A trouble-detecting system in an automatic money dispenser comprising a first detecting section for detecting a money-dispensing operation of a money-dispensing mechanism thereby to produce a first detecting signal; a second detecting section for detecting the fact that money has been actually dispensed through a money-dispensing outlet thereby to produce a second detecting signal; and a time-lapse counter operated by the first and second detecting signals, thereby to detect trouble in the dispensation of money, at the same time to stop the operation of the money-dispensing mechanism, and to operate an alarm display device.
TROUBLE-DETECTING SYSTEM IN AN AUTOMATIC MONEY DISPENSER

BACKGROUND OF THE INVENTION

This invention relates to automatic money dispensers of the type which dispenses money one by one from a money-stocking section (hereinafter referred to as a stocker) and more particularly to a trouble detecting system in a money-dispensing mechanism of an automatic money dispenser.

In a money-dispensing mechanism of the character referred to above, there is the possibility of failure to dispense money out of the stocker for reasons such as damaged money or mechanical slippage.

In the case of dispensation of coins, the failure of a coin-dispensing mechanism is caused, for instance, by the deformation of coins, while in the case of dispensation of bank-notes, the failure is caused by the nonuniform conditions of bank-notes such as creases, wrinkles, and the like.

However, in the case when such a failure is temporarily caused by the money dispensing mechanism, if the preceding money-dispensing operation covers or compensates for the failure, it can be said that the function or purpose of the money dispenser is not obstructed at all. Therefore, in this case, it is not necessary to detect the failure as a trouble. The present invention has been developed on the basis of this concept.

SUMMARY OF THE INVENTION

It is accordingly a first object of the invention to provide a trouble-detecting system in an automatic money dispenser which, when its money-dispensing mechanism continuously fails to dispense money detects the failure as a trouble in the automatic money dispenser and thereupon operates to activate an alarm display means and to stop the operation of the money-dispensing mechanism.

A second object of the present invention is to provide a trouble-detecting system in an automatic money dispenser which can detect non-reparable troubles such as mechanical troubles in the money-dispensing mechanism and troubles in the dispensation of money due to unsatisfactory conditions of the money itself.

A third object of the invention is to provide a trouble-detecting system in an automatic money dispenser comprising: a first detecting section adapted to detect a money-dispensing operation thereby to produce a first detecting signal; a second detecting section adapted to detect the actual dispensation of money thereby to produce a second detecting signal; and a time-lapse counter which receives the first and second detecting signals, wherein in a normal operating period of the money dispenser, an alarm display section is not activated, and a money-dispensing mechanism repeats its operation, whereas in an abnormal operating period of the money dispenser the alarm display section is activated, and the money-dispensing mechanism stops its operation.

The foregoing objects and other objects as well as the characteristic features of the invention will become more apparent from the following detailed description and the appended claims when read in conjunction with the accompanying drawings, in which like parts are designated by like reference symbols.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a schematic block diagram showing one example of the trouble-detecting system according to the invention in an automatic money dispenser in which a time-lapse counter comprises: a discrimination section and an output control section;

FIG. 2 is also a schematic block diagram showing another example of the trouble-detecting system provided, according to the invention, in an automatic money dispenser which is different in the composition of the time-lapse counter from the trouble-detecting system of FIG. 1;

FIG. 3 is an electrical wiring diagram showing a part of the time-lapse counter of a further example of the trouble-detecting system according to the invention in an automatic money dispenser in which the time-lapse counter is a modification of the time-lapse counter shown in FIG. 2; and

FIG. 4 is a pulse time chart showing detecting signals applied to the time-lapse counter of FIG. 3.

DETAILED DESCRIPTION OF THE INVENTION

The invention will be described with reference to the case where the invention is applied to a trouble-detecting system in a bank-note dispensing mechanism of an automatic bank-note dispenser.

One example of the trouble-detecting system according to the invention as illustrated in FIG. 1 comprises: a section 1 for detecting bank-note dispensing operations (hereinafter referred to as the first detecting section 1); a section 2 for detecting the actual dispensations of bank-notes through a bank-note dispensing outlet (hereinafter referred to as the second detecting section 2); a time-lapse counter 9; an alarm display section 7; and a section 8 for driving a bank-note-dispensing mechanism (not shown) (hereinafter referred to as the driving section 8).

The first detecting section 1 operates to generate one detecting pulse Pa for every bank-note dispensing operation in correlation with the bank-note dispensing mechanism, while the second detecting section 2 operates to generate one detecting pulse Pb whenever bank-note is dispensed through the bank-note dispensing outlet. The time-lapse counter 9 comprises a discrimination section 3, and an output control section 4 constituted by a gate circuit 5 and a flip-flop circuit 6.

The detecting pulse Pa from the first detecting section 1 is applied, as a counting input, to the discrimination section 3 which is a two-stage type quaternary counter, while the detecting pulse Pb from the second detecting section 2 is applied, as a resetting input, to the discrimination section 3. In this case, outputs Q1 and Q2 of the two stages of the counter 3 are applied, as discriminating outputs d, to the output control section 4. As mentioned above, the output control section 4 comprises, the gate circuit 5, which is in the form of an NAND circuit which receives the outputs d from the discrimination section 4, and the flip-flop circuit 6 connected to the output of the gate circuit 5. The outputs F and F of the flip-flop circuit 6 are fed, as control signals, to the alarm display section 7 and the driving section 8, respectively.

In this connection, it should be noted that the driving section 8 carried out its operation when the output F of the flip-flop circuit 6 is at a high level, and stops its
operation when the output F is at a low level, while the alarm display section 7 performs its display action when the output F of the flip-flop circuit 6 is at a high level, but stops its display when the output F is at a low level.

In the normal operation of the bank-note dispenser, or when bank-notes are being dispensed correctly, the pulse Pa is produced from the first detecting section 1 upon operation of the bank-note dispensing mechanism and is applied to the discrimination section 3, where the pulse Pa thus applied is counted. Thereafter, one bank-note is actually dispensed through the bank-note dispensing outlet, and at the same time the pulse Pb is produced from the second detecting section 2 thereby to reset the discrimination section 3.

In other words the discrimination section 3 carries out alternately its counting and resetting operations every time the bank-note dispensing mechanism repeats its bank-note dispensing operation. Under this condition, none of the outputs Q1 and Q2 of the discrimination circuit 3 become high (H) in level, and, accordingly, the output of the gate circuit 5 always remains at a high level. Therefore, the outputs F and F of the flip-flop 6 are respectively at a low level and at a high level.

Thus, in the normal operation of the automatic bank-note dispenser, since the output F of the output control section 4 delivered to the driving section 8 is at the high level, the driving section 8 carries out its predetermined operation; that is, the bank-note dispensing mechanism repeats its bank-note dispensing operation, and since the output F of the output control section 4 is applied to the alarm display section 7 is at the low level, no alarm display is effected by the alarm display section 7.

In contrast, when all of the bank-notes have been dispensed out of a bank-note stacker, or when no bank-note is attracted by a bank-note attracting head since no bank-note is dispensed through the bank-note dispensing outlet although the bank-note dispensing mechanism is carrying out its dispensing motion, the judgement section 3 can carry out its counting operation by receiving the detecting pulse Pa from the first detecting section, but it does not receive a pulse Pb.

Thus, when the judgement section successively counts detecting pulses Pa up to three, both of the outputs Q1 and Q2 become high in level. The outputs Q1 and Q2 at the high level are applied to the gate circuit 5, thereby producing an output W therefrom. The output W is applied to the flip-flop circuit 6, as a result of which the states of the flip-flop circuit 6 are changed.

In other words, the output F of the flip-flop circuit 6 is changed from the high level to the low level. As a result, the driving section 8 stops its predetermined operation while the bank-note mechanism also stops its bank-note dispensing operation. On the other hand, the output F of the flip-flop circuit 6 is changed from the low level to the high level, and the alarm display section 7 therefore performs its alarm display operation. In the case when such a trouble as described above has occurred but the trouble has been eliminated before the first detecting section 1 produces three pulses Pa whereby the bank-note is actually dispensed, the discrimination section 3 will be immediately reset. As a result, the driving section 8 begins to carry out its predetermined operation, while the alarm display section 7 stops its alarm display.

In the above-described example, the discrimination section 3 is made in the form of a quarternary counter, but the number of counter stages to be employed therein may be selected as required.

Referring now to FIG. 2, the second example of the invention will be described. As is apparent from a comparison of FIGS. 1 and 2, this second example is different mainly in the composition of the time-lapse counter from the first example described above. The other components, namely, the first detecting section 1, the second detecting section 2, the alarm display section 7 and the driving section 8 are the same as those shown in FIG. 1.

The time-lapse counter 9 comprises two two-input NAND gates G1 and G2 forming an R-S flip-flop circuit, an inverter I1 connected to the output of the flip-flop circuit, a diode Dd connected to the output of the inverter I1, and a timer which comprises transistors T1 and T2, a resistor r, a resistor R, and a capacitor C. The diode Dd is connected to the base of the transistor T1, and the resistors r is connected between the collector of the transistor T1 and a power source Vcc. The resistor R is connected to the capacitor C which is connected through a resistor to the transistor T2. In addition, the driving section 8 is connected to the collector of the transistor T2, and an inverter I2 is connected between the collector of the transistor T2 and the alarm display section 7.

The second example of the bank-note dispenser according to the invention operates as follows. In the normal operation of the second example, or when bank-notes are being dispensed correctly, the detecting pulse Pa is produced from the first detecting section 1 in the same manner as in the first example described with reference to FIG. 1, thereby to set the R-S flip-flop circuit G1 and G2. As a result, the flip-flop circuit produces an output signal of a high level. This output signal is changed from the low level to a low level by the inverter I1, and the transistor T1 is therefore kept non-conductive. As a result, the capacitor is charged through the resistors r and R from the power source Vcc.

After production of the detecting pulse Pa, a detecting pulse Pb is produced from the second detecting section 2 in the same manner as in the first example described with reference to FIG. 1, thereby to reset the flip-flop circuit G1 and G2. As a result, the flip-flop circuit produces an output signal low in level. This output signal is changed from the low level to a high level by the inverter I2, thereby to make the transistor T2 conductive. Consequently, the capacitor C is discharged through the resistor R and the transistor T1.

In other words, the capacitor C is alternately charged and discharged respectively by the detecting pulses Pa and Pb. However, it should be noted that the time constant obtained by the resistor R and the capacitor C is determined so that the capacitor C will not make the transistor T2 conductive during normal operation of the bank-note dispenser. Therefore, during normal operation, the collector of the transistor T2 is kept at a high level, whereby the alarm display section 7 is not activated, but the driving section 8 repeats its predetermined operation.

At the time of abnormal operation of the bank-note dispenser as described above with reference to FIG. 1, no detecting pulse Pb is produced from the bank-note detecting signal 2; that is, the transistor T1 is kept non-
conduct. As a result, the capacitor C is continuously charged through the resistors r and R until the transistor T₁ becomes conductive, whereby the alarm display section 7 is activated, but the driving section 8 stops its predetermined operation.

In FIG. 3, there is shown a part of the third example of the trouble-detecting system according to the invention. This system differs from that of the second example shown in FIG. 2 only in that the flip-flop circuit G₁ and G₂ and the inverter I₁ are omitted so that detecting signals Pₐ₁ and Pₐ₂ are applied respectively to the diode D₁ and a diode D₂ connected also to the base of the transistor T₁.

The detecting signal Pₐ₁ is a signal controlled by the bank-note dispensing operation of a bank-note dispenser control section (not shown), and is at a high level during a period when the bank-note dispensing operation is not being carried out, or during a stand-by period, and is at a low level during a period when the bank-note dispensing operation is being carried out, as shown in FIG. 4(a). On the other hand, the detecting signal Pₐ₂ is produced from a detecting section (not shown) similar to the previously described detecting section 2, as shown in FIG. 4(b).

During normal operation of the third example, when the detecting pulse Pₐ₁ of the low level is applied through the diode D₁ to the transistor T₁, the transistor T₁ is non-conductive, whereby the capacitor C is charged through the resistors r and R. However, the capacitor C is soon discharged by the detecting pulse Pₐ₁ of the high level whenever the bank-note is actually dispensed through the bank-note dispensing outlet. In this case, since the time constant R.C is proper determined as described before reference to FIG. 2, the alarm display section 7 is not activated, but the driving section repeats its predetermined operation.

At the time of abnormal operation of this third example of the bank-note dispenser, since no detecting pulse Pₐ₁ of high level is applied through the diode D₂ to the transistor T₁, the capacitor C is continuously charged through the resistors r and R until the transistor T₂ produces its output. As a result, the alarm display section 7 is activated thereby to perform its alarm display, but the driving section 8 stops its predetermined operation, whereby the bank-note dispensing mechanism stops its bank-note dispensing operation.

As is apparent from the above description, in the same when the bank-note dispenser fails to dispense the bank-note, this failure can be detected immediately according to the invention. In other words, when non-restorable troubles such as mechanical troubles of the bank-note dispensing mechanism and troubles in the dispensation of bank-notes due to the bank-notes themselves are caused, or when no bank-note is left in the stocker, these troubles can be reliably detected whereby they can be indicated by means of the alarm display section.

While this invention has been described with respect to a few examples of bank-note dispensers, it goes without saying that the invention can be applied with equal effectiveness to automatic coin dispensers.

We claim:

1. A trouble-detecting system in a money dispenser having a money dispensing section for dispensing money from a money-stocking section, said system comprising: a first detecting section for detecting the money dispensing operation of the money dispensing section thereby to produce a first detecting signal; a second detecting section for detecting the dispensation of money through a money-dispensing outlet thereby to produce a second detecting signal; and a time-lapse counter means operated by the first and second detecting signals, said time-lapse counter means producing a trouble-detecting signal by counting to a predetermined counting value when the second detecting signal is not produced in spite of the production of the first detecting signal, the money dispensing section operating to stop the money dispensing operation with the aid of the trouble-detecting signal when no money is dispensed in spite of the repetition of money dispensing operation.

2. A trouble-detecting system as claimed in claim 1 in which said time-lapse counter means is operated by receiving said first detecting signal and said second detecting signal as a counting input and a resetting input, respectively, the non-application of said second detecting signal to said time-lapse counter means within a predetermined period of time being detected as trouble in the money dispenser.

3. A trouble-detecting system as claimed in claim 1 in which said time-lapse counter means comprises a discriminating section formed as a counter which receives said first detecting signal and said second detecting signal as a counting input and a resetting input, respectively, said discriminating section producing an output which indicates trouble in the money dispenser when the counting of the discriminating section has come up to a predetermined counting value while said second detecting pulse has not been applied thereto.