Jan. 20, 1970 J. A. BAUER 3,490,571

COIN CHANGER MECHANISM

Filed Nov. 29, 1967 3 Sheets-Sheet 1

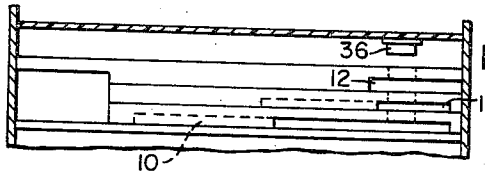


FIG.5.

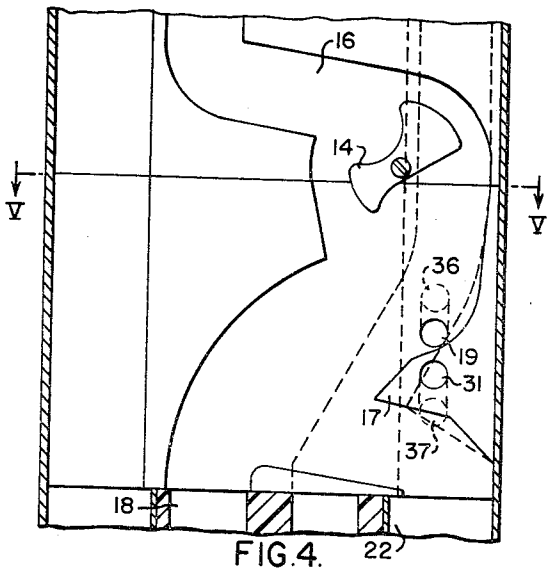


FIG.4.

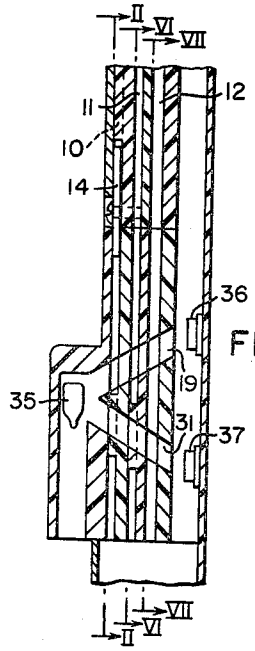


FIG. 1.

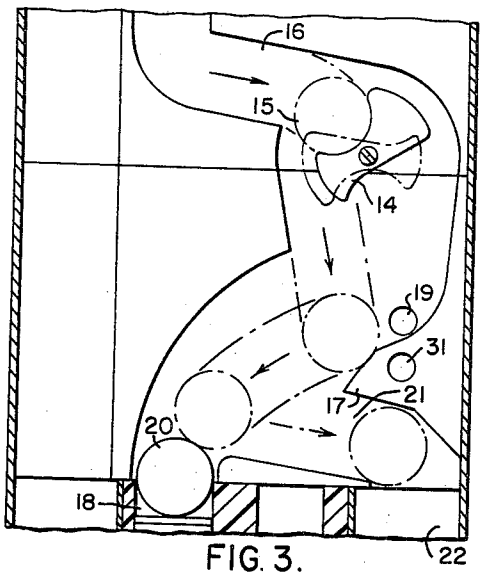


FIG. 3.

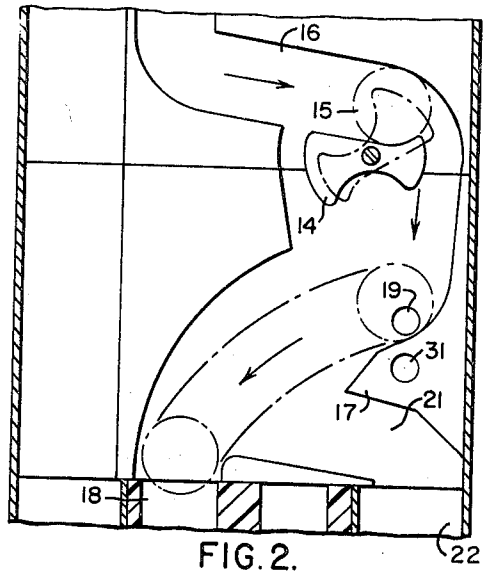


FIG. 2.

WITNESSES:

Bernard R. Giegucz

James H. Young

INVENTOR
James A. Bauer

BY
Edwin E. Baker
ATTORNEY

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COIN CHANGER MECHANISM

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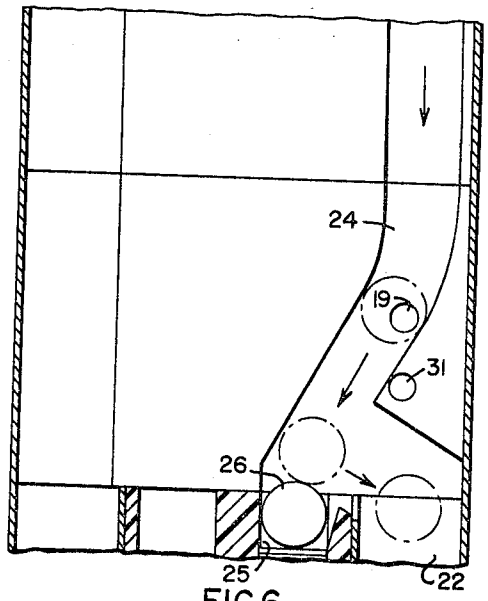


FIG.6.

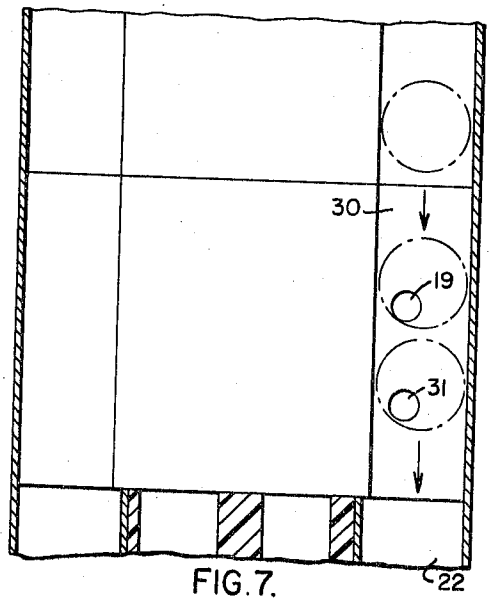


FIG.7.

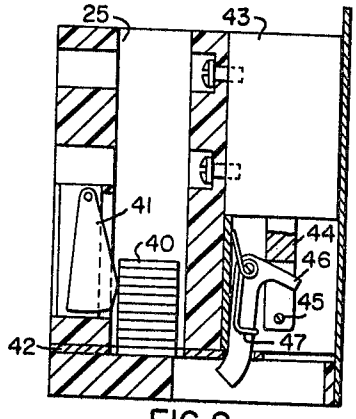


FIG.8.

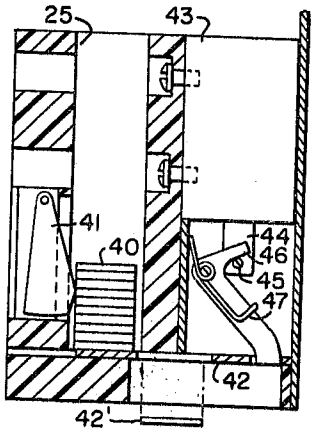


FIG.9.

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COIN CHANGER MECHANISM

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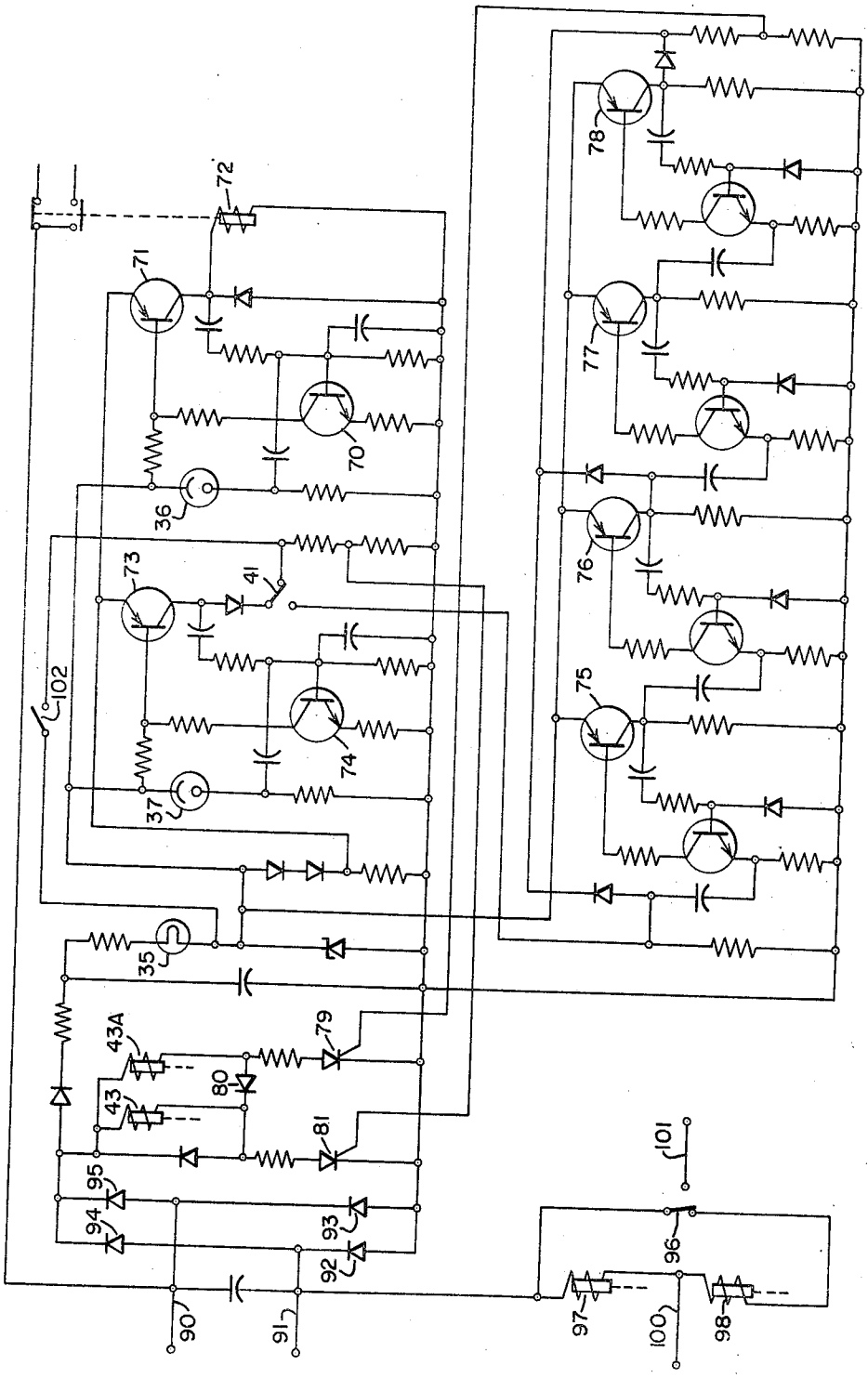


FIG. 10.

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3,490,571

COIN CHANGER MECHANISM

James A. Bauer, Monroeville, Pa., assignor to Westinghouse Electric Corporation, Pittsburgh, Pa., a corporation of Pennsylvania

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Int. Cl. G07f 5/24
U.S. Cl. 194—10 2 Claims

ABSTRACT OF THE DISCLOSURE

A coin responsive vending control and change maker having first and second coin detectors with means to route all coins equal to or above the vend price past the first detector to initiate a vend and to route all coins equal to more than the vend price past both the first and second detectors to initiate a vend and actuate change means to return change coins and further including switch means to cause the change means to return change in a combination of coin denominations or in a single coin denomination if the combination is not available. High speed pulse generating techniques coupled to pulse operated solenoid change coin release mechanisms provide fast response.

CROSS REFERENCES TO RELATED PATENT APPLICATIONS

So far as is known, this application is not related to any co-pending patent applications.

BACKGROUND OF THE INVENTION

Coin controls for vending machines having means for returning change are well known. Most of these devices in practical use at this time are of the electro-mechanical type using coin sensing switches and stepping relays to provide the functions of received coin counting and change making. It is desirable to reduce the size and complexity of these mechanisms and the availability of solid state relays and counting circuits together with new electronic forms of sensing devices enable the design of less complex and more compact arrangements giving increased reliability and faster speed of operation.

PRIOR ART

Reference may be made to U.S. Patents No. 3,307,671 to Shirley issued Mar. 7, 1967, and 3,323,626 to Akira Abe et al. issued June 6, 1967, as typical of the solid state forms of the prior art coin changers. Reference may also be made to U.S. Patent 2,257,132 to Christensen issued Apr. 1, 1941, showing the general use of photocells as coin detectors.

SUMMARY

In accordance with the invention, a vending control and coin changer arranged to vend at a fixed price such as ten cents, and to give change for a quarter is provided using only a single photocell for sensing the collection of every other nickel, the collection of a single dime, or the collection of a single quarter to initiate a vend. A second photocell for sensing the collection of the quarter only is provided to initiate a coin return in the amount of fifteen cents preferentially in the form of a nickel and a dime. If a dime is not available, the change is returned in the form of three nickels. Sensing switches in the coin storage tubes will return to the customer and not collect all quarter coins without a vend if there are insufficient coins in both nickel and dime tubes to make the fifteen cents change in either the all nickel or combination nickel and dime forms. An important feature and advantage of the invention is the elimination of

counting circuits or relays to count the coins received and a simple pulsing circuit is provided to automatically pulse the solenoid operated change release mechanisms. Preferentially, both the nickel and dime tube solenoid release mechanisms are pulsed substantially simultaneously with the pulsing of the vend relay whenever a quarter coin is collected, assuming the presence of sufficient coins in the nickel and dime storage tubes to make change. If there are insufficient dimes, a switch in the dime storage tube will cause the circuit to pulse the nickel change solenoid three times for change payout. If both storage tubes are empty, a quarter coin is not collected and returned without passing either of the photocell sensors to initiate a vend, or to make change, and a no change signal may be displayed. However, the arrangement is such that the changer is still responsive to nickels and dimes for intitiating a vend when such coins are received and such coins are accumulated in storage tubes for future change making operations which will again be possible after sufficient numbers of coins are in the storage tubes to actuate the coin tube switches for conditioning the change making functions of the system. Although this invention is particularly described in connection with a photoelectric type of coin sensing arrangement using a single light source and two photocells, certain features of the invention as will be apparent hereinafter are usable with other types of coin sensing devices such as pick-up coils or the like. Further features and advantages of the invention will be apparent with reference to the following specifications and drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGURE 1 is a cross sectional side view through the lower end of the coin slug rejector and the coin director passages of the invention with the light source and photocell detectors shown in the preferred arrangement;

FIGS. 2, 3 and 4 are sectional views on the line II—II of FIGURE 1 showing the paths of passage for alternate successively collected nickels;

FIG. 5 is a sectional view as seen from above on the line V—V of FIGURE 4 showing the different vertical planes of the coin director paths for different denomination coins to be collected;

FIG. 6 is a view similar to FIGURE 2 but taken on line VI—VI of FIGURE 1 to show the coin director path for the dime coin to be collected;

FIG. 7 is a view similar to FIGURE 6 but taken on the line VII—VII of FIGURE 1 to show the coin director path for the quarter coin to be collected;

FIG. 8 is a detailed fragmentary vertical section of one of the coin storage tubes showing the details of the solenoid operated coin payout change mechanism;

FIG. 9 is a view similar to FIGURE 8 but showing the solenoid of the change making mechanism in the energized position as a change coin is being released; and

FIG. 10 is a schematic wiring diagram of the vending control and coin changer circuit of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Reference will now be made to FIGURES 1 through 7 of the drawings for a description of the details of the coin sensing apparatus of the invention. The coin sensing apparatus of the invention is designed to match the lower end of a standard form of slug rejector commonly in use at this time. An example of such a slug rejector is the slug rejector made by the National Rejectors Co. of St. Louis, Mo. identified as their Model No. 1-15-054. As is well known in the art, these slug rejectors are necessary to sort the nickel, dime and quarter coin and to separate and reject all counterfeit coins or slugs. The

sorted coins are passed from the bottom of the slug rejector in three different respective vertical planes for the respective different coins, i.e. nickels, dimes and quarters. As seen more particularly in FIGURES 1 and 5 of the drawings, the nickel coins passed by the slug rejector are dropped in the vertical plane **10** towards the front of the rejector while the dime coins are passed in the vertical plane **11** rearwardly of the vertical plane **10** and the quarter coins are passed in the vertical plane **12** furthest to the rear of the slug rejector. The nickels passing through the vertical plane **10** are caused to engage the flip-flop mechanism **14** which is a standard feature of all slug rejectors and in passing the flip-flop **14** alternate successive nickels are passed in two alternately different directions. It is assumed that the flip-flop **14** at the start of a coin collection operation is in the position shown by FIGURES 1 and 3 of the drawings. The first nickel **15** in passing through the passage **16** pivots the flip-flop **14** from the position shown in FIGURE 3 to the position shown in FIGURE 4 and moves downwardly to hit the shoulder **17** of the coin director and bounce into the nickel storage tube **18** without passing the photocell coin detecting aperture **19**. The second nickel received then engages the flip-flop **14** in the position shown by FIGURE 2 of the drawings and follows the second path to pass the coin sensing photocell aperture **19** before being deflected by the shoulder **17** into the nickel receiving tube **18**. When the coin nickels accumulated in the storage tube **18** are sufficient to substantially fill the storage tube as shown by FIGURE 3 of the drawings, a nickel such as the nickel **20** will remain in the position shown so that a subsequent nickel received will be deflected from the change making storage collection tube **18** through the passage **21** to the passage **22** leading to the money box.

When a dime coin is deposited, it is routed by the slug rejector into the vertical passage **11** and into the coin director passage **24** shown by FIGURE 6 of the drawings past the photocell coin sensing aperture **19** into the dime storage tube **25** of the change maker and when the level of accumulated dimes reaches near the top of the storage tube the next received dime such as the dime **26** will assume the vertical position shown so that a subsequently received dime will be deflected thereby into the passage **22** leading to the money box.

As shown by FIGURE 7 of the drawings, any quarter coin passed by the slug rejector through passage **12** will also pass into the passage **30** of the coin director of the invention to be passed in front of the coin sensing photocell aperture **19** and also the coin sensing photocell aperture **31** directly to the passage **22** leading to to the money box.

The details of the coin sensing photocell and light arrangement are most clearly shown by FIGURE 1 of the drawings with the light source **35** positioned to direct beams of light through both the apertures **19** and **31** to impinge upon the respective photocell detecting elements **36** and **37**. Thus the photocells **36** and **37** are illuminated except when a coin **15** passing through a respective coin director passage and momentarily intercepts the light through either the apertures **19** and **31**. Summarizing the description of the invention thus far, it will be seen that coin director apparatus has been provided to route different denomination coins in different paths past either one of the apertures **19** and **31** for the coin sensing photocells **36** and **37** respectively. In such manner, every other nickel collected intercepts the beam of light in the aperture **19** impinging on the photocell **36** while every dime collected also intercepts the beam of light in the aperture **19** the same as every quarter collected intercepts the light in the aperture **19** impinging on the photocell **36**. Thus when any coin equal to or above a vend price of ten cents is collected a beam of light impinging upon the photocell **36** is momentarily interrupted to trigger the control circuit of the invention to initiate a vend signal to the vending machine. In addition whenever a quarter coin is collected, it passes in the passage **30** to intercept the beam of light through both the apertures **19** and **31** so that in addition to triggering the photocell **36**, the photocell **37** is triggered when the light beam impinging thereon is momentarily interrupted by the passage of the quarter coin in front of the aperture **31**. The signal from the photocell **37**, due to the momentary interruption of light thereupon, is connected to the control circuit of the invention to initiate the return of change in the amount of fifteen cents in a manner to be later described in more detail.

Referring now to FIGURES 8 and 9 of the drawings, the details of the lower end of one of the change making coin collection storage tubes such as the dime storage tube **25** are shown and will be described. A stack of dimes **40** is shown to be supported in the lower end of the storage tube **25** in sufficient amount to keep the spring pressed switch **41** in the position shown. As long as the switch **41** is in the position shown, the control circuit of the invention to be later described is conditioned to pay out coin change in the form of a nickel and a dime but should the reservoir of dimes in the storage tube **25** be less than that shown, the switch **41** will move inwardly of the storage tube and will signal the control circuit of the invention to return the change in the form of three nickels. The nickel storage tube for change coins is not shown in detail but is similar to that of the dime tube shown by FIGURES 8 and 9 of the drawings and is also provided with a sensing switch such as the switch **41** for the dime storage tube to be switched when there are insufficient nickels in the nickel storage tube for making fifteen cents change and this switch will cause the control circuit of the invention to return any quarter without change and to also have displayed an exact change sign so that the customer will not attempt to secure a vend by depositing a quarter coin.

The lower end of each storage tube such as the dime storage tube **25** is provided with a slide **42** having an aperture in which the lowermost dime in the stack of dimes **40** is received. An electric solenoid **43** has an armature **44** with a pin **45** adapted to strike the toggle **46** and move the slide **42** to the right of the drawing to the position shown by FIGURE 9 of the drawings when the solenoid **43** is energized. Thus the lowermost dime **42** in the stack of dimes **40** is dropped as shown to the change payout passage of the vending machine. It should be noted that the pin **45** of the armature **44** of the solenoid **43** does not engage the toggle **46** until near the end of its energized stroke so that a hammer action for desirable fast movement of the toggle **46** and coin slide **42** is obtained with a minimum of power required for energizing the solenoid coin. At the end of the pulse of electric energy applied to the solenoid **43** the spring **47** returns the coin slide **42** back to the position shown by FIGURE 8 of the drawings so that the then lowermost dime in the stack of dimes **40** may be received in the aperture of the coin slide **42**. The arrangement of solenoid coin release mechanism for the nickel storage tube **18** is exactly the same as the slide for the dime storage tube just described except for the size of the coin receiving aperture in the coin slide at the bottom of the storage tube.

Referring now to FIGURE 10 of the drawings, the control circuit of the invention will be described. All of the circuit elements will not be discussed in detail since it is believed that their function and nature is obvious to anyone skilled in the art. The photocell **36** for initiating the vend is connected to the circuit including the transistors **70** and **71** to the vend relay **72** of the vending machine in a manner to energize the vend relay **72** upon momentary interruption of light from the light source **35** upon the photocell **36** whenever coin is collected in the amount equal to or above the vend price. The change making photocell **37** is connected in a circuit including the transistors **73** and **74** together with the dime storage tube switch **41** in the position shown to pulse simultaneously

both the dime change solenoid **43** and the nickel change solenoid **43A** to return one dime and one nickel each time a quarter coin is collected and passed to intercept the light from the light source **35** upon the photocell **37**. If there are insufficient dimes in the dime storage tube **25**, the switch **41** will be switched from the position shown to connect the change making signal from transistor **73** to the pulsing circuit including transistor **75–78** for connecting a series of three pulses through the transistor **79** to pulse the nickel payout solenoid **43A** three times. The diode **80** prevents the dime change solenoid **43** from being pulsed simultaneously with the nickel solenoid **43A** when the pulsing signals are received through transistor **79**. However as previously described when the dime storage tube switch **41** is in the position shown by the drawings, the single pulse signal is connected through transistor **81** and diode **80** to simultaneously pulse both the dime solenoid **43** and the nickel solenoid **43A** one time. The source of operating current for all of the circuit elements of the control circuit is a conventional source of alternating current applied to lines **90** and **91** and to the rectifying circuit including the rectifiers **92–95**. A switch **96** in the nickel change storage tube **18** similar to switch **41** in the dime storage tube **25** is provided to control the operation of the coin reject solenoids **97** and **98**. Solenoid **97** when energized will allow nickel and dime coins to be collected while solenoid **98** when energized will allow twenty-five cent coins to be collected. With the nickel storage tube switch **96** in the position shown both the solenoids **97** and **98** are energized from a source of alternating curent through line **100** and the normally closed vending machine empty switch (not shown) so that all coins deposited can be collected. If the vending machine is empty, the source of alternating current in the line **100** will be interrupted by the vending machine empty switch so that neither solenoid **97** and **98** will be energized and all coins deposited will be returned to the customer. If there are insufficient nickels in the nickel storage tube **18** to enable the payout of three nickels in change, the switch **96** will be moved from the position shown so that the coin return solenoid **98** will not be energized and all quarter coins will be returned to the customer. At the same time, electric current will be connected to the line **101** to energize the exact change signal sign (not shown). The switch **102** is a manual push button switch within the mechanism to enable a service man to pulse the change payout solenoids **43** and **43A** for test purposes.

It is believed that the features and advantages together with that operation of the invention should now be apparent considering the foregoing description. It should be understood that other sensing devices may be used in place of the photocells **36** and **37** to actuate the pulsing and signaling circuit of FIGURE 10 in the manner described and such circuit changes as would be required for different electrical forms of sensing elements would be obvious to anyone skilled in the art. Various modifications may be made within the spirit of the invention.

I claim as my invention:

1. A coin responsive vending control system adapted to provide a vending control signal upon receipt of at least ten cents in coin and to give change upon receipt of twenty five cents in coin comprising, only first and second coin detectors, first coin passage means for passing a deposited dime coin past only said first detector to actuate said first detector, second coin passage means for passing a deposited quarter coin past both said first and second detectors to actuate both said detectors, third coin passage means for passing every other one only of a deposited nickel coin past only said first detector to actuate said first detector, means responsive to the actuation of said first detector to produce a vending control signal, a first coin storage receptacle for collecting dime coins from said first coin passage, a second coin storage receptacle for collecting nickel coins from said third coin passage, change making means, means responsive to the actuation of said second detector to operate said change making means to discharge one coin respectively from each of said first and second coin receptacles, said first coin receptacle having a switch to be actuated whenever there is less than a desired number of dime coins therein, the actuation of said switch being responsive to control the operation of said change making means to prevent the discharge of one dime coin from said first receptacle and to cause three nickel coins to be discharged from said second receptacle when said change making means is operated while said switch is actuated.

2. The invention of claim **1** in which said change making means includes a first pulse generating means and a second pulse generating means, said first and second coin receptacles having solenoid operated coin discharge means connected to said first pulse generating means to be simultaneously operated to discharge a coin from each receptacle for each pulse generated by the first pulse generating means, the operation of said change making means by the actuation of said second detector being normally effective to cause said first pulse generating means to generate one pulse, the operation of said change making means by the actuation of said second detector while said switch is actuated being effective to prevent said first pulse generating means from generating a pulse and to cause said second pulse generating means to generate three pulses in rapid succession, and means connecting said second pulse generator to the discharge means of said second coin receptacle only to thereby pulse three times the coin discharge means of the second coin receptacle only for a change making operation while said switch is actuated.

References Cited

UNITED STATES PATENTS

957,135	5/1910	Asbury	194—1
3,175,670	3/1965	Offutt et al.	194—10
2,237,132	4/1941	Christensen.	
2,571,596	10/1951	Meredith et al.	194—10
2,876,883	3/1959	Baker et al.	194—10
3,086,536	4/1963	Klopp.	
3,200,828	8/1965	Offutt et al.	194—10 X
3,335,838	8/1967	Schuller et al.	194—10

SAMUEL F. COLEMAN, Primary Examiner