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FLUID DELIVERY CONTROL SYSTEM

Filed Oct. 5, 1967 2 Sheets-Sheet 1

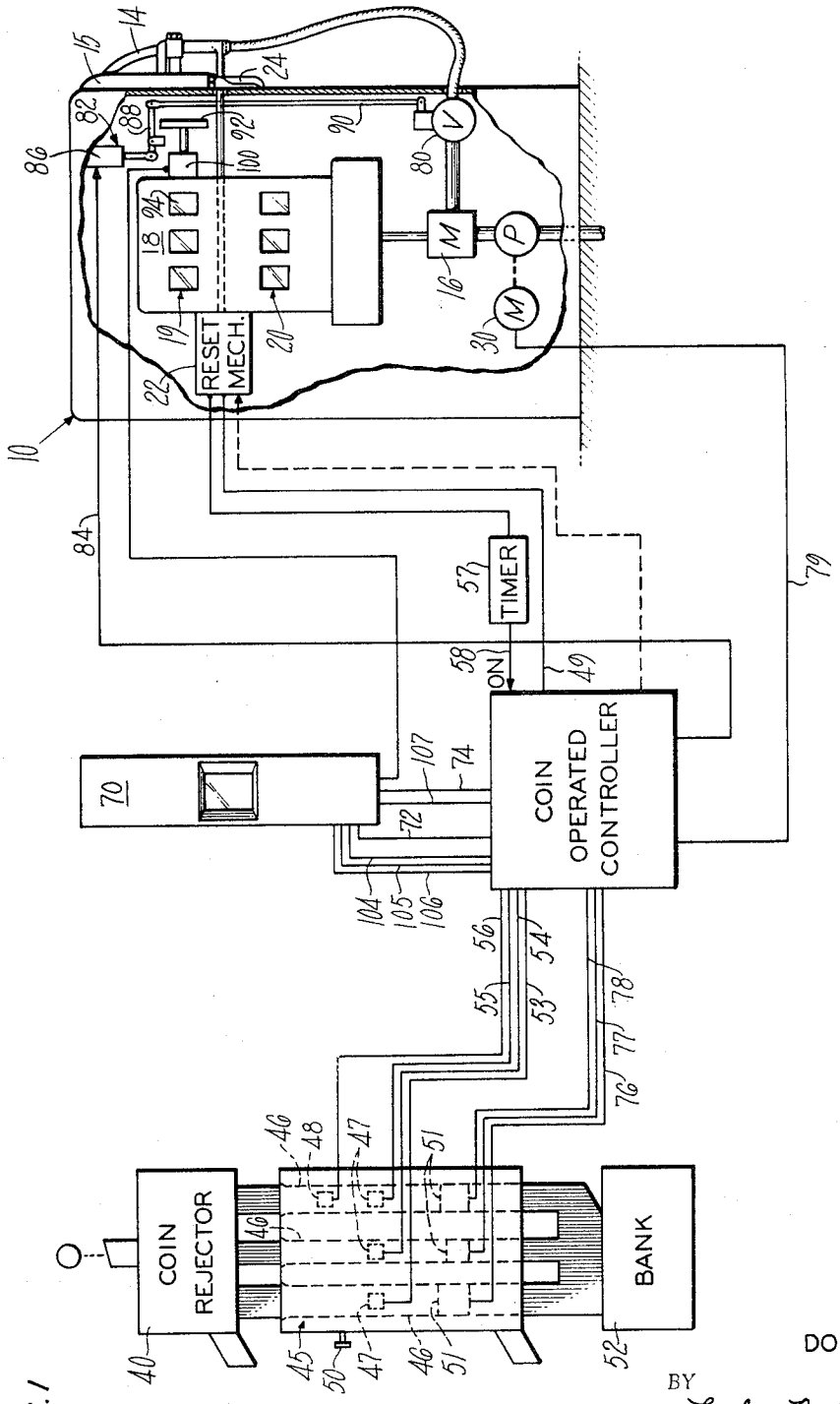


FIG. 1

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ATTORNEYS

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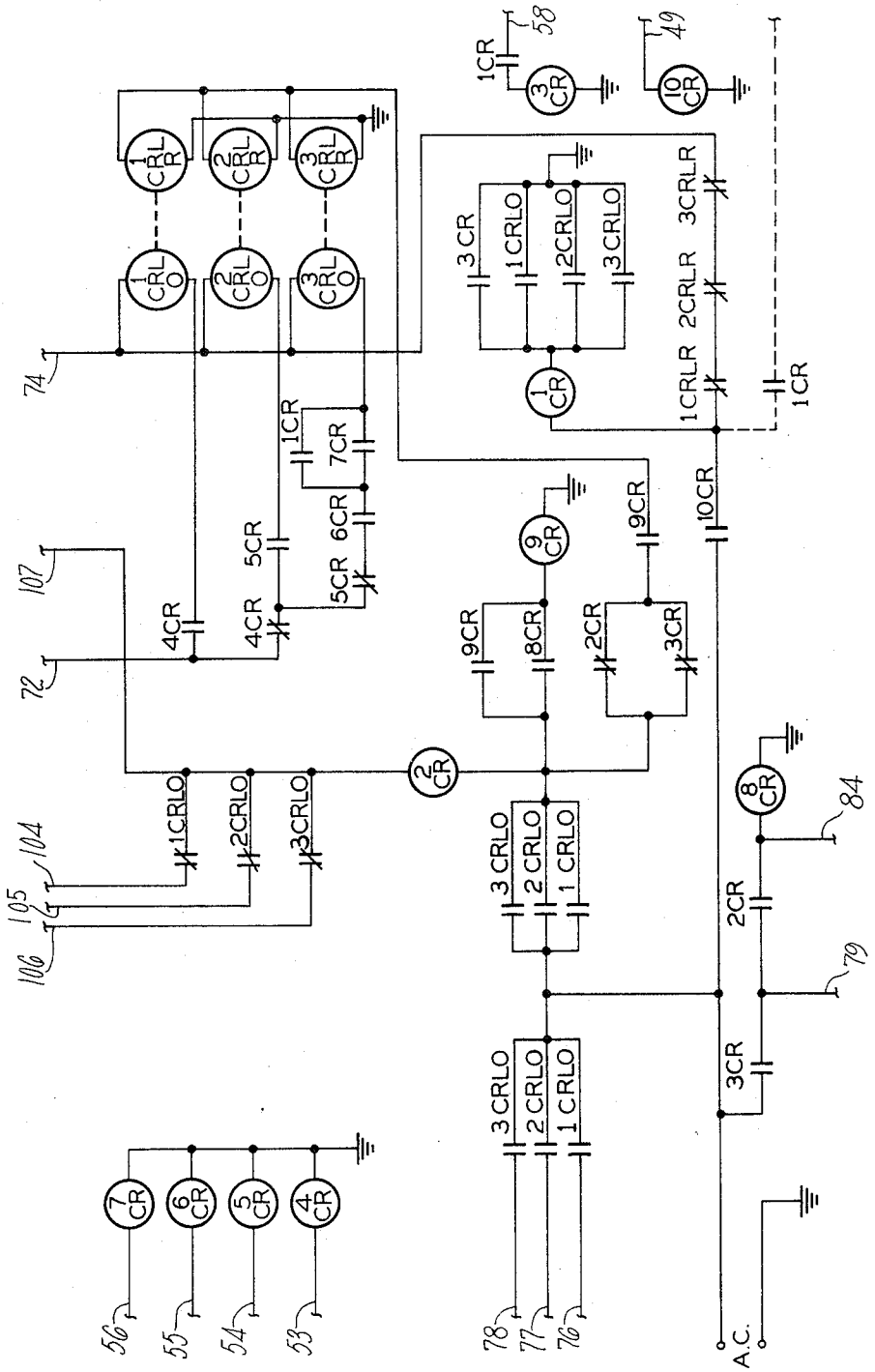


FIG. 2

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FLUID DELIVERY CONTROL SYSTEM

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ABSTRACT OF THE DISCLOSURE

A coin operated self-service fuel dispensing system having a coin rejector for accepting three denominations of coins, a coin magazine for storing the deposited coins of each denomination accepted by the rejector, a coin sensor for sensing the presence of a coin in each magazine and a coin collecting device for selectively collecting a single coin from each magazine. The coins are "held in escrow" in the magazines and a control circuit activated by the coin sensors provides for collecting the highest value coin available from the respective magazine and for activating fuel dispensing apparatus for delivering a corresponding monetary amount of fuel. The control circuit operates to de-energize a holding solenoid of a valve closure mechanism for closing a fuel delivery control valve after the corresponding monetary amount of fuel is delivered, and a stepping switch indexed by a pulse generator operated by the dispensing apparatus is connected for de-energizing the holding solenoid in accordance with the value of the collected coin. The system is "cycled" for each collected coin and after the holding solenoid is de-energized to permit the closure mechanism to close the delivery control valve, the stepping switch is reset to "0" and a succeeding coin, if any, is collected to re-energize the holding solenoid and thereby permit the delivery of an additional monetary amount of fuel corresponding to the value of the succeeding coin. A minimum control relay is employed for activating the fuel delivery apparatus when a minimum monetary amount has been deposited, and the coin magazines are provided with coin return means for returning coins remaining in the coin magazines.

BRIEF SUMMARY OF THE INVENTION

The present invention relates to fluid dispensing systems and in particular to a fluid delivery control system having notable utility with fuel dispensing equipment for providing self-service delivery of fuel.

It is a principal aim of the present invention to provide a new and improved self-service fuel dispensing system which is useful for delivering a preselected monetary amount of fuel and for accurately discontinuing the fuel delivery after the preselected amount is dispensed.

It is another aim of the present invention to provide a new and improved coin operated fuel dispensing system which provides for delivering fuel in accordance with amount preselected by the deposit of coins of one or more denominations.

It is a still further aim of the present invention to provide an inexpensive coin operated fluid dispensing system which provides reliable operation over a long service life.

It is a further aim of the present invention to provide a new and improved self-service dispensing system which may be employed with conventional fuel dispensing equipment.

It is another aim of the present invention to provide a new and improved coin operated fuel dispensing system which provides for refunding the unused coins if

the fuel delivery is terminated before the amount dispensed corresponds to the amount of money deposited.

It is another aim of the present invention to provide a new and improved coin operated fuel dispensing system which provides for sequentially collecting the deposited coins, for delivering an amount of fuel corresponding to the value of the collected coin and for refunding the uncollected coins to the depositor.

It is a still further aim of the present invention to provide a new and improved fuel dispensing system which is adapted to deliver a monetary amount of fuel in accordance with the amount of fuel preselected by the deposit of coins.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth, and the scope of the application of which will be indicated in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a schematic illustration of a fuel dispensing system employing an embodiment of the fluid delivery control system of the present invention; and

FIG. 2 is a schematic illustration of a portion of the delivery control circuitry of the fluid delivery control system.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, a self-service fuel dispensing system incorporating an embodiment of the fluid delivery control system of the present invention is shown employing a conventional fuel pump **10** having the usual nozzle **14** for delivery fuel and a suitable storage receptacle **15** for storing the nozzle **14** between deliveries. A meter **16** in the fuel line provides in a known manner for driving the cost and volume counters **19**, **20** of a register **18** for registering the cost and volume of the fuel delivered, and a suitable reset mechanism **22** of the register **18** provides in a known manner for resetting the cost and volume counters between deliveries.

A manually operable control handle **24** is shown mounted adjacent the nozzle storage receptacle **15** so that the handle must be manually turned to its "off" position before the nozzle can be returned to its storage receptacle **15**. In so doing the handle **24** turns the reset mechanism **22** to its "off" position and, if the reset mechanism **22** is adapted for manual operation, loads the usual reset spring conventionally provided in such manual reset mechanisms. The handle **24** may thereafter be manually pivoted to its "on" position (after the nozzle **14** is removed from its storage receptacle) to operate the reset mechanism **22** to reset the cost and volume counters of the register **18** and to thereby condition the pump **10** for registering the cost and volume of the succeeding delivery.

The shown system is adapted to be operated for delivering fuel in accordance with the value of the coins deposited in a suitable coin rejector **40** which for the purpose of the present explanation will be described as being employed for 25-cent pieces, 10-cent pieces and 5-cent pieces respectively. A coin collector **45** having suitable coin magazines **46** for respectively receiving the coins of each of the three coin denominations from the rejector **40** is provided with a coin sensor **47** for sensing the lowest coin in each of the three magazines and an additional coin sensor **48** for sensing the next to lowest 5-cent piece in the 5-cent magazine. The collector **45** has a suitable coin return mechanism which may be operated by a return button **50** for refunding the coins retained in the coin magazines and a

coin collecting device **51** for each of the three coin magazines for selectively collecting a single coin from each of the magazines, for example by appropriately releasing a coin from the magazine **46** to drop into a bank **52**. Thus, the deposited coins are "held in escrow" within the magazines **46** of the coin collector **45** until the coins are collected by the collecting devices **51** or the operator depresses the return button **50**.

The coin sensors **47, 48** are connected via the leads **53–56** respectively to energize coin sensor relays 4CR, 5CR, 6CR and 7CR. These relays have switch contacts forming a part of a coin selector circuit that is controlled by a relay **10**CR suitably connected by the lead **49** to be energized when the handle **24** is in its "on" position. The switch contacts of the coin sensor relays are connected for selectively energizing one of the coin selector relays 1CRLO, 2CRLO and 3CRLO in accordance with the coin of greatest value in the magazines **46**. More particularly, the coin selector relay 1CRLO will be energized if a 25-cent piece is "held in escrow" in the collector, and if the 25-cent magazine is empty and a 10-cent piece is "held in escrow" the coin selector relay 2CRLO will be energized. If only one 5-cent piece is deposited, the coin selector relay 3CRLO will remain de-energized until a second 5-cent piece is deposited. However, once one of the coin selector relays has been energized, a minimum deposit relay **1**CR is energized to provide that a single 5-cent piece will thereafter be effective to energize the corresponding coin selector relay 3CRLO.

Accordingly, the minimum deposit relay 1CR is energized when the handle **24** is turned to its "on" position if a predetermined minimum amount, here 10 cents, has been deposited and will thereafter remain energized until the fuel delivery is terminated by the return of the handle **24** to its "off" position or by the operation of a timer **57** which may be provided for safety reasons to automatically terminate the delivery after a predetermined interval, for example 5 minutes. More particularly, a delivery control relay 3CR is connected by the lead **58** to be energized by the reset mechanism **22** after the register **18** has been reset and thus after the pump **10** is conditioned for registering a succeeding delivery and to be de-energized by the timer **57** or by the handle **24** when it is returned to its "off" position at the end of a delivery. Also, if the reset mechanism employs an electric motor for resetting the register **18**, the minimum deposit relay 1CR may be used as shown in broken lines in FIGS. 1 and 2 to provide for energizing the reset motor and therefore for resetting the register **18** after the minimum deposit relay 1CR is energized.

The coin selector circuit is connected via a lead **72** to a resettable stepping switch **70** (which may be a conventional single wheel magnetic counter as shown in FIG. 1) so that the coin selector relays are adapted to be energized only when the stepping switch **70** is in its "0" position. And the coin selector circuit is also connected to the stepping switch **70** via the lead **74** to provide for resetting or indexing the stepping switch **70** to its "0" position when all of the coin selector relays are in their "off" positions. Also, after the stepping switch has been reset to its "0" position, one of the coin selector relays 1CRLO, 2CRLO or 3CRLO is adapted to be momentarily energized to its "on" position and to be mechanically held in its "on" position by a corresponding holding relay 1CRLR, 2CRLR or 3CRLR until these holding relays are energized. More particularly, the coin selector relays and their corresponding release relays are mechanically connected so that they are mutually interdependent and so that each relay is adapted to be released by and then hold the other in its energized or "on" position. (For example, this type of relay set is presently sold by Potter and Brumfield, Inc. under the series designation Type KB). Also, the holding relays have switch contacts connected in series for breaking the circuit to the coin selector relays when the active

holding relay is released by the energized coin selector relay.

When one of the coin selector relays 1CRLO, 2CRLO and 3CRLO is energized, the corresponding coin collecting device **51** is energized via the lead **76, 77** or **78** to collect the coin which has been effective to condition the system for the delivery of fuel. Also, with one of the coin selector relays energized and with the delivery control relay 3CR energized, the pump motor **30** will be energized via the lead **79** to provide for delivering fuel under pressure to a two-stage shut-off valve **80** which is employed in the system for controlling the delivery of fuel and for timely terminating the delivery after the amount of fuel paid for has been dispensed.

A valve control relay 2CR is provided for controlling a valve closure mechanism **82** for the valve **80** and, more particularly, for selectively energizing via a lead **84** a holding solenoid **86** of the valve closure mechanism to withdraw a lever **88** and through a suitable linkage **90** to open the two-stage shut-off valve **80**. A cam **92** mounted for rotation with the lowest order or penny wheel **94** of the cost counter **19** is suitably contoured to provide for timely closing the valve **80** if the solenoid **86** is de-energized. In this regard the cam **92** may provide for both partially and completely closing the valve **80** or the partial closure of the valve may accompany the release of the lever **88** upon the de-energization of the solenoid **86**. The cam **92** is suitably contoured for completely closing the two-stage shut-off valve **80** at the "5" and "0" angular positions of the penny wheel **94**. Thus, if the solenoid **86** is de-energized at the "1" or "6" angular position of the penny wheel **94**, the cam **92** will provide for closing the valve **80** after the following delivery of four additional cents' worth of fuel.

The stepping switch **70** is connected to be periodically indexed by a pulse generator **100** which is associated with the cost counter **19** to provide for indexing the stepping switch **70** one step for each 5 cents' worth of fuel delivered. The position of the stepping switch therefore provides a measure of the amount of fuel delivered.

The stepping switch provides for suitably controlling the operation of the valve control relay 2CR. In particular, the stepping switch **70** provides for connecting the relay 2CR to "ground" via a "common" lead **107** to permit the relay 2CR to be energized by the active coin selector relay when the stepping switch is in its "0" position. The "common" lead **107** is also suitably connected to the remaining contacts of the stepping switch **70** (excepting for the contacts to which control leads **104–106** are connected) to maintain the relay 2CR energized as the stepping switch **70** is indexed by the pulse generator **100**. The leads **104–106** are provided for the three denominations of coins and are connected to the contacts of the stepping switch which correspond to the monetary values associated with the three coin denominations or the three coin selector relays 1CRLO, 2CRLO and 3CRLO respectively. The circuits provided by the leads **104–106** are adapted to be disconnected by the respective coin selector relays so that the valve control relay 2CR is adapted to be timely de-energized when the monetary amount of the delivery, as measured by the position of the stepping switch, corresponds to the monetary value associated with the active coin selector relay.

Since the valve closure mechanism **82** provides for closing the valve **80** at the "5" and "0" angular positions of the penny wheel **94**, the pulse generator **100** preferably provides for indexing the stepping switch at the beginning of each 5 cents' worth of fuel which is delivered and thus to provide for de-energizing the holding solenoid **86** well in advance of the prospective closure of the valve **80** by the valve closure mechanism **82**.

When the valve control relay 2CR is de-energized by the stepping switch **70** to condition the valve closure mechanism **82** for closing the valve **80**, the relays 1CRLR, 2CRLR and 3CRLR are energized to release the active

coin selector relay and to complete the circuit via the lead **74** to reset or index the stepping switch **70** back to "0." And if one or more coins remain in the coin magazines **46** of the coin collector **45**, one of the coin selectors **1CRLO**, **2CRLO** or **3CRLO** will be energized to collect a coin from the respective magaizne and to substantially simultaneously re-energize the valve control relay **2CR** to retract the valve control lever **88** and to thereby provide for delivering an additional amount of fuel corresponding to the value of the collected coin. Also, the interval between the moment when the valve control relay **2CR** is de-energized and the amount when the valve control relay **2CR** is re-energized by a succeeding coin (i.e. the interval required for resetting the stepping switch **70**, energizing one of the selector relays and energizing the valve control relay) is preferably sufficiently short so that the holding solenoid **86** is re-energized before the valve **80** has been closed. Thus, although the holding solenoid **86** is de-energized during the interim to condition the valve closure mechanism **82** for closing the valve **80**, the solenoid **86** is re-energized by a succeeding coin before the valve **80** is actuated to discontinue the delivery of fuel.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

I claim:

1. In a fluid dispensing system having fluid delivery means, valve means for controlling the delivery of fluid, and coin operated means for operating the valve means for delivering a selected monetary amount of fluid; the improvement wherein the coin operated means comprises coin magazine means for storing coins deposited therein, coin collecting means for selectively collecting coins from the magazine means, delivery control means adapted to be cycled with a deposit in the magazine means for operating the collecting means for collecting a selective amount of money from the magazine means and for operating the valve means for delivering a corresponding monetary amount of fluid, and cycling means for cycling the delivery control means for commencing a fluid delivery and for automatically cycling the delivery control means at substantially the completion of the delivery of the preceding cycle of the delivery control means with money remaining in the magazine means for continuing the fluid delivery in successive steps, the delivery control means comprising valve control means for operating the valve means for permitting and terminating the delivery of fluid, resettable stepping means connected to be indexed in accordance with the monetary amount of fluid delivered and adapted, when indexed to a position corresponding to the amount of money collected, for operating the valve control means to terminate the delivery of fluid.

2. The fluid dispensing system of claim **1** wherein the magazine means comprises a plurality of coin magazines for a plurality of different coin denominations respectively, and wherein the delivery control means comprises magazine selector means for selecting a coin magazine with a deposit therein and for conditioning the delivery control means for operating the valve control means to terminate the delivery of fluid when the stepping means is indexed to a position corresponding to the selected coin magazine.

3. In a fluid dispensing system having fluid delivery means, valve means for controlling the delivery of fluid, and coin operated means for operating the valve means for delivering a selected monetary amount of fluid; the improvement wherein the coin operated means comprises coin magazine means for storing coins deposited therein, coin collecting means for selectively collecting coins from the magazine means, delivery control means adapted to be cycled with a deposit in the magazine means for operating the collecting means for collecting a selective amount of money from the magazine means and for operating the valve means for delivering a corresponding monetary amount of fluid, and cycling means for cycling the delivery control means for commencing a fluid delivery and for automatically cycling the delivery control means at substantially the completion of the delivery of the preceding cycle of the delivery control means with money remaining in the magazine means for continuing the fluid delivery in successive steps, the delivery control means providing for collecting money from the magazine means at the commencement of the delivery of the corresponding monetary amount of fluid.

4. The fluid dispensing system of claim **3** wherein the delivery control means is adapted to substantially simultaneously collect the money from the magazine means and operate the valve means to commence the delivery of a corresponding monetary amount of fluid.

5. The fluid dispensing system of claim **1** wherein the delivery control means comprises coin sensing means for operating the coin collecting means for collecting money from the magazine means and for operating the valve control means to operate valve means to permit the delivery of fluid.

6. In a fluid dispensing system having fluid delivery means, valve means for controlling the delivery of fluid, and coin operated means for operating the valve means for delivering a selected monetary amount of fluid; the improvement wherein the coin operated means comprises coin magazine means for storing coins deposited therein, coin collecting means for selectively collecting coins from the magazine means, delivery control means adapted to be cycled with a deposit in the magazine means for operating the collecting means for collecting a selective amount of money from the magazine means and for operating the valve means for delivering a corresponding monetary amount of fluid, and cycling means for cycling the delivery control means for commencing a fluid delivery and for automatically cycling the delivery control means at substantially the completion of the delivery of the preceding cycle of the delivery control means with money remaining in the magazine means for continuing the fluid delivery in successive steps, the magazine means comprising a plurality of coin magazines for a plurality of different coin denominations respectively; the collector means being adapted to selectively collect coins from the magazines respectively, and the delivery control means comprising stepping means connected to be indexed in accordance with the monetary amount of fluid delivered and to operate the valve means to terminate the fluid delivery, and selector means operable for selectively operating the coin collecting means for collecting a coin from one of the coin magazines and for conditioning the delivery control means for terminating the fluid delivery after the delivery of a monetary amount of fluid corresponding to the selected coin magazine.

7. In a fluid dispensing system having fluid delivery means, valve means for controlling the delivery of fluid, and coin operated means for operating the valve means for delivering a selected monetary amount of fluid; the improvement wherein the coin operated means comprises coin magazine means for storing coins deposited therein, coin collecting means for selectively collecting coins from the magazine means, delivery control means adapted to be cycled with a deposit in the magazine means for operating the collecting means for collecting a selective amount of money from the magazine means and for operating the valve means for delivering a corresponding monetary amount of fluid, and cycling means for cycling the delivery control means for commencing a fluid delivery and for automatically cycling the delivery control means at substantially the completion of the delivery of the preceding cycle of the delivery control means with money remaining in the magazine means for continuing the fluid delivery in successive steps, the delivery control

means comprising minimum deposit interlock means for preventing cycling the delivery control means until a predetermined minimum monetary amount is deposited in the magazine means.

8. The fluid dispensing system of claim **1** wherein the coin collecting means is adapted to collect one coin at a time and the delivery control means is adapted to operate the coin collecting means to collect a single coin and to operate the valve control means to operate valve means to deliver a corresponding monetary amount of fluid.

9. In a fluid dispensing system having fluid delivery means, valve means for controlling the delivery of fluid, and coin operated means for operating the valve means for delivering a selected monetary amount of fluid; the improvement wherein the coin operated means comprises coin magazine means for storing coins deposited therein, coin collecting means for selectively collecting coins from the magazine means, delivery control means adapted to be cycled with a deposit in the magazine means for operating the collecting means for collecting a selective amount of money from the magazine means and for operating the valve means for delivering a corresponding monetary amount of fluid, and cycling means for cycling the delivery control means for commencing a fluid delivery and for automatically cycling the delivery control means at substantially the completion of the delivery of the preceding cycle of the delivery control means with money remaining in the magazine means for continuing the fluid delivery in successive steps, the delivery control means comprising valve control means adapted to be operated for conditioning the valve means for permitting the delivery of fluid and to be conditioned for operating the valve means to terminate the fluid delivery after a succeeding quantity of fluid is delivered, the cycling means being adapted for commencing the cycle of the delivery control means when the valve control means is conditioned for operating the valve means to terminate the fluid delivery, and the delivery control means being adapted to operate the valve control means for conditioning the valve means for permitting the delivery of fluid at the beginning of its cycle and before the completion of the delivery of said succeeding quantity of fluid.

10. In a fluid dispensing system having fluid delivery means, valve means operable for controlling the delivery of fluid, and coin operated means for operating the valve means for delivering a selected monetary amount of fluid; the improvement wherein the coin operated means comprises coin magazine means for storing coins deposited therein, electrical sensing means for sensing the presence of a deposit in the magazine means, coin collecting means operable for selectively collecting coins from the magazine means, resettable stepping switch means connected to be indexed in accordance with the monetary amount of fluid delivered; and electrical control means adapted to be conditioned to be operated by the sensing means

to operate the coin collecting means for collecting a selective amount of money from the magazine means and to operate the valve means for commencing the delivering of a corresponding monetary amount of fluid, the electrical control means being operable by the stepping switch means to terminate the fluid delivery with the valve means after the delivery of a monetary amount of fluid corresponding to the amount of money which is collected and adapted to be conditioned by the stepping switch means for successive operation by the sensing means at substantially the completion of the delivery corresponding to the preceding selective amount of money collected for continuing the fluid delivery in successive steps.

11. In the fluid dispensing system of claim **10** further compising valve operating means operable by the electrical control means comprising a rotary control cam connected to be rotated in accordance with the monetary amount of fluid delivered, cam follower means connected for operating the valve means adapted to be withdrawn from the cam for permitting the delivery of fluid and adapted to be released into engagement with the control cam to permit the control cam to operate the valve means to effect timely termination of the fluid delivery.

12. In the fluid dispensing system of claim **10** wherein the magazine means comprises a plurality of magazines for storing coins of different denominations respectively, wherein the collector means is adapted to selectively collect money from the magazines, and wherein the electrical control means comprises selector means operable by the sensing means for selectively collecting money from one of the magazines and operable by the stepping switch means to terminate the delivery of fluid with the valve means when the corresponding monetary amount of fluid is delivered.

13. The fluid dispensing system of claim **10** wherein the electrical control means provides for resetting the resettable stepping switch means when operated by the stepping switch means to terminate the fluid delivery with the valve means.

14. The fluid dispensing system of claim **10** further comprising valve operating means adapted to be conditoned by the electrical control means for automatically terminating the fluid delivery with the valve means after the delivery of a succeeding quantity of fluid, and wherein the electrical control means is operable by the stepping switch means to condition the valve operating means for terminating the fluid delivery and for substantially simultaneously resetting the stepping switch means.

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