

Sept. 24, 1968

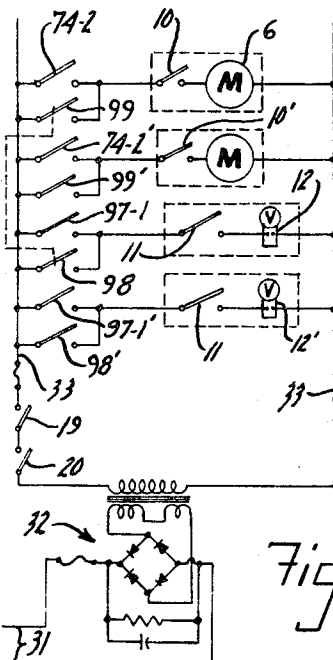
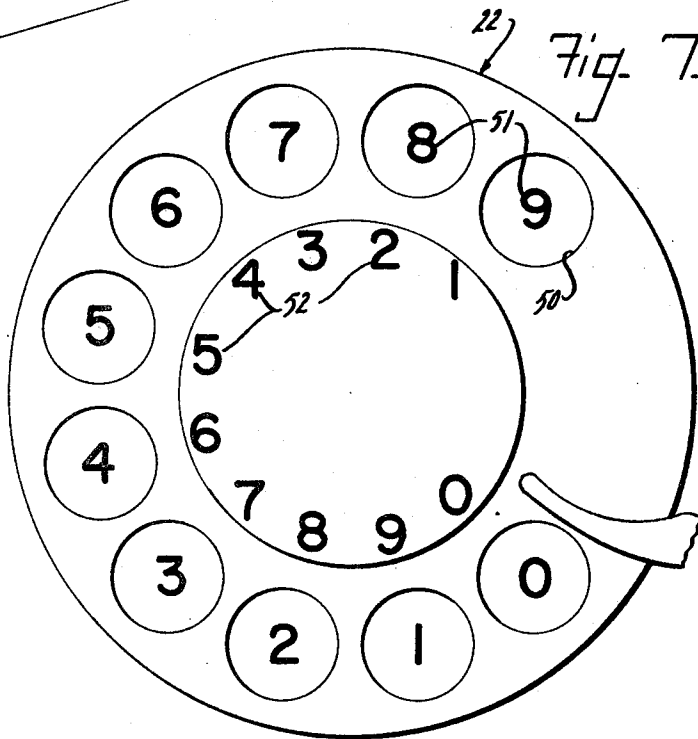
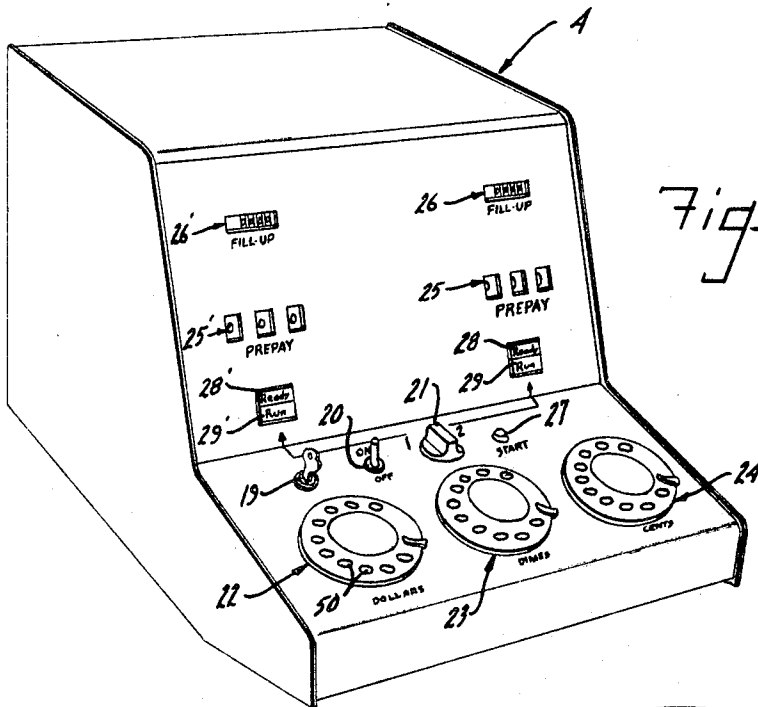
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3,402,851

REMOTE CONTROLLED DISPENSING SYSTEM

Filed July 18, 1966

3 Sheets-Sheet 2



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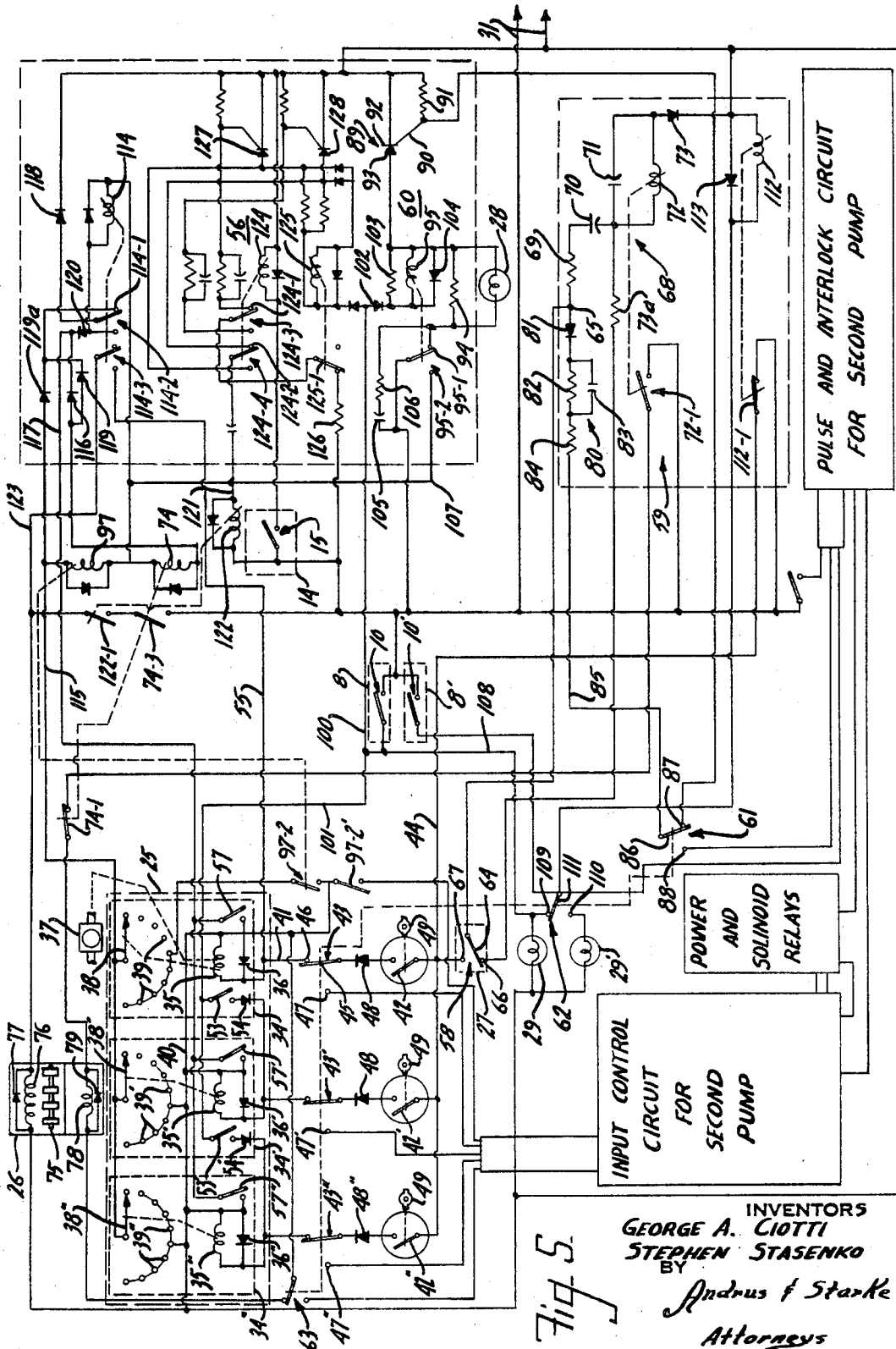


Fig. 5

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REMOTE CONTROLLED DISPENSING SYSTEM
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Filed July 18, 1966, Ser. No. 566,145
31 Claims. (Cl. 222-16)

ABSTRACT OF THE DISCLOSURE

The invention relates to a fuel dispensing system and a remote control unit for control of a plurality of pumps and permitting either a fill-up, postpayment mode or a prepayment mode of operation of each pump. An interlock system is provided whereby a single operator at the remote control unit selects the particular pump and the mode of operation and releases that pump for the desired dispensing operation. The remote control unit includes a pair of pulsed counters, one additive and a second subtractive. The latter is preset when a prepaid amount is to be dispensed. The pumps include a flow responsive pulse generator which is connected for driving the counters. In the prepayment mode only, the subtractive counter is driven to the preset null or disconnect position to automatically terminate the dispensing operation.

Telephone dials are connected in a presetting circuit to establish a number of pulses equal to 10 minus the number dialed and are connected by a selection switch to the various subtractive counters to preset a corresponding counter by a dialed number. To properly identify the numbers dialed, the decimal digits are reversed from the conventional counterclockwise arrangement. The dials are disconnected from the related counter when the corresponding pump is operating to permit control of other pumps.

This invention relates to a remote control dispensing system and particularly to gasoline retailing and dispensing wherein a cashier or central control operator conveniently controls access and operation of remotely controlled pumps without leaving the control area.

In the retail dispensing of petroleum, gasoline and the like, current developments have been directed to customer controlled systems. One of the most obvious is the self-service coin or token control system wherein the customer introduces a certain amount of money into the system and is permitted to withdraw until the related quantity has been dispensed. A modified self-service system is disclosed in the copending application of Stasenکو et al. entitled Remote Control System which was filed on Feb. 7, 1966 with Ser. No. 525,723 and is assigned to the same assignee as the present application. As more fully disclosed therein, that system provides for a central control point for completely controlling the operation or release of dispensing pumps with means to continuously monitor and supervise the dispensing of the gasoline and the subsequent collection of the money therefor. Generally, in accordance with that application, the central control station controls the release to a customer or an outside attendant. During the dispensing process, an electrical signal is generated and transmitted to the central control station to actuate a recording and if desired printing mechanism. Such a system is highly satisfactory particularly where a single inside attendant is employed in combination with a plurality of outside attendants who actually man the pumps.

The present invention is particularly directed to such a remote control system permitting either a postpayment mode or a prepayment mode of operation. In the post-payment mode, the pump is released and any desired

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amount withdrawn with a subsequent collection of money. In the prepay mode, the customer pays for the gasoline after which the pump is released and automatically disconnected when the corresponding amount of gasoline has been withdrawn.

Generally, in accordance with the present invention, a remote control unit is provided having means interconnected with the dispensing means and in particular having counting means in combination with input means for presetting the counting means in accordance with a prepaid amount of product. The remote control is interconnected to the several dispensing means and includes a program control system having means to select the dispensing means and the prepaid amount. The control unit then permits releasing of the dispensing means for operation. The dispensing means in turn includes a dispensing responsive means such as pulsing means for actuating of the counting means to drive them to a null or disconnect position when the preset amount has been dispensed.

In this system for gasoline dispensing, the customer can directly operate the pump after prepaying for the gasoline and having the pump released from the central remote control. The system however also permits the reverse or postpayment operation wherein the gasoline is first dispensed and collection made thereafter. As the fuel is withdrawn, it drives a fill-up counter which is employed to verify the amount of gasoline dispensed and provides the cashier with the information regarding the amount of money which must be collected to complete the transaction.

More particularly, in accordance with an important aspect of the present invention, the prepay system includes a recorder for each of the individual pumps being controlled. Each recorder is preferably a digital type device having switching means controlled thereby. In particular the switching means is connected in circuit with the power to the related pump and provides means to disconnect the pumping system when the recorder is in the reference or zero position. Thus, by presetting of the recorder, the amount of gasoline dispensed can be established.

In accordance with another feature of the present invention, the recorders are decade type stepping switch units. Dial units resembling those ordinarily found in telephone systems form a common input system for the several recorders and are connected to any one recorder at one time by a selector switch. Each dial includes a set of contacts connected through an appropriate power system to a pulsing relay circuitry for actuating the related decade counter of the recorder. The pulsing dials individually establish operating pulses to the related decade counter, with the number of pulses equal to 10 minus the number dialed into the unit. Thus, if the number 3 is dialed into the unit, 7 pulses will be generated and actuate the prepayment counter. In order to properly identify the system, the pulsing dials rather than following the conventional system of a telephone with the numbers 1 through 0 running in counterclockwise are reversed such that the numbers 0 through 9 run clockwise. Each of the prepayment counters has a set of transfer contacts which open momentarily as the counter moves from 0 to 9 and a set of reset contacts which opens when the counter is at zero. After setting of each of the decade counters to record the amount of prepayment, the operator actuates a suitable mechanism to release the pump for operation. Fuel is then withdrawn.

During the withdrawal, the total amount of purchase can be read on the pump register to the nearest penny. Simultaneously, the signal is transmitted back to the control center to drive the recorder and particularly the decade counters to the zero or reference position. When the zero position is reached, the switch mechanism is

actuated to stop the pump system and terminate delivery of gasoline.

In accordance with another aspect of the present invention, a flow control solenoid valve is provided in the pumping mechanism and interconnected to be controlled by the prepay decade counter. As long as a selected amount of money is set into the decade counters, full flow is established. However, when the counters drop below a preset amount; for example, 14¢ or the like, the solenoid is automatically actuated to reduce the flow. The flow more rapidly stops when the reference or zero position is established to provide for very accurate dispensing of the gasoline.

The system preferably further includes suitable indicating means and interlocking means for actuating the transmitter circuit. The phone dials are disconnected from the related decade counters any time the pump is set for operation and in use to prevent disturbing or changing of the previous preset of the system.

When the prepayment counters have reset the circuit to the stop position, the circuit is such that operating of the pump switch cannot operate the dispensing system as such but the system must be again preset at the central control station.

Further, during the dispensing, the fill-up counters are actuated in the forward direction as the prepayment counters are driven in a reverse or subtraction direction toward zero. This permits the inside attendant to verify the purchase and further if the prepaid amount exceeds the capacity of the customer's tank, a refund can be established. The operator resets the counters by dialing the complement of the numbers shown on the prepayment counter. To permit rapid insertion of complement numbers, a complement numbering system is preferably provided on the dial with appropriate legends or other distinctions to distinguish from the normal input identification.

In contrast, when a request for fill-up is made, the inside operator merely actuates a start button to release the particular pump. This interconnects the fill-up counter directly to the pump, leaving the prepay counter in the normal standby position. During the dispensing, the amount will be recorded on the fill-up counter. At the termination of the delivery, the operator resets the pump, thereby opening the pump switch and providing an inside indication to that effect. The cashier then collects the amount recorded on the fill-up counter and resets the device. The fill-up counter is reset by the initial triggering of the circuit for the related pump.

The present invention thus provides a very simple and reliable means for providing a remote control of sales from a central station and permitting either post-payment or prepayment control. The system also permits complete emergency control to stop one or all of the dispensers in an emergency situation.

The drawings furnished herewith illustrate a preferred construction of the present invention wherein the above advantages and features are clearly disclosed as well as others which will be clear from the following description.

In the drawings:

FIG. 1 is a diagrammatic view of a retail gasoline dispensing station having a central control;

FIG. 2 is an enlarged diagrammatic side illustrational view of a dispenser showing the switching and other controls necessary to the present invention;

FIG. 3 is a pictorial view of a transmitter constructed in accordance with the present invention and shown in FIGS. 1 and 2;

FIG. 4 is an enlarged pictorial view of a control console in accordance with the present invention;

FIG. 5 is an enlarged schematic circuit diagram showing in detail the circuitry for one of the pumps and showing in block diagram the corresponding elements of the second pump for purposes of clearly and completely describing the present invention;

FIG. 6 is a schematic power circuit for the one pump and shows the interconnecting control contacts actuated by the circuit of FIG. 5; and

FIG. 7 is an enlarged elevational view of the input dial unit shown in FIG. 4 and constructed for actuating a part of the circuit shown in FIG. 5.

Referring to the drawings and particularly to FIG. 1, a gasoline dispensing service station is shown generally including a pair of pumps 1 and 2 as the usual dispensing means for purposes of simplicity and clarity of explanation. The pumps 1 and 2 are shown mounted in side-by-side relation at a dispensing station and in spaced relation to a cashier's housing or station 3 which includes a remote control means or unit shown as control console 4 for completely regulating and controlling the operative access and operation of pumps 1 and 2. The pumps 1 and 2 are similarly constructed and generally include the usual computer 5 which is driven in accordance with the flow through the pump to visually record the volume dispensed and the dollar amount. A pump-motor unit 6 is actuated for actual withdrawal or dispensing of the liquid or gasoline from a central storage tank, not shown. A manually operable lever or crank 7 is provided and forms part of a nozzle support. The crank 7 is adapted to actuate a switch unit 8 for operating of the pump-motor unit 6. In accordance with well known constructions, the crank 7 is interlocked through a reset mechanism to prevent operation of the switch unit 8 until a reset lever 9 is triggered to reset the computer mechanism and release the lever or crank 7 for operation of switch unit 8. Any other suitable system may also be employed. For example, a single handle reset in which a single lever resets the computer and actuates the switch may be employed.

As shown in FIGS. 2 and 5, the illustrated switch unit 8, in accordance with the present invention, is a double-pole variety having a first set of contacts or switch 10 connected in the circuit of the motor unit 6. The switch unit 8 further includes a switch or set of contacts 11 connected in series with and adapted to condition a solenoid 12 for energization. The solenoid 12 forms a part of an explosion-proof solenoid valve 13 automatically providing a reduced flow during the terminal portion of a cycle. The solenoid 12 and motor unit 6 thus provide a pair of interlock means at the dispensing means for controlling discharge from the dispensing means.

The dispensing means of the present invention further includes dispensing responsive means shown as a pulse transmitter 14 which is preferably similar to that described in the previously referred to copending application and shown in FIG. 3. Generally, the transmitter includes a glass enclosed reed switch 15 mounted within a suitable housing which is secured to the wall of computer 5. A rotating disc 16 is rotatably mounted in the wall of the housing and coupled to a computer shaft 17. The disc 16 is provided with ten disc magnets 18 which are equidistantly distributed within the disc. The rotation of the disc 16 sequentially passes the magnets 18 over switch 15. When a magnet 18 is aligned with the switch, it is closed; otherwise it is open.

The several electrical connections within the pump and the console as well as to a power system are made through a suitable sealed conduit in order to conform with the Underwriter Laboratory requirements for use in hazardous areas.

The transmitter 14, the switch unit 8, solenoid 12 and the like are connected to control power through the console 4.

Generally, the control console 4 is shown in FIG. 4 includes a main power control key operated switch unit 19 and a toggle switch unit 20 for turning the power on and off. A selector switch knob 21 is common to the pumps 1 and 2 and determines which of the pumps will be interconnected for operation or presetting. In par-

ticular, the selector switch knob 21 initially operatively connects a set of three telephone dials 22, 23 and 24 to either one of a pair of presettable or prepay counters 25 and 25' related respectively to pumps 1 and 2.

The telephone dials 22, 23 and 24 are employed in the illustrated embodiment of the invention to record the money amount to be dispensed in units of dollars, dimes and cents, respectively, and thus permit introducing or setting of the counters 25 and 25' for any amount up to \$9.99. In addition, the console 4 includes visually displayed fill-up counters 26 and 26' mounted immediately above the corresponding prepay counters 25 and 25'. Counters 25 are subtractive type while counters 26 are additive type, both being of the well known pulse operated construction.

A start button 27 is mounted on the control console 4 immediately adjacent the selector switch. Additionally, in the illustrated embodiment of the invention, "ready" pilot lights 28 and 28' are mounted immediately below the related prepay counters 25 and 25' to indicate when the operator has actuated the push button 27 to initiate operation. "Run" pilot lights 29 and 29' are mounted immediately below the lights 28 and 28'. Lights 29 and 29' are interlocked to the related dispensing pumps 1 and 2 to indicate when the pump is actually in use.

Generally, the operation of the illustrated embodiment of the invention can be summarized as follows. The customer prepays for the gasoline in advance to the cashier at the control console 4. After receiving the amount of money, the cashier actuates the selector switch knob 21 to set up to appropriate pump 1 or 2 and then actuates the telephone dials 22, 23 and 24 in accordance with the purchased amount. Assuming pump 1 is selected, the prepay counter 25 is preset from zero to the prepaid amount. The cashier then actuates the push button 27 which simultaneously conditions the selected pump 1 for operation and illuminates the "ready" pilot light 28 beneath counter 25 at the control console 4. The customer then goes to the pump 1, actuates the reset lever 9 and turns the operating handle to turn on the pump switch unit 8 for the pump 1. Gasoline is then withdrawn through the usual nozzle 30. During the withdrawal from the pump 1, computer 5 is driven to record the withdrawal in the usual manner and also actuates the pulse transmitter 14 as a result of the rotation of magnets 18 past switch 15. The opening and closing of switch 15 creates a train of pulses which are simultaneously applied to the prepay counter 25 and to the fill-up counter 26. The prepay counter 25 is driven towards zero while the fill-up counter 26 is driven in an opposite or increasing reading to record the value of fuel dispensed. The pump 1 is automatically stopped when the prepay counter 25 has returned to the zero setting, and prevents further dispensing operation. The counter 25 thus serves as a presettable stop means for automatically terminating a prepayment dispensing operation.

The "run" pilot light remains illuminated until the nozzle 30 is returned to the nozzle support indicating the completion of the transaction. The customer is also allowed to verify the amount of purchase on the pump register to the nearest penny and the cashier can similarly verify the amount on the fill-up counter.

If for any reason the amount on the pump 1 does not correspond to that of the fill-up counter 26, correction can be made. Further, if the fuel purchase exceeds the capacity of the customer's tank, the cashier is so notified.

If the full prepaid amount is not dispensed, the prepay counter 25 would have the corresponding amount set therein. In order to reset the prepay counter, the telephone dials 22, 23 and 24 are actuated to insert the complement of the number appearing on the prepay counter. This returns the counter 25 to the zero reference setting and reestablishes the console 4 and the related pump 1 for a new cycle of operation.

If for some reason, rather than a prepay amount, the customer desired a complete fill-up, the cashier actuates the push button 27 which will simultaneously illuminate the related "ready" pilot light 28 and condition the pump for operation. The customer may then manually operate the pump by actuation of the reset lever 9 and turning of the handle 7 to the on position. This will result in the turning off of the "ready" light 28 and turning on of the "run" pilot light 29. As the fuel is withdrawn, the amount is registered on the fill-up counter 26 above the related "run" pilot light 29. After the customer has filled the tank or taken such amount of fuel as desired, the nozzle 30 is returned to the pump 1 and the "run" pilot light 29 turns off. The cashier then collects the indicated amount on the fill-up counter 26 to complete the transaction.

The pumps 1 and 2 are similarly constructed and interconnected to the console 4. Consequently, the pump 1 and the related components at the console 4 will now be described in more detail with corresponding elements of pump 2 identified by related or corresponding primed numbers. Generally, it may be assumed for purposes of discussion that pump 1 will dispense regular gasoline and pump 2 will dispense premium gasoline. This is in accordance with the conventional practice wherein a regular and a premium pump are disposed in side-by-side relation such that a customer can go to any dispensing station and receive either type of gasoline as desired.

Referring particularly to FIGS. 5 and 6, a schematic circuit diagram of the components interconnecting the pumps 1 and 2 and the control console 4 as well as the internal components thereof are shown to more clearly explain a preferred embodiment of the present invention.

Generally, in the illustrated embodiment of the invention, a pair of low voltage direct current power lines 31 is provided for the control sections of FIG. 5 and may be derived as shown in FIG. 6 from a conventional transformer-rectifier 32 which is connected to suitable A.C. power lines 33 shown connected to energize the solenoid 12 and motor unit 6. In practice, separate lines are normally provided for the motor unit 6.

The key switch 19 and the toggle switch 20 are shown connected in the circuit of the A.C. power lines 33 to the transformer-rectifier 32 and thus control application of power to the circuit of console 4.

In the illustrated embodiment of the invention, the prepay counter 25 is a three stage decade counter having three similar readout and counting sections 34 interconnected to provide a count by ones. The section 34 for the cent position will be described in detail and the corresponding elements of the dollar and dime positions identified by similar primed and double primed numbers, respectively.

The counting section 34 for reading to a penny includes a pulsing coil 35 having a protective diode 36 connected in parallel therewith. The pulsing coil is coupled to drive a counter wheel 37 which includes the identification digits 0 through 9 for visual viewing from the front of the console as shown in FIG. 4. The coil 35 is also coupled to a switch arm 38 for selective rotation thereof into sequential and cyclical engagement with any one of 10 circumferentially distributed contacts 39. The ten contacts are related to the ten significant digits in the decimal system as noted by the identifying digits 0 through 9, inclusive. The contact arm 38 and associated contacts 39 are interconnected with the corresponding elements of the dollar and dime sections 34 to provide a control of the pumping action, as more fully developed hereinafter.

The pulsing coil 35 has its one side connected directly to a negative power line 40 connected to the negative side of lines 31 and the opposite side thereof connected via a line 41 to a dial switch 42 of the associated dial 24 through a selector switch 43 for connection via positive power line 44 to the positive side of lines 31.

The selector switch 43 forms one part of a six pole rotary switch unit connected to and operated by the two

position selector switch knob 21. Switches 43, 43' and 43'' form three switch sections of the six pole rotary switch. The other related switch sections are hereinafter described in connection with the other components.

In the illustrated embodiment of the invention, the switch 43 is shown as a single-pole, double-throw switch having a switch arm 45 selectively engaging a premium pump contact 46 and a regular pump contact 47. The contacts 46 and 47 in turn are connected respectively to the pulsing coils 35 of the related counting sections 34 of the premium prepay counter 25 and the regular prepay counter 25', respectively.

The common switch arm 45 is connected in series with a diode 48 and the dial switch 42 to the positive power line 44. The dial switch 42 is coupled to the related penny dial 24 by a suitable cam 49 and is momentarily closed by the movement of the dial in accordance with the degree of angular displacement from the reference or standby position of the dial. Rotation of the penny dial 24 therefore results in a pulsing or rapid opening and closing of the dial switch 42 to generate a series of positive signal pulses flowing from the positive line 44 through the dial switch 42, the diode 48, the selector switch 43, line 41 and the coil 35 to the negative line 40.

The dial 24 as shown most clearly in FIG. 7 is similar to a conventional telephone dial unit and is provided with ten apertures 50 generally circumferentially distributed about the outer circumference of the dial. In the present invention, the input identification digits 51 are shown placed beneath the openings. In contrast to the conventional counterclockwise digit identification of 1 through 0, the present invention employs digit identification running in a clockwise direction from 0 through 9. The complement of these digits is also placed as identifying digits 52 on the immediate inside of the dialing apertures 50.

Thus, in operation, the input is normally established by inserting the money amount into the dial 24 by reading of and actuating the dial in accordance with the identifying digits 51. The effect of the reverse positioning of such identifying digits with respect to the dial 24 is to enter the complement number of pulses into the counting section 34. For example, when the penny dial 24 is actuated to insert three cents, the dial switch 42 will in fact establish the complement number of pulses; that is, seven pulses and will insert into the prepay counter the seven pulses. As a result, the contact arm 38 will move from the zero or standby contact to the seventh removed contact which corresponds to the three cents in the present control system. Simultaneously, the wheel 37 will be driven in accordance with the seven pulses. The digits on the wheel 37 however will also be properly spaced to indicate the number 3. Now, when delivery is established, the coil 35 will be pulsed in accordance with the penny unit flow of gasoline, as more fully developed hereinafter, and the initial three pennies of delivery causes the coil 35 to energize three times such that the arm 38 engages the last contact and resets to the zero position to again start counting. Similarly, the penny counter wheel 37 will be driven to the zero position.

In summary, the prepay counter 25 is connected to provide a subtracting operation although it is driven by positive pulses during the dispensing operation.

Further, if it is desired to correct an input, the operator need only dial the complement of the number shown on the prepay counter. For example, if 3¢ had been inserted into the penny section, and it is desired to reset this amount to some other figure, the operator would first dial in the complement number 7 as read from the identification digits 51 or number 3 as read from the identification digits 52. This would actuate the coil 35 the required complement three times and return it to a zero reading after which the operator could then put in the proper amount.

The counting section 34 further includes a set of transfer contacts 53 connected in series with diode 54 to the

next counting section 34' and in the illustrated embodiment particularly coil 35' of the dime or tens counting section 34'. The dime section 34' is therefore reduced by a one for each complete cycling of the section 34 during a dispensing operation. In turn, the dime section 34' has its contacts 53' similarly connected to the dollar section 34''.

A flow pulse transmission line 55 is connected to the pulse relay coil 35 of the penny counting section 34 and all counting is originated through section 34. The transmission line 55 is connected in the circuit through the pulse transmitting circuit 56 which is connected to the pulse transmitter 14 mounted at and forming a part of the pump equipment. The circuit 56 establishes a train of pulses driving the counting sections 34 toward zero in accordance with the flow. Each of the counting sections 34 includes a set of contacts or a switch 57 coupled to the counting wheels 37 and connected in the control circuit for operating the solenoid 12 and motor unit 6 such that when all are at zero, the corresponding elements cannot be energized and thus provide an automatic termination of the dispensing in accordance with the preset.

In summary, the cashier or control operator actuates the three dials 22, 23 and 24 to insert the desired prepaid amount into the counting sections 34 and thus presets the counting sections with respect to the contacts 39, 39' and 39'' accordingly. The contact arms 38 and contacts 39 in turn control the dispensing operation, as hereinafter developed. After establishing the desired preset, the operator actuates the push button unit 27 which in FIG. 5 is shown as a single-pole double-throw switch unit 58.

The switch unit 58 interconnects the power line 44 to a trigger and reset circuit 59, common to both pumps 1 and 2, and which in turn is connected through a fourth switch 61 of the six-pole rotary switch to an interlock circuit 60. The switch 58 also controls, through the circuit 59, the application of power to the "ready" indicating lamps 28 and 28' and to the reset coils 78 and 78' of the fill-up counters 26 and 26'.

The push button operated switch 58 is shown including a contact arm 64 connected to a terminal 65 of the circuit 59. The switch 58 further includes a normally closed contact 66 also connected to a portion of circuit 59 to establish a reset circuit as hereinafter described. A normally open contact 67 of switch 58 is connected to the positive line 44. Actuation of the switch 58 moves the arm 64 from the contact 66 to the contact 67 and applies a positive signal to the terminal 65 during the time the proper button is depressed.

The trigger and reset circuit 59 includes a first pulse forming circuit 68 which includes a resistor 69 in series with a capacitor 70 between the terminal 65 and a parallel capacitor 71 and counter reset relay 72. A diode 73 connects the opposite side of the paralleled circuit to a negative side of the power lines 31. When the switch 58 is actuated to apply a positive signal to terminal 65 and therefore circuit 68, current flows through the resistor 69 and the capacitors 70, 71, relay 72, and the diode 73 to energize the relay until such time as the capacitors 70 and 71 charge to the D.C. voltage level of line 31. Generally, this is a relatively wide pulse and may be of the order of 200 milliseconds wide.

A resistor 73a is connected between the normally closed contact 66 of the push button switch 58 and the junction of the capacitor 70 to the parallel capacitor 71 and relay 72. Thus, when the push button switch 58 is released, a discharge circuit is established across the capacitor 70 to permit discharge of the energy therein. The capacitor 71 can discharge through the relay 72 to maintain energization thereof for a sufficiently long time even if the switch 58 is only momentarily actuated.

The relay 72 closes normally open contacts 72-1 which are connected between the positive side of lines 31 and in series with a set of normally closed contacts 74-1 of a power relay 74 to the premium fill-up counter 26. The

counter is diagrammatically shown as such devices are well known. The counter 26 is of a digital variety having a plurality of display wheels 75 coupled to a drive coil 76 in parallel with a protective diode 77. A separate reset coil 78 in parallel with a diode 79 is provided to reset wheels 75 to the reference position.

The contacts 74-1 are connected in series with the reset coil 78 to the negative side of power lines 31 through the switch 63. The pulsed energization of the relay 72 to correspondingly close the contacts 72-1 provides a positive pulse through the reset coil 78 to reset the fill-up counter of the related circuit to zero.

Returning to the circuit 59, a second trigger pulse network 80 is connected to the positive terminal 65. The network 80 includes a diode 81 in series with a paralleled resistor 82 and capacitor 83. A resistor 84 is connected to the opposite side of the parallel circuit and connected by a line 85 to a contact arm 86 of the section 61 of the six-pole rotary switch. The contact arm 86 selectively engages the premium contact 87 which is connected to the interlock circuit 60 or a regular contact 88 which is connected to the corresponding interlock circuit for regular gasoline.

In the illustrated position, the contact arm 86 engages contact 87 which is connected to control a silicon controlled rectifier 89 in the interlock circuit 60. The firing of the silicon controlled rectifier 89 illuminates the ready-indicating light 28 mounted on the front part of the console 4 and indicates the completion of the triggering circuit.

The silicon controlled rectifier 89 of the circuit 60 is of a well known device and includes a trigger gate 90 connected to the contact 87 and a resistor 91 connected between the gate 90 and the cathode 92 which is connected to the negative side of lines 31. The anode 93 of the rectifier 89 is connected to one side of the indicating light 28 and a paralleled holding resistor 94. The opposite side of the paralleled resistor 94 and light 28 are connected in series with a set of normally closed contacts 95-1 of a control relay 95 directly to the positive side of the power lines 31. Thus, the light 28 is illuminated and the silicon controlled rectifier held in the on condition as long as contacts 95-1 are in the closed position.

This conditions the circuit 60 for operation of the premium pump 1 in response to actuation of switch unit 8. The purchaser or an attendant can then go to the pump 1, actuate the reset lever 9 to reset the computer at the pump 1 to zero and then actuate the crank 7 in the normal manner to actuate the dispenser switch unit 8 which includes main control switch 10 and solenoid switch 11 interconnected and ganged together for simultaneous and similar positioning.

The energizing circuit 96 for solenoid 12, as shown in FIG. 6, is connected to A.C. power lines 33 and includes the solenoid 12 connected in series with the pump switch 11 and a set of normally open contacts 97-1 of a solenoid control relay 97 to power lines 33.

In the illustrated embodiment of the invention, a manually operable bypass switch 98 is paralleled with the solenoid relay contacts 97-1 to permit manual operation of the circuit, if desired. A similar bypass switch 99 which is ganged to the bypass switch 98 is also connected in the circuit of the motor unit 6.

The energizing circuit for the motor 6 includes a set of normally open contacts 74-2 of the power relay 74 in series with the motor unit 6 and in particular in parallel with switch 99.

In order to operate the dispensing pump 1, the solenoid relay 97 and the power relay 74 must be operated by proper operation of the console 4 and particularly circuit 60. Relays 97 and 74 are connected in parallel branch circuits having a common side connected to the interlock circuit 60 which is actuated by operation of the pump switch 10 to connect the positive side of power lines 31 to the relays. The negative side of each branch circuit is individually connected to the negative side of lines 31.

A line 100 connects the pump switch 10 to the interlock circuit 60 to actuate the control relay 95 which in turn includes a second set of contacts 95-2 for actuating power relay 74 and solenoid relay 97. A common line 101 is also connected between line 100 and the several transfer contacts 53 and 53' of the counting sections 34 to provide for transfer of a pulse or count.

The relay 95 is connected in series with a diode 102 between the line 100 and the anode to cathode circuit of the silicon controlled rectifier 89. A resistor 103 and a protective diode 104 are connected in parallel with each other and in parallel with relay 95 between the diode 102 and the silicon controlled rectifier 89. When the pump switch 10 is closed, power is supplied to the relay 95 and the silicon controlled rectifier 89 to form a second or holding circuit for the silicon controlled rectifier 89. The relay 95 is therefore energized to open the associated contacts 95-1 and close the set of contacts 95-2.

The opening of contacts 95-1 breaks the first holding circuit to the silicon controlled rectifier 89. However, the alternate holding circuit through switch 10 and relay 95 has been established and consequently the silicon controlled rectifier 89 will be held on after opening of contacts 95-1. The indicator light 28 which was connected in the original holding circuit will now be deenergized. A capacitor 105 and resistor 106 are series connected across the switch or contacts 95-1 of relay 95 to prevent pump switch bounce from turning off the silicon controlled rectifier 89. Thus, if the pump switch 10 bounces and first turns the relay 95 on and opens contacts 95-1 and then opens switch 10, both holding circuits may be simultaneously open and thus drop out the silicon controlled rectifier. The capacitor 105 forms a storage unit to maintain the silicon controlled rectifier 89 on during such slight time period.

The closing of contacts 95-2 of circuit 60 applies positive power via a line 107 to the power relay 74 and the solenoid relay 97.

The pump switch 10 is also connected in series with the "run" light 29 via a line 108 across the D.C. power lines 31 such that when the pump switch 10 is actuated, the "run" light at the console 4 is energized.

Line 108 is also connected to the premium contact 109 of the selector switch 62. The selector switch 62 also includes a regular contact 110 and a selector contact arm 111 for interconnecting or similarly connected in the circuit for the regular gasoline dispensing control. A dialing and push button disconnect relay 112 is connected to the switch arm 111 and to the negative side of lines 31. Relay 112 is energized when the pump switch 10 is closed and opens a set of normally closed contacts 112-1 which are connected in series between the pulsing line 44 from the telephone dial switches 42 and the positive side of power lines 31. When the pump switch 10 is actuated, relay 112 serves to remove from the telephone dialing switches 42 and prevents subsequent actuation of the prepayment counters 25 or 25' associated with the console 4. In the illustrated embodiment of the invention, a protective diode 113 is connected across the relay 112 in accordance with the usual practice.

In summary, when the operator or the customer actuates the reset lever 9 and the crank 7 to start, relays 74 and 97 are energized to complete the circuits to the motor unit 6 and the solenoid 12 of pump 1. The light 28 is turned off and light 29 is turned on, power to the dial switches 42 is removed and the fill-up counter reset.

The circuits for energizing the power relay 74 and the solenoid relay 97 as well as a prepayment-postpayment or transfer relay 114 are as follows.

The closing of contacts 95-2 of circuit 60 applies positive power via a line 107 to the power relay 74 and the solenoid relay 97.

The solenoid relay 97 is connected to negative power by a connecting line 115 which is connected to several con-

tact arms 38 of the associated counting sections 34 of the prepayment counter 25.

The circuit is traced as follows: beginning at the positive side of lines 31, contacts 95-2 of circuit 60, line 107, relay 97, line 115 directly to the several arms 38 of the counting sections 34. The contacts 39 of the several sections for the dollar count and the dime count are connected directly to the negative side of the power lines. The penny counting section 34 however has its interconnected contacts 39 connected by a lead to one side of a set of normally open contacts 97-2 of the relay 97, the opposite side of which is connected to the negative side of lines 31 via the lead 40. Relay 97 is energized through the above circuit whenever the contacts 95-2 are held closed and the contact arm 38, 38' or 38'' engages one of the contacts 39, 39' or 39'' which is connected to the negative side of lines 31. In the counting sections 34, as previously noted in the dollar section, the contacts 39 related to the dollar digits 1 through 9 are interconnected to each other and to the line 40. The dime section has only the digits 1 through 8 interconnected to line 40 and the penny section has only the contacts 1 through 6 interconnected to line 40. The system thus maintains the circuit as long as 14 cents remains set in the counter. As soon as the count drops to 13 cents, the dollar section and the dime section will be at the zero and one unit contacts, respectively and contact arm 38 of the penny section 34 will be on the 3 cent contact 39; thereby opening the circuit to the relay 97. The associated contacts 97-1 in the series circuit of the associated solenoid 12 open, causing de-energizing of solenoid 12 which closes to reduce the flow. In actual practice, the actuation of the relay 97 and the operation of the solenoid 12 takes a finite period of time and the actual flow rate will not be reduced until about 4 cents remains on the prepayment counter.

During the terminal portion of the cycle, the flow is such that the stopping of the pump motor unit 6 provides very precise regulation of the amount dispensed.

The motor circuit is controlled by the relay 74 which is interconnected in the circuit through the contacts or switches 57, 57' and 57'' of the counting sections 34 and the contacts 95-2 of the control circuit 60 as follows.

The one side of the relay 74 is connected to line 107 in common with the relay 97. The opposite side of the power relay 74 is connected to the negative side of lines 31 in series with diode 116 and a common line 117 to one side of all of the switches 57 in parallel. The opposite side of switches 57 are individually connected to the line 40 which is connected directly to the negative side of the power lines 31. Power is supplied to relay 74 therefore whenever contacts 95-2 are closed simultaneously with the closing of any one of the switches 57 of the counting sections 34.

The prepayment-postpayment relay 114 is also connected into the circuit to control energization of the power relay 74 to provide for operation under a postpayment or fill-up mode.

The relay 114 includes a set of normally closed contacts 114-1, one side of which is connected to the negative side of the lines 31 in series with a diode 118. The opposite side of the contacts 114-1 is connected to the negative terminal of the relay 74 in series with a diode 119. Thus, in the absence of a set for prepayment, relay 114 remains in the standby position and the contacts 114-1 provide power to the relay 74 to permit operation of the motor unit 6 for a fill-up mode. The contacts 114-1 are also connected to the negative side of the relay 97 in series with a diode 119a and provide a similar direct connection to the negative side of lines 31. These circuits are thus established with the relay 114 in the deenergized state as shown in full in the drawing.

The relay 114 however is connected in circuit to be energized through the contacts 95-2 whenever the preset or prepayment counter 25 has been established to be en-

energized, as follows. The one side of the relay 114 is connected to lead 107. The opposite side is connected in series with a diode 120 to the line 117 which in turn is connected to the negative line 40 through the several contacts or switches 57 as heretofore described in connection with the power circuit for relay 74. Thus, whenever the system is set up for a prepayment mode of operation, the relay 114 is energized to break the previously normally standby circuits for the relays 97 and 74 and requiring completion of the previously described circuits for the associated relays 97 and 74.

The relay 114 further includes a second set of latch contacts 114-2 connected directly between the negative side of the relay 114 and the diode 118 to provide a holding circuit for the relay 114. The diode 120 isolates the negative circuit connection for the holding circuit of relay 114 from the line 117.

The relay 114 controls a third set of contacts 114-3 which interconnect the prepayment counters 25 and the fill-up counter 26 to the pulsing circuit 56 of the associated pump 1, as presently described.

The pulse forming circuit which is interconnected between the transmitter 14 and the output or the counters particularly forms the subject matter of applicant's co-pending application entitled Signal Transmitting Circuit filed on even date herewith and assigned to a common assignee and thus will only be briefly described in the present application and particularly described with regard to its interconnection in the present circuit for operating the fill-up counter 26 and the prepay counter 25.

The pulse forming circuit 56 is connected in series with the related transmitter switch 15 directly to the positive side of lines 31 and includes circuitry adapted to establish a train of pulses related to the opening and closing of the transmitter switch 15 at an output line 121 for energizing of a pulsing relay 122. In the illustrated embodiment of the invention, the positive side of the relay 122 is shown connected directly to the positive side of lines 31 and the negative circuit connection is established by the pulse forming circuit 56.

The relay 122 controls a set of normally open contacts 122-1 connected in series with a set of normally open contacts 74-3 of the power relay 74 to the positive side of lines 31. The opposite side of the contacts 122-1 is connected to the operating coil 76 of the fill-up counter 26 which is connected directly to the negative side of lines 31. As previously noted, the power contacts 74-3 are actuated by the preset counter circuit and thus condition the circuit for transmission of signals whenever the system has been properly set for prepayment operation. Each energization and deenergization of the pulse relay 122 causes a corresponding opening and closing of pulse contacts 122-1 and a corresponding pulse being transmitted to the fill-up counter 26 to record the unit flow.

Simultaneously, the signal is applied via a line 123 to the contacts 114-3 which are now closed and interconnect the line 123 directly to line 55 and thus via the input line 41 to coil 35 of the penny counting section 34 the opposite side of which completes the connection via line 40 to the negative side of the lines 31. While the circuit is maintained and dispensing established, the pulsing circuit continuously opens and closes the contacts 122-1 in accordance with the unit flow and simultaneously drives the fill-up counter 26 and the prepayment counter 25.

The fill-up counter 26 records at the console 4 the total amount of product dispensed simultaneously with the recording thereof at the outside pump. Simultaneously, the pulsing of the relay 35 causes the counter wheels 37 to be driven in the reverse direction toward the zero setting and simultaneously rotates the contact arms 38 toward the zero setting.

When the contact arms 38, 38' and 38'' are driven below 14 cents in the illustrated embodiment of the invention, the relay 97 is deenergized and contacts 97-1 open and solenoid 12 is deenergized. As previously noted,

this will require a slight amount of time and by the time the counter 25 has reached approximately a 4 cent position, the flow drops to a very slow rate. When the counter wheels 37 are at a zero position, the contacts 57 open and disconnect the circuit for the pump-motor unit 6 which immediately stops pumping to terminate the flow. As a result of the reduced flow setting created by the operation of the solenoid 12, the termination of flow will be extremely accurately recorded and related to the preset amount.

As previously noted, the pulse forming circuit 56 may take any desired form that being shown corresponding to applicant's copending application and only briefly described herein. Generally, the pulse forming circuit includes a control relay 124 connected between the transmitter switch 15 and the negative side of the power lines 31. This relay controls two similar sets of contacts which in turn control alternate paralleled circuits for operating the pulsing relay 122. The contacts of the relay 124 include similar normally closed contacts 124-1 and 124-2 and normally open contacts 124-3 and 124-4. The first set of normally closed contacts 124-1 and normally open contacts 124-3 have one side connected in common to the positive side of the lines 31 in series with a set of normally closed contacts 125-1 of an output relay 125 and a resistor 126. The opposite sides of the normally closed contacts 124-1 and the normally open contacts 124-3 are separately connected to control silicon controlled rectifiers 127 and 128 which in turn are connected to control the energization of the relay 125. The normally closed contacts 124-1 provide a bias signal on the related silicon controlled rectifier 127 such that the first operation of the associated relay 124 will trigger rectifier 127 and in essence holds its inoperative. However, the closing of the normally open contacts 124-3 is effective to form a pulse to trigger the related silicon controlled rectifier 128 to energize the relay 125 which in turn actuates its contacts to transmit a pulse to the pulsing relay 122.

The other set of contacts of relay 124 consisting of the normally closed contacts 124-2 and the normally open contacts 124-4 provide a pair of paralleled contacts interconnecting the relay 122 in series with a pulsing capacitor 129 to the respective anode sides of the silicon controlled rectifiers 127 and 128. The normally closed contacts connect the relay circuit to the silicon controlled rectifier 128 associated with the normally open contacts of the first switch section and the normally open contacts of the second section connect the relay to the silicon controlled rectifier associated with the normally closed contacts. This insures that the initial switching of the transmitter 15 will cause firing of the related silicon controlled rectifier and simultaneously connect the relay in a pulse charging circuit.

The advantage of the transmitter circuit shown herein and forming the subject matter of applicant's copending application is that remote electrical readout such as counters 25 and 26 will always be driven within a half cent of the actual pump reading whether or not transmitting is established with switch 15 in an initially closed or an initially open position. This type of transmitter must be employed as a practical matter whenever the transmission circuit is fired from or actuated from a cam arrangement which is not reset to zero.

The overall operation of the circuit may be briefly described in the prepayment and the postpayment mode as follows.

In either event the key operated switch 19 and the toggle switch 20 must be actuated to complete the power connection to the console 4.

In the fill-up or postpayment mode the selector switches 43, 61, 62 and 63 are set to the regular or the premium setting by rotation of the selector knob 21, assumed to be premium pump 1. Start button 27 is then depressed to actuate the switch 58. The normally open contact 67

is engaged by arm 64 and provides positive voltage from line 44 via contacts 112-1 to the terminal 65 of the pulse forming networks 68 and 80. Pulse network 80 generates a pulse which is applied via the switch 61 to the gate of the silicon controlled rectifier 89 of the premium circuit 60, triggering it into conduction. The initial conduction path through the anode to cathode circuit is in series with the indicating lamp 28, paralleled with resistor 94, and the normally closed contacts 95-1 of relay 95. Light 28 is illuminated and provides an indication at the panel or console 4 that the premium pump 1 is ready for use.

Simultaneously, the pulse circuit 68 generates a pulse which is transmitted by the diode 73 to actuate the relay 72 and close its normally open contacts 72-1. This provides pulsed energization of the reset coil 78 of the premium fill-up counter via the normally closed contacts 74-1 of the power relay 74 and the selector switch 63.

The premium pump 1 is now established or ready for use. The customer or outside attendant removes the nozzle and actuates the pump switch unit 8 thereby simultaneously closing the contacts or switches 10 and 11. The switch 10 connects the positive side of lines 31 to the circuit 60 and to the associated contact 109 of switch 62 via the line 108. This provides illumination of the run light 29 associated with the premium pump and simultaneously energizes the relay 95. The switch 62 of the selector switch which is set to the premium contact 109 also applies a voltage to energize the relay 112 which opens its related contacts 112-1 and disconnects power from the phone dials 42 and from the start switch 58 which is actuated by the push button unit 27. Consequently, they are inoperable any time that a pump has been set in condition for use.

The positive voltage applied to the circuit 60 results in energization of the relay 95 and the establishment of a holding circuit for the silicon controlled rectifier 89 through relay 95 and independently of the holding resistor 94. The energization of relay 95 opens the contacts 95-1 and thus removes or opens the circuit to the indicator light 28 causing it to turn off. The filter circuit of resistor 106 and capacitor 105 prevents accidental disconnect or opening of the circuit of the silicon controlled rectifier 89 as a result of contact bounce of the switch 10.

The closing of the contacts 95-2 provides a positive voltage to the relays 97 and 74.

The power relay circuit is completed through the diode 119, the contacts 114-1, diode 118 to the negative line 31. Similarly, the solenoid control relay 97 circuit is completed through the diode 119a, contacts 114-1 and diode 118. The positive voltage applied to the relay 95 is also applied to the detector circuit and particularly relay 125 in series with the paralleled silicon controlled rectifier 127 and 128.

As fluid is dispensed the associated transmitter 14 is actuated and in particular the contacts or switch 15 are periodically opened and closed in accordance with unit flow. This actuates the pulse forming circuit 56 to open and close the circuit of the relay 122. The circuit 56 will be made and broken through either of the silicon controlled rectifiers 127 or 128 depending upon whether the transmitter switch 15 starts in an initially opened or an initially closed position. In either event, the pulse train is identically formed to provide for corresponding energization of the relay 122 in accordance with the unit fluid flow.

The contacts 122-1 which are connected between the positive line and the counter 26 provide for pulse operation of the counter 26 to record the amount of flow. The circuit to the prepayment counter 25 is broken at contacts 114-3 consequently, during a fill-up mode, the prepayment counter 25 is not actuated.

When the desired amount of the product has been withdrawn, the operator returns the nozzle which opens the pump switch unit 8 and breaks the circuit through

switches 10 and 11. The opening of the pump switch 11 de-energizes the solenoid 12. The opening of the pump switch 10 breaks the holding current path for the silicon controlled rectifier 89 and the relay 95. The relay 95 drops out and opens the contacts 95-2 thereby removing power from the power relay 74 and the solenoid relay 97.

The circuit is thus back to its original starting point such that further operation of the pump switch unit 8 will not permit operation or discharge of gasoline. This can only be started by reactivation of the push button 27 to again actuate the switch 58.

The fill-up counter 26 shows the total amount of product in dollars and cents dispensed from the pump and provides the amount of money which the customer must pay.

In the prepayment mode, the key operated switch 19 and the toggle switch 20 must of course be actuated in the same manner and the selector knob 21 turned to the desired position for either the premium pump or the regular pump. The operator then programs into the system, and particularly counter 25, by rotation of the three telephone dial units 22, 23 and 24 the amount of the transaction. Each dial is connected to the corresponding counting section 34 through the switches 42, 42' and 42'' for corresponding actuation or energization of the pulsing coils 35, 35' and 35'' and positioning of the related counter wheels 37 and of the contact arms 38 with respect to contacts 39. The relationship between the input numbers and the number of pulses generated is the complement of the actual number put in. Thus, if the number 4 is dialed, the number of pulses generated will be the complement thereof; namely, 6. The arm 38 is then driven 6 steps. The number displayed by the number wheel 37 however corresponds to the number put in; namely, in the assumed illustration, the number 4. This is necessary in view of the fact that the counters are subtraction counters. Each decade counting section 34 thus has the contact arm 38 and associated contacts 39, transfer contacts 53 and the reset or interlock contacts 57 interconnected to control the discharge or dispensing control. The reset contacts 37 are closed as long as the counter 28 is set from the zero or reference setting and provides a connection between the negative side of lines 31 via the line 40 and the contacts 57 to the power relay 74.

The operator at the console 4 must actuate the push button 27 to actuate switch 58 and move contact 64 to contact 67. This initial actuation functions in the same manner as in the fill-up mode to provide positive voltage to the pulse forming circuits 68 and 80 which in turn function in exactly the same manner as heretofore discussed to trigger the related silicon controlled rectifier 89 and the counter reset relay 72. The pump has then been conditioned for use and the pump 1 operated as previously described.

However, in this case, the closing of the pump switch 10 also turns off the "ready" condition light 28 and turns on the "run" light 29. Power is also supplied via switch 62 to relay 112 which removes power from the switch 58 and therefore the telephone dial switches 42, 42' and 42''. The actuation of relay 95 again provides power to the relays 74 and 97 and with the prepayment counter 25 preset, also to the relay 114. This circuit may be traced from the line 107 which goes to the relays 74 and 97 and to the relay 114. From the relay 114 the circuit continues through the diode 120 to the line 117 and returning to the negative side of lines 31 via the several switches 57 of the several prepayment counting sections. The energization of the relay 114 disconnects the circuit lines for relays 74 and 97 as previously established. This requires that the relay 97 be energized through the counting sections 34 and particularly the contact arms 38 and the related contact 39 of the several counting sections 34. The power relay 74 similarly must now

be energized through the circuit including the diode 116, line 117 and the reset contacts 57.

Gasoline is now dispensed in the usual manner. However, when the prepayment counter 25 drops below 14 cents; that is, to 13 cents, the readout section of each unit consisting of the contact arm 38 and the contacts 39 are opened. This removes the minus power connection to the solenoid 97. As a result, the contacts 97-1 open, the solenoid 12 is deenergized and the flow restricted. As previously noted, reduced flow normally will not occur until about 4 cents is left on the prepayment counter 25 because of the operating times of the solenoid 12. During the terminal period the counter wheels 37 will be driven to the zero position. When the prepayment counter reaches zero all of the reset contacts 57 will be in open circuit condition, breaking the minus connection between the power relay 74 thereby turning off the pump motor unit 6. It is now impossible to dispense any further gasoline from the system unless the system is reset at the central control. The operator returns the nozzle to the pump opening the switches 10 and 11. Opening of switch 10 is indicated by the opening of the circuit to the "run" lamp 29 which turns off. The opening of switch 10 also resets the circuit in the same manner as previously described and further in this case resets the relay 114.

The circuit is then again at the original starting point and further operation of the pump switch unit 8 will have no effect on the system. The fill-up counter 26 shows the prepaid amount of produce in dollars and cents and the prepayment counter 25 is at zero. This thus provides a check in the event the customer asserts he did not receive the total amount paid for.

In the event the total prepaid quantity is not taken, the cashier can readily make the necessary adjustment by direct reading of the balance on the prepayment counter 25. The counter 25 is reset to zero by dialing 17 the complement of the number on the counter 25. For convenience, the complement numbers are preferably placed for direct reading on the inner face of the dial as at 52, shown in FIG. 6, so the operator can insert the counter reading directly.

The switches 98 and 99 provide a means for manually operating the system independently of the console unit.

The central operator also maintains complete control of the several pumps for emergency stopping through the console control switching, particularly switches 19 and 20 which control application of power to the console and also the mechanical control switches 98 and 99.

The present invention thus provides remote control for product dispensing means with complete control of access to the pumps from the remote station, stopping of all flow in case of emergencies and remote handling of all money transactions with a complete check on the accuracy of the dispensing and the operation of the system.

The circuit includes a first release circuit or means for actuation of the solenoid and motor-pump unit or other similar interlock means for indeterminate operation such as encountered in the postpayment operation and a second release circuit or means including the counting means or the like having the presettable stop control means to reset the interlock means after a predetermined amount has been dispensed such as encountered in the prepayment operation. It can therefore be employed in a ready manner for either prepayment or postpayment operation. If a refund is required in connection with a prepaid amount, the amount is directly readable and the circuit reset in a simple manner. The system can be applied to the standard dispensing pumps presently employed for gasoline servicing without the requirement of any special pumping mechanism. The only control necessary is the addition of the transmitter and the solenoid at the pump with the circuit interconnections through the console unit. The present invention thus provides a reliable and versatile remote control system for gasoline and other product dispensing.

Various modes of carrying out the invention are contemplated as being within the scope of the following claims particularly pointing out and distinctly claiming the subject matter which is regarded as the invention.

We claim:

1. In a dispensing system, the improvement in the control unit of the dispensing means comprising:
 - interlock means forming a part of said dispensing means and having a dispensing position and a stop position for controlling the discharge from said dispensing means,
 - first release means connected to said interlock means and operable to actuate said interlock means to the dispensing position for indeterminate operation,
 - second release means connected to said interlock means and operable to release said interlock means, said second means including a dispensing responsive disconnect means presettable stop control means to reset the interlock means to including a presettable subtractive counter means having a plurality of counter sections which establish a readout in accordance with a numbering system adapted to show multiples of a monetary unit, and a switch means positioned to open and closed circuit conditions, one condition being established with the subtractive counter means in a reference position and in the opposite condition when preset from the reference position, said switch means being connected to said circuit means to control the interlock means and thereby the dispensing means and being actuated by the presetting of the subtractive counter means,
 - dispensing responsive means connected to the dispensing means and to the presettable subtractive counter to actuate the switch means and thereby the disconnect means to terminate a dispensing operation in accordance with the setting of the presettable stop control, and
 - a separate indicating means, being separate from the stop control means and connected to said dispensing responsive means, for recording the dispensed amount.
2. The dispensing system of claim 1 wherein said separate indicating means is an additive counter means and including:
 - means connecting said dispensing responsive means to said subtractive counter means including means to selectively connect and disconnect the subtractive counter means without effecting the connection of the additive counter means.
3. In the dispensing system of claim 1 wherein:
 - said interlock means includes a partial stop means to reduce the rate of discharging and a second complete stop means to terminate discharge, and
 - means connected in circuit through said stop control means and having means to sequentially actuate the partial stop means and thereafter the complete stop means.
4. In a dispensing system, the improvement in a control system for actuating dispensing means comprising:
 - an interlock means including a control switch means forming a part of the dispensing means and controlling the discharge from said dispensing means,
 - a remote control unit remotely located from the dispensing means and including a connecting circuit means connected to the switch means,
 - first release means at the remote control unit connected to said circuit means for and operable to actuate said switch means for indeterminate operation of said dispensing means,
 - second release means at the remote control unit including a dispensing responsive disconnect means having a presettable stop control means connected to said circuit means and operable to actuate said switch means, and

dispensing responsive means connected to the dispensing means and to the disconnect means to actuate the presettable stop control means and the disconnect means to terminate a dispensing operation in accordance with the setting of the presettable stop control.

5. The dispensing system of claim 4 having:

- a "ready" indicator,
- a "run" indicator,
- final control means at the dispensing means for operating the interlock means,
- means connected to the "ready" indicator and the release means to operate the "ready" indicator in response to actuation of either of said release means, and

means actuated by the final control means to operate the "run" indicator and reset the "ready" indicator.

6. The dispensing system of claim 4 having:

- an additive counter means to record the material dispensed,

- said stop control including a subtractive counter means including switch means connected to said circuit means to control the dispensing means and actuated by the presetting of the second counter means, and
- said dispensing responsive means being connected to said counter means to actuate the counter means.

7. The dispensing system of claim 6 wherein:

- said interlock means includes a partial stop means to reduce the rate of discharging from the dispensing means,

- said subtractive counter means includes a plurality of decade counting sections each having a stepped contact selectively and cyclically engaging a plurality of fixed contacts,

- means interconnecting selected fixed contacts within each counter, and

- said circuit means including means connecting said stepped contacts and said interconnected fixed contacts in an operating circuit to control the state of the partial stop means.

8. The dispensing system of claim 6 including electrically actuated means connected in an operating circuit with the switch means of the subtractive counter means and having contact means connected in the circuit between the subtractive counter means and the dispensing responsive means.

9. The dispensing system of claim 4 including means responsive to the presetting of the stop control means to operably disconnect the first release means and operably connect the second release means.

10. In the dispensing system of claim 4 wherein:

- said interlock means includes a partial stop means to reduce the rate of discharging and a second complete stop means to terminate discharge, and
- changeover means connected in circuit through said stop control means and having means to sequentially actuate the partial stop means and thereafter the complete stop means.

11. In the dispensing system of claim 10 wherein said changeover means includes means having a standby position connecting only the first release means for operation and an actuated position connecting only the second release means for operation.

12. The dispensing system of claim 10 wherein said changeover means includes first relay means to control the partial stop means, a second relay means to control the complete stop means and a selection relay means,

- said selection relay means controlling a plurality of contacts connected in circuit with said first and second relay means and said stop control means, and
- means connecting the selection relay means in circuit with the stop control means to energize the selection relay means in response to preset actuation of the presettable stop means.

13. In the dispensing system of claim 4 wherein said presettable stop means includes a pulsed drive means, and

a telephone-type rotating dial unit having a switch means connected in series with the pulsed drive means and a power source connection for presetting of the presettable stop means.

14. In the dispensing system of claim 13 wherein said dial unit is provided with numerical decimal digits and said dial unit actuates the switch means a number of times which is the complement of the identifying digit.

15. In the dispensing system of claim 4 wherein: said dispensing means includes a plurality of individual dispensers each of which includes an individual one of said control systems,

a selection switch means at the remote control unit to selectively and operatively connect any one individual dispenser for establishing a dispensing operation at any one time, and

means connected in each of said control systems to hold said system in a dispensing operation independently of said selection switch means in response to establishment of such dispensing operation and thereby permit simultaneous operation of said dispensers.

16. In the dispensing system of claim 15 wherein each dispensing means includes a flow responsive signal source, said remote control unit includes individual transmitting circuits for each dispensing means, and said switch means selectively connects the transmitting circuits to condition them for operation.

17. The dispensing system of claim 4 wherein said interlock means comprises:

an electrically operable valve means connected to reduce the dispensing rate,

an electrically operable stop means connected to terminate dispensing,

an energizing circuit for the valve means including a set of normally open contacts of a valve relay means,

an energizing circuit for the stop means including a set of normally open contacts of a stop relay means,

a control relay having common contacts,

said relay means connected in circuit with said common contacts of the control relay,

the circuit for said valve relay means including first stop contact means coupled to and actuated by the presettable stop control means to reduce the dispensing rate a predetermined period before termination of a dispensing operation,

the circuit for said stop relay means including second stop contact means coupled to and actuated by the presettable stop control means to terminate dispensing, and

a transfer relay means having contacts connected to bypass the contacts of said presettable stop means for energizing of the valve means and the stop means independently of the presettable stop means.

18. The dispensing system of claim 17 wherein:

the presettable stop control means is a subtractive counter having a movable contact sequentially and cyclically engaging a plurality of interconnected fixed contacts, said movable and fixed contacts forming the first contact means, said counter having a null position and counting means coupled to the second stop contact means to actuate the latter in the null position.

19. The dispensing system of claim 18 wherein the counter includes a counting section having a pulsed drive means coupled to the movable contact and the counting means to simultaneously actuate the drive means and the counting means,

a preset means connected to actuate the pulsed drive means, and

means connecting the dispensing responsive means to

the pulsed drive means in response to actuation of the second release means.

20. The dispensing system of claim 19 wherein said counter includes a plurality of such counting sections interconnected to form a decade counter,

a telephone type dial unit having a rotatable multiple apertured disc coupled to a switch means, and means connecting the switch means to the counting sections for presetting of the subtractive counter from the null position.

21. The dispensing system of claim 19 wherein: said counter includes a plurality of such counting sections interconnected to form a decade counter, separate telephone type dial units, one for each counting section and each including a rotatable multiple apertured disc coupled to a switch means, and means connecting each switch means to the drive means of the corresponding counting section for presetting of the subtractive counter from the null position.

22. The dispensing system of claim 17 wherein said control relay means includes a second set of contacts, a control relay circuit serially including said control relay, a silicon controlled rectifier and final control switch means at the dispensing pump to supply power to the system,

a trigger circuit connected to the silicon controlled rectifier and actuated by a common operator at the remote control unit, and

a holding circuit for the silicon controlled rectifier serially including the silicon controlled rectifier, a holding current, impedance and normally closed contacts of the control relay, whereby said rectifier maintains conduction in response to triggering.

23. The dispensing system of claim 22 having a "ready" indicator connected in parallel with said holding current impedance.

24. The dispensing system of claim 22 having:

a capacitive means and a resistive means connected in parallel circuit with said normally closed contacts to prevent opening of the circuit through the rectifier if said switch means rapidly opens and closes.

25. The dispensing system of claim 22 wherein the common operator is a start switch connected to the trigger circuit, said trigger constituting a pulse forming circuit, a counter means at the remote control unit and connected to record units of material dispensed, said counter means having an electrically actuated reset means, and

a second pulse forming circuit connected to said start switch and including a reset relay means, said reset relay means having contacts connected in a reset circuit with said reset means to actuate the reset means upon operation of the start switch.

26. The dispensing system of claim 25 wherein the power relay means includes normally closed contacts in said reset circuit.

27. In the dispensing system of claim 4 wherein said interlock means comprises:

a solenoid and a motor-pump unit,

an energizing circuit for the solenoid including a set of normally open contacts of a solenoid relay means, an energizing circuit for the motor-pump unit including a set of normally open contacts of a power relay means,

said circuit means including said relay means connected in parallel branch circuits between power lines in series with common control contacts of a control relay,

a control relay circuit connecting the control relay to respond to the first release means and the second release means,

the branch circuit for said solenoid including first contact means coupled to and actuated by the presettable stop control means to deenergize the solenoid

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a predetermined period before termination of a dispensing operation,
 the branch circuit for said motor-pump unit including
 second contact means coupled to and actuated by the
 presetable stop control means to deenergize the
 motor-pump unit at the termination of the dispensing
 operation, and
 a transfer relay means connected in parallel with the
 power relay means and having normally closed con-
 tacts connected in circuit to bypass the contacts of
 said presetable stop means for energizing of the
 solenoid relay means and the power relay means in-
 dependently of the presetable stop means.
 28. The dispensing system of claim 27 wherein:
 the dispensing responsive disconnect means includes a
 subtractive decade counter having a plurality of
 counting sections,
 each counting section including a pulsed drive means
 coupled to sequentially and cyclically move a mov-
 able contact into engagement with a plurality of fixed
 contacts and a counting member, said movable con-
 tact and said counting member having a correspond-
 ing null position, means coupling the counting mem-
 ber to the second contact means,
 said movable and fixed contacts forming said first con-
 tact means,
 a plurality of telephone type dial units, one for each
 counting section and each having a rotatable multiple
 apertured disc coupled to a switch means,
 means connecting each switch means to the drive means
 of the corresponding counting section for presetting
 of the counter from the null position,
 said control relay circuit serially including said control
 relay, a silicon controlled rectifier and switch means
 actuated by the dispensing pump,
 a pulse forming circuit connected to the silicon con-
 trolled rectifier,
 a holding circuit for the silicon controlled rectifier
 serially including the silicon controlled rectifier, a
 holding current impedance and normally closed con-
 tacts of the control relay, whereby said rectifier
 maintains conduction in response to triggering,
 an indicating means at the remote control unit and con-
 nected in parallel with the holding impedance,
 an additive counter means at the remote control unit

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and connected to record units of material dispensed,
 said counter means having an electrically actuated
 reset means,
 a second pulse forming circuit connected to said start
 switch and including a reset relay means, said reset
 relay means having contacts connected in a reset
 circuit with said reset means to actuate the reset
 means upon operation of the start switch, and
 a start switch at the remote control unit and connected
 to the pulse forming circuit.
 29. The dispensing system of claim 28 wherein said
 first pulse forming circuit establishes a short peaked pulse
 and said second pulse forming circuit a relatively longi-
 tudinally rectangular pulse.
 30. In a liquid dispensing system having a discharge
 control means,
 a remotely located presetable stop means connected to
 actuate the control means and prevent discharge
 from the system including a stop means having a
 pulsed drive means and a subtractive counter means,
 power source connection means,
 a telephone-type rotating dial having a switch means
 connected in series with the pulsed drive means and
 the power source connection for presetting of the
 presetable stop means, said dial unit having nu-
 merical decimal digits and said dial unit actuates the
 switch means a number of times which is the com-
 plement of the identifying digit.
 31. The dispensing system of claim 30 wherein two sets
 of identifying decimal digits are provided adjacent dial
 units, said two sets being complement numbers to permit
 initial presetting by operation from one set and resetting
 by operation from the second set.

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U.S. DEPARTMENT OF COMMERCE

PATENT OFFICE

Washington, D.C. 20231

**UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION**

Patent No. 3,402,851

September 24, 1968

George A. Ciotti et al.

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 2, line 48, "apropriate" should read -- appropriate --.
Column 5, line 57, "nozble" should read -- nozzle --.
Column 13, line 29, "is" should read -- in --; line 34, "its" should read -- it --.
Column 14, line 71, after "114-3" insert -- and --.
Column 15, line 44, "contracts" should read -- contacts --; line 74, "contact" should read -- contacts --.
Column 17, line 18, cancel "presetttable stop control means to reset the interlock means to --."

Signed and sealed this 3rd day of March 1970.

(SEAL)

Attest:

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Attesting Officer

WILLIAM E. SCHUYLER, JR.

Commissioner of Patents

