liquid being conveyed to said dispensing means.

33. The method according to any one of claims 27 to 32, which comprises the step of supplying said liquid as an adhesive.

34. A method for dispensing an adhesive, the method comprising the steps of:

supplying high pressure air to a dispensing means, said supplying comprises the steps of controlling the supply of said high pressure air, and regulating the supply of said high pressure air;

supplying adhesive to said dispensing means, said step of supplying comprising the steps of:

hermetically containing a supply of said adhesive in a flexible bladder, and hermetically coupling said flexible bladder to said dispensing means;

elevating said supply of adhesive above said dispensing means;

conveying said adhesive from said hermetically sealed flexible bladder to said dispensing means, said step of conveying further comprises the step of venting gas from said flexible bladder, and thereby to indicate the flow of adhesive from said adhesive supply;

controlling the flow of adhesive from said adhesive

supply;
reducing a flow path for said adhesive to said
dispensing means;
bleeding gas from said flow path;
regulating the amount of said adhesive to said
dispensing means; and
simultaneously dispensing said adhesive and high
pressure air to form a predetermined spray pattern
of said adhesive.

35. An adhesive dispensing system,
an adhesive dispenser for spraying adhesive,
a support platform having an upper surface, said upper
surface being above said dispenser,
a container disposed on said upper surface of said
support platform, said container having an
interior for containing the adhesive,
piping connected to said container and to said
dispenser such that said interior of said
container is in communication with said dispenser,
said piping enabling the adhesive in said container to
flow from said container by gravity,
a reducer interposed in said piping between said
container and said dispenser, said reducer adapted
to increase the flow rate of the adhesive from
said container,
an air supply line connected to said dispenser to
supply air to said dispenser so that the adhesive
flowing from said container is atomized as it is
dispensed from said dispenser.

36. The system in accordance with claim 35, wherein said container includes a flexible bladder for containing the adhesive.

37. The system in accordance with claim 35 or claim 36, further including adhesive in said container.

38. The system in accordance with any one of claims 35 to 37, further including an air supply to supply air to said air supply line.

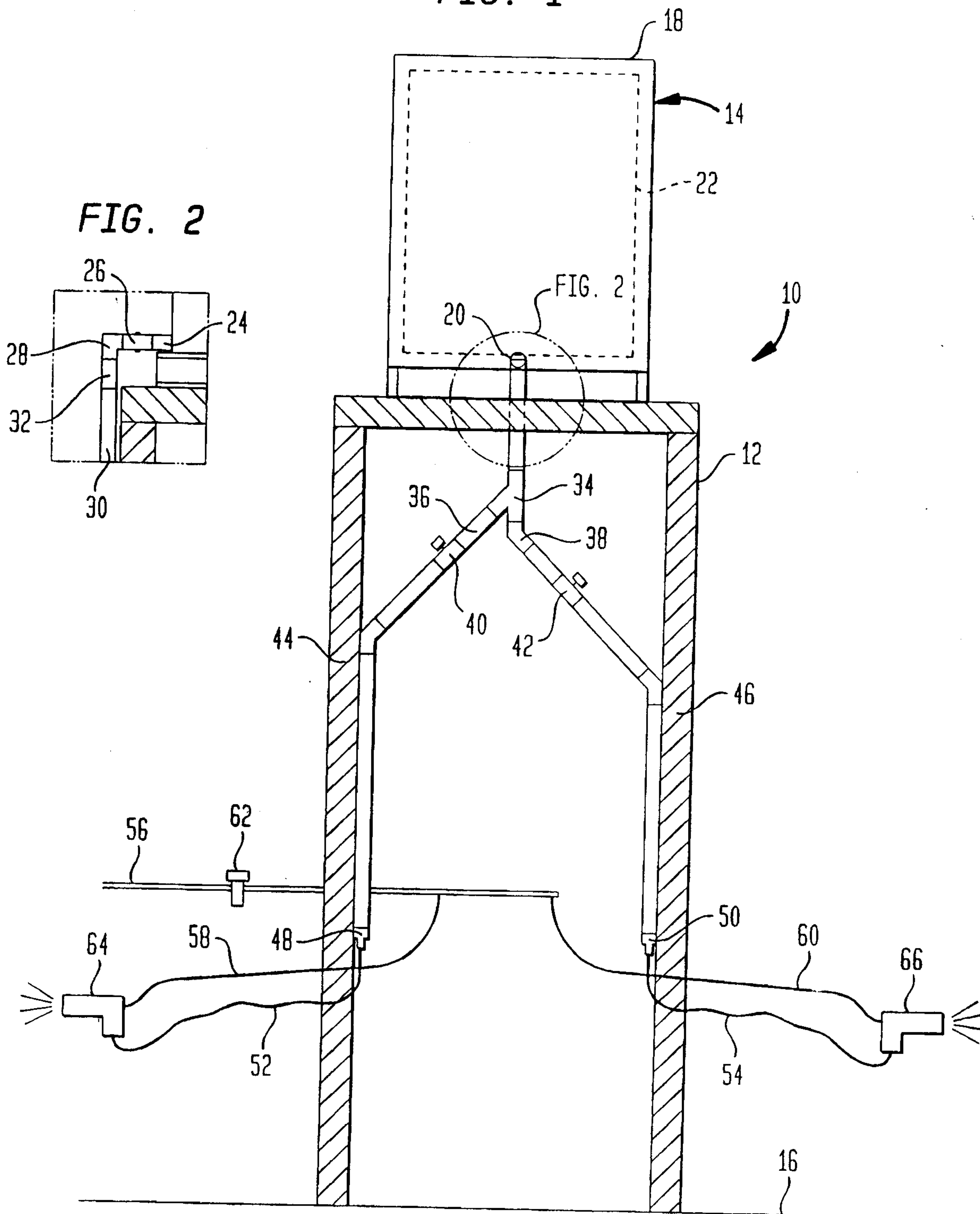
39. The system in accordance with any one of claims 35 to 38, further including a control valve arranged in said piping between said container and said reducer.

40. The system in accordance with claim 39, further including a shutoff valve in said piping adjacent said container and quick disconnect coupling in said piping between said shutoff valve and said control valve for ease of replacement or repair.

41. The system in accordance with any one of claims 35 to 40, wherein said piping is flexible.

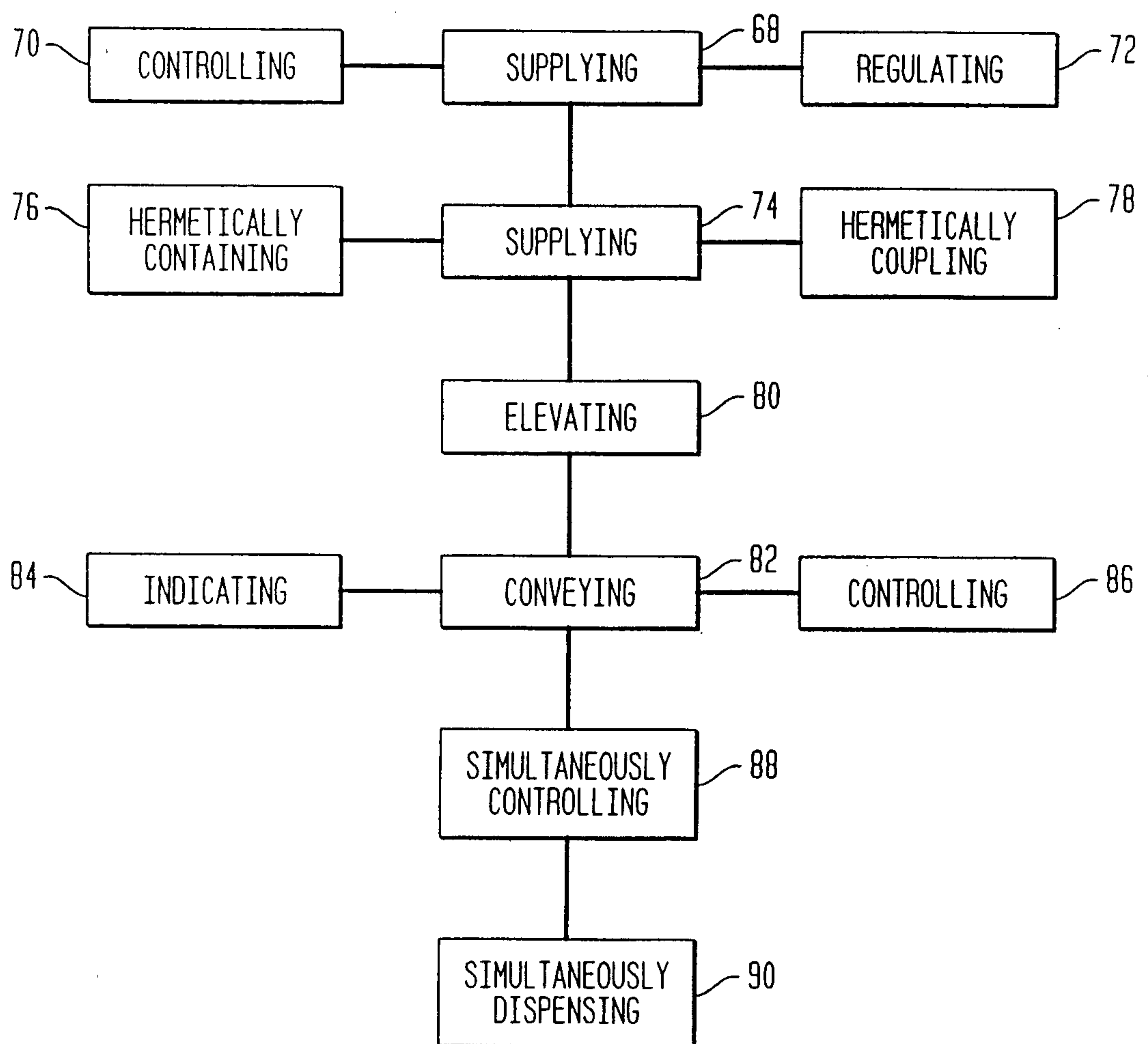
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FIG. 1



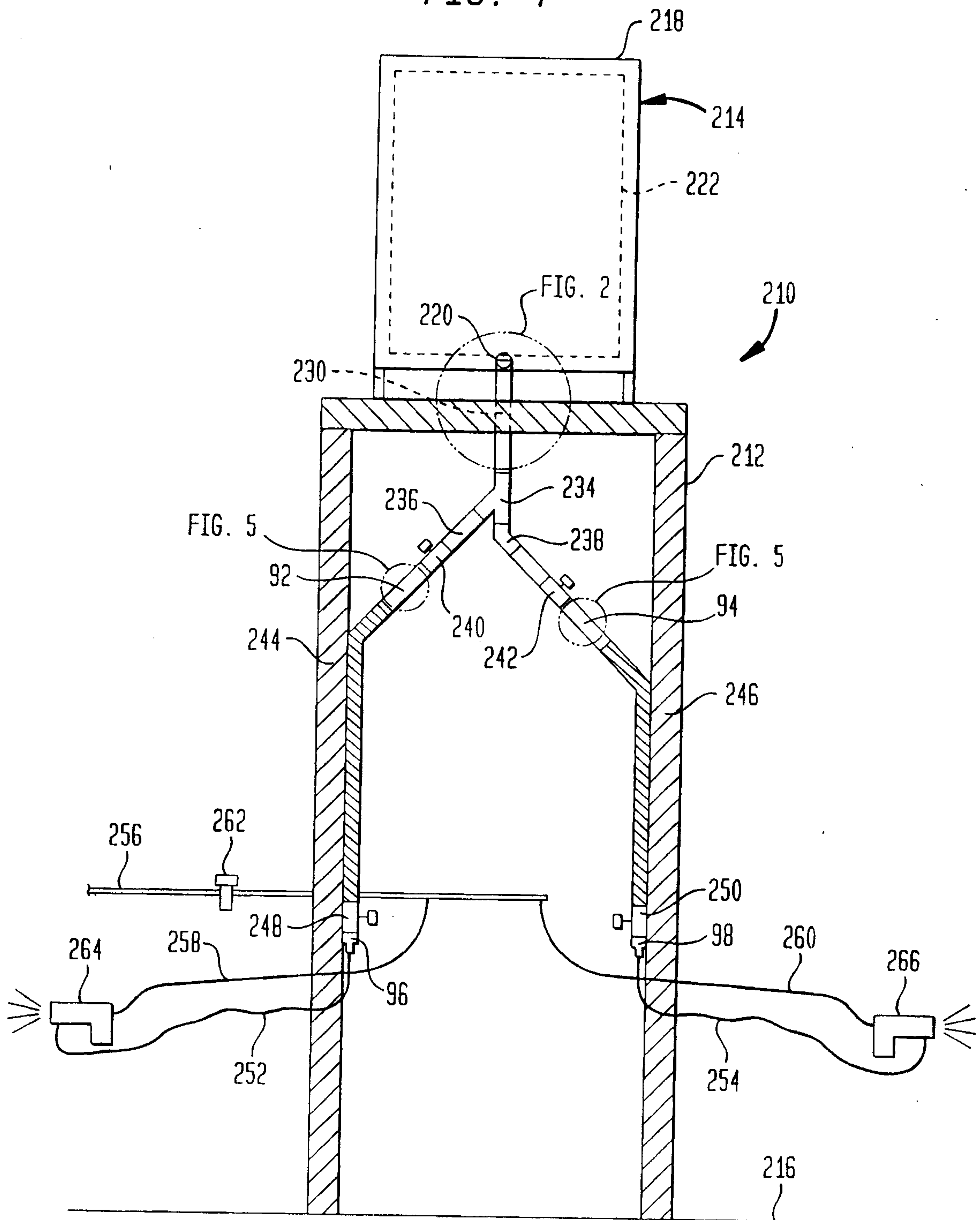
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FIG. 3



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FIG. 4



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FIG. 5

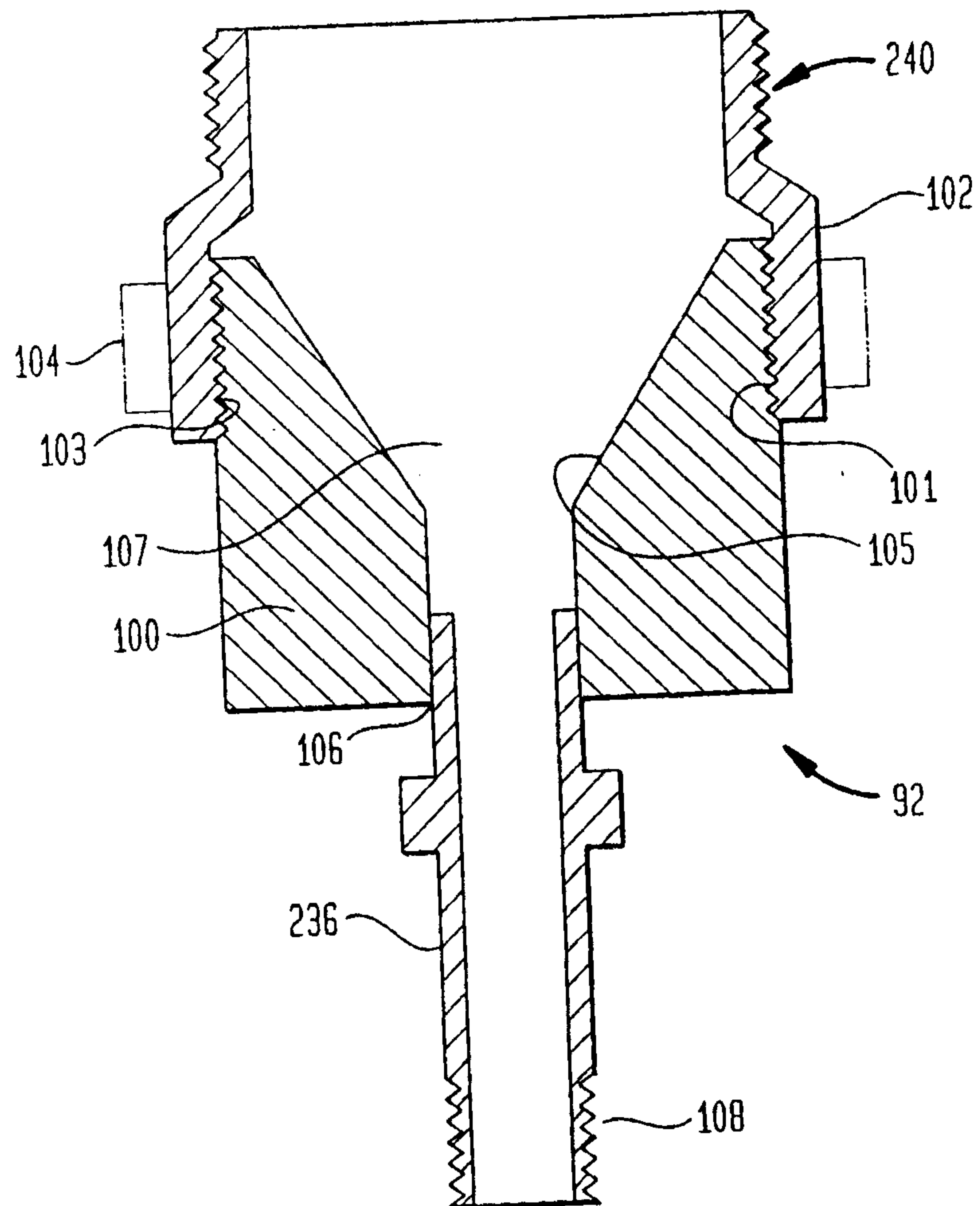
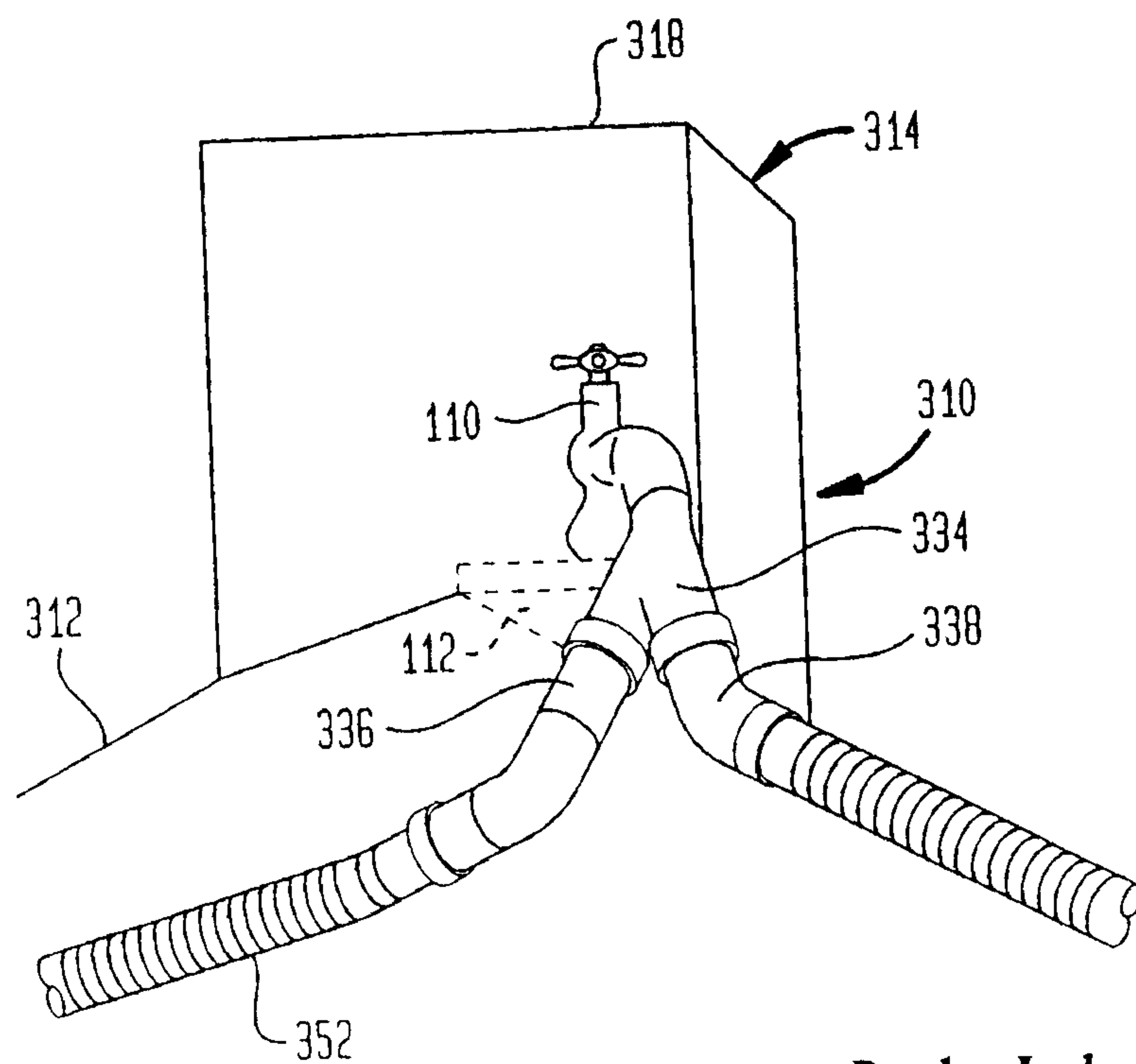
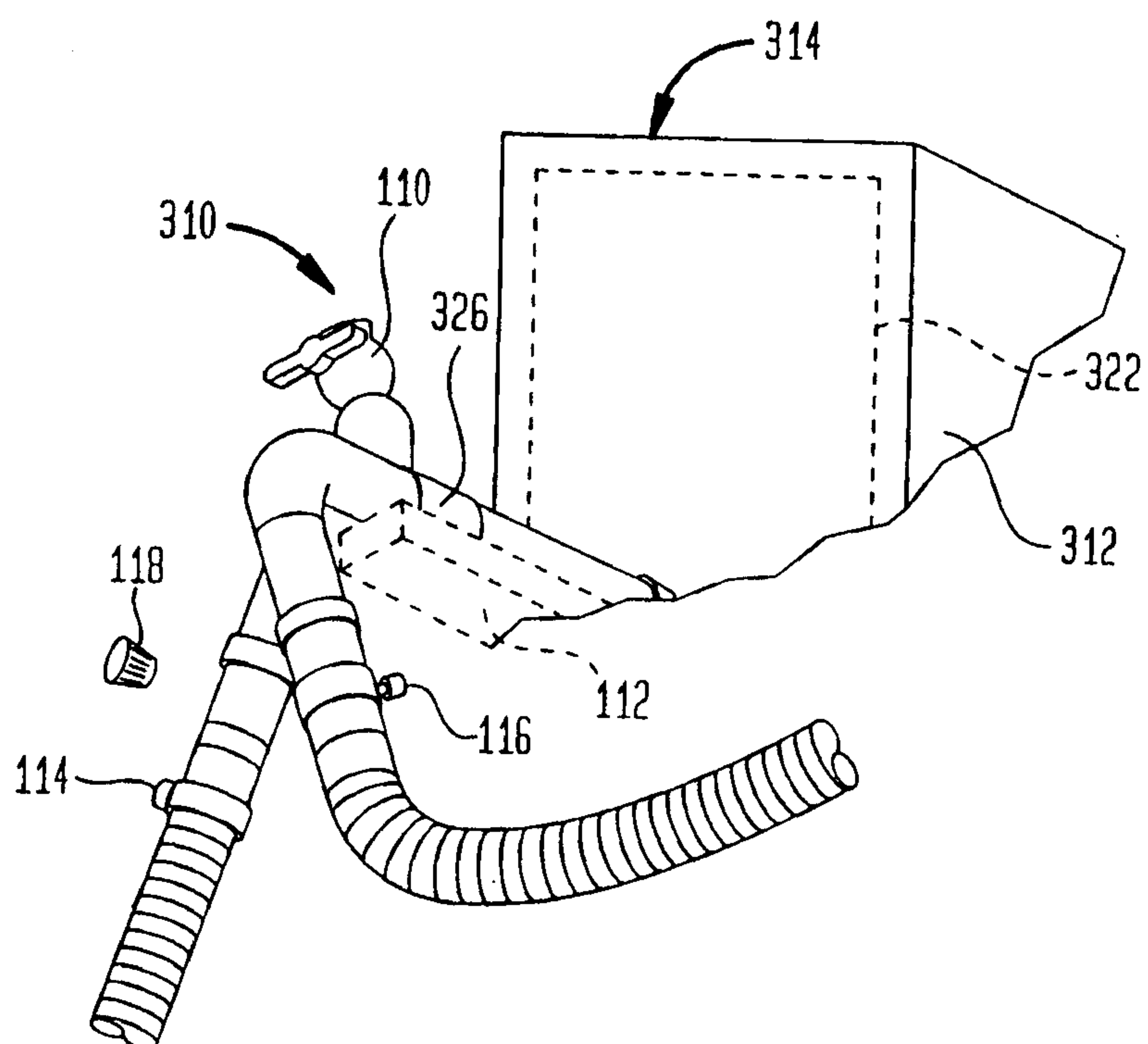


FIG. 6



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FIG. 7



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FIG. 8

