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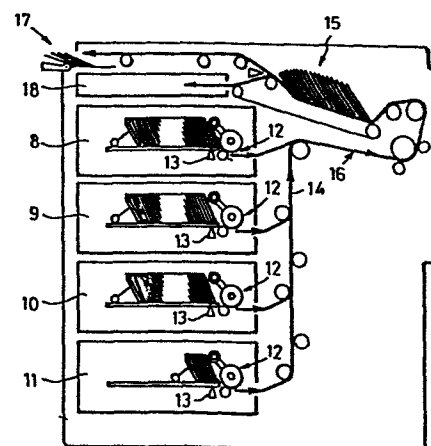
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(54) **Bill dispense control system.**

(57) In a bill issuing machine, a designated denomination and amount of bills can be dispensed from a plurality of bill cartridges (8-11). All bills dispensed are fed to an issue gate (17) which is automatically opened to the operator when any denomination of bills is exhausted during the dispensing operation, the operation is continued through dispensing the other designated denominations of bills. Then, the issue gate is not automatically opened but kept closed to have the operator manually open it, thereby indicating to the operator that an insufficient number of bills was dispensed. Also, the missing amount can be displayed to the operator.



**FIG. 2**

BILL DISPENSE CONTROL SYSTEM

This invention is related to a bill issuing machine wherein some amount of bills requested by a customer are dispensed to a teller who then hands them to the customer and, more particularly, a bill dispense control system in such bill issuing machine operated by  
5 the teller.

Generally, a cash issuing machine operated by a teller, particularly a bill dispenser, has a plurality of cartridges each corresponding to a different denomination.  
10 The requested bill amount, which is inputted by the teller through a keyboard responding to a customer's request is generally checked on the balance etc. by a host computer. If the dispensing is allowable, the host  
15 computer provides a dispensing command to cause some denomination of bills corresponding to the requested amount to be successively fed out from the cartridges and then to be stacked in a temporary store in a bill feed path. After all of the bills corresponding to the  
20 requested amount are fed into the temporary store, they are collectively fed to a take-out port and, when a gate of the port is automatically opened, they are taken out by the teller to be handed to the customer. However, if a cartridge does not contain a sufficient  
25 amount of bills and therefor cannot feed the bills during the feed-out operation, the operation of the bill dispenser stops to suppress the subsequent feed-out operation and calls a teller's attention to fill up the exhausted cartridge. Accordingly, the teller or  
30 a person in charge can fill up the cartridge. In this case, the insufficient amount of bills stacked in the temporary store are collectively transferred into a reject box. At the completion of the fill-up operation,

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the above-mentioned bill feed-out operation is re-started from the beginning.

As described above, when the bill in a cartridge is  
5 exhausted during the bill feed-out operation, all of  
the operations until then are cancelled and must be  
repeated from the beginning after the bill filling-up.  
Thus, the customer may be kept waiting at the teller  
counter for a long time. This is undesirable for the  
10 bank. This invention permits dispensing a required  
amount of bills without keeping the customer waiting  
even if a cartridge is exhausted, and also prevents  
the teller from handing an insufficient amount of  
bills to the customer in error.

15

An embodiment of this invention is described below in  
connection with the appended drawings, in which:

Figure 1 is a block diagram of a banking system con-  
20 taining the bill dispenser that embodies this  
invention;

Figure 2 schematically shows the bill feed system in  
the bill dispenser;

25

Figure 3 is a perspective view showing the construc-  
tion of the take-out port of the bill dis-  
penser that embodies this invention; and

30 Figure 4 is a flow chart illustrating the bill dis-  
pense control system of this invention.

Figure 1 is a block diagram of a banking system in-  
cluding a bill dispenser which can use this invention.  
35 A host computer 1 installed in the head office of a

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bank stores the deposit files of customers who have accounts with this bank, checks the balance of a customer in response to request for dispensing bills that is transmitted from a keyboard 4 in a branch through a controller 2 over a communication line 3 and, if the dispensing is permissible, sends a dispensing command to the controller 2. The controller 2 indicates on a display 5 the denominations and the numbers of the bills corresponding to the amount to be dispensed. The teller may change the combination of the denomination and number of the bills according to the wish of the customer. The number of bills on each denomination as determined above are sent to a bill dispenser 6 and a coin dispenser 7 from the controller 2 by a command. Because these dispensers do dispense exactly the amount of cash specified by the command, the teller can hand the dispensed cash to the customer as is without checking.

Figure 2 shows the bill feed paths schematically in the above-mentioned bill dispenser 6. It has four bill cartridges, each of which can hold any denomination of bills up to a predetermined amount (e.g. 200 bills) respectively. For example, a cartridge 8 can hold ten-thousand-yen bills, a cartridge 9 five-thousand-yen bills, cartridges 10 and 11 one-thousand-yen and five-hundred-yen bills respectively. In addition, another cartridge for one-thousand-yen or ten-thousand-yen bills which is frequently dispensed may be provided instead of the cartridge for five-hundred-yen bills. Any combination of cartridges for any denominations may be chosen. Each cartridge has a mechanism operable to feed out the specified amount of bills. The bill(s) fed from each cartridge passes through a feeding path 14, which consists of belts or rollers, and is stacked in a

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temporary reservoir or store 15. When all of the bills to be dispensed are fed out from the cartridges and no error condition such as overlapped bills or torn bills is detected by a sensor 16, all of the bills in the temporary store 15 are collectively transferred to a take-out port 17. If an error condition is detected, all of the bills in the temporary store are transferred into a reject box 18, and the operation for dispensing the bills is repeated for the transaction. Each cartridge is also provided with a device 13 for detecting the bill exhaustion in the cartridge. If any of the detecting devices 13 detects an empty cartridge, the bill feed-out operation from the associated cartridge is immediately stopped.

Figure 3 shows the construction of the take-out port 17. While a gate 31 is shown in its open state in Figure 3, it is usually in an upright position, namely the closed state. When the bills are transferred onto the bill receiving plate 32 of the take-out port from the temporary store, the belt 33 is driven by a motor (not shown) to rotate a shaft 34 counter-clockwise to open the gate 31 to the illustrated position. Then, the teller can take out the bills and hand them to the customer. When the driving force is removed from the belt 33, the gate 31 is returned to its closed state by a spring 35. Also, when the belt 33 is not driven even if the bills are fed to the take-out port, the teller may open the gate 31 by hand to take out the bills, or may open the gate by driving the belt 33 through the operation of a push button or the like (not shown) to take out the bills.

Now it is assumed that the bill dispenser 6 is requested by the controller 2 to dispense one-hundred-

thousand- yen, for example, in seven ten-thousand-yen bills, two five-thousand-yen bills, eighteen one-thousand-yen bills, and four five-hundred-yen bills. The bill dispenser 6 feeds out seven bills from the

5 cartridge 8 for ten-thousand-yen bills, and then two bills from the cartridge 9 for five-thousand-yen bills to the temporary store 15. Further eighteen bills begin to be fed out from the cartridge 10 for one-thousand-yen bills. For example, if the bills are exhausted when

10 fifteen bills are fed out, the bill dispenser detects it, stops the feed-out operation in the cartridge 10, and informs the teller of the bill exhaustion by turning on a lamp indicating that the cartridge is empty. However, the operation of the bill dispenser is con-

15 tinued to feed out four bills from the next cartridge for five-hundred-yen bills to the temporary store 13. When the feeding-out from the specified cartridges are completed, the bills stacked in the temporary store 13 are collectively transferred to the take-out port 17

20 but the gate 31 does not open because the bill exhaustion has been detected in the cartridge 10. In addition, the bill dispenser 6 sends to the controller 2 the signals representing information on the denominations and numbers of the bills actually fed out, namely seven

25 bills actually fed out, namely seven bills from the cartridge 8, two from the cartridge 9, fifteen from the cartridge 10 and four from the cartridge 11. The controller 2 compares the denominations and numbers of the bills to be dispensed with those of the bills actually

30 fed out and, when it is detected that the feeding-out of the bills comes short by three one-thousand-yen bills, the controller issues to the display 5 a command for causing it to display the denominations and numbers for the shortage. Then, the teller opens the gate 31 by

35 hand to take out the bills fed out there and also takes

out bills corresponding to the shortage displayed on the display 5 from a safe to hand them together to the customer.

- 5 The above operation is controlled by a microprocessor in the bill dispenser 6. Figure 4 is a flow chart generally illustrating its operating steps.

According to this invention, the teller can easily  
10 become aware of the bill exhaustion in the cartridge because the gate of the take-out port does not open automatically when such a problem occurs, making an error in handling the wrong amount of bills to the customer can be prevented.

C L A I M S

1. A bill dispensing machine with a plurality of cartridges (8-11) each containing one denomination of bills, bill feed-out means (12-16) for feeding out a specified number of bills from each cartridge (8-11) to a bill take-out mechanism (17) from which it can be manually removed by an operator characterized by  
  
an exhaustion detector (13) in each cartridge (8- 11) and  
  
a controllable gate (31) controlling manual access to said take-out mechanism (17), said gate being normally opened upon successful completion of the bill feed-out operation, but remaining closed when any of said exhaustion detectors (13) sensed an empty cartridge (8-11).
2. The dispensing machine of claim 1, wherein, upon detection of an empty cartridge (8-11) by the exhaustion detector (13), the feed-out means (12-16) stops feed-out from said empty cartridge and starts feed-out from the other specified cartridges.
3. The dispensing machine of claim 1 or 2, wherein the gate (31) can be manually opened in its closed position.
4. The dispensing machine of any of the preceding claims, further including a display (5) indicating to the operator the missing amount in case one empty cartridge was detected.



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5. The dispensing machine of any of the preceding claims, further including a temporary store (15) for receiving the fed-out bills.
6. The dispensing machine of claim 5, further comprising a reject container (18) into which bills can be fed from the temporary store (15) when an error is detected.
7. A method for operating the dispensing machine of any of the preceding claims, upon a detected bill exhaustion in one or more of the cartridges (8-11) during the bill feed-out operation, the remaining bills from other cartridges are fed into said take-out mechanism (17) with the gate (31) remaining closed but manually openable as indication to an operator.
8. The method of claim 7 in a machine according to claim 4, wherein the display (5) signals to the operator the amount or number of bills missing or contained in the take-out mechanism (17).

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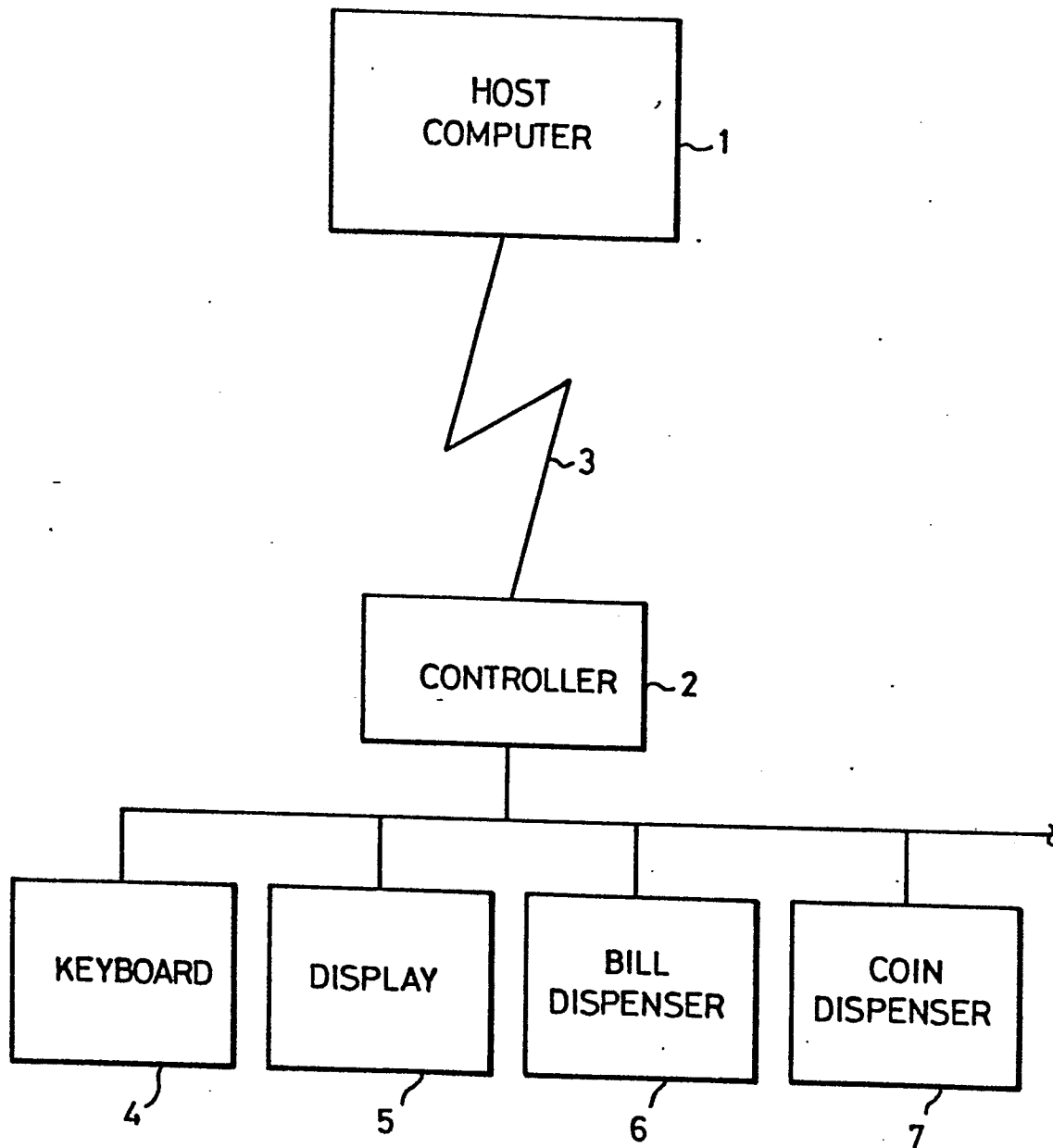


FIG. 1

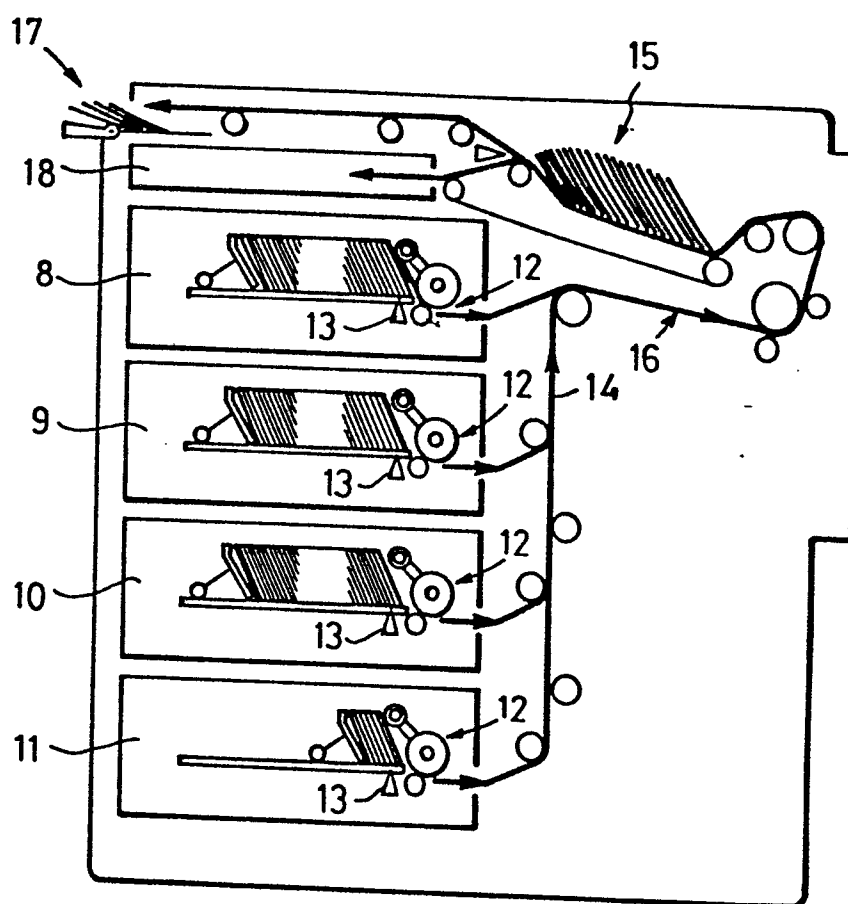


FIG. 2

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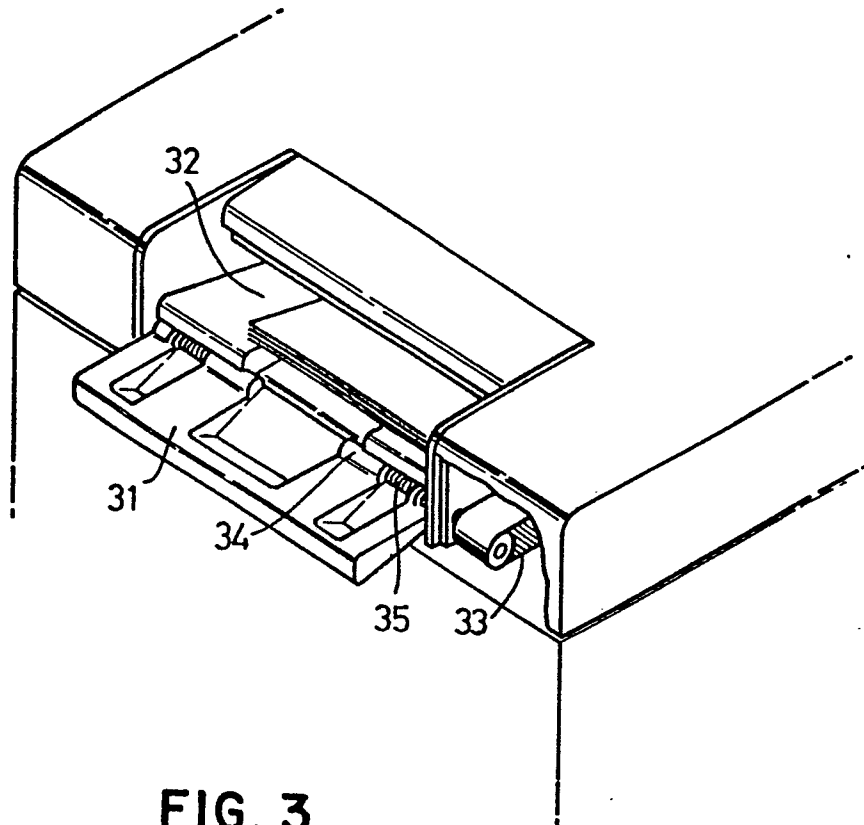


FIG. 3

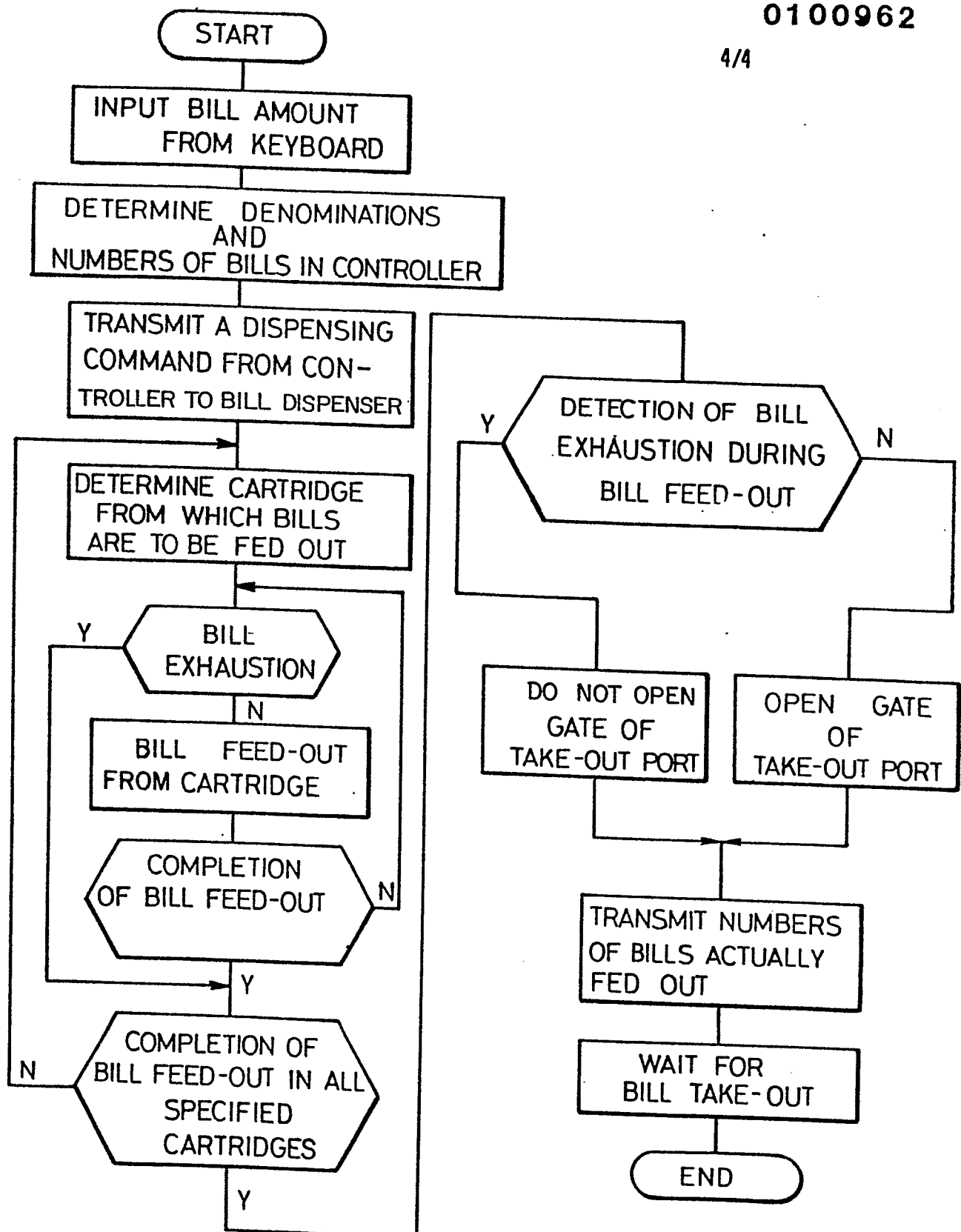


FIG. 4