Feb. 14, 1956 R. T. SETTERGREN ET AL 2,734,661

LIQUID DISPENSING APPARATUS

Filed Nov. 7, 1952 2 Sheets-Sheet 1

FIG. 1.

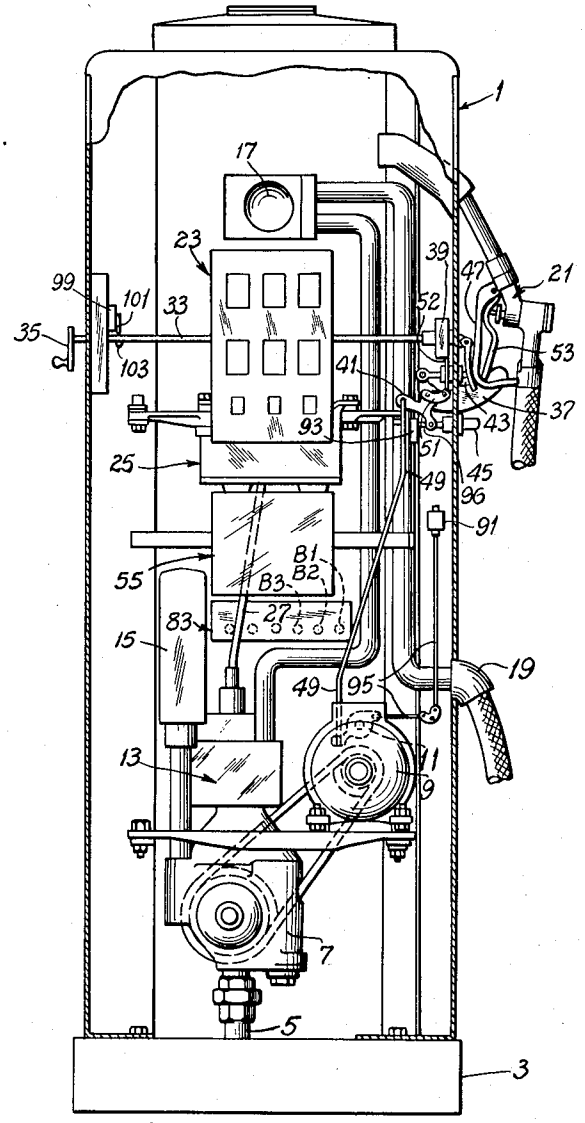
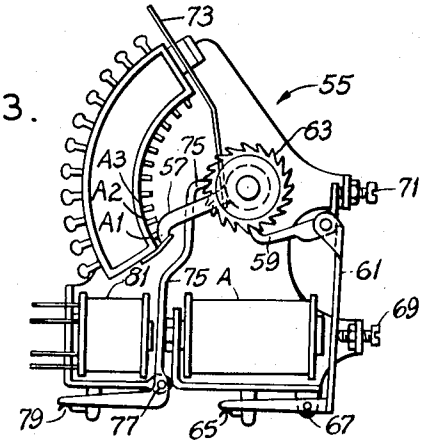


FIG. 3.



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FIG. 2.

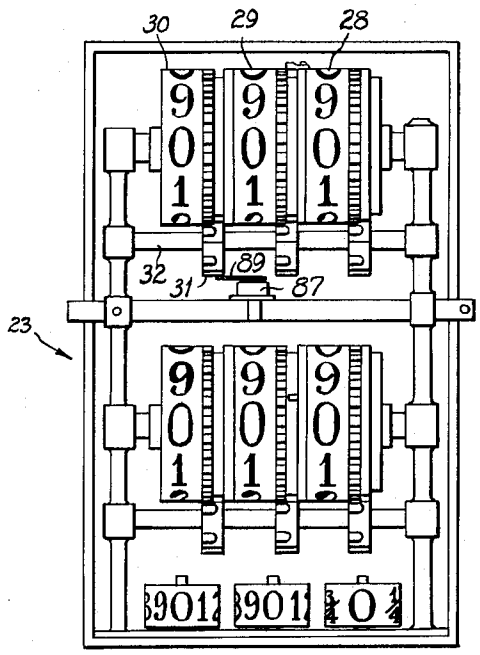
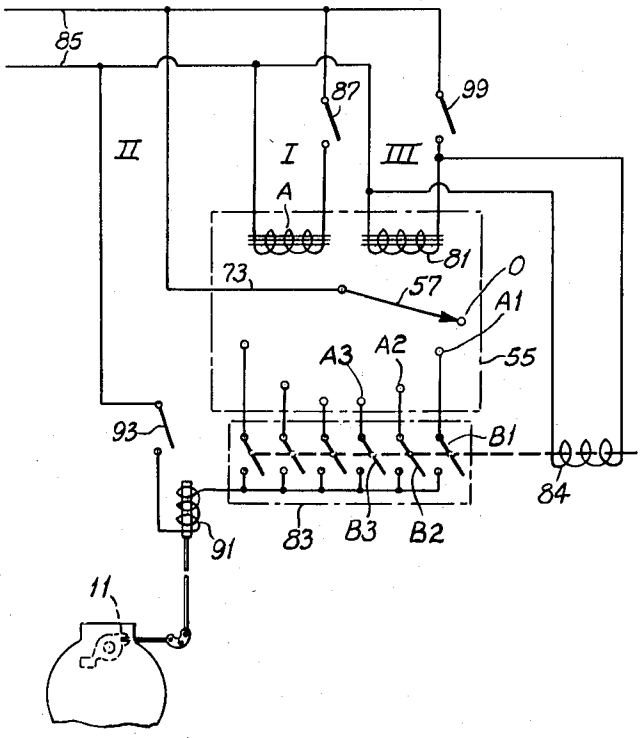


FIG. 4.



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United States Patent Office 2,734,661
Patented Feb. 14, 1956

2,734,661

LIQUID DISPENSING APPARATUS

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Application November 7, 1952, Serial No. 319,266

5 Claims. (Cl. 222—16)

This invention relates generally to liquid dispensing apparatus, and more particularly, to dispensing apparatus of the type used in automobile service stations for dispensing gasoline.

Those experienced in the art recognize that a large number if not the greater proportion of automobile owners prefer to purchase gasoline in definite quantities, as, for example, five gallons or one dollar's worth. Existing dispensing equipment generally is not adapted to deliver such predetermined quantities except under the manual control of an attendant. Although automatic controls have been proposed in the art, the proposals have heretofore suffered from various deficiencies. In some instances, the automatic apparatus is excessively costly and requires considerable space in the otherwise cramped housing of the dispenser. In other instances, the automatic control is not easily set nor foolproof in operation. Of course, an automatic control that requires substantial adjusting effort on the part of an attendant or which is tricky to operate is little better than conventional manual control over delivery.

Another important consideration is the adaptability of the control to existing manual equipment. In respect to ease of installation, it is desirable to have an automatic control that may be installed without replacing or otherwise disturbing any of the conventional mechanism in dispensers, this mechanism being quite complicated in itself.

It is accordingly an object of this invention to provide automatic liquid dispensing apparatus for delivering preselected quantities of motor fuel, such apparatus being particularly adapted for use in conventional dispensing equipment and being inexpensive, readily installed, simple and foolproof in operation, and fully cooperable with the existing mechanism.

In the attainment of these objectives, it may initially be noted that a modern dispenser includes a motor-driven pump, a motor switch operated by movement of the nozzle from its hanger, a metering device for measuring the flow of fuel, a totalizing register driven by the metering device for recording the amount of fuel delivered, and a reset crank having an interlocking cooperation with the motor switch. When a sale is made, the nozzle is lifted from its hanger and the motor is energized. Fuel flow is controlled by a manually-operated valve in the nozzle, and when delivery has been completed, the nozzle is replaced, whereupon the motor is de-energized. A new sale cannot then be made until the reset crank is manipulated to reset the register and release the motor switch for proper actuation when the nozzle is again lifted from its hanger.

According to this invention, a first normally-open control switch is arranged adjacent the totalizing register for actuation thereby, and this switch is electrically connected to excite an indexing or stepping coil of a step relay. The relay has a plurality of normally open contacts which are sequentially closed by successive energization of the indexing coil. These contacts are connected through a plurality of selectively closable circuits, each of which includes a manual switch, to energize a solenoid arranged to actuate the motor-switch linkage. Control over the quantity of fuel delivered is obtained by closing one of the branch circuits so that the solenoid is energized on the first, second, third, etc., energization of the indexing coil. The step relay may also include a reset coil, and a second control switch may be arranged adjacent the reset crank mechanism for actuation thereby.

Other features of the invention will be in part apparent from and in part pointed out in the following detail description taken in connection with the accompanying drawings, in which:

Fig. 1 is an elevation, partly in section, of a modern gasoline dispensing unit, illustrating certain features of this invention;

Fig. 2 is a detail view of a part of the totalizing register showing an indexing switch;

Fig. 3 is a plan view of a reset step relay under control of said index switch; and,

Fig. 4 is a circuit diagram illustrating electrical components and connections.

Referring now to Fig. 1 of the drawings, there is shown one form of a modern gasoline dispenser. The device includes the usual housing **1** resting upon a pedestal **3** with a pipe **5** leading out from a storage tank. A pump **7** is located at the bottom of the housing to draw fuel from the fuel supply, and the pump is belt-driven from an electric motor **9**. The usual motor supply lines (not shown) are connected through a switch operated by a switch arm **11**, which is rotated clockwise and counterclockwise, respectively, to energize and de-energize the motor. On the pressure side of the pump **7** there is a metering device generally designated **13** and an air separator generally designated **15**, these items being known in the art. From the meter **13**, fuel is pumped through a visiguage **17** (known in the art) to a hose outlet connection **19**. A hose (not shown) extends from the outlet connection **19** to a nozzle **21**, which is supported as shown when not in use.

To record the quantity of fuel delivered in each sale, there is provided a totalizing register, generally designated **23**, which is operated by a variator **25** (for example, see United States Patent No. 2,111,996), and the latter in turn is driven by a meter shaft **27** extending from the metering device **13**. A detailed description of the register is not given herein, this device being known in the art, but briefly there are two sets of revolving drums, one of which sets records fuel delivered in terms of gallons and the other of which records the delivery in terms of dollars. Each set is generally made up of three drums, and the arrangement is such that the initial drum **28** rotates continuously with flow of fuel to record tenths of a gallon or hundredths of a dollar. A middle drum **29** records complete revolutions of the initial drum **28** and a third drum **30** records complete revolutions of the middle drum, it being understood that each drum carries numerals zero through nine. The higher value drums (those to the left in Fig. 2) are driven from the lower value drums (those to the right) through Geneva movements or the like, as by sprockets **31** rotary on a shaft **32**. In addition, the register has a reset shaft **33** which is manipulated by a crank **35** on one side of the housing.

The dispensing unit also includes a motor starting and stopping mechanism. Although various arrangements may be used, they generally include a linkage interconnecting the motor switch and a nozzle-supporting part for starting and stopping the pump motor when the nozzle **21** is lifted from or replaced upon its hanger **37**. Also, there is generally interlock mechanism **39** coupling the reset shaft **33** with the motor starting linkage so that the register must be reset after each sale before the pump motor can be energized preparatory to a new sale.

In the example shown, a bell crank **41** is pivoted on the nozzle hanger **37**. At one end, the bell crank **41** is en-

gaged by a push button 43 and its other end by a push button 45. The first push button 43 is arranged for cooperation with a guard 47 on the nozzle so that the bell crank 41 is rotated counterclockwise when the nozzle is placed upon its support, whereas the other push button 45 may be manipulated to rotate the crank clockwise when the nozzle is removed preparatory to a sale. The motor switch arm 11 is operatively coupled by a rod 49 to the bell crank 41, and the motor 9 accordingly is energized and de-energized by movement of this rod.

The interlock mechanism (various types being known in the art) includes an arm 51 extending from the bell crank and connected at 52 to the mechanism generally designated 39. It will be understood the arrangement is such that after the nozzle has been lifted and then replaced, the bell crank 41 is locked against further movement, even after displacement of the nozzle, until the reset crank 35 has been first manipulated to reset the register.

In operation, the dispensing equipment as described above is essentially manual. When making a sale, the nozzle 21 is removed and the pump motor 9 is started by manipulation of the push button 45. Actual flow of fuel is then controlled by a valve in the nozzle 21, there being a manual valve lever 53 located within the guard 47. If the customer has specified a predetermined quantity of fuel, the attendant necessarily observes the register to ascertain when that quantity has been delivered. The valve is then closed and the nozzle is replaced, whereupon the motor is de-energized. It will be apparent that the attendant can only service one automobile at a time, and that while supplying gasoline he cannot perform any of the other services commonly expected at service stations.

This time-wasting situation has been largely eliminated in the case where a customer desires to have the tank completely filled, because vacuum-actuated automatic-closing valves are in general use, these valves operating to close automatically when the level of fuel in the automobile tank reaches the end of the nozzle. As yet, however, there is no general use of automatic dispensing apparatus for delivering a preselected less-than-full-tank quantity of fuel.

To this end, we provide a step relay generally designated 55, which may be mounted as a unit within the housing 1 of the dispenser. Such relays are known in the art, but for purposes of illustration, Fig. 3 shows a rotary selector type. Contacts A–1, A–2 and A–3 are arranged in a bank so as to be swept by a wiper 57. In other words, the fixed contacts A–1, A–2 and A–3 are sequentially closed upon movement of the common contact 57 thereacross in a clockwise direction. The unit incorporates the forward-drive principle, there being a ratchet wheel 63, which is driven forward (clockwise) by a pawl 59. The wiper 57 is carried by the ratchet wheel 63, and the pawl 59 is actuated by an armature 61 pivotally mounted opposite an indexing coil A for actuation thereby. A spring 65 returns the armature 61 when the indexing coil A is de-energized between steps.

As shown, the armature is pivoted at 67 and adjustments are provided at 69 and 71. A fixed brush 73 is electrically connected to the wiper 57 and a return spring (not shown) operates to bias the ratchet wheel 63 and attached wiper 57 in a counterclockwise direction. A holding pawl 75 is pivoted at 77 and spring biased at 79 against the ratchet wheel. The holding pawl 75 extends adjacent a reset coil 81, which when energized operates to release the ratchet wheel for return under bias to the zero position.

In addition to the step relay 55, there is provided a switch selector mechanism generally designated 83. In Fig. 1 this selector mechanism is shown to comprise a group of push button switches, B–1, B–2 and B–3 accessible through the housing 1, any one of which may be actuated to close a corresponding switch (Fig. 4). The mechanism may also include a releasing coil 84, which is arranged so that when it is energized, the actuated switch button returns to its circuit-open position. Such mechanism is known in the art.

The circuit, as illustrated in Fig. 4, comprises supply lines 85, which are connected in an index control circuit I including an index switch 87 and the index coil A. This control switch 87, which is of the small deflection or micro-switch type, is mounted on or adjacent the totalizing register 23 for actuation thereby (Fig. 2). It is contemplated that in many instances, the index switch will be correlated to close with movement of the dollar drum, although it will be understood that the switch might be correlated for response to movement of other drums, as for example, the gallon drum. The arrangement is such that a switch arm 89 extends into the path of the drive sprocket 31 for the proper drum. The index switch is normally open and is actuated to a closed position upon movement of the sprocket 31, as with each complete revolution of the middle drum 29. We have found that with this arrangement, considerable sensitivity can be readily and reliably obtained.

In addition, the power supply lines 85 are connected to a solenoid-control circuit II including an electric actuator or solenoid 91 and a solenoid de-energizing switch 93. The de-energizing switch 93, which is also of the micro-switch type, is mounted adjacent the nozzle hanger 37 with a switch arm 96 engaging the crank 41 for actuation thereby (Fig. 1). The arrangement is such that the control switch 93 is closed whenever the pump motor 9 is energized by manipulation of the push button 45, and is opened upon actuation of the crank 41 and the motor-switch linkage to de-energize the motor.

The solenoid 91 is mounted on the housing 1 and is mechanically connected to the motor switch arm 11 by linkage 95. Its arrangement is such that the switch arm 11 is actuated (counterclockwise) to its circuit-open position upon energization of the solenoid.

As indicated in Fig. 4, the brush 73 for the rotary contact wiper 57 is electrically connected to one of the supply lines, whereas the other supply line is connected at 97 through the de-energizing switch 93 and solenoid 91 to one side of the selector switch mechanism 83. The various switches B–1, B–2 and B–3 are connected in parallel on this side of the mechanism, and on the other side the switches are individually connected to the fixed contacts A–1, A–2 and A–3, respectively. The selector switches B–1, B–2 and B3 are normally open, and it will be apparent that any one may be manipulated to establish a branch circuit from the associated fixed contact of the reset relay to the solenoid 91. The quantity of fuel to be delivered will depend upon which of the selector switches is closed.

Finally, the control comprises a reset circuit III including a reset switch 99, the reset coil 81 of the step relay and the release coil 84 of the selector mechanism. The reset switch 99 is mounted adjacent the reset shaft 33 with the switch arm 101 arranged in cooperation with the reset shaft for actuation thereby upon manipulation of the reset crank 35. The shaft 33 generally has some eccentricity, as indicated at 103, which may be used for this purpose.

Operation is as follows: Assume that the customer desires two dollars' worth of gasoline. In accordance with customary practice, the reset crank 35 is initially manipulated to reset the totalizing register 23. With this action, the reset switch 99 is closed automatically to energize he reset coil 81 and return the relay wiper 57 to its zero position. Also, the release coil 84 is energized automatically to open any selector switch that may have been closed previously. The control apparatus is thus automatically prepared for a new sale.

The attendant next manipulates the proper selector switch which in this case (two dollars' worth of gasoline) would be the switch B–2. The nozzle 21 is lifted from its hanger 37 and the push button 45 is manipulated to close the motor switch at 11 and energize the pump motor through the customary supply lines (not shown) and

automatically close the control switch 93. The nozzle is entered into the tank opening of the automobile, and the valve 53 is opened to commence delivery of fuel. The nozzle may be left in the tank, and the attendant may proceed with other services such as cleaning the windshield and the like without further attention to the filling.

As fuel is delivered, the register is continuously operated, with the drum 28 rotating continuously and the drum 29 registering complete revolutions of drum 28. Upon a complete revolution of the middle drum 29 (tenths of a dollar) the sprocket 31 is moved to index the dollar drum 30 one step forward. In the disclosed embodiment, the control is coupled to the gear for the third drum 30, which registers dollars, hence is adapted to distinguish only between full dollar quantities, but modifications will be apparent. At the same time, the switch 87 is temporarily closed to complete a circuit to the index coil A. Energization of this coil steps wiper 57 into switch closing engagement with the first fixed contact A–1. The corresponding selector switch is open, however, hence the solenoid 91 is not energized at this time.

Upon the next complete revolution of the middle drum 29, the sprocket is again indexed forward to drive the drum 30 to the two dollar position, and the index switch 87 is again closed. This time, however, as the wiper arm moves into engagement with the fixed contact A–2, a circuit is established and current flows through the associated switch B–2 (which is closed) to energize the solenoid 91. This solenoid then mechanically actuates the link 49 and motor switch arm 11 to de-energize the motor and stop delivery of fuel. The nozzle is then returned to its hanger 37 in the customary manner, and it will be apparent that the dispenser is in the usual condition at the end of a sale. At the same time, the motor switch linkage 45 is actutaed to open the de-energizing switch 49, thereby to prevent continued energization of the solenoid.

From the above it will be apparent that the automatic control of this invention is simple to manufacture and install; the principal elements comprising a solenoid, a step-type relay, selectively closable switch means, and a control switch for detecting movement of the indicator drums of the totalizing register. Inasmuch as these drums are operated through Geneva movements or the like, a conventional microswitch may be employed for this purpose. For further improved performance, the step relay may be of the reset type and there may be a second microswitch connected to energize the reset coil and arranged for actuation by the reset mechanism. Other features are pointed out.

Although the detail description discloses use of the control in association with the dollar drum of the totalizing register, it will be understood that the index control switch may be mounted for response to the movement of other drums or other rotary elements of the register. The control may be made responsive to gallons, tenths of a dollar or almost any desired measure of the fuel delivered. Use need not be made of all of the contacts of the step relay. Where it is desired to have the control respond to delivery of fifty cents worth of fuel, the indexing switch would be arranged for actuation by the drum registering tenths of a dollar and the first four fixed contacts of the step relay would be disconnected. Moreover, the complete control need not be contained within the housing of the dispenser. It is contemplated that in the case of self-service stations, some of the control equipment (the relay and manual switches) might be located remote from the dispenser for control by an attendant servicing many dispensers. Indeed, the adaptability of the control of this invention with its ease of installation are important advantages over prior systems.

Whereas only one embodiment of the invention is disclosed in detail, it will be understood that the drawings and description are to be taken as illustrative, and that variations and modifications thereof will occur to those skilled in the art.

Having thus described the invention, what is claimed and desired to be secured by Letters Patent is:

1. In combination with a gasoline dispenser of the type having a pump, a pump motor, a motor-switch linkage, a totalizing register having a rotary element responsive to delivery of gasoline, a nozzle hanger mechanism interconnected with said motor-switch linkage for energizing and de-energizing the motor upon removal and replacement of the nozzle, and a reset mechanism interconnected between the nozzle hanger mechanism and the register for preventing energization of the motor preparatory to reset of the register; the impovement comprising an electric actuator mechanically coupled to said motor switch means, a plurality of sequentially closed contacts electrically connected through individually closable branch circuits to energize the electric actuator, an index coil for sequentially closing said contacts in response to periodic energization of the coil, and a first control switch arranged in association with said totalizing register for periodic actuation by the rotary element thereof, said first control switch being electrically connected to energize the index coil.

2. The combination as set forth in claim 1, further comprising a reset coil for opening all of said sequentially closed contacts, and a second control switch mechanically arranged in association with the reset mechanism for actuation thereby, said second control switch being electrically connected to energize said reset coil.

3. The combination as set forth in claim 2 further comprising manual switch-control means interposed between said contacts and said electric actuator, said manual switch-control means having reset means for opening all of said branch circuits preparatory to use of the dispenser.

4. The combination as set forth in claim 1, further comprising a normally-open control switch mechanically arranged in association with said nozzle hanger mechanism for closure thereby upon removal of the nozzle and for opening thereof upon replacement of the nozzle, said control switch being connected in the circuit supplying the electric actuator to de-energize the solenoid upon replacement of the nozzle.

5. A gasoline dispenser comprising a pump, pump motor, a motor switch, a totalizing register having a rotary element responsive to delivery of gasoline, a nozzle hanger mechanism, a motor-switch linkage interconnecting said motor switch and said hanger mechanism for energizing and de-energizing the motor upon removal and replacement of the nozzle, reset mechanism interconnected between the motor-switch linkage and the register for preventing energization of the motor prior to reset of the register, a solenoid mechanically connected to actuate said motor switch to circuit-open position when energized, a step relay having a plurality of fixed contacts and a movable contact, an index coil for moving said movable contact from a zero position over the fixed contacts in response to periodic excitation, a reset coil for returning the movable contact to its zero position, a plurality of manual selector switches connected in series with said fixed contacts and in parallel with said solenoid, a first microswitch arranged in association with said totalizing register for periodic actuation by the rotary element thereof, said first control switch being connected to energize the index coil, and a second microswitch mechanically arranged in association with the reset mechanism for actuation thereby, said second control switch being electrically connected to energize the reset coil.

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