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MULTI-DENOMINATION COIN ACCUMULATOR

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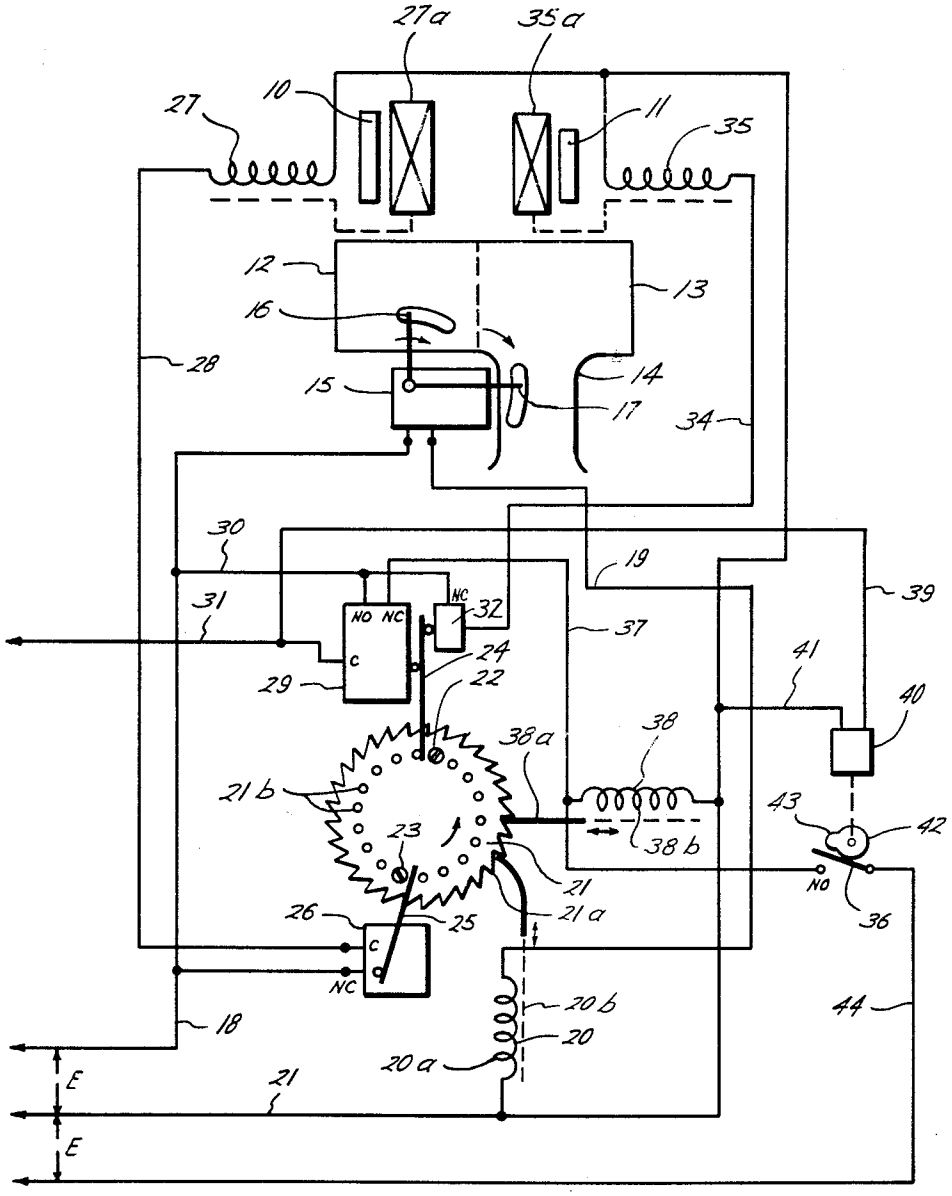

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MULTI-DENOMINATION COIN ACCUMULATOR

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This invention relates to coin accumulators generally and, in particular, to coin accumulators of the type which accumulates coins of different denominations.

This invention is particularly useful where the total amount of money to be deposited is substantial, as in the case of coin-operated dry cleaning machines and the like wherein from $1.25 to $2.00 must be deposited to start the machine. The invention is also useful where it is desirable to allow the customer some flexibility in the type of coins to be deposited regardless of the total price required to operate the machine. For even in cases where one coin has enough monetary value, if combinations of two or more coins have the same value, it is advantageous to provide a coin accumulator which will allow either the one coin or combinations of coins to be deposited. This will increase the likelihood that a customer will have the correct change necessary to operate the machine.

The invention also prevents two of the most exasperating situations, from the customer's viewpoint, which arise in connection with coin-operated machines—i.e., where money is deposited and it keeps being returned and where the machine accepts too much money. The first situation usually causes the customer to change coins to see if the trouble is in the coin and then, when this doesn't change the situation, to give the coin accumulator a good, hard blow on the side, after which he tries the coin again. This process is usually repeated several times before he decides that there is something wrong with the machine and stops trying to get it to take his coins. In most instances where this occurs, there is nothing wrong with the machine or the accumulator, at least in the beginning. The coins are merely rejected because the machine is in some part of its cycle and not ready to receive more coins. In many machines, this is self-evident to the customer. However, there are occasions where this is not apparent and this problem arises.

The second problem occurs when a combination of coins is necessary to start the machine and, for some reason, the customer loses count and deposits one too many of one denomination before depositing the required number of the other denominations. This excess coin is either rejected or kept by the coin accumulator. If the coin accumulator rejects the coin, the customer usually tries to deposit it several more times until he either remembers that he has deposited a sufficient amount of this type coin or he pushes the coin-return button, takes all his money and moves on to another machine. On the other hand, if the machine keeps the coin, then the customer is overcharged and when he realizes this, he will probably be a lost customer.

It is one of the principal objects of this invention to provide a multi-denomination coin accumulator which can be actuated by any combination of a predetermined group of coins of different denominations which equals a given total monetary value.

It is a further object of this invention to provide a multi-denomination coin accumulator which will not receive more of any denomination of coin after the total amount accumulated is such that no more coins of that denomination can be utilized in accumulating the exact total amount required. This makes it impossible for a customer to overpay the machine.

It is an additional object and one of the important features of the multi-denomination coin accumulator of this invention that it will not receive any coins after the proper amount is deposited until it has been reset, as by the machine completing its cycle.

These and other objects and features of the invention are attained in the example herein disclosed by arranging an electric switch so that it is closed at least one time by each coin deposited, with the number of times it is closed being determined by the monetary value of the coin deposited. Each time the switch is closed, an electromagnetic stepper, comprising a solenoid operated pawl and ratchet wheel, moves a control switch actuator a predetermined distance toward a main control switch. By arranging the device so that the number of times the coin-operated switch is closed by each coin equals the number of times its value can be divided by the value of the smallest denomination coin deposited, the stepper can easily be arranged to start the machine after coins having a predetermined value have been deposited, regardless of the order in which they were deposited. A coin-receiving slot is provided for each denomination coin and means are provided to close each slot when a sufficient number of coins of that particular denomination has been deposited to prevent overpayment and to prevent the deposit of coins while the machine is in operation.

The invention will now be described in connection with the accompanying drawing in which the single figure shows schematically the mechanical parts of the coin accumulator along with the electrical circuits which interconnect the various mechanical parts electrically and which control their operation.

The device illustrated is arranged to receive coins of two different denominations. The rectangle 10 indicates the window through which the larger denomination coin is deposited whereas the rectangle **11** is the coin window for the smaller denomination coin. Window 10 is shown physically larger than window 11 which would indicate that it is to receive a coin which is physically larger. This would be true if the coin combinations were half dollars and quarters, or quarters and nickels, etc., but not for dimes and nickels, so "larger" as used herein means higher in value.

Located below the coin windows are coin rejectors 12 and 13. Directly below coin rejector 13 is a coin chute 14 which leads to a container (not shown) where the coins are collected. The coin chute 14 and the coin rejectors are arranged so that a small coin leaving the coin rejector 13 can pass directly into the chute, but a large coin leaving coin rejector 12 must move laterally a short distance to reach the chute. Located below the large coin rejector 12 is a coin-operated switch 15 provided with switch actuating arms 16 and 17. Arm 16 is located below coin rejector 12 so that it is engaged by any coin passing through that rejector, whereas arm 17 is located in the chute 14 so that it will be actuated by any coin passing out of either coin rejector. With this arrange-

ment, the coin switch 15 is actuated twice by any large coin and once by any small coin deposited.

When the coin switch 15 is closed, it completes a circuit made up of input power line 18, line 19 which contains the ratchet solenoid 20, and line 21. This causes electrical energy to flow through coil 20*a* of the ratchet solenoid, moving the pawl 20*b* into engagement with the next tooth 21*a* on the ratchet wheel. As soon as the coin has passed either arm 16 or 17, the switch 15 will be opened, de-energizing the coil 20*a*, allowing the pawl to move the ratchet wheel a predetermined distance in a counter-clockwise direction. Resilient means (not shown) are provided to bias the ratchet wheel in a clockwise direction and removable stop means 38 are provided to prevent clockwise rotation of the ratchet wheel so each time the switch 15 is closed the ratchet wheel is stepped an additional predetermined distance in a counter-clockwise direction.

The ratchet wheel carries switch actuating pins 22 and 23 which are located to engage switch-actuating arms 24 and 25. These actuating pins can be placed in any of the holes 21*b* and thereby change the number of times the ratchet solenoid must be energized before they engage the switch arms 24 and 25. Instead of pins which are movable individually, two vertical tabs integrally attached to an arm may be used. The tabs are preset so that one tab will engage switch arm 25 a predetermined number of impulses before the other engages the switch arm 24. In this way, the arm can be quickly changed when the price of operating the machine or appliance changes as long as the coins involved remain the same and the tabs will automatically maintain their proper relationship.

The switch-actuating arm 25, which is engaged by the pin 23, operates the switch 26. This is a normally closed switch. It controls a circuit which consists of power line 18, line 28, line 21 and the gate solenoid 27 which, when energized, holds a gate 27*a* located adjacent the large coin window 10 to one side, allowing coins to be deposited in the window. When the gate solenoid 27 is de-energized by the opening of switch 26 (by engagement of the arm 25 by the pin 23), the gate 27*a* is released and it closes the window 10, thereby preventing any more coins from being deposited.

Switch 29 is the main control switch which starts the appliance (not shown). It is a single pole, double throw switch which is resiliently biased toward the position where the lines 30 and 31 are open and lines 31 and 37 are electrically connected. No current flows through line 37, however, except when the switch 36 is closed, which occurs only as the appliance approaches the end of its cycle. This feature of the circuit will be discussed below.

No current can flow to the appliance through the circuit consisting of lines 18, 30 and 31 until the ratchet wheel 21 has moved far enough for the pin 22 to engage the switch arm 24 and move the switch 29 to electrically connect lines 30 and 31.

Located adjacent the switch 29 and arranged to be actuated by the switch arm 24 at the same time it actuates the switch 29, is the switch 32. This is a normally closed switch which connects the line 30 with the gate solenoid 35 through line 34. When the switch is closed, the solenoid is energized and the gate 35*a* is held away from the window 11 allowing coins to be deposited. When sufficient coins are deposited to close the switch 29 and start the appliance, the switch arm 24 simultaneously opens the switch 32, de-energizing the solenoid 35, allowing the gate 35*a* to close the coin window 11, thereby preventing any more coins from being deposited therein.

If the coin accumulator is being employed in connection with a laundry machine or dry cleaning machine, or the like, which must go through an operating cycle lasting from 15 to 30 or 40 minutes, a timer 40 is usually incorporated in the circuit. This timer controls the normally open switch 36 by means of the cam 42. It is the purpose

of this switch to return the accumulator to its coin-receiving condition at the end of the operating cycle of the machine being controlled. When the timer is within a few seconds of the end of its cycle, the protrusion 43 on the cam 42 closes the switch 36 connecting the line 37 to the input line 44. This energizes the coil 38*b* which is connected across the line 37 and the common line 21. This coil moves the plunger 38*a* out of engagement with the teeth on ratchet wheel 21, allowing it to return to its initial position. The actuating pins 22 and 23 are thus moved away from the switch-actuating arms 24 and 25, allowing switch 29 to open the circuit between lines 30 and 31 and close the circuit between lines 31 and 37. Since line 37 is "hot," the appliance will continue running until the timer moves the protrusion 43 out of engagement with switch 36, a matter of a few seconds, at which time the switch 36 will open, stopping the flow of electricity to the machine and the timer 40. When the ratchet wheel is released, the switches 26 and 32 are allowed to close. This re-energizes the gate solenoids 27 and 35, pulling the gates 27*a* and 35*a* away from coin windows 10 and 11. When the timer completes its cycle, it opens the switch 36, thereby stopping the flow of electricity through the line 31, thus stopping the flow of electricity to the appliance.

Operation

Assume that the large coin window 10 is arranged to accept fifty-cent pieces and the small coin window 11 to take quarters and that the total amount required to start the machine is $1.50. This means that either three fifty-cent pieces, two fifty-cent pieces and two quarters, one fifty-cent piece and four quarters, or six quarters could be deposited to total $1.50. Assume that the customer intends to deposit one fifty-cent piece and four quarters. When the fifty-cent piece is deposited, it will enter the window 10, pass into the slug rejector 12 and, as it leaves the slug rejector, trip the switch arm 16, momentarily closing the contacts of switch 15. This energizes the ratchet solenoid 20 and causes the ratchet wheel 21 to be moved one step in a counterclockwise direction. The fifty-cent piece will then roll laterally and fall into the coin chute 14 where it will again close the contacts of switch 15 by means of the arm 17, again causing the ratchet wheel to be stepped toward the switch-actuating position. The customer then deposits a quarter through the window 11 which falls into the slug rejector 13, then into the coin-receiving slot 14 where it closes the contacts of switch 15 by means of the switch arm 17, causing the ratchet solenoid to advance the ratchet wheel another incremental distance. The customer then deposits another quarter and the same thing occurs. He now has a total of $1.00 in the machine. At this point, either a fifty-cent piece in the large window or two quarters in the window 11 will equal the required amount of money so both windows are still open to receive coins. If the customer deposits a quarter, the ratchet solenoid 20 will step the ratchet wheel 21 one more incremental distance. This is not sufficient to move the switch actuator pin 22 into engagement with the switch arm 24. It will, however, move the ratchet wheel sufficiently to cause the switch actuator pin 23 to engage the switch arm 25 of switch 26 and open the switch. This de-energizes the gate solenoid 27, allowing the gate 27*a* to close the large coin window 10. The customer is thus prevented from depositing another fifty-cent piece and thereby paying too much for the service. The quarter window, of course, remains open to receive an additional quarter which then makes $1.50 deposited. With the deposit of this last quarter, the ratchet wheel is rotated sufficiently to move the pin 22 into engagement with the switch arm 24 causing the switch 29 to connect lines 30 and 31 and energize the appliance. Simultaneously, the normally closed switch 32 is opened by the switch arm 24, thus de-energizing the gate solenoid 35. This allows the gate 35*a* associated

with the small coin window **11** to move across the opening of the window to prevent the depositing of any additional coins. Both coin windows are now closed and no additional coins can be deposited.

The timer **40** is energized at the same time the appliance circuit is closed by means of the lines **39** and **41**. It is, of course, set to run for a sufficient length of time for the appliance to complete its cycle. It may be a separate timer from the one used to control the various operations of the machine, such as the wash and rinse cycles of a washing machine, but preferably they are the same.

The cam **42** is driven by the timer and arranged to close the switch **36** just before the end of the time period. When this switch is closed, the coil **38***b* is energized, moving the plunger **38***a* out of engagement with the ratchet wheel, allowing the wheel to return to its original position. When this occurs, switches **26** and **32** close, energizing the solenoids **27** and **35** which move the gates **27***a* and **35***a* away from the coin windows **10** and **11**, thereby opening the windows to receive coins. Simultaneously switch **29** moves back to its normally closed position which opens the circuit consisting of the lines **30** and **31**. The appliance continues to receive power, however, through the lines **31**, **37** and **44** until the timer completes its cycle and opens the switch **36**.

The location of the pins **22** and **23** on the ratchet wheel will depend on the denomination of the coins and the total amount to be deposited. For example, if the total price is $1.25 instead of $1.50, the pin **22** must be moved one position closer to the switch arm **24** so that the coin switch **15** need only be actuated five times to start the machine instead of six. To prevent the possibility of overpayment, however, the stop **23** must also be moved so that it will open the switch **26** when the coin-operated switch **15** has been closed four times. The number of times the switch is actuated before the window for a particular denomination coin is closed can be calculated by subtracting the value of the coin from the total amount to be deposited, dividing this figure by the value of the coin, multiplying the result by the number of times the coin actuates the switch and adding one.

For example, if the total price is $1.75 and quarters and half dollars are the two coins being deposited so that each half dollar closes the switch twice, the switch **26** must be opened when the coin switch **15** has been closed six times.

Obviously, the simplest arrangement is possible where the large coin is twice the value of the small coin. Other combinations which are not in a one-to-two ratio can be used, however, by adding more switch operating arms so that the number of times the switch **15** is closed is in relationship to the relative value of the coins.

The invention has been described in connection with a two denomination coin accumulator. However, additional windows could be added and additional switch actuating arms attached to the coin-operated switch so that more than two denominations of coins can be accumulated. A gate for each window could easily be provided and each controlled by a solenoid and additional switches could be arranged to be actuated by the ratchet wheel so that each window would close when the aggregate amount accumulated approached the total to be accumulated closer than the value of the coin for which the window is intended.

From the foregoing, it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth, together with other advantages which are obvious and which are inherent to the apparatus and structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

The invention having been described, what is claimed is:

1. A multi-denomination coin accumulator for energizing an electric circuit when coins totaling a given amount have been deposited, comprising, in combination:
- a plurality of coin receiving slots, each slot to receive a different denomination coin;
- a control switch in the circuit to be energized, having a first position for closing the electric circuit and a second position;
- an electromagnetic stepper for moving the control switch to the first position when the stepper has been actuated a predetermined number of times to move it to a first position;
- means for holding the stepper in its first position;
- electromagnetic means for moving the holding means out of holding position;
- a switch for actuating the stepper;
- means for actuating the switch when engaged by a deposited coin, with each denomination of coin deposited engaging the switch actuating means a different number of times;
- means for closing a slot when the total value of the coins deposited is such that an additional coin deposited in the slot will result in an overpayment;
- a timer operable responsive to the control switch closing said electric circuit for controlling the length of time that the circuit is energized; and
- means actuated by the timer just before the timer reaches the end of its cycle to energize the electromagnetic means to release the stepper and allow the control switch to move to its second position and to continue to energize the electric circuit during the remainder of the timed cycle.

2. A multi-denomination coin accumulator for controlling a coin-operated machine comprising, in combination, a plurality of coin passageways terminating in slots for respectively receiving coins of different denominations; a plurality of gates, one for each slot, movable from a slot-opening position to a slot-closing position in which they block insertion of additional coins through the slots; a gate switch for each gate; means for moving the gates from one position to the other responsive to the actuation of the respective ones of said gate switches; a main control switch for starting the operation of the machine; a ratchet wheel; a plurality of switch actuating members carried by said ratchet wheel; means for stepping the ratchet wheel including a coin switch arranged so that each denomination of coin actuates the coin switch a different number of times and causes the ratchet wheel to be stepped a corresponding number of times; said switch actuating members being positioned relative to said gate switches and main control switch so that, as the ratchet wheel is stepped, they actuate the gate switches to cause each gate to close its slot when the total value of coins deposited is such that the deposit of an additional coin in such slot would result in overpayment and to actuate the main control switch when the last of the gate switches has been so actuated.

3. A multi-denomination coin accumulator for energizing an electric circuit when coins totaling a given amount have been deposited, comprising, in combination: a plurality of coin receiving slots, each slot to receive a different denomination coin; a control switch in the circuit to be energized; an electromagnetic stepper for closing the control switch when the stepper has been stepped a predetermined number of times; means for holding the stepper in its switch-closing position; electromagnetic means for moving the holding means out of holding position; means for stepping the stepper a number of times proportional to the denomination of the coins deposited;

means for closing a slot when the total value of the coins deposited is such that an additional coin deposited in the slot will result in an overpayment; a timer operable responsive to the closing of the control switch for controlling the length of time that the circuit is energized; and means actuated by the timer just before the timer reaches the end of its cycle to energize the electromagnetic means to release the stepper and allow the control switch to move to open position and to continue to energize the electric circuit during the remainder of the timed cycle.

References Cited by the Examiner

UNITED STATES PATENTS

2,236,198	3/41	Osborne	194—15
2,333,176	11/43	Hoban	194—10
2,366,469	1/45	Andres	194—9
2,433,689	12/47	Fry	194—9
2,583,461	1/52	Arnett.	
2,972,400	2/61	Gabrielsen	194—9

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