Sept. 8, 1970 D. E. SCHMITT ET AL 3,527,330

COIN CHANGER WITH REMOVABLE COMPONENTS

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Fig. 1

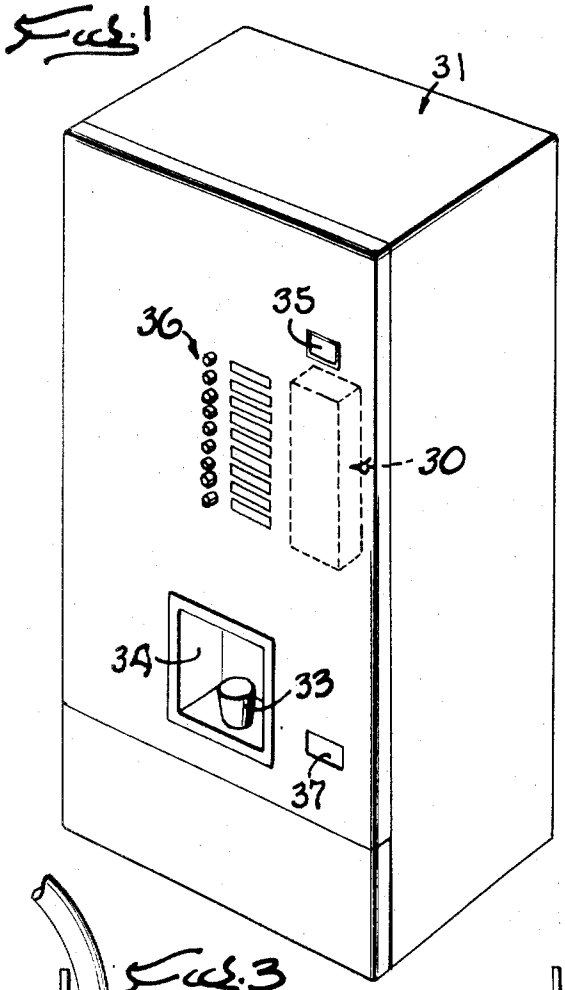


Fig. 2

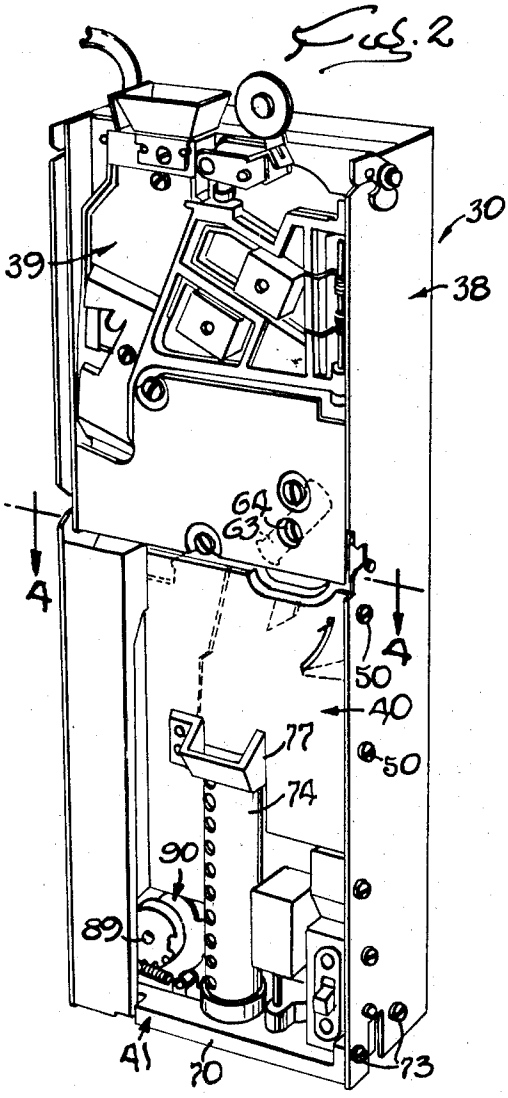


Fig. 3

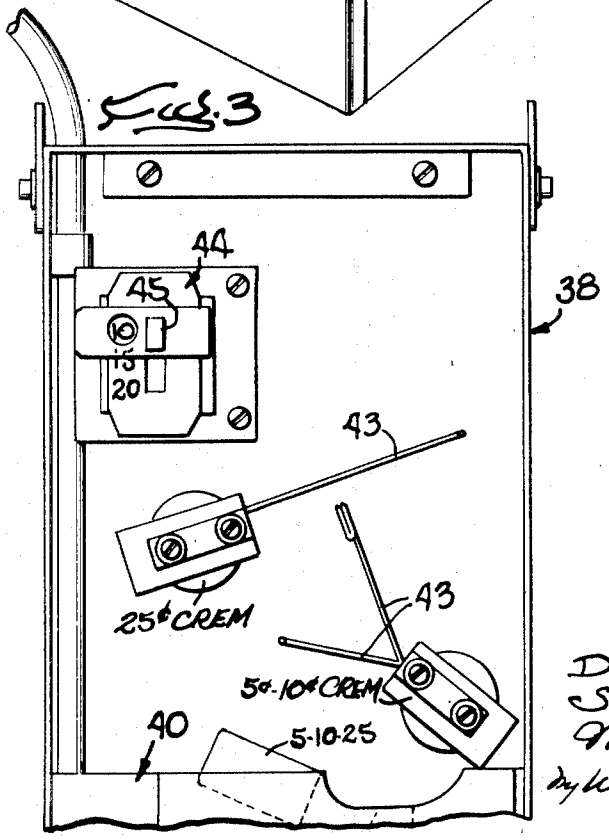
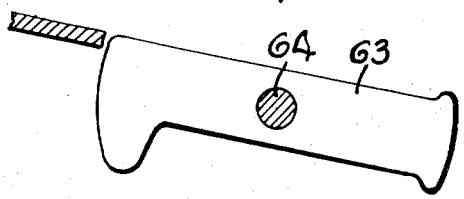


Fig. 2a



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COIN CHANGER WITH REMOVABLE COMPONENTS

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Fig. 4

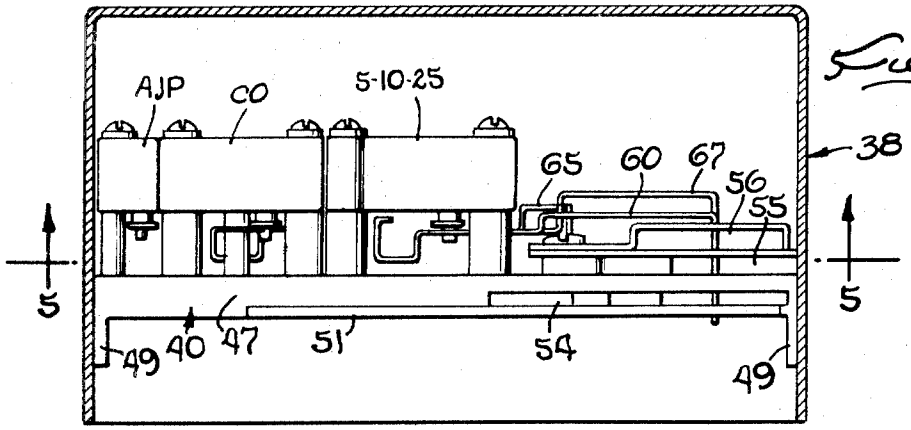
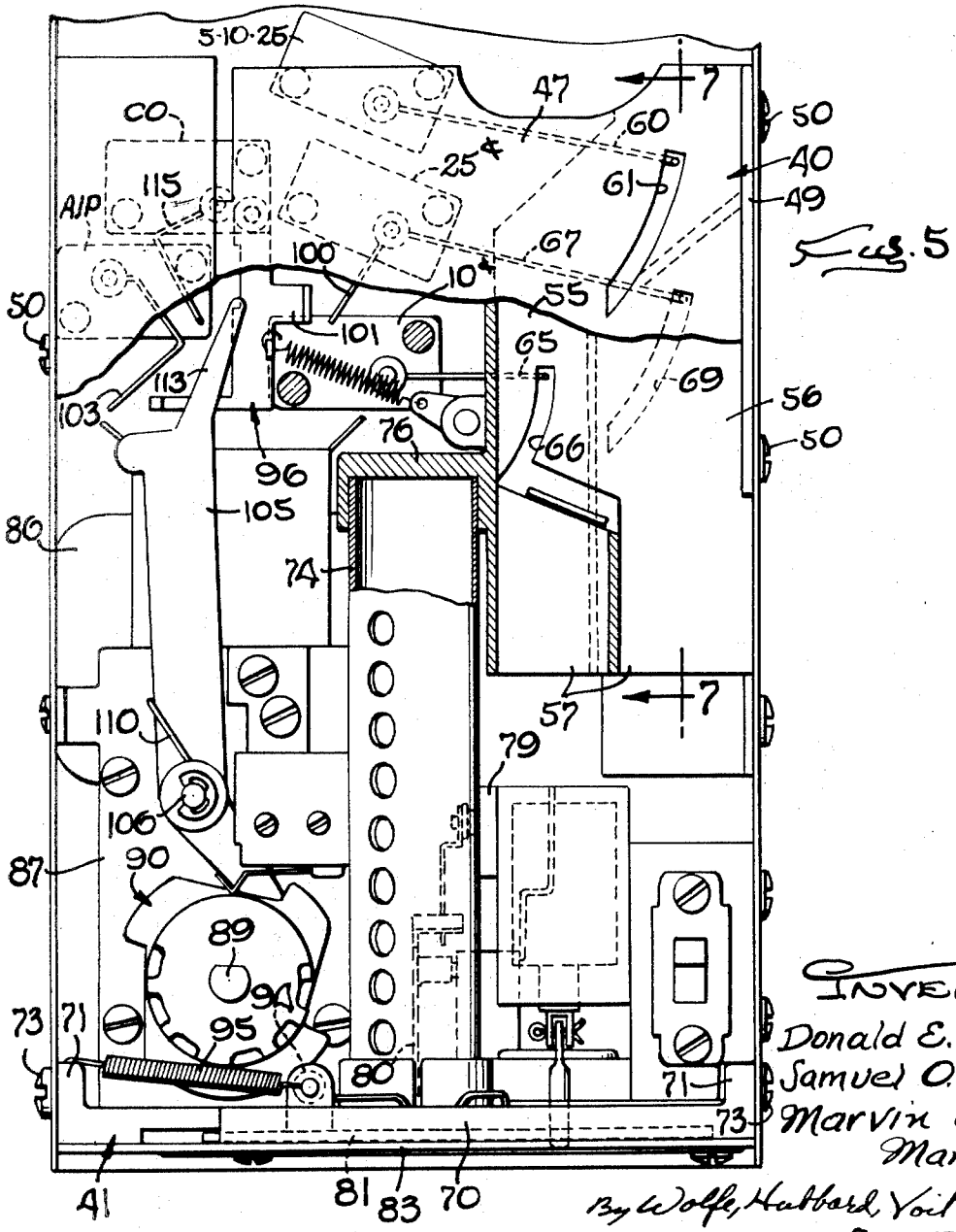


Fig. 5



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COIN CHANGER WITH REMOVABLE COMPONENTS

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Fig. 6

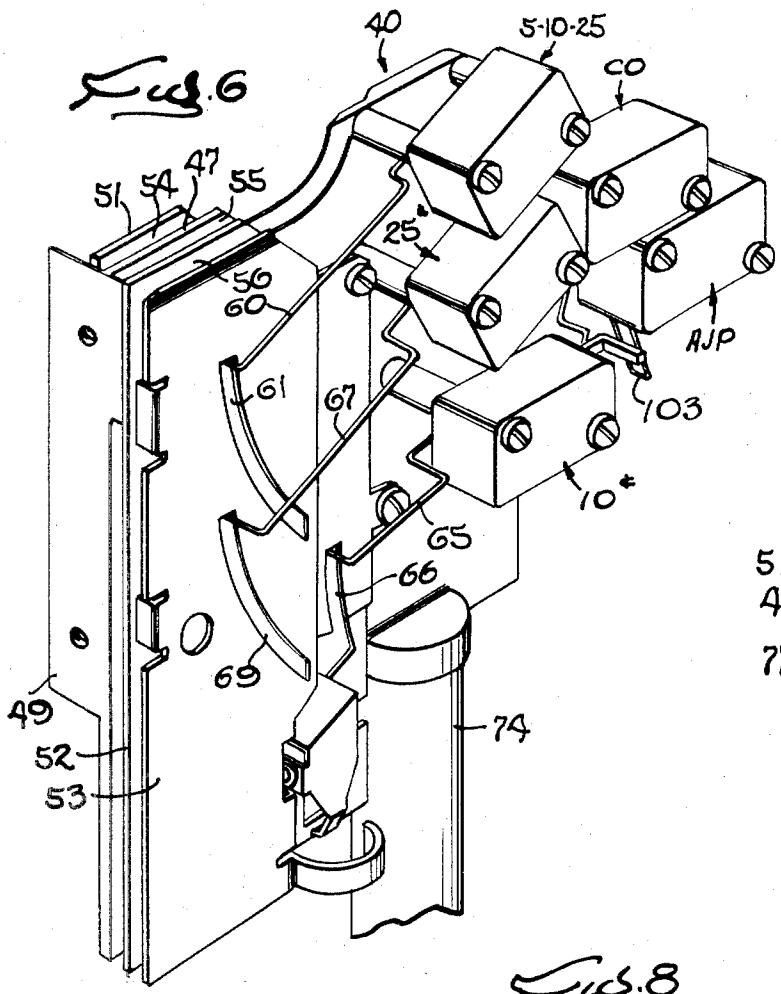


Fig. 7

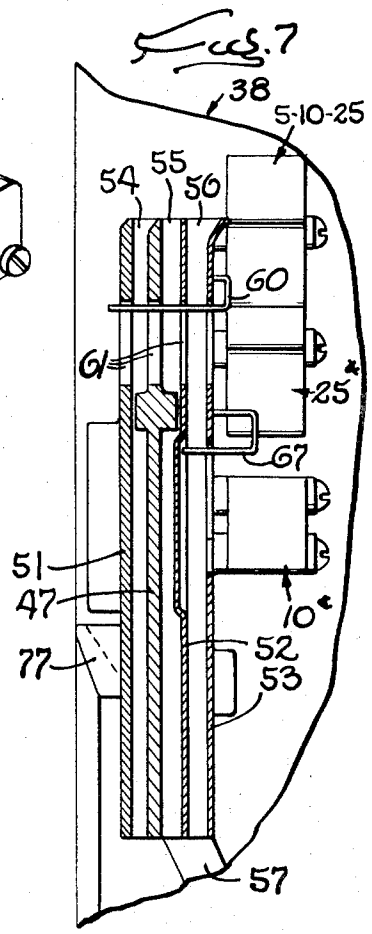
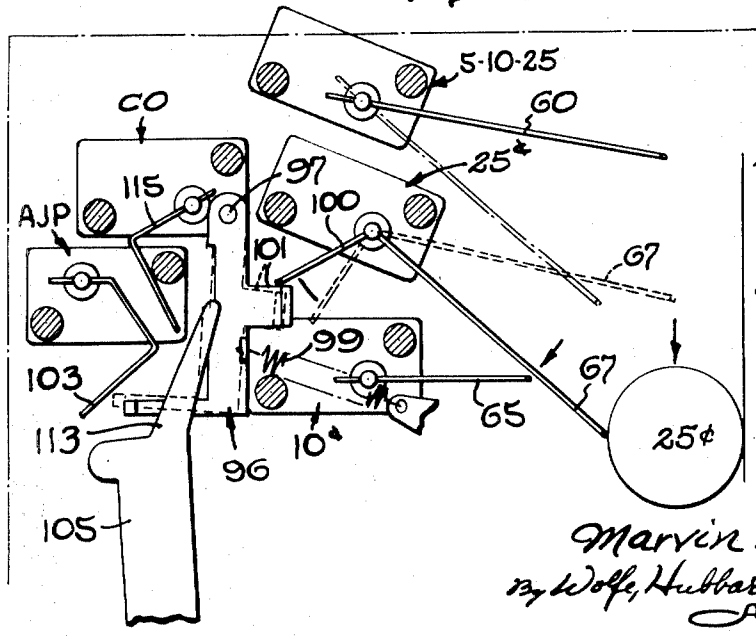


Fig. 8



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COIN CHANGER WITH REMOVABLE COMPONENTS

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Fig. 9

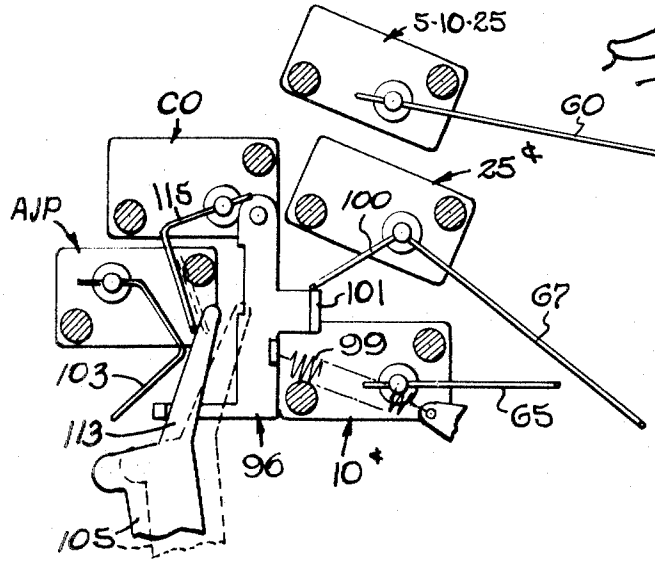


Fig. 10

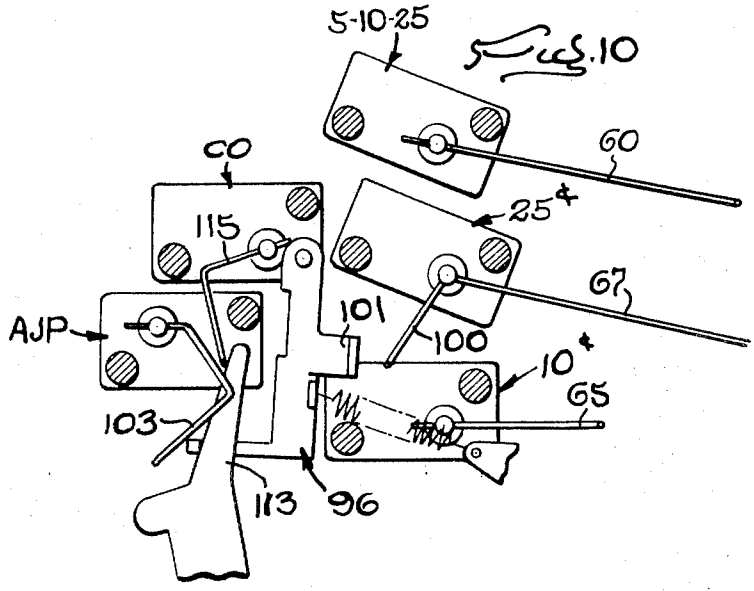
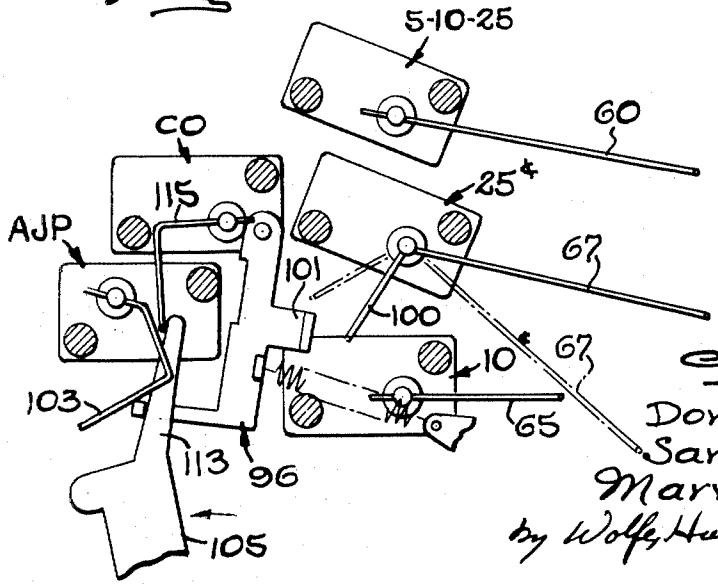


Fig. 11



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COIN CHANGER WITH REMOVABLE COMPONENTS

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Fig. 12

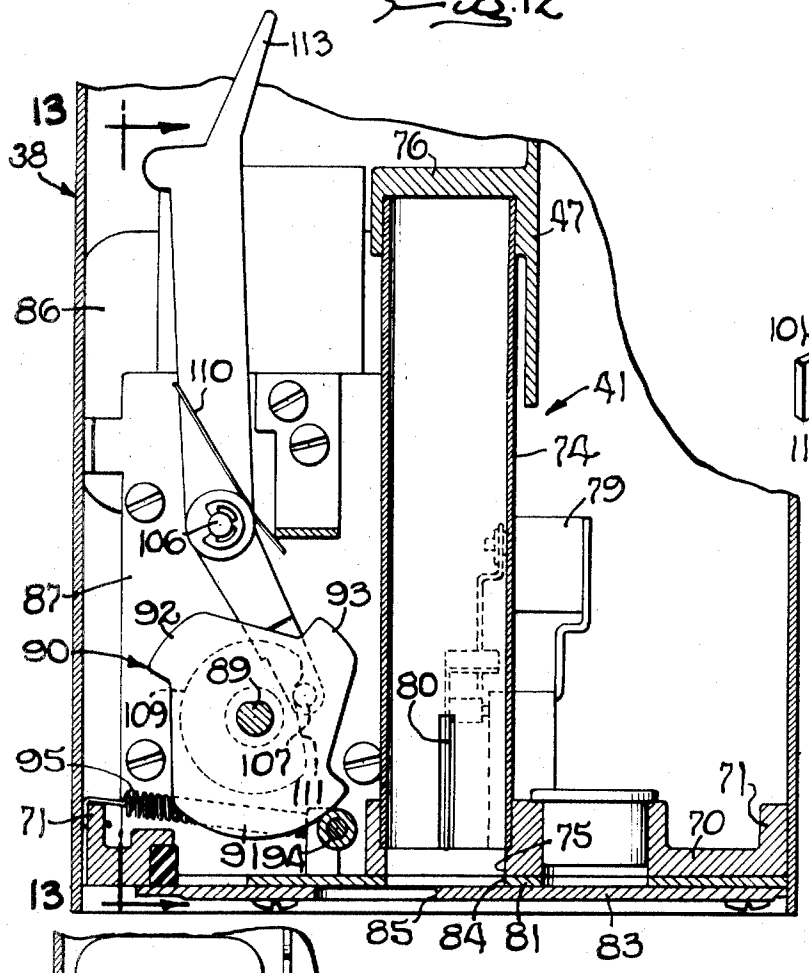


Fig. 13

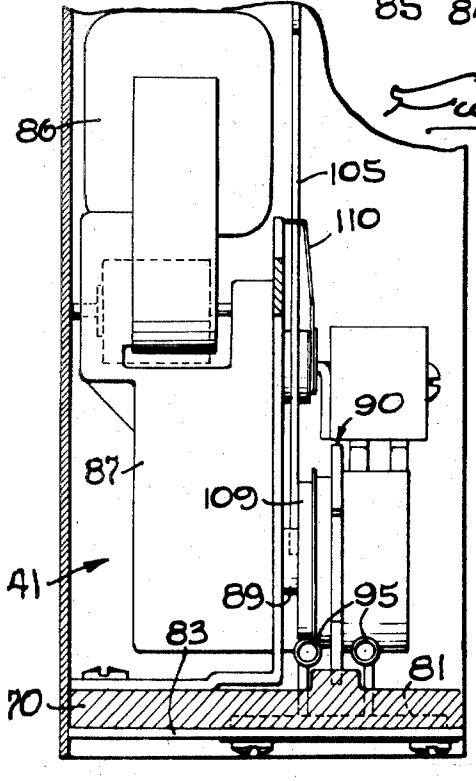
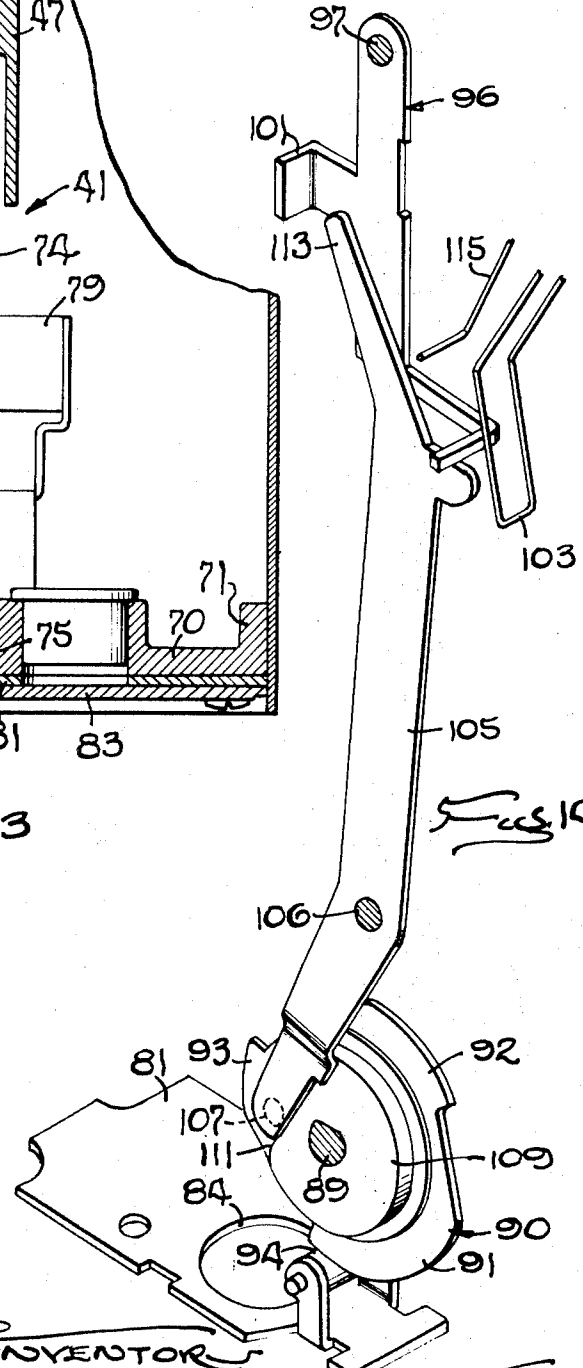


Fig. 14



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COIN CHANGER WITH REMOVABLE COMPONENTS

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Fig. 15

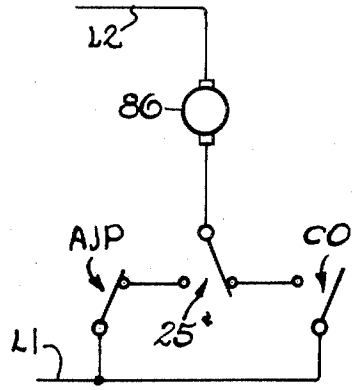


Fig. 16

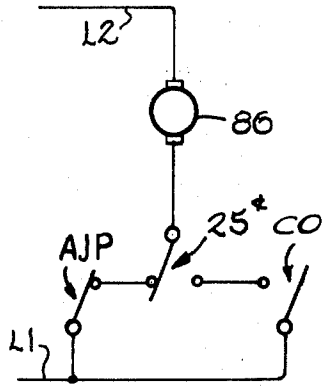


Fig. 17

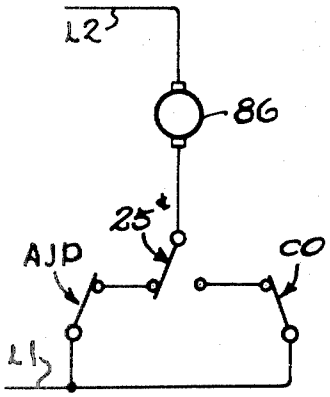


Fig. 18

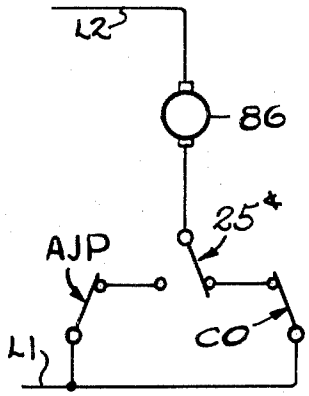


Fig. 19

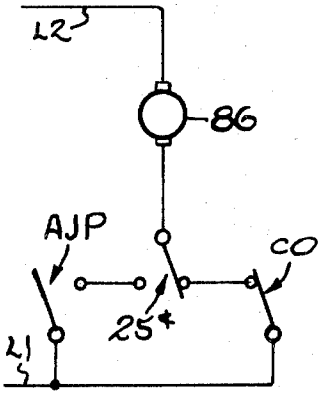
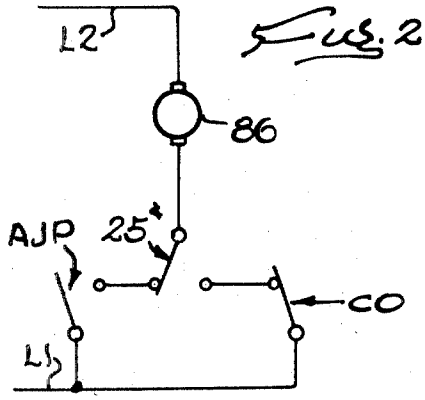


Fig. 20



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3,527,330

COIN CHANGER WITH REMOVABLE COMPONENTS

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Int. Cl. G07f 11/00
U.S. Cl. 194—10 4 Claims

ABSTRACT OF THE DISCLOSURE

An anti-jackpotting coin changer for a vending machine comprises a casing unit, a slug rejector unit, and two separately constructed primary operating units which are removable individually from the casing unit as unitary assemblies to facilitate servicing and maintenance of the changer.

BACKGROUND OF THE INVENTION

This invention relates to a coin changer adapted for use in an automatic vending machine to initiate a vend cycle as an incident to receiving coins satisfying the vend price of the machine and also to return change to the purchaser if the value of the coins received exceeds the vend price. More particularly, the invention relates to a so-called anti-jackpotting coin changer of the type wherein a change-making cycle is initiated in response to a deposited coin momentarily actuating a switch. If a malfunction should happen to prevent deactuation of the coin-responsive switch at the proper time, a so-called anti-jackpot switch is actuated to terminate the change-making cycle immediately and prevent multiple payouts of change to the purchaser.

SUMMARY OF THE INVENTION

The primary aim of the present invention is to simplify the servicing and maintenance of a coin changer of the above character. In large, this is achieved by constructing the changer with two primary operating units which may be removed individually and independently from a casing as unitary assemblies, repaired and tested, and then re-installed with full assurance that each unit is functioning properly and without need of mechanically interlinking the units.

A further object is to provide a new and improved anti-jackpotting coin changer which is simpler in construction and more trouble-free in service use than prior changers of the same general type. This feature of the invention is characterized by the provision of a single sweeping arm which not only normally deactuates the coin switch but also actuates and deactuates the anti-jackpot switch during each change-making cycle.

Other objects and advantages of the invention will become apparent from the following detailed description taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of an exemplary vending machine equipped with a new and improved coin changer embodying the novel features of the present invention.

FIG. 2 is a perspective view of the coin changer.

FIG. 2*a* is an enlarged front elevation of parts shown in FIG. 2.

FIG. 3 is a fragmentary elevation of part of the changer illustrated in FIG. 2.

FIG. 4 is an enlarged cross-section taken substantially along the line 4—4 of FIG. 2.

FIG. 5 is a fragmentary cross-section taken substantially along the line 5—5 of FIG. 4.

FIG. 6 is a perspective view of one of the primary operating units.

FIG. 7 is a fragmentary cross-section taken substantially along the line 7—7 of FIG. 5.

FIGS. 8 to 11 are fragmentary views of parts illustrated in FIG. 5 and showing the different positions of the parts during successive steps of a change-making cycle.

FIG. 12 is a fragmentary elevation of elements illustrated in FIG. 5, some parts being broken away and shown in section.

FIG. 13 is a fragmentary cross-section taken substantially along the line 13—13 of FIG. 12 and showing the second primary operating unit.

FIG. 14 is an enlarged fragmentray perspective view of part of the second primary operating unit shown in FIG. 13.

FIGS. 15 to 19 are simplified diagrams showing the different conditions of the control circuits for the changer during a normal change-making cycle.

FIG. 20 is a simplified diagram showing the changer control circuits during a change-making cycle in which a malfunction occurs.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in the drawings for purposes of illustration, the invention is embodied in a coin changer **30** adapted for use in an automatic vending machine **31** and operable (1) to receive coins of different denominations deposited into the vending machine by a purchaser, (2) to trigger the vending machine and initiate a vend cycle upon receiving of coins with sufficient value to satisfy the purchase price of the articles or products to be vended, and (3) to pay out in coins any change which may be due to the purchaser as a result of having originally deposited coins with a total value exceeding the purchase price. In this instance, the coin changer is shown in conjunction with a vending machine for dispensing a selected beverage into a cup **33** (FIG. 1) which is dropped into a delivery compartment **34** when the vend cycle is started by inserting the requisite coins into a coin slot **35** and by pushing the desired one of a series of selector buttons **36**. Any change is paid out to the customer through a return chute **37** which also serves to return any coins that are deposited when the vending machine is not functioning properly or is not conditioned to accept additional coins.

The exemplary changer **30** specifically shown herein is of the type commonly referred to as a variable price changer, meaning that the changer may be adjusted by a serviceman to trigger the vending machine **31** when coins are received to satisfy a certain selected sales price within a given range of prices. For example, the present changer may be adjusted selectively to initiate a vend upon the deposit of 10¢, 15¢ or 20¢ and is adapted to receive nickels, dimes and quarters. To simplify the description, it may be assumed throughout that the changer is set up for 10¢ sales so as to trigger the machine upon the receipt of either two nickels or one dime and also to trigger the machine and pay out 15¢ in change upon the receipt of a quarter. Herein, the changer pays out the change in the form of three nickels but, with slight modifications, may be set up to pay out one nickel and one dime.

In its primary aspect, the invention contemplates constructing the changer **30** for the most part as four separate units, namely, a support or casing unit **38** (see FIG. 2), a slug rejector unit **39** and two primary operating units **40** and **41**. The two primary operating units, being separately constructed, are removable individually from the casing as unitary assemblies and may be slipped out of the casing independently of each other to enable separate maintenance, testing and inspection of each operating unit. Servicing of the changer thus is greatly simplified.

The casing unit **38** (see FIGS. 2 and 4) is adapted to be housed within the cabinet of the vending machine and preferably is formed by an upright sheet metal channel of general U-shaped cross-section and having a forwardly facing open side. Fitted removably into the upper portion of the casing **38** is the slug rejector unit **39** which receives the coins deposited into the coin slot **35**, divides the nickels, dimes and quarters for gravitation through the changer along separate paths, and rejects any spurious coins while permitting genuine coins to proceed into the changer to initiate the vend cycle. A normally energized 25¢ CREM (coin return electromagnet) and a normally energized 5¢–10¢ CREM are mounted on the inner wall of the casing behind the rejector unit (see FIG. 3), and include fingers **43** which normally are positioned to permit genuine coins to pass through the changer. If the vending machine **31** is not operating properly or if a vending cycle is in progress, each CREM is de-energized to shift the fingers to positions causing all deposited coins to be returned to the purchaser through the return chute **37**. Also mounted behind the rejector unit is a price selector switch **44** (FIG. 3) which includes a manually adjustable actuator **45** adapted to be slid between and secured in 10¢, 15¢ and 20¢ positions to enable selection and setting of the purchase price necessary to initiate a vend.

Coins allowed to proceed downwardly through the rejector unit **39** pass into the first primary operating unit **40** (FIGS. 2 and 6) which hereinafter will be referred to as the coin path support unit, such unit being fitted into the casing **38** just below the rejector unit. The coin path unit **40** comprises a main supporting plate **47** (FIGS. 4 to 6) formed along its side margins with mounting flanges **49** which are fastened releasably to the casing by screws **50**. Attached to and generally paralleling the main plate are three coin plates **51**, **52** and **53** (FIGS. 6 and 7) which coact with the main plate to define 5¢, 10¢, and 25¢ channels **54**, **55** and **56** for receiving nickels, dimes and quarters, respectively, from the rejector and for guiding the coins downwardly along separate paths according to their denomination. Dimes and quarters leaving their respective channels are directed to a cash box (not shown) through a chute **57** (FIG. 7) while nickels leaving the 5¢ channel pass by the chute and are ultimately used to replenish the supply of change.

As the coins pass through the coin path unit **40**, various electrical signals are produced and are used to initiate the vend and change-making cycles. In this instance, the signals are created by a bank of three coin-responsive switches attached to the main supporting plate **47** and constituting part of the path unit **40**. Each switch includes a wire actuator which is spring-biased to and ordinarily disposed in a normal position to keep its respective switch in a deactuated condition but which is adapted to throw its respective switch to an actuated condition as an incident to being deflected to an operated position by a coin passing downwardly through the path unit. More particularly, a 5–10–25 switch (conveniently labeled 5–10–25 in the drawings) includes a relatively long actuator **60** (see FIG. 6) extending through slots **61** in the plates **47** and **51** to **53** and projecting into each one of the coin channels **54**, **55** and **56** so as to be located in the path of all nickels, dimes and quarters passing downwardly through their respective channels. Thus, each nickel, dime or quarter allowed to proceed through its channel engages the actuator **60** and deflects the latter from its normal position to its operated position to actuate the 5–10–25 switch. After passage of the coin, the actuator springs back to its normal position to deactuate the switch. As long as the changer is set up for 10¢ sales, each actuation of the 5–10–25 switch creates a momentary pulse which serves to start the vending machine **31** through a vend cycle.

When the changer **30** is set up for 10¢ sales, a mechanical flip-flop **63** (FIGS. 2 and 2*a*) is activated by a manual adjustment to direct only every other nickel through the 5¢ channel **54** and into contact with the switch actuator **60** so that the 5–10–25 switch will be actuated to initiate a vend only when two nickels are deposited and will not be actuated if but a single nickel is inserted into the changer. As shown most clearly in FIGS. 2 and 2*a*, the flip-flop is in the form of a lever which is pivoted intermediate its ends on the inner end portion of a screw **64** threaded into the rejector unit **39**, the flip-flop being positioned in the path followed by nickels passing downwardly through the rejector unit. Before each purchase, the flip-flop is disposed in a standby position (see FIG. 2) to be contacted by a first nickel inserted into the changer and to divert such nickel to one side of the switch actuator **60** to prevent the nickel from deflecting the actuator and actuating the 5–10–25 switch. Upon being contacted by the first nickel, the flip-flop is turned about the screw to the position shown in FIG. 2*a* to direct the second nickel inserted into the changer through the 5¢ channel **54** and into contact with the actuator **60** to actuate the switch and initiate a vend. Thus, a vend is started only when two nickels are inserted into the changer to satisfy the 10¢ purchase price. The second nickel contacting the flip-flop turns the latter reversely about the screw to its standby position (FIG. 2) in readiness for the next purchase.

In addition to the 5–10–25 switch, a 10¢ switch (labeled 10¢ in the drawings) is supported on the main plate **47** of the path unit **40** and includes an actuator **65** (see FIG. 6) projecting through slots **66** in the plates **52** and **53** and extending only into the 10¢ channel **55**. As a result, only dimes actuate the 10¢ switch, the actuator **65** being deflected momentarily to its operated position by each dime passing through the channel. As long as the changer is set for 10¢ sales, actuation and deactuation of the 10¢ switch are merely idle functions and are not necessary to the operation of either the changer or the vending machine.

Still another coin-responsive switch attached to the main plate **47** of the path unit **40** is designated as the 25¢ switch (FIG. 6) and includes an actuator **67** positioned to be deflected by quarters only and projecting into the 25¢ channel **56** through a slot **69** formed in the main plate. Each quarter passing through the 25¢ channel actuates the 25¢ switch and, when the changer is set up for 10¢ sales, such actuation produces an electrical signal which is used to initiate the change-making cycle.

The second primary operating unit **41**, hereinafter referred to as the payout unit, is used to physically return the change and is fitted into the casing **38** just below the path unit **40**. Herein, the payout unit **41** includes a lower base **70** (FIG. 5) whose opposite ends are formed with upturned flanges **71** which are attached releasably to the sides of the casing by screws **73**. An upright coin tube **74** for storing nickels to be paid out in change is supported on the base and communicates at its lower end with an opening **75** (FIG. 12) formed in the base. The upper end of the coin tube is slipped loosely and releasably into a semi-cylindrical boss **76** formed in the lower edge portion of the main plate **47**, is partially open, and is located in underlying relation with the 5¢ channel **54** so that nickels proceeding through the channel may drop into the tube to replenish the supply of change. If the tube is full, any additional nickels which are deposited simply overflow into the cash box. The coin tube also may be loaded with nickels by a serviceman through a funnel **77** (FIG. 2) communicating with the upper end of the tube and attached to the front or outer side of the plate **51**. A coin-empty switch **79** (FIG. 12) is supported on the base and includes an actuator **80** which projects into the tube and which ordinarily is held in a normal position by the nickels. When the supply of nickels in the tube runs low, the actuator is permitted to swing to an operated position to actuate the coin-empty switch and de-energize the 25¢ CREM thereby to prevent the changer from accepting further quarters until the nickel supply is replenished.

When it is necessary to pay out change, a payout mechanism in the form of a reciprocating slide **81** (FIGS. 12 and 14) picks up the lowermost nickel in the tube **74** and carries the nickel to a position in which the nickel is dropped into the return chute **37**. The slide and its actuating mechanism form part of the payout unit **41**. As shown in FIG. 12, the slide **81** is a substantially flat member which is guided for back and forth sliding between the lower side of the base **70** and the upper side of a retaining plate **83** attached to and underlying the base. In the normal or pick-up position of the slide (see FIG. 12), a hole **84** formed through the slide registers with the coin tube **74** and with the opening **75** in the base such that the lowermost coin in the tube falls into the hole. With the slide in this position, the hole **84** is offset from a similar hole **85** formed through the retaining plate **83** and thus the nickel is retained in the slide. When the slide is shifted from right to left (FIG. 12) to a pay-out position, the hole **84** registers with the hole **85** to allow the nickel to drop through the latter hole and into the chute **37**. Thereafter, the slide is shifted back to its pick-up position to receive the next nickel from the coin tube.

The coin slide **81** is shifted back and forth between its pick-up and pay-out positions when a small electric motor **86** (FIGS. 12 and 13) is energized over a predetermined interval, such energization occurring initially in response to the electrical signal produced by actuation of the 25¢ switch when the changer is set up for 10¢ sales. The motor is supported on the upper side of a gear box **87** mounted on the base **70** and is operable when energized to rotate in a counterclockwise direction (FIG. 12) the output or drive shaft **89** of reduction gearing housed within the gear box. Fast on and rotatable with the drive shaft is a payout cam **90** which normally holds the coin slide **81** in its pick-up position but which is operable to free the slide for movement to its pay-out position as an incident to rotation of the drive shaft.

As shown in FIG. 12, the periphery of the payout cam **90** includes three angularly spaced lobes **91, 92** and **93** formed with radially extending leading edges and separated by three angularly spaced falls. As long as the motor **86** is de-energized, the lobe **91** engages a roller follower **94** (FIGS. 12 and 14) and holds the slide **81** in its pick-up position, the follower being fastened to and rotatably supported on one end portion of the slide. When the motor is energized to effect counterclockwise rotation of the cam **90**, the lobe **91** rotates past the follower to allow the latter to drop into the adjacent fall and thereby free the slide for retraction to its pay-out position under the urging of a pair of contractile springs **95** which are stretched between the slide and the base **70**. With continued rotation of the cam, successive lobes and falls move past the follower to repeatedly force the slide back to its pick-up position and then to free the slide for shifting to its pay-out position. When the changer is set up for 10¢ sales, the springs and the three lobes shift the slide through three complete back and forth strokes as an incident to a one-revolution operating cycle of the cam so that three nickels are paid out in change.

As pointed out above, actuation of the 25¢ switch by a quarter dropping through the 25¢ channel **56** produces an electrical signal which energizes the payout motor **86** to start the changer **30** through a change-making cycle. Instead of relying on the quarter to physically hold the switch actuator **67** in its operated position so as to keep the 25¢ switch actuated during the entire operating cycle of the motor, the actuator is latched in its operated position independently of the quarter, and the latter is permitted to drop into the cash box immediately after the switch is actuated. In this way, continued contact of the quarter against the actuator **67** is not necessary to keep the 25¢ switch actuated thereby reducing the danger of the quarter hanging up on the actuator and avoiding the need of timing the release of the quarter from the actuator.

While the actuator **67** of the 25¢ switch could be latched in its operated position by a permanent magnet or the like, it herein is latched by a mechanical latch **96** (FIG. 8) which is pivoted on a pin **97** on the main plate **47** of the path unit **40** and which is urged in a counterclockwise direction about the pin by a contractile spring **99** stretched betwen the latch and the main plate. Each time a quarter moves past and deflects the actuator **67**, an extension or tail **100** of the actuator swings from the dotted line position to the full line position shown in FIG. 8 and engages a finger **101** on the latch to cam the latter clockwise about the pin **97** against the urging of the spring **99**. As soon as the tail **100** moves above the finger **101**, the spring **99** swings the latch in a counterclockwise direction so that the finger moves beneath and catches the tail to latch the actuator **67** in its operated position.

Shortly after initial energization of the payout motor **86**, the actuator **67** of the 25¢ switch is unlatched and springs back to its normal position to deactuate the switch, such unlatching being effected by swinging the latch **96** in a clockwise direction (FIG. 8) to move the finger **101** from beneath the tail **100**. After deactuation of the 25¢ switch, energization of the motor through its complete change-making cycle is continued through circuitry to be described below. In some instances, however, the 25¢ switch may fail and stick in its actuated condition or the quarter, because of grease or dirt in the 25¢ channel **56**, may not drop into the cash box but may hang up on the actuator **67** and keep the 25¢ switch actuated. If either of these malfunctions should happen to occur, energization of the motor could continue indefinitely through the actuator 25¢ switch so that the slide **81** would be shifted repeatedly between its pick-up and pay-out positions to pay out all of the nickels in the coin tube **74**. In other words, the changer **30** could "jackpot" and return an excessive number of nickels to the purchaser to the detriment of the owner of the vending machine **31**.

To guard against the changer **30** jackpotting, a so-called anti-jackpot switch AJP (FIG. 6) with a spring-biased actuator **103** is supported on the main plate **47** of the path unit **40** and is adapted to be actuated just shortly after the 25¢ switch actuator **67** is supposed to be unlatched. If the actuator **67** fails to unlatch and the 25¢ switch remains in an actuated condition, actuation of the AJP switch serves to break the circuit to the payout motor **86** through the 25¢ switch and to de-energize the motor immediately to prevent jackpotting. Thus, the changer is "fail-safe" since the AJP switch guards against jackpotting if the 25¢ switch fails to function normally

In carrying out the principles of the present invention, the 25¢ switch actuator **67** is unlatched and the AJP switch is actuated from the payout unit **41** by a single operating member **105** (FIGS. 8 and 14) which is driven by the payout motor **86** and which simply sweeps past the coin path unit **40** not only to unlatch the actuator **67** but also to actuate the AJP switch. By using the single operating member **105** to perform both functions instead of employing one member to unlatch the actuator **67** and another member to actuate the AJP switch, the need for apparatus for synchronizing and timing the movements of two members is eliminated. More importantly, mechanical actuating linkages connected between the payout unit **41** and the path unit **40** are unnecessary since the operating member on the payout unit simply sweeps past the path unit and, as a result, either unit may be removed quickly and easily from the casing independently of the other unit and may be separately serviced, tested and inspected.

Herein, the operating member **105** for unlatching the latch **96** and for actuating the AJP switch is in the form of a generally vertically extending lever arm which is pivoted

intermediate its ends on a pin **106** (FIGS. 12 and 14) attached to and projecting from the forward side of the gear box **87**. Carried on the lower end of the operating arm **105** is a pin-like follower **107** which is pressed against the periphery of a cam **109** by a torsion spring **110** wrapped around the pin **106**, the cam being secured to the drive shaft **89** in side-by-side relation with the payout cam **90** and being formed with a fall **111** into which the follower **107** is disposed when the changer **30** is at rest with the payout motor **86** de-energized. The upper end of the arm is formed with a finger **113** which projects upwardly alongside the main plate **47** of the path unit **40**.

When the payout motor **86** is de-energized, the finger **113** of the operating arm **105** is disposed in a starting position as shown in FIG. 8. Upon initial energization of the motor, the follower **107** rises out of the fall **111** in the cam **109**, and the arm is swung counterclockwise (FIG. 8) about the pin **106** at a relatively rapid rate to cause the finger to sweep through an active stroke from right to left alongside the main plate **47** from its starting position (FIG. 8) to a terminal position (FIG. 11). The finger substantially dwells in its terminal position for a comparatively long interval as the cam **109** continues to rotate and, as the drive shaft **89** completes one revolution, the follower **107** drops into the fall **111** to permit the finger to swing quickly from left to right to its starting position under the urging of the torsion spring **110**.

The latch **96** and the actuator **103** of the AJP switch project into the path of the finger **113** and are positioned to be operated by the finger as the latter sweeps from its starting position to its terminal position. For an advantageous purpose which will become apparent below, a so-called carryover switch CO (FIG. 8) preferably is mounted on the main plate **47** of the path unit **40** and includes a spring-biased actuator **115** which projects into the path of the finger to be moved to an operated position by the finger as the latter moves to its terminal position.

With most of the basic operating elements of the changer **30** having been described, the manner in which the changer operates when set up for 10¢ sales now can be explained. For this purpose, reference is made to FIGS. 15 to 20 which show simplified diagrams of the control circuitry for the payout motor **86**, the circuitry including conventional power lines L1 and L2 for energizing the motor. FIG. 15 shows the condition of the circuit when the changer is at rest with the various switches in their normally deactuated conditions.

When a dime is inserted into the changer **30**, it simply passes through the 10¢ channel **55** and actuates the 5–10–25 switch to create a momentary electrical pulse which is transmitted to the control circuitry of the vending machine **31** to initiate a vend cycle. Since no change is to be made, the payout motor **86** is not energized. The dime also actuates the 10¢ switch but, as pointed out above, such actuation is merely an idle function when the changer is set up for 10¢ sales.

If two nickels are used for the purchase, the first is diverted past the actuator **60** of the 5–10–25 switch by the flip-flop **63**, and the second is directed into the 5¢ channel **54** to actuate the 5–10–25 switch and create a vend pulse. Again, the motor **86** remains de-energized since there is no necessity of making change.

Upon the deposit of a quarter, the 5–10–25 switch is actuated to create a vend pulse and, in addition, the 25¢ switch actuator **67** is deflected to its operated position by the quarter (see FIG. 8) to throw the 25¢ switch from its normally deactuated condition shown in FIG. 15 to its actuated condition shown in FIG. 16. Accordingly, a circuit for energizing the motor **86** is completed through the actuated 25¢ switch and through the deactuated or closed AJP switch. The 25¢ switch actuator **67** is held in its deflected position by the latch **96** and thus the motor continues to run and to turn the drive shaft **89** as the quarter drops into the cash box.

When the drive shaft **89** first starts turning, the operating arm **105** begins swinging from right to left to cause the finger **113** to sweep past the coin path unit **40**. First, the finger **113** engages the actuator **115** of the carryover switch CO (see FIG. 9) to actuate or close that switch as shown schematically in FIG. 17. When first closed, the carryover switch CO is not in the energizing circuit of the motor **86** but simply is conditioned to maintain the circuit when the 25¢ switch is deactuated.

After closure of the carryover switch CO and with continued swinging of the arm **105**, the finger **113** engages and trips the latch **96** (see FIG. 10) to release the 25¢ switch actuator **67**. If the quarter has not hung up on the actuator **67**, the 25¢ switch returns to its deactuated condition shown in FIG. 18, and the energizing circuit for the motor **86** is maintained without interruption through the deactuated 25¢ switch and the closed carryover switch CO. At about the same time the latch **96** is released, the payout slide **81** is shifted through its first payout stroke to deliver the first nickel in change.

Immediately thereafter, the finger **113** swings into engagement with the AJP switch actuator **103** (see FIG. 11) and actuates or opens the AJP switch as shown in FIG. 19. So long as the quarter has not hung up on the 25¢ switch actuator **67** and so long as the 25¢ switch has properly returned to its deactuated condition (FIG. 19), opening of the AJP switch is merely an idle operation since the energizing circuit for the motor **86** is continued through the deactuated 25¢ switch and the closed carryover switch CO. The finger **113** thereafter dwells for a relatively long interval in its terminal position to keep the carryover switch CO closed and the AJP switch open and, during this interval, the remaining two payouts are effected by the slide **81**. Then, as the drive shaft **89** completes one revolution, the follower **107** drops into the fall **111** to enable the spring **110** to return the arm **105** from left to right to its starting position. As the arm returns, the finger **113** first releases the AJP actuator **103** to deactuate and close the AJP switch preparatory to the next operating cycle, and then releases the carryover switch operator **115** to deactuate and open the carryover switch CO and de-energize the motor **86**.

The opening or actuation of the AJP switch by the finger **113** comes into play only if the quarter hangs up on the 25¢ swtch actuator **67** or if some other malfunction prevents deactuation of the 25¢ switch after the finger has released the latch **96**. In such an instance, the energizing circuit for the motor **86** is maintained momentarily through the actuated 25¢ switch and the closed AJP switch as shown in FIG. 17 but, as soon as the AJP switch is opened by the finger (see FIG. 20), the energizing circuit is broken to immediately de-energize the motor and prevent any further payouts so that the changer **30** will not jackpot. With the motor thus de-energized, the finger stops against the AJP actuator **103** and keeps the AJP switch open to prevent the paying out of any change whatsoever until the 25¢ switch actuator **67** is freed or until the 25¢ switch is repaired by the serviceman.

From the foregoing, it will be apparent that the latch **96** holds the 25¢ switch actuator **67** in its operated position independently of the continued presence of the quarter. If the quarter should hang up on the actuator **67**, however, the AJP switch prevents the changer **30** from jackpotting and making multiple payouts. Because the carryover switch CO is actuated to set up a preparatory circuit before the 25¢ switch actuator is unlatched, the unlatching operation need not be critically timed with operation of the AJP switch to insure the maintaining of an energizing circuit to the payout motor **86**.

Since the swinging operating arm **105** serves the three functions of actuating the carryover switch CO, unlatching the 25¢ switch actuator **67** and actuating the AJP switch, additional operating members are not required and do not have to be timed with one another. The use of the single operating arm, together with the provision of the carryover switch CO, enables considerable tolerance

in the timing to promote trouble-free operation and to simplify the number of adjustments which must be made to the changer by a serviceman.

Servicing of the changer **30** is further simplified because the coin path unit **40** and the payout unit **41** may be removed separately from the casing **38** and may be individually repaired and tested. Simply by releasing the screws **73** (and a few other similar screws which are not visible) and by disconnecting the electrical connections to the electrical apparatus on the base **70**, the entire payout unit **41** including the base **70**, the slide **81**, the motor **86**, the gear box **87**, the cams **90** and **109** and the operating arm **105** may be slipped out of the casing as a unitary assembly and without detaching the parts from one another. After making any necessary repairs, the serviceman may test the operation of the payout unit **41** on a test stand and may re-install the payout unit with full assurance that the unit is operating properly. Because the operating arm **105** sweeps freely alongside the coin path support unit **40**, removal of the payout unit **41** from the casing **38** may be effected simply by slipping the arm past the various switch actuators and without the need of disconnecting mechanical linkages between the units **40** and **41**. In addition, no mechanical linkages need be re-connected between the two units and timed with one another when the payout unit is reinstalled. Finally, the coin path unit **40**, including the plates **47** and **51** to **53** and the various switches on the plate **47**, may be removed from the casing **38** as a unitary assembly and independently of the payout unit **41** by disconnecting the electrical connections, releasing the screws **50**, and slipping the switch actuators past the operating arm **105**.

We claim:

1. A coin changer for receiving first coins and for paying out second coins, said changer including an upright casing unit, a rejector unit fitted removably into the upper part of said casing unit for distinguishing between genuine and spurious first coins inserted into the changer and for permitting only genuine coins to proceed through the changer, the improvement in said changer comprising,

(1) a payout unit fitted into the lower part of said casing unit, said payout unit comprising:
  (a) a lower base,
  (b) a payout mechanism supported on said base and operable when actuated to pay out second coins,
  (c) a drive motor on said base connected to said payout mechanism and operable when energized to actuate the payout mechanism,
  (d) a generally upright operator arm drivingly connected to said motor to swing about a generally horizontal axis and to sweep along a predetermined path from a first position to a second position when the motor is energized,

(2) a coin path support unit fitted into said casing unit between said rejector unit and said payout unit, said coin path support unit comprising:
  (a) a supporting plate,
  (b) means on said supporting plate for receiving genuine first coins from the rejector unit and for guiding such coins through the coin path support unit along separate paths determined by the denomination of the coins,
  (c) a bank of switches on said supporting plate for controlling energization of said motor, at least a first of said switches having an actuator positioned to be deflected by a first coin passing through said coin path support unit and at least a second of said switches having an actuator projecting into the path of said operator arm to be deflected by the operator arm as the latter sweeps from said first position to said second position,

(3) means connecting said coin path support unit to said casing unit and detachable to permit independent removal of the coin path support unit from the casing unit by pulling the former unit out of the latter unit while slipping said second switch actuator past said operator arm, and

(4) means connecting said payout unit to said casing unit and detachable to permit independent removal of the payout unit from the casing unit by pulling the former unit out of the latter unit while slipping said operator arm past said second switch actuator.

2. An anti-jackpotting coin changer for receiving first coins and for paying out second coins, said changer including an upright channel-shaped casing unit of generally U-shaped cross-section, a rejector unit fitted removably into the upper part of said casing unit for distinguishing between genuine and spurious first coins inserted into the changer and for permitting only genuine coins to proceed through the changer, the improvement in said changer comprising,

(1) a payout unit fitted into the lower part of said casing unit, said payout unit comprising:
  (a) a lower base,
  (b) a payout mechanism supported on said base and operable when actuated to pay out second coins,
  (c) a drive motor on said base connected to said payout mechanism and operable when energized over a predetermined interval to actuate the payout mechanism,
  (d) a generally upright operator arm drivingly connected to said motor to swing about a generally horizontal axis and to sweep along a predetermined path from a first position to a second position when the motor is energized,

(2) a coin path support unit fitted into said casing unit between said rejector unit and said payout unit, said coin path support unit comprising:
  (a) a supporting plate,
  (b) means on said supporting plate for receiving genuine first coins from the rejector unit and for guiding such coins through the coin path support unit along separate paths determined by the denomination of the coins,
  (c) separate coin, carryover, and anti-jackpot switches mounted on said supporting plate and each having an actuator biased to and ordinarily disposed in a normal position to keep its respective switch in a deactuated condition and movable to an operated position to throw its respective switch to an actuated condition, circuit means for electrically connecting said switches and said motor and operable to energize said motor when (1) said coin switch is actuated and said anti-jackpot switch is deactuated and (2) when said coin switch is deactuated and said carryover switch is actuated, said circuit means being operable to de-energize said motor when both said coin switch and said anti-jackpot switch are actuated, said coin switch actuator being located to be deflected to its operated position by a first coin proceeding through the coin path support unit thereby to actuate said coin switch, means on said support unit for holding the coin switch actuator in its operated position after the first coin has passed by such actuator thereby to keep said coin switch actuated independently of the continued presence of the first coin, said carryover switch actuator projecting into the path of said operator arm to be shifted to and held in its operated position by such arm as the latter sweeps along the path toward its second position, said coin switch actuator being position to be released for return to its normal position after

shifting of said carryover switch actuator and by continued sweeping of said operator arm toward said second position, and said anti-jackpot switch actuator being positioned to be shifted to its actuated position after release of said coin switch actuator and by continued sweeping of said operator toward said second position whereby the arm not only actuates the carryover switch and normally deactuates the coin switch but also actuates the anti-jackpot switch,

(3) means connecting said coin path support unit to said casing unit and detachable to permit independent removal of the coin path support unit from the casing unit by pulling the former unit out of the latter unit while slipping said switch actuators past said operator arm, and

(4) means connecting said payout unit to said casing unit and detachable to permit independent removal of the payout unit from the casing unit by pulling the former unit out of the latter unit while slipping said operator arm past said switch actuators.

3. An anti-jackpotting coin changer for receiving first coins and for paying out second coins; said coin changer including a support; a payout mechanism on said support and operable when actuated to deliver second coins from the changer; a motor on said support and operable when energized over a predetermined interval to actuate said payout mechanism; coin, carryover, and anti-jackpot switches mounted on said support and each having an actuator biased to and ordinarily disposed in a normal position to keep its respective switch in a deactuated condition and movable to an operated position to throw its respective switch to an actuated condition; a first circuit including said coin and anti-jackpot switches and operable to energize said motor only when said coin switch is actuated and when said anti-jackpot switch is deactuated, a second circuit including said coin and carryover switches and operable to energize said motor only when said coin switch is deactuated and when said carryover switch is actuated; said coin switch actuator being located to be deflected to its operated position by a first coin inserted into the changer thereby to actuate said coin switch and to initially energize said motor through said first circuit; means on said support engageable with said coin switch actuator when the latter is deflected and operable to hold the coin switch actuator in its operated position after the first coin has passed by such actuator thereby to keep said coin switch actuated and to maintain initial energization of the motor independently of the continued presence of the first coin; an operator arm drivingly connected to said motor and movable along a predetermined path from a first position to a second position when the motor is energized; said carryover switch actuator projecting into said path to be engaged by said arm and to be moved to and held in its operated position by the arm upon movement of the latter toward said second position thereby to actuate said carryover switch idly preparatory to deactuation of said coin switch; said deflected coin switch actuator being positioned to be returned to its normal position after actuation of said carryover switch and by continued movement of said arm toward said second position so as to deactuate the coin switch to maintain energization of said motor through said second circuit; and said anti-jackpot switch actuator projecting into said path and being positioned to be shifted to its operated position after release of said latch and by continued movement of said arm toward said second position thereby to actuate said anti-jackpot switch and to break said first circuit to de-energize said motor in case the coin switch should fail to deactuate.

4. An anti-jackpotting coin changer for receiving first coins and for paying out second coins; said coin changer including a support; a payout mechanism on said support and operable when actuated to deliver second coins from the changer; a motor on said support and operable when energized over a predetermined interval to actuate said payout mechanism; coin, carryover, and anti-jackpot switches mounted on said support and each having an actuator biased to and ordinarily disposed in a normal position to keep its respective switch in a deactuated condition and movable to an operated position to throw its respective switch to an actuated condition; a first circuit including said coin and anti-jackpot switches and operable to energize said motor only when said coin switch is actuated and when said anti-jackpot switch is deactuated; a second circuit including said coin and carryover switches and operable to energize said motor only when said coin switch is deactuated and when said carryover switch is actuated; said coin switch actuator being located to be deflected to its operated position by a first coin inserted into the changer thereby to actuate said coin switch and to initially energize said motor through said first circuit; a latch on said support engageable with said coin switch actuator when the latter is deflected and operable to hold the coin switch actuator in its operated position after the first coin has passed by such actuator thereby to keep said coin switch actuated and to maintain initial energization of the motor independently of the continued presence of the first coin; an operator arm drivingly connected to said motor and movable along a predetermined path from a first position to a second position when the motor is energized; said carryover switch actuator projecting into said path to be engaged by said arm and to be moved to and held in its operated position by the arm upon movement of the latter toward said second position thereby to actuate said carryover switch idly preparatory to deactuation of said coin switch; said latch being positioned to be released after actuation of said carryover switch and by continued movement of said arm toward said second position so as to free said coin switch actuator for return to its normal position and thereby deactuate the coin switch to maintain energization of said motor through said second circuit; said anti-jackpot switch actuator projecting into said path and being positioned to be shifted to its operated position after release of said latch and by continued movement of said arm toward said second position thereby to actuate said anti-jackpot switch and to break said first circuit as a precautionary measure to de-energize said motor in case the coin switch should fail to deactuate; and said arm being connected to said motor to return to said first position upon continued energization of said motor through said second circuit after actuation of said anti-jackpot switch and acting during such return to (a) free the anti-jackpot switch actuator to return to its normal position to deactuate said anti-jackpot switch and (b) to free the carryover switch actuator to return to its normal position to deactuate said carryover switch and de-energize said motor.

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