United States Patent [19]

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[54] DOCUMENT REMOVAL AND REINSERTION DETECTOR

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[11] **3,913,087**

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[57] ABSTRACT

A detector for providing a visual indication when a document, such as a currency instrument or bill, is removed from a slotted receptacle and thereafter reinserted in an effort to avoid discovery that the currency was temporarily withdrawn from the receptacle. Also included is a microswitch, not visible exteriorly of the currency withdrawal and reinsertion detector, for triggering a remote alarm upon removal of currency from the receptacle.

9 Claims, 7 Drawing Figures



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DOCUMENT REMOVAL AND REINSERTION DETECTOR

This invention relates to document removal detection, and more particularly to an apparatus and method for detecting and indicating unauthorized resinsertion of a document temporarily removed from its normal position in a slotted receptacle.

It has been common practice in the banking field to rency of different denominations, with alarm devices which, in the event of a holdup, sense removal of the currency and in response thereto trigger a remote alarm such as a flashing light, siren or the like. These currency withdrawal sensors of these alarm devices, often termed "money clips," operate on a variety of principles including photoelectric, mechanical, electrical and the like. Illustrative of such currency withdrawal alarm devices are those described in U.S. Pat. No. 3,618,060.

The currency withdrawal sensor used in money clips to trigger remote alarms, whether of the photoelectric, mechanical, or other type, typically has two states, namely, an actuated state and an unactuated state. In the actuated state, which occurs when the currency is 25 removed from the cash box, a remote alarm is triggered. In the unactuated state, to which the currency withdrawal sensor automatically reverts upon replacement of the currency in the cash box, the alarm which has already been triggered upon removal of the cur- 30 rency, may or may not terminate depending upon whether or not the remote alarm has a self-latching feature. If the remote alarm is self-latching, the triggered alarm must be manually reset by personnel monitoring it, whereas if the remote alarm is not of the self-latching type the alarm stops when the currency withdrawal sensor reverts to deactuated condition, which it does automatically upon return of the currency to the cash box.

A problem has arisen in connection with the automatic reset, i.e., automatic reversion to its deactuated state, aspect of the sensor which detects removal of the currency and in response thereto trigger a remote alarm. Specifically, a careless teller who inadvertently removes the currency from the cash drawer, actuating the withdrawal sensor and setting off the remote alarm, can avoid detection by promptly returning the stack of currency to its normal position in the cash box compartment. Since, upon return of the currency stack to its compartment in the cash box, the currency withdrawal sensing device automatically reverts to its deactuated state, it has not been possible, by checking the currency withdrawal sensor of the cash boxes of the different tellers, to determine precisely which teller temporarily removed s stack of currency causing the re- 55 mote alarm.

Accordingly, it has been an objective of this invention to provide, in conjunction with a money clip which upon removal of a currency stack triggers a remote alarm, a device for producing a visual indication to assist authorized bank personnel in determining which teller temporarily withdrew a currency stack from its cash box compartment triggering the remote alarm. This objective has been accomplished in accordance with certain principles of the invention by providing, in $_{65}$ combination with a money clip of the type wherein removal of the bottom bill of a stack from a slotted receptacle triggers a remote alarm, the improvement com-

prising a ferromagnetic telltale, preferably a leaf spring, located within the slotted receptacle which is biased to normally position itself in a lower position underneath the bottom bill of a stack inserted in the receptacle slot. but which telltale can be lifted by authorized personnel 5 to an upper position with a magnet when the device is initially set such that it overlies the inserted currency. Upon withdrawal of the bottom bill of the stack is thereafter reinserted by the teller in an effort to avoid equip cash boxes in which tellers store stacks of cur- 10 detection of the temporary withdrawal the leaf spring underlies the bill. By providing a viewing window in the slotted receptacle in alignment with the telltale, personnel can inspect the location of the telltale with respect to the inserted currency and, depending upon whether the telltale is above the inserted currency or 15 below it, determine whether or not the currency was temporarily withdrawn triggering the alarm and thereafter reinserted to avoid detection. If the telltale is obscured from view by the inserted currency overlying it, 20 which is the case when the currency has been withdrawn and thereafter reinserted without the assistance of the magnet, authorized bank personnel inspecting the telltale have a clear visual indication that currency was withdrawn triggering the remote alarm and thereafter reinserted by the teller to avoid discovery.

The advantages and features of the invention will become more readily apparent from a detailed description thereof taken in conjunction with the drawings in which:

FIG. 1 is a side elevational view, in cross-section, of the document removal detector of the invention shown in connection with its use in a cash box compartment to detect removal of the bottommost bill of a stack of bills.

FIG. 2 is a plan view of the document removal detector.

FIG. 3 is a cross-sectional view of a portion of the document removal detector taken along line 3-3 of FIG. 2.

40 FIG. 4 is a cross-sectional view of a portion of the document removal detector taken along line 4-4 of FIG. 2,

FIG. 5 is a cross-sectional view of a portion of the document removal detector taken along line 5-5 of 45 FIG. 2,

FIG. 6 is a side elevational view, in cross-section, of a portion of a second embodiment of the invention, and FIG. 7 is a side elevational view, in cross-section, of

a portion of a third embodiment of the invention.

The document removal detector of this invention can be used in a variety of environments in which it is desired to detect the removal of a document, although a preferred application is in connection with a cash box in which it is desired to detect removal of currency from the cash box, particularly the bottommost bill of a stack of bills. While the invention will now be described in connection with use of the document removal detector of the invention as applied to detection of the removal of currency from a cash box, it is to be 60 understood that this is only illustrative of one application of the invention.

As shown in FIG. 1, the document removal detector 10 is positioned underneath a stack of superimposed bills 12 in a bill compartment 14 of a cash box 16. The cash box 16 typically has a plurality of bill compartments to accomodate bills of different denominations, such as one dollar, five dollar, ten dollar, twenty dollar,

etc. Each of the compartments 14 is generally rectangular in shape and slightly larger than the rectangular bills placed therein. The compartment 14 includes a vertical front wall 18, a vertical rear wall 20, a vertical right side wall 22 and vertical left side wall 24 (only a 5 portion of the latter of which is shown), and a flat horizontal bottom 26. The height of the front, rear and side walls, which defines the depth of the compartment 14, is selected to accomodate the combined height of a stack of bills 12 and the document removal detector 10 10 lower position shown in FIG. 5 to its raised upper posiof this invention which in use is disposed beneath it.

The document removal detector 10, considered in more detail in connection with FIGS. 1-5, includes a base 30 and a cover 32, both preferably made of molded plastic. The base 30, as viewed from the top, is 15 generally rectangular and has an upper surface 34 for supporting the lowermost bill 36 of the stack 12. The bill-supporting surface 34 is planar except for two recesses 35a and 35b provided in a portion of the left and right sides which are designed to accomodate the fin- 20 gers of a bank employee for the purpose of convenience in removing the entire stack of bills 12, including the lowermost bill 36, from the compartment 14. The bill-supporting surface 34 is provided with an elongated slot or aperture 37 through which extends in an 25 upwardly direction a movable arm 38 of a microswitch 39 mounted to the base 30 below the bill supporting surface 34. The microswitch arm 38, in a manner to be described hereafter, detects removal of the bottommost bill 36 of the stack 12 providing an electrical sig- ³⁰ nal to an alarm (not shown) upon removal of the bottom bill 36. The alarm provides an audible and/or visual indication that the bottom bill has been removed in a manner well known in the art and hence not further described herein. Also included in the bill support sur- ³⁵ face 34 is an elongated recess 40 which, in a manner also to be described, accomodates a "telltale" element 41 when the latter is in its lower position shown in FIGS. 3-5. Completing the base 30 are front and rear 40 vertical walls 42 and 43, a vertical right side wall 44, and a vertical left side wall 45 only a portion of which is shown. The walls 42, 43, 44, and 45, along with the bill-supporting surface 34 and the compartment bottom 26, collectively define a cavity 48 which, among 45 other things, accomodates the body of the microswitch 39. Also positioned in the cavity 48 are tubular spacers 50 and 51 which space the bill-supporting surface 34 from compartment bottom 26 as well as accomodate fasteners 52 and 53 which are used to secure the base 50 30 to the compartment bottom.

The cover 32 which, like the base 30, may be fabricated of molded plastic, includes a bottom surface 55, a top surface 56 and right and left side walls 57 and 58. The bottom surface 55, unlike the top surface 34 of the base 30, is not substantially continuous due to the molded nature of the cover which provides a number of recesses, such as blind recess 60, therein. The cover 32 is secured to the base 30 by fastener 59 in a manner such that the bottom surface 55 of the cover is spaced 60 slightly above the bill supporting surface 34 of the base to define a slot 62 between which currency, such as to bottommost bill 36 of the stack 12, can be inserted. The bottom surface 55 of the cover 32, which restrains upward movement of a bill 36 inserted in slot 62, is pro-65 vided with an elongated recess 61 which, in a manner to be described, accomodates the telltale element 41 when it is moved from its lower position (shown in FIG.

5) to its upper position (not shown in FIG. 5). The cover 32 also includes a window 63, preferably in the form of an aperture which passes entirely through the cover from the top 56 to the bottom surface 55. The window 63, for reasons to be described, permits the position of the telltale element 41 relative to the bottom bill 56 to be visually observed, as well as permits a magnet 64 to be placed in magnetically attractive relation to the telltale element 41 to raise it from its normal tion.

The recess 60 in the bottom surface 55 of the cover 32 accomodates the uppermost portion 38a of the microswitch actuating arm 38 in the absence of a bill 36 in the slot 62. Thus, in the absence of a bill 36 in slot 62, the microswitch arm 38 spans the entire slot 62 from bill-supporting surface 34 to bill restraining surface 55. Of course, upon insertion of a bill 36 in the slot 62 the leading edge of the bill engages the arm 38 pivoting it downwardly below the cover bottom surface 55 to deactuate the microswitch 39 and terminate the alarm. Upon removal of the bottom bill 36 from the slot 62 the microswitch actuating arm 38, which is biased upwardly by a spring (not shown), returns to its upper position with extremity 38a thereof in cover recess 60, actuating the microswitch and triggering the alarm to thereby provide an indication that the bottom bill 36 of the stack 12 has been removed. Since the cover 32 is preferably fabricated of opaque material, and further since the recess 60 which accomodates the upper extremity 38a of the microswitch arm 38 upon removal of a bill 36 from the slot 62 is blind, i.e., does not extend entirely through the cover 32, the presence of the microswitch 39 and its actuating arm 38 is entirely obscured from view.

The telltale element 41 preferably is in the form of an elongated strip of ferromagnetic material, such as a leaf of spring steel, and includes a telltale section 41a which is visible through the window 63 in the cover 32 when a bill is either absent from the slot 62 or positioned in the slot 62 below the telltale section 41a, and a mounting section 41b. The mounting section 41b is sandwiched between mounting surfaces 32a and 30a of the cover 32 and base 30. Mounting surfaces 30a and 32a are preferably angulated downwardly and rightwardly as viewed in FIG. 3 at an angle of approximately 2° for the purpose of insuring that the forward edge 41c of the telltale section 41a will be positioned in the recess 40 below the bill supporting surface 34 of the base 30. With edge 41c so positioned, when a bill 36 is inserted into slot 62 without simultaneously using the magnet 64 to raise the telltale section 41a to its upper position cover in recess 61, the inserted bill will position itself above the telltale section 41a. Of course, when a bill 36is inserted in the slot 62 and the magnet 64 is in the aperture 63 magnetically attracting the telltale element 41a to its upper position in cover recess 61, the inserted bill will locate beneath the telltale section 41a.

In operation, the microswitch 39 with its pivotal actuating arm 38 biased into blind cover cavity 60 above the cover surface 55 functions to detect removal of the bottom bill 36 from slot 62 and in response thereto provide an alarm, the bottom bill 36 typically being removed along with the stack of bills 12 during a holdup or burglary of the bank or the like where the cash box 16 is located. Whereas, the telltale 41a in combination with the viewing window 63 functions to provide a visual indication to banking personnel when the bottom bill 36 of the stack 12 has been removed from, and thereafter reinserted into, the slot 62.

For example, a bank teller may inadvertently remove the stack 12, including the bottom bill 36, from the 5 cash box compartment 14 in which event the microswitch arm 38 would pivot upwardly into recess 60 to actuate the microswitch 39 and in turn trigger an alarm. The teller, to avoid discovery of the fact that he turn the stack of bills 12 to the cash box compartment 14 and, in an effort to avoid discovery that it was he who triggered the alarm, will return the bottom bill 36 to its normal position in the slot 62. The telltale section 41a in combination with the window 63 permits bank 15 62 in an effort to defeat the currency reinsertion detecpersonnel to visually inspect the position of the telltale section 41a relative to the inserted bottom bill 36. Since the bank teller who removed the bottom bill 36 and promptly returned it to the slot 62 to avoid discovery did not, in returning the bottom bill 36 to the slot, 20 use the magnet 64 to attract the telltale 41a to its upper position in recess 61, the reinserted bill 36 will be positioned above the telltale section 41a. As a consequence, bank personnel attempting to view the telltale 41a through the inspection window 63 will find that the 25telltale 41a is obscured by the bottom bill 36 which is positioned above the telltale section 41a and will know that it was removal of this particular stack 12, including bottom bill 36, that triggered the alarm.

Authorized bank personnel will be provided with the 30magnet 64 and as a consequence when the document removal device 10 is initially set up the bottom bill 36 when inserted in the slot 62 will be positioned below the telltale 41a since at the time of initial bill insertion the magnet 64 will be inserted in the aperture 63 to 35 magnetically attract the telltale 41a to its upper position in recess 61 wherein the forward edge 41c of the telltale is positioned above the bottom surface 55 of the cover 32. With the forward edge 41c of the telltale 41a40 so positioned, when the bottom bill 36 is inserted the bill will lie underneath the telltale 41a. When the magnet 64 is now removed from the aperture 63 visual inspection of the telltale section 41s through the window 63 will reveal that the telltale section 41a is visible since it lies above the inserted bill 36 and is not obscured by it. Thus, in initially setting up the document removal detector 10 of this invention, authorized bank personnel will use magnet 64 to raise the telltale 41a to its upper position in cover recess 61 while inserting the 50 bottom bill 36 of the stack 12 so that the inserted bill will be below telltale section 41a. When the bottom bill 36 is thereafter removed from slot 62 by the bank teller, producing an alarm, the telltale 41a returns to its lower position in base recess 40 and when the bill 36 55 is thereafter reinserted in slot 62 by the bank teller to avoid discovery the bill positions itself above the telltale 41a obscuring it from view through the window 63. When authorized bank personnel now remove the stack 12, except for the bottom bill 36, and inspect 60 through the window 63 the telltale 41a is seen to be obscured by the inserted bottom bill 36 and it is apparent that it is the teller using this particular cash box compartment which has removed the bottom bill, causing the alarm, and reinserted it in an effort to avoid discov-65 ery.

The size of the telltale element 41a in the region of the magnet insertion aperture 63 is selected to be larger

than the cross-sectional area of the magnet insertion opening. This reduces the likelihood that a bank teller, by inserting his finger, pencil, nail file, screw driver or the like, in the magnet insertion opening 63, could engage the edge of the telltale section 41a and lift it upwardly while inserting the bottom bill 36 in the slot 62 and thereby effectively defeat the currency reinsertion detection feature of the invention. Additionally, the size of cover 32 relative to telltale section 41a and the accidentally triggered the alarm, may immediately re- 10 height of slot 62 are selected to make the telltale section 41a generally inaccessible to bank personnel who might, by inserting their fingers or other instrumentability in slot 62, attempt to elevate the telltale section 41a to its upper position when reinserting a bill in slot

tion feature of the invention.

In the preferred embodiment of the invention shown in FIGS. 1-5 the magnet 64 is inserted in an aperture 63 in the cover 32, to raise telltale section 41a to its upper position. Aperture 63, which passes entirely through the cover 32, also functions as a window for viewing the position of the telltale 41a. If a sufficiently strong magnet 64 is available, the window 63', as shown in FIG. 6, may be a blind hole, that is, a hole which does not pass entirely through the cover 32'thereby preventing tampering with the telltale section 41a with a nail file, pencil, etc. in an attempt to compromise the device. Of course, in such an arrangement the cover material 63'' at the bottom of the aperture 63' would be made of transparent material to permit inspection of the position of the underlying telltale section 41a'.

Alternatively, and as shown in FIG. 7, the viewing window 63" and the magnet insertion aperture 63"" could be separate and distinct. The viewing window 63" could, for example, take the form of a transparent insert in the cover 32'' overlying the telltale 41a'', while the magnet insertion aperture 63"" could take the form of a through hole in the cover 32''.

I claim:

1. A currency removal and reinsertion detector comprising:

a base having a currency supporting surface,

- a cover overlying said base and having a currency restraining surface, said cover being fixedly secured relative to said base with said currency restraining and currency supporting surfaces in closely spaced confronting relation establishing a currency receiving slot into which currency can be inserted for placement between said surfaces,
- a ferromagnetic element having a mounting section and a telltale section, said mounting section being mounted relative to said base and cover to position said telltale section inaccessibly within said slot for movement therein alternatively between upper and lower positions overlying and underlying, respectively, currency inserted in said slot,
- said cover being provided with a viewing window therein overlying said telltale section to permit visual inspection of the position, upper or lower, of said telltale section relative to currency inserted in said slot, and
- a magnet for moving said telltale section to its upper position to permit currency inserted in said slot to underlie said telltale section, said telltale section returning to its lower position upon removal from said slot of currency initially underlying said

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telltale, whereby reinsertion of said currency initially underlying said telltale without concurrent attraction thereof by said magnet will place said reinserted currency overlying said telltale section and obscure it from view through said window, thereby providing a visual indication that currency initially inserted in said slot concurrent with magnetic attraction of said telltale section has been removed and reinserted.

2. The detector of claim 1 wherein said currency sup- 10 porting surface includes a recess, said telltale section is a leaf spring normally biased into said recess by said mounting section to underlie currency which is inserted in said slot in the absence of magnetic attraction of said telltale section. 15

3. The detector of claim 1 wherein said cover includes an aperture aligned with said telltale section and wherein said magnet is insertable into said aperture to magnetically attract said element.

4. The detector of claim 1 wherein said window is a 20 single aperture in said cover serving the dual purpose of a) permitting visual inspection of said telltale position and b) insertion of said magnet therein for magnetically attracting said telltale section to its upper position.

5. The detector of claim 4 wherein said element underlies at least the entire cross-sectional area of said aperture.

6. The detector of claim 1 further including:

- cover in communication with said slot, an alarm.
- a microswitch electrically connected to said alarm and having a switch-actuating arm biased to span with a portion thereof extending into said blind recess in the absence of currency in said slot, said arm portion being movable into said recess to actuate said microswitch and trigger said alarm upon removal of currency from said slot, and

said cover being opaque and said blind recess in nonalignment with said window to preclude viewing

said microswitch arm exteriorly of said cover. 7. A method of detecting removal and reinsertion of currency in a slot established by closely spaced confronting surfaces of a base and cover, comprising the steps of:

- a magnetically attracting and thereby moving a ferromagnetic element located in the slot which is biased toward the confronting surface of the base, to a position spaced from the surface of the base,
- initially inserting currency in the slot between the base surface and the ferromagnetic element while the element is spaced from the base surface by magnetic attraction thereof,
- removing the inserted currency from between the element and base surface,
- reinserting currency in the slot between the ferromagnetic element and the confronting surface of the cover in the absence of magnetic attraction of the element to a position spaced from the confronting surface of the base, and
- viewing the position of the ferromagnetic element relative to the inserted currency through a window in the cover aligned with the element.

8. The method of claim 7 wherein said magnetic at-25 traction step includes inserting a magnet into an aperture in the cover aligned with the element to magnetically attract the element, wherein said initial currency insertion step includes inserting currency into the slot while the magnet is in the aperture magnetically ata blind recess in said confronting surface of said 30 tracting the element, and wherein said currency reinsertion step includes reinserting currency into the slot with the magnet removed from the cover aperture.

9. The method of claim 7 wherein the magnetic attraction step includes inserting a magnet into the viewsaid slot established by said confronting surfaces 35 ing window to magnetically attract the element, wherein said initial currency insertion step includes inserting currency into the slot while the magnet is in the window magnetically attracting the element, and wherein said currency reinsertion step includes rein-40 serting currency into the slot with the magnet removed from the viewing window.

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