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(71) Applicant: **JAPAN CASH MACHINE CO., LTD.**
Osaka-shi,
Osaka 547-0035 (JP)

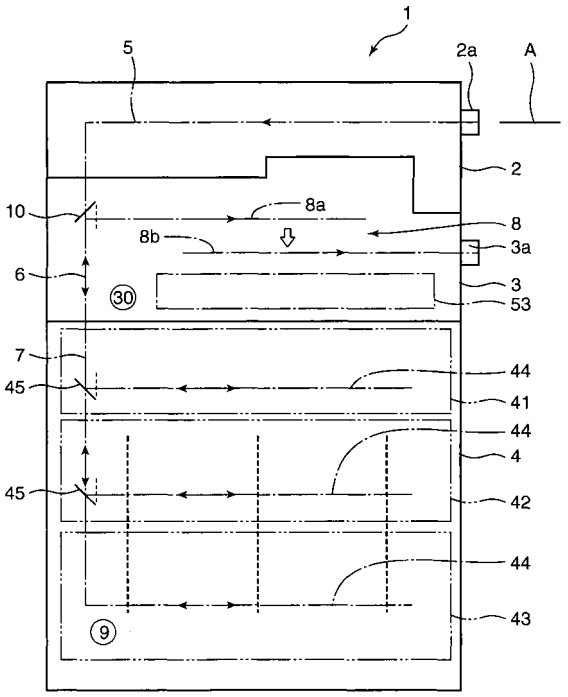
(72) Inventors:
- **Kobayashi, Hidetoshi**
  Minamikoma-gun
  Yamanashi (JP)
- **Mitsui, Ikugo**
  c/o Kofu Lab. of Japan Cash Machine Co.,Ltd.
  Yamanashi (JP)

(74) Representative: **Müller-Boré & Partner**
Patentanwälte
Grafinger Strasse 2
81671 München (DE)

(54) Banknote processing apparatus

(57) A banknote processing apparatus is provided which includes: a paying-out line (8) that has a first paying-out line (8a), and a second paying-out line (8b) which is provided under the first paying-out line (8a), has a temporarily holding portion (11) and leads to a paying-out opening (3a); a pair of edge support members (15) that supports both edges in the width directions of a banknote (A) on the first paying-out line (8a), so that no matter what kind of banknote (A) it is, a virtual line (AL) along the middle in the width directions of the banknote (A) coincides with a reference line (BL) located along the middle in the width directions of the first paying-out line (8a); and a banknote pressing-down means (14) for pressing down the part between both edges in the width directions of the banknote (A) supported by the edge support members (15), so that the banknote (A) falls off from the edge support members (15) and moves to the temporarily holding portion (11).

FIG.1



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Description

Background of the Invention

Field of the Invention;

[0001] The present invention relates to a banknote processing apparatus which is capable of paying out several kinds of banknotes in different widths.

Background Art:

[0002] As a banknote processing apparatus, the following configuration is known as disclosed, for example, in Japanese PatentLaid-OpenNo. 2002-279487specification. Specifically, in this banknote processing apparatus, when a banknote has been put in, the kind of the banknote inserted from an insertion opening is identified. Then, this banknote is sent into a banknote storage portion specified according to the kind of the banknote. On the other hand, when a banknote is taken out, the banknote is fed from a banknote storage portion according to a designated kind of banknote. Then, this banknote is sent out to a paying-out opening.

[0003] Incidentally, there is a currency which has banknotes in different widths according to their kinds, for example, as is the case with a Eurocurrency.

[0004] In the apparatus disclosed in the above described specification, in order to distinguish banknotes stably, a mechanism is provided which allows the middle in the width directions of a banknote to coincide with a virtual reference line of a forwarding line when this banknote has been put in. However, in this apparatus, no such mechanism is provided on the paying-out side, thus raising the following disadvantage. Specifically, in the case where a temporarily holding portion for piling banknotes is provided halfway through a paying-out line, banknotes may not be correctly positioned in this temporarily holding portion. This can cause those banknotes to be placed one-sidedly with respect to the paying-out line. As a result, a banknote may come into contact with a paying-out opening and be bent, and such a defect can hinder it from being normally paid out.

Summary of the Invention

[0005] It is an object of the present invention to provide a banknote processing apparatus which is capable of resolving the above described disadvantage.

[0006] It is another object of the present invention to provide a banknote processing apparatus which is capable of paying out a banknote normally.

[0007] A banknote processing apparatus according to an aspect of the present invention which includes a paying-out line for a banknote and a temporarily holding portion for a banknote provided on the paying-out line, the apparatus paying out, through a paying-out opening, a plurality of kinds of banknotes in different widths held temporarily in the temporarily holding portion, characterized in that: the paying-out line has a first paying-out line and a second paying-out line provided under the first paying-out line, the second paying-out line having the temporarily holding portion and leading to the paying-out opening; and the banknote processing apparatus includes an edge supporting means for supporting both edges in the width directions of a banknote on the first paying-out line so that no matter what kind of banknote it is, a virtual line along the middle in the width directions of the banknote coincides with a reference line located along the middle in the width directions of the first paying-out line, and a banknote pressing-down means for pressing down a part between both edges in the width directions of a banknote supported by the edge supporting means, so that the banknote falls off from the edge supporting means and moves to the temporarily holding portion.

[0008] In this banknote processing apparatus, the banknote pressing-down means presses down the middle part of a banknote which is supported at both edges in the width directions by the edge supporting means provided in the first paying-out line so that the banknote can fall off. Thus, the banknote's width-direction both edges are pulled so that it falls off from the edge supporting means. Thereby, the banknote is moved to the temporarily holding portion. According to such a mechanism, a plurality of banknotes can be stacked in this temporarily holding portion, and the plurality of banknotes with kept piled can be paid out from the paying-out opening. Particularly, above this temporarily holding portion, no matter what kind of banknote it is, the virtual line along the middle in the width directions of the banknote is centered so as to coincide with the reference line (hereinafter, referred to as the "centering"). Thereafter, the banknote is pushed down by the banknote pressing-down means, and thus, it is moved to the temporarily holding portion. Therefore, the virtual line along the middle in the width directions of the banknote meets with the middle line of the paying-out line. In this state, this banknote is piled on top of the other banknotes and is temporarily stored. Thereby, the banknote can be prevented from coming into contact with the paying-out opening, thus helping pay out the banknote normally.

[0009] Herein, the edge supporting means may also have: a pair of edge support members, each of which having a concave groove into which an edge in the width directions of a banknote is inserted; a cam which rotates on its vertical axis and positions the pair of edge support members symmetrically with respect to the reference line; and a force-giving means which gives the pair of edge support members a force toward their mutually approaching directions.

[0010] According to this aspect, a force is applied to the pair of edge support members so that they are pressed against the peripheral surface of the cam. Thereby, both edge support members are positioned symmetrically with respect to the reference line. This makes it

possible to realize the centering, using a simple mechanism.

[0011] In this aspect: the cam may also be provided with a plurality of pairs of regulation surfaces disposed in accordance with the kind of a banknote to be paid out, each pair of regulation surfaces being symmetrical with respect to the rotational center; and the edge supporting means may also have a servo motor which controls the rotation of the cam so that the separation distance between the pair of edge support members is adjusted using the regulation surfaces.

[0012] According to this aspect, the cam's rotational angle is controlled by the servo motor, and the separation distance between the pair of edge support members is adjusted using the regulation surfaces of the cam in accordance with the kind of a banknote. Therefore, their interval can be controlled so as to be exactly the value which corresponds to the kind of a banknote.

[0013] Furthermore: the cam may also have a symmetrical shape with respect to the rotational center and be shaped so that its radius changes continuously; and the edge supporting means may also have a servo motor which controls the rotation of the cam so that the separation distance between the pair of edge support members is adjusted using any radius part of the cam.

[0014] According to this aspect, the cam's rotational angle is controlled by the servo motor, and the separation distance between the pair of edge support members is adjusted using the radius part of the cam in accordance with the kind of a banknote. Therefore, their interval can be controlled so as to be exactly the values according to kinds of banknotes. Thereby, even if each country of the world has banknotes which differ in width, this banknote processing apparatus can handle banknotes of any country.

[0015] Moreover: the edge supporting means may also have a pair of edge support members, each of which having a concave groove into which an edge in the width directions of a banknote is inserted, racks which move the pair of edge support members in the width directions of a banknote, and a toothed gear which engages with the racks; and the pair of edge support members may also move along with the rotation of the toothed gear with kept symmetrical with respect to the reference line.

[0016] According to this aspect, using the mechanism formed by combining the racks and the toothed gear which engages with this, the pair of edge support members is positioned symmetrically with respect to the reference line. This makes it possible to omit a spring which gives an elastic force.

[0017] In addition, each concave groove may also have: a guide surface which slants so as to gradually come close to the reference line along the direction in which a banknote is inserted; and a positioning surface which is connected to the guide surface and is parallel to the reference line.

[0018] According to this aspect, a banknote is guided by the oblique guide surfaces which are formed, respectively, in the concave grooves of the pair of edge support members. This banknote is led to the parallel positioning surfaces and is centered at these positioning surfaces.

[0019] In this aspect, it is preferable that the concave grooves of the pair of edge support members be formed so that the edges in the width directions of a banknote come into contact with the positioning surfaces, respectively and so that the depth of the concave groove in each positioning surface becomes equal.

[0020] According to this aspect, when the banknote pressing-down means pushes down the middle part of a banknote which is supported at both edges in the width directions by the edge supporting means so that the banknote can fall off, the banknote's width-direction both edges can be pulled so that it falls off from the edge supporting means, simultaneously or almost simultaneously. Thereby, the banknote's width-direction both edges can be pulled out in the same timing, thus preventing either edge from remaining without falling off.

[0021] Furthermore, it is preferable that the apparatus comprises a storage portion disposed below the paying-out opening and the temporarily holding portion, and a money receipt portion disposed above the paying-out opening and the temporarily holding portion.

[0022] According to this aspect, the paying-out opening and the money receipt portion are disposed above the storage portion. Therefore, the positions in which money is paid in and out can be set at easily-operable heights.

Brief Description of the Drawings

[0023]

Fig. 1 is a schematic front view of the whole of a banknote processing apparatus according to an embodiment of the present invention.

Fig. 2 is a front view of a paying-out unit provided in the banknote processing apparatus of Fig. 1, showing its configuration.

Fig. 3 is a plan view of the paying-out unit of Fig. 2.

Fig. 4 is a sectional view of the paying-out unit of Fig. 2, seen along the IV-IV line (herein, only its main part is shown).

Figs. 5A and 5B are plan views of a pair of edge support members provided in the banknote processing apparatus of Fig. 1, showing their motions.

Fig. 6 is a plan view of springs which allow the pair of edge support members of Fig. 5 to come close to each other, and their vicinity.

Fig. 7 is a plan view of the pair of edge support members of Fig. 5A and 5B, showing their motions to come close to and go away from each other.

Fig. 8 is a plan view of a rise-and-fall driving means which forms a part of a banknote pressing-down means provided in the banknote processing apparatus of Fig. 1.

Figs. 9A and 9B are plan views of a pusher, showing

its drive by the rise-and-fall driving means of Fig. 8.

Figs. 10A and 10B are flow charts, showing a banknote paying-out operation in a banknote processing apparatus according to an embodiment of the present invention.

Fig. 11 is a plan view of a cam used in another embodiment of the present invention.

Fig. 12 is a plan view of a mechanism formed by combining racks and a toothed gear which is used in still another embodiment of the present invention.

Detailed Description of the Preferred Embodiments of the Invention

[0024] Fig. 1 is a schematic front view of the whole of a banknote processing apparatus according to an embodiment of the present invention. This banknote processing apparatus 1 includes: at its uppermost part, a money receipt unit 2 as the money receipt portion; a paying-out unit 3 provided under this; and further under this, a storage unit 4 as the storage portion provided. Hence, the paying-out unit 3 and the money receipt unit 2 are placed above the storage unit 4. This offers an advantage in that the positions in which money is paid in and out can be set at easily-operable heights.

[0025] The money receipt unit 2 is provided with a money receipt opening 2a, and an identification portion (not shown) which identifies the kind and authenticity of a banknote A. The banknote A is inserted into the money receipt unit 2 and is identified with respect to its kind and authenticity. Thereafter, it is carried to the storage unit 4, through a forwarding line 5 in the money receipt unit 2, a forwarding line 6 in the paying-out unit 3 and a forwarding line 7 in the storage unit 4. In the storage unit 4, it is stored according to the kind of the banknote A. The storage unit 4 is provided with a plurality of (e.g., in this embodiment, three) storage cases 41, 42, 43. Each storage case 41, 42, 43 corresponds to several kinds of banknotes in different widths, and thus, in each storage case 41, 42, 43, the banknote A of the corresponding kind is stored. Incidentally, a signal such as the kind of a banknote which is detected by the above described identification portion is given from this identification portion to an arithmetic and control unit (not shown) which is formed by a CPU. If this arithmetic and control unit decides that the banknote A should be paid out, it issues a paying-out command. Thereby, it controls the drive of the banknote processing apparatus 1, so that the banknote A can be paid out. This paying-out command is outputted, for example, if change is necessary or in another such case, based on the inputted signal according to the kind of a banknote.

[0026] The above described drive control so that the banknote A can be paid out is executed on the basis of the above described command in the following way. Specifically, from the corresponding one or more storage cases 41, ..., the one or more banknotes A are paid out to the paying-out unit 3, through the forwarding line 6 and the forwarding line 7. Through a paying-out line 8 of this paying-out unit 3, they are paid out from a paying-out opening 3a to the outside. Herein, the banknotes A are stored in and paid out from each storage case 41, ..., using a storage paying-out line 44, a flapper 45 and a feeding motor (not shown) which are provided in each storage case 41, ··· . The flapper 45 is disposed in the two storage cases 41 , 42 on the upper side. When the banknotes A are stored in and paid out from the corresponding storage cases 41, ..., the flappers 45 are kept swung state (i.e., inclined) as shown by the solid lines. Otherwise, they are kept swung state (i.e., vertical) as shown by the dashed lines.

[0027] The banknote forwarding mechanism through the above described forwarding lines 5 to 7 is configured in the following way. Specifically, the money receipt unit 2 is connected to the paying-out unit 3, and thereby, the forwarding line 5 is linked to the forwarding line 6 so that the banknote A can be carried. This linkage between these lines is realized by engaging a lower gear in the money receipt unit 2 and an upper gear in the paying-out unit 3. In addition, the paying-out unit 3 is connected to the storage unit 4, and thereby, the forwarding line 6 is linked to the forwarding line 7 so that the banknote A can be carried. This linkage between these lines is realized by engaging a lower gear in the paying-out unit 3 and an upper gear in the storage unit 4.

[0028] Then, for example, a forwarding motor 9 provided in the storage unit 4 is revolved in either of normal and reverse directions, so that through the forwarding lines 5, 6, 7, the banknote A can be carried from the money receipt unit 2 to the storage unit 4. In other words, the forwarding lines 5, 6, 7 come into the state where the banknote A is carried in the storage direction. On the other hand, if the forwarding motor 9 is revolved in the other direction, then through the forwarding lines 6, 7, the banknote A can be carried from the storage unit 4 toward the paying-out unit 3. In other words, the forwarding lines 6, 7 come into the state where the banknote A is carried in the paying-out direction.

[0029] The above described paying-out line 8 is put into operation by a motor (e.g., a paying-out reject motor) 30 which is separate from the forwarding motor 9. The paying-out line 8 is a line for paying out the banknote A carried to the paying-out unit 3 through the paying-out opening 3a. In terms of the banknote A carried to the paying-out unit 3, for example, if two or more banknotes are placed on top of one another, or in another such case, then these banknotes A can be rejected and sent into a reject box 53, as described later.

[0030] Therefore, the above described forwarding lines 6, 7 function as forwarding lines for storing and paying out the banknote A. In contrast, the forwarding line 5 functions as a forwarding line for storing it. A flapper 10 provided in the forwarding line 6 is switched to the state (i.e., the vertical state) shown by the dashed line when the banknote A is carried through the forwarding line 6 in the storage direction. On the other hand, when the

banknote A is carried through the forwarding line 6 in the paying-out direction, the flapper 10 is switched to the state (i.e. , the inclination state) shown by the solid line. Incidentally, the forwarding motor 9 may also be provided in any one of the money receipt unit 2 and the paying-out unit 3.

[0031] The above described paying-out line 8 in the paying-out unit 3 is divided halfway. Specifically, the paying-out line 8 includes an upper line 8a on the side of the forwarding line 6, and a lower line 8b on the side of the paying-out opening 3a which is provided separately from and independently of this upper line 8a. The upper line 8a represents the first paying-out line, and the lower line 8b represents the second paying-out line.

[0032] Fig. 2 is a front view of a paying-out unit, showing its configuration. Fig. 3 is a plan view of it, and Fig. 4 is a sectional view of it, seen along the IV-IV line of Fig. 2 (herein, only its main part is shown).

[0033] The paying-out unit 3 is provided with the paying-out line 8, in other words, the upper line 8a and the lower line 8b. In the paying-out unit 3, the paying-out opening 3a is located in the paying-out direction (i.e., on the right) of the lower line 8b. This paying-out opening 3a is placed at the tail-end portion of the lower line 8b. The lower line 8b's starting-end portion is apart downward from a tail-end portion 12 of the upper line 8a. In other words, the lower line 8b's starting-end portion is located right under the upper line 8a's tail-end portion 12. If seen from above, the lower line 8b's starting-end portion looks to overlap with the upper line 8a's tail-end portion 12. That is to say, the lower line 8b is directly below the upper line 8a, and thus, the lower line 8b's middle line (i.e., reference line) lies on the same vertical plane with the upper line 8a's middle line (i.e., reference line). The lower line 8b's starting-end portion makes up a temporarily holding portion 11 for temporarily holding the banknote A.

[0034] The paying-out unit 3 is provided with an edge supporting means 13 and a banknote pressing-down means 14. The edge supporting means 13 supports the banknote A so that a virtual middle line HL of the banknote A coincides with a virtual reference line BL in the upper line 8a's tail-end portion 12 (i.e., in the centering state). Each of the middle line HL and the reference line BL is a straight line which extends in the direction where the banknote A is carried. The middle line HL is the straight line which halves the banknote A in the width directions. The edge supporting means 13 is configured so as to center the banknote A, no matter what kind of banknote it is. At the same time, it supports the banknote A while permitting the banknote A to be pulled and dropped off by the banknote pressing-down means 14. Hereinafter, a specific description will be given.

[0035] Specifically, the edge supporting means 13 includes: a pair of edge support members 15 which is apart from each other and supports both edges in the width directions of the banknote A on the upper line 8a; a pair of tension springs 16 which gives an elastic force this pair of edge support members 15 so that both edge support members 15 can approach each other; a cam 17 which drives the pair of edge support members 15 while keeping both edge support members 15 symmetrical with respect to the reference line BL; a cam driving motor 18 which can rotate the cam 17; and a rotary encoder 19 which is a rotational-angle detecting means for detecting a rotational angle of the cam 17.

[0036] Each of the edge support members 15 has own concave groove 20. These concave grooves 20 are provided on opposite side to each other with respect to the upper line 8a' s tail-end portion 12. Both concave grooves 20 are located mutually symmetrical with respect to the reference line BL. In the concave grooves 20, the edges in the width directions of the banknote A are inserted, respectively. If seen from the side of the paying-out opening 3a, a left-hand edge support member 15a and a right-hand edge support member 15b are disposed so that the concave grooves 20's openings face each other. The innermost surface 20a of each concave groove 20 is made up of a positioning surface 20b and a guide surface 20c. The positioning surface 20b is located on the tail-end side of the upper line 8a, and this positioning surface 20b is parallel to the virtual reference line BL. The guide surface 20c is located on the banknote-insertion side with respect to the positioning surface 20b. This guide surface 20c is at a slant so as to separate from the reference line BL as it becomes away from the upper line 8a's tail end. In other words, the guide surface 20c slants so as to come close gradually to the reference line BL along the banknote-insertion direction. The positioning surface 20b is a surface for the centering, and the guide surface 20c is a surface for leading the banknote A to the positioning surface 20b. In the positioning surfaces 20b for the centering, each concave groove 20 is formed so that its groove depth is unchanged along the direction where the banknote A is carried. This helps prevent both edges in the width directions of the banknote A from being pulled and dropped off in different timing (or prevent either edge from remaining without falling off).

[0037] Above the positioning surfaces 20b of the edge support members 15a, 15b on both right-and-left sides, guides 21a, 21b are provided which each have a long shape in the direction where they are perpendicular to the upper line 8a. These guides 21a, 21b move both edge support members 15a, 15b in the perpendicular directions to the reference line BL. The guides 21a, 21b is guided by two guide rollers 22 provided between both guides 21a, 21b, and two guide rollers 23 provided on the outside of both guides 21a, 21b. As shown in Figs. 5A and 5B, the guide 21a attached to the edge support member 15a and the guide 21b attached to the edge support member 15b move in the opposite direction to each other. At this time, in parallel with the reference line BL, both edge support members 15a, 15b move in the width directions of the banknote A.

[0038] The above described cam 17 and the tension springs 16 allow both edge support members 15a, 15b

to approach and separate, with kept mutually symmetrical with respect to the reference line BL. Hereinafter, a mechanism will be described for allowing the edge support members 15a, 15b to come close to and go away from each other.

[0039] As shown in Fig. 4 and Fig. 6 which is a plan view showing the vicinity of a support plate 25, one end of each tension spring 16 is attached to each of holes 25a of the support plate 25 which is horizontally placed inside of a frame body 24 provided so as to surround the cam 17. The other end of each tension spring 16 is attached to each of attachment portions 26 disposed above both edge support members 15a, 15b. Thereby, both edge support members 15a, 15b are given an elastic force in the mutually-approaching directions by the tension springs 16 (see Fig. 7).

[0040] As shown in Fig. 4, between both edge support members 15a, 15b and the above described attachment portions 26, contact portions 27 are provided each of which has a circular sectional shape. The peripheral surface of the cam 17 is in contact with these contact portions 27.

[0041] In the above described frame body 24, a pair of upper and lower bearing portions 28a, 28b are provided, and to these bearing portions 28a, 28b, a vertical shaft 29 is supported so as to rotate freely. The cam 17 is attached to this vertical shaft 29. In the cam 17, three pairs of regulation surfaces 17a, 17b, 17c are formed at its peripheral surface. Each pair of regulation surfaces 17a, 17b, 17c has a symmetrical shape with respect to a center 17d of the cam 17 , and the radius of each pair of regulation surfaces 17a, 17b, 17c is different from each other. With one pair of these pairs of regulation surfaces 17a, 17b, 17c, the above described contact portions 27 are designed to come into contact. Thereby, both edge support members 15a, 15b separate from each other by the distance which corresponds to the diameter of each pair of regulation surfaces 17a, ... In both edge support members 15a, 15b, a separation distance L1 between the above described positioning surfaces 20b corresponds to the width of the banknote A of a specific kind (see Fig. 7) . This separation distance L1 can be adjusted by controlling the rotational angle of the cam 17. Specifically, a choice is made which pair of the regulation surfaces 17a to 17c should come into contact with the contact portions 27, so that the separation distance L1 can be adjusted. In this embodiment, the three kinds of regulation surfaces 17a to 17c are provided so that three kinds of banknotes can be treated. Incidentally, each pair of regulation surfaces 17a to 17c is set to have the same radius at each part on the corresponding regulation surfaces, but each adjacent regulation surface 17a to 17c is linked via a tilted surface. Thereby, the contact portion 27 is designed to move smoothly from a specific regulation surface to its adjacent regulation surface.

[0042] The above described rotary encoder 19 is used for controlling the cam driving motor 18 so that the rotational angle of the cam 17 can be precisely adjusted to a predetermined angle. Specifically, the rotary encoder 19 includes: a disk 19a which has a large number of slits 19b1, 19b2 around it; a standby-angle detection sensor 19c which is provided around the disk 19a; and a rotational-angle detection sensor 19d. In terms of the slit 19b1, one slit is formed on the periphery while many slits 19b2 are formed at regular intervals along the peripheral directions. The standby-angle detection sensor 19c is a sensor for stopping the cam 17 at a predetermined standby angle on the basis of the light which passes through the slit 19b1. The rotational-angle detection sensor 19d is a sensor for detecting a rotational angle of the cam 17 on the basis of the light which passes through the slits 19b2. The disk 19a is attached to the above described vertical shaft 29, and a pulley 29a is attached to this vertical shaft 29. To this pulley 29a, the cam driving motor 18's revolving force is transmitted via a belt 18a.

[0043] As described above, the rotary encoder 19 detects a rotational angle of the cam 17 continuously. Then, it gives the detection signal to the above described arithmetic and control unit (not shown). On the basis of this signal, the arithmetic and control unit controls the revolution of the cam driving motor 18. Through this revolution control, any one is chosen from among the pairs of regulation surfaces 17a to 17c. With this pair of regulation surfaces, the contact portions 27 come into contact, so that the above described separation distance L1 can be adjusted. Thereby, the banknote A is supported at both width-direction edges by the concave grooves 20 of the edge support members 15a, 15b. Thus, the banknote A's both width-direction edges come into contact with the innermost surfaces 20a of the concave grooves 20. As a result, the banknote A is subjected to the centering. In other words, the banknote A is moved in the width directions so that the banknote A's virtual middle line HL coincides with the virtual reference line BL which corresponds to the middle in the width directions of the above described tail-end portion 12.

[0044] The above described banknote pressing-down means 14 pushes down the middle part of the banknote A supported at both width-direction edges, using the pair of edge support members 15 . Thereby, the banknote A's both edges are pulled and dropped off from the edge support members 15, and thus, the banknote A is moved to the temporarily holding portion 11. In this embodiment, the banknote pressing-down means 14 is configured in the following way.

[0045] Specifically, the banknote pressing-down means 14 includes: a rise-and-fall member 32 which is made up of a pair of X-shaped members 31 formed by crossing two bars 31a, 31b like the letter of X; a pusher 33 which is provided under this rise-and-fall member 32; and a rise-and-fall driving means 34 shown in Fig. 8 which raises and drops the pusher 33 while keeping them horizontal by changing the X shape of the rise-and-fall member 32. Fig. 8 is a rear view of a part of the banknote pressing-down means 14 shown in Fig. 2.

[0046] Both X-shaped members 31 of the rise-and-fall

member 32 connect mutually via shafts 35a, 35b, 35c, 35d, 35e at the total five places of the cross part of the two bars 31a, 31b and both ends of each bar 31a, 31b. The shafts 35a, 35b, 35c, 35d, 35e support, at both ends, the bars 31a, 31b so that they can make a swing motion. As shown in Fig. 2: the shaft 35a is disposed at the above described cross part; the shaft 35b is disposed on the side of the paying-out opening 3a at the upper end (i.e., on the upper-end side of the bar 31a); the shaft 35c is disposed on the opposite side to the paying-out opening 3a at the upper end (i.e. , on the upper-end side of the bar 31b); the shaft 35d is disposed on the side of the paying-out opening 3a at the lower end (i.e., on the lower-end side of the bar 31b); and the shaft 35e is disposed on the opposite side to the paying-out opening 3a at the lower end (i.e., on the lower-end side of the bar 31a).

[0047] The rise-and-fall member 32 is supported, via the two shafts 35a, 35b on the upper side, by both right-and-left side plates 3b of the paying-out unit 3. In further detail, in each of both side plates 3b are formed a long hole 3c which has a long shape in the horizontal directions and a circular hole 3d. The shaft 35b is inserted through the long holes 3c, and the shaft 35c is inserted through the circular holes 3d. To the circular hole 3d located in one side plate 3b (on the left side if seen from the side of the paying-out opening 3a), the corresponding end of the shaft 35c is attached so that it cannot rotate. To the circular hole 3d located in the other side plate 3b (on the right side if seen from the side of the paying-out opening 3a), a halfway part of the shaft 35c is attached so that it cannot rotate. On the other hand, to the long holes 3c of both side plates 3b, the ends of the shaft 35b, respectively, are attached so that it can move horizontally along the long hole 3c without slipping off.

[0048] The pusher 33 is held in a horizontal posture by the two shaft 35d and shaft 35e on the lower side. In further detail, in a halfway part in the longitudinal direction of the pusher 33, a long hole 33a is formed which has a long shape in the horizontal directions. Then, a circular hole 33b is formed on the side of the pusher 33 which is opposite to the paying-out opening 3a. Through the circular hole 33b, the shaft 35e is inserted so as to rotate, and through the long hole 33a, the shaft 35d is inserted so as to move horizontally along the long hole 33a.

[0049] On the side of the other end of the shaft 35c is provided the above described rise-and-fall driving means 34. This rise-and-fall driving means 34 rotates the shaft 35c within a specific angular range in its forward and reverse directions. Thereby, the pusher 33 is moved up and down. The rise-and-fall driving means 34 includes: a swing member 36 which is attached at its middle part to the other end of the shaft 35c; a plurality of (in the figure, three) toothed gears 37 , 38 , 39 which are used for swinging this swing member 36 on the shaft 35c; a driving motor 40 for pressing down a banknote; and an upper position sensor 46a and a lower position sensor 46b which are disposed so as to face the swing range of a detection portion 36b of the swing member 36. The toothed gear 38 is formed by placing a large-diameter toothed gear 38a and a small-diameter toothed gear 38b concentrically.

[0050] The toothed gear 39 is attached to the revolving shaft of the driving motor 40. With this toothed gear 39, the large-diameter toothed gear 38a of the toothed gear 38 engages, and the toothed gear 37 on the lowermost side engages with the small-diameter toothed gear 38b of the toothed gear 38. In this toothed gear 37, an eccentric protrusion 37a is provided at a biased position from its center. This eccentric protrusion 37a is inserted into a long hole 36a formed in the swing member 36. If the toothed gear 37 is rotated by the driving motor40, the eccentric protrusion 37 ais also rotated together . This motion interlocks the swing member 36, so that it turns around the shaft 35c. Along with this, the shaft 35c rotates within the specific angular range, thus causing the bar 31b of the rise-and-fall member 32 to make a pivotal motion. At this time, as shown in Fig. 2, if the bar 31b shifts from a near-horizontal posture shown by the solid line to an inclining posture shown by the dashed line, then as shown in Figs. 9A and 9B, the pusher 33 moves down. Then, the pusher 33 pushes down the middle part of the banknote A which is supported so as to fall off by the pair of edge support members 15a, 15b. Thereby, it is moved to the temporarily holding portion (i.e., the lower line 8b's starting-end portion) 11. On the other hand, if the shaft 35c rotates reversely, the pusher 33 moves up and returns to its standby state. This operation is repeated, so that several such banknotes A are stacked one after another on the temporarily holding portion 11. Incidentally, when the detection portion 36b is detected through the upper position sensor 46a, the pusher 33 lies at the uppermost position. In contrast, when the detection portion 36b is detected through the lower position sensor 46b, the pusher 33 lies at the lowermost position.

[0051] In the temporarily holding portion 11 is provided an endless paying-out belt 47. In this paying-out belt 47, a projection 47a is provided individually at two places. This projection 47a pushes the banknote A's rear end, so that the banknote A can be paid out from the paying-out opening 3a. Herein, the paying-out belt 47 is locates at the middle part in the width directions of the temporarily holding portion 11. It is driven by the paying-out reject motor 30.

[0052] Between the temporarily holding portion 11 and the paying-out opening 3a, a paying-out means 51 is provided which includes a paying-out roller 51a and a paying-out belt 51b. A paying-out opening shutter 52 is provided closer to the paying-out opening 3a than to the paying-out means 51.

[0053] Below the temporarily holding portion 11, the reject box 53 is disposed which holds the banknote A on the temporarily holding portion 11 without paying it out. In the temporarily holding portion 11 , in a position opposite to the paying-out opening 3a, a roller 54 for rejection and a belt 55 for rejection are provided which are both driven by the paying-out reject motor 30. The banknote

A to be rejected on the temporarily holding portion 11 is pushed at its front end by the projection 47a when the paying-out belt 47 runs reversely to the banknote paying-out direction. Thereby, it is moved back reversely to the paying-out direction. Thereafter, the banknote A is sent to the reject box 53 by the above described roller 54 and belt 55.

[0054] Herein, a passage sensor 61 is provided near the flapper 10 of the forwarding line 6. On the side of the pair of edge support members 15 where the banknote A is carried in, a stack-in sensor 62 is provided for detecting it being sent in. In addition, in the temporarily holding portion 11, a stacker residual sensor 63 is provided for detecting the banknote A lying or not in the temporarily holding portion 11. In the paying-out opening 3a, a paying-out opening sensor 64 is provided for detecting the banknote A paid out to the paying-out opening 3a being extracted or not from the paying-out opening 3a. Besides, in the reject box 53, a reject-empty sensor 65 is provided for detecting it being empty or not. On the side of the reject box 53 which is opposite to the paying-out opening 3a, a paying-out belt home sensor 66 is provided for stopping the paying-out belt 47 at its standby position. Near the paying-out opening shutter 52, a shutter detection sensor 67 is provided for detecting the paying-out opening shutter 52 opening or closing. All detection signals from these sensors 61 to 67 and the above described upper position sensor 46a, lower position sensor 46b, standby-angle detection sensor 19c and rotational-angle detection sensor 19d are given to the above described arithmetic and control unit. Based on those detection signals, the arithmetic and control unit is configured to control the drive of each portion.

[0055] Next, a paying-out operation for the banknote A will be described based on the flow chart of Figs. 10A and 10B. This paying-out operation is executed when the arithmetic and control unit decides that the banknote A needs paying out.

[0056] First, the forwarding motor 9 is driven and revolved in the paying-out direction (in a step S1).

[0057] Next, based on the cam 17's rotational angle, in other words, the rotary encoder 19's detection signal, a decision is made whether or not the separation distance L1 between the positioning surfaces 20b of the pair of edge support members 15 is equal to the width of the banknote A to be paid out (in a step S3). If the separation distance L1 is different from the width of the banknote A to be paid out, the cam driving motor 18 is driven (in a step S5).

[0058] Then, on the basis of the rotary encoder 19's detection signal, the separation distance L1 is detected being equivalent or not to the width of the banknote A to be paid out (in a step S7). If the former is equal to the latter, a stop is put to the cam driving motor 18 (in a step S9).

[0059] Next, the feeding motor (not shown) of the storage case 41 , ... which corresponds to the paying out of the banknote A is driven in the paying-out direction (in a step S11). This step S11 is executed after the step S3, if the decision is made that the separation distance L1 is equal to the width of the banknote A to be paid out in the step S3.

[0060] Then, the passage sensor 61 detects the banknote A being fed from the corresponding storage case 41, ··· , and thereafter, the feeding motor is stopped (in a step S13). Next, a decision is repeated whether or not the banknote A has passed through the stack-in sensor 62's detection position, until the stack-in sensor 62 detects its passage (in a step S15). If the banknote A's passage is detected, the pusher 33 is moved down and up by one cycle (in a step S17).

[0061] Sequentially, a decision is made whether or not the banknote A on the temporarily holding portion 11 should be rejected (in a step S19). If it should be rejected, the paying-out operation by the forwarding motor 9 is brought to a halt (in a step S21). Simultaneously, the pusher 33 is moved down (in a step S23), and in the rejection direction (i.e. , reversely to the paying-out direction), the paying-out reject motor 30 is driven (in a step S25). Then, the banknote A's rear end passes through the stacker residual sensor 63, and thereafter, the paying-out reject motor 30 is stopped (in a step S27) . Next, the pusher 33 is lifted and the paying-out reject motor 30 is driven until the paying-out belt 47 comes to its standby position (in a step S29). Thereafter, the processing returns to the step S1.

[0062] In the step S19, if the decision is made that the banknote A should not be rejected, a decision is made whether or not a required number of such banknotes A have been delivered from the corresponding storage cases 41 , ... (in a step S31) . Unless they have been delivered, the steps S11 to S31 are repeated. On the other hand, if they have been delivered, a decision is made whether or not there is a request to pay out another kind of such banknote A from another storage case 41, ... (in a step S33). If there is a request to pay out another kind of such banknote A, the processing returns to the step S3. In contrast, if no such request is made to pay out another kind of such banknote A, the processing goes ahead to a step S35 and the pusher 33 is moved downward.

[0063] Next, the paying-out reject motor 30 is driven in the paying-out direction (in a step S37). Then, the banknote A's rear end passes through the stacker residual sensor 63, and thereafter, the paying-out reject motor 30 comes to a stop (in a step S39).

[0064] Sequentially, on the basis of the detection of the paying-out opening sensor 64, a decision is repeated whether or not the banknote A has been extracted through the paying-out opening 3a, until such an extraction is completed (in a step S41). If the extraction is completed, the pusher 33 is moved upward. Then, the paying-out reject motor 30 is driven until the paying-out belt 47 reaches its standby position (in a step S43). Thereby, this control comes to an end.

[0065] As described so far, in this embodiment, the

banknote pressing-down means 14 presses down the middle part of the banknote A which is supported at both edges in the width directions by the edge supporting means 13 provided in the tail-end portion 12 of the upper line 8a so that the banknote can fall off. Thus, the banknote A's width-direction both edges are pulled so that it falls off from the edge supporting means 13. Thereby, the banknote A is moved to the temporarily holding portion 11. Therefore, a plurality of such banknotes A can be stacked in this temporarily holding portion 11, and the plurality of banknotes A with kept piled can be paid out through the paying-out opening 3a. Particularly, above this temporarily holding portion 11 , the banknote A is subjected to the centering, no matter what kind of banknote it is. Afterward, the banknote A is moved to the temporarily holding portion 11. Hence, the virtual middle line HL of each such banknote A meets with the middle line of the lower line 8b. In this state, the banknotes A can be stacked and temporarily stored. Thereby, the banknote A can be prevented from coming into contact with the paying-out opening 3a, thus helping pay out the banknote A normally.

[0066] Furthermore, in this embodiment, an elastic force is applied to the pair of edge support members 15 so that they are pressed against the peripheral surface of the cam 17. Thereby, the pair of edge support members 15 can be positioned symmetrically with respect to the reference line BL. This makes it possible to realize the centering, using a simple mechanism. Besides, in this embodiment, the revolution of the cam driving motor 18 is controlled by the rotary encoder 19. Thereby, the contact portions 27 of the pair of edge support members 15 come into contact with the regulation surfaces 17a, ... of the cam 17 in accordance with the kind of a banknote. Therefore, the distance between the pair of edge support members 15 can be controlled so as to be exactly the value which corresponds to the kind of a banknote.

[0067] Incidentally, in the above described embodiment, a rotary encoder controls the revolution of such a motor, so that the rotational angle of such a cam can be adjusted. However, the application of the present invention is not limited to this configuration in which the cam's rotational angle is adjusted by such a servo motor. For example, a servo motor may also be used which controls the revolution of a pulse motor using a pulse number so that the cam's rotational angle is adjusted. Or, the cam's rotational angle may also be adjusted using another type of servo motor.

[0068] Moreover, in the above described embodiment, three pairs of such regulation surfaces are formed in the peripheral surface of such a cam, so that three kinds of banknotes in different widths can be handled. However, the application of the present invention is not limited to this. Specifically, it can be applied to an apparatus which pays out two or more kinds of banknotes whose widths are different from each other. In this case, the number of regulation-surface pairs and the number of storage cases are also adjusted.

[0069] In addition, in the case where the rotational angle of such a cam is adjusted using such a servo motor as described above, the cam 17 is used which includes regulation surfaces that each have the same radius within a specific angular range. Instead of the cam 17, as shown in Fig. 11, a cam 17A may also be used whose radius (or diameter) changes continuously. In this case, the maximum radius (or diameter) of the cam 17A can be set to be larger than the maximum banknote measurement in all states and regions of the world, as well as its minimum radius (or diameter) can be set to be smaller than the minimum banknote measurement in all states and regions of the world. This makes it possible to treat any banknotes whichever nation they belong to. In Fig. 11, component elements are given the same reference characters and numerals as those of Fig. 7, as long as the former are identical to the latter.

[0070] Still further, instead of the configuration where the distance between such edge support members is adjusted using the above described cams 17 , 17A, as shown in Fig. 12, a rack and pinion may also be used so that the distance between the edge support members can be adjusted. Specifically, such an interval adjustment mechanism includes racks 56 which are provided in the guide 21a attached to the edge support member 15a and the guide 21b attached to the edge support member 15b, as well as an outside toothed gear 57 which engages with both racks 56. It is preferable that the outside toothed gear 57 be configured to be sandwiched between by both racks 56. In the case of this rack and pinion, the above described tension spring 16 can be omitted.

[0071] Moreover, in the above described embodiment, as the banknote pressing-down means 14, the driving motor 40 rotates the shaft 35c which connects the ends of some of the bars that make up such X-shaped members. This configuration helps move the pusher 33 up and down. However, the application of the present invention is not limited to this. For example, in terms of the two shafts which connects the ends of the two upper parts of a pair of such X-shaped members, one shaft may also be configured to come close to and go away from the other. Or, in terms of the two shafts which connects the two upper and lower ends of the pair of X-shaped members on the paying-out direction side or on its opposite side, one shaft may also be configured to come close to and go away from the other. Or, another such configuration may also be adopted. Besides, as such a rise-and-fall member, a pair of such X-shaped members may also be replaced with a single X-shaped member, or a rhombic member such as a pantograph.

[0072] In addition, in the above described embodiment, such a money receipt unit, a paying-out unit and a storage unit which are each formed originally as a separate body are placed on top of each other. However, the application of the present invention is not limited to this. For example, a money receipt portion, a paying-out portion and a storage portion may also be united. In the same way, the present invention can be applied to these

three members as a single unit.

Claims

1. A banknote processing apparatus which includes a paying-out line for a banknote and a temporarily holding portion for a banknote provided on the paying-out line, the apparatus paying out, through a paying-out opening, a plurality of kinds of banknotes in different widths held temporarily in the temporarily holding portion, **characterized in that**:

   the paying-out line has a first paying-out line and a second paying-out line provided under the first paying-out line, the second paying-out line having the temporarily holding portion and leading to the paying-out opening; and
   the banknote processing apparatus includes,
   an edge supporting means for supporting both edges in the width directions of a banknote on the first paying-out line, so that no matter what kind of banknote it is, a virtual line along the middle in the width directions of the banknote coincides with a reference line located along the middle in the width directions of the first paying-out line, and
   a banknote pressing-down means for pressing down a part between both edges in the width directions of the banknote supported by the edge supporting means, so that the banknote falls off from the edge supporting means and moves to the temporarily holding portion.

2. The banknote processing apparatus according to claim 1, **characterized in that** the edge supporting means has:

   a pair of edge support members, each of which having a concave groove into which an edge in the width directions of a banknote is inserted;
   a cam which rotates on its vertical axis and positions the pair of edge support members symmetrically with respect to the reference line; and
   a force-giving means which gives the pair of edge support members a force toward their mutually approaching directions.

3. The banknote processing apparatus according to claim 2, **characterized in that**:

   the cam is provided with a plurality of pairs of regulation surfaces disposed in accordance with the kind of a banknote to be paid out, each pair of regulation surfaces being symmetrical with respect to the rotational center; and
   the edge supporting means has a servo motor which controls the rotation of the cam so that the separation distance between the pair of edge support members is adjusted using the regulation surfaces.

4. The banknote processing apparatus according to claim 2 or 3, **characterized in that**:

   the cam has a symmetrical shape with respect to the rotational center and is shaped so that its radius changes continuously; and
   the edge supporting means has a servo motor which controls the rotation of the cam so that the separation distance between the pair of edge support members is adjusted using any radius part of the cam.

5. The banknote processing apparatus according to any one of the preceding claims, **characterized in that**:

   the edge supporting means has a pair of edge support members, each of which having a concave groove into which an edge in the width directions of a banknote is inserted, racks which move the pair of edge support members in the width directions of a banknote, and a toothed gear which engages with the racks; and
   the pair of edge support members moves, along with the rotation of the toothed gear, with kept symmetrical with respect to the reference line.

6. The banknote processing apparatus according to any one of claims 2 to 5, **characterized in that** each concave groove has:

   a guide surface which slants so as to gradually come close to the reference line along the direction in which a banknote is inserted; and
   a positioning surface which is connected to the guide surface and is parallel to the reference line.

7. The banknote processing apparatus according to claim 6, **characterized in that** the concave grooves of the pair of edge support members are formed so that the edges in the width directions of a banknote come into contact with the positioning surfaces, respectively and so that the depth of the concave groove in each positioning surface becomes equal.

8. The banknote processing apparatus according to any one of the preceding claims, **characterized by** comprising a storage portion disposed below the paying-out opening and the temporarily holding portion, and a money receipt portion disposed above the paying-out opening and the temporarily holding portion.

FIG.1

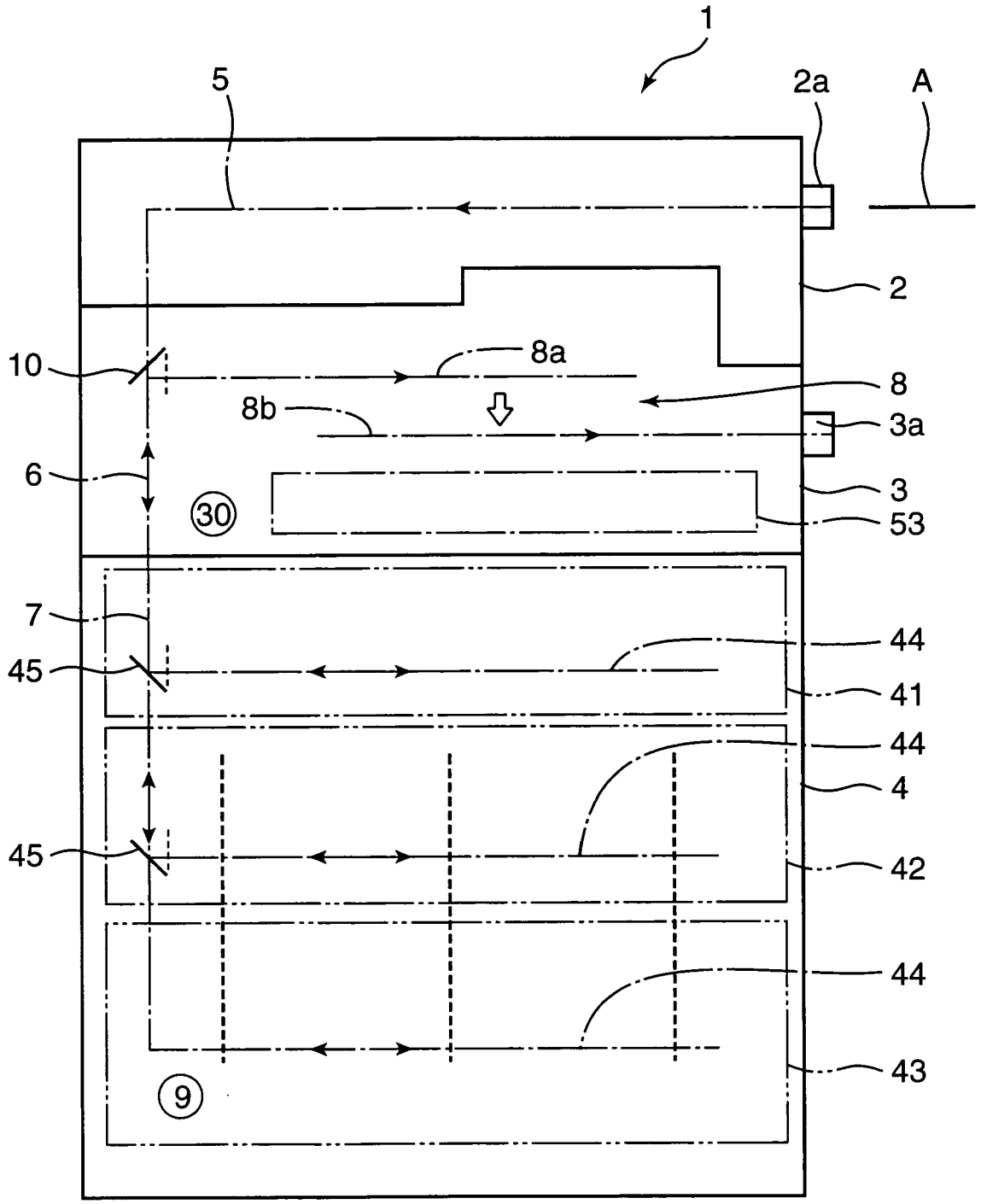
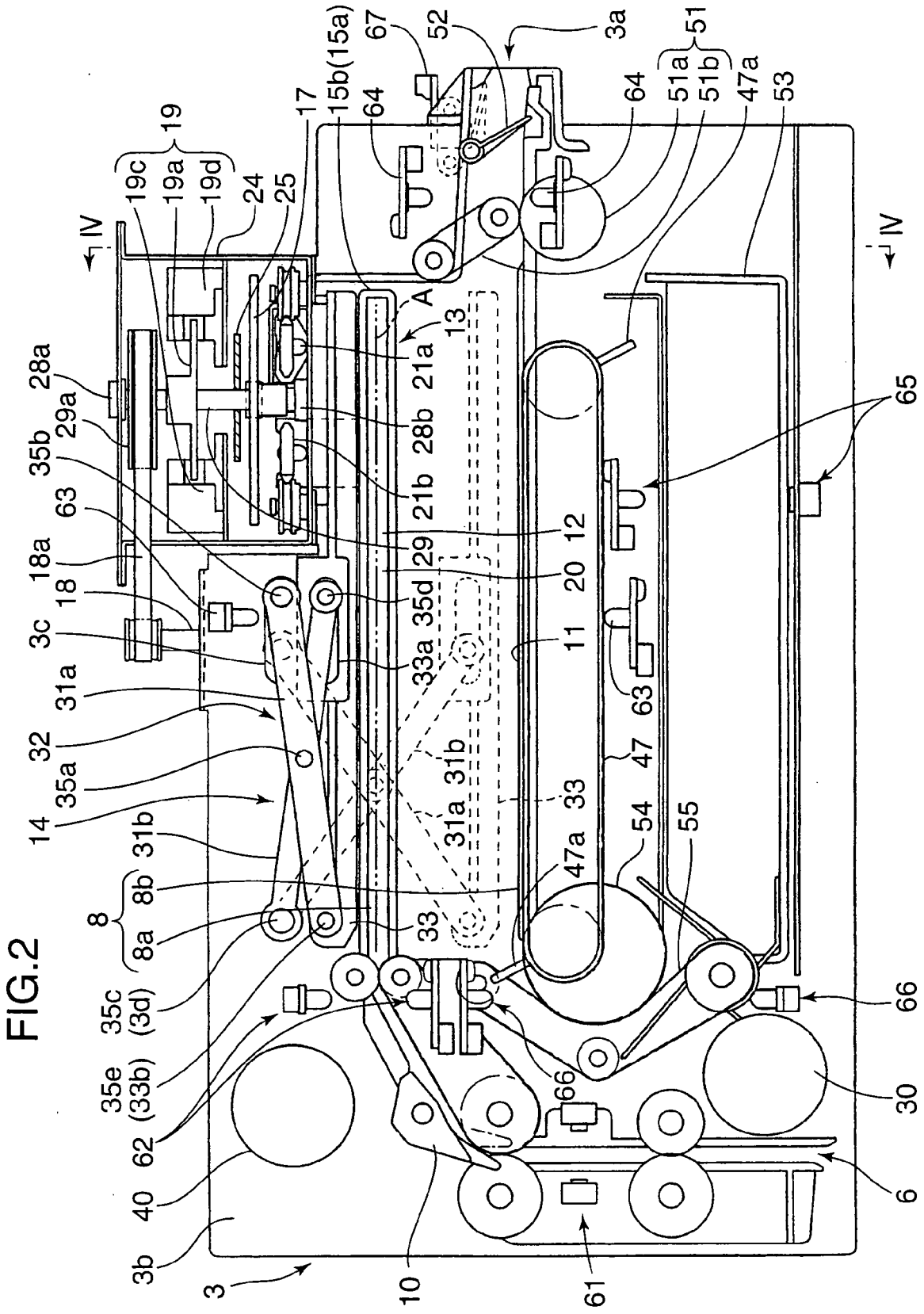


FIG.2


IV
IV
A
3
3a
3b
3c
3d
6
8
8a
8b
10
11
12
13
14
15a
15b
17
18
18a
19
19a
19c
19d
20
21a
21b
24
25
28a
28b
29
29a
30
31a
31b
32
33
33a
33b
35a
35b
35c
35d
35e
40
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51a
51b
52
53
54
55
61
62
63
64
65
66
67

FIG.3

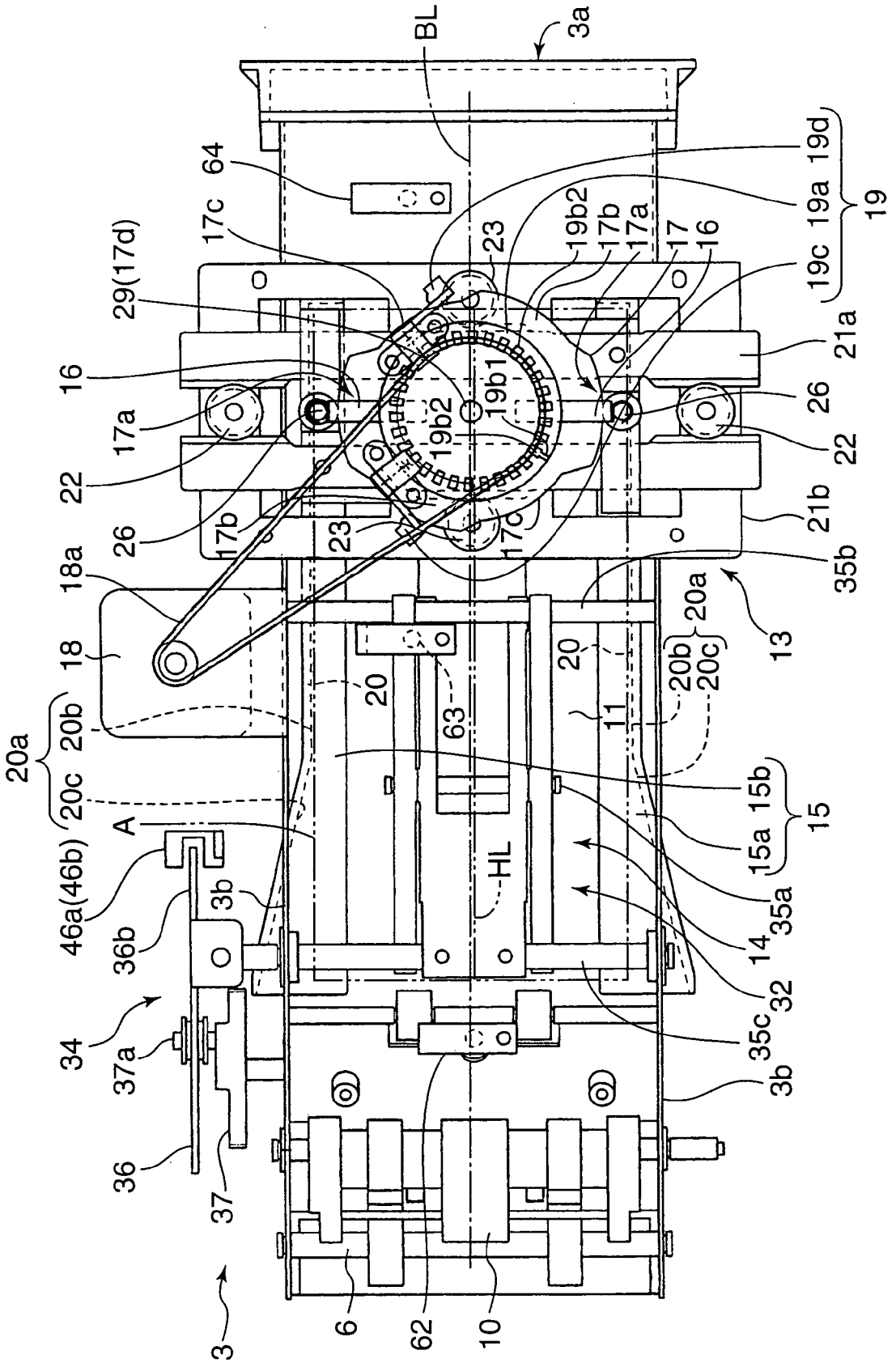
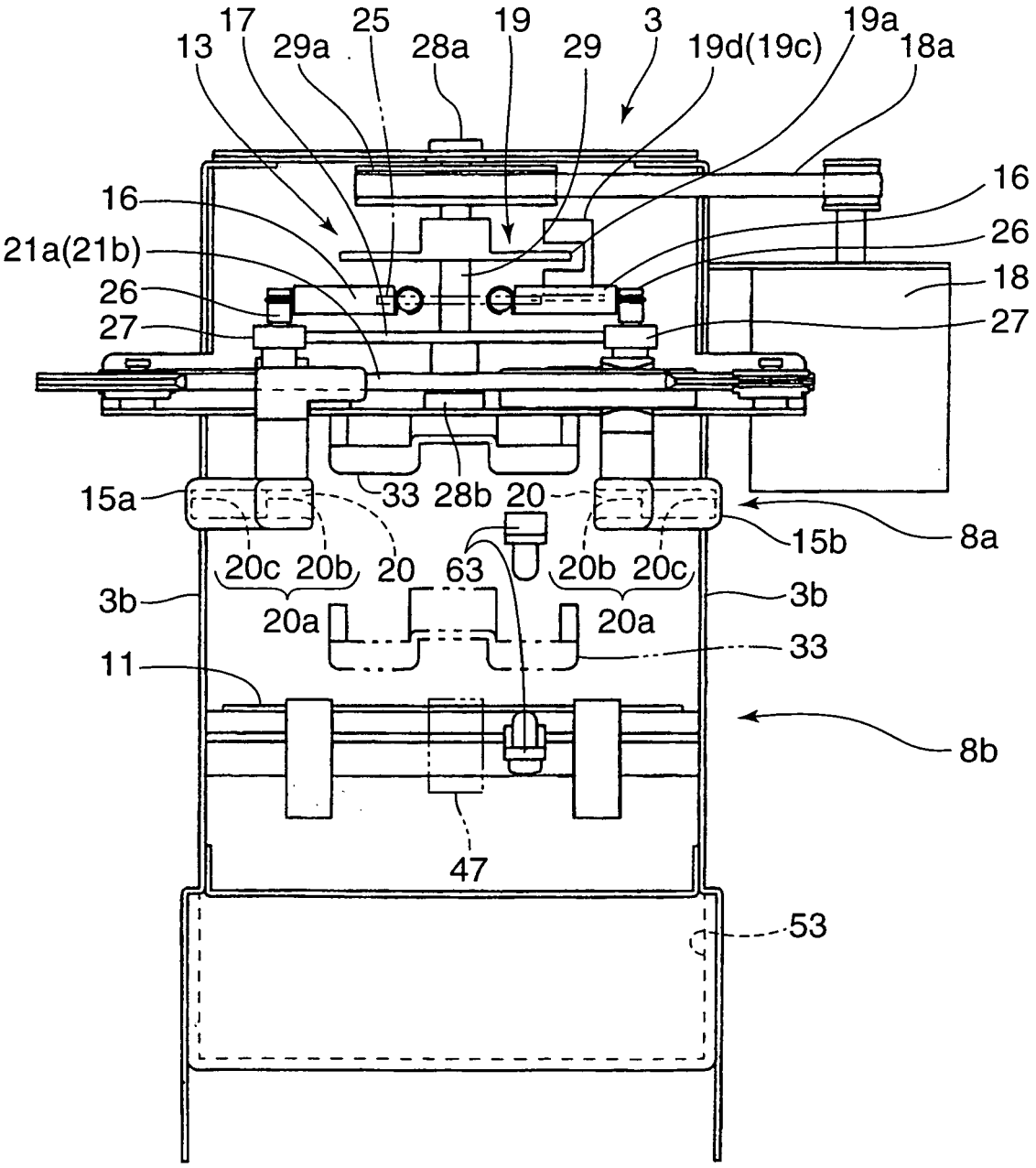

BL
3a
64
17c
29(17d)
16
17a
22
26
17b
23
19b2
19b1
19d
19a
19
19c
17
16
17a
21a
26
22
21b
35b
18a
18
20a
20b
20c
20
63
11
13
15b
15
15a
35a
14
32
35c
3b
46a(46b)
36b
3b
34
37a
36
37
HL
A
3
6
62
10

FIG.4


17
25
19
3
19a
13
29a
28a
29
19d(19c)
18a
16
16
21a(21b)
26
26
18
27
27
15a
33
28b
20
15b
8a
20c
20b
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63
20b
20c
3b
3b
20a
20a
11
33
8b
47
53

FIG.5A

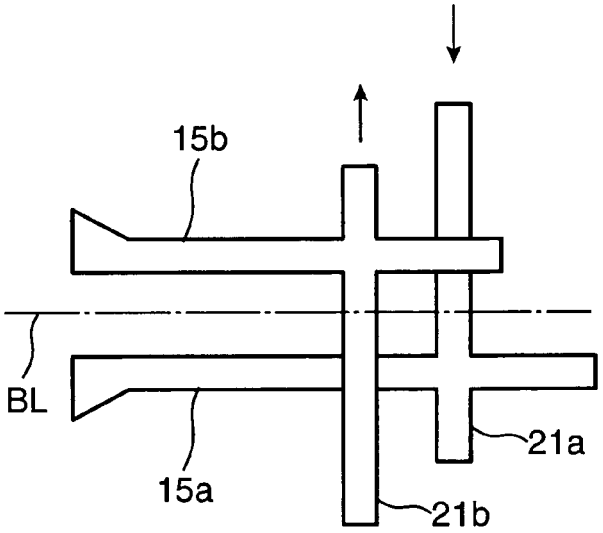


FIG.5B

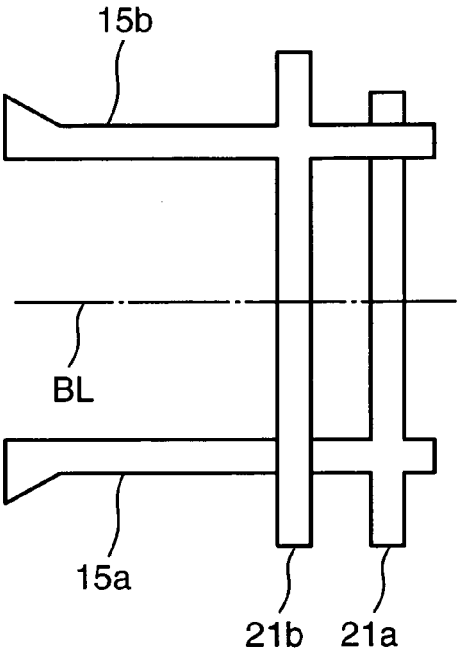


FIG.6

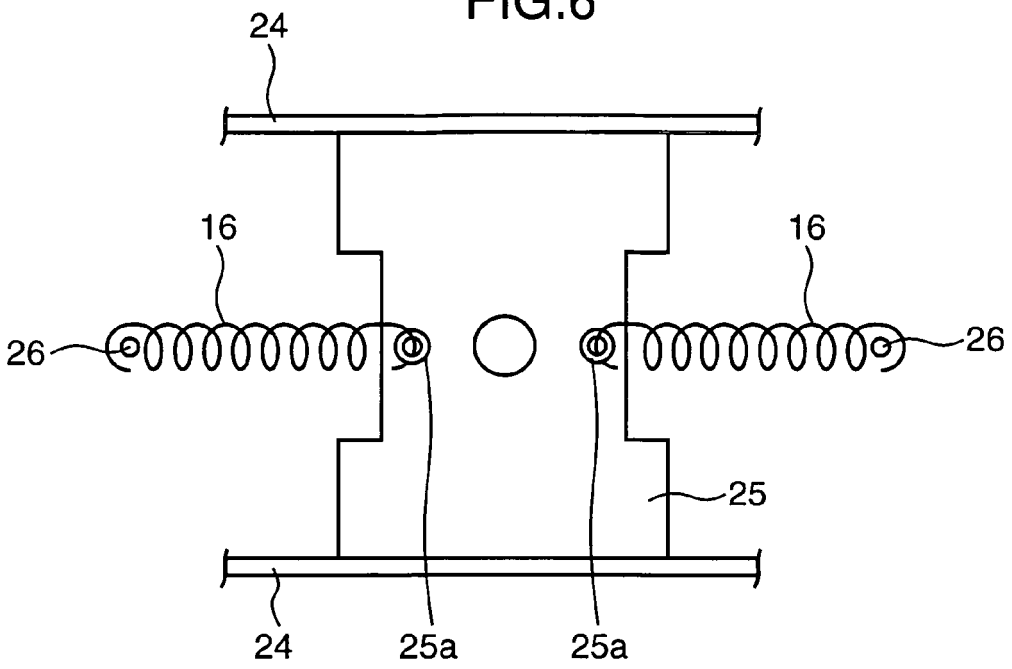

24
16
16
26
26
25
24
25a
25a

FIG.7

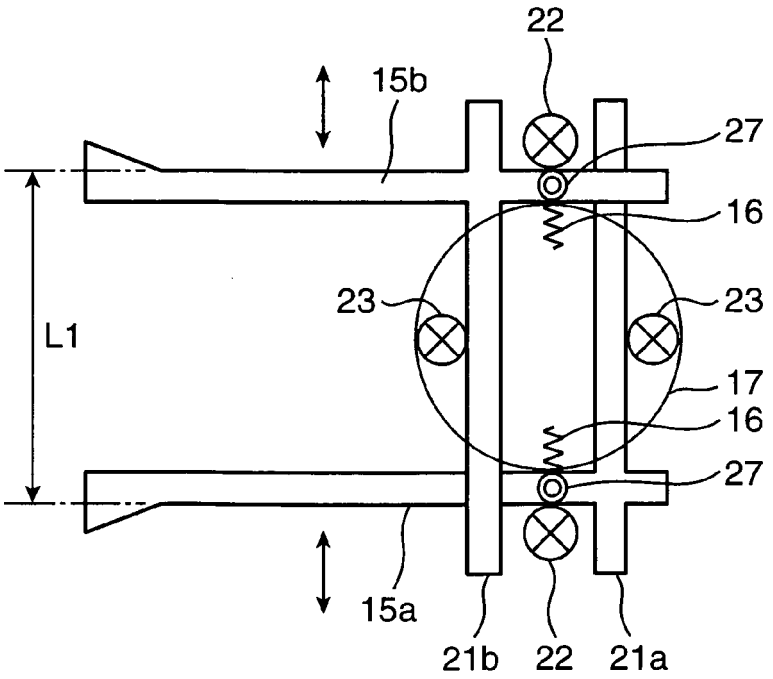

22
15b
27
16
23
23
L1
17
16
27
15a
21b
22
21a

FIG.8

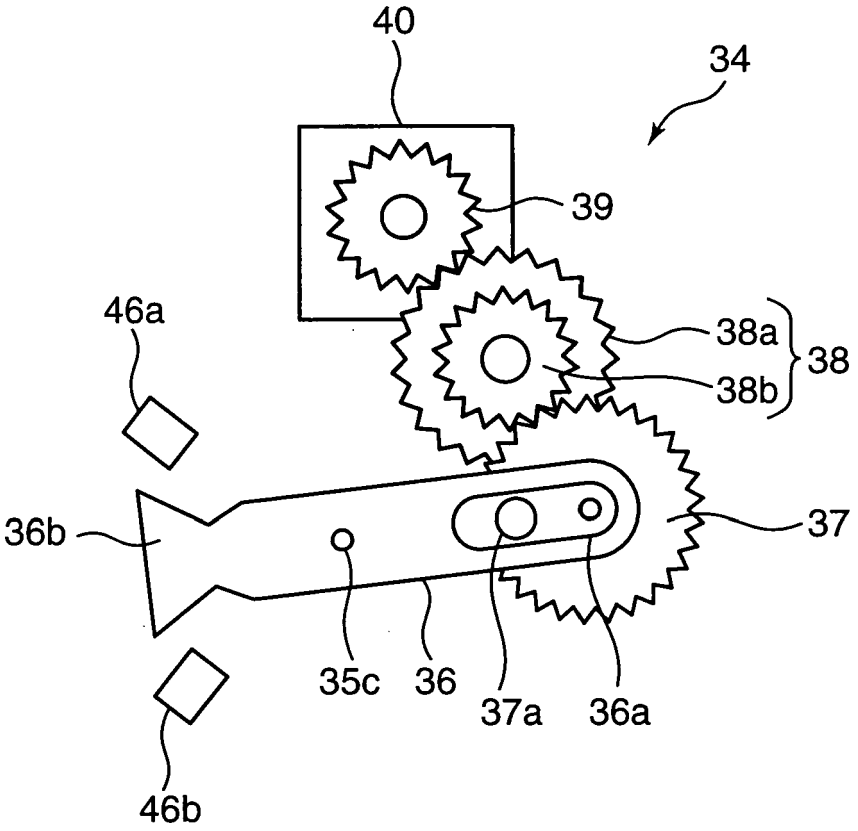


FIG.9A

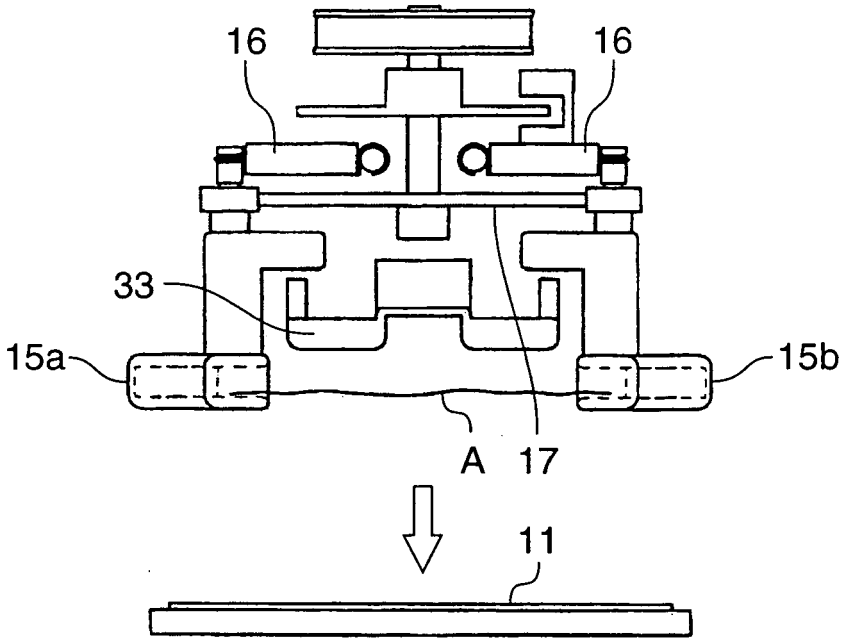


FIG.9B

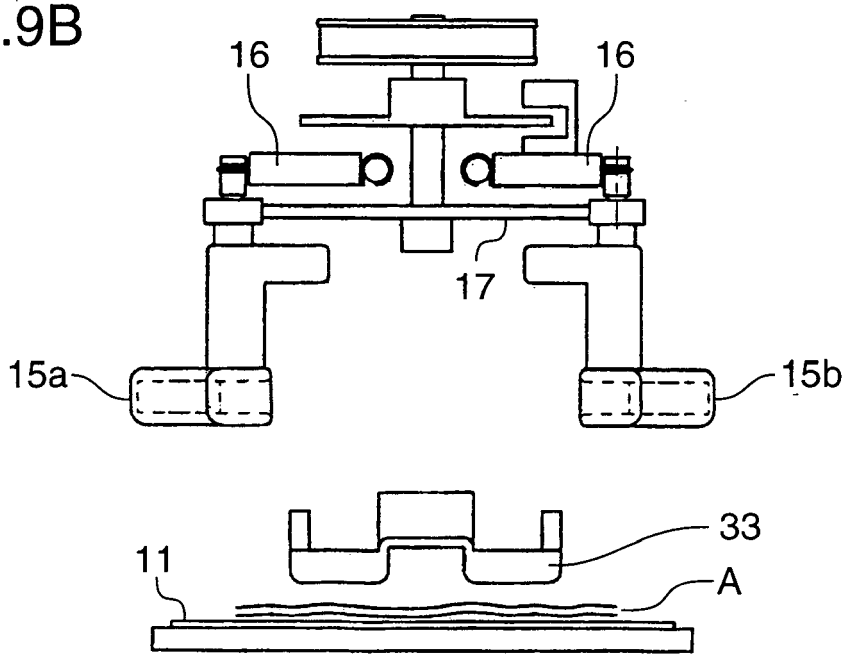


FIG. 10A

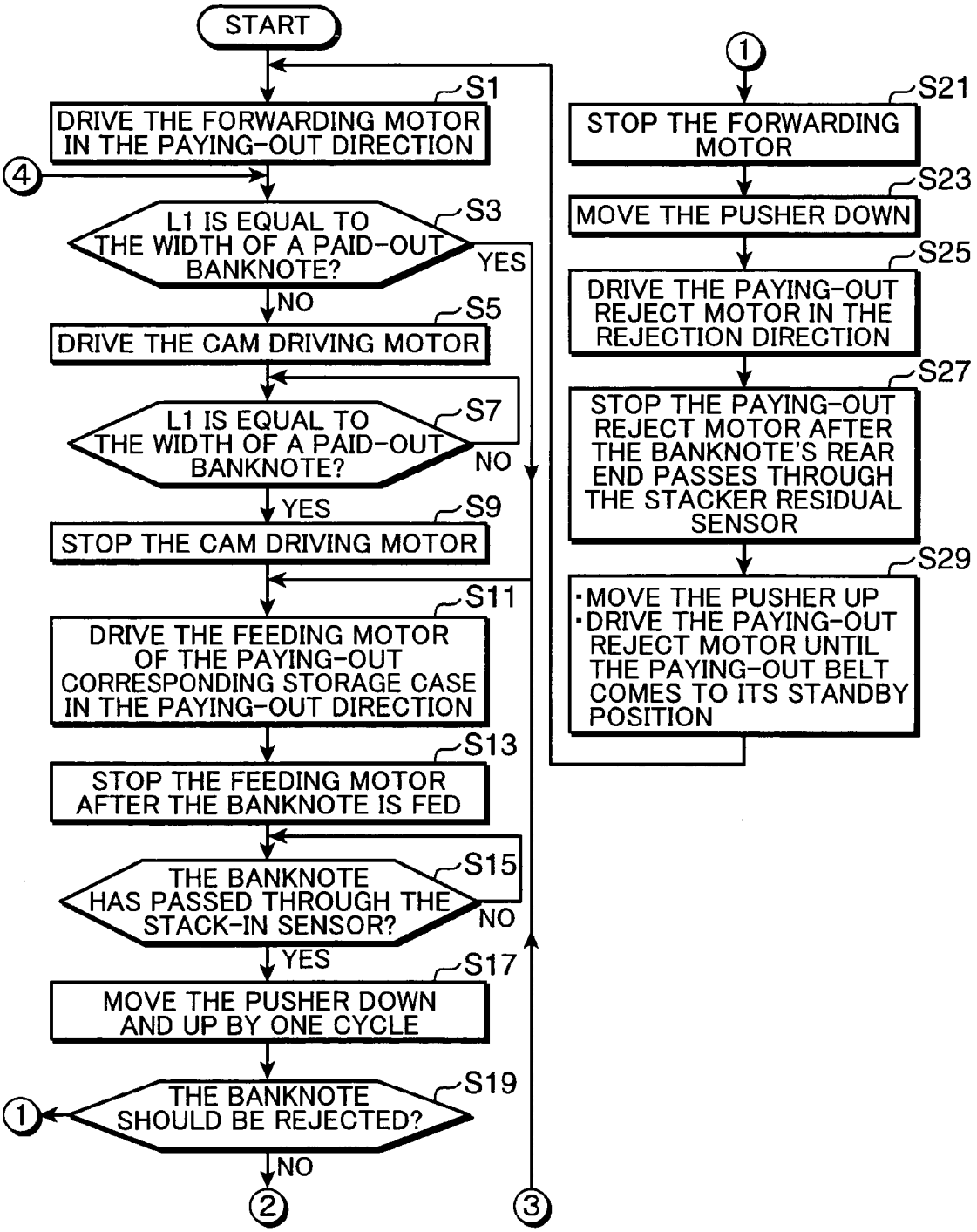

START
S1
DRIVE THE FORWARDING MOTOR IN THE PAYING-OUT DIRECTION
4
S3
L1 IS EQUAL TO THE WIDTH OF A PAID-OUT BANKNOTE?
YES
NO
S5
DRIVE THE CAM DRIVING MOTOR
S7
L1 IS EQUAL TO THE WIDTH OF A PAID-OUT BANKNOTE?
NO
YES
S9
STOP THE CAM DRIVING MOTOR
S11
DRIVE THE FEEDING MOTOR OF THE PAYING-OUT CORRESPONDING STORAGE CASE IN THE PAYING-OUT DIRECTION
S13
STOP THE FEEDING MOTOR AFTER THE BANKNOTE IS FED
S15
THE BANKNOTE HAS PASSED THROUGH THE STACK-IN SENSOR?
NO
YES
S17
MOVE THE PUSHER DOWN AND UP BY ONE CYCLE
S19
THE BANKNOTE SHOULD BE REJECTED?
1
NO
2
3
1
S21
STOP THE FORWARDING MOTOR
S23
MOVE THE PUSHER DOWN
S25
DRIVE THE PAYING-OUT REJECT MOTOR IN THE REJECTION DIRECTION
S27
STOP THE PAYING-OUT REJECT MOTOR AFTER THE BANKNOTE'S REAR END PASSES THROUGH THE STACKER RESIDUAL SENSOR
S29
·MOVE THE PUSHER UP
·DRIVE THE PAYING-OUT REJECT MOTOR UNTIL THE PAYING-OUT BELT COMES TO ITS STANDBY POSITION

FIG. 10B

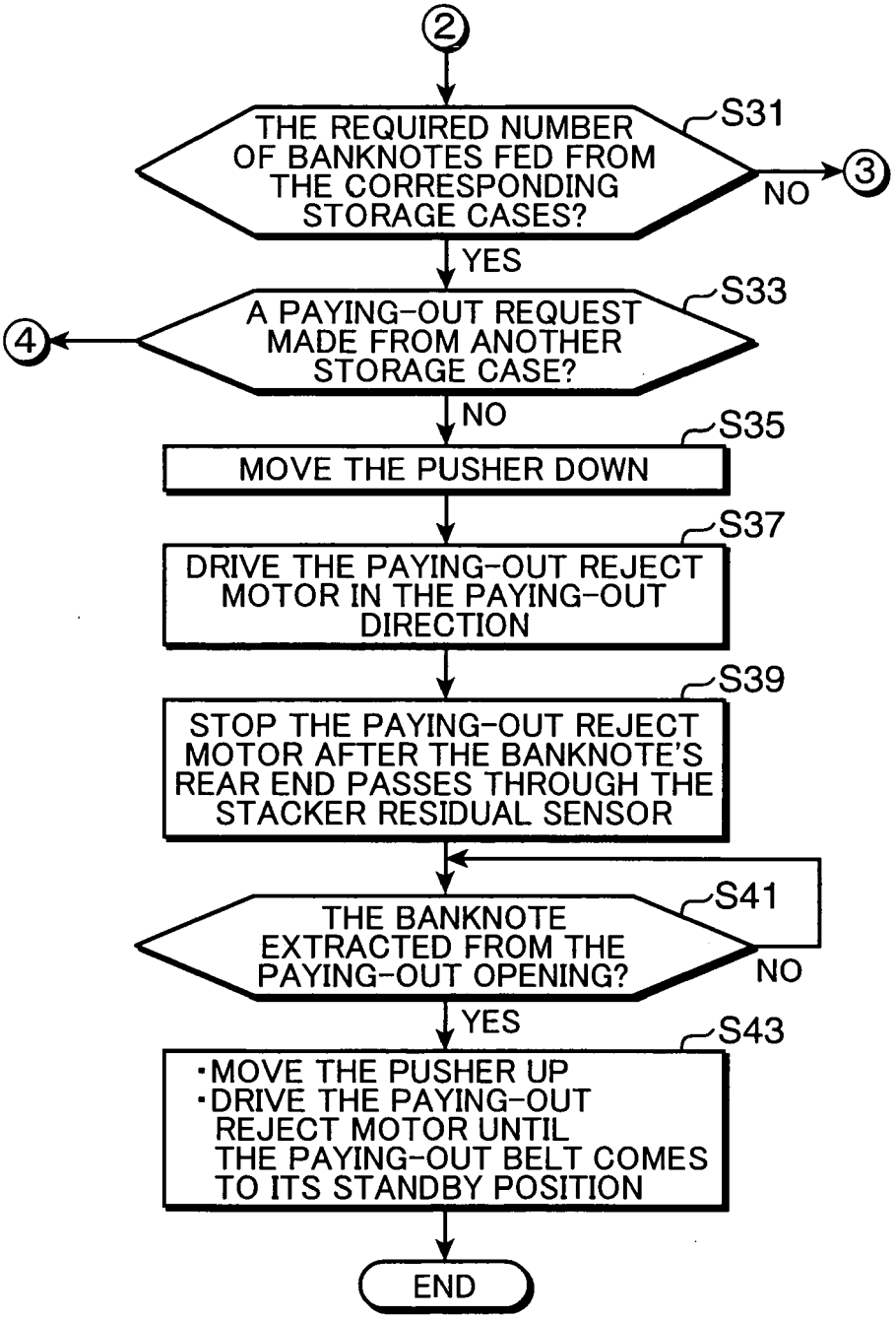

2
THE REQUIRED NUMBER OF BANKNOTES FED FROM THE CORRESPONDING STORAGE CASES?
S31
NO
3
YES
A PAYING-OUT REQUEST MADE FROM ANOTHER STORAGE CASE?
S33
4
NO
MOVE THE PUSHER DOWN
S35
DRIVE THE PAYING-OUT REJECT MOTOR IN THE PAYING-OUT DIRECTION
S37
STOP THE PAYING-OUT REJECT MOTOR AFTER THE BANKNOTE'S REAR END PASSES THROUGH THE STACKER RESIDUAL SENSOR
S39
THE BANKNOTE EXTRACTED FROM THE PAYING-OUT OPENING?
S41
NO
YES
·MOVE THE PUSHER UP
·DRIVE THE PAYING-OUT REJECT MOTOR UNTIL THE PAYING-OUT BELT COMES TO ITS STANDBY POSITION
S43
END

FIG.11

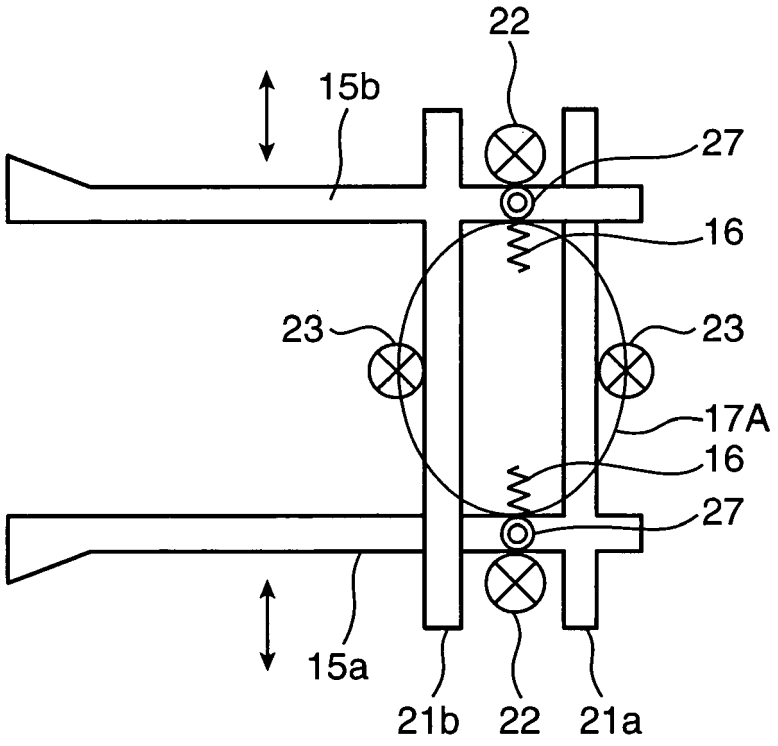
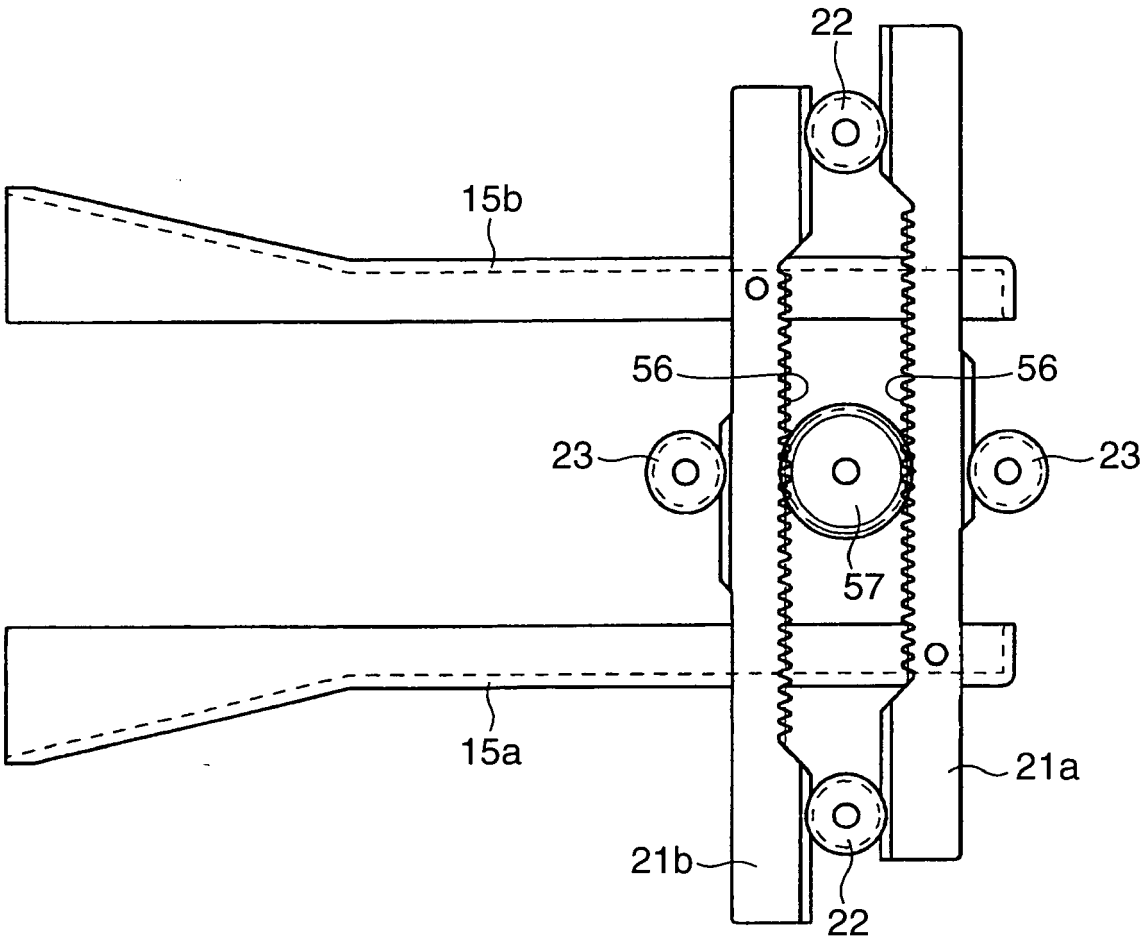


FIG.12



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EUROPEAN SEARCH REPORT

Application Number
EP 07 00 4055

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 2002/180136 A1 (AMARI ISAO [JP] ET AL) 5 December 2002 (2002-12-05) * paragraphs [0047] - [0062] * * paragraphs [0099] - [0107] * * paragraphs [0131] - [0139] * * figures 1,5,31,32 *	1-8	INV. G07D7/16 G07D11/00
Y	WO 00/46761 A (CASHCODE CO INC [CA]) 10 August 2000 (2000-08-10) * page 2, line 11 - page 3, line 22 * * page 5, line 7 - page 7, line 28 * * figures 1-5 *	1-8	
A	EP 0 443 590 A1 (CANON KK [JP]) 28 August 1991 (1991-08-28) * column 3, line 25 - column 4, line 4 * * figure 1 *	1-8	
A	US 2005/045449 A1 (NAGO TOKIMI [JP] ET AL) 3 March 2005 (2005-03-03) * paragraphs [0023] - [0027] * * figures 1-4 *	1-8	TECHNICAL FIELDS SEARCHED (IPC) G07D
A	US 4 907 792 A (WASHIASHI MORIMASA [JP] ET AL) 13 March 1990 (1990-03-13) * column 3, line 47 - column 5, line 4 * * figures 4,5 *	1-8	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 August 2007	Espuela, Vicente

CATEGORY OF CITED DOCUMENTS

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22-08-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002180136 A1	05-12-2002	AT 361510 T	15-05-2007
		AU 7106501 A	30-01-2002
		CA 2385058 A1	24-01-2002
		EP 1302911 A1	16-04-2003
		WO 0207108 A1	24-01-2002
WO 0046761 A	10-08-2000	AU 763239 B2	17-07-2003
		AU 2406199 A	25-08-2000
		BR 9917017 A	15-01-2002
		CN 1334946 A	06-02-2002
		EP 1149362 A1	31-10-2001
		JP 2002536752 T	29-10-2002
		US 6149150 A	21-11-2000
EP 0443590 A1	28-08-1991	DE 69103546 D1	29-09-1994
		DE 69103546 T2	12-01-1995
		JP 2858151 B2	17-02-1999
		JP 3249023 A	07-11-1991
		US 5172138 A	15-12-1992
US 2005045449 A1	03-03-2005	NONE	
US 4907792 A	13-03-1990	DE 3836023 A1	03-05-1989
		JP 1068350 U	02-05-1989
		JP 5044357 Y2	10-11-1993

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Patent documents cited in the description

- JP 2002279487 A **[0002]**