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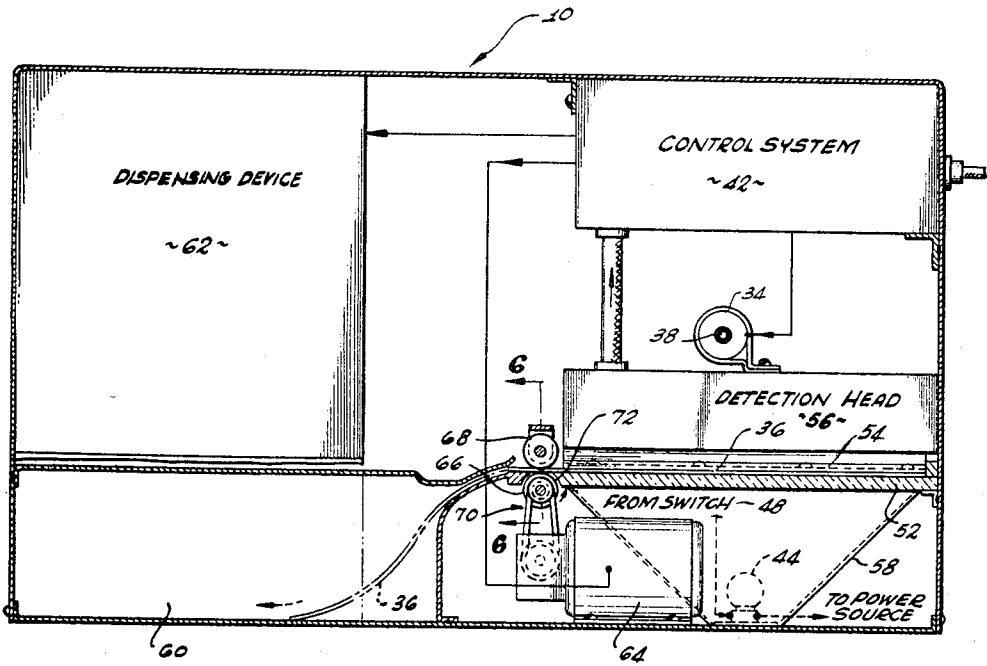
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BILL ACCEPTANCE AND DETECTION SYSTEM

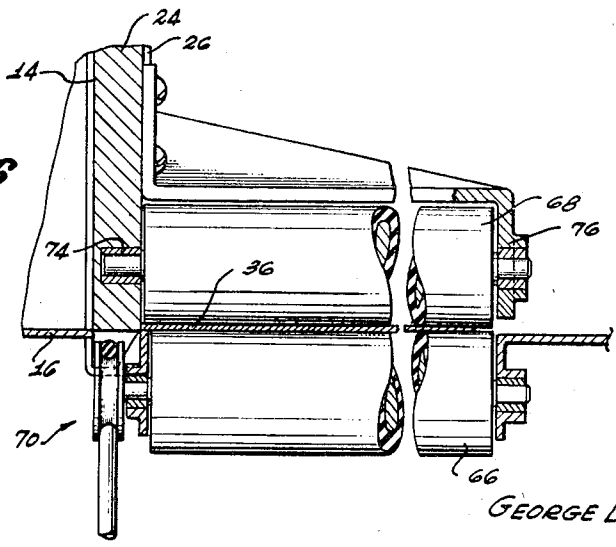
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*Fig. 5*



*Fig. 6*



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**BILL ACCEPTANCE AND DETECTION SYSTEM**

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11 Claims. (Cl. 209—111.7)

This invention relates generally to systems of the type used for controlling dispensing apparatus to make change and/or dispense merchandise for paper currency. More particularly, the invention relates to a new and improved bill acceptance and detection unit for receiving and evaluating the authenticity of paper money of a pre-selected denomination.

Due to the relatively high costs of sales personnel, merchandising through vending machines has, in recent years, taken on increasing significance as a sales medium. To accommodate users of such vending machines, a number of coin changing devices have been developed which either make change for a larger coin or, in conjunction with a suitable dispensing mechanism, issue selected merchandise along with an amount in change equal to the difference between the price of the merchandise and the coin inserted into the machine.

In order to extend the versatility and utility of dispensing machines to higher priced merchandise, a need has arisen for devices capable of changing paper money or dispensing merchandise and change for paper money. In devices of this type which have theretofore been produced, a bill is placed in a special tray which is adapted to slide into a detection unit for testing the bill to determine whether or not it is authentic. Such testing may be effected either photoelectrically or electromagnetically by methods well known in the art.

A mechanism capable of making change and/or dispensing merchandise is coupled to the detection unit and, if the bill placed in the sliding tray is accepted as authentic, change and/or merchandise is dispensed therefor. If the detection unit indicates that the bill is not authentic, the bill is not accepted, but rather is returned to the consumer.

In view of the ever-increasing need for devices capable of dispensing merchandise and/or making change for paper currency, a considerable amount of time, expense, and effort has been devoted to the development of improved devices for performing such functions.

Accordingly, it is an object of this invention to provide a new and improved bill acceptance and detection system which is compact, reliable, and relatively inexpensive to manufacture.

Another object is to provide a new and improved bill acceptance and detection unit which is rugged, reliable, and of relatively simple construction requiring a minimum of parts.

A further object of the invention is the provision of a new and improved bill acceptance and detection device which obviates the need for sliding trays or the like for receiving bills to be tested.

The above and other objects and advantages of this invention will be better understood by reference to the following detailed description, when considered in connection with the accompanying drawings of an illustrative embodiment thereof, and wherein:

FIGURE 1 is a perspective view of a device embodying

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the improved bill acceptance and detection unit of the present invention in combination with an appropriate device for dispensing merchandise and/or change;

FIGURE 2 is a left-side elevational view of the apparatus of FIGURE 1, portions of the external housing and internal components being broken away, and illustrating the device prior to insertion therein of a bill to be tested;

FIGURE 3 is a fragmentary sectional view, similar to FIGURE 2, and illustrates the device after insertion of a bill and during test by the detection unit;

FIGURE 4 is an enlarged, fragmentary sectional view of the area 4 in FIGURE 3, and illustrates the manner in which the detection unit is activated following insertion of a bill to be tested;

FIGURE 5 is a front elevational view of the apparatus in FIGURE 1, portions of the housing and internal components being in section; and

FIGURE 6 is an enlarged sectional view, taken along the line 6—6 in FIGURE 5, and illustrating the mechanism for stripping an authentic bill from the detection unit.

Referring now to the drawings, and particularly to FIGURE 1 thereof, a combined bill acceptance, detection and dispensing apparatus 10 includes an external housing 12 of steel or any other structural material suitable for resisting and discouraging tampering with the device by unauthorized personnel.

The housing 12 includes a vertically disposed front panel 14 and a horizontal platform surface 16 extending to the base of the panel. All of the components of the bill detection system are contained within the housing 12 behind the panel 14, and a bill must be moved past the panel 14 into proper alignment with the detection system before the bill can be tested. To this end, the base of the panel 14, adjacent the surface 16, is provided with a horizontal slot 18 through which a bill can be inserted. Insertion is accomplished by resting the bill upon the surface 16 and sliding it manually along the surface, towards the panel 14 and through the slot 18. To aid in guiding the bill through the slot 18, a pair of bill guides 20 are affixed to the surface 16, and the panel 14 is also provided with an oval cut-out 22 to insure adequate clearance for the fingers of one hand during placement of the bill in the detection unit.

Although the illustrated embodiment of the apparatus 10 is a configuration wherein the surface 16 is embodied into the same construction as the acceptance and detection unit of the present invention, the invention is not to be construed as being so limited, and the surface 16 may be separately provided at the site where the acceptance and detection unit is eventually used.

Referring now additionally to FIGURES 2 and 3, a vertically disposed slide plate or door 24 is supported behind and immediately adjacent the front panel 14, the opposite ends of the slide plate being carried in a pair of channel members 26, so that the plate is capable of sliding movement relative to the panel. The slide plate 24 carries a handle 28 which extends through a vertical clearance slot 30 in the panel 14, so that the slide plate can be removed via the handle from the opposite side of the panel. The slide plate 24 is biased to its normally raised position shown in FIGURE 2 by a return spring 32 coupled to the inside end of the handle 28 or to any other convenient portion of the slide plate structure. When the slide plate 24 is moved to its lowered position shown in FIGURE 3, the slide plate overlies the slot 18

and opening 22 in panel 14, thus denying access to the detection unit.

A solenoid 34 is mounted within the housing 12 behind the slide plate 24, and this solenoid is adapted to lock the slide plate in its lowered position, after insertion of a bill 36 to be tested and manual lowering of the slide plate via movement of the handle 28 by the consumer. As will be apparent in FIGURES 2 and 3, the solenoid 34 has a normally extended solenoid plunger 38 which is biased against the rear surface of the slide plate 24 when the plate is in the raised position of FIGURE 2. The slide plate 24 is provided with a hole or recess 40 extending into the plate from its rear face. The recess 40 is in vertical alignment with the solenoid plunger 38, and its central axis is spaced above the central axis of the plunger a distance equal to the travel of the plate between its raised and lowered positions. When the slide plate 28 is moved to the lowered position of FIGURE 3, the solenoid plunger 38 engages the recess 40 and thereby locks the plate in the down position. Hence, the solenoid plunger 38 and recess 40 essentially provide a detent mechanism for locking the slide plate 24 and thereby closing off the openings 18 and 22 in the panel 14 after a bill has been inserted into the detection unit.

After the bill 36 has been appropriately tested and processed, i.e., as by removal of an authentic bill or rejection of an unacceptable bill, the solenoid 34 is momentarily energized by a signal from a control system 42 (see FIGURES 2 and 5). Energization of the solenoid 34 causes the plunger 38 to retract from the recess 40 and thereby release the slide plate 24 so that the spring 32 can return the slide plate to its normally raised position. This clears the openings 18, 22 in the panel 14, and enables the consumer to either remove a rejected bill or insert another bill if the previous bill has been accepted and deposited by the apparatus 10.

As will be apparent in FIGURE 4, lowering of the slide plate 24 not only closes the openings 18, 22, but also completes an electrical circuit between a source of electrical power and a light source 44 (see FIGURES 2 and 5) which is used in photoelectrically testing the bill 36 after it has been inserted into the detection unit. To accomplish this energization of the light source 44, an electrical switch 46, having a pushbutton actuator 48, is mounted so that the pushbutton will be depressed by the lower end of the slide plate 24 when the plate is moved to its lowermost position shown in FIGURES 3 and 4.

It will also be observed in FIGURE 4 that the rear face of the slide plate 24, near the lower end thereof, is provided with a bevel face 50. If the bill 36 has not been fully inserted into the detection unit behind the panel 14, the bevel face 50 tends to drive the bill to a fully inserted position when the slide plate 24 is lowered.

Referring now more particularly to FIGURES 2, 5 and 6, the operation of the system following insertion of the bill 36 is next described. After insertion of the bill 36 through the insert slot 18 in the panel 14, the bill rests upon a transparent or translucent plate 52 which is mounted within the housing 12 so that its upper surface is in the same horizontal plane as the platform surface 16. The depth of insertion of the bill 36 is limited by a suitable stop member 54 projecting above the plate 52, so that abutment of the leading edge of the bill with the stop will automatically assure proper alignment of the bill with a detection head 56 supported within the housing above the plate 52.

The light source 44 is supported below the plate 52 within a suitable enclosure 48 for directing light through the plate 52. As previously indicated, the light source 44 is energized only when the slide plate 24 has been moved to its lowermost position and, hence, access to the bill 36 while it is being tested is effectively prevented. The light passing through the plate 52 illuminates the bill 36 and passes through the bill with an intensity pat-

tern duplicating the printed pattern upon the bill being tested.

The detection head 56 preferably comprises an array of photoelectric cells or the like arranged to read selected portions of the light pattern emanating from the bill 36, so that the pattern may be electronically evaluated with respect to the proper pattern for an authentic bill of selected denomination. In this respect, it will be apparent that the photoelectric cell array may be periodically altered to make the system less susceptible to paying out for counterfeit bills. Moreover, different arrays may be used for bills of different denomination, so that each individual unit 10 is capable of being customized to receive and evaluate bills of any single selected denomination. These same units may be subsequently modified for use with bills of a different denomination.

The electrical output from the detection head 56 is directed as an input to the control system 42. If the bill 36 is authentic, the control system energizes appropriate stripping means for removing the bill 36 from beneath the detection head 56 and depositing the bill in a suitable money box 60. The control system 42 also provides, upon receipt of an authentic bill, a command signal output which is directed to a dispensing device 62, to cause the latter to dispense merchandise and/or pay out change through an appropriate chute 63 shown in FIGURE 1.

After the bill 36 has been stripped from beneath the detection head 56, the control system 42 generates a signal for momentarily energizing the solenoid 34, so that the slide plate 24 is unlocked and returned to its normally raised position in FIGURE 2. If the bill 36 is not authentic, the control system 42 does not energize stripping means or the dispensing device, but rather merely energizes the solenoid 34. In this latter instance, when the slide plate 24 is raised, the consumer can remove the rejected bill and insert a new one.

The stripping means for removing an authentic bill includes a stripper motor 64 which drives a pair of resilient stripping rollers 66, 68 through a conventional pulley and drive belt arrangement 70 or the like. The lower roller 66 is a driving roller journaled for rotation below the plate 52, and adapted to engage the underside of the bill 36 through a clearance opening 72 in the plate 52. The upper roller 68 is an idler roller carried by the slide plate 24, one end of the roller being journaled in the plate itself at 74 with the other end journaled in a suitable bracket 76 mounted upon the plate 24. Hence, when the slide plate 24 is lowered, the idler roller 68 engages the upper face of the bill 36 and pinches the bill between the idler roller and the driving roller 66. Therefore, when the stripper motor 64 is energized by the control system 42, the rollers 66 and 68 both rotate to strip the bill 36 from beneath the detection head 56.

It will be apparent from the foregoing that, while a particular form of my invention has been illustrated and described, various modifications can be made without departing from the spirit and scope of my invention. Accordingly, I do not intend that my invention be limited, except as by the appended claims.

I claim:

1. A bill acceptance and detection device, comprising: a bill detection system including a detection head and a control system;
- a housing enclosing said bill detection system, said housing having a panel member, said panel member having a slot through which a bill to be tested may be inserted to place the bill within the detection head, said panel member also having a clearance opening adjacent said slot, said opening being of sufficient size to permit the fingers of a hand to be inserted therethrough in placing a bill in proper alignment with said detection head;
- movable means within said housing adjacent said slot and said opening having a portion accessible from outside said housing, said movable means being se-

lectively operable from outside said housing to a position overlying said slot and said opening and thereby denying access to said detection head;

locking means for locking said movable means in the position overlying said slot and said opening;

and means under the control of said detection system for releasing said locking means.

2. A device as set forth in claim 1, wherein said clearance opening communicates with said slot.

3. A device for receiving and evaluating paper money of prescribed denomination, comprising:

a bill detection system including a detection head and a control system;

an enclosure about said bill detection system, said enclosure having a front panel member, said panel member having an opening through which a bill may be inserted and placed in alignment with said detection head;

movable means within said enclosure and adjacent said opening having a portion accessible from outside said enclosure, said movable means being operable from outside said enclosure from an open position to a closed position overlying said opening in said panel member;

locking means for locking said movable means in a closed position;

means responsive to closing of said movable means to activate said detection system;

and means responsive to said detection system for releasing said locking means.

4. A device as set forth in claim 3, including additional means for biasing said movable means to a normally open position.

5. In a bill acceptance and detection apparatus, the combination comprising:

a bill detection station;

a bill detection system including a detection head juxtaposed to said detection station;

a housing enclosing said detection station and said detection system, said housing having a front panel member, said panel member having an opening of sufficient size to permit a bill and a portion of a hand to be inserted therethrough in aligning the bill at said detection station;

sliding means within said housing adjacent said panel member, said sliding means being selectively operable from outside said housing from a normally open first position to a second position overlying said opening;

locking means for automatically locking said sliding means when said sliding means is brought to its second position;

electrical switching means conditioned by said sliding means in its second position to activate said detection system;

and means responsive to said detection system for releasing said locking means.

6. A device as set forth in claim 5 wherein said locking means is solenoid actuated.

7. A bill acceptance and detection device, comprising:

a bill detection station, said station including a substantially planar surface for supporting a bill under test;

a bill detection system including a control system and a detection head for examining bills upon said planar surface;

a housing enclosing said detection station and said detection system, said housing having a front panel member, said panel member having a slot through which a bill to be tested may be inserted, said slot being in substantial alignment with said planar surface, said panel member also having a clearance opening of sufficient size to permit a portion of a hand to be inserted therethrough in aligning said bill at said detection station;

bill guiding means adjacent said slot to aid in proper insertion of a bill through said slot;

a slide plate within said housing and adapted to slide relative to said panel member, said slide plate being selectively operable from outside said housing from a normally open position to a closed position overlying said slot and said clearance opening, said slide plate having a recess in one face thereof;

means for spring biasing said slide plate to its normally open position;

a solenoid plunger biased against said slide plate and adapted to engage said recess when said slide plate overlies said slot and said opening, whereby said slide plate is automatically locked in its closed position;

electrical switching means conditioned by said slide plate in its closed position to activate said detection system;

and means responsive to said detection system for retracting said solenoid plunger from said recess, whereby said slide plate is returned to its normally open position.

8. A device as set forth in claim 7, including stripping means responsive to detection of an authentic bill by said detection system to strip said bill from said planar surface.

9. A device as set forth in claim 8, wherein a portion of said stripping means is carried upon said slide plate.

10. A device as set forth in claim 7, including means for biasing a bill to a properly inserted position at said detection station as said slide plate is moved to its position overlying said slot and said opening.

11. In a bill acceptance and detection system, the combination comprising:

a bill detection station, said station including a substantially horizontal and light pervious surface for supporting a bill under test;

a photoelectric bill detection system in juxtaposition to said planar surface to examine and evaluate a bill upon said surface;

a housing enclosing said detection station and said detection system, said housing having a substantially vertical front panel member, said panel member having a substantially horizontal slot in alignment with said planar surface and through which a bill to be tested may be inserted, said panel member also having a larger opening communicating with said slot, said opening being of sufficient size to permit a portion of one hand to be inserted therethrough in aligning a bill at said detection station;

a substantially planar surface outside said housing in alignment with said slot and said horizontal surface at said detection station;

bill guiding means carried upon said planar surface to aid in properly inserting a bill through said slot;

a slide plate adjacent said panel member within said housing and adapted to move relative to said panel member, said slide plate having a recess in one face thereof;

handle means secured to said slide plate and extending through said panel member for selectively operating said slide plate from outside said housing from an open position to a closed position overlying both said slot and said opening;

means for spring biasing said slide plate to its open position;

means for biasing a bill to be tested into said housing as said slide plate is moved to its closed position;

a normally extended solenoid plunger biased against the face of said slide plate having said recess, said plunger being adapted to engage said recess when said slide plate overlies said slot and said opening, whereby said slide plate is automatically locked in its closed position;

electrical switching means conditioned by said slide

plate in its closed position to activate said detection system;  
 stripping means within said housing for removing and depositing a tested bill in response to a favorable evaluation of said bill by said detection system;  
 and means responsive to both removal of a bill by said stripping means or an unfavorable evaluation by said detection means to retract said solenoid plunger from said recess in said slide plate, whereby said slide plate is automatically returned to its normally open position.

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