June 22, 1965 B. S. CAHILL ETAL 3,190,426

MONEY-HANDLING DEVICES

Filed April 3, 1961 7 Sheets-Sheet 1

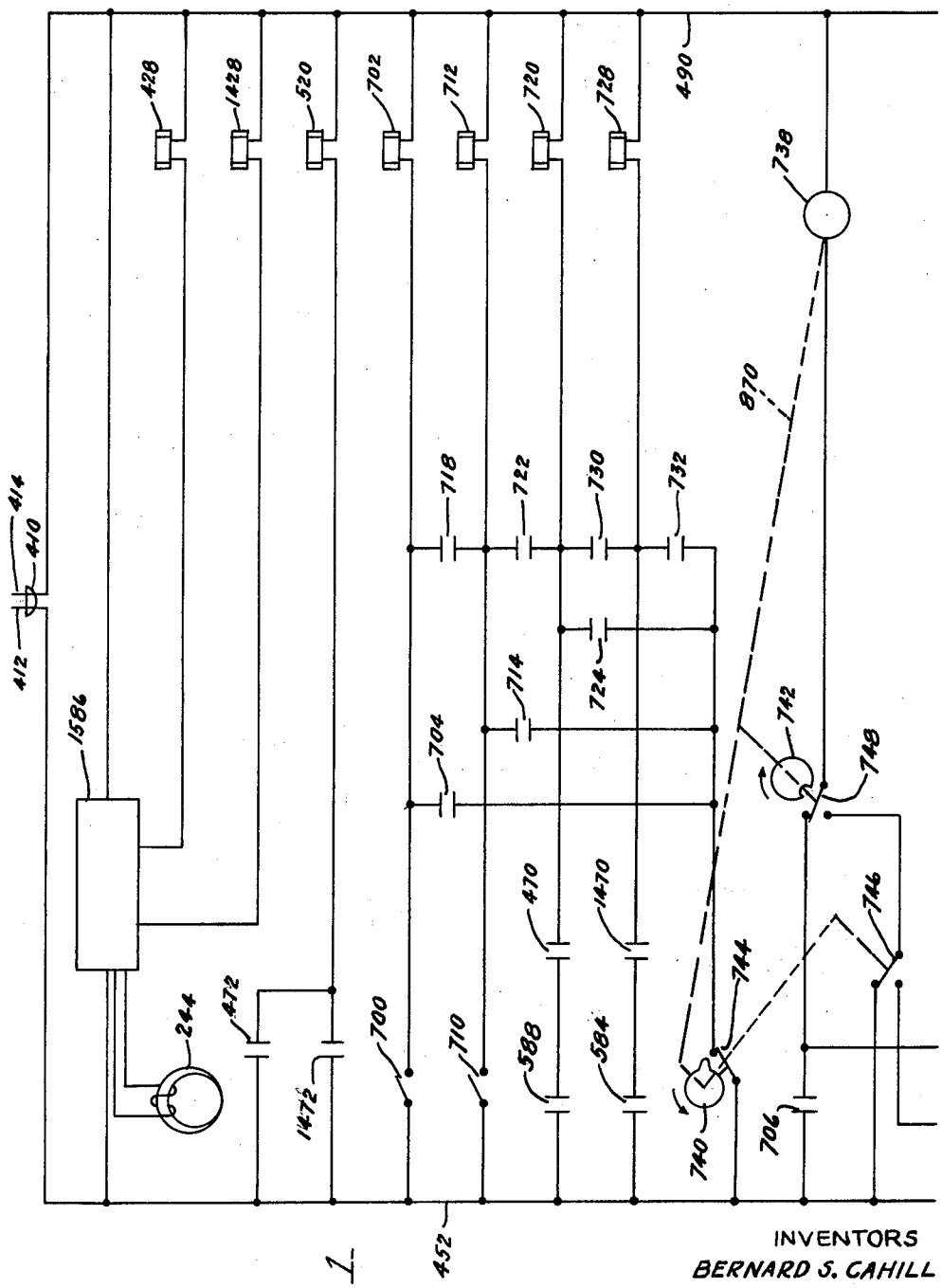


FIG. 1

INVENTORS
BERNARD S. CAHILL
DANIEL J. SCHEPFLIN
BY
ATTORNEY

June 22, 1965 B. S. CAHILL ETAL 3,190,426

MONEY-HANDLING DEVICES

Filed April 3, 1961 7 Sheets-Sheet 2

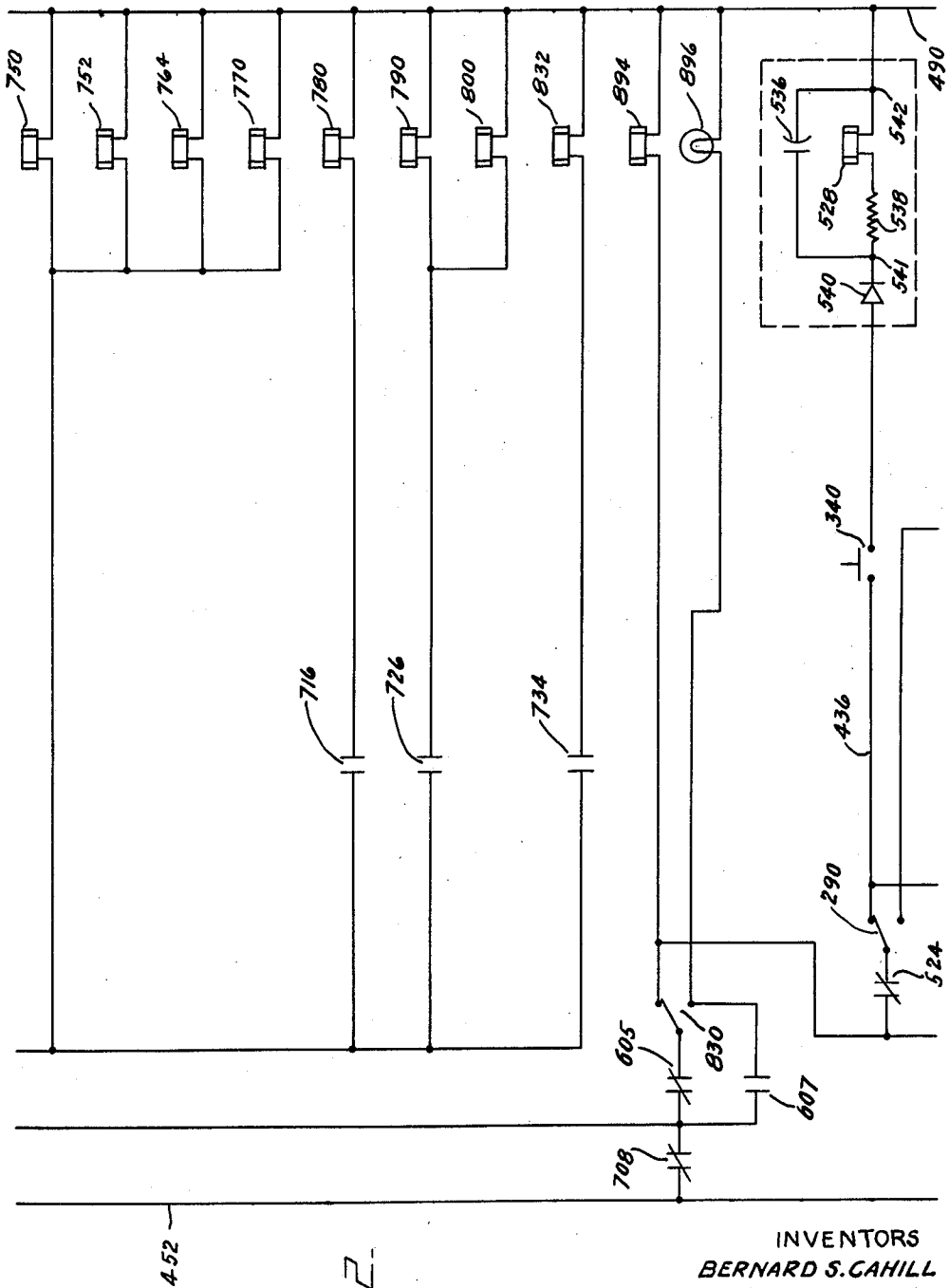


FIG. 2

INVENTORS
BERNARD S. CAHILL
DANIEL J. SCHEPFLIN

BY Ray Eales
ATTORNEY

June 22, 1965 B. S. CAHILL ETAL 3,190,426

MONEY-HANDLING DEVICES

Filed April 3, 1961 7 Sheets-Sheet 3

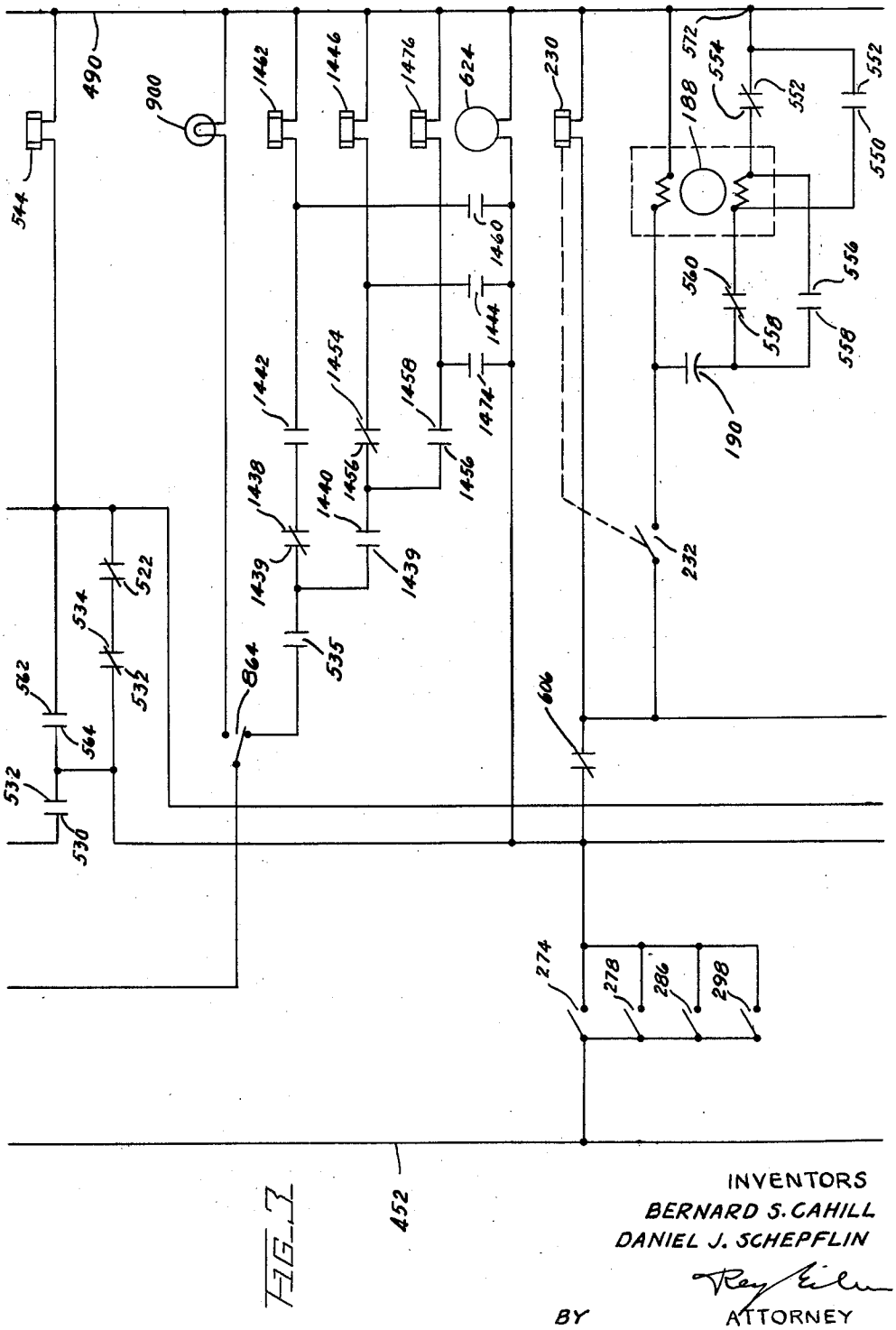


FIG. 3

INVENTORS
BERNARD S. CAHILL
DANIEL J. SCHEPFLIN

BY ATTORNEY

June 22, 1965 B. S. CAHILL ETAL 3,190,426

MONEY-HANDLING DEVICES

Filed April 3, 1961 7 Sheets-Sheet 4

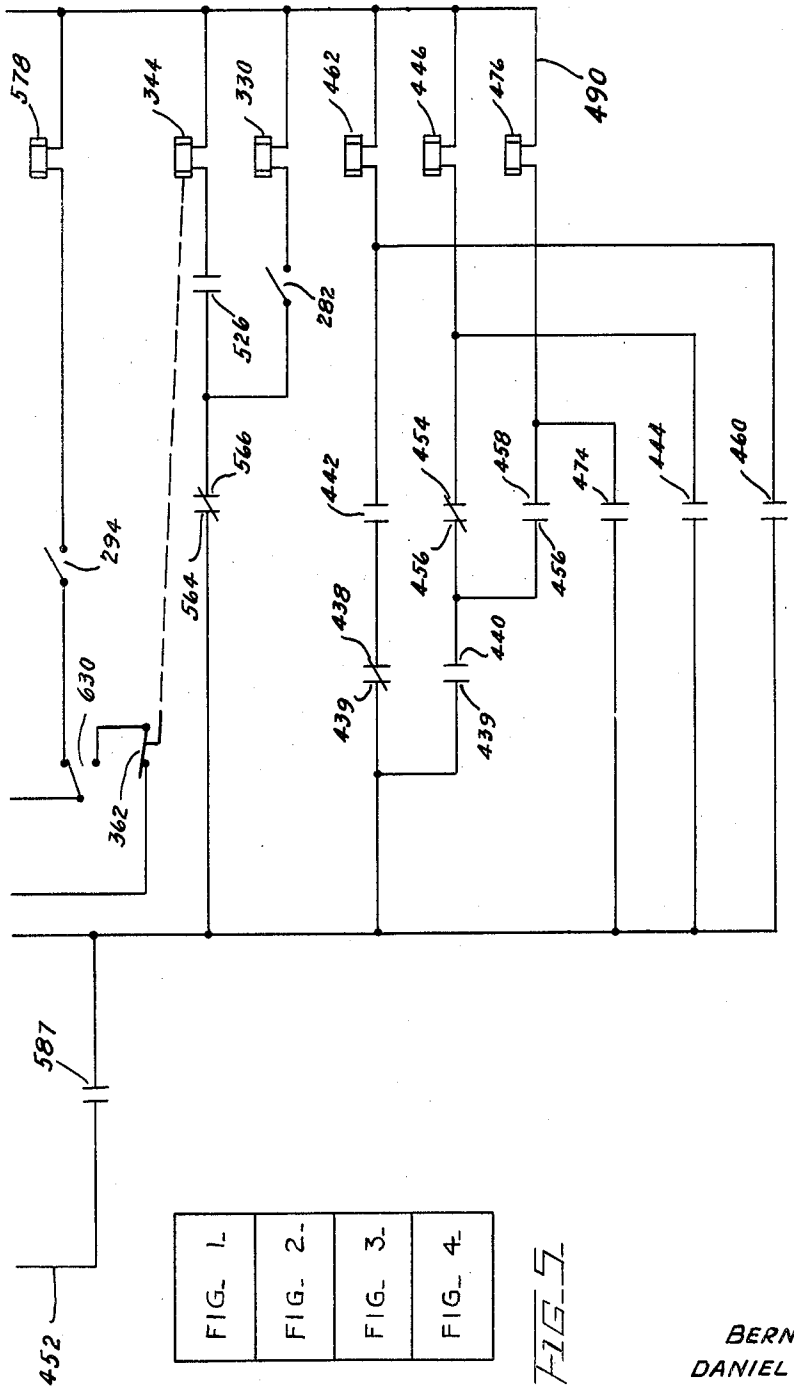


FIG. 4

FIG. 1.	FIG. 2.	FIG. 3.	FIG. 4.

FIG. 5

INVENTORS
BERNARD S. CAHILL
DANIEL J. SCHEPFLINN

BY ATTORNEY

June 22, 1965 B. S. CAHILL ETAL 3,190,426

MONEY-HANDLING DEVICES

Filed April 3, 1961 7 Sheets-Sheet 5

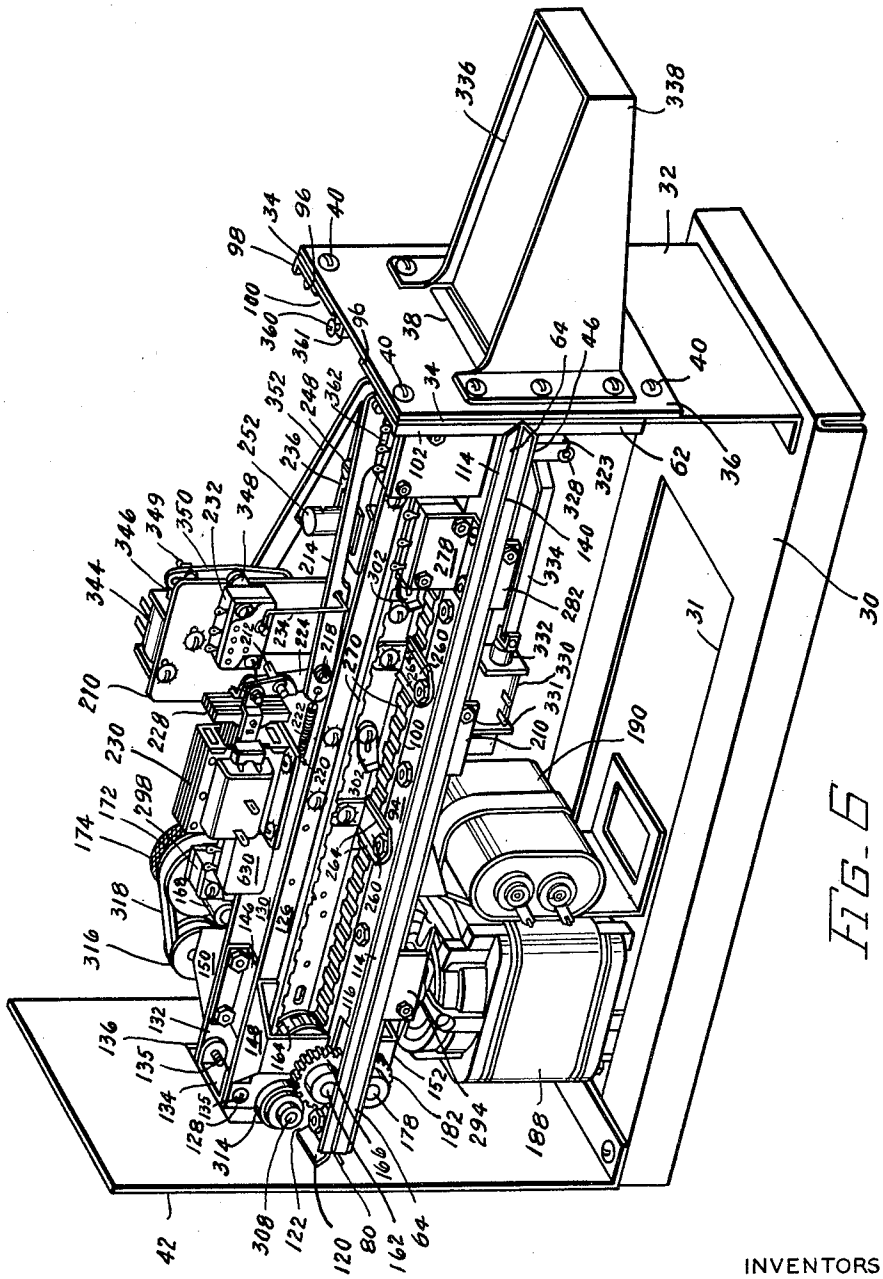


FIG. 6

INVENTORS
BERNARD S. CAHILL
DANIEL J. SCHEPFLIN

BY

ATTORNEY

June 22, 1965 B. S. CAHILL ETAL 3,190,426

MONEY-HANDLING DEVICES

Filed April 3, 1961 7 Sheets-Sheet 6

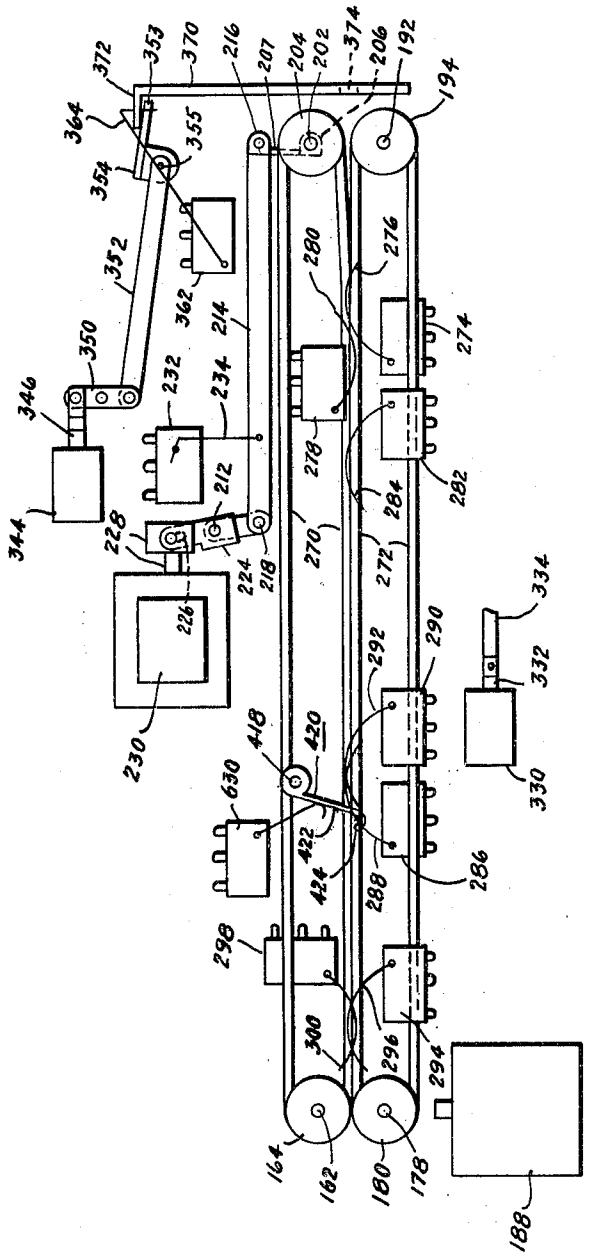


FIG. 7

INVENTORS
BERNARD S. CAHILL
DANIEL J. SCHEPFLIN

BY ATT'Y.

June 22, 1965 B. S. CAHILL ETAL 3,190,426

MONEY-HANDLING DEVICES

Filed April 3, 1961 7 Sheets-Sheet 7

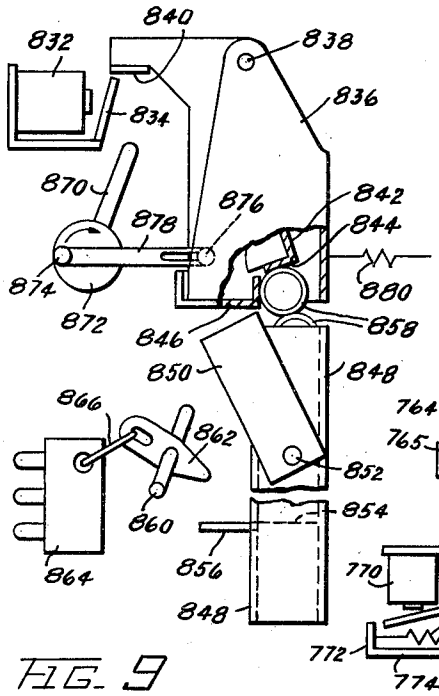


FIG. 9

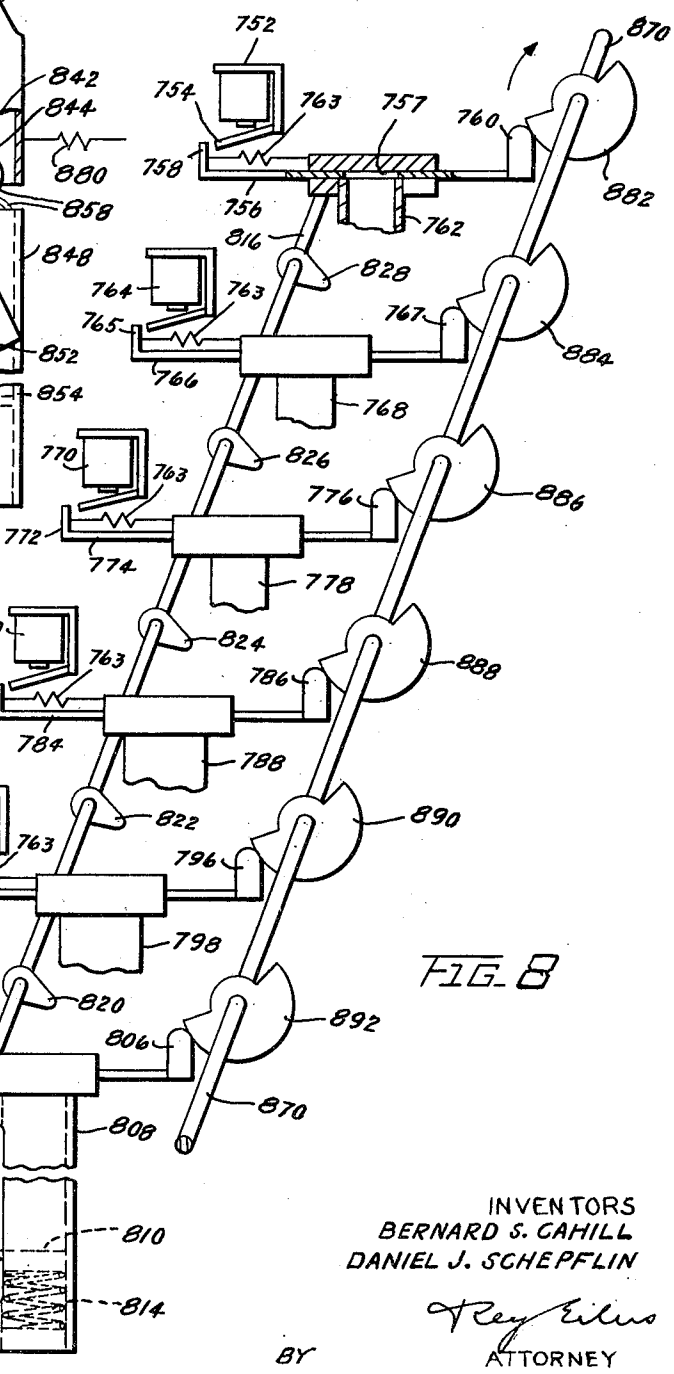


FIG. 8

INVENTORS
BERNARD S. CAHILL
DANIEL J. SCHEPFLIN

BY

ATTORNEY

United States Patent Office 3,190,426 Patented June 22, 1965

3,190,426

MONEY-HANDLING DEVICES

Bernard S. Cahill, Kirkwood, and Daniel J. Schepflin, St. Louis County, Mo., assignors to National Rejectors, Inc., St. Louis, Mo., a corporation of Missouri

Filed Apr. 3, 1961, Ser. No. 100,272
14 Claims. (Cl. 194—4)

This invention relates to improvements in money-handling devices. More particularly, this invention relates to improvement in devices that can accept money and that can pay out change.

It is, therefore, an object of the present invention to provide a device which can accept money and which can pay out change.

The money-handling device provided by the present invention can accept paper currency and can also accept coins. Further, that money-handling device can accept paper currency of different denominations and can accept coins of different denominations. This is desirable because it enables that device to provide change for all patrons who carry paper currency and coins of the denominations which are customarily carried on one's person. It is, therefore, an object of the present invention to provide a device which can accept paper currency and can also accept coins, and which can accept paper currency of different denominations and can accept coins of different denominations.

One embodiment of the present invention can accept five dollar bills, can accept one dollar bills, can accept fifty cent pieces, and can accept quarters. When a quarter is inserted in that embodiment of the present invention, certain coin ejectors will pay out change for that quarter. When a fifty cent piece is inserted, those certain coin ejectors will pay out change for a quarter, and a further coin ejector will pay out a quarter. When a dollar bill is inserted, those certain coin ejectors will pay out change for a quarter, the further coin ejector will pay out a quarter, and two additional coin ejectors will each pay out a quarter. When a five dollar bill is inserted, those certain coin ejectors will pay out change for a quarter, the further coin ejector will pay out a quarter, the two additional coin ejectors will each pay out a quarter, and a bill ejector will pay out four one dollar bills. It will be noted that whenever a higher denomination unit of money is inserted, the change for the lower denomination unit of money is still paid out, and that only such additional change is paid out as is necessary to match the higher value of the higher denomination unit of money. This is desirable because it makes possible the paying out of widely different amounts of change with a minimum number of pre-set combinations of ejectors. It is, therefore, an object of the present invention to provide a money-handling device wherein the change for a lower denomination unit of money is paid out when a higher denomination unit of money is inserted and only such additional change is paid out as is necessary to match the higher value of the higher denomination unit of money.

In the event the supply of one dollar bills, that are to be paid out as change, becomes exhausted it would be desirable to have the money-handling device return to the patron any five dollar bills that are inserted; and yet it would be desirable to have that money-handling device continue to accept one dollar bills, fifty cent pieces and quarters and to pay out the appropriate amounts of change. The present invention makes it possible for a money-handling device to effect the return of inserted five dollar bills when the supply of one dollar bills is exhausted while permitting that money-handling device to continue to accept one dollar bills, fifty cent pieces and quarters and to pay out appropriate amounts of change.

It is, therefore, an object of the present invention to provide a money-handling device which effects the return of five dollars bills when the supply of one dollar bills is exhausted but which will continue to accept one dollar bills, fifty cent pieces and quarters and to pay out appropriate amounts of change.

In the event the supply of any of the coins, that are to be paid out as change, becomes exhausted it would be desirable to have the money-handling device effect the return of any further bills or coins that might be inserted. The present invention provides a money-handling device which effects the return of all coins and bills that are inserted after the supply of any of the coins that are to be paid out as change becomes exhausted. It is, therefore, an object of the present invention to provide a money-handling device which effects the return of all bills and coins that are inserted after the supply of any of the coins that are to be paid out as change becomes exhausted.

The embodiment of money-handling device provided by the present invention uses one bill-transporting device to grip and move one dollar bills and to grip and move five dollar bills, but it uses two individually different electric channels to control the accepting of those bills. This is desirable because it means that the electric channel for the identifying and accepting of five dollar bills can be disabled, to effect the return of five dollar bills, without affecting the operation of the electric channel for the identifying and accepting of one dollar bills. As a result, the money-handling device of the present invention is fully capable of gripping all inserted bills, of moving all those bills along a predetermined testing path, and of identifying and accepting authentic one dollar bills while returning all five dollar bills when the supply of one dollar bills, to be paid out as change, becomes exhausted. It is, therefore, an object of the present invention to provide a money-handling device that uses one bill-transporting device to grip and move one dollar bills and to grip and move five dollar bills but that uses two individually different electric channels to control the identifying and accepting of those bills so those channels can be individually disabled.

It would be undesirable for a money-handling device to pay out more than the required amount of change. The present invention prevents the paying out of more than the required amount of change by providing an anti-jackpot circuit for the money-handling device provided by the present invention. That anti-jackpot circuit includes contacts on a relay which must operate during each and every cycle of operation of the money-handling device; and those contacts must return to their normal positions before the money-handling device can complete its cycle of operations. The switch that initiates a cycle of operation of the money-handling device when a five dollar bill is inserted must re-open before the end of that cycle of operation or the contacts of the relay will not restore themselves to permit that money-handling device to complete that cycle of operation. Similarly, the contacts that initiate a cycle of operation of the money-handling device when a one dollar bill is inserted, and the contacts that initiate a cycle of operation of the money-handling device when a fifty cent piece is inserted, and the contacts that initiate a cycle of operation of the money-handling device when a quarter is inserted, must re-open before the end of that cycle of operation or the contacts of the relay will not restore themselves to permit that money-handling device to complete that cycle of operation. This means that if any of the switches, that initiate a cycle of operation of the money-handling device, fails to re-open before the end of that cycle of operation, the anti-jackpot circuit of that money-handling device will cause that money-handling device to come to rest, and will thereby keep that

money-handling device from paying out more than the required amount of change. It is, therefore an object of the present invention to provide an anti-jackpot circuit which includes relay contacts that must operate and must restore themselves during each and every cycle of operation of the money-handling device, and which requires the switches, that initiate cycles of operation of the money-handling device, to restore themselves before the ends of those cycles of operation or the relay contacts will not be able to restore themselves.

The money-handling device provided by the present invention has a delayed-action protective device than can open the circuit to the motor of the currency-identifying unit if one of the bill-actuated switches of that unit sticks or is held closed by a jammed bill. In addition, that protective device will block the insertion of further coins, will block the initiation of further cycles of operation of the currency-identifying unit, and will cause an empty lamp to become illuminated. In this way, that protective device gives full protection to the money-handling device and to the patrons thereof.

Other and further objects and advantages of the present invention should become apparent from an examination of the drawing and accompanying description.

In the drawing and accompanying description, a preferred embodiment of the present invention is shown and described but it is to be understood the drawing and accompanying description are for the purpose of illustration only and do not limit the invention and that the invention will be defined by the appended claims.

In the drawing, FIG. 1 is a schematic diagram of a portion of the circuit of the money-handling device provided by the present invention,

FIG. 2 is a schematic diagram of a further portion of the circuit of the money-handling device provided by the present invention,

FIG. 3 is a schematic diagram of a still further portion of the money-handling device provided by the present invention,

FIG. 4 is a schematic diagram of the rest of the circuit of the money-handling device provided by the present invention,

FIG. 5 is a view showing how FIGS. 1–4 are interrelated,

FIG. 6 is a perspective view of one form of bill-transporting device which can be used in the money-handling device provided by the present invention,

FIG. 7 is a schematic view of the bill-transporting device of FIG. 6, and its shows the locations of several of the switches, shows the location of the motor, and shows the locations of the solenoids used with that bill-transporting device,

FIG. 8 is a partially-broken, partially-sectioned, perspective view, that is largely schematic rather than structural in nature, of the portion of the money-handling device which pays out coins as change, and

FIG. 9 is a partially-broken, partially-sectioned, perspective view, that is largely schematic rather than structural in nature, of the portion of the money-handling device which pays out bills.

Referring to the drawing in detail, the numeral **30** denotes a base for one embodiment of currency identification device that is made in accordance with the principles and teachings of the present invention. That base is generally rectangular in plan, it has stiffening flanges that extend downwardly from the sides thereof, and it has stiffening flanges that extend downwardly from the ends thereof. That base has a large opening **31** therein, and that opening begins at a point about one third of the way toward the rear of that base, and that opening extends almost all the way to the rear of that base.

The numeral **32** denotes a vertically-directed plate which has a horizontally-directed flange at the bottom thereof; and that flange serves as a foot. As indicated by the drawing, the foot of the plate **32** is secured to the base **30** adjacent the front edge of that base. A plate **34** of U-shaped configuration is disposed above the plate **32**, and that plate lies in the same plane as the lower plate **32**. The closed end of the U-shaped plate **34** rests on the top of the plate **32**, and the arms of that plate project upwardly from the plate **32**. A front plate **36** overlies the front face of the plate **34**, and also projects downwardly beyond the bottom of that plate to overlie the front portion of the upper part of the plate **32**. A horizontally-directed opening **38** is formed in the plate **36**, and that opening is wide enough to accommodate a dollar bill when that bill is inserted lengthwise through that opening. Fasteners **40**, shown in the form of machine screws, pass through openings adjacent the bottom of the front plate **36** and seat in threaded openings adjacent the upper end of the plate **32**. Other fasteners **40**, shown in the form of machine screws, pass through openings adjacent the top of the front plate **36** and seat in threaded openings adjacent the upper ends of the arms of the plate **34**.

The numeral **42** denotes the rear plate for the embodiment of currency identification device shown by the drawing, and that plate has a horizontally-directed flange which acts as a foot. As indicated by the drawing, the flange on the plate **42** is secured to the top of the base **30**. The rear plate **42** is parallel to the plate **32**, and it is in register with that plate.

The base **30**, the front plate **32** and the rear plate **42** are parts of a bill-transporting device which can receive an inserted bill, which can test that bill, and which can then accept or reject that bill. That bill-transporting device is similar to the bill-transporting device shown and described in Daniel J. Schepflin aplication Serial No. 73,016 for Currency Detectors which was filed on December 1, 1960, and that bill-transporting device is shown and described in complete detail in said application.

The currency identification device shown by the drawing has a horizontally-directed platen which is disposed above and which is parallel to the base **30**. That platen has a downwardly-extending wall portion, not shown, at the front thereof; and that wall portion has a vertical flange, not shown, at one side thereof, has a centrally-located rectangular opening, not shown, extending upwardly from the lower edge thereof, and has a vertical flange **62** at the other side thereof. The two vertical flanges act to stiffen that downwardly-extending wall portion. That platen has a flange **64** which extends downwardly from one of the elongated sides thereof, and that flange is contiguous with the vertical flange **62** and extends almost all the way to the rear edge of that platen. An elongated opening, not shown, is formed in the platen, and that opening is parallel to but spaced inwardly from the flange **64**. A short, but wide, rectangular opening, not shown, is provided in the platen near the front of that platen. A second elongated opening, not shown, is provided in the platen, and that opening is parallel to, and has the same length as, the first elongated opening. A flange that is similar to the flange **64** is formed at the other elongated side of the platen; and the flange **64** and its counterpart reinforce and stiffen the platen. Rectangular openings, not shown, are formed in the platen, adjacent the rear of that platen; and those openings are intermediate the elongated openings and the elongated sides of that platen. The platen terminates in a downwardly-inclined trailing edge **80**. Notches, not shown, extend inwardly through that trailing edge; and those notches are generally in register with the elongated openings in that platen.

A short slot is provided in the platen, and that slot is disposed between the elongated openings. The platen will preferably be punched or pressed to provide a conical relief at each end of that slot.

A vertical plate **46**, which has a foot-like flange, is secured to the lower face of the platen by that flange. Spot welds can be used to secure that foot-like flange to the lower face of that platen. In addition, a second and similar vertical plate, not shown, will be secured to the lower

face of the platen. The vertical plate 46 and its counterpart are parallel to each other, and they abut the adjacent edges of the elongated openings in the platen.

Short vertical plates, not shown, are secured to the lower face of the platen; and one of those plates is alined with the plate 46 and extends between the rear edge of that plate and the rear edge of the platen. The other of those plates is alined with the counterpart of the plate 46 and extends between the rear edge of that counterpart plate and the rear edge of the platen.

A securing flange is provided at the front of the plate 46, and a similar flange is provided at the front of the counterpart of the plate 46. Those securing flanges are suitably secured to the rear face of the vertical wall portion of the platen; and that wall portion is fixedly secured to front plate 36 and to the U-shaped plate 34 by fasteners. The short vertical plates on the lower face of the platen are secured to a U-shaped bracket, not shown, on the rear plate 42; and hence that platen is rigidly secured to both the rear plate 42 and the front plate 32.

The numeral 94 generally denotes a horizontal platen that is substantially identical to the first platen. The platen 94 has a wall portion 96 at the front thereof; but instead of extending downwardly from the plane of that platen, that wall portion extends upwardly from that plane. The wall portion 96 has a vertical flange 98 at one side thereof, has a centrally-located rectangular opening 100 extending downwardly from the upper edge thereof, and has a vertical flange 102 at the other side thereof. The flanges 98 and 102 act to stiffen the wall portion 96 of platen 94. The platen 94 has a flange, not shown, which extends upwardly from one of the elongated sides thereof; and that flange is contiguous with the vertical flange 98. An elongated opening 106, not shown, is formed in the platen 94; and that opening is parallel to, but is spaced inwardly from, the other elongated side of that platen. A short, but wide, rectangular opening, not shown, is provided in the platen 94 near the front of that platen; and that opening is in register with the short, but wide, rectangular opening in the first platen. A second elongated opening, not shown, is formed in the platen 94, and that opening is parallel to the said one elongated side of the platen 94. A flange 114 is formed at the said other elongated side of the platen 94, and that flange is contiguous with the vertical flange 102 on the wall portion 96, and it extends almost all the way to the rear edge of the platen 94. The flange 114 and its counterpart reinforce and stiffen the platen 94. An opening 116 is provided in the platen 94 adjacent the rear of that platen; and a similar opening, not shown, also is provided in the platen 94 adjacent the rear of that platen. The platen 94 is provided with an upwardly-inclined trailing edge 120; and a notch 122 and a second notch, not shown, extend inwardly through that trailing edge and into the horizontally-directed portion of the platen 94.

A short slot, not shown, is provided in the platen 94, and that slot is disposed between the opening 106 and its counterpart. The platen 94 will preferably be punched or pressed to provide a conical relief at each end of the short slot therein.

The numeral 126 denotes a vertical plate which has a foot-like flange, and that flange is secured to the upper face of the platen 94. That plate has a securing flange, not shown, that is suitably secured to the inner face of the portion 96. The numeral 130 denotes a second vertical plate which has a foot-like flange; and that flange also is secured to the upper face of the platen 94. That plate has a securing flange, not shown, that is suitably secured to the inner face of the portion 96. The vertical plates 126 and 130 are disposed in parallel to each other, and they abut the adjacent edges of the elongated opening 106 and its counterpart.

A short vertical plate 128 has a foot formed on it; and that foot is secured to the platen 94 by a fastener, such as a machine screw. The plate 128 is alined with the vertical plate 126; but it is spaced a short distance rearwardly of the trailing edge of that plate. The plate 128 extends to the rear edge of the platen 94. A short vertical plate 132 has a foot formed on it; and that foot is secured to the platen 94 by a fastener, such as a machine screw. The plate 132 is alined with the vertical plate 130; but it is spaced a short distance rearwardly of the trailing edge of that plate. The plate 132 extends to the rear edge of the platen 94. The space defined by the confronting edges of the plates 126 and 128 is in register with the space defined by the confronting edges of the plates 130 and 132.

The securing flanges at the leading edges of the vertical plates 126 and 130 are suitably secured to the rear face of the vertical wall portion 96 of the platen 94. That vertical wall portion is suitably secured to the front plate 36 and to the arms of the U-shaped plate 34 by suitable fasteners; and hence the platen 94 and the vertical plates 126 and 130 thereon are fixedly secured to the front plate 36. Fasteners 135 secure the short vertical plates 128 and 132 to a U-shaped bracket 134 that is spot welded to the front face of the rear plate 42. In this way the platen 94 and the short vertical plates 128 and 132 thereon are fixedly secured to the rear plate 42.

The rear plate 42 has a generally H-shaped opening 136 therein. However, the cross bar of that opening extends outwardly beyond the vertical portions of that opening. That cross bar is dimensioned to accommodate an inserted bill when that bill is moved through that cross bar in a direction which is parallel to the elongated axis of that bill. The cross bar of the H-shaped opening 136 in the rear plate 42 is in direct alinement with the opening 38 in the front plate 36; and that cross bar and the opening 38 are in register with the space intermediate the upper surface of the lower platen and the lower surface of the platen 94.

A guide plate 140 is mounted intermediate the upper platen 94 and the lower platen, and that plate is narrower than that portion of the platen 94 which is intermediate the opening 106 and the flange 114. That guide plate has its inner edge spaced outwardly from the outer edge of the opening 106; and that inner edge will coact with the upper and lower platens to define an elongated recess which can accommodate one edge of an inserted bill. A similar guide plate is disposed intermediate the upper and lower platens adjacent the other elongated opening in the platen 94; and the inner edge of that guide plate will coact with the upper and lower platens to define an elongated recess which can accommodate the other edge of the inserted bill.

The numeral 148 denotes a J-shaped bracket which has a frusto-triangular closed end; and the short arm of that bracket is at the widest portion of that closed end. Three similar J-shaped brackets are provided; and two of those brackets are shown and are denoted by the numerals 150 and 152. The J-shaped bracket 148 has its short arm secured to the plates 126 and 128 and the J-shaped bracket 150 has its short arm secured to the plates 130 and 132. The J-shaped plate 152 has its short arm secured to the plate 46 and the short plate, not shown, in register with that plate; and the fourth J-shaped plate has its short arm secured to plates that are secured to the lower platen and that are in vertical registry with the plates 130 and 132.

The long arms of the J-shaped brackets 148 and 150 extend toward but terminate short of the platen 94, and the long arms of the J-shaped bracket 152 and of the fourth J-shaped bracket extend toward but terminate short of the lower platen. Suitable bushings are held by those long arms; and the bushings in the long arms of the J-shaped brackets 148 and 150 rotatably support a shaft 162. Timing belt pulleys 164 are fixedly secured to that shaft, and those pulleys will be in register with the elongated opening 106 and with the other elongated opening in the platen 94. A spur gear 166 is fixedly secured to one end of the shaft 162; and a ratchet-faced clutch member 168 is secured to the shaft 162 intermediate the other end of

that shaft and the bushing which supports the other end of that shaft. A ratchet-faced clutch member, not shown, rotates freely on the shaft **162**, and the ratchet-face of that clutch member confronts and can engage the ratchet face of the clutch member **168**. A large diameter pulley **172** is mounted on and supported by the shaft **162**, adjacent the said other end of that shaft; but that pulley is free to rotate relative to that shaft. A knurled hand wheel **174** is fixedly secured to the said other end of the shaft **162**, and that hand wheel can be used to effect rotation of the shaft **162** whenever desired. A helical spring, not shown, is telescoped over the said other end of the shaft **162**, and one end of that spring is seated in a socket in the clutch member, not shown, while the other end of that spring is seated in a socket in the large diameter pulley **172**. That spring is wound in such a way that it will tend to wind tightly if the large diameter pulley **172** is held stationary while the shaft **162** rotates in the clockwise direction in FIG. 6.

The numeral **178** denotes a shaft which is held by the bushings that are held by the long arms of J-shaped bracket **152** and of the fourth J-shaped bracket. That shaft is located below the level of, and in vertical registry with, the shaft **162**; and that shaft extends through the openings in a gear housing, not shown. The shaft **178** has timing belt pulleys **180** fixedly secured thereto, and those pulleys are in register with the elongated openings in the lower platen. A spur gear **182** is mounted on one end of the shaft **178**, and that gear meshes with the spur gear **166** on the one end of the shaft **162**. A worm wheel, not shown, is mounted on the shaft **178**, and that wheel is disposed within the gear housing; and that worm wheel meshes with and is driven by a worm gear which is mounted on the shaft of a motor **188**. That motor shaft is vertically directed, and it extends upwardly through an opening in the bottom of the gear housing. The motor **188** is suitably secured to and depends downwardly from the gear housing. That motor is long enough to extend down into the large opening **31** in the base **30**, but it is short enough so it does not extend down below the level of the lower edges of the flanges on that base.

The motor **188** is a reversible motor; and a capacitor **190** is connected in series with the phase winding of motor **188**, and that capacitor is mounted on a bracket adjacent the motor **188**. That bracket is secured to, and depends downwardly from, the vertical plate **46** and its counterpart. That bracket has an opening in the bottom thereof which can accommodate a multi-prong connector to which the various electrical components of the bill-transporting device of FIG. 6 can be connected.

A bracket, not shown, is secured to the plate **46** and its counterpart adjacent the front plate **32**; and that bracket carries bushings which accommodate a horizontally-directed pivot **192**. That pivot has timing belt pulleys **194** rotatably mounted thereon, and those pulleys are in register with the elongated openings in the lower platen.

A U-shaped bracket, not shown, is rotatably secured to the plates **126** and **130** adjacent the forward ends of those plates; and that bracket carries bushings which support an elongated pivot **202**. The ends of that pivot extend through openings in the vertical plates **126** and **130**; and those openings are considerably larger than the diameter of the pivot **202**. As a result, the U-shaped bracket which supports that pivot can rotate a limited number of degrees without having the pivot **202** engage the openings in the plates **126** and **130**.

The bushings which are carried by the U-shaped bracket for the pivot **202** also support a U-shaped bracket **206**. The latter bracket is narrower than the U-shaped bracket for the pivot **202**; and hence the bracket **206** can be disposed between the arms of that bracket. The bracket **206** can rotate about the pivot **202**, and thus relative to the bracket for that pivot; and the bracket **206** can be rotated in the counter clockwise direction to raise the pivot **202** to the position shown by FIG. 7. The bracket **206** can also be rotated in the clockwise direction to lower the pivot **202**.

Timing belt pulleys **204** are rotatably mounted on the outer ends of the pivot **202**; and those pulleys will move up and down as the bracket **206** coacts with the U-shaped bracket for the pivot **202** to raise and lower that pivot. The pulleys **204** are mounted in register with the opening **106** and its counterpart in the platen **94**. The U-shaped bracket **206** has an upwardly-extending arm **207**, as shown by FIG. 7.

The numeral **210** denotes a mounting bracket that is secured to, but is laterally spaced from, the vertical plate **126**; and that mounting plate projects upwardly above the top of the plate **126**. A horizontally-directed pivot **212** is supported by the mounting bracket **210**; and a lever **224** is rotatably mounted on that pivot. A connecting rod **214** extends between the upwardly-extending arm **207** of the bracket **206** and the lower end of the lever **224**; and pin joints **216** and **218** connect that rod with that upwardly-projecting arm and with that lever, respectively. The connecting rod **214** extends to the left beyond the lower end of the lever **224**; and the left-hand end of that rod has an opening in which one end of a helical extension spring **222** is hooked. The other end of that spring is hooked around a pin **220** which is secured to the mounting bracket **210**.

The lever **224** has a slot **226** in the upper end thereof, and that slot accommodates a pin which is carried by the plunger **228** of a solenoid **230**. That solenoid is suitably secured to and supported by the mounting bracket **210**; and that solenoid can be energized to retract the plunger **228** and thereby rotate the lever **224** in the counter clockwise direction in FIG. 6. A switch **232** is suitably secured to the mounting bracket **210**; and the actuator **234** of that switch extends into a hole in the connecting rod **214**. The spring **222** normally holds the connecting rod **214**, the lever **224**, and the plunger **228** in the positions shown by FIG. 6; and, in doing so, that spring normally holds the bracket **206** in the raised position shown by FIG. 7. This means that under normal conditions the spring causes the bracket **206** to hold the pivot **202** and the U-shaped bracket therefor in their raised positions. The force of the spring **222** will be overcome by the solenoid **230** whenever the latter is energized; and hence that solenoid can cause the bracket **206** to rotate to its lower position; and as that bracket so rotates it will permit the pivot **202** to move down to its lower position. The energization of the solenoid **230** will also cause the connecting rod **214** to move the actuator **234** far enough to close the contacts of the normally-open switch **232**.

The numeral **236** denotes a bracket which is secured to, and which spans the space between, the vertical plates **126** and **130**. That bracket has downwardly depending legs with slots which accommodate projections on a mounting for a magnetic head **244**; and those slots and projections guide the vertical movement of that mounting. A helical compression spring, not shown, biases that mounting, and thus the magnetic head **244**, downwardly relative to the bracket **236**; and hence that spring biases that head downwardly relative to the platen **94**. However, the spring **246** can yield to permit upward movement of that mounting and of the magnetic head **244**. An adjusting screw **248** has the shank thereof passing through a threaded opening in the bracket **236**, through the compression spring, and through an opening in the mounting. Vertical movement of the adjusting screw **248** fixes the normal position of the magnetic head **244** relative to the platen **94**.

The numeral **252** denotes a socket which can receive a connector that will serve to connect the magnetic head **244** into a suitable circuit. That socket is mounted on the bracket **236**, and it is connected to the magnetic head **244** by two short wires. Those wires are readily flexible so they can permit movement of the magnetic head **244** relative to the platen **94**.

The numeral **260** generally denotes a bracket that is L-

shaped in configuration; and that bracket has a long horizontally-directed arm and has a short vertically-directed arm and both of those arms have openings therein. The horizontally-directed arm also has leading and trailing edges 264 that incline upwardly from the plane of that arm. A hardened face plate, not shown, is suitably secured to the horizontally-directed arm of the bracket 260; and that hardened face plate is strongly resistant to wear. That face plate underlies part of that horizontally-directed arm and also underlies the upwardly inclined leading and trailing edges 264. That face plate also has a downwardly depending lip, not shown, and that lip will confront the innermost edge of one of the timing belts used in the bill-transporting device shown in the drawing.

A number of L-shaped brackets 260 are provided; and the long arms of those brackets are secured to the platen 94 and to the lower platen, and the short arms of those brackets are secured to the vertical plates 126, 130 and 46 and to the counterpart of the plate 46. The brackets 260 which are secured to the platen 94 are paired and the brackets of each pair are set opposite each other; and the brackets 260 which are secured to the lower platen are paired and the brackets of each pair are set opposite each other. However, the pairs of brackets 260 which are secured to the platen 94 are displaced from the pairs of brackets 260 which are secured to the lower platen.

The numeral 270 denotes timing belts which extend around and are supported by the timing belt pulleys 204 and 164. The numeral 272 denotes timing belts which extend around and are supported by the timing belt pulleys 194 and 180. The timing belts 270 are mounted so the ribs thereon engage and pass under the hardened face plates of the brackets 260 which are supported by the platen 94. The timing belts 272 are mounted so the ribs thereon engage and pass over the hardened face plates of the brackets 260 which are supported by the lower platen. The hardened face plates of the brackets 260 carried by the lower platen define a horizontally-directed plane, and the hardened face plates of the brackets 260 carried by the platen 94 define a second horizontally-defined plane; and the vertical distance between those two planes is less than twice the thickness of any of the timing belts 270 and 272. As a result, the timing belts 270 and 272 must bow downwardly to pass under the hardened face plates of the brackets 260 secured to the platen 94 and must bow upwardly to pass over the hardened face plates of the brackets 260 secured to the lower platen. The downward and upward bowing of the timing belts will alternate and will force those belts to undulate as they move relative to the platen 94 and the lower platen. This undulation is very desirable because it recurrently forces the confronting faces of the timing belts 270 and 272 into intimate engagement with a bill interposed between those faces. If desired, rollers could be used instead of the brackets 260. However, while rollers would reduce the frictional forces applied to the timing belts 270 and 272, those forces have not been found to be particularly objectionable.

The timing belts 270 and 272 will be driven by the timing belt pulleys 164 and 180 mounted on the shafts 162 and 178, respectively. The shaft 178 will be directly driven by the motor 188, and the spur gears 182 and 166 will enable that shaft to drive the shaft 162. The gears 182 and 166 are important in keeping the belts 270 and 272 moving in synchrony with each other.

The numeral 274 denotes a switch that has an arcuate actuator 276. That switch is secured to the lower platen adjacent the front of that platen, and the actuator of that switch extends upwardly into the openings, for the belts 270 and 272, which are adjacent the plate 130 and the plate below that plate. In doing so, that actuator extends into the path of movement of any bill which is inserted within the bill-transporting device shown in the drawing. The actuator 276 extends toward the front wall portions of the platen 94 and the lower platen, and, consequently, that actuator will be engaged and moved by an inserted bill almost as soon as the leading edge of that bill passes inwardly beyond those wall portions.

The numeral 278 denotes a switch that has an arcuate actuator 280. That switch is secured to the platen 94 adjacent the front of that platen; and the actuator of that switch extends downwardly into the opening 106 and its counterpart in the lower platen. In doing so, that actuator extends into the path of any bill that is inserted within the bill-transporting device shown by the drawing. The actuator 280 also extends toward the front wall portions of the platen 94 and the lower platen, and, consequently, will be engaged by an inserted bill almost as soon as the leading edge of that bill passes inwardly beyond those wall portions. The actuator 276 of the switch 274 and the actuator 280 of switch 278 will be engaged by an inserted bill at about the same time where that inserted bill is intact and the corners thereof are not folded. However, if a corner of the inserted bill has been torn off or has been folded, one of those actuators will be engaged and moved before the other actuator is engaged and moved. To make certain that the presence of an inserted bill is sensed promptly, the switches 274 and 278 are connected in parallel, as shown by FIG. 3. This means that a closed circuit will be established almost as soon as the inserted bill passes inwardly beyond the front wall portions of the platen 94 and the lower platen; and that closed circuit will be established by one or the other or both of switches 274 and 278.

The numeral 282 denotes a switch that has an arcuate actuator 284. That switch is secured to the lower platen about one quarter of the distance toward the rear of that platen, and the actuator 284 extends upwardly into the opening 106 and its counterpart in the lower platen. The actuator 284 extends rearwardly; and that actuator is thus, in part at least, disposed rearwardly of the actuator 280.

The numeral 286 denotes a switch that has an arcuate actuator 288. That switch is secured to the lower platen at a point about one half of the distance toward the rear of that platen, and the actuator 288 extends upwardly into the openings, for the belts 270 and 272, which are adjacent the plate 130 and the plate below that plate. The actuator 288 extends forwardly toward the front plate 36; and an inserted bill will engage that actuator while that bill is still engaging and holding the actuators 276 and 280 of the switches 274 and 278.

The numeral 290 denotes a switch that has an arcuate actuator 292. That switch is secured to the lower platen at a point which is just a little closer to the front of that platen than is the point at which the switch 286 is secured to that platen. The actuator 292 extends upwardly into the opening 106 and the counterpart of that opening in the lower platen, and it extends rearwardly from that switch. That actuator is immediately adjacent the belts 270 and 272 which are disposed within the opening 106 and the counterpart of that opening in the lower platen, and those belts will give full and complete support to the leading edge of any inserted bill.

The numeral 294 denotes a switch that has an arcuate actuator 296. That switch is secured to the lower platen adjacent the rear of that platen, and the actuator of that switch extends ino the opening 106 and the counterpart of that opening in the lower platen. The actuator 296 extends rearwardly, and it extends between the shafts 162 and 178. That actuator is immediately adjacent the belts 270 and 272 which are disposed within the opening 106 and the counterpart of that opening in the lower platen; and those belts will give full and complete support to the leading edge of any inserted bill.

The numeral 298 denotes a switch that has an arcuate actuator 300. That switch is secured to the platen 94 adjacent the rear of that platen, and the actuator of that switch extends into the openings, for the belts 270 and 272, which are adjacent the plate 130 and the plate below that plate. The actuator 300 extends rearwardly toward

the rear of the platen **94**, and it extends between the shafts **162** and **178**.

The actuators **296** and **300** are opposite each other, and they will be engaged by the leading edge of an inserted bill at about the same time. Further, those actuators extend as close to the rear edges of the lower platen and of the plate **94** as is practicable; and hence an inserted bill will hold those actuators in moved position until that bill has passed almost all the way through the opening **136** in the rear plate **42**.

Stops **302** are provided for some of the switch actuators, and those stops will be secured to the vertical plate **46** and its counterpart and to the plates **126** and **130** by machine screws or other suitable fasteners. Those stops will limit the extent to which those actuators project through the openings for the belts **270** and **272**. Those stops are adjustable to facilitate the making of adjustments in the normal positions of the switch actuators.

A shaft **308** is rotatably supported above the platen **94** and adjacent the rear plate **42**. That shaft has soft-faced rollers **314** fixedly secured to it, and those rollers rotate with that shaft. The soft-faced rollers are immediately adjacent the outer faces of the vertical plates **126** and **130**; and parts of those rollers extend into the opening **136**. A small diameter pulley **316** is fixedly secured to and rotatable with the shaft **308**, and that pulley is in alinement with the large diameter pulley **172** that is loosely mounted on and carried by the shaft **162**. An endless belt **318** extends around and is supported by the large diameter pulley **172** and by the small diameter pulley **316**.

The short plates, that are secured to the lower platen and that are disposed below and in register with the short plates **128** and **132**, rotatably support a shaft which is below and in vertical registry with the shaft **308**. That lower shaft is shorter than the shaft **308**, but it has soft-faced rollers mounted on, and fixedly secured to, it; and those rollers engage and are driven by the soft-faced rollers **314** which rotate with the shaft **308**. The diameters of the various soft-faced rollers are so large that the confronting faces of those rollers always abut and slightly deform each other.

A U-shaped bracket, not shown, is disposed between and is secured to the plate **46** and its counterpart on the lower platen; and that bracket is disposed adjacent the front ends of those plates. A pivot is supported by that bracket, and a carrier **323** is rotatably mounted on that pivot. That carrier is generally U-shaped; and that carrier rotatably holds a soft-faced roller in register with the lower face of the magnetic head **244**.

A pin joint **328** is provided at the bottom of the carrier **323**, and that pin joint is connected to one end of a connecting rod **334**. The other end of that connecting rod is secured to the plunger **332** of a solenoid **330**. That solenoid is fixedly secured to a small plate **331** which, in turn, is fixedly secured to the plate on the lower platen that is the counterpart of the plate **46**.

The numeral **336** denotes a horizontal platform which projects outwardly from the front face **36** of the currency identification device, and that platform serves to support a bill which is to be tested by that device. A bracket **338** of attractive appearance surrounds and helps support the platform **336**; and the upper edges of that bracket project upwardly beyond the upper face of that platform. Those edges help a patron aline a bill with the opening **38** in the front plate **36**, and they also make certain that the patron will move the leading edge of that bill far enough through that opening to be intermediate the leading edges of the belts **270** and **272**.

The numeral **370** denotes a gate which is generally flat but which has a horizontally-directed ear **372** adjacent the top thereof. That gate is thinner than the U-shaped plate **34**, and that gate is narrower than the horizontal distance between the upstanding arms of that plate. As a result, that gate can fit within the space defined by the arms and the closed end of the U-shaped plate **34**. The wall portion **96** of the platen **94** overlies part of the rear face of that gate but does not obstruct movement of that gate; and the front plate **36** overlies substantially all of the front face of that gate but does not obstruct movement of that gate. As a result, the gate **370** is held in a vertical position by, but is free to move vertically relative to, the front plate **36** and the wall portion **96** of the platen **94**.

The gate **370** has an opening **374** therein, and that opening is made wide enough to accommodate a bill when that bill has its long axis perpendicular to the plane of that gate. That opening will normally be set in register with the opening **38** in the front plate **36**; but that opening can be moved downwardly out of register with the opening **38**. A switch **362** is mounted on the platen **94** adjacent the front of that platen, and the actuator **364** of that switch extends to, and is hooked through, an opening in the ear **372** on the gate **370**. Whenever the gate **370** is in the raised position shown by FIG. 7, the movable contact of that switch will engage the fixed contact of that switch, as shown by FIG. 4; but whenever that gate is in its lowered position that movable contact will be spaced away from that fixed contact.

A solenoid **344** is supported on and carried by the mounting bracket **210**; and that solenoid is at one face of that bracket while the switch **232** is at the other face of that bracket. The plunger **346** of the solenoid **344** is disposed adjacent the upper end of a rocker arm **350** which is rotatably supported by a pivot **348** that is carried by the mounting bracket **210**. The upper end of that rocker arm is rotatably secured to the plunger **346** by a pin joint **349**; and the lower end of that rocker arm is secured to one end of a connecting rod **352** by a pin joint, not shown.

The other end of that connecting rod is connected to an ear on a bracket **354** by means of a pin joint **355**. That bracket is rotatably mounted on a pivot held by the vertical plates **126** and **130**; and that bracket has an extension **353** which underlies the ear **372** on the gate **370**. A helical extension spring, not shown, urges the rocker arm **350** for rotation in the clockwise direction and also urges the connecting rod **352** for movement to the right in FIG. 7. Such movement of that connecting rod will rotate the U-shaped bracket **354** to the raised position shown by FIG. 7; but that spring can yield to permit that bracket to move to a lowered position. When the bracket **354** is in its raised position it will hold the ear **372** of the gate **370** up against the adjustable stop **360**, shown in the form of a machine screw. That stop is suitably held by a bracket **361** which is secured to and supported by the vertical plate **130**. When the bracket **354** is in its lowered position, the gate **370** will be free to move downwardly and sense for the presence or absence of a thread, tape or other member attached to the inserted bill.

Referring particularly to FIGS. 1–4, the numeral **1586** denotes a unit which includes the similarly-numbered unit, in copending Smith et al. application Serial No. 849,066 for Currency Detectors which was filed on October 27, 1959, now abandoned, plus the triodes, resistors, capacitors, inductors, and thyratrons which are shown connected to the output of that unit. Power is supplied to the unit **1586** by a conductor **452** which is connected to the prong **412** of a male plug **410** and by a conductor **490** which is connected to the prong **414** of that plug. The magnetic head **244** of the bill-transporting device has the coils thereof connected to the input of the unit **1586**.

A coil **428** of a relay is connected intermediate one of the output terminals of the unit **1586** and the conductor **490**. Contacts **438**, **439** and **440**, which are shown in FIG. 4, are mounted adjacent the coil **428**; and the contacts **438** and **440** will preferably be stationary contacts while the contact **439** will preferably be a contact that is selectively movable into engagement with the stationary contact **438** or the stationary contact **440**. As indicated

by FIG. 4, the contacts 438 and 439 are normally in engagement and the contacts 439 and 440 are normally spaced apart. The numeral 446 denotes the coil of a relay that has normally-open contacts 442 and 444; and that coil and those contacts are shown in FIG. 4. The numeral 462 denotes the coil of a relay that has contacts 454, 456, 458 and 460; and that coil and those contacts are shown in FIG. 4. The contacts 454 and 458 will preferably be stationary contacts while the contact 456 will preferably be a contact that is selectively movable into engagement with the stationary contact 454 or the stationary contact 458. The contacts 460 are normally open. The numeral 476 denotes the coil of a relay that has normally-open contacts 470, 472 and 474; and the contacts 470 and 472 are shown in FIG. 1, while the contacts 474 and the coil 476 are shown in FIG. 4. Those four relays are part of a relay chain which is similar to the relay chain, in the said copending Smith et al. application, that has similarly-numbered coils and contacts.

The numeral 520 denotes the coil of a relay that has contacts 522, 524 and 526. That coil is shown in FIG. 1, the normally-closed contacts 522 are shown in FIG. 3, the normally-closed contacts 524 are shown in FIG. 2, and the normally-open contacts 526 are shown in FIG. 4. The numeral 528 denotes the coil of a relay that has contacts 530, 532, 534 and 535. The coil 528 is shown in FIG. 2 and the contacts 530, 532, 534 and 535 are shown in FIG. 3. The contacts 530 and 534 will preferably be stationary contacts while the contact 532 will preferably be a contact that is selectively movable into engagement with the stationary contact 530 or the stationary contact 534. The contacts 535 normally open.

One terminal of the coil 528 is connected to the conductor 490 and the other terminal of that coil is connected to one of the fixed contacts of a pushbutton 340 by a resistor 538 and a rectifier 540. A capacitor 536 is connected in parallel with the serially-connected resistor 538 and coil 528 by junctions 541 and 542, as shown by FIG. 2. The other stationary contact of the pushbutton 340 is connected to the upper stationary contact of the switch 290 by a conductor 436.

The numeral 544 denotes the coil of a relay; and the numerals 550, 552, 554, 556, 558, 560, 562, 564 and 566 denote the contacts of that relay. The coil 544 and the contacts 550, 552, 554, 556, 558, 560, 562 and 564 are shown in FIG. 3, and the contacts 564 and 566 are shown in FIG. 4. The contacts 550 and 554 will preferably be stationary contacts while the contact 552 will preferably be a contact that is selectively movable into engagement with the stationary contact 550 or the stationary contact 554. The contacts 556 and 560 will preferably be stationary contacts while the contact 558 will preferably be a contact that is selectively movable into engagement with the stationary contact 556 or the stationary contact 560. The contacts 562 and 566 will preferably be stationary contacts while the contact 564 will preferably be a contact that is selectively movable into engagement with the stationary contact 562 or the stationary contact 566.

The numeral 578 denotes the coil of a relay that has normally-open contacts 584, 587 and 588. The coil 578 and the contacts 587 are shown in FIG. 4, and the contacts 584 and 588 are shown in FIG. 1.

The numeral 624 denotes the motor of a time delay relay which has a pair of normally-closed contacts 605, a pair of normally-closed contacts 606, and a pair of normally-open contacts 607. The motor 624 and the contacts 606 are shown in FIG. 3, and the contacts 605 and 607 are shown in FIG. 2. The motor 624 is a stall-type motor; and an actuator on the output shaft of that motor will respond to rotation of that output shaft to cause the contacts 605 and 606 to open and to cause the contacts 607 to close. As that actuator opens the contacts 605 and 606 and closes the contacts 607, the motor 624 will stall and will hold the contacts 605 and 606 open and will hold the contacts 607 closed until the circuit to that motor is interrupted. Once that circuit is interrupted the output shaft of that motor and the actuator mounted thereon will be restored to normal position by a returning spring; and thereupon the contacts 605 and 606 will re-close and the contacts 607 will re-open. In one preferred embodiment of the present invention, the motor 624 will run about thirty seconds before the actuator on the output shaft thereof opens the contacts 605 and 606 and closes the contacts 607. Such a length of time is many times longer than the normal time cycle of the bill-transporting device; and yet it is short enough to prevent undue running of the motor 138 of that bill-transporting device. One commercially-available time delay relay that can be used is made by the Struthers Dunn Company.

Referring to FIG. 7, the numeral 420 denotes a feeler that has ears at the upper end thereof which confront the inner-faces of the vertical plates 126 and 130 of the bill-transporting device. Suitable pivots 418 secure those ears to those vertical plates and maintain that feeler in assembled relation with those vertical plates while permitting ready oscillation of that feeler relative to those plates. The feeler 420 has a narrow, elongated, bill-receiving portion 422; and that bill-receiving portion normally extends downwardly through the short slot in the upper platen 94 and through the short slot in the lower platen. As a result, that bill-receiving portion is normally in the position shown by FIG. 7; and in that position that feeler will be engaged by any bill that is gripped and moved by the belts 270 and 272.

Whenever the feeler 420 is in the position shown by FIG. 7, it will permit the actuator of a switch 630, that is held by a bracket on the plate 130, to move to a position where the movable contact of that switch is in the raised position shown by FIG. 4. However, whenever a bill raises the feeler 420 far enough to enable that bill to pass under the bill-receiving portion 422 of that feeler, that feeler will cause the actuator of the switch 630 to move the movable contact thereof down into engagement with the lower fixed contact of that switch.

The bill-receiving portion 422 of the feeler 420 has a bend 424 adjacent the bottom thereof, and that bend forms a smoothly-rounded surface that will not snag a bill as that bill passes under the bill-receiving portion 422 of that feeler. In its normal position, the feeler 420 inclines dowardly from upper right to lower left, and hence it inclines in the direction in which a bill must move as that bill moves toward the rear plate 42. This is desirable because it facilitates the raising of that feeler by the leading edge of an inserted bill.

The feeler 420 will be held up in its raised position until after an inserted bill has moved completely beyond the bend 424 in the bill-receiving portion 422 of that feeler; and this means that the movable contact of the switch 630 will be held in engagement with the lower fixed contact of that switch until after the inserted bill has moved completely beyond the bend 424. After the trailing edge of that bill has moved beyond the bend 424, the feeler 420 will fall back to its normal position and the movable contact of the switch 630 will re-engage the upper fixed contact of that switch. At such time, the bill-receiving portion 422 of the feeler 420 will be inclined away from the direction in which a bill would have to move if a patron were to withdraw that bill from the bill-transporting device. This means that if a patron attached a thread, tape or other member to a bill and tried to withdraw that bill after that bill had passed beyond the feeler 420, any such attempted withdrawal would cause that bill to jam the feeler even more solidly into bill-obstructing position.

Referring to FIG. 1, the numeral 1428 denotes a relay coil which is connected between another output terminal of the unit 1586 and the conductor 490. That relay, of which that coil is a part, includes contacts 1438, 1439 and 1440. Those contacts are shown in FIG. 3; and the contacts 1438 and 1440 will preferably be stationary con-

tacts while the contact **1439** will preferably be a contact that is selectively movable into engagement with the stationary contact **1438** or the stationary contact **1440**. The numeral **1446** denotes the coil of a relay which has normally-open contacts **1442** and **1444**. That coil and those contacts are shown in FIG. 3. The numeral **1462** denotes that coill of a relay which has contacts **1454, 1456, 1458** and **1460**. That coil and those contacts are shown in FIG. 3; and the contacts **1454** and **1458** will preferably be stationary contacts while the contact **1456** will preferably be a contact that is selectively movable into engagement with the stationary contact **1454** or the stationary contact **1458**. The contacts **1460** are normally open. The numeral **1476** denotes the coil of a relay which has normally-open contacts **1470, 1472** and **1474**. The coil **1476** and the contacts **1474** are shown in FIG. 3, while the contacts **1470** and **1472** are shown in FIG. 1.

The coil **1428** is similar to the coil **428**, the coil **1446** is similar to the coil **446**, the coil **1462** is similar to the coil **462**, and the coil **1476** is similar to the coil **476**. However, the coils **1428, 1446, 1462** and **1476** are energized during the identification and acceptance of an authentic five dollar bill whereas the coils **428, 446, 462** and **476** are energized during the identification and acceptance of an authentic one dollar bill.

Referring to FIG. 1, the numeral **700** denotes a switch which is mounted adjacent a passageway, not shown, in the money-handling device provided by the present invention. The actuator of that switch extends into that passageway and will be struck by any quarters which patrons introduce into the money-handling device. The stationary contact of the switch **700** is connected to one terminal of the coil **702** of a relay which has contacts **704, 706** and **708**. The coil **702** and the normally-open contacts **704** and **706** are shown by FIG. 1, while the normally-closed contacts **708** are shown in FIG. 2.

The numeral **710** denotes a switch which is mounted adjacent a second passageway, not shown, in the money-handling device provided by the present invention. The actuator of that switch extends into that passageway and will be struck by any fifty cent pieces which patrons introduce into the money-handling device. The stationary contact of the switch **710** is connected to one terminal of the coil **712** of a relay which has normally-open contacts **714, 716** and **718**. The coil **712** and the contacts **714** and **718** are shown in FIG. 1, while the contacts **716** are shown in FIG. 2.

The numeral **720** denotes the coil of a relay which has normally-open contacts **722, 724** and **726**. The coil **720** and the contacts **722** and **724** are shown in FIG. 1, while the contacts **726** are shown in FIG. 2.

The numeral **728** denotes the coil of a relay which has normally-open contacts **730, 732** and **734**. The coil **728** and the contacts **730** and **732** are shown in FIG. 1, while the contacts **734** are shown in FIG. 2.

The numeral **738** denotes a motor which has a shaft **870** on which a number of cams and a crank are mounted. That motor and two of those cams are shown in FIG. 1, and those cams are denoted by the numerals **740** and **742**. The other cams are shown in FIG. 8, and they are denoted by the numerals **882, 884, 886, 888, 890** and **892**. The crank is shown in FIG. 9, and it is denoted by the numeral **872**.

The cam **740** is a single lobe cam, and the cam **742** is a single notch cam. A cam-operated switch **744** and a cam-operated switch **746** are mounted adjacent the cam **740**; and a cam-operated switch **748** is mounted adjacent the cam **742**. The switches **744** and **746** are so mounted with respect to the cam **740** that the said cam rotates in the counter clockwise direction relative to those switches. The switch **748** is so mounted with respect to the cam **742** that the said cam rotates in the clockwise direction relative to that switch.

The cams **882, 884, 886, 888, 890** and **892** have high dwells of over one hundred and eighty degrees; and those cams are shown as rotating in the clockwise direction. The crank **872** is shown as a disc, and is shown as rotating in the clockwise direction.

The numeral **750** denotes the coil of a counting mechanism; and that counting mechanism is intended to record each and every cycle of operation of the money-handling device. That counter can be of standard and usual construction; and the coil **750** thereof is shown in FIG. 2.

The numeral **752** denotes an electromagnet which has an armature **754**, all as shown in FIG. 8. That armature is normally disposed in the path of an ear **758** on a coin-ejecting slide **756** which is mounted adjacent a coin storage tube **762**. That tube can hold a supply of nickels, to be paid out as change; and the slide **756** has an opening **757** therein which is normally held in register with the upper end of the tube **762**. An ear **760** is provided on the right-hand end of the slide **756**, and a spring **763** urges that ear against the cam **882**. Whenever the electromagnet **752** is energized, the armature **754** will be raised up out of the path of the ear **758**; and at such time that armature will free the slide **756**.

The numeral **764** denotes an electromagnet which has an armature that is normally disposed in the path of an ear **765** on a coin-ejecting slide **766**, all as shown by FIG. 8. That slide is mounted adjacent a coin storage tube **768**, and it has an ear **767** on the right-hand end thereof. That tube can hold a supply of dimes, to be paid out as change; and the slide **766** has a coin-receiving opening therein which is normally held in register with the upper end of the tube **768**. A spring **763** urges the ear **767** against the cam **884**.

The numeral **770** denotes an electromagnet which has an armature that is normally disposed in the path of an ear **772** on a coin-ejecting slide **774**, all as shown by FIG. 8. That slide is mounted adjacent a coin storage tube **778**, and it has an ear **776** on the right-hand end thereof. That tube can hold a supply of dimes to be paid out as change; and the slide **774** has a coin-receiving opening therein which is normally held in register with the upper end of the tube **778**. A spring **763** urges the ear **776** against the cam **886**.

The numeral **780** denotes an electromagnet which has an armature that is normally disposed in the path of an ear **782** on a coin-ejecting slide **784**, all as shown by FIG. 8. That slide is mounted adjacent a coin storage tube **788**, and it has an ear **786** on the right-hand end thereof. That tube can hold a supply of quarters to be paid out as change; and the slide **784** has a coin-receiving opening therein which is normally held in register with the upper end of the tube **788**. A spring **763** urges the ear **786** against the cam **888**.

The numeral **790** denotes an electromagnet which has an armature that is normally disposed in the path of an ear **792** on a coin-ejecting slide **794**, all as shown by FIG. 8. That slide is mounted adjacent a coin storage tube **798**, and it has an ear **796** on the right-hand end thereof. That tube can hold a supply of quarters, to be paid out as change; and the slide **794** has a coin-receiving opening therein which is normally held in register with the upper end of the tube **798**. A spring **763** urges the ear **796** against the cam **890**.

The numeral **800** denotes an electromagnet which has an armature that is normally disposed in the path of an ear **802** on a coin-ejecting slide **804**, all as shown by FIG. 8. That slide is mounted adjacent a coin storage tube **808**, and it has an ear **806** on the right-hand end thereof. That tube can hold a supply of quarters, to be paid out as change; and the slide **804** has a coin-receiving opening therein which is normally held in register with the upper end of the tube **808**. A spring **763** urges the ear **806** against the cam **892**.

Each of the coin storage tubes **762, 768, 778, 788, 798** and **808** has a coin-supporting platform **810** therein; and each of those platforms has an ear **812** that projects outwardly through a vertically-directed slot **811** in the

tube in which that platform is held. A helical compression spring 814 underlies the coin-supporting platform 810 in each tube, and thereby biases that platform upwardly. As a result, the various coin-supporting platforms 810 hold the coins in the various coin storage tubes adjacent the upper ends of those tubes and urge those coins for movement into the coin-receiving openings in the coin-ejecting slides 756, 766, 774, 784, 794 and 804.

The numeral 816 denotes a shaft which is rotatably mounted adjacent the various coin storage tubes 762, 768, 778, 788, 798 and 808; and that shaft has arms 818, 820, 822, 824, 826 and 828 fixedly mounted thereon and rotatable therewith. The arm 818 overlies and is in register with the ear 812 on the platform 810 within the tube 808; and the arms 820, 822, 824, 826 and 828 overlie and are in register with the ears 812 on the coin-supporting platforms, respectively, in the tubes 798, 788, 778, 768 and 762.

The arm 818 has a slot in the left-hand end thereof, and that slot accommodates the actuator 831 of a switch 830. The movable contact of that switch will engage the upper fixed contact of that switch, as shown by FIG. 2, whenever the ears 812 of all of the coin-supporting platforms 810 are below the level of the arms 818, 820, 822, 824, 826 and 830. Those ears will be below the level of those arms as long as an adequate supply of coins is in the coin storage tubes 808, 798, 788, 778, 768 and 762. However, if the supply of coins in any one of those coin storage tubes becomes depleted, the ear 812 on the coin-supporting platform 810 for that tube will engage the arm which is adjacent that tube and will rotate that arm far enough in the counter clockwise direction to cause the movable contact of the switch 830 to move down into engagement with the lower fixed contact of that switch. That movable contact will remain in engagement with that lower fixed contact until sufficient coins have been introduced into the tubes 808, 798, 788, 778, 768 and 762 to cause all of the ears 812 on all of the coin-supporting platforms 810 to move downwardly out of engagement with the arms 818, 820, 822, 824, 826 and 828.

The numeral 832 denotes an electromagnet which has an armature 834, and that armature is normally disposed in the path of an ear 840 on a U-shaped member 836 which is shown in FIG. 9. That U-shaped member is mounted on a pivot 838, and it can oscillate relative to that pivot. A plate 842, which has a rearwardly-directed flange 844 at the bottom thereof, is suitably mounted within the U-shaped member 836; and that plate is spaced a short distance rearwardly of the closed front portion of that U-shaped member. A U-shaped closure 846 is provided for the rearmost portion of the bottom of the U-shaped member 836; and that closure is normally spaced rearwardly of the upper end of a vertically-directed currency storage tube 848. A closure 850, which has the configuration of an inverted U, has the arms thereof secured to the storage tube 848 by pivots 852. The end of that closure is normally spaced rearwardly from the upper end of the storage tube 848, but it can be moved into position to close that upper end.

A movable platform 854 is mounted within the currency storage tube 848, and that platform has an ear 856 which projects through a slot in the currency storage tube 848. A negator spring, not shown, will be suitably connected to the platform 854 to urge that platform upwardly relative to the storage tube 848. That storage tube can accommodate cylindrical, currency dispensing tubes 858; and the space defined by the front face of the U-shaped closure 846, by the rearwardly-extending flange 844 of the plate 842, and by the closed front portion of the U-shaped member 836 can accommodate one of those currency-dispensing tubes.

The coin storage tubes 808, 798, 788, 778, 768 and 762 and the currency storage tube 848 are of the type shown in Erickson et al. application Serial No. 35,504 for Coil Separators which was filed June 13, 1960. Further, the coin-ejecting slides 804, 794, 784, 774, 776 and 754 and the electromagnets 800, 790, 780, 770, 764 and 752 are of the type shown in the said Erickson et al. application. Further, the electromagnet 832, the U-shaped member 836, the currency storage tube 848 are of the type shown in the said Erickson et al. application.

The numeral 860 denotes a shaft which is mounted adjacent the currency storage tube 848; and an arm 862 is fixedly mounted on that shaft. The right-hand end of that arm overlies, and is in vertical registry with, the ear 856 on the movable platform 854. A slot is provided in the left-hand end of the arm 862, and that slot accommodates the actuator 865 of a switch 864. The movable contact of that switch will engage the lower fixed contact of that switch, as shown by FIG. 3, whenever the ear 856 is below the level of the arm 862. That ear will be below the level of that arm as long as an adequate supply of currency dispensing tubes 858 is in the currency storage tube 848. However, if the supply of currency dispensing tubes 858 becomes depleted, the ear 856 on the movable platform will engage the arm 862 and will rotate that arm far enough in the counter clockwise direction to cause the movable contact to the switch 864 to move up into engagement with the upper fixed contact of that switch. That movable contact will remain in engagement with that upper fixed contact until the supply of currency dispensing tube 858 is replenished.

As indicated by FIG. 9, the crank 872 carries a pin 874 which rotatably supports the left-hand end of a slotted connecting rod 878. A pin 876 extends through the slot in that connecting rod and is secured to one wall of the U-shaped member 836. In the normal position of the components of the money-handling device provided by the present invention, the right-hand end of the slot in the connecting rod 878 abuts the pin 876.

In the normal position of the components of the money-handling device provided by the present invention, the high dwells of the cams 882, 884, 886, 888, 890 and 892, respectively engage and hold the ears 760, 767, 776, 786, 796 and 806. However, after the shaft 870 has rotated approximately one hundred and eighty degrees in the clockwise direction in FIG. 8, the high dwells of those cams will release those ears. If, at that time, any of the armatures of the electromagnets 752, 764, 770, 780, 790 and 800 have been raised, by the energization of those electromagnets, the coin-ejecting slides adjacent those raised armatures will be free to move to coin-ejecting position.

Prior to the time the shaft 870 rotates the cams 882, 884, 886, 888, 890 and 892 to the position where they can free the ears 760, 767, 776, 786, 796 and 806, that shaft will rotates the crank 872 far enough to move the slotted connecting rod 878 to its right-handmost position. Such movement of that connecting rod will, if the armature 834 of the electromagnet 832 has previously been moved out of the path of the ear 840, enable the spring 830 to rotate the U-shaped member 836 in the counter clockwise direction until the pin 876 is stopped and held by the right-hand end of the slot in the connecting rod 878. That rotation of the U-shaped member will cause the currency dispensing tube 858, held in the space defined by the U-shaped closure 836, by the flange 844 on the plate 842 and by the closed front end of the U-shaped member 836, to move into register with, and to fall downwardly into, a chute. Subsequently, the coins which are ejected by the coin-ejecting slides 756, 766, 774, 784, 794 and 804 will be moved into register with, and will fall downwardly into that chute. The currency dispensing tube 858 and the coins will pass to a cup-like receptacle which will hold that tube and those coins available for the patron. Whenever a currency dispensing tube 858 is ejected by the U-shaped member 836, a coin will be ejected by each of the coin-ejecting slides 756, 766, 774, 784, 794 and 804. This means that six

coins and the currency dispensing tube **858** will pass to the cup-like coin receptacle.

The numeral **894** in FIG. 2 denotes a coin return electromagnet; and that electromagnet will be mounted adjacent the slug rejector used in the money-handling device. That electromagnet will normally be energized and will thus normally hold coin-intercepting pins out of the quarter passageway and out of the fifty cent piece passageway of that slug rejector. That electromagnet will respond to the de-energization thereof to permit those coin-intercepting pins to enter those passageways; and thereafter those pins will intercept, and effect the return of, all quarters and fifty cent pieces that are introduced by patrons until that electromagnet is again re-energized. The electromagnet **894** also will enable the coin-intercepting pins to intercept, and effect the return of, all quarters and fifty cent pieces that are introduced by patrons when the plug **410** is disconnected or a fuse blows. In this way, the electromagnet **894** protects patrons against the loss of quarters and fifty cent pieces at times when the money-handling device is not able to dispense change.

The numeral **896** in FIG. 2 denotes an electric lamp. That lamp will be mounted so it can illuminate a sign on the money-handling device which indicates that the money-handling device is out of change. That sign will make clear to patrons why their money is not being accepted by the money-handling device.

The numeral **900** in FIG. 3 denotes an electric lamp. That lamp will be mounted adjacent a sign on the money-handling device which indicates that only one dollar bills, quarters and fifty cent pieces will be accepted. That sign will make clear to patrons why any five dollar bills that the patron attempts to insert are being returned to him.

Whenever the money handling device is at rest, the spring **222** in FIG. 7 will pull the connecting rod **214** to the left and thus cause the U-shaped bracket **206** to raise the pivot **202** to its upper position. This means that whenever the money-handling device is at rest, the leading edges of the timing belts **270** will be above, and out of engagement with, the leading edges of the timing belts **272**. This is desirable because it facilitates the ready introduction of the leading edge of a bill between those leading edges.

Also at this time, the rocker arm **350** will be held in the position indicated by FIG. 7; and, as a result, the connecting rod **352** will hold the U-shaped bracket **354** in its raised position and thereby hold the gate **370** in its raised position. This means that a patron can easily introduce the leading edge of a bill through the opening **38** in the front plate **36**, through the opening **374** in the gate **370**, and into the space between the leading edges of the belts **270** and **272**.

Additionally at this time, the plunger **332** of the solenoid **330** will be held in extended position, and that plunger will act through the connecting rod **334** and the carrier **323** to hold the soft-faced, bill-engaging roller below, and out of engagement with, the magnetic head **244**. As a result, that roller will not impede the movement of an inserted bill toward the rear plate **42**.

If a patron inserts a quarter, that quarter will be tested by the slug rejector and will be delivered to the quarter passageway. As that quarter moves through that passageway, it will close the switch **700**; and that switch will complete a circuit via prong **412**, conductor **452**, switch **700**, relay coil **702**, conductor **490**, and prong **414**. The resulting energization of the relay coil **702** will close the contacts **704** and **706** in FIG. 1 and will open the contacts **708** in FIG. 2. The closing of the contacts **704** will complete a holding circuit for the relay coil **702** via prong **412**, conductor **452**, cam-operated switch **744**, contacts **704**, relay coil **702**, conductor **490**, and prong **414**. The closing of the contacts **706** will energize the motor **738** via prong **412**, conductor **452**, contacts **706**, the movable and upper fixed contacts of the cam-operated switch **748**, motor **738**, conductor **490**, and prong **414**. The closing of the contacts **706** will also energize coil **750** and electromagnets **752**, **764** and **770** via prong **412**, conductor **452**, contacts **706**, parallel-connected coil **750** and electromagnets **752**, **764** and **770**, conductor **490**, and prong **414**. The opening of the contacts **708** will disconnect the electromagnet **894** from the prong **412** and will positively isolate the push button **340** from that prong. In this way, the energization of the coil **702** will establish a holding circuit for that coil, will start the motor **738**, will enable the electromagnet **894** to effect the return of all further inserted quarters and fifty cent pieces, and will keep the closing of the pushbutton **340** from initiating a cycle of operation of the bill-transporting device.

As the motor **738** rotates its shaft **870**, the cams **740**, **742**, **882**, **884**, **886**, **888**, **890** and **892** and the crank **872** will rotate with that shaft. Almost immediately, the cam **742** will force the movable contact of the switch **748** to move down into engagement with the lower fixed contact of that switch. Such movement will complete a running circuit for the motor **738** via prong **412**, conductor **452**, the movable and upper fixed contacts of the cam-operated switch **746**, the movable and lower fixed contacts of the cam-operated switch **748**, motor **738**, conductor **490**, and prong **414**.

After the shaft **870** has rotated about one hundred and eighty degrees, the crank **872** will have shifted the connecting rod **878** to its right-handmost position. However, a currency dispensing tube **858** will not be paid out because the armature **834** will be in its extended position and will intercept the ear **840** and thus keep the spring **880** from rotating the U-shaped member **836** in the counterclockwise direction.

The shaft **870** will rotate a few more degrees in the clockwise direction, and then the cams **882**, **884**, **886**, **888**, **890** and **892** will move out of engagement with the ears **760**, **767**, **776**, **786**, **796** and **806**, respectively. The ears **782**, **792** and **802** of the coin-ejecting slides **784**, **794** and **804** will be intercepted and held by the armatures of the electromagnets **780**, **790** and **800**; and hence no quarters will be paid out. However, the armatures of the electromagnets **752**, **764** and **770** will be in their raised positions and will not intercept the ears **758**, **765** and **772**; and hence a nickel and two dimes will be paid out.

The shaft **870** will continue to rotate in the clockwise direction, and as that shaft approaches its normal position the cams **882**, **884** and **886** will re-engage the ears **760**, **767** and **776** and force the coin-ejecting slides **756**, **766** and **774** back to their normal positions. Thereupon, a nickel will enter the coin-receiving opening **757** in the slide **756**, a dime will enter the coin-receiving opening **757** in the slide **766**, and a dime will enter the coin-receiving opening **757** in the slide **774**. Subsequently, the cams **888**, **890** and **892** will engage the ears **786**, **796** and **806** and force the coin-ejecting slides **784**, **794** and **804** back to their normal positions.

Shortly before the shaft **870** reaches its normal position, the lobe on the cam **740** will open the switch **744** and will shift the movable contact of the switch **746** down into engagement with the lower contact of that switch. The opening of the switch **744** should de-energize the relay coil **702**, and that coil should permit the contacts **704** and **706** to re-open and should permit the contacts **708** to re-close. If the relay coil **702** does become deenergized, and if it does permit the contacts **704** and **706** to re-open, the coil **750** and the electromagnets **752**, **764** and **770** will become de-energized. If the relay coil **702** does become de-energized, and if it does permit the contacts **708** to re-close, a circuit will be completed via prong **412**, conductor **452**, contacts **708**, the movable and lower fixed contacts of the switch **746**, the movable and lower fixed contacts of the switch **748**, motor **738**, conductor **490**, and prong **414**. That circuit will keep the motor **738** energized; and the lobe of the cam **740** will then permit the contacts **744** to re-close and will permit the movable contact of the

switch 746 to move back up into engagement with the upper fixed contact of that switch. The re-closing of the switch 744 will not have any effect at this time because the contacts 704 re-opened; and the returning of the movable contact of the switch 746 to its upper position will not stop the motor because a further running circuit will be completed via prong 412, conductor 452, the movable and upper fixed contacts of switch 746, the movable and lower fixed contacts of switch 748, motor 738, conductor 490, and prong 414.

As the shaft 870 reaches its normal position, the notch in the cam 742 will permit the movable contact of the switch 748 to move back up to its normal position; and thereupon the motor 738 will come to rest because the contacts 706 re-opened. This completes one cycle of operation of the money-handling device of the present invention; and during that cycle of operation, the coil 750 caused the counter to record the fact that a cycle of operation had occurred, the electromagnets 752, 764 and 770 coacted with the cams 882, 884 and 886 to effect the paying out of one nickel and two dimes, the electromagnet 894 permitted the coin-intercepting pins to effect the return of any further quarters and fifty cent pieces, and the pushbutton 340 was isolated from the prong 412. At the conclusion of that cycle of operation, the electromagnet 894 again withdrew the coin-intercepting pins from the slug rejector to permit the acceptance of further quarters and fifty cent pieces, and the pushbutton 340 was again connected to the prong 412.

In the foregoing description of the cycle of operation of the money-handling device, it was assumed that the opening of the switch 744 de-energized the relay coil 702; and that is what normally happens. However, if the switch 700 were to stick closed, that relay coil would not become de-energized when the cam 740 opened the switch 744; and this means that the contacts 706 would remain closed. Those contacts could not, however, cause the motor 738 to run indefinitely because of the anti-jackpot circuit provided by the present invention. That circuit includes the contacts 708, the switch 746 and the switch 748; and it would halt the operation of the motor 738 when the lobe of the cam 740 shifted the movable contact of the switch 746 down into engagement with the lower contact of that switch, because the contacts 708 would still be open and would be isolating that lower contact from the prong 412.

As a result, the sticking of the coin switch 700 could not lead to the dispensing of more than the proper amount of change—that sticking merely leading to the de-energization of the motor 738. That motor would remain de-energized until the switch 700 re-opened, either spontaneously or in response to the efforts of a service man; and until that switch reopened, the still-open contacts 708 would prevent the acceptance of further coins and bills by isolating the electromagnet 894 and the pushbutton 340 from the prong 412.

If a patron inserts a fifty cent piece, that fifty cent piece will be tested by the slug rejector and will be delivered to the passageway for fifty cent pieces. As that fifty cent piece moves through that passageway, it will close the switch 710; and that switch will complete a circuit via prong 412, conductord 452, switch 710, relay coil 712, conductor 490, and prong 414. The resulting energization of the relay coil 712 will close the contacts 714 and 718 in FIG. 1 and will close the contacts 716 in FIG. 2. The closing of the contacts 714 will complete a holding circuti for the coil 712 via prong 412, conductor 452, cam-operated switch 744, contacts 714, relay coil 712, conductor 490, and prong 414. The closing of the contact 716 will pre-set a circuit for the relay coil 780, but that circuit will not be completed at this time because the contacts 706 will be open. The closing of the contacts 718 will coact with the closing of the contacts 714 to energize the relay coil 702; and thereupon that relay coil will close the contacts 704 and 706 in FIG. 1 and will open the contacts 708 in FIG. 2. The closing of the contacts 704 will not be significant at this time because the contacts 714 and 718 will provide a holding circuit for the relay coil 702; but the closing of the contacts 706 will energize the motor 738, will energize the coil 750 of the counter, and will energize the electromagnets 752, 764, 770 and 780. The opening of the contacts 708 will disconnect the electromagnet 894 and the pushbutton 340 from the prong 412, as explained previously.

The motor 738 will cause its shaft to make one complete revolution, all as described previously in connection with the insertion of a quarter. However, as the cams 882, 884, 886, 888, 890 and 892 free the ears 760, 767, 776, 786, 796 and 806, the slide 784 will join the slides 756, 766 and 774 in moving to coin-ejecting position. As a result, one nickel, two dimes and one quarter will be paid out as change.

As the shaft 870 rotates, the switches 748, 744 and 746 will be actuated in the same sequence in which they were actuated when a quarter was inserted. Further, the anti-jackpot circuit will permit the shaft 870 to be rotated all the way to its normal position only if the switch 710 has re-opened. Specifically, if the switch 710 sticks closed, the relay coil 712 will hold the contacts 714 and 718 closed and thus keep the relay coil 702 energized, with consequent continued opening of the contacts 708. As a result, the anti-jackpot circuit of the present invention will halt the motor 738, and thus prevent the paying out of more than the right amount of change, if the switch 710 sticks closed.

If a patron inserts the leading edge of a one dollar bill between the leading edges of the upper and lower timing belts 270 and 272 and then presses the pushbutton 340, a circuit will be completed via prong 412, conductor 452, contacts 708, contacts 605, the movable and upper fixed contacts of switch 830, contacts 524, the movable and upper fixed contacts of switch 290, conductor 436, pushbutton 340, rectifier 540, junction 541, parallel-connected capacitor 536 and serially-connected resistor 538 and relay coil 528, junction 542, conductor 492, and prong 414. The resulting energization of the relay coil 528 will cause the movable contact 532 in FIG. 3 to move out of engagement with the contact 534 and to move into engagement with the fixed contact 530, and it will also close the contacts 535. As the movable contact 532 moves into engagement with the stationary contact 530, a circuit will be completed via prong 424, conductor 452, contacts 708, contacts 605, the movable and upper fixed contacts of switch 830, contacts 524, the movable and upper fixed contacts of switch 290, now-closed contacts 530–532, time delay relay motor 624, conductor 490, and prong 414. Simultaneously, a circuit will be completed via prong 412, conductor 452, contacts 708, contacts 605, the movable and upper fixed contacts of switch 830, contacts 524, the movable and upper fixed contacts of switch 290, contacts 530–532, contacts 606, solenoid 230, conductor 490, and prong 414. The closing of the contacts 530–532 will not energize the relay coil 544 because the contacts 532–534 opened as the contacts 530–532 closed.

The energization of the time delay relay motor 624 will start that motor running; but under normal conditions of operation, the energization of that motor will not affect the operation of the money-handling device. This is due to the fact that the time cycle of that motor is many times longer than the normal time cycle of the money-handling device.

The energization of the solenoid 230 will cause the plunger 228 to move to the left in FIG. 7 and thereby rotate the lever 224 in the counter clockwise direction, with consequent shifting of the connecting rod 214 to the right. That shifting will cause the pivot 202 to move downwardly and permit the leading edges of the upper belts 270 to engage the leading edge of the bill and to force that bill against the leading edges of the lower belts 272. Further, that shifting of the connecting rod 214 will close the switch 232. Thereupon, a circuit will

be completed via prong 412, conductor 452, contacts 708, contacts 605, the movable and upper fixed contacts of switch 830, contacts 524, the movable and upper fixed contacts of switch 290, contacts 530–532, contacts 606, now-closed switch 232, and then both through the main winding of the motor 188 and through the capacitor 190 and contacts 558–560 and the phase winding of the motor 188 and contacts 554–552 and junction 572 to the conductor 490, and thence to the prong 414. As a result, the motor 188 will be energized and will start moving the confronting faces of the belts 270 and 272 for right to left in FIG. 7.

The patron does not have to keep the pushbutton 340 closed, because the capacitor 536, the resistor 538 and the relay coil 528 constitute a timing circuit which will hold the relay coil 528 energized for about one second after the pushbutton 340 is released. This means that even if a patron presses the pushbutton 340 only momentarily, the relay coil 528 will remain energized long enough to insure starting of the motor 188 and to insure running of that motor for about one second.

As the belts 270 and 272 move the bill toward the rear plate 42, the leading edge of that bill will quickly engage the actuators 276 and 280 of the switches 274 and 278. Thereupon those switches will close and will establish a holding circuit for the solenoid 230 and a running circuit for the motor 188; that holding circuit including prong 412, conductor 452, switches 274 and 278, contacts 606, solenoid 230, conductor 490, and prong 414, and that running circuit including prong 412, conductor 452, switches 274 and 278, contacts 606, switch 232, the main winding of the motor 188, capacitor 190, contacts 558–560, the phase winding of motor 188, contacts 554–552, junction 572, conductor 490 and prong 414. The motor 188 will thus be kept energized and will thus cause the belts 270 and 272 to continue to move the bill toward the rear plate 42.

The leading edge of the bill will promptly engage the actuator 284 of the switch 282 and close that switch; and thereupon a circuit will be completed via prong 412, conductor 452, switches 274 and 278, contacts 564–566, switch 282, relay coil 330, conductor 490, and prong 414. The resulting energization of the solenoid 330 will retract the armature 332 and act through the connecting rod 334 to cause the carrier 323 to urge the soft-faced pressure roller up against the bill. As a result, that bill will be forced up into intimate engagement with the air gap of the magnetic head 244.

The actuator 284 for the switch 282 is set far enough away from the front plate 36 to enable the leading edge of the bill to pass between the magnetic head 244 and the soft-faced pressure roller before that leading edge moves the actuator 284. As a result, the magnetic head 244 and the soft-faced pressure roller can not cause the leading edge of the bill to crumple or roll up. However, the actuator 284 is set close enough to the front plate 36 to enable the leading edge of the bill to move that actuator before the portrait background of that bill reaches the magnetic head 244. Consequently, the magnetic head 244 will engage and sense the portrait background of the bill.

By the time the inserted bill has moved into engagement with the actuator 284 of the switch 282, that bill will have been raised to the desired synchronous speed; and the engagement of the soft-faced pressure roller with that bill, and the engagement of that bill with the magnetic head 244, will not keep that bill from continuing to move at synchronous speed. The continued movement of the inserted bill past the magnetic head 244 will cause voltage variations to be generated in the coils of that magnetic head, all as disclosed in the said copending Smith et al. application. Those voltage variations will be suitably amplified by the unit 1586 in FIG. 1 to produce two validating signals, all as disclosed in the said copending Smith et al. application. The first of those two validating signals will energize the relay coil 428; and that coil will cause the contact 439 to engage the contact 440 in FIG. 4. Thereupon, a circuit will be completed via prong 412, conductor 452, switches 274 and 278, contacts 439–440, contacts 456–454, relay coil 446, junction 572, conductor 490, and prong 414. The resulting energization of the coil 446 will cause relay contacts 442 and 444 in FIG. 4 to close. The contacts 444 will establish a holding circuit for the relay coil 446 via prong 412, conductor 452, switches 274 and 278, contacts 444, relay coil 446, junction 572, conductor 490, and prong 414. Contacts 442 will preset a circuit for the relay coil 462, but that circuit will not be completed at this time because the contact 439 is out of engagement with the contact 438.

As the first validating signal passes, the relay coil 428 will become de-energized and the contact 439 will move back into engagement with the contact 438 in FIG. 4; and such engagement will complete the pre-set circuit via prong 412, conductor 452, switches 274 and 278, now-closed contacts 439–438, now-closed contacts 442, relay coil 462, junction 572, conductor 490, and prong 414. The resulting energization of relay coil 462 will close the contacts 456–458 in FIG. 4, will open the contacts 456–454 in FIG. 4, and will close the contacts 460 in FIG. 4. The contacts 460 will establish a holding circuit for the relay coil 462 via prong 412, conductor 452, switches 274 and 278, contacts 460, relay coil 462, junction 572, conductor 490, and prong 414. The closing of the contacts 456–458 will pre-set a circuit for the relay coil 476, but that circuit can not be closed at this time because the contact 439 is out of engagement with the contact 440.

The movement of the contact 439 out of engagement with the contact 440 did not de-energize the relay coil 446, because the contacts 444 hold that coil energized. Similarly, the movement of the contact 456 out of engagement with the contact 454 did not de-energize the relay coil 446, because the contacts 444 hold that coil energized.

The second validating signal will again energize the relay coil 428; and the resulting re-engagement of the contact 439 with the contact 440 in FIG. 4 will energize the relay coil 476 via prong 412, conductor 452, switches 274 and 278, contacts 439–440, contacts 456–458, relay coil 476, junction 572, conductor 490, and prong 414. The resulting energization of the coil 476 will close the contacts 470 in FIG. 1, will close the contacts 472 in FIG. 1, and will close the contacts 474 in FIG. 4. The contacts 474 will establish a holding circuit for the relay coil 476 via prong 412, conductor 452, switches 274 and 278, contacts 474, relay coil 476, junction 572, conductor 490 and prong 414. The closing of the contacts 470 will preset a circuit for the relay coil 720, but that circuit will not be completed at this time because the contacts 588 are open. The closing of the contacts 472 will complete a circuit via prong 412, conductor 452, now-closed contacts 472, relay coil 520, conductor 492, and prong 414; and the resulting energization of the coil 520 will open the contacts 522 in FIG. 3, will open the contacts 524 in FIG. 2, and will close the contacts 526 in FIG. 4. The opening of the contacts 522 and 524 will prevent the energization of the relay coil 544. The closing of the contacts 526 will complete a circuit via prong 412, conductor 452, switches 274 and 278, contacts 564–566, now-closed contacts 526, solenoid 344, junction 572, conductor 490, and prong 414. The passing of the second validating signal will again de-energize the relay coil 428 and thus cause the contact 439 to move away from the contact 440; but the relay coil 476 will be kept energized by the contacts 474.

The energization of the solenoid 344 will retract the plunger 346 and thereby shift the connecting rod 352 toward the front plate 36. That shifting will rotate the bracket 354 forwardly and downwardly; and the extension 353 thereof will move downwardly and release gate 370. If no thread, tape or other member is attached to the bill, the gate will be able to move down far enough to permit switch 362 in FIG. 4 to open. At this time, the trailing

edge of the bill will have passed inwardly of the gate 370, and that gate will then move downwardly to block the opening in the front plate 36. In doing so, that gate will protect the patron from the loss of a further inserted bill. The gate 370 will remain in its lowered position, and the switch 360 will remain in its shifted position, as long as the solenoid 344 remains energized.

This bill will continue to move rearwardly of the bill-transporting device and its leading edge will engage the actuator 292 of the switch 290 in FIG. 2, and thereby move the movable contact of that switch down into engagement with the lower fixed contact of that switch. Because the relay coil 520 was energized previously and is still energized, that downward movement of that movable contact will not produce any immediate change in the position of any other electrical component of the money-handling device.

As the bill continues to move toward the rear of the bill-transporting device, the leading edge thereof will engage the actuator 288 of the switch 286 in FIG. 3. The switch is connected in parallel with the switches 274 and 278; and hence the closing of that switch will merely help maintain the circuits which were being maintained by the switches 274 and 278.

As the bill moves still further toward the rear plate 42, the leading edge thereof will engage the elongated, bill-receiving portion 422 of the feeler 420 and will raise that portion. As that elongated, bill-receiving portion is raised, it will move the actuator of switch 630 in FIG. 4, and thereby shift the movable contact of that switch down into engagement with the lower fixed contact of that switch. Such shifting will not have any effect at this time because the switch 362 was previously opened.

Continued rearward movement of the bill will cause that bill to engage the actuators 296 and 300 of the switches 294 and 298. Thereupon, the switch 298 will close to provide a further path in parallel with the paths provided by the switches 274, 278 and 286. The closing of the switch 294 will not have any effect at this time because the switch 630 will be isolating the movable contact of the switch 294 from the prong 412.

The bill 400 will move through the opening 136 in the rear plate 42; and as that bill does so, its leading edge will pass between the small diameter rollers 314 and the small diameter rollers which are disposed below and in vertical registry with those small diameter rollers. Those rollers normally rotate at an angular rate which is greater than the angular rate at which the pulley 172 rotates. As long as the inserted bill is held by the timing belts 270 and 272, it will be unable to move at a speed which is equal to the normal, high peripheral speed of the rollers 314. Further, as long as the inserted bill engages the timing belts 270 and 272 as well as the small diameter rollers 314, those rollers will be held to a lower-than-normal peripheral speed. This means that the pulley 316 will not be able to rotate at its normal angular rate; and the overall result is that the helical torsion spring, not shown, will tend to wind itself tighter, and store energy within itself. As soon as the trailing edge of the inserted bill passes beyond the trailing edges of the timing belts 270 and 272, that helical torsion spring will restore itself to its normal condition. As it does so, that spring will rapidly rotate the small diameter rollers 314 in the same direction in which they had been rotating; and that rapid rotation will give an added impetus to the movement of the bill toward the cash box, not shown, which will be set adjacent the opening 136 in the rear plate 42.

As the inserted bill successively moves out of engagement with the actuators 276, 280 and 288 of the switches 274, 278 and 286, the movable contacts of those switches will return to the open positions shown by FIG. 3. However, the switch 298 will serve to maintain the circuits which were previously maintained by the switches 274, 278 and 286, because the actuator of that switch is disposed immediately adjacent the rear plate 42 of the bill-transporting device, all as shown by the drawing. This means that the switch 298 will be able to keep the solenoid 230, the solenoid 330, the solenoid 344, the motor 183, and the relay coils 446, 462 and 476 energized until the trailing edge of the bill has passed rearwardly beyond, and out of engagement wtih, the trailing edges of the timing belts 270 and 272.

As the trailing edge of the bill moves beyond the elongated bill-receiving portion 422 of the feeler 420, that feeler will return to its normal position and thus permit the movable contact of the switch 630 to re-engage the upper fixed contact of that switch. Thereupon a circuit will be completed via prong 412, conductor 452, switch 298, contacts 606, the movable and upper fixed contacts of switch 630, now-closed switch 294, relay coil 578, junction 572, conductor 490, and prong 414. The resulting energization of the coil 578 will close the contacts 584 in FIG. 1, will close the contacts 588 in FIG. 1, and will close the contacts 587 in FIG. 4; and the contacts 587 are in parallel with the switch 298. The closing of the contacts 584 will not have any effect at this time because the contacts 1470 are open, but the closing of the contacts 588 will complete a circuit via prong 412, conductor 452, now-closed contacts 588, contacts 470, relay coil 720, conductor 490, and prong 414. The resulting energization of the coil 720 will close the contacts 722 and 724 in FIG. 1 and will close the contacts 726 in FIG. 2. The closing of the contacts 724 will establish a holding circuit for the relay coil 720 via prong 412, conductor 452, cam-operated switch 744, now-closed contacts 724, relay coil 720, conductor 490, and prong 414. The closing of the contacts 722 will complete a circuit via prong 412, conductor 452, cam-operated switch 744, contacts 724, contacts 722, relay coil 712, conductor 490, and prong 414. The closing of the contacts 726 will preset a circuit for the electromagnets 790 and 800, but that circuit will not close at this time because the contacts 706 are open.

The energization of the coil 712 will close the contacts 714 and 718 in FIG. 1 and will close the contacts 716 in FIG. 2, all as explained previously in connection with the insertion of a fifty cent piece. The relay coil 702 will then be energized and a cycle of operation of the money-handling device will be initiated. During that cycle of operation, the contacts 706 will close and energize the motor 738, the coil 750 of the counter, and the electromagnets 752, 764, 770, 780, 790 and 800; and during that cycle of operation the slides 756, 766, 774, 784, 794, and 804 will eject one nickel, two dimes, and three quarters.

As the shaft 870 rotates, the switches 748, 744 and 746 will be actuated in the same sequence in which they were actuated when a quarter or a fifty cent piece was inserted. Further, the anti-jackpot circuit will permit the shaft 870 to be rotated all the way to its normal position only if the switch 294 has re-opened as the bill passed from the rear of the bill-transporting device. Specifically, if the switch 294 sticks closed, the relay coil 578 will hold the contacts 588 closed and thereby keep the relay coil 720 energized; and that relay coil will act through contacts 722, relay coil 712, contacts 718 and relay coil 702 to keep the contacts 708 from re-closing. As a result, the anti-jackpot circuit of the present invention will halt the motor 738, and thus prevent the paying out of more than the right amount of change, if the switch 294 sticks closed.

As the trailing edge of the bill moved out of engagement with the actuator 296 of the switch 294 in FIG. 4, that switch broke the connection to the relay coil 578. The resultant opening of the contacts 587 in FIG. 4 and the reopening of the switch 298 in FIG. 3, as the bill moved beyond the actuator 300, de-energized the solenoid 230, de-energized the motor 183, de-energized the solenoid 330, de-energized the solenoid 344, and de-energized the relay coils 446, 462 and 476. The de-energization of the coil 476 permitted the contacts 472 in FIG. 1 to reopen and thus cause the de-energization of the relay coil 520. As a result, all of the electrical components of the money-

handling device will return to the positions shown by FIGS. 1–4. At this time, that money-handling device will be ready for the insertion of further money.

In the foregoing description of the operation of the money-handling currency device, it was assumed that the inserted bill was an authentic bill; but if that bill had been a spurious bill, the currency identification device would have rejected that bill. For example, if that bill had been a spurious bill, the relay coil **428** would not have received two validating signals, and hence the relay coil **476** would not have been energized. This means that the relay coil **520** also would not have been energized, because that coil is energized only by the closing of the contacts **472** when a dollar bill is inserted.

If the relay coil **520** had not become energized, the contacts **526** in FIG. 4 would have been unable to close to energize the solenoid **344**. As a result, the gate **370** would have had no chance to move downwardly from its raised position, and the movable contact of the switch **362** would not have opened. Also, the contacts **524** in FIG. 2 would have been unable to open to separate the relay coil **544** from the prong **412**. Moreover, the contacts **522** in FIG. 3 would have been unable to open; and that fact is important in connection with the actuation of the switch **290** by the leading edge of the inserted bill.

Specifically, as the inserted bill causes the movable contact of the switch **290** to move down into engagement with the lower fixed contact of that switch, a circuit will be completed via prong **412**, conductor **452**, contacts **708**, contacts **605**, the movable and upper fixed contacts of the switch **830**, contacts **524**, the movable and lower fixed contacts of the switch **290**, relay coil **544**, conductor **490**, and prong **414**. The resulting energization of the relay coil **544** will disconnect the solenoid **344** from the prong **412** by moving the contact **564** away from the contact **566** in FIG. 4, and that energization will establish a holding circuit for the relay coil **544** through the contacts **562–564**. The energization of the relay coil **544** will also move the contacts **558** and **552**, respectively, away from the contacts **560** and **554** and into engagement with the contacts **556** and **550**. The resulting reversal of the connections to the phase winding of the motor **188** will cause that motor to start rotating in the opposite direction; and that rotation will cause the timing belts **270** and **272** to move the inserted bill back toward the opening **38** in the front plate **36**.

As the inserted bill moves outwardly through the opening **38** in the front plate **36**, the trailing edge of that bill will pass out of engagement with the actuators **276** and **280**, respectively, of the switches **274** and **278**. As the innermost edge of the bill moves out of engagement with the actuators **276** and **280**, the switches **274** and **278** will return to their normally-open position and the solenoid **230** will become de-energized. At such time, the spring **222** will rotate the rocker arm in the clockwise direction and thereby shift the bracket **204** to the raised position where it holds the leading edges of the timing belts **270** up out of engagement with the leading edges of the timing belts **272**. As the spring **222** rotated the bracket **206**, that spring also shifted the actuator **234** of the switch **232** and thereby re-opened that switch. Thereupon, the motor **188** became de-energized and the money-handling device came to rest. At such time the bill will be resting freely upon the platform **336** and the patron can easily retrieve that bill. In this way, if the inserted bill does not coact with the magnetic head **244** to produce voltage variations that enable the unit **1586** to produce two validating signals, the currency detector will not accept the bill.

In the event a patron attaches a sturdy thread, tape or other member to the inserted bill and lets the leading edge of that bill pass the magnetic head **244** and then lets the leading edge of that bill pass far enough toward the rear of the platen **94** to actuate the switch **630**, he will still not obtain the desired change. Instead, the currency detector will reverse the motor **188** and will send the bill and its attached thread, tape or other member back to the patron. This is due to the fact that the thread, tape or other member attached to the bill will keep the gate **370** from moving downwardly far enough to open the switch **362**. Consequently, when the leading edge of the bill causes the elongated bill-receiving portion **422** of the feeler **420** to rise up and shift the movable contact of switch **630** into engagement with the lower fixed contact of that switch, a circuit will be completed via prong **412**, conductor **452**, switches **274** and **278**, contacts **606**, the movable and lower fixed contacts of switch **630**, switch **362**, relay coil **544**, conductor **490**, and prong **414**. The resulting energization of the coil **544** will reverse the motor **188** and will cause the timing belts **270** and **272** to send the inserted bill back to the opening **38** in the front plate **36**. Hence, if a patron attaches a sturdy thread, tape or other member to the inserted bill, that patron will not obtain the desired change but instead will have the inserted bill and its attachment returned to him.

If a patron attached a very light thread, tape or other member to the inserted bill and lets both sides of the portrait background of that bill move past the magnetic head **244**, the relay coils **428**, **446**, **462** and **476** can become energized and can cause energization of the relay coil **520**. The energization of that coil will close the contacts **526** and thereby energize the solenoid **344**. If the thread, tape or other member is sufficiently light, the gate **370** will be able to move down far enough to open the switch **362**; and this means that as the leading edge of the bill engages and raises the bill-receiving portion **422** of the feeler **420**, the switch **630** will not be able to complete a circuit to the motor-reversing coil **544**. As the patron lets the leading edge of that bill pass to the actuator **296** of switch **294**, that bill will not lead to the immediate dispensing of the desired change because the switch **630** will be isolating the coil **578** from the prong **412**. Not until the trailing edge of the bill has passed wholly beyond the bill-receiving portion **422** of the feeler **420** and has permitted that bill-receiving portion to rotate down into position behind that trailing edge, will the switch **630** coact with the switch **294** to energize the coil **578** and thereby effect the dispensing of the desired change. At such time, the bill-receiving portion **422** of the feeler **420** will effectively block any attempt to withdraw the bill. Not only will the bill-receiving portion **422** be directly in the path which a bill would have to follow to be withdrawn, but that bill-receiving portion will incline away from the direction of the withdrawing movement. As a resulting, any effort to withdraw an inserted bill will jam the bill-receiving portion **422** of the feeler **420** even more solidly into a position where it will obstruct the withdrawal of the bill.

As a result, irrespective of whether a patron attaches a light or a sturdy thread, tape or other member to a bill, he will not obtain the desired change plus his inserted bill. If the thread, tape or other member is very light, the patron will be able to obtain the desired change but will not be able to withdrawn the bill. If the thread, tape or other member is sturdy, the patron may be able to withdraw the bill but will not be able to obtain the desired change.

If a patron inserts a five dollar bill and presses the push-button **340**, the unit **1586** will energize the relay coil **1428** instead of the relay coil **428**. The energization of the coil **1428** will cause the movable contact **1439** in FIG. 3 to move out of engagement with the contact **1438** and into engagement with the fixed contact **1440**. The movement of the contact **1439** into engagement with the contact **1440** will complete a circuit via prong **412**, conductor **452**, contacts **708**, contacts **605**, the movable and upper fixed contacts of switch **830**, the movable and lower fixed contacts of switch **864**, contacts **535**, contacts **1439–1440**, contacts **1456–1454**, relay coil **1446**, conductor **490**, and prong **414**. The resulting energization of the coil **1446** will close the contacts **1442** and **1444** in FIG. 3. The closing of the contacts **1444** will com-

plete a holding circuit for the coil 1446 via prong 412, conductor 452, switches 274 and 278, contacts 1444, relay coil 1446, conductor 490, and prong 414; and the closing of the contacts 1442 will pre-set a circuit for the relay coil 1462, but that circuit will not be completed at this time because the contact 1439 is out of engagement with the contact 1438.

As the first validating signal passes, the contact 1439 will move back into engagement with the contact 1438; and thereupon the relay coil 1462 will be energized via prong 412, conductor 452, contacts 708, contacts 605, the movable and upper fixed contacts of switch 830, the movable and lower fixed contacts of switch 864, contacts 535, contacts 1439–1438, contacts 1442, relay coil 1462, conductor 490, and prong 414. The resulting energization of relay coil 1462 will move the contact 1456 out of engagement with the contact 1454 and move that contact into engagement with the contact 1458, and it will also close the contacts 1460. The closing of the contacts 1460 will establish a holding circuit for the relay coil 1462 via prong 412, conductor 452, switches 274 and 278, contacts 1460, relay coil 1462, conductor 490, and prong 414. The movement of the contact 1439 out of engagement with the contact 1440 will not de-energize the relay coil 1446 because the contacts 1444 will hold that coil energized. Similarly, the movement of the contact 1456 out of engagement with the contact 1454 will not de-energize the relay coil 1446 because the contacts 1444 will hold that coil energized.

The second validating signal will enable the relay coil 1428 to cause the contact 1439 to again engage the contact 1440. Thereupon, a circuit will be completed via prong 412, conductor 452, contacts 708, contacts 605, the movable and upper fixed contacts of switch 830, the movable and lower fixed contacts of switch 864, contacts 535, contacts 1439–1440, contacts 1456–1458, relay coil 1476, conductor 490, and prong 414. The energization of the relay coil 1476 will close the contacts 1470 and 1472 in FIG. 1 and will close the contacts 1474 in FIG. 3. The closing of the contacts 1474 will establish a holding circuit for the coil 1476 via prong 412, conductor 452, switches 274 and 278, contacts 1474, relay coil 1476, conductor 490, and prong 414. The closing of the contacts 1472 will energize the coil 520, and the closing of the contacts 1470 will pre-set a circuit for the relay coil 728. The energization of the relay coil 520 will open the contacts 522 in FIG. 3, will open the contacts 524 in FIG. 2, and will close the contacts 526 in FIG. 4. The opening of the contacts 524 and 522 will isolate the motor-reversing relay coil 544 from the prong 412, and the closing of the contacts 526 in FIG. 4 will complete a circuit via prong 412, conductor 452 contacts 274 and 278, contacts 564–566, contacts 562, relay coil 344, junction 572, conductor 490, and prong 414. The resulting energization of the solenoid 344 will retract the plunger 346 and thereby shift the connecting rod 352 toward the front plate 36. That shifting will rotate the bracket 354 forwardly and downwardly; and the extension 353 thereof will move downwardly and release the gate 370. If no thread, tape or other member is attached to the bill, the gate 370 will be able to move down far enough to permit the switch 362 to open. At this time, the trailing edge of the inserted bill will have passed inwardly through the opening 374; and the gate 370 will then move downwardly to block the opening 38 in the front plate 36. The gate 370 will remain in its lowered position, and the switch 362 will remain in open position as long as the solenoid 344 remains energized.

Further rearward movement of the bill will cause the leading edge of that bill to engage the actuator 292 of switch 290 and thereby move the movable contact of that switch down into engagement with the lower fixed contact of that switch. Because the relay coil 520 was energized previously and is still energized, the movement of that movable contact will not produce any immediate change in the position of any other electrical component of the money-handling device.

The bill will continue to move rearwardly of the bill-transporting device; and its leading edge will engage and move the actuator of the switch 286. That switch is connected in parallel with the switches 274 and 278; and hence the closing of that switch will merely help maintain the circuits which were being maintained by the switches 274 and 278.

As the bill continues to move toward the rear plate 42, the leading edge thereof will engage the elongated bill-receiving portion 422 of the feeler 420 and will raise that portion. As that elongated bill-receiving portion is raised, it will move the actuator of switch 630 and thereby shift the movable contact of that switch down into engagement with the lower fixed contact of that switch. Such shifting will not have any effect at this time because the switch 362 was previously opened.

Continued rearward movement of the bill will cause that bill to engage the actuators 296 and 300 of the switches 294 and 298. Thereupon the switch 298 will close and provide a further path in parallel with the paths provided by the switches 274, 278 and 286. The closing of the switch 298 will not have any effect at this time because the switch 630 will be isolating the movable contact of the switch 294 from the prong 412.

The bill will continue to move toward the rear of the bill-transporting device, and as that bill does so, its leading edge will pass between the small diameter rollers 314 and the small diameter rollers therebelow. As previously indicated, those rollers will be held to a slower than normal speed and will thereby store up energy in the helical torsion spring. That energy will be released as the trailing edge of the bill moves beyond the trailing edges of the timing belts 270 and 272; and that spring will then rapidly rotate the small diameter rollers 314 and give an added impetus to the movement of the bill toward the cash box.

As the inserted bill successively moves out of engagement with the actuators 276, 280 and 288 of the switches 274, 278 and 286, the movable contacts of those switches will return to the positions shown by FIG. 4. However, the switch 298 will maintain the circuits previously maintained by the switches 274, 278 and 286. This means that the switch 298 will keep the solenoid 230, the solenoid 330, the solenoid 344, the motor 188, and the relay coils 1446, 1462 and 1476 energized until the trailing edge of the bill has passed rearwardly beyond the trailing edges of the timing belts 270 and 272.

As the trailing edge of the bill passes beyond the elongated bill-receiving portion 422 of the feeler 420, that feeler will return to its normal position and permit the movable contact of the switch 630 to re-engage the upper fixed contact of that switch. Thereupon a circuit will be completed via prong 412, conductor 452, switch 298, contacts 605, the movable and upper fixed contacts of switch 630, switch 294, relay coil 578, junction 572, conductor 490, and prong 414. The resulting energization of the relay coil 578 will close the contacts 584 and 588 in FIG. 1 and will close the contacts 587 in FIG. 4. The contacts 587 will parallel the contacts 298 as previously described. The closing of the contacts 588 will not energize the relay coil 720 because the contacts 470 are open; but the closing of the contacts 584 will energize the relay coil 728 because the contacts 1470 are closed. The energization of the relay coil 728 will close the contacts 730 and 732 in FIG. 1 and will close the contacts 734 in FIG. 2. The contacts 732 will complete a holding circuit for the relay coil 728 via prong 412, conductor 452, cam-operated switch 744, contacts 732, relay coil 728, conductor 490, and prong 414. The closing of the contacts 734 will preset a circuit for the electromagnet 832, but that circuit will not be completed at this time because the contacts 706 are open. The closing of the contacts 730 will energize the relay coil 720 via prong 412, conductor 452, switch 744, contacts 732, contacts 730, relay coil 720, conductor 490, and

prong 414. The energization of the relay coil 720 will then initiate a cycle of the money-handling device in the same manner in which that relay coil initiated such a cycle when the contacts 488 and 470 closed to energize that relay coil. During that cycle of operation, the motor 738 will cause the shaft 870 to make one complete revolution and then come to rest; and as that shaft makes that revolution, the U-shaped member 836 will eject a currency dispensing tube 858, and the slides 756, 766, 774, 784, 794 and 804 will eject one nickel, two dimes and three quarters.

The bill will continue to move through the bill-transporting device until its trailing edge passes beyond the switch 298; and thereupon the bill-transporting device will come to rest in the manner previously described. It will thus be seen that when a five dollar bill is inserted and the pushbutton 340 is pressed, a currency dispensing tube 858 which contains four one dollar bills will be dispensed and coins aggregating one dollar in value will be dispensed.

As the shaft 870 rotates, the switches 748, 744 and 746 will be actuated in the same sequence in which they were actuated when a quarter or a fifty cent piece or a dollar was inserted. Further, the anti-jackpot circuit will permit the shaft 870 to be rotated all the way to its normal position only if the switch 294 has re-opened as the bill passed from the rear of the bill-transporting device. Specifically, if the switch 294 sticks closed, the relay coil 578 will hold the contacts 584 closed and thereby keep the relay coil 728 energized; and that relay coil will act through contacts 730, relay coil 720, contacts 722, relay coil 712, contacts 718 and relay coil 702 to keep the contacts 708 from reclosing. As a result, the anti-jackpot circuit of the present invention will halt the motor 738, and thus prevent the paying out of more than the right amount of change, if the switch 294 sticks closed.

In the event the supply of currency dispensing tubes 858 becomes depleted, the ear 856 on the platform 854 will engage the arm 862 and permit the movable contact of switch 864 in FIG. 3 to move up into engagement with the upper fixed contact of that switch. Thereupon, a circuit will be completed via prong 412, conductor 452, contacts 708, contacts 605, the movable and upper fixed contacts of switch 830, the movable and upper fixed contacts of switch 864, lamp 900, conductor 490, and prong 414. The resulting illumination of the lamp 900 will highlight the sign which will indicate to a patron that he should insert only one dollar bills, fifty cent pieces or quarters. When the movable contact of the switch 864 moved upwardly, it isolated the contact 1439 from the prong 412 and thereby prevented the actuation of the relay coils 1446, 1462 and 1476 of the relay chain. This means that the money-handling device provided by the present invention not only advises a patron not to insert five dollar bills but will cause all five dollar bills to be returned to the patrons.

In the event the supply of coins in any of the tubes 762, 768, 778, 788, 798 or 808 were to become depleted, the ear 812 on the platform 810 of that tube would rise upwardly and strike the appropriate arm on shaft 816. The resultant clockwise rotation of the switch arm 831 would cause the movable contact of the switch 830 in FIG. 2 to move down into engagement with the lower fixed contact of that switch. Such movement would de-energize the electromagnet 894, would illuminate the lamp 896, and would isolate the pushbutton 430 from the prong 412. The de-energization of the electromagnet 894 would permit the coin-intercepting pins to enter the slug rejector and reject any quarters or fifty cent pieces that were inserted in the money-handling device. The illumination of the lamp 896 would indicate to patrons that the money-handling device was out of change. The isolation of the pushbutton 340 from the prong 412 prevents the initiation of any further cycles of operation of the bill-transporting device. In this way, the present invention completely shuts down the money-handling device whenever the supply of change coins of any denomination becomes depleted.

The time delay relay, of which the motor 624 and the contacts 605, 606 and 607 are parts, does not ordinarily play a significant part in the operation of the money-handling device provided by the present invention. The motor 624 will be energized whenever the solenoid 230 is energized because the normally-closed contacts 606 place that solenoid and that motor in parallel; but the solenoid 230 and the motor of the relay 624 will normally be de-energized long before the actuator on the output shaft of that motor can open the contacts 606. However, if any of the switches 274, 276, 286 or 298 remained closed indefinitely, those switches would tend to keep the solenoid 230 and motor 188 energized indefinitely. Indefinite energization of that solenoid and of that motor would be undesirable, and it is prevented by the time delay relay—that relay opening the contacts 606 within thirty seconds after any of the switches 274, 276, 286 or 298 become stuck. That relay will keep the contacts 606 open, and thus prevent energization of the solenoid 230 or of the motor 188 until the stuck switch is re-opened.

At the time the contacts 606 open, the contacts 605 will open and the contacts 607 will close. The opening of the contacts 605 will de-energize the electromagnet 894 and will isolate the pushbutton 340 from the prong 412, thereby preventing the acceptance of all further money. The closing of the contacts 607 will complete a circuit via prong 412, conductor 452, contacts 708, contacts 607, lamp 896, conductor 490, and prong 414; and the resulting illumination of the lamp will advise patrons that they can not expect change.

Whereas the drawing and accompanying description have shown and described a preferred embodiment of the present invention it should be apparent to those skilled in the art that various changes may be made in the form of the invention without affecting the scope thereof.

What we claim is:

1. In a change-making device, a plurality of coin-jecting assemblies, a currency-ejecting assembly, a coin storage tube associated with each of said coin-ejecting assemblies, a currency storage tube associated with said currency-ejecting assembly, each of said coin-ejecting assemblies having an electrically-actuated element that must be actuated to enable said coin-ejecting assembly to eject a coin, said currency-ejecting assembly having an electrically-actuated element that must be actuated to enable said currency-ejecting assembly to eject currency, a passageway for coins of a predetermined denomination, a switch that is adjacent said passageway and that is actuated by coins passing through said passageway, a second passageway for coins of a different, predetermined denomination, a second switch that is adjacent said second passageway and that is actuated by coins passing through said second passageway, a currency-identifying unit, a relay that is responsive to the actuation of the first said switch to actuate the electrically-actuated element of one of said coin-ejecting assemblies, a second relay that is responsive to the actuation of said second switch to actuate the electrically-actuated element of another of said coin-ejecting assemblies and also to actuate the first said relay and thereby also actuate the electrically-actuated element of the first said coin-ejecting assembly, a third relay that is responsive to said currency-identifying unit to actuate the electrically-actuated element of a third coin-ejecting assembly and also to actuate said second relay and thereby actuate the electrically-actuated element of said other coin-ejecting assembly and actuate the first said relay and consequently also actuate the electrically-actuated element of the first said coin-ejecting assembly, and a fourth relay that is responsive to said currency-identifying unit to actuate the electrically-actuated element of said currency-ejecting assembly and also to actuate said third relay and thereby actuate the electrically-actuated element of said third

coin-ejecting assembly and also to actuate said second relay and consequently actuate the electrically-actuated element of said other coin-ejecting assembly and actuate the first said relay and finally actuate the electrically-actuated element of the first said coin-ejecting assembly, said second passageway accepting coins of a denomination higher than that of the coins accepted by the first said passageway, said currency-identifying unit and said third relay responding to currency having a value higher than that of the coins accepted by said second passageway, said currency-identifying unit and said fourth relay responding to currency having a value higher than that of the currency to which said currency-identifying unit and said third relay respond, whereby the insertion of money of a higher value effects the actuation that is effected by the insertion of money of a lower value and also effects the actuation of a further electrically-actuated element, and an anti-jackpot circuit that includes contacts which are actuated by the first said relay and which must be restored to their normal position before a further cycle of operation of said change-making device can be initiated, whereby said switches and said third and said fourth relays must be restored to their normal positions before a further cycle of operation of said change-making device can be initiated.

2. In a change-making device, a plurality of coin-ejecting assemblies, a currency-ejecting assembly, a coin storage tube associated with each of said coin-ejecting assemblies, a currency storage tube associated with said currency-ejecting assembly, each of said coin-ejecting assemblies having an electrically-actuated element that must be actuated to enable said coin-ejecting assembly to eject a coin, said currency-ejecting assembly having an electrically-actuated element that must be actuated to enable said currency-ejecting assembly to eject currency, a passageway for coins of a predetermined denomination, a switch that is adjacent said passageway and that is actuated by coins passing through said passageway, a second passageway for coins of a different, predetermined denomination, a second switch that is adjacent said second passageway and that is actuated by coins passing through said second passageway, a currency-identifying unit, a relay that is responsive to the actuation of the first said switch to actuate the electrically-actuated element of one of said coin-ejecting assemblies, a second relay that is responsive to the actuation of said second switch to actuate the electrically-actuated element of another of said coin-ejecting assemblies and also to actuate the first said relay and thereby also actuate the electrically-actuated element of the first said coin-ejecting assembly, a third relay that is responsive to said currency-identifying unit to actuate the electrically-actuated element of a third coin-ejecting assembly and also to actuate said second relay and thereby actuate the electrically-actuated element of said other coin-ejecting assembly and actuate the first said relay and consequently also actuate the electrically-actuated element of the first said coin-ejecting assembly, and a fourth relay that is responsive to said currency-identifying unit to actuate the electrically-actuated element of said currency-ejecting assembly and also to actuate said third relay and thereby actuate the electrically-actuated element of said third coin-ejecting assembly and also to actuate said second relay and consequently actuate the electrically-actuated element of said other coin-ejecting assembly and actuate the first said relay and finally actuate the electrically-actuated element of the first said coin-ejecting assembly, said second passageway accepting coins of a denomination higher than that of the coins accepted by the first said passageway, said currency-identifying unit and said third relay responding to currency having a value higher than that of the coins accepted by said second passageway, said currency-identifying unit and said fourth relay responding to currency having a value higher than that of the currency to which said currency-identifying unit and said third relay respond, whereby the insertion of money of a higher value effects the actuation that is effected by the insertion of money of a lower value and also effects the actuation of a further electrically-actuated element.

3. In a change-making device, a plurality of coin-ejecting assemblies, a coin storage tube associated with each of said coin-ejecting assemblies, each of said coin-ejecting assemblies having an electrically-actuated element that must be actuated to enable said coin-ejecting assembly to eject a coin, a passageway for coins of a predetermined denomination, a switch that is adjacent said passageway and that is actuated by coins passing through said passageway, a second passageway for coins of a different, predetermined denomination, a second switch that is adjacent said second passageway and that is actuated by coins passing through said second passageway, a currency-identifying unit, a relay that is responsive to the actuation of the first said switch to actuate the electrically-actuated element of one of said coin-ejecting assemblies, a second relay that is responsive to the actuation of said second switch to actuate the electrically-actuated element of another of said coin-ejecting assemblies and also to actuate the first said relay and thereby also actuate the electrically-actuated element of the first said coin-ejecting assembly, and a third relay that is responsive to said currency-identifying unit to actuate the electrically-actuated element of a third coin-ejecting assembly and also to actuate said second relay and thereby actuate the electrically-actuated element of said other coin-ejecting assembly and actuate the first said relay and consequently also actuate the electrically-actuated element of the first said coin-ejecting assembly, said second passageway accepting coins of a denomination higher than that of the coins accepted by the first said passageway, said currency-identifying unit and said third relay responding to currency having a value higher than that of the coins accepted by said second passageway, whereby the insertion of money of a higher value effects the actuation that is effected by the insertion of money of a lower value and also effects the actuation of a further electrically-actuated element.

4. In a change-making device, a plurality of coin-ejecting assemblies, a coin storage tube associated with each of said coin-ejecting assemblies, each of said coin-ejecting assemblies having an electrically-actuated element that must be actuated to enable said coin-ejecting assembly to eject a coin, a passageway for coins of a predetermined denomination, a switch that is adjacent said passageway and that is actuated by coins passing through said passageway, a second passageway for coins of a different, predetermined denomination, a second switch that is adjacent said second passageway and that is actuated by coins passing through said second passageway, a relay that is responsive to the actuation of the first said switch to actuate the electrically-actuated element of one of said coin-ejecting assemblies, and a second relay that is responsive to the actuation of said second switch to actuate the electrically-actuated element of another of said coin-ejecting assemblies and also to actuate the first said relay and thereby also actuate the electrically-actuated element of the first said coin-ejecting assembly, said second passageway accepting coins of a denomination higher than that of the coins accepted by the first said passageway, whereby the insertion of money of a higher value effects the actuation that is effected by the insertion of money of a lower value and also effects the actuation of a further electrically-actuated element.

5. In a change-making device, a plurality of coin-ejecting assemblies, a currency-ejecting assembly, a coin storage tube associated with each of said coin-ejecting assemblies, a currency storage tube associated with said currency-ejecting assembly, a shaft that is disposed adjacent said coin-ejecting assemblies and said currency-ejecting assembly and that is rotatable to cause said change-making device to experience a cycle of operation, a motor which rotates said shaft to cause said change-making de-

vice to experience a cycle of operation, each of said coin-ejecting assemblies having an electrically-actuated element that must be actuated to enable said coin-ejecting assembly to eject a coin, each of said coin-ejecting assemblies being adjacent a member on said shaft that must be rotated to enable said coin-ejecting assembly to move and eject a coin, said currency-ejecting assembly having an electrically-actuated element that must be actuated to enable said currency-ejecting assembly to eject currency, said currency-ejecting assembly being adjacent a further member on said shaft that must be rotated to enable said currency-ejecting assembly to move and eject currency, a passageway for coins of a predetermined denomination, a switch that is adjacent said passageway and that is actuated by coins passing through said passageway, a second passageway for coins of a different, predetermined denomination, a second switch that is adjacent said second passageway and that is actuated by coins passing through said second passageway, a currency-identifying unit, contacts that open every time either of said switches is actuated and that open every time said currency-identifying unit is actuated, a running circuit for said motor, and a switch that is operated by said shaft to transfer the running circuit for said motor to said contacts after said contacts should re-close, whereby if the first said or said second switches remain actuated or if said currency-identifying unit remains actuated and thereby keeps said contacts open, the said motor cannot complete a cycle of operation of said change-making device.

6. In a change-making device, a plurality of coin-ejecting assemblies, a coin storage tube associated with each of said coin-ejecting assemblies, a shaft that is disposed adjacent said coin-ejecting assemblies and that is rotatable to cause said change-making device to experience a cycle of operation, a motor which rotates said shaft to cause said change-making device to experience a cycle of operation, each of said coin-ejecting assemblies having an electrically-actuated element that must be actuated to enable said coin-ejecting assembly to eject a coin, each of said coin-ejecting assemblies being adjacent a member on said shaft that must be rotated to enable said coin-ejecting assembly to move and eject a coin, a passageway for coins of a predetermined denomination, a switch that is adjacent said passageway and that is actuated by coins passing through said passageway, a second passageway for coins of a different, predetermined denomination, a second switch that is adjacent said second passageway and that is actuated by coins passing through said second passageway, contacts that open every time either of said switches is actuated, a running circuit for said motor, and a switch that is operated by said shaft to transfer the running circuit for said motor to said contacts after said contacts should re-close, whereby if the first said or said second switches remain actuated and thereby keep said contacts open, the said motor cannot complete a cycle of operation of said change-making device.

7. In a change-making device, a plurality of coin-ejecting assemblies, a coin storage tube associated with each of said coin-ejecting assemblies, a passageway for coins of a predetermined denomination, a switch that is adjacent said passageway and that is actuated by coins passing through said passageway, a second passageway for coins of a different, predetermined demnomination, a second switch that is adjacent said second passageway and that is actuated by coins passing through said second passageway, a currency-identifying unit, a shaft that is rotatable to cause said change-making device to experience a cycle of operation, a motor that is responsive to actuation of either of said switches or to actuation of said currency-identifying unit to rotate said shaft and thereby initiate a cycle of operation of said change-making device, an electrically-responsive device that responds to the energization thereof to permit coins to pass to the first said and to said second passageways and that responds to the de-energization thereof to effect the rejection of coins, an initiating circuit for said currency-identifying unit, and contacts that normally connect said electrically-responsive device and said initiating circuit to a source of power, said contacts responding to actuation of either of said switches or to actuation of said currency-identifying unit to open and to thereby disconnect said electrically-responsive device and said initiating circuit from said source of power, a running circuit for said motor, and a switch that is operated by said shaft to transfer the running circuit for said motor to said contacts after said contacts should re-close, whereby if the first said or said second switches remain actuated or if said currency-identifying unit remains actuated and thereby keeps said contacts open, the said motor cannot complete a cycle of operation of said change-making device, said contacts thereafter preventing the acceptance of coins and preventing the initiation of said currency-identifying unit by keeping said electrically-responsive device and said initiating circuit disconnected from said source of power.

8. In a change-making device, a plurality of coin-ejecting assemblies, a currency-ejecting assembly, a coin storage tube associated with each of said coin-ejecting assemblies, a currency storage tube associated with said currency-ejecting assembly, a passageway for coins of a predetermined denomination, a switch that is adjacent said passageway and that is actuated by coins passing through said passageway, a second passageway for coins of a different, predetermined denomination, a second switch that is adjacent said second passageway and that is actuated by coins passing through said second passageway, a currency-identifying unit and a circuit that interconnects said currency-identifying unit with said currency-ejecting assembly and with said coin-ejecting assemblies, whereby the insertion of currency can effect the paying out of currency and coins, said circuit also interconnecting said switches with said coin-ejecting assemblies whereby the insertion of coins can effect the paying out of coins, said change-making device thereby being adapted to accept currency and coins and to pay out currency and coins.

9. In a change-making device, a coin-ejecting assembly, a currency-ejecting assembly, a coin storage tube associated with said coin-ejecting assembly, a currency storage tube associated with said currency-ejecting assembly, a passageway for coins of a predetermined denomination, a switch that is adjacent said passageway and that is actuated by coins passing through said passageway, a currency-identifying unit and a circuit that interconnects said currency-identifying unit with said currency-ejecting assembly and with said coin-ejecting assembly, whereby the insertion of currency can effect the paying out of currency and a coin, said circuit also interconnecting said switch with said coin-ejecting assembly, whereby the insertion of coins can effect the paying out of a coin.

10. In a change-making device, a coin-ejecting assembly, a currency-ejecting assembly, a coin storage tube associated with said coin-ejecting assembly, a currency storage tube associated with said currency-ejecting assembly, a currency-identifying unit, a relay that coacts with said currency-identifying unit to respond to the insertion of a bill of predetermined denomination to effect the acceptance of said bill and to cause said coin-ejecting assembly to pay out a coin, a second relay that coacts with said currency-identifying unit to respond to the insertion of a bill of higher denomination to effect the acceptance of said bill of higher denomination and to cause said coin-ejecting assembly to pay out a coin and to cause said currency-ejecting assembly to pay out currency, and a switch that is adjacent said currency storage tube and that responds to the depletion of the supply of currency within said currency storage tube to prevent the further paying out of currency and to prevent the further acceptance of bills of said higher denomination

while permitting continued acceptance of bills of said predetermined denomination.

11. In a change-making device, a coin-ejecting assembly, a currency-ejecting assembly, a coin storage tube associated with said coin-ejecting assembly, a currency storage tube associated with said currency-ejecting assembly, a currency-identifying unit, a circuit that can coact with said currency-identifying unit to respond to the insertion of currency of a predetermined denomination to effect the acceptance of said currency and to cause said coin-ejecting assembly to pay out a coin, a second circuit that can coact with said currency-identifying unit to respond to the insertion of currency of a higher denomination to effect the acceptance of said currency of higher denomination and to cause said coin-ejecting assembly to pay out a coin and to cause said currency-ejecting unit to pay out currency, an empty switch adjacent said currency storage tube than can respond to depletion of the supply of currency within said currency storage tube to disable said second circuit and thereby prevent the acceptance of currency of said higher denomination and to keep said currency-ejecting assembly from paying out currency while permitting the first said circuit to coact with said currency-identifying unit to respond to the insertion of currency of said predetermined denomination to effect the acceptance of said currency and to cause said coin-ejecting assembly to pay out a coin, and a second empty switch adjacent said coin storage tube that can respond to depletion of the supply of coins within said coin storage tube to disable the first said circuit and said second circuit thereby prevent the acceptance of currency of said predetermined denomination and of said higher denomination and to keep said coin-ejecting assembly from paying out a coin and to keep said currency-ejecting assembly from paying out currency.

12. In a change-making device, a coin-ejecting assembly, a currency-ejecting assembly, a coin storage tube associated with said coin-ejecting assembly, a currency storage tube associated with said currency-ejecting assembly, a shaft that is disposed adjacent said coin-ejecting assembly and said currency-ejecting assembly and that is rotatable to cause said change-making device to experience a cycle of operation, a motor which rotates said shaft to cause said change-making device to experience a cycle of operation, an electrically-actuated element that must be actuated to enable said coin-ejecting assembly to eject a coin, said coin-ejecting assembly being adjacent a member on said shaft that must be rotated to enable said coin-ejecting assembly to move and eject a coin, said currency-ejecting assembly having an electrically-actuated element that must be actuated to enable said currency-ejecting assembly to eject currency, said currency-ejecting assembly being adjacent a further member on said shaft that must be rotated to enable said currency-ejecting assembly to move and eject currency, a currency-identifying unit, contacts that open every time said currency-identifying unit is actuated, a running circuit for said motor, and a switch that is operated by said shaft to transfer the running circuit for said motor to said contacts after said contacts should reclose, whereby if said currency-identifying unit remains actuated, the said contacts will remain open and will not complete said running circuit for said motor when said switch is operated and will thereby de-energize said motor.

13. In a change-making device, a plurality of coin-ejecting assemblies, a currency-ejecting assembly, a coin storage tube associated with each of said coin-ejecting assemblies, a currency storage tube associated with said currency-ejecting assembly, a passageway for coins of a predetermined denomination, a switch that is adjacent said passageway and that is actuated by coins passing through said passageway, a second passageway for coins of a different, predetermined denomination, a second switch that is adjacent said second passageway and that is actuated by coins passing through said second passageway, a currency-identifying unit, a circuit that responds to actuation of the first said switch to actuate one of said coin-ejecting assemblies, a second circuit that responds to actuation of said second switch to actuate another of said coin-ejecting assemblies and to energize the first said circuit with resulting actuation of said one coin-ejecting assembly, a third circuit that responds to actuation of said currency-identifying device by a bill of predetermined denomination to actuate a further coin-ejecting assembly and to energize the first said and said second circuits with resulting actuation of said one and said other coin-ejecting assemblies, and a fourth circuit that responds to actuation of said currency-identifying device by a bill of higher denomination to actuate said currency-ejecting assembly and to energize the first said and said second and said third circuits with resulting actuation of said one and said other and said further coin-ejecting assemblies, whereby the change for lower denomination units of money is paid out when a larger denomination unit of money is inserted and further change is paid out.

14. In a change-making device, a coin-ejecting assembly, a currency-ejecting assembly, a coin storage tube associated with said coin-ejecting assembly, a currency storage tube associated with said currency-ejecting assembly, a currency-identifying unit that can grip and move bills of different denomination and that has an electric channel responsive to bills of one denomination and that has a second electric channel responsive to bills of higher denomination, said second electric channel being disabled but permitting the first said electric channel to continue operation whenever the supply of currency in said currency storage tube becomes disabled.

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SAMUEL F. COLEMAN, *Primary Examiner.*

ERNEST A. FALLER, JR., *Examiner.*