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UNLOADING MEANS FOR GASOLINE DISPENSING PUMPS

Filed March 14, 1951 2 SHEETS—SHEET 1

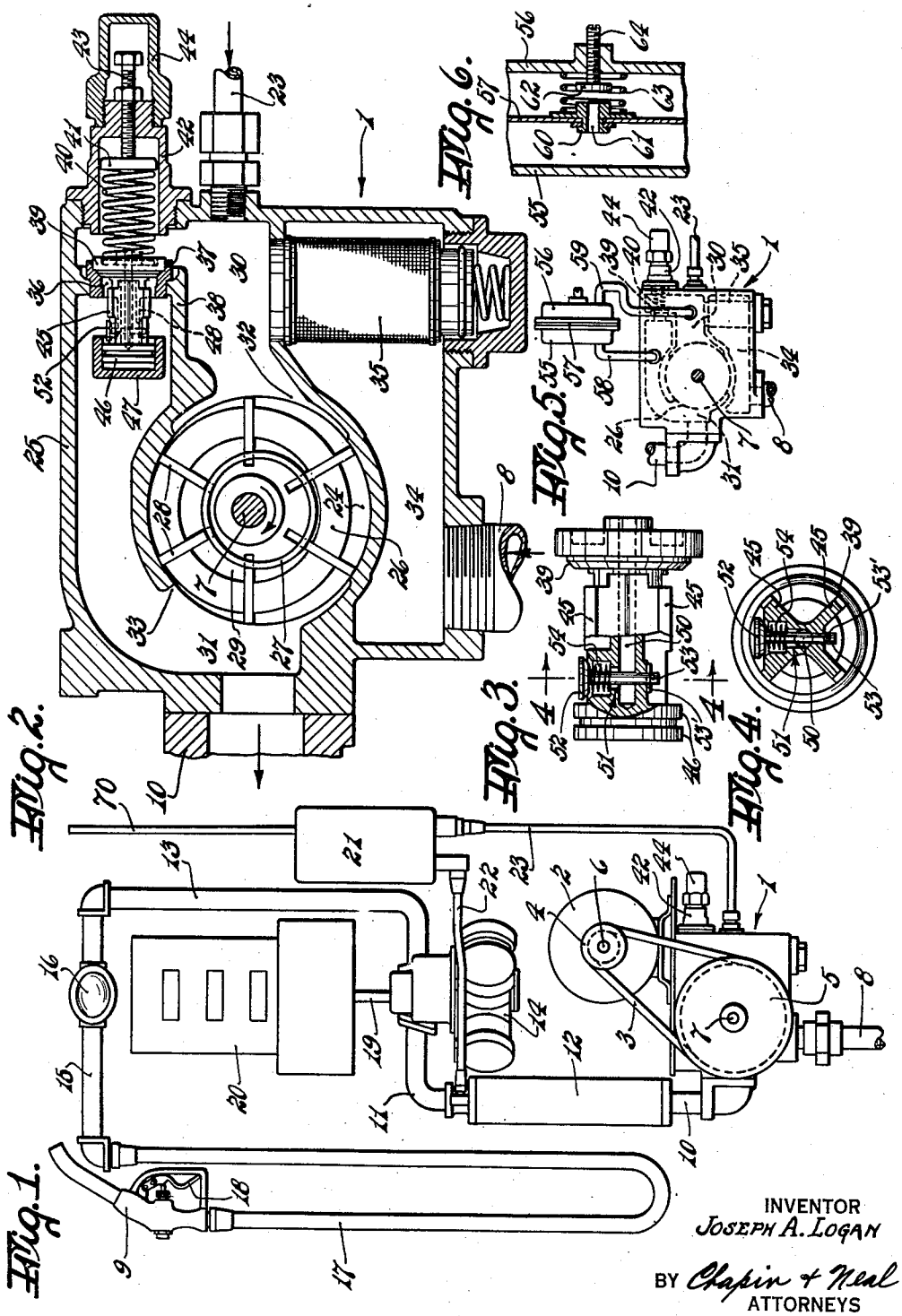

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

INVENTOR
JOSEPH A. LOGAN

BY Chapin & Neal
ATTORNEYS

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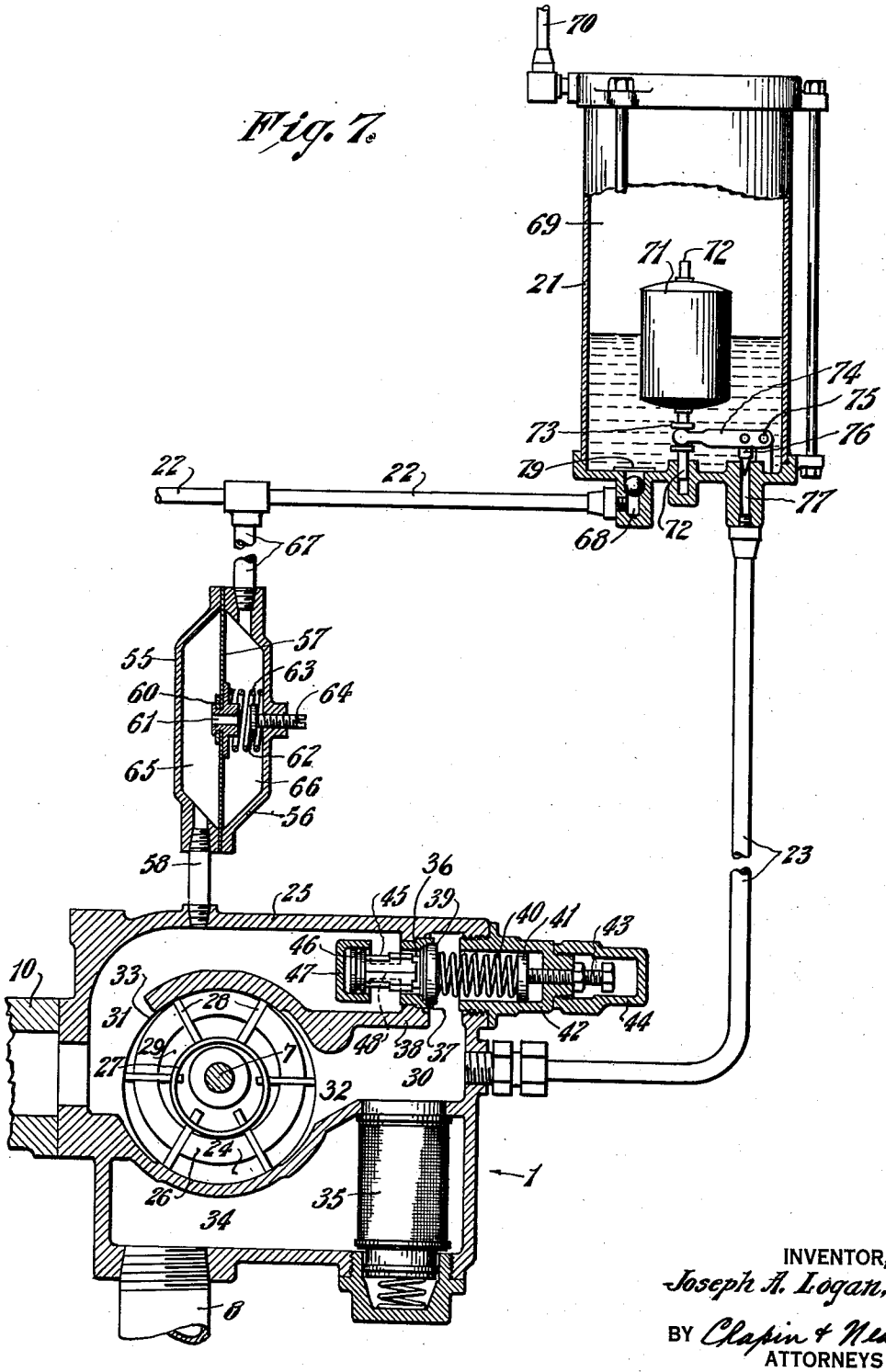
Fig. 7.



INVENTOR,
Joseph A. Logan,
BY Clapin & Neal
ATTORNEYS

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UNLOADING MEANS FOR GASOLINE DISPENSING PUMPS

Joseph A. Logan, Hadley, Mass., assignor to Gilbert & Barker Manufacturing Company, West Springfield, Mass., a corporation of Massachusetts

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7 Claims. (Cl. 103—42)

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This invention relates to improvements in liquid dispensing apparatus, such for example, as is adapted for the dispensing of measured quantities of gasoline and the like.

This application is a continuation in part of my application Serial No. 179,125, filed August 14, 1950, now abandoned.

Apparatus of this class commonly includes a motor-driven positively-acting pump for drawing up liquid through a suction pipe from a low-level supply tank and forcing it through a discharge conduit, having a meter interposed therein, to a delivery nozzle, which has a valve that is maintained closed except when manually opened and held open during dispensing operations. Since the pump can be, and usually is, started up while the nozzle valve is closed, a by-pass from the discharge side to the suction side of the pump is provided together with a relief valve which opens the by-pass when the pump builds up a predetermined pressure. Such pressure must be greater than any pressure that the pump can build up during a normal dispensing operation, when the nozzle valve is open. This relief valve is initially closed and accordingly, the pump has to start up under the load of the spring of the relief valve, which load is considerable and greater than the load due to dispensing. For example, the by-pass valve may open at around 22 pounds per square inch, while the dispensing pressure may be around 16 pounds per square inch. Consequently, the electric motor, that drives the pump, must be able to develop considerable starting torque and is relatively expensive as compared to others that might be used if such high starting torque were not required.

This invention has for its object the provision of means for enabling a pump of the class described to start up in unloaded condition, whereby the motor, which drives the pump, can have substantially less driving torque than would otherwise be necessary.

More particularly, the invention has for an object the provision of a vent conduit, leading from the discharge side of the pump, which conduit has a restricted part of substantially less cross sectional area than the relief-valve-controlled bypass of the pump and is controlled by a valve, which is initially held open and closes only after the motor has acquired considerable speed and the pump has built up a predetermined pressure that is substantial although less than the dispensing pressure.

The invention has for another object the provision of an unloading arrangement of the class

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described, in which the vent conduit serves to initially vent the discharge side of the pump to the suction side of the pump.

The invention has for another object the provision of an unloading arrangement of the class described, in which the vent conduit serves to initially vent the discharge side of the pump to the atmosphere.

The invention has for a further object to provide an unloading arrangement of the class described, having a vent conduit, connecting the discharge side of the pump to the atmosphere, together with a trap for liquid which trap is interposed in the vent conduit to collect any liquid escaping through such conduit and is provided with means operable from time to time to return the collected liquid to the suction side of the pump.

The invention will be disclosed with reference to illustrative examples of it in the accompanying drawings, in which

Fig. 1 is a diagrammatical view of a gasoline measuring and dispensing apparatus embodying the invention, the housing and supports for the elements and many of the usual accessories being omitted to simplify the illustration;

Fig. 2 is a sectional elevational view, drawn to a larger scale, of the pump element of the apparatus;

Fig. 3 is an elevational view partly in section of a by-pass valve for the pump, having incorporated therein the vent conduit of this invention and a control valve therefor;

Fig. 4 is a cross sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a small-scale elevational view of a pump having an external vent conduit and control valve therefor;

Fig. 6 is a fragmentary cross sectional view of the control valve of the Fig. 5 arrangement; and

Fig. 7 is a sectional elevational view showing another form of the invention.

Referring to these drawings; there is shown in Fig. 1, in more or less conventional form, a gasoline measuring and dispensing apparatus, which is of a common and well known type and in which the invention may be embodied. A pump, designated generally as 1 and suitably driven from an electric motor 2, as by means of a belt 3 and the pulleys 4 and 5, respectively fixed to the drive shafts 6 and 7 of the motor and pump, draws up liquid through a suction conduit 8, as from a low level supply tank (not shown) and forces it outwardly through a dispensing conduit to the tank to be serviced under the control of a suitable

flow control valved nozzle 9 on the delivery end of the dispensing conduit. This latter conduit, in the form herein shown, includes pipes 10 and 11, between which an air separator 12 is interposed; a pipe 13, between which and pipe 11 a suitable meter 14 is interposed; a pipe 15, between which and pipe 13 a suitable flow indicator 16 is interposed; and a flexible hose 17, which connects pipe 15 to nozzle 9. The latter has the usual spring-closed valve, which can be manually opened to various degrees by means of a hand lever 18 in order to control the rate at which the liquid is dispensed. The meter 14 drives by a shaft 19 a suitable register 20, which may indicate either the quantity or the cost of the liquid dispensed, or both. A casing 21 houses a liquid recovery chamber, usually associated with the separator 12, this chamber receiving mixed air and liquid through a tube 22, venting the air to the atmosphere and returning the recovered liquid by way of a tube 23 to the suction side of the pump.

The apparatus described is usually enclosed in a suitable housing, except for the hose 17, nozzle 9 and some appurtenances, such as a suitable control handle for starting and stopping the motor and a crank for resetting the dials of register 20. This housing, these appurtenances and the supports for the various elements described have been omitted as unnecessary to an understanding of the present invention.

The pump 1 is of the positively-acting type. An example of one suitable type is shown in Fig. 2. The described shaft 7 passes eccentrically through a cylindrical pump chamber 24, formed in the housing 25, and has fixed thereto a rotor 26 in which a plurality of angularly-spaced vanes 28 are mounted for radial sliding movement. These vanes are held with their outer edges bearing against the peripheral wall of the chamber 24 by means of two rings 27, mounted one in each of two cylindrical recesses 29, provided one in each of the two opposite end faces of the rotor. The length of the vanes and the length of the rotor is substantially equal to the length of the pump chamber, whereby the end faces of the vanes and rotor press against the end walls of the pump chamber. The housing 25 has formed therein suction and discharge chambers 30 and 31, respectively, communicating with the pump chamber 24 by suitable inlet and outlet ports 32 and 33 respectively. The chamber 31 is connected to pipe 10. There is also an inlet chamber 34 connected to suction pipe 8 and communicating with suction chamber 30 by means of a suitable filter 35.

The pump housing is also provided with a by-pass 36 interconnecting the suction and discharge chambers 30 and 31. As shown, this by-pass is formed in a bushing 37, pressed into the partition 38 which separates the chambers 30 and 31. The bushing is provided with a seat for a relief valve 39, which is held to the seat by a spring 40, acting between the valve and a spring seat 41. The latter is located in a housing 42, fixed as indicated to the housing 25, and is adjustable by means of a screw 43, threaded into the end wall of housing 42. A cap unit 44, threaded on the outer end of housing 42, covers and conceals the head of screw 43. The relief valve 39 (Figs. 3 and 4) has an extension 45 of cross-shaped section extending from its inner face through and beyond the by-pass 36 and carrying a cylindrical part 46 which is located coaxially of the valve and which as shown in Fig. 2 is slidably mounted in a hollow cylindrical guide 47, fixed by two side arms 48 to the bushing 37. The by-pass 36 and its valve 39 are usual in apparatus of this kind, the relief valve opening to allow liquid to pass from the discharge chamber 31 to the suction chamber 30, whenever the pump is operating with the flow control valve in nozzle 9 closed. The spring 40 will be adjusted so as to hold the valve 39 closed under any pressure that may be developed during a dispensing operation. For example, if the dispensing pressure is 16 pounds per square inch, the valve 39 will be arranged to open at a somewhat higher pressure say 22 pounds per square inch.

According to this invention a vent conduit is provided for unloading the pump and such conduit may vent the discharge side to the suction side of the pump. This vent conduit is open at the time the pump is started. At least a portion of this vent conduit is of relatively-restricted cross-sectional area with respect to the effective cross sectional area of the relief-valve controlled by-pass 36. This vent conduit is controlled by a valve, which is initially held open by a spring but closes, when the pumped liquid attains a certain velocity. One way is to form the vent conduit directly in the above described relief valve 39. As shown in Fig. 3, a passage 50 extends axially inwardly from the outer face of valve 39 toward the end 46 but terminates short of such end. A radial passage 51 formed in the valve body, communicates at its inner end with passage 50 and has its outer end counterbored and provided with a seat for a valve 52, the stem 53 of which is slidably mounted in the part 45. A spring 54, located in the counterbore of passage 51, acts between the base of the counterbore and valve 52 to hold the latter in open position to the extent permitted by the abutment of a pin 53' in stem 53 with the part 45. The vent conduit 50, 51 is always open when the pump is at rest. Hence, when the motor 2 is started up with the valve in nozzle 9 closed, the pump can start up without the load of the relief valve spring 40. The relief valve 39 does not have to open immediately, as heretofore, because liquid can flow through the vent conduit from the discharge chamber 31 to the suction chamber 30, until sufficient pressure is built up to close valve 52, which may, for example, be around 10 pounds per square inch. When valve 52 closes, valve 39 must open, if the flow control valve in nozzle 9 is still closed, and the pump must build up the heavier pressure, say 22 pounds per square inch, for this purpose. However, the motor 2 has had a chance to acquire some speed before it is required to do the heavy work of opening valve 39. A motor with considerably less starting torque than is ordinarily required will suffice for the work when the vent conduit is used.

This vent conduit need not necessarily be provided in the main by-pass valve, as above described, although that method has the advantage that existing equipment can be easily converted to embody the present invention by removing the main by-pass valve and substituting another one which has therein the second by-pass and its control valve.

In Fig. 5, the vent conduit takes the form of a casing, composed of two cup-shaped sections 55 and 56 having a flexible diaphragm 57 clamped between them, and two tubes 58 and 59 which respectively connect the discharge and suction chambers 31 and 30 to the sections 55 and 56 on opposite sides of diaphragm 57. A portion of the

casing and diaphragm is shown in section on a larger scale in Fig. 6. The diaphragm has suitably and centrally fixed thereto a bushing 60, having therethrough a hole 61, which is substantially smaller in cross sectional area than the effective cross sectional area of the by-pass 36. A valve 62, fixed to the inner end of a screw 64, threaded into casing 56, is positioned in the path of the bushing 60 and can engage the end face thereof and close hole 61, when the sufficient pressure is developed, to move the diaphragm 57 to the right against the force of a spring 63, which acts between the diaphragm 57 and casing 56 with a tendency to hold the diaphragm away from the valve and keep the passage 61 open. When the pump is idle, the parts are positioned as shown in Fig. 6. Hence, the restricted part 61 of the vent conduit is open, allowing the pump to start up without first opening the relief valve, as is normally required. As the pump increases in speed, pressure builds up on the left hand side of diaphragm 57 because the opening 61 is not large enough to pass all the liquid that the pump can pump and, eventually, the pressure is sufficient to move the diaphragm to the right and press the end face of bushing 60 against the closure disk 62 to close the vent conduit.

The vent conduit may also communicate with the atmosphere and Fig. 7 shows such an arrangement, which has the advantage that it will operate whether or not the supply tank and suction line are primed. The control valve shown in Figs. 5 and 6 is used with the same kind of pump shown in Fig. 2 (except that there is no vent passage in the by-pass valve). Parts in Fig. 7, which correspond with parts in Figs. 5 and 6 have been given the same reference numerals. The vent conduit includes the pipe 58; the chambers 65 and 66 formed in casing sections 55 and 56, respectively, on opposite sides of diaphragm 57; the passage 61, which connects these chambers and is of much less cross sectional area than that of the by-pass 36 controlled by valve 39; a pipe 67, which connects chamber 66 to the described tube 22; the right hand part of tube 22; a passage 68 in the base of casing 21; liquid recovery chamber 69 in casing 21; and a vent tube 70, which leads upwardly from the chamber to a suitable height, usually a little above the highest point in the gasoline delivery conduit as indicated in Fig. 1. The liquid recovery chamber 69 is of usual and well known form. It includes a float 71 having a clutch collar 73 fixed thereon and slidably mounted on a guide rod 72 fixed to the base of casing 21; a lever 74, fulcrumed at one end at 75 to the base of casing 21 and having its other end forked to engage in the groove in collar 73; a valve 76 pivotally connected to lever 74 and controlling the outlet 77, which is connected by pipe 23 to the suction side of pump 1. The inlet passage 68 is controlled by an upwardly-opening ball check valve 78, mounted in a recess in the base of casing 21 and held in place by a narrow, diametrical cross strip 79, fixed to the base of casing 21 and spanning the recess.

The operation of the Fig. 7 form of the invention will next be described. Assuming that the gasoline supply tank, suction pipe 8 and chambers 34 and 30 are filled with air, the pump 1, being of the positively-acting type, will, when set in operation, draw air from these chambers, suction pipe 8 and the supply tank and force the air into chamber 31, then through pipe 10 into the air separator 12 and from the latter by pipe 22 into the liquid recovery chamber 69, and out through vent 70. Some of the air will also pass out through tube 58 into chamber 65, through passage 61, past the open valve 62 into chamber 66, thence up pipe 67 and to the right by pipe 22 into the chamber 69 and out through vent 70. Eventually the liquid will rise into and fill the pump chambers, the pipe 10 and the separator 12, the delivery conduit and meter 14. Thereafter, some liquid will pass from the vent outlet of the separator 12 into pipe 22 and into chamber 69. When such liquid accumulates in chamber 69 to a sufficient extent, valve 76 will be lifted by float 71 to allow some of the liquid to return, by way of pipe 23, to the suction side of the pump. Liquid will also enter tube 58 and chamber 65, but, as soon as it reaches restricted passage 61 a pressure will be built up in chamber 65 and move diaphragm 57 to valve 62 and thus close the vent passage.

The Fig. 7 arrangement enables air to be eliminated from the pump-unloading means, as distinguished from the Fig. 5 arrangement, which would merely allow the air to circulate in a closed path without eliminating it. The Fig. 5 arrangement is operative when the dispensing pump is primed. The Fig. 7 arrangement will operate whether or not the dispensing pump is primed. In each case the unloading of the pump is effected by a vent conduit having a restriction therein, which will pass all the air that the pump can pump but not all the liquid that the pump can pump, whereby pressure is built up to close the unloading valve. The vent conduit may discharge to the atmosphere, to the suction side of the pump or, if desired, back to the supply tank, which is the equivalent of the liquid recovery chamber 69, being continually vented to the atmosphere.

What is claimed is:

1. In liquid dispensing apparatus, a positively-acting pump, suction and discharge conduits for the pump, a flow control valve in the delivery end of the discharge conduit adapted to be maintained closed except during dispensing of liquid, a by-pass interconnecting the suction and discharge sides of said pump, a relief valve controlling the by-pass, a spring for holding the relief valve closed under a predetermined pressure greater than any that the pump can build up during dispensing while the flow control valve is open, a vent conduit connected at one end to the discharge side of said pump and including a part having a cross-sectional area substantially restricted as compared to the cross-sectional area of the by-pass, a valve controlling the vent conduit, and a spring for holding the last-named valve open until the pump builds up a second predetermined pressure less than the dispensing pressure.

2. A liquid dispensing apparatus as claimed in claim 1, in which the vent conduit at its other end communicates with the atmosphere.

3. A liquid dispensing apparatus as claimed in claim 1, in which a liquid trap chamber is interposed in the vent conduit, such trap chamber having an outlet, a valve controlling said outlet, means responsive to the level of liquid in the trap chamber for opening and closing said last-named valve, when the liquid in said chamber respectively rises above or falls below a predetermined level, and a liquid return conduit connecting said outlet to the suction side of the pump.

4. A liquid dispensing apparatus as claimed in

claim 1, in which the venting conduit at its other end communicates with the suction side of the pump.

5. A liquid dispensing apparatus as claimed in claim 1, in which the vent conduit is provided in the relief valve and interconnects the suction and discharge sides of the pump and the valve which controls the vent conduit and the spring for the last-named valve are mounted in the relief valve.

6. In liquid dispensing apparatus, a positively-acting pump, suction and discharge conduits for the pump, a flow control valve in the delivery end of the discharge conduit adapted to be maintained closed except during dispensing of liquid, a by-pass interconnecting the suction and discharge sides of said pump, a relief valve controlling said by-pass, a spring for holding the relief valve closed under a predetermined pressure greater than any that the pump can build up during dispensing while the flow control valve is open, a casing, a movable wall mounted in the casing and dividing the same into two chambers, a conduit connecting one chamber to the discharge side of the pump, a vent conduit connected to the other chamber, said wall having a passage extending through it of a cross-sectional area relatively small in comparison to that of said by-pass, a valve for controlling said passage, and a spring acting on said wall in opposition to the pressure of liquid discharged from the pump and tending to hold said wall away from the valve and keep said passage open until the pump has built up a second predetermined pressure less than the dispensing pressure.

7. The combination as claimed in claim 6, in which the vent conduit has a trap chamber interposed therein, said chamber having outlets for air and liquid at its upper and lower portions respectively, a valve controlling the liquid outlet, and liquid-level responsive means for opening and closing said valve as the liquid in the trap chamber respectively rises above or falls below a predetermined level, and a liquid return conduit connecting the liquid outlet to the suction side of the pump.

JOSEPH A. LOGAN.

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