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FLUID DISPENSING APPARATUS

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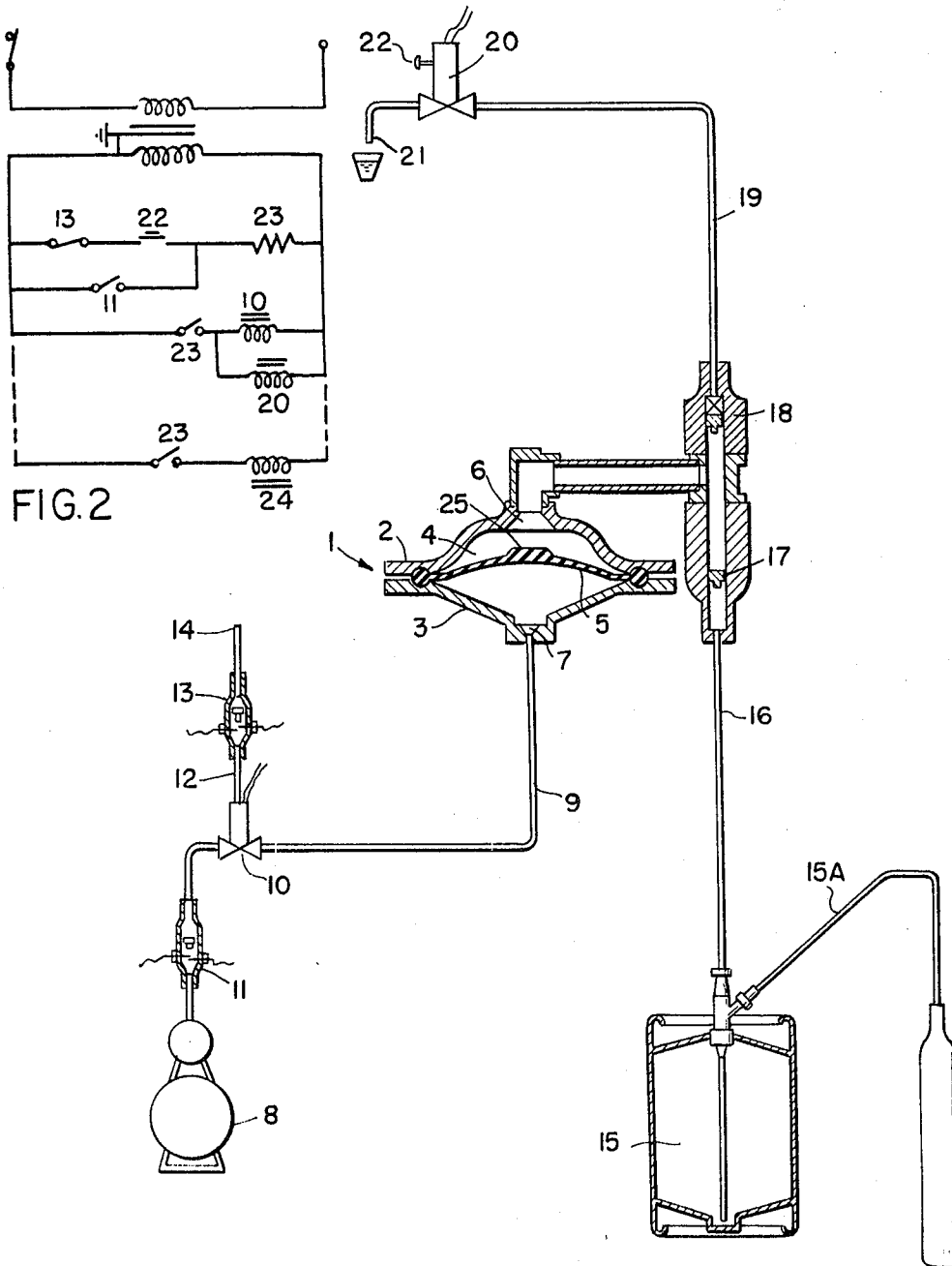


FIG. 1

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FLUID DISPENSING APPARATUS

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5 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for dispensing beer and similar liquids comprising a diaphragm pump and various switches and valves to ensure the delivery of measured quantities of the beer or liquid as required.

This invention relates to dispensing apparatus, more particularly to apparatus for the dispensing of liquids including carbonated liquids for example beer.

It is already known to dispense liquids, by means which include piston-operated or diaphragm pumps.

It is an object of the present invention to provide apparatus for dispensing liquids which provides various improvements over that already known.

Accordingly, the present invention provides apparatus for dispensing a liquid, hereinafter called "beer," which comprises a diaphragm pump, fitted with

- (a) a beer supply pipe having a beer inlet nonreturn valve and
- (b) a beer dispensing pipe fitted with a nonreturn outlet valve, a beer dispensing valve and a dispensing control device,
- (c) a pipe for supplying a fluid hereinafter referred to as "air" to operate the diaphragm, fitted with an air control valve, a high speed exhaust valve and a flow-operated electromagnetic switch and

electric circuitry connecting the switches and valves in such a way that when the pump is full of beer and the dispensing control switch is operated, a predetermined volume of beer is dispensed.

The diaphragm pump used in the apparatus of this invention comprises two dished plates with a diaphragm between them. The beaded perimeter of the diaphragm is gripped by peripheral flanges in the dished plates but the central part is freely movable between the two dished plates. The diaphragm provides an effective seal for the joint between the plates at their perimeters. It is preferably designed so that the part which receives beer is the upper part and is provided with a common inlet and outlet port for the beer while the part which receives the air is the lower part. This is preferably also provided with a single port through which the air can be introduced to exert pressure on the diaphragm and expel the beer. This port can also be used for the discharge of the air from the pump after the beer discharge stroke. If desired, however, a second port could be provided for this purpose and this could also be controlled by means of, for instance, a solenoid valve. It has been found that if the neck of the common inlet and outlet port is widened so that its diameter is greater than that of the beer dispensing pipe a better response is obtained at the end of the dispensing cycle, when the pre-determined quantity of beer has been displaced from the pump. To assist this quick shut off from the constant velocity condition that exists during the beer discharge stroke the diaphragm is provided with a pad or thickened portion at that part of

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it which corresponds with the widened neck. This is a preferred feature of the invention. If desired a volumetric adjustment device can be incorporated in the pump, for example secured to the bottom diaphragm plate or the underside of the diaphragm. This device may be a disc perforated with a number of concentric rings and having a central hole. This stroke of the diaphragm then depends on the number of rings in the disc and so can be varied as desired.

The material used for the construction of the dished plates may be of ferrous or non-ferrous type, for example aluminum. The surfaces in contact with the beer or liquid being dispensed are suitably coated with an epoxy resin or nickel tin plating. Plastic diaphragm plates may also be used.

The beer supply pipe preferably has a fairly large bore for example $\frac{5}{8}$ inch internal diameter to permit rapid filling of the pump after each cycle. It can be fitted if desired with a branch connection for cleaning purposes.

The beer dispensing pipe, however, is preferably of a smaller bore for example $\frac{1}{4}$ inch internal diameter. This provides a high rate of flow through the pipe which ensures self-cleansing of the pipe and the avoidance of the collection of sediment in the apparatus. The beer dispensing valve and dispensing control device is conveniently located at the bar or other dispensing point. They can be manual, electric or pneumatic. The dispensing control device is preferably a press button switch which on pressing closes an electric circuit.

The flow-operated switch in the air supply pipe may be any device which will actuate an electrical circuit when the rate of flow of air through it reaches a certain value. A preferred device comprises a valve body of non-magnetic material through which the air can pass, at least one magnetic reed switch mounted adjacent to the valve body and a non-return valve with a magnetic core which actuates the switch when the valve is adjacent to it. The valve is, however, responsive to the flow of air through the pipe and when it is thereby caused to move away from the switch, the circuit is broken.

The high speed exhaust valve may be incorporated in the air control valve for instance as a three-way solenoid-operated valve which when open supplies air to the pump, but when closed cuts off the air and provides a vent to the atmosphere for the air in the pump. It is preferred, however, to have a high speed exhaust valve close to the air inlet of the pump in order to remove air from the pump chamber in the quickest possible time, thereby ensuring rapid refilling of the pump with beer. A convenient high speed exhaust valve depends on pressure differences in the pipe and only operates when such a difference exists, i.e. in the apparatus of the invention when the air flow is cut off.

The circuitry connects the switches and valves in such a way that when the dispensing control device is operated the valves in the air supply pipe and the beer dispensing pipe are opened, whereupon the flow of air through the electromagnetic switch in the air supply pipe into the pump forces the diaphragm across the chamber and so displaces beer through the outlet port and the beer dispensing valve which has been simultaneously opened. When the pump chamber is empty, air ceases to flow, so that the switch in the air supply pipe opens the circuit and the valves in the air supply pipe and the beer dispensing pipe are closed and the air vent is opened so that the air in the pump is vented to the atmosphere under the pressure of the beer which flows into the pump from the beer container and so fills the pump with beer ready for another cycle.

The beer is maintained in a reservoir at a sufficient pressure to cause it to enter and fill the dispensing cham-

ber when the vent is open. The reservoir can be refrigerated if desired.

The invention further comprises means whereby the sequence of operations causing beer to be dispensed can only be commenced when the dispensing chamber of the pump is full of beer. This is achieved by placing a second switch of the type hereinbefore described before the air escape vent. This switch is so arranged as to prevent completion of the electrical circuit initiating the dispensing sequence of operations whilst air is passing through the switch. As soon as the air ceases to flow, that is to say when the dispensing chamber is full of beer, the switch returns to its rest position and permits the electrical circuit to be completed.

The drawing accompanying the provisional specification illustrates one embodiment of the invention.

FIGURE 1 is a representation of apparatus suitable for dispensing beer.

FIGURE 2 gives the electrical circuit of the apparatus.

In FIGURE 1 is shown a diaphragm pump 1 consisting of two dished pieces of metal 2 and 3 fitted together to form a dispensing chamber 4 across which is situated a flexible diaphragm 5 which is provided with a pad or thickened portion 25 and which is provided with beer port 6 and an air port 7. Air is fed to the dispensing chamber 4 from a pressurised store 8 by means of the pipe 9 in which is situated a solenoid valve 10 and a flow-operated switch 11. Built into solenoid valve 10 is an escape pipe 12 which passes through a second flow-operated switch 13 to vent 14. Solenoid valve 10 either permits air to flow from the pressurised source 8 and closes escape pipe 12 or shuts off the air supply and opens the escape pipe.

Beer is stored in a reservoir 15 at 3-5 p.s.i., pressure applied by for instance carbon dioxide through line 15a. It is fed to the dispensing chamber 4 by means of pipe 16 which passes through a non-return valve 17 to the beer port 6.

Beer is expelled from the dispensing chamber 4 through port 6, through a non-return valve 18, and by means of pipe 19 to a solenoid valve 20 and finally to a dispensing point 21.

In FIGURE 2 is shown the electrical circuit for the apparatus just described. A push-button switch 22, a relay 23 and an optional dispensing counter 24 are shown in addition to the features already described.

Before a dispensing cycle is initiated the dispensing chamber 4 is full of beer; that is to say the flexible diaphragm 5 is in the position shown in FIGURE 1, the solenoid valves 10 and 20 are closed, switch 11 is open and switch 13 is closed. The dispensing cycle is initiated by depressing push button switch 22 which energizes relay 23 which in turn energizes and opens solenoid valves 10 and 20. The opening of solenoid valve 10 permits air to flow through switch 11 thereby closing said switch and maintaining the system in operation. The flow of air under pressure through port 7 acts on the reverse side of the diaphragm 5 forcing the contents of the dispensing chamber through port 6, through non-return valve 18, through solenoid valve 20 to the dispensing point 21. As soon as the diaphragm completes its stroke no further air passes into the dispensing chamber and flow of air through switch 11 ceases, causing it to revert back to its open position. Relay 23 and solenoid valves 10 and 20 are de-energised which has the effect of closing said valves, the closing valve 10 causing

escape pipe 12 to be opened. Air is then forced through vent 14 via pipes 9 and 12 from the dispensing chamber 4 under the pressure of beer acting on the other side of the diaphragm. The venting of air through switch 13 opens the switch and prevents initiation of the dispensing cycle until the flow of air ceases when the dispensing chamber is full of beer, whereupon the switch 13 reverts back to its closed position. The apparatus is then ready for a further dispensing cycle. Besides the dispense cycle counter 24 a continuous cycling device for cleaning purposes could also be included in the system if desired.

We claim:

1. Apparatus for dispensing a liquid which comprises a diaphragm pump, fitted with

- (a) a liquid supply pipe having a liquid inlet non-return valve,
- (b) a liquid dispensing pipe fitted with a non-return outlet valve, an electrically operated liquid dispensing valve and a dispensing control switch,
- (c) a pipe for supplying a fluid to operate the diaphragm, fitted with an electrically operated fluid control valve and a fluid flow-operated electromagnetic switch and electric circuitry connecting the switches and valves, whereby when the pump is full of liquid and the dispensing control switch is operated, the circuit is closed, causing the fluid supply valve and the liquid dispensing valve to open and the fluid exhaust valve to close, whereupon fluid flows into the pump and drives liquid out until the pump is empty of liquid, the fluid ceases to flow so that the electromagnetic switch opens the circuit which shuts off the fluid supply and closes the liquid dispensing valve, but the fluid exhaust valve opens so that liquid flows into the pump under pressure from the liquid container until the pump is full again and ready for a further dispensing cycle.

2. Apparatus as claimed in claim 1 wherein a fluid exhaust pipe is connected into the fluid supply pipe and an electro-magnetic fluid flow-operated switch is fitted in the fluid exhaust pipe, the switch is electrically connected into the circuitry so that as long as fluid is flowing, the switch is open and liquid cannot be dispensed.

3. Apparatus as claimed in claim 1 wherein the diaphragm pump has a common inlet and outlet valve for the liquid.

4. Apparatus as claimed in claim 1 wherein the outlet port of the pump is of greater diameter than the liquid dispensing pipe and the diaphragm has a pad or thickened portion at that part of it which corresponds with the port.

5. Apparatus as claimed in claim 1 wherein the flow-operated electrical switch is a magnetic reed switch.

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