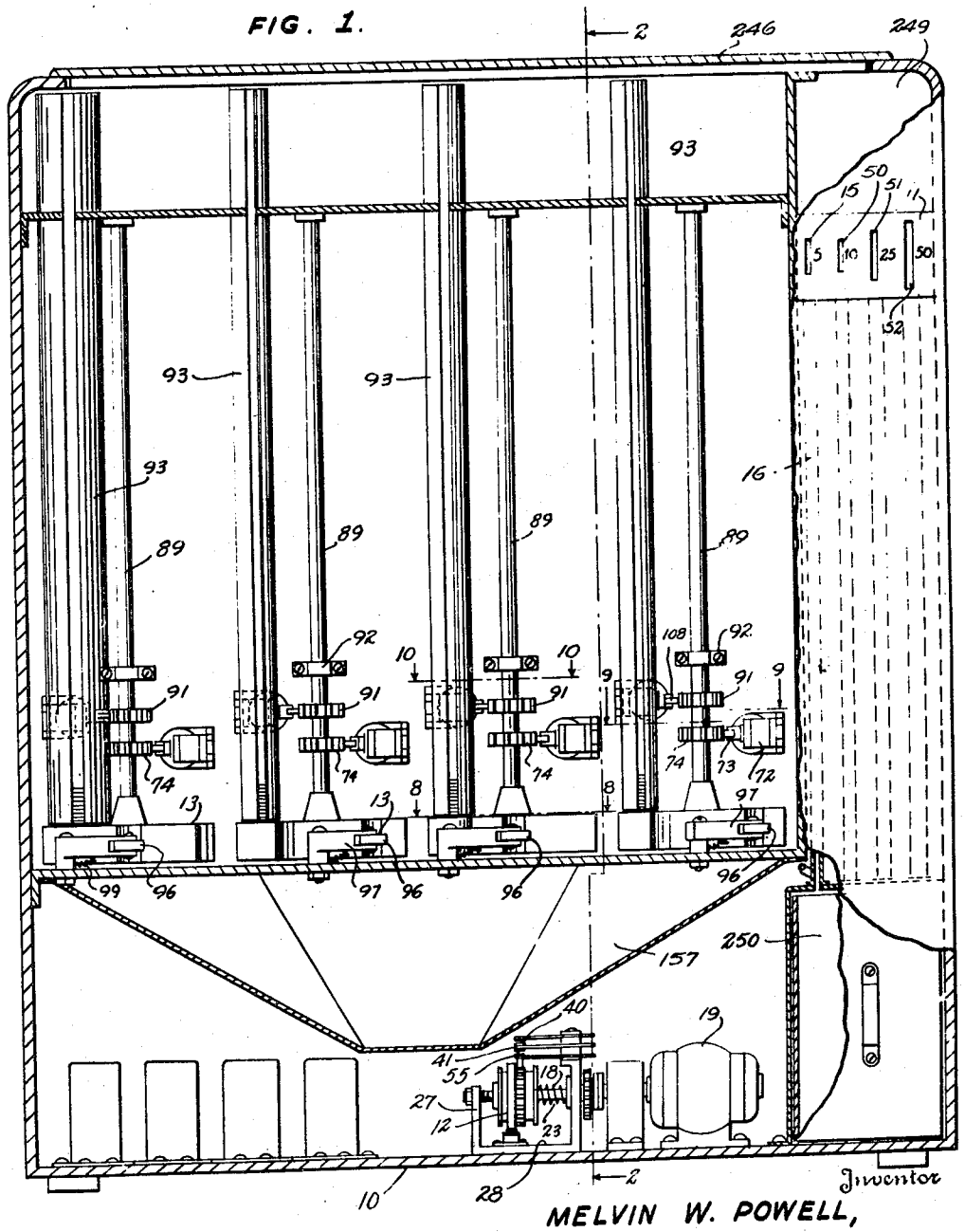
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COIN-ACTUATED CONTROL AND CHANGE DELIVERY MECHANISM

Filed April 15, 1947 6 Sheets-Sheet 1

FIG. 1.



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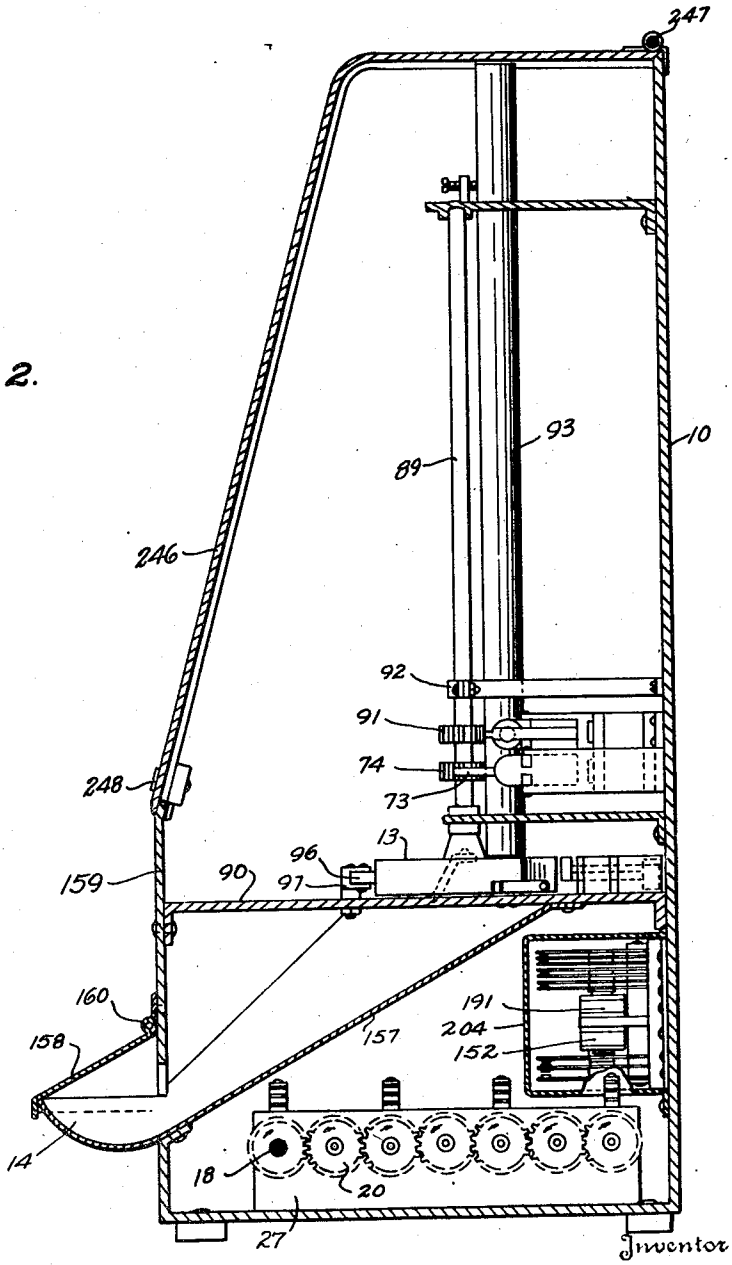
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COIN-ACTUATED CONTROL AND CHANGE DELIVERY MECHANISM

Filed April 15, 1947 6 Sheets-Sheet 2

FIG. 2.



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COIN-ACTUATED CONTROL AND CHANGE DELIVERY MECHANISM

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FIG. 4.

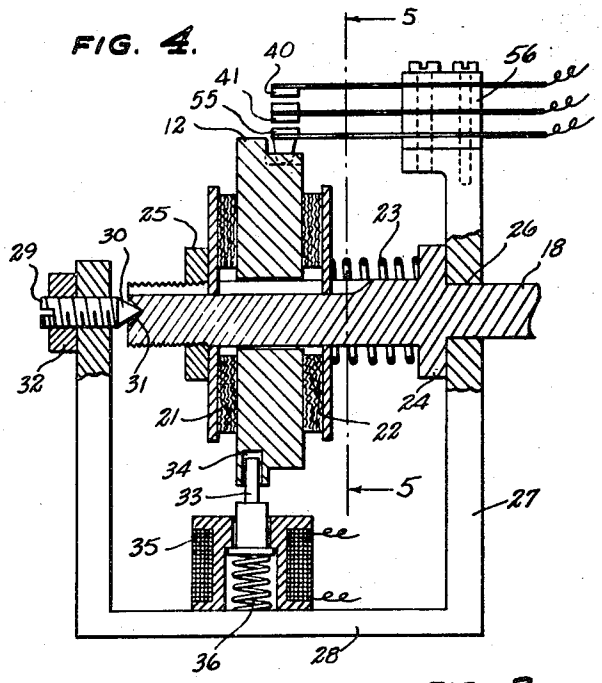


FIG. 5.

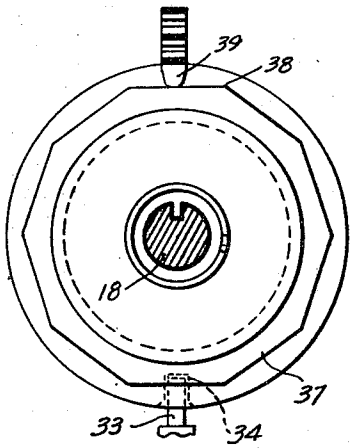
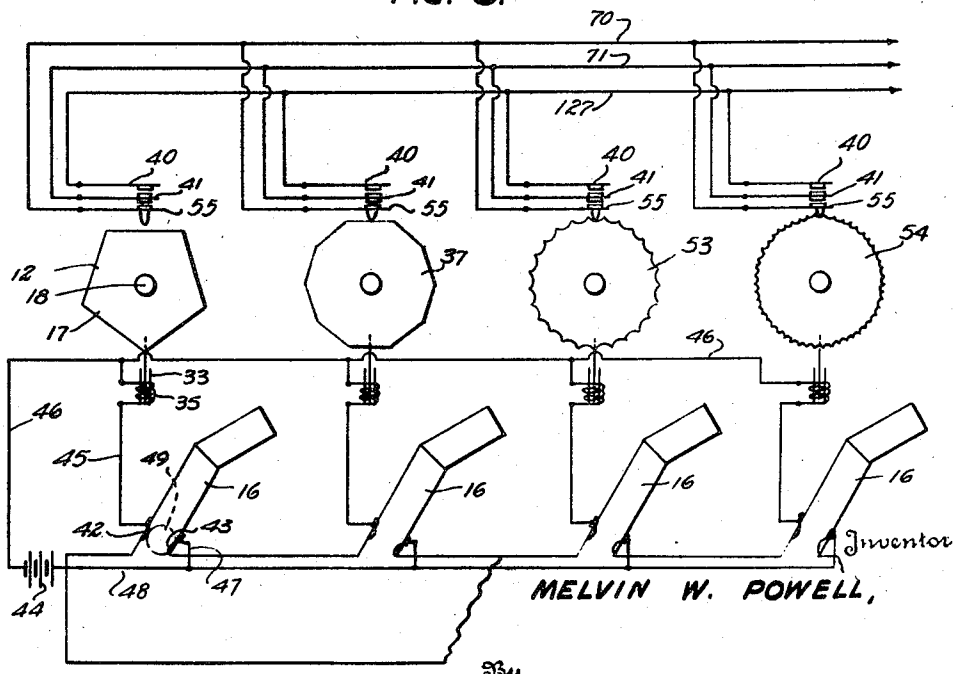


FIG. 3.



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COIN-ACTUATED CONTROL AND CHANGE DELIVERY MECHANISM

Filed April 15, 1947 6 Sheets-Sheet 4

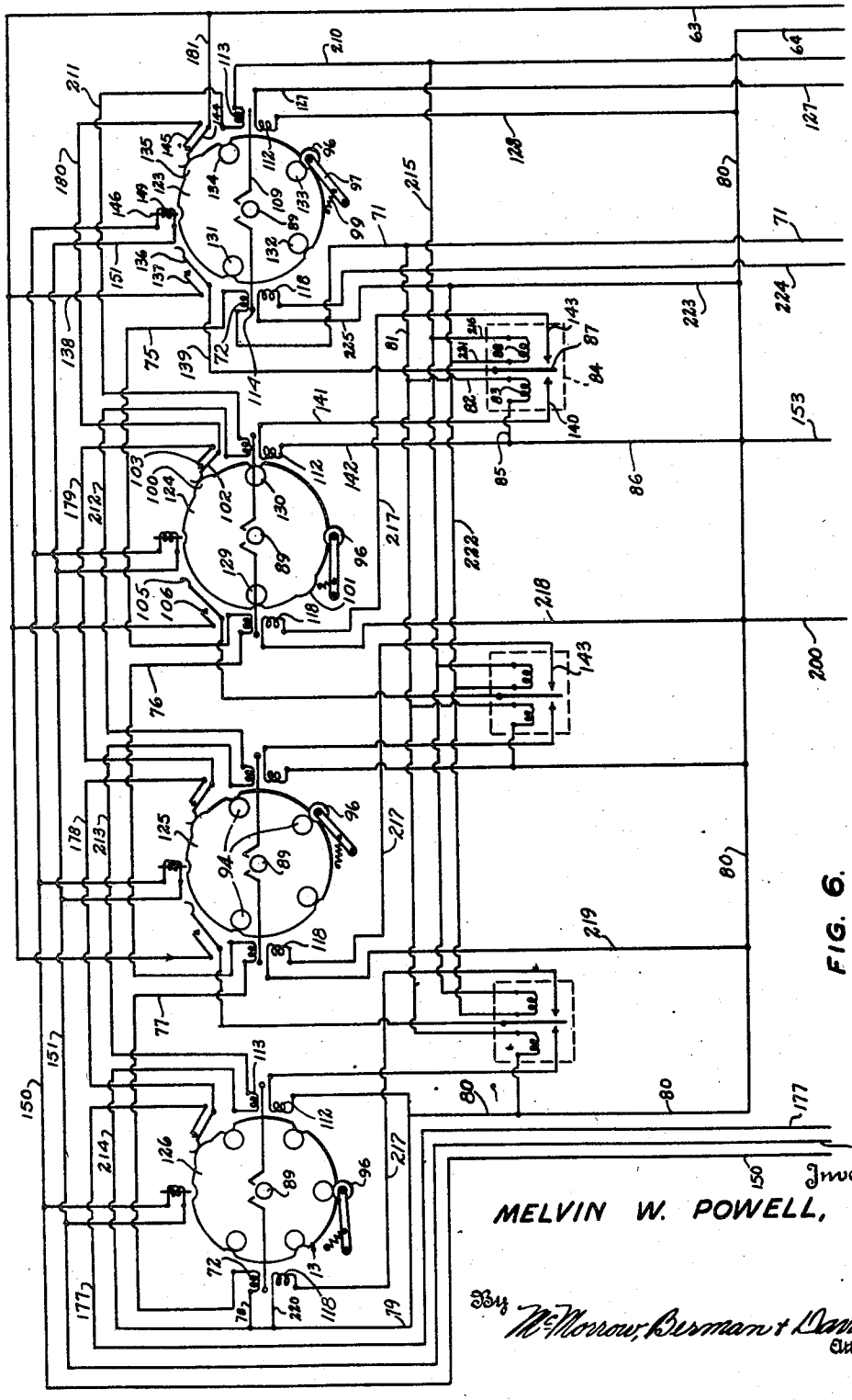


FIG. 6.

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COIN-ACTUATED CONTROL AND CHANGE DELIVERY MECHANISM

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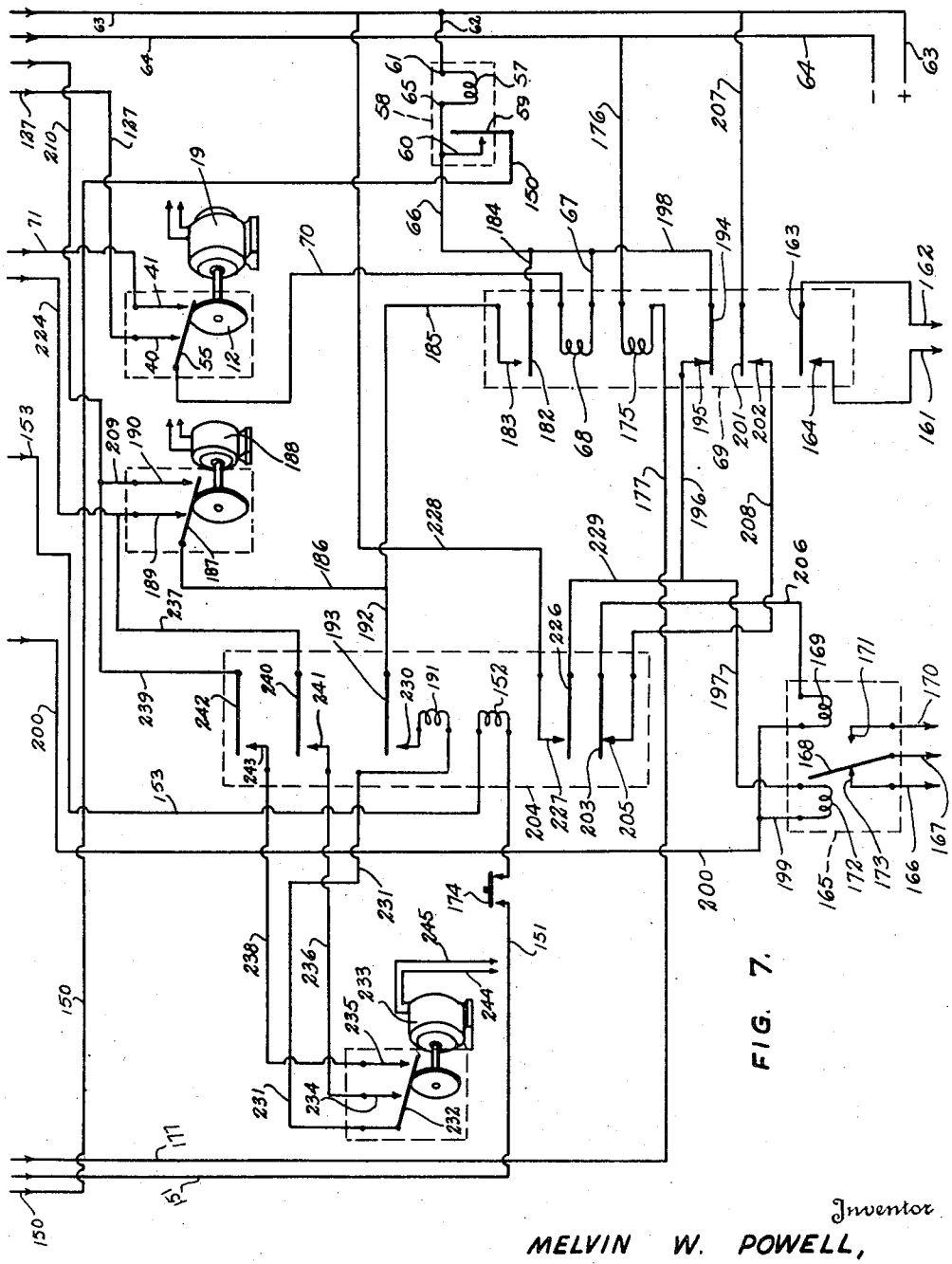


FIG. 7.

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COIN-ACTUATED CONTROL AND CHANGE DELIVERY MECHANISM

Filed April 15, 1947 6 Sheets-Sheet 6

FIG. 8.

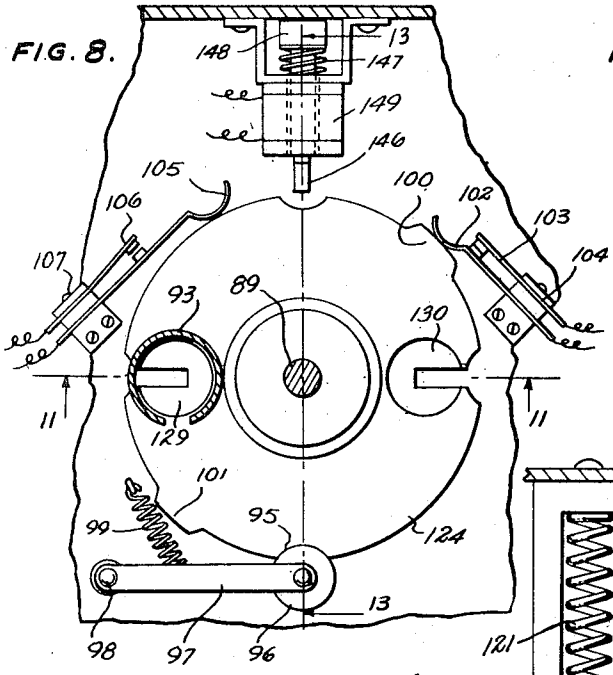
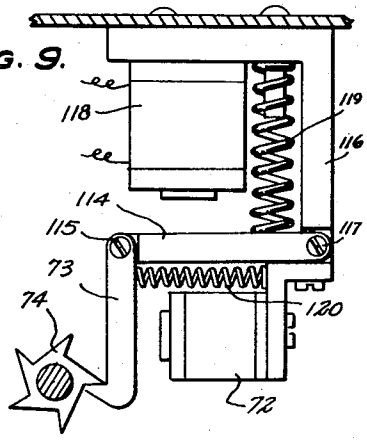


FIG. 9.



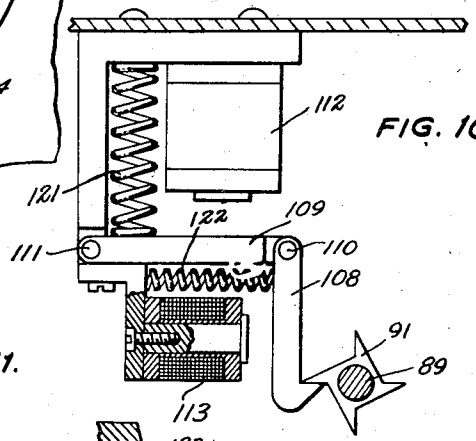


FIG. 10.

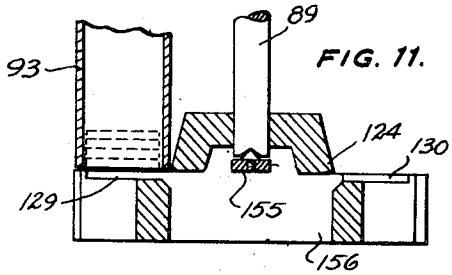


FIG. 11.

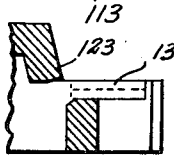


FIG. 12.

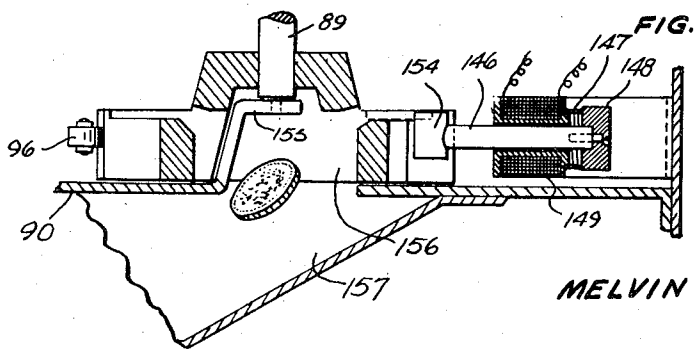


FIG. 13.

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Patented Aug. 21, 1951 2,564,719

UNITED STATES PATENT OFFICE

2,564,719

COIN-ACTUATED CONTROL AND CHANGE DELIVERY MECHANISM

Melvin W. Powell, Pelham, Ga.

Application April 15, 1947, Serial No. 741,492

9 Claims. (Cl. 194—7)

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This invention relates to electrically operated change-making, vending, computing, and control machines, wherein upon the insertion of coins of different denominations, coins are delivered from coin chutes containing coins of different denominations representing the difference between the amount of the inserted coins and an amount to which the machine is set or to which it is actuated.

A purpose of this invention is to provide a coin-actuated control and change delivery mechanism wherein upon completion of the performance of certain functions an amount is established in the machine and change representing the difference between the amount established and the amount of coins inserted in the machine is mechanically discharged or delivered therefrom.

In the usual change-delivery and control machine (such as proposed in Mihalek Patent No. 2,491,900, dated December 20, 1949, with dispensing mechanism not shown), the amount of the function is established, and as a coin is inserted in the machine, the function is performed and the instrumentalities automatically operate to deliver the proper change. In some cases, however, it is desired to first compute an amount after the desired coins are inserted and then deliver the proper change, and for this reason it is desirable to provide means for accumulating credit values representing the amount of the inserted coins until the performance of certain control functions is completed, and, during the completion of credit deducting functions, establish the amount and then deliver the correct change.

It is, therefore, among the objects of this invention to provide an improved coin-actuated control and change delivery mechanism; which is used to receive coins of various denominations to establish a desired credit amount and provide control functions for any service function controlled mechanism (not shown) that is operative on a rate basis and performs a service, sale or like function; which may be actuated to return change amounting to the difference between the value of the deposited coin or coins and the value of the service control functions provided; which will, upon the deposit of coins therein, accumulate unit credits to the full value of the coins deposited; which will deduct unit credits from the accumulated credits in amounts equal in value to the value of the service control functions provided; which accumulates credit units by applying electrical impulses from a coin controlled impulse generator to the credit accumulating mechanism and utilizes electrical impulses generated at a predetermined rate by a service controlled credit deducting impulse generator to deduct credit units corresponding in value to the value of service control functions provided; which maintains the proper amount of change available

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for immediate delivery but will not deliver change prior to the completion and evaluation of the service control functions provided; which will return the entire value of the deposit if no credits are deducted; which will automatically terminate the service control functions provided in the event the credits deducted become equal in value to the value of the credits established at the beginning of an operative cycle; which will automatically terminate one of the service control functions provided and then return to a zeroized condition after any delivery of change in order to provide an accurate performance during the next operative cycle; which is simple and durable in construction, positive and accurate in operation and capable of a change delivering range from zero to several dollars in one cent variations.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawings wherein:

Figure 1 is a view showing a front elevation of the change delivery and control machine illustrating a machine of a typical design and showing the relative positions of the coin deposit slots for coins of different denominations, and with parts broken away showing the deposited coin chutes and the money box from which the deposited coins may be removed.

Figure 2 is a typical cross-section through the change delivery and control mechanism, showing one of the chutes or tubes holding some of the coins used for change and some of the operating instrumentalities associated therewith, taken on line 2—2 of Figure 1.

Figure 3 is a diagrammatic view illustrating a plurality of coin controlled impulse generators such as controlled by deposited nickels, dimes, quarters and half-dollars, with the electric integrally associated circuit therewith, wherein a number of credit accumulating electrical impulses are generated corresponding with the number of cents of the coins deposited.

Figure 4 is a cross-section through one of the generators illustrated in Figure 3, showing the friction clutch elements through which the actuating cam disc associated therewith is rotated and a stop pin by which the cam disc is held from rotation until a coin controlling the operation of the generator is inserted in the associated coin deposit slot.

Figure 5 is a detail taken on line 5—5 of Figure 4 showing a side view of the actuating cam disc with the shaft thereof shown in section.

Figure 6 is a diagrammatic view, illustrating a plurality of credit accumulating and credit deducting and change carrying discs which are rotated in a credit accumulating direction through credit accumulating means by impulses generated by the coin controlled impulse generators for

nickels, dimes, quarters and half-dollars illustrated in Figures 3 and 7, and which are rotated in the credit deducting direction through credit deducting means by impulses generated by a service controlled impulse generator illustrated in Figure 7.

Figure 7 is a continuation of the wiring diagram illustrated in Figure 6, illustrating in particular the electrical impulse generators, relays and controls.

Figure 8 is an enlarged detail illustrating one of the credit accumulating and credit deducting and change carrying discs shown in Figure 6, showing in particular the disc for carrying nickels.

Figure 9 is a detail taken on line 9—9 of Figure 1 illustrating a combination of solenoids through which the credit accumulating and credit deducting and change carrying disc 123 is rotated in the credit deducting direction through a ratchet wheel and shaft with each impulse generated by the service controlled credit deducting impulse generator.

Figure 10 is a detail taken on line 10—10 of Figure 1 illustrating a combination of solenoids through which the credit accumulating and credit deducting and change carrying disc 124 is rotated in the credit accumulating direction through a ratchet wheel and shaft.

Figure 11 is a detail showing a section, on line 11—11 of Figure 8, through one of the credit accumulating and credit deducting and change carrying discs illustrating in particular a disc for carrying two coins, such as nickels, wherein one coin only may be positioned adjacent change delivery means at a time.

Figure 12 is a detail illustrating a section similar to that shown in Figure 11, showing one of the credit accumulating and credit deducting and change carrying discs coin receptacles in which a plurality of coins may be positioned adjacent change delivery means at a time.

Figure 13 is a detail showing a section through one of the credit accumulating and credit deducting and change carrying discs taken on line 13—13 of Figure 8, the disc being shown as rotated ninety degrees from the position shown in Figure 8, illustrating the solenoid actuated change delivery kicker associated therewith.

Referring now to the drawings, wherein like reference characters indicate similar parts, the change delivery and control mechanism of this invention is illustrated as being incorporated in a casing 10 with a plurality of coin receiving slots in a plate 11 on the face of the casing, with a plurality of actuating cam discs 12 and credit accumulating and credit deducting and change carrying discs 13 in the casing and with a change receiving tray 14 at the lower part of the front of the casing positioned to receive all coins that may be kicked or delivered from the change carrying discs 13.

In the operation of the machine, a coin, such as a nickel, is inserted in the nickel slot 15 and the coin drops downward through one of the chutes 16, illustrated diagrammatically in Figure 3, until it arrives at a position between two electrical contacts 42 and 43 wherein it completes a circuit that causes an actuating cam disc 17, having five projections or lobes on the periphery thereof, to be released and rotated for one complete rotation by drive means later to be described. The rotation of cam 17 closes the normally open credit accumulating impulse generating contacts 55, 41 and 40 five times, through a pin 38 similar to the one as illustrated in Figure 5, generating five credit accumulating impulses to cause the penny change carrying disc 123 to be rotated in a credit accumulating direction for a complete rotation and thereby impart a partial rotation to nickel change carrying wheel 124 in credit accumulating direction so as to position a nickel in position adjacent the coin kicker 146 (Fig. 13) later to be described. Should the value of a service control function provided be, as an illustration, 3 cents, credit deducting impulses generated at a predetermined rate by the service controlled impulse generator contacts 187, 188 and 189 will cause the two above mentioned change carrying discs to be rotated in the credit deducting direction whereby the nickel change carrying disc 124 will remove the nickel formerly presented for delivery as change and the penny change carrying disc 123 will position two pennies adjacent the kicker 146 positioned or combined with this credit accumulating and credit deducting and change carrying disc, wherein two pennies in change may be delivered therefrom as will hereinafter appear.

In the design as illustrated in the drawings, the actuating cam discs 12 are mounted each on one of four separate shafts 18, which are rotated continuously by a motor 19 (connected to any suitable electric power supply) through a train of gears 20 as illustrated in Figures 1 and 2, between rotatably affixed clutch elements 21 and 22 mounted on an associated shaft as shown for one combination thereof in Figure 4 and held in frictional contact with the disc by spring 23 positioned between collar 24 on the shaft and the back of one clutch element and holding the clutch elements and the disc against lock nut 25. The shafts are rotatably mounted in separate bearings 26 in upwardly extending element 27 of a base 28 and the outer ends of the shafts are held by separate screws 29 with conical shaped points 30 that extend into sockets 31 in the ends of the shafts and are secured by separate lock nuts 32 as shown for one combination thereof in Figure 4. The actuating cam discs 12, therefore, are frictionally coupled to their associated shafts which rotate continuously but the discs are normally held against rotation by stop pins 33 which extend into sockets 34, provided one adjacent and one in each cam disc. When a coin of the proper denomination is inserted in an associated coin deposit slot located in plate 11, the stop pin 33 of the associated credit accumulating impulse generator is withdrawn from the socket 34 in the associated cam disc by an associated solenoid 35, such as illustrated in Figures 3 and 4, whereupon the associated actuating cam disc is released and is rotated by the turning shaft 18 associated therewith, through clutch elements such as 21 and 22. The coin makes only a momentary connection between the contacts 42 and 43 energizing the solenoid 35 to withdraw the stop pin 33 from the socket 34. The circuit is broken as soon as the coin passes from between the contacts 42 and 43 and the stop pin is returned to holding position illustrated in Figure 4, by a spring 36, to stop the disc after one revolution thereof. In the design shown in Figures 3 and 5, a disc 37 is illustrated as having ten cam points similar to the cam of the distributor of a motor vehicle, and each time one of these points 38 passes a contact pin 39 attached to one end of a contact arm 55, normally open contacts 55, 41 and 40 as numbered in Figures 1, 3, 4 and 7 are alternately closed and opened, intermittently

completing circuits therethrough and generating ten credit accumulating electrical impulses as wires 70, 71 and 127 in Figure 3 are also shown in schematic form in Figure 7, electrically connected therewith.

As illustrated in Figure 3, the solenoids 35 by which the stop pins 33 are actuated are included in a circuit wherein contacts 42 and 43 in opposite sides of the coin chutes 16 are connected to a battery 44. The contact 42 is connected by a wire 45 to one terminal of the solenoid 35 with the other terminal of the solenoid connected by a wire 46 to one side of the battery 44. The contact 43 is connected by wires 47 and 48 to the opposite side of the battery. With a coin, as indicated by the numeral 49, in the coin chute providing connecting means between the contacts 42 and 43, the circuit is completed and the solenoid 35 actuates the stop pin 33 to release the actuating cam disc associated with that particular coin deposit chute for one complete revolution only, for and by the reasons explained herein.

Similar contacts are provided in the different coin chutes to release the associated actuating cam discs for coins of different denominations. Therefore; when a nickel is deposited in the coin slot 15, it will fall down the chute 16 associated therewith and cause the cam disc 17 to be rotated by the associated drive means for one revolution, actuating the contacts therewith and generating five credit accumulating impulses; when a dime is deposited in the coin slot 50, it will fall down the chute 16 associated therewith and cause the cam disc 37 to be rotated by the associated drive means for one revolution, actuating the contacts therewith and generating ten credit accumulating impulses; when a quarter is deposited in the coin slot 51, it will fall down the chute 16 associated therewith and cause the cam disc 53 to be rotated by the associated drive means for one revolution, actuating the contacts therewith and generating twenty-five credit accumulating impulses, and when a half-dollar is deposited in the coin slot 52, it will fall down the chute 16 associated therewith and cause the cam disc 54 to be rotated by the associated drive means for one revolution, actuating the contacts therewith and generating fifty credit accumulating impulses. In Figure 4, one contact arm 55 is shown as a spring arm projecting from an insulating block 56 and one each of contacts 40 and 41 are also shown as spring arms projecting from the block 56, these spring arm contacts are normally open until operated or actuated by an associated actuating cam disc.

The ratchet wheels 91, associated one each with each change carrying disc shaft 89 and that rotates each associated shaft and disc in a clockwise or credit accumulating direction, are actuated by pawls 108 on armatures 109, the armatures being pivotally connected to the pawls by pins 110 and pivotally mounted at the opposite ends on brackets by pins 111. The armatures 109 are influenced by solenoids 112, as shown for one combination thereof in Figure 10, that draw the armatures 109 upward when the solenoids 112 are energized by electrical credit accumulating impulses and during the times that the solenoids 112 are not energized the springs 121 force the armatures downward, and the springs 122 holding pawls 108 in engagement with ratchet wheels 91, except when solenoids 113 are energized which is during the time of impulse generation by contacts 107 and 100 or 232 and 235, later to be described.

The ratchet wheels 74, associated one each with each change carrying discs shaft 89 and that rotates each associated shaft and disc in a counter-clockwise or credit deducting direction, are actuated by pawls 73 on armatures 114, the armatures being pivotally connected to the pawls by pins 115 and pivotally mounted at the opposite ends on brackets 116 by pins 117. The armatures 114 are influenced by solenoids 118, as shown for one combination thereof in Figure 9, that draw the armatures 114 upward when the solenoids 118 are energized by electrical credit deducting impulses and during the times that the solenoids 118 are not energized the springs 119 force the armatures downward and the springs 120 holding pawls 73 in engagement with ratchet wheels 74, except when solenoids 72 are energized which is during the time of impulse generation by contacts 55 and 41, later to be described.

The credit accumulating and credit deducting and change carrying discs 13 are fixedly mounted, by any desired means, on the lower ends of vertically disposed shafts 89 above a horizontally disposed partition 90 in the casing 10, and the ratchet wheels 91 through which the shafts and discs are rotated in a clock-wise or credit accumulating direction, are positioned on the shafts 89, and affixed thereto by any desired means, below the bearings 92, and below the ratchet wheels 91 are the ratchet wheels 74 that rotate the change carrying discs and their associated shafts, as they are also affixed one to the other by any desired means, in a counter-clockwise or credit deducting direction. The number of teeth of each ratchet wheel corresponding with the number of divisions of the disc fixedly mounted on a shaft therewith and the teeth of the ratchet wheels are in proper alignment with said disc divisions. Vertically disposed coin chutes or tubes 93, angularly spaced one division counter-clockwise from coin kickers 146, as shown in Figure 8 for the nickel carrying disc 124, extend upward from the upper surfaces of the discs and the upper surfaces of the discs are provided with coin carrying receptacles or recesses such as numbered 94, 129, 130, 131, 132, 133 and 134 in three of the change carrying discs, said recesses or receptacles corresponding with the number and denominations of coins handled thereby. The depth and diameters of the recesses varying as necessary in order to deliver proper change if necessary, also, the number of the divisions in some of the discs varying for the same reason. The outer surfaces of the discs 13 are provided with indentations 95, and rollers 96 on arms 97 that are pivotally mounted at points 98 and resiliently held by springs 99 against the outer surfaces of the discs and are positioned to register with the indentations 95 to releasably restrain the rotation of the discs in between the times of the step by step rotative movements or rotation of the discs. Each of the discs 13 has on its periphery one or more projections to close contacts to establish or complete circuits to be hereinafter described. The disc designated as 124 in Figure 8, for example, and designed to position for delivery as change one nickel is also provided with the projections 100 and 101 which actuate normally open contacts 102 and 103 of switch 104 located adjacent the disc, and normally open contacts 105 and 106 of switch 107 also located adjacent this change carrying disc.

The depth of the coin carrying recesses in the

upper surfaces of the coin carrying discs determines the number of coins carried and positioned for delivery as change thereby. As a matter of information in Figures 6, 11, and 12, the depth of the coin carrying recesses or receptacles varying in the different discs. The disc 124, illustrated in Figures 6, 8, 11 and 13 provides means for carrying only one coin in each of the two recesses 129 and 130 as this disc will never need to position for delivery as change more that one nickel, whereas in the disc 123, the recess 131 carries one penny, the recess 132 carries two pennies, the recess 133 carries three pennies and the recess 134 carries four pennies. The dime carrying disc 125 is likewise provided with four recesses, three of which are indicated by the numeral 94, that increase in coin capacity similar to the penny carrying disc 123, also, the half-dollar carrying disc 126 is provided with recesses, not indicated by a numeral, that progressively increase in coin capacity, with respect to the change delivery kicker means 146 associated therewith and adjacent thereby at zero position, in the direction of credit accumulating movement of the disc.

At least one blank or zero reference division is necessary in all of the change carrying discs in order that the mechanism may be zeroized or operated so that no change is positioned for delivery and also in order that control means may be operated, later to be described.

In the schematic diagram illustrated in Figures 6 and 7, the contacts 55, 41 and 40 that are closed by the cam points of the actuating cam disc 12 are, as previously explained, connected with the wires 70, 71 and 127 in Figure 3 and are shown in Figures 1 and 3 as adapted to be actuated by any of the cam discs 12 which are rotated by the motor 19 (connected to any suitable power supply) through drive gears 20 as shown in Figure 2. When a coin of the proper denomination is deposited in the mechanism, the credit accumulating impulse generator associated therewith will start operating, as previously explained, upon closure of the normally open contacts 55, 41 and 40; the first contact to be engaged by contact 55 will be contact 41 which will complete a circuit from the main current supply wire 63 through wire 62 to terminal 61, from terminal 61 through coil 57 to terminal 65, from terminal 65 through wires 66, 67, coil 68, wire 70, contact 55, contact 41, and, from the contact 41 the circuit extends through a wire 71 to a solenoid 72 positioned to actuate a pawl 73 to disengaging position with respect to the teeth of a ratchet wheel 74 mounted on an associated change carrying disc shaft. From the solenoid 72, the circuit extends through similar solenoids adjacent to the different change carrying discs, being connected through wires 75, 76, 77 and 78. From the last of the solenoids 72 the circuit extends through wires 78 and 79 to a wire 80 and the wire 80 extends to the wire 64 of the main current supply, thereby disengaging all the pawls 73 from contact with the teeth of the ratchet wheels 74 to allow rotation of all the change carrying discs in a clock-wise direction when the solenoids 112 associated therewith are energized.

The relays 84 are provided with centrally disposed armatures 87 and electromagnets 83 are positioned on the opposite sides of the armatures from the electromagnets 83 so that alternative energization of the electromagnets or solenoids 83 and 88 causes the armatures to move to one side or the other to condition the associated circuits for the rotative actuation of the change carrying discs 124, 125 and 126 in either a credit accumulating or a credit deducting direction. Therefore or furthermore, upon closing of the contacts 41 and 55, a circuit is completed through wire 71, through wires 81 and 82 to one side of three electromagnets 83 each on one side of double acting magnetic relays 84 and from the other side of the electromagnets 83 the circuits are completed through wires 85 and the wires 86 or 89, through wire 80 to the wire 64, the wire 71 being connected to wire 63 through the closed contacts 41 and 55, wires 70, 67, 66 and 62 and through the electromagnets or solenoid windings 68 and 57 in series circuit therewith. Thus, the three armatures 87 of the three similar relays 84 are in contact with the three contacts 140 and the associated circuits are conditioned for the rotative actuation of the change carrying discs 124, 125 and 126 in a credit accumulating direction. With the electromagnets 83 in the circuit with the credit accumulating impulse generating contacts the change carrying discs will be rotatively stepped in the credit accumulating direction by the electric impulses generated thereby through means as will hereinafter appear.

As previously explained herein, upon the rotation of the actuating cam disc 12, contacts 41 and 55 are first closed. This operation causes all four of the pawls 73 to be disengaged from contact with the teeth of the four ratchet wheels 74, thus making it possible for the shafts 89 and their associated change carrying discs to be rotated in the clock-wise or credit accumulating direction. Also, closure of contacts 41 and 55 causes the three armatures 87 of the three relays 84 to contact the three contacts 140, as previously described. Upon the closure of contacts 55, 41 and 40, the armature 109 which actuates the change carrying disc 123 in a clock-wise or credit accumulating direction, as illustrated in Figure 6, is actuated by a solenoid 112 and the solenoid is energized with each electric impulse generated by the coin controlled credit accumulating impulse generators, as shown in Figures 3, 6 and 7, to rotate the disc 123 a number of rotative steps corresponding to the value in cents of the deposited coins. As illustrated in Figures 3, 6 and 7 wherein the contact 40 is connected by a wire 127 to one terminal of a solenoid 112 associated with disc 123 and the opposite terminal of that solenoid is connected by a wire 128 to the wire 80 which is connected to the current supply wire 64. The current supply wire 63 is connected to the contact 40 through the now closed contact 55, the wire 70, relay coil 68, wires 67 and 66, relay coil 57 and wire 62. The circuit is thereby completed through that solenoid 112 associated with the change carrying disc 123 and actuates the associated credit accumulating ratchet wheel 91 through the pawl 108 and armature 109 associated therewith, thereby rotating the associated shaft 89 and disc 123 clockwise through an angle of seventy-two degrees for each impulse generated by the credit accumulating impulse generators contacts 55, 41 and 40. As the contacts 55, 41 and 40 continue to generate a sufficient number of impulses the disc 123 continues to be rotatively stepped in a clock-wise direction, a projection 135 thereon moves seventy-two degrees with each rotative movement of the disc and after the disc has received four rotative movements the projection 135 is in position so that when the fifth rotative movement is accomplished, the projection 135 will have engaged normally open transfer

contact 136 which engaged contact 137 and completed a circuit through the solenoid 112 of the ratchet wheel pawl combination associated with the nickel change carrying disc 124, causing the disc to have been rotatively moved ninety degrees in the credit accumulating direction. The contact 137 is connected to the main current supply wire 63 through one wire 138 and a circuit from the contact 136 goes through one wire 139 to one armature 87, which being held in contact with one contact 140 by one relay coil 83 as previously described, is in contact with one contact 140 and that contact 140 is connected by one wire 141 to one terminal of the solenoid 112 associated with the nickel change carrying disc 124. The other terminal of the solenoid 112 associated with this disc 124 is connected by one wire 142 to the main current supply wire 64 through one of the wires 86 and wire 80. Every other rotative stepping movement of disc 124 will have caused one of the projections 100 or 101 thereon to have closed normally open transfer contacts 105 and 106 and this will have caused disc 125 to be rotatively stepped one step, by the similar solenoid 112 and electrical circuits associated therewith, and every fifth rotative stepping movement of disc 125 will have caused the projection thereon, similar to projection 135 on disc 123, to have closed normally open transfer contacts associated therewith, similar to contacts 106 and 105 of disc 124, and this will have caused disc 126 to be rotatively stepped one step by the similar solenoid 112 and electrical circuits associated therewith. This series of operations continues as the credit accumulating impulses are generated and presents for delivery as change coins equal in value to the value of the deposited sum.

The combinations and series of operations as hereinbefore described will rotate the credit accumulating and credit deducting and change carrying discs 13 in a clock-wise direction, wherein after four pennies are positioned for delivery as change, the next credit accumulating impulse is effectively transferred to the nickel carrying disc to position for delivery as change one nickel, and after nine cents are presented for delivery as change, the next impulse is effectively transferred to the dime carrying disc to position for delivery as change one dime, and after forty-nine cents are positioned for delivery as change, the next impulse is effectively transferred to the half-dollar carrying disc to present a half-dollar in position for delivery as change. This sequence will continue until the sum of $2.50 has been deposited in the coin deposit slots. Each rotative stepping movement of the penny carrying disc carries it through an angle of seventy-two degrees as it is divided ıto five divisions. Each rotative movement of the nickel rrying disc carries it through an angle of ninety degrees as it is divided into four divisions. Each rotative stepping movement of the dime carrying disc carries it through an angle of seventy-two degrees as it is divided into five divisions. Each rotative stepping movement of the half-dollar carrying disc carries it through an angle of sixty degrees as it is divided into six divisions. All of the ratchet wheels, as previously described, having a number of teeth corresponding to the number of divisions of the change carrying disc associated on a shaft therewith.

Referring now to Figures 6 and 7, the control instrumentalities provided as well as those used in the mechanism are illustrated as relays 58, 69, 165 and 204 with their armatures in the positions assumed when the change carrying discs 13 are zeroized or are in rotative positions with a blank space of each disc adjacent the four coin kickers 146, as a circuit from wire 64 extends through wire 176, relay coil 175, wires 177, 178, 179 and 180 and all of the closed contacts similar to and such as 145 and 144 adjacent disc 123 as they are in a series circuit therewith and from contact 144 the circuit extends through wire 181 to wire 63, completing the circuit and causing relay coil 175 to hold the armatures 182, 194, 201 and 163 of relay 69 in the positions as shown. With armature 182 held open with respect to the associated contact 183, no credit deducting operation can occur as will hereinafter be described. With armature 194 held closed with respect to the associated contact 195, a circuit is completed from wire 63 through wire 62, coil 57 (holding the armature 59 open with respect to the contact 60 of relay 58 to prevent the operation of change delivery means, later to be described), wires 66 and 198, now closed armature 194 and contact 195, wires 196 and 197, relay coil 172, wires 199, 200 and 80 which is connected to wire 64 thereby completing a circuit through the coil 172 of relay 165 and holding the armature 168 of that relay in the position as shown so that any circuit in series with wire 167, armature 168, contact 173 and wire 166 will be subject to control thereby and also, any circuit connected through wire 170, contact 171, armature 168 and wire 167 would be subject to control thereby. With the armature 201 of relay 69 held open, as shown, with respect to the associated contact 202 the circuit from wire 63 through wire 207, now open armature 201 and contact 202, wire 208, now closed contact 205 and armature 203, wire 206, relay coil 169, wires 200 and 80 to wire 64 will be open, releasing the armature 168 of relay 165 from magnetic influence of the relay coil 169 so that it will be under magnetic influence of relay coil 172, as shown. With the armature 163 of relay 69 held open, as shown, with respect to the associated contact 164 any circuit in series therewith through wires 161 and 162 will be subject to control thereby. The relay coil 68 in relay 69 is connected in series with the credit accumulating impulse generating contacts, as previously described, in order that all the armatures of relay 69 will be held in the positions shown during the time of credit accumulating impulse generation by the contacts 55, 41 and 40.

In the first cycle of operation of the mechanism, the credit accumulating impulses generated, corresponding in number to the value of the coin or coins deposited will cause the change carrying discs 13 to be rotatively stepped in the credit accumulating direction and position for delivery as change a coin or coins equal in value to the value of the deposited sum, the credit accumulating impulses generated will also cause relay coil 68 of relay 69 to hold the armatures of relay 69 in the positions shown in Figure 7 during the time of credit accumulating impulse generation. When any one or more of the four credit accumulating and change carrying discs 13 are not at zero position, that is, when any one or more than one of the change carrying discs are not presenting at least one zero reference division adjacent the coin kickers 146, the projection on the periphery of said any one or more than one of the discs similar to or such as projection 135 of disc 123 and projections 100 or 101 of disc 124, will be moved away from engagement with any one or more than one of the four contact combinations similar to or such as contacts 144

and 145 adjacent disc 123 or contacts 182 and 183 adjacent disc 124. This condition will open the circuit through the coil 175 of relay 69 as follows, from wire 64 through wire 176, coil 175, wire 177 to any one or more than one of the open contact combinations referred to above as they are connected in a series circuit through wires 177, 178, 179, 180 and 181 to the wire 63. Therefore, after the credit accumulating impulses cease flowing through the coil 68, which is connected in series with the credit accumulating impulse generators contacts 55, 41 and 40 to prevent the movement of the armatures 182, 194, 201 and 183 of the relay 69 during the time of credit accumulating in the mechanism so that the control means provided will not be actuated at this time, the armatures 183, 201 and 182 of the relay 69 will be released from the magnetic influence of coils 175 and 68 to allow them to return to normally closed positions with respect to their associated contacts 183, 202 and 184 for armatures 182, 201 and 183 and armature 194 will be allowed to return to normally open position with respect to the contact 195 associated therewith, thereby opening the circuit from wire 63 through wire 62, coil 57, wires 66 and 198, now open armature 194 and contact 195, wires 196 and 197, coil 172, wires 199, 200 and 80 to wire 64 thereby releasing armature 168 of relay 165 from magnetic influence of coil 172 to allow coil 169 the controlling influence, as will hereinafter appear.

After a credit has been established in the mechanism and the armatures of the relay 69 have been released from magnetic influence of coils 175 and 68, as previously described, a circuit is open from wire 63 through wire 62, coil 57 (releasing the armature 58 so that it can engage contact 60 of the relay 58 to allow operation of change delivery means if no credits are being deducted, later to be described), wires 66 and 198 to now open armature 194 and contact 195, through wires 196 and 197, coil 172, wires 199, 200 and 80 to wire 64 thereby releasing the magnetic influence of relay coil 172 on armature 168, and, a circuit is completed from wire 63 through wire 207, armature 201 and contact 202 now closed, wire 208, normally closed contact 205 and armature 203, wire 206, relay coil 169, wires 200 and 80 to wire 64, energizing relay coil 169 so that the armature 168 thereof will engage contact 171 and provide a primary electrical control means for any service function controlled mechanism or device that is operative on a rate basis. As a provisional illustration, the wires 167 and 170 may be connected in an operating circuit of a long-distance dial-telephone system so that when the circuit is completed by actuation of the armature 168 to engagement with contact 171 the telephone service may be commenced. Electrical switching means such as wire 167, armature 168, contact 173 and wire 166 are also provided to be used if desired.

In addition to the above described control means; after the armatures of the relay 69 have been released from the magnetic influence of coils 175 and 68, as previously described, the wire 181, contact 184, armature 183 and wire 182 of relay 69 can provide a closed circuit for control purposes that may be used to directly or indirectly commence the operation of the credit deducting function in the mechanism. As a provisional illustration, the motor 188 and cam affixed to the shaft thereof shown in Figure 7 for the operation of normally open credit deducting impulse generating contacts 187, 190 and 189, which are similar in structure to contacts 55, 41 and 40, could be directly connected to any suitable power supply in the circuit of which wire 181, contact 184, armature 183 and wire 182 would control. These credit deducting impulses are produced at a predetermined rate corresponding to the value of the service provided by any service function controlled mechanism operative on a rate basis and under secondary control of the mechanism herein disclosed, and said credit deducting impulses also corresponding in value to the value of service control functions provided by the mechamism herein disclosed as will hereinafter appear.

Operation of any service function controlled mechanism operative on a rate basis, such as an amusement device, long distance telephone, or equivalent device, as previously described herein, influencing or causing actuation of the motor 188 periodically closes normally open contacts 187 and 189 during the time the controlled service mechanism is in operation, thereby completing circuits to the solenoids 113 of the ratchet assemblies illustrated for one combination thereof in Figure 10, drawing the pawls 108 away from the ratchet wheels 91, and thereby disengaging the credit accumulating and change carrying discs 13 from clockwise rotation. Operation of motor 188 is timed and controlled by the operation of the service function controlled mechanism so that it will cause the credit deducting impulse generating contacts 187, 190 and 189 to generate a number of credit deducting impulses corresponding to the value of service provided, and relay 69 does not operate between current impulses generated by contacts 187, 190 and 189. The contact 190 is connected by a wire 209 to a wire 210 which extends to one terminal of the solenoid 113 associated with disc 123 and the other terminal of this solenoid is connected through the similar solenoids 113 in series circuit therewith by wires 211, 212, 213 and 214 and the wire 214 is connected to the wire 78 which extends to the main current supply wire 64 through the wire 80. The circuit is completed through the armature 187, the wires 186, 185 and through the now closed contact 183 and armature 182 to the wire 184 which is connected to the other main supply wire 63 through the wire 66, relay coil 57 and wire 62. The disengaging solenoids 113, therefore, hold the pawls 108 away from the ratchet wheels 91 so that the change carrying discs 13 are ready for rotative stepping in the credit deducting direction. The armature 182 is, as hereinbefore described, in contact with the contact 183 during this operation.

The contact 190 also completes a circuit through the wires 209, 210 and a wire 215 through the solenoids 88 which are connected to the wire 215 by wires 216, and the opposite terminals of the solenoids 88 are connected by wires 221, 222 and 223 to the wire 80 that carries the circuit to the main current supply wire 64. This operates the relays 84, wherein the armatures 87 are actuated to engage the contacts 143. The contacts 143 of the relays 84 are connected by wires 217 to the solenoids 118 which actuate the armatures 114 and pawls 73 to rotatively step the succeeding discs 124, 125 and 126 in the counter-clockwise or credit deducting direction through shafts 89 and ratchet wheels 74 when the circuits prepared by closure of contacts 143 are subsequently completed by closure of contacts similar to or such as 136 and 137 or 185 and 186 by cam projections similar to or such as 135 and 190 or 191 of a preceding disc. The relays 84 disposed be-

tween discs 123 and 124 and between discs 124 and 125 and between discs 125 and 126 are, therefore, similarly controlled and circuits are prepared by contacts 143 to energize the deducting solenoids 118 for a succeeding disc when a circuit is completed by the closure of contacts similar to or such as contacts 105 and 106 by a cam projection of a preceding disc. The opposite terminals of the solenoids 118 associated with discs 124 and 125 are connected by wires 218 and 219 to the main current supply wire 64 through the wire 80, and the solenoid 118 associated with disc 126 is connected by a wire 220 to the wire 79 through which it is connected to the wire 64 through the wire 80. The circuit for solenoid 118 associated with disc 124 is completed, as will be noted in the diagram shown in Figure 6, through the armature 87, the wire 139, the contacts 136 and 137, the wire 138 and the main current supply wire 63. The contacts 137 and 136 are closed by the cam projection 135 as the disc 123 is rotated.

The disc 123, which is rotatively stepped during the closure of contacts 187 and 189, upon their actuation by motor 188, as previously described, is rotated in the counter-clockwise or credit deducting direction by its associated shaft 89, ratchet wheel 74, pawl 73, armature 114 and solenoid 118, and the solenoid 118 with this disc 123 is, therefore, directly connected by a wire 224 to the contact 189 which engages the armature 187, the opposite terminal of this solenoid 118 being connected by the wire 225 to the wire 223 and from there through the wire 80 to the main supply wire 64. It will, therefore, be observed that during credit deducting, the credit deducting and change carrying discs 13 are rotated in the counter-clockwise direction to reduce the value of a coin or coins positioned for delivery as change, with the disc 123 moving one step through an angle of seventy-two degrees with each electrical credit deducting impulse generated and succeeding discs 124, 125 and 126 rotated counter-clockwise one step upon each closure of contacts similar to or such as 136 and 137 or 105 and 106 of a preceding disc, and if the operations are continued to use up the entire value of the deposit, the zero reference divisions of the discs or at least one zero reference division of each disc will be returned to positions adjacent the coin kickers 146, causing the relay 69 to operate and remove the electric power from armature 187 as armature 182 and contact 183 will now be open, terminating the credit deducting functions and the control functions provided by the mechanism.

The construction of one of the change carrying discs is illustrated in Figures 8, 11 and 13 and it will be noted that the upper surface of the disc extends under the coin tube 93 with the change carrying recess 129, in Figures 8 and 11, contiguous with the lower end of the coin tube 93. In the disc 124 illustrated in Figures 6, 8, 11 and 13, which may be designated as the nickel change carrying disc, two recesses 129 and 130 are provided in two opposite divisions upper surfaces as taken on line 11—11 Figure 8 and the two zero reference divisions or blank spaces are provided at the other two opposite divisions of this disc 124 as taken on line 13—13 Figure 8. As either one of the recesses 129 or 130 arrives at a position under the coin supply tube 93, having nickel coins therein, one nickel will drop from the tube into the recess, and when the other recess is disposed directly under the coin supply tube another nickel will be received and carried by the change carrying disc 124. As the disc is rotated through an angle of ninety degrees from the position shown in Figure 8, one of the recesses will be aligned adjacent one change delivery kicker 146, as shown in Figure 13, which is normally held away from the disc by one spring 147 positioned under one head 148 thereof and which is actuated for kicking change from the disc 124 by one solenoid 149 when it is necessary to deliver one nickel in change as illustrated in Figure 13. Figure 12 is a detail showing a section through the coin carrying receptacle 132 of disc 123 wherein two pennies are carried. The discs 123, 125 and 126 are also provided with change delivery kicker means similar to the one associated with disc 124, and they are also provided with associated coin supply tubes 93. As hereinbefore described, as the change carrying discs 13 are rotated in the credit accumulating direction the value of the deposited coin or coins will be presented in position for delivery as change and as the change carrying and credit deducting discs 13 are rotated in the credit deducting direction the value of the coin or coins presented for delivery as change will be decreased.

In the event the change carrying discs 13 are not returned to zero positions, with one zero reference division or blank space of each disc positioned adjacent the coin kickers 146, at the conclusion of a service operation or in the event no credit has been deducted after a credit has been established in the mechanism, a change delivery and zeroizing function is initiated by closure of manually operated change delivery switch 174. With the normally open service controlled credit deducting impulse generating contacts 187, 189 and 190 and also the normally open credit accumulating impulse generating contacts 55, 40 and 41 open, the circuit is broken through the solenoid 57 of relay 58 which releases the armature 59, whereby the armature 59 engages the contact 60 and the circuit is completed from the main current supply wire 63 through the wire 62, relay coil 57, now closed contact 60 and armature 59, wire 150 through the four solenoids 149 and from the solenoids through the wire 151, now closed switch 174, solenoid 152 and wire 153 to the wire 80 which is connected to the other main current supply wire 64. Therefore, as the switch 174 is closed, under conditions as above stated, a circuit is completed through the four solenoids 149 and the four coin kickers 146 are actuated to kick coins from all coin carrying receptacles or recesses positioned in the paths of actuation of the elongated heads 154. Therefore, change representing the difference between the credit accumulated and the credit deducted will be delivered or change representing the credit accumulated will be delivered if no credit has been deducted. The brackets 155 and the openings 156 in the centers of the under sides of the change carrying discs are designed to allow the coins delivered as change to pass from the recesses of the discs down the coin chute 157 to the change receiving tray 14 on the front of the mechanism. The tray may be provided with a hinged cover 158 mounted on the front 159 of the casing through a hinge 160.

The relay 58 is a slow-release type, so tha as long as a current or impulses flow through the windings of the solenoid 57 the armature 59 will be held away from the contact 60 in order to prevent the circuit being completed to the solenoids

149 of the coin kickers adjacent all the discs 13 when the switch 174 is closed. This is necessary to prevent operation of the change delivery means during the times that either the credit accumulating or the credit deducting functions are taking place, and also to prevent operation of the change delivery means during the time that the discs 13 are positioned at zero or with a blank space of each disc positioned adjacent the change kickers 146, as a current will be flowing through solenoid 57, as previously described, at this time.

Closure of switch 174 completes the circuit through solenoid 152 and draws the armature 226 of relay 204, whereby it contacts the contact 227 and closes a circuit through the solenoid 172 of relay 165. The contact 227 is connected by wire 228 to the main supply wire 63 and the armature 226 is connected by wire 229 to the wire 197 which is connected to one terminal of the solenoid 172 and the other terminal of this solenoid is connected by the wires 199 and 200 to the wire 80 which is connected to the main current supply wire 64. At the same time, the solenoid 152 causes opening of the armature 203 and contact 205, whereby the circuit to the solenoid 169 is broken as one end of solenoid 169 is connected through wire 206 to armature 203. This operation terminates the control functions provided by armature 168, of relay 165, and the associated contact 171.

Shortly after the change delivery means are operated the armature 59 of relay 58 will again break the circuit through contact 60, as coil 57 is in series with the change delivery circuit, in order that the change delivery kickers 146 will be withdrawn from the discs 13 by the associated springs 147 so that the discs can be zeroized or rotated counter-clockwise to refill the emptied coin carrying recesses and return a zero reference division or blank space of each disc to positions adjacent the kickers 146, and to operate the control functions provided by the mechanism to the positions as shown in Figures 6 and 7, as previously described.

Energizing the soleoid 152 by closure of switch 174 also draws the armature 193 into contact with contact 230 closing a circuit from now closed armature 182 and contact 183 through wires 185 and 192, now closed armature 193 and contact 230, solenoid 191, wire 231, armature 232 which is intermittently operated by a cam driven by motor 233 to intermittently contact contacts 235 and 234 to generate the zeroizing credit deducting impulses. From the contacts 235 and 234 the circuits extend through wires 238 and 236 to contacts 243 and 241 which are now closed with armatures 242 and 240 and from there the circuits are connected in parallel to contacts 190 and 188 through wires 239 and 237. The relay 204 is also a slow-release type, and, therefore the armatures 226, 193, 240 and 242 and contacts 227, 230, 241 and 243 will remain in closed positions and armature 203 and contact 205 will remain in open position as long as current impulses flow through the solenoid 191, and the zeroizing impulses will continue to flow through this solenoid until all of the change carrying discs 13 are returned to zero positions with a zero reference division or blank space of each disc positioned adjacent the coin kickers 146. The continuously running motor 233 is connected by wires 244 and 245 to any suitable source of electric current. When the change carrying discs 13 are returned to zero positions the relay 69 will be operated, as previously described, wherein the armature 182 and contact 183 will be opened thereby breaking the circuit to armature 232. This will cause de-energization of relay 204, wherein armatures 193, 240 and 242 and contacts 230, 241 and 243 will open and remain open, breaking the circuits from armature 232 and contacts 235 and 234 until another zeroizing cycle is in progress. Also, armature 226 and contact 227 will open, allowing now closed armature 194 and contact 195 of relay 69 control over solenoid 172 of relay 165, as armature 201 and contact 202 of relay 69 will now be open the now closed armature 203 and contact 205 of relay 204 will have no control over solenoid 169 of relay 165, therefore, the armature 168 will be held in the position as shown in Figure 7 until another control cycle is provided.

The elements may be used in combination with equipment or may be incorporated in a machine, or may be provided in a simple unitary casing, such as shown in Figures 1 and 2, and the casing may be of any practical size, shape or design. In the design shown, the casing is provided with a front door 246 attached by a hinge 247 to the upper end of the casing and held by a lock 248 at the front. The door provides access to the coin tubes 93 and associated parts. The plate 11 having the coin deposit slots therein is positioned at one side of the casing, wherein the coin chutes 16 extend downward in a compartment 249 in one side of the casing, and a money box or drawer 250 provided with a lock if desired is located in the lower section of the compartment 249 and positioned to receive all coins deposited in the coin deposit slots after they have dropped through the chutes 16 and the associated contacts 42 and 43.

The control and change delivery mechanism of this invention is used to collect the charges, deliver the change if necessary and provide control functions for any equipment operative on a rate basis that serves a sales, service or like purpose. The instrumentalities are caused to operate by an electrical impulse or series of electrical impulses that are sent or set up by pairs of contacts positioned in opposite sides of the coin chutes, wherein separate coin chutes are provided for coins of different denominations, such as nickels, dimes, quarters and half-dollars, and with the chute of each coin deposit slot provided with contact points and with the contact points connected through a circuit to release an associated actuating cam disc for one revolution thereof, with the disc having a number of cam projections thereon corresponding with the number of cents of the deposited coin, a number of electrical impulses corresponding with the number of cents of the deposited coin will be generated as the disc makes one complete revolution. Each impulse generated is equivalent to one cent accumulated in the credit accumulating cycle of operation.

As the credit accumulating impulses are used to rotatively step the change carrying and selector discs of the mechanism, the discs 13 are rotated to store the total number of cents wherein the credits accumulated may be deducted or spent with the equipment in combination with which the mechanism may be used. The credit deducting function is accomplished by electrical contacts generating impulses of electrical current, one for each cent deducted, to rotatively step the change carrying discs 13 so as to deduct credits for so much service, sale or like value and position for delivery as change if necessary a coin or coins which will be received by the

person inserting the coin or coins in the coin deposit slots of the mechanism and associated equipment which may be used in combination therewith.

Brief statement of operation

In order to carry the device through a brief illustrative cycle of operation, let it be assumed that the device is connected to a service instrument, such as a long distance system telephone, charging and thereby deducting credits at a constant or a varying rate for time used. Let it be further assumed that coins to the value of $2.50 are deposited and include one nickel, two dimes, one quarter and four half-dollars deposited in the order named.

Any suitable means may be incorporated with the mechanism, such as a sheet of printed instructions for operation, to limit the total number of coins deposited during an operative cycle and to insure that the coins are deposited one at a time in succession.

Now let it be assumed that the credits deducted for the telephone service rendered is $1.32 and that change amounting to $1.18 is delivered or returned.

The first coin deposited being the nickel deposited in the nickel slot will close the circuit through contacts 42 and 43 in the nickel chute and energize the solenoid 35 to withdraw the stop pin 33 from the five lobed nickel registering cam 17. After momentarily closing the contacts 42 and 43 the nickel passes through the chute to the coin drawer 250 and the cam 17 makes one complete revolution whereupon the stop pin 33 re-enters the socket 34 in the cam and holds the cam against further rotational movement. When the two dimes are successively deposited in the dime slot the ten lobed cam 37 will be given one complete revolution for each dime in the same manner. When the quarter is deposited, the cam 53 having twenty five lobes, will be given one complete revolution, and when the four half dollars are successively deposited the cam 54, having fifty lobes or projections, will be given one complete revolution for each one of the four half dollars deposited.

When the cam disc 17 makes a complete revolution it closes the switch contacts 40, 41 and 55 five times in rapid succession. Closing of contacts 41 and 55 energizes the solenoids 72 of all of the credit deducting solenoid assemblies, moving the pawls 73 away from the ratchet wheels 74, thereby freeing the discs to rotate in a clockwise or credit accumulating direction. Closing of the contacts 55 and 41 also energizes the electromagnets 83 of the three magnetic relays 84, moving the armatures 87 of these relays into engagement with the associated contacts 140 so that the circuits of the credit accumulating solenoids 112 will be conditioned for successive credit accumulating rotation of the three discs 124, 125, and 126 as the credit accumulating capacity of each preceding disc is used up. The circuits through the armatures 87 being successively closed by rotation of the change carrying discs to successively close the associated switches such as the pair of transfer contacts 136 and 137 associated with the penny carrying disc 123 or such as the pair of contacts 105 and 106 associated with disc 124.

When the discs 123, 124, 125, and 126 are all in their zero position with a blank space of each disc adjacent the kickers 146, all of the switches corresponding to the contacts 144—145 operated by the disc 123 are closed, energizing electromagnet 175 of relay 69 to maintain the control switch 163—164 open, the switch 194—195 closed and the switch 201—202 open to maintain armature 168 controlling the outside circuits through wires 166, 167 and 170 in its position as shown contacting contact point 173. All of the disc operated switches similar to transfer switch 136—137 operated by the penny carrying disc will be open and only the credit accumulating solenoid driving the penny carrying disc can be energized.

Closing of the contacts 55 and 40 by the cam disc 17 applies current impulses to the solenoid 112 associated with the first or penny credit accumulating disc 123 to impart five rotational steps of 72 degrees each to this disc. The disc 123 successively moves groups of one, two, three and four pennies to position adjacent the change delivery kicker 146 and upon the fifth movement closes the contacts 136 and 137 so that the fifth current impulse effects the operation of the two solenoids 112 respectively actuating the disc 123 and the disc 124. This moves the penny disc 123 to present its zero reference division to the associated change delivery kicker and open the associated switch contacts 136—137, and moves the nickle disc 124 to present one nickel to its associated change delivery kicker.

A credit of five cents has now been established and may be withdrawn either as change or service or partly in service, and partly in change.

Closing of the contacts 40 and 41 with the contact 55 also energizes the electromagnet 57 of the relay 58 moving the armature 59 away from the contact 60 to open the normally closed relay switch and simultaneously energizes electromagnet 68 of relay 69 moving armature 182 away from contact 183 to open this normally closed switch of relay 69. Relays 58 and 69 being both slow release relays, the above mentioned switches will remain open during a complete revolution of any one of the cam discs 17, 37, 53 and 54.

Opening of the switch in relay 58 places all of the solenoids 149 operating the change delivery kickers or plungers 146 out of circuit so that these kickers cannot be moved to interfere with rotation of the credit accumulating discs or to deliver change while the credit for a deposited coin is being established in the mechanism.

Opening of the switch including armature 182 and contact 183 in relay 69 interrupts the circuit to the credit deducting mechanism including the contacts 187, 189 and 190 operated by the motor 188 and to the zeroizing mechanism including the contacts 232, 234 and 235 operated by the motor 233, so that no credit deducting or zeroizing operation on the credit accumulating discs can take place during the credit accumulating operation incident to the deposit of a coin in the mechanism.

When rotation of the cam disc 17 terminates, the above described relay switches close and the switches of the relays 84 open. We now have in the mechanism an accumulated credit of five cents and a nickel is held by the disc 124 in position for delivery as change by the associated kicker upon manual closure of the switch 174.

Next, a dime is deposited and the ten lobed cam disc 37 will be given one complete rotation generating ten current impulses through the conductor 127 to the solenoid 112. The penny disc will make ten more steps. At the conclusion of the first five additional steps of the penny disc the contacts 136 and 137 will again have been closed

imparting the fifth impulse to the nickel disc moving this disc one step and to the dime disc through the nickel disc operated switch moving the dime disc one step to present one dime for delivery as change, the nickel disc operated switch now being open.

As the credit accumulating solenoid is further pulsed the penny disc continues its step by step rotation and at the tenth impulse of the dime controlled ten lobe cam 37 the penny disc again closes its associated switch 136—137 so that the tenth impulse moving the penny discs zero reference division to zero position is transfered to the nickel disc moving the nickel disc one step to present a nickel for change.

Insertion of the next dime imparts ten more steps to the penny disc, two more to the nickel disc, and one more to the dime disc, establishing a credit of twenty-five cents and presenting two dimes and a nickel for discharge as change.

Insertion of the quarter imparts twenty-five additional steps to the penny disc, five more to the nickel disc, and three more to the dime disc. The third additional step of the dime disc completes a total of five steps and closes the associated transfer switch so that the last impulse generated by the twenty-five lobed cam 53 is transferred to the half-dollar carrying disc 126, imparting one step to this disc and positioning a half dollar for delivery as change.

The penny, nickel and dime discs zero reference divisions are now returned to positions adjacent the kickers opening the associated transfer switches and a credit of fifty cents will now have been established.

Deposit of the first half-dollar will impart fifty additional steps to the penny disc leaving it at blank or zero position, ten additional steps to the nickel disc leaving it in blank or zero position, five additional steps to the dime disc returning it to blank or zero position, and one additional step to the half-dollar carrying disc and will move this disc one step to present two half-dollars for discharge. A credit of one dollar is now established and two half-dollars are presented in position for delivery as change.

Deposit of the three more half-dollars will act to advance the half-dollar carrying disc one step for each half-dollar deposited so that a final credit of $2.50 is established and five half-dollars are positioned for return as change.

Assuming now that, instead of pressing the button switch 174 to return the change, the depositor utilizes the $1.32 worth of service mentioned above. Since only coins valued at five units or multiples of five units can be inserted, when the final credit has been established, all of the switches corresponding to the switch including the contacts 144 and 145 associated with the penny disc 123 will be closed except the corresponding switch associated with the half-dollar carrying disc 126. Electromagnet 175 will be de-energized and contacts 55, 40 and 41 will remain open, thus de-energizing the electromagnet 68 causing switch 182—183 to close, switch 163—164 to close, completing the outside circuit through wires 161 and 162 and switch 201—202 to close and switch 194—195 to open, de-energizing electromagnet 172 and energizing electromagnet 169 to swing armature 168 into engagement with contact 171 and effectuate the second outside circuit.

The outside device is now in operation and controlling the motor 188 so that it periodically closes the contact armature 187 with the contacts 189 and 190 to establish credit deducting electric impulses corresponding in number to the cents value of service provided.

Closing of contacts 187 and 190 energizes all of the solenoids 113 of the credit accumulating solenoid assemblies for freeing the credit accumulating discs to rotate in a counter-clockwise or credit deducting direction and through wires 210—215 completes a circuit through relay coils 88 to close contacts 142—87, thus preparing circuits to be subsequently completed by closure of contacts similar to or such as 136—137 or 105—106.

Contact 187 is connected to relay 58 through contacts 182 and 183 to maintain contacts 59 and 60 open so that change cannot be withdrawn during the period of service operation.

Normally closed contacts 182 and 183 will remain closed since electromagnet 68 is de-energized by opening of the contacts 55, 40 and 41. Electromagnet 175 is also de-energized at this time.

Closing of contacts 187 and 189 during the credit deducting operation will close a circuit through coil 118 to step the penny disc counterclockwise, closing upon the first step thereof contacts 136—137, thus completing a circuit through wire 139 and contacts 87—143 to the stepping magnet 118 of the nickel disc 124, to step the latter counterclockwise, thus closing its associated contacts 105—106 to complete a circuit to the stepping magnet 118 of dime disc 125, which will similarly close contacts to complete a circuit to the stepping magnet 118 of the half-dollar carrying disc 126. The first impulse caused by closing contacts 187 and 189 will, therefore, effectively go to the penny, the nickel, the dime and the half-dollar carrying discs deducting solenoids, moving the half-dollar disc back one step to present four half-dollars, the dime disc back one step to present four dimes, the nickel disc back one step to present a nickel and the penny disc back one step to present four pennies in position for delivery as change and opening the associated transfer contacts.

The next impulse will move only the penny disc and when the penny disc has stepped five times it will have returned to zero position. During the sixth step of the credit deducting operation the penny disc 123 will again close transfer contacts 136—137 and the nickel disc will be moved back one step deducting a nickel. The next five steps of the penny disc will bring up a nickel and remove a dime. This continues until forty-nine cents have been deducted and another impulse is then effectively transferred to the half-dollar disc deducting fifty cents.

When the deduction of $1.32 has been completed, the coins positioned for delivery as change will be two half-dollars, one dime, one nickel and three pennies.

After the credit deducting impulses cease due to opening of the circuit through wire 186 by any suitable means, such as normally open service controlled credit deducting impulse generating contacts 189, 190 and 187, at the termination of a service operation electromagnet 57 is de-energized, permitting contacts 59 and 60 to close. Switch 174 may now be manually closed to energize solenoids 149 and the change will be delivered.

When the switch 174 is closed it also energizes an electromagnet 152 which closes four pair of normally open contacts 193—230, 240—241, 242—243 and 226—227, and it also opens one pair of normally closed contacts 203—205.

With the closure of contacts 226—227, electromagnet 172 is energized to cause the outside circuit normally maintained by armature 168 and contact 171 to be disconnected as the electromagnet 169 is now deenergized due to opening of contacts 203—205.

Closing contacts 242—243, 240—241 and 193—230 puts into operation a zeroizing mechanism presently to be described and energizes a holding electromagnet 191 which keeps these contacts closed until the zeroizing operation is completed even though the button switch 174 is released.

Shortly after the change is delivered relay coil 57 will open the circuit through armature 59 and contact 60, by actuation thereof, to allow the withdrawal of the coin kickers so that the change carrying discs can be zeroized or rotated to present a zero reference division or blank space of each disc adjacent the change delivery kickers.

The credit accumulating and credit deducting and change carrying discs will not now be in their blank or zeroized positions and it is necessary to automatically return them to their blank positions or to zeroize the mechanism in order that the correct credits will be established and the correct change delivered upon the next operation of the mechanism.

For this purpose a continuously operating zeroizing motor 233 with a cam on the shaft thereof is provided and periodically moves a contact 232 into engagement with two contacts 234 and 235, which are similar in structure and function to contacts 187, 189 and 190.

The contact 232 is connected through normally open contacts 230 and 193 and the normally closed contacts 182 and 183 to one side of the power supply. When the button switch 174 is closed, energizing electromagnet 152, contacts 242—243, 240—241, 193—230 and 226—227 are closed, as explained above, and are held closed by the holding electromagnet 191 energized by the closing of the contacts 193—230, 240—241, 242—243 and 232—234, 235. Contact 232 is now impulsing the deducting solenoids 118, electromagnet 191 being a slow release type.

Contact 234 is now connected to conductor 224 leading from the credit deducting contact 189 and contact 235 is connected to the conductor 210 leading from the credit deducting contact 190.

Operation of motor 233 will thus continue the step by step reverse movement of the credit accumulating and credit deducting and change carrying discs until all of the discs have been returned to the previously described zero positions.

When this occurs, all of the contact pairs corresponding to the pair of contacts 144 and 145 operated by disc 123 will be closed. These contact pairs are connected in series with electromagnet 175 and when all are closed this electromagnet is energized, opening contacts 182 and 183. This de-energizes the holding electromagnet 191 and terminates operation of the zeroizing mechanism.

Energizing solenoid 175 opens switch 163—164 discontinuing the associated outside circuit. It also opens switch 201—202 and closes switch 194—195 holding the reversed energization of electromagnets 169 and 172 causing armature 168 to remain away from contact 171, rendering the associated outside circuit ineffective to continue service. Thus, when the change is delivered the mechanism is zeroized and the service is immediately discontinued through one outside circuit by the closure of contacts 226—227 and the opening of contacts 203—205. If the entire deposit were used up the discs 123, 124, 125 and 126 would return to their blank or zero positions immediately energizing electr. magnet 175, discontinuing both outside circuits. The discs being in blank position, no change can be delivered and, the switch 182—183 being held open, the zeroizing mechanism cannot operate.

The mechanism is now zeroized and ready to go through another cycle of operation similar to the one described hereinbefore.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment may, therefore, be considered as illustrative but not entirely restrictive, the scope of the invention being indicated by the appended claims and the foregoing description, and all changes which come within the meaning and range of equivalency of the description or any of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. Coin actuated change collecting and change delivery mechanism comprising coin controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of deposited coins, credit accumulating means operated by said impulse generating means to rotationally accumulate credits equal in value to the value of deposited coins, service controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of service provided, credit deducting means operated by said service controlled impulse generating means to rotationally deduct credits from the credit established by said credit accumulating means, change carrying means driven in respectively opposite directions by said credit accumulating means and said credit deducting means and effective to present for delivery change equal in value to the difference in value between the credits accumulated and the credit deducted, manually operated change delivery means combined with said change carrying means, and means actuated by said change delivery means for returning said change carrying means to zero position after change has been delivered from the latter.

2. Coin actuated change collecting and change delivering means comprising coin controlled impulse generating means effective to generate series of electrical impulses corresponding in value to the value of deposited coins, service controlled impulse generating means effective to generate series of electrical impulses corresponding in value to the value of service provided, credit accumulating means operated by said coin controlled means to accumulate credits to the value of coins deposited, change carrying means moved by said credit accumulating means to present for delivery as change coins to the value of the accumulated credits, credit deducting means operated by said service controlled means subsequent to operation of said credit accumulating means and driving said change carrying means to reduce the value of coins positioned for delivery as change by the value of the service performed, and manually actuated means combined with said change carrying means for delivering change from the latter after the conclusion of the service performance, said change carrying means comprising movable elements carrying coins of respectively different denominations and at least some of said elements having coin re-

ceptacles increasing progressively in coin capacity in the direction of movement imparted to said elements by said credit accumulating means.

3. Change carrying and change delivering means comprising a series of rotatable members carrying coins of respectively different denominations and at least some of said members having coin receptacles increasing progressively in coin capacity in a predetermined direction, means imparting step by step rotation successively to said members beginning with the member carrying coins of the least denomination, said means imparting one step to a member carrying coins of a higher denomination as the receptacle carrying coins of a preceding lower denomination completes a predetermined rotational phase to continuously maintain coins of a value corresponding to predetermined amounts in position for delivery as change, and manually actuated means disposed adjacent said members and engageable with coins positioned thereby to discharge such coins from said members.

4. Coin carrying and change delivery means comprising a series of rotatable discs carrying coins of respectively different denominations and at least some of which have individual series of coin receptacles increasing progressively in coin capacity in a predetermined direction of rotation of said discs, means successively imparting step by step rotational movements to said discs beginning with the disc carrying coins of the least denomination and imparting one step to a disc as the immediately preceding disc completes a rotational phase to position for delivery as change coins having a value equal to a predetermined amount, means imparting step by step rotational movements in a reverse direction to said discs progressively from the disc carrying coins of the least denomination to the disc carrying coins of the highest denomination to position for delivery as change coins having a value less than said predetermined amount, and manually actuated means disposed adjacent said discs and engageable with the coins having a value less than said predetermined amount to discharge such coins from said discs.

5. Coin actuated change collecting and change delivering mechanism comprising coin controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of deposited coins, credit accumulating means operated by said impulse generating means to rotationally accumulate credits equal in value to the value of deposited coins, service controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of service provided, credit deducting means operated by said service controlled impulse generating means to rotationally deduct credits from the credit established by said credit accumulating means, change carrying means driven by said credit accumulating means and said credit deducting means and effective to present for delivery change equal in value to the difference in value between the credits accumulated and the credits deducted, manually operated change delivery means combined with said change carrying means, impulse generating means actuated by said change delivery means and connected to said credit deducting means to zeroize said credit accumulating means and said change carrying means after change has been delivered from the latter, means controlled by said coin controlled impulse generating means rendering said credit deducting means, said change delivery means and the zeroizing means inoperative during operation of the credit accumulating means, and means controlled by said service controlled impulse generating means rendering said change delivery means and said zeroizing means inoperative during operation of the credit deducting means.

6. Coin actuated change collecting and change delivering mechanism comprising coin controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of deposited coins, credit accumulating means operated by said impulse generating means to rotationally accumulate credits equal in value to the value of deposited coins, service controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of service provided, credit deducting means operated by said service controlled impulse generating means to rotationally deduct credits from the credit established by said credit accumulating means, change carrying means driven by said credit accumulating means and said credit deducting means and effective to present for delivery change equal in value to the difference in value between the credits accumulated and the credit deducted, manually operated change delivery means combined with said change carrying means, and impulse generating means actuated by said change delivery means and connected to said credit deducting means to zeroize said credit accumulating means and said change carrying means after change has been delivered from the latter, said coin controlled impulse generating means comprising rotatable cam discs one for each coin denomination receivable by the mechanism and each having a number of lobes corresponding to the penny value of the corresponding coin, sets of contacts disposed one set adjacent each cam disc and closed each time a lobe of the corresponding cam disc passes thereby upon rotation of the corresponding cam disc, drive means connected to said cam discs, and means actuated by deposited coins controlling said drive means to impart one complete rotation to the corresponding cam disc upon deposit of a coin of proper denomination in the mechanism.

7. Coin actuated change collecting and change delivering mechanism comprising coin controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of deposited coins, credit accumulating means operated by said impulse generating means to rotationally accumulate credits equal in value to the value of deposited coins, service controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of service provided, credit deducting means operated by said service controlled impulse generating means to rotationally deduct credits from the credit established by said credit accumulating means, change carrying means driven by said credit accumulating means and said credit deducting means and effective to present for delivery change equal in value to the difference in value between the credits accumulated and the credit deducted, manually operated change delivery means combined with said change carrying means, and impulse generating means actuated by said change delivery means and connected to said credit deducting means to zeroize said credit accumulating means and said change carrying means after change has been delivered from the latter, said credit accumulating means

comprising rotatable shafts, ratchet wheels secured one on each shaft, electric solenoids disposed one adjacent each ratchet wheel and electrically connected to said coin controlled impulse generating means, and pawls disposed one in engagement with each ratchet wheel and actuated by the corresponding solenoid to impart step by step rotation to the associated shaft, said credit deducting means comprising ratchet wheels opposite in direction to said first mentioned ratchet wheels secured one on each shaft, credit deducting solenoids disposed one adjacent each of said opposite ratchet wheels and electrically connected to said service controlled impulse generating means, and pawls disposed one in engagement with each of said opposite ratchet wheels and operated by the corresponding credit deducting solenoid to impart step by step rotation in a reverse direction to the associated shaft, and said change carrying means comprising discs rotated one by each of said shafts and each having a series of angularly spaced apart recesses receiving corresponding coins, the number of coins received in the recesses of each disc progressively increasing in the credit accumulating direction of rotation of the disc and the corresponding shafts.

8. Coin actuated change collecting and change delivering mechanism comprising coin controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of deposited coins, credit accumulating means operated by said impulse generating means to rotationally accumulate credits equal in value to the value of deposited coins, service controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of service provided, credit deducting means operated by said service controlled impulse generating means to rotationally deduct credits from the credit established by said credit accumulating means, change carrying means driven by said credit accumulating means and said credit deducting means and effective to present for delivery change equal in value to the difference in value between the credits accumulated and the credit deducted, manually operated change delivery means combined with said change carrying means, and impulse generating means actuated by said change delivery means and connected to said credit deducting means to zeroize said credit accumulating means and said change carrying means after change has been delivered from the latter, said credit accumulating and credit deducting and change carrying means comprising rotatable discs one for each denomination of coins to be delivered as change and arranged in order corresponding to the increasing value of the coins, each disc having therein a series of coin receiving recesses progressively increasing in coin capacity in the direction of credit accumulating movement of said discs, electric impulse actuated means connected to said coin controlled impulse generator and drivingly connected to said discs to impart step by step rotational movements to said discs in a credit accumulating direction, electric impulse actuated means connected to said service controlled impulse generating means and drivingly connected to said discs to impart step by step rotational movements to said discs in a credit deducting direction, and means controlled by said coin controlled impulse generating means rendering the last mentioned electric impulse actuated means inoperative during operation of said coin controlled impulse generating means.

9. Coin actuated change collecting and change delivering mechanism comprising coin controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of deposited coins, credit accumulating means operated by said impulse generating means to rotationally accumulate credits equal in value to the value of deposited coins, service controlled impulse generating means effective to generate series of electrical impulses corresponding to the value of service provided, credit deducting means operated by said service controlled impulse generating means to rotationally deduct credits from the credit established by said credit accumulating means, change carrying means driven by said credit accumulating means and said credit deducting means and effective to present for delivery change equal in value to the difference in value between the credits accumulated and the credit deducted, manually operated change delivery means combined with said change carrying means, and impulse generating means actuated by said change delivery means and connected to said credit deducting means to zeroize said credit accumulating means and said change carrying means after change has been delivered from the latter, said credit accumulating and credit deducting and change carrying means comprising rotatable discs one for each denomination of coins to be delivered as change and arranged in order corresponding to the increasing value of the coins, each disc having therein a series of coin receiving recesses progressively increasing in coin capacity in the direction of credit accumulating movement of said discs, electric impulse actuated means connected to said coin controlled impulse generator and drivingly connected to said discs to impart step by step rotational movements to said discs in a credit accumulating direction, electric impulse actuated means connected to said service controlled impulse generating means and drivingly connected to said discs to impart step by step rotational movements to said discs in a credit deducting direction, means controlled by said coin controlled impulse generating means rendering the last mentioned electric impulse actuated means inoperative during operation of said coin controlled impulse generating means, and means operated by said discs and connected to said electric impulse actuated means to constrain the latter to impart rotational movements to said discs in succession beginning with the disc carrying coins of the least value.

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Disclaimer

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Hereby enters this disclaimer to claim 7 of said patent.

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