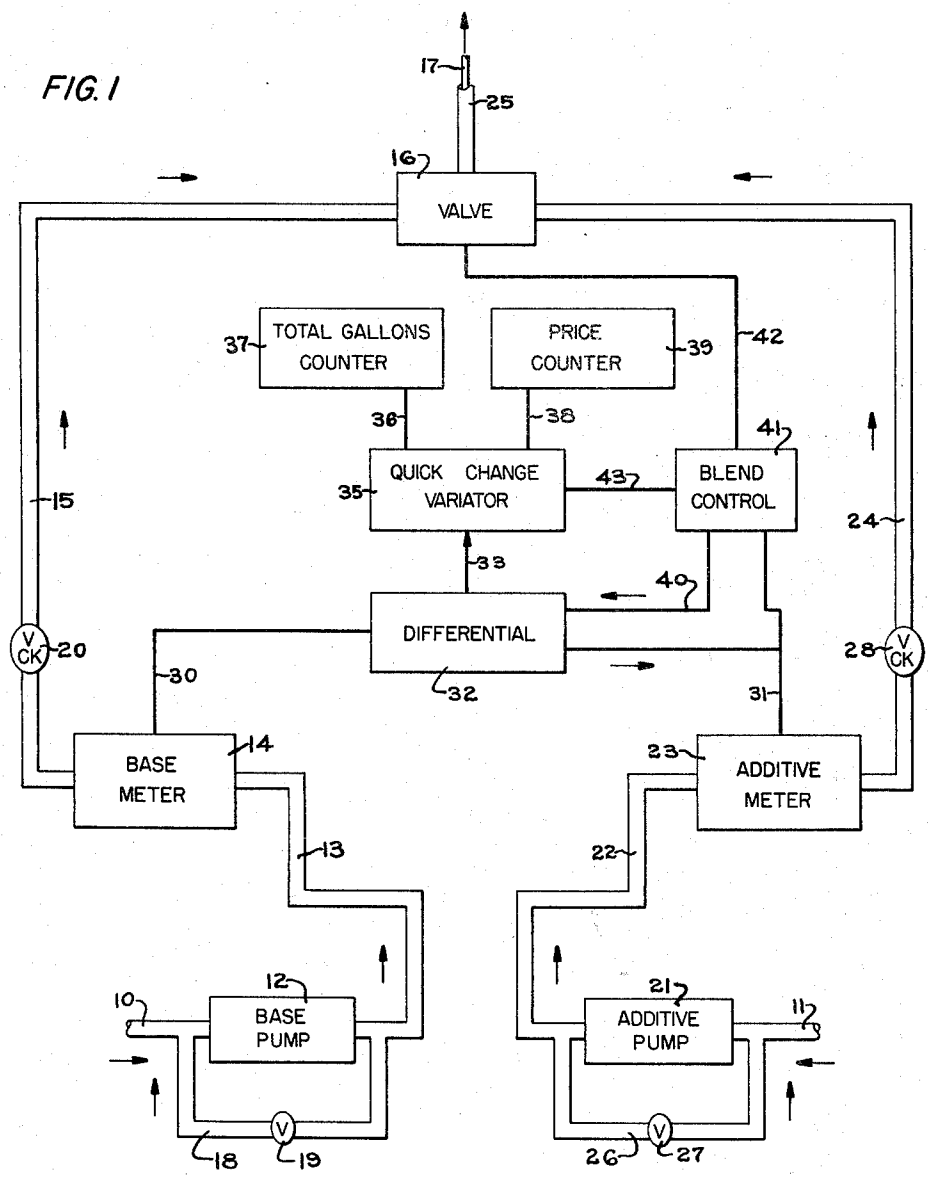
March 30, 1965 A. J. WELLS 3,175,414

QUICK-CHANGE VARIATOR

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FIG. 1



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QUICK-CHANGE VARIATOR

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FIG. 2

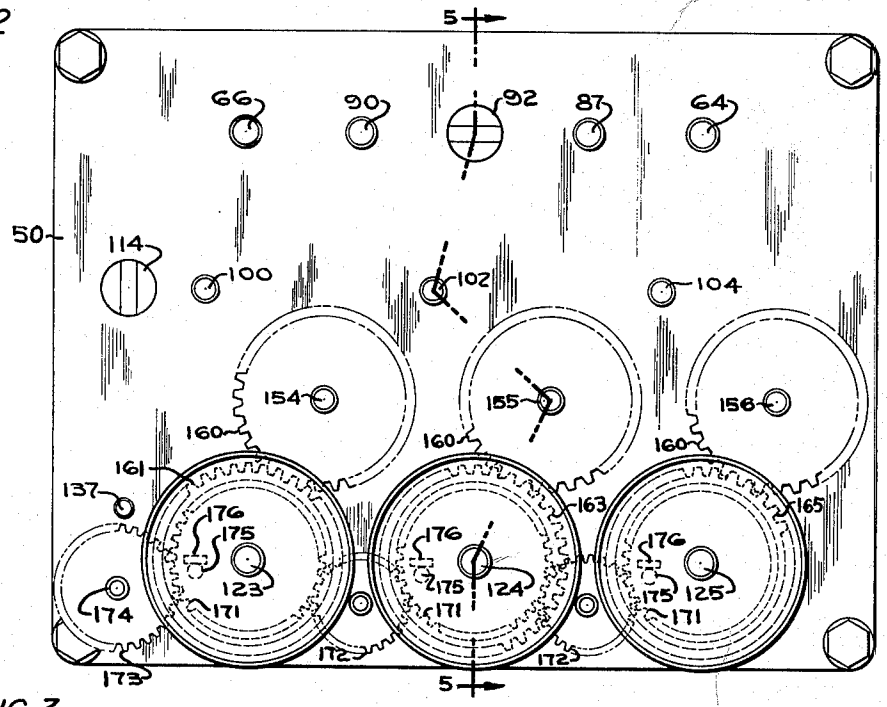
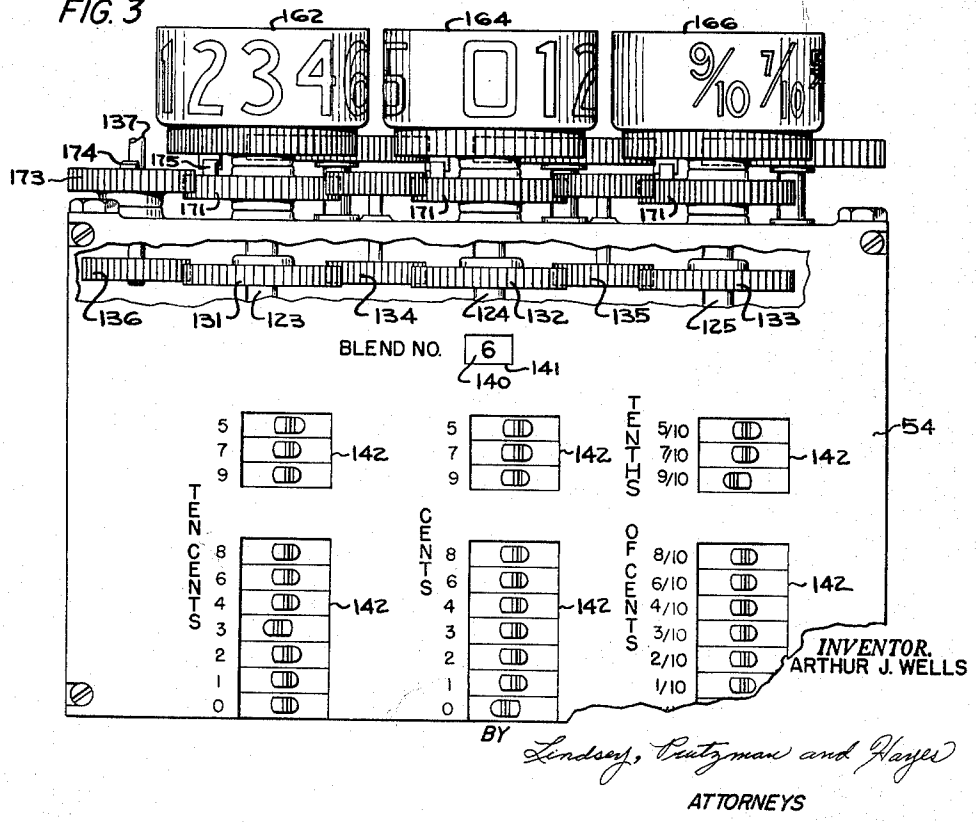


FIG. 3



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QUICK-CHANGE VARIATOR

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FIG. 4

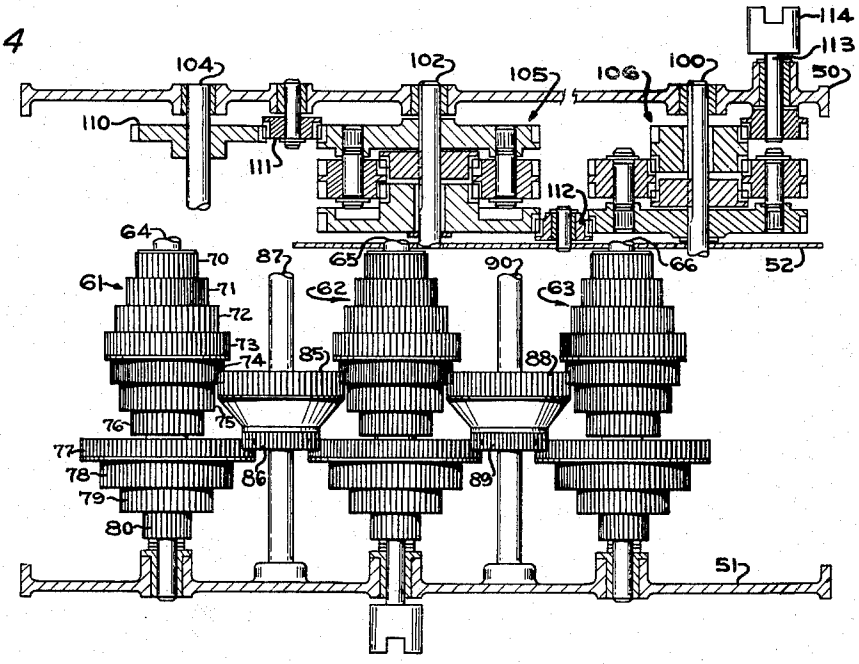


FIG. 5

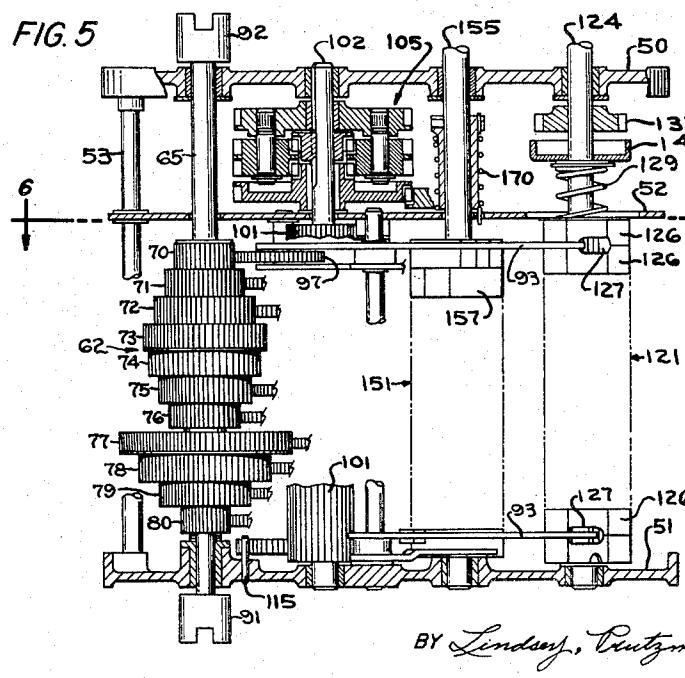
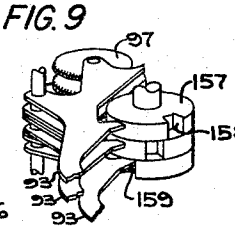


FIG. 9



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QUICK-CHANGE VARIATOR

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FIG. 6

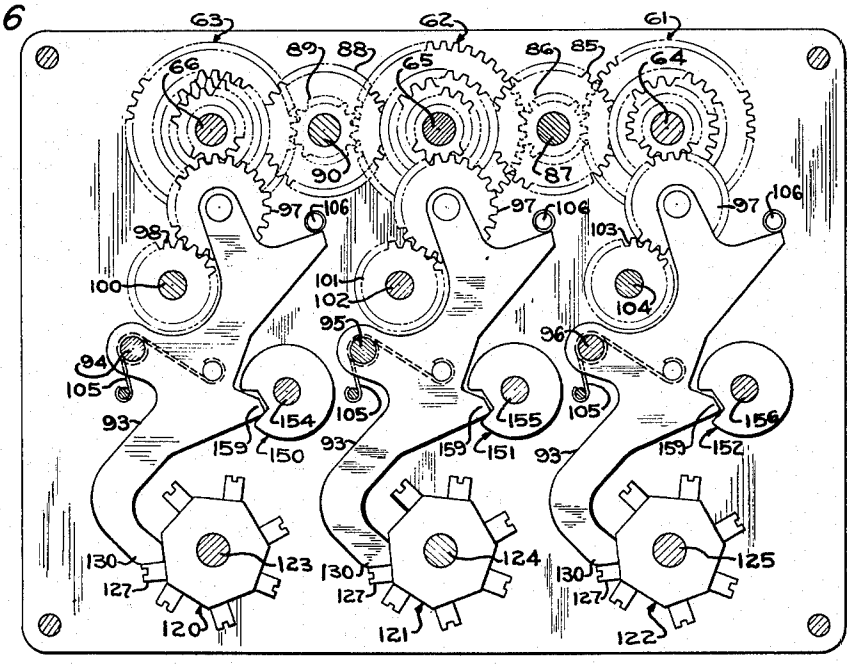


FIG. 7

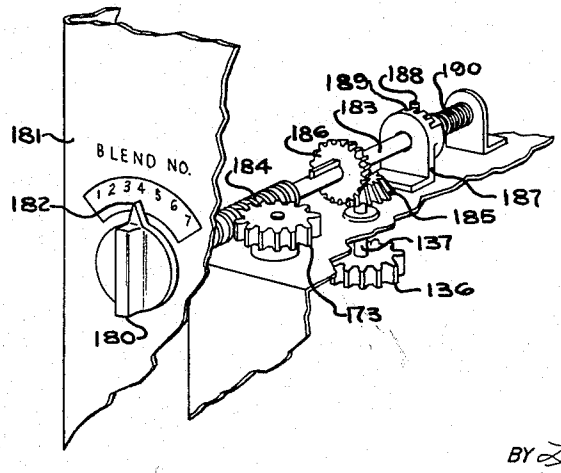
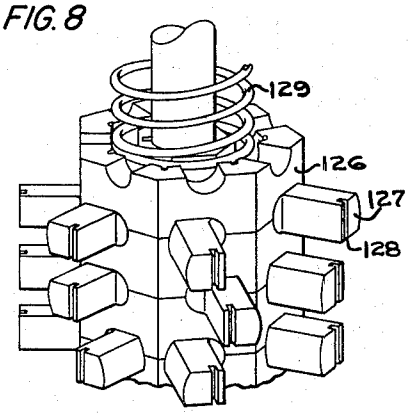


FIG. 8



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United States Patent Office 3,175,414 Patented Mar. 30, 1965

3,175,414

QUICK-CHANGE VARIATOR

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Filed Oct. 2, 1961, Ser. No. 142,388
28 Claims. (Cl. 74—354)

The present invention relates generally to speed-change mechanisms and is concerned, more particularly, with such mechanisms usually referred to as variators intended for use with counters or registers so as to form a computer for registering cost as well as quantity. Although not necessarily limited thereto, a principal use of the variator of the present invention is in connection with gasoline dispensing apparatus.

In conventional gasoline dispensing apparatus, the variator is driven by the meter and produces an output which is proportional to the quantity of liquid dispensed multiplied by the unit price of the liquid. The mechanism is arranged so that it can be set for any unit price within the range of the variator. While the variator is arranged so that it can be set for varying prices, nonetheless a gasoline dispensing apparatus which dispenses only one grade of gasoline will be operated for long periods at the same unit price so that provision for quick change of the variator setting is not required nor is it necessary to have the setting mechanism readily available. However, a different situation is present when the gasoline dispensing apparatus is designed to dispense two different grades of gasoline and varying mixtures or blends thereof from a single dispenser. It is desired with such blender-type gasoline dispensers to utilize a single register for registering the quantity and cost of the gasoline dispensed and this requires some means for adjusting the drive to the cost side of the register each time the grade or blend is changed.

It is an aim of the present invention to provide a single instrument or variator which can be set over a wide range for the varying prices of the grades and blends of gasoline to be dispensed and which can be quickly and easily shifted from one setting to another as required in a dispensing operation.

Included in the foregoing aim is the provision of a variator of the type referred to which can be preset or preconditioned for the range of price settings desired for the particular blender apparatus in a simple and convenient manner and which thereafter can be shifted from one presetting to another in a simple operation, preferably by the same control which changes the grade or blend being dispensed.

A further aim is to provide such a quick-change variator which is of compact but also rugged design so that it can be fitted into the relatively small space available in gasoline dispensing equipment and yet will function effectively for long periods of time even under the extremely adverse conditions encountered in such installations.

Another aim is to provide a quick-change variator which is accurate and foolproof in operation as well as being easy to set and which will automatically and accurately display the price to which it is set to the customer.

A further aim is to provide a variator of the type referred to which will permit a wide range of settings to meet varying conditions and wherein the settings for the various grades or blends may be selected independently of each other.

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 which will be indicated in the appended claims.

In the drawings:

FIG. 1 is a schematic diagram of a gasoline dispensing apparatus of the blender type showing an intended use of the quick-change variator of the present invention;

FIG. 2 is a top view of an embodiment of the quick-change variator;

FIG. 3 is a fragmentary end view thereof;

FIG. 4 is a fragmentary end view partially in cross section of the opposite end of the variator;

FIG. 5 is a cross-sectional view taken along the line 5—5 of FIG. 4.

FIG. 6 is a cross-sectional view taken along the line 6—6 of FIG. 5 but showing only a single range arm and turret segment of each series;

FIG. 7 is a fragmentary perspective view of the combination blend and price setting control;

FIG. 8 is an enlarged fragmentary perspective view of one of the turrets of the setting mechanism; and

FIG. 9 is a fragmentary perspective view showing certain of the range gears and cam release mechanisms.

Referring to the drawings, FIG. 1 is intended to show by way of example, in diagrammatic form a typical gasoline blending apparatus and the manner in which the quick-change variator of the present invention may be employed therein. The apparatus is intended to draw gasoline through the inlet pipes 10 and 11 from separate reservoirs or storage tanks (not shown) containing different grades of gasoline. For convenience, the grade of gasoline entering through pipe 10 will be designated as the "base" and that entering through pipe 11 will be denoted as the "additive." The base is pumped by the base pump 12 through the pipe 13 to the base meter 14 and thence through pipe 15 to the control valve 16 from which it passes to the outlet pipe 17. The by-pass 18 and relief valve 19 are provided in the usual manner to relieve excess pressure at the outlet side of the pump 12. The valve 20 is a conventional check valve.

In similar manner, the additive is pumped by the additive pump 21 through pipe 22 to the additive meter 23 and thence through pipe 24 to valve 16 and outlet pipe 25. A by-pass 26 containing relief valve 27 connects opposite ends of the pump 21 and a check valve 28 is provided in pipe 24.

As is conventional in gasoline blending apparatus, the outlet pipes 17 and 25 are intended to be connected to a dual dispensing hose (not shown) provided with a dispensing nozzle by means of which the operator may control the delivery. The valve 16 is a conventional dual valve having the characteristic that as it is moved in one direction the flow from pipe 15 is diminished and the flow from pipe 24 is increased and when the valve is moved in the opposite direction, the flow from pipe 24 is diminished and the flow from pipe 15 is increased. Thus the valve 16 becomes a convenient means of varying the proportion of base and additive or for dispensing only one of them so as to provide the particular grade or blend desired.

The meters 14 and 23 are of conventional design and their output shafts are denoted, respectively, by the solid lines 30 and 31. As is well known, the meters are arranged so that the shafts 30 and 31 rotate in proportion to the amount of liquid passing through the respective meters. The shafts 30 and 31 are connected to a differential 32 which combines the output of the two shafts and transmits the combined output through its output shaft 33 to the quick-change variator 35 of the present invention. The output shaft 36 from the variator 35 has a fixed connection within the variator to the output shaft

33 of differential 32 and is utilized to drive the total gallons counter 37. The output shaft 38 from variator 35 is connected by variable transmission means within variator 35 as described in detail hereafter to the output shaft 33 of differential 32 and is utilized to drive the price counter 39. Actually, the total gallons counter 37 and price counter 39 are preferably contained in a single instrument such as the register disclosed in the Bliss Patent No. 2,814,444 granted November 26, 1957.

The output shaft 31 of the additive meter 23 and the output of differential 32, through connection 40, are connected to the blend control 41 which may be of the type disclosed in the Young Patent No. 2,880,908 granted April 7, 1959. As described in said patent, the blend control is comprised essentially of a differential to which the input shafts are connected in opposition and a speed-change mechanism interposed between one of the input shafts and the differential. The output of the differential denoted by the solid line 42 is utilized to set the valve 16. The connecting line 43 denotes a shaft or linkage whereby the setting of the variator is transmitted to the speed-change mechanism of the blend control 41 so that the two may be set simultaneously and in unison, i.e., when the variator 35 is set to a different price corresponding to a different grade, the blend control 41 is also set to adjust the valve 16 to provide the selected different grade.

Turning now to the details of the embodiment of a quick-change variator 35 of the present invention as shown in the remaining figures of the drawings, it will be noted that the variator is housed for convenience in a frame comprising a top plate 50, a bottom plate 51 and an intermediate plate 52 supported in spaced relationship by the corner posts 53. A front face plate 54 is also secured to the frame as shown in FIG. 3. The variator comprises three main groupings of parts which will be referred to hereinafter as the speed-change gearing, the price-selecting mechanism and the shifting mechanism.

Referring first to the speed-change gearing, this includes three separate stacks of gears of varying diameter indicated generally at 61, 62 and 63 and mounted on the shafts 64, 65 and 66, respectively. Since these stacks may conveniently be duplicates of each other and are so shown in the drawings, the description of one will apply to all three. Each stack of gears comprises two separate gear clusters, the first of which includes the gears 70–76 and the second of which includes the gears 77–80. The first cluster of gears 70–76 are secured together in any convenient manner so that they will rotate in unison but are otherwise free to rotate on the shaft on which they are mounted. The second cluster of gears 77–80 are keyed to the shaft so as to rotate therewith. The first and second clusters on the shaft 64 and the first and second clusters on the shaft 65 are geared together by a composite idler gear consisting of a large gear 85 meshing with gears 74 and having a common hub with small gear 86 meshing with gears 77. The composite idler is mounted on the vertical shaft 87. The relative sizes of the gears 85 and 86 and the gears 74 and 77 with which they respectively mesh are such that a step-up in speed of rotation from the lower cluster to the upper cluster is achieved. In the specific embodiment the resulting gear ratio is 4 to 1 so that the top cluster rotates as a unit at four times the speed of the lower cluster. In similar manner the upper and lower clusters of gears on shaft 66 are geared together and also with the gear clusters on the shaft 65 by the composite idler gear consisting of the larger gear 88 and smaller gear 89 mounted on the shaft 90. The sizes, i.e., number of teeth, of the various gears of the stacks of gears taken together with the relative speed of rotation of the two clusters in each stack is such that an output drive is provided which, starting with the bottom gear 80 and proceeding in sequence through to the gear 70 is in the relative proportions of 1, 2, 3, 4, 6, 8, 10, 11, 9, 7 and 5. When the variator is to be used with a decimal money system, which is the case in the specific embodiment shown in the drawings, the gears 73 and 74 providing the peripheral speed ratios of 10 and 11 are not utilized as counter driving gears but these gears would be utilized in the event the variator is to be operated for other than a decimal money system such as for example, the British monetary system.

As will be apparent, all of the gears described above will turn simultaneously and a driving connection to operate all of the stacks of gears could be provided by utilizing any of the shafts 64, 65, 66, 87 or 90. In the specific embodiment the central shaft 65 supporting the stack 62 has been selected for this purpose and this shaft is extended so that it projects through the journals in the top plate 50 and bottom plate 51. Shaft 65 is provided at its lower end with a coupling 91 by means of which it may be connected to the drive shaft 33 of the differential 32 referred to in connection with the description of FIG. 1 and the upper end of shaft 65 is provided with a coupling 92 for connection to the connecting shaft 36 of the total gallons counter 37 also referred to in connection with FIG. 1. Thus, the shaft 65 with its couplings 91 and 92 provides a direct drive connection between the differential 32 and the total gallons counter 37.

Associated with each stack of gears 61–63 is a series of range arms or levers 93 mounted in vertically stacked relationship on a pivotal axis parallel to the axis of the gear stack. One series of range levers 93 is pivotally mounted on the vertical supporting rod 94 for cooperation with the stack of gears 63 while the second series of range levers 93 are similarly mounted for pivoting movement on the vertical rod 95 for coaction with the stack of gears 62; and the third series of range arms 93 is pivotally mounted on the vertical rod 96 for cooperation with the stack of gears 61. As best shown in FIGS. 6 and 9, each range lever 93 carries at one end a takeoff gear 97 which is intended to mesh with the individual gears 70–80 with which it is aligned. The takeoff gears 97 supported by the range levers 93 mounted on the vertical rod 94 are in continuous mesh with an elongated gear 98 extending between the bottom plate 51 and intermediate plate 52 and fixed to a range shaft 100. In similar manner the takeoff gears 97 supported by the range arms 93 which are pivotally supported on the vertical rod 95 are in continuous mesh with an elongated gear 101 fixed to the range shaft 102. In like manner the takeoff gears 97 supported by the range levers 93 supported on vertical rod 96 are in continuous mesh with the elongated gear 103 secured to the range shaft 104. The range levers 93 are biased by springs 105 in a counterclockwise direction as viewed in FIG. 6 of the drawings so that takeoff gear 97 thereon will be urged into mesh with the aligned gear of the stack of gears with which it is associated. Stops 106 limit counterclockwise pivoting of the levers 93 and thus avoid undue pressure of the gears. By pivoting the range levers 93 in a clockwise direction, the range gears 97 associated therewith may be moved out of mesh with the stack of gears, but this movement is not sufficient to take the range gears 97 out of mesh with the elongated gears 98, 101 and 103, respectively. As will be explained more fully hereinafter in connection with the description of the shifting mechanism and price-selecting mechanism, only one range lever of each series will be permitted at one time to pivot in a counterclockwise direction so that its takeoff gear 97 will form a driving connection between one of the gears of the stack of gears and the elongated gear 98, 101 or 103.

The driving movement applied to the elongated gears 98, 101 and 103 by the mechanism just referred to is combined by means of the differentials indicated generally at 105 and 106 interconnecting the shafts 100, 102 and

104, the differentials being conveniently located between the intermediate plate 52 and the top plate 50. As best shown in FIG. 4 of the drawings, the shaft 104 is provided with a gear 110 which is connected by idler 111 to the cage of the differential 105 and the differential 105 is connected to the differential 106 by the idler gear 112. The combined output is then transmitted to the final output shaft 113 provided with the coupling 114 which is connected to the driving connection 38 between the variator 35 and the price counter 39 as described in connection with FIG. 1 of the drawings. The gear ratios provided by the differentials 105 and 106 and connecting gearing is such that the selection of different range levers 93 cooperating with the stack of gears 61 will produce an output varying relatively within the range of 1/10 to 9/10 at the final output shaft 113. Thus, for convenience the stack of gears 61 will be referred to as the "tenths" gear stack. Similarly, the selection of different range levers associated with the stack of gears 62 hereinafter referred to as the "units" gear stack will produce a final output varying relatively within the range of one cent to nine cents. The selection of different range levers 93 of the series cooperating with the stack of gears 63 hereinafter referred to as the "tens" gear stack will provide an output ranging in the relationship of from ten cents to ninety cents. In addition to the series of nine range levers 93 associated with each stack of gears 61–63, there is a lowermost range arm 93 which is disposed below the stack of gears so as to be engageable with a stop pin 115 mounted in the base plate 51 adjacent each stack of gears. The stop pins 115 provide a lock-out setting preventing rotation of the range gear of the lowermost additional range arm and hence locking the elongated gears 98, 101 and 103 against movement which provides the zero setting for each range.

Turning now to the price-selecting mechanism, it will be noted that situated at the front end of the variator are three turrets 120, 121 and 122 which are keyed, respectively, to the rotatable shafts 123, 124 and 125. For convenience as best shown in FIG. 8, each turret is a composite structure comprised of individual segments 126 maintained in contiguous stacked relationship by springs 129. Since the specific embodiment of the variator shown is designed for use with a blender for dispensing seven different grades or blends, the segments 126 are heptagon in shape, i.e., they have as many sides or faces as the number of grades or blends to be dispensed. Intermediate each adjacent pair of segments and at each face thereof there is journaled an eccentric lug or stop 127. A slot 128 at the outer end of each lug 127 provides a convenient means by which the lug may be turned by a suitable tool such as a screwdriver so that the lug will extend offset to the left or to the right as viewed in FIGS. 3 and 8.

The turrets are located, as best shown in FIG. 6, so that lugs 127 extending from the lefthand face thereof as viewed in FIG. 6 will cooperate with the extending tip portions 130 of the range levers 93. In the event that the lugs 127 are turned to the right of the centerline as shown in FIG. 6, hereinafter referred to as the releasing position, the tip portion 130 of the range lever 93 will not be engaged and the range lever will be permitted to pivot so that its range gear 97 will mesh with the aligned gear of the associated stack of gears. However, if the lug is turned in the opposite direction, the tip portion 130 of the range lever 93 will be engaged and stopped so that it cannot pivot sufficiently to mesh its range gear 97 with one of the stack of gears. It thus will be apparent that by proper presetting of the lugs 127 any range gear of the tens units and tenths gear stacks can be selected for each setting of the turrets. The turret shafts 123, 124 and 125 are provided at their upper ends with gears 131, 132 and 133 fixed thereto which are interconnected by idlers 134 and 135. A drive gear 136 connected to drive shaft 137 and meshing with gear 131 is provided to turn the turrets in unison to the seven rotated operative positions.

In order to facilitate the presetting of the turret lugs, a number wheel 140 is secured to the turret shaft 124 so as to rotate therewith and it has indicia thereon such as the numbers 1 to 7 to indicate the blend whose price is being set by the outermost rows of lugs 127. The end wall 54 is apertured at 141 to expose the number wheel 140 and also has additional apertures 142 registering with and exposing the lugs 127 which are to be set by the operator for each blend. Suitable indicia extending along the sides of the apertures 142 assist the operator in selecting the proper lugs 127 to be turned to arrive at the selected price.

Turning now to the shifting mechanism, this comprises three cam stacks 150, 151 and 152 secured respectively to the rotatable shafts 154, 155 and 156. The cam stack 150 is intended for cooperation with the series of range levers 93 associated with the tens gear stack 63, while cam stack 151 cooperates with the range levers 93 of the units gear stack 62 and cam stack 152 cooperates with the range levers 93 of the tenths cam stack 61. For convenience, each stack cam stack is composed of a series of individual cams 157, one cam 157 being provided for each range lever 93. Each cam 157 has a radial notch 158 therein for cooperation with a projection 159 on each of the range levers 93, the arrangement being such that when the cam is in rotated position so that the notch 158 therein is in registry with the projection 159 of a range lever 93, the range lever 93 will be permitted to pivot in a counterclockwise direction as viewed in FIG. 6 to permit its takeoff or range gear 97 to mesh with the aligned gear of the associated gear stack. However, in all other rotated positions the cam will move or hold the range lever in the retracted position so that its range gear 97 is out of mesh with the associated gear stack.

Each of the shafts 154, 155 and 156 projects upwardly through journals in the top plate 50 and has a gear 160 secured thereto. The gear 160 on shaft 154 meshes with a gear 161 freely mounted on the upper extension of shaft 123 and to which is secured a tens price wheel 162 bearing indicia from 0 through 9 in the same order as the gear settings previously described plus a blank space or gap between the 0 and 5. The gear 160 on shaft 155 meshes with a gear 163 freely mounted on the upper extension of shaft 124 and to which is secured a units price wheel 164 bearing similar indicia from 1 to 9 plus a blank space between the 0 and 5. The gear 160 on shaft 156 meshes with a gear 165 freely mounted on the upper extension of shaft 125 and to which is secured a tenths price wheel 166 bearing indicia from 0 to 9/10 in the same order as described above plus a blank space between 0 and 5/10. The variator is intended to be mounted so that the price wheels 162, 164 and 166 are visible to the customer to indicate the unit price for which the variator has been set.

The individual cams 157 of the cam stacks 150, 151 and 152 are secured in relative rotated positions on the shafts 154, 155 and 156 so that the positions of the notches 158 therein are correlated with the numbers on the price wheels 162, 164, 166. For example, when the price wheel 162 is rotated to expose the numeral 1, then the cam 157 on shaft 154 for releasing the range lever 93 which meshes its takeoff gear 97 with the ten output gear (gear 80) of the tens gear stack 63 is in rotated position so that its notch 158 will receive the projection 159 of that range lever and all other range levers associated with that gear stack will be cammed out of meshing position. Similarly, when the numeral 2 is exposed, the cam 157 on shaft 154 for releasing the range lever 93 and its takeoff gear 97 for meshing with the twenty output gear (gear 79) will be in rotated position so that its notch 158 will receive the projection 159 of that range lever and all other range levers will be cammed, and so on through-

out the whole range of numbers of the number wheel. In the rotated position of the number wheel where the blank between the 0 and 5 is exposed, all of the cams 157 will have their notches 158 out of registry with the projections 159 of the range levers 93 and thus all of the range levers 93 will be cammed out of meshing position. A similar correlation will exist between the various positions of price wheel 164 and the position of notches 158 in the cams 157 on shaft 155 and between the various positions of price wheel 166 and the position of notches 158 in the cams 157 on shaft 156.

Each of the shafts 154, 155 and 156 is individually biased in a clockwise direction as viewed in FIG. 2 of the drawings by a winding spring 170 secured at one end to the shaft and at the other end to the intermediate plate 52 of the spring. The shafts 154, 155 and 156 can be turned in the opposite or counterclockwise direction manually against the force of the springs 170 by a pick-up drive arrangement comprising the gears 171 loosely mounted on shafts 123, 124 and 125 interconnected by idlers 172. Gear 173 on control shaft 174 and meshing with one of the gears 171 is provided to actuate the gear train just described. Each gear 171 has an upwardly projecting pin 175 adapted to engage a shoulder 176 on the gear 161, 163 or 165 immediately above it so as to pick up this gear at whatever rotated position it is in and return it to a fixed starting or initial position which is that which positions the number wheel secured to that gear in the blank position in which position, as previously described, all of the range levers 93 are cammed out of meshing position.

As will be apparent from the above description, when the control shaft 174 is rotated so as to cause the gears 161, 163 and 165 to be turned to place the shifting mechanism in blank position, all of the range levers 93 will be pivoted to non-meshing position which will dispose the tip portions 130 of all of these levers away from the turrets 121, 122 and 123. As a consequence, the turrets 121, 122 and 123 can then be turned using the blend selector shaft 137 to position the turrets in the rotated position for the selected blend. Following this operation, the operator can then turn the control shaft 174 in the opposite direction to back off the gears 171 so that the pins 175 no longer engage the shoulders 176 and thus release the gears 161, 163 and 165 which, in turn, release the price wheels 162, 164 and 166 and the shafts 154, 155 and 156 carrying the cam stacks 150, 151 and 152 for return rotation under the influence of springs 170. As the cam stacks 150, 151 and 152 and price wheels 162, 164 and 166 rotate in the return direction, the range arms will be released in sequence by the notches 158 of the cams 157. However, only a range arm having its tip portion 130 unblocked by a lug 127 on the associated turret 121, 122 or 123 which has been turned to the releasing position will be permitted to pivot to meshing position. When such a range arm is released by both the cam stack and the turret, the projection 159 of that range arm will fall into the notch 158 of the associated cam 157 and stop the cam stack from any further rotation. As will be observed, the shape of the projections 159 is such that the range levers 93 can readily be cammed to non-meshing position when the cam stacks are rotated in a counterclockwise direction as viewed in FIG. 6 but will interlock with the notches when the reverse movement takes place. Accordingly, when each cam stack 150, 151 and 152 has been brought to a halt in its return movement by the coincidence of a notch 158 of one of the cams 157 thereof registering with the projection 159 of a range lever 93 at the same time that the tip portion 130 of that range arm registers with a lug 127 of the associated turret which has been turned to the releasing position, then the preselected gear of the associated gear stack will be meshed with a takeoff gear 97 as predetermined by the turret setting and the associated price wheel will show the setting.

In order to provide means to permit the carrying out of the foregoing sequence of operations in proper order, a single control handle may be provided as shown in the exemplary embodiment illustrated in FIG. 7 of the drawings. Referring to FIG. 7 of the drawings, it will be noted that a knob 180 is mounted on the exterior of the housing 181 of the gasoline dispensing apparatus and that it has a pointer 182 cooperating with indicia on the housing indicating the particular blends for which the variator and blend control may be set. The knob 180 is connected to a shaft 183 which is mounted for both rotational and axial sliding movement. Fixed to the shaft 183 near its outer end adjacent the knob 180 is a cylindrical rack 184 which meshes with the cam stack control gear 173. Next adjacent the cylindrical rack 184 is a bevel gear 186 which is keyed to the shaft 183 but arranged so that the shaft 183 can slide axially with respect thereto. The bevel gear 186 meshes with a bevel gear 135 which is secured to the blend selector shaft 137, the lower end of which is secured to the gear 136. The inner end of shaft 183 extends through a locking ring segment 187 and has a pin 188 secured thereto for cooperation with notches 189 of the locking ring 187. The shaft 183 is biased outwardly by the spring 190. The shaft 183 may be secured by the linkage 43 shown diagrammatically in FIG. 1 of the drawings to the blend control apparatus 41 so that the blend control will be set simultaneously with the setting of the variator.

As will be apparent from the foregoing description, in order to change the setting of the variator and the blend control apparatus 41 the operator will first thrust in the knob 180 which will move the shaft 183 axially inwardly causing the rack 184 to turn the gear 173 which, in turn, will move the cam stacks to the blank position. At the same time the pin 188 is withdrawn from the locking ring segment 187 to permit the shaft to be turned. The operator may then turn the knob 180 which will drive the bevel gear 185 and thus turn the turrets 121–123 to the selected blend which, as previously mentioned, will be indicated to the operator by the indicia cooperating with the pointer 182. The operator may then withdraw the shaft or merely release it for return movement by the spring 190 which will cause reverse rotation of the gear 173 thereby releasing the cam stacks 150–152 for return movement so as to release the desired range levers 93 to establish the variator drive at the desired price rate and causing the established price to be exhibited by the price wheels 162, 164 and 166. The pin 188 will thereupon reenter one of the notches 189 of the locking ring segment 187 to lock the setting mechanism. The notches 189 in the locking ring segment 187 correspond, of course, with the blend numbers displayed at the exterior of the casing.

It is believed that the operation of the variator of the present invention will be apparent from the foregoing detailed description of the apparatus taken together with the following brief explanation. Before placing the variator in operation, the operator will first precondition or preset the variator to provide the desired speed changes corresponding to the established prices for each of the grades to be dispensed. In order to accomplish the presetting, the operator will thrust in the knob 180 so as to move the cam stacks 150, 151 and 152 to the blank position thus camming out all of the range arms 93 so that there is no interference of the tip portions thereof with the turrets 121–123. The operator can thereafter turn the knob 180 to rotate the turrets to each of the blend settings as indicated by the number wheel 140. At each setting a row of lugs 127 on each of the turrets 121, 122 and 123 will be exposed at the apertures 142 in the end plate 54. By means of a screwdriver or similar implement, the operator can turn the selected lugs at each setting to provide the desired price for the particular grade or blend to be dispensed at that setting. After each row of lugs of all of the turrets has been thus set, the variator is then preconditioned for use in a dispensing opera-

tion. As will be apparent, each price setting of each grade or blend may be established independently of the price of any other grade or blend if desired.

As previously described, the operator by manipulation of the knob **180** and shaft **183** can thereafter change the blend and set the variator for the established price of that blend or grade at will. In the event that the same grade or blend is to be dispensed in a subsequent dispensing operation, no manipulation of the knob **180** is required. However, when a change is desired, the change may be accomplished in a quick, simple and easy manner by pushing in on the knob **180**, turning it to the new blend and then releasing it to return to original position. As will be readily apparent, the control or setting mechanism as shown in FIG. 7 is readily suitable for remote actuation in any known manner.

It thus will be seen that there has been provided in accordance with the invention an extremely compact and useful variator having a wide range of settings and which is convenient, easy and simple both to preset for the various settings desired and also arranged for quick setting to the different grades or blends and the corresponding prices thereof desired in a specific dispensing operation. It is contemplated that variations in the specific embodiment disclosed will be apparent to one skilled in the art and all such variations and modifications are intended to be included within the scope of the invention.

I claim:

1. A quick-change variator for use with a cost register comprising driving means, a plurality of drive gears driven by the driving means at different peripheral speeds, a takeoff gear associated with each of the respective drive gears, output drive means for operation by the takeoff gears, and presettable means for rendering at least one of the takeoff gears operable to form a driving connection between the respective drive means and the output drive means and rendering the remaining takeoff gears inoperable to form a driving connection, said presettable means having a plurality of operating positions and a series of presettable elements operable in each operating position for controlling the takeoff gears, said series of presettable elements operable in each operating position being relatively adjustable so as to selectively cause formation of a driving connection with a preselected drive gear in each position of the presettable means.

2. A quick-change variator for use with a cost register or the like comprising driving means, a plurality of drive gears driven by the driving means at different peripheral speeds, a takeoff gear associated with each of the respective drive gears, means mounting the takeoff gears for movement into and out of mesh with the respective drive gears, output drive means operably connected to the takeoff gears, movable programming means having a plurality of settable positions, and means including presettable elements on the programming means operable responsive to the selected position of the programming means for meshing at least one of the takeoff gears with its respective drive gear and retaining the remaining takeoff gears out of mesh, said elements operable in each position of the programming means being relatively adjustable so as to selectively cause meshing with a selected drive gear in each position of the programming means.

3. A quick-change variator for use with a cost register or the like comprising driving means, a plurality of drive gears driven by the driving means at different peripheral speeds, a pivotally mounted range arm associated with each of the respective drive gears, a takeoff gear mounted on each range arm for movement into and out of mesh with the respective drive gears, output drive means operably connected to the takeoff gears, shifting means for pivoting the range arms to move the takeoff gears into and out of mesh with the drive gears, and presettable programming means for preventing selected range arms from being pivoted into meshing position by the shifting means.

4. A quick-change variator as set forth in claim 3 wherein the plurality of drive gears comprises two groups of gears of different diameters and wherein the two groups of gears are driven at different rotational speeds.

5. A quick-change variator for use with a cost register or the like comprising driving means, a plurality of drive gears driven by the driving means at different peripheral speeds, a plurality of movable range arms, one range arm being associated with each of the respective drive gears, a take-off gear mounted on each range arm for movement therewith into and out of meshing position with the respective drive gears, output drive means connected to the take-off gears, shifting means for moving the range arms to and from a position wherein the take-off gears mesh with the drive gears, and movable programming means having a plurality of selective positions, said programming means being presettable in each of said selective positions to permit at least one range arm to move to meshing position and preventing such movement by the remaining range arms.

6. A quick-change variator as set forth in claim 5 wherein the shifting means comprises a movable cam having first camming surfaces for positioning all of the range arms in nonmeshing position and having second camming surfaces for sequentially positioning the range arms in meshing position in predetermined sequence.

7. A quick-change variator as set forth in claim 6 wherein a price indicator is connected to the movable cam for movement therewith.

8. A quick-change variator for use with a cost register or the like comprising a stack of coaxially arranged drive gears, means for rotating the drive gears, a plurality of pivotally mounted range levers in stacked relationship adjacent the stack of drive gears, one range lever being provided for each of the respective drive gears, a takeoff gear mounted on each range lever for movement into and out of mesh with the respective drive gears, shifting means for pivoting the range levers to and from a position wherein the takeoff gears mesh with the drive gears, output drive means connected to the takeoff gears, and rotatable programming means having means engageable with the range levers in various rotated positions of the programming means to permit one preselected range lever to move into meshing position and preventing such movement by the remaining range levers.

9. A quick-change variator as set forth in claim 8 wherein the programming means is a rotatable turret having a plurality of rotated positions and provided with longitudinally arranged rows of individually adjustable stop elements, said rows of stop elements being positioned for movement selectively into position for engaging the range levers by rotation of the turret.

10. A quick-change variator as set forth in claim 9 wherein the turret is polygonal in cross section and the stop elements are eccentrically mounted for adjustment into and out of range lever engaging position.

11. A quick-change variator as set forth in claim 8 wherein a fixed stop is mounted adjacent the stack of drive gears and an additional range lever is provided having a takeoff gear movable with said additional range lever into and out of engagement with the fixed stop.

12. A quick-change variator for use with a cost register or the like comprising a stack of coaxially arranged drive gears, means for rotating the drive gears, a plurality of pivotally mounted range levers in stacked relationship adjacent the stack of drive gears, one range lever being provided for each of the respective drive gears, a takeoff gear mounted on each range lever for movement therewith into and out of mesh with the respective drive gears, output drive means connected to the takeoff gears, shifting means including a rotatable cam member having surfaces engageable with the levers to cam the levers to position with the takeoff gears out of mesh with the stack of drive gears when the cam is rotated in one direction and having other surfaces for releasing the levers in pre-

determined sequence as the cam is rotated in the opposite direction, and presettable programming means for conditioning a selected lever for release by the rotatable cam and preventing release of the remaining levers, said cam being engageable with the released levers to halt further turning movement of the cam in said opposite direction.

13. A quick-change variator as set forth in claim 12 wherein means is provided to oscillate the rotatable cam by turning it first in said one direction and then in the opposite direction, and a price indicator is connected to the rotatable cam.

14. A quick-change variator for use with a cost register or the like comprising a stack of coaxially arranged drive gears, means for rotating the drive gears, a fixed stop adjacent the stack of drive gears, a plurality of pivotally mounted range levers in stacked relationship adjacent the stack of drive gears, a range lever being generally aligned with each drive gear and an additional range lever being generally aligned with the stop, a takeoff gear mounted on each range lever movable therewith into an engaging position for engagement with the respective drive gears and stop, means biasing the levers into engaging position, a rotatable cam engageable with the levers during rotation in one direction to position the levers away from engaging position and for releasing the levers in predetermined sequence as the cam is rotated in the opposite direction, said cam having means engageable with the released lever to halt rotation of the cam in said opposite direction, and a rotatable programming turret having a plurality of rotated positions and having a row of adjustable stops effective in each rotated position for permitting release of only one of the range levers.

15. A quick-change variator as set forth in claim 14 wherein means is provided to turn the rotatable cam in said one direction to move all of the range levers out of engaging position and to then turn the turret to selected rotated position and thereafter return the rotatable cam in the opposite direction.

16. A quick-change variator as set forth in claim 15 wherein a spring is provided to bias the rotatable cam in said opposite direction and pick-up means is provided to turn the rotatable cam in said one direction to a predetermined rotated position.

17. A quick-change variator as set forth in claim 16 wherein a price indicator is connected to the rotatable cam for rotation therewith, said price indicator having a blank corresponding to said predetermined rotated position of the cam and having indicia corresponding to the remaining rotated positions of the cam.

18. A quick-change variator for use with a cost register or the like comprising a stack of coaxially arranged drive gears, means for rotating the drive gears, a plurality of pivotally mounted range levers in stacked relationship adjacent the stack of drive gears, one range lever being provided for each of the respective drive gears, a takeoff gear mounted on each range lever for movement therewith into and out of mesh with the respective drive gears, means biasing the range levers into meshing position, output drive means connected to the takeoff gears, a cylindrical cam member mounted for rotation on an axis parallel to that of the drive gears, said range levers having projections engaging the cam member for retaining the range levers away from meshing position, said cam member having longitudinally spaced recesses in staggered radial positions for cooperation with the projections of the range levers to release the range levers in predetermined sequence as the cam member is rotated in one direction, and programming means presettable to condition a selected range lever for release by the cam member and preventing release of the remaining levers.

19. A quick-change variator for use with a cost register or the like comprising a stack of coaxially arranged drive gears, means for rotating the drive gears, a plurality of pivotally mounted range levers in stacked relationship adjacent the stack of drive gears, one range lever being provided for each of the respective drive gears, a takeoff gear mounted on each range lever for movement therewith into and out of mesh with the respective drive gears, means biasing the range levers into meshing position, output drive means connected to the takeoff gears, programming means for conditioning one preselected range lever for movement to meshing position and for preventing such movement of the remaining range levers, a cylindrical cam member mounted for rotation on an axis parallel to that of the drive gears, said range levers having projections engaging the cam member, said cam member having longitudinally spaced notches in angularly related radial positions for cooperation with the projections of the range levers, said notches and projections being configured to cause the range levers to be cammed to nonmeshing position when the cam member is turned in one direction and to release the levers in predetermined sequence for movement to meshing position and to interlock with the range lever released by the programming means when the cam member is turned in the opposite direction, a price indicator connected to the cam member for rotation therewith, means biasing the cam member in said opposite direction, and pick-up means for driving the cam member in the said one direction to a predetermined initial position.

20. A quick-change variator for use in gasoline dispensing equipment of the type having a variable blend control and metering means, said variator comprising driving means for connection to the metering means of gasoline dispensing equipment, a plurality of coaxially arranged drive gears operated at varying peripheral speeds by said driving means, a set of pivotally mounted range arms in stacked relationship, each range arm being associated with one of the drive gears, a takeoff gear carried by each of the said range arms for movement therewith into mesh with the drive gears, output drive means connected to the takeoff gears, a rotatable programming member having circumferentially spaced groups of settable means for preselecting the range arms to be moved to meshing position, shifting means for moving all of the range arms out of meshing position and for releasing the range arms in predetermined sequence for movement to meshing position, and setting means for operating the shifting means and turning the programming member in sequence, said setting means having means for connection to a variable blend control for simultaneous operation therewith.

21. A quick-change variator for use with a cost register or the like comprising driving means, a plurality of stacks of coaxially arranged drive gears operated at varying peripheral speeds by said driving means, a set of movably mounted range arms associated with each stack of drive gears, a takeoff gear carried by each of said range arms for movement therewith into and out of mesh with one of the respective drive gears, means connected to the takeoff gears including a differential for combining the output of the takeoff gears in predetermined ratio, shifting means associated with each set of range arms for moving the range arms away from meshing position and for returning the lever arms to meshing position in predetermined sequence, presettable programming means for conditioning preselected levers for movement to meshing position by the shifting means, and price-indicating means connected to the shifting means.

22. A quick-change variator for use with a cost register or the like comprising driving means, a plurality of stacks of coaxially arranged drive gears operated at varying peripheral speeds by said driving means, a set of movably mounted range arms associated with each stack of drive gears, a takeoff gear carried by each of said range arms for movement therewith into and out of mesh with one of the drive gears, means for combining the output

of the takeoff gears in predetermined ratio, a rotatable programming member for each set of range arms having circumferentially spaced groups of settable means for preventing movement of the range arms into meshing position, and a cam member associated with each set of range arms having means for camming all of the range arms out of said pivoted position and for releasing the range arms in predetermined sequence, and means for actuating the cam members and programming members in sequence.

23. A quick-change variator for use with a cost register or the like comprising driving means, a plurality of stacks of coaxially arranged drive gears operated at varying peripheral speeds by said driving means, a set of pivotally mounted range arms associated with each stack of drive gears, a takeoff gear carried by each of said range arms, said range arms being arranged in stacked range arms, said range arms being arranged in stacked relationship so that one takeoff gear can be meshed with each drive gear of the stack, means including a differential combining the output of the takeoff gears in predetermined ratio, a rotatable programming turret for each set of range arms having groups of settable means for preventing movement of the range arms into meshing position, means for rotating the turrets in unison to select the groups of settable means operable to control the range arms, a cam member associated with each set of range arms having means for camming all of the range arms out of meshing position and for releasing the range arms in predetermined sequence, and single control means for oscillating the cam members.

24. A quick-change variator for use with a cost register or the like comprising driving means, a plurality of stacks of coaxially arranged drive gears operated at varying peripheral speeds by said driving means, a set of pivotally mounted range arms associated with each stack of drive gears, a takeoff gear carried by each of said range arms, said range arms being arranged in stacked relationship so that one takeoff gear can be meshed with each drive gear of the stack, means including a differential combining the output of the takeoff gears in predetermined ratio, a rotatable programming turret for each set of range arms having groups of settable means for engagement with the range arms to prevent movement of the range arms into meshing position, said turrets being rotatable into different rotated positions to condition a selected group of settable means for engagement with the range arms, a rotatable cam associated with each set of range arms having means for camming all of the range arms out of said pivoted position and for releasing the range arms in predetermined sequence, and a price indicator wheel connected to each cam.

25. A quick-change variator for use in gasoline dispensing equipment of the type having metering means, said variator comprising driving means for connection to the metering means of gasoline dispensing equipment, a plurality of stacks of coaxially arranged drive gears operated at varying peripheral speeds by said driving means, a fixed stop adjacent each stack of gears, a set of pivotally mounted range arms associated with each stack of drive gears and fixed stop, a takeoff gear carried by each of said range arms, said range arms being arranged in stacked relationship so that one takeoff gear can be meshed with each drive gear of the stack and one with a fixed stop, means biasing the range arms into pivoted position for meshing the takeoff gears with the drive gears and stop, an elongated gear associated with each stack of range arms and in mesh with the takeoff gears, means including a differential combining the output of the elongated gears in predetermined ratio, a programming turret for each set of range arms having settable means for preventing movement of the range arms into said pivoted position, a cam stack associated with each set of range arms having means for camming all of the range arms out of said pivoted position and for releasing the range arms in predetermined sequence, and a price indicator associated with each cam stack responsive to movement of the cam stack.

26. A quick-change variator for use in gasoline dispensing equipment of the type having metering means, said variator comprising driving means for connection to the metering means of gasoline dispensing equipment, a plurality of stacks of coaxially arranged drive gears operated at varying peripheral speeds by said driving means, a fixed stop adjacent each stock of gears, a set of pivotally mounted range arms associated with each stack of drive gears and fixed stop, a takeoff gear carried by each of said range arms, said range arms being arranged in stacked relationship so that one takeoff gear can be meshed with each drive gear of the stack and one with a fixed stop, means biasing the range arms into pivoted position for meshing the takeoff gears with the drive gears and stop, an elongated gear associated with each stack of range arms and in mesh with the takeoff gears, means including a differential combining the output of the elongated gears in predetermined ratio, a programming turret for each set of range arms having groups of settable means for preventing movement of the range arms into said pivoted position, said turret being rotatable to move a selected group of settable means into position for cooperation with the range arms, a cam stack associated with each set of range arms having means for camming all of the range arms out of said pivoted position when the cam stacks are rotated in one direction and for releasing the range arms in predetermined sequence when the cam stacks are rotated in the opposite direction, said cam stack being engageable with a range arm simultaneously released by a turret and the cam stack to halt movement of the cam stack in said opposite direction, and a price indicator associated with each cam stack positioned responsive to movement of the cam stack.

27. A quick-change variator for use in gasoline dispensing equipment of the type having a variable blend control and metering means, said variator comprising driving means for connection to the metering means of gasoline dispensing equipment, a plurality of stacks of coaxially arranged drive gears operated at varying peripheral speeds by said driving means, a fixed stop adjacent each stack of gears, a set of pivotally mounted range arms associated with each stack of drive gears and fixed stop, a takeoff gear carried by each of said range arms, said range arms being arranged in stacked relationship so that one takeoff gear can be meshed with each drive gear of the stack and one with the fixed stop, means biasing the range arms into pivoted position for meshing the takeoff gears with the drive gears and stop, an elongated gear associated with each stack of range arms and in mesh with the takeoff gears, means including a differential combining the output of the elongated gears in predetermined ratio, a programming turret for each set of range arms having rows of settable means for preventing movement of the range arms into said pivoted position, said turret being rotatable to move a selected row of settable means into position for cooperation with the range arms, a cam stack associated with each set of range arms having means for camming all of the range arms out of said pivoted position when the cam stack is rotated in one direction and for releasing the range arms in predetermined sequence when the cam stack is rotated in the opposite direction, said cam stack being engageable by a range arm released by the turret and cam stack to halt movement of the cam stack in said opposite direction, a price indicator associated with each cam stack responsive to movement of the cam stack, means biasing the cam stack in said opposite direction, and control means for rotating the cam stacks in said one direction and for rotating the turrets in sequence and thereafter releasing the cam stacks for rotation in said opposite direction, said control means being connectable to the variable blend control for simultaneous setting of the variator and blend control.

28. A quick-change variator for use with a cost register or the like comprising a plurality of drive gears rotated at different peripheral speeds, stop means located adjacent said drive gears, a plurality of stacks of pivotally mounted range levers adjacent said drive gears and stop means, a takeoff gear mounted on each range lever, one of the range levers of each stack being pivotal to an operating position wherein the takeoff gear thereof is in engagement with the stop means and each of the remaining range levers of each stack being individually pivotal to an operating position wherein the takeoff gear thereof is in engagement with a predetermined one of the drive gears, output drive means associated with each stack of range levers and continuously drivingly connected to all the takeoff gears of the associated stack, differential means combining the output of the output drive means of the respective stacks, and programming means for concomitantly moving a selected single range lever of each stack into operating position.

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