Dec. 2, 1941. E. J. SVENSON 2,264,344

LIQUID DISPENSING DEVICE

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FIG. 1.

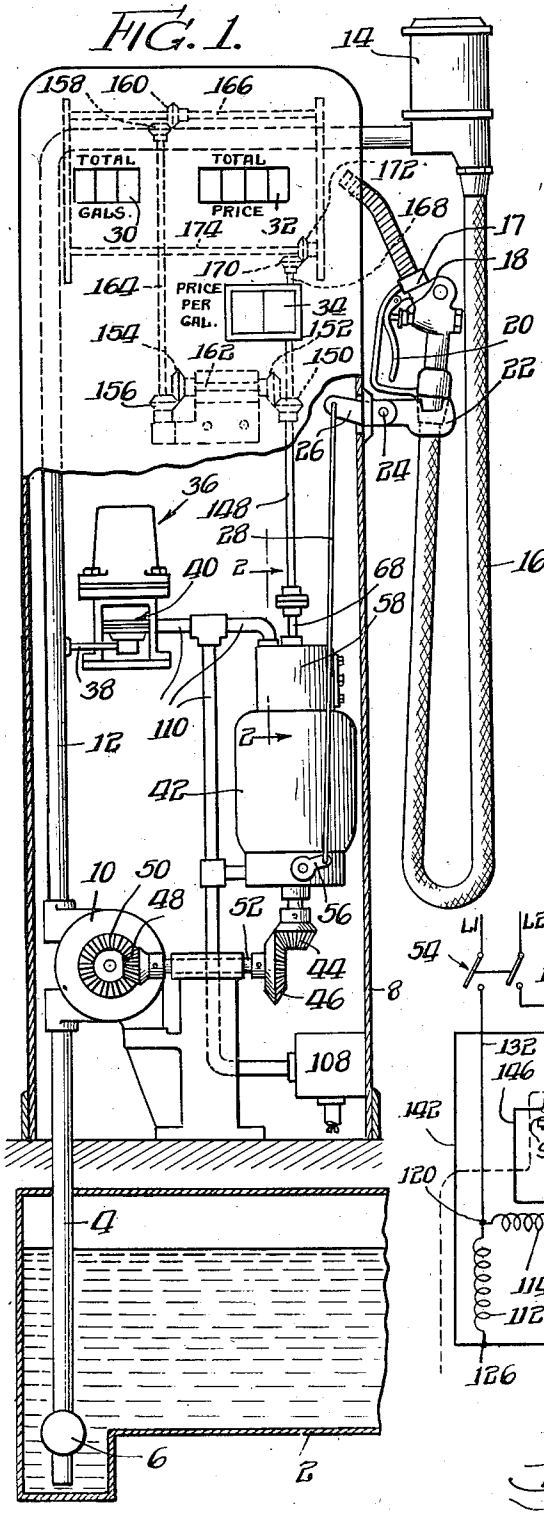


FIG. 2.

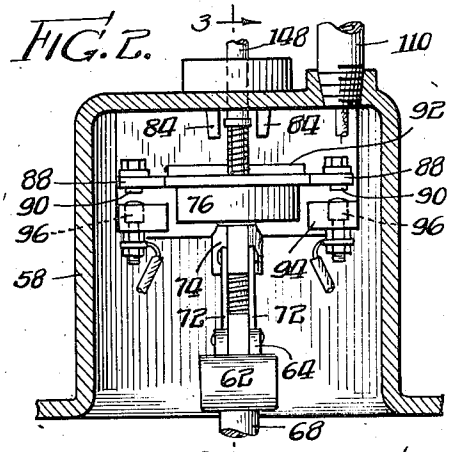


FIG. 3.

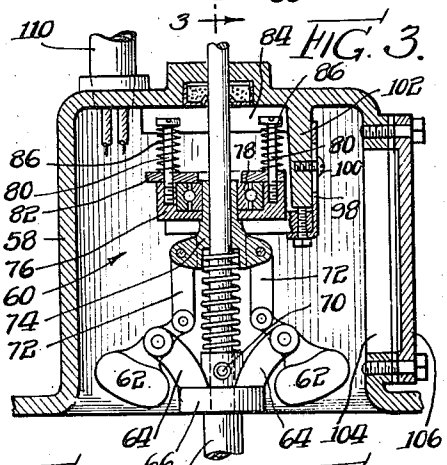


FIG. 4.

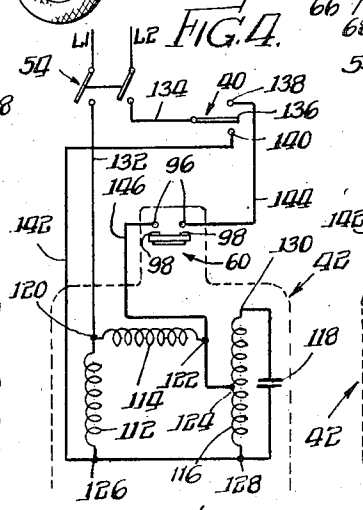
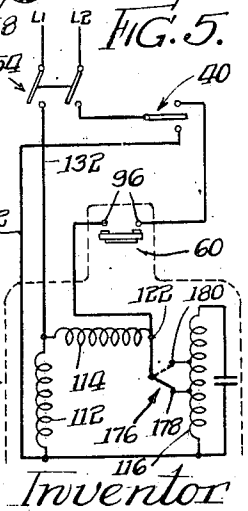


FIG. 5.



Inventor
Ernest J. Svenson
By:- Cox & Moore attys.

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FIG. 6.

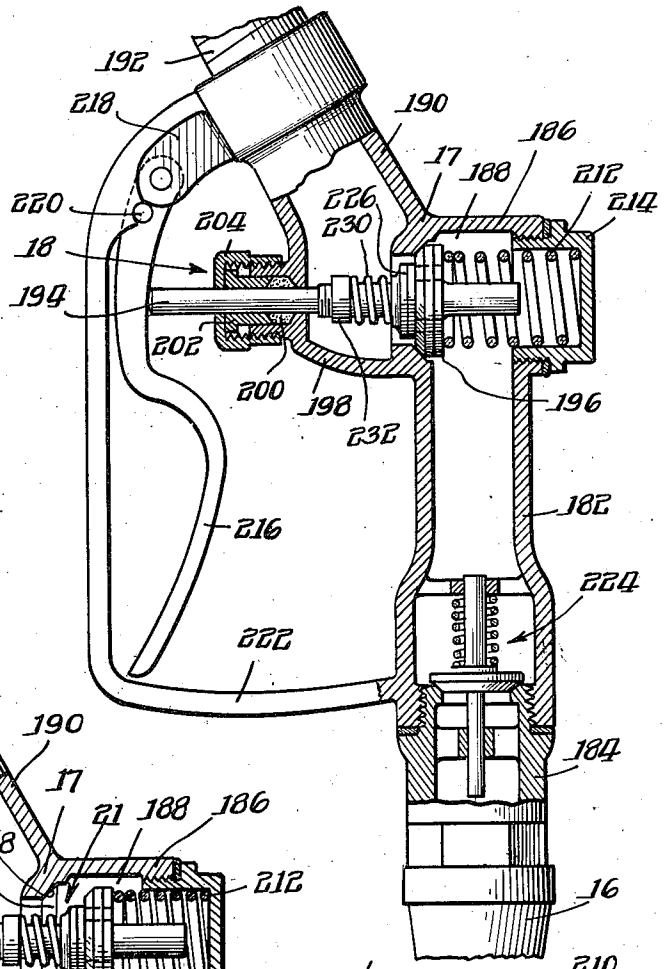


FIG. 7.

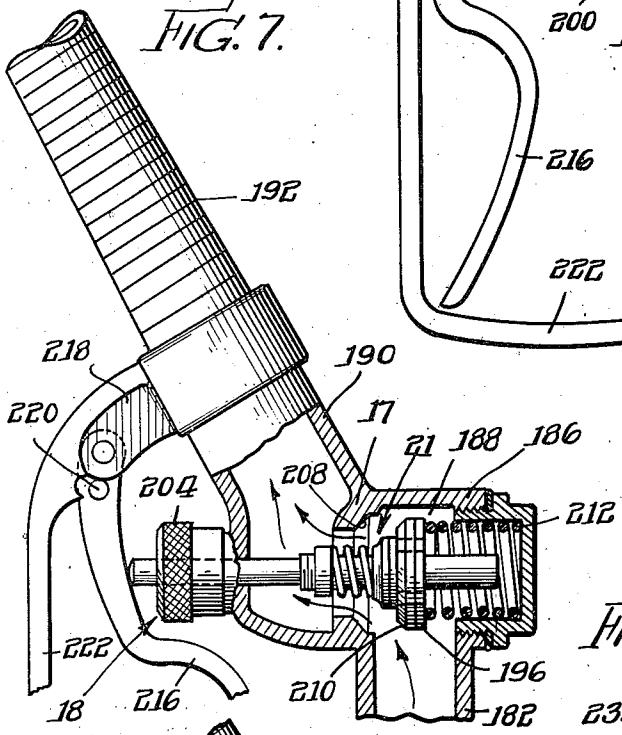


FIG. 8.

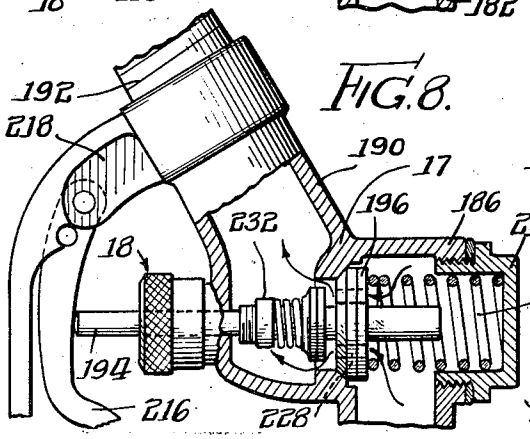
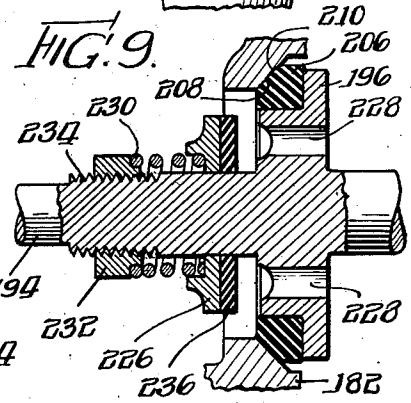


FIG. 9.



Inventor
Ernest J. Svenson
By:- Cox & Moore attys

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UNITED STATES PATENT OFFICE

2,264,344

LIQUID DISPENSING DEVICE

Ernest J. Svenson, Rockford, Ill.

Application February 21, 1938, Serial No. 191,751

7 Claims. (Cl. 221—95)

This invention relates to an electric dispensing device and more particularly to a computing pump type of liquid dispensing apparatus.

It is an object of this invention to provide in a liquid dispensing apparatus efficient and practically operable means for controlling the operation of the pump or other liquid feeding means from a remote point and particularly from and by the nozzle of the dispensing hose. Liquid dispensing devices in which the operation of the liquid feeding means is directly controlled from and by the nozzle valve have been heretofore suggested. This method of control has not proven entirely satisfactory because it causes errors in measurement of the quantity and cost of the liquid dispensed and because excessive strains are placed upon the dispensing means including a hose which is usually of a flexible character and therefore quickly destroyed by such excessive strains.

Applicant has found that these errors in measurement and the excessive straining of the hose are due to the lag between the operation of the nozzle valve and the stopping of the liquid feeding means or pump, this lag in operation causing an excessive pressure to be built up between the pump or meter and the hose nozzle valve and in the flexible dispensing hose. This excessive pressure forces the hose to "bulge" or "kick" and after the pump has substantially come to rest causes the liquid to flow backwardly or "leak" from the hose to the meter or pump and to return into the supply line or reservoir. The liquid delivered to the hose having been passed through the meter and measured thereby, the amount of this reverse flow or leakage represents an actual error in measurement of the total quantity and cost of the liquid dispensed.

It is accordingly an object of applicant's invention to provide in a liquid dispensing device means for overcoming these defects and insufficiencies of such prior art devices.

Another object of applicant's invention is to provide in a liquid dispensing device, means associated with the hose or dispensing line for relieving the pressures built up therein upon the closing of the nozzle valve.

It is a further object of applicant's invention to provide in a liquid dispensing device means for quickly stopping the liquid feeding means in response to the closure of the nozzle valve or in response to the operation of other remote control means to prevent so far as possible the building up of an excessive pressure in the hose and between the nozzle valve or control means and the liquid feeding means.

A more specific object of applicant's invention contemplates the provision of a means for plugging the electric motor which drives the liquid feeding means or pump and a means for relieving the pressure in the hose or dispensing line so that upon closure of the nozzle valve, or upon operation of other remote control means, the motor and hence the pump will be so quickly brought to rest that substantially no increase in pressure, above the operating pressure of a pressure control switch, will normally occur in the dispensing hose or in the dispensing line between the control means and the liquid feeding means, but if such a pressure increase does occur, the pressure relief means will automatically function and prevent damage to the hose or dispensing line and prevent any backward flow or leakage of the liquid through the metering device or pump.

Other objects and advantages of the invention will be apparent from the following description when taken in connection with the accompanying drawings, wherein:

Fig. 1 is a view, partly in elevation and partly in section, of a liquid dispensing device embodying the invention;

Fig. 2 is a fragmentary vertical section taken along the line 2—2 of Fig. 1;

Fig. 3 is a vertical section taken along the line 3—3 of Fig. 2;

Figs. 4 and 5 are schematic diagrams of circuits for controlling the electric motor;

Fig. 6 is an enlarged fragmentary view in elevation and partly in section of the dispensing nozzle;

Figs. 7 and 8 are fragmentary views in elevation and partly in section of the dispensing nozzle for showing the operation of the nozzle valve and pressure relief means; and

Fig. 9 is a fragmentary section showing in detail the construction of the pressure relief means.

As shown in Fig. 1 of the drawings, there is provided the usual fluid reservoir, specifically a gasoline reservoir, 2 into which an inlet pipe 4 enters, being provided with the common type of foot control valve 6 well known in the art. The inlet pipe 4 passes upwardly from the reservoir 2 and into an upstanding casing 8 of any suitable form and the pipe is connected to the intake of a liquid pump or liquid metering pump 10 of desired type, preferably of the intermeshing gear type which measures as well as pumps the liquid into a dispensing line 12 connected to the outlet of the metering pump. The type of pump and air-release mechanism, preferred for use with the present invention are disclosed in applicant's co-

pending applications, Serial No. 151,858, filed July 3, 1937; Serial No. 153,578, filed July 14, 1937; and Serial No. 155,265, filed July 23, 1937.

The liquid from the dispensing line 12 passes to a sight glass 14 and thence through a flexible dispensing hose 16. The hose 16 is provided with a nozzle 17 and with suitable flow control means, preferably a nozzle valve 18 at the dispensing end thereof, this nozzle valve being operable by a valve control lever 20 for controlling the flow therethrough. Pressure relief means 21, later to be described, is preferably associated with the nozzle valve 18 and automatically acts, as will later appear, to relieve the pressure of the liquid in the dispensing hose and the dispensing line when said pressure rises above a certain predetermined value. A stand-by hook 22 of conventional construction is pivoted at 24 to the casing 6 and is provided with an inwardly extending arm 26 pivotally connected to a switch operating link 28.

The housing 6 is provided with a plurality of windows, preferably on opposite sides thereof, there being on each side a window 30 in which an indication of the number of gallons dispensed may be displayed; a second window 32 in which a running indication of the total volume of gasoline dispensed and the final value of the purchase may be displayed; and also a third window 34 for indicating unit price, i. e., price per unit of volume, specifically cents or fraction of cents per gallon when used in the United States and, when used in other countries, according to the units of price and volume.

Conventional gallonage and price computing registers may be mounted within the casing 6, these registers being provided with indicating dials visible through the openings 30 and 32. A price per gallon register or indicator is also mounted within the casing 6 in a position to be visible through the opening 34. These registers are operated and controlled in a manner later to be described.

A pressure operating switch 36 is mounted within the casing 8 and has its liquid pressure line or pipe 38 connected at a suitable point to the dispensing line 12 in order that the plugging switch 40 (Figs. 4 and 5) of the pressure operating switch 36 may be controlled in accordance with the pressures in the dispensing line.

An electric motor 42, supported in any suitable manner within the casing 8, is drivingly connected by means of suitable gearing such as bevel gears 44, 46, 48 and 50 and the shaft 52 to the metering pump 10. The motor 42 may be of any desired type, either of direct or alternating current but preferably is an alternating current motor of the single phase capacitor type since most gasoline dispensing stations are supplied with single phase, alternating current and the capacitor type of motor has been found by applicant to be most readily adaptable with a minimum of external equipment for dynamic braking in accordance with applicant's invention.

A circuit breaker or primary control switch 54 (Figs. 4 and 5) may be mounted upon or within the casing of the motor 42 and is operated by the stand-by hook 22 through the link 28 and a crank 56 attached to the operating shaft of said switch. Within the cylindrical end portion 58 of the motor casing there is housed a zero speed, centrifugal switch 60, best shown in Figs. 2 and 3. This switch preferably comprises a pair of weighted levers 62 pivoted to the arcuate arms 64 of a collar 66 pinned to the motor shaft 68 as at 70. The weighted levers 62 are connected by links 72 to a cross head 74 splined to the shaft 68 for rotation therewith and for axial movement therealong.

A cup-shaped member 76 is journaled on the cross head 74 by a frictionless ball bearing 78 received within the cup-shaped member. Rotation of the cup-shaped member 76 is prevented by bolts 80 passing through the bearing retaining plate 82 and threaded into said cup-shaped member. The bolts 80 extend upwardly from the cup-shaped member 76 and the plate 82 and are received between transverse plates 84 secured to or formed integrally with the housing portion 58. The plates 84 prevent any substantial rotation of the bolts 80, the plate 82 and the cup-shaped member 76 about the axis of the shaft 68. A spring 86 interposed between the head of each bolt 80 and the plate 82 retains this plate in its proper position, as shown in Fig. 3.

The plate 82 is provided with opposite, diametrically extending projections or lugs 88 on which are insulatingly mounted contact points or buttons 90, these buttons being connected by a wire 92 (Fig. 2). A generally U-shaped or semicircular plate 94, carrying diametrically opposed contact points or buttons 96 (Fig. 2), is bolted to a bracket 98 adjustably secured by a bolt 100 passing through an enlarged opening in the bracket 98 to an inwardly extending flange 102 formed integrally with the housing portion 58.

The cylindrical switch housing portion 58 of the motor casing is provided with an opening 104 and a detachable cover 106 for said opening, whereby, upon removal of the cover, an adjustment of the bracket 98 and the switch contacts 96 may be accomplished.

Wires for connecting the pressure operating switch 36 to the motor 42 and to the outlet box 108 within the casing 8 are enclosed within suitable electric conduits or ducts 110 within the casing 8.

The internal construction of one form of motor 42 is schematically illustrated in Fig. 4. As there shown, the motor comprises windings 112 and 114 disposed electrically at right angles to each other, an auto transformer 116 and a capacitor 118. One end of the winding 114 is connected to one end of the winding 112 as at 120, the opposite end 122 of the winding 114 being connected to an intermediate point 124 on the auto transformer 116. The opposite end 126 of the winding 112 is connected to the end 128 of the auto transformer and the capacitor 118 is connected between the ends 128 and 130 of the auto transformer.

It will therefore be seen that the single phase motor 42 is self-starting, the capacitor 118 and the auto transformer 116 causing the currents through the windings 112 and 114 to be displaced in phase sufficient to create a rotating field supplying a starting torque.

The primary control switch 54, the plugging switch 40 and the zero speed, centrifugal switch 60 are connected to the internal circuit of the motor as follows. The primary control switch is directly inserted in the supply lines L^1 and L^2 and one contact of this switch is connected by a wire 132 to the common point of connection 120 between the windings 112 and 114. The other contact of the switch 54 is connected by a wire 134 to the contact blade 136 of the plugging switch 40. The plugging switch 40 comprises, in addition to the contact blade 136, which is operated by the diaphragm of the pressure operating

switch 36, a pair of fixed contact blades 138 and 140 adapted to be selectively engaged by the blade 136. The contact 140 of the plugging switch is connected by a wire 142 to the end 126 of the winding 112 and to the end 128 of the auto transformer 116. The contact 138 of the plugging switch is connected by a wire 144 to one of the fixed contacts 96 of the zero speed switch 60. The other contact 96 of this last mentioned switch is connected by a wire 146 to the end 122 of the winding 114 and thereby to the intermediate point 124 of the auto transformer.

The operation of the control circuit shown in Fig. 4 is as follows. The primary control switch 54 being in closed position and the switch blade 136 of the switch 40 being in engagement with the contact 140, current is supplied to the motor from the line L^1 through the wire 132, the winding 112, the wire 142, contact 140, switch blade 136 and wire 134 to the line L^2. The winding 114 and the primary winding portion of the auto transformer 116 are serially connected in parallel to the winding 112. The capacity impedance reflected into the primary winding portion causes the current in the winding 114 to lead the current in the winding 112 to thereby create a starting torque in a forward direction. As the motor picks up speed, the zero speed switch 60 is operated to cause its contacts 98 to engage the contacts 96 which remain thus connected until the motor is substantially brought to rest.

The motor is brought to rest or stopped by the engagement of the blade 136 of the plugging switch 40 with the contact 138 which completes a circuit from the supply line L^2, the wire 134, the blade 136, the contact 138, wire 144, contacts 96 and 98 of the zero speed switch 60 and the wire 146 to the end 122 of the winding 114.

The common point of connection 120 of the windings 112 and 114 remains connected to the supply line L^1 through the wire 132. The winding 114 is now connected directly across the supply lines L^1 and L^2 and the winding 112 and the primary winding portion of the auto transformer 116 are now connected serially in parallel to the winding 114. Since the current to the winding 112 now leads the current in the winding 114, a retarding torque is created which quickly brings the motor to rest. As the motor slows down and reaches substantially zero speed, the switch 60 breaks the connection between the fixed contacts 96 and thereby opens the motor circuit before an actual reversal of the motor is accomplished.

The blade 136 of the plugging switch 40 which effects this quick stopping of the motor 42 is operated by the pressure responsive diaphragm of the pressure operating switch 36 in response to the pressure of the liquid in the dispensing line 12. The pressure in this dispensing line is controlled by the nozzle valve 18.

A register operating shaft 148 is preferably connected or coupled to the motor shaft 68 and is in turn connected by suitable gears 150, 152, 154, 156, 158 and 160 and shafts 162 and 164 to the gallon register operating shaft 166. The shaft 148 is also connected through suitable change speed mechanism (not shown) under the control of the conventional price adjustment means to a shaft 168 which is connected by bevel gears 170 and 172 to the cost register operating shaft 174.

The operation of a liquid dispensing device constructed in accordance with the invention as illustrated in Figs. 1 to 4 is as follows. The dispensing hose 16 is removed from the stand-by hook 22 and the latter rotated about its pivot 24 to operate the link 28 to close the primary switch 54. The motor circuit remains open at the zero speed switch 60 and at the contact 140 of the plugging switch 40. Upon opening of the nozzle valve 18 to dispense the liquid, the pressure in the hose 16 and the dispensing line 12 is reduced. The pressure operating switch 36, in response to this reduced pressure, moves the blade 136 of the plugging switch into engagement with the contact 140 and completes the forward circuit of the motor through the connections previously described. The metering pump 10 is thus started into operation in synchronism with the motor 42 and in synchronism with the register operating shaft 148. The desired quantity of liquid having been dispensed, as evidenced by the gallonage and price indicating registers, the nozzle valve 18, which is preferably spring urged toward closed position, is allowed to quickly close.

The closing of this valve causes an increase in the pressure of the liquid in the hose 16 and the dispensing line 12. The pressure responsive diaphragm of the pressure responsive switch 36 is adjusted to operate instantly upon an increase in pressure in the dispensing line 12 to move the blade 136 of the plugging switch 40 into engagement with the contact 138.

This completes the reverse or dynamic breaking circuit to the motor 42 in the manner previously described and quickly brings the motor to rest.

The zero speed switch 60, as previously stated, breaks the circuit between its contacts 96 before any reverse rotation of the motor can be effected. Since the metering pump 10 is directly connected to the motor 42, this quick stopping of the motor also effects a rapid deceleration of the metering pump and in normal operation prevents the building up of an excessive pressure within the dispensing line 12 and the flexible hose 16.

The motor circuit shown in Fig. 5 differs from the motor circuit shown in Fig. 4 only in that the motor is provided internally with a centrifugally operated switch 176 for selectively connecting the end 122 of the winding 114 to the intermediate points 178 and 180 of the auto transformer 116. In starting the motor, the centrifugal switch 176 connects the point 178 of the auto transformer with the winding 114 and as the motor approaches running speed the switch connects said winding to the point 180 of the auto transformer. It has been found that by increasing the number of windings in the primary portion of the auto transformer after the motor is started, the heating of the motor is materially reduced.

If for any cause the pressure in the dispensing hose and line should increase above the value predetermined for the operation of the pressure responsive switch, such failure, for example, as might be caused by the failure of the motor control circuits or switches to effect the braking and stopping of the motor, the pressure relief means 21 will automatically operate to relieve this pressure. The pressure relief means 21 is preferably associated with the nozzle valve 18 and an illustrative embodiment thereof is shown in Figs. 6 to 9.

As shown in said Figs. 6 to 9, the nozzle 17, with which the nozzle valve 18 and pressure relief means 21 are associated, may be of any desired construction comprising a lower tubular

portion threadedly secured to the coupling 184 carried at the free end of the flexible hose 16. The lower tubular portion 182 is formed integrally with a valve housing 186 having an opening 188 extending transversely to the axis of the tubular portion 182 and in liquid communication with the bore of said tubular portion. An upper tubular portion 190 formed integrally with the valve housing 186 extends upwardly therefrom and at an angle to the longitudinal axis of the valve housing. The usual flexible nozzle tube 192 is coupled to the tubular portion 190 in any customary manner.

The valve 18 comprises a stem or rod 194 and a valve disk 196 carried by or formed integrally with the stem or rod, the stem or rod 194 passing through and being slidably received in the dome-shaped portion 198 of the nozzle 17. A suitable packing gland 200 is secured in position about the stem 194 by a retainer 202 and a clamping nut 204 threaded on the nozzle 17. The valve disk 198 is provided with a wear-resistant ring 206 having a beveled face 208 adapted to engage the valve seat 210. The valve 18 is normally urged to closed position by a coiled spring 212 interposed between the valve disk 196 and the head of a plug 214 threaded into the open end of the valve housing 186. This valve is manually moved into open position against the force of the spring 212 by a valve lever 216 pivoted to a lug 218 projecting laterally from the upper tubular portion 190. The valve operated lever 216 overlies the free end of the valve stem 194 and its outward movement under the action of the valve spring 212 is limited by the engagement of a pin 220 carried by the lever with a handle bar or guard 222 formed integrally with or secured to the nozzle 17. The usual check valve 224 may be mounted in the lower tubular portion 182 of the nozzle 17.

The pressure relief means 21 comprises a valve disk 226 slidably mounted on the stem 194 of the valve 18 and cooperating with a plurality of angularly spaced openings 228 extending axially of the valve disk 196. The valve disk 226 is urged in a direction to close the openings 228 by a coiled spring 230 interposed between the disk and a nut or collar 232 threaded on the threaded portion 234 of the valve stem 194. A suitable washer 236 may be secured to the valve disk 226 to insure the complete closure of the openings 228 in the main valve disk 196.

Upon manual manipulation of the operating lever 216, the disk 196 of the valve 18 will be moved away from its seat 210 to permit a free flow of the liquid from the dispensing hose, the pressure relief means 21 moving with the valve 18 and the valve disk 226 of said means maintaining the openings 228 closed against a flow of liquid through the valve disk 196. The desired quantity of liquid having been dispensed, the valve operating lever 218 is released to permit the valve 18 to close under the action of the spring 212. As previously described the closing of the valve 18 causes an increase in the pressure of the liquid in the hose 16 and dispensing line 12, which increase in pressure causes an operation of the pressure responsive switch 36 and the latter in turn reverses the motor circuit to dynamically brake the motor and bring the same and its directly connected metering pump to rest.

If for any reason the pressure built up in the hose 16 and dispensing line by the closure of the valve 18 should exceed the normal operating pressure of the pressure responsive switch 36, the valve disk 226 of the pressure relief means 21 will be moved away from the valve disk 196 against the action of the spring 230 thereby uncovering the openings 228 in the valve disk 196. Liquid within the dispensing line 12 and hose 16 then goes outwardly of the nozzle through said openings, thereby to relieve the pressure of the liquid in said hose and line and prevent any damaging of the hose and dispensing line and also to prevent any backward flow or leakage of the liquid past the metering pump. Upon release of the pressure within the hose and dispensing line, the valve disk 226 of the pressure relief means will be automatically reseated upon the valve disk 196 and prevent further flow of liquid through the openings 228. The pressure at which the valve disk 226 will be operated to relieve the pressure within the hose can be predetermined by adjustment of the collar or nut 232 along the stem 194 of the valve 18.

It will be seen from the foregoing description that applicant has provided simple, efficient and practically operable means for controlling the operation of a dispensing pump from a remote point, particularly from, and by, a nozzle valve located at the end of the dispensing hose, and has provided means for quickly decelerating or dynamically braking the liquid supply pump and its driving means so as to prevent, so far as possible, the building up of excessive pressures in the hose and between the nozzle valve control means and the liquid feeding means when the nozzle valve control means is moved into closed position to terminate the dispensing operation. Applicant has in addition provided simple and efficient pressure responsive means for automatically relieving the pressure of the liquid in the dispensing hose or dispensing line if for any reason or because an excessive pressure should momentarily be built up therein.

Changes may be made in the form, construction and arrangement of the parts without departing from the spirit of the invention or sacrificing any of its attendant advantages, and the right is hereby reserved to make all such changes as fairly fall within the scope of the following claims.

I claim:

1. In a liquid dispensing device, a dispensing line, fluid forcing means for delivering liquid under pressure to said dispensing line, driving means for said fluid forcing means, flow control means for terminating the flow of liquid from said dispensing line, and means including a mechanism responsive to the termination of the flow of liquid from said line upon operation of said flow control means for braking said driving means to stop said fluid forcing means.

2. In a liquid dispensing device, a dispensing line, fluid forcing means for delivering liquid under pressure to said dispensing line, a motor for driving said fluid forcing means, valve means for terminating the flow of liquid from said dispensing line, and means including a mechanism responsive to the termination of the flow of liquid from said line upon operation of said valve means for plugging said motor and braking said fluid forcing means.

3. In a liquid dispensing device, a dispensing line, fluid forcing means for delivering liquid under pressure to said dispensing line, flow control means for terminating the flow of liquid from said dispensing line, a motor for driving said fluid forcing means, and switch operating means responsive to the pressure of the liquid in said dis-

pensing line for plugging said motor and stopping said fluid forcing means upon operation of said flow control means.

4. In a liquid dispensing device, a dispensing line, a meter pump for measuring and delivering liquid under pressure to said dispensing line, a register, flow control means for initiating and terminating the dispensing of liquid from said dispensing line, a motor for driving said pump and register in synchronism, forward and reverse circuits for said motor, switch means responsive to the pressure of the liquid in said dispensing line for completing the forward motor circuit upon operation of said flow control means to initiate the dispensing operation and for completing the reverse motor circuit to plug the motor and simultaneously stop the meter pump and register upon operation of said flow control means to terminate the dispensing operation, and additional switch means responsive to motor speed for breaking the reverse circuit before rotation of the motor in the reversing direction.

5. In a liquid dispensing device, a flow line, a dispensing valve in said flow line, said valve having an operating stem, a main valve carried by said stem and having an opening therethrough, an auxiliary valve adjustably mounted on said stem, resilient means for urging said auxiliary valve into engagement with said main valve to normally close said opening, said resilient means permitting movement of said auxilary valve away from said main valve in response to a predetermined pressure of liquid within said flow line to uncover said opening and relieve the pressure of the liquid in said flow line.

6. In a liquid dispensing device, flow control means comprising a main valve, means for operating said main valve, an auxiliary valve operble at a predetermined pressure to permit liquid to flow through said main valve when the latter is in closed position, and means for normally maintaining said auxiliary valve in its closed position, said means determining the pressure at which said valve is operable to its open position.

7. In a liquid dispensing device, a dispensing line having a dispensing nozzle, means for delivering measured quantities of liquid under pressure to said dispensing line, a manually operable cut-off valve in said nozzle terminating the flow of liquid through said dispensing line, said liquid delivering means including a fluid forcing element, a motor for driving said fluid forcing element, switch operating means responsive to the closure of said cut-off valve for dynamically braking said motor and said fluid forcing element to prevent the building up of excessive pressure in said dispensing line, and pressure responsive means automatically operable upon closure of said cut-off valve for causing a transient discharge of liquid from said dispensing line to prevent a backward flow of measured liquid through said line.

ERNEST J. SVENSON.