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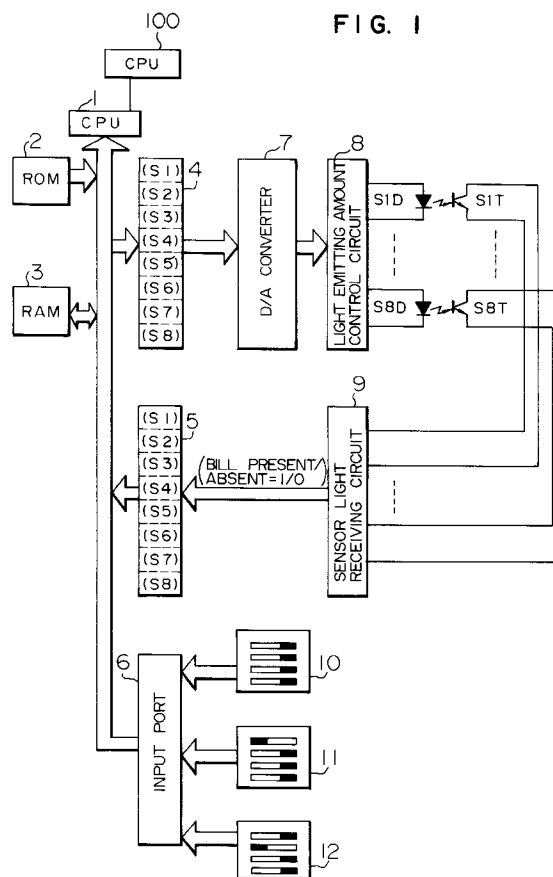
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(54) Method and apparatus for controlling optical sensor.

(57) The invention is to control light emission of sensors to optimal light emitting amounts depending upon a kind of bills to be objects for detection and whereby to eliminate erroneous detection of the bills. Therefore, in the invention, the kinds of paper sheets as objects for detection are set in dip switches (10, 11 and 12). CPU (1) detects the set values of the DIP switches (10, 11 and 12) to detect the kinds of bills and reads out the corresponding light emitting amounts in sensor light emitting amount tables stored in ROM (2). The sensors (S1 ~ S8) emit lights in light emitting amount set in a light emitting amount register (4) and whereby emits the light in the light emitting amount corresponding to the kinds of bills as objects for detection.

FIG. 1



The present invention relates to a method and an apparatus for controlling an optical sensor. More particularly, the invention relates to a method and an apparatus for controlling an optical sensor suitable for accurately detecting bill or the like.

Conventionally, as disclosed in Japanese Unexamined Patent Publication No. 62-65188, there is a known system, in which a sensitivity of a sensor provided in a transaction processing apparatus is switched at a predetermined level so that a sensor causing lowering of the output due to dirt or so forth at a light emitting portion or a light sensing portion, is detected in advance for preventing the sensor from causing failure during transaction.

In the prior art, it has been not possible to set the sensitivity of the sensor depending upon the bill or the like to be detected. Therefore, when a plurality of kinds of bills or the like having different thickness are processed, a light tends to pass through a thin bill to make it impossible to detect the bill.

It is an object of the present invention to provide a method and an apparatus for controlling an optical sensor which can accurately detect paper sheet by adjusting a light emitting amount to an optimal amount depending upon kinds of bill or the like to be detected.

Therefore, in the present invention, a light emitting amount data defining a light emitting amount of a light emitting element is stored with respect to each kind of the bill or the like to be detected. The light emitting amount data is read out depending upon the kind of bill or the like to be detected so that the light emitting amount of the light emitting element is controlled on the basis of the read out light emitting amount data.

With the present invention, since the light emitting amount data corresponding to the bill or the like to be detected is read out among a plurality of preliminarily stored light emitting amount data and the light emitting amount of an optical sensor is controlled on the basis of the read out light emitting amount data, the sensor can emit the light with the optimal emitting amount depending upon the bill or the like to be detected for accurately detecting the bill or the like.

In the drawings:

Fig. 1 is a block diagram of one embodiment of an optical sensor control apparatus according to the present invention;

Fig. 2 is an explanatory sectional view showing one example of a cash dispensing apparatus employing the optical sensor control apparatus of Fig. 1;

Fig. 3 is an explanatory illustration showing sensor light emitting amount tables stored in ROM of Fig. 1; and

Fig. 4 is a flowchart showing a process of setting a light emitting amount for each sensor in the optical sensor control apparatus of Fig. 1.

The present invention will be discussed hereafter in greater detail with reference to the accompanying drawings.

Fig. 2 is an explanatory sectional view of one example of a cash dispensing apparatus, in which an embodiment of an optical sensor control apparatus according to the invention. In Fig. 2, bills are set in cassettes 17, 18 and 19 depending upon bill kinds. Upon dispensing cash, desired kinds of bills are fed from the cassettes 17, 18 and 19. A piling bill detecting portion 15 detects bills fed in pile and discriminate the piling bills from normal bills for separating at a gate 20. The normal bills are stacked in a dispensing stacker 14. On the other hand, the piling bills are stacked in a reject box 16. On feeding path, sensors S1 to S8 are provided for monitoring transportation of the bills.

Fig. 1 is a block diagram of one embodiment of the optical sensor control apparatus according to the invention, which is adapted to be employed in the cash dispensing apparatus 13 of Fig. 2. In Fig. 1, CPU 1 operates according to programs stored in RAM 3. In ROM 2, a plurality of sensor light emitting amount tables corresponding to kinds of bills to be detected are stored. DIP switches 10, 11 and 12 are adapted to be set bill codes indicative of kinds of bills stored in the cassettes 17, 18 and 19 which are shown in Fig. 2. When the bills are to be fed from the cassette 17, the CPU 1 reads out the set value of the DIP switch 10 via a bill information input port 6. Assuming that the value of the DIP switch 10 is 0, CPU 1 sets a light emitting amount data (digital data) stored in ROM 2 for each of the sensors S1 to S8 corresponding to the bill code 0 in a light emitting amount register 4. When the bills are to be fed from the cassette 18, CPU 1 sets the light emitting amount data corresponding to the bill code set in the DIP switch 11, to the light emitting amount register 4. When the bills are to be fed from the cassette 19, CPU 1 sets the light emitting amount data corresponding to the bill code set in the DIP switch 12, to the light emitting amount register 4.

CPU 1 is controlled by a control CPU 100 of the dispensing apparatus. CPU 100 also controls a bill feeding path and the piling bill detecting portion 15. This CPU 100 is, in turn, controlled by a superior control device, such as a host computer. Respective optical sensors S1 to S8 comprise light-emitting diodes S1D to S8D and phototransistors S1T to S8T.

The digital light emitting amount data for the sensor S1, written in the light emitting amount register 4, is converted into an analog value by a D/A converter 7, and further converted into a current in a light emitting amount control circuit 8 to drive the light emitting diode S1D of the sensor S1. When the bill is present between the light emitting diode S1D and the phototransistor S1T, the light emitted from the light emitting diode S1D may not reach the phototransistor S1T so as to maintain the phototransistor S1T at OFF posi-

tion. Then, the OFF position of the phototransistor S1T is converted into a logical value "1" by a light receiving circuit 9 of the sensor. The converted logical value is read out by CPU 1 through a sensor information input port 5. On the other hand, when the bill is not present between the light emitting diode S1D and the phototransistor S1T of the sensor S1, the light emitted from the light emitting diode S1D reaches the phototransistor S1T to turn the latter ON. Then, the logical value converted by the light receiving circuit 9 of the sensor becomes "0". CPU 1 reads out the logical value through the sensor information input port 5. Similarly, the sensors S2 to S8 emit the lights according to the corresponding light emitting amount data which are set in the light emitting amount register 4 to perform detection of the bills. The bills are semi-light permeable articles which permits certain amount of light. The thicker bills pass the smaller amount of light and thinner bills pass the greater amount of light. Therefore, it becomes necessary to properly set the light emitting amount depending upon the bills to be detected.

Fig. 3 is an explanatory illustration showing the sensor light emitting amount table for the sensor, which is set for each kind of bills and stored in ROM 2. In each of the sensor light emitting amount tables for each of the bill codes 0 ~ n, proper light emitting amounts corresponding to the thickness of the bills are set with respect to respective sensors. As set forth above, CPU 1 reads out the light emitting amount data for respective of the sensors S1 to S8, stored in ROM 2, corresponding to the bills to be used and writes in the light emitting amount register 4. By this, the lights in the proper light emitting amount corresponding to the kinds of bills can be emitted from the sensors S1 to S8 to successfully avoid erroneous detection of the bills.

Fig. 4 is a flowchart showing process for setting the light emitting amounts for the sensors upon dispensing a cash. Every time of switching the bill to be fed from the cassette, the light emitting amounts of the sensors S1 to S8 are modified through the process as illustrated in Fig. 4. At first, when the bill is fed from the cassette 17, CPU 1 reads out the value of the DIP switch 10 as shown in Fig. 1, through the bill information input port 6. For the DIP switch 10 as a bill kind setting means, the code indicative of the kind of bill stored in the cassette 17 is set. Assuming that the value of the DIP switch 10 is "0", CPU 1 sets the light emitting amount data stored in ROM 2 and corresponding to the bill code 0, in the light emitting amount register 4. When the bill is fed from the cassette 18, the light emitting amount data corresponding to the bill code set in the DIP switch 11 is set. Also, when the bill in the cassette 19 is fed, the light emitting amount data corresponding to the bill code set in the DIP switch 12 is set.

As can be clear from the above, with the shown

embodiment, it becomes possible to operate the sensors to emit the lights with the proper light emitting amounts corresponding to the kind of the bills to be dispensed. Also, when the kinds of bills to be set in the cassettes 17, 18 and 19 are changed, the user may easily adapt the apparatus for modification of the bill kinds by changing the bill codes set in the DIP switches.

It should be appreciated that although the foregoing embodiment sets the kinds of bills by means of the DIP switches, the present invention should not be limited to the shown arrangement. For instance, it is possible to connect the optical sensor control apparatus shown in Fig. 1 to a superior system through a network so as to set the kinds of bills to detect according to a command from the superior system.

Since it becomes possible to operate the optical sensors to emit the lights in the proper light emitting amount corresponding to the kind of the bills to be used, the erroneous detection of the bills which can be caused by passing of the light through the bills can be successfully prevented.

Though the foregoing embodiment has been discussed in terms of the optical sensor and its control apparatus applicable for the dispensing apparatus for the bills, it should be apparent that the present invention is applicable for apparatus distributing cards, bonds or so forth of different kinds, particularly having different thickness or paper quality.

The present invention has been described in detail, it should be understood that various changes, substitutions and alternations can be made hereto without departing from the spirit and scope of the present invention as defined by the appended claims.

Claims

1. A method for controlling an optical sensor for controlling light emitting amount of an optical sensor (S1 ~ S8) constituted of a light emitting element (S1D ~ S8D) and a light receiving element (S1T ~ S8T), comprising the steps of:
 - storing light emitting amount data defining light emitting amounts of said light emitting element depending upon kinds of paper sheets to be objects for detection by said sensor;
 - reading out the light emitting amount data corresponding to the kind of the paper sheet to be detected by said sensor; and
 - controlling the light emitting amount of said light emitting element on the basis of the read out light emitting amount data.
2. An optical sensor control apparatus comprising:
 - an optical sensor (S1 ~ S8) constituted of a light emitting element (S1D ~ S8D) and a light receiving element (S1T ~ S8T);

light emitting amount storage means (2) for storing light emitting amount data defining light emitting amounts of said light emitting element depending upon kinds of paper sheets to be objects for detection of said optical sensor; 5

light emitting amount controlling means (8) for controlling light emitting amount of said light emitting element on the basis of said light emitting amount data; 10

paper sheet setting means (10, 11, 12) for setting kind of the paper sheets to be detected by said optical sensor; and

controlling means (1) for detecting kind of the paper sheet set in said paper sheet setting means, reading out the light emitting amount data corresponding to the detected kind of the paper sheet from said light emitting amount storage means and outputting the read out light emitting amount data to said light emitting amount controlling means. 15 20

3. An optical sensor control apparatus as set forth in claim 2, wherein said paper sheet setting means (10, 11, 12) is a switch. 25

4. An optical sensor control apparatus comprising:
an optical sensor (S1 ~ S8) constituted of a light emitting element (S1D ~ S8D) and a light receiving element (S1T ~ S8T); 30

light emitting amount storage means (2) for storing light emitting amount data defining light emitting amounts of said light emitting element depending upon kinds of paper sheets to be objects for detection of said optical sensor; 35

light emitting amount controlling means (8) for controlling light emitting amount of said light emitting element on the basis of said light emitting amount data; 40

controlling means (1) connected to a superior system (100) via a network, for setting kind of the paper sheet to be detected by said optical sensor according to a command from said superior system, reading out the light emitting amount data corresponding to the detected kind of the paper sheet from said light emitting amount storage means and outputting the read out light emitting amount data to said light emitting amount controlling means. 45

5. A cash dispensing apparatus including said optical sensor control apparatus as defined in claim 2. 50

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FIG. 1

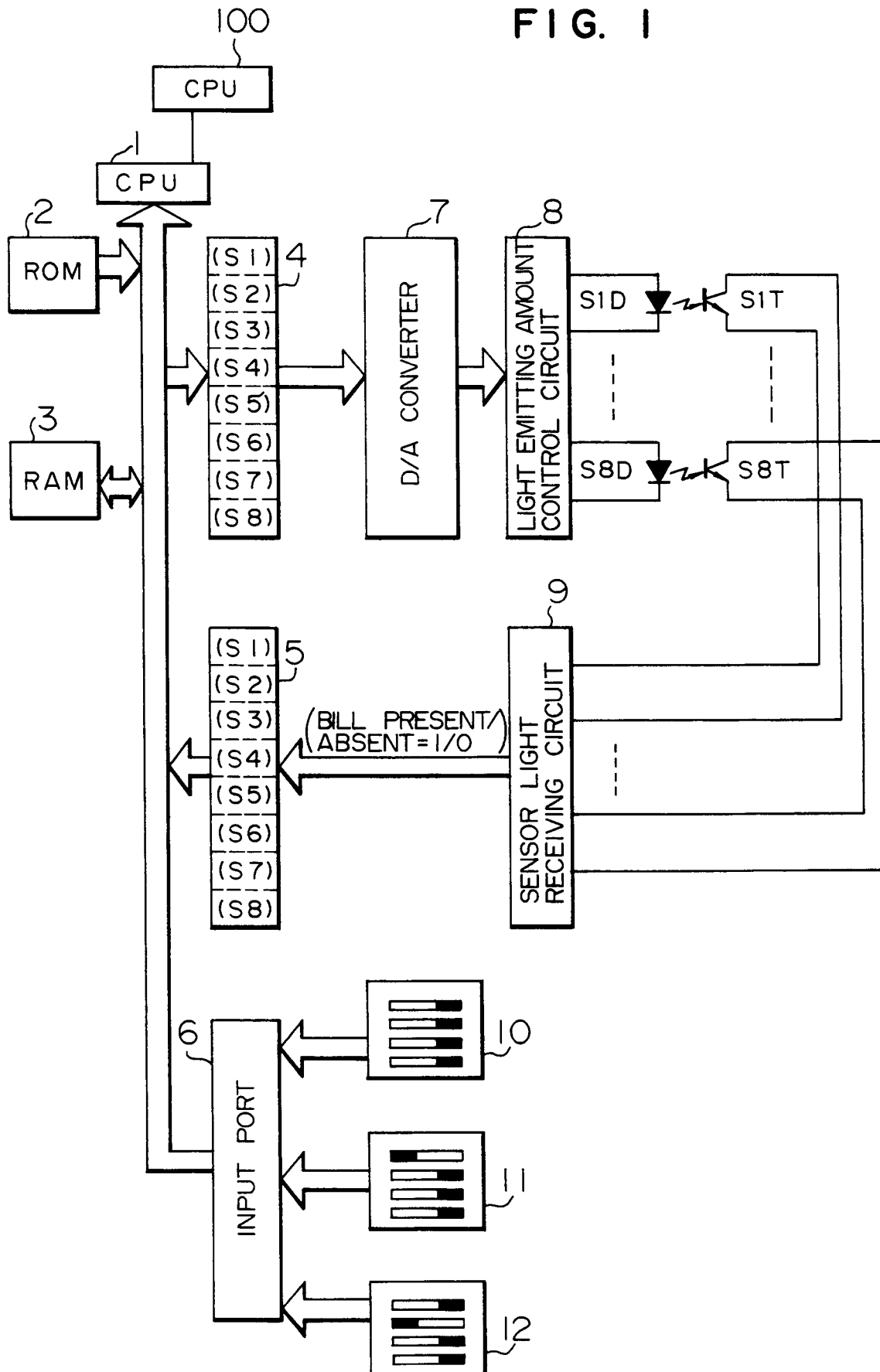


FIG. 2

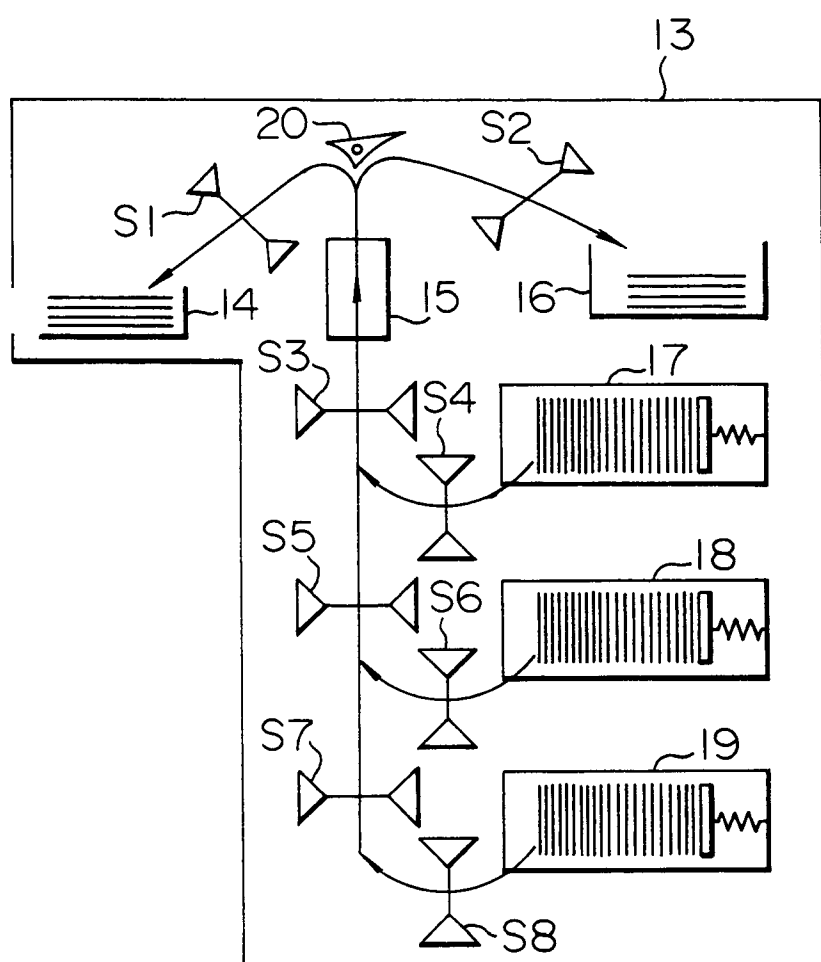
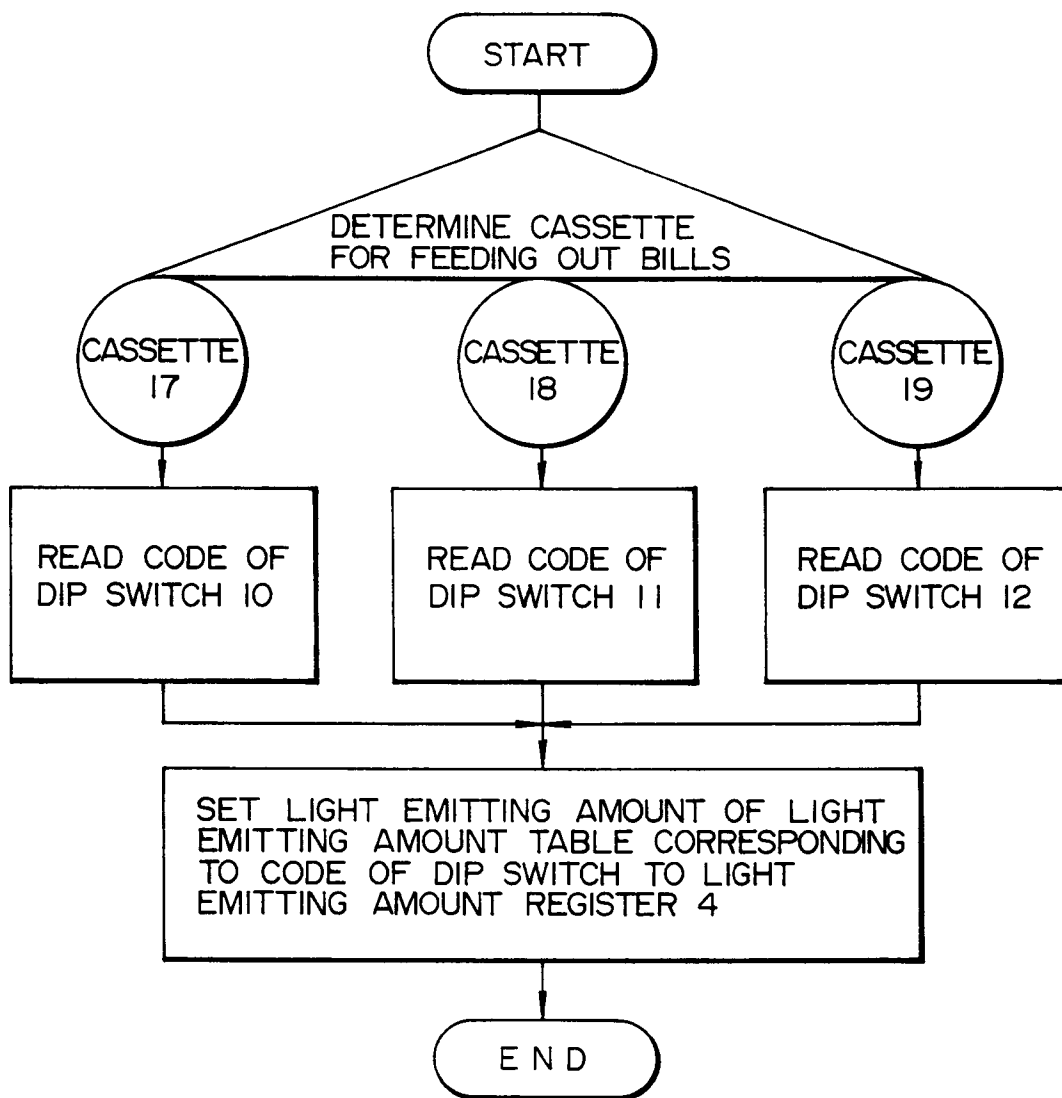


FIG. 3

BILL CODE 0 LIGHT EMITTING AMOUNT TABLE		BILL CODE 1 LIGHT EMITTING AMOUNT TABLE		BILL CODE n LIGHT EMITTING AMOUNT TABLE	
SENSOR NUMBER	LIGHT EMITTING AMOUNT	SENSOR NUMBER	LIGHT EMITTING AMOUNT	SENSOR NUMBER	LIGHT EMITTING AMOUNT
S 1	(X X) 16	S 1	(X X) 16	S 1	(X X) 16
S 2		S 2		S 2	
S 3		S 3		S 3	
S 4		S 4		S 4	
S 5		S 5		S 5	
S 6		S 6		S 6	
S 7		S 7		S 7	
S 8	(X X) 16	S 8	(X X) 16	S 8	(X X) 16

FIG. 4





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

DOCUMENTS CONSIDERED TO BE RELEVANT			EP 92308165.7
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
Y	<u>EP - A - 0 342 647</u> (NIXDORF COMPUTER AKTIEN-GESELLSCHAFT) * Claims 1-5,15; column 3, lines 41-48; fig. 1,2 * --	1,2,4	G 07 D 7/00 G 07 D 1/00
Y	<u>DE - A - 3 417 218</u> (ROWE INTERNATIONAL, INC.) * Page 6, last paragraph; page 7; fig. 2 * ----	1,2,4	
A	----	5	
			TECHNICAL FIELDS SEARCHED (Int. Cl.5) G 07 D 1/00 G 07 D 7/00
The present search report has been drawn up for all claims			
Place of search VIENNA	Date of completion of the search 14-12-1992	Examiner BISTRICH	
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

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