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Burzen

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[54] **CONTROL MEANS FOR ADJUSTING THE VEND PRICE OF A COIN HANDLING MECHANISM**

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[52] **U.S. Cl.** ..... **194/1 L**; 194/9 R

[51] **Int. Cl.²** **G07F 9/00**

[58] **Field of Search** ..... 194/1 L, 9 R, 9 T, 10

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Assistant Examiner—H. Grant Skaggs, Jr.
Attorney, Agent, or Firm—Gravely, Lieder & Woodruff

[57] **ABSTRACT**

The control unit for a coin handling mechanism of a vending machine includes a rotatable cam having sections which can be displaced relative to each other about the axis of rotation for the cam. The one section carries a rotatable adjusting element which is offset radially from the cam axis, and this adjusting element has a spur gear which engages a gear segment on the other cam section. Thus, when the adjusting element is rotated, one cam section is angularly displaced relative to the other. The two sections have lobes at their peripheries and these lobes operate switches. The angular interval between the operation of the switches varies according to the relative positions of the cam sections, and this enables the control unit to adjust for different sale prices. A solenoid actuator rotates the cam in incremental advances.

13 Claims, 7 Drawing Figures

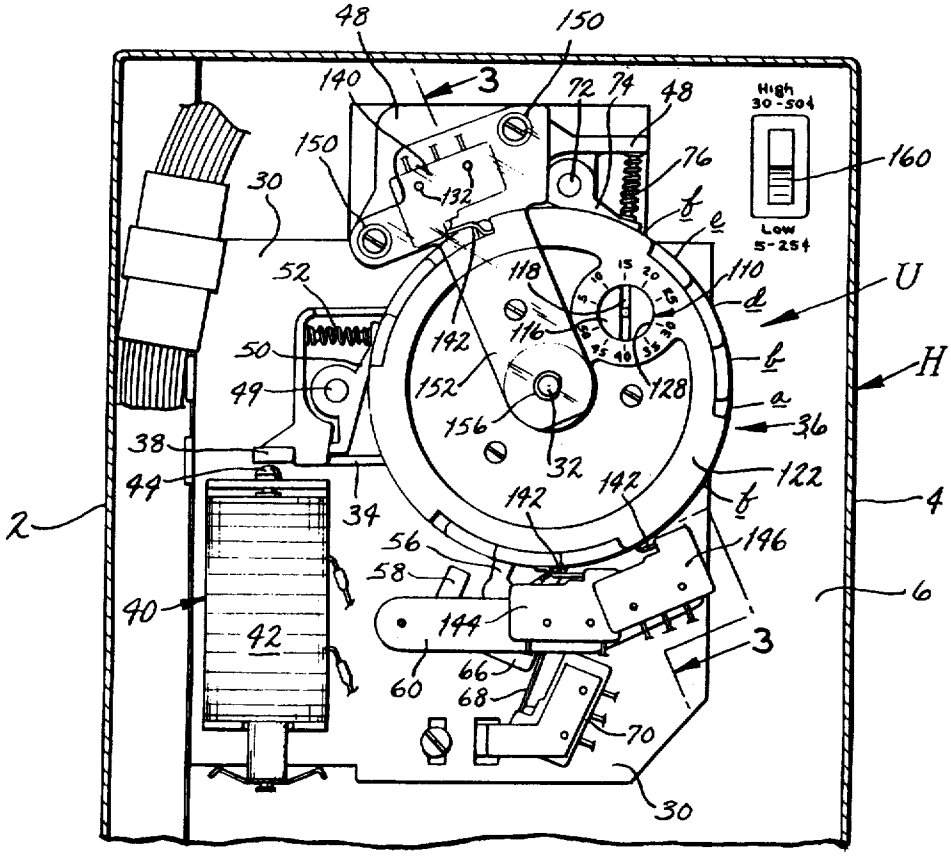


FIG. 1

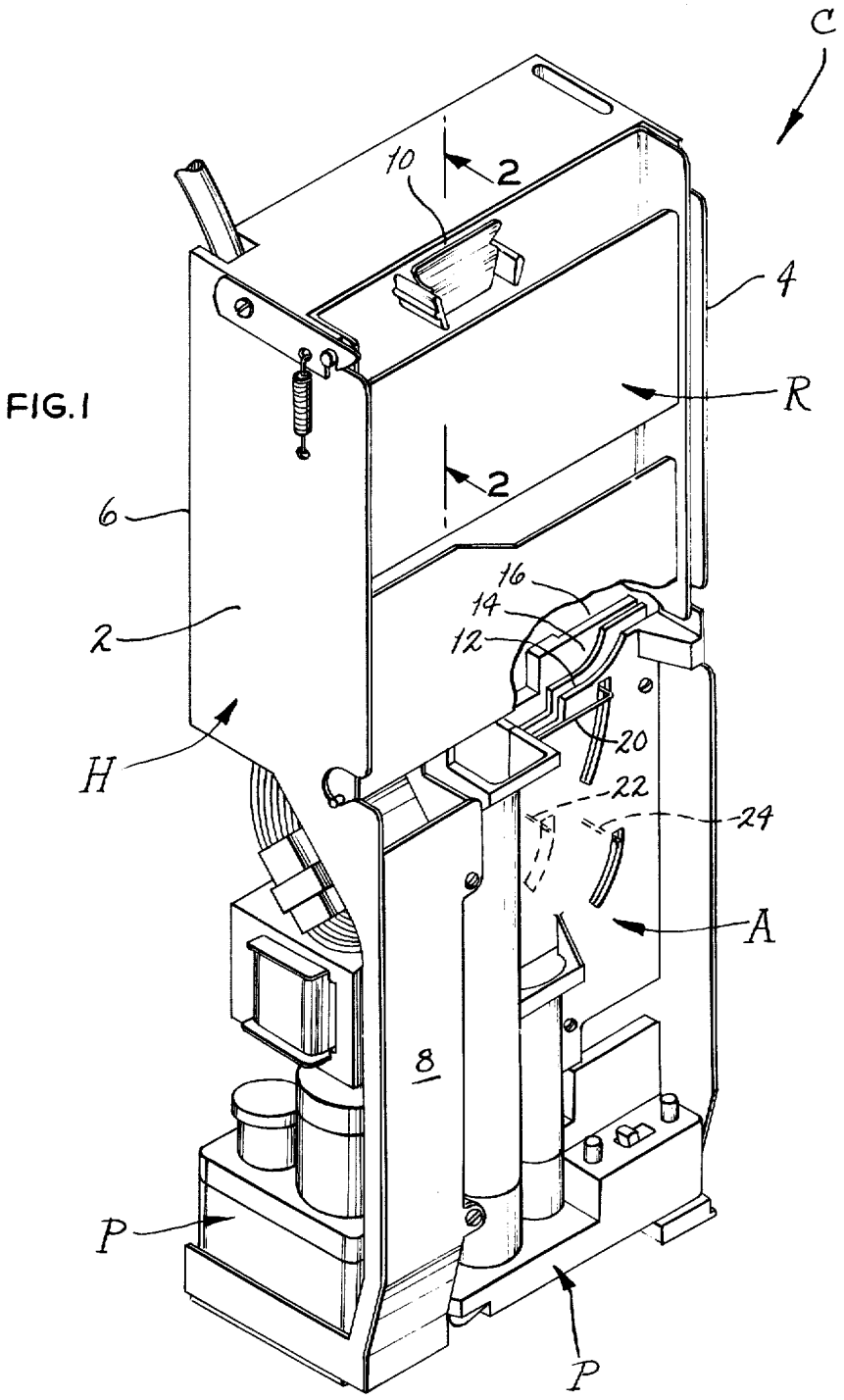


FIG. 2

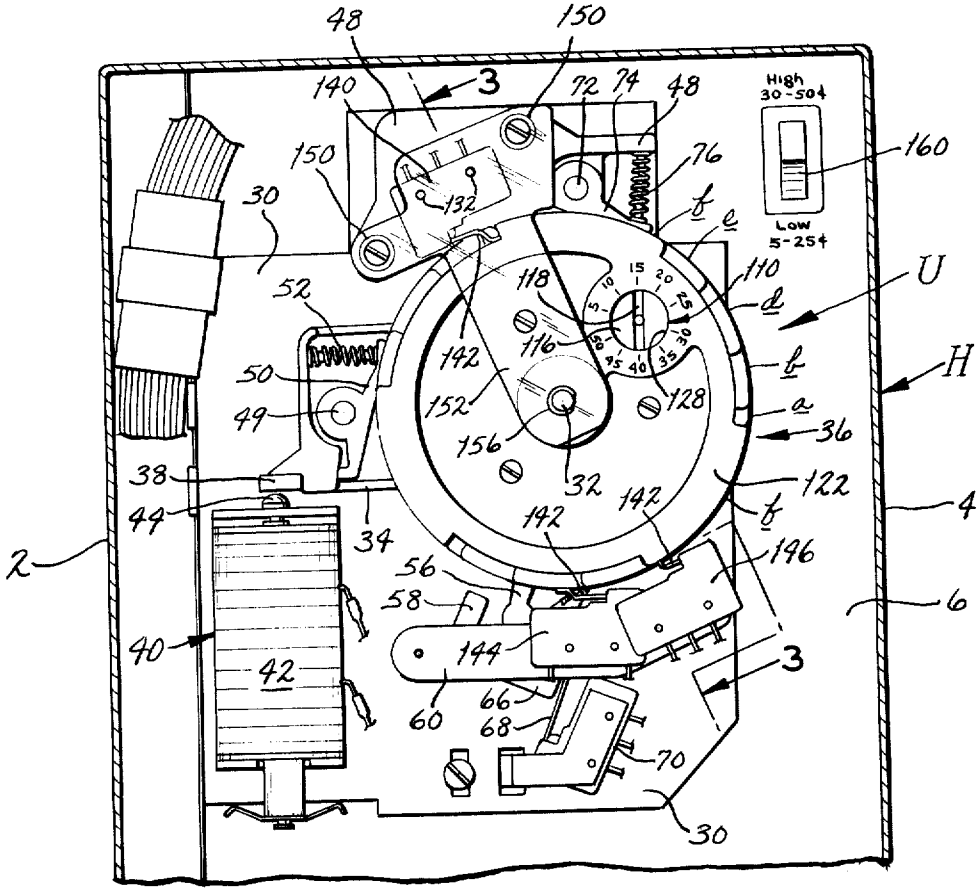

48
150
140
3
72
74
48
High
30-50¢
160
150
76
132
30
f
e
Low
5-25¢
110
U
52
118
15
20
25
10
5
30
35
40
45
d
116
142
H
50
152
128
b
49
a
36
156
32
142
122
38
f
4
44
34
142
196
2
56
58
6
40
42
144
3
66
60
68
70
30

FIG. 3

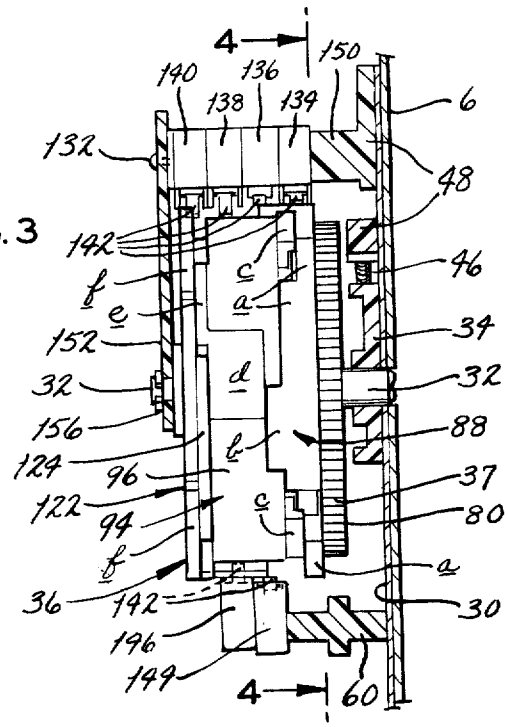

4
150
140
136
138
139
6
132
48
142
46
f
c
e
a
34
152
d
32
32
156
88
b
124
96
37
122
c
80
94
f
a
36
142
30
196
149
4
60

FIG. 4

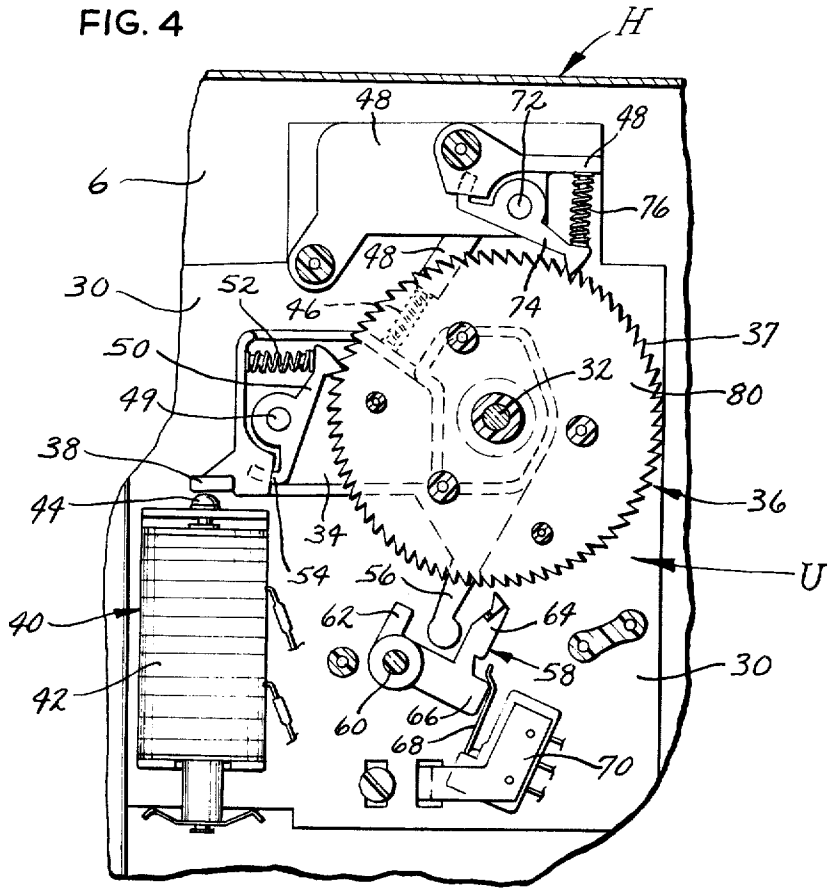
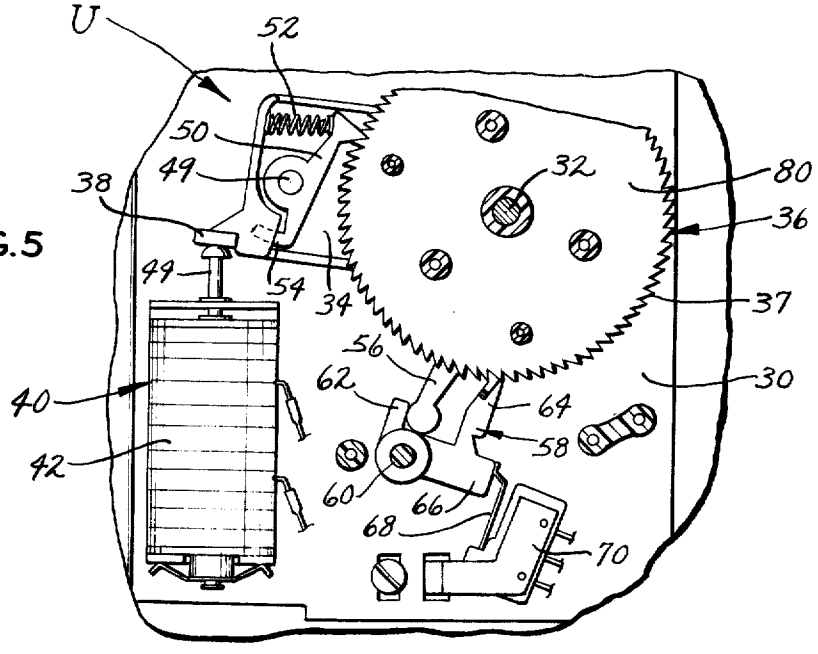

H
48
72
48
6
76
48
30
52
46
74
37
50
32
49
80
38
44
34
36
54
56
U
40
62
64
58
30
42
60
66
68
70

FIG. 5


U
52
50
49
38
32
80
36
49
54
34
37
56
30
40
62
64
58
42
60
66
68
70

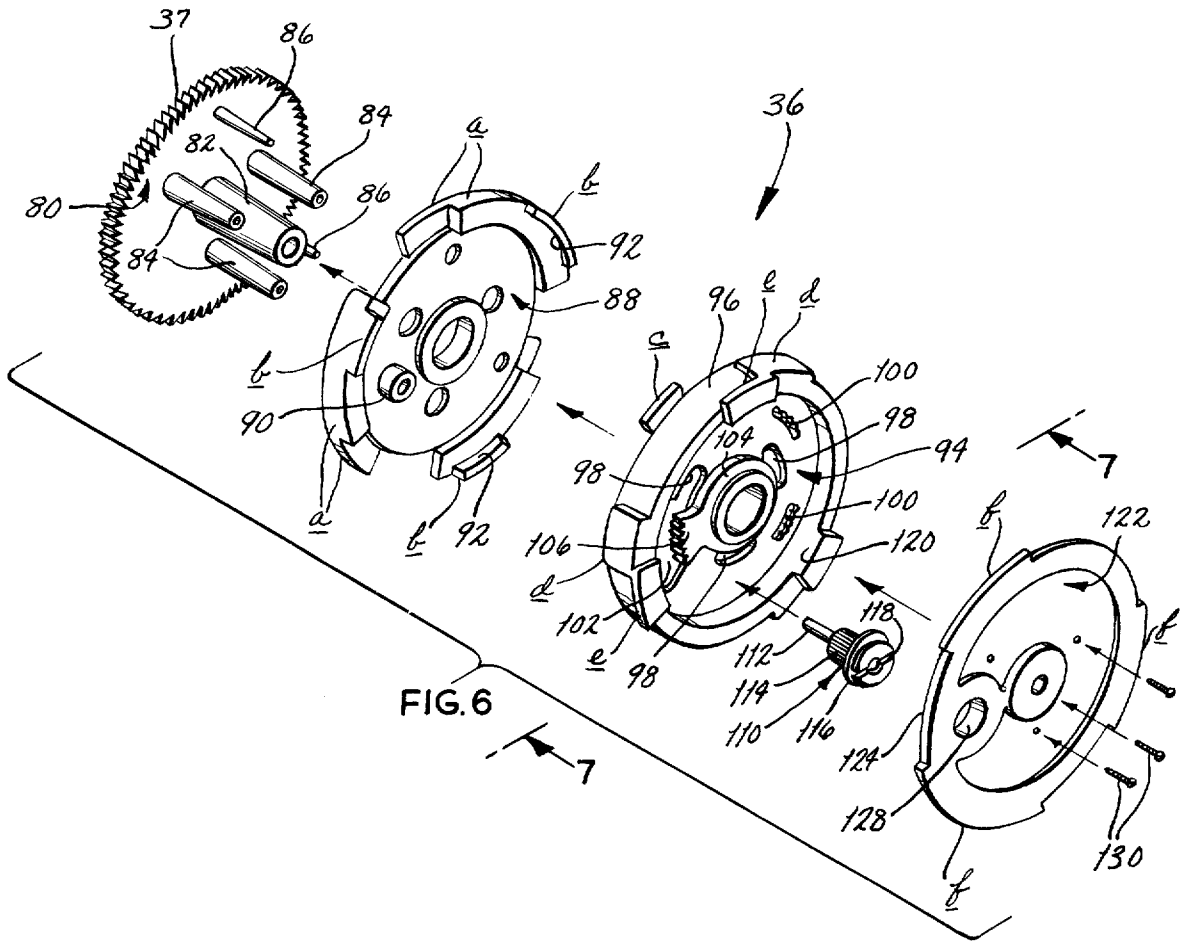

37
86
84
82
80
86
84
a
b
92
88
36
96
e
d
c
100
98
94
104
7
98
100
120
106
d
102
e
98
112
114
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116
118
b
122
124
128
f
130
b
92
a
b
90
a
7

FIG. 6

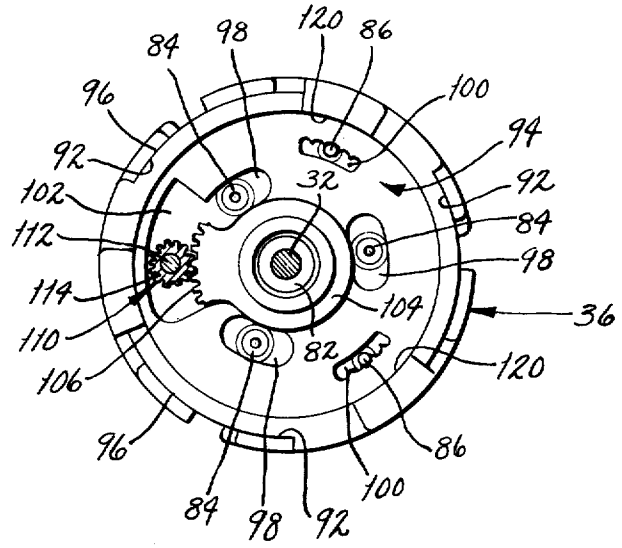

84
98
120
86
96
100
94
92
92
102
32
84
112
98
114
109
36
110
82
120
106
96
86
84
98
92
100

FIG. 7

CONTROL MEANS FOR ADJUSTING THE VEND PRICE OF A COIN HANDLING MECHANISM

BACKGROUND OF THE INVENTION

This invention relates in general to coin handling mechanisms, and more specifically to control means for adjusting the vend price of such mechanism.

The more versatile coin handling mechanisms used in vending machines today have the capability of dispensing change when the amount of coin received by the mechanism exceeds the value of the sale. Such mechanisms have the further capability of operating the vending machine at any one of several vend prices. For example, a coin handling mechanism in a soft drink vending machine may initially be set to cause the machine to deliver a soft drink at 15 cents. If the wholesale price for the drink increases enough, the operator should be able to change the setting on the coin handling mechanism so that it will operate the machine only when 20 cents is received. In other words, the vend price is variable.

Heretofore, one of the more common means for controlling a coin handling mechanism has been a cam, the operation of which is initiated by and is responsive to coins introduced into the mechanism. The cam is stepped through a full cycle by a pawl and ratchet device each time a sale is made, and as the cam moves through its cycle it closes and opens various switches. To change the vend price, the cam must be completely removed from the coin handling mechanism. Moreover, the cam is quite intricate in that it is composed of many parts which easily become misaligned.

A few coin handling mechanisms capable of dispensing change and varying the vend price operate electronically, but these coin devices are much more expensive than the cam operated mechanisms and are not very reliable.

SUMMARY OF THE INVENTION

One of the principal objects of the present invention is to provide a coin handling mechanism which has the capability of both dispensing change and varying the vend price. Another object is to provide a coin handling mechanism in which the vend price may be altered with relative ease and without requiring a major disassembly of the mechanism. A further object is to provide a coin handling mechanism of the type stated which is simple in construction and reliable in operation. An additional object is to provide a coin handling mechanism of the type stated having an adjustable control cam which can be adjusted by turning a small adjusting element exposed at the front face of the cam. These and other objects and advantages will become apparent hereinafter.

The present invention is embodied in a control unit for a coin handling mechanism and includes a cam having sections capable of being displaced relative to each other and adjusting means which is carried by the cam itself and is movable relative thereto to effect a displacement of one cam section relative to the other. The invention also resides in the cam itself. The invention also consists in the parts and in the arrangements and combinations of parts hereinafter described and claimed.

DESCRIPTION OF THE DRAWINGS

In the accompanying drawings which form part of the specification and wherein like numerals and letters refer to like parts wherever they occur:

FIG. 1 is a perspective view of a coin handling mechanism provided with a control unit constructed in accordance with and embodying the present invention;

FIG. 2 is a sectional view taken along line 2—2 of FIG. 1 and showing the control unit;

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2 with the cam being shown in full and the dark lines delineating the three cam rings;

FIG. 4 is a sectional view taken along line 4—4 of FIG. 3 and showing the ratchet arm and the solenoid actuator de-energized;

FIG. 5 is a sectional view similar to FIG. 4 but showing the ratchet arm when the solenoid actuator is energized;

FIG. 6 is an exploded perspective view of the cam;

FIG. 7 is a sectional view of the cam taking immediately behind the outer cam ring, that is along line 7—7 of FIG. 6.

DETAILED DESCRIPTION

Referring now to the drawings (FIG. 1), a coin handling mechanism C includes a housing H which contains a slug rejector R, a chute assembly A, a payout unit P, and a control unit U (FIG. 2). The housing H has sidewalls 2 and 4 connected by a back wall 6. Along the sidewall 2, the housing H has a coin return chute 8.

The slug rejector R (FIG. 1) is located in the upper portion of the housing H in front of the control unit U and includes a coin slot 10 into which coin is introduced into the coin mechanism C. The slug rejector R not only separates legitimate coins from illegitimate ones, the latter of which are directed to the return chute 8, but also segregates legitimate coins of different value. In particular, it separates nickels, dimes and quarters into different channels which lead to the chute assembly A.

The chute assembly A (FIG. 1) is located directly below the slug rejector R and has a nickel channel 12, a dime channel 14, and a quarter channel 16 which align with corresponding channels in the slug rejector R. The nickel channel 12 has a feeler wire 20 extended through and connected to a nickel switch (not shown) so that when a nickel passes through the channel 12 the wire 20 will be depressed and will operate the nickel switch. The wire 20 also projects through the dime channel 14 so the nickel switch is also operated by dimes. Likewise, the dime channel 14 has a wire 22 projected through it and connected to a dime switch (not shown), while the quarter channel 16 has a wire 24 projected through it and connected to a quarter switch (not shown). Since a dime operates both the wires 20 and 22, and the switches associated with them, two pulses are provided in sequence when a dime passes through the dime channel 14.

The payout unit P (FIG. 1) is located directly below the chute assembly A and receives nickels from the chute assembly A to dispense as change. It may also be furnished with nickels by the service man. The payout unit may include the timing apparatus illustrated in the co-pending application of Norman J. Burzen, Ser. No. 425,525, filed Dec. 17, 1973 and now U.S. Pat. No. 3,866,001, for initiating operation thereof upon receipt of a signal from the control unit U.

The control unit U is mounted on the back wall **6** of the housing H behind the slug rejector R and is triggered by anyone of the switches operated by the feeler wires **20, 22** and **24.** Depending on the switch which is closed, it will totalize the amount of coin passing through the chute assembly A, and if the amount of coin equals or exceeds the vend price it will close the electrical circuit to the vending machine in which it is installed. The control unit U will also actuate the payout unit P when the amount of coin exceeds the vend price, and controls the payout unit such that it pays back the correct amount of change in nickels. The control unit U is in effect a credit mechanism which operates in a stepping action, stepping once for each 5 cents value of coin inserted into the device insofar as nickels and dimes are concerned. Quarters are registered on relays for that purpose and these relays have the capability of initiating the stepping action.

The control unit U includes (FIGS. **2** and **3**) a base plate **30** which is fastened firmly to the back wall **6** of the housing **30.** The base plate **30** has a main spindle **32** projecting from it toward the coin rejector R, and this spindle **32** serves as a journal for a ratchet arm **34** and for a cylindrical cam **36,** the latter of which has ratchet teeth **37** arranged circumferentially at the back side thereof and projected generally in the radial direction. In all 60 ratchet teeth **37** exist along the periphery of the cam **36** immediately in front of the ratchet arm **34.** The arm **34** moves back and forth through a very limited arc, and as it does it causes the cam **36** to undergo rotation in one direction only.

The ratchet arm **34** has a tab **38** (FIG. **4**) located outwardly from the cam **36,** and this tab is disposed directly above a solenoid actuator **40** including a coil **42** which is fastened firmly to the base plate **30** and an armature **44** which moves upwardly downwardly within the coil **42.** When the coil **42** is de-energized, the armature **44** assumes its lower position (FIG. **4**). However, when the coil **42** is energized, the armature **44** moves axially upwardly and engages the tab **38** on the ratchet arm **34,** driving the tab **38** upwardly (FIG. **5**). This in turn causes the arm **34** to rotate through an arc of about 6°. The ratchet arm **34** is urged toward the armature **44** by a coil-type compression spring **46** (FIG. **3**) which extends between the upper edge of the arm **34** and a mount **48** secured to the base plate **30** above the cam **36.**

Immediately above the tab **38** the ratchet arm **34** is provided with a small pintle **49** (FIG. **3**) on which a ratchet pawl **50** pivots and the pawl **50** is urged toward the periphery of the cam **36** by a compression type coil spring **52.** Actually, the pawl **50** is normally engaged with the teeth **37** on the cam **36.** The pawl **50** has an arcuate tail portion **54** which underlies a portion of the ratchet arm **34** and prevents the pawl **50** from working off of the pintle **49.** Thus, the pawl **50** connects the ratchet arm **34** with the cam **36** and causes the cam **36** to rotate along with the arm **34** when the coil **42** of the solenoid actuator **40** is energized to move the armature **44** upwardly.

The ratchet arm **34** further includes an actuating finger **56** (FIGS. **4** and **5**) which projects downwardly and operates a toggle **58** as the arm **34** rocks back and forth. The toggle **58** pivots on a mount **60** secured firmly to the base plate **30** and includes an actuating tab **62** which lies in the path of the finger **56** and a pallet **64** which moves upwardly into the space between two ratchet teeth **37** when the actuating tab **62** is displaced, thereby preventing further rotation of the cam **36.** The toggle **58** further includes a projection **66,** which extends beyond the pallet **64** and operates the blade **68** of an interrupter switch **70** connected in series with the coil **42** of the solenoid actuator **40.** When the pallet **64** is disengaged from the teeth **37** (FIG. **4**) the switch **70** is closed, but when the pallet **64** is elevated into engagement with the ratchet teeth **37** as a result of the arm **34** being pivoted upwardly by the solenoid actuator **40** (FIG. **5**), the switch **70** is open.

The mount **48** which is located above the cam **36** has a small pintle **72** (FIG. **4**) about which a detent pawl **74** rotates, and this pawl is urged toward and into engagement with the ratchet teeth **37** by a compression type coil spring **76** extended between it and the mount **48.** The detent pawl **74** is identical in configuration to the drive pawl **50** and its arcuate tail underlies a portion of the mount **48** to prevent the pawl **74** from leaving the pintle **72.** However, the pawl **74** pivots about an axis fixed in position with respect to the base plate **30** so that once the cam rotates through an angle equalling the spacing between adjacent teeth **37** (6°) the detent pawl **74** prevents the cam **36** from rotating back to its original position.

Thus, when the solenoid actuator **40** is energized, the ratchet arm **34** rotates upwardly (FIG. **5**) and through the drive pawl **50** causes the cam **36** to rotate. The actuating finger **56,** moreover, pivots the toggle **58,** causing its pallet **64** to move up into the teeth **37** and thereby prevent further rotation of the cam **36** beyond and angle equal to the arc occupied by one tooth **37** on the cam **36.** The projection **66** furthermore bears against the blade **68** of the interrupter switch **70** and opens the switch **70,** thus de-energizing the solenoid coil **42** and causing the armature **42** thereof to drop back to its original position. The spring **46** causes the ratchet arm **34** to likewise move back to its original position (FIG. **4**). The detent pawl **74,** however, prevents the cam **36** from likewise rotating back to its original position and as a result the drive pawl **50** skips over one tooth **37** into the notch following that tooth **37.** As the arm **34** moves back to its initial position, the actuating finger **56** thereon moves against the pallet **64** of the toggle **58** and swings the toggle **58** back to its initial position, in which case the projection **66** of the toggle releases the blade **68** at the interrupter switch **70** and the switch **70** closes. Unless, the circuit to the solenoid **42** is interrupted at some other point in the circuitry, the foregoing cycle will be repeated and the cam **36** will index one more tooth **37,** etc.

The cam **36** includes (FIG. **6**) a ratchet wheel **80** having the ratchet teeth **37** around its periphery. The wheel **80** is preferably injection molded from plastic and has an integral hug **82** which receives the spindle **32** and extends practically all the way through the cam **36.** Outwardly from the hub **82,** the wheel **80** has three mounting posts **84** which are spaced at 120° intervals and two detent pins **86** which are located radially outwardly from the posts **84,** but from an angular standpoint are centered between adjacent posts **84.** Thus, the two pins **86** are likewise spaced 120° apart, but are offset 60° with respect to the adjacent mounting posts **84.** While the pins **86** are molded integral with the wheel **80,** they are relatively small in diameter so that they are somewhat flexible.

Positioned firmly against the front face of the ratchet wheel **80,** that is the face from which the posts **84** and pins **86** project, is a back or payout cam ring **88** (FIG.

6) having a center hole for receiving the hub 82 and other holes for receiving the posts 84 and the pins 86, these holes being spaced 60° apart. In the remaining 120° sector, that is the sector not occupied by a hole for the pins 86, the cam ring 88 on its front face is provided with a bearing boss 90 having an axially extended bore therein. At its periphery, the cam ring 88 has lobes *a* and *b*, which are arranged in three groups with equal circumferential spacing between the groups. The two lobes *a* and *b* of each group are contiguous, but are offset axially with the lobe *a* being closer to the ratchet wheel 86. Also, the lobe *a* is of greater arcuate length than the lobe *b*. The lobes *b* have inwardly presented guide surfaces 92 which are arcuate and concentric to the hub 82 of the ratchet wheel 80.

Fitted against the front of the payout cam ring 88 is an intermediate or master cam ring 94 (FIGS. 6 and 7) which is likewise injection molded from a suitable plastic. The master cam ring 94 has an outwardly presented cylindrical surface 96 at its periphery, and that surface fits into the guide surfaces 92 of the payout ring 88 so that the guide surfaces 92 serve to locate the master ring 94 with respect to the payout ring 88. In addition, the master cam ring 94 has arcuate slots 98 and 100 which receive the mounting posts 84 and detent pins 86, respectively, (FIG. 7), of the ratchet wheel 80. Being arcuate, the slots 98 and 100 permit the intermediate plate 94 to rotate through a prescribed angle with respect to the back plate 88 and the ratchet wheel 80. Moreover, the outer margins of the two slots 100 which receive the detent posts 86 are notched with the spacing between the notches equaling that spacing between the teeth 37 on the ratchet wheel 80. Preferably, 5 notches are provided in each detent slot 100. The engagement of the detent pins 86 with notches in the slots 100 (FIG. 7) locates and holds the master ring 94 in prescribed angular positions with respect to the payout ring 88, with the spacing between successive angular positions equaling the spacing between adjacent teeth 37 on the ratchet wheel 80.

In the vicinity of the bearing boss 90 the master cam ring 94 has an enlarged cutout 102 (FIGS. 6 and 7) which exposes the boss 90. Secured firmly to the ring 94 is a small drive ring 104 having a gear sector 106 located at the enlarged cutout 102 and immediately outwardly from the bearing boss 90 on the back ring 88.

The bearing boss 90 serves as a mount for an actuating element 110 including a spindle 112 which fits into the axial bore in the bearing boss 90 and a spur gear 114 on the spindle 112. At its outer end the gear 114 has a flanged head 116 (FIGS. 2 and 6) which is for the most part cylindrical, and the head 114 is provided with a cross slot 118 capable of receiving the blade of a screwdriver.

The intermediate cam ring 94 along its periphery is provided with lobes *c*, *d* and *e* (FIG. 6) which are arranged in three groups and are disposed in that order from the payout cam ring 88. The lobes *c* project radially and axially beyond the cylindrical surface 96 of the ring 94 where they overlie part of the payout ring 88 and abut against a stepped portion on the lobes *a* of the ring 88 (FIG. 3). In effect, the lobes *c* of the ring 94 increase the arcuate length of the lobes *a* on the payout ring 88, with the increase in length being dependent on the relative angular positions of the cam rings 88 and 94.

The lobes *d* are detached and spaced axially from the lobes *c*, with the axial spacing equaling the overlap of the lobe *b* over the cylindrical surface 96 on the master cam ring 94 (FIG. 3 — note, the dark lines in this figure denote the edges of the three cam rings 88, 94 and 122). The side faces of the lobes *d* at times abut against the forwardmost side faces on the lobes *b*, or are at least coplanar with those side faces. The rear portion of each lobe *d* forms a continuation of a corresponding lobe *b* on the payout ring 88 with the increase in length of the lobe *b* being dependent on the angular position of the ring 94 with respect to the ring 88.

The lobes *d* and *e* are contiguous, but are offset axially and circumferentially. Moreover, the lobes *e* project axially beyond the cylindrical surface 96 on the ring 94 and have inwardly presented locating surfaces 120 which are arcuate and concentric to the hub 82 of the ratchet wheel 80.

The hollow interior of the master cam ring 94 is closed with a front or high price cam ring 122 (FIG. 6) which is also molded from a suitable plastic. The high price cam ring 122 has a cylindrical surface 124 which fits into the arcuate locating surfaces 120 on the lobes *e* of the master ring 94 so that the surfaces 120 confine the high price ring 122 in the radial direction (FIG. 3). The high price ring 122 has a rearwardly presented central recess which receives the end of the hub 82 and outwardly from the hub 82 is provided with a circular aperture 128 (FIGS. 2 and 6) in which the cylindrical head 116 of the actuating element 110 fits. Indeed, the walls defining the aperture 128 form a bearing for one end of the actuating element 110 as does the bore in the bearing boss 90 of the payout ring 88. The high price ring 122 is secured to the mounting posts 84 by screws 130 which thread into the posts 84. Thus, the ratchet wheel 80, the payout ring 88 and the high price ring 122 are locked firmly together and always possess the same angular position with respect to each other.

Along its periphery the high price ring 122 has three equally spaced lobes *f* which abut against the sides of the axially projected lobes *e* on the master ring 94. The outwardly presented surfaces of the lobes *e* and *f* are flush and the latter in effect forms a circumferential extension of the former. The increase in length of the lobes *e* is dependent on the angular position of the high price ring 122 with respect to the master ring 94.

To rotate the master cam ring 94 relative to the payout and high price cam rings 88 and 122, to thereby increase or decrease the effective lengths of the lobes *a*, *b* and *e*, the actuator element 110 is turned merely by inserting the blade of a screwdriver into the slot 118 of the head 116 thereof and rotating the screwdriver. When the element 110 turns, its spur gear 114 drives the drive ring 104 which in turn rotates the master ring 94 between the payout and high price rings 88 and 122. This in turn moves the lobes *c* relative to the lobes *a* and changes the effective length of the lobes *a*, moves the lobes *d* relative to the lobes *b* and changes the effective length of the lobes *b*, and also moves the lobes *f* relative to the lobes *e* and changes the effective length of the lobes *e*. The dentent pins 86 move from notch to notch along the arcuate slots 100 as the actuating element 110 is turned and thus indicate each time the relative positioning changes an amount equal to the arc occupied by one tooth 37 on the ratchet wheel 80.

The upper switch mount 48 has two pins 132 (FIG. 2) projected from it parallel to the main spindle 32 and mounted on these pins are four switches (FIG. 3),

namely, a payout switch **134**, an over insert switch **136**, a ten cent relay switch **138**, and a high price switch **140**, with the switches **134, 136, 138, 140** being disposed in that order from rear to front. Each of the switches has an operating blade **142**. The blade **142** of the switch **134** aligns with the plane separating the lobes *a* and *c* on the cam **36**. As such it will bridge the lobes *a* and *c* and will be depressed by either one of them. The blade **142** of the over insert switch **136** aligns with the plane separating the lobes *b* and *d* and will bridge both of them. Therefore, either of the lobes *b* or *d* will depress the blade **142** of the switch **136**. The blade **142** of the ten cent relay switch **138** aligns only with the lobes *d* and is depressed thereby. The blade **142** of the high price switch **140** aligns with the plane separating the lobes *e* and *f* and is depressed by both of those lobes.

The lower switch mount **60** (FIGS. **2** and **3**) carries a low price switch **144** and a vend switch **146** with the former being closer to the base plate **30**. The blade **142** of the low price switch **144** aligns with the plane separating the lobes *b* and *d* on the cam **36** and hence is depressed by both of those lobes (FIG. **3**). The blade **142** of the vend switch **146** aligns with only the lobe *d*. Hence, the arcuate span for which the blades **142** of the switches **134, 136, 140** and **144** remain depressed is variable and depends on the circumferential position of the master cam ring **94** between the payout and high price rings **88** and **122**. However, the switches **138** and **146** remain actuated for the same arcuate span, irrespective of the position of the intermediate ring **94**, since they are operated by only the lobe *d* on the master cam ring **94**.

Aside from the positioning pins **132**, the switch mount **48** also has two mounting posts **150** (FIGS. **2** and **3**) between which the switches **134, 136, 138** and **140** are disposed, and these posts **150** are bridged by a retainer **152** secured thereto by screws **154**. The retainer **152** receives the outer ends of the positioning pins **132** and prevents the switches **134, 136, 138** and **140** from being withdrawn. The retainer **152** also extends over the front ring **122** of the cam **36** to the center thereof where the main spindle **32** projects through it. That end of the spindle **32** is embraced by a clip **156** which overlies the retainer **152**. Thus, the retainer **152** maintains the proper radial distance between the spindle **32** and the switches **134, 136, 138** and **140** and further confines the cam **36** in the axial direction.

The electrical circuitry for the coin handling mechanism C includes a vend range selector switch **160** (FIG. **2**) which has two positions, namely, a low range setting and a high range setting. When in the lower range setting, the switch **160** sets the control unit U for sales of 5 cents to 25 cents in five cent increments, depending on the setting of the cam **36**. When in the high range setting the switch sets the control unit U for sales of 30 cents to 50 cents in five cent increments, again depending on the setting of the cam **36**. The circuitry is quite extensive and yet is similar to that of conventional coin mechanisms of the type which utilize a cam in the control units thereof. Therefore, the electrical circuitry and the function of the various switches in it will be described in a relatively brief manner, with emphasis on the function of the various switches.

Basically, the cam **36** begins each sale at a standby position (FIG. **2**). The introduction of nickels and dimes into the coin handling mechanism C at the coin slot **10** and the subsequent passage of those coins through the chute assembly A causes the cam **36** to undergo a cumulating cycle in which the coins are totalized. Each 5 cents worth of such coin will cause the cam **36** to step or advance one increment. An increment in this instance means one tooth **37** on the ratchet wheel **80** or more specifically an angle equal to that occupied by one tooth **37**. For example, a nickel will cause the cam **36** to index once, and a dime will cause it to index twice. Once the cam **36** indexes an amount corresponding to the value of the sale, it undergoes a homing cycle wherein the interrupter switch **70** is in series with the coil **42** of the solenoid actuator **40** and the cam **36** steps or indexes generally without interruption. If the amount of nickels and dimes inserted exactly equals the value of the sale, the homing cycle continues until the cam **36** again comes to the standby cycle. However, if the amount of coin inserted exceeds the value of the sale by five cents (e.g. two dimes inserted for a 15 cent sale) a 10 cent relay will be energized which will send a pulse to the payout unit P which in turn will pay back one nickel in change during the homing cycle.

A quarter will cause the cam **36** to immediately undergo the homing cycle in the case of a low setting sale. In the case of a high setting sale, a quarter will cause the cam **36** to enter the homing cycle only if the quarter when added to the value of the coin previously inserted equals or exceeds the value of the sale. More specifically, in a low setting sale the introduction of a quarter pulls in a quarter relay which places the solenoid actuator **40** in series with the interruptor switch **70** and the cam begins to home. In a high value sale, the first quarter pulls in a quarter credit relay, while the second quarter pulls in the quarter relay which begins the homing cycle. Whenever the insertion of a quarter causes the total value of coins to exceed the sale price, the rapid stepping of the cam **36** terminates short of the standby position by the number of increments equaling each 5 cents worth of excess. At this point the responsibility for continued stepping of the cam **36** transfers from the interrupter switch **70** to the payout unit U. For example, if the sale is 15 cents and a quarter is introduced into the coin slot, the homing cycle continues in a series of rapid steps until two steps from the succeeding standby position. The two remaining steps of the homing cycle are initiated by the payout unit P. For each nickel in change paid out by the unit P, the unit P will index the cam **36** one increment toward the end of the homing cycle.

Thus, for each sale, the cam **36** may undergo a totalizing cycle and always undergoes a homing cycle, and where the value of coin exceeds the value of sale the payout unit P operates during homing cycle. At the end of the homing cycle the cam **36** is back to the next standby position. In this regard, it will be recalled, that the lobes *a* through *f* on the cam **36** are arranged in three groups circumferentially around the cam **36**. Each group represents one sale. Therefore, for each sale, the cam **36** rotates through a one-third revolution or 120°. Hence, three standby positions exist, and these are spaced 120° apart. The cam **36** may have more or less lobe groups.

Turning now to the circuitry, when the selector switch **160** is in the lower range setting, it sets the control unit U for sales of 5 cents to 25 cents in five cent increments, depending on the setting of the cam **36**. When in the high range setting the switch sets the con-

trol unit U for sales of 30 cents to 50 cents in five cent increments, again depending on the setting of the cam **36.** The cam **36** is set or altered by rotating the adjusting element **110,** which changes the position of the master cam ring **94** relative to the payout cam ring **88** and the high price cam ring **122.** The adjusting element **110** has five positions (FIG. **2**), namely, 5 cents, 10 cents, 15 cents, 20 cents and 25 cents, and each position corresponds to a different notch in the arcuate slots **100** of the ring **94,** and is clearly recognized by the detent pins **86** snapping into those notches. The five positions represent sales of corresponding value for the low range setting of the selector switch **160.** For the high range setting of the selector switch, the five positions represent a sale equal in value to position plus 25 cents. For example, for a 35 cent sale, the selector switch would be moved to its high range and the actuator **110** to its 10 cent – 35 cent position.

The feeler wire **20** operates a nickel switch which is connected to the coil **42** of the solenoid actuator **40** such that the actuator **40** will step the cam **36** one increment each time the wire **20** is depressed. Thus, when a nickel is inserted into the coin slot **10,** the cam **36** will rotate through an angle equal to the space occupied by one of the teeth **37** on the ratchet wheel **80.** This space may be 6°.

The feeler wire **22** is connected to the dime switch which is likewise connected to the solenoid actuator **40** to index the cam **36** one increment when that switch is closed. However, since the feeler wire **20,** in addition to extending through the nickel channel **12** also extends through the dime channel **14,** as does the wire **22,** a dime passing through the dime channel **14** will first close the nickel switch and then the dime switch, causing two pulses to be delivered in succession to the solenoid actuator **40.** Hence, a dime will cause the cam **36** to rotate two increments, that is through the angle occupied by two teeth **37.** The dime switch also closes a dime relay which sends a pulse to the payout unit P whenever the dime which triggers the dime relay causes the total amount of coin inserted to exceed the value of the sale by 5 cents. The payout unit will thus pay back one nickel in change during the homing cycle.

The remaining feeler wire **24** is connected to the quarter switch and when actuated with the selector switch in the low setting pulls in a quarter relay which places the interrupter switch **70** in series with the solenoid actuator **40** and the cam **36** begins its homing cycle. When the switch **160** is in the high, first quarter inserted will pull in a quarter credit relay and this relay will start the homing cycle only if the value of coin inserted equals or exceeds the value of the sale. The second quarter pulls in the quarter payout relay which causes the cam **36** to home.

The low price switch **144** is controlled by the lobes *b* and *d* on the payout and master cam rings **88** and **94** (FIGS. **2** and **3**) respectively and at the standby condition its blade **142** is depressed by the lobe *d* on the master ring **94.** In that condition, the switch **144** is open. The blade **142** drops off of the lobe *d* once the value for a low setting sale is reached. In other words, for a 5 cent sale the blade **142** of the low price switch **144** will drop off of the lobe *d* on the first increment of advance for the cam **36** out of the standby position. The switch **144** will then close. For a 10 cent sale, the switch **144** will close on the second increment beyond standby. For a 15 cent, 20 cent, and 25 cent sales, the switch **144** will close on the third, fourth, and fifth increments from standby. Once, the low price switch **144** closes with the selector switch **160** in the low range, the interruptor switch **70** is placed in series with the coil **42** of the solenoid actuator **40** and the cam **36** begins its homing cycle. The low price switch **144** is rendered inactive when the selector switch is at its high range setting. The position at which the blade **142** of the switch **144** drops of the lobe *d* and thereby closes the switch **144** is dependent on the position of the master cam ring **94** with respect to the high price cam ring **88.** By turning the actuating element **110** of the cam **36,** the lobe *d* changes its position on the cam **36** and the value of the sale can be either increased or decreased.

The high price switch **140** has its blade **142** extended at the end of the lobe *f* when in its standby condition (FIGS. **2** and **3**) and remains in that position until the fifth increment past the closing of the low price switch **144,** at which time the blade **142** of the high price switch **140** is depressed by the lobe *e* on the master cam ring **94.** Thus, the high price switch **140** follows the low price switch **144** by 25 cents irrespective of the setting of the adjusting element **110.** This enables the high price switch **140** to initiate the homing cycle for high price sales (30 cents – 50 cents) just as the low price switch initiates the homing cycle for low price sales (5 cents – 25 cents). Thus, at the instant the blade **142** of the switch **140** is depressed by the lobe *e* the switch **140** places the interrupter switch **70** in series with the coil **42** of the solenoid actuator **40** and the homing cycle begins for the high price sale. The blade **142** of the high price switch **140** remains depressed for the remainder of the sale, being held in that condition by the lobe *f* on the high price ring **122,** and terminates the homing when it drops off of the lobe *f.* At that time, the cam **36** is in its standby position for the next sale.

The 10 cent relay switch **138** is operated only by the lobe *d* (FIG. **3**) on the master ring **94** and controls a 10 cent relay circuit, and that circuit when energized shows a credit of 10 cents when the selector switch **160** is in the high range setting, so that when the insertion of a dime carries the total amount of coin inserted over the sale price by 5 cents, the payout unit U will be operated. For example, in the event one quarter and one dime are inserted for a 30 cent sale the insertion of the last coin will cause the solenoid actuator **40** to begin the homing cycle for the cam **36,** and will further actuate the payout unit P for a one nickel payout.

The blade **142** of the over insert switch **136** is actuated by the lobes *b* and *d* (FIG. **3**) of the payout and master rings **88** and **94,** respectively. It causes the payout unit P to dispense one nickel in change upon over-insertion of 5 cents by using dimes.

The blade **142** of the payout switch **134** follows the lobes *a* and *c* (FIG. **3**) of the payout and master rings **88** and **94,** respectively, and is normally depressed by the lobes *a* and *c*. Indeed, at the standby position the blade **142** is depressed by the lobe *a* and during the end of the homing cycle it is depressed by the lobe *c*. When the adjusting element **110** is set in 25 cent position, the lobe *c* is continuous with the lobe *a* of the succeeding group of lobes so that the blade **142** remains depressed throughout the entire sale. However, when the cam **36** is set for anything less than a 25 cent sale a gap exists between the end of the lobe *c* and the beginning of the lobe *a* for the succeeding group of lobes and the length of this gap is dependent on the amount of the sale. When the blade **142** is in the gap a circuit to the payout

unit P is completed and the payout unit P pays out nickels in change, indexing the cam **36** one increment with each nickel dispensed. Thus, when the sale is 20 cents the gap should be one increment in length so that a nickel in change is paid back, upon insertion of a quarter. However, where the sale is 10 cents the gap should be three increments in length so that three nickels are paid back. The payout switch **134** is rendered effective only when the quarter payout relay is in, and that relay is only actuated when a quarter is inserted into the coin slot and trips the quarter feeler wire **24.** If the selector switch is at the high range setting the first quarter inserted energizes the 25 cent credit relay which connects a circuit for the second quarter to energize the quarter payout relay.

The vend switch **146** is actuated by the lobe *d* (FIGS. 2 and 3) on the master cam ring **94** and is positioned such that its blade **142** is depressed during the homing cycle. As a result, the switch **146** closes only momentarily, and when closed sends a pulse to the vending machine to cause the vending machine to operate and dispense goods or perform whatever operation is assigned to it.

This invention is intended to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure which do not constitute departures from the spirit and scope of the invention.

What is claimed is:

1. In a coin handling mechanism, including switches, a cam rotatable about an axis and having lobes for actuating the switches, the cam having first and second sections which are adjustable relative to each other so that the angular relationship between the lobes varies to alter the position at which the switches are actuated along the cam, actuating means for rotating the cam to bring the lobes thereon past the switches, the improvement comprising adjusting means carried by the cam and being rotatable relative to the cam sections about an axis fixed with respect to the first section for producing relative rotation between the cam sections when so moved, the adjusting means including a spur gear, and said second section having a gear segment which is engaged by the spur gear, whereby when the gear is turned, relative movement between the sections will occur.

2. The structure according to claim **1** wherein the adjusting means is offset from the axis of rotation for the cam.

3. In a coin handling unit, a cam rotatable about an axis for actuating switches as it rotates, said cam comprising first and second sections which are rotatable relative to each other and have lobes thereon which pass by and operate the switches as the cam revolves, a gear segment secured to the second section, and a rotatable adjusting element rotatable about an axis fixed in position relative to the first section and including a spur gear engaged with the gear segment on the second section such that the spur gear travels along the gear segment and the second section rotates relative to the first section when the element rotates about its axis.

4. The structure according to claim **3** and further comprising a ratchet wheel secured to the first section and engaged by actuating means for rotating the cam in incremental movements.

5. The structure according to claim **3** wherein the rotatable adjusting element has one end which is exposed and provided with a slot so that a narrow implement may be inserted into the slot to turn the adjusting element.

6. A control unit for a coin handling machine, said control unit comprising: a base; a spindle projected from the base; a cam carried by and rotatable about the spindle; the cam including a first section, a second section rotatable relative to the first section, and a rotatable adjusting element mounted on the first section radially outwardly from the spindle, the adjusting element being engaged with the second section such that the second section will rotate relative to the first section when the adjusting element is turned, at least one of the sections having lobes thereon; at least one switch mounted on the base and positioned about the periphery of the cam in the path of the lobe so as to be operated by the lobe; and actuating means for rotating the cam.

7. A control unit according to claim **6** wherein the first section of the cam has a ratchet wheel connected firmly thereto and the actuating means comprises a solenoid actuator and a pawl engaged with the ratchet wheel and moved by the solenoid actuator to incrementally advance the cam in one direction of rotation.

8. A control unit according to claim **7** wherein the actuator further comprises a plate rotatable back and forth about the axis of the spindle through a limited arc, the pawl being on the plate, and the solenoid actuator being engaged with the plate to move it.

9. A control unit according to claim **8** wherein the actuating means further includes a toggle which rocks back and forth and an interrupter switch which is connected to the solenoid actuator and opens and closes as the toggle rocks back and forth; and wherein the plate has an actuating arm which engages the toggle and rocks the toggle when the plate rotates back and forth, whereby the circuit to the solenoid actuator is repeatedly interrupted.

10. In a coin handling unit, a cam rotatable about an axis for actuating switches as it rotates, said cam comprising first and second sections which are rotatable relative to each other and have lobes thereon which pass by and operate the switches as the cam revolves, the first section including front and back rings and the second section being an intermediate ring interposed between the front and back rings, a rotatable adjusting element rotatable about an axis fixed in position relative to the first section and engaged with the second section such that the second section rotates relative to the first section when the element rotates about its axis.

11. The structure according to claim **10** wherein the adjusting element extends between the front and back rings with its axis of rotation parallel to the axis of rotation for the cam and is confined in the radial direction by the front and back rings.

12. The structure according to claim **11** wherein the adjusting element includes a spur gear and the intermediate ring carries a gear segment which is engaged by the spur gear, the gear segment being concentric to the axis of rotation for the cam.

13. In a coin handling unit, a cam rotatable about an axis for actuating switches as it rotates, said cam comprising first and second sections which are rotatable relative to each other and have lobes thereon which pass by and operate the switches as the cam revolves, a rotatable adjusting element rotatable about an axis fixed in position relative to the first section and engaged with the second section such that the second section rotates relative to the first section when the

element rotates about its axis, detent pins fixed relative to one of the sections, and detent notches on the other section, the pins engaging notches to indicate prescribed positions of the second section relative to the first section.

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