United States Patent [19]

Kelly

[11] **3,723,826**

[45] **Mar. 27, 1973**

[54] CONTROL APPARATUS FOR FUEL PUMPS

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[22] Filed: **Sept. 30, 1970**

[21] Appl. No.: **76,817**

[52] **U.S. Cl.** .....**317/135 R,** 222/14

[51] **Int. Cl.** **B67d 5/30**

[58] **Field of Search**.....317/134, 135 R; 222/14, 15, 222/16

[56] **References Cited**

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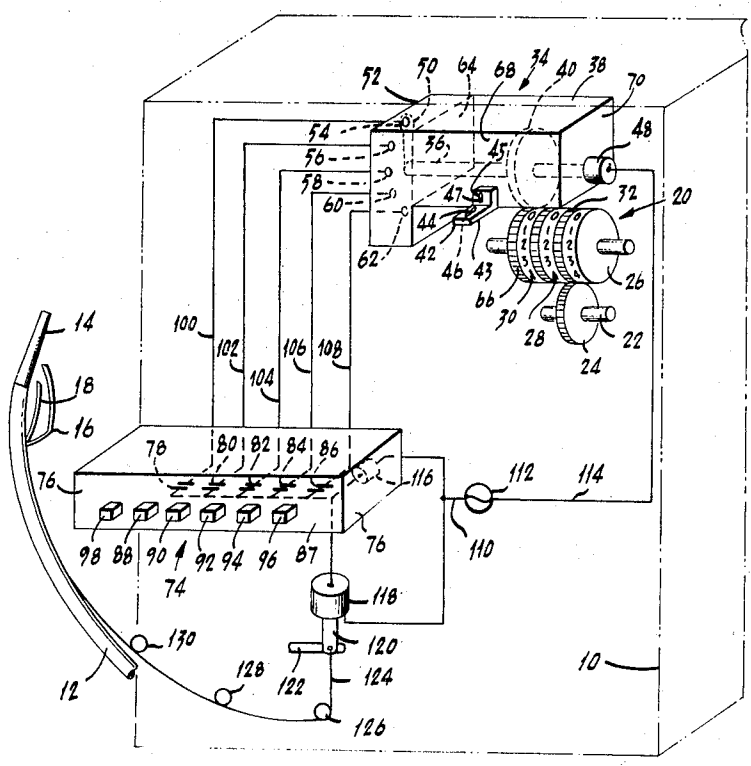
1,607,899	11/1926	Long	222/14
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3,140,409	7/1964	Dickinson	317/135 R
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Primary Examiner—L. T. Hix
Attorney—Sperry and Zoda

[57] **ABSTRACT**

A unique arrangement of elements is integrated into discrete modules for automatically controlling the quantity of fuel dispensed from service station fuel pumps in response to a pre-selected value. The arrangement may include three principal assemblies consisting of two modules and a solenoid. A rotary switching arrangement may be housed within the first module to be directly mechanically driven by a cost-of-purchase totalizer of the service station fuel pump. The rotary switch includes arcuately arranged, fixed electrical contact buttons which are each electrically connected with one of a plurality of selector switches provided within the second module. A keyboard having a plurality of pushbuttons may be displayed on a face of a second module and each pushbutton is operable to close a corresponding one of the selector switches. The first and second modules may be electrically connected to form a normally opened series circuit, having a plurality of branch circuits. A solenoid may be integrated with the second module and connected in parallel with the circuit for resetting each pushbutton upon the dispensing of the desired dollar amount of fuel. A second solenoid may be connected in parallel with the circuit to be operable, upon actuation, to apply a mechanical pull to an existing fuel pump cutoff mechanism. The electrical circuit is adaptable for connection with a source of electrical power and is momentarily closed by the co-existing conditions of a closed selector switch and the engagement of the rotary switch with the fixed contact button electrically connected with that closed selector switch. The momentary closing of the circuit is operable to actuate both solenoids to cut off further fuel dispensing by the service station fuel pump and to reset the selector switch to an initial position for the next dispensing operation. In this manner of operation, the circuit is energized only for brief periods of time for actuating the solenoids. The arrangement of elements is such as to facilitate the installation of the present control system either in existing pumps or as original equipment.

15 Claims, 5 Drawing Figures



3 Sheets-Sheet 1

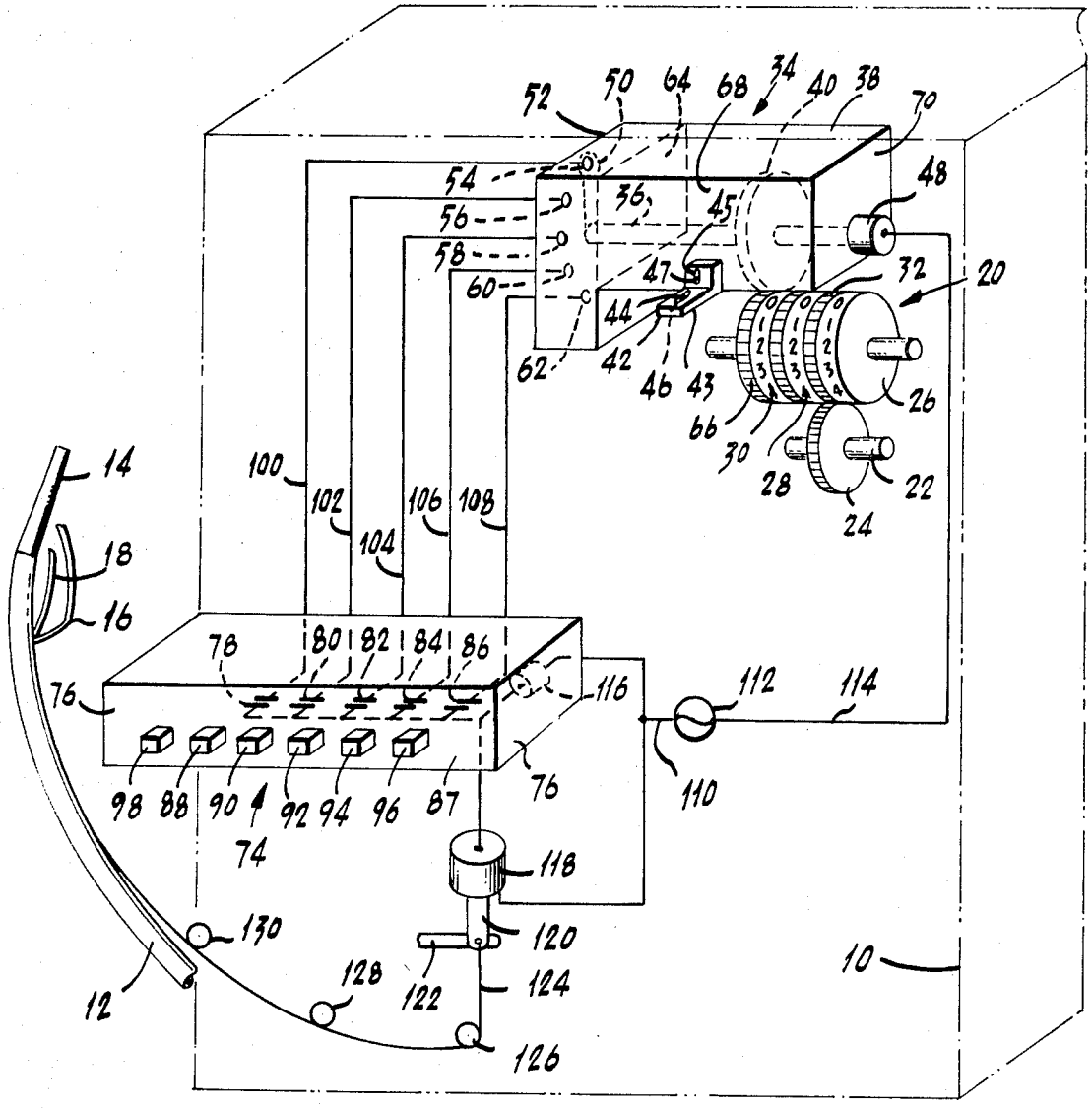


Fig. 1.

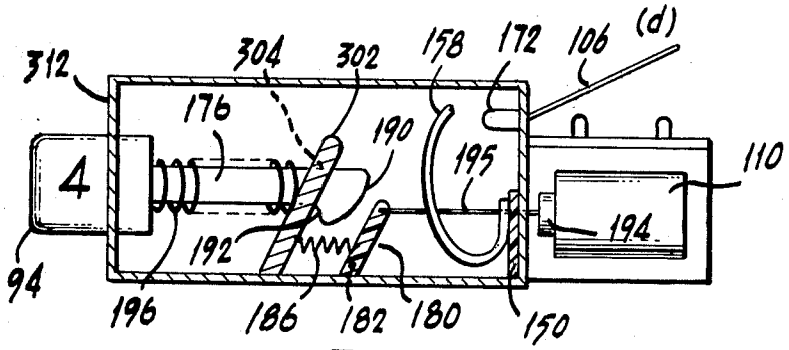


Fig. 5.

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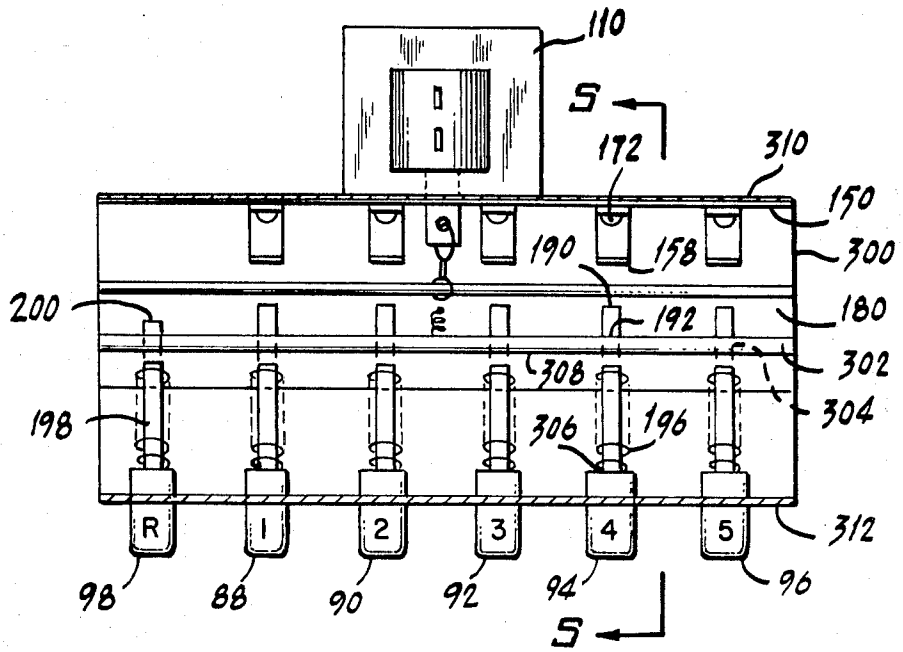


Fig. 4.

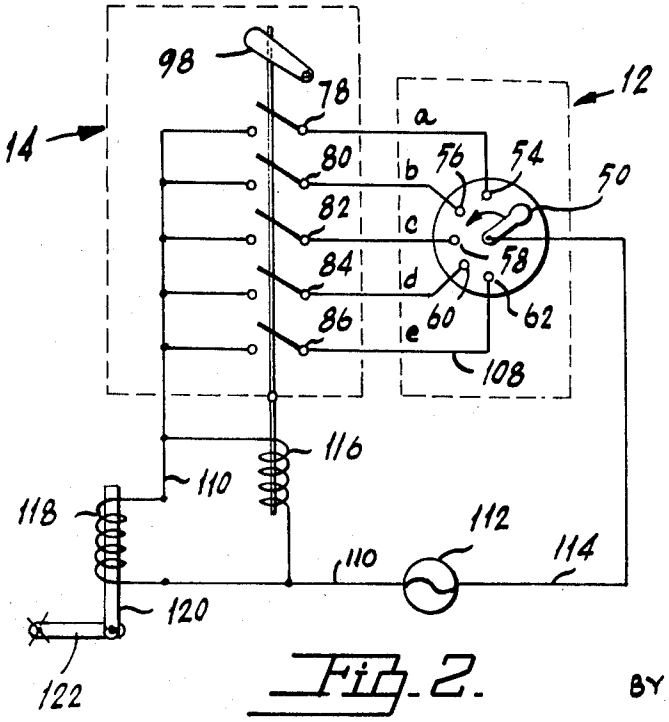


Fig. 2.

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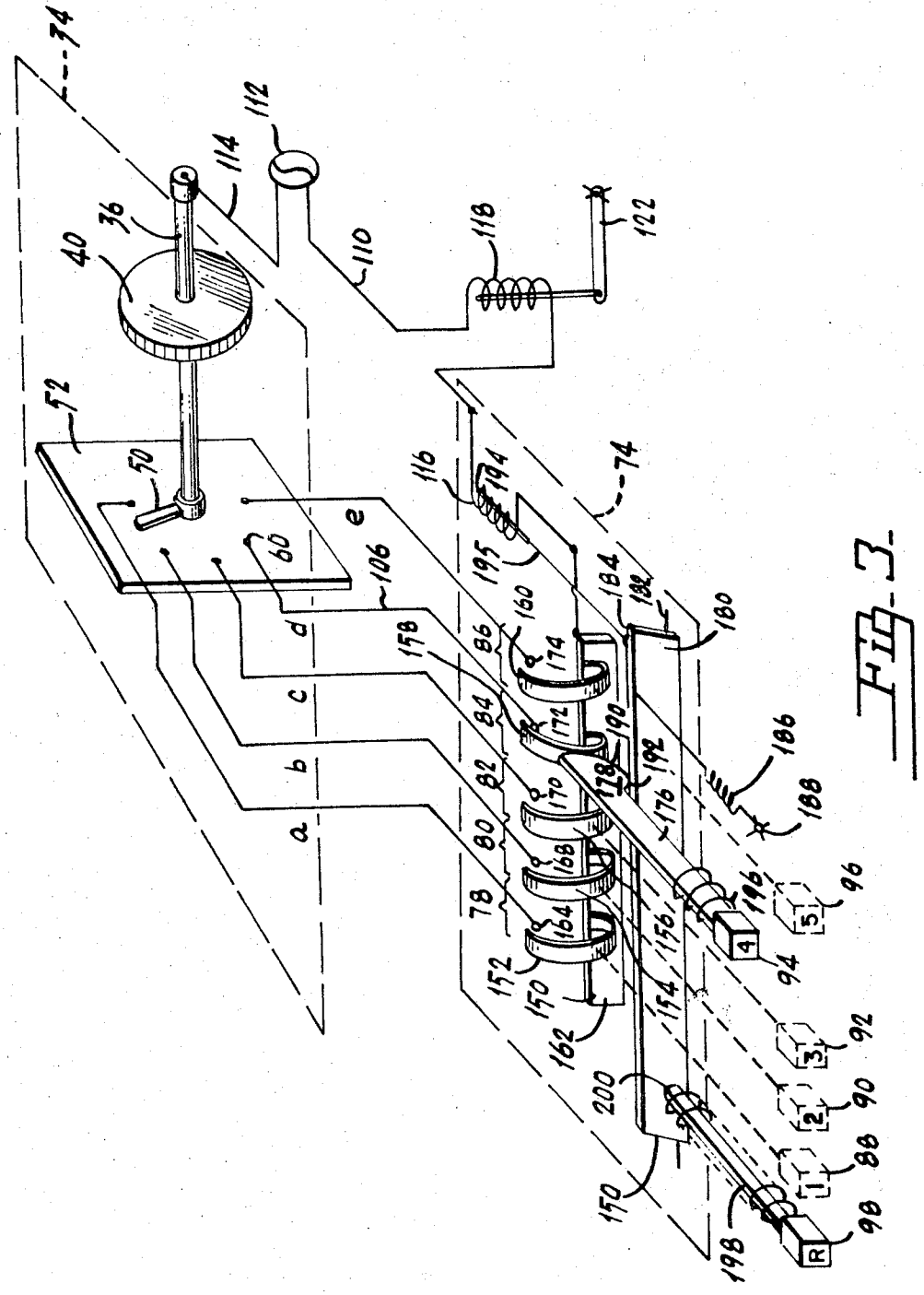


FIG. 3

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CONTROL APPARATUS FOR FUEL PUMPS

BACKGROUND OF THE INVENTION

The invention relates to a dispensing control means and, more specifically, relates to an arrangement of integrated elements for controlling the dispensing of a specific value of fuel from existing or original equipment commercial pumps such as those commonly found in automobile service stations.

Over the years, there has been a continual effort to provide an improved control apparatus for dispensing specific dollar amounts of fuel, which apparatus may be easily installed within existing commercial fuel pumps found in gas stations. Early efforts in the field include an attempt by Rockwell, as evidenced by U. S. Pat. No. 1,714,447, wherein a fairly intricate electrical circuit and a rudimentary mechanical mechanism is disclosed for controlling fluid dispensing. The Rockwell apparatus could not easily be adapted to existing conventional service station fuel pumps without additional inventive skill being applied thereto.

At a later date, Daley, et al., provided an improved fuel dispensing system shown in U. S. Pat. No. 2,643,792. The Daley, et al., apparatus incorporates a rather complicated and intricate counting system with an attending expense of manufacture which would minimize any advantages of the overall system.

U.S. Pat. No. 2,734,661, issued to Settergren, et al., reveals a system for controlling the dispensing of fuel from fuel pumps and illustrates the complexity of currently known such apparatus. The Settergren, et al., arrangement includes a complicated step relay system operating through a plurality of sequential steps and requiring substantial revision and modification of existing service station fuel pumps for the proper operation thereof.

U.S. Pat. No. 2,784,874, issued to Harper, illustrates another effort in improving fuel dispensing attachments. Harper discloses the utilization of a second cost-of-purchase wheel which must be installed within a pump to count backward as fuel is being dispensed to an automobile. The Harper apparatus requires substantial mechanical gearing and electrical circuitry. Bliss, et al., in U.S. Pat. Nos. 3,037,666 and 3,087,651, discloses some recent efforts in improving fuel dispensing control apparatus which patents, once again, illustrate the complicated nature of currently used such control systems.

Contrue, in U.S. Pat. No. 3,399,807, teaches one of the latest arrangements for providing a commercially and mechanically feasible apparatus for controlling the dollar amount of fuel dispensed from conventional fuel pumps. The Contrue arrangement is not integrated into modules presents a proliferation of switches, and requires critical placement of a plurality of microswitches for sequential operation. Despite the relative complexity of the Contrue apparatus, a manual reset is required so as to preclude the fully automatic operation thereof.

A perusal of the above cited patents indicates that rather complicated and expensive apparatus has been embodied in the various prior attempts to solve the many problems arising from the strict requirements attending the dispensing of predetermined dollar amounts of fuel. Such control means must be of a practical nature in that it must be easily adaptable for installation within existing service station fuel pumps comprising any of a wide spectrum of sizes and shapes. To be commercially feasible, such a control apparatus must be uniquely uncomplicated and comprise a minimum number of components. The apparatus must be compact and should be fully automatic, requiring only a one-step operation by an attendant or a customer. Due to the gasoline fume environment within which such control apparatus must function, it would be further desirable if any electrical switching portion of the control system were adaptable for immersion in a spark suppressing fluid, such as oil. Alternately, an explosion proof housing or mercury switches could be incorporated in the design.

Maintenance is always an important consideration in any control system, therefore, it is desirable that the fuel pump control elements be easily removable for periodic maintenance and trouble-shooting. Such maintenance would be facilitated if the apparatus were unitized into a few principal assemblies including uniquely compartmented modules. The assemblies may be formed in configurations which would facilitate the strategic positioning thereof within conventional service station fuel pumps as well as providing for the easy removal of control system elements for the proper maintenance thereof. Further advantages would be realized if the elements facilitated remote operation wherein an operator could control an outdoor pump from inside a sheltered space.

OBJECTS AND SUMMARY OF THE INVENTION

It is therefore, an object of the present invention to provide an arrangement of elements for controlling a fuel pump in response to a selection of a desired value of fuel, which apparatus solves many of the problems attending prior such apparatus.

It is another object of the present invention to provide an apparatus for controlling a fuel pump in response to a desired value of fuel, which apparatus is uniquely uncomplicated.

It is yet another object of the present invention to provide a control apparatus for dispensing fuel from existing or original equipment service station fuel pumps which may be easily installed therein without altering fuel pump structure.

It is still another object of the present invention to provide a fuel pump control apparatus which may operate in response to a cost of fuel dispensed, which control apparatus has fewer elements than heretofore possible.

It is a further object of the present invention to provide a control apparatus for a commercial fuel pump, which apparatus is integrated into modules for ease of installation and removal.

It is still a further object of the present invention to provide a control apparatus for a fuel pump which is compact so as to occupy a minimum amount of space within a fuel pump.

It is yet still a further object of the present invention to provide a control apparatus for a fuel pump wherein any sparking due to electrical switching may be effectively suppressed.

Another object of the present invention is to provide an apparatus for controlling the amount of fluid dispensed from a pump in accordance with a pre-

selected dollar value, which apparatus is fully automatic and requires only a single step actuation by a pump attendant or a customer.

Another object of the present invention is to provide an apparatus for controlling a pumping operation, which apparatus is uniquely adaptable for providing a remote control capability.

At least some of the above listed objects are achieved by integrating elements into a unique arrangement of module assemblies which cooperate in a synergestic manner to actuate a pump cutoff mechanism in response to the closing of an electrical circuit formed by the elements. The apparatus includes a first module assembly, having a rotary switch, and a second module assembly comprising a plurality of, normally open, dollar value selector switches. The circuit is adapted for connection with a source of electrical power and electromagnetic means is connected therewith to actuate the fuel pump cutoff mechanism in response to a momentary closing of the circuit. The rotary switch is mechanically driven directly by a moving surface of a cost-of-fuel totalizer of the pump. The rotary switch is operable to sequentially close a plurality of circuit branches, comprising the overall circuit, in response to the movement of the totalizer. When the rotary switch closes a circuit branch, which includes a closed fuel dollar value selector switch, the overall circuit is closed and the electro-magnetic means is operable. Additional electro-magnetic means may be integrated into the second module assembly to automatically open a closed dollar value selector switch to reset the overall control apparatus to an intial position for the next dispensing operation.

BRIEF DESCRIPTION OF THE DRAWINGS

While the invention is particularly pointed out and distinctly claimed in the concluding portion of the specification, a preferred embodiment is disclosed in the following detailed description, which may be best understood when read in connection with the accompanying drawings in which:

FIG. **1** is a perspective view of apparatus according to the present invention, showing the integrated nature of the control system and schematically indicating the positioning of the module assemblies thereof within an existing conventional service station pump;

FIG. **2** is a circuit diagram of the fuel pump control apparatus of the present invention as embodied within the system of FIG. **1**;

FIG. **3** is a perspective view showing the physical configuration and arrangement of electrical elements comprising the circuit shown in diagrammatic view in FIG. **2**;

FIG. **4** is a top plan view of the desired cost-of-fuel selector, which is compartmentized into a single module assembly comprising a portion of the circuit shown diagramatically in FIG. **2**; and

FIG. **5** is a sectional elevation view of the module assembly shown in FIG. **4**, taken along line **5—5**.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in which like numerals are used to indicate like parts throughout the various views thereof, FIG. **1** shows a unique arrangement of unitized compartmented elements forming module assemblies according to the present invention.

A conventional service station fuel pump is represented by phantom lines and is indicated generally as **10**. A fuel dispensing hose **12** leads from the fuel pump **10** and terminates in a nozzle **14**. The nozzle **14** may be formed with a hand guard **16** and a mechanical trigger-like fuel pump cutoff lever **18**. Of course, the overall fuel pump **10** may be internally provided with conventional pumping and conduit apparatus which is well known in the art. The dispensing pump (not shown) may be of a centrifugal type and may be mechanically geared to drive a "cost-of-dispensed-fuel" totalizer, indicated generally as **20**, and also well known in the art.

The totalizer arrangement **20**, shown in FIG. **1**, includes a drive shaft **22** which is journaled to be continuously diriven while the dispensing pump (not shown) is operating. The drive shaft **22** may be provided with a pinion drive gear **24** fixed thereon for rotation therewith. The totalizer **20** is rotatably mounted adjacent to the drive shaft **22** and generally comprises three rotatable drums **26**, **28** and **30**. The totalizer **20** is provided with conventional gearing which may be of the Geneva type or the like, for engagement with the drive pinion gear **24** of the shaft **22**. A gear **32** is associated with the drum **26** and is driven by the drive pinion **24** to rotate the drum **26**. The drive train between the pump (not shown) and the drum **26** is calibrated to rotate numerical indicia displayed on the drum **26**, so as to indicate the value of fuel, in terms of cents, which has been dispensed to an automobile between the initiation of the pumping operation and the time of totalizer reading.

The drum **26** is adapted through appropriate conventional gearing to rotate the next adjacent drum **28**, once for every 10 revolutions thereof. The drum **30**, in turn, is adapted by similar gearing to be rotated once for every 10 turns of the drum **28**. In this manner, the drum **26** is operable to indicate the cents value of fuel dispensed, the drum **28** is operable to indicate the tens of cents value of fuel dispensed, and the drum **30** is operable to indicate the whole dollar value of fuel dispensed. The overall totalizer **20** may be of any conventional existing design for the proper functioning of the present invention, provided that the totalizer presents a moving surface for indicating dollar values.

First Module Assembly

A unique rotary switch and gear arrangement is integrated into a module assembly **34** and adapted for mounting immediately adjacent any existing rotary totalizer **20**. The assembly **34** includes a shaft **36** journaled for rotation within a housing **38**. The housing **38** may consist of an electrically insulating material. A torque transmitting gear **40** may be fixed for rotation with a shaft **36**, and may be so disposed with respect to the whole dollar indicating drum **30**, of the rotary totalizer **20**, that the shaft **36** rotates in a fixed relationship with the rotation of the whole dollar indicating drum **30**. Of course, other torque transmitting devices (e.g.driving wheel with rubber edge) may be substituted for the gear **40**. Similarly, the driving surface may be a planar surface instead of the gear **66** associated with the totalizer **20**. A flange **42** may be provided on the housing **38** of the assembly **34** to extend

outwardly therefrom. An aperture 44 may be formed within the flange member 42 for the insertion of fastening means (not shown) for the proper mounting of the assembly 34 within the overall fuel pump assembly 10, and for proper positioning with respect to the included totalizer 20. Of course, any conventional bracket means may be utilized for mounting the assembly 34. The flange 42 may be made adjustable by providing a mounting leg 43 on the flange 42 and forming the leg 43 with a slot 45. The leg 43 may be adjustably attached to the housing 38 by a fastening member 47 inserted through the slot 45 and threadedly engaged within the housing 38. Similarly, the aperture 44 may be formed as an elongated slot 46, indicated in phantom lines, to permit additional freedom of adjustment in mounting the overall assembly 34.

The shaft 36 is of an electrically conductive material and the driving gear 40 is preferably of an electrically insulating material. The shaft 36 may be rotatably supported at a first end thereof by an electrically conductive journal member 48, and may terminate at the second end thereof in a radially extending wiper contact 50. The second end of the shaft 36, provided with the wiper contact 50, may be merely journaled by the insertion thereof within a bore hole formed in a wall 52 of the casing 38. The first end may be spring biased into engagement with the member 48 by the wiper contact 50 which may be resiliently urged toward an initial position and against the wall 52.

The wall 52 of the housing 38 is provided with a plurality of fixed button contacts 54, 56, 58, 60 and 62. The fixed button contacts 54 through 62 are arranged in an arcuate path described by the terminal end of the wiper contact 50 as the contact is rotated by the shaft 36 of the overall assembly 34.

The housing 38 of the assembly 34 may, itself, by compartmented to enclose the wiper contact 50 and the fixed button contacts 54 through 62 by means of a laterally extending internal wall 64. Thusly, an enclosed space is defined between the walls 52 and 64, which space may be of a generally rhomboidal configuration. Since the switching action of the wiper contact 50, when engaging with the fixed button contacts 54 through 62, may cause sparking, and since the occurence of such sparking may be dangerous in a gasoline fume environment, such as that presented in a gasoline fuel pump, a spark suppressing fluid, such as oil, may be retained within the compartment defined by the walls 52 and 64 of the module assembly 34. Similarly, explosion proof housings or mercury switches may be used to prevent ignition of any fuel fumes.

The remaining portion of the housing 38 of the module assembly 34 may be opened at a bottom side thereof for the projection of the driven gear 40 outwardly therefrom for engagement with a driving gear 66 associated with the whole dollar indicator 30 of the overall totalizer 20. Since no sparking would be anticipated from this gear portion of the assembly 34, this portion may be left opened and need only comprise the walls 68, 70 and 72. Of course, the function of the walls 68, 70 and 72 is merely to provide a bracket-like rigid support extending from the enclosed portion of the module assembly 34, defined by the walls 52 and 64, which support functions to position the journal member 48 within which the shaft 36 is rotatably mounted. Therefore, these walls 68, 70 and 72 could be replaced by any bracket-like member suitable for supporting the journal member 48 without departing from the spirit and scope of the present invention.

The fixed contact buttons 54, 56, 58, 60 and 62 are arcuately arranged on the wall 52 of the assembly 34. The fixed contact buttons 54 through 62 are spaced and calibrated with respect to the whole dollar indicating drum 30, so that the wiper contact 50 engages the fixed button contact 54 when the numeral 1, indicated on the whole dollar drum 30 is visible through a viewer window (not shown) of the overall fuel pumping apparatus 10. Similarly, the numeral 2 of the drum 30 is displayed in the viewer window when the wiper contact 50 engages the fixed contact button 56. in the same manner, fixed contact button 58 corresponds with the numeral 3 displayed on the drum 30, fixed contact 60 corresponds with the numeral 4, and fixed contact 62 corresponds with the numeral 5.

It is apparent from the foregoing description that the overall assembly 34 is of a very simple and compact nature suitable for adjustable mounting adjacent to an existing cost-of-fuel totalizer rotatably mounted within the conventional fuel pump equipment commonly found in service stations. No modification need be made on a fuel pump for the proper installation of the module assembly 34, and the use of adjustable bracket flange members 42 permits the installation of the assembly 34 in any of the many variously configured types of existing fuel pumps. The bracket-like flange member 42 may be bent to any desired shape to facilitate the proper positioning of the assembly 34. Of course, the apparatus may also be incorporated in original equipment as well as existing equipment.

Second Module Assembly

A second group of elements is integrated into a second module assembly indicated generally as 74. The assembly 74 may be housed within a casing 76, presenting a relatively thin, rhomboidal profile. As shown schematically in FIG. 1, the casing 76 houses electrical selector switches 78, 80, 82, 84 and 86. Pushbutton actuators 88, 90, 92, 94 and 96 are slidably mounted within a keyboard-like front face 87 of the assembly 74. Pushbutton actuator 88 is operable to close selector switch 78, pushbutton actuator 90 is operable to close selector switch 80, pushbutton actuator 92 is operable to close selector switch 82, pushbutton actuator 94 is operable to close the selector switch 84, and the pushbutton 96 is operable to close the selector switch 86. An additional pushbutton actuator 98 is provided on the face of the casing 76. The pushbutton actuator 98 is operable to unlatch and to open all the selector switches 78 through 86 by a mechanical arrangement which will be discussed in detail later in the specification with respect to FIGS. 3, 4, and 5 of the drawings.

Electrical conductors 100 through 108 each lead from one of the fixed contact buttons 54 through 62 to the respective selector switches 78 through 86 so that the electrical conductor 100 connects the fixed contact button 54 with the normally opened selector switch 78 housed within the assembly 74. Similarly, electrical conductor 102 connects the fixed contact button 56 with the normally opened selector switch 80, the conductor 104 connects the fixed contact button 58 with

the normally open selector switch **82**, the electrical conductor **106** connects the fixed contact button **60** with the normally open selector switch **84**, and the electrical conductor **108** connects the fixed button contact **62** with the normally opened selector switch **86**.

The selector switches **78** through **86** of the cost-of-fuel selector assembly **74** may be also connected by an electrical conductor **110** to a source of alternating current indicated as **112**. The shaft **36** supporting the wiper contact **50** is also electrically connected with the source of power **112** by means of an electrical conductor **114** to complete a circuit which is normally opened at the wiper contact **50** and at the selector switches **78** through **86**.

A solenoid **116** may be mounted on a rear portion of the cost-of-fuel selector assembly **74** by any conventional means. The solenoid **116** is operable to reopen any of the switches **78** through **86** upon the closing of the overall circuit by virtue of the wiper contact **50** engaging the one of the fixed contact buttons **54** through **62** associated with one of the selector switches **78** through **86**, which has been closed by a corresponding one of the pushbutton actuators **88** through **96**. The physical arrangement of the solenoid **116** with respect to the switch opening mechanism disposed within the selector assembly **74** will be discussed in detail with respect to FIGS. **3**, **4** and **5** of the drawings. The solenoid **116** may be connected with the electrical conductor **110** connecting the selector switches **78** through **86** with the source of electrical power **112**.

Fuel Pump Cutoff Actuator

A second solenoid **118** may be mounted within the overall service station fuel pump **10** as a discrete entity by any conventional fastening means and may be electrically connected with the electrical conductor **110**, connecting the selector **78** through **86** with the power source **112**. The coils of the solenoids **116** and **118** may be connected in series or parallel with each other. Upon closing one of the cost-of-fuel selector switches **78** through **86**, and upon the subsequent engagement of the wiper contact **50** with the one of the fixed contact buttons **54** through **62** associated with that closed selector switch, the overall circuit is closed so as to energize the solenoid **118** and to move a plunger **120** provided as the working member of the solenoid **118**. The plunger **120** may be pivotally connected with an existing lever **122** of the pump shutoff apparatus provided within conventional fuel pumps so that the longitudinal movement of the plunger **120** is operable to pivot, push or pull the lever **122** into a pump shutoff position by a direct mechanical linkage between the lever **122** and the plunger **120**. Alternatively, an actuating cord **124** may be attached to and moved by the plunger **120** of the solenoid **118** over a series of pulleys represented by the members **126**, **128** and **130**, provided along the length of the fuel dispensing hose **12**. The actuating cord **124** may be attached at a free end thereof with the trigger-like fuel cutoff mechanism **18** provided on the handle portion of the fuel dispensing nozzle **14**. By such aforesaid arrangements, the solenoid **118** actuates the existing conventional cutoff mechanisms of existing fuel pumps commonly found in service stations in response to the closing of the overall circuit provided within the preferred embodiment of the present invention and diagrammed in FIG. **2** of the drawings.

The Electrical Circuit

Referring now to FIG. **2**, a circuit diagram is displayed showing, symbolically, the allocation of electrical elements to the two principal assemblies **34** and **74**, indicated in phantom lines. As can be see, the circuit generally comprises a plurality of circuit branches "*a*" through "*e*". Circuit branch "a" is defined by fixed contact **54**, conductor **100** and selector switch **78**; circuit branch "b" is defined by fixed contact **56**, electrical conductor **102** and selector switch **80**; branch "*c*" comprises the fixed contact **58**, the electrical conductor **104** and the selector switch **82**; the circuit branch "*d*" comprises the fixed contact **60**, the electrical conductor **106** and the selector switch **84**; and finally, the circuit branch "*e*" comprises the fixed contact button **62**, the electrical conductor **108** and the selector switch **86**.

The overall circuit is energized upon the closing of one of the selector switches **78** through **86** by a pushbutton selection and the subsequent rotation of the wiper contact **50** within the assembly **34** to complete a circuit through one of the branches "*a*", "*b*", "*c*", "*d*" or "*e*". Upon the closing of the overall circuit, the solenoid **116** is momentarily actuated long enough to reopen the one of the selector switches **78** through **86** which was chosen, so as to once again reopen the circuit in readiness for the next selection. However, during the time that the circuit is closed and the solenoid **116** operating, the second solenoid **118** is operating to mechanically pivot the fuel shutoff lever **122** or to actuate the trigger-like cutoff mechanism **18** discussed with reference to FIG. **1**.

Therefore, the unique arrangement of circuit elements provided in the present invention is operable to perform the dual functions of cutting off the dispensing of fuel and automatically resetting the selector switch arrangement to an initial position in a synergestic manner utilizing a minimum number of components which may be unitized into assemblies readily adaptable for easy installation within any existing service station fuel pump.

Physical Arrangement of the Elements Comprising the Overall Circuit

Referring now to FIG. **3**, the physical elements of the overall circuit shown in FIG. **2** are shown in perspective view. The arrangement is shown with the pushbutton actuator **94** depressed so as to indicate a selection of $4.00 worth of fuel. The pushbutton actuator **94** operates to latch the selector switch **84** in a closed position so as to complete the overall circuit through branch "*d*" upon the engagement of the wiper contact **50** with the fixed button contact **60**.

It will be noted that the pushbutton selectors **88** through **96** are labeled with numerical indicia ranging from 1 through 5. It has been found that the whole number dollar selections are the most practical for fuel pump systems in that a service station customer will generally ask for 1, 2, 3, 4 or 5 dollars' worth of fuel. Very often,when a customer desires more than 5 dollars worth of fuel, he will desire to have his fuel tank filled and, consequently, the control apparatus of the present invention need not be utilized. Therefore, it is preferable that the customer be provided with dollar

choices ranging from 1 to 5 dollars. However, any number of selections may be provided.

The physical construction of the selector switches **78** through **86** of the preferred embodiment generally comprise an elongated plate-like conductor element **150**, having resilient fingers **152**, **154**, **156**, **158** and **160**, curving generally downwardly and upwardly from a flat surface **162** thereof. The elongated contact **150** supports each of the contact fingers **152** through **160** and also electrically connects each contact finger to the other at the lower end thereof. The remaining portion of the selector switches **78** through **86** consist of fixed button contacts **164–174** positioned so that, for example, the button contact **164** cooperates with the resilient finger contact **152** to form the overall selector switch **78**. Similarly, the contact button **166** cooperates with the resilient contact finger **154** to provide the selector switch **80**. The button contact **170** cooperates with the finger contact **156** to form the selector switch **82**, the button contact **172** cooperates with the finger contact **158** to form the selector switch **84**, and the button contact **174** cooperates with the finger contact **160** to provide the selector switch **86**.

It will be noted in FIG. **3** that the resilient finger contact **158** is being urged in to engagement with the fixed button contact **172** to close the selector switch **84**. The engagement is forced by the operation of the pushbutton actuator **94**, displaying the dollar value **4**. The pushbutton actuator **94** is provided with a shank portion **176** formed with a downwardly extending camming portion **178**, formed at a terminal free end thereof. A latching member **180** is hingedly mounted about an axis **182** within the overall assembly **74** and may be arranged transversely of a path described by the pushbutton movement of the members **88** through **96**, when depressed by an operator. The latching member **180** may be spring biased by a conventional spring **186**, which may be fixedly attached to the housing of the selector unit **74** at point **188**. The spring bias on the member **180** is operable to urge the upper edge **184** of the member **180** about the hinge axis **182** thereof, and toward the selector pushbuttons **88** through **96**.

When a pushbutton selector, e.g. pushbutton **94**, is depressed by an operator, a forward camming surface **190** of the downwardly extending portion **178** formed on the shank extension **176**, cams the latching member **180** to pivot about the hinge axis **182** away from the pushbuttons until a rear detented portion **192** of the downwardly extended cam **178** is disposed adjacent the upper edge of the latch **180**. At this point, the edge **184** of the latch member **180** locks within the detent **192** of the overall pushbutton **194** to lock the pushbutton **94** in the depressed position and to latch the selector switch **84** closed.

With the selector switch **84** closed and the contacts **172** and **158** thereof in electrical connection relationship, the solenoids **116** and **118** will be energized upon the sequential rotary movement of the contact wiper **50** over the arcuately arranged contact buttons **54** through **62** until the wiper **50** engages the button contact **60** electrically connected with the closed selector switch **84**. Upon the engagement of the wiper contact **50** with the button contact **60**, the solenoid **116** is energized momentarily and a plunger member **194** thereof is longitudinally translated. The plunger **194** is connected with the latch member **180** by connector member **195** so as to displace the upper edge **184** of the latching member **180** from engagement within the detent **192** of the pushbutton actuator **94** upon actuation of the solenoid **116**.

The pushbutton actuators **88** through **96** may be spring biased outwardly by a conventional helical spring **196**, so that, e.g. upon the disengagement of the latching member **180** from within the detent **192**, the pushbutton actuator **94** is repositioned away from the selector switch **84**, permitting the resilient contact finger **158** to disengage from the fixed button contact **172** so as to open the overall selector switch **84** and disable the circuit. This last operation clears the keyboard in readiness for a new selection of a dollar value of fuel to be dispensed.

It will be noted in FIG. **3**, that an additional selector pushbutton **98** is provided and displays the letter R. The pushbutton **98** comprises a portion of a manual reset arrangement and is formed with a camming shank **198** extending therefrom. The shank **198** terminates in an abutting surface **200** which is aligned so that the latching member **180** is disengaged from within the detent **192** of, e.g. pushbutton **94**, upon the abutment of the terminal end **200** thereagainst, which is operable to pivot the edge **184** of the latching member **180** about the axis **182**. In this manner, if an incorrect dollar value of fuel should be selected, the manual reset button actuator **98** may be depressed so as to reset the improperly depressed fuel-dollar value selector button and a new dollar value may be selected. Of course, the location of any of the buttons may be arranged to suit without departing from the invention.

Physical Details of Second Module Assembly

Referring now to FIGS. **4** and **5**, the selector module assembly **74** is shown in detail.

FIG. **4** is a top plan view of the assembly **74**, showing the generally box-like housing **300** provided for closing the elements comprising the selector switch module. The housing **300** may consist of an electrically insulating material and may be constructed of a fluid tight nature, so that a spark suppressing fluid may be retained therein to preclude any sparking of the selector switches **78** through **86** during gasoline dispensing operations. A partition **302** may be mounted within the casing **300** to extend transversely of the direction of movement of the selector pushbuttons **88** through **96**. The partition **302** may be formed with slots **304** for the sliding support of the pushbutton actuating members **88** through **96**. The reset springs **196**, which bias the pushbuttons out from engagement with the fingers **78** through **86**, urge against both a rear wall surface **306** of each pushbutton and a front wall surface **308** of the partition **302**.

The pushbutton reset solenoid **116** may be mounted on the rear portion **310** of the overall selector assembly **74** and may be connected with the latching member **180** in the manner discussed with reference to FIG. **3** of the drawings. The solenoid **116** may be secured to the rear wall of the assembly **74** by any conventional fastening means.

FIG. **5** is a sectional view of the apparatus shown in FIG. **4**, taken along the line **5—5**. It will be noted that the arrangement of the assembly **74** is such as to present a very thin profile, which is significant in that, if

the apparatus is to be installed with an existing service station fuel pump having a cylindrical configuration, the assembly **74** may be arranged with the longitudinal extension thereof extending generally along the axial extension of the cylindrical pump, therefore, the keyboard-like front wall **312** of the module assembly **74** may be flush with the outer skin of the overall service station fuel pump.

Some Advantages of the Present Invention

It can thus be seen that a service station fuel pump control apparatus has been herein provided which is operable to regulate the dispensing of fuel in response to the selection of a desired value thereof. The apparatus according to the present invention is uniquely uncomplicated and includes a minimum number of elements which are integrated into module assemblies for ease of installation within any existing service station fuel pump. The installation of apparatus according to the present invention requires a minimum of, if any, modification of existing service station fuel pumps. The only operable connections between the fuel pump and the control apparatus of the present invention are the torque drive engagement of the first module assembly **34** with the existing totalizer **20** and a simple connection of the plunger **120** of the solenoid **118** with the existing fuel pump cutoff mechanism.

Due to the uncomplicated nature of the apparatus according to the present invention, the arrangement lends itself to economy and ease of manufacture. A pushbutton feature of the selector selection of the present invention permits economy of space when installing the apparatus within existing fuel pumps. While the present invention is uniquely uncomplicated, the functioning thereof is fully automatic, requiring only the depression of a selector pushbutton for the proper operation thereof. The apparatus according to the present invention resets itself to an initial position and may be manually reset if a wrong selector button is pushed.

Since the apparatus according to the present invention is only energized momentarily while the fuel pump is being shut off, the apparatus is not consuming electrical power for long periods of time, as is the case in existing apparatus which is energized during the pumping operation and is disabled to effect the fuel cutoff upon the dispensing of the predetermined dollar value of fuel. The integration of the apparatus according to the present invention, into two module assemblies, lends itself to the inclusion of a spark suppressing fluid, so as to provide a safety feature which has heretofore not been shown in the fuel pump control art. A remote control feature is provided in that the length of electrical connectors **100–108** may be chosen so as to permit the first module assembly to be installed in an outdoor pump while the second module assembly is operatively installed inside a sheltered space.

Scope of the Invention

While what has been shown is a preferred embodiment of the present invention, it is of course understood that various modifications and changes may be made therein without departing from the true spirit and scope of the invention. For example, the control may be adapted for measuring out a desired value of any fluid or fungible material from any pump having a pump cutoff and a totalizer including a moving surface for indicating dispensed value of material. For the purposes of the invention, the term value includes both quantity and dollar cost total of dispensed fluent material.

Therefore, it is intended to cover in the following claims all such modifications and changes as may fall within the true spirit and scope of the present invention.

I claim:

1. Apparatus for actuating a pump cutoff mechanism independently of the operation of a pump and in response to an indication of a pre-selected value of dispensed fluent material displayed on a totalizer having a moving surface for indicating said value:

a. A first module assembly including a resettable rotary switch means having a plurality of fixed contacts and including a wiper contact disposable in direct mechanical drive relationship with said moving surface of said totalizer;

b. A second module assembly including a plurality of normally open selector switches;

c. Said first and said second module assemblies being electrically connected to form a normally open electrical circuit adapted for connection with a source of electrical power; and

d. Electro-magnetic means connected in said electrical circuit and operable to actuate said pump cutoff mechanism in response to the closing of said circuit when said circuit is connected with a source of electrical power and said totalizer indicates a value corresponding with a value associated with a closed one of said selector switches.

2. An apparatus according to claim **1**, wherein said first and said second assemblies are connected in series with said electro-mechanical means and with said circuit.

3. An apparatus according to claim **1**, wherein said electro-mechanical means is further operable to actuate a selector switch reset mechanism for reopening said circuit in response to the closing thereof.

4. An apparatus according to claim **1**, wherein said first module assembly comprises an electrically conductive shaft journaled for rotation within an electrically insulated support means;

a. torque transmission means being mounted on said shaft for rotation therewith; and

b. said shaft being connected with the source of electrical power at a first end thereof and presenting said wiper contact at a second end thereof.

5. An apparatus according to claim **1**, wherein said rotary switch means is disposed within a casing consisting of an electrically insulating material;

a. said casing being formed with a chamber completely enclosing said rotary switch means;

b. a spark suppressing fluid being retained in said chamber and completely surrounding all electrical contact engaging surfaces of said rotary switch means.

6. An apparatus according to claim **1**, wherein said second module assembly comprises a first elongated conductor formed with resilient contact fingers extending transversely therefrom;

a. fixed button contact members being supported in switching relationship with said contact fingers;

b. pushbutton means operable to resiliently urge one of said contact fingers into engagement with one of said second fixed button contact members; and

c. the engagement of one of said fingers with one of said electrical button contact members being operable to electrically close a circuit from said rotary switch means to the source of electrical power.

7. An apparatus according to claim 4, wherein said wiper contact resiliently urges against said support means to spring bias said first end of said shaft into a journal means supporting said first end of said shaft.

8. In an apparatus according to claim 6, wherein said pushbutton means comprises discrete camming means operable to urge against any of said resilient fingers of said first conductor member in response to the depression of said camming means into a supporting keyboard;

a. said discrete camming means being formed with detent means;

b. latching means being pivotally urged into said detent means formed on said camming means to hold said camming means forcibly against any of said resilient fingers of said first conductor to latch one of said selector switches in a closed condition;

c. said latching means being removable from within said detent means of said camming means by said electro-magnetic means; and

d. said camming means being spring biased into a resilient finger contact non-engaging position.

9. In an apparatus according to claim 8, wherein said camming means is formed with a downwardly extending surface;

a. said latching means comprising an elongated flat bar extending transversely of the normal movement of said camming means;

b. said bar being pivotable about a longitudinal axis;

c. said bar being spring biased into engagement within said detent means upon the depression of said camming means into said keyboard;

d. said electro-magnetic means comprising a solenoid having a plunger connected with said upper surface of said latching bar and operable to pivot said upper surface about said longitudinal axis to a position out of engagement with said detent means; and

e. whereupon said spring bias means is operable to urge said camming means out of engagement with said resilient finger means to open said selector switch.

10. A module assembly of integrated elements for use in a control system for dispensing fuel from any existing automobile service station fuel pump wherein said control system operates in response to an indication of a predetermined desired value of dispensed fuel displayed on a cost-of-fuel totalizer comprising:

a. a casing

b. a plurality of selector switches mounted within said casing

c. said elements of said module assembly cooperating with said control system to form a normally open electrical circuit connected with a source of electrical power; and

d. electro-magnetic means operatively connected with said circuit for automatically opening a closed one of said selector switches in response to the closing of said electrical circuit.

11. An assembly according to claim 10, with the addition of pushbutton means for manually closing one of said plurality of selector switches.

12. An assembly according to claim 11 with the addition of latching means for locking one of said selector switches in a closed condition upon the manual depression of said pushbutton means.

13. An assembly according to claim 12 wherein said pushbutton means is spring biased away from operative engagement with any of said selector switches; and

said electro-magnetic means is operable to release said latching means upon the closing of said electrical circuit.

14. An assembly according to claim 13 with the addition of manual selector switch reset means comprising pushbutton means operable to release said latching means in response to the depression of said last mentioned pushbutton means.

15. An assembly according to claim 13 wherein said casing is of an elongated rhomboidal shape and support said selector switches in a generally straight line arrangement:

said pushbutton means comprising a plurality of discrete camming members;

one of said camming members being slidably supported within said casing adjacent one of each said selector switches;

detent means formed in each of said camming members; and said latching means including an elongated bar pivotable about a longitudinal axis thereof and aligned with respect to said straight line arrangement of selector switches to engage within said detent means of any one of said camming members upon the movement thereof into engagement with an associated selector switch.

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