United States Patent

Bateman et al.

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[54] **ELECTRICAL UNIT FOR FUEL DELIVERY PUMP**

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[52] **U.S. Cl.** .....**340/203,** 235/144 R, 235/94 A, 222/26

[51] **Int. Cl.** **G08c 19/16**

[58] **Field of Search** .....340/203, 271; 235/144 D, 235/92 FL, 92 AC, 94; 335/205; 222/32, 33, 26; 235/151.34

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[57] **ABSTRACT**

A gasoline delivery system with pump and auxiliary registers for registering the volume and cost of each gasoline delivery. An electrical reset mechanism for resetting the pump register and a pulse generator for indexing the auxiliary register are mounted within an explosion-proof housing. Input shafts extending through the housing operate volume and cost pulsers of the pulse generator and the reset mechanism has a drive shaft extending through the housing for simultaneously resetting the volume and cost pulsers and the pump register.

12 Claims, 2 Drawing Figures

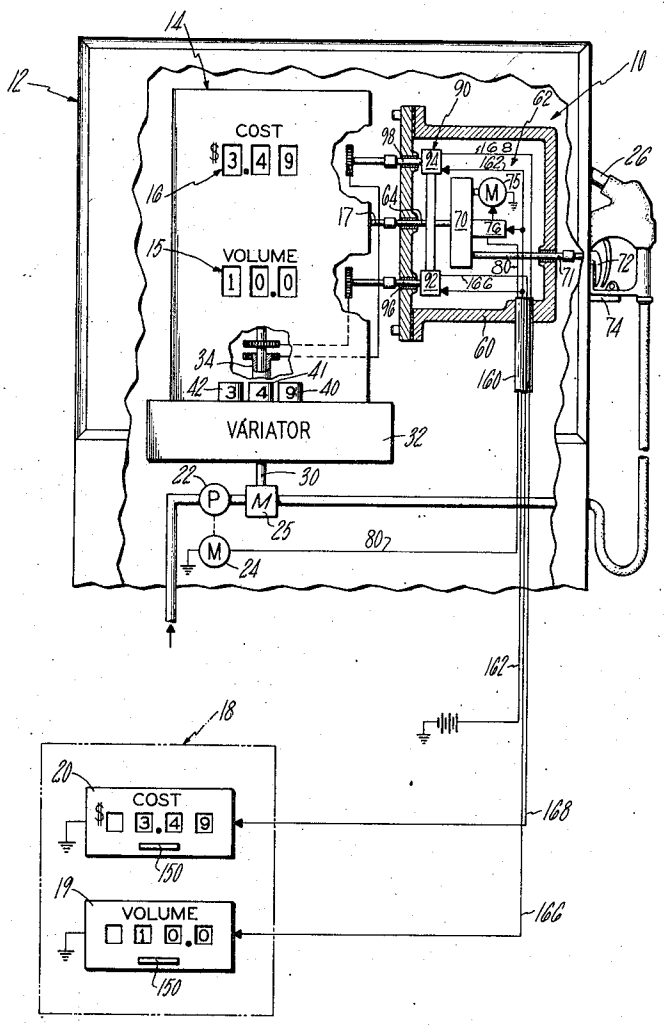
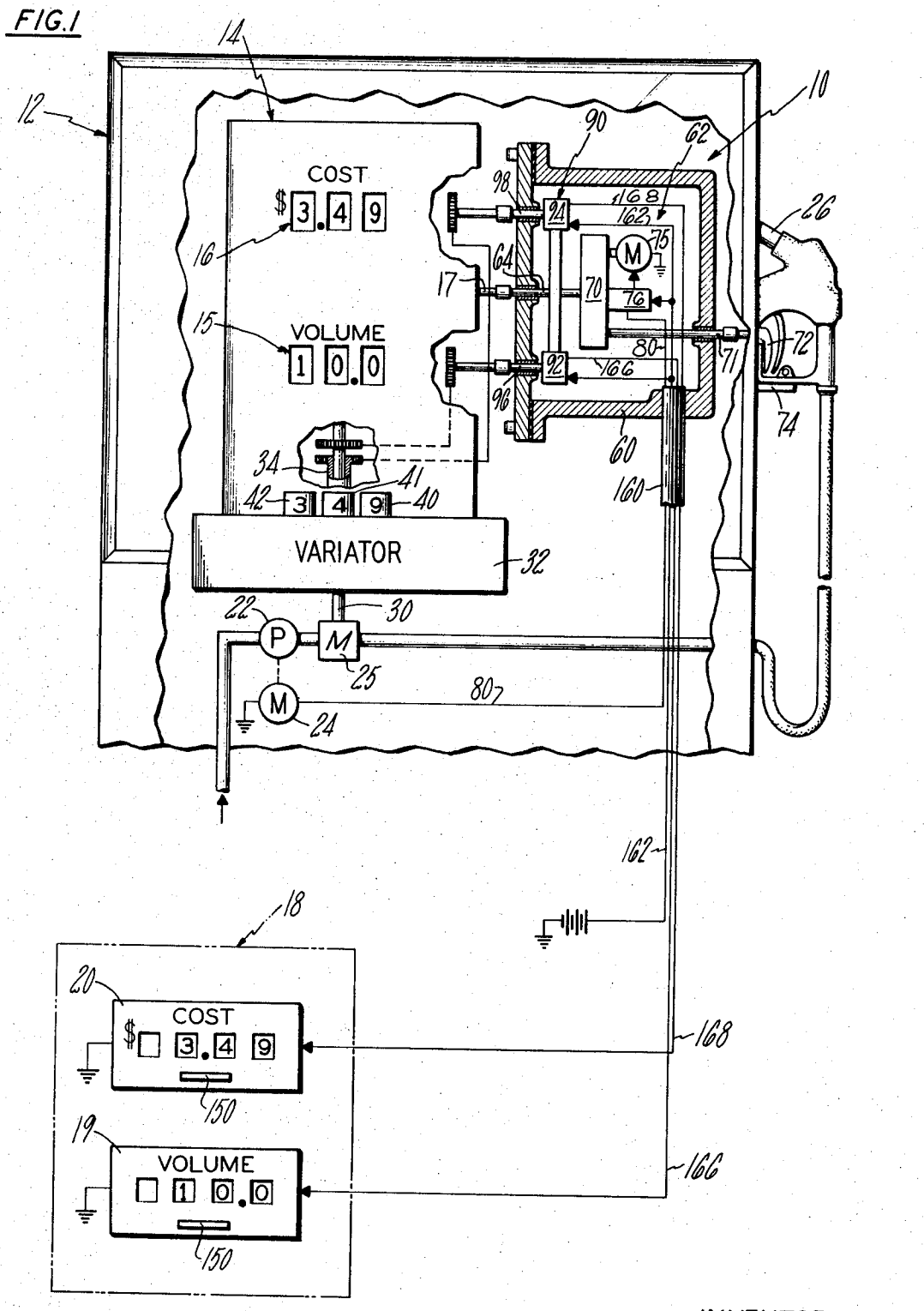


FIG. 1

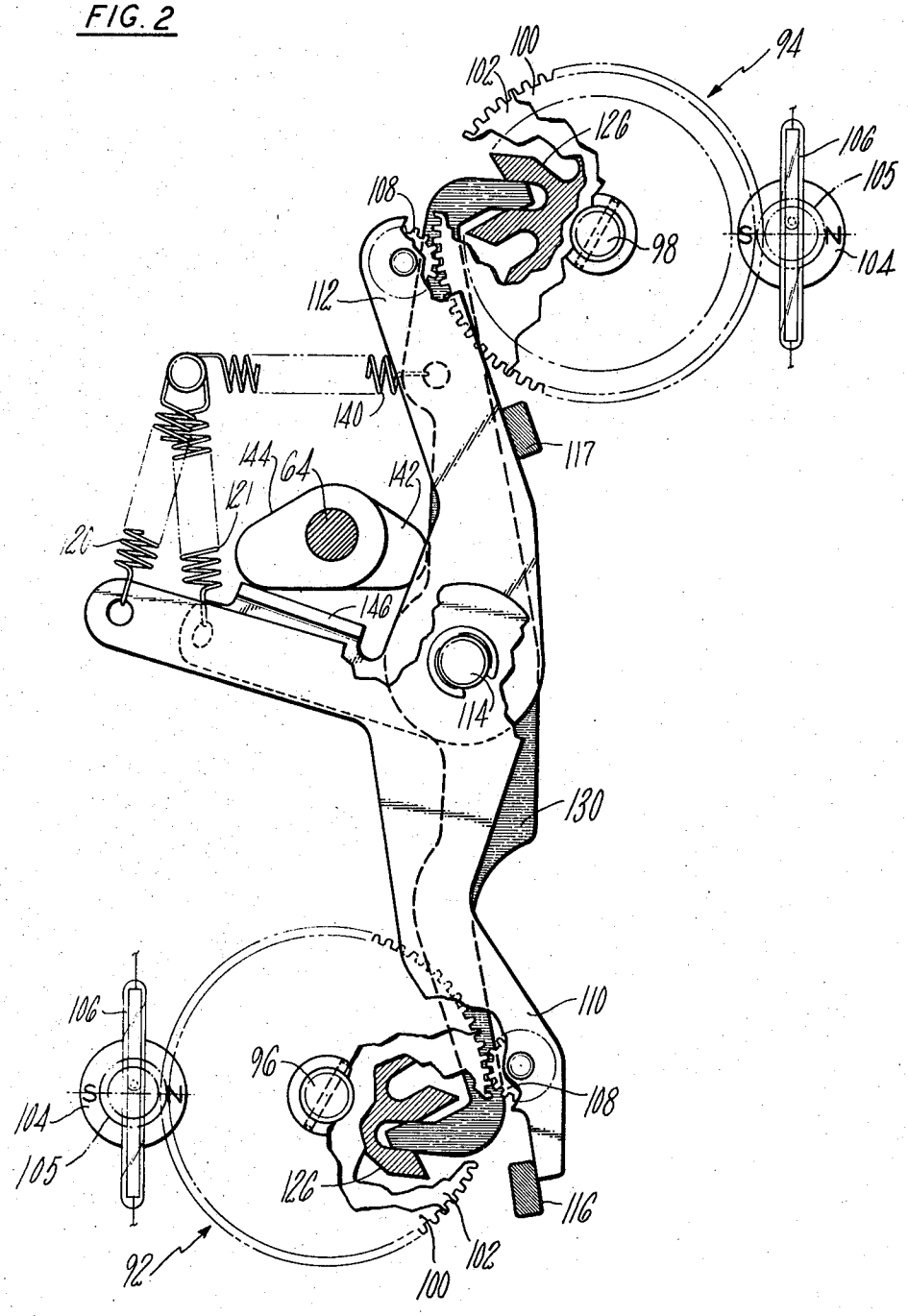


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FIG. 2


94
100
102
126
106
105
108
98
S
N
104
112
140
117
144
64
142
121
120
146
114
130
110
96
108
126
116
102
100
92

ELECTRICAL UNIT FOR FUEL DELIVERY PUMP

BRIEF SUMMARY OF THE INVENTION

The present invention relates generally to fuel delivery pumps and more particularly to a new and improved electrical unit for a fuel delivery pump useful in one embodiment thereof for resetting the mechanical register conventionally employed in such pumps and for generating electrical pulses for indexing an auxiliary register which for example may be located remotely of the mechanical register for self-service accounting or inventory control.

It is a principal aim of the present invention to provide a new and improved electrical unit for a fuel delivery pump which provides an economical and compact explosion-proof assembly of the electrical switching components of the pump.

It is another aim of the present invention to provide a new and improved electrical unit for a fuel delivery pump for simplifying the explosion-proofing of the electrical components of the pump.

It is a further aim of the present invention to provide a new and improved electrical unit for a fuel delivery pump adapted for resetting the mechanical register conventionally employed in such pumps and for generating volume and/or cost pulse trains for operating an auxiliary register located for example remotely of the fuel delivery pump.

It is another aim of the present invention to provide a new and improved pulse generator for a gasoline dispensing system operable for generating volume and/or cost pulse trains for registering the volume and/or cost of each fuel delivery and resettable between fuel deliveries.

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

A better understanding of the invention will be obtained from the following detailed description and the accompanying drawings of an illustrative application of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a generally schematic representation, partly broken away, of a gasoline dispensing system incorporating an embodiment of the electrical unit of the present invention; and

FIG. 2 is an enlarged elevation view, partly broken away and partly in section, showing a resettable pulse generator of the electrical unit.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings in detail wherein like numerals represent like parts, a gasoline dispensing system incorporating an embodiment of an electrical unit **10** of the present invention is shown comprising a gasoline delivery pump **12** having a conventional resettable mechanical register **14** (for example of the type disclosed in U.S. Pat. No. 3,216,659 of Edward C. Ambler et al. dated Nov. 9, 1965 and entitled "Resetting Control Mechanism For Counting Device") with a three wheel volume counter **15** for registering the volume amount of fuel delivered (e.g., to the nearest 1/10th gallon) and a three wheel cost counter **16** for registering the cost amount of fuel delivered (e.g., to the nearest cent) and a reset shaft **17** adapted to be rotated one revolution for resetting the volume and cost counters **15, 16** to zero between fuel deliveries. An auxiliary register **18** having pulse operated electromagnetic volume and cost counters **19, 20** respectively (for example of the type shown and described in U.S. Pat. No. 3,588,476 of Lloyd J. LaPointe dated June 28, 1971 and entitled RESETTABLE ELECTROMAGNETIC COUNTER) provides for similarly registering the volume and cost amounts of fuel delivered, for example, at a remote location for use in self-service accounting and/or inventory control.

The gasoline delivery pump **12** comprises in a conventional manner a pump **22** driven by an electric motor **24** for delivering gasoline from a suitable source and via a fluid meter **25** to a dispensing nozzle **26**. The output or volume shaft **30** of the meter **25** is connected for driving a suitable variator **32** (for example, a variator of the type disclosed and described in U.S. Pat. No. 3,413,867 of Richard B. Hamlin dated Dec. 3, 1968 and entitled "Variator") and for driving the volume counter **15** for registering the volume amount of gasoline dispensed. A cost output sleeve **34** of the variator **32** is connected for driving the cost counter **16** for registering the cost amount of gasoline dispensed in accordance with the volume amount dispensed and a unit volume price within a three place price range established by the variator setting, and the variator **32** has price wheels **40–42** for posting the unit volume price established by the variator setting.

The electrical unit **10** comprises an explosion-proof housing **60** and a sequencing mechanism **62** (which housing **60** and sequencing mechanism **62**, for example, may be of the type shown and described in the aforementioned U.S. Pat. No. 3,216,659). The sequencing mechanism **62** is mounted within the housing **60** and has a drive shaft **64** extending through the housing and suitably coupled to the register reset shaft **17** for resetting the volume and cost counters **15, 16**. A control mechanism **70** of the sequencing mechanism has a control shaft **71** extending through the housing **60** (parallel to and in the opposite direction of the drive shaft **64** as seen in FIG. **1**) to be coupled to an operating handle **72**. In a conventional manner the operating handle **72** has to be turned to its vertical or "Off" position shown in FIG. **1** to replace the nozzle **26** in its storage receptacle **74** and the nozzle **26** has to be removed from the storage receptacle to permit turning the operating handle **72** to its horizontal or "On" position. The control mechanism **70** is designed (for example as described in the aforementioned U.S. Pat. No. 3,216,659) such that when the operating handle **72** is turned to its "On" position the control mechanism **70** is operated to energize an electric reset motor **75** with a suitable switch mechanism **76** and connect the motor **75** for rotating the drive shaft **64** one revolution for resetting the register **14**. Upon completion of the reset cycle the switch mechanism **76** is actuated by the control mechanism **70** to turn off the reset motor **75** and turn on the pump motor **24** (via lead **80**) and thereby condition the pump **12** for delivering gasoline. Upon turning the operating handle **72** to its vertical or "Off" position, the control mechanism **70** is operated to actuate the switch mechanism **76** to turn off the pump motor **24** and thereby deactivate the pump **12**.

A pulse generator 90 mounted within the explosion-proof housing 60 comprises a pair of rotary substantially identical volume and cost pulsers 92, 94 respectively, and volume and cost drive shafts 96, 98 extend through the housing 60 (parallel to and on opposite sides of the drive shaft 64 as seen in FIG. 1) for driving the rotary pulsers 92, 94 respectively. The pulser drive shafts 96, 98 are respectively connected to be rotated by the meter output shaft 30 and the variator output sleeve 34, for example so that the volume drive shaft 96 is rotated one revolution for each gallon of gasoline delivered and the cost drive shaft 98 is rotated one revolution for each ten cents of gasoline delivered.

Referring to FIG. 2, each rotary pulser 92, 94 comprises a drive gear 100 fixed to the respective drive shaft 96, 98, a driven gear 102 substantially identical to the drive gear 100 rotatably mounted on the drive shaft, and a rotary magnet 104 having a gear 105 in mesh with the driven gear 102. A magnetically operable reed switch 106 overlying the rotary magnet 104 is momentarily closed to generate an electrical pulse as the magnetic axis of the rotary magnet 104 passes through alignment with the longitudinal axis of reed switch 106. An idler gear 108 is mounted for engagement with the gears 100,102 for connecting the rotary magnet 104 for being operated by the respective drive shaft 96, 98, and the gears 102, 105 provide a 1:5 gear ratio for rotating the rotary magnet 104 five revolutions for each revolution of the drive shaft and for thereby operating the reed switch 106 for generating 10 pulses for each revolution of the drive shaft.

The idler gears 108 are mounted on separate levers 110, 112 respectively which are pivotally mounted on a center stud 114 and biased by tension springs 120, 121 into engagement with stops 116, 117 respectively to position the idler gears 108 in mesh with the respective gears 100, 102.

A ten-tooth reset cam 126 is fixed to each driven gear 102 and a reset lever 130 is pivotally mounted on the center stud 114 for engaging the cam teeth of the reset cams 126 for resetting the rotary magnets 104. The reset lever 130 and reset cams 126 are therefore designed to reset each rotary magnet 104 to the nearest 180° "reset" position. For example, each rotary magnet may be reset to the nearest 180° "reset" position where the magnetic axis of the rotary magnet 104 is approximately perpendicular to the longitudinal axis of the reed switch 106, such that the reed switch 106 will be "open" when the rotary magnet 104 is at its "reset" position and the rotary magnet 104, upon being rotated approximately 90°, will operate the reed switch 106 to generate an electrical pulse. Also, each reed switch 106 is preferably adjustably mounted for accurately adjusting the pulse timing so that the initial and successive pulses occur as desired, for example exactly halfway between full counts (e.g., halfway between 1/10th gallon counts of the volume counter 15 and halfway between 1 cent counts of the cost counter 16).

A tension spring 140 is provided for normally holding the reset lever 130 in its retracted position, and a pair of cams 142, 144 are mounted on the drive shaft 64 for respectively pivoting the reset lever 130 against the bias of its return spring 140 for resetting the rotary magnets 104, and pivoting the idler gear support levers 110, 112 against the bias of their return springs 120, 121 for disengaging the rotary magnets 104 for being reset. More particularly, the cam 144 engages a flange 146 of the lever 112 to pivot that lever against the bias of the spring 121 and the flange 146 in turn engages the lever 110 to pivot it against the bias of its return spring 120. The cams 142, 144 are contoured for sequentially (a) pivoting the levers 110, 112 outwardly for disengaging the rotary magnets 104, (b) pivoting the reset lever 130 inwardly for resetting the rotary magnets 104, (c) returning the levers 110, 112 for re-engaging the rotary magnets while the reset lever 130 holds the rotary magnets against rotation (as shown in FIG. 2), and (d) withdrawing the reset lever 130. The cams 142, 144 are also angularly positioned on the reset drive shaft 64 such that as the drive shaft 64 is rotated one revolution for resetting the mechanical register 14, the rotary pulsers 92, 94 are also fully reset for the succeeding delivery of fuel.

The remote volume and cost counters 19, 20 are operated by the volume and cost pulsers 92, 94 so that the volume and cost readouts of the counters 19, 20 accurately correspond (e.g., within ½ count) to the readouts of the volume and cost counters 15, 16. The remote volume and cost counters may be used in any desired way, for example, in inventory control for maintaining a record of the total volume and cost amount of fuel delivered during any given period or in postpay self-service accounting for ascertaining the amount to charge a customer. The remote volume and cost counters are preferably resettable and, for example, provided with a suitable reset button 150 for resetting them after each delivery.

A suitable electrical conduit 160 is provided for conducting the electrical leads through the explosion-proof housing 60. In the shown embodiment the electrical leads include a power supply lead 162 for supplying electrical power from a suitable source to the switch mechanism 76 and rotary pulsers 90, 92; the pump motor lead 80; and pulser output leads 166, 168 for connecting the pulsers 90, 92 for operating the remote volume and cost counters 19, 20. The conduit 160 is suitably constructed to meet the explosion-proof requirements and is mounted to extend through the housing 60 so as to prevent flame propagation through the conduit opening. Likewise the shafts 64, 71, 96, 98 are also suitably rotatably mounted in the housing to prevent flame propagation through the shaft openings.

As will be apparent to persons skilled in the art, various modifications, adaptations and variations of the foregoing specific disclosure can be made without departing from the teachings of the present invention.

We claim:

1. For use in fuel delivery apparatus having electrically operated means operable for conditioning the apparatus for dispensing fluid, a first resettable register for registering the amount of fluid dispensed having a reset shaft rotatable for resetting the register between fluid deliveries, and a second register operable by electrical pulses for registering the amount of fluid dispensed; an electrical control unit comprising an explosion-proof housing; a rotatable drive shaft extending through the housing for connection to the reset shaft for resetting said first register, an electrical reset mechanism mounted within the housing having an electrical reset motor for rotating the drive shaft and switch means for operating the reset motor and said electri-

cally operated means; a rotatable control shaft extending through the housing for operating the switch means; an electrical rotary pulse generator mounted within said housing; at least one rotatable pulse generator operating shaft parallel to the drive shaft extending through the housing and connected for operating the pulse generator for generating an electrical pulse for each predetermined incremental amount of fuel delivered; and electrical lead means extending through the explosion-proof housing for connecting the pulse generator for operating the second register, for supplying power to the reset motor and for connecting said switch means to said electrically operated means.

2. An electrical control unit according to claim 1 wherein the electrical lead means is provided by a single electrical conduit extending through the explosion-proof housing.

3. An electrical control unit according to claim 1 wherein the second auxiliary register is operable by electrical pulses for separately registering the volume and cost amounts of fuel dispensed and wherein the electrical pulse generator comprises a first rotary pulser connected to be rotated by said one operating shaft for generating an electrical pulse for each predetermined incremental volume amount of fuel delivered and a second rotary pulser, wherein the control unit comprises a second rotatable operating shaft extending through the housing parallel to the drive shaft and connected for operating the second pulser for generating an electrical pulse for each predetermined incremental cost amount of fuel delivered, and wherein the lead means provides for connecting the first and second pulsers to the auxiliary second register for separately registering the volume and cost amounts of fuel delivered.

4. A control unit for fuel dispensing apparatus comprising an explosion-proof housing; a rotatable output drive shaft, a rotatable control shaft and at least one rotatable input drive shaft extending through the housing with their axes extending generally parallel; a drive mechanism mounted within said housing comprising an electrical drive motor for rotating the output drive shaft and switch means connected to be operated by the control shaft for energizing the drive motor, a rotary pulse generator mounted within said housing operable by said input drive shaft for generating pulses in accordance with the amount of fluid delivered by the fuel dispensing apparatus, and conduit means extending through the explosion-proof housing for providing electrical connections to said switch means and the pulse generator.

5. A control unit for fuel dispensing apparatus according to claim 4 comprising two of said rotatable input drive shafts and wherein the pulse generator comprises rotary volume and cost pulsers operable by said two input drive shafts respectively for generating separate pulse trains in accordance with the volume and cost amounts respectively of fuel delivered by the fuel dispensing apparatus.

6. For use in fuel delivery apparatus having electrically operated means operable for conditioning the apparatus for dispensing fluid, a first resettable register for registering the amount of fluid dispensed having a reset shaft rotatable for resetting the register between fluid deliveries, and a second register operable by electrical pulses for registering the amount of fluid dispensed; an electrical control unit comprising an explosion-proof housing; a rotatable drive shaft extending through the housing for connection to the reset shaft for resetting said first register, an electrical reset mechanism mounted within the housing having an electrical reset motor for rotating the drive shaft and switch means for operating the reset motor and said electrically operated means; a control shaft extending through the housing for operating the switch means; an electrical pulse generator mounted within said housing; at least one pulse generator operating shaft extending through the housing for operating the pulse generator for generating an electrical pulse for each predetermined incremental amount of fuel delivered; and electrical lead means extending through the explosion-proof housing for connecting the pulse generator for operating the second auxiliary register, for supplying power to the reset motor and for connecting said switch means to said electrically operated means, the pulse generator comprising a rotary pulser operable by said one operating shaft for generating an electrical pulse for each predetermined incremental amount of fuel delivered, and pulser resetting means operable by the drive shaft for angularly resetting the rotary pulser when the drive shaft is rotated for resetting said first register.

7. An electrical control unit according to claim 6 wherein the pulser resetting means comprises a disengageable clutch interconnecting said one operating shaft and the rotary pulser comprising a pair of coaxial gears, a pivotal lever, an idler gear mounted on the lever for selective engagement with coaxial gears, and a cam on said drive shaft engageable with the lever for selectively withdrawing the idler gear from engagement with the coaxial gears.

8. An electrical control unit according to claim 6 wherein the rotary pulser comprises a pulser switch and a rotary switch actuator operable to actuate the pulser switch a plurality of times for generating a corresponding plurality of pulses for each revolution of the rotary switch actuator, and wherein the pulser resetting means provides for angularly resetting the rotary actuator to its nearest reset position without additional actuation of the pulser switch.

9. An electrical control unit according to claim 8 wherein the pulser resetting means comprises a multitooth reset cam connected for rotation with the rotary switch actuator, a reset lever pivotally mounted for engagement with the reset cam for resetting the rotary actuator, and a reset cam on said drive shaft engageable with the reset lever for pivoting the reset lever into engagement with the reset cam when the drive shaft is rotated for resetting said first register.

10. A control unit for fuel dispensing apparatus comprising an explosion-proof housing; an output drive shaft, a control shaft and at least one input drive shaft extending through the housing; a drive mechanism mounted within said housing comprising an electrical drive motor for rotating the output drive shaft and switch means operable by the control shaft for energizing the drive motor, a pulse generator mounted within said housing operable by said input drive shaft for generating pulses in accordance with the amount of fluid delivered by the fuel dispensing apparatus, and

conduit means extending through the explosion-proof housing for providing connections to said switch means and the pulse generator, the pulse generator comprising a resettable pulser operable by said one input drive shaft for generating said pulses and a pulser reset mechanism operable by said output drive shaft for resetting the pulser.

11. A control unit for fuel dispensing apparatus according to claim 10 wherein the pulser comprises a rotary pulse actuator rotatable by said one input drive shaft and wherein the pulser reset mechanism is operable for angularly resetting the rotary pulse actuator.

12. A control unit for fuel dispensing apparatus according to claim 11 wherein the pulser comprises a pulser switch operable by the rotary pulse actuator to generate a plurality of pulses for each revolution of said one input drive shaft, and wherein the pulser reset mechanism is operable to angularly reset the rotary pulse actuator to its nearest reset position without additional operation of the pulser switch.

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