

[54] COIN CREDIT ACCUMULATING DEVICE

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[51] Int. Cl. G07f 5/22

[58] Field of Search 194/10, 1 N, 1 M;
235/100

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Primary Examiner—Stanley H. Tollberg

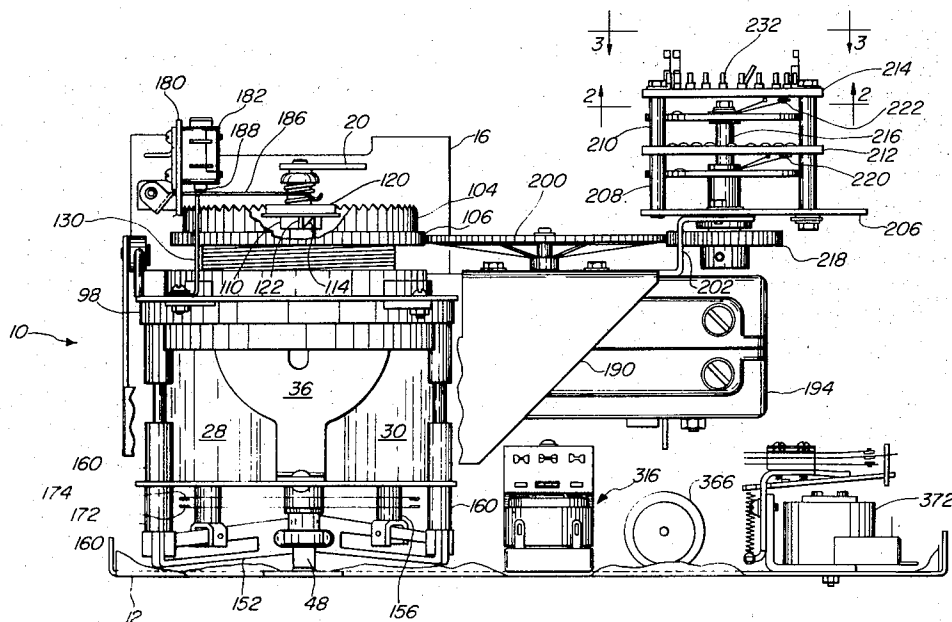
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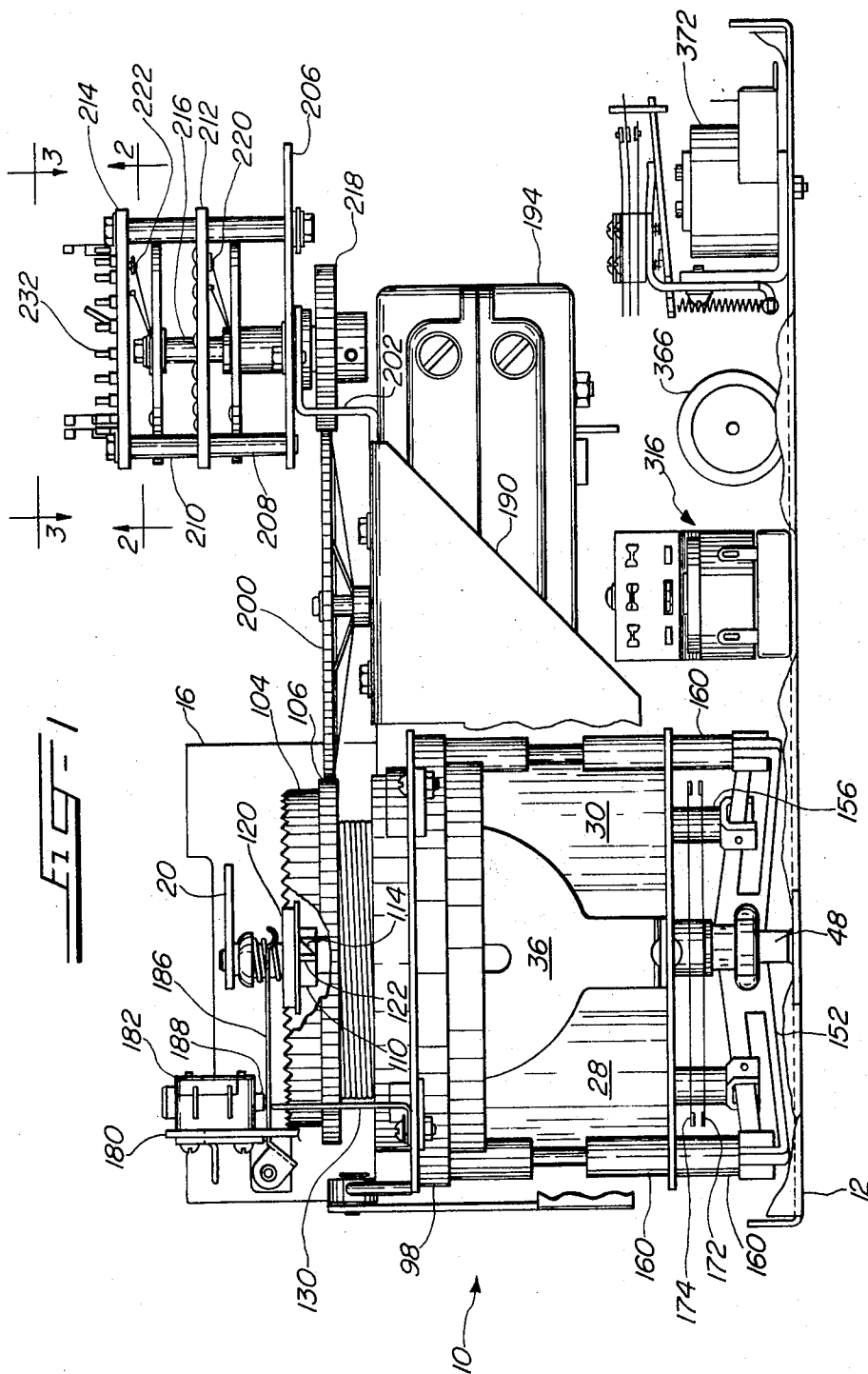
[57] ABSTRACT

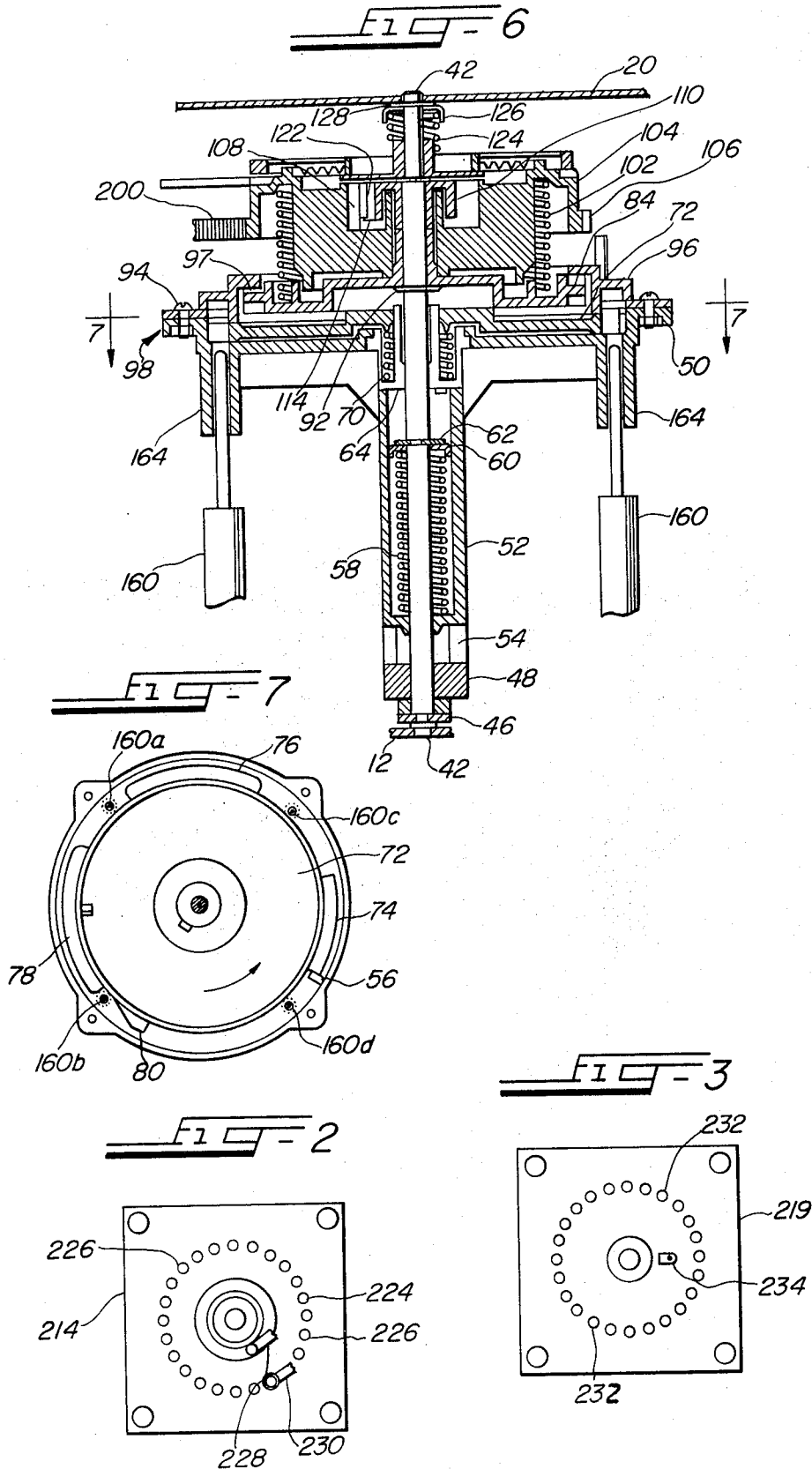
A device for accumulating coin credits corresponding to the denomination of coins inserted into a coin responsive machine rendering the machine operative

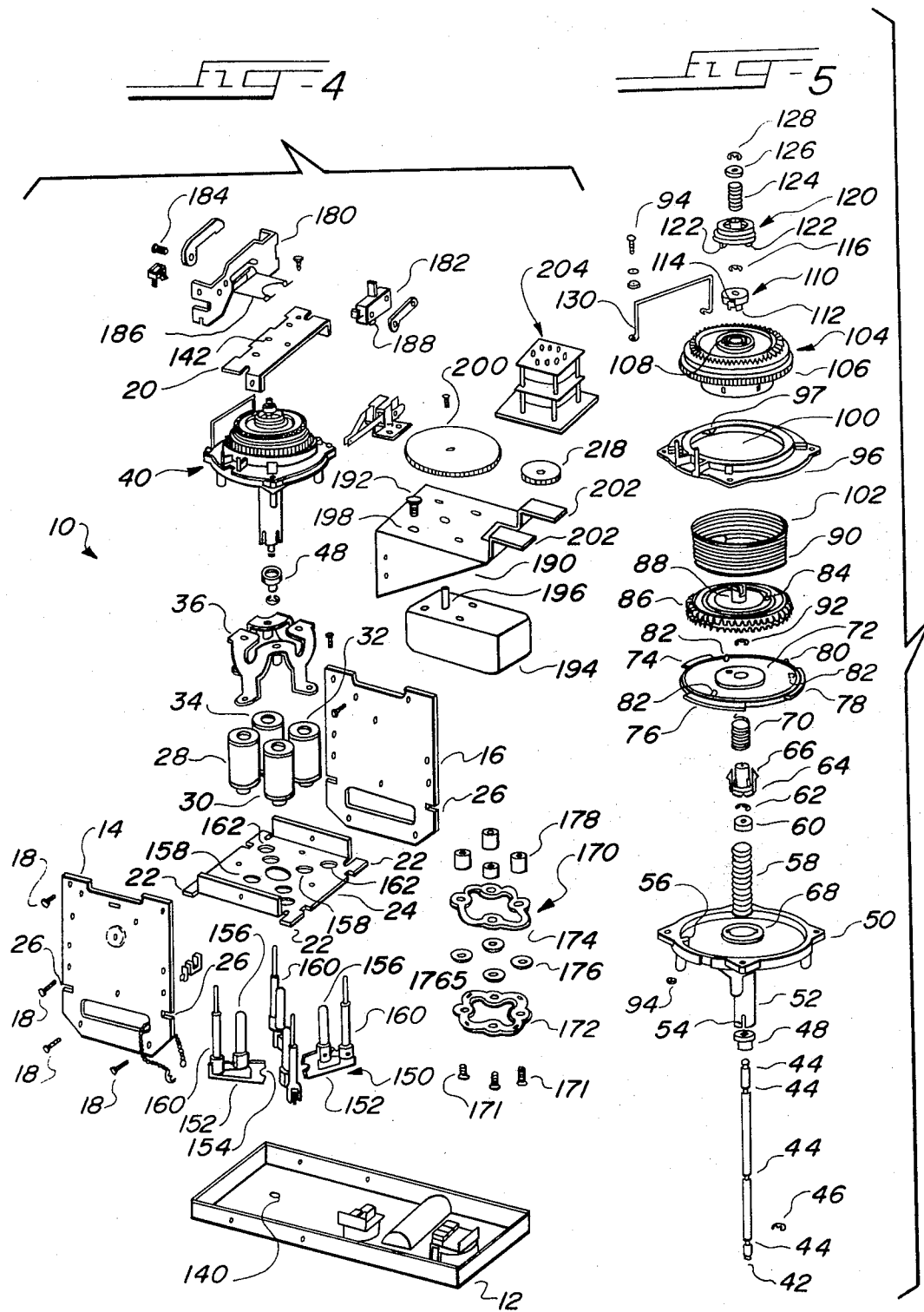
when a predetermined total of coin credits have been accumulated. Each deposited coin actuates an associated solenoid causing an angular displacement of a coin determinative pawl actuator proportional to the denomination of the inserted coins. The angular displacement of the pawl actuator causes a switch actuator to disengage motor switch activating a motor. The motor, by a gear linkage, rotates a registering gear through the same angular displacement as the pawl actuator, thereby "tracking" the rotation of the pawl actuator through the same angular displacement until the switch actuator deactivates the motor. The gear linkage also moves the wipers of a rotating switch across a circular configuration of switch contacts to the contact corresponding to the denomination of the inserted coin. This operation is repeated for each inserted coin thus moving the wiper to a new contact representing the accumulated total of coin credits inserted until the wipers reach a predetermined contact representing a total accumulation of coin credits necessary to render the machine operative. After the operation of the machine, the associated solenoids operate automatically to cause the sequential rotation of the pawl actuator and the corresponding operation of the motor until the wipers of the rotating switch are returned or "homed" to the original rest position.

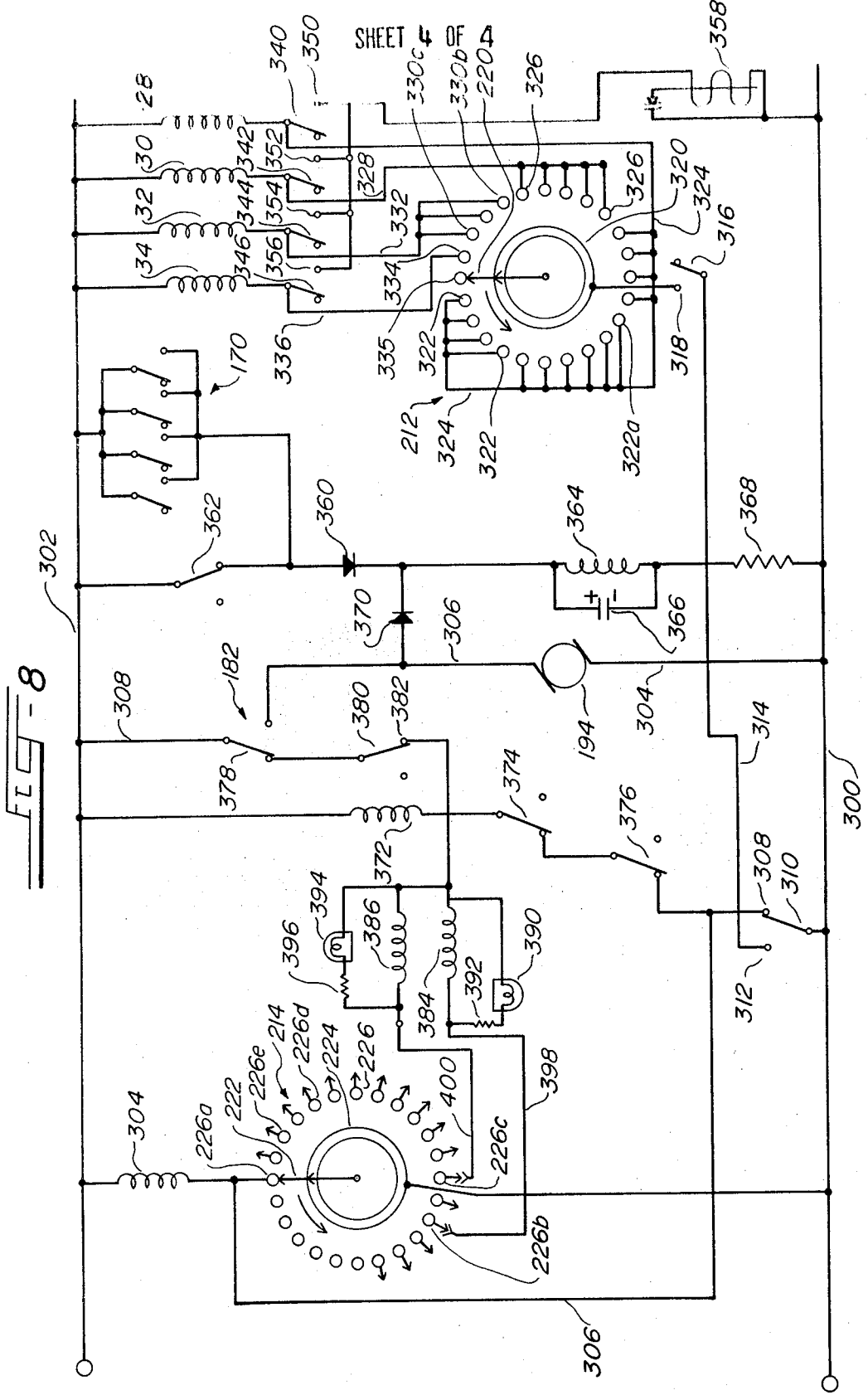
12 Claims, 8 Drawing Figures











COIN CREDIT ACCUMULATING DEVICE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to devices for accumulating coin credits corresponding to the denomination of coins inserted into a coin operated machine and more particularly to a device for accumulating coin credits inserted into a coin operated machine so that when a total accumulation of coin credits corresponding to the price of a selectable item has been accumulated, the machine is rendered operative to deliver the selected item.

2. Description of the Prior Art

In the past, the accumulation of coin credits representative of the denomination of deposited coins was generally achieved with mechanical and electro-mechanical devices. Such arrangements have been functional, but there have been many disadvantages connected therewith.

For example, prior art electro-mechanical accumulators have often involved complicated homing mechanisms to reverse the direction of travel of the accumulator so that it can be returned or homed back to a starting position after operation. Such reversing mechanisms increase the cost of the accumulator and require careful adjustment. Also, some prior art accumulators are very inflexible in price adjustment and require extended down time to make adjustments in the price sensing mechanism. Further, some prior art accumulators have been limited to single price merchandise, thus limiting the types of merchandise that can be vended from the machine. Thus, a highly reliable electro-mechanical accumulator which avoids the problems incident to the prior art electronic and electro-mechanical accumulators is a desirable advance in the art.

Income totalizing devices of the type described and claimed in U. S. Pat. No. 3,339,839, Jensen et al. have become recognized as providing highly reliable electro-mechanical means of determining and totalizing the total amount of coins inserted into a coin responsive mechanism. Because of the high reliability of the Jensen et al. income totalizing devices in totalizing the total amount of coins inserted into a coin responsive mechanism, a coin credit accumulator operating on the same reliable principle would solve many of the problems and deficiencies existing with the prior art accumulators.

SUMMARY OF THE INVENTION

The present invention is a device for accumulating coin credits corresponding to the total denomination of coins inserted into a coin receiving mechanism of a coin responsive machine. The coin responsive machine has a vend means for supplying a selected item upon a purchaser's selection when a predetermined total of coin credits equal to the price of the selected item is accumulated. The device comprises a coin credit recording means for recording the accumulated total of inserted coin credits having a starting zero credit position. A motor means is provided for operating the recording means. A coin credit sensing means is provided for sensing the denomination of coins inserted into the coin receiving means and providing a credit signal corresponding to the denomination of inserted coins. A registering means receives the credit signals and regis-

ters the inserted coin credits corresponding to the received credit signals. A motor switch means operably connected to the registering means operates the motor means so that the motor means operates the coin credit recording means to record the accumulated total of inserted coin credits registered by the registering means. A price sensing means provides a price signal to the vend means of the coin responsive machine in response to the coin credit recording means recording an accumulated total of inserted coin credits equal to the price of the selected item. A clearing means provides a credit clearing signal in response to the vend of the selected item. A homing means causes a sequential operation of the registering means in response to receipt of the clearing signal until the coin credit recording means is returned to the zero credit position so that subsequent purchaser selections may be made.

The present invention is very flexible since the price sensing means may be adapted to sense a multiplicity of total coin credits inserted into the machine. Consequently, multiple priced items may be supplied upon purchaser selection.

Accordingly, it is a primary object of the invention to provide a device for accumulating coin credits which utilizes highly reliable electro-mechanical components.

Yet another object of this invention is to provide a device for accumulating coin credits which permits flexible adjustment of the device so that multiple priced items may be supplied utilizing the same apparatus.

Yet another object of the present invention is to provide a device for accumulating coin credits having a homing mechanism which homes the device without reversing the direction of travel of the recording mechanism of the device.

These and other objects, advantages and features of the subject invention will hereinafter appear and for the purposes of illustration but not of limitation, exemplary embodiments of the subject invention are shown in the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side partially fragmentary view of a preferred embodiment of the present invention.

FIG. 2 is a plane view taken substantially along line 2—2 in FIG. 1.

FIG. 3 is a plan view taken substantially along line 3—3 in FIG. 1.

FIG. 4 is an exploded perspective view of the preferred embodiment illustrated in FIG. 1.

FIG. 5 is an exploded view of the totalizing mechanism illustrated in FIG. 4.

FIG. 6 is a cross sectional view of the assembled totalizing mechanism illustrated in FIG. 5.

FIG. 7 is a cross sectional view taken substantially along line 7—7 in FIG. 6.

FIG. 8 is a schematic circuit diagram of the preferred embodiment of this invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to FIGS. 1, 4, and 5, credit accumulator 10 comprises base 12, side members 14 and 16 which are mounted to base 12 by screws 18, and top bracket 20 which connected the upper portion of side members 14 and 16 to provide an essentially rigid structure. Tabs 22 on solenoid bracket 24 mate with grooves 26 in side wall 14 and 16 and it is held in posi-

tion by screws 18. Solenoid coils 28, 30, 32, and 34 are mounted on solenoid bracket 24 and are held in position by retaining bracket 36.

Mounted immediately above retaining bracket 36 is coin credit register 40. With reference to FIG. 5, coin credit register 40 comprises shaft 42 having retaining ring grooves 44 circumferentially positioned along the length of shaft 42. Positioned around shaft 42 and held in position by retaining ring 46 is collar 48. Immediately above collar 48 is lower housing 50. Lower housing 50 has a hollow stem 52 which fits over shaft 44 and which has vertical retaining grooves 54 at the bottom thereof. Formed on the interior edge of lower housing 50 is pawl actuator stop 56. Compression spring 58 is positioned around shaft 42 within stem 52 of lower housing 50 and rests against the bottom of the interior of stem 52. The upward expansion of spring 58 is restrained by cup washer 60 and retaining ring 62. The bias of compression spring 58 tends to urge lower housing 50 in a downward direction against collar 48. Immediately above retaining ring 62 within the hollow interior of stem 52 of lower housing 50 is pawl actuator bearing 64. Pawl actuator bearing 64 has ears 66 which engage grooves 68 on the interior surface of stem 52 which prevent pawl actuator bearing 64 from rotating about shaft 42. Torsion spring 70 is attached at one end to pawl actuator bearing 64 and at its opposite end to pawl actuator 72. Pawl actuator 72 is mounted for rotation about shaft 42 and torsion spring 70 tends to urge pawl actuator 72 to rotate until peripherally extending pawl 74 on the circumference of pawl actuator 72 contacts pawl actuator stop 56. Also positioned peripherally around the circumference of pawl actuator 72 are pawls 76, 78, and 80. Formed on the upper surface of pawl actuator 72 are engaging tabs 82.

Mounted immediately above pawl actuator 72 for rotation about shaft 42 is ratchet wheel 84 having upwardly and downwardly disposed ratchet teeth 86 formed around the circumference thereof. Ratchet wheel 84 has an upwardly disposed stem 88 having engaging flanges 90 formed therein. The downward movement of ratchet wheel 84 is restrained by retaining ring 92. Positioned above ratchet wheel 84 and bolted to lower housing 50 with nut and bolt assemblies 94 is upper housing 96. Formed on the interior surface of upper housing 96 is ratchet tooth pawl 97. Lower housing 50 and upper housing 96 form housing assembly 98 when bolted together. Attached to upper housing 96 by nut and bolt assemblies 94 is switch retaining member 130. Extending through opening 100 in upper housing 96 is main spring 102. Also mounted for rotation about shaft 42 and partially positioned within opening 100 of upper housing 96 is registering gear 104. Main spring 102 is engaged at its lower end to ratchet wheel 84 and at its upper end to registering gear 104 so that a torsional spring bias exists between ratchet wheel 84 and registration gear 104. Formed around the periphery of registering gear 104 are gear teeth 106. Also formed within the hollow upper portion of registration gear 104 are flanges 108.

Positioned immediately above registering gear 104 for rotation about shaft 42 is cam member 110. Formed at the lower portion of cam member 110 are engaging flanges 112 which mate with engaging flanges 90 on ratchet wheel 84 so that angular rotation of ratchet wheel 84 causes an equal angular rotation of cam member 110. Also formed on the periphery of cam member

110 are sloping cam surfaces 114 and the upward movement of cam member 110 is restrained by retaining ring 160 which engages retaining ring groove 44 in shaft 42.

Mounted immediately above cam member 110 for vertical movement along shaft 42 is switch actuator member 120. Formed on the lower surface of switch actuator member 120 are cam follower flanges 122. Positioned immediately above switch actuator member 120 is actuator compression spring 124. The upward displacement of actuator compression spring 124 is restrained by cup washer 126 and retaining ring 128 which engages groove 44 in shaft 42 so that switch actuator member 120 is always biased in a downward direction.

With reference to FIGS. 1, 4, and 6, coin credit register 40 is mounted between base 12 and top bracket 20 so that the ends of shaft 42 are held in opening 140 in base 12 and opening 142 in top bracket 20.

Positioned below solenoid bracket 42 and engaging retaining grooves 54 in stem 52 of lower housing 50 is solenoid lever assembly 150. Solenoid lever assembly 150 comprises lever arms 152 having formed at one end thereof protrusions 154 which mate and engage with retaining grooves 54 in stem 52 of lower housing 50 so that lever arms 152 can pivot freely. Pivotably mounted to lever arms 152 are solenoid plungers 156 which extend through openings 158 in solenoid bracket 24 into the hollow interior portion of solenoid coils 28, 30, 32, and 34 respectively. Also pivotably mounted at the end of lever arms 152 are stop pins 160. Stop pins 160 extend through openings 162 in solenoid bracket 24 and into hollow stems 164 on lower housing 50. Electrical excitation of solenoid coils 28, 30, 32, and 34 cause an upward displacement of solenoid plungers 156 pivoting lever arms 152 upwardly to move stop pins 160 in a vertical direction.

Mounted to the lower surface of solenoid bracket 24 by screws 171 is transfer switch assembly 170. Contact members 172 and 174 of transfer switch assembly 170 are separated by insulating separators 176 and electrically isolated from solenoid bracket 24 by insulating separators 178. Transfer switch assembly 170 is positioned relative to solenoid lever assembly 150 so that upward movement of any of the lever arms 152 causes contact member 172 to make electrical contact with contact member 174.

Mounted between side members 14 and 16 by screws 18 is switch bracket 180. Motor switch 182 is mounted to switch bracket 180 by screws 184. Pivotably mounted to switch bracket 180 beneath motor switch 182 is switch lever 186. Switch lever 186 is contacted by switch actuator member 120 so that downward movement of switch actuator 120 causes switch lever 186 to pivot downwardly thus disengaging button 188 on the bottom of motor switch 182. When button 188 is disengaged by switch lever 186, motor switch 182 is switched as will be described later.

Also mounted to side members 14 and 16 by screws 18 is motor bracket 190. Mounted beneath motor bracket 190 by screws 192 is motor 194. Shaft 196 of motor 194 extends through opening 198 in motor bracket 190, and linkage gear 200 is attached to shaft 196. Motor bracket 190 has L-shaped flanges 202 at the free end thereof upon which is mounted rotating switch assembly 204.

With reference to FIG. 1, rotating switch assembly 204 comprises base plate 206 mounted to L-shaped flanges 202. Mounted above base plate 206 and separated by separators 208 and 210 respectively are first contact board 212 and second contact board 214. A switch shaft 216 is mounted for rotation through base plate 206. Switch gear 218 is mounted at the lower end of shaft 216 and is engaged by linkage gear 200. First and second switch wipers 220 and 222 are mounted to switch shaft 217 so that rotation of switch shaft 216 causes first and second switch wipers 220 and 222 to be moved in a circular path around the face of contact board 212 and 214.

With reference to FIGS. 2 and 3, second contact board 214 is substantially the same as contact board 212 and comprises a circular contact path 224 and a circular configuration of individual contacts 226. Wiper 222 has arm 228 which contacts circular path 224 and arm 230 which contacts individual contacts 226. Contacts 226 extend through contact board 214 to terminals 232 on the opposite side of contact board 214. Circular contact path 224 is electrically connected to contact lug 234 on the opposite side of contact board 214.

With reference to FIG. 8, the electrical circuitry used in conjunction with the preferred embodiment of the present invention is illustrated. Motor 194 is connected between voltage source lines 300 and 302 by connectors 304, 306, and 308. Motor switch 182 is shown in its normal rest position with an open circuit to motor 194. Contact board 214 is schematically illustrated showing circular contact path 224 and individual contacts 226. Second switch wiper 222 is shown in the zero credit rest position. Connected from contact 226a to voltage line 302 is coin block relay coil 304. Coin block relay coil 304 is also connected by connector 306 to contact 308 of first credit relay switch 310. Contact 312 of first credit relay switch 310 is connected by connector 314 to homing relay switch 316. Contact 318 of homing relay switch 316 is connected to wiper 220 through circular contact path 320. Contacts 322 are electrically connected by conductor 324 to solenoid coil 28. Contacts 326 are connected by connector 328 to solenoid coil 30. Contacts 330 are connected by connector 332 to solenoid coil 32 and contact 334 is connected by contact 336 to solenoid coil 34. Solenoid coils 28, 30, 32, and 34 are connected from voltage line 302, and through coin switches 340, 342, 344, and 346 respectively in parallel through thermal switch 358 to voltage line 300. Transfer switch assembly 170 is connected from voltage line 302 to the anode of diode 360. The anode of diode 360 is also connected to voltage line 302 through second credit relay switch 362 (shown in its normal rest position in FIG. 8). The cathode of diode 360 is connected to one side of DC homing relay coil 364 and capacitor 366 is connected in parallel across DC homing relay coil 364. Current limiting resistor 368 is connected between voltage line 300 and DC homing relay coil 364. Also connected between connector 306 and the cathode of diode 360 is diode 370.

Homing relay coil 364 is a DC operated coil. Thus, capacitor 366 and current limiting resistor 368 operate to provide about a 40 millisecond delay in the pull in and drop out of homing relay switch 316. Diodes 360 and 370 rectify the alternating current in voltage lines 300 and 302 to provide direct current to homing relay

coil 364. Diode 370 permits current to flow through homing relay coil 364 when motor switch 182 is switched to the opposite position as shown in FIG. 8. However, diode 370 prevents current from flowing through motor 194 when either second credit relay switch 362 or transfer switch assembly 170 is closed.

Credit relay coil 372 is connected from voltage line 302 through vend complete switch 374 and coin return switch 376 and first credit relay switch 310 to voltage line 300. Contact 378 of motor switch 182 is connected to third credit relay switch 380. Contact 382 of third credit relay switch 380 is connected to the parallel combination of first price solenoid coil 384 and second price solenoid coil 386. First indicator light 390 and resistor 392 are connected in parallel across first price solenoid coil 384. Second indicator light 394 and resistor 386 are connected in parallel across second price solenoid coil 386. Contact 226b is connected by connector 398 to first price solenoid coil 384, and contact 226c is connected by connector 400 to second price solenoid coil 386.

In describing the operation of the preferred embodiment, reference is made to U. S. Pat. No. 3,339,839, Jensen et al., which describes in great detail the mechanical operation of coin credit register 40. To describe the operation, it will be assumed that the credit accumulator 10 has been set up to receive coins of the denominations of a nickel, a dime, a quarter, and a fifty cent piece. Insertion of a nickel causes switch 346 to contact contact 356 thus completing a circuit through solenoid coil 34; insertion of a dime causes switch 344 to close thus completing a circuit through solenoid coil 32; insertion of a quarter causes switch 342 to close thus completing a circuit through solenoid coil 30; and insertion of a fifty cent piece causes switch 340 to close thus completing a circuit through solenoid coil 28.

Assuming that a dime is inserted into the machine, switch 344 is closed thereby electrically exciting solenoid coil 32. The electrical excitation of solenoid coil 32 causes solenoid plunger 156 to be moved in an upward direction within solenoid coil 32 thus pivoting lever arm 152 upwardly moving stop pin 160 in an upward direction. As stop pin 160 moves in an upward direction, it contacts hollow stem 164 of lower housing 50 causing housing assembly 98 to move in an upward direction. The upward movement of housing assembly 98 causes pawl actuator 72 to be moved in an upward direction until engaging tabs 82 engage ratchet teeth 86 on ratchet wheel 84. After engaging tabs 82 have engaged the ratchet teeth 86, the upward movement of housing assembly 98 allows ratchet tooth pawl 97 to disengage ratchet teeth 86 on the upper portion of ratchet wheel 84 thereby freeing ratchet wheel 84 and engaged pawl actuator 72 for rotation about shaft 42. Main spring 102 is biased to rotate ratchet wheel 84 and pawl actuator 72 in a counterclockwise direction as illustrated in FIG. 7 until pawl 76 on pawl actuator 72 strikes stop pin 160a extending into housing 98. If a nickel had been inserted into the machine, pawl actuator 72 would rotate until pawl 78 contacted stop pin 160b extending into housing 98 as a result of the electrical excitation of solenoid coil 34. Similarly, if a quarter were inserted, pawl actuator 72 would rotate until pawl 74 contacted the upwardly disposed stop pin 160c, and if a fifty cent piece had been inserted, pawl actuator 72 would rotate until pawl 80 contacted the upwardly disposed stop pin 160d. Thus, it may be seen

that the angular rotation of ratchet wheel 84 and engaged pawl actuator 72 is directly related to the denomination of coins inserted into the machine.

The rotation of ratchet wheel 84 causes an equal angular rotation of cam member 110 thus permitting cam follower flanges 122 of switch actuator member 120 to follow the downward slope of sloping cam surfaces 114 on cam member 110 allowing actuator compression spring 124 to push switch actuator member in a downward direction. The downward displacement of switch actuator member 120 allows switch actuator member 120 to disengage switch lever 186. However, as long as housing assembly 98 is held in an upwardly disposed position by stop pin 160, switch retaining member 130 contacts switch lever 186 thereby holding switch lever 186 in contact with button 188 on motor switch 182 thereby preventing the operation of motor switch 182 until housing assembly 98 returns to its original downward disposed position.

Switches 340, 342, 344, and 346 are only momentarily actuated as a coin is inserted into the vending machine. Thus, once these switches are opened, solenoid coils 28, 30, 32, and 34 are deactivated permitting housing assembly 98 to move downwardly to its original position. As housing assembly 98 returns to its original position, ratchet tooth pawl 97 engages ratchet teeth 86 on the top surface of ratchet wheel 84 thereby holding ratchet wheel in its angularly disposed position. Also, as housing assembly 98 moves back to its original position, pawl actuator 72 is also moved in a downward direction thereby allowing engaging tabs 82 to disengage ratchet teeth 86 on the lower surface of ratchet wheel 84 thereby permitting torsion spring 70 to rotate pawl actuator 72 in a clockwise direction (as shown in FIG. 7) until pawl 74 contacts pawl actuator stop 56, thus returning pawl actuator 72 to its original rest position. Torsion spring 70 is much smaller than main spring 102 and thus is overcome by the spring bias of main spring 102 when pawl actuator 72 engages ratchet wheel 84.

As housing assembly 98 moves downwardly to its original position, switch retaining member 130 disengages switch lever 186 thereby permitting switch lever 186 to pivot downwardly thereby disengaging button 188 on motor switch 182 permitting motor switch 182 to switch to complete a circuit to motor 194. Completion of a circuit to motor 194 results in rotation of linkage gear 200. Rotation of linkage gear 200 causes registering gear 104 to rotate until flanges 108 on registration gear 104 engage cam follower flanges 122 on switch actuator member 120 thereby pushing cam follower flanges 122 back up along sloping cam surface 114 until switch actuator member 120 moves upwardly to engage switch lever 186 pivoting switch lever 186 until it contacts button 188 thereby opening motor switch 182 and breaking the circuit to motor 194. At this point, registering gear 104 will have moved through the same angular displacement as ratchet wheel 84 and pawl actuator 72 rotated when solenoids 28, 30 32 and 34 were electrically excited. Thus, the angular rotation of registering gear 104 is directly proportional to the denomination of coins inserted into the machine.

The rotation of linkage gear 200 by motor 194 also rotates switch gear 218 thereby rotating switch shaft 216 and first and second switch wipers 220 and 222. The gear ratio between linkage gear 200 and switch

gear 218 is such that rotation of registering gear 104 by an angular displacement corresponding to one nickel causes first and second switch wipers 220 and 222 to move one contact. Thus, each contact 226 on contact board 214 represents a five cent increment. Consequently, if a nickel is inserted into the machine, wiper 222 will be moved from contact 226a to the next contact; if a dime is inserted, wiper 222 will be moved two contacts; if a quarter is inserted, wiper 222 will be moved five contacts; and if a fifty cent piece is inserted, wiper 222 will be moved ten contacts to contact 226b.

The operation previously described is repeated for each coin inserted into the vending machine. For example, if a quarter is inserted into the vending machine switch 342 will be closed thereby exciting solenoid coil 30 and causing a rotation of wiper 222 by five contacts. If a dime is then inserted into the machine, switch 344 will be closed thereby exciting solenoid coil 32 and causing wiper 222 to move two more contacts. Thus, wiper 222 has been moved a total of seven contacts representing seven nickel increments or 35 cents.

Inserted coin credits are thereby accumulated by the movement of second switch wiper 222 until wiper 222 reaches either contact 226b or contacts 226c. Movement of second switch wiper 222 to contact 226b completes the circuit through first price solenoid coil 384. In this case, first price solenoid coil is actuated when fifty cents is accumulated, and thus, represents a low price of fifty cents for the merchandise to be vended. Insertion of an additional dime will move second switch wiper 222 to contact 226c thus completing a circuit to second price solenoid coil 386. First and second price solenoid coils 384 and 386 are connected to the operative portions of the vending machine (not shown) so that electrical excitation of first or second price solenoid coil will render the machine operative to deliver a selected item (e.g., a package of cigarettes, or in the case of a phonograph, a particular record selection).

As first wiper 222 leaves contact 226a after a coin has been inserted, current is maintained in credit relay coil 372 through vend complete switch 374, coin return switch 376 and first credit relay switch 310. First credit relay switch 310, second relay switch 362, and third credit relay switch 380 are all held in the position shown in FIG. 8 when current is flowing through credit relay coil 372. Termination of current through credit relay coil 372 allows first, second and third credit relay switches 310, 362 and 380 to switch to the opposite position as shown in FIG. 8. When a circuit is completed through first or second price solenoid 384 and 386, and a selected item is delivered by the machine, the vend complete switch 374 will be opened automatically thereby breaking the circuit to credit relay coil 372 allowing first, second and third credit relay switches 310, 362, and 380 to switch. Also, if the purchaser changes his mind and pushes the coin return button on the front of the machine (not shown) to have the inserted coins returned, coin return switch 376 is open also terminating current through credit relay coil 372. Typically, the coin responsive machine in connection with which credit accumulator 10 is used has an escrow arrangement for holding the inserted pins until the vend is complete. Thus, if the purchaser presses the coin return button, the coins are returned from the escrow, however, upon completion of vend, the coins are deposited in a cash box.

The opening of third credit relay switch 380 breaks the circuit to first and second price solenoid coils 384 and 386 thereby preventing subsequent selections of merchandise. The opening of second credit relay switch 362 breaks the circuit to DC homing relay coil 364 which allows homing relay switch 316 to switch to contact 318 after capacitor 366 has discharged. The combination of capacitor 366 and current limiting resistor 368 acts as a time delay circuit to cause a slight time delay (approximately 40 milliseconds) in the actuation of homing relay switch 316. When homing relay switch 316 contacts contact 318, a circuit is completed from voltage line 300 (through first credit relay switch 310 which has switched to contact 312) through first switch wiper 220 to contacts 322 (assuming wiper 222 is on either contacts 226b or 226c). Completion of a circuit to contact 322 completes a circuit through conductor 324 to solenoid coil 28 thereby causing electrical excitation of solenoid coil 28 to move stop pin 160d resulting in a rotation of pawl actuator 72 and ratchet wheel 84 by an angular amount corresponding to a fifty cent piece as previously described. The electrical excitation of solenoid coil 28 causes lever arm 152 to contact transfer switch assembly 170 thereby closing transfer switch assembly 170 completing a circuit to DC homing relay coil 364. This causes homing relay switch 316 to switch to break contact with contact 318 thereby breaking the circuit to solenoid coil 28. Capacitor 366 delays actuation of homing relay switch 316 as it is charged.

When the circuit to solenoid coil 28 is broken, lever arm 152 disengages transfer switch assembly 170 thereby breaking the circuit to homing relay coil 364 (second credit relay switch 362 is open at this point due to the interruption of current to credit relay coil 372). However, as the circuit to solenoid coil 28 is broken, housing 98 moves downwardly allowing switch retaining member to disengage switch arm 186 to that motor switch 182 completes a circuit through motor 194. This also allows current to flow through diode 370 to maintain current in DC homing relay coil 364 until completion of the operation of motor 194. When motor switch 182 is opened, current in DC homing relay coil is terminated, thus permitting homing relay switch 316 to switch.

Completion of a circuit to solenoid coil 28 as previously described results in the operation of motor 194 as previously described to rotate first and second wipers 220 and 222. For the purpose of illustration, assuming that wiper 222 was on contact 226b at the time vend complete switch 374 or coin return switch 376 was opened, the electrical excitation of solenoid coil 28 will cause motor 94 to rotate wipers 220 and 222 across ten contacts (ten nickel increments or fifty cents) to contact 226d and 330b respectively. In this position, a circuit is completed to solenoid coil 32 when the interruption of current to homing relay coil 364 permits homing relay switch 316 to switch to contact 318. Electrical excitation of solenoid coil 32 (which represents a dime increment) causes the same sequence of operation as previously described to cause pawl actuator 72 and ratchet wheel 84 to rotate by an angular displacement corresponding to a dime. Once again, the pivoting of lever arm 152 causes transfer switch 170 to close completing a circuit through homing relay coil 364 thereby permitting homing relay switch 316 to break the circuit to solenoid coil 32. Motor switch 182 is then

actuated to complete a circuit through motor 94 causing first and second wipers 220 and 222 to rotate by a time increment to contact 330c and 226e respectively. Once again, when motor switch 182 opens, capacitor 366 decays allowing homing relay switch 316 to switch to complete a circuit through solenoid coil 32. The electrical excitation of solenoid coil 32 when first and second wipers 220 and 222 are on contacts 330c and 226e causes wipers 220 and 222 to rotate through a time increment back to the original zero credit contacts numbers 335 and 226a respectively.

As can be seen, contact board 212 is wired in such a manner to assure that wipers 220 and 222 are always returned to the zero credit position after current to credit relay coil 372 has been broken. If wiper 220 is on any of the contacts 322, solenoid coil 28 will be electrically excited thereby causing a movement of wiper 220 by 10 contact increments. If wiper 222 then stops on any of the contacts 326, solenoid coil 30 will be electrically excited thereby causing wiper arm 220 to rotate by five contact increments. If wiper 220 stops on contacts 330, solenoid coil 32 will be actuated to cause wiper arm to move by two contact increments, and if wiper arm 220 stops on contact 334, solenoid coil 34 will be electrically excited to cause wiper 220 to move one contact increment back to the contact 335 corresponding to the zero credit position. Consequently, upon the completion of the delivery of a selected item, or upon actuation of the coin return button, the accumulator 10 automatically "homes" back to a zero credit position ready for a subsequent accumulation of coin credits.

When first wiper 220 reaches contact 235 and second wiper 222 returns to contact 226a after the "homing" operation, a circuit is completed through contact 226a through connector 306 through coin return switch 376 and vend complete switch 374 to credit relay coil 372. Thus, current flows through credit relay coil 372 causing first, second and third credit relay switches 310, 362, and 380 to switch back to the positions as shown in FIG. 8. Thus, second credit relay switch 362 completes a circuit through homing relay coil 364 causing homing relay switch 316 to switch to the open position as shown in FIG. 8 thereby terminating further operation of solenoid coils 28, 30, 32, and 34. In addition, first credit relay switch 310 switches to the position as shown in FIG. 8 also breaking the circuit to homing relay switch 316. Thus, the circuit returns to the condition as shown in FIG. 8 and is ready for a subsequent accumulation of coin credit inserted into the machine.

Coin block relay coil 304 is provided in the circuit illustrated in FIG. 8 to prevent the insertion of coins during the homing operation. Coin block relay coil operates to move a mechanical member (not shown) to prevent the insertion of coins whenever electrical current through coin block relay coil 304 is terminated. Thus, as can be seen, a circuit is completed through coin block relay coil 304 through connector 306 to first credit relay switch 310. As long as first credit relay switch 310 remains in the position as shown in FIG. 8, coins may be inserted into the machine. However, during either the coin return or the vend operation if the circuit is broken to credit relay coil 372, first credit relay switch 310 switches breaking the circuit to coin block relay coil 304 thereby operating the mechanical coin block to prevent insertion of coins. Thus, during

the entire homing operation the coin block prevents the insertion of additional coins which would cause the operation of one of the solenoid coils 28, 30, 32, or 34 during the homing operation resulting in wiper 220 going past the zero credit contact 335. Consequently, coin block relay coil 304 prevents the insertion of coins assuring that the device will return to the zero credit position upon completion of the "homing" operation.

An additional feature of this embodiment is that wiper 222 is never making or breaking contact with contacts 226b and 226c while under electric load. Motor switch 182 is connected in series to first and second price solenoid coils 384 and 386 so that the circuit to these coils is broken before motor 194 operates to move wiper 222. Thus, it is impossible for a make or break electric arc to occur which might damage contacts 226b or 226c or wiper 222 and cause failure of the device.

It should also be understood that various changes, modifications and variations in the structure and function of the present invention may be affected without departing from the spirit and scope of the present invention as defined in the appended claims.

I claim:

1. A device for accumulating coin credits corresponding to the total denomination of coins inserted into a coin receiving mechanism of a coin response machine having a vend means for supplying a selectable item upon purchaser selection when a predetermined total of coin credits equal to the price of the selectable item is accumulated, said device comprising:

coin credit recording means for recording the accumulated total of inserted coin credits, said coin credit recording means having a starting zero credit position;

coin credit sensing means for sensing the denomination of coins inserted into the coin receiving means and providing a credit signal corresponding to the denomination of the inserted coins;

registering means having a starting position for receiving and accumulating the credit signals and registering the accumulated total of inserted coin credits corresponding to the received credit signals;

motor means for driving said recording means and said registering means;

motor switch means operably connected to said registering means for providing electrical power to said motor means so that said motor means drives said coin credit recording means to record the accumulated total of inserted coin credits registered by said registering means in response to said registering means registering said coin credits after said registering means registers the coin credit and simultaneously returns said registering means to its starting position;

price sensing means for providing a price signal to the vend means in response to said coin credit recording means recording an accumulated total of inserted coin credits equal to the price of the selectable item;

clearing means for providing a credit clearing signal in response to the vend of the selectable item;

homing means for causing repetitive sequential operation of said registering means in response to receipt of the clearing signal until said coin credit recording means is returned to the zero credit position

tion and said registering means is returned to its starting position.

2. The device as claimed in claim 1 wherein said coin credit recording means comprises rotatable switch means having a multiplicity of switch contacts arranged in a circular path and a wiper contact for rotatably traversing said switch contacts, one of said multiplicity of switch contacts corresponding to a zero coin credit position, and each of the remainder of said switch contacts along said circular path corresponding to an increased accumulated total of inserted coin credits.

3. The device as claimed in claim 1 wherein said coin credit sensing means comprises a multiplicity of credit solenoids, each of said credit solenoids corresponding to a different denomination of coins, and each of said solenoids being actuated in response to the insertion of its corresponding denomination of coins.

4. The device as claimed in claim 1 wherein said registering means comprises:

a shaft;

a housing mounted on the shaft for axial displacement relative thereto;

a coin determinative pawl actuator mounted in the housing for angular rotation about the shaft;

a ratchet wheel mounted in the housing for angular rotation about the shaft;

registering gear means mounted for rotation about the shaft, said registering gear means being driven by said motor;

spring means interconnecting said ratchet wheel and said registering gear means for rotating said ratchet wheel;

means for axially displacing the housing in response to receipt of a credit signal from the coin credit sensing means to free the ratchet wheel for rotation;

interengaging means for interengaging the coin determinative pawl actuator and the ratchet wheel for rotation upon axial displacement of the housing;

limiting means for limiting the angular rotation of coin determinative pawl actuator when it is engaged by the ratchet wheel such that the ratchet wheel rotates by an angular displacement proportional to the denomination of coins corresponding to the coin credit signal provided by the coin credit sensing means;

means for actuating the motor switch means in response to rotation of said coin determinative pawl actuator so that said motor drives said registering gear through the same angular displacement as the angular displacement of said coin determinative pawl actuator.

5. The device as claimed in claim 1 wherein said price sensing means comprises a first and a second pricing solenoid connected to said coin credit recording means, said first pricing solenoid actuated in response to said coin credit recording means recording an accumulated total of coin credits equal to a first price of the selectable item, and said second pricing solenoid actuated in response to said coin credit recording means recording an accumulated total of coin credits equal to a second price of the selectable item.

6. The device as claimed in claim 3 wherein said homing means comprises:

homing switch means having a multiplicity of homing switch contacts arranged in a circular path and a wiper contact operably connected to said motor

means for rotatably traversing said switch contacts, said homing switch contacts being sequentially connected to an associated one of said credit solenoids;

a time delay switch means electrically connected to said wiper contact so that actuation of said time delay switch means actuates the credit solenoid associated with the homing switch contact contacted by the wiper means thereby causing said registering means to sequentially operate said motor switch means so that said motor means rotates said homing switch means and said coin credit recording means to the zero credit position.

7. The device as claimed in claim 1 further comprising a coin block means for preventing the insertion of coins during operation of the homing means.

8. A device for accumulating coin credits corresponding to the total denomination of coins inserted into a coin receiving mechanism of a coin responsive machine, the coin responsive machine having a vend means for vending merchandise upon purchaser selection when a predetermined total of coin credits equal to the price of the merchandise is accumulated, said device comprising:

recording switch means having a wiper means and multiplicity of switch contacts traversed by said wiper means, one of said contacts representing a zero credit position, and each succeeding one of the remainder of said contacts representing an increased accumulated total of inserted coin credits; coin credit sensing means for sensing the denomination of coins inserted into the coin receiving means and providing a coin credit signal corresponding to the denomination of inserted coins; registering means having a starting position for receiving and accumulating the credit signals and registering the accumulated total of the inserted coin credits by moving away from said stationary position;

motor means for moving said wiper means sequentially across said multiplicity of switch contacts and for driving said registering means;

motor switch means for operating said motor means in response to said registering means registering the accumulated total of inserted coin credits so that said motor means moves said wiper means to a switch contact corresponding to the total inserted coin credits registered by said registering means and simultaneously returns said registering means to its starting position;

price sensing means connected to said multiple switch means for providing a price signal to the vend means in response to said wiper means contacting a predetermined switch contact corresponding to a total of accumulated coin credits equal to the price of the merchandise so that the purchaser can make a selection and receive the vend merchandise;

clearing means for providing a credit clearing signal in response to a vend of merchandise;

homing means for causing sequential operation of said registering means in response to receipt of the clearing signal until said recording switch means is returned to the zero credit position and said registering means is returned to its starting position.

9. The device as claimed in claim 8 wherein said coin credit sensing means comprises:

a multiplicity of electrically actuated solenoids, each of said solenoids corresponding to a different denomination of coins and each solenoid being actuated when its corresponding denomination of coins is inserted into the coin responsive machine;

a lever assembly actuated by said solenoids comprising a multiplicity of stop pins associated with each of said solenoids so that actuation of one of said solenoids causes a vertical displacement of the associated one of said stop pins.

10. The device as claimed in claim 9 wherein said registering means comprises:

a shaft;

a housing mounted on the shaft for axial displacement relative thereto in response to vertical displacement of said stop pins;

a coin determinative pawl actuator mounted in the housing for angular rotation about the shaft;

a ratchet wheel mounted in the housing for angular rotation about the shaft;

registering gear means mounted for rotation about the shaft said registering gear means being driven by said motor means;

spring means interconnecting said ratchet wheel and said registering gear means for rotating said ratchet wheel;

interengaging means for interengaging the coin determinative pawl actuator and the ratchet wheel for rotation upon axial displacement of the housing by a vertically displaced stop pin, the amount of angular rotation of said coin determinative pawl actuator being limited by said vertically displaced stop pin so that the amount of angular rotation of said coin determinative pawl actuator and said ratchet wheel is proportional to the denomination of the coin inserted into the coin responsive machine;

means for actuating said motor switch means in response to rotation of said coin determinative pawl actuator and said ratchet wheel so that said motor means drives said registering gear means by an amount of angular rotation equal to the amount of angular rotation of said coin determinative pawl actuator and said ratchet wheel.

11. The device as claimed in claim 10 wherein said homing means comprises:

a homing switch having a contact wiper interconnecting the wiper means of said recording switch means and having a multiplicity of homing switch contacts traversed by said contact wiper, one of said homing switch contacts representing a zero credit position and the remainder of said homing switch contacts being sequentially connected to an associated one of said solenoids;

delay switch means connected to said contact wiper, said delay switch means being actuated in response to receipt of said clearing signal so that the associated one of said solenoids is electrically excited when said delay switch means is actuated to cause said motor means to move said wiper means and said contact wiper to their respective zero credit positions.

12. A device for accumulating coin credits corresponding to the total denomination of coins inserted into a coin receiving mechanism of a coin responsive machine, the coin responsive machine having a delivery means for delivering a selectable item upon purchaser selection when a predetermined total of coin

credits equal to the price of the item is accumulated, said device comprising:

a first rotating switch means comprising:

a first contact board having a multiplicity of first contacts arranged in a circular path, one of said contacts representing a zero credit position, and each succeeding one of said contacts representing an increased accumulated total of inserted coin credits;

a first rotating wiper for traversing and individually contacting said first contacts;

a second rotating switch means comprising:

a second contact board having a multiplicity of second contacts arranged in a circular path, one of said second contacts representing a zero credit position;

a second rotating wiper means for traversing and individually contacting said second contacts;

means interconnecting said first and second wipers for simultaneous rotation of said first and second wipers;

motor means for rotating said first and second wiper means;

coin credit sensing means comprising:

a multiplicity of electrically actuated solenoids, each of said solenoids corresponding to a separate denomination of coins and each of said solenoids being actuated when its corresponding denomination of coins is inserted into the coin responsive machine;

a multiplicity of stop pins, each one of said stop pins being associated with one of said solenoids so that actuation of said solenoid causes a vertical displacement of the associated one of said stop pins;

a registering means comprising:

a shaft;

a housing mounted on the shaft for axial displacement relative thereto in response to vertical displacement of said stop pins;

a coin determinative pawl actuator mounted in the housing for rotation about the shaft;

a ratchet wheel mounted in the housing for angular rotation about the shaft;

a registering gear mounted for rotation about the shaft, said registering gear being driven by said motor means;

spring means interconnecting said ratchet wheel and said registering gear for rotating said ratchet wheel;

interengaging means for interengaging the coin determinative pawl actuator and the ratchet wheel for rotation upon axial displacement of the hous-

ing by a vertically displaced stop pin, the amount of angular rotation of said coin determinative pawl actuator being limited by said vertically displaced stop pin so that the amount of angular rotation of said coin determinative pawl actuator and said ratchet wheel is proportional to the denomination of the coin inserted into the coin responsive machine;

motor switch means for operating said motor means;

means for actuating said motor switch means in response to rotation of said coin determinative pawl actuator and said ratchet wheel and in response to said housing returning to an axially undisplaced position so that said motor means rotates said registering gear by an amount of angular rotation equal to the angular rotation of said coin determinative pawl actuator and said ratchet wheel, said motor means simultaneously rotating said first and second wipers across said first and second contacts to the contact representing the accumulated coin credit corresponding to the amount of angular rotation of the said coin determinative pawl actuator and said ratchet wheel;

first price sensing means connected to a predetermined first one of said first contacts for providing a first price signal to the delivery means in response to said first wiper contacting said predetermined first one of said first contacts so that said delivery means may deliver a selected item having a first price;

second price sensing means connected to a predetermined second one of said first contacts for providing a second price signal to the delivery means in response to said first wiper contacting said predetermined second one of said first contacts so that said delivery means may deliver a selected item having a second price;

a clearing switch operated in response to delivery of the selected item for providing a clearing signal;

a time delay switch means connected to said second wiper, said second contacts being sequentially connected to an associated one of said solenoids so that upon receipt of said clearing signal, said time delay switch means sequentially switches to actuate the associated one of said solenoids connected to the contact being contacted by the second wiper to cause said motor means to sequentially operate to return said first and second wipers to their respective zero credit positions.

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