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Dykehouse et al.

[11] **3,768,616**

[45] **Oct. 30, 1973**

[54] **BILL AND COIN CHANGER**

[75] Inventors: **David B. Dykehouse**, Muskegon; **Oliver G. Okkonen, Norman J. Zoodsma**, both of Grand Rapids, all of Mich.

[73] Assignee: **Rowe International, Inc.**, Whippany, N.J.

[22] Filed: **Sept. 17, 1971**

[21] Appl. No.: **181,586**

Related U.S. Application Data

[62] Division of Ser. No. 887,063, Dec. 22, 1969, Pat. No. 3,690,332.

[52] **U.S. Cl.** ..... **194/4 R**

[51] **Int. Cl.** **G07f 1/06**

[58] **Field of Search** 194/4, 10; 133/2

[56] **References Cited**

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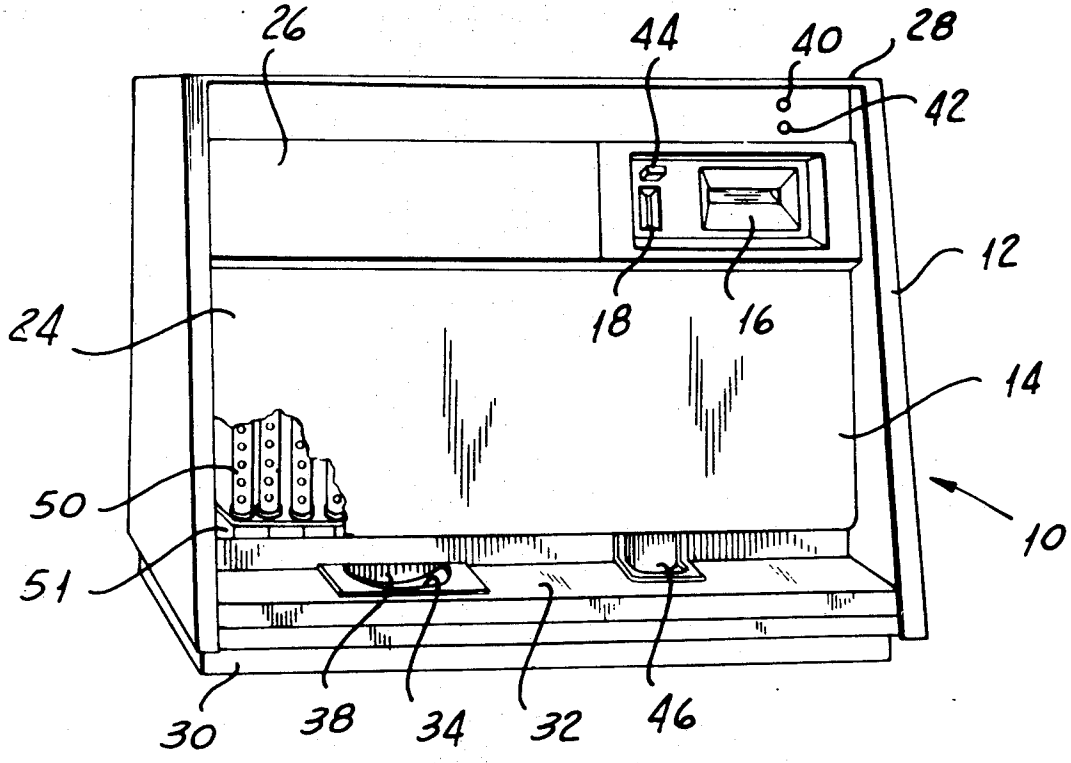
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Primary Examiner—Samuel F. Coleman
Attorney—Shenier and O'Connor

[57] **ABSTRACT**

A machine for changing currency such as bills or coins of larger denomination for change in the form of coins of a lower denomination. When a bill is to be changed, a settable group of coin ejectors is operated. When a coin is to be exchanged, for example a 50-cent piece, other groupings of coin ejectors are operated in combinations which can be varied at the option of the machine service personnel.

3 Claims, 8 Drawing Figures



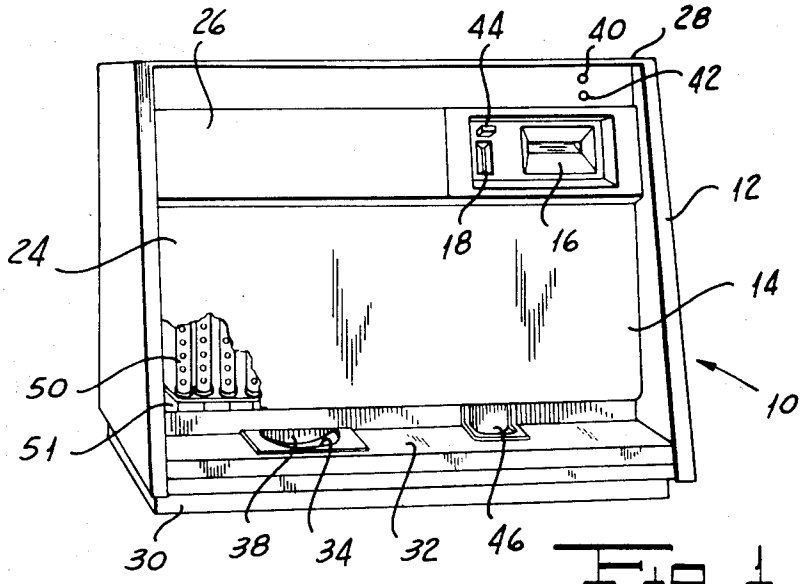

26
44
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28
42
12
24
18
16
14
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10
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34
32
46

Fig 1

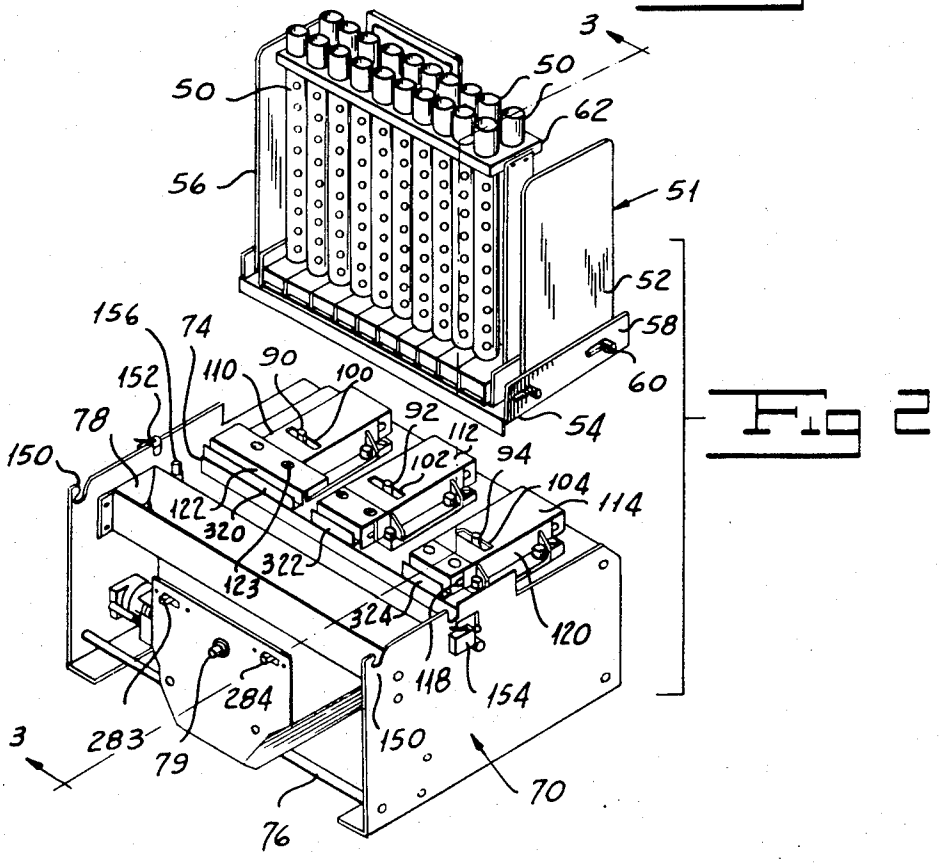

3
50
50
62
56
51
52
58
60
54
156
74
152
110
90
100
78
92
112
102
94
150
104
114
122
320
322
123
324
120
118
154
284
283
79
150
3
70
76

Fig 2

Fig 3

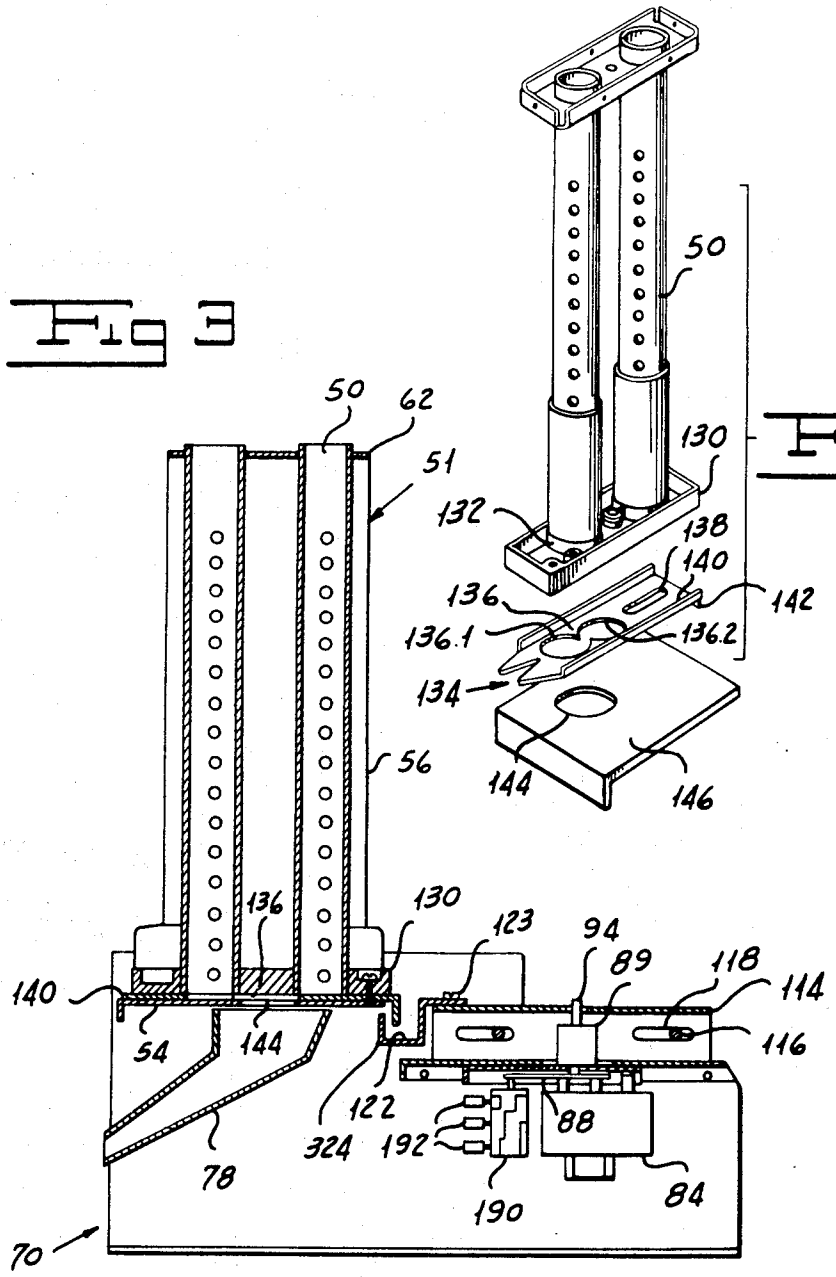
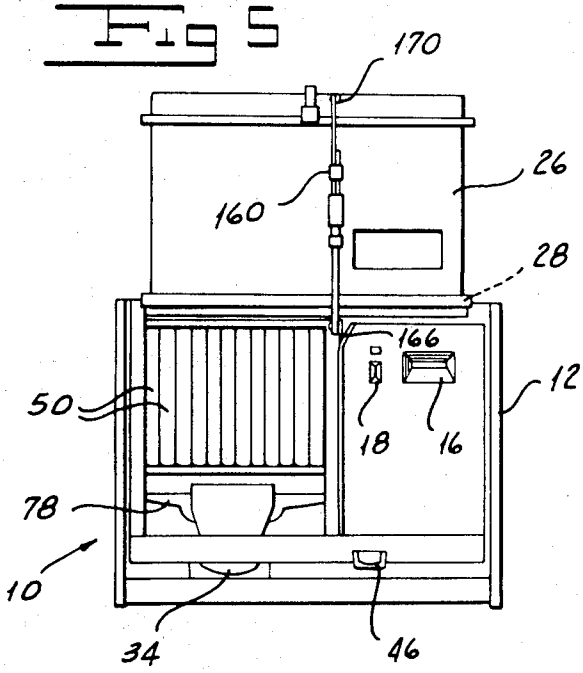

50
62
51
56
136
130
123
94
89
118
114
116
140
54
144
122
324
192
88
84
190
78
70

Fig 4

50
130
132
138
140
142
136
136.1
136.2
134
144
146

Fig 5



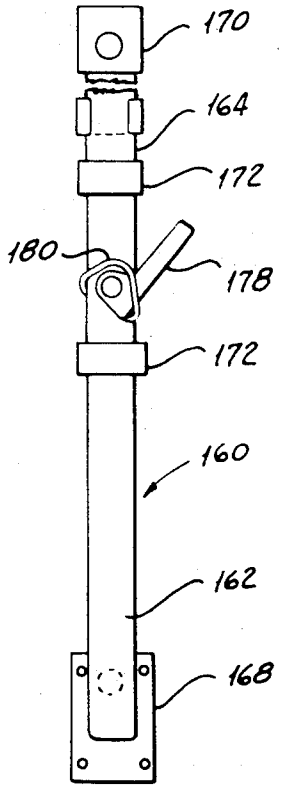


Fig 6

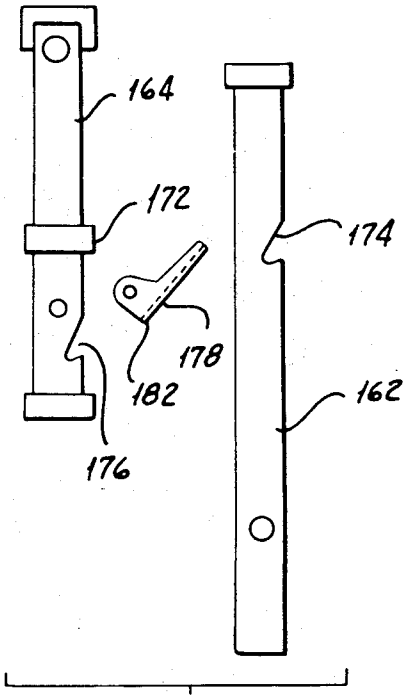


Fig 7

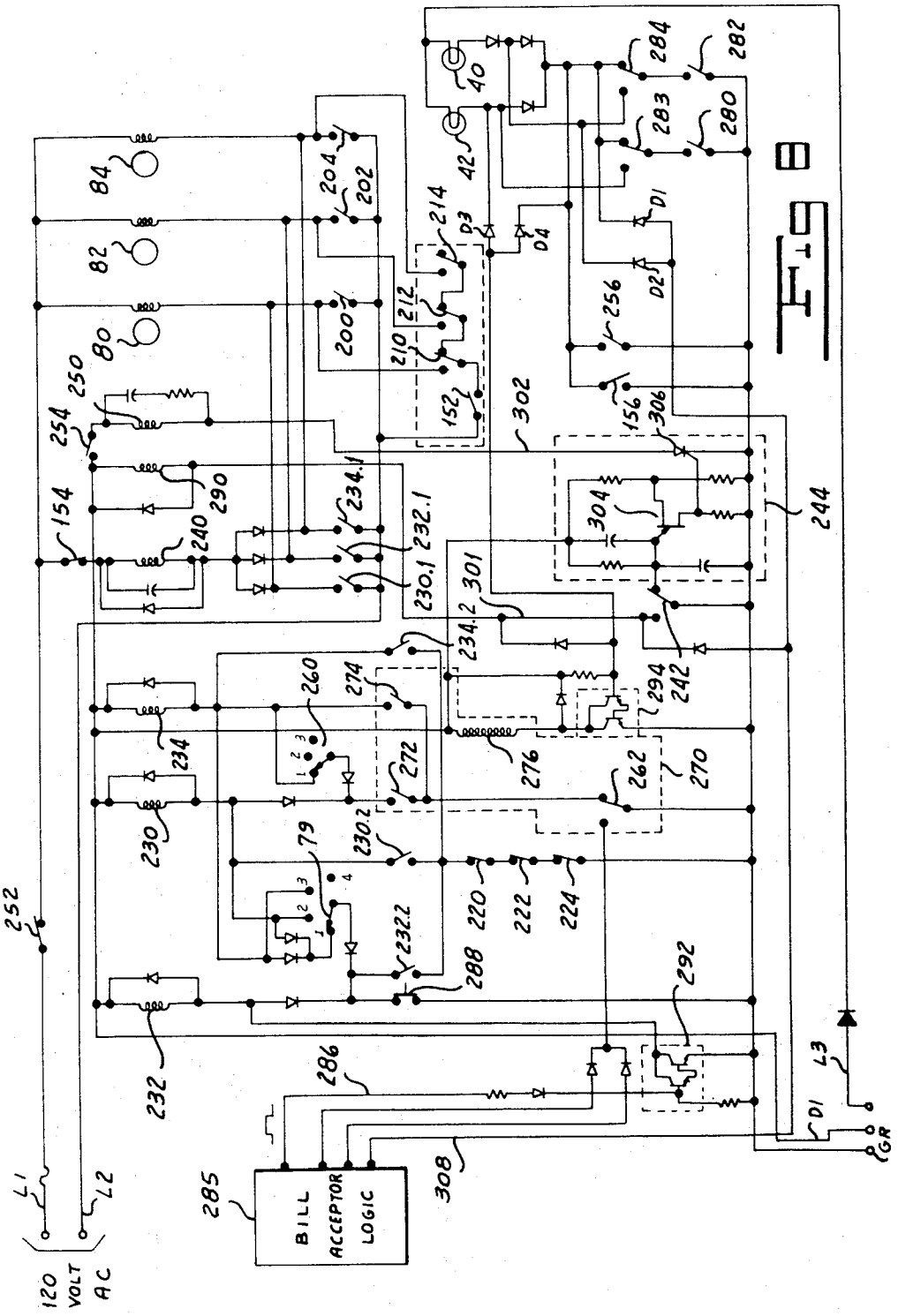

120 VOLT AC
L1
L2
BILL ACCEPTOR LOGIC
285
252
232
286
308
292
288
220
222
224
2322
230.2
79
230
234
272
276
262
270
260
274
294
242
234.2
301
304
244
230.1
232.1
234.1
240
290
154
254
250
80
82
84
200
202
204
210
212
214
152
302
156
306
256
D1
D2
D3
D4
42
40
280
283
282
284
L3
GR

FIG 8

BILL AND COIN CHANGER

This application is a division of our copending application Ser. No. 887,063, filed Dec. 22, 1969, now U.S. Pat. No. 3,690,332, issued Sept. 12, 1972.

BACKGROUND OF THE INVENTION

Machines for changing bills and coins as shown by the prior art generally provide fixed combinations of coin ejection tubes, with a full back and forth cycle necessary for each dispensing operation. Such machines have a low storage capacity and generally a slower operating cycle time.

A different approach to the dispensing of change is shown by U.S. Pat. No. 3,366,127, issued on Jan. 30, 1968, to Charles T. Breitenstein et al. In the Breitenstein patent, a high storage capacity changer is provided in which one fourth of a complete slide reciprocatory cycle only is required for each dispensing operation. Each coin dispensing slide remains in the position to which it has moved during the last operation. Certain dispensing slides may be operated simultaneously to provide a multiplicity of different output conditions in the dispensing of change.

SUMMARY OF THE INVENTION

The present invention provides a machine for exchanging coins for currency such as bills or coins, and whose dispensing system has a number of improvements over the dispensing mechanism shown by the Breitenstein patent. The present machine utilizes in its dispensing operations a dual bank of coin tubes providing large capacity storage. The bank of coin tubes may readily be dropped into place for operation and may be readily removed as a unit. Removal of the unit is sensed to inactivate acceptance of further currency.

It is therefore an object of our invention to provide a new and an improved Bill and Coin Changer.

It is another object of the invention to provide an improved currency changer which allows the output of coins for various currency inputs to be changed readily.

It is a further object of our invention to provide a currency changer which permits ready removal and replacement of the coin tubes.

It is a still further object of the invention to provide a currency changer which responds to malfunction and in response thereto renders itself inoperative.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a front view in perspective of a machine embodying our invention, one corner of the cabinet being broken away to show the interior thereof;

FIG. 2 is a front view in perspective of the mechanism embodying the invention with a coin magazine shown separated from the dispensing mechanism;

FIG. 3 is a sectional view of the dispensing mechanism taken along line 3-3 of FIG. 2 with the components thereof operatively joined;

FIG. 4 is an exploded view of a sample pair of coin tubes and their slide and dispensing plate, the components being shown in exploded form below the tubes;

FIG. 5 is a perspective view of the machine with the front service door in the fully open position;

FIG. 6 is a side elevational view of the door check structure of FIG. 5;

FIG. 7 is a side view in exploded form of the major elements of the door check structure of FIG. 6;

FIG. 8 is a schematic circuit drawing of one form of electrical circuit which may be used with our bill and coin changing machine.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In FIG. 1 there is shown the exterior of the Coin and Bill Changer 10 embodying our invention. The changer 10 has an exterior cabinet 12 of rectangular configuration forming a decorative housing in addition to safeguarding the changer contents which may total 5 hundred dollars to 1 thousand dollars at any one time. The machine may be mounted in a number of ways, none of which has been shown. These include mounting on a pedestal or stand or, optionally, the cabinet may be wall mounted.

The front wall 14 of the cabinet 12 has an upper control area with a bill inlet opening 16 and a coin insert slot 18 to allow bills or larger denomination coins to be inserted and tested. The bill inlet opening 16 may feed a Bill Detector or Acceptor of the type shown in copending U.S. Pat. application 633,903, filed Apr. 26, 1967 by Donald Hooker, the bill acceptor being shown herein schematically in FIG. 8. The coin insert slot 18 may pass coins to a conventional multi-denominational coin testing and validating mechanism of any standard type known to the art, (not shown herein). Such accepting mechanisms are well known in the art, and as is generally known, provide an output in the form of a switch pulse designating the value of the coin accepted.

The machine front wall 14 has below the control area and recessed therefrom a vertical panel 24, which with the control area, forms a service door 26 pivotal about a hinge axis 28 along the top front edge of the cabinet 12. Below service door 26 and spaced therefrom adjacent the cabinet base 30 is a convenience shelf 32. The shelf 32 has a recessed coin tray 34 partially covered by the panel 24 of the wall 14 and partially accessible from the exterior of the machine. Depending from panel 24 and covering the vertical extent of the opening provided by recessed tray 34 is a small semi-circular door 38 movable about a horizontal axis at its upper edge. The door 38 is pivotal such that its curved lower portion moves freely forward on being struck by coins dispensed from inside the machine and allows these coins to enter the tray 34. Blocking shoulders (not shown) are provided to the rear of door 38 to prevent inward movement of the door thereby deterring improper access to the cabinet interior. Various indicator lamps have been provided, a first lamp 40 to show that no further change is available for dollar bills and a second lamp 42 to indicate the unavailability of change for coins.

A coin return button 44 is provided adjacent the insert openings to allow an optional return of coins or the bill, if desired by the user. Naturally such button must be actuated prior to the acceptance of the inserted money in order to return the bill or coin, since the changing operation occurs automatically on acceptance. Coins returned in this manner or coins rejected by the coin validator pass through the coin return chute and tray 46 located below the coin insertion area.

In FIG. 1, there can be seen a bank of coin tubes 50 positioned within the coin tube assembly 51 located generally above and behind the recessed coin tray 34. In FIG. 2, we show the bank of coin tubes 50 mounted in a carrying holder 52, the holder being of generally

U-shaped configuration with base plate **54** and side uprights **56**. Extending normally downwardly from the front of base **54** are flanges **58** and protruding normally outwardly from uprights **56** are mounting lugs **60**. Top and side brackets **62** hold the tubes fixedly in alignment with one another with respect to carrying holder **52** to form te assembly **51**.

The coin tube assembly **51** seats cooperatively on dispensing motor housing **70** (FIG. 2). Housing **70** is rigidly affixed to cabinet base **30** within the enclosure cabinet **12** as can be seen best in FIG. **5**. Housing **70** is comprised of side housing walls **72** supported mutually in parallel relationship by transverse top bracing plate **74**, transverse tie rod **76** and coin chute **78**. Affixed suitably to the underside of bracing plate **74** (as seen best in FIG. 3), are three dispensing motors **80, 82** and **84** each disposed with its output shaft (not shown) extending upwardly. The output shaft of each motor is connected to provide the input to a speed reducing gear box **88** to reduce the rotary speed of each motor output. Each gear box **88** rotates an eccentric **89**, each eccentric having its respective crank pin **90, 92**, and **94** extending upwardly to protrude through laterally slotted openings **100, 102** and **104** in the respective reciprocating driving slides **110, 112** and **114**. These driving slides are channel members with the channel web disposed downwardly. The driving slides are individually reciprocated by the eccentric movement of the respective crank pins **90, 92** and **94**. The slides are restrained and guided within a forward to rear path by the mating of inwardly facing bosses **116** on the respective stationary bracing members **120** within horizontal slots **118** in each slide side wall. Bracing members **120** are stationarily secured to the top plate of motor housing **70** in a suitable fashion to provide structural guiding members for the respective slides.

Each slide has mounted on its front end a coupler, the couplers being numbered **320, 322** and **324**. Each coupler has equally spaced apart holes for receiving screws **123** which are tightened into suitably threaded openings in the driving slides. Each coupler has an upwardly open, lateral channel **122** at its front end, the channels **122** being transmissive of the reciprocatory movement of the driving motors, as will be explained.

As can be seen in FIGS. **2** and **4**, coin tubes **50** are aligned in pairs of tubes in a forward-to-rear sense, the tubes of a pair being of the same diameter for holding coins of the same denomination. Laterally there are ten pairs of tubes mounted in assembly **51**. Each coin tube pair has an individual coin tube base **130** with two upstanding annuli **132**, each annulus is of sufficient height to carry therein a tube of the pair. Each annulus is sized to receive a coin tube with the bottom of the annulus and tube open. Secured slideably to the underside of each coin tube base is a coin dispensing slide **134**, the slide serving the two tubes in the front-to-rear lineup on base **130**. Each coin slide **134** has extending through it two overlapping coin-sized openings **136** in its slide face and rearwardly thereof longitudinally elongate mounting slots **138**. Mounting pins **139** in the coin tube base **130** ride within the slots **138** to join the slide **134** to the tube base. The slide face is formed with upstanding flanged guide rails **140** along both sides and at its rear edge with a downwardly projecting coupling finger **142**. Finger **142** of each coin tube pair rides in open channel **122** of the adjacent motor slide coupler when the coin tube assembly **51** is mounted on the motor housing **70** to thereby couple the coin dispensers to the coin tubes.

Each coin slide **134** rests between the coin tube base and assembly base **54** and, as mentioned, is slideable in a forward-to-rear horizontal plane. Within each assembly base **54** midway between the front and rear tubes, there is a single coin dispensing opening **144** for passing a coin therefrom to the output coin chute **78**, the assembly base **54** thereby acting as a coin dispensing slide keeper **146**.

The lateral width of the respective channels **122** of the coupler controls the number of dispensing slides which can be operated by each dispensing motor. Shown are coupler **320** on driving slide for four coin dispensing slides, coupler **322** on driving slide for three coin dispensing slides and coupler **324** on driving slide for three coin dispensing slides respectively. By replacing the couplers shown with couplers of different widths, other coin combinations are possible, as will be described. Such replacenent can be effected by removing the mounting screws **123** and reaffixing couplers of the desired width to the respective slides. When a coin tube assembly **51** is placed on the dispensing motor housing, mounting lugs **60** mate within receiving cutouts **150** in housing side walls **72** and this mating alignment allows each mating finger **142** to mate with the respective channel **122** of its coupler. On side walls **72** adjacent cutouts **150**, there are mounted miniature snap switches **152, 154** and **156** to sense the presence or absence of the coin tube assembly **51**.

In FIGS. **5** through **7** we show a door check mechanism **160** for positively retaining the service door **26** in the open position during servicing. As mentioned previously, service door **26** is opened upwardly about a conventional hinge on the axis **28** along the top of the door. It is therefore important that the door be kept open during servicing and prevented from inadvertent closure which could cause possible physical harm to the serviceman.

Door check mechanism **160** includes two telescoping slider bars **162** and **164**. Lower bar **162** is affixed pivotally to a suitable cabinet bracket **166** by means of a mounting bracket **168**. Upper bar **164** is pivotally secured to the door through a suitable mounting **170**. The bars **162** and **164** are held adjacent one another by upper and lower clips **172**, the clips allowing relative linear sliding movement of the bars with respect to one another. The bars have similarly shaped notches **174** and **176** which reach alignment with the door fully open. Pinned to upper bar **164** adjacent the notch **176** is a release latch **178** which nests in the aligned notches **174** and **176** with the notches aligned. A torsion spring **180** holds the latch **178** with its latch tip **182** in the aligned notches to hold the mechanism fully extended and thereby latch the service door in its open position. To release the latch **178**, pressure is exerted on the outer finger **184** of the latch to pivot latch top **182** out of the notches and to allow the slide bars to slideably telescope while the service door is being closed.

When the service door is being opened, the slide bars slide relative to another until the notches are in alignment at which time under the urging of spring **180**, latch tip **182** falls into the aligned notches.

Turning to FIG. **3**, there we show the respective dispensing motors **80, 82** and **84**, each with its cam structure **190** and each with its cam operated switches generally indicated by numeral **192**. Each full cycle of

motor operation causes one half revolution of cam **190**, each cycle causing either forward or backward movement of the slide between forward or alternate position and rear or home positions of the coin slides.

In FIG. **8** we show the circuitry to operate the changer. The circuit is powered by 120-volt AC leads L1 and L2 in the motor operating circuit and derived therefrom a 30-volt direct current from leads D1 and ground (G), and rectified DC on lead L3 for pulsing lamps **40** and **42.** As previously mentioned, each dispensing motor **80, 82** and **84** has three cam switches generally indicated as **192** on FIG. **3.** These cam switches include a first set of cam switches **200, 202,** and **204,** one on the structure of and sensing the cycling of each motor **80, 82** and **84.** These switches perform the function of carrying the motors through one cycle (one half revolution of the cams **190**) and opening the circuits to the respective motors at the end of the dispensing cycle of the motors. A second set of cam switches **210, 212** and **214** serves to perform an automatic homing function for their motor output mechanisms as controlled by homing switch **152.** The latter cam switches close once for each full revolution of cams **190**; hence, they close once for each two motor cycles of operation. The home position of these switches occurs when the respective motor slide is in the rear position of the two possible at-rest positions. The other respective motor cam switches **220, 222** and **224** are normally closed and are mutually in series such that when one opens, it releases the operating circuit to the control relays. The cam switches **220, 222** and **224** open near the end of each cycle of operation of their respective motors **80, 82** and **84.**

To control the operation of the circuit, there are provided respective motor control relays **230, 232,** and **234** for operating the rspective dispensing motor **80, 82** and **84.** Each relay has two normally open contact sets, one for holding the relay operated (**230.2, 232.2** and **234.2**) and a set of contacts (**230.1, 232.1** and **234.1**) for operating the respective dispensing motors. A timer relay **240** with one make-break contact set **242** acts in conjunction with a solid state timer circuit **244** to protect the machine against overlong machine operative cycles. A latch relay **250** is controlled by contact set **242.** This relay **250** is electrically actuated and once actuated must be mechanically reset within the interior of the machine cabinet. The latch relay **250** controls three sets of contacts **252, 254** and **256.** Contact set **252** is normally closed and on actuation of relay **250,** the contact set opens to disconnect the **120** volt source current on AC source lead L1 from the circuit. A second contact set **254,** normally closed, interrupts the circuit to latch relay set **250** when opened, resets the solid state timer **244** and the third contact set **256** closes to energize the trouble lamps **40** and **42.**

To provide an option as to which motors are to be operated for different input amounts, there are provided the dollar select switch **79** and the 50 cent select swich **260.** Switch **79** has three contacts, a first which is connected in parallel through rectifiers to motors **230** and **234** to permit operation of motors **80** and **84.** Position 2 is connected through a rectifier to relay **230** alone, and position 3 is connected to relay **234** alone. Circuits through the contacts of switch **79** are in parallel to a circuit to relay **232,** so that relay **232** will be operated on all dollar bill change dispensing cycles regardless of which combination of coin payouts is used. Thus, motor **82** and center slide **112** must be actuated for all dollar change dispensing cycles and the combination with other motor or motors **80** and **84** and their respective couplers **110** and **114** are dependent on the setting of switch **79.**

Switch **260** provides an option as to whether relay **230** and its motor **80** alone shall be operated (switch position 2) or both **230** and **234** in parallel, the premise being that either a combination of the left and right motor **80** and **84** or only one motor **80** may be operated to provide change for a 50 CENT piece at the option of the service personnel.

In addition, the circuit has a bill reject switch **262,** operated in response to the coin reject button. The area designated in dashed lines as **270** schematically represents the coin testing mechanism and includes a 50 cent validating switch **272,** a 25 cent validating swich **274,** and a coin lockout solenoid **276.** Coin empty switch **280** responds to an empty condition of the coin tubes to indicate that the coins stored are insufficient to provide change for coin insertions and switch **282** responds to an empty condition of tubes to indicate that insufficient change is available for dollar insertions. Each empty switch **260** and **282** has associated therewith a manual switch shown as **283** and **284,** so that each empty switch may light both lamps or its own, as necessary. The dollar bill acceptor shown as box **285** provides an indication to the circuit in the form of an output pulse on lead **286.** This pulse transmits information that a dollar bill has been tested, found valid, accepted and removed to storage so that 1 dollar's worth of change may safely be paid out. A conventional, manual actuatable test switch **288** is provided, as is a circuit operation counter **290.** Two separate transistor amplifiers are provided, both two-stage networks. A first amplifier **292** amplifies the bill acceptance signal on lead **286** to trigger a machine cycle, while the second amplifier **294** amplifies a trouble signal or signal indicating empty coin tubes to actuate the coin mechanism lockout solenoid **276.**

As explained previously, three dispensing motors are provided, **80, 82** and **84.** Each motor on operation dispenses simultaneously through the dispensing slides certain of the bank of coin tubes **50.** The number of coin dispensing slides actuated by each motor may be varied by changing the couplers to ones of desired width to dispense from the coin tubes to be operated by each motor.

To provide change for a quarter, half dollar or dollar using a storage medium of 10 coin tubes, the following tube operating combinations have been found to be quite acceptable.

In a first arrangement, one coin tube pair, the fourth from the left (D) is not used. The tubes have the following change:

A	B	C	D	E	F	G	H	I	J
5¢	10¢	10¢	25¢	25¢	25¢	5¢	10¢	5¢	5¢
80				82		84			

Using this pattern, all motors (**80, 82** and **84**) will be operated to dispense 1 dollar change in the form of two quarters, three dimes, and four nickels from the nine tubes in use. For 50 cents change, motors **80** and **84** may be operated to dispense three dimes and four nick-

els in change from tubes A, B, C, G, H, I and J. For 25 cents, an operation of motor **84** will pay out three nickels and one dime from tubes G, H, I, and J. To accomplish these combinations of coin tube dispensings, switches **79** (dollars) and **260** (50 cents) are each set to its No. 1 position, and indicator switches **283** and **284** are set to the right (the position shown in FIG. **8**).

As an alternative, with all tubes in use, the following coin loading and slider combinations may be used:

A	B	C	D	E	F	G	H	I	J
5¢	10¢	10¢	0	25¢	25¢	5¢	10¢	5¢	5¢
80			82			84			

Dollar payout in this instance will use only motors **80** and **82**. Motor **80** will dispense a coin from each tube A-D and motor **82** from tubes E-F. This payout totals three quarters, two dimes and a nickel. For a 50 cent payout, motor **80** alone will be operated to dispense from tubes A-D one quarter, two dimes and one nickel. Quarter payout will cause operation of motor **84** and tubes G-J to emit one dime and three nickels. Switches **79** (dollar) and **260** (50 cents) are set to their No. 2 position to produce this combination, and indicator switches **283** and **284** are set to the left in FIG. **8**.

Other combinations are possible as can readily be seen, it only being required by the wiring shown that center motor **82** be operated on responses to a dollar insertion and motor **84** for all quarter insertions.

Now, turning to the method of operation of the invention utilizing the circuit of FIG. **8**, we assume the setting combination first described with switches **79** and **260** both at their No. 1 position, as shown in FIG. **8**.

Insertion of a valid dollar bill into dollar inlet **16** sill cause the bill to pass to the bill acceptor and be accepted by the bill acceptor **285**. The bill will pass to a storage chamber (not shown herein) and will be stored there. Acceptor **285** will emit a positive pulse on lead **286**, which will reach the base of the left transistor in the transistor amplifier **292**. This amplifier will conduct, will cause the other transistor to conduct, and will cause relay **232** to be energized. Relay **232** on energization closed its contacts **232.1** and **232.2**. At contacts **232.2**, there is now closed an enabling path for relays **230** and **234**, through closed motor cam switches **220**, **222** and **224** to ground lead G. With switch **70** at its No. 1 position, relays **230** and **234** are energized through closed contacts of switch **79** and the previously described enabling path through contacts **232.2**.

Relay contacts **230.1**, **232.1** and **234.1** close and complete operating paths for motors **80**, **82** and **84** between leads L1 and L2. At contacts **230.2**, **232.2** and **234.4**, self-holding paths for relays **230**, **232** and **234** are closed through the previously described enabling path.

Closure of contacts **230.1**, **232.1** and **234.1** close a path to relay **240** between leads L1 and L2. Relay **240** operates and switches its contacts **242**. Contacts **242**, on switching over, remove ground from the R-C timing network **244** to permit the network to start timing, and place ground on lead **301** to actuate counter **290** through a one-count cycle. Ground on conductor **301** causes amplifier **294** to stop conducting and cause normally operated solenoid **276** to release. This solenoid when released diverts inserted coins to coin return tray **46**. Motors **80**, **82** and **84** once operated enter into their operating cycles to dispense coins from each tube and close their respective cam switches **200**, **202**, and **204** to provide an alternate hold path for the motors and for relay **240**, the hold paths being obvious paths between power leads L1 and L2.

The functional cycle of a motor begins with one coin slide opening of the connected double opening **136** beneath a coin tube and the other opening over the dispensing opening **144** of the coin slide keeper **146**. For example, if a driving slide **110**, **112** or **114** is in the forward position at the start of its cycle, the coin dispensing slides **134** coupled thereto have their forwardmost opening **136.1** under the front tube of the pair with the rear opening **136.2** positioned over dispensing opening **144**. A coin within **136.1** will be pushed rearwardly during the motor operative cycle until forward opening **136.1** is over single opening **144**, at which time the coin from **136.1** will fall into coin chute **78** and the rear opening **136.2** will then be below the rear coin tube of the tube pair. At this position, functionally the cycle has been completed. Simultaneously, each coin dispensing slide to which each driven motor is coupled has emitted its single coin. As the end of the dispensing cycle nears, cycle switches **220**, **222** and **224** open to open the hold circuit to the operated relays **230**, **232** and **234**. These relays release and open their contacts **230.1**, **232.1**, **234.1**, **230.2**, **232.2** and **234.2**. The original operating paths to both the relays **230**, **232** and **234** and to the motors are opened. The motors continue through their cycles through their own alternate hold paths at contcts **200**, **202** and **204**.

As the motors **80**, **82** and **84** reach the end of their operative cycles, cam switches **200**, **202** and **204** open to terminate the cycle and release relay **240** and counter **290**. The timer **244** is restored by release of contact set **242** of relay **240** and the changer is then in condition to accept other bills or coins for changing.

In the circuit, as described, for normal operation, operated motors, of course, restore after each cycle. If for some reason the motor cycle does not end within a predetermined time period, (approximately 1.3 to 1.5 times the normal cycle period), timer **244** will emit an output signal. Timer **244** is a conventional timing circuit utilizing a unijunction transistor **304** to respond to the R-C timing to trigger SCR **306** and thereby energize relay **250**. Energization of relay **250** opens contacts **252**, **254** and closes contacts **256**. Contacts **252** on opening open conductor L1 and remove 120 volt power from the dispensing motors **80**, **82** and **84** and relay **240**. Opening of contacts **254** open the circuit to relay **250**. Contacts **256** on closure connect ground to trouble lights **40** and **42** whose circuit is completed to lead L3, a rectified low voltage AC source causing there lamps to flicker. A ground pulse through contact **256** passes through diode D4 to end conduction of transistor combintion **294**, thereby deenergizing solenoid **276** and causing rejection of coins inserted. This ground is also closed through diode D1 to conductor **308** to reject all bills inserted.

Relay **240** on being deenergized restores its contacts **242** to reset the timer **244** and discontinue timing.

Relay **250** is of the type which, once electrically pulsed, operates mechanically, latches itself operated, and must be manually reset by personnel having access

to the machine interior, personnel such as machine servicemen.

In response to the normal insertion and acceptance of a valid 50 cent piece, coin switch **272** closes. With switch **260** in its No. 1 position, a circuit is completed from ground on lead G, closed contacts **262** and **272** to relays **230** and **234** and lead D1. Relays **230** and **234** are energized, closing their contacts **230.1, 230.2** and **234.1** and **234.2.** Closure of these contacts initiates a cycle similar to the cycle previously described for 1 dollar payout, except that motor **82** is not energized. The payout from motors **80** and **84** dispenses three dimes and four nickels. The timing circuit functions as described previously in that the operative cycle length for the dispensing motors does not differ.

Similarly when a quarter is inserted into the machine, tested, validated and accepted, switch **274** closes to complete a circuit to relay **234.** This relay controls the operation of motor **84** to pay out a dime and three nickels during a machine operation cycle.

A number of added safeguards have been provided including the functioning of tube assembly controlled switches **152, 154** and **156.** Switch **154** is normally closed, and switches **152** and **156** are normally open, the normal condition being with the coin tube assembly **51** in place on the dispensing motor housing **70.**

When the coin tube assembly is removed, switch **154** opens to deenergize the timer relay **240** so that no trouble timing can occur. Switch **156** closes to connect ground from lead G to empty lamps **40** and **42.** These lamps are connected to lead L3 which provides a **9** volt AC supply. In this way, lamps **40** and **42** are pulsed with a flickering pulsation which, it has been found, is more noticeable than steadily lighted lamps. Ground through switch **156** and Diode D1 is closed to lead **308** to inactivate the bill acceptor **285.** Ground through switch **156** is transmitted to the base of the right transistor of combination **294** to shut off conduction of the transistor combination and to deenergize solenoid **276.** Deenergization of solenoid **276** rejects all inserted coins.

When switch **152** closes its contacts, it causes any dispensing motor **80, 82** or **84** which is not in the rear slide position to sequence itself home. With a motor in its forward position, its contacts **210, 212,** or **214** will be closed. If it is assumed that only motors **80** and **84** are in the forward position, a circuit will be closed from lead L2 through switch **152,** and closed contacts **210** to motor **80.** Motor **80** will cycle itself until contacts **210** open at which time the motor operating path is opened. This path through contacts **210,** switch **152** and the then open contacts **212** (motor **82** being assumed to be at home) is closed to contacts **214** and motor **34.** Motor **84** will cycle itself to its home position at which time contacts **214** open to render closed contacts **152** ineffective.

This homing feature assures that all motors will be aligned in their home position, such that a coin tube assembly can be placed on the motor housing without the need for any adjustments or manipulation of the motors or coin tube assemblies.

It can further be seen that closure of either or both empty switches **280** and **282** will in the manner previously mentioned connect ground lead G to one or both of these lamps **40** and **42** to flicker. Further, the ground will also be connected to diodes D1 and/or D2, D3 and/or D4 to disable coin solenoid **276** and the bill insertion over conductor **308.**

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of our claims. It is further obvious that various changes may be made in details within the scope of our claims without departing from the spirit of our invention. It is, therefore, to be understood that our invention is not to be limited to the specific details shown and described.

Having thus described our invention, what we claim is:

1. A currency changing machine including in combination, a source of power, a source of control potential, means including a motor adapted to be energized to deliver coins on each cycle of operation thereof, means including a first normally open switch and a first normally closed switch for connecting said motor to said source of power, a control relay winding, means including a second normally open switch and a second normally closed switch for connecting said means winding to said source of control potential, currency accepting meqns for producing a signal in response to insertion of a valid bill therein, means responsive to said signal for closing said second normally open switch, means responsive to energization of said relay winding for closing said first normally open switch, means responsive to operation of said motor for opening said second normally closed switch at the completion of a cycle of operation of said motor, timing means having a cycle of operation which is longer than said motor cycle, and shorter than twice said motor cycle, means responsive to energization of said relay winding for energizing said timing means, and means responsive to the completion of a cycle of operation of said timing means for opening said first normally closed switch to deenergize said motor to prevent recycling thereof in the event of failure of said motor responsive means to open said second normally closed switch.

2. A currency charging machine as in claim **1** including means responsive to completion of a cycle of operation of said timing means for disabling said currency accepting means.

3. A currency changing machine as in claim **1** in which said coin delivering means comprises a coin tube assembly, a support for said coin tube assembly, and means responsive to the absence of said assembly on said support for disabling said bill accepting means.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,768,616 Dated October 30, 1973

Inventor(s) David B. Dykehouse, Oliver G. Okkonen, and Norman J. Zoodsma

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 10, line 29, "means" should read -- relay --;

line 31, "meqns" should read -- means --.

Signed and sealed this 2nd day of April 1974.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents

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