Aug. 17, 1965 E. B. OFFUTT ET AL 3,200,828

COIN CHANGER HAVING DOUBLE ESCROW UNIT

Filed July 3, 1962 4 Sheets-Sheet 1

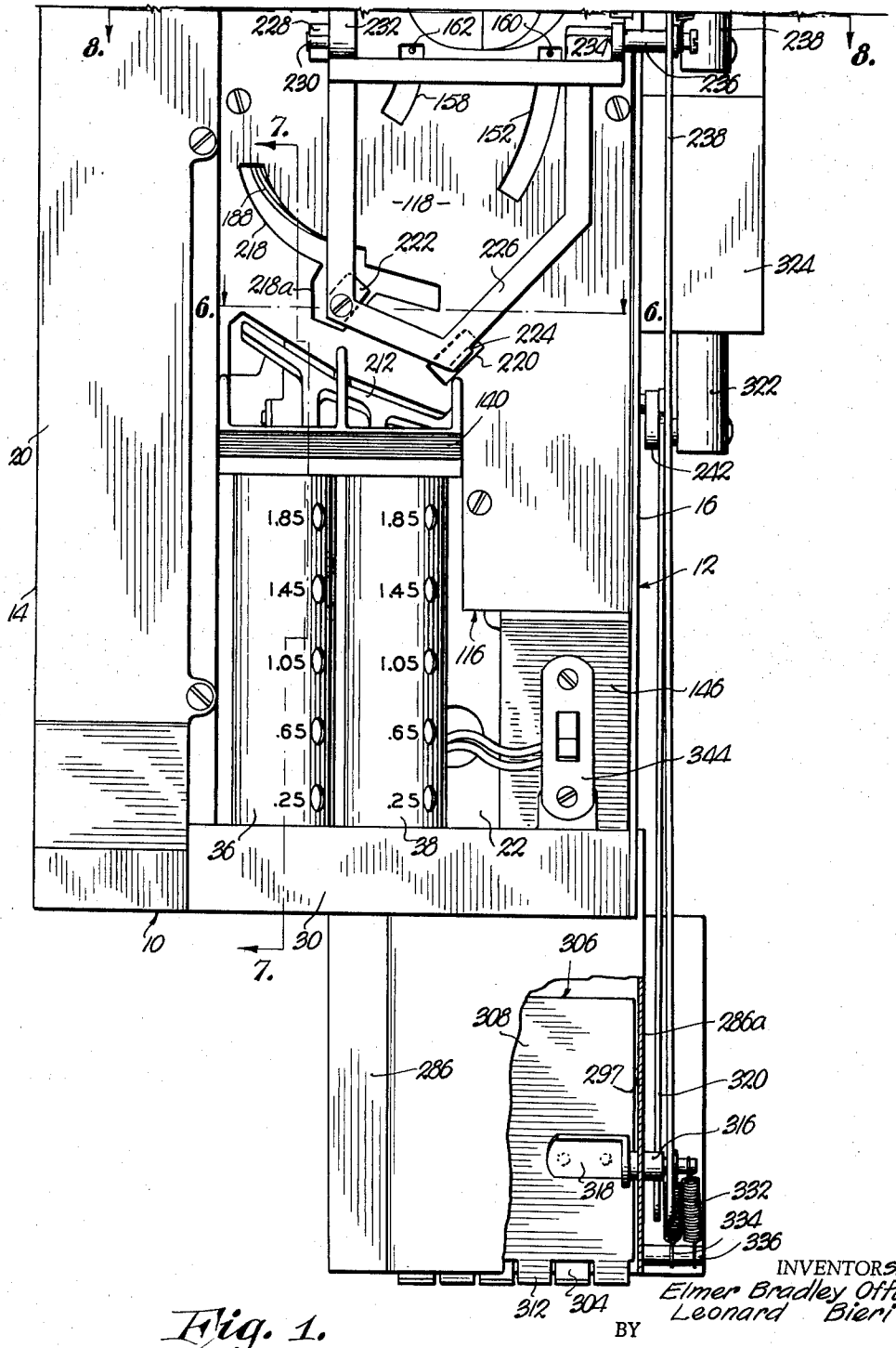


Fig. 1.

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COIN CHANGER HAVING DOUBLE ESCROW UNIT

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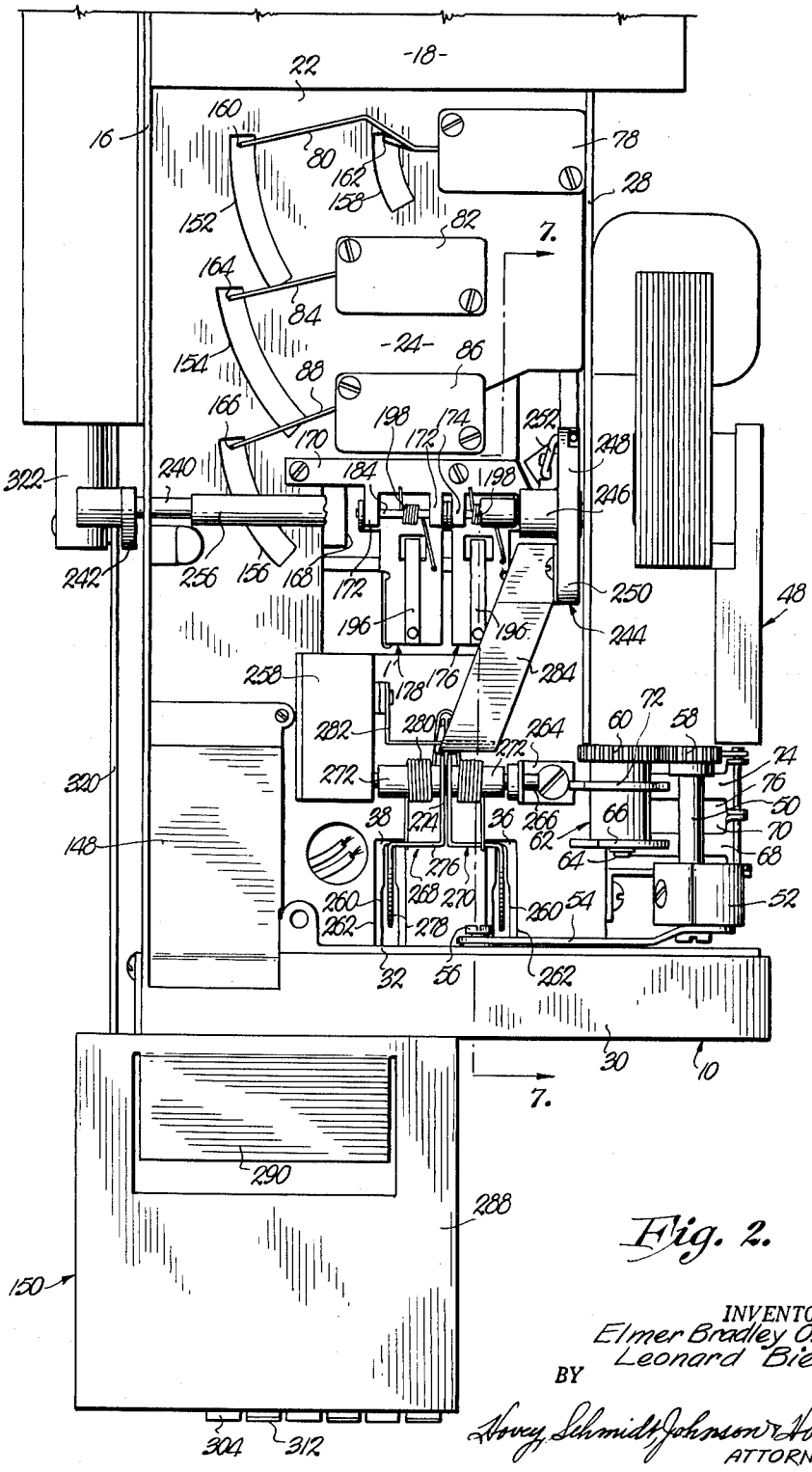


Fig. 2.

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COIN CHANGER HAVING DOUBLE ESCROW UNIT

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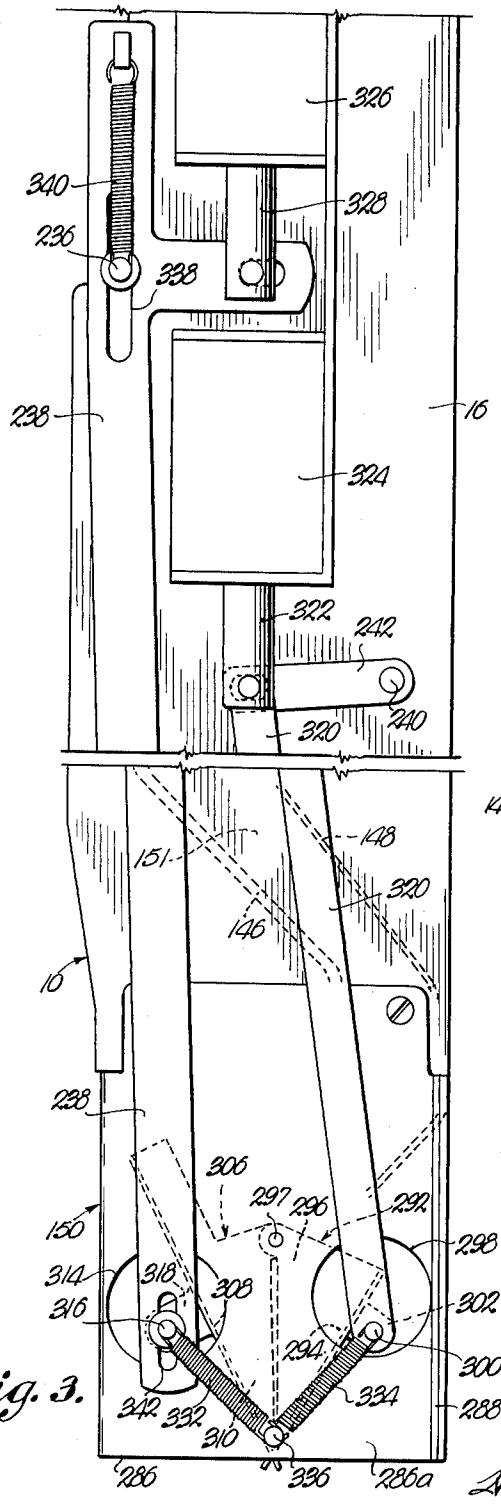
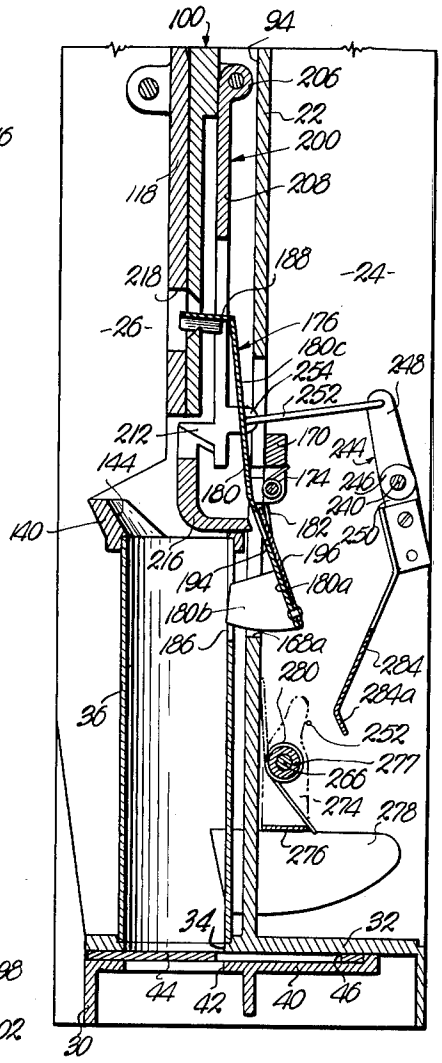


Fig. 3.

Fig. 7.



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COIN CHANGER HAVING DOUBLE ESCROW UNIT

Filed July 3, 1962 4 Sheets-Sheet 4

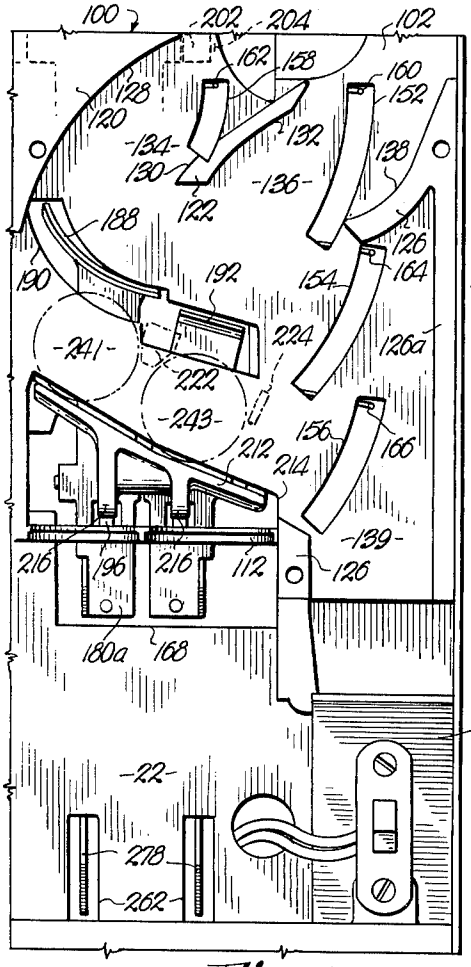


Fig. 4.

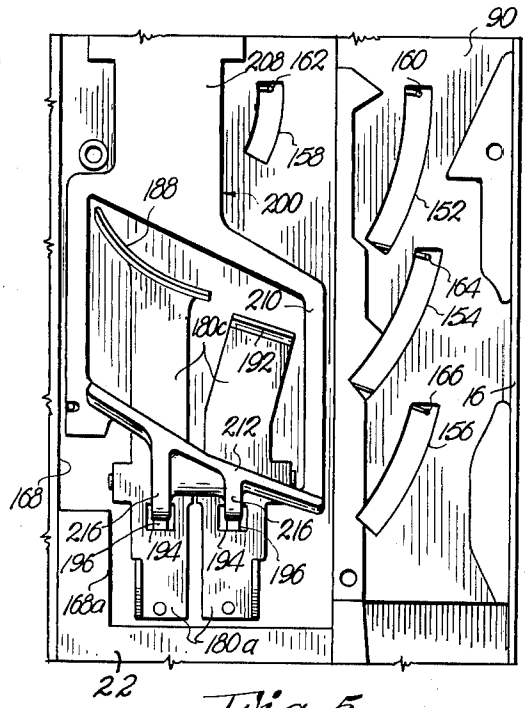


Fig. 5.

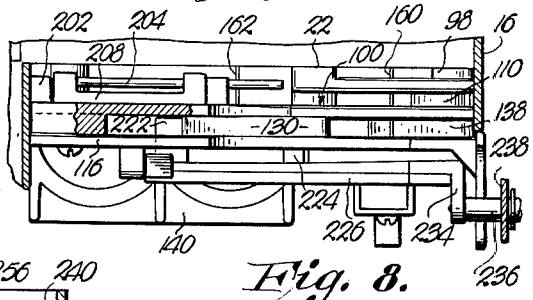


Fig. 8.

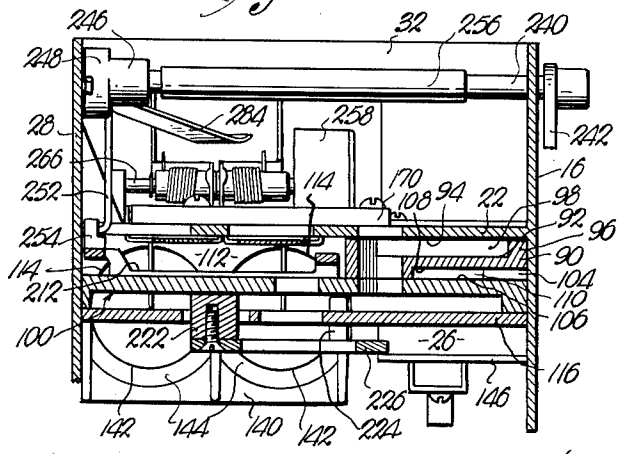


Fig. 6.

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United States Patent Office 3,200,828 Patented Aug. 17, 1965

3,200,828

COIN CHANGER HAVING DOUBLE ESCROW UNIT

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Filed July 3, 1962, Ser. No. 207,233
10 Claims. (Cl. 133—4)

This invention relates generally to coin handling equipment and especially to coin operated apparatus used in conjunction with vending machines for controlling the dispensing of an article to the customer and also returning a required number of change coins if the value of the deposit exceeds the price of the product.

Various types of change making devices have previously been provided for vending machines wherein change is returned to the customer equal to the excess deposit which the person has inserted in the machine over and above the price of the article purchased, but the prior change making units have suffered from the primary inherent defect of requiring considerable space in the vending cabinet to accommodate the change coins dispensed during the change making cycle of the apparatus. It can be appreciated that space occupied in the vending machine by the control mechanism of the unit materially decreases the effective portion of the cabinet which may be used to store products to be vended. Furthermore, attempts to solve the problem in the past have led to very complicated and expensive mechanisms which although operable for the subject purpose, were not completely practical from a commercial standpoint principally because of the space limitations in present vending equipment.

The only other prior solution resided in the utilization of a coin changer having limited storage capacity for change coins, and thereby either necessitating more frequent servicing of the vending machine to replenish the change coin storage tubes, or in the alternative, simply requiring that all customers have correct change for the products in the machine, after depletion of the coin storage structure.

It is also to be pointed out that utilization of coins inserted in the machine by customers to replenish the change coin storage tubes is complicated by the fact that in postselect machines, it is necessary that all money inserted be held in escrow until after the customer has made a selection because of the possibilities of a particular product either being sold out in the machine, or the customer changing his mind in respect to purchase of an article contained in the machine.

It is therefore the primary object of the present invention to provide coin operated control apparatus for vending machines or the like, wherein is included novel escrow structure permitting holding of all coins deposited in the apparatus in escrow until completion of the vend cycle, but still permitting direction of at least a certain proportion of the coins deposited in the machine, into the change coin storage tubes of the apparatus to minimize the space required in the vending machine cabinet for the change making and control unit.

It is another significant object of the invention to provide change making and control apparatus as referred to above wherein the space occupied by the coin storage tubes is maintained at an absolute minimum by virtue of the utilization of a pair of escrow units in the apparatus, one of which functions to hold change coin denomination coins in escrow above the change coin tubes, while the other coins deposited in the mechanism are retained in a second escrow so that if the customer does not receive a product, or changes his mind in regard to purchase of an article, all of the coins can be returned to the depositor, whereas, if the purchaser does receive an article, the change coins held in one escrow are directed into the change coin tubes, while the other escrowed coins are directed to the coin collection area of the machine.

A further significant object of the invention is to provide coin operated control and change making apparatus wherein the coins of the denomination used to make change, are not held in escrow above the change coin storage tubes, if the tubes are filled to a predetermined level, and thereby causing all of the coins deposited in the machine to pass to the second escrow unit, for ultimate return to the customer, or direction into the coin collection box, if the depositor actually receives a product from the machine. In this manner, coins of change making denomination are held in escrow above the coin storage tubes, only if the tubes require replenishment and thus maintaining the level of the coins in the tubes at a maximum level at all times, notwithstanding the fact that the coin storage tubes are not of extensive, space consuming length.

A still further important object of the invention is to provide apparatus as referred to above wherein the mechanism for preventing coins of change making denomination, being retained in escrow over the coin tubes, includes structure capable of sensing the level of coins in the respective coin tubes, to determine if change making coins should be retained in escrow above the storage tubes, and with the coin sensing structure being automatically retracted from and inserted into each of the coin storage tubes during each cycle of operation of the apparatus to assure that all of the change coins contained in the tubes lie on their sides and are not located at an angle which would not only decrease the capacity of the storage tubes, but also result in possible jamming of the tubes and precluding subsequent return of proper coins to a customer.

Also an important aim of the invention is to provide coin operated control and changing apparatus wherein the functions set forth above are accomplished utilizing simple and efficient electro-mechanical elements which are positive in operation and do not require frequent maintenance or adjustment.

Other important objects and details of the present invention will become obvious or be explained in greater detail as the following specification progresses.

In the drawings:

FIGURE 1 is a fragmentary, front elevational view of the lower portion of coin changing apparatus embodying the preferred concepts of the present invention and having a pair of escrow units thereon, certain portions of the apparatus being broken away and in section to reveal details of construction thereunder;

FIG. 2 is a rear elevational view of the lower portion of the apparatus as shown in FIG. 1;

FIG. 3 is a side elevational view of one side of the apparatus and showing the lower portion thereof as illustrated in FIGS. 1 and 2, certain elements of the lowermost escrow unit being shown in dotted line to indicate the relative positions thereof;

FIG. 4 is a fragmentary, front elevational view of the central section of the apparatus as shown in FIG. 1, and with the coin storage tubes and the front coin path defining plate as well as a portion of the upper escrow unit being removed for clarity and to better illustrate details of other elements of the apparatus;

FIG. 5 is a fragmentary, front elevational view similar to FIG. 4 and with an additional coin channel defining plate removed from the apparatus to show the elements therebehind;

FIG. 6 is a fragmentary, horizontal cross-sectional view taken substantially on the line 6—6 of FIG. 1 and looking downwardly in the direction of the arrows;

FIG. 7 is a vertical cross-sectional view taken on the line 7—7 of FIG. 1 and looking to the left as indicated by the arrows; the section line for FIG. 7 is also shown on FIG. 2 for purposes of clarity; and

FIG. 8 is a fragmentary, horizontal cross-sectional view taken substantially on the line 8—8 of FIG. 1.

The coin operated control and changing apparatus embodying the preferred concepts of the present invention is designated broadly by the numeral 10 in the drawings and includes a main housing 12, only the lower portion of which is illustrated in the drawings hereof, because the upper portion of apparatus 10 is conventional and forms no portion of the instant invention. It is to be understood however that the side walls 14 and 16 of housing 12 extend substantially the full vertical height of the latter and cooperate with the upper, upright rear wall 18 (FIG. 2) to define an upper compartment for receiving a coin accepting and rejecting unit capable of separating coins inserted in apparatus 10, into the various denominations thereof, and also segregating spurious discs from authentic coins in a manner well known in this field.

The side wall 14 cooperates with other internally disposed walls (not shown in detail) of housing 12 adjacent the lower left-hand corner thereof viewing FIG. 1, to present a coin reject chute covered by elongated, upright, removable plate 20 whereby scavenging of the coin accepting and rejecting unit results in return of coins or discs to the coin return chute of the vending machine via the chute behind plate 20.

The main upright, centrally disposed interior wall 22 of housing 12 divides the latter into a pair of upright compartments 24 and 26 as best shown in FIG. 6 with compartment 26 extending from the coin reject chute adjacent wall 14, to the side wall 16, whereas the compartment 24 is divided by an upright interior wall 28 located in proximal, parallel relationship to the margin of housing 12 defined by side wall 14. The lower extremity of interior wall 28 terminates in spaced relationship to the base section 30 of housing 12 which is integral with side walls 14 and 16 as well as the interior wall 22.

The base section 30 of housing 12 mounts change coin delivery mechanism which also forms no part of the present invention and therefore is not illustrated in detail, although it is to be understood that the change coin delivery mechanism is capable of successively directing change coins into the coin return chute of the vending machine and which has previously been described as being in communication with the coin return chute behind plate 20. Base section 30 includes a horizontal base wall 32 provided with a pair of circular openings 34 therein in the portion of the same defining a segment of compartment 26, and which serve to receive the lower extremities of corresponding upright change coin storage tubes 36 and 38 as shown in FIG. 1.

A casting 40 releasably secured to base section 30 of housing 12 in underlying relationship to the wall 32, is provided with a pair of coin delivery openings 42 therein below coin storage tubes 36 and 38, and an oscillatable coin delivery control plate 44 interposed between wall 32 and casting 40, serves to effect successive delivery of coins from tubes 36 and 38 as the plate 44 is oscillated. The plate 44 has a pair of openings 46 therein alternately alignable with the lower open extremities of tubes 36 and 38 so that oscillation of plate 44 through an arc to bring openings 46 into successive alignment with tubes 36 and 38, results in delivery of coins from the lower extremities of the tubes, as the openings 46 are then moved into alignment with the delivery openings 42 in casting 40.

The structure for oscillating plate 44 includes an electric motor and gear unit 48 carried within compartment 24 by interior wall 28 as shown in FIG. 2, and provided with a vertical output shaft 50 depending therefrom and

extending toward base wall 32. An eccentric block 52 secured to the lower end of shaft 50 for rotation therewith, serves as means for mounting a link 54 which is pivotally coupled to block 52 in eccentric relationship to the axis of rotation of shaft 50, and also to an upright lug 56 secured to coin dispending plate 44. The base wall 32 is provided with an arcuate slot therein (not shown for clearing lug 56 during oscillation thereof by link 54. A pinion 58 on output shaft 50 and rotatable therewith is in operable intermeshing relationship with a gear section 60 forming a part of a cam unit 62 rotatable on a stub shaft 64 depending from unit 48 in parallelism with shaft 50. A three-lobe cam 66 on the lower extremity of unit 62 is positioned to engage the operating arm 68 of a switch 70 while an intermediate, three-lobe cam 72 is located to actuate the arm 74 of another switch 76. The operation of the coin dispening mechanism and the function of switches 70 and 75 shall be explained hereinafter. Reference is made to application Serial No. 206,950 for a further showing of the specific components of the change coin payout mechanism.

As shown in the drawings, apparatus 10 is especially adapted for handling nickels, dimes and quarters, and to return nickels for purposes of making change, and therefore in order to provide proper actuation of the mechanism, a switch 78 is mounted on interior wall 22 within compartment 24 immediately below the lower extremity of rear wall 18, and provided with an arm 80 adapted to be actuated by nickels, dimes or quarters deposited in the machine and passing through apparatus 10. The switch 82 on interior wall 22 immediately below switch 78 has an arm 84 that is adapted to be actuated by only quarters passing downwardly through the quarter chute to be described in detail hereinafter. The switch 86 located below switch 82 on wall 22 has an actuating arm 88 that is positioned to be engaged by either dimes or quarters passing through the control and changing apparatus 10.

The coin accepting and rejecting unit carried by the upper compartment of housing 12, is adapted to segregate the coins introduced thereinto, in a manner causing the quarters to emerge from the rejecting and accepting unit adjacent the rearmost wall thereof, the dimes to emerge therefrom next to the quarters, and the nickels to gravitate out of the unit adjacent the forwardmost portion thereof. It therefore is to be recognized that the coin accepting and rejecting unit is mounted in the upper compartment of housing 12 in disposition causing the quarter, dime and nickel outlets thereof to be located immediately in front of interior wall 22 viewing the front of housing 12. In this manner, the face of wall 22 defining a portion of compartment 26 serves as one surface of the coin track for quarters gravitating downwardly through the lower portion of apparatus 10.

As indicated in FIGS. 5 and 6, an elongated, generally rectangular, upright coin channel defining plate 90 is removably positioned over the surface of wall 22 defining a portion of compartment 26, and located in proximal relationship to the side wall 16 of housing 12. The face 92 of plate 90 is maintained in spaced relationship to the proximal face 94 of wall 22, by integral, coin channel defining lugs and elongated spacer sections 96 which engage face 94. The 25¢ chute 98 between faces 92 and 94 is aligned with the quarter opening in the lower extremity of the coin accepting and rejecting unit carried by the upper portion of housing 12, so that quarters passing out of the upper unit gravitate directly into the coin chute 98 for passage downwardly therein.

A plate broadly designated by the numeral 100 is removably mounted on the face 94 of wall 22 in overlying relationship to plate 90, and extending the full width of housing 12 between the coin return chute and wall 16, for the purpose of defining not only the rear face of a dime chute as will be explained, but also the front surface of nickel chutes which communicate with the nickel

outlet of the coin accepting and rejecting unit in the upper portion of the coin control and changing apparatus 10. The main planar section 102 of plate 100 is in engagement with outwardly extending lug and abutment means 104 of plate 90 which cooperates with face 106 of section 102 and face 108 of plate 90, to define a dime chute 110 extending vertically in parallel relationship to quarter chute 98.

An inwardly extending, generally horizontal ledge 112 integral with the lower margin of plate section 102, is provided with a pair of generally arcuate notches 114 therein for complementally receiving the upper extremities of corresponding coin tubes 36 and 38. The rear edge of ledge 112 engages the proximal face 94 of interior wall 22 and thereby maintains the lower section of plate 100 in proper spaced relationship from wall 22.

The final coin pathway defining structure in compartment 26 of apparatus 10 comprises an irregularly configured plate broadly designated 116 in FIG. 1, and including a main planar section 118 in overlying relationship to plate 100 and maintained in horizontal spaced relationship therefrom, by the abutments 120, 122, 124 and 126 integral with the normally outermost face of planar section 102 of plate 100. The generally triangular abutment 120 has an arcuate inner edge 128 which defines the margin of the left-hand coin chute of apparatus 10, while the opposed arcuate edges 130 and 132 of centrally positioned abutment 122, define the right-hand margin and the left-hand extremity respectively of the nickel coin chutes 134 and 136 on opposite sides of plate 100. The right-hand margin of coin chute 136 is defined by the arcuate edge 138 of abutment 126. As best shown in FIG. 4, the upright, elongated extension 126*a* of abutment 126 and integral with the side margin of planar section 102, cooperates with the relatively short abutment 126 to define the lower portion of the nickel coin chute 139 communicating with the upper divided nickel coin chutes 134 and 136. An integral, outwardly projecting flanged member 140, projecting outwardly from the forwardmost face of planar section 118 (FIG. 6) is provided with a pair of arcuate, inwardly facing notches 142 therein adapted to complementally engage the upper ends of coin tubes 36 and 38 and thereby clamp the latter against the arcuate surfaces of ledge 112 on plate 100. The inclined surfaces 144 of flanged member 140, permit rapid filling of coin tubes 36 and 38 with nickels at the time of servicing of the machine containing apparatus 10.

The interior wall 22 is provided with a rectangular opening in the lower right-hand corner thereof (not shown) viewing FIG. 1, and a generally triangular coin diverting chute 146 integral with side wall 16 and the lower portion of interior wall 22, is disposed to receive coins gravitating from the lower extremities of chutes 98, 110 and 139 for direction of such coins into a lower escrow unit to be described. An inclined plate 148 secured to the rear face of interior wall 22 adjacent side wall 16, forms the rear portion of the coin diverting chute below plates 90, 100 and 116. The lower base section 30 of housing 12 is provided with a transversely rectangular (not shown) coin passage therethrough immediately below the coin chute presented by chute wall 146 and plate 148, for directing coins into the lower escrow assembly broadly designated 150 and carried by base section 30 at the right-hand corner thereof as illustrated in FIG. 1. The coin chute for diverting coins into the assembly 150 is illustrated by the dotted lines in FIG. 3 and designated 151.

The interior wall 22, plate 90, and the planar section 102 of plate 100, are provided with three generally arcuate, vertically spaced, generally aligned slots 152, 154 and 156 adjacent the switches 78, 82 and 86 as indicated in FIG. 2. The wall 22, plate 90, plate 100 and plate 116 are additionally provided with shorter, generally arcuate, aligned slots 158 in somewhat closer proximity to switch 78 and lying on the radius of slots 152. Actuating arm 80 of switch 78 is provided with an inwardly extending projection 160 on the outer extremity thereof located in aligned slots 152 and extending through quarter chute 98, dime chute 110 and nickel chute 136 to cause the contacts of switch 78 to be shifted by a coin passing downwardly through any of the coin pathways defined above. An integral, inwardly extending projection 162 on arm 80 intermediate projection 160 and switch 78, projects through the aligned openings 158 into the nickel chute 134 to also effect change of condition of the contacts of switch 78 by a nickel gravitating through nickel chute 134. It can now be appreciated that the contacts of switch 78 will be altered by a coin moving downwardly through any of the chutes 98, 110, 134 or 136.

The actuating arm 84 of switch 82 is provided with a generally horizontal, inwardly extending projection 164 on the outer extremity thereof, located in aligned slots 154 and projecting only into the quarter chute 98 for effecting depression of arm 84 by a coin gravitating downwardly through the 25¢ chute 98.

The generally horizontal, inwardly extending projection 166 of switch actuating arm 88 extends through aligned slots 156 and projects into quarter chute 98 and dime chute 110 for actuation by coins gravitating through these respective coin pathways. It is to be noted that the inner extremity of projection 166 does not extend into the coin chute 139 for actuation by nickels passing downwardly therethrough.

As is apparent from FIG. 5, upright interior wall 22 is provided with a centrally disposed, irregular opening 168 therein with the lower, generally rectangular section 168*a* of opening 168 being located in alignment with the upper extremities of coin storage tubes 36 and 38. An elongated, generally horizontal mounting bar 170 secured to the rear face of interior wall 22 (FIG. 2) and projecting across opening 168, has two pairs of integral, depending, horizontally spaced mounting lugs 172 and 174 in alignment with opening 168. The pairs of lugs 172 and 174 serve to pivotally mount a pair of nickel deflector members broadly designated 176 and 178. Since deflector members 176 and 178 are substantially identical in most respects, only the details of member 176 will be described and the differences therebetween explained. With reference to FIGS. 2, 5 and 7, it can be perceived that the deflector member 176 includes a main elongated strip 180 having a pair of integral, outwardly projecting, horizontally spaced ears 182 thereon located outboard of corresponding lugs 174. A horizontal pivot pin 184 carried by and extending between all of the lugs 172 and 174 pivotally receives the ears 182 of both deflector members 176 and 178 to permit free sewinging movement of the deflector members about the axis of pivot pin 184. The lower, generally rectangular section 180*a* is normally positioned at an angle with respect to the vertical and carries an inwardly turned, irregularly configured feeler projection 180*b* on the lower end thereof, and which projects through the rectangular section 168*a* of opening 168. Each of the coin storage tubes 36 and 38 is provided with an upright, elongated slot 186 therein for clearing the feeler projections 180*b* of each of the deflector members 176 and 178. The upper section 180*c* of strip 180 is located in generally overlying relationship to the face 94 of interior wall 22 and extends upwardly into underlying relationship to the coin chute 134. An integral, horizontally arcuate deflector extension 188 on section 180*c* of deflector member 176, directly underlies the coin chute 134, and as is apparent from FIG. 4, the planar section 102 of plate 100 is provided with an arcuate slot 190 therein for clearing extension 188. The slot 190 is of irregular configuration and also serves to clear the somewhat shorter, relatively straight deflector extension 192 on the upper end of strip 180 of nickel deflector member 178, and projects into the nickel chutes immediately be-

low chute 136 for deflection of nickels into the nickel delivery chute 139.

Each of the lower sections 180*a* of deflector members 176 and 178 is provided with rectangular openings 194 therein (FIG. 5) immediately below the pivot axis of deflector members 176 and 178 and which clear pusher lugs to be hereinafter described. Upright leaf springs 196 secured to the rear faces of each of the lower sections 180*a* extend upwardly and overlie openings 194 as is apparent from FIG. 7. The coil springs 198 mounted on pivot pin 184 between lugs 172 and 174, engage the lower sections 180*a* of each of the nickel deflector members 176 and 178, as well as the main portion of mounting bar 170, to bias the deflector members 176 and 178 in a clockwise direction viewing FIG. 7.

The plate 100 serves to mount a nickel support member broadly designated 200 (FIG. 5) between the inner face of planar section 102 of plate 100 and the face 94 of interior wall 22, to the left of plate 90. The inner face of planar section 102 of plate 100 is provided with a pair of horizontally spaced, inwardly projecting lugs 202 thereon (FIG. 4) which serve to carry a horizontal pivot pin 204 that in turn rotatably carries the tubular bearing section 206 of the upright hanger segment 208 of support member 200. The parallelpipedal section 210 of member 200 and depending from segment 208, carries an integral, outwardly projecting, double inclined ledge 212 which projects through an irregular opening 214 (FIG. 4) in planar section 102 of plate 100. The ledge 212 thereby normally extends into the nickel chutes and precludes coins passing downwardly through chutes 134 and 136, gravitating directly into the open upper ends of coin tubes 36 and 38. A pair of generally L-shaped pusher extensions 216, integral with ledge 212, are aligned with the openings 194 and lower sections 180*a* of deflector members 176 and 178, to effect pivoting of the latter in response to swinging movement of member 200 as will be explained.

The outer plate 116 is provided with an irregular, generally arcuate slot 218 therein generally complemental to, and aligned with the slot 190 in planar section 102 of plate 100, and thereby serving to provide adequate clearance for the extensions 188 and 192 of the deflector members 176 and 178, when the latter are rotated by the pusher extensions 216 on member 200. The downwardly extending notch portion 218*a* of slot 218, as well as another, generally rectangular opening 220 in plate 116 immediately above flanged member 140, serve to clear the inwardly extending lugs 222 and 224 of a polygonal gate member 226 pivotally mounted on the front face of plate 116. Suitable, horizontally spaced lugs 228 on the outer face of plate 116 adjacent the upper edge thereof, rotatably carry oppositely extending, cylindrical projections 230 located on a common horizontal axis to permit swinging movement of member 226 about such axis. The upwardly extending segment 232 of member 226 located adjacent the left-hand projection 230 as shown in FIG. 1, is positioned to engage the outer face of plate 116 during swinging movement of member 226 to limit rotation thereof about the axis of projections 230. An outwardly extending ear 234 on member 226 on the upper corner thereof opposed to segment 232, serves to receive a horizontal pin 236 coupled to an actuating link 238 to be explained hereinafter. The lugs 222 and 224 are located in disposition above ledge 212 and cooperate with the latter to present an upper escrow unit adapted to retain nickels 241 and 243 which are maintained on edge on the upper inclined surfaces of ledge 212 between the side walls of plates 100 and 116 as best shown in FIGS. 4 and 7, when lugs 222 and 224 project through notch portion 218*a* and opening 220 into the coin chute defined between plates 116 and 100.

The side wall 16 and interior wall 28 serve to rotatably mount an elongated, horizontally disposed rod 240 which projects outwardly through side wall 16 and carries an elongated rocker arm 242 thereon as shown in FIG. 3. A rocker element 244 carried by rod 240 adjacent wall 28, has a tubular, central section 246 telescoped over rod 240 and suitably secured thereto, as well as an upwardly extending leg 248 and a downwardly projecting leg 250 on opposite sides of the axis of rod 240. An irregularly shaped wire 252 pivotally joins the upper extremity of leg 248 to an ear 254 on the lower portion of support member 200 directly behind support ledge 212 (FIGS. 2 and 7). A tubular sleeve of insulating material 256 is positioned over rod 240 between walls 16 and 28, to prevent engagement of the terminals of switch 86 with the preferably metallic rod 240.

Mechanism is also provided in the lower portion of compartment 24 for sensing when the change coins in tubes 36 or 38, reach a level where it is impossible to continue the change making function of apparatus 10, and as shown in FIG. 2, a coin level sensing switch 258 is carried by wall 22 adjacent coin chute 151. The coin tubes 36 and 38 are provided with upright, elongated slots 260 therein which are aligned with corresponding rectangular openings 262 in wall 22 immediately above section 30 of housing 12. A mounting lug 264 in horizontal spaced relationship from the body of switch 258, cooperates with the latter to support a horizontal pivot pin 266 which carries a pair of identical coin level feeler elements broadly designated 268 and 270. Each of the elements 268 and 270 includes a tubular bearing portion 272 rotatably mounted on pin 266 and carrying a generally Z-shaped feeler having an upright section 274, a horizontal segment 276 projecting toward a corresponding opening 262, and a generally oval shaped feeler 278 located to pass through the aligned openings 262 and 260 to feel the level of coins in the respective coin tubes 36 and 38. Coil springs 280 carried by respective bearing portions 272 of feeler element 268, engage wall 22 and the horizontal segments 276 of each of the feelers 268 and 270 for biasing the same in a clockwise direction as indicated in FIG. 7. The generally L-shaped actuating arm 282 of switch 258, projects downwardly and lies within the path of travel of the upper ends of sections 274 of feeler elements 268 and 270 to effect change of the contacts of switch 258 in response to pivoting of the feeler elements.

As shown in FIGS. 2 and 7, an elongated, generally L-shaped pusher member 284 of spring material is secured to the lower end of leg 250 of rocker element 244 for movement therewith, and terminates adjacent the upper ends of sections 274 of feeler elements 268 and 270. During rotation of rod 240, the lower, outwardly bent extremity 284*a* of pusher member 284 engages the upper ends of segments 274 to swing feeler elements 268 and 270 in a counterclockwise direction viewing FIG. 7, against the bias of coil spring 280.

The escrow assembly 150 positioned below coin chute 151, is of generally cubical configuration and is formed of a generally U-shaped member 286 closed at the open vertical side thereof by a rectangular plate 288 having an inwardly bent, integral segment 290 serving to deflect coins entering assembly 150 from chute 151, toward the central area of the U-member 286.

The escrow elements of assembly 150 are of the double clamshell type and adapted for separate actuation. The coin accept element 292 includes a main, angularly disposed planar section 294 provided with a pair of inwardly directed, integral ears 296 which are pivotally carried by opposed stub pins 297 mounted on opposite side walls of U-member 286. The outer side wall 286*a* of member 286 has a relatively large opening 298 therein for clearing the projection 300 of L-shaped lug 302 on the rear face of planar section 294 of element 292. The lower margin of planar section 294 has a series of spaced teeth 304 which mesh with similar teeth of the coin return escrow element 306 also carried within member 286. The element 306 is substantially identical with element 292 with the exception that the main planar section 308

thereof is of somewhat greater length than section 294 to assure retention of coins in the assembly 150 as the same gravitate downwardly thereinto from the coin chute 151. The ears 296 on opposed side walls of member 286 also rotatably carry the ears 310 of element 306 so that the teeth 312 at the lower margin of planar section 308 intermesh with teeth 304 of planar section 294. The circular opening 314 in outer side wall 286*a* of member 286 and in direct opposition to opening 298, clears the projection 316 of a generally L-shaped lug 318 mounted on the outer surface of planar section 308.

An elongated link 320 pivotally secured to projection 309 of element 292, extends upwardly therefrom, and is pivotally joined not only to the rocker arm 242 of rod 240, but also to the armature extension 322 of a solenoid 324 mounted on the outer face of side wall 16 of housing 12. Another solenoid 326 carried by wall 16 above solenoid 324, has an armature extension 328 which is pivotally connected to the elongated link 238 also pivotally joined to the projection 316 of element 306. Coil springs 332 and 334 connected to the projections 316 and 309 respectively, are hooked over lug 336 projecting outwardly from the outer side wall 286*a* of member 286, to bias elements 292 and 306 toward the dotted line positions thereof illustrated in FIG. 3. It is to be noted that link 238 is provided with an elongated slot 338 therein for clearing the pin 236 and that the actual mechanical connection of the latter to link 238 takes the form of a coil spring 340 joined to pin 236 as well as to the upper extremity of link 238. Additional lost motion is provided at the lower end of link 238, by an elongated slot 342 therein which clears the projection 316 of escrow element 306.

An inventory switch 344 is mounted on coin diverting chute member 146 above section 30 to permit operation of motor and gear unit 48 for any desired length of time to oscillate the plate 44 through a sufficient number of oscillations to empty the coin tubes 36 and 38 if desired. This function is desirable so that the serviceman may determine the amount of coins remaining in the machine at the time of restocking of products to be vended.

Operation

In the stand-by condition of apparatus 10, the solenoids 324 and 326 are deenergized, the inventory switch is off, the actuating arms 80, 84 and 88 of switches 78, 82 and 86 are in the uppermost, normal positions thereof as shown in FIG. 2, and the upper and lower escrows are adapted to receive and retain coins therein. For purposes of this description, it is also initially assumed that the coin tubes 36 and 38 contain a supply of nickels sufficient to bring the levels thereof to points intermediate the feelers 278 of feeler elements 268 and 270, and the feeler projections 180*b* of nickel deflector members 176 and 178. Thus, the feelers 278 engage the stack of nickels in each of the tubes 36 and 38 to thereby maintain the upper extremities of sections 274 of each of the feeler elements 268 and 270, in proximal relationship to wall 22, thereby permitting the switch actuating arm 282 to be maintained in the normal location thereof with the switch contacts of switch 258 in a closed condition.

The feeler projections 180*b* of nickel deflector members 176 and 178, are maintained in the upper extremities of coin tubes 36 and 38 under the influence of coil springs 198, whereby the deflector extensions 188 and 192 are maintained out of the nickel coin chutes between the plates 100 and 116.

The gate member 226 is also in the disposition thereof illustrated in FIG. 7 causing the lugs 222 and 224 to be maintained in the nickel chute above ledge 212 to effect trapping of nickels thereon as indicated in FIG. 4.

The escrow elements 292 and 306 of assembly 150 are also in the normal disposition of the same as shown in FIG. 3, whereby coins gravitating into member 286 from chute 151 are retained on the planar sections 294 and 308 of elements 292 and 306.

It is further assumed that the products to be vended from the machine containing apparatus 10 are set up for a price of 35¢ which may be deposited in the coin control and changing apparatus 10 either in the form of all nickels, or combinations of nickels, dimes and quarters. If the customer deposits seven nickels in the coin receiving slot of the panel of the vending machine receiving apparatus 10, the nickels will pass into the coin accepting and rejecting unit carried by the upper portion of housing 12, in successive order. The first nickel deposited will pass downwardly through the coin accepting and rejecting unit and will gravitate from the outlet of the accepting unit, either into coin chute 134 or 136. It is to be pointed out that the coin accepting and rejecting unit has a flipper element therein which delivers the nickles therefrom in alternate directions so that one nickel will pass into either chute 134 or 136, and the next successive nickel will then move downwardly into the other chute. Therefore, for purposes of the present description, it is assumed that the first nickel is caused to gravitate into the chute 134 between plates 100 and 116, whereby such nickel continues to move downwardly past the arcuate surfaces 128 and 130, and eventually comes to rest on the ledge 212 and maintained thereon by the lug 222 of gate member 226. The first nickel is designated 241 in FIG. 4, and the disposition of the coin is clearly illustrated therein. The next nickel 243 inserted in the vending machine, passes through the coin accepting and rejecting unit and is diverted into the upper end of nickel chute 136 by the diverting element referred to above. The second nickel 243 is also retained in escrow on the ledge 212 by virtue of engagement of such coin with the lug 224 of member 226.

The third nickel introduced into apparatus 10 is directed into the coin chute 134, but this nickel is not retained in escrow above the coin tubes 36 and 38, because such coin engages the upper edges of the nickels 241 and 243 as well as the upper surface of lug 222 and is thereby caused to gravitate downwardly into the nickel chute 139 for conveyance to the lower escrow assembly 150 via chute 151. Since the elements 292 and 306 are in interlocking relationship, the third nickel is retained in escrow within assembly 150. The fourth to seventh nickels also are diverted past the upper escrow defined by ledge 212 and lugs 222 and 224, and the subsequent nickels are also retained in the lower escrow assembly 150 as described above.

During gravitation of the nickels downwardly through the nickel chutes 134 and 136, the coins engage the projections 160 and 162 of switch actuating arm 80 to effect change of the contacts of switch 78. It is to be appreciated that switch 78 is operably coupled to stepper mechanism forming a part of the vending machine, requiring seven steps thereof before a product may be vended from the machine at a price of 35¢. Thus, the seven nickels described above pulse the stepper mechanism seven times to thereby permit the customer to obtain a product upon actuation of the postselect mechanism.

During delivery of the product from the machine, the stepper mechanism is returned to normal, and in association therewith, the solenoid 324 is energized to effect retraction of the armature therein and consequent upward movement of the armature extension 322. Elevation of the linkage 320 operably coupled to extension 322, causes the coin accept element 292 to be rotated about the axis of stub pins 297 whereby the nickels held in escrow in assembly 150 are permitted to gravitate into a coin accepting chute leading to a collection box in the vending machine.

Simultaneously with release of coins from assembly 150, the nickels 241 and 243 retained in the upper escrow unit are also released for gravitation into the open upper ends of coin storage tubes 36 and 38. Retraction of extension 322 rocks the arm 242 to effect rotation of rod 240 in a clockwise direction as shown in FIG. 7, whereby

the member 200 is pivoted in a direction to shift the ledge 212 out of the nickel coin chutes, by virtue of the coupling wire 252 interconnecting rocker element 244 on rod 240, with the ear 254 of member 200. Since the support for nickels 241 and 243 is removed from the nickel coin chutes, the nickels are free to gravitate downwardly into the coin tubes 36 and 38.

During swinging movement of the support member 200, the gate member 226 remains in the normal position thereof, to assure that the coins 241 and 243 fall into correct coin tubes 36 and 38, and also the deflector members 176 and 178 are shifted out of the coin tubes 36 and 38, to prevent the nickels 241 and 243 from coming to rest at an angle within corresponding tubes. During rocking motion of element 244 under the rotational action of rod 240, the pusher extensions 216 on section 210 of support member 200, pass through the openings 194 of deflector member strips 180, to thereby pivot the deflector members 176 and 178 in a counterclockwise direction as shown in FIG. 7, to shift the feeler projections 180*b* out of the upper extremities of tubes 36 and 38. Removal of the feeler projections 180*b* from tubes 36 and 38 prevents the feeler projections from causing the nickels to come to rest on edge, or at an angle, rather than lying flatly aganist the uppermost nickels in each of the coin storage tubes.

During the limited rotation of rod 240 as described above, the pusher member 284 on rocker element 244 is also shifted through an arc to cause the extremity 284*a* thereof to engage the upper ends of sections 274 of feeler elements 268 and 270, to effect withdrawal of the feelers 278 from the lower ends of tubes 36 and 38. This action assures proper downward movement of the coins in tubes 36 and 38 during the change making function of apparatus 10 as will be set forth hereinafter.

By virtue of the construction defined above, it can be seen that the storage capacity of tubes 36 and 38 may be substantially less than in other types of change making units, because of the fact that nickels deposited in the machine by a customer, are employed to replenish tubes 36 and 38 as required.

In the event that customer changes his mind after depositing the seven nickels referred to above, he may obtain return of all of the nickels by simply pressing a suitable scavenge or coin return button mounted on the control panel of the vending machine. Actuation of the coin return button effects energization of solenoid 326 whereby the armature extension 328 is shifted upwardly in response to retraction of the armature, thus causing the link 238 to be moved in an upward direction. Since the link 238 is operably coupled to the coin return element 306, the latter will be rotated about the axis of stub pins 297 to cause the nickels held in escrow in assembly 150 to be directed into the coin return chute of the vending machine. The gate member 226 is also pivoted substantially simultaneously with rotation of element 306 whereby the nickels 241 and 243 retained on ledge 212, are permitted to gravitate therefrom by virtue of removal of the lugs 222 and 224 from the nickel coin chutes. The nickels 241 and 243 gravitate directly into the coin chute 139 for movement along chute 151 into assembly 150. It is to be pointed out that the solenoid 326 is retained in an energized condition for a period sufficient to assure gravitation of the nickels 241 and 243 from ledge 212, through the escrow assembly 150 and into the coin return slot for delivery to the depositor, along with the other coins originally retained in assembly 150. Since both of the lugs 222 and 224 are simultaneously removed from the coin chutes between plates 100 and 116, coins are permitted to gravitate from the upper escrow, regardless of whether one or two coins are retained on ledge 212.

If gravitation of the nickels 241 and 243 into the coin tubes 36 and 38 effects filling thereof to a level causing the feelers 180*b* of deflector members 176 and 178 to be maintained out of the coin tubes 36 and 38, the extensions 188 and 192 are retained in the coin chute between plates 100 and 116, to preclude additional nickels passing downwardly onto the ledge 212, until after coins have been delivered from the tubes 36 and 38 during a change making cycle. When the deflector members 176 and 178 are retained in the positions thereof illustrated in FIG. 7, nickels passing downwardly through the chutes 134 and 136 are diverted directly into the nickel chute 139 by the upper surfaces of extensions 188 and 192 which are maintained in the nickel chute by the feeler projections 180*b* being prevented from entering corresponding tubes 36 and 38.

The same function occurs even if one of the tubes 36 or 38 contains sufficient coins to preclude the feeler projection 180*b* of the respective nickel deflector members 176 or 178 from moving into the coin tube, by virtue of the independent operation of the deflector members.

If the customer inserts two quarters in the vending machine, requiring return of three change nickels for example, the quarters pass downwardly through the coin accepting and rejecting unit, and then are diverted into the coin chute 88 for passage into the lower escrow assembly 150. During downward movement, the quarters successively engage the projection 166 of switch actuating arm 88 to effect closing of switch 86 twice in a manner to energize the stepper mechanism ten times in a manner conventional in this field and forming no part of the present invention. Thus, during return of the stepper, the motor and gear unit 48 is activated for sufficient cycles to cause three change nickels to be returned to the customer from the tubes 36 and 38. During energization of the motor of unit 48, shaft 50 is rotated through a sufficient number of degrees to cause the plate 44 to be oscillated three times, thereby resulting in delivery of three nickels from the lower extremities of tubes 36 and 38. The motor carrier switch 70 assures that motor and gear unit 48 discontinues operation at exactly the right instant, whereas the switch 76, which is actuated by the cam 72 on unit 62, is normally employed in connection with returning the stepper to normal.

The quarters maintained in the escrow assembly 150 may be either returned to the customer, if he pushes the coin return button prior to making a selection, or will gravitate into the coin collection box, when the customer selects a product.

The operation described above is essentially the same for deposits of other combinations of coins, including nickels, dimes and quarters in various sequences, and different total values. In all cases, deposit of nickels in apparatus 10, causes two of the same to be retained in escrow above the coin tubes 36 and 38, for replenishment of such tubes, if additional coins are required to bring the level of the tubes up to a point where the feeler projections 180*b* of deflector members 176 and 178, are maintained out of the upper extremities of the coin storage tubes.

The switch 258 functions to require deposit of proper change in the vending machine, if the tubes 36 and 38 do not contain a sufficient number of coins to return a proper amount of money to the customer upon deposit of coinage exceeding the price of the articles selected. The manner in which switch 258 requires insertion of proper coins in the machine, forms no part of the present invention but it is important to make note of the way in which the pusher member 284 engages the feeler elements 268 and 270 to rotate the latter in a direction to retract the feelers 278 from coin tubes 36 and 38, to assure proper downward movement of the coins in the storage tubes, and to prevent canting or jamming of the change coins in the tubes.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. Coin actuated, cyclic control apparatus having mechanism for returning change coins, said apparatus including:

structure for storing a quantity of change coins to be

delivered therefrom by said change coin return mechanism;

means defining a first coin receiving pathway for coins deposited in the apparatus corresponding in value to said change coins and disposed to direct said coins into the coin storage structure;

means defining a second coin receiving pathway extending from said first coin pathway;

a first escrow unit positioned to receive coins from said second coin pathway and normally hold said coins in escrow, said first unit including first means actuable to direct coins in the first unit toward a coin return area and second means actuatable to direct coins in the first unit toward a coin collection area;

a second escrow unit operably associated with said first coin pathway for receiving and holding in escrow, at least one of the coins introduced into said first coin pathway during each cycle of operation of the apparatus while effecting direction of other coins including change denomination coins passing through the first coin pathway during said cycle of operation, into the second coin pathway, said second escrow unit including first means actuatable to release said one coin from escrow and permit the same to be directed into said change coin storage structure, and second means actuatable to release said one coin from escrow in said second unit for passage into said second coin pathway;

separate, independently operable first and second power means, said first power means being operably connected to the first means of said first escrow unit and to the second means of the second escrow unit for actuating the same and the second power means being operably connected to the second means of said first escrow unit and the first means of the second escrow unit for actuating the same whereby during each cycle of operation of the apparatus, all of the coins deposited therein may be returned to the depositor, or at least a portion of the deposited coins, if of change coin denomination, used to replenish the change coinl storage structure as the remaining coins are accepted, depending on whether the first or second power means is independently operated; and

blocking means for preventing a coin passing through said first coin pathway being retained in escrow by said second unit when the change coin storage structure is filled to a predetermined level, said blocking means including a blocking member mounted for pivotal movement from a first position preventing coins from moving through the first coin pathway into escrow in said second unit, to a second position clearing coins passing through said first coin pathway, said blocking member including coin sensing means thereon and movable therewith, said coin sensing means being directly engageable with coins in said change coin storage structure for maintaining said blocking member in said first position thereof when the coins in said structure have reached said predetermined level therein.

2. Apparatus as set forth in claim 1 wherein is provided means operably coupling said second power means to said blocking member for shifting the latter from the first position thereof to the second position of the same each time said second power means is operated with the coin sensing means on said blocking member thereby being shifted out of disposition sensing the level of coins in said structure.

3. Apparatus as set forth in claim 2 wherein said change coin storage structure comprises an elongated, upright tube for receiving a plurality of coins in stacked, aligned relationship, said tube being provided with a slot in the upper extremity thereof for clearing said coin sensing means of the blocking member.

4. Coin actuated, cyclic control apparatus having

mechanism for returning change coins, said apparatus including:

a pair of generally upright, open-top change coin storage tubes overlying said mechanism and disposed to deliver change coins thereto during operation of the same;

means defining separate first and second coin receiving pathways above said coin tubes for coins deposited in the apparatus corresponding in value to said change coins, said first and second coin pathways being positioned to direct coins into the upper ends of respective change coin storage tubes;

means defining a generally upright third coin receiving pathway extending downwardly from and communicating with said first and second coin pathways;

a first escrow unit positioned to receive coins from said third coin pathway and normally hold said coins in escrow, said first unit including first means actuatable to direct coins in the first unit toward a coin return area and second means actuatable to direct coins in the first unit toward a coin collection area;

a second escrow unit operably associated with said first and second coin pathways for receiving and holding in escrow, at least one of the coins introduced and passing downwardly through each of said first and second coin pathways during each cycle of operation of the apparatus, while effecting direction of other coins passing downwardly through the first and second coin pathways during said cycle of operation, into the third coin receiving pathway, said second escrow unit including first means actuatable to release coins held in said second unit for gravitation into respective coin storage tubes and second means actuatable to release coins held in said second unit for gravitation into said third coin receiving pathway;

separate, independently operable first and second power means, said first power means being operably connected to the first means of said first escrow unit and to the second means of the second escrow unit for actuating the same and the second power means being operably connected to the second means of said first escrow unit and the first means of said second escrow unit for actuating the same whereby during each cycle of operation of the apparatus, all of the coins deposited therein may be returned to the depositor, or at least a portion of the deposited coins, if of change coin denomination, used to replenish said change coin storage tubes as the remaining coins are accepted, depending on whether the first or second power means is independently operated; and

coin blocking means operably associated with said second escrow unit for preventing retention of coins therein above a change coin storage tube filled to a predetermined level with change coins and serving to deflect all coins passing downwardly through the first and second coin pathways above the filled storage tube, directly into said third coin receiving pathway.

5. Apparatus as set forth in claim 4 wherein said coin blocking means includes a cam deflector member for each of said storage tubes and overlying the first and second means of said second unit, each of said deflector members being pivotally mounted for independent movement from first positions preventing coins from gravitating through the first and second coin pathways respectively into said second escrow, to second positions clearing coins passing downwardly through corresponding first and second coin pathways, each of said deflector members being provided with coin sensing means thereon and movable therewith, each of said coin sensing means being directly engageable with coins in the corresponding storage tube aligned therewith for maintaining a respective deflector member in said first position thereof when the coins in the aligned storage tube have reached said predetermined level therein.

6. Apparatus as set forth in claim 5 wherein is provided means powered by said second power means for inserting and withdrawing each of the coin sensing means from respective coin storage tubes during each cycle of operation of the appartus to assure that all coins lie on their sides in said tubes.

7. Apparatus as set forth in claim 6 wherein is provided yieldable means coupling each of said deflector members to said second power means to provide lost motion for each of the deflector members when the aligned coin tube is filled with coins to substantially said predetermined level.

8. In coin changing apparatus for a postselect vending machine:

structure for storing a quantity of coins of change making denomination;

means defining a coin pathway above said structure for coins of said change making denomination and positioned to direct coins therefrom into the structure;

an upper escrow unit having movable inclined means normally located in said coin receiving pathway above the structure in blocking relationship to the latter for supporting at least one coin of change making denomination on edge above the structure and movable out of the coin pathway to a position releasing said change making denomination coin thereon to the structure, and movable coin retaining means normally located in said coin receiving pathway above the inclined means and cooperable therewith to receive and retain a coin of said change making denomination on the inclined means, said retaining means being movable out of the coin pathway to a position clearing the initially retained coin for gravitational movement from the inclined means;

a lower escrow unit below said upper escrow unit and having a first element movable to a position releasing all coins received therein for return to the depositor and a second element movable to a position releasing coins received in the lower escrow unit to a collection area;

means defining an upright coin passage and including a portion extending downwardly from the coin pathway and the lower extremity of said inclined means, to said lower escrow for directing coins released from said inclined means, change making denomination coins deflected from the coin pathway into said coin passage by a coin retained on said inclined means, and coins deposited on the apparatus other than of change denomination, into said lower escrow;

means coupled to said retaining means and the first element for moving the same to coin releasing positions in response to depositor actuation thereof; and

means operably coupled to said inclined means and the second element for moving the same to coin releasing positions thereof only after an article selection has been made.

9. Apparatus as set forth in claim 8 wherein said coin retaining means includes a pair of lugs normally extending into the coin pathway for retaining two coins of change making denomination on the inclined means with one of the lugs being positioned between the retained coins, said one lug having an upwardly facing surface located to cooperate with coins retained on said inclined means for deflection of additional change denomination coins into the coin passage by the retained coins and said one lug whereby lodging of coins between the retained coins is precluded.

10. Apparatus as set forth in claim 8 wherein is provided a movable deflector above said coin retaining means normally positioned out of said coin pathway and movable into said pathway to a location for engagement by coins of said change making denomination falling in said pathway toward the inclined means for diverting said change denomination coins directly to said coin passage, and sensing means operably associated with said structure for sensing filling of the structure with change coins to a predetermined level and connected to said deflector means for moving the latter to said location thereof in the coin pathway upon filling of said structure with coins to said level.

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