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(54) **Automatic drinks vending machine**

(57) An automatic drinks vending machine (10) has devices (12, 14, 16, 18, 20) for drawing water from an external supply and for purifying the water drawn, one or more containers (52) containing consumable liquid substances to be mixed with the water, devices (46, 48, 50, 55, 76) for conveying the water drawn and purified and the liquid substances held in the containers (52) towards a drinks-dispensing outlet (77) in controlled manner, and an electronic control unit (78) which is connected to the devices and which, upon an external command, arranges for the supply of purified water and one or more liquid substances so as to output a drink constituted by a mixture of purified water and one or more liquid substances. The vending machine prevents the problems of known vending machines in relation to the transportation, storage and loading of packaged drinks and mineral waters and also in relation to the ageing thereof.

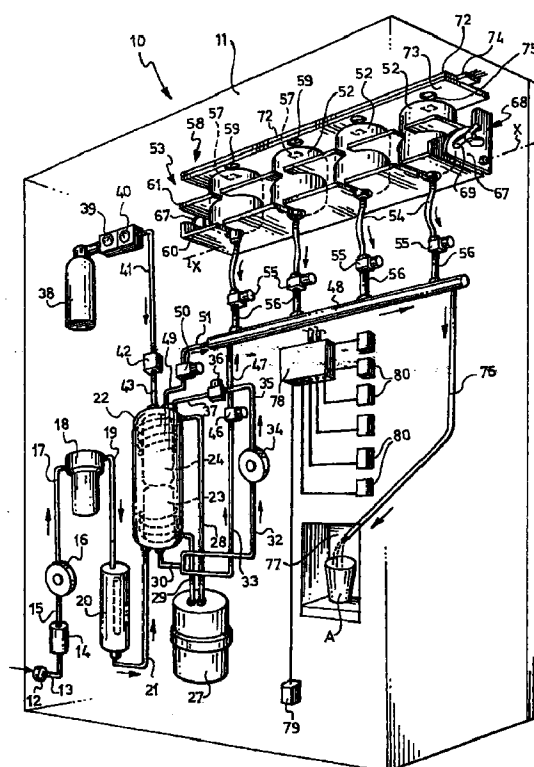


FIG.1

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Description

[0001] The subject of the present invention is an automatic drinks vending machine.

[0002] As is well known, a conventional automatic drinks vending machine comprises a refrigerating cabinet inside which there are compartments in which packaged drinks and mineral waters of various types are stacked in an orderly manner, each type in a respective compartment. A dispensing mechanism discharges the drink or mineral water selected by the user by means of a suitable push-button after payment of a predetermined charge.

[0003] The drinks supplied are normally packaged in cans or in bottles. There are carousel dispensers in which drinks packaged in cartons can also be loaded. Mineral water is normally packaged in bottles.

[0004] Although these automatic drinks vending machines are widespread, they are not free of problems.

[0005] First of all, the drinks and mineral waters have to be packaged at suitable production sites from which they are transported to intermediate storage sites and, finally, they are transported to the sites at which the automatic vending machines are located. This involves packaging and transportation costs which are a considerable burden on the final cost of the drink or mineral water.

[0006] Moreover, the operation of loading the drinks and mineral waters into the vending machines takes a certain amount of time, given the large number of items to be loaded.

[0007] Moreover, the packaged drinks and mineral waters take up a considerable amount of space and, if there are many users of the vending machine, the operator has to reload the machine frequently.

[0008] It should be added that the drinks and mineral waters which are in least demand remain in the vending machine for a long time without checks and thus inevitably lose their freshness.

[0009] The object of the present invention is to prevent the aforementioned problems.

[0010] This object is achieved by means of an automatic drinks vending machine comprising:

- means for drawing water from an external water supply,
- means for purifying the water drawn,
- one or more containers containing consumable liquid substances to be mixed with the water,
- means for conveying the water drawn and purified and the liquid substances held in the containers towards a drink-dispensing outlet in a controlled manner,
- an electronic control unit which is connected to the drawing and conveying means and which, upon an external command, arranges for the supply of purified water and one or more liquid substances so as

to provide a drink constituted by a mixture of purified water and one or more liquid substances.

[0011] For a better understanding, an embodiment of the invention is described by way of example below and shown in the appended drawings, in which:

Figure 1 is a schematic view of an automatic drinks vending machine according to the invention,

Figure 2 shows a component of the vending machine of Figure 1 in longitudinal section, and on an enlarged scale,

Figure 3 shows a detail of the vending machine of Figure 1,

Figure 4 shows the detail of Figure 3 during the reloading of the vending machine,

Figure 5 shows another detail of the vending machine of Figure 1, in section and on an enlarged scale,

Figure 6 shows a variant relating to the detail of Figure 5.

[0012] The automatic drinks vending machine, generally indicated 10 in Figure 1, comprises a cabinet 11 housing the components of the vending machine.

[0013] On the outside of the cabinet 11 there is a connector 12 for connection to a continuous water supply such as, for example, the water mains.

[0014] All of the elements described below are inside the cabinet 11.

[0015] A pipe 13 extends from the connector 12 and is connected to the inlet of a first, coarse-filtration filter 14, for example, a metal mesh filter the outlet of which is connected to the intake of a pump 16 by means of a pipe 15. The output of the pump 16 is connected by means of a pipe 17 to the inlet of a further, fine-filtration filter 18 which may be a reverse osmosis filter, an activated-carbon filter, or the like, according to the type of water to be treated. The outlet of the filter 18 is connected to the inlet of an ultraviolet sterilizer 20 by means of a pipe 19. The outlet of the sterilizer 20 is connected to a storage device 22 by means of a pipe 21.

[0016] This device 22 is shown in detail in Figure 2. It comprises two separate cylindrical tanks 23 and 24 arranged coaxially and surrounded by a thermally-insulating casing 25 in which a coil 26 surrounding the two tanks 23 and 24 is incorporated. A coolant liquid flowing in the coil 26 is provided by a refrigeration circuit, of which the compressor 27 and two pipes 28 and 29 connecting the compressor to the inlet end and to the outlet end of the coil 26, respectively, are shown. The pipe 21 coming from the sterilizer 20 is connected to an inlet of the tank 23. An outlet of the tank 23 is connected by means of a pipe 30 to a T-shaped connector 31 from which a pipe 32 and a pipe 33 extend. The pipe 32 is connected to the intake of a pump 34 the output of which is connected to an inlet of the tank 24 by means of a pipe 35, a non-return valve 36 and a pipe 37.

Another inlet of the tank 24 is connected to a cylinder, indicated 38, containing carbon dioxide; the cylinder 38 is connected to a manometer 39 and also to a pressure switch 40 connected to the tank 24 by means of a pipe 41, a non-return valve 42 and a pipe 43. The device 22 is completed by a temperature sensor 44 fitted in the tank 23 and two level sensors, indicated 45.1 and 45.2, respectively, fitted in the tank 24 for detecting minimum and maximum levels:

[0017] With reference to Figure 1, the outlet of the tank 23 of the device 22 is connected to one end of a manifold pipe 48 by means of the pipe 33, an on/off solenoid valve 46, and a pipe 47. An outlet of the tank 24 of the device 22 is also connected to the aforesaid end of the manifold pipe 48 by means of a pipe 49, an on/off solenoid valve 50, and a pipe 51.

[0018] A series of bottles 52 each containing a respective liquid substance to be combined with the water to produce a particular drink is also connected to this manifold pipe 48. The bottles 52 are mounted on a support structure 53 above the manifold pipe 48 with their mouths facing downwardly. Each bottle 52 is connected to the manifold pipe 48 by means of a respective pipe 54 extending from the mouth of the bottle, a respective on/off solenoid valve 55, and a respective pipe 56 which is connected to the manifold pipe at a point between the two end portions of the manifold. The base of each bottle 52 has a transponder 57; above the bottles 52 there is a bracket 58 which includes a series of antennas 59 each mounted in the vicinity of a respective transponder 57.

[0019] With reference to both Figure 1 and Figure 3, the support structure 53 comprises a lower horizontal shelf 60, an upper horizontal shelf 61, and a vertical rear wall 62 which connects the two above-mentioned shelves. For each bottle 52, a hole 63 with a diameter slightly larger than the neck of a bottle is formed in the lower shelf 60, and a hole 64 with a diameter slightly larger than the body of the bottle is correspondingly formed in the upper shelf 61; the bottle is housed in the two holes 63 and 64 with the neck of the bottle extending through the hole 63, the shoulders of the bottle bearing against the portion of the shelf 60 around the hole 63, and the body of the bottle fitted in the hole 64. Passageways, indicated 65 and 66, respectively, extend from the holes 63 and 64 and open outwardly in the front edges of the surfaces 60 and 61. The support structure 53 is hinged on two shoulders 67 so that it can pivot about an axis X between the operative position described and a forwardly inclined position. A nut-and-bolt coupling 68 provided on each shoulder 67 connects the shoulder to the support structure and slides in a slot 69 so that the support structure 53 can be locked in the operative position or released in order to be inclined forwardly. Each pipe 54 is connected to the respective bottle 52 by means of a needle 70 inserted in a membrane 71 closing the bottle; the pipe 54 is connected to the respective solenoid valve 55 by means of a quick cou-

pling, not shown.

[0020] With particular reference to Figure 3, the bracket 58 is constituted by an upper plate 72 of insulating material and by a lower base 73 of plastics material. The antennas 59 are fixed to the lower face of the plate 72 and the connections to the antennas 59, all of which are united in a single connector element 74 at the side of the bracket, are applied to the lower face of the plate 72 by the printed-circuit technique. The base 73 has a series of through-holes 75 each of which houses a respective antenna 59.

[0021] As shown in Figure 1, a pipe 76 extends from the opposite end of the manifold pipe 48 to the end to which the pipes 47 and 51 are connected and terminates in a compartment 77 into which cups are supplied one at a time, in known manner. The cup supplied, indicated A, is disposed adjacent the outlet of the pipe 76.

[0022] The vending machine 10 has a control unit 78 connected to the pumps 16 and 34, to the filter 18, to the sterilizer 20, to the compressor 27, to the sensors 44, 45.1 and 45.2, to the solenoid valves 46, 50 and 55, and to the antennas 59, by means of the connector element 74. There is also a temperature sensor 79 located in the lower portion of the vending machine and connected to the control unit 78 for detecting the temperature outside the vending machine. The unit 78 thus controls the operation of the vending machine 10. The unit 78 is also connected to a series of control push-buttons 80 disposed on the outside of the cabinet 11.

[0023] The automatic vending machine 10 described operates as follows.

[0024] In the operating condition, the tank 23 is full of water and the tank 24 is full of carbonated water. In order to bring the vending machine to the operating condition, the control unit 78 operates the pump 16 which draws mains water through the connector 12 and sends it to the tank 23 of the device 22 through the pipes 13, 15, 17, 19, and 21; during this operation, the water passes through the filters 14, 18 and through the sterilizer 20 so as to be filtered and sterilized. The water thus purified accumulates in the tank 23. The control unit 78 also operates the pump 34 which draws purified water from the tank 23 and admits it to the tank 24 through the pipes 32, 35 and 37; carbon dioxide flows from the cylinder 38 to the tank 24 so that carbonated water is formed in the tank 24. The non-return valve 36 prevents carbonated water from flowing back from the tank 24 to the tank 23 and the non-return valve 42 prevents carbon dioxide from flowing back from the tank 24 to the cylinder 38. The compressor 27 is also activated so as to activate the refrigeration circuit and to cause coolant liquid to flow in the coil 26, cooling the tanks 23 and 24. The control unit 78 keeps the tanks 23 and 24, and hence the water, at a predetermined temperature dependent on the outside temperature, by means of the temperature sensors 44 and 79, and maintains a predetermined level of water in the two interconnected tanks, by means of the level sensors 45.1 and 45.2. The

charge state of the cylinder 38 can be monitored by means of the manometer 39. The pressure switch 40, on the other hand, maintains a predetermined carbon-dioxide pressure in the tank 24.

[0025] When the vending machine is in operation, if one of the push-buttons 80 is pressed, the control unit 78 opens the solenoid valve 46, if a non-carbonated drink is required, or the solenoid valve 50, if a carbonated drink is required, until a predetermined quantity of water has passed, and also opens, for a predetermined time, the solenoid valve 55 connected to the bottle 52 which contains the liquid substance to be combined with the water to produce the selected drink. If a non-carbonated drink has been selected and the solenoid valve 46 is therefore opened, a certain quantity of water enters the manifold pipe 48 through the pipe 47 and a certain quantity of liquid substance, depending on the time for which the solenoid valve 55 is open, falls by gravity from the corresponding bottle 52 through the pipes 54 and 56 into the manifold pipe 48 and is mixed with the water. The mixture of water and the liquid substance is then conveyed by the pipe 76 into the cup A previously supplied into the compartment 77. A drink ready to drink from the cup A is thus produced. If a carbonated drink has been selected and the solenoid valve 50 is therefore opened, carbonated water flows into the manifold pipe 48 from the tank 24 through the pipes 49 and 51. This carbonated water is mixed with the liquid substance which falls by gravity from the bottle 52 as in the previous case and a carbonated drink is thus supplied in the cup A.

[0026] To prevent a liquid substance not relating to the selected drink from being mixed with the water during a subsequent drink selection, the solenoid valve 55 is closed before the solenoid valve 46 or the solenoid valve 50 is opened. As shown in Figure 5, the water which flows into the manifold pipe 48 thus also rises into the pipe 56 taking with it the residual liquid substance contained therein and thus washing the pipe; the water cannot at the same time rise towards the bottle 52 through the pipe 54 since the solenoid valve 55 is closed. Alternatively, as shown in Figure 6, the pipe 56, which in this case is indicated 56.1, may be connected so as to be inclined in the direction of the water-flow, relative to the axis of the manifold pipe 48; a vacuum is thus created in the pipe 56.1 enabling all of the liquid substance contained in this pipe 56.1 to be drawn in, so as to clean it.

[0027] The liquid substances contained in the bottles 52 may be aromatic essences, mineral salts dissolved in water, tonics, etc.

[0028] Several liquid substances may also be mixed with the water to produce a particular drink simply by the simultaneous opening of the respective solenoid valves 55.

[0029] Naturally, the vending machine can also supply solely non-carbonated or carbonated water by the opening of the solenoid valve 46 or the solenoid valve

50 with the solenoid valves 55 kept closed.

[0030] The automatic vending machine 10 described and illustrated solves all of the problems of the known vending machines described in the introduction.

[0031] There is no need to transport and store drinks or water since they are not packaged beforehand but are produced on the spot.

[0032] Loading involves only the bottles which, however, do not have to be replaced frequently since they contain concentrated liquid substances which are used in very small measures for each drink.

[0033] Since there are no packaged drinks or mineral waters in the vending machine 10 a large space is not required for housing them therein. Space is required for the bottles but, as stated above, these have a high output in comparison with the space which they occupy.

[0034] The drink or mineral water obtained from the vending machine 10 is fresh since it is produced on the spot. If mineral salts are added, the water has the characteristics of artificial mineral water.

[0035] Moreover, the vending machine 10 has further advantages.

[0036] The bottles 52 are easy to replace. With reference to Figure 4, for this operation, it is necessary to loosen the couplings 68, to incline the support structure 53 forwards, to extract the bottles 52 from the holes 63 and 64 by removing the pipes 54 through the passages 65 and 66, to disconnect the pipes 54 from the bottles and then to proceed in reverse in order to load the new bottles. The connection of the pipe 54 to the bottle 52 by means of the needle 70 which perforates the membrane 71 makes the operation even easier. The pipe 54 can be replaced upon each loading operation.

[0037] The control unit 78 converses with the transponder 57 of each bottle 52, sending interrogation signals to the transponder and receiving response signals therefrom by means of the antenna 59. This provides various useful items of data regarding the bottle. First of all, the control unit 78 recognizes, by checking a suitable code contained in the transponder, if it is an original bottle and if not, for example, locks the vending machine. Moreover, the control unit 78 picks up data relating to the type of liquid substance contained in the bottle in order to supply it when requested, data relating to the capacity of the bottle in order to indicate when the bottle is empty on the basis of consumption, data relating to the use-by date, in order to indicate that the bottle should be replaced, etc.

[0038] Naturally, variants and/or additions to the above-described embodiment are possible.

[0039] The water may be purified by other devices arranged differently from those illustrated.

[0040] The storage device may also be constructed differently from that shown. Amongst other things, two separate storage tanks may be considered, instead of a single device. The system for adding carbon dioxide to the water may differ from that shown.

[0041] The structure for supporting the bottles may

also vary both structurally and functionally, provided that it permits convenient loading of the bottles.

[0042] Another type of container with a quick coupling may be used instead of the bottles with quick coupling of the pipe by means of a needle.

[0043] Moreover, instead of the manifold pipe, separate pipes may be used for the non-carbonated water, for the carbonated water and for the liquid substances, all of the pipes converging towards the cup where the mixing of the water with the liquid substances takes place.

[0044] It should, however, be stressed that, as stated above, the vending machine described and illustrated has been found advantageous with regard to the particular solutions adopted, as well as with regard to the general solution.

[0045] Water may also be drawn from other external supplies such as large tanks, wells, etc., instead of from the water mains.

Claims

1. An automatic drinks vending machine (10) comprising:

- means (12, 16) for drawing water from an external water supply,
- means (15, 18, 20) for purifying the water drawn,
- one or more containers (52) containing consumable liquid substances to be mixed with the water,
- means (46, 48, 50, 55, 76) for conveying the water drawn and purified and the liquid substances held in the containers (52) towards a drink dispensing outlet (77) in a controlled manner,
- an electronic control unit (78) which is connected to the drawing means (12, 16) and the conveying means (46, 48, 50, 55, 76) and which, upon an external command, arranges for the supply of the purified water and of one or more liquid substances so as to provide a drink constituted by a mixture of purified water and one or more liquid substances.

2. A drinks vending machine according to Claim 1, in which the means for drawing water comprise a connector (12) for connection to the external supply and a pump (16) connected to the control unit (78) for drawing the water through the connector (12).

3. A drinks vending machine according to Claim 1 or Claim 2, in which the means for purifying the water drawn comprise at least one filter (14; 18) and one sterilizer (20).

4. A drinks vending machine according to Claim 3, in

which there is a filter (14) for coarse filtration of the water and a filter (18) for fine filtration of the water.

5. A drinks vending machine according to any one of the preceding claims, in which a purified-water storage tank (23), filled and cooled in a manner controlled by the control unit (78), is interposed between the purifying means (14, 18, 20) and the conveying means (46, 48, 50, 55, 76).

6. A drinks vending machine according to Claim 5, in which a further purified-water storage tank (24), filled and cooled in a manner controlled by the control unit (78), is interposed between the purification means (14, 18, 20) and the conveying means (46, 48, 50, 55, 76) and is supplied, in controlled manner, with carbon dioxide coming from a container (38) in order to carbonate the water.

7. A drinks vending machine according to any one of the preceding claims, in which the conveying means comprise a manifold (48) communicating with the outlet of the vending machine, first valve means (46, 50) which allow water to flow into the manifold (48) under the control of the control unit (78), and second valve means (55) which allow one or more liquid substances to flow from the respective bottles (52) into the manifold (48) upon command by the control unit (78) so that the mixture of purified water and of one or more liquid substances is formed in the manifold (48).

8. A drinks vending machine according to Claim 7 when it is dependent on Claim 6, in which the first valve means (46, 50) allow non-carbonated water or carbonated water to flow into the manifold (48) from the respective tanks (23, 24).

9. A drinks vending machine according to any one of the preceding claims, in which the liquid substances are supplied from the respective bottles (52) to the conveying means by gravity.

10. A drinks vending machine according to any one of the preceding claims, in which each bottle (52) is connected to the conveying means by a respective pipe (54) which is engaged in the bottle by means of a needle (70) which pierces a membrane (71) sealing the bottle (52).

11. A drinks vending machine according to Claim 7 or Claim 8, in which, during the dispensing operation, the second valve means (55) are closed before the first valve means (46, 50) are opened.

12. A drinks vending machine according to Claim 9 when it is dependent on Claim 7 or Claim 8, in which each bottle (52) is connected to the manifold

(48) by means of a respective pipe (56.1) which is connected so as to be inclined in the direction of the flow of water in the manifold (48), relative to an axis of the water-flow.

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13. A drinks vending machine according to any one of the preceding claims, in which each bottle (52) is replaceable and comprises bottle-identification means (57) which can be read by the control unit (78).

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14. A drinks vending machine according to Claim 13, in which the identification means comprise a transponder (57) fixed to the bottle (52) and communicating with the control unit (78) by means of an antenna (59) disposed in the vicinity of the transponder (57).

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15. A drinks vending machine according to Claim 5 or Claim 6, in which there are sensor means (44) for detecting the temperature of the tank (23) or of the tanks (23, 24) containing water and further sensor means (79) for detecting the temperature outside the vending machine, the control unit (78) being connected to the sensor means (44, 79) in order to keep the tank (23) or the tanks (23, 24) at a predetermined temperature dependent on the temperature outside the vending machine.

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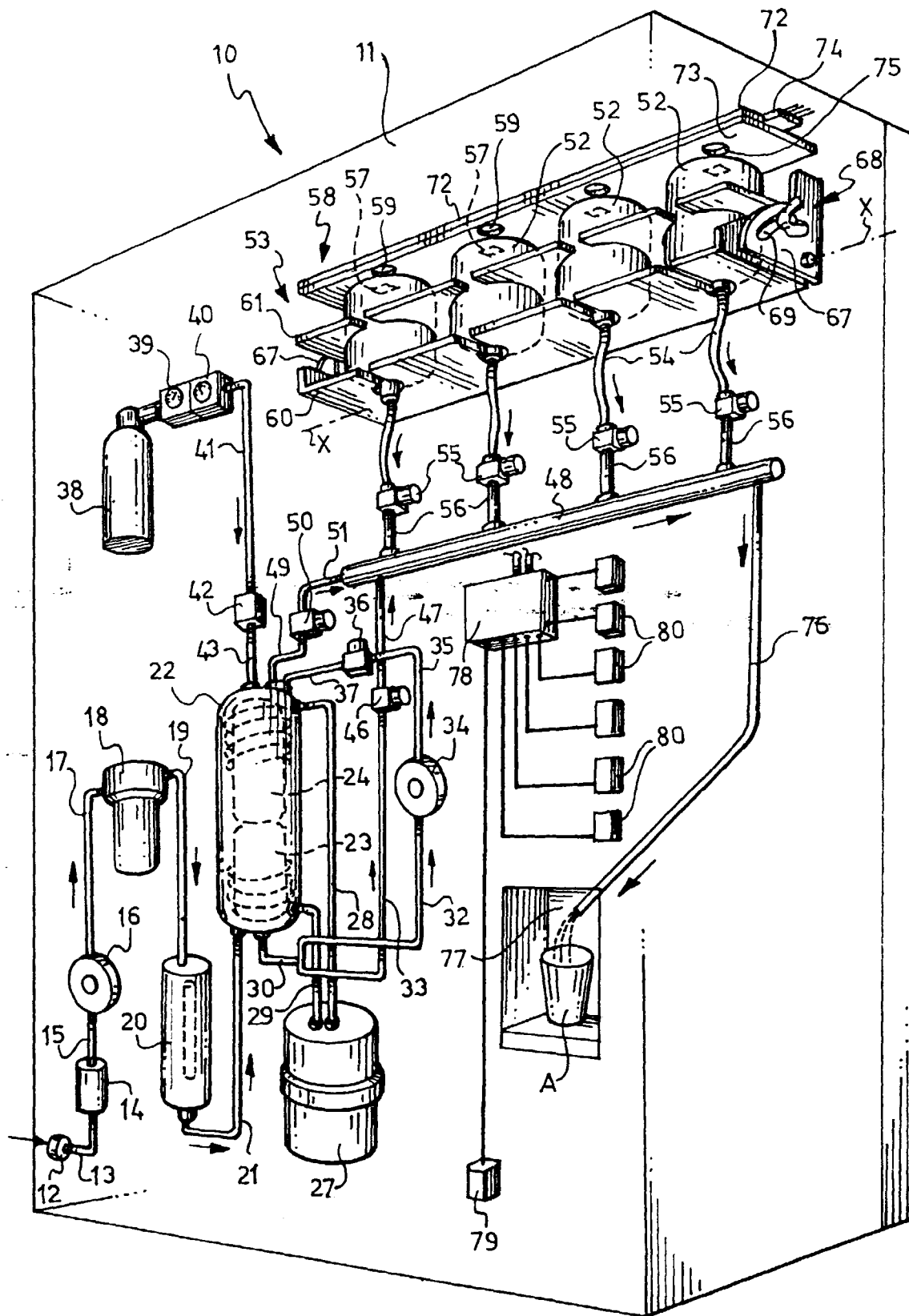


FIG.1

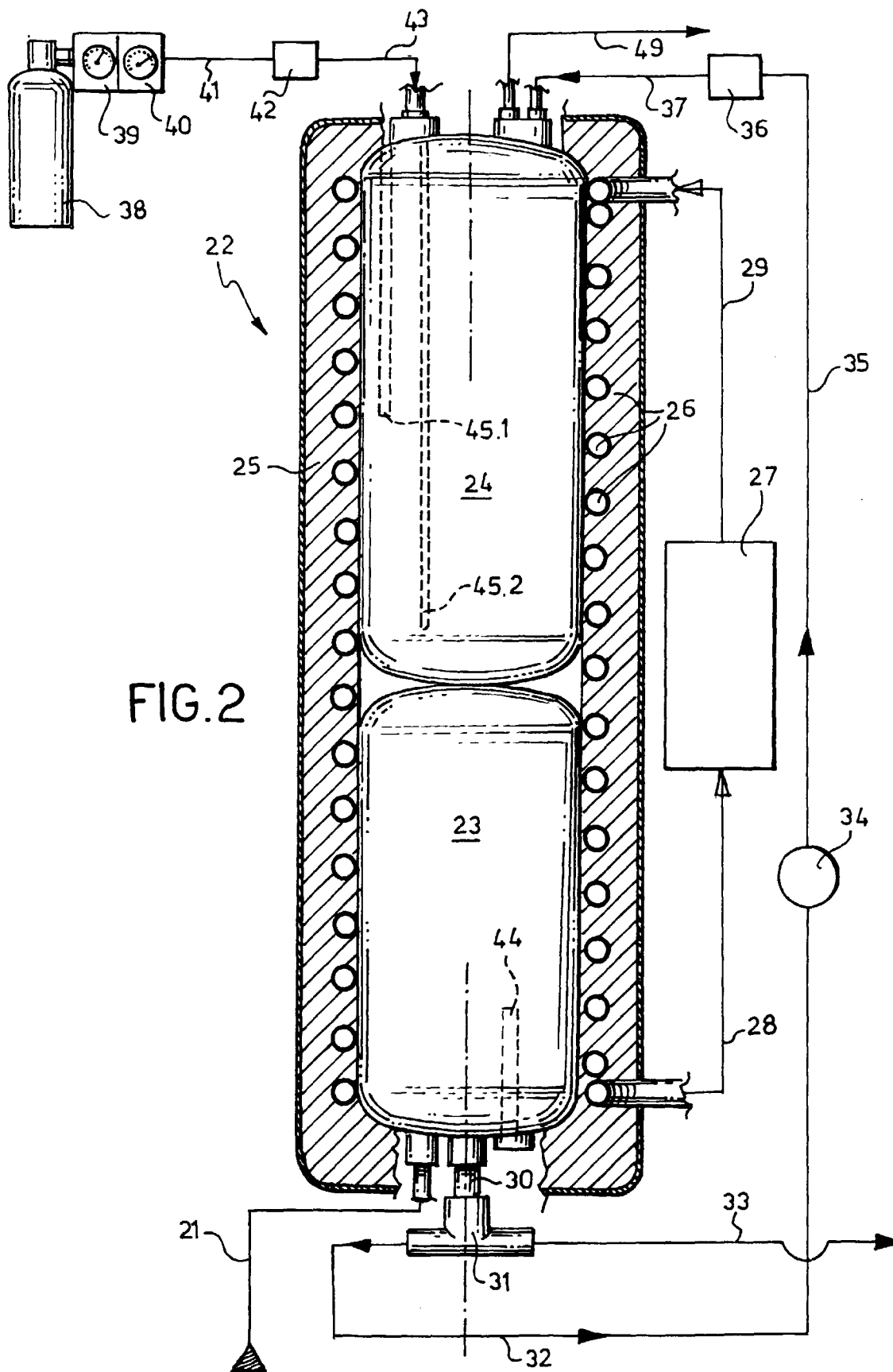


FIG. 2

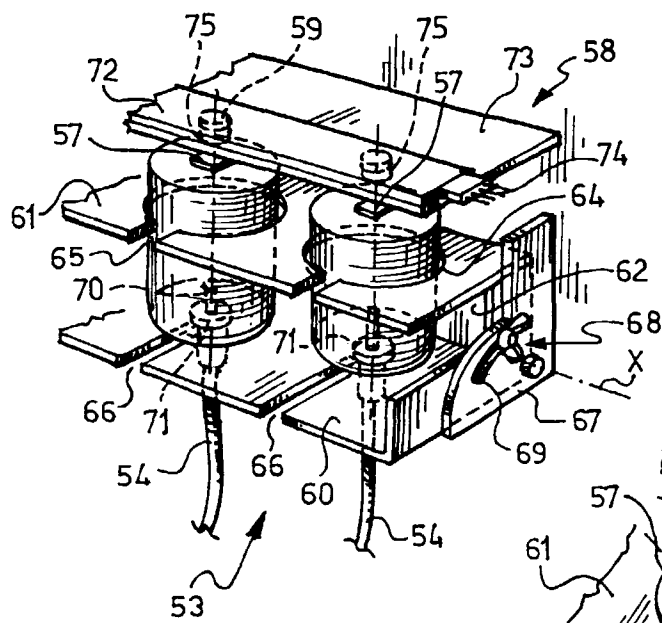


FIG. 3

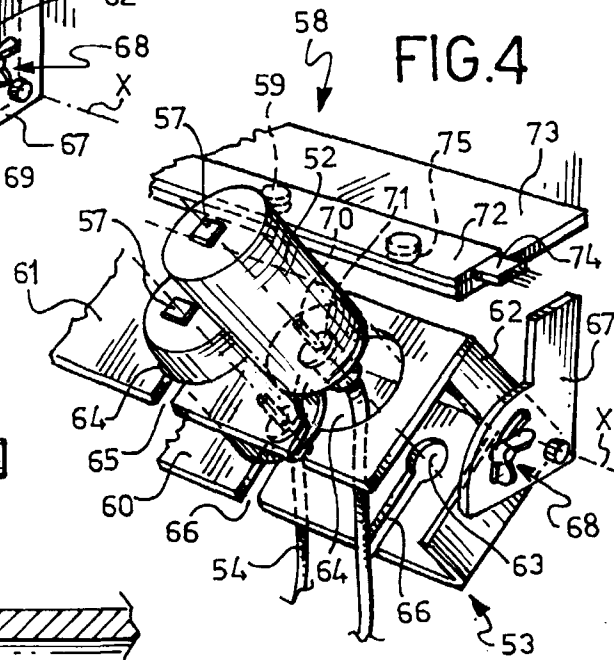


FIG. 4

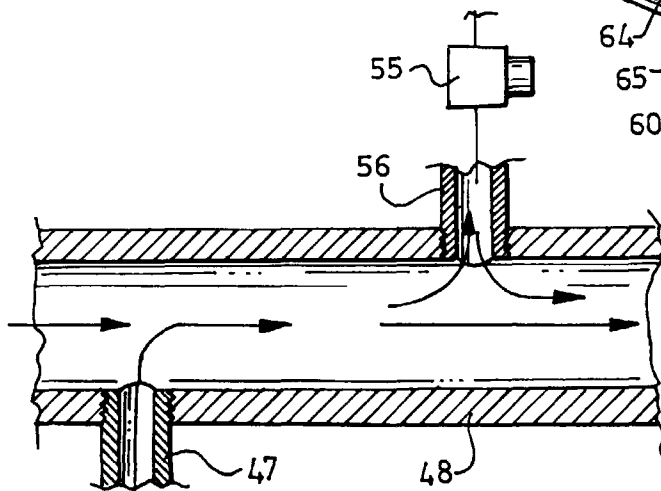


FIG. 5

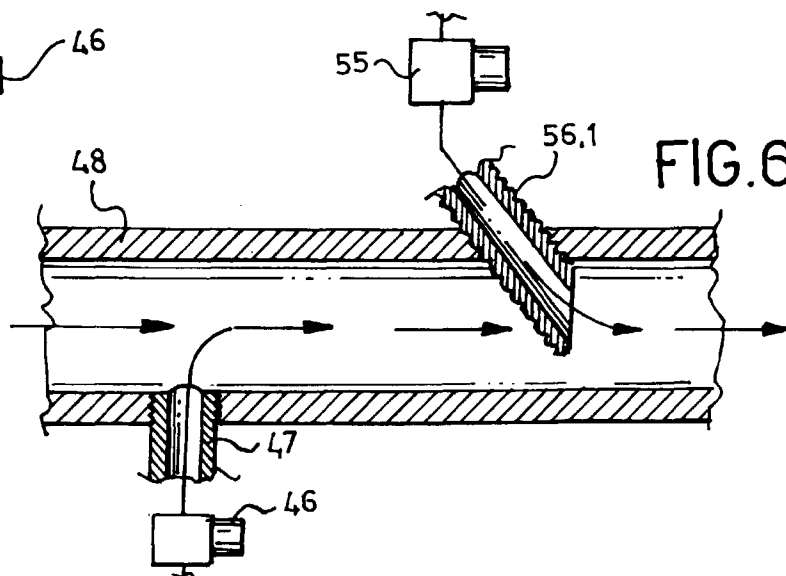


FIG. 6



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Application Number
EP 98 83 0190

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X A	WO 90 05348 A (COCA COLA CO) 17 May 1990 * page 3, line 23 - page 5, line 10 * * page 8, line 1 - page 10, line 12 * * page 13, line 28 - page 14, line 19 * * figures 1-7 * ---	1 2,6	C07F1/00 G07F13/06
A	EP 0 651 358 A (ZANDER GMBH GES FUER UMWELT UN) 3 May 1995 * abstract * * column 3, line 14 - column 4, line 20 * * column 6, line 44 - column 8, line 16 * * figures 1-3 * ---	1-3,5,6, 9,12	
A	EP 0 676 730 A (FUJI ELECTRIC CO LTD) 11 October 1995 * abstract * * column 1 - column 2 * * figure 1 * ---	1,2,6,15	
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A	GB 2 160 503 A (SANDEN CORP) 24 December 1985 * page 1, line 58 - page 2, line 17 * ---	1,2,6,15	
A	US 5 350 082 A (KIRIAKIDES JR ALEX ET AL) 27 September 1994 -----		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 September 1998	Examiner Bocage, S
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