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MULTIPLE PUMP CONTROL SYSTEM

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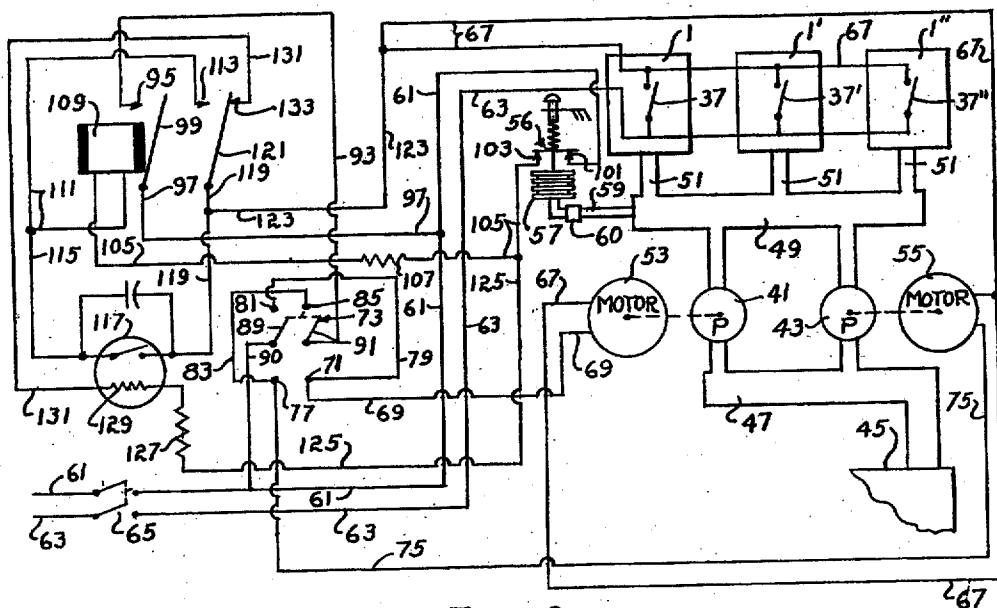


Fig. 2

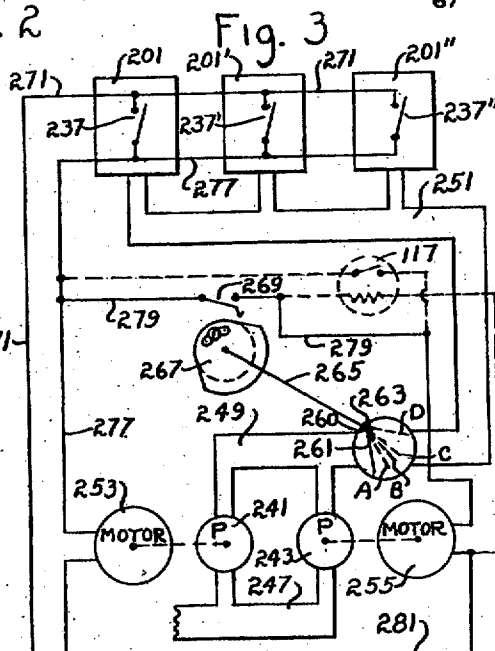


Fig. 3

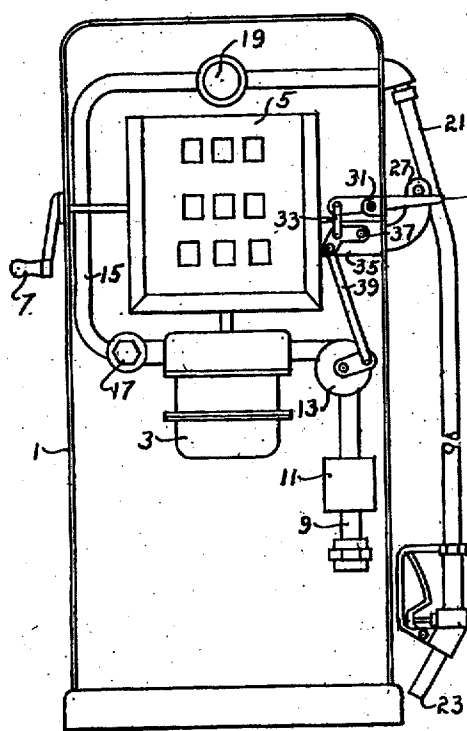


Fig. 1

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MULTIPLE PUMP CONTROL SYSTEM

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11 Claims. (Cl. 222—63)

This invention relates to a multiple pump control system. More specifically, it relates to a liquid pumping system in which a number of dispensers are served by two pumps and in which one pump is started as soon as one dispenser is operated and the second pump is operated when a predetermined number of additional dispensers is operated and in which the pumps are stopped in reverse order as the dispensers are closed down.

It is an object of the invention to provide a control system in which two pumps may serve from 3 to 6 or more dispensers in accordance with the demand.

One object of the invention is to provide a control system which is responsive to changes in pressure in the liquid system for starting and stopping a second pump.

Another object of the invention is to provide means for starting the pumps in a predetermined order and stopping them in reverse order.

A further object is to provide a control system which is responsive to the rate of flow of liquid in the system to start and stop the pumps.

These and other objects will become apparent from a study of this specification and the drawings which are attached hereto, made a part hereof and in which:

Figure 1 is a diagrammatic view of a dispenser or pedestal.

Figure 2 is a schematic wiring and piping diagram of a pressure responsive control system.

Figure 3 is a schematic wiring and piping diagram of a rate of flow responsive control system.

Referring first to Figure 1, the numeral 1 represents the housing in which is mounted a meter 3 which drives a resettable register 5, the reset crank for which is shown at 7. The inlet pipe 9 contains a strainer 11 and a valve 13. The discharge pipe 15 from the meter contains a combined check and relief valve 17 of conventional structure and a sight glass 19 and terminates in a dispensing hose 21 which is fitted with a nozzle 23 having the usual self-closing valve 25.

A nozzle support 27 is fixed to the housing and a switch lever 29 is pivoted at 31 and extends outside the housing over the hose hook in the usual manner.

The other end of the lever is connected by link 33 to the actuating arm 35 of a switch 37. A link 39 runs from arm 35 to the valve 13.

Thus, as the lever 29 is raised, after removal of the nozzle from hook 27, link 33 depresses arm 35 and link 39 to close switch 37 and open valve 13. Reverse operation of lever 29 opens the switch 37, closes valve 13 and clears hook 27 so that the nozzle may be replaced. An interlock mechanism, as shown in Patent Number 2,299,894 issued to C. P. Griffith, October 27, 1942, is conventionally used to prevent operation of the switch lever to close switch 37 until the register 5 is reset to zero.

Referring now to Figure 2, the numerals 41 and 43 are liquid pumps which have their suction sides connected to tank 45 by line 47. The discharge sides of the pumps

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are connected by a manifold 49 and the latter is connected by pipes 51 to the dispensers 1, 1' and 1''.

A motor 53 drives pump 41 and a motor 55 drives pump 43. A pressure switch 56 has its bellows 57 connected by tube 59 to the manifold 49. The tube 59 may be provided with a restriction or snubber 60 to prevent surges in the line from operating the bellows.

WIRING DIAGRAM

The mains 61 and 63 are connected through a suitable main switch 65 to the electrical control mechanism.

Main 63 is connected to one side of each of the pedestal switches 37, 37' and 37''. The opposite sides of these switches, which are connected in parallel, are connected to a line 67 which runs to one terminal of each of the motors 53, 55. From the other terminal of motor 53 a line 69 runs to terminal 71 of reversing switch 73 while a line 75 runs from the other terminal of motor 55 to the terminal 77 of the reversing switch. A jumper 79 connects terminals 71 and 81 of the switch, while a jumper 83 connects terminals 77 and 85.

Main 61 is connected by wire 90 to the blade 89 of the switch while blade 91 of the switch is connected by wire 93 to the relay contact 95. Main 61 is connected by wire 97 to the relay blade 99 which cooperates with contact 95. Main 61 is also connected to one pole 101 of the pressure switch, the other pole 103 of which is connected by wire 105 through a resistance 107 to the coil of the relay 109. The other side of the relay coil is connected by line 111 to the relay contact 113 and by line 115 through the tube 117 and wire 119 to the blade 121 of the relay which cooperates with contact 113.

The line 119 is also connected by line 123 to the line 67 which runs to the motors, as described above.

A branch line 125 connects line 105 running from pressure switch contact 103, through resistance 127, the heater 129 of tube 117 and line 131 to contact 133 of the relay which cooperates with blade 121.

Operation

Assume that the reversing switch is set with blades 89, 91 contacting terminals 81, 85.

Closure of any of the pedestal switches 37, 37' or 37'' closes the circuit to motor 53 as follows: main 63, the pedestal switch, line 67, motor 53, line 69, jumper 79, contact 81, blade 89, line 90 to main 61.

The starting of pump 41 causes a flow of liquid from the tank 45 to the pedestal hose and applies line pressure to the bellows 57 to open the pressure switch 56. Since the tube 117 has not time to heat sufficiently to close the line 115—119, no other action occurs at this time.

For the same reason, any momentary reductions in pressure in the bellows which may cause a closure of the pressure switch will not cause any action of the rest of the system. The snubber 60 also reduces the action of the bellows to surges or other changes in line pressure so that a sustained pressure condition is necessary to cause any further action of the control system.

Assuming now that another pedestal 1' is placed in operation by closing switch 37''. Since this opens another outlet, the pressure in the tube 59 will be reduced. Depending upon the setting of the pressure switch, the contraction of the bellows may be enough to close the switch or it may not.

Assume that it does not and that a further reduction in pressure is required and is attained by the operation of the third pedestal 1''. When the nozzle valve is opened, the pressure in the bellows will be further reduced and switch 56 will be closed.

The heater of tube 117 will be placed in circuit from main 61, through pressure switch 56, lines 105, 125, resistor 127, heater 129, line 131, contact 133, blade 121,

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lines 119, 123, 67, any of the pedestal switches 37 to main 63.

After the required period of time, the tube closes lines 115, 119 which in turn energizes the relay coil 109 as follows: main 61, pressure switch 56, line 105, relay coil 109, lines 111, 115, 119, 123, 67, any of the pedestal switches 37 to the main 63.

Energization of the relay opens the heater circuit by breaking switch 121, 133 and closes switches 95, 99 and 113, 121.

The latter sets up a holding circuit from main 61, through pressure switch 56, line 105, relay coil 109, line 111, switch 113, 121, lines 119, 123, 67, a pedestal switch 37 to main 63. The relay is thus held energized.

Switch 95, 99 closes the circuit to the other motor 55 as follows: main 61, line 97, switch 99, 95, line 93, blade 91 and contact 85 of the reversing switch, jumper 83, line 75, motor 55, line 67, a pedestal switch to main 63.

Thus, the second motor will be energized and will drive pump 43 to contribute additional liquid to the pedestals.

The pressure is not raised sufficiently to open the pressure switch since three nozzles are open and any surge which might result from the additional pump is choked off by the snubber.

Operation of both pumps will continue so long as the pressure switch remains closed. When one dispenser is closed down, the pressure will increase in the bellows until it opens the pressure switch at which time the relay coil circuit is killed and the switches 95, 99 and 113, 121 are opened to stop the motor 55. Motor 53 continues to run until the last pedestal switch is opened.

The reversal of blades 89, 91 of the reversing switch to contacts 77, 71 merely reverses the operation of the motors. In such case motor 55 will start upon closure of any pedestal switch and motor 53 will start only when the predetermined minimum pressure is reached. When shutting down, motor 53 will first be stopped, then motor 55.

The tube 117 is a conventional time delay or heater actuated thermostatic switch which has a delay period of preferably 5 to 6 seconds and which is mounted in a pronged tube for ease of installation and replacement.

MODIFIED FORM

In the modified form, Figure 3, the pedestals 201, 201' and 201'' are similar in all respects to the pedestal shown in Figure 1 and the pedestal switches are numbered 237, 237' and 237''.

Pump 241 is driven by motor 253 while pump 243 is driven by motor 255.

The suction sides of the pumps are connected by line 247 to a tank (not shown) while the discharge sides are connected by manifold 249.

Somewhere in the pipe 251 which carries all of the liquid dispensed by the pumps and which connects the manifold 249 with the pedestals, a flow valve 260 has a flow actuated member 261 which is interposed in the stream of liquid.

The member is here shown as a flap valve which is fixed at 263 to a pivotal shaft 265 so as to be held transversely of the direction of flow by gravity. As the flow starts, the flap will be raised and as the rate of flow increases or decreases, the flap will rise or fall.

A cam 267 is adjustably connected to the shaft 265 for rotation thereby and operates a normally open switch 269. The cam is adjusted so that the switch is closed when the member reaches the position B, but is open at all lower positions.

WIRING DIAGRAM

The mains 271 and 273 are provided with a switch 275. The main 271 is connected to one side of each of the pedestal switches. A line 277 runs from the other side

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of all said switches to the motor 253 which is connected to main 273.

A branch line 279 runs from line 277, through switch 269 to motor 255 and the other side of the motor is connected by line 281 to main 273.

Operation

When any one of the pedestal switches is closed, the motor 253 is started at once by means of the circuit 271, the pedestal switch, line 277, motor 253 to main 273.

The pump 241 draws liquid from the tank and forces it through manifold 249, the valve 260, line 251 to the hose 21 of the pedestal. The member 261 of the valve takes a position which is the result of the rate of flow of liquid past it and is indicated by the letter A.

When another pedestal is brought into operation, the rate of flow of liquid increases slightly so that the member will assume the position B. A similar result will be attained if the third pedestal is operated, the member taking a position such as C.

The cam 267 being adjustably mounted on shaft 265 may be set to close the switch 269 when the member reaches its B position, if preferred, when it reaches the C position depending upon the operation required.

As soon as the switch 269 is closed the motor 255 is started by way of main 271, a pedestal switch, lines 277, 279, switch 269, motor 255 and line 281 to main 273.

The rate of flow will again increase and the member 261 will occupy some such position as D. The cam will still keep the switch 269 closed so that both pumps will now be operating.

If, at any time, the rate of flow through the valve 260 decreases to the point that the member returns to a position below the C position, the switch 269 will be opened by cam 267 and the second motor 255 will stop. Motor 253, of course, will continue to run so long as any pedestal switch remains closed.

It is obvious, of course, that by the addition of the reversing switch, the motors 253, 255 could be alternated as the number 1 motor, as shown in Figure 2 above, the object being to distribute the wear between the two motors and pumps.

In the event trouble is incurred with rate of flow changes due to surges in the line, a time delay tube, such as 117, may be interposed in the line so that several seconds delay are incurred before the second motor is started, to prevent hunting.

It will be seen that both of the systems disclosed utilize only two wires which run between the pedestals and the pump and control structure, thus economy of installation is achieved. The pedestals are almost always surrounded by a heavy concrete apron and it would be expensive to tear up a great deal of this concrete in order to install the wires.

It will also be seen that instead of having a pump and motor for each pedestal, only two of each are needed to serve 3 or more pedestals. Usually, the latter are distributed over the service area and only a few are simultaneously in operation at any one time. In this way economy of equipment is achieved.

A further benefit is attained in that the pumps are located close to the tanks, the liquid is not unduly heated, and the suction lift is reduced to a minimum. The long lines leading to the pedestals under the drives and apron, where considerable heat is accumulated, are all under pressure so that vaporization is reduced to a minimum. In the usual installation with an individual pump and motor for each pedestal, the suction lift is high and the vaporization of the liquid due to such lift and the heat in the liquid often renders such pumps entirely inoperative in hot weather.

It is obvious that various changes may be made in the form, structure and arrangement of parts without departing from the spirit of the invention. Accordingly, applicant does not desire to be limited to the specific em-

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bodiment disclosed herein primarily for purposes of illustration; but instead, he desires protection falling fairly within the scope of the appended claims.

What I claim to be new and desire to protect by Letters Patent of the United States is:

1. In a liquid dispensing system, the combination of a dispensing line, a number of dispensing pedestals connected to said line and each having a dispensing hose controlled by a nozzle valve, a manually operable switch in each pedestal, two pumps connected in parallel to supply liquid under pressure to said dispensing line, a motor connected to drive each pump, means connecting said switches in parallel with each other and in series with one motor so that the closure of any switch will start said motor, sensing means disposed in said dispensing line operable in response to the hydraulic conditions in said line, and means responsive to a predetermined operation of said sensing means for controlling the other motor, said last named means being adjustable so that it will start said other motor in response to the opening of the nozzle valve of the third pedestal with the nozzles of two other pedestals open.

2. In a liquid dispensing system, the combination of a dispensing line, a number of dispensing pedestals connected to said line and each having a dispensing hose controlled by a nozzle valve, a manually operable switch in each pedestal, two pumps connected in parallel to supply liquid under pressure to said dispensing line, a motor connected to drive each pump, means connecting said switches in parallel with each other and in series with one motor so that the closure of any switch will start said motor, sensing means disposed in said dispensing line operable in response to the hydraulic conditions in said line created by the operation of the pedestal nozzle valves, and means responsive to a predetermined operation of said sensing means for controlling the other motor.

3. In a liquid dispensing system, the combination of a dispensing line, a number of dispensing pedestals connected to said line and each having a dispensing hose controlled by a nozzle valve, a manually operable switch in each pedestal, two pumps connected in parallel to supply liquid under pressure to said dispensing line, a motor connected to drive each pump, means connecting said switches in parallel with each other and in series with one motor so that the closure of any switch will start said motor, sensing means disposed in said dispensing line operable in response to the hydraulic conditions in said line created by the opening of a number of said pedestal nozzle valves, and means connected for control by said sensing means for starting said other motor.

4. In a liquid dispensing system, the combination of a dispensing line, a number of dispensing pedestals connected to said line and each having a dispensing hose controlled by a nozzle valve, a manually operable switch in each pedestal, two pumps connected in parallel to supply liquid under pressure to said dispensing line, a motor connected to drive each pump, means connecting said switches in parallel with each other and in series with one motor so that the closure of any switch will start said motor, sensing means disposed in said dispensing line including means responsive to a predetermined low pressure in said line for starting said other motor and said means being also responsive to a succeeding higher pressure in said line for stopping said other motor.

5. In a liquid dispensing system, the combination of a dispensing line, a number of dispensing pedestals connected to said line and each having a dispensing hose controlled by a nozzle valve, a manually operable switch in each pedestal, two pumps connected in parallel to supply liquid under pressure to said dispensing line, a motor connected to drive each pump, means connecting said switches in parallel with each other and in series with one motor so that the closure of any switch will start said motor, sensing means disposed in said dispensing

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line including means responsive to the rate of flow of liquid in the line for controlling said other motor.

6. In a liquid dispensing system, the combination of a dispensing line, a number of dispensing pedestals connected to said line and each having a dispensing hose controlled by a nozzle valve, a manually operable switch in each pedestal, two pumps connected in parallel to supply liquid under pressure to said dispensing line, a motor connected to drive each pump, means connecting said switches in parallel with each other and in series with one motor so that the closure of any switch will start said motor, sensing means disposed in said dispensing line including means responsive to a predetermined high flow of liquid in the line for starting the other motor, said means being also responsive to a predetermined succeeding lower flow for stopping said other motor.

7. In a liquid dispensing system, the combination of a dispensing line, a number of dispensing pedestals connected to said line and each having a dispensing hose controlled by a nozzle valve, a manually operable switch in each pedestal, two pumps connected in parallel to supply liquid under pressure to said dispensing line, a motor connected to drive each pump, means connecting said switches in parallel with each other and in series with one motor so that the closure of any switch will start said motor, sensing means disposed in said dispensing line operable in response to the hydraulic conditions in said line, and means responsive to a predetermined operation of said sensing means for controlling the other motor, said last named means including a time delay means for preventing operation of said other motor until a predetermined period of time has elapsed.

8. In a liquid dispensing system, the combination of a dispensing line, a number of dispensing pedestals connected to said line and each having a dispensing hose controlled by a nozzle valve, a manually operable switch in each pedestal, two pumps connected in parallel to supply liquid under pressure to said dispensing line, a motor connected to drive each pump, means connecting said switches in parallel with each other and in series with one motor so that the closure of any switch will start said motor, sensing means disposed in said dispensing line including means responsive to a predetermined pressure in said line for controlling said other motor, said last named means including a time delay means for preventing operation of said other motor until a predetermined period of time has elapsed.

9. In a liquid dispensing system, the combination of a dispensing line, a number of dispensing pedestals connected to said line and each having a dispensing hose controlled by a nozzle valve, a manually operable switch in each pedestal, two pumps connected in parallel to supply liquid under pressure to said dispensing line, a motor connected to drive each pump, means connecting said switches in parallel with each other and in series with one motor so that the closure of any switch will start said motor, sensing means disposed in said dispensing line including means responsive to a predetermined low pressure in said line for starting said other motor and said means being also responsive to a succeeding higher pressure in said line for stopping said other motor, said last named means including a time delay means for preventing operation of said other motor until a predetermined period of time has elapsed.

10. In a liquid dispensing system, the combination of a dispensing line, a number of dispensing pedestals connected to said line and each having a dispensing hose controlled by a nozzle valve, a manually operable switch in each pedestal, two pumps connected in parallel to supply liquid under pressure to said dispensing line, a motor connected to drive each pump, means connecting said switches in parallel with each other and in series with one motor so that the closure of any switch will start said motor, sensing means disposed in said dispensing line including means responsive to the rate of

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flow of liquid in the line for controlling said other motor, said last named means including a time delay means for preventing operation of said other motor until a predetermined period of time has elapsed.

11. In a liquid dispensing system, the combination of 5
a dispensing line, a number of dispensing pedestals connected to said line and each having a dispensing hose controlled by a nozzle valve, a manually operable switch in each pedestal, two pumps connected in parallel to supply liquid under pressure to said dispensing line, a 10
motor connected to drive each pump, means connecting said switches in parallel with each other and in series with one motor so that the closure of any switch will start said motor, sensing means disposed in said dispensing line including means responsive to a predetermined 15

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high flow of liquid in the line for starting the other motor, said means being also responsive to a predetermined succeeding lower flow for stopping said other motor, said last named means including a time delay means for preventing operation of said other motor until a predetermined period of time has elapsed.

References Cited in the file of this patent

UNITED STATES PATENTS

1,304,529	Arnold	May 27, 1919
1,618,006	Hawxhurst	Feb. 15, 1927
2,028,259	Van Valkenburg	Jan. 21, 1936
2,051,597	Head	Aug. 18, 1936
2,732,100	Jackson et al.	Jan. 24, 1955