(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 532 217 A1**

(12) EUROPEAN PATENT APPLICATION

(21) Application number : **92307941.2**

(22) Date of filing : **02.09.92**

(51) Int. Cl.[5] : **B65H 31/20**

(30) Priority : **03.09.91 JP 222022/91**

(43) Date of publication of application :
17.03.93 Bulletin 93/11

(84) Designated Contracting States :
DE FR GB IT SE

(71) Applicant : **HITACHI, LTD.**
6, Kanda Surugadai 4-chome
Chiyoda-ku, Tokyo 100 (JP)

(71) Applicant : **HITACHI ASAHI ELECTRONICS CO., LTD.**
1, Haruokacho Ikegami
Owariasahi-shi (JP)

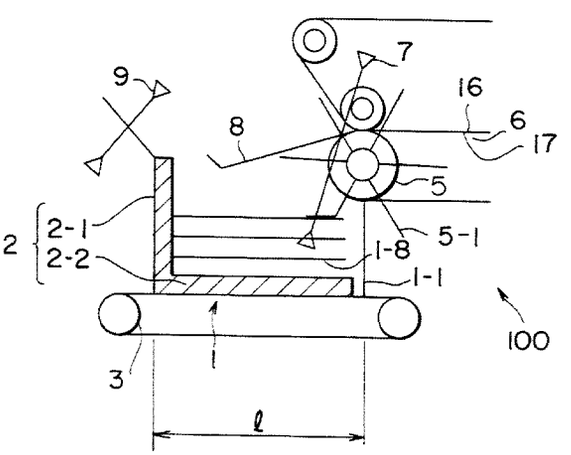
(72) Inventor : **Matsubara, Harumi**
4-9 Sakura-3-chome
Ichinomiya-shi (JP)
Inventor : **Kitano, Kazuhiko**
61 Wakabadai-1-chome
Kani-shi (JP)
Inventor : **Matsuura, Kunihisa**
53, Shinmachi, Niiya, Jimokujicho
Ama-gun, Aichi-ken (JP)
Inventor : **Shibata, Shinji**
1206 Rikumaecho, Meito-ku
Nagoya-shi (JP)

(74) Representative : **Paget, Hugh Charles Edward et al**
MEWBURN ELLIS 2 Cursitor Street
London EC4A 1BQ (GB)

(54) Method of and apparatus for piling bills or the like.

(57) An apparatus for piling bills (18) or the like of different sizes in a single storage part (1) is disclosed, in which a pile of bills of the like stored in the storage part does not interfere with a bill or the like from a carrying path (6). In this apparatus, the rear end of the pile of bills or the like in the storage part is pressed down by flexible sheets (5-1) of a sheet roller (5), and thus the bill or the like from the carrying path enters the storage part through the sheet roller (5) and a bill guide (8) without interfering with the rear end of the pile. When the bill or the like from the carrying path is stored in the storage part, a stopper (2-1) is moved in accordance with the size of the bill or the like, and the pile of bills or like in the storage part is moved together with the stopper. preferably, after the front end of the bill or the like from the carrying path has entered the storage part, or the front end portion of the bill or the like from the carrying path which has predetermined length, has entered the storage part, both of the stopper and the pile of bills or the like in the storage part are moved.

FIG. 1



EP 0 532 217 A1

BACKGROUND OF THE INVENTION

The present invention relates to a method of and an apparatus for piling bills or the like. It is to be noted that the term "a bill or the like" includes a bill (namely, bank note), a card, securities, and others.

In a conventional apparatus for stacking bills or the like, as described in JP-A 61-37,658, a rotating, flexible member for correcting the state of bills or the like is disposed between the end of a path for carrying the bills or the like and the rear end of a stack of bills or the like having been stored in a storage part. In more detail, a stopper fixed to the front and of the storage part true up the front ends of bills or the like having entered the storage part, and the rear end of a stack of bills or the like having been stored in the storage part is pressed against a horizontal plane by the correcting member so that the rear end of the stack is never lifted. Thus, the rear end of the stack will never interfere with a bill or the like which is supplied from the carrying path and is to be stacked. In the conventional apparatus, however, no attention is paid to a case where bills of different sizes are piled in a single storage part.

Such a correcting member is disclosed not only in JP-A 61-37,658 but also in JP-A 1-69,450.

As mentioned above, in the prior art, the fixed stopper trues up the front ends of bills or the like having entered the storage part, and the rear end of the stack of such bills or the like is pressed against a horizontal plane by the rotational motion of the correcting members so that the rear end of the stack is never lifted. Thus, the rear end of the stack is prevented from interfering with a bill or the like which is supplied from the carrying path and is to be stacked. In a case where a bill or the like having a length greater than a predetermined value enters the storage part, however, the front end of the bill or the like is restricted by the stopper, and thus there arises a problem that the rear end of the bill or the like protrudes from the storage part. On the other hand, in a case where a bill or the like having a length smaller than the predetermined value enters the storage part, the front end of the bill or the like bits on the stopper, and thus the rear end of the bill or the like is not affected by the rotational motion of the correcting member. Accordingly, the bill or the like will be bent upwardly on the basis of fact that the bill or the like was once folded up. Thus, there arises a problem that the bent bill collides with a bill or the like which is supplied from the carrying path and is to be stacked, and hence it is impossible to stack the bills or the like in a favorable manner.

SUMMARY OF THE INVENTION

The present invention has been made to solve the above problems, and it is a first object of the present invention to provide an apparatus for piling bills or the like of different sizes in a single storage part.

In order to attain the first object, according to an aspect of the present invention, a stopper for trueing up the front ends of bills or the like, or both of the stopper and a pile of bills or the like in the storage part are moved in accordance with the size of a bill or the like to be piled.

Further, it is a second object of the present invention to prevent a bill or the like which is to be piled, from lying incorrectly upon a pile of bills or the like stored in a storage part, that is, to prevent a jam state in the storage part surely.

In order to attain the second object, according to another aspect of the present invention, after the front end of a bill or the like which is to be piled, has been put in contact with the surface of a pile of bills or the like stored in the storage part, that is, after a part of the bill or the like has been placed on the surface of the pile, the stopper or both of the stopper and the pile are moved.

The pile of bills or the like stored in a state that the front ends of the bills or the like are trued up, is discharged from the storage part, as it is. Usually, the pile of bills or the like is stored in the storage part in a state that a short bill or the like is placed under a long bill or the like. When the pile is turned upside down, the pile will look better. Accordingly, in an embodiment of the present invention, when the pile of bills or the like is discharged from the storage part while being held between a pair of belts, the belts are twisted through an angle of 180°.

As is evident from the above explanation, an apparatus for piling bills or the like in accordance with the present invention, is suitable for used in a cash paying apparatus such as a cash dispenser.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic diagram showing the outline of an embodiment of an apparatus for piling bills or the like in accordance with the present invention.

Fig. 2 is a schematic diagram showing the outline of a cash paying apparatus, to which the embodiment of Fig. 1 is applicable.

Fig. 3 is a block diagram which shows a control system used for the embodiment of Fig. 1.

Fig. 4 is a perspective view showing a sheet roller.

Fig. 5 is a schematic diagram showing the construction of a table moving device.

Figs. 6 and 7 are schematic diagrams showing the construction of devices for taking out a pile of bills or the like.

Fig. 8 is a flow chart for explaining an example of the operation of the embodiment of Fig. 1.

Fig. 9 is a block diagram which shows a different control system used for the embodiment of Fig. 1.

Figs. 10 to 13 are flow charts for explaining other

examples of the operation of the embodiment of Fig. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the present invention will be explained below, with reference to the drawings.

Fig. 1 is a schematic diagram showing the outline of an embodiment 100 of an apparatus for piling bills in accordance with the present invention. The embodiment 100 comprises a storage part 1, a correcting member 5 and a carrying path 6, and is applicable to a cash dispenser 110 shown in Fig. 2. Fig. 3 shows a control system used for the embodiment of Fig. 1.

The cash dispenser 110 includes cassettes 111, 112 and 113 for stacking bills, and each cassette is connected to the present embodiment 100 through the carrying path 6. Further, in Fig. 2, reference numeral 114 designates a reject box, 115 a device for detecting the overlaying of bills, and S1 to S8 sensors.

As shown in Fig. 1, the carrying path 6 is formed of a pair of belts 16 and 17 which are arranged so as to hold a bill 18 therebetween.

Further, the storage part 1 includes a storage table 2 made up of a front stopper 2-1 and a bottom plate 2-2, and a rear stopper 101. The rear stopper 1-1 is fixed, and the storage table 2 is moved by the table moving device 3. Fig. 5 shows the construction of the table moving device 3. A plurality of sheet rollers 5 shown in Fig. 4 and serving as the correcting member, are disposed over the rear end of the storage part 1. Each sheet roller 5 has a plurality of flexible sheets 5-1, and the sheet 5-1 is formed of a polyimide film having a thickness of 0.125 mm. The sheet 5-1 presses down the rear end of a pile of bills, and thus the rear end of the pile is prevented from interfering with a bill to be piled.

In Fig. 1, reference numeral 7 designates an inlet sensor disposed at the entrance of the storage part 1 for delivering a dark signal at a time when the front end of a bill reaches the storage part 1, 9 a sensor for detecting the position of the front stopper 2-1, and 8 a guide for bills.

Next, the table moving device 3 will be explained, with reference to Fig. 5. The storage table 2 is fixed to a toothed belt 31, which engages with a toothed pulley 32. The pulley 32 is rotated by a step motor 38 through gear mechanisms 33 to 36. The amount of rotation of the pulley 32, that is, the amount of movement of the storage table 2 is detected by a position sensor 37.

In Fig. 5, the storage table 2 is moved, as a whole, that is, the front stopper 2-1 and the bottom plate 2-2 are moved together. Accordingly, a pile of bills on the bottom plate 2-2 is moved in synchronism with the movement of the front stopper 2-1. In order to change the length of the storage part in accordance with the size of a bill to be piled so that the bill will never bring about a jam, at least the stopper 2-1 has to be moved. In this case, only the stopper 2-1 is fixed to the belt 31, and the bottom plate is held by a member other than the bottom plate 2-2.

Fig. 6 shows a discharge mechanism 40 for a pile of bills. As shown in Fig. 6, a pile of bills 18 is held among three belts 41, 42 and 43, to be discharged. At this time, the stopper 2-1 is removed from a discharge path with the aid of a mechanism (not shown).

Fig. 7 shows another discharge mechanism, in which a pile of bills is turned upside down. As shown in Fig. 7, a pile of bills 18 is held between belts 52 and 53, each of which is stretched and moved by four rollers. Further, those portions of the belts 52 and 53 which hold the pile of bills, are twisted through an angle of 180°. Thus, the pile kept at a state that a bill of small size is placed under a bill of large size, is discharged in a state that the bill of large size is placed under the bill of small size and the front ends of the bills are still trued up.

Next, the operation of the present embodiment will be explained. Fig. 8 is a flow chart showing the above operation.

The operation of the present embodiment is controlled by a control unit 12 shown in Fig. 3. The control unit 12 stores therein a control program. Further, a size-of-bill storing part (that is, memory) 19 shown in Fig. 3 stores therein the size of bills stacked in each of the cassettes 111 to 113.

Referring back to Fig. 3, the control unit 12 selects the smallest one of bills to be dispensed, with reference to the contents of the memory 19, and transfers the selected bill from a corresponding cassette to the storage part 1 through the carrying path 6 (step 1). At this time, the control unit 12 locates the storage table 2 so that the stopper 2-1 is placed at a predetermined position corresponding to the size of the selected bill. Incidentally, the carrying path 6 is driven by a step motor 13, and the motor 13 also rotates the sheet rollers 5 a shown in Fig. 6.

In step 2, the control unit 12 selects a small bill next to the smallest one, with reference to the contents of the memory 19, and starts the motor 13 so that the selected bill is carried from a corresponding cassette. In step 3, the control unit 12 detects the position of the stopper 2-1 with the aid of the output of the sensor 9. In step 4, the control unit 12 calculates a difference in size between the largest one of bills stored in the storage part 1 (namely, the uppermost one of bills stored in the storage part 1) and a bill to be piled, and the number of pulses for moving the stopper 2-1 in accordance with the above difference is set. In step 5, it is checked whether or not that front end portion of the to-be-piled bill which has predetermined length, has entered the storage part 1. In other words, it is checked whether or not the front end of the bill to be piled is put in contact with a pile of bills stored

in the storage part 1, or it is checked whether or not an end portion of the bill to be piled has been placed on the pile of bills stored in the storage part 1. Thus, the sheet roller 5 presses down the pile of bills stored in the storage part 1, together with the bill to be piled, and thus the generation of a jam is surely prevented. The length of that portion of the to-be-piled bill which is carried into the storage part 1, is determined by the number of rotational steps of the motor 13 counted up after the inlet sensor 7 has detected the to-be-piled bill.

In step 6, the table moving device 3 is operated. Thus, in Fig. 1, the storage table 2 is moved to the left. The moving speed of the storage table 2 is made equal to or a little higher than the moving speed of the bill due to the carrying path.

Thereafter, a predetermined number of bills having the same size are stacked in the storage part (step 7). Then, it is checked whether a bill to be piled, is present or not (step 8), to repeat the above processing.

When all bills are stored in the storage part 1, the bills are discharged to the outside with the aid of the discharge device of Fig. 6 or 7 (step 9).

In the above operation of the present embodiment, after that front end portion of the to-be-piled bill which has the predetermined length, has been carried into the storage part 1, the stopper 2-1 (that is, storage table 2) is moved. In a case where the generation of a jam is surely prevented by the sheet roller 5, however, the storage table 2 may be moved at the same time as the to-be-piled bill reaches the storage part. Further, the storage table may be moved in a period when the to-be-piled bill is still stored in a corresponding cassette or is being carried by the carrying path.

In the above explanation bill are piled in the storage part. It is needless to say that the present embodiment is applicable to a case where cards of different sizes or securites of different sizes are piled.

Further explanation will be made of the present embodiment.

Next, other operations of the present embodiment will be explained. The position of the front stopper 2-1 is set in accordance with the size of a bill or the like to be piled. Bill or the like will be sent to the storage part 1 through the carrying path 6, one by one. The front end of the to-be-piled bill or the like bits on the front stopper 2-1 at a time when the rear end of the bill or the like enters the storage part 1. Thus, the position of the front end of the to-be-filed bill or the like is determined by the front stopper 2-1. Further, the flexible sheets 5-1 of the sheet roller 5 which is rotated anticlockwise, press down the rear end of the to-be-piled, bill or the like and the rear end of a pile of bills 18 or the like stored in the storage part 1. Thus, each of succeeding bills or the like is piled on a pile of bills or the like without making the front end of the succeeding bill or the like collide with the rear end of the pile.

Fig. 9 is a block diagram showing a control system which is used for the embodiment of Fig. 1. In Figs. 3 and 9, the same reference numerals designate like parts. Referring to Fig. 9, the control unit 12 detects the present position of the front stopper 2-1 on the basis of the output signal of the position sensor 9 for the front stopper. Further, the size-of-bill storing part 19 stores therein the size of each of to-be-carried bills or the like, the size information on a carried bill or the like is read out from the size-of-bill storing part 19 while using the carried bill or the like as a key. Next, the control unit 12 calculates the amount of control for the stopper 2-1 on the basis of the present position of the stopper 2-1 and the size information on the carried bill or the like, and applies a start signal to a front-stopper driving motor 15, to move the front stopper 2-1 to an optimum position. The size information on the carried bill or the like may be obtained in the following manner. That is, a sensor is provided on the carrying path 6, and the size of a bill or the like is determined on the basis of a period, during which the bill or the like is detected by the sensor.

Next, the control unit 12 applies a start signal to the carrying-path driving motor 13, to drive the carrying path 6 and the sheet roller 5. A carrying-path encoder 11 delivers an encoder pulse signal in accordance with the amount of movement of the carrying path 6. The control unit 12 detects the movement of the pass 6 according to the encoder pulse signal. The stacke inlet sensor 7 l delivers a dark signal when a bill or the like exists at the entrance of the stacker, and delivers a :light signal when the bill or the like is absent at the entrance of the stacker. The control unit 12 detects a time when the front-stopper driving motor 15 is started, from the output signal of the inlet sensor 7. A bill-moving-belt driving pulse motor 14 drives a bill moving belt, to move a pile of bills 18 or the like to the left or right.

Fig. 10 is a flow chart showing a first example of the operation of the control system of Fig. 9. Referring to Fig. 10, the carrying-path driving pulse motor 13 is first started, to carry bills or the like one by one. Next, the size of a bill or the like to be piled is read out from the size-of-bill storing part 19. Then, the present position of the front stopper 2-1 is detected by the position sensor 9 for the front stopper, the amount of movement of the front stopper is calculated, and the number of pulses for moving the front stopper is set. Thereafter, the front-stopper driving motor 15 is rotated through an angle corresponding to the above number of pulses, to move the front stopper, and then the bill or the like is piled on a pile of bills or the like in the storage part 1. Thus, bills of various sizes can be piled in the stacker.

Fig. 11 is a flow chart showing a second example of the operation of the control system of Fig. 9. In this

example, a plurality of kinds of bills are piled in order of increasing length, and a predetermined number of bills of the same kind are successively piled. The carrying path driving motor 13 is first started, to carry bills or the like, one by one. Next, the size of a bill or the like to be piled is read out from the size-on-bill storing part 19. Then, the present position of the front stopper 2-1 is detected by the position sensor 9 for the front stopper, the amount of movement of the front stopper is calculated, and the number of pulses for moving the front stopper is set. Next, it is detected by the dark signal from the inlet sensor 7 that the front end of the to-be-piled bill or the like has been inserted in the entrance of the stacker. Thereafter, the front stopper 2-1 is moved. When the to-be-piled bill or the like has been stored in the stacker, the position of the front stopper is fixed, and a piling operation is continued till a predetermined number of bills or others equal in size to the to-be-piled bill or the like are piled in the storage part.

Next, in a case where bills or the like different in kind from the above-mentioned is further piled, the size of the bills or the like is detected. In this case, the rear end of a pile of bills 18 or the like is always pressed down by the rotating sheet roller 5. In this state, the inlet sensor 7 delivers the dark signal and the front end of the first one of the bills or the like reaches the entrance of the storage part 1. Accordingly, the front end of the first bill or the like can be inserted in the entrance of the storage part 1 without interfering with the rear end of the pile of bills. After the first bill or the like has been inserted in the storage part 1, the front stopper 2-1 is moved, to pile the first bill or the like on the pile of bills or the like. Then, the front stopper 2-1 is fixed, and a storing operation is continued till a predetermined number of bills equal in size to the first bill are piled in the storage part 1. As mentioned above, in a case where bills different in size from a pile of bills are piled on the pile, after the front end of the first one of the to-be-piled bills has been inserted in the storage part, the front stopper 2-1 is moved. Accordingly, bills of different size can be piled in the storage part 1 in order of increasing length without interfering with a pile of bills in the storage part.

Fig. 12 is a flow chart showing a third example of the operation of the control system of Fig. 9. In this example, a plurality of kinds of bills are piled in order of increasing length, and a predetermined number of bills of the same size are successively piled. Specifically, in a case where the first one of bills different in size from bills having been stored in the storage part is piled on the latter bills, after that front end portion of the first bill which has predetermined length, has been inserted in the storage part 1, the front stopper 2-1 is moved. Thus, the rear end of a pile of bills stored in the storage part is surely prevented from interfering with the front end of the first bill.

In more detail, the carrying-path during motor 13 is started to carry bills or the like, one by one. Next, the size of a bill or the like to be piled is read out from the size-of-bill storage part 19. Then, the present position of the front stopper 2-1 is detected by the position sensor 9 for the front stopper, the amount of movement of the front stopper is calculated, and the number of pulses for moving the front stopper is set. After that front end portion of the to-be-piled bill which has the predetermined length, has been inserted in the storage part 1, the front stopper 2-1 in moved. When the to-be-piled bill has been piled in the storage part 1, the position of the front stopper 2-1 is fixed, and a piling operation is continued till a predetermined number of bills equal in size to the above bill are piled in the storage part.

Next, in a case where bills or the like different in kind from the above-mentioned is further piled, the size of the bills or the like is read out from the size-of-bill storing part 19, and the number of pulses for moving the front stopper is set. After the front end portion of the first one of the bills or the like which has the predetermined length, has been inserted in the storage part 1, the front stopper 2-1 is moved. Hence, a rear end portion of a pile of bills or the like stored in the storage part 1 is always pressed down by the flexible sheets 5-1 of the sheet roller 5. In this state, the front end of the first one of the to-be-piled bills or the like reaches the entrance of the storage part 1. Thus, the rear end of the pile of bills or the like stored in the storage part 1 does not interfere with the front end of the first bill or the like, and the first bill or the like is surely stored in the storage part 1. When the first bill or the like is piled on the pile of bills or the like in the storage part 1, the position of the front stopper 2-1 is fixed, and a piling operation is continued till a predetermined number of bills equal in size to the first bill are piled on the pile of bills in the storage part 1. Thus, bills or the like of different sizes can be piled in a single storage part 1 without interfering with each other.

Fig. 13 is a flow chart showing a fourth example of the operation of the control system of Fig. 9. In this example, a plurality of kinds of bills are piled in order of increasing length, and a predetermined number of bills of the same size are successively piled. Further, at the same time as the front stopper 2-1 is moved, the bill moving belt is moved, to move a pile of bills 18. Thus, bills of different sizes can be piled in a state that the front ends of the bills are trued up.

The carrying-path driving pulse motor 13 is started to carry bills or the like, one by one. Next, the size of a bill or the like to be piled is read out from the size-of-bill storing part 19. Then, the present position of the front stopper 2-1 is detected by the position detector 9 for the front stopper, the amount of movement of the front stopper is calculated, and the number of pulses for moving the front stopper is set. After the front end of the to-be-piled bill or the like has been in-

serted in the entrance of the storage part 1, both of the front stopper 2-1 and a bill moving belt (a pile of bills 18 or the like) are moved. The pile of bills or the like is moved in such a manner that the bill moving belt is moved by driving the bill-moving -belt driving pulse motor 14. When the to-be-piled bill or the like has been stored in the storage part, the position of the front stopper is fixed, and a stacking operation is continued till a predetermined number of bills or others equal in size to the to-be-piled bill or the like are piled.

Next, in a case where bills or the like different in size from the above-mentioned will be further piled, the size of the to-be-piled bills or the like is read out from the size-of-bill storing part 19, and the number of pulses for moving the front stopper is set. After the inlet sensor 7 has delivered a dark signal, both of the front stopper 2-1 and the bill moving belt for moving a pile of bills 18 or the like, are moved. Hence, a rear end portion of the pile of bills 18 or the like is always pressed down by the flexible sheets 5-1 of the rotating sheet roller 5. In this state, the front end of the first one of the to-be-piled bills or the like, which is different in size from bills or the like to have been piled, is inserted in the entrance of the storage part 1. Thereafter, the front stopper 2-1 and the pile of bills or the like are moved at the same time, and the first bill or the like is piled on the pile of bills or the like. Thus, when the first bill or the like is stored in the storage part 1, near end of the pile of bills or the like which is pressed down by the sheet roller 5, does not interfere with the first bill or the like. When the first bill or the like has been piled on the pile of bills or the like, the position of the front stopper 2-1 is fixed, and a piling operation is continued till a predetermined number of bills or others equal in size to the first bill or the like have been piled in the storage part. Thus, bills or the like of different sizes can be piled in a single storage part 1 without interfering with each other, and moreover can be piled in a state that the front ends of the bills or the like are trued up by the front stopper 2-1.

Claims

1. An apparatus (100) for piling bills (18) or the like, the apparatus including a storage part (1) for storing bills (18) or the like in the form of a pile, a stopper (2-1) for trueing up the front ends of bills or the like piled in the storage part, a carrying path (6) for carrying bills or the like to the storage part; and means (5) disposed between the carrying path and the storage part for preventing the rear end of a pile of bills or the like in the storage part, from interfering with a bill or the like which is carried by the carrying path and is to be piled,

   characterized in that the apparatus is provided with means (3, 12, 19) for changing the position of the stopper in accordance with the size of the to-be-piled bill or the like, to make it possible to pile a plurality of kinds of bills or the like having different sizes in the storage part.

2. An apparatus according to Claim 1, the apparatus further comprises means (12, 19) for detecting the size of the to-be-piled bill or the like, wherein the stopper moving means moves the stopper when the uppermost bill or the like of the pile in the storage part is different in size from the to-be-piled bill or the like.

3. An apparatus according to Claim 2, the apparatus further comprises means (7) for detecting that the front end of the to-be-piled bill or the like reaches the storage part, wherein the stopper moving means moves the stopper at substantially the same time as the detection means (7) detects that the front end of the to-be-piled bill or the like reaches the storage part.

4. An apparatus according to Claim 2, the apparatus further comprises means (7) for detecting that the front end of the to-be-piled bill or the like reaches the storage part, wherein when the detection means (7) detects that the front end of the to-be-piled bill or the like reaches the storage part, the stopper moving means moves the stopper after the front end of the to-be-piled bill or the like has been put in contact with the pile stored in the storage part.

5. An apparatus according to any one of Claims 1 to 4, further comprising means (2, 3) for moving the pile stored in the storage part, in synchronism with the movement of the stopper.

6. An apparatus according to Claim 5, further comprising means (40, 50) for discharging the pile of bills or the like to the outside in a state that the front ends of the bills or the like are trued up.

7. An apparatus according to Claim 6, wherein the discharge means (50) turns the pile of bills or the like upside down.

8. An apparatus according to Claim 5, wherein the pile moving means moves the pile at a speed substantially equal to the moving speed of the stopper and in substantially the same direction as the moving direction of the stopper.

9. A cash dispenser (110) including a storage part (1) for storing bills (18) in the form of a pile, a stopper (2-1) for trueing up the front ends of bills stored in the storage part, a carrying path (6) for carrying bills to the storage part, means (5) disposed

between the carrying path and the storage part for preventing the rear end of a pile of bills in the storage part from interferring with a bill which is carried by the carrying path and is to be piled, and means (40, 50) for discharging the pile of bills stored in the storage part to the outside, characterized in that the apparatus further comprising means (3, 12, 19) for changing the position of the stopper in accordance with the size of the to-be-piled bill, to make it possible to pile a plurality of kinds of bills having different sizes in the storage part.

10. A cash dispenser according to Claim 9, further comprising means (2, 3) for moving the pile of bills in synchronism with the movement of the stopper.

11. A cash dispenser according to Claim 10, wherein the discharge means (40, 50) discharges the pile of bills in a state that the front ends of the bills are trued up.

12. A cash dispenser according to Claim 11, wherein the discharge means (50) turns the pile of bills upside down.

13. A method of piling bills or the like of different sizes by using an apparatus according to Claim 1, comprising the steps of:

determining bills or the like to be piled;

sending the bills or the like to the storage part in order of increasing length; and

moving the stopper when a bill or the like longer than the pile of bills or the like stored in the storage part is sent to the storage part.

14. A method of piling bills or the like of different sizes by using an apparatus according to Claim 5, comprising the steps of:

determining bills or the like to be piled;

sending the bills or the like to the storage part in order of increasing length; and

moving both of the stopper and a pile of bills or the like stored in the storage part, when a bill or the like longer than the pile of bills or the like is sent to the storage part.

15. A method of dispensing bills of different sizes by using a cash dispenser according to Claim 9, comprising the steps of:

determining bills to be dispensed;

sending the bills to the storage part in order of increasing length;

moving the stopper when a bill longer than a pile of bills stored in the storage part is sent to the storage part; and

discharging all of the to-be-dispensed bills in the form of a pile, when the to-be-dispensed bills have been all piled in the storage part.

16. A method of dispensing bills of different sizes by using a cash dispenser according to Claim 10, comprising the steps of:

determining bills to be payed;

sending the bills to the storage part in order of increasing length;

moving both of the stopper and a pile of bills stored in the storage part, when a bill longer than the pile of bills is sent to the storage part; and

discharging all of the to-be-dispensed bills in the form of a pile when the to-be-dispensed bills have been all piled in the storage part.

FIG. 1

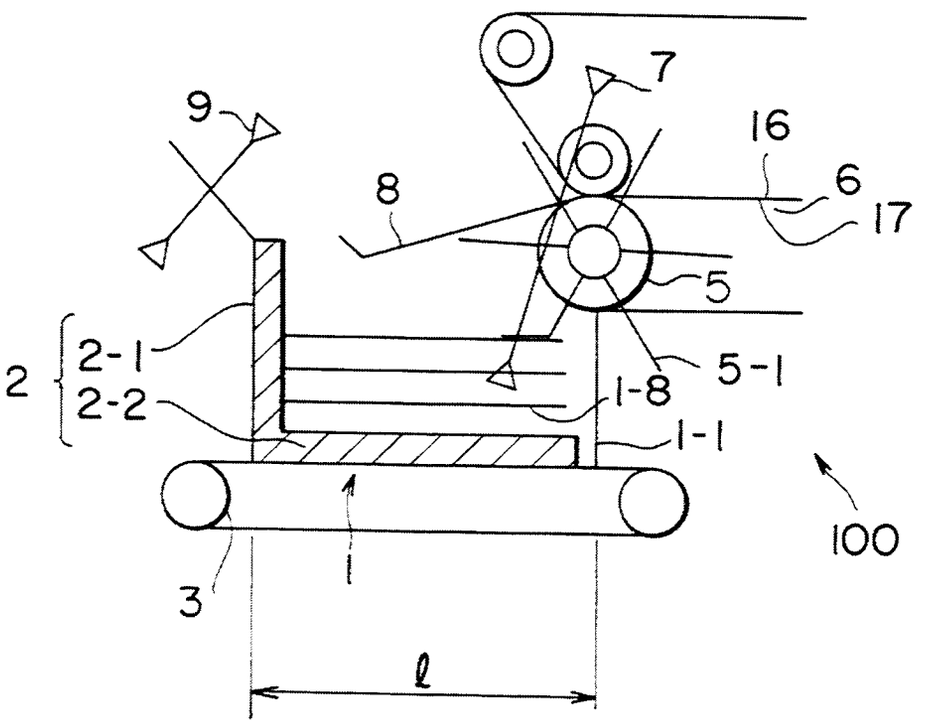


FIG. 2

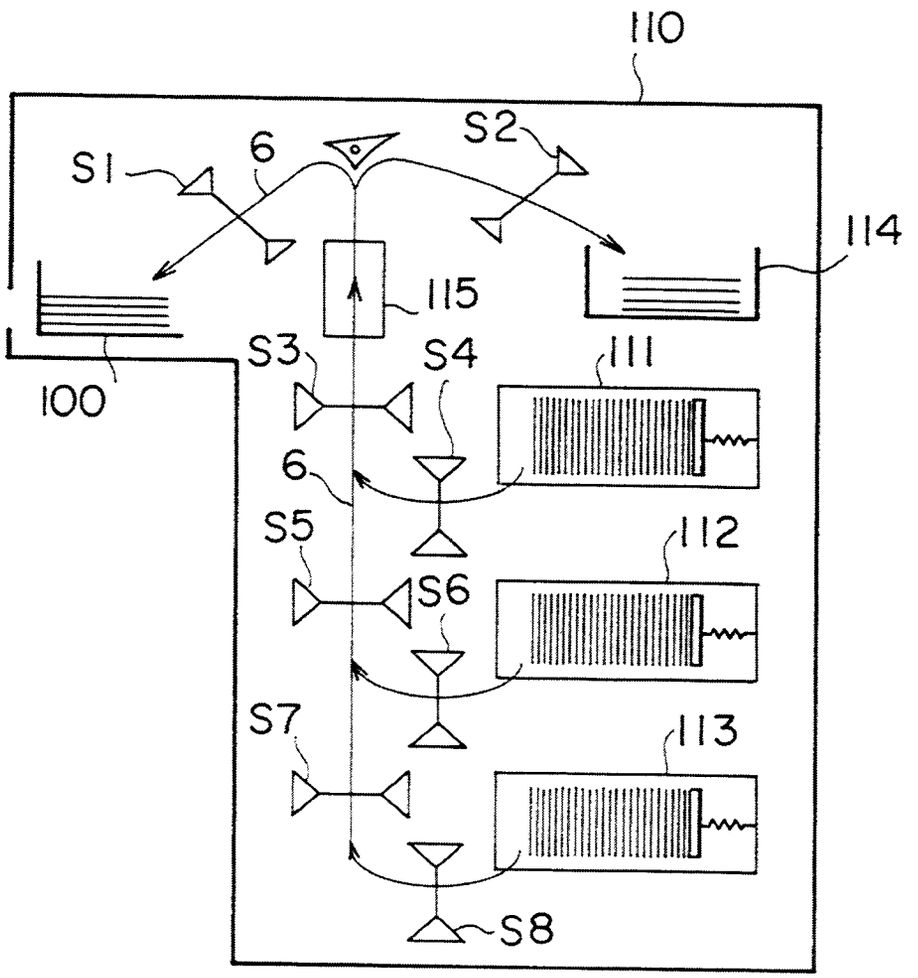


FIG. 3

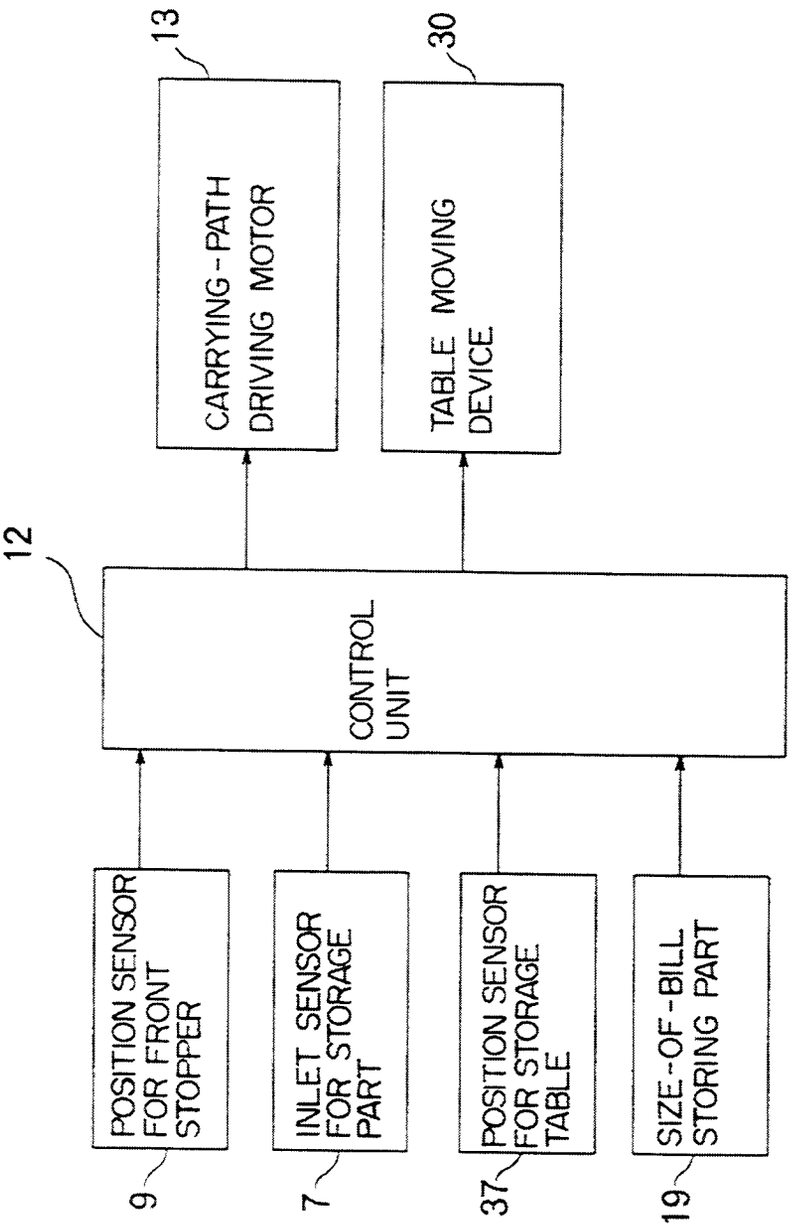

13
30
CARRYING-PATH DRIVING MOTOR
TABLE MOVING DEVICE
12
CONTROL UNIT
POSITION SENSOR FOR FRONT STOPPER
INLET SENSOR FOR STORAGE PART
POSITION SENSOR FOR STORAGE TABLE
SIZE-OF-BILL STORING PART
9
7
37
19

FIG. 4

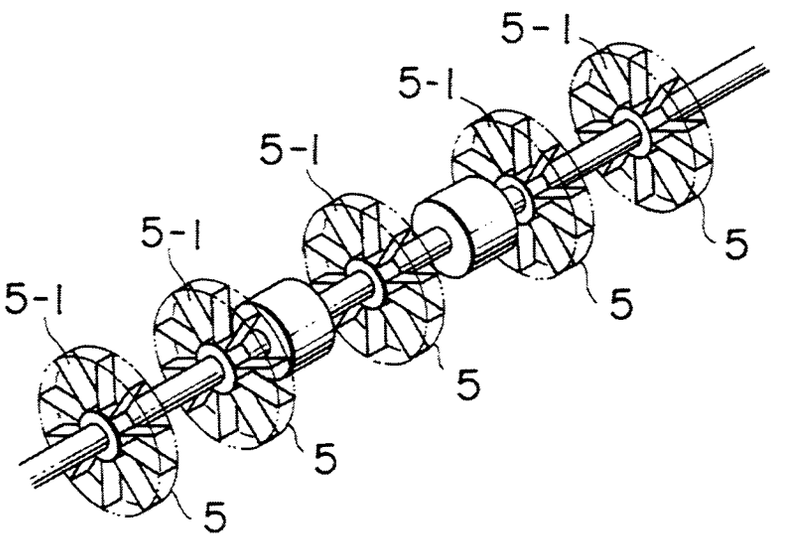


FIG. 5

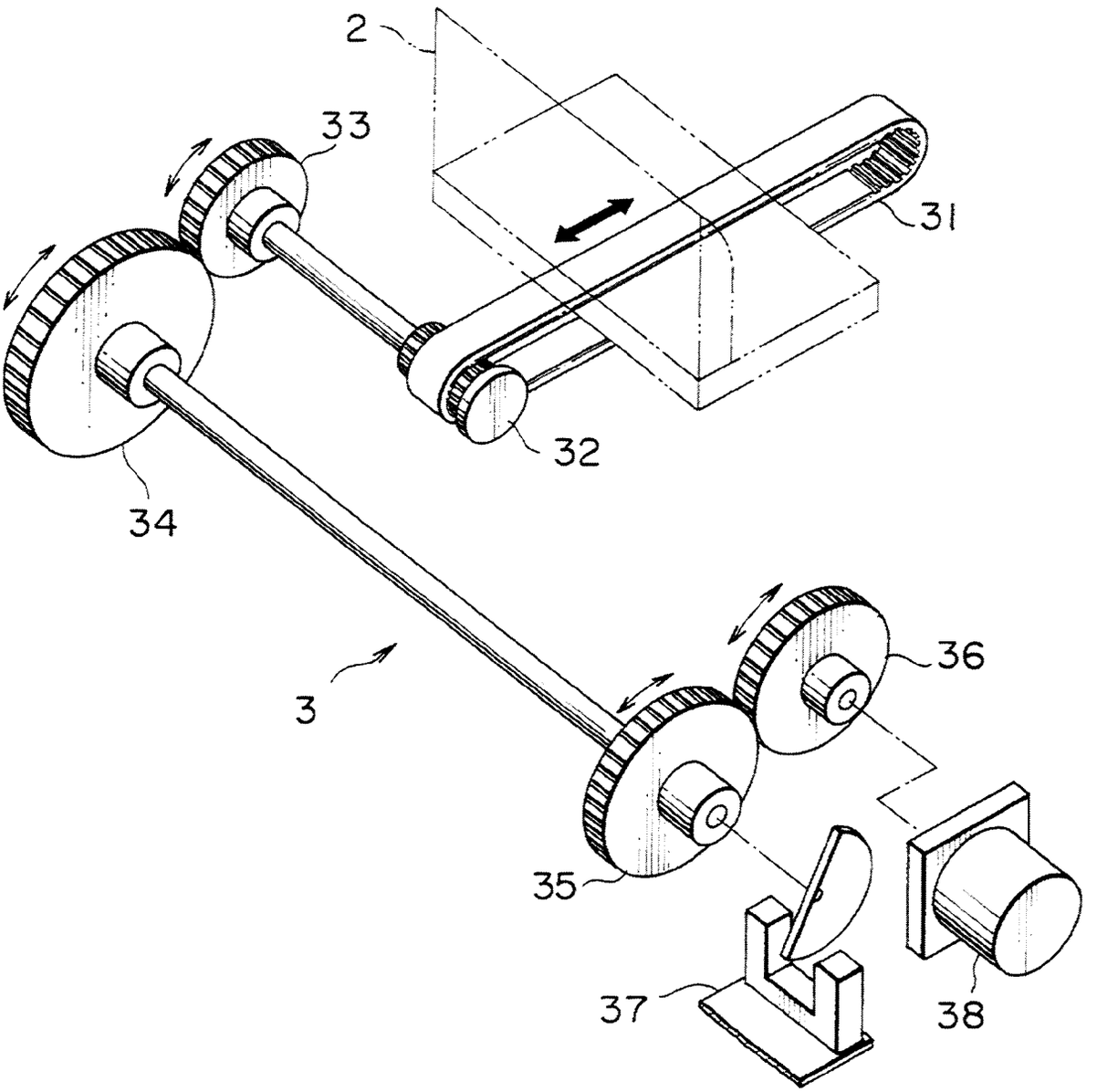


FIG. 6

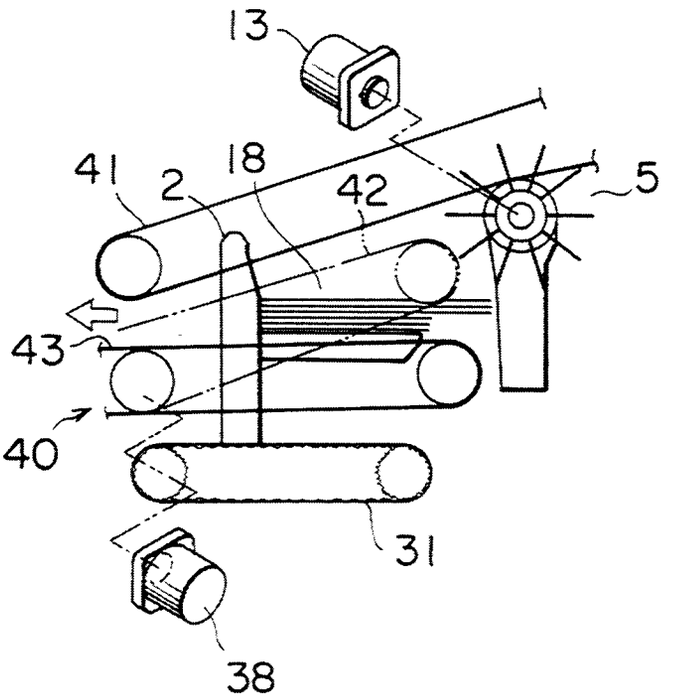


FIG. 7

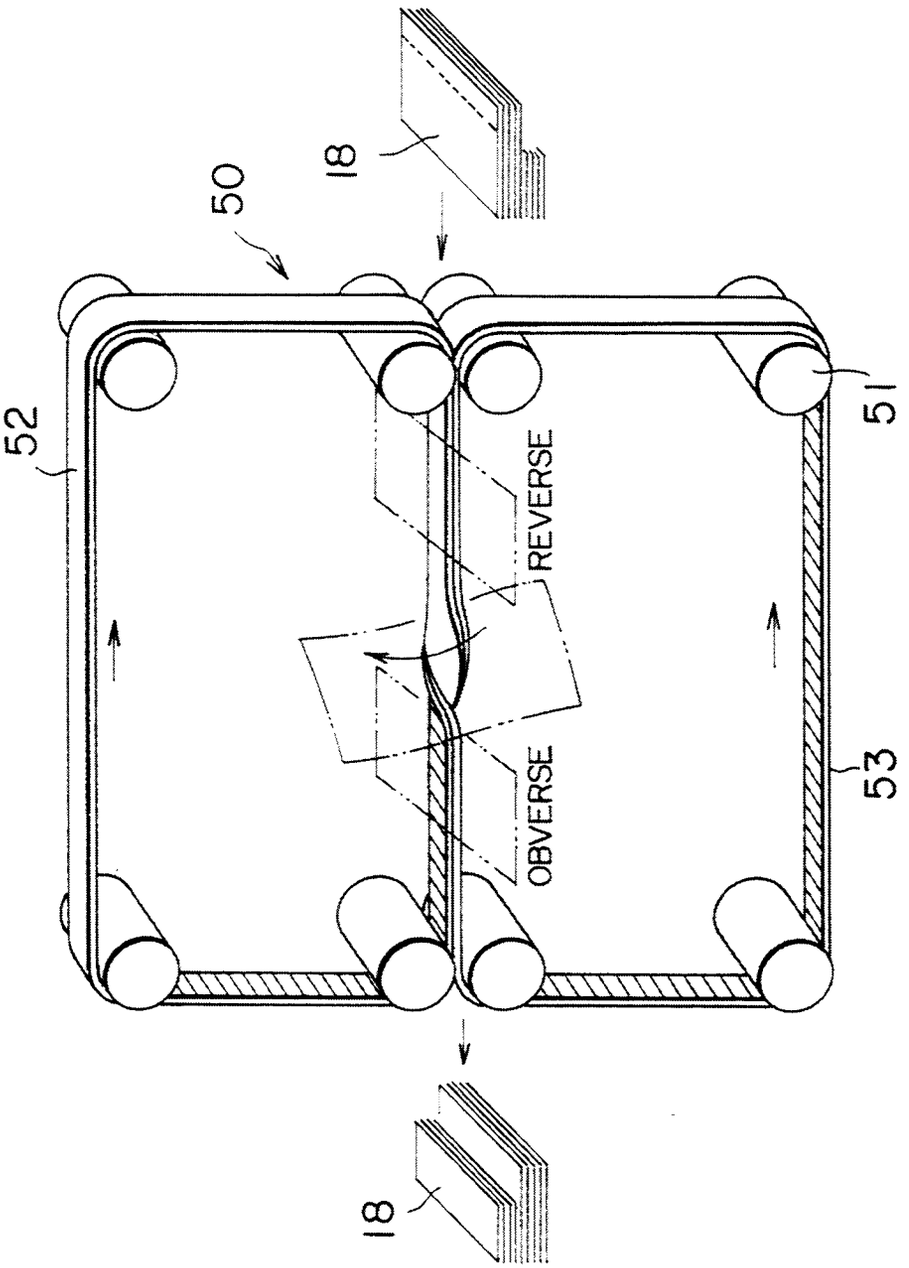


FIG. 8

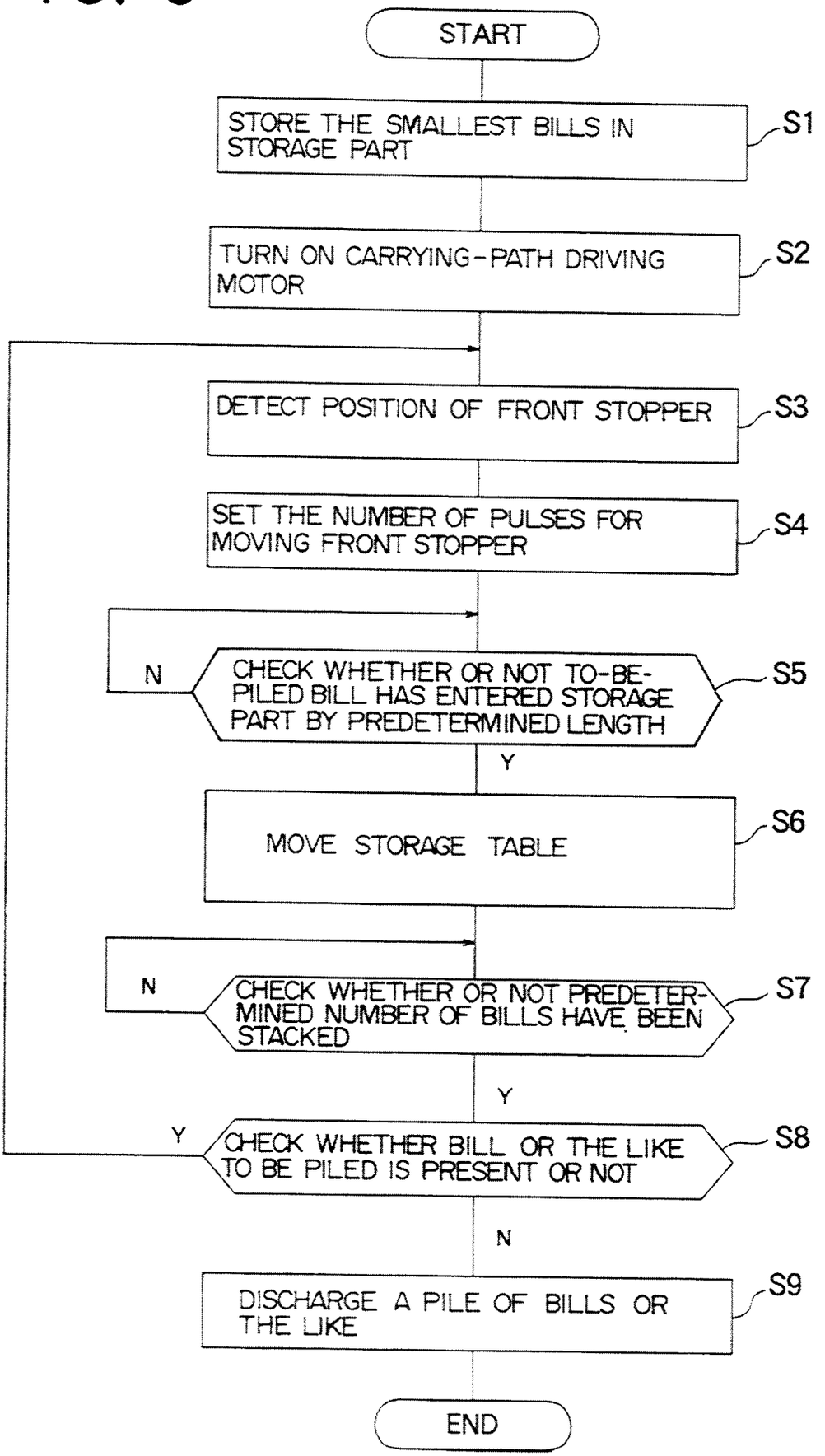

START
STORE THE SMALLEST BILLS IN STORAGE PART
S1
TURN ON CARRYING-PATH DRIVING MOTOR
S2
DETECT POSITION OF FRONT STOPPER
S3
SET THE NUMBER OF PULSES FOR MOVING FRONT STOPPER
S4
N
CHECK WHETHER OR NOT TO-BE-PILED BILL HAS ENTERED STORAGE PART BY PREDETERMINED LENGTH
S5
Y
MOVE STORAGE TABLE
S6
N
CHECK WHETHER OR NOT PREDETERMINED NUMBER OF BILLS HAVE BEEN STACKED
S7
Y
Y
CHECK WHETHER BILL OR THE LIKE TO BE PILED IS PRESENT OR NOT
S8
N
DISCHARGE A PILE OF BILLS OR THE LIKE
S9
END

FIG. 9

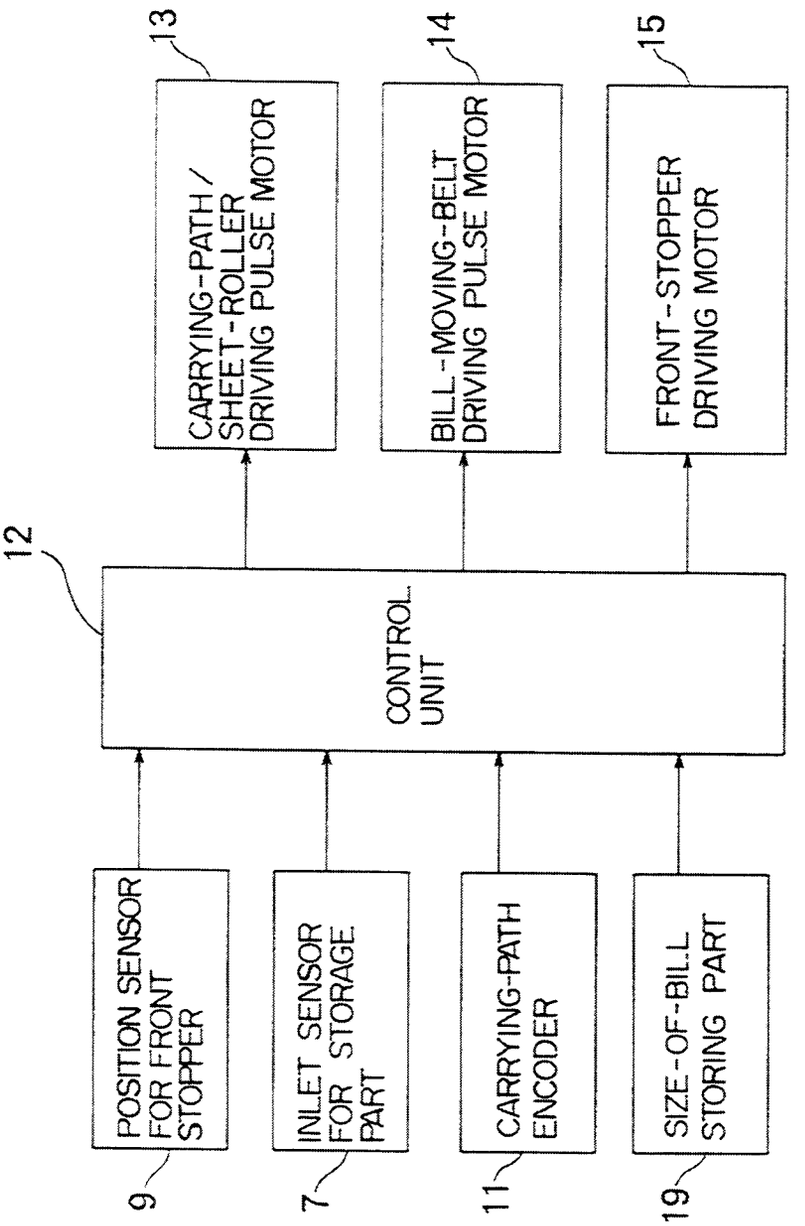

13
14
15
CARRYING-PATH / SHEET-ROLLER DRIVING PULSE MOTOR
BILL-MOVING-BELT DRIVING PULSE MOTOR
FRONT-STOPPER DRIVING MOTOR
12
CONTROL UNIT
POSITION SENSOR FOR FRONT STOPPER
INLET SENSOR FOR STORAGE PART
CARRYING-PATH ENCODER
SIZE-OF-BILL STORING PART
9
7
11
19

FIG. 10

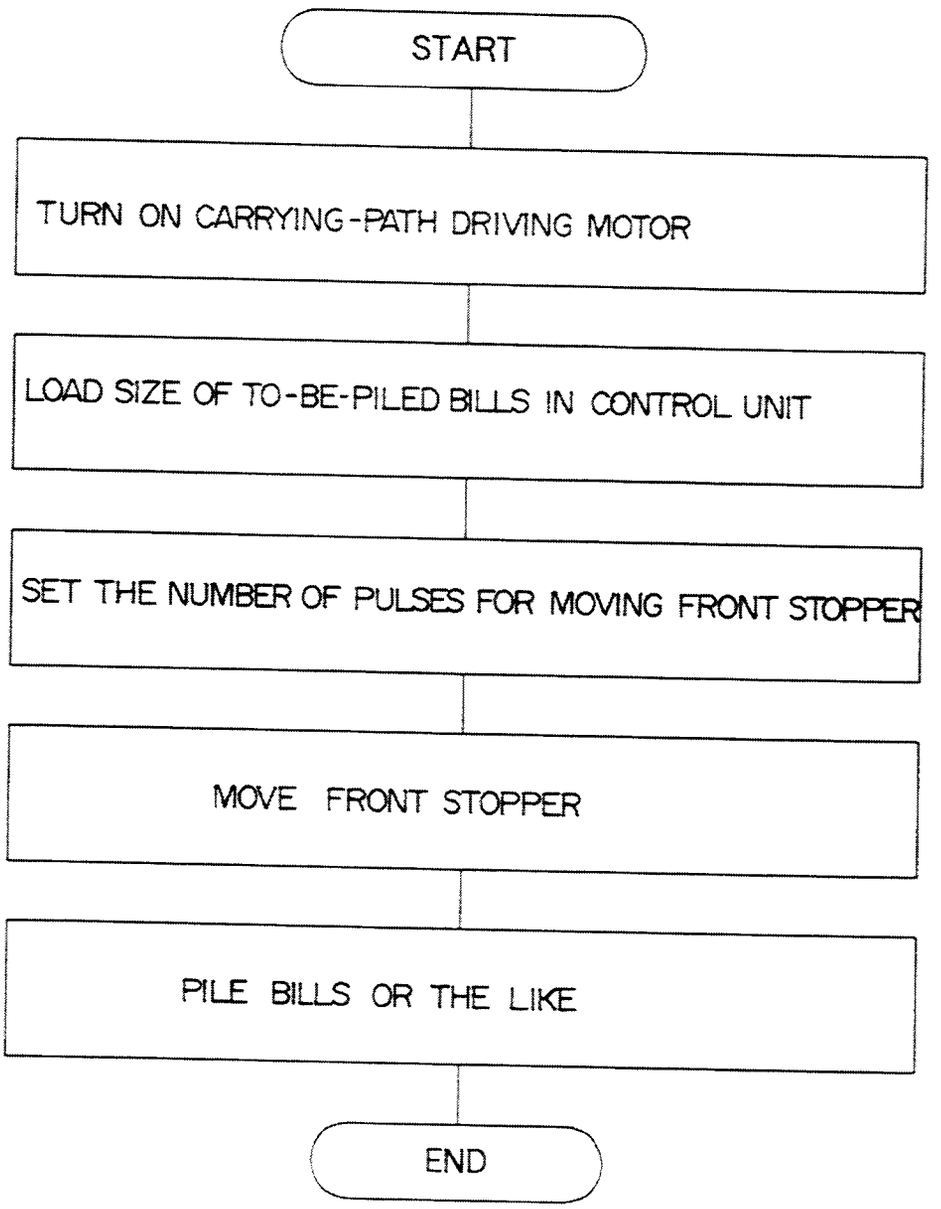

START
TURN ON CARRYING-PATH DRIVING MOTOR
LOAD SIZE OF TO-BE-PILED BILLS IN CONTROL UNIT
SET THE NUMBER OF PULSES FOR MOVING FRONT STOPPER
MOVE FRONT STOPPER
PILE BILLS OR THE LIKE
END

FIG. 11

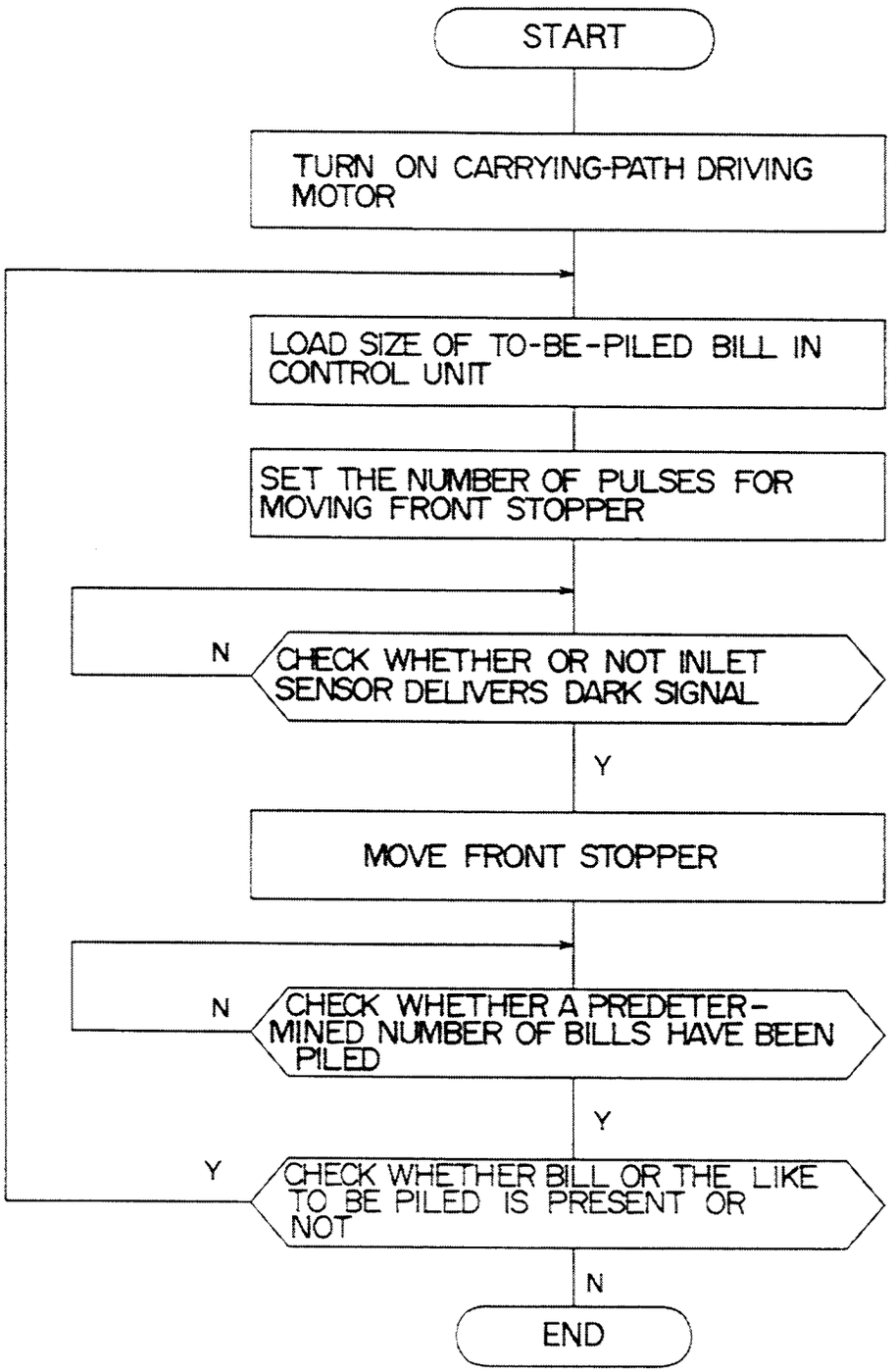

START
TURN ON CARRYING-PATH DRIVING MOTOR
LOAD SIZE OF TO-BE-PILED BILL IN CONTROL UNIT
SET THE NUMBER OF PULSES FOR MOVING FRONT STOPPER
N
CHECK WHETHER OR NOT INLET SENSOR DELIVERS DARK SIGNAL
Y
MOVE FRONT STOPPER
N
CHECK WHETHER A PREDETERMINED NUMBER OF BILLS HAVE BEEN PILED
Y
Y
CHECK WHETHER BILL OR THE LIKE TO BE PILED IS PRESENT OR NOT
N
END

FIG. 12

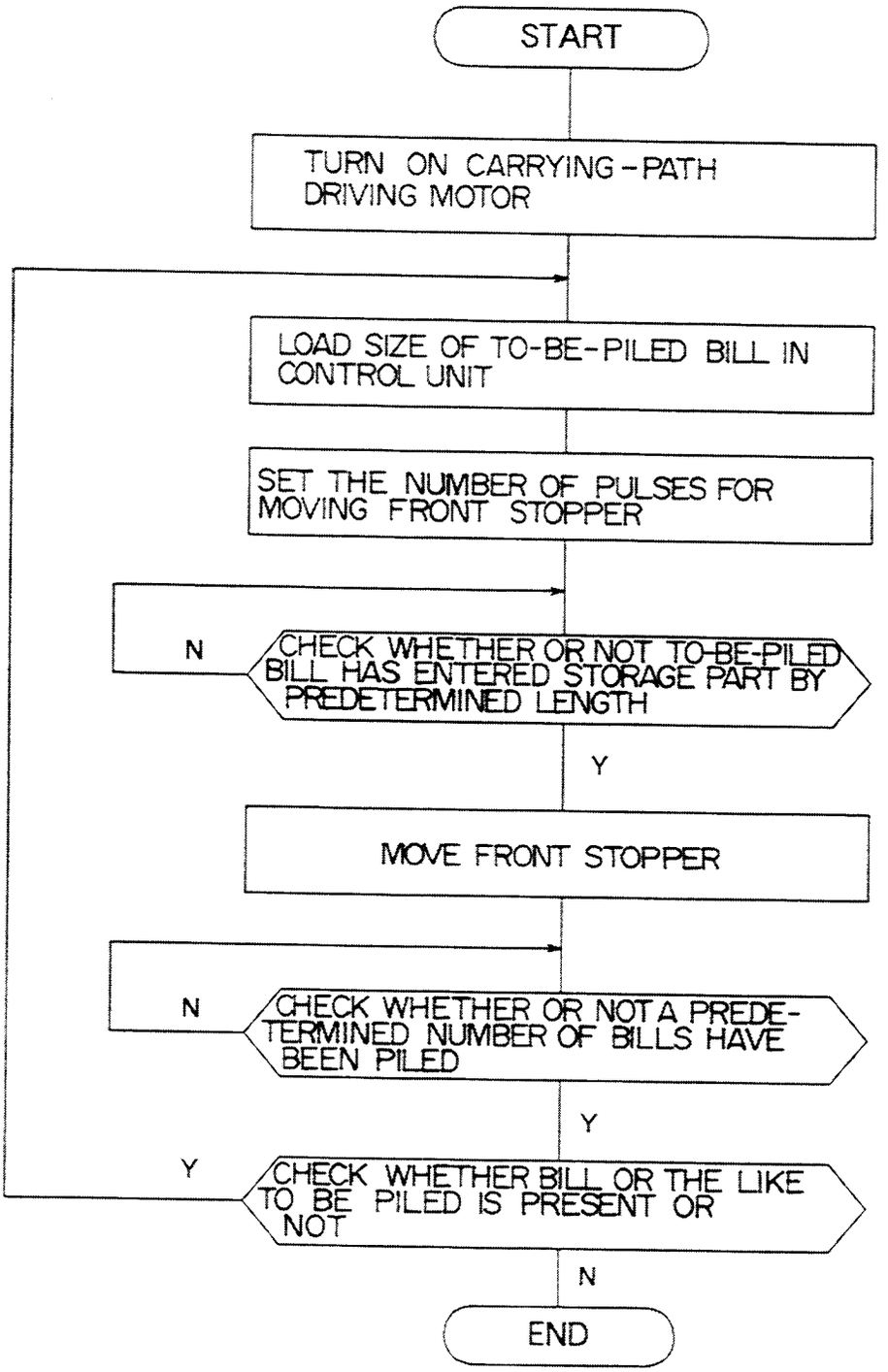
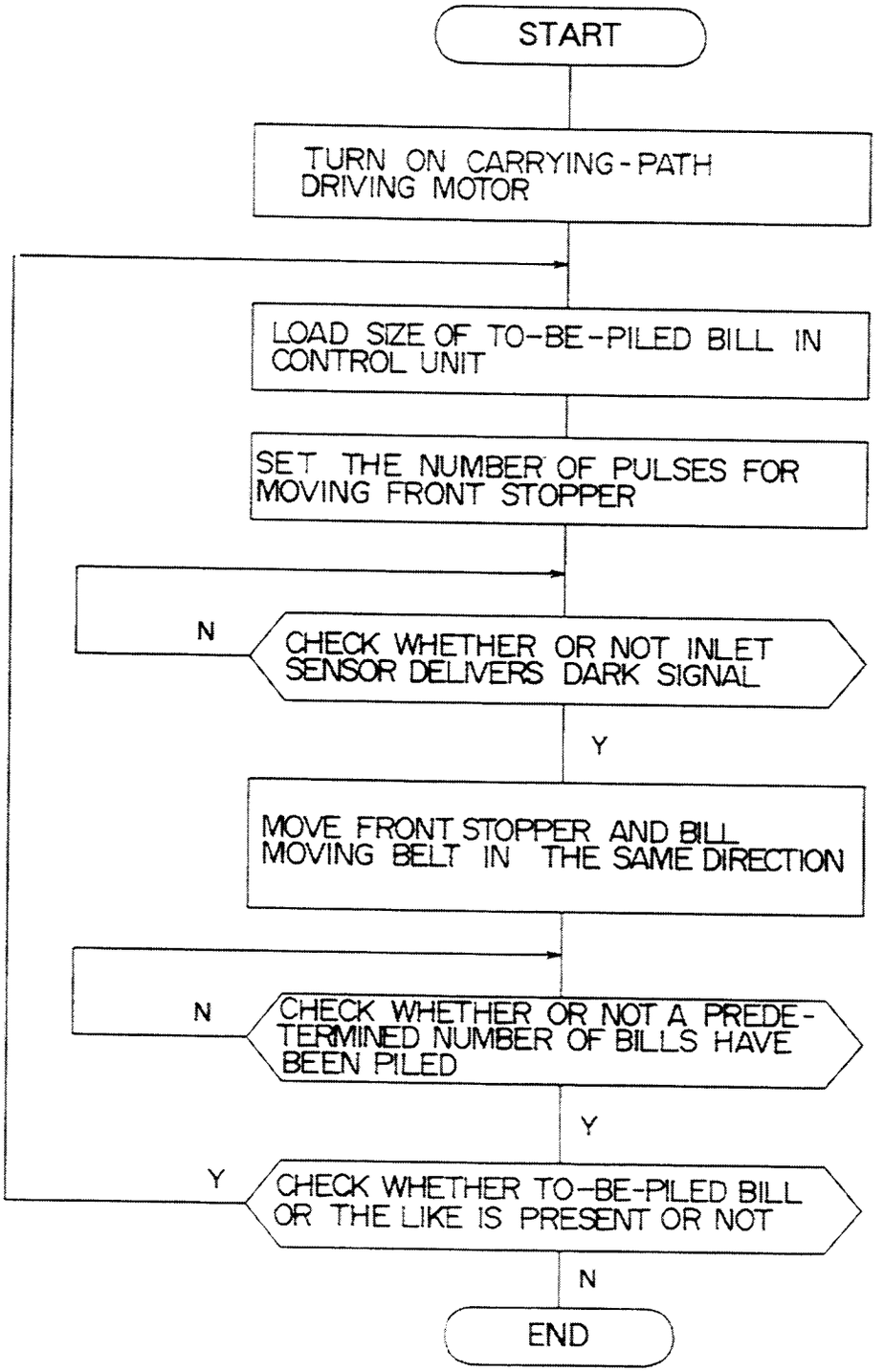

START
TURN ON CARRYING-PATH DRIVING MOTOR
LOAD SIZE OF TO-BE-PILED BILL IN CONTROL UNIT
SET THE NUMBER OF PULSES FOR MOVING FRONT STOPPER
N
CHECK WHETHER OR NOT TO-BE-PILED BILL HAS ENTERED STORAGE PART BY PREDETERMINED LENGTH
Y
MOVE FRONT STOPPER
N
CHECK WHETHER OR NOT A PREDE-TERMINED NUMBER OF BILLS HAVE BEEN PILED
Y
Y
CHECK WHETHER BILL OR THE LIKE TO BE PILED IS PRESENT OR NOT
N
END

FIG. 13


START
TURN ON CARRYING-PATH DRIVING MOTOR
LOAD SIZE OF TO-BE-PILED BILL IN CONTROL UNIT
SET THE NUMBER OF PULSES FOR MOVING FRONT STOPPER
N
CHECK WHETHER OR NOT INLET SENSOR DELIVERS DARK SIGNAL
Y
MOVE FRONT STOPPER AND BILL MOVING BELT IN THE SAME DIRECTION
N
CHECK WHETHER OR NOT A PREDE-TERMINED NUMBER OF BILLS HAVE BEEN PILED
Y
Y
CHECK WHETHER TO-BE-PILED BILL OR THE LIKE IS PRESENT OR NOT
N
END

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 92 30 7941

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X Y	PATENT ABSTRACTS OF JAPAN vol. 8, no. 170 (M-315)(1607) 7 August 1984 & JP-A-59 64 470 (TOSHIBA) 12 April 1984 * abstract * ---	1-4,9 5-8, 10-12	B65H31/20
A	PATENT ABSTRACTS OF JAPAN vol. 10, no. 253 (M-512)(2309) 29 August 1986 & JP-A-61 81 357 (TOSHIBA) 24 April 1986 * abstract * ---	9-12	
Y	PATENT ABSTRACTS OF JAPAN vol. 7, no. 257 (M-256)(1402) 16 November 1983 & JP-A-58 139 961 (FUJI XEROX) 19 August 1983 * abstract * ---	5,8,10	
Y	DE-A-2 535 123 (TOMOKU) * claim 1; figures * ---	6,7,11, 12	TECHNICAL FIELDS SEARCHED (Int. Cl.5) B65H
X	GB-A-2 141 111 (XEROX) * page 7, line 31 - line 109; figure 13 * -----	1-4	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 DECEMBER 1992	HAGBERG A.M.E.

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

EPO FORM 1503 03.82 (P0401)