Dec. 16, 1969 J. H. BICKFORD ET AL 3,484,021

FLUID DISPENSING APPARATUS WITH COST AND VOLUME REGISTERS

Filed Dec. 15, 1967 6 Sheets-Sheet 1

FIG. 1

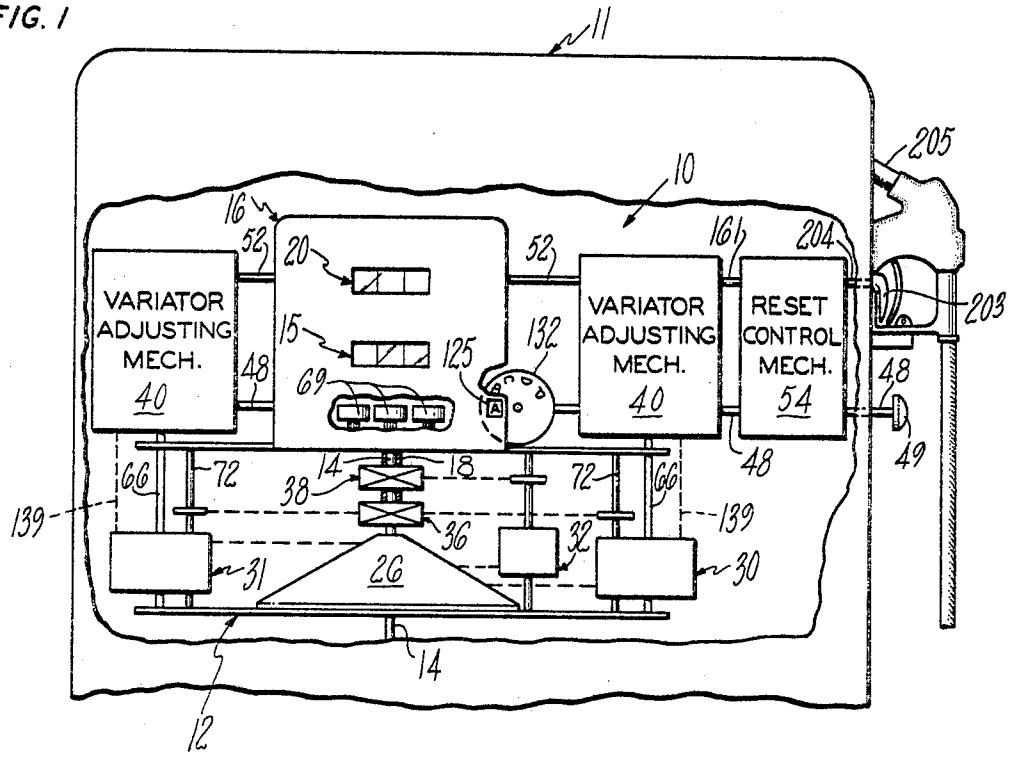


FIG. 9

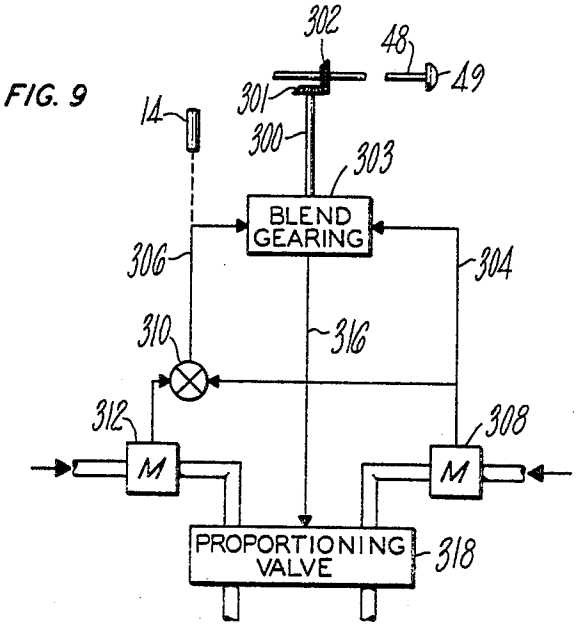
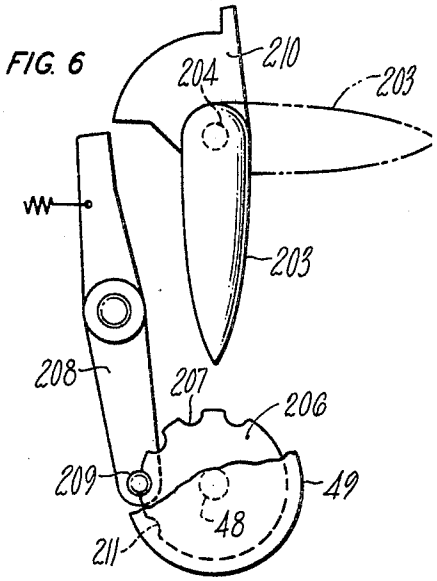


FIG. 6



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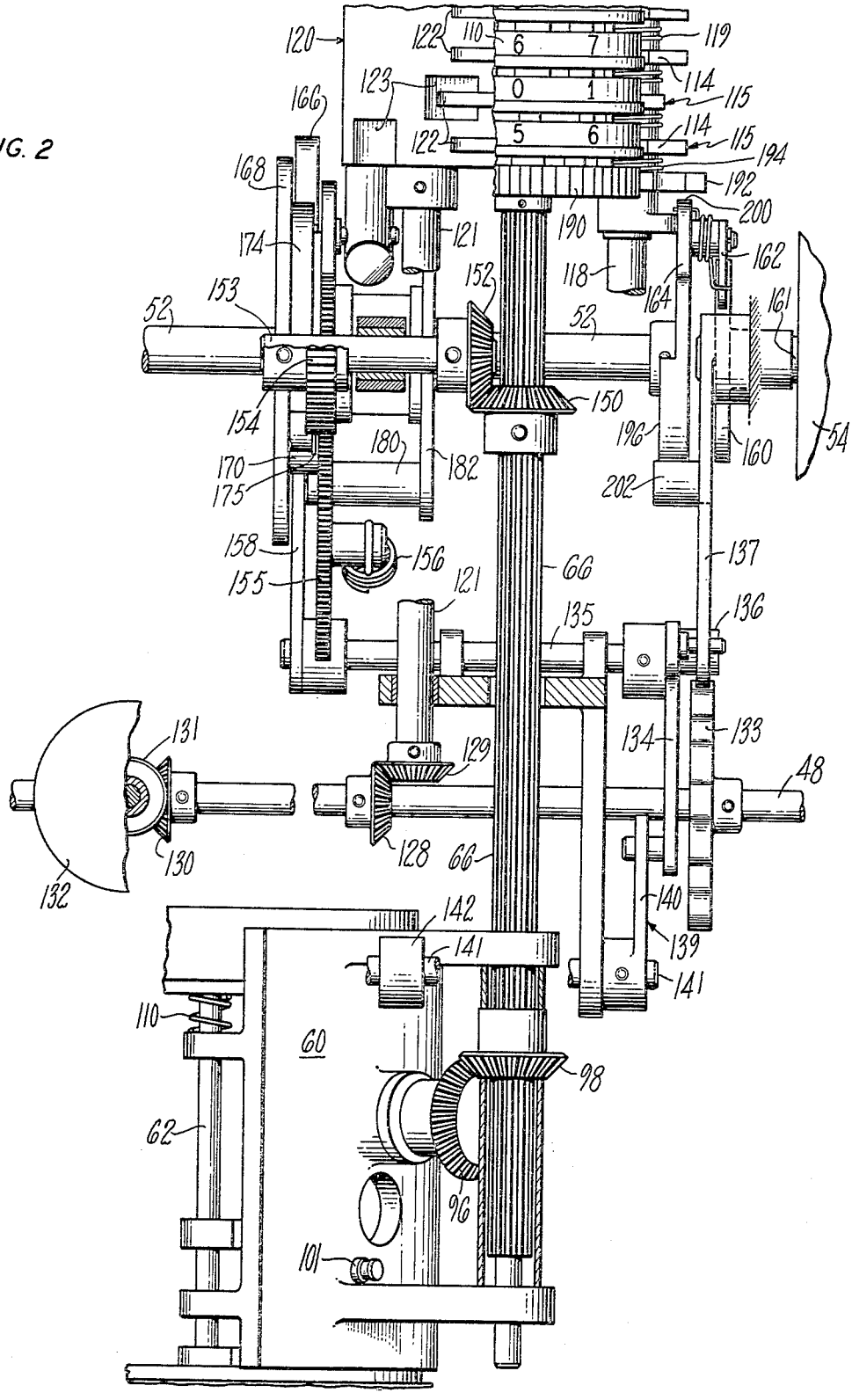
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FLUID DISPENSING APPARATUS WITH COST AND VOLUME REGISTERS

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FIG. 2



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FLUID DISPENSING APPARATUS WITH COST AND VOLUME REGISTERS

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FIG. 3

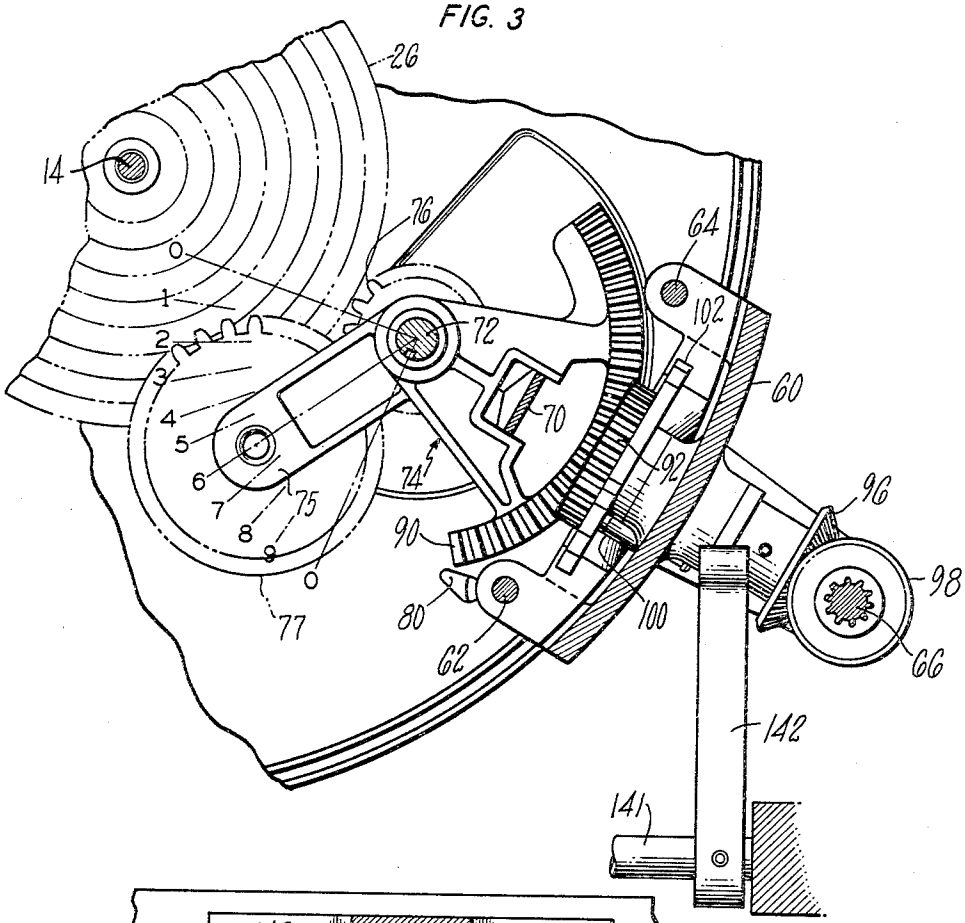
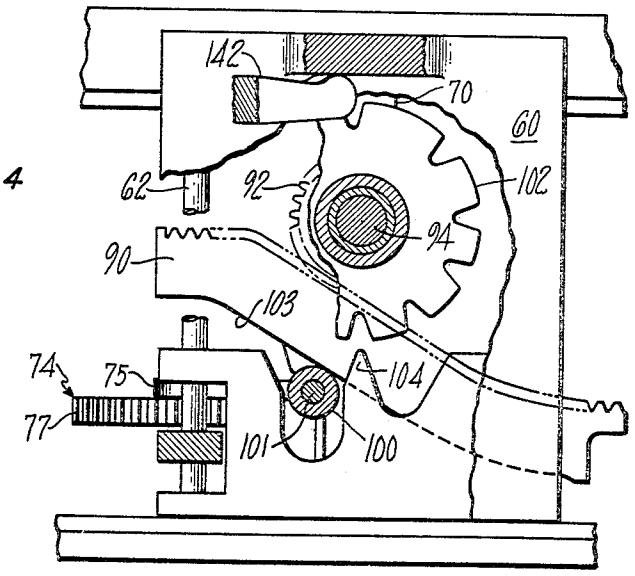


FIG. 4

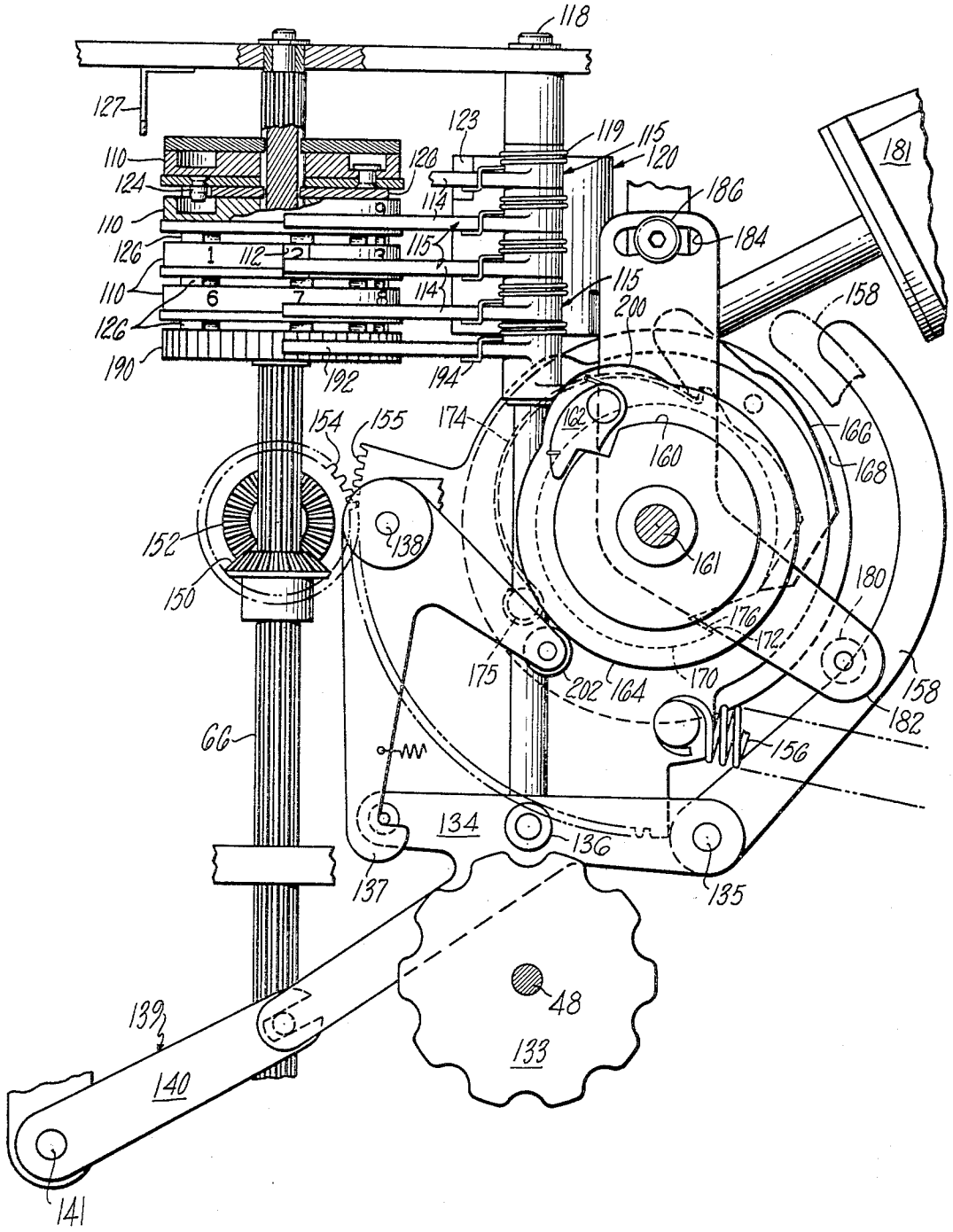


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FLUID DISPENSING APPARATUS WITH COST AND VOLUME REGISTERS

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FIG. 5



FLUID DISPENSING APPARATUS WITH COST AND VOLUME REGISTERS

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FIG. 7

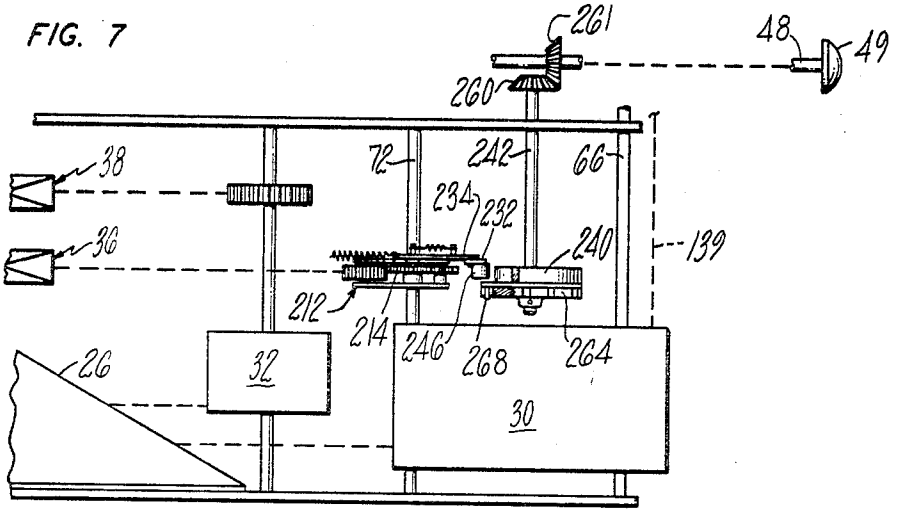
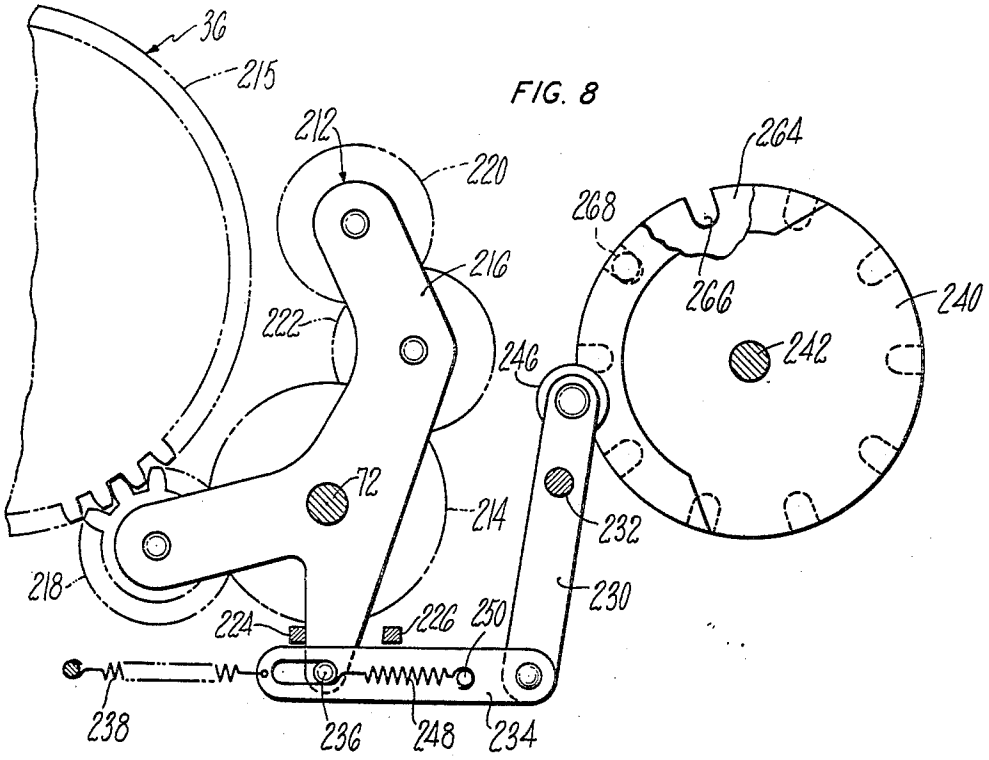


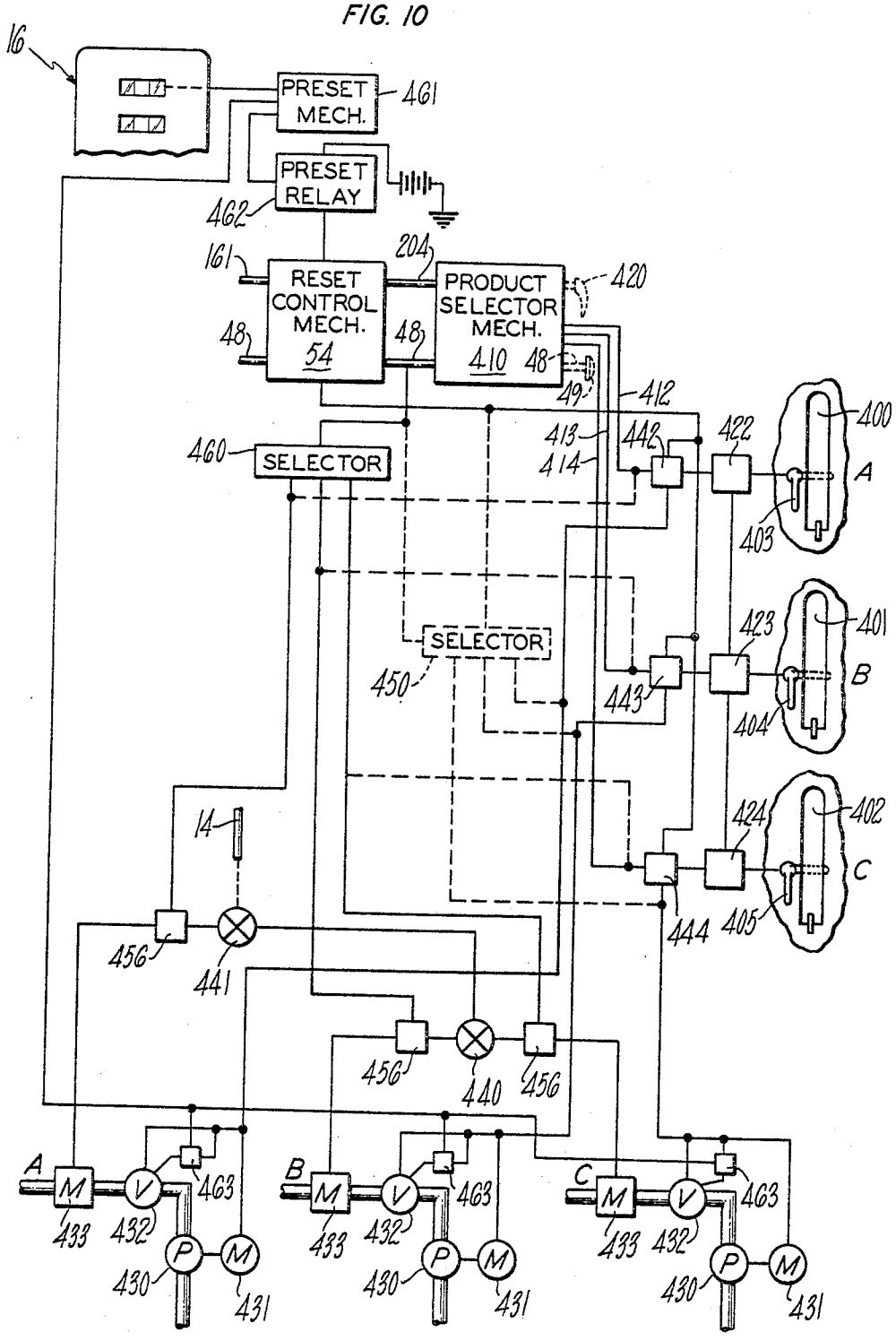
FIG. 8



FLUID DISPENSING APPARATUS WITH COST AND VOLUME REGISTERS

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FIG. 10



United States Patent Office 3,484,021 Patented Dec. 16, 1969

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FLUID DISPENSING APPARATUS WITH COST AND VOLUME REGISTERS

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Filed Dec. 15, 1967, Ser. No. 690,902
Int. Cl. B67d 5/22; F16h 3/22
U.S. Cl. 222—26 46 Claims

ABSTRACT OF THE DISCLOSURE

Fuel dispensing apparatus having a register for registering the cost and volume of fuel dispensed, and a variator for setting the unit volume price with two quick-change range arms and corresponding range arm setting mechanisms controllable by a selector knob and operable to set the range arms when the register is reset. The quick change range arms are adapted to be selectively set into engagement with the steps of a variator input cone gear and with a fixed detent by a specially contoured generally helically extending rack and a pinion driven by a vertically extending range arm setting shaft. A plurality of "price" cams angularly adjustable on the range arm setting shaft cooperate with corresponding selectively operable pawls to set the angular position of the range arm setting shaft, and the selector knob through a selector cam provides for selectively activating the "price" cams by withdrawing the pawls from the remaining "price" cams. During the reset cycle of the register the register reset shaft operates to rotate the range arm setting shaft in one angular direction to load a range arm setting spring which is subsequently tripped to rotate the range arm setting shaft in the opposite angular direction to set the range arm in accordance with the angular position of the active "price" cam.

A modified variator is shown in FIGS. 7 and 8 in which the quick change range arm output shaft is adapted to be selectively added to or subtracted from the outputs of the remaining two range arms of the variator. A ± range arm is mounted on the range arm output shaft to selectively rotate a variator summing differential input gear in opposite angular directions. The ± range arm is controlled by a cam which is set with the selector knob and which is adapted to be adjustably mounted to provide for either adding or subtracting the range arm output at each position of the selector knob.

The computing apparatus may be employed in a blending fuel dispensing system as shown in FIG. 9 wherein the selector knob is employed to select the blend ratio in conjunction with the selection of each of the "price" cams; or may be employed in a nonblending multiple product fuel dispensing system as shown in FIG. 10. In the nonblending system three separate fuel delivery systems and corresponding control handles are provided for dispensing three separate products, and the control handles are connected to a product selector mechanism to position a "price" selector shaft and for automatically operating a register reset control mechanism after the selector shaft is positioned. Interlocks are provided to permit operating the product selector mechanism with one of the control handles and a switching arrangement is employed for selectively energizing the pump motor and shut-off valve of each of the three separate fuel delivery systems.

BRIEF SUMMARY OF THE INVENTION

The present invention relates to fluid dispensing apparatus and to variators having primary utility in fluid dispensing apparatus for varying the price per unit volume of the fluid dispensed.

It is a principal aim of the present invention to provide a new and improved variator of the type conventionally employed in fuel dispensing apparatus for varying the price per unit volume of fuel dispensed and which may be readily reset to readjust the unit volume price.

It is another aim of the present invention to provide a new and improved variator of the type conventionally employing an input cone gear and one or more range arms adapted to be selectively set into engagemernt with the steps of the cone gear for setting the drive ratio of the variator and in which one or more of the range arms may be quickly reset to adjust the drive ratio.

It is a further aim of the present invention to provide a new and improved range arm adjusting mechanism which may be programmed for selectively setting a range arm in any one of a plurality of predetermined positions.

It is a still further aim of the present invention to provide a new and improved quick change variator wherein its drive ratio may be manually selected and thereafter readily set in accordance with the manual selection. When used in a fuel dispensing apparatus the variator is preferably automatically set in accordance with the manual selection during a subsequent reset cycle of the register conventionally employed in fuel dispensing apparatus for registering the cost and volume of the fuel dispensed. The register is conventionally reset just before each fuel delivery and accordingly after the operator has an opportunity to select the variator drive ratio and thus the corresponding price per unit volume to be charged, as for example in conjunction with the selection of a product blend in a multiple blend fuel dispensing system.

It is a still further aim of the present invention to provide a new and improved variator adapted for selecting a unit volume price through an extended range. Prices within the extended price range may be pre-established in accordance with the present invention and the pre-established prices may then be selected as for example in conjunction with the selection of product blends in a product-blending fuel dispensing system.

It is another aim of the present invention to provide a new and improved variator for fluid dispensing apparatus which provides for an extended range of price adjustment by the adjustment of one of the range arms.

It is a still further aim of the present invention to provide a new and improved variator of the type having an input cone gear and two or more range arms for varying the drive ratio of the variator and in which the output of at least one of the range arms may be selectively added to or subtracted from the summation of the outputs of the remaining range arms.

It is another aim of the present invention to provide a new and improved fluid dispensing system for independently dispensing each one of two or more nonblended products and having a single register for registering the cost of each of the products dispensed and a variator associated with the register adapted to be appropriately set prior to each delivery for setting the pre-established price of the product to be delivered.

It is a further aim of the present invention to provide a new and improved multiple product nonblending fluid dispensing system which employs two or more separate product delivery systems and controls for independently activating each of the delivery systems one at a time. The fluid delivery systems may in accordance with the present invention employ separate dispensing nozzles and separate control handles for activating the corresponding delivery systems, or alternatively all of the products may be dispensed from a single nozzle as for example through a plurality of concentric hoses, one for each product, leading to the nozzle.

It is a still further aim of the present invention to provide a new and improved multiple product nonblending fluid dispensing system having a plurality of separate fluid delivery systems and a single computing device for computing and registering the cost and/or volume of the fluid delivered.

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

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

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

FIG. 1 is a partial diagrammatic view partly broken away and partly in section of a fuel delivery pump employing a computing device incorporating the present invention;

FIG. 2 is an enlarged elevation view partly broken away and partly in section showing a variator range arm adjusting mechanism of the computing device of FIG. 1;

FIG. 3 is an enlarged plan section view partly broken away and partly in section showing a range arm mechanism of the computing device of FIG. 1;

FIG. 4 is an enlarged side elevation view partly broken away and partly in section of the range arm mechanism and showing a development of a helical rack of the range arm mechanism;

FIG. 5 is an enlarged side elevation view partly broken away and partly in section of the variator range arm adjusting mechanism;

FIG. 6 is an enlarged elevation view partly broken away showing a selector knob and operating handle of the computing device and an interlock arrangement therebetween;

FIG. 7 is an enlarged elevation view partly broken away and partly in section showing a modified variator in accordance with the present invention;

FIG. 8 is an enlarged partial plan section view partly broken away and partly in section of the variator of FIG. 7;

FIG. 9 is a schematic representation partly broken away of a portion of a blending fluid dispensing system incorporating the fuel delivery pump of FIG. 1; and

FIG. 10 is a partial schematic representation partly broken away of a nonblending multiple product dispensing system incorporating the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to he drawings in detail, a computing apparatus **10** incorporating the present invention is shown in FIG. 1 employed in a fuel dispensing pump **11** for registering the cost and volume of the fuel dispensed by the pump. The computing apparatus includes a variator **12** (which is generally of the type described in U.S. patent application Ser. No. 619,408 of Richard B. Hamlin, filed Feb. 28, 1967, and entitled Improved Variator, now U.S. Patent No. 3,413,867) having a rotatable input shaft **14** connected for driving the volume counter **15** of a register **16**, and a rotatable output sleeve **18** connected for

driving the cost counter **20** of the register **16**. An input cone gear **26** of the variator is driven by the shaft **14** and three range arm mechanisms **30**, **31**, **32** are employed in a known manner for selecting the price per unit volume of gasoline dispensed as, for example, as described in the aforementioned U.S. patent application Ser. No. 619,408. Thus, the cone gear **26** may have nine gear steps and the outputs of the range arm mechanisms may be combined in accordance with the ratio of 1:10:100 through a pair of adding differentials **36**, **38** so that the range arm mechanisms **30**, **31**, **32** are adapted for respectively setting the first, second and third decimal places of the desired price per unit volume of gasoline.

In the embodiment shown in FIG. 1 the range arm mechanisms **30**, **31** are designed in accordance with the present invention for being automatically set with corresponding range arm setting mechanisms **40**, and the range arm mechanism **32** is adapted for being manually set in a conventional manner. If desired, however, only one or all three range arm mechanisms could be automatically set in accordance with the present invention. More particularly, and as more fully explained hereinafter, the range arm mechanisms **30**, **31** are adapted to be set in accordance with the angular setting of a selector shaft **48** having a selector knob **49**. And, after the selector shaft **48** is set with the selector knob **49**, the range arm mechanisms **30**, **31** are adapted to be automatically set with a register reset shaft **52** when the reset shaft **52** is rotated by a reset control mechanism **54** for resetting the register **16**. The reset control mechanism **54** may be an electrically powered reset control mechanism, for example, of the type described in U.S. Patent No. 3,216,659 of E. C. Ambler et al. dated Nov. 9, 1965 and entitled "Resetting Control Mechanism for Counting Device"; or may be a manually operated control mechanism, for example, of the type described in U.S. patent application Ser. No. 620,108 of E. C. Ambler et al. dated Mar. 2, 1967 and entitled "Register Reset Mechanism," now U.S. Patent No. 3,383,016.

Referring to FIGS. 2–5, the range arm mechanism **30** or **31** is shown comprising a slide **60** mounted for reciprocable movement parallel to the axis of the cone gear **26** on a splined range arm setting shaft **66** and a pair of support rods **62**, **64**; a range arm **74** pivotally mounted on a range arm output shaft **72** which extends parallel to the axis of the cone gear **26**; and a bail **70** (incompletely shown) pivotally mounted on the shaft **72** with the range arm **74** and having at its upper end a gear sector (not shown) for positioning a corresponding price posting wheel **69** (FIG. 1) as described in the aforementioned U.S. patent application Ser. No. 619,408. The range arm **74** comprises a lever or arm **75** mounted for pivotal and axial movement on the shaft **72**, a sliding gear **76** keyed to and axially slidable on the shaft **72** with the arm **75**, and an idler gear **77** rotatably mounted on the arm **75** in mesh with the sliding gear **76** and adapted to be selectively positioned in engagement with the steps of the cone gear **26** and a fixed detent **80** (FIG. 3) by appropriately angularly and axially positioning the arm **75**.

The arm **75** has an integral specially contoured generally helically extending combination cam and rack **90** which is coaxial with the shaft **72** and which meshes with a pinion **92** fixed to one end of a transverse shaft **94** rotatably mounted on the slide **60**. A bevel gear **96** is fixed to the other end of the shaft **94** in mesh with a bevel gear **98** slidable on the range arm setting shaft **66** so that the shaft **66** is connected to adjust the range arm **74** in accordance with the contour of the rack **90**. And, as a result of the coaction of the pinion **92** with the rack **90** the pinion **92** is adapted to vertically raise and lower the range arm **74** as well as pivot the range arm about the shaft **72**. Also, the gear ratios of the meshing gears **90**, **92** and **96**, **98** are selected such that the range arm **74** may be operated between its upper and

lower operational limits by rotation of the range arm setting shaft **66** through approximately (but preferably slightly less than) 360°.

The combination cam and rack **90** is contoured to provide for angularly and axially adjusting the range arm **74** for selectively positioning the idler gear **77** in engagement with the fixed detent **80** and with each of the steps of the cone gear **26**. As can be seen upon reference to FIG. 3 in which the operative angular positions of the arm **75** are marked by the numerals **0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0** representing the upper angular limit position and the ten angular settings (which includes the lower angular limit position) of the arm **75** respectively, the angular displacement of the arm **75** between its ten settings is uneven (although its axial displacement between settings is substantially constant). The combination cam and rack **90**, however, is specifically contoured to provide for coordinating the angular and axial displacements of the arm **75** for selectively setting the range arm idler gear **77** in engagement with each of the steps of the cone gear **26** and with the detent **80**.

A support roller **100** is mounted on a transverse stub shaft **101** on the slide **60** for engagement with the lower contoured cam edge **103** of the rack **90** for supporting the range arm **74** and for providing appropriate intermeshing engagement of the rack **90** and pinion **92**. Also, a detent wheel **102** having suitably angularly spaced peripheral detent slots is fixed on the shaft **94** adjacent the pinion **92** for cooperation with an upstanding fixed detent **104** mounted on the rods **62, 64** for accurately locating and retaining the range arm **74** in its ten settable positions.

For resetting the range arm **74** the slide **60** is initially raised or withdrawn from its lower operating position shown in FIG. 2 to its upper or withdrawn operating position shown in FIG. 4 to disengage the idler gear **77** and the detent wheel **102**. The range arm setting shaft **66** may then be rotated to position the range arm **74** for reengagement with a selected step of the cone gear or with the fixed detent **80** when the slide **60** is subsequently released to be returned to its normal position by a compression spring **110** (FIG. 2) and the force of gravity If when the slide **60** is released the teeth of the idler gear **77** axially abut the fixed detent **80** or the teeth of the selected step of the cone gear **26**, the range arm will subsequently fall in place when the variator input shaft **14** is rotated at the beginning of the succeeding fuel delivery. In addition, the teeth on the idler gear **77** may be axially tapered at their lower end to increase the likelihood of reengagement with the cone gear or detent **80**.

Referring particularly to FIG. 5, a number of preset or programmed range arm settings are adapted to be established with a stack of identical "price" or one-way detent cams **110** (there being four "price" cams **110** shown in the embodiment described) each having a single peripheral slot **112** adapted to receive the end of a corresponding pawl or arm **114** of a lever **115** and thereby lock the shaft **66** against rotation in the counterclockwise direction as viewed from above. The levers **115** are independently pivotally mounted on a rod **118** and biased into engagement with the respective "price" cams **110** by torsion springs **119**, and a selector cam **120** fixed on a vertical selector shaft **121** is provided with a generally cylindrical surface engageable with the outer rounded ends of arms **122** of the levers **115** for withdrawing the detent pawls **114** from the "price" cams **110** against the bias of the springs **119**. The selector cam **120** also has a plurality of axially and angularly spaced recesses **123** (here four) with an equi-angular spacing of 36° for selectively and individually releasing the detent pawls **114** for engagement with the respective "price" cams **110** and for thereby conditioning the active "price" cam **110** for setting the angular position of the shaft **66**.

The "price" cams **110** are adapted to be individually angularly adjusted on the shaft **66** at any one of ten positions corresponding to the ten available settings of the range arm **74** by lifting and then rotating each "price" cam **110** to position its depending post **124** in the appropriate peripheral slot of a corresponding detent plate **126** therebelow. The detent plates **126** are slidable (but not rotatable) on the splined shaft **66** and each is adapted to be raised when a "price" cam below it is raised. Also, the peripheral slots in the detent plates **126** are appropriately located so that when the shaft **66** is rotated, in the counterclockwise direction as viewed from above, until the active detent pawl **114** is received in the slot **112** of the corresponding cam to restrain the shaft **66** against further rotation, the range arm **74** will be accurately positioned in accordance with the setting of the "price" cam **110**. The "price" cams may have appropriate indicia on the outer periphery thereof as shown in FIGS. 2 and 5 to assist in setting the cams and, for example, such indicia may be positioned on the "price" cams **110** for cooperation with a fixed pointer **127** (FIG. 5) when the range arm setting shaft **66** is in its counterclockwise limit position as viewed from above and the range arm is in its corresponding lower limit position.

The selector shaft **48** is connected to the vertical selector shaft **121** by 1:1 bevel gearing **128, 129** so that the selector knob **49** can be set to four 36° angularly spaced positions corresponding to the four available "price" cams **110**. Referring to FIGS. 1 and 2, the selector shaft **48** is also shown connected through 1:1 bevel gearing **130, 131** to rotate a selector disk **132** for suitably indicating in a window **125** the selection set with the knob **49**.

In the shown embodiment, the selector shaft **48** and knob **49** have ten angular positions with an even angular spacing of 36° such that if desired a total of nine "price" cams **110** could be conveniently employed on the shaft **66**, and the remaining position could be employed for resetting the "price" cams **110** as hereinafter explained. Also, a ten position detent cam **133** is fixed to the selector shaft **48** for cooperation with a combined detent and control lever **134** fixed to a pivot shaft **135** and having a roller or follower **136** engageable with the periphery of the cam **133**. Upon rotation of the selector shaft **48** from any previously selected angular position, the lever **134** is adapted to be pivoted upwardly to a withdrawn position shown in FIG. 5 where it is held by a latch **137** pivotally mounted on a fixed pin **138**. The lever **134** thereby raises the slide **60** through a linkage **139** which includes a lever **140**, shaft **141** and lever **142** to condition the range arm **74** for being reset.

The range arm setting shaft **66** is connected for being rotated, in the clockwise direction as viewed from above, through bevel gears **150, 152**, shaft **153**, spur gear **154** and gear sector **155** rotatably mounted on the reset shaft **52**. A tension spring **156** is connected to the gear sector **155** for biasing the gear sector **155** in the counterclockwise direction as viewed in FIG. 5—and to thereby bias the range arm setting shaft **66** in the counterclockwise direction as viewed from above—into engagment with the hub of a drive release lever **158** which thereby provides a stop for setting the lower limit position of the range arm **74**. Thus, with the gear sector **155** in engagement with the hub of the lever **158** the "price" cams **110** may be set with the aid of the indicia on the cams **110** and the pointer **127**.

In the shown embodiment the reset shaft **52** adapted to be rotated 360°, in the clockwise direction as viewed from the right in FIG. 2, for resetting the register **16** in any conventional manner as for example as described in the aforementioned U.S. Patent No. 3,216,659. The shaft **52** is rotated through a one-way drive shown comprising a single notch ratchet wheel **160** mounted on a drive shaft **161** driven by the reset control mechanism **54** and a spring biased ratchet pawl **162** pivotally mounted on a plate **164** fixed to the reset shaft **52**. The gear sector **155** is in turn adapted to be rotated, in the clockwise direction as viewed in FIG. 5, by the reset shaft **52** through a one-way drive mechanism comprising a drive

pawl 166 pivotally mounted on a drive plate 168 fixed to the reset shaft 52 and a ratchet plate 170 fixed to the gear sector 155. The ratchet plate 170 is shown having a single generally V-shaped peripheral notch 172 for receiving the inner end of the drive pawl 166, and a leaf spring 174 having one end secured to a post 175 fixed to the drive plate 168 and its other end connected to the drive pawl 166 biases the drive pawl into engagement with the ratchet wheel 170.

As the reset shaft 52 is rotated 360° from its initial angular position shown in FIG. 5, the drive pawl 166 is adapted to engage the edge 176 formed by the notch 172 in the ratchet wheel 170 to rotate the gear sector 155, in the clockwise direction as viewed in FIG. 5, and to thereby rotate the range arm setting shaft 66, in the clockwise direction, as viewed from above, and raise the range arm 74 to its upper limit position, whereupon a roller 180 engages the outer end of the drive pawl 166 to withdraw the drive pawl and thereby release the gear sector 155 to permit the tension spring 156 to rotate the range arm setting shaft 66 in the opposite angular direction, which rotation is dampened by a dashpot 181 connected to the gear sector 155. The roller 180 is mounted on a lever 182 adapted for limited angular adjustment on the shaft 52 by an angular slot 184 and set screw 186 so that the roller 180 may be properly positioned to withdraw the drive pawl 166 when the range arm 74 reaches its upper limit position.

When the drive pawl 166 is withdrawn from the ratchet plate 170 the shaft 66 and "price" cams 110 are rotated by the tension spring 156, in the counterclockwise direction as viewed from above, until the active detent pawl 114 is received in the slot 112 of the respective active "price" cam 110 to restrain the shaft 66 against further movement. The range arm 74 is thereby set in accordance with the pre-established setting of the active "price" cam 110.

The drive release lever 158 is fixed to the shaft 135 for being pivoted by the control lever 134 such that when the control lever 134 is in its lower inactive position with the roller 136 received in a peripheral recess of the cam 133 the lever 158 is positioned as shown in part in broken lines in FIG. 5 to engage the outer end of the drive pawl 166 and thereby prevent the operation of the range arm setting shaft 66 with the drive pawl 166. Thus, during a register reset operation not accompanied by a prior rotation of the selector knob 49, the range arm setting shaft 66 and the range arm 74 will remain in their previously set positions. If, however, the selector knob 49 is rotated, the control lever 134 will be pivoted upwardly and latched in its upper position and the release lever 158 will be held in its withdrawn position shown in full lines in FIG. 4 to permit the reset shaft 52 to retract the range arm 74 to its upper limit position.

An auxiliary one-way ratchet wheel 190 is fixed to the range arm setting shaft 66 for cooperation with an auxiliary ratchet pawl 192 to hold the shaft 66 against rotation by the return spring 156 when the active pawl 114 is withdrawn by the selector knob 49. The ratchet pawl 192 is adapted to be withdrawn from the auxiliary ratchet wheel 192 against the bias of a torsion spring 194 by a face cam 196 formed on the plate 164 during the reset cycle and preferably just before the drive pawl 166 is withdrawn by the roller 180. The face cam 196 is contoured to permit the detent pawl 192 to reengage the auxiliary ratchet wheel 190 at the end of the reset cycle and after the shaft 66 has been set by the selected "price" cam 110. Also the plate 164 is provided with a peripheral cam lobe 200 (FIG. 5) to engage a roller or follower 202 mounted on the latch lever 137 to withdraw the latch lever at the end of the reset cycle and therefore sufficiently after the detent pawl 166 is withdrawn to permit the range arm 74 to be properly set before the range arm 74 is released for engagement with the cone gear 26 or detent 80.

For resetting the "price" cams 110 on the shaft 66 the selector knob 49 may be set to withdraw all of the detent pawls 114 from the "price" cams 110 so that during the subsequent resetting cycle the range arm 74 will be set in its lower limit position where the indicia on the "price" cams 110 will cooperate with the pointer 127 to show the "price" setting of the cams, thereby facilitating the price resetting operation. Alternatively the range arm 74 may be set in its lower limit position for resetting the "price" cams 110 by setting the selector knob 49 for withdrawing all of the pawls 114 and by manually withdrawing the auxiliary ratchet pawl 192. To facilitate setting the selector knob 49 for resetting the "price" cams 110 the disk 132 may have suitable indicia on its face which is viewable through the window 125 when the knob 49 is positioned for withdrawing all of the pawls 114 from the "price" cams 110.

Referring to FIGS. 1 and 6, the reset control mechanism 54 is operated by a handle 203 fixed to a control shaft 204. In a conventional manner the handle 203 may be associated with the storage receptacle of the pump dispensing nozzle 205 so that the handle 203 must be pivoted to its "off" position shown in full lines in FIG. 6 to permit the nozzle to be replaced in its storage receptacle, and so that the handle can be subsequently pivoted to its "on" position shown in broken lines in FIG. 6 to operate the reset control mechanism 54 to reset the register only after the nozzle is removed from its storage receptacle.

An interlock is provided between the selector shaft 48 and the control shaft 204 to permit the selector shaft 48 to be set with the knob 49 only when the handle is in its "off" position and to permit rotation of the handle 203 to its "on" position only when the selector shaft 48 is in one of its five operational positions (i.e., its four "price" cam selecting positions and its "price" cam resetting position). For this purpose a detent wheel 206 having five detents or recesses 207 is fixed to the selector shaft 48 for cooperation with a spring biased pivotal interlock lever 208 having a roller or follower 209 engageable with the periphery of the detent wheel 206. The opposite end of the interlock lever 208 cooperates with a second interlock lever 210 fixed to the control shaft 204 for locking the control handle 203 in its "off" position when the selector shaft 48 is in other than one of its five operative positions with the roller 209 received in one of the five recesses 207. Also the interlock levers 208, 210 cooperate to prevent operation of the selector knob 49 when the handle 203 is in other than its "off" position.

Alternatively the detent or recess 211 on the detent wheel 206 for the "price" cam resetting position of the selector knob 49 may be sufficiently shallow (as shown in FIG. 6) to provide a detent for the knob 49 without releasing the interlock provided by the levers 208, 210. The handle 203 would then remain locked in its "off" position and the range arm 74 would have to be set in its lower limit position for resetting the "price" cams 110 by manually withdrawing the auxiliary ratchet pawl 192. Accordingly the pump housing would have to be opened to set the range arm in its lower limit position, and the handle 203 could not be turned to its "on" position for delivering fuel unless it is in one of its four "price" cam selecting positions.

The reset shaft 52 could be rotated through 360° by an electrical motor (not shown) as in a conventional electrically powered reset control mechanism as described in the aforementioned U.S. Patent No. 3,216,659, to provide for settling the variator and for zeroizing the register when the control handle 203 is turned to its "on" position just prior to each delivery and after the selector knob 49 is set. Alternatively the reset shaft 52 could be manually operated and for example manually oscillated through less than 360° as described in the aforementioned U.S. application Ser. No. 620,108 so as to provide for manually loading the variator setting spring 156 when the control handle 203 is rotated to its "on" position and immediately

prior to the reset cycle, in which instance the face cam **196** for withdrawing the auxiliary ratchet pawl **192** and the cam lobe **200** for releasing the latching lever **137** would be suitably mounted to provide for timely withdrawing the auxiliary ratchet pawl **192** and for timely releasing the control lever **134** preferably at the end of the reset cycle.

Referring to FIGS. 7 and 8, a modified embodiment of the variator **12** is shown in which one of the range arms **74** is selectively adapted to be added to or subtracted from the outputs of the remaining range arms. For this purpose a ± range arm **212** is provided for selectively connecting a gear **214** fixed to the associated range arm output shaft **72** to a differential input gear **215**. For example, the associated range arm **74** may be the second place range arm and the ± range arm **212** may be selectively used for adding the output of the range arm to or subtracting it from the summation of the outputs of the first and third place range arms.

The ± range arm **212** comprises a dual-purpose arm or lever **216** pivotally mounted on the associated range arm output shaft **72** and three idler gears **218, 220, 222** rotatably supported on the arm **216** so that when the arm **216** is pivoted into engagement with a stop **224** the idler gear **218** interconnects the gear **214** with the differential input gear **215** and when the arm **216** is pivoted into engagement with a stop **226**, the idler gears **220** and **222** interconnect the gears **214, 215** to drive the gear **215** in the opposite angular direction.

The operative position of the ± range arm **212** is controlled by a linkage comprising a lever **230** pivotally mounted on a fixed rod **232** and a link **234** pivotally connected to the lever **230** and having an elongated slot receiving a pin **236** fixed to the arm **216**. A first tension spring **238** connected to the link **234** provides for biasing the arm **216** to one operative position in engagement with the stop **224**, and a ten-position ± selector cam **240** mounted on a vertical selector shaft **242** is adapted to engage a follower or roller **246** on the end of the lever **230** to pivot the arm **216** into engagement with the stop **226** through the medium of the tension spring **248** connected to the pin **236** and a pin **250** fixed to the link **234**. Thus, the arm **216** is adapted to be pivoted to its operative positions through the tension springs **238** and **248**, and if the idler gears **218** or **220** do not properly engage the differential input gear **215** when the arm **216** is pivoted to its other operative position, the arm **216** will remain partially withdrawn until the variator input shaft **14** is rotated at the beginning of the following delivery.

The selector shaft **242** is connected to the selector shaft **48** through 1:1 bevel gearing **260, 261** so that the selector shaft **242** and therefore the ± selector cam **240** is positioned in accordance with the selected "price" cam **110**. Also, the cam **240** is shown to be angularly adjustable on the shaft **242** through the provision of a plate **264** fixed to the shaft **242** having ten equiangularly spaced peripheral slots **266** adapted for receiving a depending post **268** of the ± cam **240**. The cam **240** is accordingly adapted to be set by raising and angularly positioning it relative to the plate **264** whereby the cam **240** may be selectively positioned for adding or subtracting the output of the associated range arm **74** in conjunction with the selection of one, two, three, or all four "price" cams **110**.

Accordingly, the available range of adjustment provided by the combination of the range arm **74** and the ± range arm **212** is twice that of the range arm **74** alone and consequently a variator having a single adjustable range arm **74** and an associated ± range arm **212** may be employed to provide an extended range of adjustment with a single range arm. Thus, if a single quick setting range arm **74** is used for setting the second decimal place of a three place unit price, and if the first place range arm were set at **2** and the third place range arm were set at **9**, the quick setting range arm **74** could be used to provide a price range between **219** (e.g., 21.9 cents per gallon) and **399** (e.g., 39.9 cents per gallon). In addition, a greater price range could be provided by adding additional steps to the cone gear **26** and/or greater flexibility could be provided within a more limited maximum price by reducing the price increment of the first place range arm. For example, gearing could be employed such that the first place range arm provides a lower incremental price change of six cents rather than the usual ten cents. The quick setting price range could then be "centered" on the prices of, for example, 24.9 cents per gallon, 30.9 cents per gallon or 36.9 cents per gallon.

The computing apparatus described could be employed, for example, in a fuel blending system of the type shown in FIG. 9 or in a nonblending multiple product system of the type shown in FIG. 10. Referring particularly to FIG. 9 the selector shaft **48** is connected to a blend setting shaft **300** through 1:1 bevel gearing **301, 302** for setting the blend gearing **303** in accordance with the setting of the selector shaft **48**. The blend gearing **303** has a pair of inputs **304, 306** driven respectively by the meter **308** for one of the base products of the blend and by the output of a summing differential **310** connected for adding the output of the meter **308** and the output of the meter **312** for the other base product. The output of the differential **310** is also connected to drive the variator input shaft **14**, and the blend gearing output **316** is connected to operate a proportioning valve **318** to control the blend in accordance with the setting of the blend gearing **303** established by the position of the selector knob **49**.

A three-product nonblending dispensing system is shown in FIG. 10 in which three separate nozzle storage receptacles **400, 401, 402** are provided for storing three separate nozzles (not shown) for the three products respectively. (Alternatively three concentric hoses for example leading to a single nozzle could be employed in the manner of the pair of concentric hoses conventionally used in blending equipment.) Control handles **403–405** are associated with the nozzle receptacles **400–402** for operating the dispensing equipment in conjunction with the withdrawal of the nozzle from and replacement of the nozzle in its storage receptacle. The handles **403–405** are connected to a product selector mechanism **410** through the linkages **412–414** respectively such that the selector mechanism **410** is adapted to set the selector shaft **48** in accordance with the handle employed when the selected handle is rotated, in the clockwise direction as viewed in FIG. 10, to its operative or "on" position shown in broken lines. Also, the product selector mechanism **410** provides for rotating the reset control shaft **204** after the selector shaft **48** is set for resetting the register **16**. Alternatively, the selector shaft **48** could be manually set with a selector knob **49** (shown in broken lines in FIG. 10) and/or a single three-position control handle **420** (also shown in broken lines in FIG. 10) could be employed to provide the necessary input to the product selector mechanism **410**.

Interlocks **422–424** for the linkages **412–414** respectively are provided to inactivate the remaining two control handles when one of the control handles **403–405** is pivoted to its "on" position. Such interlocks could be employed to lock the remaining two handles in their inoperative or "off" positions or to merely disconnect the remaining handles from the product selector mechanism **410**.

For purposes of illustration the handles **403–405** and associated nozzle receptacles **400–402** and the corresponding individual delivery systems (each of which is shown including a fluid pump **430** operated by a motor **431**, a two-step shut-off valve **432** and a meter **433**) are designated with the letters A, B, and C respectively representing the three separate products which may be dispensed. The output of the B and C product meters **433** are combined by an adding differential **440** and the output of the differential **440** and the A product meter **433** are com-

bined by a second adding differential 441 which is suitably connected to drive the variator input shaft 14. The pump motors 431 and corresponding valves 432 are adapted to be selectively energized at the end of the reset cycle (i.e., after the variator has been set in accordance with the selected product and the register has been reset) by individual switches 442–444 and a master switch (not shown) incorporated in the reset control mechanism 54. More particularly, when one of the control handles 403–405 is pivoted to its operative position the corresponding switch 442–444 is actuated to provide for energizing the corresponding pump motor 431 and valve 432 with the master switch at the end of the reset cycle. Alternatively, in lieu of the switches 442–444 a selector switch 450 shown in broken lines in FIG. 10 could be operated by the selector shaft 48 to provide for energizing the appropriate system at the end of the reset cycle.

In order to avoid feedback through the differentials 440 and 441 to the inactive meters 433, suitable locks 456 are provided for selectively locking the meter outputs. These locks could be simple one-way brakes to provide for preventing reverse rotation of the meter output shafts or could be selectively engaged and disengaged by the selector shaft 48 through a suitable brake selector 460. Alternatively the locks 456 could be connected as shown in broken lines in FIG. 10 to be individually released by the linkages 412–414 when the corresponding control handles 403–405 are rotated to their "on" positions.

The system shown in FIG. 10 incorporates a preset mechanism 461 which may be of the type which is manually operated or money operated to select the amount of fuel to be delivered. The preset mechanism 461 is preferably suitably connected to the register 16 to be operated in accordance with the operation of the cost counter or volume counter of the register and is connected to timely terminate the delivery of fuel with a preset relay 462 and to provide in advance of the termination of the fuel delivery for partially closing the two-stage shut-off valves 433 with first-stage control relays 463. Also, the preset relay may if desired be employed to prevent the delivery of fuel until the preset mechanism is set and also to prevent operation of the reset control mechanism 54 if it is electrically powered.

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

We claim:

1. In a variator having multiple step gear means, a range arm pivotally and axially adjustable for selective engagement with the steps of the gear means, and a range arm adjusting mechanism for selectively setting the range arm in engagement with the steps of the gear means, the improvement wherein the range arm adjusting mechanism comprises first control means for the range arm operable for disengaging the range arm from and reengaging the range arm with the selected step of the gear means, and second control means operable with the range arm disengaged from the gear means for selectively axially and pivotally adjusting the range arm for selective engagement with the steps of the gear means, said second control means comprising an arcuate gear coaxial with the range arm axis and rotary setting means including a rotary gear in mesh with the arcuate gear for pivotally adjusting the range arm about its axis.

2. The variator of claim 1 wherein the first control means comprises a slide mounted for reciprocable movement generally parallel to the axis of the range arm and connected to the range arm for axially displacing the range arm out of engagement with the gear means upon movement of the slide in one reciprocable direction from an operating position to a withdrawn position.

3. The variator of claim 1 wherein the second control means comprises cooperating cam and follower means for axially adjusting the range arm in cooperation with the angular adjustment thereof to provide for engagement by the range arm with the steps of the gear means.

4. The variator of claim 3 wherein the cooperating cam and follower means comprises a generally helically extending cam contoured to provide for coordinated axial and pivotal adjustment of the range arm for engagement with the steps of the gear means.

5. The variator of claim 1 wherein the adjusting mechanism further comprises a plurality of controllers on the rotary setting means respectively operable for angularly setting the rotary means, and selector means manually operable for individually selecting the controllers for angularly setting the rotary setting means.

6. The variator of claim 2 wherein the adjusting mechanism further comprises detent means for retaining the range arm in engagement with the selected step of the gear means comprising a rotary detent wheel on the rotary setting means and a detent pawl cooperable with the rotary detent wheel to retain the rotary setting means against rotation with the slide in its normal operating position and to permit the setting means to be rotated with the slide in its withdrawn position.

7. The variator of claim 1 wherein the arcuate gear is a generally helically extending axially facing rack gear contoured to provide for coordinated axial and angular adjustment of the range arm for engagement with the steps of the gear means.

8. The variator of claim 7 wherein the range arm adjusting mechanism further comprises a slide mounted for reciprocable movement generally parallel to the axis of the range arm and connected to the range arm for axially displacing the range arm out of engagement with the gear means upon movement of the slide in one reciprocable direction.

9. The variator of claim 8 wherein the multiple step gear means is a cone gear, wherein the range arm is mounted for axial and pivotal movement about an axis generally parallel to the axis of the cone gear, and wherein the rack gear is mounted on the range arm and the rotary gear is mounted on the slide.

10. The variator of claim 1 wherein the adjusting mechanism further comprises manually operable selector means for selecting the range arm setting and connected for operating the first control means to disengage the range arm from the gear means when operated to select a different range arm setting, and means connected for operating the second control means for axially and pivotally adjusting the range arm in accordance with the selected range arm setting.

11. In a computing device for a fluid dispensing system having a resettable register operable for registering the cost of the fluid dispensed in accordance with the established unit volume price of the fluid, a variator connected for operating the register in accordance with a unit volume price established by the variator drive ratio and adjustable for varying its drive ratio and therefore the unit volume price of the fluid, variator adjusting means for setting the variator drive ratio, and register resetting means operable for resetting the register, the improvement wherein the variator adjusting means comprises manually operable selector means for manually selecting a drive ratio from a plurality of available drive ratios, and variator setting means connected for operation by the register resetting means to set the variator drive ratio in accordance with the selected drive ratio.

12. The computing device of claim 11 wherein the variator adjusting means is adapted to be conditioned for setting the variator in accordance with the selected drive ratio, and wherein the computing device further comprises conditioning means connected for operation by the selector means to condition the variator adjusting means for setting the variator in accordance with the selected drive ratio when the selector means is manually operated to select a different drive ratio.

13. The computing device of claim 12 wherein the

variator comprises a multiple step rotary cone gear and a range arm mounted for pivotal movement about and axial movement along an axis extending generally parallel to the axis of the cone gear for selective engagement with the steps of the cone gear, wherein the variator is adjustable for varying its drive ratio by adjustment of the range arm into engagement with the steps of the cone gear, wherein the variator setting means is operable for selectively setting the range arm for engagement with the steps of the cone gear in accordance with the selected drive ratio, and wherein the conditioning means is connected for operation by the selector means to move the range arm out of engagement with the cone gear to condition the variator setting means for setting the range arm in accordance with the selected drive ratio.

14. The computing device of claim 13 wherein the cone gear has a generally vertically extending axis and steps of diminishing diameter in the upward direction and wherein the conditioning means is connected for operation by the selector means to move the range arm upwardly out of engagement with the cone gear.

15. The computing device of claim 12 wherein the selector means comprises a manually operable rotary selector angularly settable for selecting a drive ratio from the plurality of available drive ratios, and wherein the conditioning means comprises rotary cam means operable by the rotary selector, and cam follower means operable by the rotary cam means and connected for conditioning the variator adjusting means for setting the variator when the rotary selector is rotated to select a different drive ratio.

16. The computing device of claim 15 wherein the rotary cam means comprises a rotary detent cam operable by the rotary selector, the detent cam having a plurality of angularly spaced cam lobes for operating the cam follower means and intermediate recesses for respectively receiving the cam follower means at the angular settings of the rotary selector.

17. In the computing device of claim 15 wherein the cam follower means is reciprocably mounted and adapted to be actuated to a withdrawn reciprocable position by the rotary cam means when the rotary selector is rotated to select a different drive ratio and thereby condition the variator adjusting means for setting the variator in accordance with the selected drive ratio, and wherein the conditioning means further comprises retaining means for retaining the variator adjusting means in condition for setting the variator until after the variator setting means is operated by the register resetting means to set the variator in accordance with the selected drive ratio.

18. The computing device of claim 11 wherein the register resetting means comprises a rotary member adapted to be rotated for resetting the register, and wherein the variator setting means is connected for operation by the rotary member to set the variator.

19. In the computing device of claim 18 wherein the variator setting means comprises rotary setting means angularly settable to set the variator drive ratio and connected to be rotated in one angular direction by the rotary member, biasing means biasing the rotary setting means in the opposite angular direction for setting the variator, and a plurality of controllers selectively operable by the selector means for selectively limiting the rotation of the rotary setting means in said opposite angular direction.

20. In the computing device of claim 19 wherein the variator adjusting means comprises disengageable drive means interconnecting said rotary member and said rotary setting means for rotating the rotary setting means in said one angular direction, and means for disengaging the disengageable drive means to permit the biasing means to rotate the rotary setting means in the opposite angular direction.

21. In the computing device of claim 12 wherein the variator adjusting means comprises a selectively engageable drive for connecting the adjusting means for operation by the register resetting means, and wherein the conditioning means is connected for operation by the selector means for engaging said selectively engageable drive when the selector means is manually operated to select a different drive ratio.

22. In the computing device of claim 21 wherein the selectively engageable drive comprises a rotary ratchet wheel and a pivotal pawl engageable with the ratchet wheel for engaging the drive, and wherein the conditioning means comprises pawl control means for withdrawing the pawl from the ratchet wheel to disengage the drive and operable when the selector means is manually operated to select a different drive ratio to permit the pawl to engage the ratchet wheel.

23. The computing device of claim 11 in combination with blend control means adaptable for controlling the blend of a dispensed fluid and adjustable for varying the blend ratio of the dispensed fluid, and wherein the manually operable selector means is connected for adjusting the blend control means for simultaneously setting blend ratios and selecting corresponding drive ratios.

24. In a variator having a multiple step input rotary cone gear, a range arm mounted for pivotal movement about the axial movement along an axis extending generally parallel to the axis of the cone gear for selective engagement with the steps of the cone gear, and a range arm adjusting mechanism for axially and pivotally adjusting the range arm for engagement with the steps of the cone gear, the improvement wherein the range arm adjusting mechanism comprises a slide mounted for reciprocable movement generally parallel to the axis of the range arm, cooperating means on the slide and range arm for axially displacing the range arm out of engagement with the cone gear upon movement of the slide in one reciprocable direction to a withdrawn position and for axially displaying the range arm simultaneously and in accordance with the angular adjustment thereof to provide for engagement by the range arm with the steps of the cone gear, and rotary means connected to the range arm for angularly adjusting the range arm with the slide in its withdrawn position.

25. In a computing device for a fluid dispensing system having a register operable for registering the cost of the fluid dispensed in accordance with the established unit volume price of the dispensed fluid, a settable variator having an output connected for operating the register in accordance with the volumetric amount of the fluid dispensed and a unit volume price established by the variator setting, the variator having at least two variator portions having corresponding intermediate outputs and combining means for combining the intermediate outputs to provide said variator output, at least one of the variator portions being settable to vary its intermediate output and hereby the variator output and the established unit volume price, the improvement wherein said one variator portion comprises adjustable means selectively settable for setting the amount and the negative or positive value of the intermediate output of said one variator portion.

26. The computing device of claim 25 wherein the adjustable means comprises a first adjustable section selectively settable for setting the amount of the intermediate output of said one variator portion, and a second adjustable section selectively settable for setting the positive or negative value of the amount of the intermediate output of said one variatior portion.

27. The computing device of claim 25 wherein the variator has at least two variator portions settable for varying the amounts of their respective intermediate outputs in fixed equal steps respectively, a first of said settable variator portions being said one variator portion, and the fixed step of a second of said settable variator portions being a whole multiple of the fixed step of said first settable variator portion.

28. The computing device of claim 27 wherein said whole multiple is less than ten.

29. The computing device of claim 26 wherein the variator comprises multiple step rotary input gear means, wherein said first adjustable section comprises range arm means providing a range arm output and selectively settable into engagement with the steps of the multiple step gear means for setting the amount of the intermediate output of said one variator portion.

30. The computing device of claim 26 wherein the second adjustable section comprises a rotary gear, a pivotally mounted combination positive and negative range arm having positive and negative idler gears selectively engageable with said rotary gear by pivoting the range arm to two alternative pivotal positions respectively for selectively setting the positive or negative value of the intermediate output of said one variator portion.

31. The computing device of claim 30 wherein the combining means comprises differential gear means for combining the intermediate outputs of the variator portions, and wherein said rotary gear is a differential gear means input gear.

32. The computing device of claim 25 wherein the adjustable means is adjustable for independently setting the amount and the value of the intermediate output of said one variator portion.

33. The computing device of claim 32 wherein the variator comprises a selector having a plurality of operative positions for respectively selecting each of a plurality of available intermediate outputs of said one variator portion, first setting means for adjusting the adjustable means for selectively setting the amount of the intermediate ouput of said one variator portion in accordance with the operative position of the selector, and second setting means for adjusting the adjustable means for selectively setting the value of the intermediate output of said one variator portion in accordance with the operative position of the selector.

34. The computing device of claim 33 wherein said second setting means is presettable for preselecting the value settings for the operative positions of the selector.

35. The computing device of claim 34 wherein the second setting means comprises rotary cam means connected for rotation by the selector and angularly presetable for preselecting the value settings for the operatives of the selector.

36. The computing device of claim 25 wherein the adjustable means comprises rotary gear means and pivotal range arm means selectively settable into engagement with the rotary gear means for varying the intermediate output of said one variator portion, the pivotal range arm means including positive and negative pivotally mounted idler gears selectively pivotal into engagement with the rotary gear means for providing positive and negative value intermediate outputs respectively of said one variator portion.

37. In a computing device for a fluid dispensing system having a register operable for registering the cost of the fluid dispensed in accordance with the established unit volume price of the dispensed fluid, a settable variator having a unit volume output connected for operating the register in accordance with a unit volume price established by the variator setting and variator setting means for setting the variator, the improvement wherein the variator setting means comprises rotary setting means connected for setting the variator in accordance with the angular position thereof, biasing means biasing the rotary setting means in one angular direction for setting the variator, and manually operable selector means having a plurality of manually selectable controllers for limiting the rotation of the rotary setting means in said one angular direction.

38. The computing device of claim 37 wherein the variator setting means further comprises drive means for rotating the rotary setting means in the opposite angular direction against the bias of the biasing means to a withdrawn angular position to permit the biasing means to return the rotary setting means in said one angular direction to set the variator.

39. The computing device of claim 38 wherein the register is resettable, wherein the computing device comprises register resetting means operable for resetting the register and wherein the drive means is connected for operation by the register resetting means.

40. The computing device of claim 39 wherein the register resetting means comprises a rotary reset member rotatable for resetting the register, and wherein the variator setting means comprises engageable clutch means interconnecting the rotary reset members and drive means for rotating the rotary setting means to its withdrawn angular position when the rotary reset member is rotated for resetting the register.

41. The computing device of claim 40 wherein the manually operable selector means is connected for engaging the engageable clutch means when the selector means is operated to select a different controller for limiting the rotation of the rotary setting means in said one angular direction.

42. The computing device of claim 40 wherein said rotary reset member is rotated in one angular direction only for resetting the register, and wherein the register resetting means further comprises an electric reset motor connected for rotating the rotary reset member in its said one angular direction.

43. The computing device of claim 37 wherein the rotary setting means comprises a plurality of coaxial rotary detent wheels; and wherein the manually operable selector means comprises a plurality of coaxial detent pawls adapted for engagement with the rotary detent wheels respectively for limiting the rotation of the rotary setting means in said one angular direction, and rotary selector cam means manually angularly settable for selectively withdrawing the detent pawls out of engagement with the rotary detent wheels respectively.

44. In a multiple product fluid dispensing apparatus having a plurality of fluid meters for measuring the volumetric amounts dispensed of separate fluids respectively, a register operable for registering the cost of the fluid product dispensed in accordance with an established unit volume price for the dispensed fluid, settable variating means operable by the fluid meters for operating the register in accordance with the volumetric amount of the fluid product dispensed and a unit volume price established by the setting of the variating means, connecting means operable for connecting the meters for operating the settable variating means, and control means operable for controlling the fluid product dispensed and for setting the variating means and therefore the unit volume price in accordance with the fluid product dispensed; the improvement wherein the control means comprises separate manually operable selectors for the separate fluids respectively connected for selectively dispensing the separate fluids respectively and for setting the variating means and therefore the unit volume price in accordance with the selector which is manually operated, and interlock means interconnecting the separate manually operable selectors for deactivating the remaining selectors when one of the selectors is manually operated to dispense the respective fluid and set the variating means.

45. The multiple product fluid dispensing apparatus of claim 44 wherein the register is resettable and wherein the apparatus further comprises a reset control mechanism operable to reset the resettable register, and wherein the control means further comprises a selector mechanism connected to be operated by each of the plurality of separate manually operable selectors to set the variating means in accordance with the selector manually operated and to operate the reset control mechanism to reset the register.

46. The multiple product fluid dispensing apparatus of claim 45 wherein the apparatus further comprises fluid pumps and associated electric pump motors for delivering

the separate fluids respectively, and switching means connected to be operated by the manually operable selectors to condition the electric motors respectively for being energized when the selectors are manually operated to operate the selector mechanism to set the variating means and operate the reset control mechanism to reset the register.

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