Dec. 27, 1955 A. W. BOWSER 2,728,196

VOLATILE LIQUID DISPENSING SYSTEM

Filed Nov. 26, 1954 2 Sheets-Sheet 1

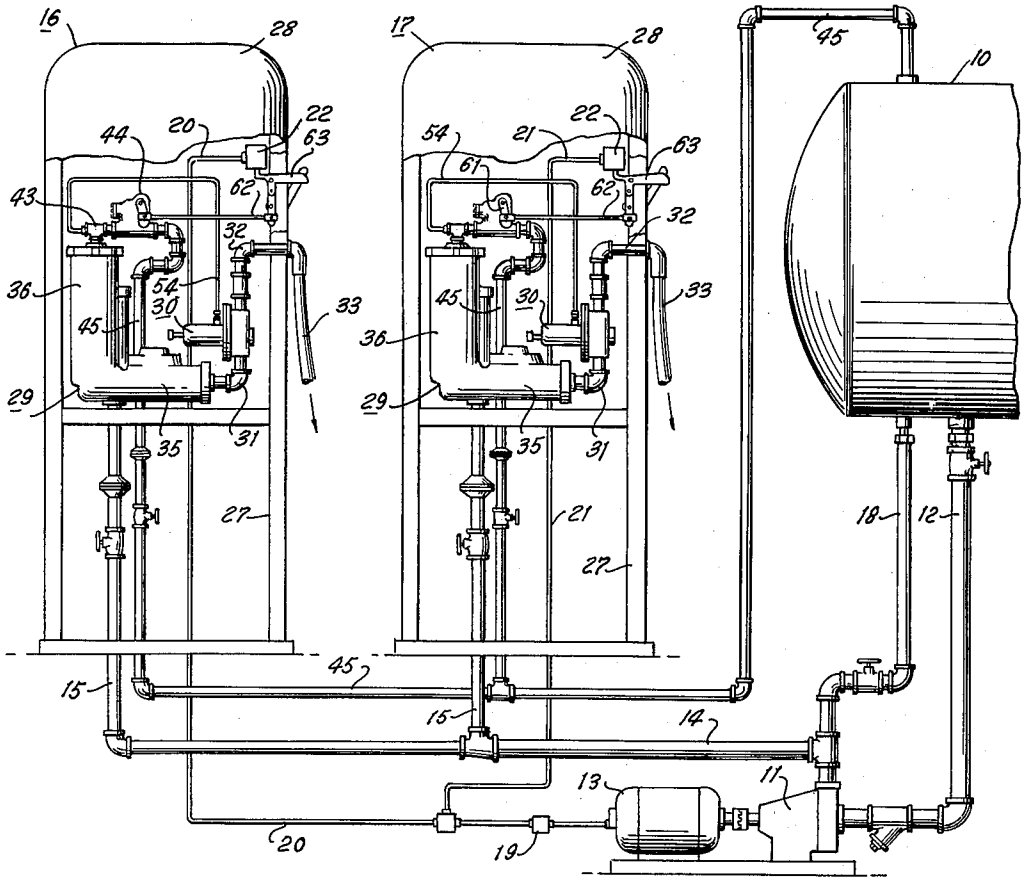


Fig. 1

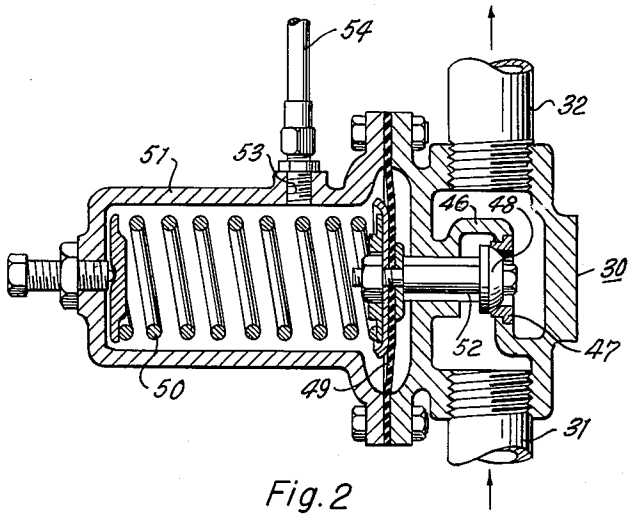


Fig. 2

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VOLATILE LIQUID DISPENSING SYSTEM

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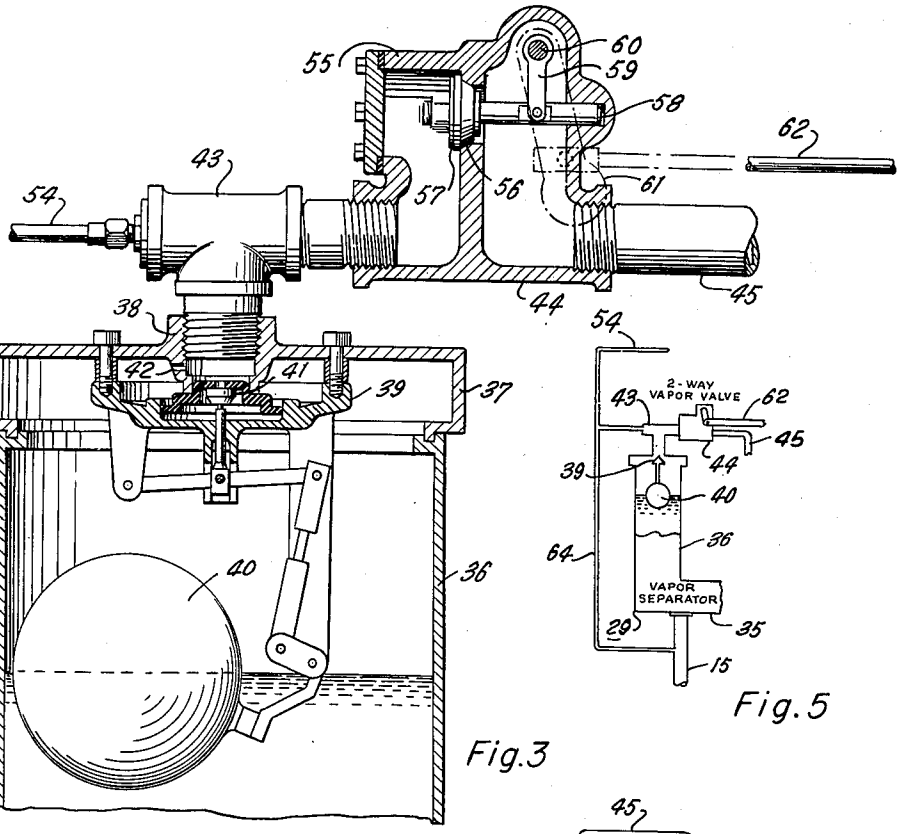


Fig. 3

Fig. 5

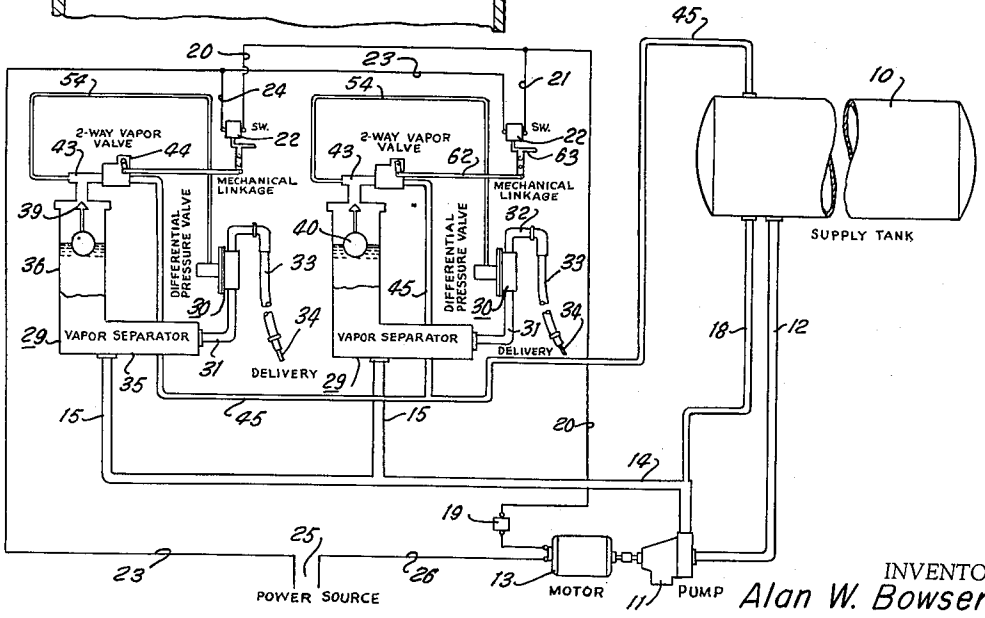


Fig. 4

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VOLATILE LIQUID DISPENSING SYSTEM

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7 Claims. (Cl. 62—1)

This invention relates to new and useful improvements in systems for dispensing volatile liquids.

Dispensing systems for volatile liquids, such as liquified petroleum gas which includes butane, propane and mixtures thereof, are comprised of one or more dispensing means communicating with a common supply tank and having vapor separating means for preventing the delivery of vapor and a pressure differential valve for preventing the vaporization of the volatile liquid during delivery. When two or more dispensing means are employed, it has been customary to provide a common pump for the same whereby the delivery hose of each dispensing means is constantly subjected to the pressure of the pump and the volatile liquid is prevented from escaping only by a valve, such as the manual valve at the hose nozzle, provided for each dispensing means. Manifestly, this arrangement is dangerous and safety requirements necessitate the use of separate pumps for each dispensing means.

Therefore, one object of the invention is to provide an improved system for dispensing volatile liquids of such construction that a single pump may be utilized for two or more dispensing means without subjecting the delivery hose of an inactive dispensing means to the pressure of the pump.

An important object of the invention is to provide an improved volatile liquid dispensing system having two or more dispensing means and a common pump wherein the pressure differential valve of each dispensing means is prevented from opening when the dispensing means is inactive whereby the pressure of the pump is not exerted upon the delivery hose of said means.

A particular object of the invention is to provide an improved dispensing system, of the character described, wherein each dispensing means includes a vapor return line extending between its vapor separating means and pressure differential valve and communicating with the supply tank, and means for shutting off communication with said supply tank upon the dispensing means being rendered inactive whereby the pressure differential valve is subjected to and held closed by the pressure of the fluid.

Another object of the invention is to provide an improved dispensing system, of the character described, wherein each dispensing means includes means for controlling the operation of the pump and having connection with a valve for controlling the return flow of vapor from the vapor separating means and pressure differential valve to the supply tank whereby the control valve is closed to shut off the vapor return flow to said supply tank upon actuation of the control means to stop operation of said pump.

A construction designed to carry out the invention will be hereinafter described, together with other features of the invention.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings, wherein an example of the invention is shown, and wherein:

Fig. 1 is a side elevational view, partly in section, of a dispensing system embodying the principles of the invention,

Fig. 2 is a transverse, vertical, sectional view of the pressure differential valve of one of the dispensers,

Fig. 3 is a transverse, vertical, sectional view of the vapor control valve and the vapor release valve of one of the dispensers,

Fig. 4 is a diagrammatic view of the dispensing system, and

Fig. 5 is a diagrammatic view of a portion of a modified system.

In the drawings, the numeral **10** designates the storage or supply tank of a system for dispensing volatile liquids, such as liquified petroleum gas which includes butane, propane and mixtures thereof, which tank may be above ground or underground. A suitable pump **11** is connected to the lower portion of the tank by an intake pipe or conductor **12** and is adapted to be driven by an electric motor **13**. The discharge side of the pump is connected to an outlet pipe or conductor **14** having two or more branch pipes or conductors **15** leading to two or more dispensers **16** and **17**, and a return pipe or conductor **18** extends between the outlet pipe and the lower portion of the tank **10**. A conventional starter **19** is provided for the motor and is electrically connected by leads **20** and **21** to a manual switch **22** forming a part of each dispenser **16** and **17**. As shown in Fig. 4, leads **23** and **24** connect the switches to a power source **25** which is connected by a lead **26** to the starter to complete the electrical circuit. Since the switches **22** are connected in parallel, the circuit is completed and the starter **19** activated upon closing of either switch.

The dispensers may be identical and each includes an upright frame **27** having a housing or casing **28** of the usual construction. A vapor trap or separator **29** is connected to each branch pipe **15** and has a pressure differential valve **30** communicating with its liquid outlet by means of pipe fittings **31**, such as an elbow and nipples. The outlet of the valve **30** is connected by similar fittings **32** to a delivery hose **33** having a conventional nozzle **34** (Fig. 4). As is well known, the separator **29** is adapted to prevent the dispensing of vapor and includes an angular or L-shaped housing **35** having an upstanding portion **36** for the accumulation of vapor above liquid trapped in the housing (Fig. 3). A cap **37** closes the upper end of the housing portion **36** and has an axial, flanged, vapor outlet or collar **38** forming an inwardly-directed valve seat for coacting with a valve release valve **39** mounted in said housing portion and actuated by a float **40**. The valve is conventional and includes a pilot valve **41** to facilitate opening thereof when the liquid level falls below a predetermined point. A vent opening **42** is formed in the internal portion of the collar **38** in communication with the vapor space of the valve housing to permit a constant bleeding or escape of vapor from said housing. Pipe fittings **43**, including a T and nipples, connect the vapor outlet or collar to a control valve **44** which is connected to a vapor return line or pipe **45** extending to the upper portion of the tank **10**, whereby the vapor may flow from the vapor release valve to the vapor space of said tank upon opening of the valve member **39** and the control valve.

The pressure differential valve **30** is adapted to maintain a constant differential between the pressure of the liquid being dispensed and the pressure of the vapor in the tank and is of conventional construction which includes a housing **46** having a valve seat **47** for coacting with a valve element **48** actuated by an overlying, flexible diaphragm **49** and held in engagement with the seat by a coiled spring **50** which is confined with a dia-

phragm housing 51 above the diaphragm (Fig. 2). A longitudinally-fluted stem 52 connects the valve element 42 to the diaphragm 49 whereby the underside of said diaphragm is exposed to the pressure of the volatile liquid or liquefied gas for opening the valve against the force of the spring. The diaphragm housing 51 has an opening 53 for connection with one end of a vapor line or tube 54 having its other end connected to the T 43. Due to the provision of the vent opening 42, the upper side of the diaphragm is constantly exposed to the pressure of the vapor and said vapor pressure coacts with the spring 50 to hold the valve element seated except when the control valve 44 is open to permit said vapor to flow through the return pipe 45 to the tank. Upon opening of the vapor release valve when the control valve is closed, the vapor is directed to the upper side of the diaphragm to hold the pressure differential valve closed. The pressure of the vapor acting upon the diaphragm is substantially equal to the pressure of the liquid since said vapor is subjected to the pressure of the pump by means of the vapor release valve and its vent. Of course, opening of the control valve relieves the vapor pressure and permits the liquid pressure to open the pressure differential valve.

The control valve 44 is adapted to be opened and closed by closing and opening of the electrical switch 21 and includes a housing 55 having a valve seat 56 and a coacting valve disk or head 57 carried by a stem 58 reciprocally mounted in the housing. An arm or lever 59 connects the valve stem to a rock shaft 60 journaled in the housing 55 and having one end projecting externally therefrom with a crank arm 61 mounted thereon. The latter is pivotally attached to one end of a link or rod 62 having its other end pivotally fastened to one arm of an angular lever or bell crank 63 pivotally mounted on the frame 27 adjacent the switch 21 for actuating said switch. Upon opening of the switch by counter-clockwise movement of the lever 63 to open the circuit to the motor 13 and its starter 19, the link 62 swings the arm 61 to turn the rock shaft 60 and pivot the lever 59 in the same direction for reciprocating the valve stem 58 and moving the valve head 57 into engagement with the seat 56. Thus, the control valve is closed when the switch is opened to prevent the flow of vapor through the return pipe 45 and the pressure of said vapor is exerted upon the upper side of the diaphragm 49 to hold the pressure differential valve 30 closed in coaction with the spring 50 and prevent the delivery hose 33 from being subjected to the pressure of the pump 11. As has been explained, the underside of the diaphragm is subjected to the pressure of the liquid when the motor 13 and its starter 19 are actuated by closing the switch of the other dispenser and said liquid pressure is equalized or offset by the vapor pressure whereby the valve element 48 is maintained seated by the force of the spring. Conversely, upon closing of the switch to close the circuit to the motor and its starter for operating the pump, the linkage opens the valve 44 to relieve the pressure of the vapor and permit the flow of said vapor through the return pipe to the tank. Manifestly, the pressure of the liquid readily overcomes the force of the spring and raises the valve element from its seat 47 when there is insufficient vapor pressure to offset or equalize said liquid pressure. Due to the control valve and its operation by the switch, the pressure differential valve 30 of one dispenser is prevented from being opened by the pressure of the liquid when the pump is operated by the closing of the switch of the other dispenser and said pressure differential valve may be opened by said liquid pressure only when the switch of its dispenser is closed.

A slightly modified system is shown in Fig. 5 and includes all of the elements of the system described hereinbefore with the exception of the vent opening 42 of the collar 38. For constantly applying the pump pressure to the upper side of the diaphragm 49 of each pressure differential valve 30, a bypass line or tube 64 extends from each branch pipe 15 of the outlet pipe 14 to the vapor line 54 of each of the dispensers 16 and 17. Since the bypass line is connected to the vapor line between the pressure differential valve and the control valve 44, any fluid or pump pressure exerted upon the underside of the diaphragm is also exerted upon the top side of said diaphragm to hold said pressure differential valve closed when said control valve is closed. Upon opening of the control valve, the fluid delivered to the vapor return line 54 is returned to the tank 10 by the line 45.

The foregoing description of the invention is explanatory thereof and various changes in the size, shape and materials, as well as in the details of the illustrated construction may be made, within the scope of the appended claims, without departing from the spirit of the invention.

What I claim and desire to secure by Letters Patent is:

1. In a volatile liquid dispensing system; a liquid storage tank; two or more dispensing means; a pump for supplying liquid from the tank to the dispensing means; a motor for operating the pump; each dispensing means including an electrical switch for controlling actuation of the motor independently of the switch of the other dispensing means, pressure responsive means for maintaining a constant differential between the pressure of the liquid being dispensed and the vapor pressure in said tank, vapor separating means connected between said pump and pressure responsive means and having an inlet and liquid and vapor outlets, said tank and pressure responsive means having vapor spaces communicating with each other and with the vapor outlet, and means actuated by the switch for shutting off communication between said vapor outlet and the vapor space of the tank to direct the vapor from the separating means to the vapor space of said pressure responsive means to prevent actuation thereof by the pressure of the pump.

2. In a volatile liquid dispensing system as set forth in claim 1 wherein the switch actuated means shuts off communication between the vapor spaces of the tank and pressure responsive means.

3. In a volatile liquid dispensing system, a liquid storage tank; two or more dispensers; a pump for supplying liquid from the tank to the dispensers; means for driving the pump; each dispenser including means controlling operation of the pump driving means independently of the control means of the other dispenser, a pressure differential valve for maintaining a constant differential between the pressure of the liquid being dispensed and the vapor pressure in said tank, vapor separating means between said pump and valve, a vapor line connecting said tank, valve and vapor separating means, and a valve actuated by the control means and connected in the vapor line for shutting off communication of the pressure differential valve and vapor separating means with said tank to prevent opening of the pressure differential valve.

4. In a volatile liquid dispensing system as set forth in claim 3 wherein the pressure differential valve includes pressure responsive means exposed to the pressures of the liquid supplied by the pump and the vapor in the vapor line so as to be actuated by the differential therebetween, and means coacting with the vapor pressure for holding said valve closed.

5. In a volatile liquid dispensing system as set forth in claim 4 wherein the pressure responsive means is constantly exposed to the pressure of the vapor in the vapor line and vapor separating means whereby said vapor pressure is substantially equalized with the pressure of the liquid upon operation of the pump driving means by actuation of the control means of the other dispenser.

6. In a volatile liquid dispensing system; a liquid storage tank; a pair of dispensers; a liquid conductor connecting the dispensers to the tank; a pump in the conductor; each dispenser including means independently

controlling operation of the pump whereby liquid may be supplied to either dispenser independently of the other, a pressure differential valve connected to said conductor for maintaining a constant differential between the pressure of the liquid in said conductor and the pressure of the vapor in said tank, vapor separating means between said pump and valve, a vapor line connecting the valve and vapor separating means to each other and to said tank, a control valve in the vapor line between the vapor separating means and tank and adapted to be closed for preventing the return of vapor to said tank whereby said vapor is directed to said pressure differential valve, and means connecting the control valve to the pump control means for actuation therewith.

7. In a volatile liquid dispensing system as set forth in claim 6 wherein each dispenser includes a bypass line connecting the conductor to the vapor line between the pressure differential valve and control valve whereby said pressure differential valve is exposed to the pressure of the liquid upon operation of the pump by the control means of the other dispenser.

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