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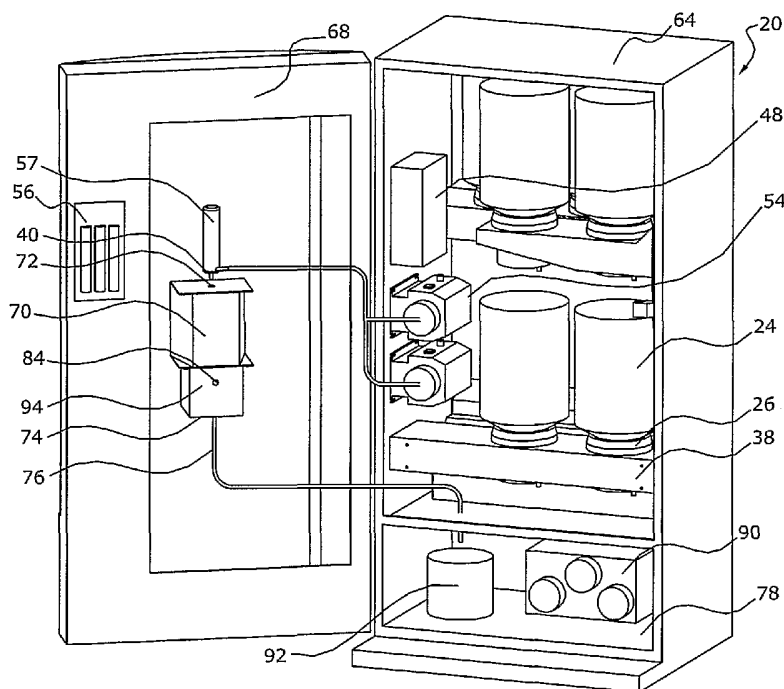
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(54) Title: VENDING MACHINE FOR DISPENSING POTABLE LIQUID



(57) Abstract: The present invention is a currency-operated liquid dispensing machine for liquid retained in a plurality of removable and replaceable containers such as carboys or bags. More specifically, it is for a vending machine for dispensing metered quantities of water

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## VENDING MACHINE FOR DISPENSING POTABLE LIQUID

### FIELD OF THE INVENTION

The present invention relates to a currency-operated liquid dispensing machine for  
5 liquid retained in a plurality of removable and replaceable containers such as carboys. More  
specifically, it is for a vending machine for dispensing water from carboys.

### BACKGROUND OF THE INVENTION

Vending machines have been used for many years for dispensing a variety of goods,  
10 ranging from clothing, to beverages, to food. Beverages may be dispensed in bottles, cans  
or into a cup or other suitable container.

In recent years, bottled water has been made available in vending machines. The  
increase in water purchases results from concerns that consumers have about the quality of  
15 tap water. Additionally, consumers find it convenient to carry water in bottles rather than  
looking for a source of water. There are, however, problems associated with the sale of  
bottles of water that are sized for individual usage. According to some records, 1.5 million  
tons of plastic are used to bottle water every year. These bottles have to be recycled or  
disposed of, both of which lead to pollution.

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As an alternative to bottled water, many businesses provide water coolers or water  
dispensers. As disclosed in US5,409,094 these may be coin-operated. Water dispensers  
usually provide both chilled and ambient temperature water from a five gallon carboy. The  
carboy is inverted into a reservoir, which is usually gravity fed. This means that for water to  
25 be released from the reservoir and carboy, air must replace the water. Accordingly, water  
dispensers of this type generally have an open reservoir to allow air exchange. Concern  
over the safety of these water dispensers has resulted in the development of closed system  
dispensers as disclosed in US 5,222,531 and US 6,442,960. While this overcomes the  
concern over cleanliness, the problem of a limited supply of water remains, as these are  
30 designed to deliver water from a five gallon carboy. Accordingly, they are not well suited  
for commercial sales of water.

Another approach to providing clean drinking water is to provide a reverse osmosis  
machine. These are attached to a water supply, most typically, a municipal water system,  
35 hence the constraint of limited water supply is overcome. The water passes through a series

of filters in addition to undergoing reverse osmosis. Unfortunately, there have been many problems associated with the cleanliness of the filters, pipes and storage tanks for these machines. Despite these problems, reverse osmosis machines have been installed in, for example, shopping centres where they are coin operated.

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It is an object of the invention to overcome the deficiencies in the prior art.

### SUMMARY OF THE INVENTION

It is an object of the invention to provide a vending machine that delivers measured quantities of liquid from a plurality of containers such as carboys in response to input of a selected value of currency. The vending machine is comprised of a cabinet in which the carboys are housed. The carboys are releasably housed on holders. The vending machine may be coin-operated or may be operated by an alternative currency source, such as a credit card. The quantity of liquid dispensed is determined by the amount paid. A controller and a monitor are provided to control and measure the quantity of liquid dispensed.

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The liquid is gravity-fed or pumped from a plurality of carboys, which are arranged in series, with one emptying, then the second emptying and so on, until all the carboys have been drained or in parallel, with all the carboys draining at the same rate, or if preferred, sequentially, under the control of a solenoid valve. A furcated passage having a branch draining each carboy carries the liquid from the carboy to an outlet. In order to permit the release of liquid, there is provided an air exchange means.

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In one aspect of the invention there is provided a currency operated liquid dispensing machine for liquid retained in a plurality of removable and replaceable containers such as carboys or bags. The liquid dispensing machine comprises a cabinet, a suitably selected holder housed in the cabinet, for releasably retaining the plurality of containers, a furcated passage, a plurality of terminally located liquid dispensing systems, a controller, a dispensing valve, and a currency acceptor and processor.

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The furcated passage comprises a main passage, an open end to define an outlet and a plurality of branches, each terminating in an inlet. The furcated passage is to permit fluid communication between the plurality of containers and the outlet. The outlet is in communication with the ambient atmosphere, and is located to permit feeding of the liquid from the containers to the outlet. The plurality of terminally located liquid dispensing

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systems is for releasably coupling the inlet to a container to permit the flow of liquid. The controller is to determine the flow of liquid through the furcated passage. A dispensing valve is to stop and start the flow of liquid. The controller is also in communication with the dispensing valve to selectively actuate the dispensing valve. A currency acceptor and processor is for communication with the controller. This allows the liquid to be dispensed from the currency operated liquid dispensing machine in a metered volume in response to input of a selected value of currency.

In one aspect of the invention, a currency operated liquid dispensing machine for liquid retained in a plurality of removable and replaceable containers such as carboys or bags is provided. The liquid dispensing machine comprises;

- a cabinet;
- a suitably selected holder housed in the cabinet, for releasably retaining the plurality of containers;
- a furcated passage comprising a main passage, an open end to define an outlet and a plurality of branches, each terminating in an inlet, the furcated passage to permit fluid communication between the plurality of containers and the outlet, the outlet being in communication with the ambient atmosphere, the outlet located to permit feeding of the liquid from the containers to the outlet,
- a plurality of terminally located liquid dispensing systems for releasably coupling the inlet to a container to permit the flow of liquid;
- a monitor to determine the flow of liquid through the furcated passage;
- a dispensing valve to stop and start the flow of liquid;
- a controller in communication with the monitor to selectively actuate the dispensing valve; and
- a currency acceptor and processor for communication with the controller, wherein liquid is dispensed from the currency operated liquid dispensing machine in a metered volume in response to input of a selected value of currency.

In another aspect the invention further comprises a pump to urge the liquid from the containers to the outlet.

In another aspect of the invention each branch has a solenoid valve in communication with the controller to control the flow of liquid.

In another aspect of the invention the main branch comprises a manifold.

In another aspect the invention further comprises a gas exchanger for gaseous exchange between the ambient atmosphere and the containers.

5 In another aspect of the invention the gas exchanger comprises a filter unit.

In another aspect of the invention the liquid dispensing system comprises a penetrater and a coupler.

10 In another aspect of the invention the controller comprises a flow monitor.

In another aspect of the invention the flow monitor is located in line with the main passage.

15 In another aspect of the invention the flow monitor is integral with the pump.

In another aspect of the invention the flow monitor is located in parallel to the main passage.

20 In another aspect of the invention the controller comprises a timer.

In another aspect of the invention the controller is in electronic communication with the monitor.

25 In another aspect of the invention the currency acceptor and processor is in electrical communication with the controller.

In another aspect the invention further comprises a surge buffer, the surge buffer located to dampen surging of the liquid from the outlet.

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In another aspect of the invention the dispensing valve is a check valve.

In another aspect of the invention the holder comprises an at least one rack for releasably retaining the containers.

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In another aspect the invention further comprises a collar for receiving each container, the collar being releasably housed on the holder.

In another aspect of the invention the cabinet is refrigerated.

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In another aspect the invention further comprises a counterbalance.

In another aspect the invention further comprises a water presence sensor.

10 In another aspect the invention further comprises an alarm system to indicate when the dispensing machine is empty.

In another aspect of the invention the rack is a shelf that is rotatably mounted to the cabinet to permit swinging of the shelf.

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In another aspect of the invention the pump is a peristaltic pump.

In another aspect the invention further comprises a bottle presence sensor.

20 In another aspect of the invention the branches of the furcated passage are in series, such that in use, one container is substantially drained before the next container begins to drain.

In another aspect of the invention the outlet is located to permit gravity feeding of  
25 the liquid from the containers to the outlet.

### **BRIEF DESCRIPTION OF THE DRAWINGS**

Fig. 1 An orthogonal view of a vending machine for dispensing bottled water in accordance with the present invention.

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Fig. 2 An orthogonal view of the vending machine of Figure 1 with the door opened.

Fig.3 A schematic of a single water line from a carboy to the outlet in accordance  
35 with the present invention.

Fig. 4 An orthogonal view of the vending machine of Figure 1 with the door removed and the rack swung open.

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### DETAILED DESCRIPTION OF THE INVENTION

A vending machine, as shown in Fig. 1 and 2, generally indicated as 20 has a cabinet 22 in which a plurality of carboys 24 are housed for dispensing a measured quantity of water. Each carboy is removably mounted in an inverted manner on a holder 26. As shown in the schematic of Figure 3, the holder 26 is comprised of a water container support 28 and a hygienic water dispensing system 30 having a mounting adapter 32, a diaphragm/feed tube 34, and an air filter 36 provided with a filter element, as disclosed in US 5,222,531, hereby incorporated by reference. The feed tube 34 is sufficiently resilient to pierce a carboy cap 25, and therefore functions as both a penetrator and a coupler.

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As shown in Fig. 2, the holder 26 for supporting the carboy 24 is mounted on a rack 38. As shown in Figure 4, the racks 38 swing in and out to assist in the loading and unloading of the carboys 24.

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As shown in Fig. 3, the carboys 24 are arranged in parallel and are in fluid communication with an outlet 40 by means of a furcated passage 42, each branch 44 of the furcated passage 42 being fed by a single carboy 24 through an inlet 43. On each branch 44 is a solenoid valve 46, the solenoid valve 46 being in communication with a controller 48 to control the flow of water. The main passage of the furcated passage 42 is a manifold 45 located downstream from the solenoid valves 46. It functions to collect water from the various carboys 24. The controller operates to control a flow meter 50 located in-line between the outlet 40 and the branches 44 of the furcated passage 42. In an alternate embodiment, the controller 48 has a timer 52 to determine the flow of water. The controller 48 is in communication with a peristaltic pump 54 that pumps the water and controls the amount of time that the pump turns at a specific rate. In the embodiment that relies on gravity to feed water through the system, the pump 54 is absent, and the controller 48 is in communication with a dispensing valve, which can be a check valve 66 to control the flow of water. The controller 48 is also in communication and under the control of a coin-operated dispenser 56 as described in US 5409,094, hereby incorporated by reference.

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A check valve 66 acts as a sealing mechanism and opens when the pump operates and closes when the pump stops to stop and start the flow of water. A surge buffer 57 reduces surging of water from the peristaltic pump 54. The outlet 40 is configured as a nozzle to dispense water in a smooth laminar flow.

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The cabinet 22 is equipped with a refrigeration unit 90 for chilling the water. The cabinet 22 is generally rectangular with a front 58, a back 60, two sides 62, a top 64 and a bottom 67. The front 58 is essentially comprised of a door 68 for accessing the carboys 24. A recess 70 in the cabinet 22 has an aperture 72 to accept the outlet 40, as shown in Fig. 2. There is a second aperture 73 in the base of the recess to receive the bottle to be filled. Beneath the recess and the aperture is a bottle centering mechanism 94 that acts to position bottles of various sizes to be concentric with the outlet for filling. A drip tray 74 forms the lower surface of the centering mechanism 94 and is in fluid communication with an overflow tube 76. The overflow tube 76 preferably is fed into a drain or a drip pan 92.

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The cabinet 22 is equipped with a counterbalance 78 that is proximal to the bottom 67 of the cabinet to assist in counterbalancing the weight of the carboys 24.

Two sensors, a water present sensor 82 and a bottle present sensor 84 communicate with the controller 48. The water present sensor 82 is located directly after the manifold 45. The bottle present sensor 84 is located in the bottle centering mechanism 94 and is an optical sensor. Additionally, the dispensing machine may be equipped with an alarm 86 to indicate when the dispensing machine is empty.

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The foregoing description of a vending machine for dispensing potable liquid describes the preferred embodiment and is not meant to be limiting. As would be apparent to one skilled in the art, there can be, for example, variations in the feed tube, variations in the currency acceptor and processor, and variations in the cabinet. Further variations may relate to the containers available to retain the liquid, for example, if the liquid is delivered into the system from a bag, a suitably selected accepting means to releasably retain a bag would be provided while there would be little need for a gas exchange system. Other variations include a number pad for entering a custom amount of liquid, and a touch screen rather than a keypad. The bottle present sensor may be a capacitive sensor, a force sensor or a limit switch, for example, but not to be limiting. The racks may be removable, they may be replaced with a rail that the holders can move along, and they may be configured to

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accept a range of number of containers, depending upon the size and weight of the containers, for example, but not to be limiting.

We claim:

1. A currency operated liquid dispensing machine for liquid retained in a plurality of removable and replaceable containers such as carboys or bags, said liquid dispensing machine comprising;  
5 a cabinet;  
a suitably selected holder housed in the cabinet, for releasably retaining the plurality of containers;  
10 a furcated passage comprising a main passage, an open end to define an outlet and a plurality of branches, each terminating in an inlet, said furcated passage to permit fluid communication between the plurality of containers and said outlet,  
said outlet being in communication with the ambient atmosphere, said outlet located to permit feeding of the liquid from the containers to said outlet,  
15 a plurality of terminally located liquid dispensing systems for releasably coupling said inlet to a container to permit the flow of liquid;  
a dispensing valve to stop and start the flow of liquid;  
a controller to determine the flow of liquid through said furcated passage and to selectively actuate said dispensing valve; and  
20 a currency acceptor and processor for communication with said controller,  
wherein liquid is dispensed from said currency operated liquid dispensing machine in a metered volume in response to input of a selected value of currency.
2. The dispensing machine of claims 1 further comprising a pump to urge the  
25 liquid from the containers to the outlet.
3. The dispensing machine of claim 2, wherein each branch has a solenoid valve in communication with said controller to control the flow of liquid.
- 30 4. The dispensing machine of claim 3 wherein said main branch comprises a manifold.
5. The dispensing machine of claim 4, further comprising a gas exchanger for gaseous exchange between the ambient atmosphere and the containers.

6. The dispensing means of claim 5 wherein said gas exchanger comprises a filter unit.

7. The dispensing machine of claim 4, wherein said liquid dispensing system comprises a penetrater and a coupler.

8. The dispensing machine of claim 7, wherein said controller is comprised of a flow monitor.

9. The dispensing machine of claim 8 wherein said flow monitor is located in line with said main passage.

10. The dispensing machine of claim 9 wherein said flow monitor is integral with said pump.

11. The dispensing machine of claim 9 wherein said flow monitor is located in parallel to said main passage.

12. The dispensing machine of claim 7, wherein said controller comprises a timer.

13. The dispenser of claim 10, wherein said controller is in electronic communication with said monitor.

14. The dispensing machine of claim 13, wherein said currency acceptor and processor is in electrical communication with said controller.

15. The dispensing machine of claim 14, further comprising a surge buffer, said surge buffer located to dampen surging of the liquid from said outlet.

16. The dispensing machine of claim 15, wherein said dispensing valve is a check valve.

17. The dispensing machine of claim 16, wherein the holder comprises at least one rack for releasably retaining the containers.

18. The dispensing machine of claim 17 further comprising a collar for receiving each container.
- 5 19. The dispensing machine of claim of claim 18 wherein said cabinet is refrigerated.
20. The dispensing machine of claim 19 further comprising a counterbalance.
- 10 21. The dispensing machine of claim 20 further comprising a water presence sensor.
22. The dispensing machine of claim 19 further comprising an alarm system to indicate when said dispensing machine is empty.
- 15 23. The dispensing machine of claim 22 wherein said rack is a shelf that is rotatably mounted to said cabinet to permit swinging of said shelf.
24. The dispensing machine of claim 23 wherein said pump is a peristaltic pump.
- 20 25. The dispensing machine of claim 24 further comprising a bottle presence sensor.
- 25 26. The dispensing machine of claim 1 wherein the branches of the furcated passage are in series, such that in use, one container is substantially drained before the next container begins to drain.
- 30 27. The dispensing machine of any one of claims 1 to 26, wherein said outlet is located to permit gravity feeding of the liquid from the containers to said outlet.

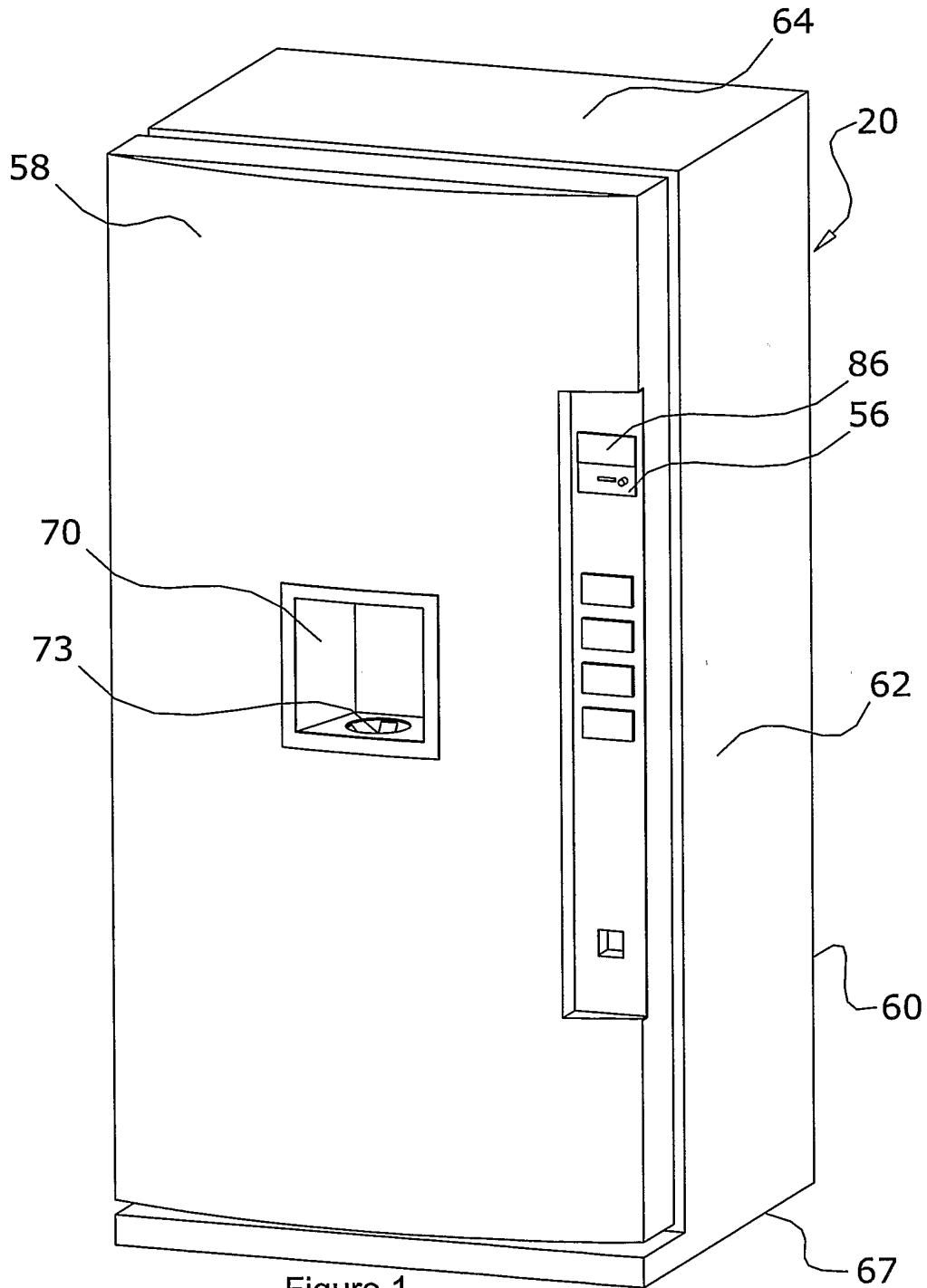
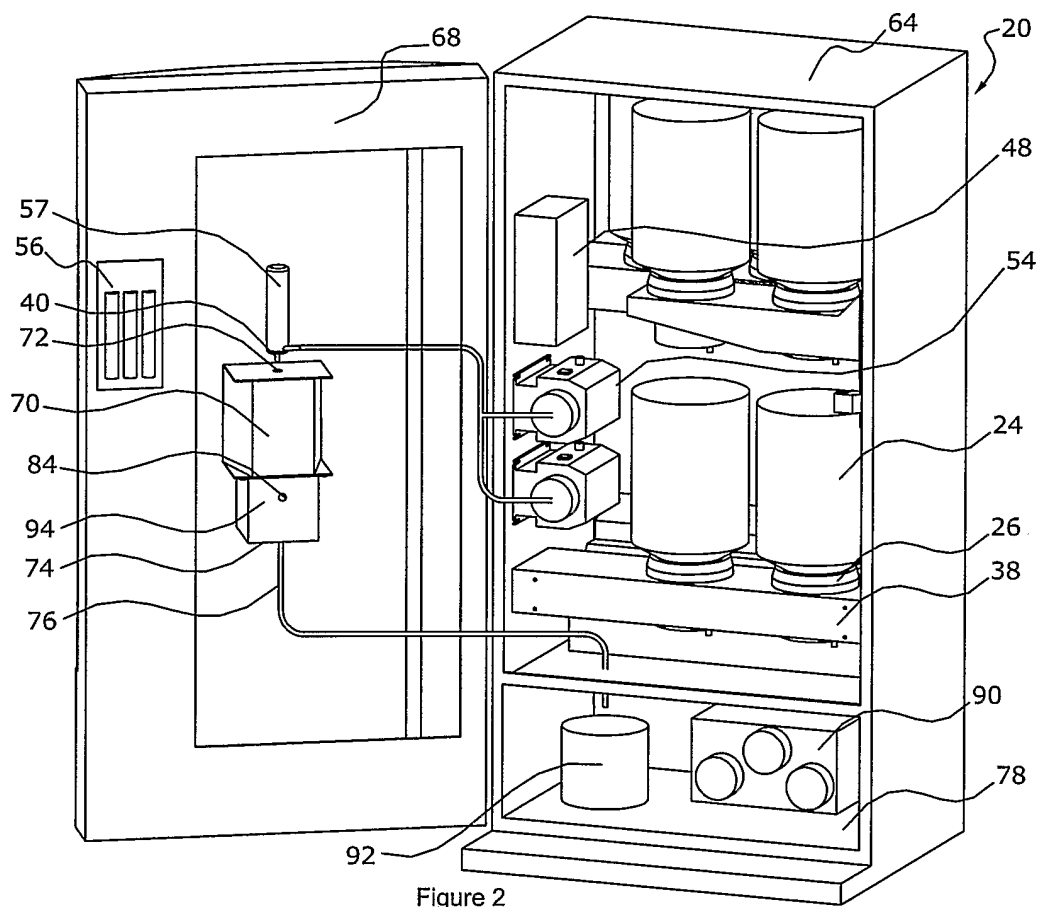


Figure 1



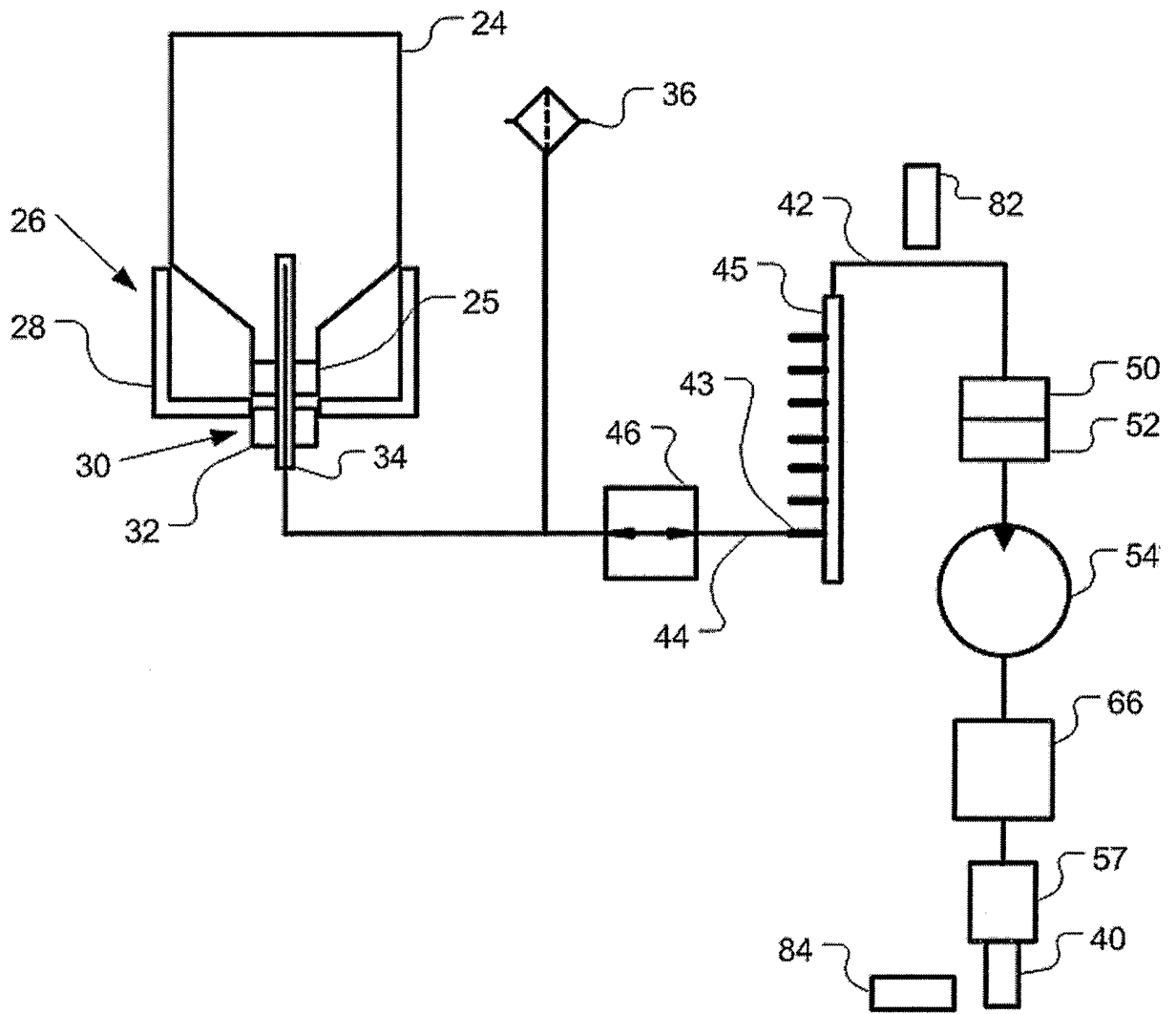


Figure 3



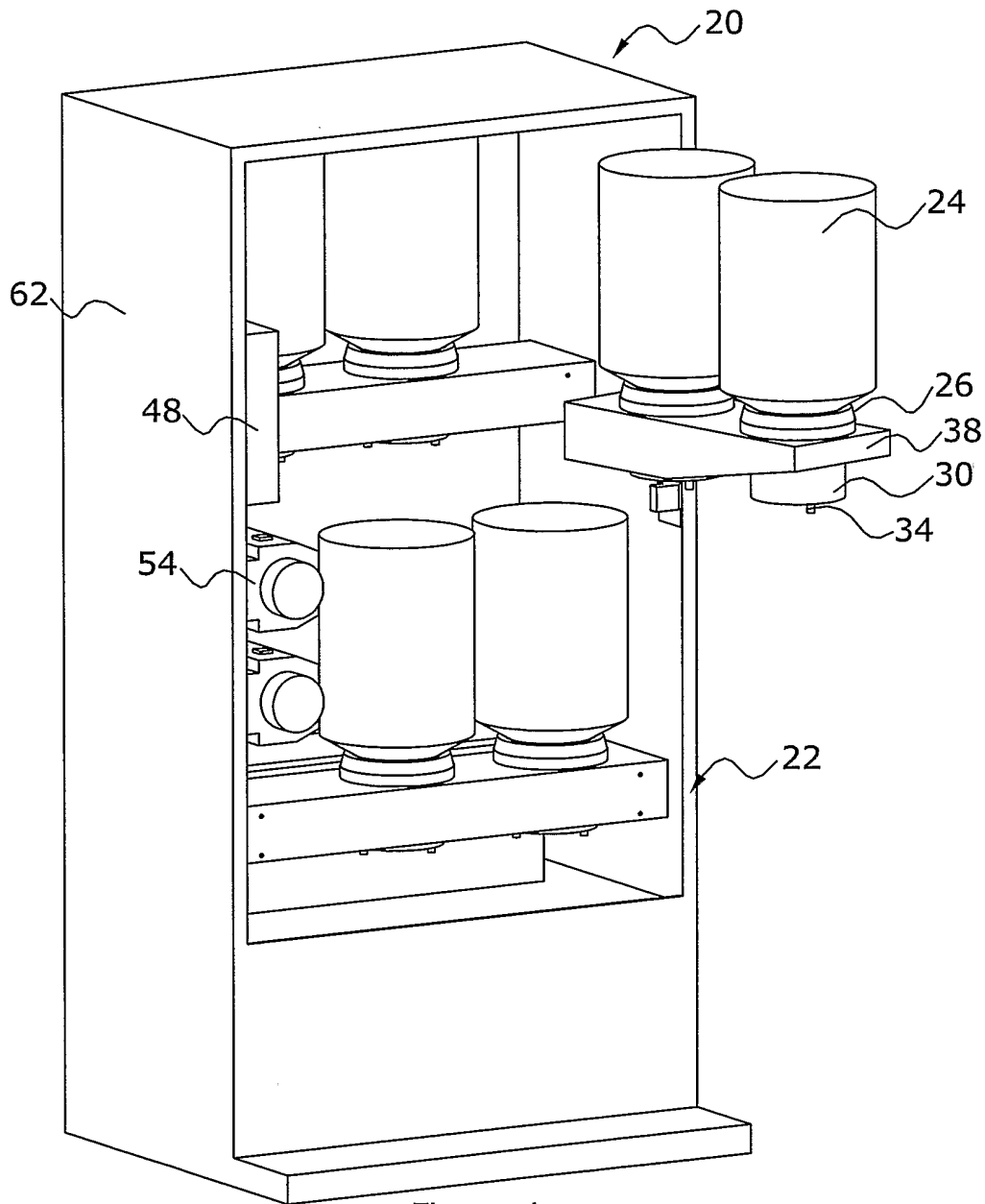


Figure 4

INTERNATIONAL SEARCH REPORT

International application No.  
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<p>A. CLASSIFICATION OF SUBJECT MATTER IPC<sup>7</sup>: G07F 13/02</p> <p>According to International Patent Classification (IPC) or to both national classification and IPC</p>											
<p>B. FIELDS SEARCHED</p> <p>Minimum documentation searched (classification system followed by classification symbols) IPC<sup>7</sup>: G07F</p> <p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p> <p>Electronic database(s) consulted during the international search (name of database(s) and, where practicable, search terms used) Databases: Canadian Patent Database, USPTO WEST, Internet Search terms: carboy, bag, vending, water, dispensing/dispenser/dispense, money/currency/coin, bulk</p>											
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p> <table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>US 4 226 267 (MEECHAM) 7 October 1980 (7-10-1980) abstract column 2, line 65 to column 3, line 43</td> <td>1 to 21</td> </tr> <tr> <td>A</td> <td>US 6 578 763 (BROWN) 17 June 2003 (17-06-2003) entire document</td> <td>1 to 21</td> </tr> </tbody> </table>			Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	A	US 4 226 267 (MEECHAM) 7 October 1980 (7-10-1980) abstract column 2, line 65 to column 3, line 43	1 to 21	A	US 6 578 763 (BROWN) 17 June 2003 (17-06-2003) entire document	1 to 21
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<p><input type="checkbox"/> Further documents are listed in the continuation of Box C.      <input checked="" type="checkbox"/> See patent family annex.</p>											
<p>* Special categories of cited documents :</p> <table border="0"> <tr> <td style="vertical-align: top;"> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="vertical-align: top;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p> </td> </tr> </table>			<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier application or patent but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p>							
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.  
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Patent Document Cited in Search Report	Publication Date	Patent Family Member(s)	Publication Date
US 4 226 267	07-10-1980	none	07-10-1980
US 6 578 763	17-06-2003	CA 2 473 961 A1 EP 1 432 618 A2 US 6 578 763 B1 US 6 772 944 B2 US 2004 226 994 A1 WO 03 020 598 A2	13-03-2003 30-06-2004 17-06-2003 10-08-2004 18-11-2004 13-03-2003