Feb. 5, 1957 J. A. FREMON 2,780,337

COIN DEVICE

Filed Sept. 4, 1952 6 Sheets-Sheet 1

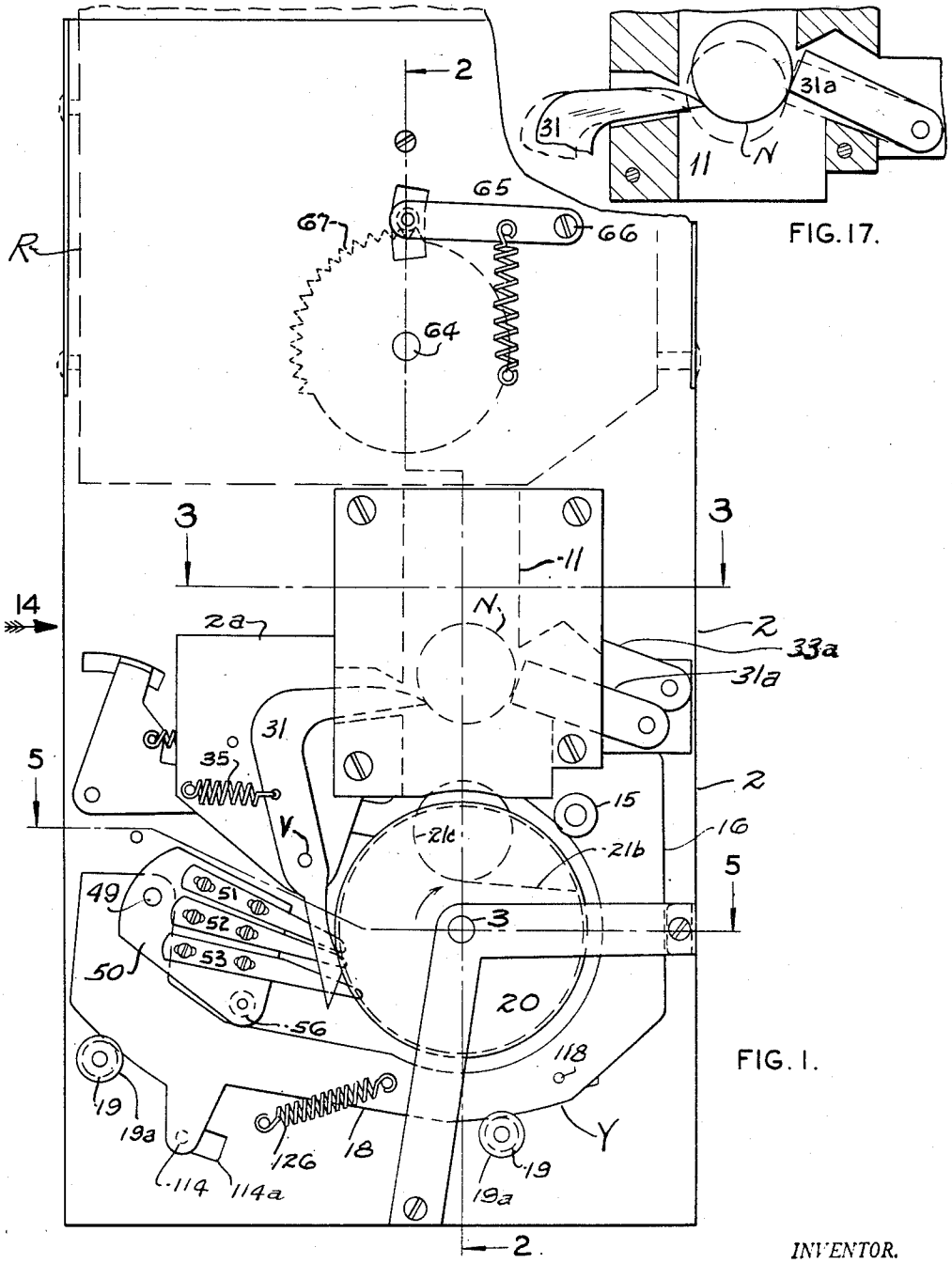


FIG. 17.

FIG. 1.

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COIN DEVICE

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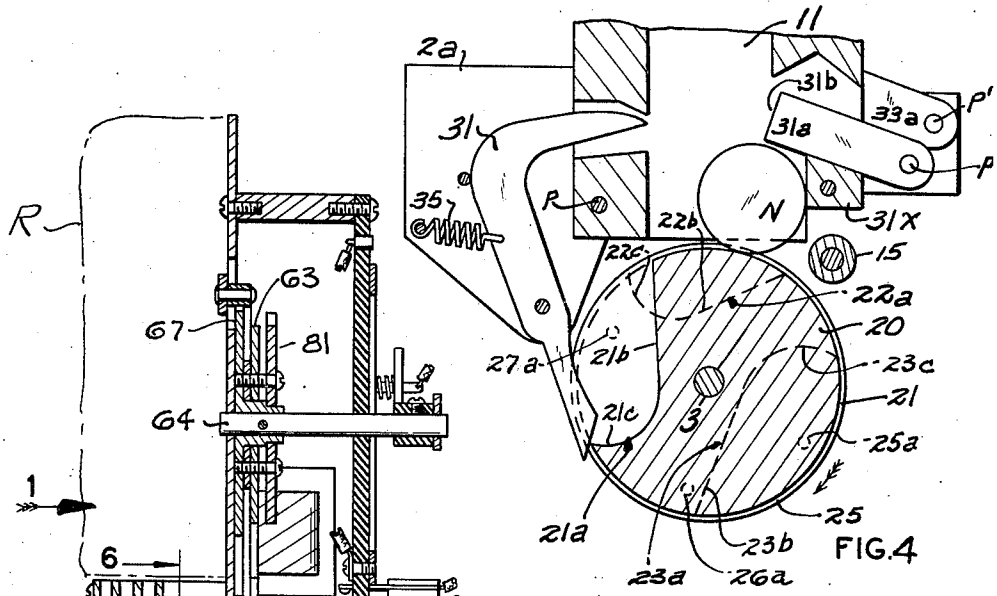


FIG. 4

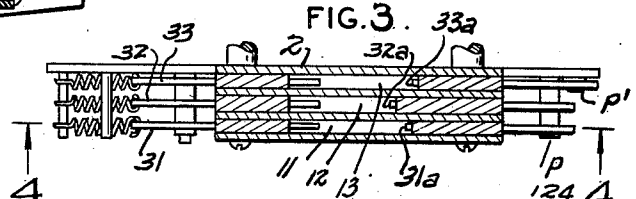


FIG. 3.

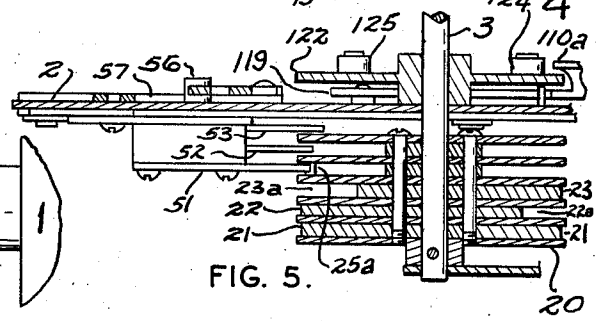


FIG. 5.

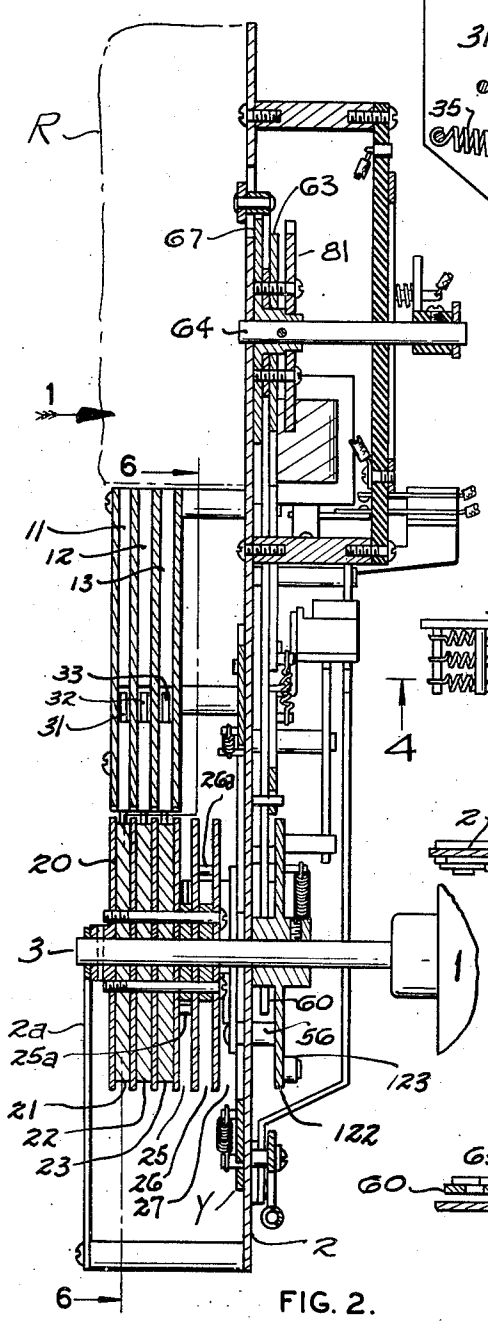


FIG. 2.

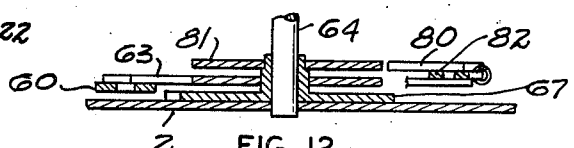


FIG. 12.

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COIN DEVICE

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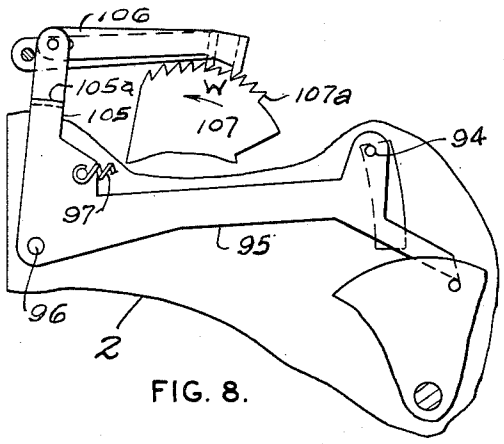


FIG. 8.

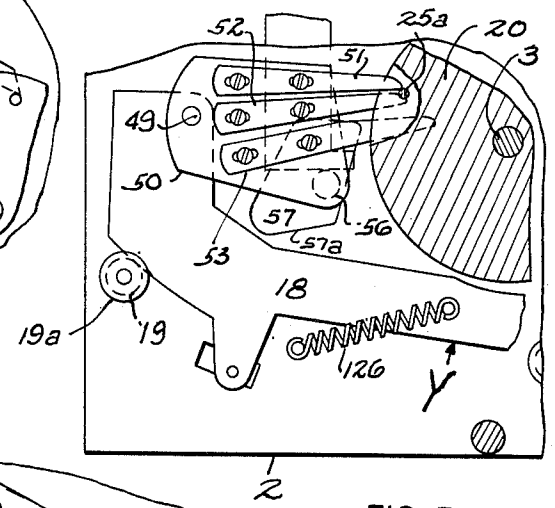


FIG. 7.

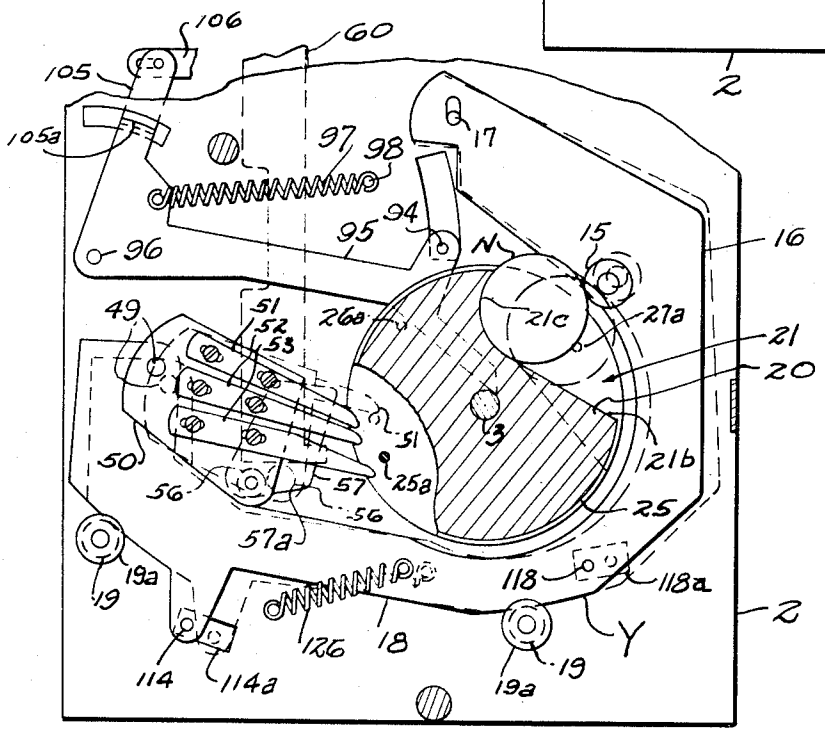


FIG. 6.

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COIN DEVICE

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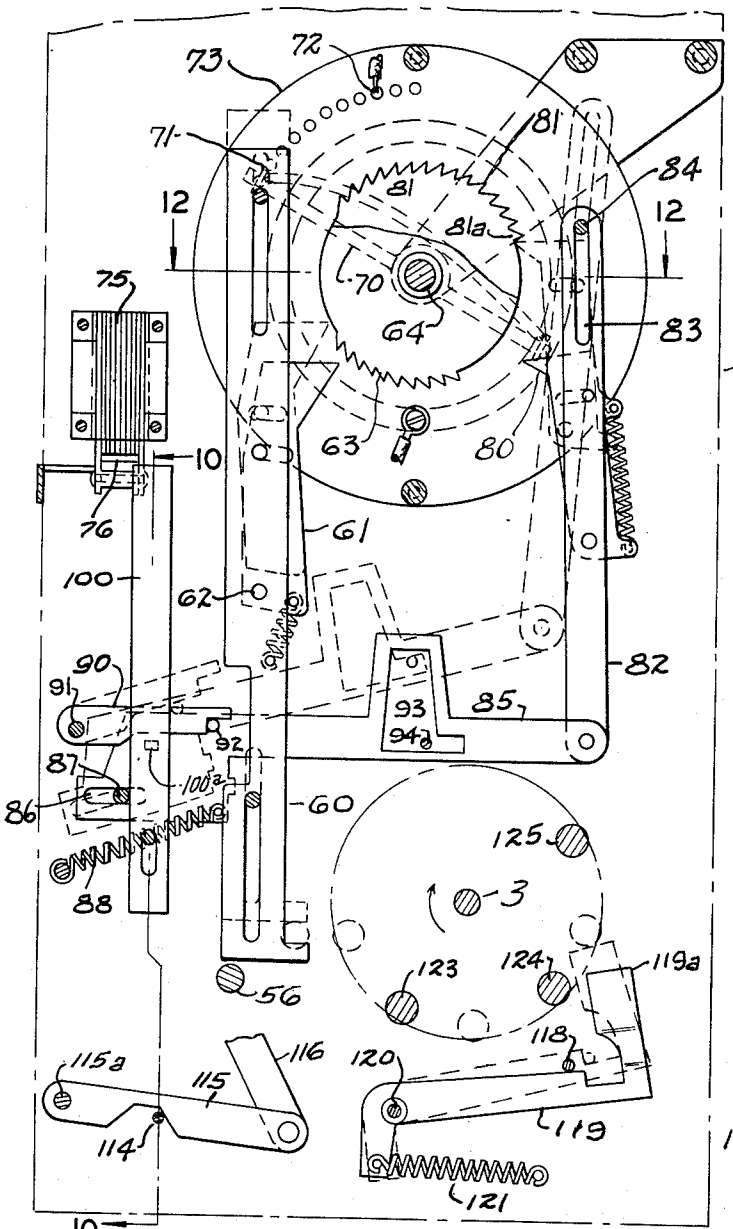


FIG. 9.

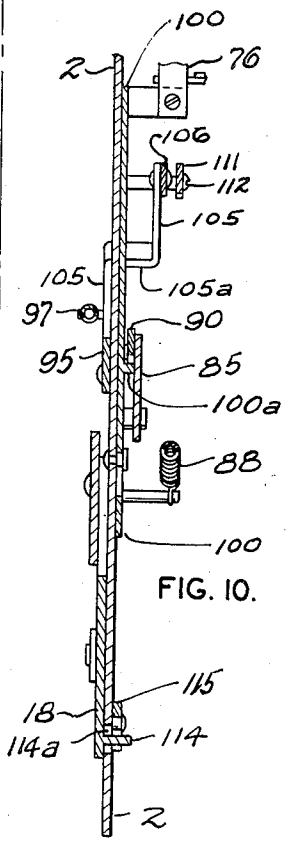


FIG. 10.

FIG. 11.

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COIN DEVICE

Filed Sept. 4, 1952 6 Sheets-Sheet 5

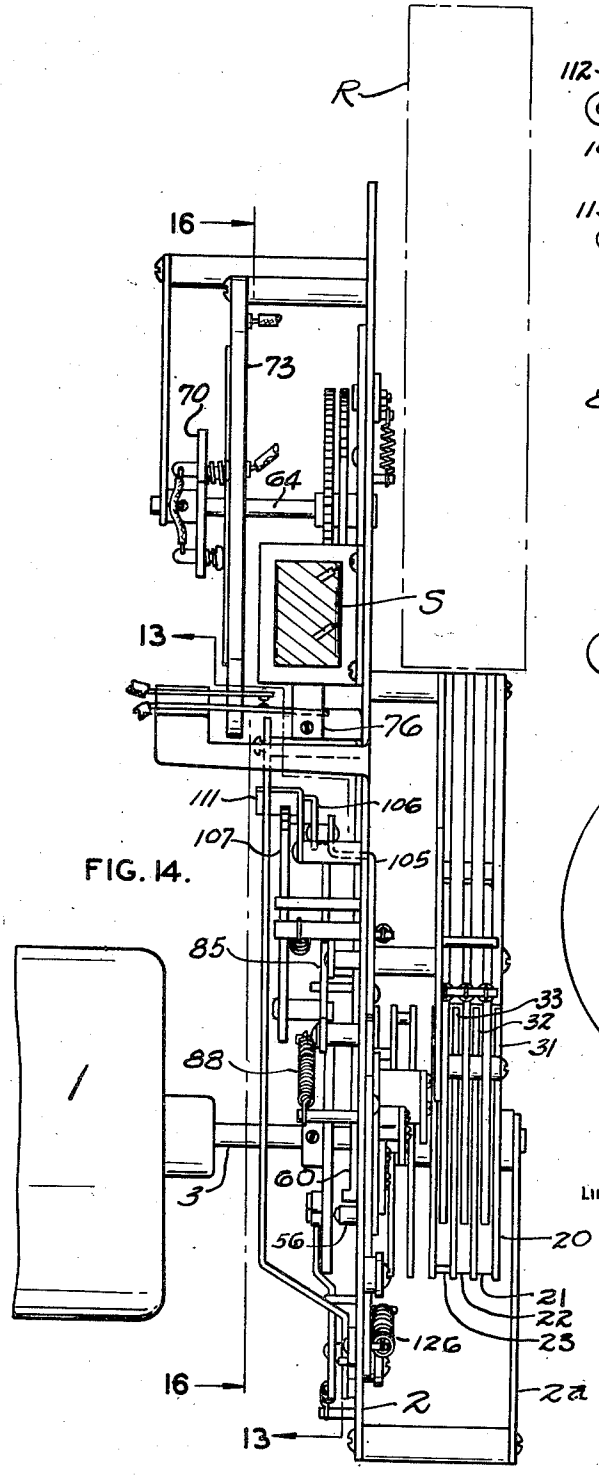


FIG. 14.

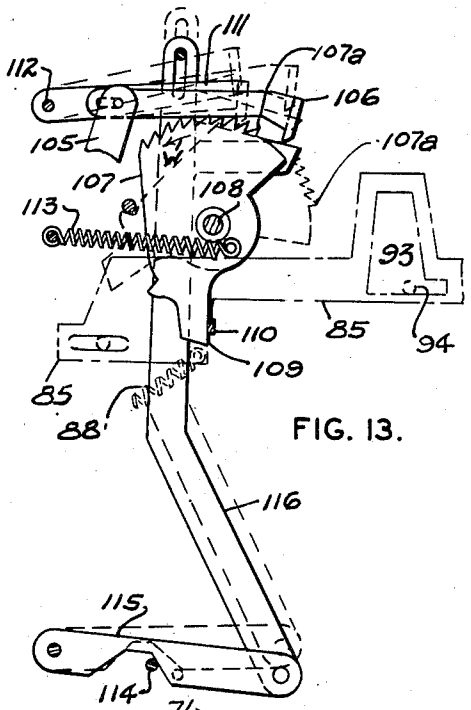


FIG. 13.

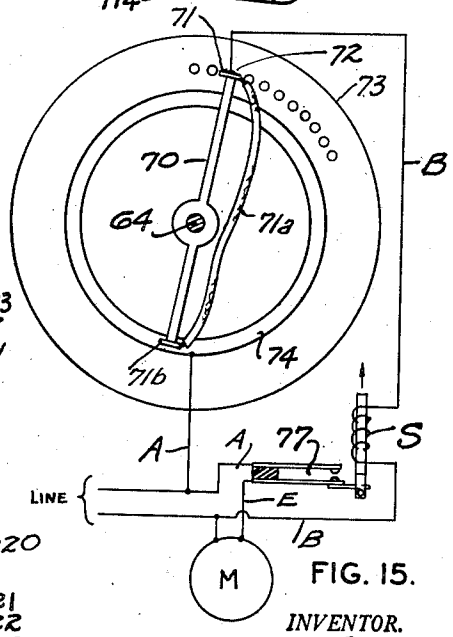


FIG. 15.

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COIN DEVICE

Filed Sept. 4, 1952

6 Sheets-Sheet 6

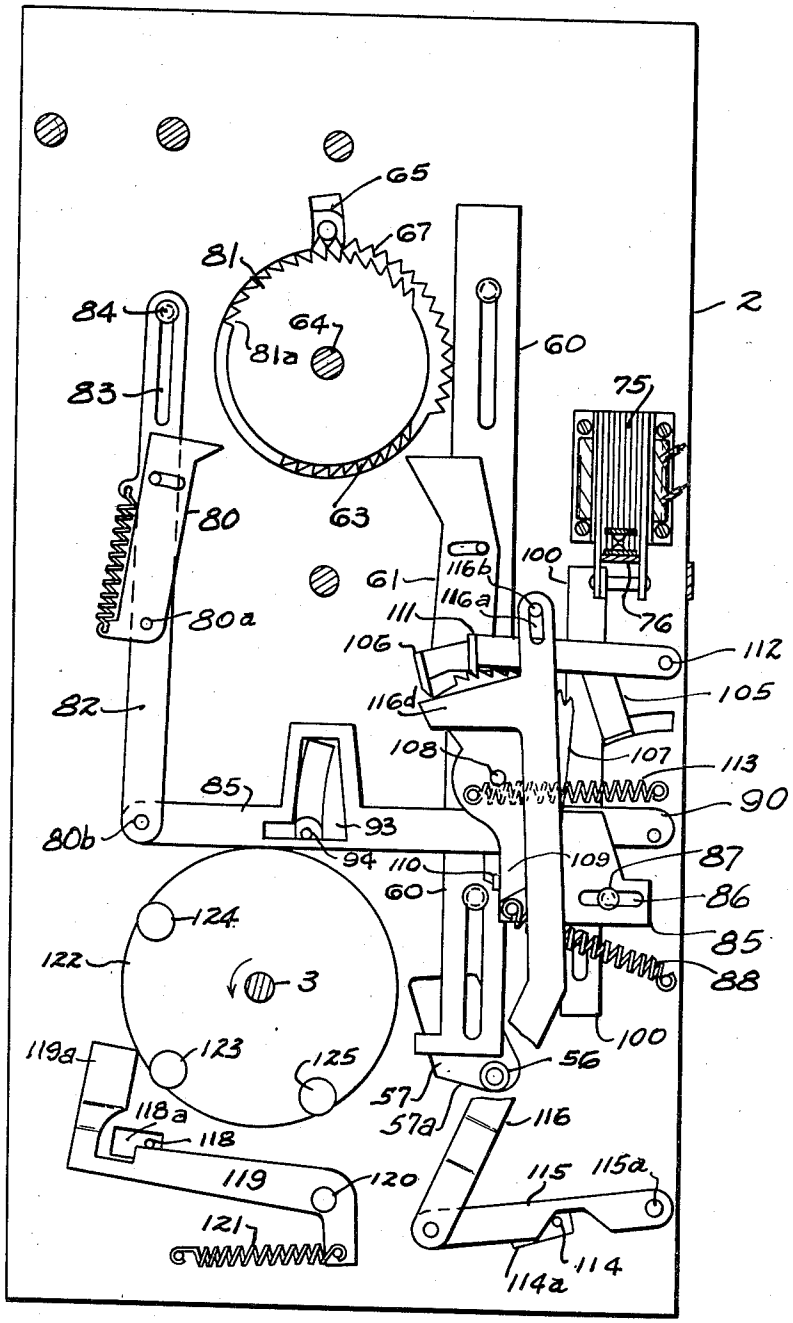


FIG. 16.

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United States Patent Office 2,780,337 Patented Feb. 5, 1957

2,780,337

COIN DEVICE

Jules A. Fremon, University City, Mo.

Application September 4, 1952, Serial No. 307,838

23 Claims. (Cl. 194—83)

The invention relates to a device which initiates or controls the operation of a transaction machine for delivering a commodity, or effecting a service, by the insertion into the device of any plurality of coins of different denominations totaling a predetermined sum required for a given transaction. For convenience, such a device may be termed a coin device.

More specifically, the device operates through a number of cycles to set up or accumulate a "credit" status or relation of the device parts and then initiates the operation of the associated transaction machine. Thereupon, the device parts are promptly restored to their normal or original status, irrespective of the operation of the associated transaction machine.

The device described herein is intended for use in association with transaction machines of wide adaptability and corresponding complexity, as for example, a transaction machine dispensing a plurality of articles at different prices, ranging from one cent up to several dollars. For convenience and simplification of explanation, the device illustrated and described in detail in this specification is adapted to handle only nickels, dimes and quarters of United States coinage.

The commercial excellence of such a coin-control device is directly affected by (*a*) its reliability, and (*b*) its convenience from the viewpoint of the patron of a controlled machine.

While the supreme importance of the first-mentioned consideration is obvious, it should be understood that reliability of performance is possible only in such degree as the device is free from operating failures under conditions met in actual service. The chief consideration which enhances customer-convenience is the rapidity by which coins may be deposited in the device. A device which rejects and returns to the patron a considerable proportion of the deposited coins because they were inserted in too rapid sequence to be "processed" commercially by the device, is objectionable.

The purpose of this invention is to provide a coin-controlled device capable of rendering service which, in respect of reliability and customer-convenience is far superior to any such device which is now commercially available.

The present invention embodies an electric circuit closure which is actuated by a so-called stepper or accumulator mechanism by which a current-carrying contact brush is caused to move along a series of contact points, being advanced one step from its "zero" position for each unit value of a deposited coin, and upon the completion of a "transaction," the contact brush is caused to return to its zero position. In similar coin-control devices prior to this invention, this stepper mechanism has been actuated by electrical means, employing for that purpose usually a coin-actuated switch for each denomination of coin accepted and a corresponding number of solenoids actuated by current impulses transmitted by the coin-switches, each solenoid effecting the movement of the contact brush over the number of steps corresponding to the value of the deposited coin.

Because of mechanical difficulties encountered when the power stroke of a solenoid is employed directly to actuate a driven part, such power stroke is utilized to tension a driving spring which, upon its recoil, effects movement of the succeeding driven part. In such devices prior to this invention, the accumulator usually is advanced by the spring-driven part, step by step, against the tension of another spring which is adapted to return the accumulator to its normal position upon completion of the operation. As long as all of such electrical and mechanical components are maintained in near perfect operating condition, the mechanism may satisfactorily accomplish the desired end, but in actual service it is difficult to maintain all of the many parts in such condition that each one of them continues to perform its proper function for a sufficient length of time to be commercially practical.

To appreciate the magnitude of the difficulties encountered in day to day operation of prior art machines under actual service conditions just described, it must be realized that for each denomination of coin accepted, (*a*) a coin-switch (which obviously is a delicate mechanism, since it must respond to the slight gravity pressure exerted by the weight of a dime) must, despite necessarily weak operating springs, corrosion of contact points, and other electric-switch hazards, assure the passage of a current of sufficient intensity and for the required duration of time to properly actuate the associated solenoid; (*b*) the associated solenoid must compress a power spring; and (*c*) upon its unbraked recoil, the power spring must impart movement to the accumulator ratchet or slide, this last requirement necessitating accurate control and adjustment of parts to assure sufficient—but prevent excess—registration of credit. The problem of maintaining the parts in proper operating condition is aggravated by the necessity of employing solenoids far more powerful than would be required if the generated energy were employed directly to drive the stepper mechanism, and by the fact that the necessarily uncushioned metal-to-metal impact of the heavy armatures of these over-sized solenoids results in mechanical shocks of such intensity as to disarrange adjustments not only of the solenoids but of all parts of the whole assembly. Thus, such devices present manifold opportunities for failure of one of several parts, and these adverse possibilities are directly multiplied by the number of denominations of coins accepted.

The principal objective of this invention is to provide a device of the nature referred to which accomplishes actuation of a credit-accumulator solely by mechanically-operated means, and without employing either coin-switches, power solenoids, power-springs, or any of the associated elements which are required to utilize such electrical components. To this end, all movements of the parts which co-act to produce the desired results are induced by positively-driven elements responsive to power directly transmitted from a single independently-driven revolving shaft, so that the function of each such part or element is performed with that degree of certainty which characterizes the operation of usual types of power-driven machines and devices.

Instead of falling upon and actuating a coin-switch a deposited coin drops into a receptacle moving independently of the coin and thereafter the coin serves momentarily as a mechanical link to move another part of the device into operative position, and this having been accomplished, the resulting chain of positively-driven movement of the parts inevitably sets up the proper credit. Upon completion of a "transaction," all parts are restored

to their normal positions in an equally positive manner, and without use of a loaded spring for that purpose.

Throughout the whole construction of this device, and particularly in the stepper-actuating mechanism, the means, or method of imparting the force by which one part positively drives another part is in every instance such as to produce minimum shock. The intensity of the greatest shock developed in the operation of this device approaches in only a negligible degree the intensity of a shock resulting from an uncushioned power-stroke of a solenoid.

Another object is to control the passage of coins through the device so that they may be presented successively to actuate mechanism irrespective of the variety and number of the coins and of the rapidity with which they are deposited in the machine and without affecting the orderly operation of the machine.

Another object is to provide for unusually liberal tolerances throughout the device and in particular to permit liberal over-run in instances where one element drives another part. Where such liberality is not permissible, provision is made to readily adjust the parts to correct manufacturing variations.

Still other objects, which are achieved by the operation of the device, are indicated in the following specification.

In the accompanying drawings which illustrate a selected embodiment of the invention,

Figure 1 is a front elevation of mechanism mounted on the near side of the main upright frame plate **2** looking in the direction of the arrow **1** in Figure 2.

Figure 2 is a vertical transverse section taken on the line **2—2** of Figure 1.

Figure 3 is a horizontal section on line **3—3** in Figure 1.

Figure 4 is a detail vertical section on the line **4—4** of Figure 3 with the parts in a different position than indicated in Figure 1.

Figure 5 is a horizontal section taken on the line **5—5** of Figure 1.

Figure 6 is a detailed vertical section on the line **6—6** of Figure 2 but shows some parts in a different position than indicated in Figures 1 and 3.

Figure 7 corresponds to the left hand lower portion of Figure 6 but shows the same parts in another position.

Figure 8 corresponds to the upper left hand portion of Figure 6 but shows the same parts, and additional parts, in another position.

Figure 9 corresponds generally to Figure 1 but shows parts behind the parts shown in Figure 1. Most of the parts shown in Figure 9 are mounted at the rear of the main upright frame plate **2**.

Figure 10 is a detail vertical section taken on the line **10—10** of Figure 9.

Figure 11 is a detail view of some parts shown in Figure 9 but in a different position.

Figure 12 is a detail horizontal section taken on the line **12—12** of Figure 9.

Figure 13 is a detail vertical section taken along line **13—13** of Figure 14 and shows additional mechanism associated with the parts indicated in Figures 9 and 11.

Figure 14 is an elevation looking at the edge of the device, as indicated by the arrow **14** in Figure 1, which is in the reverse direction of the arrows of section line **2—2**.

Figure 15 is a view of an electrical contact disc indicated generally in Figures 1 and 9 and includes a wiring diagram showing the relation between the illustrated mechanism and a transaction machine circuit.

Figure 16 is a detail vertical section taken along line **16—16** of Figure 14 and illustrates the parts shown in Figure 9 but viewed in the opposite direction.

Figure 17 is a detail section showing some of the parts illustrated in Figures 1 and 4 but in a different position.

Associated with the coin device will be a coin-rejector selector and distributor unit R (Figures 1, 2) such as is in general use whereby different denominations of accepted coins are directed to different coin chutes.

An operation is begun by the deposit into the machine in any order any number of coins of various denominations, such as nickels, dimes, and quarters, the total value of which amounts to the price of the article or service vended. For example, if a selected vending price is forty cents, there may be deposited, as a minimum number of coins, one quarter, one dime, and one nickel or, as a maximum number of coins, eight nickels, or there may be deposited any other combinations of nickels or multi-nickel value coins which will add up to a total of forty cents; such as four dimes, two dimes and four nickels, or one quarter and three nickels.

The present invention may utilize pennies in reaching the desired total, but the details of such use are not shown in the present disclosure.

The transaction machine which vends the merchandise or commodity or service forms no part of the present invention, but it will be controlled by one or more electric circuits including conduit wires A, B and A, E (Figure 15) which circuits are closed by an operation of the coin device.

The following description is based upon the assumption that a coin device motor **1** (Figures 2, 14) having a drive shaft **3** is plugged into any convenient electric circuit connection and runs continuously, but drives the device mechanism only when coins are supplied to the device. This motor does not operate the transaction machine. Means are well known in the art whereby the driving motor is operated intermittently and is controlled either by a switch actuated by the deposit of a coin or by the manual closing of a switch by the patron of the transaction machine with each operation.

None of these intermittent controls is required when it is possible, as in this invention, to utilize a continually running motor.

The coin mechanism is mounted upon a frame which includes a main upright plate **2**. The motor shaft 3 will be driven in a clockwise direction in Figures 1, 4, 5, 6, 7, 9, or anti-clockwise in Figure 16. From unit R, the nickel, dime, and quarter coins are delivered to corresponding chutes **11**, **12**, **13**, respectively (Figures 2, 3). Each chute has relatively wide sides and relatively narrow edges spaced apart a substantially greater distance than the diameter of the corresponding coin (Figures 1, 3, 4). As a coin in a chute moves downwardly through the chute, it passes by, or may be stopped by, an interruptor **31**, **32**, **33**, respectively, and a cooperating stop **31*a***, **32*a***, **33*a***, respectively. If not so stopped, or if stopped and later released, the coin will drop onto a cylindrical actuator **20** fixed on shaft **3**, having a drum portion with shallow axially spaced grooves **21**, **22**, **23** (Figure 2) in vertical alignment with the discharge ends of chutes **11—13**, respectively. The actuator has a spaced-disc portion at the rear of chutes **11—13** and forming channels **25**, **26**, **27**, except that channel **27** is formed in part by plate **2**.

Grooves **21—23** have individual J-shaped recesses **21*a***, **22*a***, **23*a***, respectively (Figure 4), spaced angularly about the actuator axis, each adapted to receive the major portion of a nickel, dime, or quarter coin, respectively.

The purpose of spacing recesses **21*a***, **22*a***, **23*a*** angularly about the axis of actuator **20** is to separate the operation which results from the deposit of a coin of one denomination from such operation resulting from the deposit of a coin of different denomination; that is, to "process" the deposit of a quarter, for example, to effect a result (the establishment of a twenty-five cent credit), before starting to "process" the deposit of a following dime or nickel, to set up a credit of an additional ten or five cents, as the case may be.

The recesses will vary in depth so that the projection of one denomination coin beyond the actuator periphery will be the same as the projection of other denomination coins. Each recess has a relatively long forward edge

21*b*, 22*b*, 23*b*, which is first presented to the coin as the actuator rotates and allows the coin to settle easily into the lower portion of the recess. Each recess has a relatively short rear edge 21*c*, 22*c*, 23*c*, which, as the actuator rotates, positively engages the coin and positively drives it forwardly to move the coin against a roller 15 on the upper arm 16 of a U-shaped control yoke Y (Figures 1, 6) having a vertically elongated pivot slot at its upper end receiving a pin 17 on plate 2 which serves to prevent upward movement of yoke Y and also to prevent lateral movement of the upper end of yoke Y, but does not support the weight of yoke Y or prevent its downward movement. The lower arm 18 of yoke Y rests upon rollers 19 mounted on shoulder studs 19*a* on plate 2, so that the weight of yoke Y is supported solely by rollers 19. At the points where yoke Y rests on rollers 19 respectively, the lower edges of yoke Y form arcs of different radii about pivot pin 17.

Reciprocating or oscillating interruptors 31, 32, 33 are pivoted on a bracket 2*a* offset from plate 2 (Figures 1, 4, 14). Each interruptor 31—33 comprises an inverted L-shaped member pivoted at V on bracket 2*a* intermediate the ends of its upright arm. The lower ends of the upright arms ride in corresponding grooves 21, 22, 23, respectively, on actuator 20 which normally hold the interruptors with their upper arms projected into the chutes against the tension of individual springs 35 (Figure 1).

The function of interruptors 31—33 is to prevent the discharge of a coin from its respective chute except at a predetermined point in the rotation of the actuator. The operation of each interruptor is governed by the rotation of an associated recess 21*a*—23*a* in the actuator. For example, when the end of the lower arm of interruptor 31 rides from drum groove 21 into recess 21*a* (under pull of its spring 35, Figure 4), with consequent withdrawal of its upper arm from chute 11, at or during the instant when a coin may be entering and dropping through chute 11 (or which may have lodged in the interruptor previously and is being released) the coin falls onto groove 21 and not into the recess 21*a*.

Further rotation of actuator 20 causes the end of the interruptor lower arm to be cammed out of recess 21*a* by the outer end of recess rear edge 21*c* and up onto groove 21, again resulting in the projection of the upper arm into chute 11 (Figure 1). This is effected before actuator 20 has rotated a sufficient distance to align recess 21*a* with chute 11. The upper interruptor arm thereafter remains projected into chute 11 until recess 21*a* again is positioned as shown in Figure 4. Upon such completion of a full revolution of actuator 20, the lower end of interruptor 31 again enters recess 21*a* and permits a coin in chute 11 to drop through the chute and onto actuator 20. This may occur only during a period prior to the time when recess 21*a* is aligned with chute 11. The reason for this restricted movement of coins is that if, in the exmaple just cited, a coin should happen to drop from chute 11 into recess 21*a* at a time when the rear edge 21*c* of such recess is advancing across the mouth of chute 11, the coin could be caught between said rear edge 21*c* and the forward wall of chute 11, and if so caught, could prevent further rotation of actuator 20.

Opposite to interruptors 31, 32, are corresponding stops 31*a*, 32*a*, pivoted at P on bracket 2*a* substantially below the level of the point of possible contact between a coin and the stop. Opposite interruptor 33 is a corresponding stop 33*a* pivoted at P'. Each stop rests upon an individual support (the support for stop 31 is shown at 31*x*) so that the stop is inclined upwardly and towards its associated chute. Each stop terminates in an end edge which is inclined upwardly and away from the chute. When an interruptor is withdrawn from the chute, the coin passes freely by the end of the stop and the stop has no function. If, at any time, an interruptor is positioned in its respective chute so that it prevents the passage of a then dropping coin, such interrupted coin is thereby caused

to fall against the outwardly inclined edge (as 31*b*) of the respective stop, the gravity pressure of the interrupted coin serving to increase the tendency of the stop to hold the coin rather than to release it. This state of affairs exists regardless of whether the interruptor is moving into or out of the chute—that is, so long as the passage of a coin is interrupted, the coin rests upon the stop.

However, if the interruptor should be moving forwardly into the chute at the time when it engages and stops a coin, the pressure exerted by the continued inward movement of the interruptor against the coin (broken lines Figure 17) is transmitted by the coin to the stop, at a point substantially above the level of the stop pivot, causing the stop to swing upwardly about its pivot (full lines Figure 17) and thus relieve the jam which would result if the stop were immovable, but still holding the coin from dropping so long as the interruptor remains projected into the chute. It is essential that the forward or inward movement of an interruptor never be positively restricted, since if that should occur the result would be a positive blocking of rotation of actuator 20 by the abutment of the corresponding recess edge 21*c*—23*c* with the inyielding lower end of the interruptor.

As above explained, coins can drop from chutes 11—13 onto actuator 20 only when the drum-like portion of the corresponding actuator groove 21—23 is in register with the lower exit of the chute. Any coin so positioned, rides or rolls in the shallow groove upon which it is resting, but the major portion of the coin still remains in the chute (Figure 4) and the coin is held by the forward wall of the chute against movement with the actuator. Upon continued rotation of the actuator to move the respective recess 21*a*—23*a* beneath the coin, the latter rides smoothly down the elongated recess edge 21*b*—23*b* to the bottom of the recess (Figure 1), where it is engaged by the steep rear edge 21*c*—23*c* of the recess and is positively driven forward, clearing the lower forward end of the chute and engaging and raising roller 15 (Figure 6). If no coin is present in a recess, roller 15 is not affected by rotation of the actuator.

When a coin is seated in a recess, the projecting portion will be a sector somewhat less than one-third the periphery of the coin. Accordingly, the camming of roller 15 is an easy motion as compared to the action which would result with a greater projection.

Actuator channels 25—27 are provided with transverse pins 25*a*, 26*a*, 27*a*, respectively (Figures 2, 4, 5, 6). A finger member 50 is pivoted at 49, at its left hand end, on the left hand end of yoke Y lower arm 18 and carries three fingers 51, in front, 52, behind 51, and 53, behind 52, in different vertical planes as indicated in Figure 5. Each finger enters a corresponding channel 25—27. Finger member 50 is provided near its right hand end with a roller 56 which projects through a slot 57 in plate 2 (Figures 5, 6) and rests upon the upwardly inclined bottom 57*a* of the slot, thus supporting the forward (right hand) end of finger member 50 so that normally the tips of fingers 51, 52, 53 barely enter the corresponding channels 25, 26, 27, and lie outside the paths of pins 25*a*, 26*a*, 27*a*.

When a coin of any denomination is received in a corresponding recess 21*a*—23*a* in an actuator groove 21—23 and raises roller 15 to swing yoke Y about pivot 17 to the position shown in broken lines in Figure 6, pivot pin 49 is shifted downwardly and to the right, thus lowering the left hand end of finger member 50, and, since the forward or right hand end of member 50 is held against similar downward movement due to its being supported by roller 56 which rests on and moves along the upwardly inclined lower edge of slot 57, said roller serves as a rising fulcrum upon which member 50 rocks so that the right hand end of member 50 moves both to the right and upwardly, thus projecting the ends of fingers 51, 52, 53 across the paths of movement of pins 25*a*—27*a*. Such projection occurs at a moment when an appropriate pin 25*a*—27*a* is about to contact one of fingers 51—53.

If the deposited coin is a nickel N, Figure 6, such projection occurs at the moment when nickel pin 25*a* is about to engage finger 51 in channel 25. Fingers 52 and 53 are by the same action projected into channels 26 and 27, respectively, but this produces no effect because there is no contact by pins 26*a* and 27*a* with fingers 26 and 27.

When yoke Y is moved to the right, it is held in that position due to the engagement of a pin 118 on the yoke, projecting through a slot 118*a* in plate 2 (Figure 6), by a detent 119 pivoted at 120 to plate 2 and thrust into pin-engaging position by a spring 121 (Figure 9). Upon engagement of yoke pin 118 by detent 119, the yoke is firmly supported and held in the broken line position shown in Figure 6 by rollers 19, pivot 17 and detent 119 irrespective of the continued presence of the coin in the actuator recess.

Continued rotation of actuator 20 causes pin 25*a* to swing finger 51 and finger member 50 about pin 49 from the position shown in dotted lines in Figure 6 to the position shown in Figure 7.

Fingers 51, 52, 53 vary one from another both as to their respective lengths and their respective height. (Figures 5, 6, 7.) Thus, finger 51 is contacted by pin 25*a* at a point approximately 90 degrees before the pin reaches its highest position (Figure 6), and since finger 51 is comparatively short, it is carried upward only a short distance before pin 25*a* runs out from under it (Figure 7).

When a dime is received in recess 22*a*, fingers 51—53 are projected into channels 25—27 at a time when nickel pin 25*a* is far advanced above finger 51 and at the moment when dime pin 26*a* is about to engage finger 52 at a point approximately 95 degrees before pin 26*a* reaches its highest position. The result of this longer contact and of the slightly greater length of finger 52 is that finger 52 is lifted a slightly greater distance before pin 26*a* runs out from under it than was true of the movement of finger 51 by pin 25*a*.

Similarly insertion of a quarter into recess 23*a* results in the fingers being projected into the respective channels at the moment when pin 27*a* is approaching finger 53. This contact is effected when pin 27*a* almost is at its lowest point, and since finger 53 is longer than finger 52, the result is to lift finger 53 a much greater distance than was true of fingers 51 and 52. In order that the required movement be imparted to finger 53 without undesirably increasing the diameter of actuator 20, the forward end of this finger is positioned so low that if it were projected forwardly horizontally, it would be below the path of pin 27*a*, but due to the upward swing of the right end of finger member 50 caused by roller 56 as it moves along the upwardly inclined bottom 57*a* of slot 57 (Figure 6), the forward end of finger 53 is swung upwardly and across the path of pin 27*a* before pin 27*a* reaches the point of its contact with finger 53.

With any of the above described movements of member 50, the end of roller 56 projecting through slot 57 and beyond plate 2 lifts the lower end of a driver 60, Figures 6, 7, 9, and 16, slidable vertically on plate 2. A driver pawl 61 is pivoted on driver 60 at 62 (Figure 9) and rotates an accumulator ratchet 63, fixed on a ratchet shaft 64 journaled in plate 2, the angular distance of one notch, when a nickel coin enters actuator 20 and its pin lifts finger 51. The driver and pawl rotate ratchet 63 an angular distance of two notches when a dime coin enters actuator 20. The driver and pawl rotates ratchet 63 an angular distance of five notches when a quarter enters actuator 20.

When a pin 25*a*, 26*a*, or 27*a* engages a corresponding finger, the finger movement is started relatively slowly, then accelerates and effects substantially the entire upward thrust of the driver in a relatively small portion of the movement of member 50 and then decelerates, ending the upward thrust slowly so that at the end of the driver advance there is no undue momentum in the driver. This smooth action is particularly important in the lifting of finger 53 by a quarter which results in the greatest intermediate momentum of the driver and the accumulator. Preferably, each of fingers 51, 52, 53 is adjustably mounted upon member 50 and the effective positioning of the fingers on member 50 relative to the finger actuating pins 25*a*, 26*a*, 27*a*, will insure the proper functioning of the device, irrespective of manufacturing variations in forming and assembling the parts.

A spring-pressed brake pawl 65 pivoted at 66 on plate 2 (Figures 1, 16) engages a brake ratchet 67 fixed on shaft 64 to hold ratchet 63, shaft 64 and any associated parts against free momentum movement or retrograde movement. Hence, successive coins received in actuator 20 will effect cumulative clockwise rotation (Figure 9) of ratchet 63 until a desired total is reached.

Since the peripheral speeds of pins 25*a*—27*a* are determining factors in the creation (or lessening) of shocks imparted through fingers 51—53 to ratchet 64, it is highly desirable that actuator 20, and the circles described by pins 25*a*—27*a*, be held to the smallest diameter which will permit actuator 20 to accommodate the processed coins, this end being accomplished in the arrangement here disclosed.

Immediately following the completion of the upward shifting of member 50 responsive to the lift of any one of fingers 51, 52, 53 in the manner just explained, driver 60 and member 50 drop to their initial positions, and yoke Y is also returned promptly to its initial position to "process" the succeeding coin, which may be another nickel or a dime or a quarter. To effect this return of yoke Y, detent 119 is moved out of engagement with pin 118, thus permitting spring 126 to restore yoke Y to its normal position shown by full lines in Figure 6. The releasing movement of detent 119 is effected by a disc 122 fixed on shaft 3 (Figure 16) which carries pins 123, 124, 125 disposed to engage the upward end 119*a* of detent 119 which is projected into the path of pins 123—125 when detent 119 is in locked position, such engagement resulting in depressing detent 119 out of engagement with pin 118. This restoration of yoke Y to its normal position is effected before a succeeding cycle of operation of yoke Y can be started by the lifting of roller 15 by the next following coin, so that the cycle of operation of these parts to "process" any deposited coin is wholly completed before another such cycle of operation can be started.

The device herein described is adapted to initiate the operation of an associated transaction machine by either electrical or mechanical means. One of several methods by which such initiation may be effected electrically is illustrated in Figure 15, in which the transaction machine is assumed to be an electrically operated vending machine dispensing merchandise at a single price which, in this instance, is forty cents. After the ratchet 63 has been advanced eight teeth by successive coins, ratchet shaft 64 has been rotated to move a stepper contact arm 70, fixed on shaft 64, from an initial or zero position, as shown in broken lines in Figure 9, to the advanced position shown in Figure 15, in which its contact 71 engages a contact 72 on a stationary commutator insulator 73 to complete a circuit through line A, commutator ring 74, stepper contact 71*b*, cable 71*a*, stepper contact 71, commutator contact 72, and line B. This circuit includes a coil S for a solenoid 75 (Figures 9, 16) having an armature 76. When the energized solenoid lifts armature 76, the latter closes a switch 77 (Figure 15), completing a circuit through lines A, E, and B to a vending machine operating motor M, which effects the delivery of the vended article. This completes the function of the control device with relation to the associated machine, it being assumed that the vending mechanism after being set in motion will complete its cycle of operation, including the restoration of its parts to their normal positions.

From the foregoing illustration, it will be obvious to

one versed in the art that the price of the article dispensed by a one-price vender may be changed merely by shifting wire B from one contact point **72** to another; that multiple prices in connection with a vending machine dispensing variously priced articles may be provided for by wiring layouts which are well known in the art and in common use; and that a lever may be substituted for switch arm **77**, and when such lever is lifted by solenoid armature **76**, it will unlock a vender of the type in which delivery of the article is effected by manual operation of a push-or-pull rod.

Immediately upon the closing of circuit A, E, B, as above described, the "credit" then existing in the accumulator mechanism is "cleared out" by returning ratchet **63** and contact arm **70** to their zero positions. This is effected by reciprocation of a return pawl **80**, engaging a return ratchet **81** (Figures 9, 16) fixed on shaft **64**.

Pawl **80** is pivoted at **80***a* on a link **82** having a slot-pivot mounting **83**, **84** on plate **2**. The lower end of link **82** is pivotally supported at **80***b* on one end of a bar **85** having a slot-pivot mounting **86**, **87** at its other end on plate **2**. A spring **88** anchored to plate **2** urges bar **85** towards the left hand position shown in Figure 9 (right hand position in Figure 16) but throughout each accumulative operation, bar **85** is held in its right hand position (Figure 9) by a detent **90** pivoted at **91** on plate **2** and engaging a stud **92** on bar **85**. Bar **85** has an angular slot **93** which receives a pin **94** on a lever **95** (Figures 6, 8) pivoted at **96** on plate **2** and thrust in a clockwise direction by a spring **97** anchored at **98** to plate **2**. Lever **95** and its pin **94** are lifted with each revolution of actuator **20** through the action of pin **27***a* on the actuator. This movement of lever **95** and pin **94** does not affect bar **85** as long as bar **85** is in the full line position shown in Figures 9, 16.

Bar **85** is moved to the left (Figure 9) by spring **88** upon the lifting of detent **90** by a stud **100***a* on bar **100**. This is effected by the lifting of bar **100** by solenoid armature **76** energized by the closing of the vending circuit through lines A—B. When bar **85** moves to the left, the horizontal portion of slot **93** receives pin **94** (Figure 11) and upon subsequent rotations of actuator **20**, pin **94** raises bar **85**, link **82** and pawl **80** to dotted line position (Figure 9) to rotate return ratchet **81**. The reciprocation of link **82** continues until bar **85** is again moved to the full line position shown in Figures 9, 16, so that pin **94** is in the upright portion of slot **93**, but movement of return ratchet **81** ceases as soon as its last tooth **81***a* has been engaged and moved by pawl **80**, irrespective of continued reciprocation of link **82**. When return ratchet **81** has reached its normal zero position, accumulator ratchet **63** and contact arm **70** will have returned to their initial position. The return movement of bar **85** to the full line position shown in Figures 9, 16, is effected by the following parts.

Lever **95** has an upstanding arm **105** (Figures 6, 8) at its left hand end and this arm is offset at **105***a* (Figure 10) to project through plate **2** where it pivotally mounts a pawl **106**, reciprocable by arm **105** to actuate a toothed segment **107** (Figures 8, 13, 16), pivoted at **108**, in the direction of the arrow W, and having a depending tail **109**, Figures 13, 16, opposing a projection **110** depending from bar **85** (Figure 11). Segment **107** is moved one tooth with each reciprocation of pawl **106**; i. e., with each revolution of actuator **20**, until tail **109** engages projection **110** and moves bar **85** to the right, thereby moving the vertically elongated portion of slot **93** over pin **94**. At this point, the extreme right hand tooth **107***a* of segment **107** will be so far to the left of the tooth of pawl **106** that further reciprocation of the pawl will not move the ratchet. Segment **107** is provided with a detent pawl **111**, pivoted at **112** on plate **2** (Figure 13) and holding segment **107** against retraction by its spring **113**. Pawl **111** functions until another coin is inserted in actuator **20** and yoke Y is moved to the broken line position shown in Figure 6. Upon such movement, a pin **114** on yoke lower arm **18**, and movable through a slot **114***a* in plate **2**, raises a lever **115** pivoted at **115***a* on plate **2**, Figures 9, 13, 16. A link **116**, Figure 16, having a slot-pivot mounting **116***a*, **116***b* on plate **2**, is pivotally supported at its lower end on the free end of lever **115**, and upon being lifted by lever **115** a projecting arm **116***d* of link **116** lifts both detents **106**, **111**, thus permitting spring **113**, Figure 13, to retract segment **107** to its initial position and, in that manner, start a new cycle of operation of segment **107** coincident with the "processing" of each successive deposited coin.

The coin device illustrated and described provides for the positive mechanical operation of numerous parts, such as the projection of the interruptors into the coin chute, controlling the feeding of the coins to the actuator; the movement of the coin against the yoke roller **15**, controlling the shifting of the fingers of member **50** into the paths of movement of the actuator pins; the elevation by the fingers of the driver **60**, controlling the rotation of accumulator ratchet **63** and the stepper contact arm **70**; the elevation of lever **85**, controlling link **82** and return ratchet **81** and the return of stepper **70**, and other parts to their zero or normal position at the end of a completed circuit-closing operation.

The individual coin values are accumulated mechanically and positively without the employment of any electrical contrivance, and the accumulator mechanism is restored to its initial state at the conclusion of a transaction also mechanically and positively upon the actuation of the single solenoid **75** which serves only to lift the mechanical detent **106**; thus eliminating numerous electrical components which are features of prior coin devices and are the source of frequent failures of such devices in actual service.

Different phases of operation by successive coins may occur simultaneously; as, for example, the stopping of a coin by an interruptor to properly time the dropping of the coin onto the actuator without regard to the order in which several coins are deposited in the device; the receipt of another coin in its proper actuator recess; the operation of the yoke by another coin while the driver is being raised responsive to a previously "processed" coin. This feature of the invention, together with the rapidity with which coins may be processed, avoids the necessity of rejecting coins which otherwise might be deposited in too rapid sequence therefore no means are required to effect such rejections. It should be noted also that a plurality of coins of different denominations can be handled by the actuator upon each revolution.

In a selected machine, rotation of motor shaft **3** and actuator **20** has been at the speed of approximately 160 revolutions per minute. Such rotation at 100 revolutions per minute is ample for actual service since that speed greatly exceeds the rapidity with which coins may be deposited manually through commercial types of coin inlets.

As previously indicated, the device illustrated by this disclosure will handle any combination of nickel, dime or quarter coins fed to the machine in any order to accumulate the desired credit necessary to complete the solenoid circuit, which initiates operation of the controlled transaction machine. The device is adaptable also to handle pennies, although in that event the total credit-storage capacity would be only one-fifth that of a nickel-unit accumulator of equal dimensions. The device can be adapted readily to handle half-dollar coins also, or any metal coinage which is based upon decimal increments of a single unit value.

Obviously, the details of the structure may be varied extensively without departing from the spirit of the invention and it is possible to use some of the features illustrated without necessarily including all of the other features illustrated without departing from the general spirit of the invention. The exclusive use of those modifications coming within the scope of the claims is contemplated.

What is claimed is:

1. In a coin device, a coin chute having a single

continuous coin path, an interruptor associated therewith, means positively moving the interruptor inwardly of the chute, a stop at the side of the chute opposite to the interruptor and normally projecting into the path of a coin passing through the chute but insufficiently to bar the passage of a coin through the chute when the interruptor is withdrawn, said stop being movable outwardly of the chute by said means and interruptor and a coin caught between the stop and the inwardly moving interruptor.

2. In a coin device, a rotatable drum-like actuator having a series of coin-receiving recesses in its periphery, individual coin feeding chutes leading to said actuator, said recesses being spaced apart angularly of the actuator axis, individual coin interruptors movable into and out of the paths of coins in said chutes, each interruptor having an operating arm engaging said periphery, to position the interruptor in the coin path, but receivable in the corresponding recess to permit retraction of the interruptor from said path, and yielding means for retracting the interruptors when said arms are in said recesses.

3. In a coin device, a coin chute, a movable actuator immediately beneath the discharge end of said chute and provided with a recess adapted to receive a coin passing through said chute as said recess is moved beneath said chute, one end of said recess forming a cam, an interruptor movable into and out of said chute to intercept the passage of a coin therethrough and including a cam follower engaged by said cam-forming recess end to actuate the interruptor.

4. In a coin device, a frame, a coin chute, a movable actuator immediately beneath the discharge end of said chute in the form of a rotatable drum provided with a recess in its periphery adapted to receive a coin passing through said chute as said recess is moved beneath said chute, an interruptor with a coin-contacting terminal, movable into and out of said chute, and an actuator-contacting terminal engaging the periphery of said drum and movable into said recess, said interruptor being pivoted on the frame between said terminals so that the coin-contacting terminal is withdrawn from the chute as the actuator-contacting terminal is received in said recess.

5. In a coin device, a frame, a drum-like rotatable actuator journaled on the frame, a downwardly leading coin chute discharging immediately above said actuator, an interruptor pivoted on said frame and having a downwardly extending arm riding on said actuator and having an upwardly extending arm with a coin-contacting element projecting into said chute during a portion of the cycle of rotation of the actuator, said actuator having a recess receiving said first-mentioned arm to permit the movement of said element out of said chute during another portion of said cycle, means positively driving the actuator, a stop mounted on the frame and opposed to the coin-contacting element but spaced therefrom, said stop yielding to thrust from the interruptor, against a coin caught between them, to accommodate further movement of the interruptor inwardly of the chute.

6. A coin device as described in claim 5 in which the stop is elongated and pivoted at its lower end on the frame below the level of the coin-contacting element, and inclined from its pivot upwardly and inwardly of the chute, and terminating in a coin-contacting element abreast of, but spaced horizontally from, the interruptor coin-contacting element.

7. In a coin device, a credit accumulator, an operator therefor, a lever rotatable about its pivot for moving the operator and provided with projecting fingers one for each denomination of coin the device is adapted to receive, a rotating actuator having individual lift elements for engaging said fingers and spaced apart angularly of the actuator axis, individual recesses in said actuator for receiving different size coins, and a device engaged by coins in different recesses at different angular positions of the actuator to shift said device into position to effect engagement of corresponding fingers and lift elements.

8. In a coin device, a rotating actuator having a plurality of radial recesses spaced apart axially and angularly of the actuator, one for each denomination of coin to be accepted in the mechanism, each recess being shaped to receive edgewise the major portion of a corresponding coin with a portion of the coin projecting from the periphery of the actuator, each recess having a face disposed to positively engage the edge of a coin in the recess and advance it about the actuator axis, pin-like elements on the actuator spaced angularly of its axis, one for each of said recesses, individual fingers movable as a group into and out of position to be engaged by respective ones of said pins as the actuator rotates, a credit accumulator, an operator therefor movable different distances by said fingers, and a mechanism for advancing all of said fingers simultaneously and having a part adjacent to the periphery of the actuator and engageable by movement of a coin in any of said recesses.

9. In a coin device, a rotatable actuator having recesses in its periphery for receiving different size coins, said recesses being spaced apart angularly of the actuator axis, corresponding elements on the actuator in fixed relation to said recesses, a credit accumulator, a reciprocating driver therefor, a member having a shiftable pivot and movable about its pivot as a fulcrum for operating said driver and provided with projecting fingers associated with but normally out of the paths of movement of said elements, and a device engageable by a coin in any one of said recesses at a corresponding predetermined point in the cycle of the actuator rotation to shift said member fulcrum to project the appropriate finger into the path of movement of the associated element and thereby operate the driver to an extent in accordance with the denomination of said coin.

10. In a coin device, a rotatable actuator having recesses extending inwardly from its periphery and spaced apart angularly of the actuator axis and adapted, respectively, to partly receive a nickel, a dime, and a quarter, corresponding pins on the actuator extending parallel to the actuator axis and spaced apart angularly of the actuator axis, a lever-like member having a shiftable fulcrum spaced from the actuator axis, said member having fingers associated, respectively, with said pins but normally out of the paths of movement of said pins, a mechanism including a part engageable by the projecting part of a coin in any one of said recesses, as the coin is moved by said part, to shift said fulcrum and thereby move into the path of the corresponding pin the associated finger, a credit accumulator and a reciprocating driver therefor operable different distances by movement of said lever member about its fulcrum by engagement of different pins and associated fingers.

11. In a coin device, a frame, a drum-like rotatable actuator journaled on the frame, a downwardly leading coin chute discharging immediately above said actuator, an interruptor pivoted on said frame and having an upwardly extending arm with a coin-contacting element projecting into said chute during a portion of the cycle of rotation of the actuator and having a downwardly extending arm riding upon said actuator to positively hold said element projected during such portion of the cycle of rotation of the actuator, said actuator having a recess receiving said downwardly extending arm to permit the movement of said element out of said chute during another portion of said cycle, and means yieldingly thrusting said element out of said chute.

12. In a coin device, a movable actuator having recesses for receiving and moving coins of different denominations with the coins projecting from the actuator, said recesses varying in depth so that the coins will project from the actuator the same distance irrespective of the coin denomination, a shiftable yoke having an element in the path of the projecting portions of coins in the

actuator to be moved forward by engagement with said coins, pins on the actuator spaced angularly about its axis, spaced supports for said yoke, the support-engaging surface of said yoke being inclined downwardly at the rear support to cause the yoke rear end to lower as its forward end is moved forward, a member pivoted on the rear end of the yoke and provided with a plurality of fingers projecting inwardly beyond the periphery of the actuator, a cam engaged by said member and raising the projecting ends of said fingers as the rear end of said yoke is lowered and moved forward, said fingers carried by said member and normally clearing said pins but positioned in the path of said pins when said yoke is shifted, and an accumulator driver engageable by said member as said fingers are engaged by said pins.

13. In a coin device, a rotatable drum-like actuator with recesses extending inwardly from its periphery to partly receive coins of different denominations respectively, said recesses being spaced apart angularly of the actuator axis, an accumulator operator, a single carrier having a plurality of elements for operatively connecting said actuator to said operator, spring means thrusting said carrier towards inoperative position, said carrier including a member in the path of the projecting portions of all the coins in said recesses and engageable by the projecting portions of such coins successively to shift said carrier and elements against the thrust of said spring into operating position to connect said actuator and operator intermittently as the actuator is rotated.

14. In a coin device, a rotatable drive shaft, a credit accumulator advanced to a predetermined position by said drive shaft by successive coin-effected operations, a solenoid energized by said accumulator when the latter has reached said predetermined position, a ratchet and pawl for returning said accumulator to initial position, a member for reciprocating said pawl, and means operable by the energizing of said solenoid for operatively connecting said member to said shaft.

15. In a coin device, a credit accumulator, a rotatable drive shaft provided with an actuator for receiving coins of different denominations, structure providing for the advancement of said credit accumulator by rotation of said drive shaft and actuator and coins received successively into the actuator, a ratchet and pawl for returning the accumulator to initial position by repeated reciprocation of said pawl, said accumulator and ratchet being normally disassociated from said drive shaft, mechanism operatively connecting said actuator and accumulator upon the insertion of coins into said actuator, a solenoid energized by said accumulator when the latter has reached a predetermined position, and means operable by the solenoid for reciprocating said pawl by said drive shaft.

16. In a coin device, a rotatable drive shaft including an actuator for receiving coins of different denominations, a rotatable credit accumulator provided with right hand and left hand ratchet wheels, individual pawls for said ratchets, parts operable by said drive shaft to advance one of said pawls by the insertion of a coin into said actuator, parts operable by said drive shaft to advance the other of said pawls when said accumulator reaches a predetermined advanced position, and means disassociating said drive shaft from the latter-mentioned pawl following return of the accumulator to its initial position.

17. In a coin device, an accumulator mechanism, a rotating actuator having recesses for receiving coins of different denominations, individual interruptors for timing the feeding of coins to the actuator recesses, angularly spaced parts on said actuator associated with respective recesses for individually operating said interruptors, angularly spaced elements on said actuator associated with respective recesses for individually positively engaging and advancing said accumulator mechanism, the said part and element associated with a given recess functioning successively as the actuator rotates, and a said part associated with one recess functioning simultaneously with a said element associated with another recess.

18. In a coin device, a drum-like actuator with coin-receiving recesses in its periphery spaced apart axially and angularly of the actuator, a plurality of coin chutes discharging to the actuator periphery and positioned in the same vertical planes as said recesses, coin interruptors, each having a part movable transversely of an individual chute and having a part receivable in a corresponding actuator recess during a predetermined angular position of the actuator to control the position of the first-mentioned part in the chute, an accumulator mechanism, elements fixed on and spaced angularly of the actuator and angularly positioned relative to responsive recesses and advancing said mechanism different distances in accordance with the denomination of the coins in the associated recesses, each of said recesses receiving the associated interruptor part to withdraw the other interruptor part from the corresponding chute while an element associated with another recess and interruptor simultaneously advances the accumulator.

19. In a coin device, a rotatable drum-like actuator having recesses in its periphery for receiving and moving coins of different denominations with portions projecting from the actuator periphery, an accumulator, a member for advancing the accumulator and having a plurality of fingers extending towards the actuator, one finger for each denomination of coin, said actuator having an individual lifting element for each finger, and a control part having a portion in the path of the projecting portions of coins in the actuator, said part being movable by engagement of said portion by a coin in the actuator to shift all of said member fingers into the path of movement of said actuator elements.

20. In a coin device, a movable actuator having recesses for receiving and moving coins of different denominations with the coins projecting from the actuator periphery, a control yoke having an element in the path of movement of the projecting portions of coins in the actuator to be moved forwardly by engagement with the coins, elements on the actuator spaced angularly about the actuator axis, a support for the rear portion of said yoke spaced from its coin-engageable element, the support-engaging surface of said yoke being inclined downwardly and forwardly over said support to cause the rear end of the yoke to lower as said yoke element is engaged by a coin, a member pivoted on the rear part of the yoke and provided with a plurality of fingers projecting inwardly beyond the periphery of the actuator, means associated with the actuator for raising the projecting ends of said fingers as said member is lowered and moved forwardly, said fingers normally clearing said actuator elements but being positioned in the path of said actuator elements when said yoke is shifted forwardly, and an accumulator advanced by said member when said fingers are engaged by said actuator elements.

21. In a coin device, a step accumulator, an operator having fixed elements for positively engaging and advancing said accumulator, a rotating actuator having spaced recesses in its periphery for individually receiving edgewise coins of different denominations respectively and positively moving the coins about the actuator axis, the actuator also having elements spaced angularly about its axis in predetermined relation to said recesses and disposed to engage the operator and move it different distances when coins of different denominations are in the the actuator, individual coin interruptors positioned in the paths of movement of coins to the actuator and timing the feeding of successive coins to the actuator and controlled by the angular position of the actuator, the interruptor in the path of a coin of one denomination functioning simultaneously with the actuator element associated with a recess for a coin of the same denomination.

22. A coin device according to claim 19 which includes

means associated with the control part and maintaining it in finger shifting position, following engagement of the control part by a projecting coin portion, until the finger lifting elements on the actuator have completed the finger lifting movement and irrespective of the continued presence of the coin in the actuator recess.

23. A coin device according to claim 19 which includes a detent engaging the control part, when the latter is actuated by a projecting coin portion, and maintaining the control part in finger shifting position, and a member rotating with the actuator and engaging said detent and releasing the control part from the detent at predetermined points in the cycle of operation of the actuator.

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