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(54) PAPER SHEET TRANSPORTING DEVICE

PAPIERBLATTTRANSPORTVORRICHTUNG

DISPOSITIF DE TRANSPORT DE FEUILLES DE PAPIER

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Description

TECHNICAL FIELD

[0001] The present invention relates to a paper sheet transporting device for transporting a paper sheet such as a banknote and the like, and more particularly to a paper sheet transporting device for shifting a paper sheet being transported to a predetermined position such as a center position in a width direction of a transport path.

DESCRIPTION OF THE RELATED ART

[0002] In a banknote depositing and dispensing machine for depositing and dispensing banknotes such as ATM installed in a financial institution such as a bank, a banknote transporting device for transporting the banknote is installed in a housing. The banknote transported by the banknote transport device is stored in a storage cassette. However, if a width of a transport path of the banknote in the banknote transporting device is larger than a width of an opening of the storage cassette, it is necessary the banknote transported in the banknote transporting device is shifted to a predetermined position such as a center position and the like in a width direction of the transport path. More specifically, there are multiple types of the banknote, and the size of the banknote differs depending on the issuing country and denomination. Therefore, if the various types of the banknotes are processed, when trying to put the banknote in the storage cassette suitable for the size of the banknote for each type, in order to ensure that the banknotes are stored in the various kinds of the storage cassettes, it is necessary to adjust the position of the banknote in the width direction of the transport path to the predetermined position since the size of the opening of the storage cassette varies depending on the type of banknote.

[0003] In adjusting the position of the banknote in the width direction of the transport path, Japanese Patent Laid-Open No. 2006-111446 (JP2006-111446A) discloses a banknote shifting device in which a plurality of skewing execution rollers having a surface formed of a rubber member are disposed and the banknote is forcibly shifted along the width direction of the transport path by skewing the banknote by these skewing execution rollers.

[0004] However, in the conventional banknote shifting device disclosed in Japanese Patent Laid-Open No. 2006-111446, since the position of the banknote in the width direction of the transport path is adjusted by forcibly displacing the banknote by the rollers, if a damaged banknote is transported to the banknote shifting device, there is a possibility of a trouble such as the banknote being broken. In addition, in the conventional banknote shifting device, the position of the displacement means for displacing the banknote along the width direction of the transport path is fixed. Therefore, there is a problem that the banknote can not be reliably moved along the width direction of the transport path depending on the position of the banknote with respect to the transport path or the skewed state of the banknote.

[0005] In contrast, it is conceivable to use a banknote transporting device in which a plurality of transport units, each of which is slidable along the width direction of the transport path, are arranged along a transport direction of the banknote. In the banknote transporting device like that, each transport unit slides along the width direction of the transport path and sequentially transfers the banknote from the upstream side to the downstream side in each transport unit. This makes it possible to move the banknote along the width direction of the transport path and shift it to the predetermined position. Specifically, a pair of upper and lower transporting units are used, and the banknote is transported along the transport path formed between these upper and lower transporting units. In more detail, the upper transporting unit and the lower transporting unit respectively include transporting rollers, and each transporting roller of the upper transporting unit and each transporting roller of the lower transporting unit are in contact with each other, and in this state the banknote is sent between these transporting rollers, whereby the banknote is transported. In the banknote transporting device, a plurality of upper transporting units are respectively provided movably on an upper cover unit, and a plurality of lower transporting units are respectively provided movably on a lower cover unit. When a trouble such as a jamming of the banknote occurs between the upper transporting unit and the lower transporting unit, by opening the upper cover unit upward from the lower cover unit and separating the upper transporting unit and the lower transporting unit from each other, it is possible to remove the banknote sandwiched between the upper transporting unit and the lower transporting unit.

[0006] However, in such a banknote transporting device, when the upper cover unit is opened upward, the upper transporting unit and the lower transporting unit can slide independently of each other along the width direction of the transport path. Therefore, when the upper cover unit is closed in a state in which the positions of the upper transporting unit and the lower transporting unit are misaligned, since each transporting roller of the upper transporting unit and each transporting roller of the lower transporting unit do not match each other, the banknote can not be transported.

JP 2002-187667 A relates to a recording material post-processing device. The recording material post-processing device is configured so that a pair of transporting members for pinching the recording material and transporting are arranged in the direction across the width perpendicularly intersecting the transporting direction of the recording material and that the discharging position of the recording material relative to an exhaust tray is changed by moving the transporting members across the width using a shifting means, wherein the shifting amount is reduced from the case in which shifting is made in one

direction by displacing the transporting members to the two sides in the width direction by the shifting means while the reference position where the transporting members receive the recording material is used as the boundary.

US 2008/0061499 A1 relates to a pre-registration apparatus. A stalled roll registration system and method includes a mechanism that allows for pivoting deskew action in a pre-registration nip in the form of a segmented pre-registration drive roll assembly mounted on a releasable low friction lateral translation carriage. Outer pre-registration idler nips are provided that open to allow a sheet to pivot and close for transport the sheet. The pre-registration idlers are engaged and the drive roll assembly remains locked in the lateral position for initial paper transport up to the stalled registration roll. After the sheet arrives at the stalled registration roll and starts to form a buckle for deskew, the outer pre-registration idlers and carriage are released. The body of the sheet is then free to pivot about the center drive nip and translate in the lateral direction to self align itself with the registration roll.

WO 2014/208657 A1 relates to a paper sheet conveyor and paper sheet conveyance method. A paper sheet conveyor provided with conveying members (for example, drive rollers and driven rollers) that are capable of sliding along the width direction of a conveying route and that convey a paper sheet along the conveying route, and a paper sheet detection unit (inlet-side paper sheet detection sensor) for detecting the position of the paper sheet in the width direction of the conveying route, the paper sheet detection unit being provided upstream of the conveying members in the direction in which the paper sheet is conveyed along the conveying route. A control unit calculates the movement rate of the conveying members on the basis of the position of the paper sheet in the width direction of the conveying route as detected by the paper sheet detection unit, and a designated preset position of the paper sheet in the width direction of the conveying route.

SUMMARY OF THE INVENTION

[0007] The present invention has been made in view of the above banknote transport matter, and an object of the present invention is to provide a paper sheet transporting device in which when closing a second supporting unit and forming a transport path between a first slide unit and a second slide unit, the first slide unit and the second slide unit can be aligned in the width direction of the transport path, so it is possible to transport the paper sheet properly between the first slide unit and the second slide unit.

[0008] The scope of the present invention is defined by a paper sheet transporting device according to claim 1. Particular embodiments of the present invention are defined by the dependent claims.

[0009] A paper sheet transporting device of the present invention for transporting a paper sheet along a transport path includes: a first slide unit that is slidable along a width direction of the transport path and is in contact with one side of the paper sheet transported along the transport path; a second slide unit that is slidable along the width direction of the transport path and is in contact with another side of the paper sheet transported along the transport path; a first supporting unit that supports the first slide unit; a second supporting unit that supports the second slide unit and is movable relative to the first supporting unit to move between a first position in which the first slide unit and the second slide unit face each other to form the transport path between the first slide unit and the second slide unit and a second position in which the second slide unit is separated from the first slide unit to open the transport path; a positioning unit for positioning the first slide unit and the second slide unit such that a relative position of the second slide unit with respect to the first slide unit in the width direction of the transport path becomes a predetermined position when the second supporting unit moves to the first position.

[0010] In the paper sheet transporting device of the present invention, the positioning unit may inlcude a guiding member provided on at least one of the first slide unit and the second slide unit and the guiding member may align the first slide unit and the second slide unit in the width direction of the transport path when the second supporting unit moves to the first position.

[0011] In this case, the guiding member may include a first guiding member provided on the first slide unit and a second guiding member provided on the second slide unit so as to face the first guiding member, the first guiding member or the second guiding member may include a first inclined surface inclined with respect to the width direction of the transport path, and at least one of the first guiding member and the second guiding member may be guided along the first inclined surface to move along the width direction of the transport path so that the first slide unit and the second slide unit are aligned, when the second supporting unit moves to the first position.

[0012] In the paper sheet transporting device of the present invention, the positioning unit may include a position fixing member that fixes the position of at least one of the first slide unit and the second slide unit in the width direction of the transport path when the second supporting unit moves to the second position.

[0013] In this case, the positioning unit may further include a release member that releases a position fixed state of at least one of the first slide unit and the second slide unit by the position fixing member when the second supporting unit moves to the first position.

[0014] Furthermore, the release member may include a contacting member provided on the position fixing member and contacting the first supporting unit when the second supporting unit moves to the first position, and the position fixed state of at least one of the first slide unit and the second slide unit by the position fixing member may be released as the contacting member provided on the position fixing member is brought into contact with

the first supporting unit and pushed, and then a distance between the second slide unit and the position fixing member increases, when the second supporting unit moves to the first position.

[0015] In addition, a cover unit may be provided outside the second supporting unit, the position fixing member may include a lever rotatable about an axis provided on the second supporting unit and provided with the contacting member, and an elastic member provided between the lever and the cover unit and biasing the lever in a direction toward the second slide unit while leaving the lever away from the cover unit, and the position fixed state of at least one of the first slide unit and the second slide unit by the position fixing member may be released as the elastic member deforms by the contacting member provided on the lever contacting the first supporting unit and being pushed, and then the distance between the second slide unit and the lever of the position fixing member increases, when the second supporting unit moves to the first position.

[0016] In the paper sheet transporting device of the present invention, the position fixing member may guide and fix at least one of the first slide unit and the second slide unit to a predetermined position in the width direction of the transport path, when the second supporting unit moves to the second position.

[0017] In this case, the position fixing member may include a third guiding member provided on the second slide unit and including a second inclined surface inclined with respect to the width direction of the transport path and a fourth guiding member that contacts the third guiding member when the second supporting unit moves to the second position, and the fourth guiding member may come in contact with the third guiding member provided on the second slide unit and relatively move along the second inclined surface so that the second slide unit moves along the width direction of the transport path and is fixed to the predetermined position in the width direction of the transport path, when the second supporting unit moves to the second position.

[0018] Furthermore, a cover unit may be provided outside the second supporting unit, the position fixing member may include a lever rotatable about an axis provided on the second supporting unit and provided with the fourth guiding member, and an elastic member provided between the lever and the cover unit and biasing the lever in a direction toward the second slide unit while leaving the lever away from the cover unit, and the fourth guiding member may come in contact with the third guiding member by the elastic member biasing the lever toward the second slide unit, and the fourth guiding member may relatively move along the second inclined surface so that the second slide unit moves along the width direction of the transport path and is fixed to the predetermined position in the width direction of the transport path, when the second supporting unit moves to the second position.

[0019] In the paper sheet transporting device of the present invention, the position fixing member may include a regulating member that restricts movement of at least one of the first slide unit and the second slide unit in the width direction of the transport path when the second supporting unit is positioned at the second position.

[0020] Alternatively, the position fixing member may include a drive motor that slides at least one of the first supporting unit and the second supporting unit along the width direction of the transport path, and the positioning unit may fix the position of the supporting unit to be driven by the drive motor among the first supporting unit and the second supporting unit in the width direction of the transport path, when the second supporting unit moves to the second position.

[0021] In the paper sheet transporting device of the present invention, each of the first slide unit and the second slide unit may include a roller that contacts the paper sheet for transporting the paper sheet, the paper sheet is transported between the roller of the first slide unit and the roller of the second slide unit when the second supporting unit is in the first position, and the positioning unit may position the first slide unit and the second slide unit such that the position of the roller of the first slide unit and the position of the roller of the second slide unit substantially coincide in the width direction of the transport path, when the second supporting unit moves to the first position.

[0022] In the paper sheet transporting device of the present invention, a plurality of combinations of the first slide unit and the second slide unit may be provided so as to line up along the transport direction of the paper sheet in the transport path, and a plurality of positioning units may be provided so as to correspond to each of the plurality of combinations.

[0023] In the paper sheet transporting device of the present invention, a plurality of combinations of the first slide unit and the second slide unit may be provided so as to line up in the transport direction of the paper sheet in the transport path, the position fixing member of the positioning unit may be provided to extend over a plurality of combinations, and the position fixing member may simultaneously fix the position of at least one of the first slide unit and the second slide unit in each of the plurality of combinations in the width direction of the transport path, when the second supporting unit moves to the second position.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1A is a schematic configuration diagram showing an internal configuration of a banknote handling machine including a banknote shifting device according to an embodiment of the present invention.

FIG. 1B is a functional block diagram showing a configuration of a control system in the banknote handling machine shown in FIG. 1A.

FIG. 2 is a configuration diagram showing a sche-

matic configuration when the banknote shifting device in the banknote handling machine shown in FIG. 1A is viewed from above.

FIG. 3 is a side view of the banknote shifting device shown in FIG. 2.

FIG. 4 is a perspective view of the banknote shifting device shown in FIGS. 2 and 3.

FIG. 5 is a perspective view showing details of a configuration of a slide type transporting mechanism in the banknote shifting device shown in FIG. 2 and the like.

FIGS. 6 (a) to (e) are explanatory diagrams showing an example of a banknote transporting method by the banknote shifting device shown in FIG. 2 and the like.

FIGS. 7 (a) to (f) are explanatory diagrams showing the example of the banknote transporting method by the banknote shifting device shown in FIG. 2 and the like subsequent to FIG. 6 (e).

FIGS. 8 (a) to (f) are explanatory diagrams showing another example of a banknote transporting method by the banknote shifting device shown in FIG. 2 and the like.

FIG. 9A is a perspective view showing a state in which an upper cover unit of the banknote shifting device shown in FIG. 2 is opened upward.

FIG. 9B is a side view showing a configuration of a position fixing member and an elastic member provided in the banknote shifting device shown in FIG. 2, where (a) shows a state in which a second supporting unit of the banknote shifting device is located at a first position and (b) shows a state in which the second supporting unit of the banknote shifting device is located at a second position.

FIGS. 10 (a) to (e) are explanatory diagrams sequentially showing such an operation that an alignment of a lower guiding unit and an upper guiding unit in each slide type transporting mechanism is performed automatically when closing the upper cover unit after opening the upper cover unit upward from the lower cover unit to the state as shown in FIG. 9A, in the banknote shifting device shown in FIG. 2 and the like.

FIGS. 11 (a) and (b) are diagrams showing such an operation that a position of the upper guiding unit in a width direction of a transport path is automatically fixed to a predetermined position (more specifically, a center position in the width direction of the transport path) when the upper cover unit is opened upward from the lower cover unit to the state as shown in FIG. 9A in the banknote shifting device shown in FIG. 2 and the like.

FIG. 12 is a longitudinal sectional view showing a configuration of the lower guiding unit, the upper guiding unit, and the like of each slide type transporting mechanism in the banknote shifting device shown in FIG. 2 and the like.

FIG. 13 is a longitudinal sectional view showing the configuration of the lower guiding unit, the upper guiding unit, and the like of each slide type transporting mechanism in the banknote shifting device shown in FIG. 2 and the like.

FIG. 14 is a longitudinal sectional view showing the configuration of the lower guiding unit, the upper guiding unit, and the like of each slide type transporting mechanism in the banknote shifting device shown in FIG. 2 and the like.

FIG. 15 is a longitudinal sectional view showing the configuration of the lower guiding unit, the upper guiding unit, and the like of each slide type transporting mechanism in the banknote shifting device shown in FIG. 2 and the like.

FIG. 16 is a longitudinal sectional view showing the configuration of the lower guiding unit, the upper guiding unit, and the like of each slide type transporting mechanism in the banknote shifting device shown in FIG. 2 and the like.

FIG. 17 is a longitudinal sectional view showing the configuration of the lower guiding unit, the upper guiding unit, and the like of each slide type transporting mechanism in the banknote shifting device shown in FIG. 2 and the like.

FIG. 18 is a longitudinal sectional view showing the configuration of the lower guiding unit, the upper guiding unit, and the like of each slide type transporting mechanism in the banknote shifting device according to a modified example.

FIG. 19 is a configuration diagram showing a photo-interrupter and the like for detecting the positions of the lower guiding unit and the upper guiding unit of each slide type transporting mechanism in the banknote shifting device shown in FIG. 2 and the like.

FIG. 20 is a timing chart showing a relationship between an operation of the lower guiding unit and the upper guiding unit and a state of the photo-interrupter in the case where the photo-interrupter is arranged as shown in FIG. 19.

FIGS. 21 (a) and (b) are configuration diagrams showing a configuration when an inlet unit of a banknote handling machine according to a modified example is viewed from a front side.

DETAILED DESCRIPTION OF THE INVENTION

[0025] Hereinafter, embodiments of the present invention will be described with reference to the drawings. FIGS. 1A to 17 are diagrams showing a banknote shifting device (banknote transporting device) according to the present embodiment and a banknote handling machine including the banknote shifting device. Among these diagrams, FIG. 1A is a schematic configuration diagram showing an internal configuration of the banknote handling machine including the banknote shifting device according to the present embodiment, and FIG. 1B is a functional block diagram showing a configuration of a control system in the banknote handling machine shown

in FIG. 1A. FIG. 2 is a configuration diagram showing a schematic configuration when the banknote shifting device in the banknote handling machine shown in FIG. 1A is viewed from above, FIG. 3 is a side view of the banknote shifting device shown in FIG. 2, and FIG. 4 is a perspective view of the banknote shifting device shown in FIGS. 2 and 3. FIGS. 6 and 7 are explanatory diagrams showing one example of the banknote transporting method by the banknote shifting device shown in FIG. 2 and the like, and FIG. 8 is an explanatory diagram showing another example of the banknote transporting method by the banknote shifting device shown in FIG. 2 and the like. FIG. 9A is a perspective view showing a state in which an upper cover unit of the banknote shifting device shown in FIG. 2 is opened upward, and FIG. 9B is a side view showing a configuration of a position fixing member and an elastic member provided in the banknote shifting device shown in FIG. 2. FIGS. 10 (a) to (e) are explanatory diagrams sequentially showing such an operation that an alignment of a lower guiding unit and an upper guiding unit in each slide type transporting mechanism is performed automatically when closing the upper cover after opening the upper cover unit upward from the lower cover unit to the state as shown in FIG. 9A, in the banknote shifting device shown in FIG. 2 and the like. FIGS. 11 (a) and (b) are diagrams showing such an operation that a position of the upper guiding unit in a width direction of a transport path is automatically fixed to a predetermined position (more specifically, a center position in the width direction of the transport path) when the upper cover unit is opened upward from the lower cover unit to the state as shown in FIG. 9A in the banknote shifting device shown in FIG. 2 and the like. FIGS. 12 to 17 are longitudinal sectional views showing a configuration of the lower guiding unit, the upper guiding unit, and the like of each slide type transporting mechanism in the banknote shifting device shown in FIG. 2 and the like, respectively.

[0026] A banknote handling machine 100 according to the present embodiment can perform various processes such as a depositing process and a dispensing process of the banknotes. As shown in FIG. 1A, the banknote handling machine 100 according to the present embodiment is composed of two assemblies including an upper assembly 102 and a lower assembly 104. The banknote handling machine 100 includes a substantially rectangular parallelepiped housing 101, an inlet unit 110 for inserting the banknotes into the housing 101 from the outside, and an ejecting unit 112 for ejecting the banknotes from the inside of the housing 101 to the outside. A left side surface of the housing 101 in FIG. 1A is a front side of the housing 101, and a right direction in FIG. 1A is a depth direction of the housing 101. Therefore, the inlet unit 110 and the ejecting unit 112 are disposed on the front side of the housing 101. Furthermore, in the housing 101 of the banknote handling machine 100, a transporting unit 114 for transporting the banknotes one by one is provided.

[0027] The multiple banknotes are placed in a stacked manner in the inlet unit 110 from the outside of the housing 101 by the operator. A banknote feeding mechanism 111 is provided in the inlet unit 110. The banknote feeding mechanism 111 is configured to feed out the banknotes placed in the inlet unit 110 one by one to the inside of the housing 101 so that the banknotes are sent to the transporting unit 114. With such a configuration, the banknotes placed on the inlet unit 110 are fed one by one into the housing 101 by the banknote feeding mechanism 111 and are sent to the transporting unit 114, and then are transported one by one in the housing 101 by the transporting unit 114. In the present embodiment, the banknotes are inserted in a stacked state in the inlet unit 110 along the short-edge direction thereof, and the transporting unit 114 transports the banknotes along the short-edge direction thereof. A recognition unit 116 is provided in the transporting unit 114, and the recognition unit 116 recognizes a denomination, authenticity, front/back, correctness, new/old, transport status, and the like of the banknote being transported by the transporting unit 114. The recognition unit 116 includes an image sensor, and an image of the banknote is taken by this image sensor. Furthermore, in the recognition unit 116, information related to a serial number of the banknote is obtained based on the image of the banknote taken by the image sensor. An escrow unit 118 is connected to the transporting unit 114. The banknote recognized by the recognition unit 116 is sent to the escrow unit 118 by the transporting unit 114, and then escrowed in the escrow unit 118.

[0028] In the banknote handling machine 100 according to the present embodiment, a banknote shifting device 10 is provided in the transporting unit 114. The banknote shifting device 10 shifts a position of the banknote transported by the transporting unit 114 along a direction perpendicular to a transport direction of the banknote by the transporting unit 114 (that is, along a width direction of the banknote transported by the transporting unit 114). With the banknote shifting device 10, it is possible to shift the banknote transported by the transporting unit 114, for example, to a center position in the width direction of the transport path of the transporting unit 114. Details of the configuration of the banknote shifting device 10 will be described later.

[0029] In the present embodiment, the inlet unit 110, the ejecting unit 112, the recognition unit 116, the escrow unit 118 and the banknote shifting device 10 are provided in the upper assembly 102.

[0030] As shown in FIG. 1A, in the lower assembly 104 of the banknote handling machine 100, a plurality of banknote storage units 120 are provided in parallel, and each banknote storage unit 120 is connected to the transporting unit 114, respectively. Each banknote storage unit 120 is arranged such that the banknotes sent from the transporting unit 114 are stored in a stacked state and the banknotes stored in the banknote storage unit 120 can be fed out to the transporting unit 114 one by one by a banknote feeding mechanism 122 provided in each banknote storage unit 120. In each banknote storage unit

120, the banknotes are stored for each denomination. With such a configuration, based on the recognition result of the banknote by the recognition unit 116, the banknote escrowed in the escrow unit 118 is fed out from the escrow unit 118 to the transporting unit 114, and the fed banknote is sent to each banknote storage unit 120 for each denomination via the banknote shifting device 10 by the transporting unit 114.

[0031] Next, the configuration of the control system in the banknote handling machine 100 will be described with reference to FIG. 1B. As shown in FIG. 1B, the banknote handling machine 100 of the present embodiment is provided with a controlling unit 150 for controlling each constituent member of the banknote handling machine 100. More specifically, the banknote feeding mechanism 111 provided on the inlet unit 110, the transporting unit 114, the recognition unit 116, the banknote shifting device 10, the escrow unit 118, each banknote feeding mechanism 122 provided on each banknote storage unit 120 are communicably connected to the controlling unit 150, respectively. A signal related to the recognition result of the banknote by the recognition unit 116 is sent to the controlling unit 150 and the controlling unit 150 controls the operation of these constituent members by sending a command signal to each constituent member of the banknote handling machine 100.

[0032] Furthermore, as shown in FIG. 1B, an operation/display unit 152, a memory unit 154, a printing unit 156, and a communication interface unit 158 are communicably connected to the controlling unit 150, respectively. The operation/display unit 152 is composed of a touch panel and the like provided on an upper surface of the housing 101, for example. Information on a process status such as the depositing process and the dispensing process of the banknotes in the banknote handling machine 100, information on an amount-of-money data of the banknotes stored in each banknote storage unit 120 and the like are displayed on the operation/display unit 152. In addition, by operating the operation/display unit 152, the operator can give various instructions to the controlling unit 150.

[0033] The memory unit 154 stores a process history such as the depositing process and the dispensing process of the banknotes in the banknote handling machine 100, information on the amount-of-money data of the banknotes stored in each banknote storage unit 120 and the like. The printing unit 156 is composed of, for example, a printer and the like provided on the upper surface of the housing 101. Information on the process status such as the depositing process and the dispensing process of the banknotes in the banknote handling machine 100, information on the amount-of-money data of the banknotes stored in each banknote storage unit 120 and the like are printed on a receipt and the like by the printing unit 156. The controlling unit 150 can transmit and receive signals to and from an external device (specifically, for example, an upper terminal) provided separately from the banknote handling machine 100 according to the present embodiment via the communication interface unit 158.

[0034] Next, a configuration of the banknote shifting device 10 in the banknote handling machine 100 will be described in detail with reference to FIGS. 2 to 5.

[0035] As shown in FIG. 2 and the like, the banknote shifting device 10 according to the present embodiment includes a first fixed transporting unit 20 whose position is fixed and transports the banknotes along a transport path 11, a plurality (for example, four) of slide type transporting mechanisms 30, and a second fixed transporting unit 50 whose position is fixed and transports the banknotes delivered from the slide type transporting mechanisms 30 along the transport path 11. Each of the slide type transporting mechanisms 30 is slidable along the width direction of the transport path 11 (up and down direction in FIG. 2), and transports the banknotes delivered from the first fixed transporting unit 20, respectively. An upstream side transporting unit 12 is provided upstream of the first fixed transporting unit 20 in the transport direction of the banknote. In FIG. 2, the banknote shifting device 10 transports the banknotes one by one from the right side to the left side along the transport path 11 extending in the left-right direction in FIG. 2. At this time, the banknotes are transported along the short-edge direction thereof.

[0036] Details of each constituent element of the banknote shifting device 10 will be described below.

[0037] As shown in FIGS. 2 and 3, the upstream side transporting unit 12 is composed of an upper transporting belt 14 stretched by a plurality of upper rollers 15 and a lower transporting belt 16 stretched by a plurality of lower rollers 17. FIG. 2 shows the configuration of the lower transporting belt 16 when the upper transporting belt 14 and the upper rollers 15 are removed from the banknote shifting device 10. A drive motor is attached to one lower roller 17 among the plurality of lower rollers 17, and as the lower roller 17 is rotated by this drive motor, the lower transporting belt 16 circulates in the counterclockwise direction in FIG. 3. The upper transporting belt 14 also circulates with the lower transporting belt 16. When the lower transporting belt 16 is circulated in the counterclockwise direction in FIG. 3, the upper transporting belt 14 is also circulated in the clockwise direction in FIG. 3. In the upstream side transporting unit 12, the banknotes are transported from the right side to the left side in FIGS. 2 and 3 in a state of being sandwiched between the upper transporting belt 14 and the lower transporting belt 16. As shown in FIG. 2, the lower transporting belts 16 are arranged to be a pair of left and right along the width direction (up and down direction in FIG. 2) of the transport path 11. The upper transporting belts 14 provided so as to correspond to the lower transporting belts 16 are also arranged to be a pair of left and right along the width direction of the transport path 11 although not shown.

[0038] As shown in FIGS. 2 and 3, the first fixed transporting unit 20 is composed of an upper guiding unit 22 and a lower guiding unit 24 arranged so as to be apart

from each other with a small distance therebetween in the vertical direction. Between the upper guiding unit 22 and the lower guiding unit 24, the transport path 11 of the banknote is formed. As shown in FIG. 2, the lower guiding unit 24 is provided with a pair of left and right drive rollers 26 along the width direction of the transport path 11, and the upper guiding unit 22 is provided with a pair of left and right driven rollers 28 along the width direction of the transport path 11 such that each driven roller 28 faces each drive roller 26. FIG. 2 shows the configuration of the lower guiding unit 24 and the drive rollers 26 when the upper guiding unit 22 and the driven rollers 28 are removed from the first fixed transporting unit 20.

[0039] In the first fixed transporting unit 20, a high friction member such as a rubber is disposed on an outer peripheral surface of each of the drive rollers 26. Each of the drive rollers 26 is rotated in the counterclockwise direction in FIG. 3 by a roller driving unit 60 (to be described later) via a drive shaft 29. A metal member is disposed on an outer peripheral surface of each of the driven rollers 28. Each of the driven rollers 28 is provided on the upper guiding unit 22 so as to come into contact with each drive roller 26 and rotate together with each drive roller 26. As the banknote is sent to a nip formed between each drive roller 26 and each driven roller 28, the banknote is transported in the left direction in FIGS. 2 and 3 along the transport path 11.

[0040] Like the first fixed transporting unit 20, the second fixed transporting unit 50 is composed of an upper guiding unit 52 and a lower guiding unit 54 arranged so as to be apart from each other with a small distance therebetween in the vertical direction. Between the upper guiding unit 52 and the lower guiding unit 54, the transport path 11 of the banknote is formed. As shown in FIG. 2, the lower guiding unit 54 is provided with a pair of left and right drive rollers 56 along the width direction of the transport path 11, and the upper guiding unit 52 is provided with a pair of left and right driven rollers 58 along the width direction of the transport path 11 such that each driven roller 58 faces each drive roller 56. FIG. 2 shows the configuration of the lower guiding unit 54 and the drive rollers 56 when the upper guiding unit 52 and the driven rollers 58 are removed from the second fixed transporting unit 50.

[0041] In the second fixed transporting unit 50, a high friction member such as a rubber is disposed on an outer peripheral surface of each of the drive rollers 56. Each of the drive rollers 56 is rotated in the counterclockwise direction in FIG. 3 by the roller driving unit 60 (to be described later) via a drive shaft 59. A metal member is disposed on an outer peripheral surface of each of the driven rollers 58. Each of the driven rollers 58 is provided on the upper guiding unit 52 so as to come into contact with each drive roller 56 and rotate together with each drive roller 56. As the banknote is sent to a nip formed between each drive roller 56 and each driven roller 58, the banknote is transported in the left direction in FIGS. 2 and 3 along the transport path 11.

[0042] Between the first fixed transporting unit 20 and the second fixed transporting unit 50, a plurality (for example, four) of slide type transporting mechanisms 30 are arranged in series along the transport direction of the banknotes. Each slide type transporting mechanism 30 is slidable along the width direction (up and down direction in FIG. 2) of the transport path 11 independently of the other slide type transporting mechanism 30. As a result, regardless of the position of the banknote in the width direction of the transport path 11 in the first fixed transporting unit 20 upstream of each slide type transporting mechanism 30, each slide type transporting mechanism 30 can move the banknote along the width direction of the transport path 11. Therefore, the position of the banknote sent from each slide type transporting mechanism 30 to the second fixed transporting unit 50 in the width direction of the transport path 11 is shifted to the predetermined position (for example, the center position).

[0043] As shown in FIGS. 2 and 3, each slide type transporting mechanism 30 is composed of an upper guiding unit 32 and a lower guiding unit 34 arranged so as to be spaced apart from each other with a small distance therebetween in the vertical direction. Between the upper guiding unit 32 and the lower guiding unit 34, the transport path 11 of the banknote is formed. As shown in FIG. 2, the lower guiding unit 34 is provided with a pair of left and right drive rollers 36 along the width direction of the transport path 11, and the upper guiding unit 32 is provided with a pair of left and right driven rollers 38 along the width direction of the transport path 11 such that each driven roller 38 faces each drive roller 36. FIG. 2 shows the configuration of the lower guiding unit 34 and the drive rollers 36 when the upper guiding unit 32 and the driven rollers 38 are removed from each slide type transporting unit 30.

[0044] In each slide type transporting unit 30, a high friction member such as a rubber is disposed on an outer peripheral surface of each of the drive rollers 36. Each of the drive rollers 36 is rotated in the counterclockwise direction in FIG. 3 by the roller driving unit 60 (to be described later) via a drive shaft 39. A metal member is disposed on an outer peripheral surface of each of the driven rollers 38. Each of the driven rollers 38 is provided on the upper guiding unit 32 so as to come into contact with each drive roller 36 and rotate together with each drive roller 36. As the banknote is sent to a nip formed between each drive roller 36 and each driven roller 38, the banknote is transported in the left direction in FIGS. 2 and 3 along the transport path 11. As each driven roller 38 provided in the upper guiding unit 32 and each drive roller 36 provided in the lower guiding unit 34 come into contact with each other, the upper guiding unit 32 and the lower guiding unit 34 can slide integrally along the width direction of the transport path 11 by the frictional force acting between each driven roller 38 and each drive roller 36.

[0045] In the banknote shifting device 10 of the present embodiment, as shown in FIG. 9A, the first fixed transporting unit 20, the second fixed transporting unit 50, and each slide type transporting mechanism 30 are provided between a lower cover unit 80 and an upper cover unit 90. The upper cover unit 90 is freely rotatable with respect to the lower cover unit 80 about an axis 81. More specifically, the upper guiding unit 22 and the driven rollers 28 of the first fixed transporting unit 20, the upper guiding unit 52 and the driven rollers 58 of the second fixed transporting unit 50, and the upper guiding unit 32 and the driven rollers 38 of each slide type transporting mechanism 30 are provided on the upper cover unit 90. In addition, the lower guiding unit 24 and the drive rollers 26 of the first fixed transporting unit 20, the lower guiding unit 54 and the drive rollers 56 of the second fixed transporting unit 50, and the lower guiding unit 34 and the drive rollers 36 of each slide type transporting mechanism 30 are provided on the lower cover unit 80. If a trouble such as a jamming of the banknote occurs when the banknote is transported in the first fixed transporting unit 20, each slide type transporting mechanism 30, the second fixed transporting unit 50, and the like, the upper cover unit 90 is opened upward from the lower cover unit 80 as shown in FIG. 9A. This makes it possible to remove the banknote sandwiched between the upper guiding units 22, 32, 52 and the lower guiding units 24, 34, 54 in the first fixed transporting unit 20, each slide type transporting mechanism 30, the second fixed transporting unit 50, and the like.

[0046] In the present embodiment, by opening the upper cover unit 90 upward from the lower cover unit 80, the banknote causing the trouble such as the jamming is removed, and then the upper cover unit 90 is closed, whereby, the transport path of the banknote is formed between the upper guiding units 22, 32, 52 and the lower guiding units 24, 34, 54 in the first fixed transporting unit 20, each slide type transporting mechanism 30, and the second fixed transporting unit 50. At this time, in each slide type transporting mechanism 30, it is possible to position the lower guiding unit 34 and the upper guiding unit 32 by a positioning unit 31 (see FIGS. 10 to 17) such that a relative position of the upper guiding unit 32 with respect to the lower guiding unit 34 in the width direction of the transport path becomes a predetermined position. In this case, it is possible to align the position of the upper guiding unit 32 with respect to the lower guiding unit 34 in the width direction of the transport path, so that the banknote can be appropriately transported between the lower guiding unit 34 and the upper guiding unit 32. Details of the configuration of the positioning unit 31 will be described later.

[0047] Next, in each slide type transporting mechanism 30, a mechanism for integrally sliding the upper guiding unit 32 and the lower guiding unit 34 along the width direction of the transport path 11 will be described with reference to FIG. 5. As shown in FIG. 5, two guide rails 40, 41 extending in parallel along the width direction of the transport path 11 are provided below the lower guiding unit 34. In addition, a first lower member 34a is attached to a center position of the lower guiding unit 34 in a lower portion, and a second lower member 34b and a third lower member 34c are attached to both end positions of the lower guiding unit 34 in the lower portion. The first lower member 34a is provided with a tubular member, and the guide rail 40 passes through the tubular member, so that the first lower member 34a is guided along the guide rail 40 in the horizontal direction. The second lower member 34b and the third lower member 34c are also provided with tubular members respectively. As the guide rail 41 passes through these tubular members, the second lower member 34b and the third lower member 34c are guided along the guide rail 41 in the horizontal direction.

[0048] In each slide type transporting mechanism 30, an endless drive belt 42 is arranged below the guide rails 40, 41 along the horizontal direction. The drive belt 42 is stretched around a plurality of pulleys including a drive pulley 44 (the pulleys other than the drive pulley 44 are not shown in FIG. 5). In each slide type transporting mechanism 30, a drive motor 46 such as a stepping motor for rotating the drive pulley 44 in both forward and reverse directions is disposed. The second lower member 34b attached to the lower part of the lower guiding unit 34 is provided with a belt mounting unit 34d and this belt mounting unit 34d is attached to the drive belt 42. According to such a configuration, when the drive motor 46 rotates the drive pulley 44, the drive belt 42 stretched around the drive pulley 44 circulates. As this causes the belt mounting unit 34d to move in the horizontal direction, the second lower member 34b and the third lower member 34c move along the guide rail 41. In this case, the first lower member 34a also moves along the guide rail 40, and the upper guiding unit 32 and the lower guiding unit 34 integrally slide along the width direction of the transport path 11.

[0049] In the present embodiment, the drive rollers 26 of the first fixed transporting unit 20, the drive rollers 36 of each slide type transporting mechanism 30, and the drive rollers 56 of the second fixed transporting unit 50 are driven by the roller driving unit 60 which is a single drive system. Details of a configuration of the roller driving unit 60 will be described with reference to FIGS. 2 and 4. As shown in FIGS. 2 and 4, the drive shaft 29 of the drive rollers 26 of the first fixed transporting unit 20, the drive shaft 39 of the drive rollers 36 of each slide type transporting mechanism 30, and the drive shaft 59 of the drive rollers 56 of the second fixed transporting unit 50 are provided with gear wheels 29a, 39a and 59a, respectively. In addition, each drive gear 64 is disposed between the gear wheels 29a, 39a and 59a, respectively. A gear wheel 29a provided at the tip portion of the drive shaft 29 of the drive rollers 26 of the first fixed transporting unit 20 is arranged so that the gear wheel 29a and a drive gear 62 mesh with each other. In addition, the drive gear 62 is arranged so that the drive gear 62 and a drive gear

61 meshes with each other. The drive gear 61 is rotated by a drive motor (not shown) such as a stepping motor and the like, so that the gear wheel 29a is rotated via the drive gear 62, and then this rotational driving force is transmitted to each gear wheel 39a and gear wheel 59a via each drive gear 64. In this way, each drive shaft 29, 39, 59 rotates integrally, and each drive roller 26, 36, 56 also rotates integrally.

[0050] As shown in FIGS. 2 and 4, each drive gear 64 extends along the width direction of the transport path 11 (that is, the longitudinal direction of each drive shaft 39). Therefore, even when the upper guiding unit 32 and the lower guiding unit 34 of each slide type transporting mechanism 30 slide along the width direction of the transport path 11 and the drive shaft 39 of each drive roller 36 also moves along the width direction of the transport path 11, the coupling between each gear wheel 39a and each drive gear 64 is not disengaged. As a result, even when the drive shaft 39 of each drive roller 36 moves along the width direction of the transport path 11, each drive roller 26, 36, 56 can be integrally rotated by the roller driving unit 60.

[0051] As shown in FIG. 2, in the banknote shifting device 10, an inlet side banknote detecting sensor 70 is installed upstream of the first fixed transporting unit 20 in the transport direction of the banknote. The inlet side banknote detecting sensor 70 detects the length of the banknote in the width direction thereof, the position of the banknote in the width direction of the transport path 11, the skew angle (skew amount) of the banknote, and the like, regarding the banknote transported by the upstream side transporting unit 12 along the transport path 11. Detection information on the banknote detected by the inlet side banknote detecting sensor 70 is sent to the controlling unit 150. An inlet side transport timing detecting sensor 74 is installed upstream of the first fixed transporting unit 20 and downstream of the inlet side banknote detecting sensor 70 in the transport direction of the banknote. The inlet side transport timing detecting sensor 74 detects the timing of the banknote just before being sent to the first fixed transporting unit 20. The detection information on the banknote by the inlet side transport timing detecting sensor 74 is sent to the controlling unit 150.

[0052] Next, an operation of the banknote shifting device 10 (specifically, an operation of shifting the banknote along the width direction thereof by the banknote shifting device 10) will be described. The operation of the banknote shifting device 10 as described below is performed by the controlling unit 150 controlling each constituent member of the banknote shifting device 10.

[0053] In a standby state of the banknote shifting device 10, the controlling unit 150 places the upper guiding unit 32 and the lower guiding unit 34 of each slide type transporting mechanism 30 at the center position in the width direction of the transport path 11. Then, when the banknote transported by the transporting unit 114 is sent to the banknote shifting device 10, the controlling unit 150 calculates a movement amount of each slide type transporting mechanism 30 based on a position of the banknote in the width direction of the transport path 11, before being sent to each slide type transporting mechanism 30, detected by the inlet side banknote detecting sensor 70 and the predetermined position of the banknote in the width direction of the transport path 11 (for example, the center position). Specifically, for example, when the position of the banknote in the width direction of the transport path 11, before being sent to each slide type transporting mechanism 30, detected by the inlet side banknote detecting sensor 70 is deviated by 10 mm from the predetermined position (for example, the center position) of the banknote in the width direction of the transport path 11, the controlling unit 150 calculates that the movement amount of each slide type transporting mechanism 30 is 10 mm. In the present embodiment, the movement amount of each slide type transporting mechanism 30 is the same as the movement amount of the transporting member composed of the drive rollers 36 and the driven rollers 38.

[0054] When the banknote is transported by each slide type transporting mechanism 30, the controlling unit 150 controls each slide type transporting mechanism 30 so as to slide each slide type transporting mechanism 30 along the width direction of the transport path 11 by the calculated movement amount. In more detail, when the banknote is sequentially transported by each slide type transporting mechanism 30, the controlling unit 150 slides each slide type transporting mechanism 30 along the width direction of the transport path 11 such that the sum of the movement amounts of the banknote in the width direction of the transport path 11 by each slide type transporting mechanism 30 becomes the calculated movement amount. Therefore, regardless of the position of the banknote in the width direction of the transport path 11 in the first fixed transporting unit 20 on the upstream side, the banknote is moved along the width direction of the transport path 11 by each slide type transporting mechanism 30, and then the position of the banknote sent from each slide type transporting mechanism 30 to the second fixed transporting unit 50 in the width direction of the transport path 11 is shifted to the predetermined position (for example, the center position). Details of the operation will be described with reference to FIGS. 6 and 7. FIGS. 6 (a) to (e) and FIGS. 7 (a) to (f) are explanatory diagrams showing an example of the banknote transporting method by the banknote shifting device 10. The operation as shown in FIGS. 7 (a) to (f) is subsequently performed after the operation as shown in FIGS. 6 (a) to (e). In FIGS. 6 and 7, as the four slide type transporting mechanisms 30, a first slide type transporting mechanism 30a, a second slide type transporting mechanism 30b, a third slide type transporting mechanism 30c, and a fourth slide type transporting mechanism 30d are provided. In FIGS. 6 and 7, the banknote sequentially transported by the first to fourth slide type transporting mechanisms 30a to 30d are denoted by reference symbol P.

[0055] As shown in FIG. 6 (a), when the banknote is

transferred from the upstream side transporting unit 12 to the first fixed transporting unit 20, if the position of this banknote in the width direction of the transport path 11 deviates from the predetermined position (for example, the center position), the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b start to move, as shown in FIG. 6 (b), in a direction approaching the banknote (that is, downward in FIG. 6 (b)), in order to shift this banknote to the predetermined position in the width direction of the transport path 11. Such movement of the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b is performed until the banknote is sent to the nip between each drive roller 36 and each driven roller 38 of the first slide type transporting mechanism 30a. Then, as shown in FIG. 6 (c), after the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b are stopped, the banknote is sent to the nip between each drive roller 36 and each driven roller 38 of the first slide type transporting mechanism 30a.

[0056] Thereafter, as shown in FIG. 6 (d), when the rear end portion of the banknote in the transport direction comes out of the nip between each drive roller 26 and each driven roller 28 of the first fixed transporting unit 20, the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b are moved toward the predetermined position (for example, the center position) in the width direction of the transport path 11. In this way, as shown in FIG. 6 (e), while the banknote is gripped between each drive roller 36 and each driven roller 38 in the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b, the banknote is moved so as to approach the predetermined position along the width direction of the transport path 11.

[0057] Thereafter, while transporting the banknote by the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b, the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d start to move, as shown in FIG. 7 (a), in the direction approaching the banknote (that is, downward in FIG. 7 (a)), in order to shift this banknote to the predetermined position (for example, the center position) in the width direction of the transport path 11. Such movement of the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d is performed until the banknote is sent to the nip portion between each drive roller 36 and each driven roller 38 of the third slide type transporting mechanism 30c. Then, as shown in FIG. 7 (b), after the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d are stopped, the banknote is sent to the nip between each drive roller 36 and each driven roller 38 of the third slide type transporting mechanism 30c.

[0058] Thereafter, as shown in FIG. 7 (c), when the rear end portion of the banknote in the transport direction comes out of the nip between each drive roller 36 and each driven roller 38 of the second slide type transporting mechanism 30b, the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d are moved toward the predetermined position (for example, the center position) in the width direction of the transport path 11. In this way, as shown in FIG. 7 (e), while the banknote is gripped between each drive roller 36 and each driven roller 38 in the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b, the banknote is moved so as to approach the predetermined position along the width direction of the transport path 11, and then the banknote is positioned at the predetermined position in the width direction of the transport path 11. Thereafter, as shown in FIG. 7 (f), the banknote is transferred from the fourth slide type transporting mechanism 30d to the second fixed transporting unit 50, and the banknote is sent further downstream from the second fixed transporting unit 50.

[0059] At this time, when the following banknote (indicated by reference sign P' in FIGS. 7 (d) to (f)) is transferred from the upstream side transporting unit 12 to the first fixed transporting unit 20, if the position of the following banknote in the width direction of the transport path 11 deviates from the predetermined position (for example, the center position), the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b start to move, as shown in FIG. 7 (f), in the direction approaching the banknote (that is, downward in FIG. 7 (f)), in order to shift the following banknote to the predetermined position in the width direction of the transport path 11. As described above, in the present embodiment, when the banknote is transferred from some slide type transporting mechanism (for example, the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b) to another slide type transporting mechanism (for example, the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d) positioned downstream of the former slide type transporting mechanism, the controlling unit 150 moves the former slide type transporting mechanism (specifically, the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b) to a position where the following banknote is received.

[0060] As described above, after the banknote is transferred from the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b to the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d, by moving the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b to the position to receive the following banknote, the banknote shifting device 10 according to the present embodiment can cope with the banknotes continuously sent. In the case where each of the first to fourth slide type transporting mechanisms 30a to 30d slides along the

width direction of the transport path 11 independently of the other slide type transporting mechanisms 30a to 30d, after the banknote is transferred from the first slide type transporting mechanism 30a to the second slide type transporting mechanism 30b, for example, by moving the first slide type transporting mechanism 30a to the position to receive the following banknote, it is possible to cope with the banknotes continuously sent.

[0061] In the banknote transporting method by the first to fourth slide type transporting mechanisms 30a to 30d as shown in FIGS. 6 and 7, the controlling unit 150 slides each slide type transporting mechanism 30a to 30d along the width direction of the transport path 11 such that the sum of the movement amounts of the banknote by the first to fourth slide type transporting mechanisms 30a to 30d is the same as the movement amount calculated when the banknote is detected by the inlet side banknote detecting sensor 70 (that is, the distance between the position of the banknote in the width direction of the transport path 11 before being sent to each slide type transporting mechanism 30 and the predetermined position (for example, the center position) of the banknote in the width direction of the transport path 11 set in advance). More specifically, if the movement amount calculated by the controlling unit 150 when the banknote is detected by the inlet side banknote detecting sensor 70 is, for example, 18 mm and the maximum movement amount of each of the slide type transporting mechanisms 30a to 30d is, for example, 10 mm, the slide amount of the banknote when the banknote is slid along the width direction of the transport path 11 by the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b is, for example, 10 mm, and the slide amount of the banknote when the banknote is slid along the width direction of the transport path 11 by the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d is, for example, 8 mm.

[0062] If the movement amount calculated when the banknote is detected by the inlet side banknote detecting sensor 70 is smaller than the maximum movement amount of each of the slide type transporting mechanisms 30a to 30d, the controlling unit 150 slides only some slide type transporting mechanism or mechanisms along the width direction of the transport path 11 among multiple (specifically, four) slide type transporting mechanisms 30a to 30d. More specifically, if the movement amount calculated by the controlling unit 150 when the banknote is detected by the inlet side banknote detecting sensor 70 is, for example, 8 mm and the maximum movement amount of each of the slide type transporting mechanisms 30a to 30d is, for example, 10 mm, the banknote is slid by 8 mm along the width direction of the transport path 11 by the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b, and the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d do not slide along the width direction of the transport path 11. This makes it possible to reduce the number of the slide type transporting mechanisms 30 that slide along the width direction of the transport path 11.

[0063] In the banknote transporting method by the first to fourth slide type transporting mechanisms 30a to 30d as shown in FIGS. 6 and 7, the timing of starting to move each slide type transporting mechanism 30a to 30d will be described below. In this embodiment, the period of the time from the detection of the banknote by the inlet side banknote detecting sensor 70 or the inlet side transport timing detecting sensor 74 to the start of sliding of each slide type transporting mechanism 30a to 30d is set for each slide type transporting mechanism 30a to 30d, respectively, in the controlling unit 150. Then, when the preset time elapses for each of the slide type transporting mechanisms 30a to 30d after the banknote is detected by the inlet side banknote detecting sensor 70 or the inlet side transport timing detecting sensor 74, the controlling unit 150 starts to slide each slide type transporting mechanism 30a to 30d along the width direction of the transport path 11.

[0064] In the banknote transporting method using the first to fourth slide type transporting mechanisms 30a to 30d as shown in FIGS. 6 and 7, the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b integrally slide along the width direction of the transport path 11 and the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d integrally slide along the width direction of the transport path 11; however, it is not limited to such an aspect. Each of the first to fourth slide type transporting mechanisms 30a to 30d may slide along the width direction of the transport path 11 independently of the other slide type transporting mechanisms 30a to 30d. In addition, after transporting the banknote by each of the slide type transporting mechanisms 30a to 30d, the controlling unit 150 returns the slide type transporting mechanisms 30a to 30d to the predetermined position (for example, the center position) in the width direction of the transport path 11; however, it is not limited to such an aspect. After transporting the banknote by each of the slide type transporting mechanisms 30a to 30d, the controlling unit 150 may slide each of the slide type transporting mechanisms 30a to 30d to a position to receive the following banknote.

[0065] The banknote transporting method by the banknote shifting device 10 shown in FIG. 2 and the like is not limited to the example shown in FIGS. 6 and 7. Another example of the banknote transporting method by the banknote shifting device 10 shown in FIG. 2 and the like will be described with reference to FIGS. 8 (a) to (f). In FIG. 8, similar to FIGS. 6 and 7, as the four slide type transporting mechanisms 30, the first slide type transporting mechanism 30a, the second slide type transporting mechanism 30b, the third slide type transporting mechanism 30c, and the fourth slide type transporting mechanism 30d are provided. In FIG. 8, the banknote sequentially transported by the first to fourth slide type

transporting mechanisms 30a to 30d are denoted by reference symbol P.

[0066] As shown in FIG. 8 (a), when the banknote is transferred from the upstream side transporting unit 12 to the first fixed transporting unit 20, if the position of this banknote in the width direction of the transport path 11 deviates from the predetermined position (for example, the center position), the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b start to move, as shown in FIG. 8 (b), in the direction approaching the banknote (that is, downward in FIG. 8 (b)), in order to shift this banknote to the predetermined position in the width direction of the transport path 11. For example, in the case where the position of the banknote delivered from the upstream side transporting unit 12 to the first fixed transporting unit 20 in the width direction of the transport path 11 is deviated by, for example, 20 mm from the center position, the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b are moved from the center position downward in FIG. 8 (b) by, for example, 5 mm. Such movement of the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b is performed until the banknote is sent to the nip between each drive roller 36 and each driven roller 38 of the first slide type transporting mechanism 30a. In the example shown in FIG. 8, compared to the example shown in FIGS. 6 and 7, the movement amount of the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b from the predetermined position (for example, the center position) is halved. Thereafter, as shown in FIG. 8 (c), when the rear end portion of the banknote in the transport direction comes out of the nip between each drive roller 26 and each driven roller 28 of the first fixed transporting unit 20, the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b are moved upward to shift the banknote close to the predetermined position (for example, center position) in the width direction of the transport path 11. At this time, the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b are moved to a position in the upward direction in FIG. 8 (c) rather than the predetermined position. Specifically, the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b are moved from the center position to, for example, 5 mm in the upward direction in FIG. 8 (c). As a result, the amount of the deviation of the banknote from the center position in the width direction of the transport path 11 is reduced to 10 mm.

[0067] In addition, the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d start to move, as shown in FIG. 8 (c), in the direction approaching the banknote (that is, downward in FIG. 8 (c)). Specifically, the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d are moved from the center position downward in FIG. 8 (c) by, for example, 5 mm. Such movement of the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d is performed until the banknote is sent to the nip between each drive roller 36 and each driven roller 38 of the third slide type transporting mechanism 30c. In the example shown in FIG. 8, compared to the example shown in FIGS. 6 and 7, the movement amount of the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d from the predetermined position (for example, the center position) is halved. Thereafter, as shown in FIG. 8 (d), when the rear end portion of the banknote in the transport direction comes out of the nip between each drive roller 36 and each driven roller 38 of the second slide type transporting mechanism 30b, the first slide type transporting mechanism 30a and the second slide type transporting mechanism 30b return to the predetermined position (specifically, the center position). At the same time, as shown in FIG. 8 (e), the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d are moved upward to further shift the banknote close to the predetermined position (for example, center position) in the width direction of the transport path 11. At this time, the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d are moved to a position in the upward direction in FIG. 8 (e) rather than the predetermined position. Specifically, the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d are moved from the center position to, for example, 5 mm in the upward direction in FIG. 8 (e). As a result, the amount of the deviation of the banknote from the center position in the width direction of the transport path 11 becomes 0 mm and then the banknote is shifted to the predetermined position in the width direction of the transport path 11. Thereafter, as shown in FIG. 8 (f), the banknote is transferred from the fourth slide type transporting mechanism 30d to the second fixed transporting unit 50, and the banknote is sent further downstream from the second fixed transporting unit 50. In addition, the third slide type transporting mechanism 30c and the fourth slide type transporting mechanism 30d return to the predetermined position (specifically, the center position).

[0068] As described above, even in the banknote transporting method as shown in FIG. 8, when the banknote is transported by a plurality of slide type transporting mechanisms 30a to 30d, the banknote is reliably moved along the width direction of the transport path 11 and shifted to the predetermined position by sliding each slide type transporting mechanism 30a to 30d along the width direction of the transport path 11 based on the amount of deviation between the preset predetermined position in the width direction of the transport path 11 and the actual banknote position in the width direction of the transport path 11. Further, in the banknote transporting method as shown in FIG. 8, each of the slide type transporting mechanisms 30a to 30d is moved to both sides

(specifically, the upper side and the lower side in FIG. 8) of the predetermined position (for example, the center position) in the width direction of the transport path 11. As a result, the size of the moving range of each slide type transporting mechanism 30a to 30d with respect to the predetermined position in the width direction of the transport path 11 (for example, the center position) is halved compared with the example shown in FIGS. 6 and 7. This makes it possible to reduce the size of the transport path 11 in the width direction itself, so that the banknote shifting device 10 can be made more compact.

[0069] In the banknote shifting device 10 of the present embodiment, by opening the upper cover unit 90 upward from the lower cover unit 80, the banknote causing the trouble such as the jamming is removed, and then the upper cover unit 90 is closed, whereby, the transport path of the banknote is formed between the upper guiding units 22, 32, 52 and the lower guiding units 24, 34, 54 in the first fixed transporting unit 20, each slide type transporting mechanism 30, and the second fixed transporting unit 50. The positioning unit 31 is provided in each slide type transporting mechanism 30 to position the lower guiding unit 34 and the upper guiding unit 32 when the upper cover unit 90 is closed such that the relative position of the upper guiding unit 32 with respect to the lower guiding unit 34 in the width direction of the transport path becomes the predetermined position. Details of the configuration of the positioning unit 31 will be described later. In the banknote shifting device 10 of the present embodiment, the positioning unit 31 is provided corresponding to each slide type transporting mechanism 30.

[0070] As shown in FIGS. 12 to 17, in each slide type transporting mechanism 30, a first supporting unit 82 for supporting the lower guiding unit 34 is provided in the lower cover unit 80 (not shown in FIGS. 12 to 17). In addition, the upper cover unit 90 is provided with a second supporting unit 92 for supporting the upper guiding unit 32. As shown in FIG. 9A, when the upper cover unit 90 is opened upward from the lower cover unit 80, the second supporting unit 92 also moves integrally with the upper cover unit 90, and the second supporting unit 92 moves away from the first supporting unit 82. That is, the second supporting unit 92 is movable between a first position (see FIGS. 12 and 17) in which the lower guiding unit 34 and the upper guiding unit 32 are opposed to each other to form the transport path of the banknote between the lower guiding unit 34 and the upper guiding unit 32 and a second position (see FIGS. 15 and 16) in which the upper guiding unit 32 moves away from the lower guiding unit 34 and the transport path of the banknote is released. When the second supporting unit 92 is located at the second position as shown in FIGS. 15 and 16, the operator can take out the banknote between the lower guiding unit 34 and the upper guiding unit 32 to the outside of the slide type transporting mechanism 30. In the present embodiment, when the second supporting unit 92 is moved from the second position as shown in FIGS. 15 and 16 to the first position as shown in FIGS. 12 and 17, positioning of the lower guiding unit 34 and the upper guiding unit 32 is performed by the positioning unit 31 such that the relative position of the upper guiding unit 32 with respect to the lower guiding unit 34 in the width direction of the transport path (that is, the left-right direction in FIGS. 12 to 17) is the predetermined position.

[0071] As shown in FIGS. 12 to 17, first guiding members 84 are provided at both ends of the lower guiding unit 34 in each slide type transporting mechanism 30 and each first guiding member 84 includes a first inclined surface 84a inclined with respect to the width direction of the transport path (that is, the left-right direction in FIGS. 12 to 17). The first inclined surfaces 84a of the pair of left and right first guiding members 84 face the upper guiding unit 32 side supported by the second supporting unit 92. Second guiding members 94 are provided at both ends of the upper guiding unit 32 in each slide type transporting mechanism 30 so as to face the respective first guiding members 84. The pair of left and right second guiding members 94 are shaped so as to protrude downward from the upper guiding unit 32. When the lower guiding unit 34 and the upper guiding unit 32 move towards each other, the lower end portion of either one of the pair of left and right second guiding members 94 contacts the first inclined surface 84a of the first guiding member 84. Then, as the lower end portion of the second guiding member 94 moves along the first inclined surface 84a of the first guiding member 84, the second guiding member 94 and the first guiding member 84 guide each other. Therefore, the lower guiding unit 34 moves relative to the upper guiding unit 32 along the width direction of the transport path.

[0072] As shown in FIGS. 12 to 17, each of the pair of left and right first guiding members 84 has a recess 84b for accommodating the lower end portion of each second guiding member 94 when the second supporting unit 92 supporting the upper guiding unit 32 moves to the first position as shown in FIGS. 12 and 17. When the lower end portion of each second guiding member 94 is accommodated in the recess 84b of each first guiding member 84, the lower guiding unit 34 can not move in the width direction of the transport path with respect to the upper guiding unit 32. As a result, the positioning of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path is performed.

[0073] As shown in FIGS. 12 to 17, a position fixing member 96 is provided in the second supporting unit 92. The position fixing member 96 fixes the position of the upper guiding unit 32 in the width direction of the transport path to the predetermined position (more specifically, the center position in the width direction of the transport path), when the second supporting unit 92 moves from the first position as shown in FIGS. 12 and 17 to the second position as shown in FIGS. 15 and 16. More specifically, the position fixing member 96 includes a lever 96b that is rotatable around an axis 96a provided on the second supporting unit 92. As shown in FIGS. 9B (a) and (b), the lever 96b is a plate-like member disposed so as

to extend over the first fixed transporting unit 20, each slide type transporting mechanism 30, and the second fixed transporting unit 50 above these first fixed transporting unit 20, each slide type transporting mechanism 30 and second fixed transporting unit 50. FIG. 9B (a) is a view showing the state when the second supporting unit 92 is located at the first position as shown in FIGS. 12 and 17, and FIG. 9B (b) is a view showing the state when the second supporting unit 92 is located at the second position as shown in FIGS. 15 and 16.

[0074] A third guiding member 96c is provided on the surface of the upper guiding unit 32 on the side opposite to the lower guiding unit 34 (that is, the upper surface of the upper guiding unit 32 in FIGS. 12 to 17). The third guiding member 96c includes a second inclined surface 96d inclined with respect to the width direction of the transport path. In the lever 96b, there is provided a fourth guiding member 96e facing the third guiding member 96c provided on the upper guiding unit 32. The fourth guiding member 96e has a shape protruding downward from the lever 96b. When the upper guiding unit 32 moves upward away from the lower guiding unit 34, a lower end portion of the fourth guiding member 96e contacts the second inclined surface 96d of the third guiding member 96c, and then the lower end portion of the fourth guiding member 96e relatively moves along the second inclined surface 96d of the third guiding member 96c. As a result, the upper guiding unit 32 moves relative to the second supporting unit 92 along the width direction of the transport path. As shown in FIG. 9B, a plurality of (specifically, six) fourth guiding members 96e are provided in one lever 96b so as to correspond to the plurality of third guiding members 96c provided in each of the first fixed transporting unit 20, each slide type transporting mechanism 30 and the second fixed transporting unit 50.

[0075] As shown in FIGS. 12 to 17, the third guiding member 96c includes a recess 96f for accommodating the lower end portion of the fourth guiding member 96e when the second supporting unit 92 supporting the upper guiding unit 32 moves to the second position as shown in FIGS. 15 and 16. When the lower end portion of the fourth guiding member 96e is accommodated in the recess 96f of the third guiding member 96c, the upper guiding unit 32 can not move in the width direction of the transport path with respect to the second supporting unit 92. As a result, positioning of the second supporting unit 92 and the upper guiding unit 32 in the width direction of the transport path is performed. More specifically, when the lower end portion of the fourth guiding member 96e is accommodated in the recess 96f of the third guiding member 96c, the upper guiding unit 32 is positioned at the center position of the second supporting unit 92 in the width direction of the transport path. As a result, the upper guiding unit 32 is fixed to the center position in the width direction of the transport path.

[0076] As shown in FIGS. 12 to 17, an elastic member 98 is provided between the lever 96b of the position fixing member 96 provided on the second supporting unit 92 and the upper cover unit 90. The elastic member 98 urges the lever 96b away from the upper cover unit 90 toward the upper guiding unit 32. Specifically, the elastic member 98 includes a spring 98a disposed between the lever 96b of the position fixing member 96 and the upper cover unit 90. The spring 98a is wound around a rod member 98b provided so as to extend downward from the lower surface of the upper cover unit 90. With the elastic member 98 including the spring 98a, the lever 96b is constantly urged by a force to rotate the lever 96b in the counterclockwise direction in FIG. 12 and the like about the axis 96a. That is, the elastic member 98 including the spring 98a urges the lever 96b away from the upper cover unit 90 toward the upper guiding unit 32. When the second supporting unit 92 moves from the first position as shown in FIGS. 12 and 17 to the second position as shown in FIGS. 15 and 16, as the elastic member 98 including the spring 98a urges the lever 96b toward the upper guiding unit 32 (that is, as the force to rotate the lever 96b in the counterclockwise direction in FIG. 12 and the like about the axis 96a is given to the lever 96b by the elastic member 98), the fourth guiding member 96e contacts the third guiding member 96c and relatively moves along the second inclined surface 96d. As a result, the upper guiding unit 32 moves along the width direction of the transport path, and the upper guiding unit 32 is guided to the predetermined position in the width direction of the transport path (more specifically, the center position in the width direction of the transport path).

[0077] In the present embodiment, the lever 96b, the third guiding member 96c, the fourth guiding member 96e, the elastic member 98 and the like constitute the position fixing member 96 for fixing the position of the upper guiding unit 32 in the width direction of the transport path to the predetermined position (more specifically, the center position in the width direction of the transport path) when the second supporting unit 92 moves to the second position as shown in FIGS. 15 and 16.

[0078] As shown in FIGS. 12 to 17, the second supporting unit 92 is provided with a release member 97 for releasing the position fixed state of the upper guiding unit 32 by the position fixing member 96 when the second supporting unit 92 moves from the second position as shown in FIGS. 15 and 16 to the first position as shown in FIGS. 12 and 17. More specifically, at the end of the first supporting unit 82, a rod member 82a extending upward from the first supporting unit 82 is provided. At the end of the lever 96b of the position fixing member 96, there is provided a contacting member 97a facing the rod member 82a provided on the first supporting unit 82. When the second supporting unit 92 moves to the first position as shown in FIGS. 12 and 17, the contacting member 97a contacts the upper end portion of the rod member 82a provided in the first supporting unit 82. As a result, the contacting member 97a provided on the lever 96b is pushed upward in FIGS. 12 to 17 by the upper end portion of the rod member 82a provided on the first supporting unit 82, and the lever 96b rotates in the clockwise

direction about the axis 96a, when the second supporting unit 92 moves from the second position as shown in FIGS. 15 and 16 to the first position as shown in FIGS. 12 and 17. In this way, the fourth guiding member 96e provided on the lever 96b moves in a direction away from the third guiding member 96c, and the distance between the fourth guiding member 96e and the third guiding member 96c increases. As a result, as indicated by the two-dot chain line in FIG. 17, the fourth guiding member 96e comes out upward from the recess 96f of the third guiding member 96c, so that the position fixed state of the upper guiding unit 32 by the position fixing member 96 is released. When the second supporting unit 92 moves to the second position as shown in FIGS. 15 and 16, the contacting member 97a separates upward from the upper end portion of the rod member 82a provided on the first supporting unit 82.

[0079] As described above, the elastic member 98 including the spring 98a is provided between the lever 96b and the upper cover unit 90 and the force to rotate the lever 96b in the counterclockwise direction about the axis 96a is always given to the lever 96b by the elastic member 98. When the second supporting unit 92 moves to the first position as shown in FIGS. 12 and 17, the contacting member 97a provided on the lever 96b comes into contact with the upper end portion of the rod member 82a provided on the first supporting unit 82 and is pushed upward. As a result, the spring 98a of the elastic member 98 deforms so as to contract vertically. In this way, by increasing the distance between the upper guiding unit 32 and the lever 96b of the position fixing member 96, the position fixed state of the upper guiding unit 32 by the position fixing member 96 is released.

[0080] Next, with reference to FIG. 10, an explanation will be given of an operation in which the alignment of the lower guiding unit 34 and the upper guiding unit 32 in each slide type transporting mechanism 30 is performed automatically when the upper cover unit 90 is closed after opening the upper cover unit 90 upward from the lower cover unit 80 to the state as shown in FIG. 9A. In addition, with reference to FIG. 11, an operation in which the position of the upper guiding unit 32 in the width direction of the transport path is automatically fixed to the predetermined position (more specifically, the center position in the width direction of the transport path), when the upper cover unit 90 is opened upward from the lower cover unit 80 to the state as shown in FIG. 9A, will be described. FIGS. 10(a) and 11 (a) show a state in which the upper cover unit 90 is closed and the second supporting unit 92 provided on the upper cover unit 90 is located at the first position as shown in FIGS. 12 and 17. At this time, as shown in FIG. 12 and the like, the position of each driven roller 38 provided on the upper guiding unit 32 and the position of each drive roller 36 provided on the lower guiding unit 34 in the width direction of the transport path substantially coincide with each other and then the outer circumferential surface of each driven roller 38 and the outer circumferential surface of each drive roller 36 are in contact with each other.

[0081] When the problem such as the jamming of the banknote occurs when the banknote is being transported in the banknote shifting device 10, the upper cover unit 90 is opened upward from the lower cover unit 80 as shown in FIG. 9A. As a result, in each slide type transporting mechanism 30, the upper guiding unit 32 separates upward from the lower guiding unit 34, as shown in FIG. 10 (b) and FIG. 11 (b), and then it becomes possible to remove the banknote sandwiched between the upper guiding unit 32 and the lower guiding unit 34. At this time, as shown in FIGS. 13 to 15 sequentially, the second supporting unit 92 provided on the upper cover unit 90 moves upward away from the first supporting unit 82 provided on the lower cover unit 80. When the second supporting unit 92 moves upward away from the first supporting unit 82, as shown in FIG. 11 (b) and FIG. 15, the contacting member 97a of the release member 97 provided at the end of the lever 96b of the position fixing member 96 separates upward from the upper end portion of the rod member 82a provided on the supporting unit 82. Also, due to the elastic member 98 such as the spring 98a, the lever 96b is given the force to rotate the lever 96b in the counterclockwise direction in FIG. 12 and the like about the axis 96a. As a result, the fourth guiding member 96e provided on the lever 96b contacts the third guiding member 96c and relatively moves along the second inclined surface 96d. Therefore, the lower end portion of the fourth guiding member 96e enters the recess 96f of the third guiding member 96c. By this way, the position of the upper guiding unit 32 in the width direction of the transport path is automatically fixed to the predetermined position (more specifically, the center position in the width direction of the transport path). As shown in FIG. 9B, the lever 96b is disposed so as to extend over the first fixed transporting unit 20, each slide type transporting mechanism 30, and the second fixed transporting unit 50 above these first fixed transporting unit 20, each slide type transporting mechanism 30 and second fixed transporting unit 50, and a plurality of fourth guiding members 96e are provided in one lever 96b so as to correspond to the plurality of third guiding members 96c provided on each of the first fixed transporting unit 20, each slide type transporting mechanism 30 and the second fixed transporting unit 50. Therefore, the fourth guiding member 96e of each slide type transporting mechanism 30 simultaneously contacts the third guiding member 96c and relatively moves along the second inclined surface 96d, when the second supporting unit 92 moves to the second position and the lever 96b is pushed in the direction approaching the upper guiding unit 32 by the elastic member 98 such as the spring 98a, as shown in FIG. 9B (b). Therefore, the position of the upper guiding unit 32 of each slide type transporting mechanism 30 is simultaneously fixed to the predetermined position (specifically, the center position in the width direction of the transport path).

[0082] After the upper cover unit 90 is opened upward

from the lower cover unit 80, when the lower guiding unit 34 moves along the width direction of the transport path as shown in FIG. 10 (c), the position of the lower guiding unit 34 and the position of the upper guiding unit 32 in the width direction of the transport path may not match. In this embodiment, even when the upper cover unit 90 is closed in such a case, the lower end portion of the second guiding member 94 relatively moves along the first inclined surface 84a of the first guiding member 84 as shown in FIG. 10 (d), and the second guiding member 94 and the first guiding member 84 guide each other. As a result, as shown in FIG. 10 (e), the alignment of the lower guiding unit 34 and the upper guiding unit 32 is automatically performed. Specifically, if the lower guiding unit 34 is deviated to the right with respect to the upper guiding unit 32 in the width direction of the transport path as shown in FIG. 15, when the lower guiding unit 34 and the upper guiding unit 32 move towards each other, the lower end portion of the second guiding member 94 on the left side of the pair of left and right second guiding members 94 contacts the first inclined surface 84a of the first guiding member 84 on the left side. Then, as the lower end portion of the second guiding member 94 relatively moves along the first inclined surface 84a of the first guiding member 84, the lower guiding unit 34 moves to the left in FIG. 15. As shown in FIG. 17, when the lower end portion of the second guiding member 94 is accommodated in the recess 84b of the first guiding member 84, the positions of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path match. In contrast, if the lower guiding unit 34 is deviated to the left with respect to the upper guiding unit 32 in the width direction of the transport path as shown in FIG. 16, when the lower guiding unit 34 and the upper guiding unit 32 move towards each other, the lower end portion of the second guiding member 94 on the right side of the pair of left and right second guiding members 94 contacts the first inclined surface 84a of the first guiding member 84 on the right side. Then, as the lower end portion of the second guiding member 94 relatively moves along the first inclined surface 84a of the first guiding member 84, the lower guiding unit 34 moves to the right in FIG. 16. As shown in FIG. 17, when the lower end portion of the second guiding member 94 is accommodated in the recess 84b of the first guiding member 84, the positions of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path match. In this way, when the lower end portion of each second guiding member 94 is accommodated in the recess 84b of each first guiding member 84, the upper guiding unit 32 can not move in the width direction of the transport path with respect to the lower guiding unit 34. As a result, the positioning of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path is performed.

[0083] According to the banknote shifting device 10 (banknote transporting device) of the present embodiment having the above configuration, the second supporting unit 92 supporting the upper guiding unit 32 (second slide unit) is movable relative to the first supporting unit 82 to move between the first position (see FIGS. 12 and 17) in which the lower guiding unit 34 (first slide unit) and the upper guiding unit 32 face each other to form the transport path of the banknote between the lower guiding unit 34 and the upper guiding unit 32 and the second position in which the upper guiding unit 32 is separated from the lower guiding unit 34 to open the transport path of the banknote. In addition, the lower guiding unit 34 and the upper guiding unit 32 are positioned by the positioning unit 31 such that the relative position of the upper guiding unit 32 with respect to lower guiding unit 34 in the width direction of the transport path becomes the predetermined position when the second supporting unit 92 moves to the first position. This makes it possible to align the positions of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path when closing the second supporting unit 92 and forming the transport path of the banknote between the lower guiding unit 34 and the upper guiding unit 32. Therefore, it is possible to properly transport the banknote between the lower guiding unit 34 and the upper guiding unit 32. If the positioning unit 31 is not provided, when the lower guiding unit 34 slides along the width direction of the transport path in a certain slide type transporting mechanism 30 when the upper cover unit 90 is opened upward, as the upper cover unit 90 is closed with the positions of the lower guiding unit 34 and the upper guiding unit 32 being displaced, the position of each drive roller 36 provided on the lower guiding unit 34 and each driven roller 38 provided on the upper guiding unit 32 do not match. At this time, there was a problem that the banknote can not be transported. In contrast, in the banknote shifting device 10 of the present embodiment, even if the lower guiding unit 34 slides along the width direction of the transport path in a certain slide type transporting mechanism 30 when the upper cover unit 90 is opened upward, when forming the transport path of the banknote between the lower guiding unit 34 and the upper guiding unit 32 by closing the second supporting unit 92, the positioning unit 31 aligns the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path. This makes it possible to align each drive roller 36 provided on the lower guiding unit 34 and each driven roller 38 provided on the upper guiding unit 32 so that it is possible to transport the banknote appropriately between each drive roller 36 and each driven roller 38.

[0084] In the banknote shifting device 10 of the present embodiment, the positioning unit 31 for positioning the lower guiding unit 34 and the upper guiding unit 32 such that the relative position of the upper guiding unit 32 with respect to lower guiding unit 34 in the width direction of the transport path becomes the predetermined position when the second supporting unit 92 moves to the first position inlcudes the guiding member provided on at least one of the lower guiding unit 34 and the upper guiding unit 32 and the guiding member aligns the lower guiding

unit 34 and the upper guiding unit 32 in the width direction of the transport path when the second supporting unit 92 moves to the first position as shown in FIGS. 12 and 17. Specifically, the guiding member includes the first guiding member 84 provided on the lower guiding unit 34 and the second guiding member 94 provided on the upper guiding unit 32 so as to face the first guiding member 84. The first guiding member 84 includes the first inclined surface 84a inclined with respect to the width direction of the transport path. When the second supporting unit 92 moves to the first position, the second guiding member 94 is guided along the first inclined surface 84a of the first guiding member 84 and then the second guiding member 94 and the first guiding member 84 guide each other so that the lower guiding unit 34 and the upper guiding unit 32 are aligned. In the present embodiment, the first inclined surface may be formed in the second guiding member 94 provided on the upper guiding unit 32 rather than the first guiding member 84 provided on the lower guiding unit 34 and the first guiding member 84 may protrude upward from the lower guiding unit 34. In this case, when the second supporting unit 92 moves to the first position, the upper end portion of first guiding member 84 is guided along the first inclined surface of the second guiding member 94 and then the second guiding member 94 and the first guiding member 84 guide each other so that the lower guiding unit 34 and the upper guiding unit 32 are aligned. In addition, the above described guiding member may be provided only in one of the lower guiding unit 34 and the upper guiding unit 32.

[0085] In the banknote shifting device 10 of the present embodiment, as described above, the positioning unit 31 includes the position fixing member 96 that fixes the position of the upper guiding unit 32 in the width direction of the transport path when the second supporting unit 92 moves to the second position as shown in FIGS. 15 and 16. Thus, when the upper cover unit 90 is opened upward from the lower cover unit 80, the position of the upper guiding unit 32 in the width direction of the transport path can be fixed. Furthermore, in the banknote shifting device 10 of the present embodiment, as described above, the positioning unit 31 further includes the release member 97 that releases the position fixed state of the upper guiding unit 32 by the position fixing member 96 when the second supporting unit 92 moves to the first position as shown in FIGS. 12 and 17. Thus, after closing the upper cover unit 90, the movement of the upper guiding unit 32 in the width direction of the transport path can be made to follow the movement of the lower guiding unit 34. Therefore, the lower guiding unit 34 and the upper guiding unit 32 can be integrally moved in the width direction of the transport path. The position fixing member 96 may be configured to fix the position of the lower guiding unit 34 instead of the upper guiding unit 32 in the width direction of the transport path, when the second supporting unit 92 moves to the second position as shown in FIGS. 15 and 16. Alternatively, the position fixing member 96 may be configured to fix the positions of both the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path. Details of such a modified example will be described later.

[0086] The release member 97 includes the contacting member 97a provided on the position fixing member 96 and contacting the first supporting unit 82 (specifically, the upper end portion of the rod member 82a provided on the first supporting unit 82) when the second supporting unit 92 moves to the first position. The position fixed state of the upper guiding unit 32 by the position fixing member 96 is released as the contacting member 97a provided on the position fixing member 96 is brought into contact with the first supporting unit 82 and pushed, and then the distance between the upper guiding unit 32 and the position fixing member 96 increases, when the second supporting unit 92 moves to the first position. Furthermore, the position fixed state of the upper guiding unit 32 by the position fixing member 96 is released as the contacting member 97a provided on the position fixing member 96 is brought into contact with the first supporting unit 82 and is pushed so that the elastic member 98 provided between the lever 96b of the position fixing member 96 and the upper cover unit 90 is deformed in the vertical direction, and then the distance between the upper guiding unit 32 and the lever 96b of the position fixing member 96 increases, when the second supporting unit 92 moves to the first position.

[0087] The position fixing member 96 guides and fixes the upper guiding unit 32 to the predetermined position in the width direction of the transport path (more specifically, the center position in the width direction of the transport path) when the second supporting unit 92 moves to the second position. In addition, the position fixing member 96 includes the third guiding member 96c provided on the upper guiding unit 32 and including the second inclined surface 96d inclined with respect to the width direction of the transport path and the fourth guiding member 96e that contacts the third guiding member 96c when the second supporting unit 92 moves to the second position. The fourth guiding member 96e comes in contact with the third guiding member 96c provided on the upper guiding unit 32 and relatively moves along the second inclined surface 96d so that the upper guiding unit 32 moves along the width direction of the transport path and is fixed to the predetermined position in the width direction of the transport path, when the second supporting unit 92 moves to the second position. Furthermore, the position fixing member 96 includes the lever 96b rotatable about the axis 96a provided on the second supporting unit 92 and provided with the fourth guiding member 96e, and the elastic member 98 provided between the lever 96b and the upper cover unit 90 and biasing the lever 96b in the direction toward the upper guiding unit 32 while leaving the lever 96b away from the upper cover unit 90. The fourth guiding member 96e contacts the third guiding member 96c by the elastic member 98 biasing the lever 96b toward the upper guiding unit 32, and the fourth guiding member 96e relatively moves

along the second inclined surface 96d so that the upper guiding unit 32 moves along the width direction of the transport path and is fixed to the predetermined position in the width direction of the transport path, when the second supporting unit 92 moves to the second position.

[0088] In the banknote shifting device 10 of the present embodiment, as described above, a plurality of combinations (that is, a plurality of slide type transporting mechanisms 30) composed of the lower guiding unit 34 and the upper guiding unit 32 are provided so as to line up along the transport direction of the banknote in the transport path. A plurality of positioning units 31 are provided so as to correspond to each of a plurality of combinations (that is, a plurality of slide type transporting mechanisms 30). In the banknote shifting device 10 of the present embodiment, the position fixing member 96 of the positioning unit 31 is provided to extend over a plurality of combinations. The position fixing member 96 simultaneously fixes the position of the upper guiding unit 32 in each of the plurality of combinations in the width direction of the transport path when the second supporting unit 92 moves to the second position. Specifically, as shown in FIG. 9B, the lever 96b of the position fixing member 96 is disposed so as to extend over the first fixed transporting unit 20, each slide type transporting mechanism 30, and the second fixed transporting unit 50 above these first fixed transporting unit 20, each slide type transporting mechanism 30 and second fixed transporting unit 50. In addition, a plurality of fourth guiding members 96e are provided on one lever 96b so as to correspond to the plurality of third guiding members 96c provided on each of the first fixed transporting unit 20, each slide type transporting mechanism 30 and the second fixed transporting unit 50. Therefore, the fourth guiding member 96e of each slide type transporting mechanism 30 simultaneously contacts the third guiding member 96c and relatively moves along the second inclined surface 96d, when the second supporting unit 92 moves to the second position and the lever 96b is pushed in the direction approaching the upper guiding unit 32 by the elastic member 98 such as the spring 98a, as shown in FIG. 9B (b). Therefore, the position of the upper guiding unit 32 of each slide type transporting mechanism 30 is simultaneously fixed to the predetermined position (specifically, the center position in the width direction of the transport path).

[0089] Note that the banknote shifting device 10 according to the present embodiment and the banknote handling machine 100 including the banknote shifting device 10 are not limited to the above-described aspects, and various modifications can be made.

[0090] For example, in the present embodiment, in the banknote shifting device 10 as shown in FIGS. 2 to 17, the position fixing member 96 for fixing the position of the upper guiding unit 32 in the width direction of the transport path when the second supporting unit 92 moves to the second position can be omitted. Also, it is possible to omit the release member 97 for releasing the position fixed state of the upper guiding unit 32 by the position fixing member 96. In the banknote shifting device according to such a modified example, when the second supporting unit 92 moves to the second position, the upper guiding unit 32 and the lower guiding unit 34 are movable in the width direction of the transport path. However, when closing the upper cover unit 90, as the second supporting unit 92 moves from the second position to the first position, the positioning of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path is performed by the first guiding member 84 and the second guiding member 94. Therefore, the relative position of the upper guiding unit 32 with respect to the lower guiding unit 34 in the width direction of the transport path becomes the predetermined position. That is, when the second supporting unit 92 moves to the first position, the position of each drive roller 36 provided on the lower guiding unit 34 and the position of each driven roller 38 provided on the upper guiding unit 32 in the width direction of the transport path are substantially aligned. However, if the position fixing member 96 and the release member 97 are omitted, when the second supporting unit 92 moves to the second position, there is a possibility that the lower guiding unit 34 moves to the leftmost side in the width direction of the transport path and the upper guiding unit 32 moves to the rightmost side in the width direction of the transport path, for example. In order to cope with such a case, it is necessary that the length of the first guiding member 84 in the width direction of the transport path is made larger than the aspect shown in FIGS. 12 to 17 (specifically, it is doubled in size). On the other hand, if the position fixing member 96 and the release member 97 are installed, when the second supporting unit 92 moves to the second position, the upper guiding unit 32 is fixed to the center position in the width direction of the transport path, for example. Therefore, as compared with the case where the upper guiding unit 32 and the lower guiding unit 34 are respectively movable in the width direction of the transport path, the maximum distance between the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path is halved. Therefore, the length of the first guiding member 84 in the width direction of the transport path (specifically, the length of the first inclined surface 84a in the width direction of the transport path) can also be halved.

[0091] As a banknote shifting device according to still another modified example, in the banknote shifting device 10 as shown in FIGS. 2 to 17, a position fixing member that fixes the position of the lower guiding unit 34 in the width direction of the transport path to the predetermined position (for example, the center position in the width direction of the transport path) when the second supporting unit 92 moves to the second position, and a release member that releases the position fixed state of the lower guiding unit 34 by the position fixing member may be provided, instead of providing the first guiding member 84 and the second guiding member 94. In the banknote shifting device according to such a modified example, the position fixing member that fixes the posi-

tion of the lower guiding unit 34 in the width direction of the transport path to the predetermined position when the second supporting unit 92 moves to the second position has substantially the same configuration as the position fixing member 96 that fixes the position of the upper guiding unit 32 to the predetermined position as described above. In addition, the release member that releases the position fixed state of the lower guiding unit 34 by the position fixing member has substantially the same configuration as the release member 97 that releases the position fixed state of the upper guiding unit 32 by the position fixing member 96 as described above. In other words, the position fixing member 96, the release member 97, the elastic member 98 and the like as shown in FIGS. 12 to 17 are provided not only on the upper guiding unit 32 side but also on the lower guiding unit 34 side. In the banknote shifting device according to such a modified example, the positions of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path are respectively fixed to the predetermined positions (for example, the center positions in the width direction of the transport path) when the upper cover unit 90 is opened upward from the lower cover unit 80. Therefore, it is prevented that the relative positions of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path deviate. As a result, even when the upper cover unit 90 is closed, the relative position of the upper guiding unit 32 with respect to the lower guiding unit 34 in the width direction of the transport path becomes the predetermined position. That is, when the second supporting unit 92 moves to the first position, the position of each drive roller 36 provided on the lower guiding unit 34 and the position of each driven roller 38 provided on the upper guiding unit 32 in the width direction of the transport path are substantially aligned.

[0092] in the banknote shifting device 10 of the present embodiment, as described above, the lower guiding unit 34 is slid along the width direction of the transport path by the drive motor 46 such as the stepping motor and the like. However, if the torque of the drive motor 46 is large, when the upper cover unit 90 is opened upward from the lower cover unit 80 and the second supporting unit 92 is moved to the second position as shown in FIGS. 15 and 16, the lower guiding unit 34 is less likely to move in the width direction of the transport path by the torque of the drive motor 46 when trying to move the lower guiding unit 34 in the width direction of the transport path. That is, if the force applied to the lower guiding unit 34 is smaller than the torque of the drive motor 46 when trying to move the lower guiding unit 34 in the width direction of the transport path after the second supporting unit 92 moves to the second position, the drive belt 42 does not circulate due to the fact that the drive motor 46 does not idle. Therefore, the lower guiding unit 34 does not move in the width direction of the transport path. In this manner, the drive motor 46 such as the stepping motor that slides the lower guiding unit 34 along the width direction of the transport path functions as the position fixing member for fixing the position of the lower guiding unit 34 in the width direction of the transport path when the second supporting unit 92 moves to the second position. In this case, the installation of the position fixing member 96 for fixing the position of the upper guiding unit 32 in the width direction of the transport path when the second supporting unit 92 moves to the second position and the release member 97 for releasing the position fixed state of the upper guiding unit 32 by the position fixing member 96 can be omitted. If the installation of the position fixing member 96 and the release member 97 is omitted, when the second supporting unit 92 moves to the first position, as the load is applied to the lower guiding unit 34 by the drive motor 46, the lower guiding unit 34 does not move in the width direction of the transport path and the upper guiding unit 32 moves along the width direction of the transport path, when the second guiding member 94 relatively moves along the first inclined surface 84a of the first guiding member 84. As a result, the upper guiding unit 32 is aligned with respect to the lower guiding unit 34.

[0093] As a slide type transporting mechanism of the banknote shifting device 10, a slide type transporting mechanism having a configuration as shown in FIG. 18 may be used instead of using the configuration as shown in FIGS. 2 to 17. A slide type transporting mechanism 210 as shown in FIG. 18 includes an upper guiding unit 232 and a lower guiding unit 234 arranged so as to be spaced apart from each other by a small distance. Between these upper guiding unit 232 and lower guiding unit 234, a transport path of the banknote is formed. As shown in FIG. 18, the lower guiding unit 234 is provided with a pair of left and right drive rollers 236 along the width direction of the transport path. The upper guiding unit 232 is provided with a pair of left and right driven rollers 238 along the width direction of the transport path such that each driven roller 238 faces each drive roller 236. As each driven roller 238 provided on the upper guiding unit 232 and each drive roller 236 provided on the lower guiding unit 234 come into contact with each other, the upper guiding unit 232 and the lower guiding unit 234 can slide integrally in the width direction of the transport path (that is, in the left-right direction in FIG. 18) by the frictional force acting between each driven roller 238 and each drive roller 236.

[0094] In the banknote shifting device 10 having a plurality of slide type transporting mechanisms 210 shown in FIG. 18, each slide type transporting mechanism 210 is provided between a lower cover unit 280 and a upper cover unit 290, and the upper cover unit 290 can be opened upward from the lower cover unit 280. Accordingly, if a trouble such as a jamming of the banknote occurs when the banknote is being transported in the slide type transporting mechanism 210 and the like, by opening the upper cover unit 290 upward from the lower cover unit 280, it is possible to remove the banknote sandwiched between the upper guiding unit 232 and the lower guiding unit 234 in the slide type transporting mech-

anism 210.

[0095] As shown in FIG. 18, the lower cover unit 280 is provided with a first supporting unit 282 for supporting the lower guiding unit 234, and the upper cover unit 290 is provided with a second supporting unit 292 for supporting the upper guiding unit 232. When the upper cover unit 290 is opened upward from the lower cover unit 280, the second supporting unit 292 also moves integrally with the upper cover unit 290, and then the second supporting unit 292 moves away from the first supporting unit 282. That is, the second supporting unit 292 is movable between a first position in which the lower guiding unit 234 and the upper guiding unit 232 face each other to form the transport path of the banknote between the lower guiding unit 234 and the upper guiding unit 232 and a second position in which the upper guiding unit 232 is separated from lower guiding unit 234 to release the transport path of the banknote. In FIG. 18, a state when the second supporting unit 292 is located at the second position is shown. As shown in FIG. 18, when the second supporting unit 292 is located at the second position, the operator can take out the banknote between the lower guiding unit 234 and the upper guiding unit 233 to the outside of the slide type transporting mechanism 210. When the second supporting unit 292 moves from the second position to the first position, each driven roller 238 provided on the upper guiding unit 232 and each drive roller 236 provided on the lower guiding unit 234 come into contact with each other.

[0096] In the present embodiment, when the second supporting unit 292 moves from the second position as shown in FIG. 18 to the first position, positioning of the lower guiding unit 234 and the upper guiding unit 232 is performed by a positioning unit 231 such that the relative position of the upper guiding unit 232 with respect to the lower guiding unit 234 in the width direction of the transport path (that is, the left-right direction in FIG. 18) becomes the predetermined position. Details of a configuration of the positioning unit 231 will be described below.

[0097] As shown in FIG. 18, each contacting member 282a provided at both ends of the first supporting unit 282 and each contacting member 292a provided at both ends of the second supporting unit 292 face each other. When the second supporting unit 292 is located at the second position, each contacting member 292a provided at the both ends of the second supporting unit 292 is separated upward from each contacting member 282a provided at both ends of the first supporting unit 282. In contrast, when the second supporting unit 292 moves from the second position to the first position, each contacting member 292a provided at both ends of the second supporting unit 292 and each contacting member 282a provided at the both ends of the first supporting unit 282 come into contact with each other. Then, each contacting member 292a and each contacting member 282a push each other in the vertical direction in FIG. 18.

[0098] As shown in FIG. 18, between the lower cover unit 280 and the first supporting unit 282, there is provided a pair of elastic members 286 that biase the first supporting unit 282 upward away from the lower cover unit 280 toward the lower guiding unit 234. Specifically, each elastic member 286 includes a spring 286a disposed between the lower cover unit 280 and the first supporting unit 282. Each spring 286a is wound around a rod member 286b provided so as to extend upward from an upper surface of the lower cover unit 280. Between the upper cover unit 290 and the second supporting unit 292, there is provided a pair of elastic members 296 that biase the second supporting unit 292 downward away from the upper cover unit 290 toward the upper guiding unit 232. Specifically, each elastic member 296 includes a spring 296a disposed between the upper cover unit 290 and the second supporting unit 292. Each spring 296a is wound around a rod member 296b provided so as to extend downward from a lower surface of the upper cover unit 290.

[0099] As shown in FIG. 18, a regulating member 284 is attached to the first supporting unit 282. When the second supporting unit 292 moves to the second position as shown in FIG. 18, the regulating member 284 regulates the movement of the lower guiding unit 234 in the width direction of the transport path (that is, the left-right direction in FIG. 18). The regulating member 284 projects upward from an upper surface of the first supporting unit 282. A serrated engaged member 235 is provided at a position opposing the regulating member 284 in the lower guiding unit 234. The upper end portion of the regulating member 284 enters a recess of the serrated engaged member 235, whereby the movement of the lower guiding unit 234 in the width direction of the transport path is restricted, when the second supporting unit 292 moves to the second position as shown in FIG. 18. In addition, a regulating member 294 is attached to the second supporting unit 292. When the second supporting unit 292 moves to the second position as shown in FIG. 18, the regulating member 294 regulates the movement of the upper guiding unit 232 in the width direction of the transport path (that is, the left-right direction in FIG. 18). The regulating member 294 projects downward from a lower surface of the second supporting unit 292. A serrated engaged member 233 is provided at a position opposing the regulating member 294 in the upper guiding unit 232. The lower end portion of the regulating member 294 enters a recess of the serrated engaged member 233, whereby the movement of the upper guiding unit 232 in the width direction of the transport path is restricted, when the second supporting unit 292 moves to the second position as shown in FIG. 18.

[0100] When the second supporting unit 292 moves from the state shown in FIG. 18 to the first position, each contacting member 292a and each contacting member 282a come into contact with each other. Then, as each contacting member 292a and each contacting member 282a push each other in the vertical direction in FIG. 18, each elastic member 286 such as the spring 286a is deformed so as to contract in the vertical direction in FIG. 18. This causes the first supporting unit 282 to move

downward in FIG. 18 away from the lower guiding unit 234 and each regulating member 284 separates downward from each engaged member 235. In addition, as each contacting member 292a and each contacting member 282a push each other in the vertical direction in FIG. 18, each elastic member 296 such as the spring 296a is deformed so as to contract in the vertical direction in FIG. 18. This causes the second supporting unit 292 to move upward in FIG. 18 away from the upper guiding unit 232 and each regulating member 294 separates upward from each engaged member 233. As a result, the lower guiding unit 234 and the upper guiding unit 232 can integrally move along the width direction of the transport path.

[0101] In the slide type transporting mechanism 210 as shown in FIG. 18, each regulating member 284, 294 regulates the movement of each of the lower guiding unit 234 and the upper guiding unit 232 in the width direction of the transport path, when the second supporting unit 292 moves to the second position. In this way, each regulating member 284, 294 functions as the position fixing member for fixing the positions of the lower guiding unit 234 and the upper guiding unit 232 in the width direction of the transport path when the second supporting unit 292 moves to the second position. The positioning unit 231 for positioning the lower guiding unit 234 and the upper guiding unit 232 is constituted by such a position fixing member. That is, in the slide type transporting mechanism 210 as shown in FIG. 18, when the upper cover unit 290 is opened upward from the lower cover unit 280, the movement of each of the lower guiding unit 234 and the upper guiding unit 232 in the width direction of the transport path is regulated by the regulating members 284, 294. Therefore, the lower guiding unit 234 and the upper guiding unit 232 in the width direction of the transport path are prevented from being displaced relative to each other. As a result, when the upper cover unit 290 is closed, the relative position of the upper guiding unit 232 with respect to the lower guiding unit 234 in the width direction of the transport path becomes the predetermined position. That is, when the second supporting unit 292 moves to the first position, the position of each drive roller 236 provided on the lower guiding unit 234 and the position of each driven roller 238 provided on the upper guiding unit 232 in the width direction of the transport path substantially coincide.

[0102] A loop-shaped transport path may be provided in the transporting unit 114 of the banknote handling machine 100 shown in FIG. 1A, and the banknote shifting device 10 may be located on this loop-shaped transport path. In this case, when the banknote sent from the transporting unit 114 to the banknote shifting device 10 is not shifted to the predetermined position in the width direction of the transport path (for example, the center position) by the banknote shifting device 10, the banknote discharged from the banknote shifting device 10 circulates around the loop-shaped transport path and is sent to the banknote shifting device 10 again. Such an operation will be described below.

[0103] When the banknote handling machine 100 shown in FIG. 1A performs the depositing process of the banknotes, the banknotes inserted into inlet unit 110 are fed out one by one into housing 101 by the banknote feeding mechanism 111, and transported by the transporting unit 114. After the recognition unit 116 recognizes the banknote being transported by the transporting unit 114, the banknote recognized by the recognition unit 116 as a normal banknote is sent to the escrow unit 118 by the transporting unit 114, and escrowed in the escrow unit 118. The banknote that can not be recognized by the recognition unit 116 or the banknote recognized by the recognition unit 116 as not a normal banknote is sent to the ejecting unit 112 by the transporting unit 114 as a reject banknote. After all the banknotes inserted into the inlet unit 110 are fed out into the housing 101 and sent to the escrow unit 118 or the ejecting unit 112, when the operator inputs a deposit confirmation command to the controlling unit 150 by the operation/display unit 152, the banknotes are fed out one by one from the escrow unit 118 to the transporting unit 114. Then, the fed banknote is sent to the banknote shifting device 10 by the transporting unit 114, and shifted to the predetermined position (for example, the center position) in the width direction of the transport path by the banknote shifting device 10, and then transferred to each banknote storage unit 120 for each denomination. If the banknote fed out from the escrow unit 118 and then sent to the banknote shifting device 10 by the transporting unit 114 is not shifted to the predetermined position in the width direction of the transport path by the banknote shifting device 10, the banknote discharged from the banknote shifting device 10 circulates around the loop-shaped transport path and is sent to the banknote shifting device 10 again. Then, this banknote is again shifted along the width direction of the transport path by the banknote shifting device 10.

[0104] More specifically, as shown in FIG. 1A, the loop-shaped transport path in the transporting unit 114 is provided with a banknote detecting sensor 114a for detecting the position of the banknote in the width direction of the transport path. When it is detected by the banknote detecting sensor 114a that the position of the banknote in the width direction of the transport path is not shifted to the predetermined position, the banknote is circulated around the loop-shaped transport path. When the banknote discharged from the banknote shifting device 10 is circulated around the loop-shaped transport path, the feeding operation of the banknote from the escrow unit 118 to the transporting unit 114 is temporarily stopped. When it is detected by the banknote detecting sensor 114a that the position of the banknote in the width direction of the transport path has been brought to the predetermined position, the banknote is diverted from the loop-shaped transport path and is sent to each banknote storage unit 120 and the like. Thereafter, the feeding operation of the banknote from the escrow unit 118 to the transporting unit 114 is restarted.

[0105] When it is detected by the banknote detecting sensor 114a that the position of the banknote in the width direction of the transport path is not shifted to the predetermined position and then the banknote is circulated around the loop-shaped transport path, the amount of deviation of the banknote from the predetermined position in the width direction of the transport path may be detected by the recognition unit 116. In this case, based on the deviation amount of the banknote recognized by the recognition unit 116, the shifting operation of the banknote to the predetermined position in the width direction of the transport path is performed by the banknote shifting device 10.

[0106] When such operation is performed in the banknote shifting device 10 according to the present embodiment, even if some of the slide type transporting mechanisms 30 among a plurality of slide type transporting mechanisms 30 in the banknote shifting device 10 fails and then the banknote shifting device 10 can not shift the banknote to the predetermined position in a single pass, for example, it is possible to bring the position of the banknote transported by the transporting unit 114 to the predetermined position in the width direction as the banknote passes through the banknote shifting device 10 multiple times. As a result, the banknotes can be appropriately stored in each banknote storage unit 120. Therefore, when the banknote shifting device 10 performs the dispensing process of the banknotes, the banknote feeding mechanism 122 can smoothly feed out the banknotes stored in each banknote storage unit 120 to the transporting unit 114, and occurrence of the trouble such as the jamming of the banknote can be suppressed as much as possible.

[0107] In each slide type transporting mechanism 30 of the present embodiment, as shown in FIG. 19, a photo-interrupter 66, for detecting the position of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path, is disposed in the middle of the movable area (indicated by a dotted line in FIG. 19) of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path. In addition, a light shielding member 68 is provided in one of the lower guiding unit 34 and the upper guiding unit 32. The light shielding member 68 extends from the center position of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path to either the left or the right (in the example shown in FIG. 19, the light shielding member 68 extends to the right side from the center position of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path). The photo-interrupter 66 includes a light emitting element and a light receiving element. When the lower guiding unit 34 and the upper guiding unit 32 slide from the position shown in FIG. 19 (center position) to the right side in FIG. 19, the light path between the light emitting element and the light receiving element is not obstructed by the light shielding member 68 and the photo-interrupter 66 is in a light transmitting state. In contrast, when the lower guiding unit 34 and the upper guiding unit 32 are located at the position shown in FIG. 19 (center position) or when the lower guiding unit 34 and the upper guiding unit 32 are moved to the left side from this center position, the optical path between the light emitting element and the light receiving element is shielded by the light shielding member 68, and the photo-interrupter 66 is brought into a light shielded state.

[0108] The relationship between the operation of the lower guiding unit 34 and the upper guiding unit 32 and the state of the photo-interrupter 66 when the photo-interrupter 66 is arranged as shown in FIG. 19 will be described with reference to the timing chart shown in FIG. 20. As shown in FIG. 20, each time the left end portion of the light shielding member 68 provided in one of the lower guiding unit 34 and the upper guiding unit 32 passes the optical path between the light emitting element and the light receiving element in the photo-interrupter 66, the light transmitting state and the light shielded state in the photo-interrupter 66 are switched. Thus, it is detected that the lower guiding unit 34 and the upper guiding unit 32 have reached the center position in the width direction of the transport path. In this way, it can be confirmed whether or not the lower guiding unit 34 and the upper guiding unit 32 are positioned at the center position as the fixed position for each banknote, when each slide type transporting mechanism 30 performs a centering operation of the banknote (that is, the operation of shifting the banknote to the center position in the width direction of the transport path). Further, when the photo-interrupter 66 is arranged as shown in FIG. 19, it can be confirmed whether or not the lower guiding unit 34 and the upper guiding unit 32 are located at the center position as the fixed position by one photo-interrupter 66. That is, in the past, since photo-interrupters were respectively installed near both ends of the lower guiding unit 34 and the upper guiding unit 32 in the width direction of the transport path, it was necessary to install two photo-interrupters for one slide type transporting mechanism 30. In contrast, when the photo-interrupter 66 is arranged as shown in FIG. 19, the number of photo-interrupter 66 can be set to one for one slide type transporting mechanism 30.

[0109] In the banknote shifting device 10 according to the present embodiment, when an error occurs in a certain slide type transporting mechanism 30 among a plurality of slide type transporting mechanisms 30, the upper guiding unit 32 and the lower guiding unit 34 of this slide type transporting mechanism 30 can not be slid along the width direction of the transport path. In this case, a degraded operation of the slide type transporting mechanisms 30 may be performed such that the slide type transporting mechanisms 30 other than the slide type transporting mechanism 30 in which the error occurred shifts the banknote to the predetermined position in the width direction of the transport path (for example, the center position in the width direction of the transport path). When such a degraded operation of the slide type transporting mechanisms 30 is performed, the amount

by which the banknote can be shifted along the width direction of the transport path by the banknote shifting device 10 is reduced. Therefore, depending on the position of the banknote in the width direction of the transport path before being sent to the banknote shifting device 10, the banknote shifting device 10 may not be able to shift the banknote to the predetermined position in the width direction of the transport path. Specifically, when the banknote shifting device 10 shifts the banknote to the center position in the width direction of the transport path, if the degraded operation of the slide type transporting mechanisms 30 is performed, when the banknote before being sent to the banknote shifting device 10 is located in the vicinity of the end in the width direction of the transport path, there is a case this banknote can not be shifted to the center position in the width direction of the transport path by the banknote shifting device 10. Therefore, when the degraded operation of the slide type transporting mechanisms 30 is performed in the banknote shifting device 10, if the amount of the deviation of the banknote before being sent to the banknote shifting device 10 in the width direction of the transport path from the predetermined position is larger than the amount by which the banknote shifting device 10 can shift the banknote along the width direction of the transport path is determined based on the recognition result by the recognition unit 116, for example, the banknote is not sent to the banknote shifting device 10 but is sent to the ejecting unit 112, a reject unit (not shown) and the like as the reject banknote. As a result, even when the amount by which the banknote can be shifted along the width direction of the transport path becomes small by performing the degraded operation of the slide type transporting mechanisms 30 in the banknote shifting device 10, it is possible to certainly shift the banknote sent to the banknote shifting device 10 to the predetermined position in the width direction of the transport path. Therefore, it is possible to prevent occurrence of the trouble such as the jamming of the banknote when the banknote passing through the banknote shifting device 10 is stored in the banknote storage unit 120 and the like.

[0110] If the above described degraded operation of the slide type transporting mechanisms 30 can be performed in the banknote shifting device 10, as shown in FIG. 21, a plurality of lamps 110a, 110b such as LEDs may be provided in the inlet unit 110 of the banknote handling machine 100 so as to indicate the position at which the banknotes can be inserted in the width direction of the inlet unit 110. In this case, when the degraded operation of the slide type transporting mechanisms 30 is not performed in the banknote shifting device 10, the pair of outer left and right lamps 110a among the plurality of lamps 110a and 110b shown in FIG. 21 are turned on (see FIG. 21 (a)). When the degraded operation of the slide type transporting mechanisms 30 is not performed in the banknote shifting device 10, since all slide type transporting mechanisms 30 can shift the banknote along the width direction of the transport path, the amount by which the banknote can be shifted along the width direction of the transport path increases. Therefore, even if the banknotes are inserted into the position in the vicinity of the end in the width direction of the inlet unit 110, when the banknotes are fed out to the inside of the housing 101, the banknote shifting device 10 can shift the banknote to the predetermined position in the width direction of the transport path (for example, the center position in the width direction of the transport path).

[0111] In contrast, when the degraded operation of the slide type transporting mechanisms 30 is performed in the banknote shifting device 10, the pair of inner left and right lamps 110b among the plurality of lamps 110a and 110b shown in FIG. 21 are turned on (see FIG. 21(b)). When the degraded operation of the slide type transporting mechanisms 30 is performed in the banknote shifting device 10, since some slide type transporting mechanism 30 can not shift the banknote along the width direction of the transport path, the amount by which the banknote can be shifted along the width direction of the transport path decreases. Therefore, the position in the width direction of the transport path of the banknote before being sent to the banknote shifting device 10 is restricted. In this way, when the degraded operation of the slide type transporting mechanisms 30 is performed in the banknote shifting device 10, by turning on the pair of inner left and right lamps 110b as shown in FIG. 21 (b), the position of the banknote in the width direction of the transport path before being sent to the banknote shifting device 10 can be brought close to the predetermined position. Therefore, it is possible to prevent the banknote before being sent to the banknote shifting device 10 from being rejected.

[0112] The paper sheet transporting device according to the present invention is not limited to the banknote shifting device for transporting the banknote. As the paper sheet transporting device according to the present invention, one transporting the paper sheet other than the banknote (more specifically, a check or a gift certificate) may be used.

Claims

1. A paper sheet transporting device (10) for transporting a paper sheet along a transport path (11) comprising:

   a first slide unit (34) that is slidable along a width direction of the transport path (11) and is in contact with one side of the paper sheet transported along the transport path (11);
   a second slide unit (32) that is slidable along the width direction of the transport path (11) and is in contact with another side of the paper sheet transported along the transport path (11);
   a first supporting unit (82) that supports the first slide unit (34);

a second supporting unit (92) that supports the second slide unit (32), **characterized in that** the second supporting unit (92) is movable relative to the first supporting unit (82) to move between a first position in which the first slide unit (34) and the second slide unit (32) face each other to form the transport path (11) between the first slide unit (34) and the second slide unit (32) and a second position in which the second slide unit (32) is separated from the first slide unit (34) to open the transport path (11); and **in that** the paper sheet transporting device (10) further comprises:

a positioning unit (31) for positioning the first slide unit (34) and the second slide unit (32) such that a relative position of the second slide unit (32) with respect to the first slide unit (34) in the width direction of the transport path (11) becomes a predetermined position when the second supporting unit (92) moves to the first position.

2. The paper sheet transporting device (10) as claimed in claim 1, **characterized in that** the positioning unit (31) includes a guiding member (84, 94) provided on at least one of the first slide unit (34) and the second slide unit (32) and the guiding member aligns the first slide unit (34) and the second slide unit (32) in the width direction of the transport path (11) when the second supporting unit (92) moves to the first position.

3. The paper sheet transporting device (10) as claimed in claim 2, **characterized in that** the guiding member includes a first guiding member (84) provided on the first slide unit (34) and a second guiding member (94) provided on the second slide unit (32) so as to face the first guiding member (84),

the first guiding member (84) or the second guiding member (94) includes a first inclined surface (84a) inclined with respect to the width direction of the transport path (11), and

at least one of the first guiding member (84) and the second guiding member (94) is guided along the first inclined surface (84a) to move along the width direction of the transport path (11) so that the first slide unit (34) and the second slide unit (32) are aligned, when the second supporting unit (92) moves to the first position.

4. The paper sheet transporting device (10) as claimed in any one of claims 1 to 3, **characterized in that** the positioning unit (31) includes a position fixing member (96) that fixes the position of at least one of the first slide unit (34) and the second slide unit (32) in the width direction of the transport path (11) when the second supporting unit (92) moves to the second position.

5. The paper sheet transporting device (10) as claimed in claim 4, **characterized in that** the positioning unit (31) further includes a release member (97) that releases a position fixed state of at least one of the first slide unit (34) and the second slide unit (32) by the position fixing member (96) when the second supporting unit (92) moves to the first position.

6. The paper sheet transporting device (10) as claimed in claim 5, **characterized in that** the release member (97) includes a contacting member (97a) provided on the position fixing member (96) and contacting the first supporting unit (82) when the second supporting unit (92) moves to the first position, and

the position fixed state of at least one of the first slide unit (34) and the second slide unit (32) by the position fixing member (96) is released as the contacting member (97a) provided on the position fixing member (96) is brought into contact with the first supporting unit (82) and pushed, and then a distance between the second slide unit (32) and the position fixing member (96) increases, when the second supporting unit (92) moves to the first position.

7. The paper sheet transporting device (10) as claimed in claim 6, **characterized in that** a cover unit (90) is provided outside the second supporting unit (92),

the position fixing member (96) includes a lever (96b) rotatable about an axis (96a) provided on the second supporting unit (92) and provided with the contacting member (97a), and an elastic member (98) provided between the lever (96b) and the cover unit (90) and biasing the lever (96b) in a direction toward the second slide unit (32) while leaving the lever (96b) away from the cover unit (90), and

the position fixed state of at least one of the first slide unit (34) and the second slide unit (32) by the position fixing member (96) is released as the elastic member (98) deforms by the contacting member provided on the lever (96b) contacting the first supporting unit (82) and being pushed, and then the distance between the second slide unit (32) and the lever (96b) of the position fixing member (96) increases, when the second supporting unit (92) moves to the first position.

8. The paper sheet transporting device (10) as claimed in any one of claims 4 to 6, **characterized in that** the position fixing member (96) guides and fixes at least one of the first slide unit (34) and the second slide unit (32) to a predetermined position in the width direction of the transport path (11), when the second supporting unit (92) moves to the second position.

9. The paper sheet transporting device (10) as claimed in claim 8, **characterized in that** the position fixing member (96) includes a third guiding member (96c) provided on the second slide unit (32) and including

a second inclined surface (96d) inclined with respect to the width direction of the transport path (11) and a fourth guiding member (96e) that contacts the third guiding member (96c) when the second supporting unit (92) moves to the second position, and
the fourth guiding member (96e) comes in contact with the third guiding member (96c) provided on the second slide unit (32) and relatively moves along the second inclined surface (96d) so that the second slide unit (32) moves along the width direction of the transport path (11) and is fixed to the predetermined position in the width direction of the transport path (11), when the second supporting unit (92) moves to the second position.

10. The paper sheet transporting device (10) as claimed in claim 9, **characterized in that** a cover unit (90) is provided outside the second supporting unit (92),
the position fixing member (96) includes a lever (96b) rotatable about an axis (96a) provided on the second supporting unit (92) and provided with the fourth guiding member (96e), and an elastic member (98) provided between the lever (96b) and the cover unit (90) and biasing the lever (96b) in a direction toward the second slide unit (32) while leaving the lever (96b) away from the cover unit (90), and
the fourth guiding member (96e) comes in contact with the third guiding member (96c) by the elastic member (98) biasing the lever (96b) toward the second slide unit (32), and the fourth guiding member (96e) relatively moves along the second inclined surface (96d) so that the second slide unit (32) moves along the width direction of the transport path (11) and is fixed to the predetermined position in the width direction of the transport path (11), when the second supporting unit (92) moves to the second position.

11. The paper sheet transporting device (10) as claimed in any one of claims 4 to 7, **characterized in that** the position fixing member (96) includes a regulating member that restricts movement of at least one of the first slide unit (34) and the second slide unit (32) in the width direction of the transport path (11) when the second supporting unit (92) is positioned at the second position.

12. The paper sheet transporting device (10) as claimed in any one of claims 4 to 7, **characterized in that** the position fixing member (96) includes a drive motor (46) that slides at least one of the first supporting unit (82) and the second supporting unit (92) along the width direction of the transport path (11), and
the positioning unit (31) fixes the position of the supporting unit (82, 92) to be driven by the drive motor (46) among the first supporting unit (82) and the second supporting unit (92) in the width direction of the transport path (11), when the second supporting unit (92) moves to the second position.

13. The paper sheet transporting device (10) as claimed in any one of claims 1 to 12, **characterized in that** each of the first slide unit (34) and the second slide unit (32) includes a roller (36, 38) that contacts the sheet for transporting the sheet, the sheet is transported between the roller (36) of the first slide unit (34) and the roller (38) of the second slide unit (32) when the second supporting unit (92) is in the first position, and
the positioning unit (31) positions the first slide unit (34) and the second slide unit (32) such that the position of the roller (36) of the first slide unit (34) and the position of the roller (38) of the second slide unit (32) substantially coincide in the width direction of the transport path (11), when the second supporting unit (92) moves to the first position.

14. The paper sheet transporting device (10) as claimed in any one of claims 1 to 13, **characterized in that** a plurality of combinations of the first slide unit (34) and the second slide unit (32) are provided so as to line up along the transport direction of the sheet in the transport path (11), and
a plurality of positioning units (31) are provided so as to correspond to each of the plurality of combinations.

15. The paper sheet transporting device (10) as claimed in any one of claims 4 to 11, **characterized in that** a plurality of combinations of the first slide unit (34) and the second slide unit (32) are provided so as to line up in the transport direction of the sheet in the transport path (11),
the position fixing member (96) of the positioning unit (31) is provided to extend over a plurality of combinations, and
the position fixing member (96) simultaneously fixes the position of at least one of the first slide unit (34) and the second slide unit (32) in each of the plurality of combinations in the width direction of the transport path (11), when the second supporting unit (92) moves to the second position.

Patentansprüche

1. Papierbogentransportvorrichtung (10) zum Transportieren eines Papierbogens entlang eines Transportweges (11), die Folgendes umfasst:

eine erste Gleiteinheit (34), die entlang einer Richtung der Breite des Transportweges (11) gleiten kann und mit einer Seite des Papierbogens, der entlang des Transportweges (11) transportiert wird, in Kontakt ist;
eine zweite Gleiteinheit (32), die entlang der Richtung der Breite des Transportweges (11) gleiten kann und mit einer anderen Seite des

Papierbogens, der entlang des Transportweges (11) transportiert wird, in Kontakt ist;
eine erste Trageinheit (82), die die erste Gleiteinheit (34) trägt;
eine zweite Trageinheit (92), die die zweite Gleiteinheit (32) trägt, **dadurch gekennzeichnet, dass** die zweite Trageinheit (92) relativ zu der ersten Trageinheit (82) beweglich ist, um sich zwischen einer ersten Position, in der die erste Gleiteinheit (34) und die zweite Gleiteinheit (34) einander zugewandt sind, um den Transportweg (11) zwischen der ersten Gleiteinheit (34) und der zweiten Gleiteinheit (32) zu bilden, und einer zweiten Position, in der die zweite Gleiteinheit (34) von der ersten Gleiteinheit (34) getrennt ist, um den Transportweg (11) zu öffnen, zu bewegen; und dadurch, dass die Papierbogentransportvorrichtung (10) ferner umfasst:
eine Positionierungseinheit (31) zum Positionieren der ersten Gleiteinheit (34) und der zweiten Gleiteinheit (32) derart, dass eine relative Position der zweiten Gleiteinheit (32) in Bezug auf die erste Gleiteinheit (34) in Richtung der Breite des Transportweges (11) eine vorbestimmte Position wird, wenn sich die zweite Trageinheit (92) zu der ersten Position bewegt.

2. Papierbogentransportvorrichtung (10) nach Anspruch 1, **dadurch gekennzeichnet, dass** die Positionierungseinheit (31) ein Führungselement (84, 94) enthält, das auf der ersten Gleiteinheit (34) und/oder der zweiten Gleiteinheit (32) vorgesehen ist, und das Führungselement die erste Gleiteinheit (34) und die zweite Gleiteinheit (32) in Richtung der Breite des Transportweges (11) ausrichtet, wenn sich die zweite Trageinheit (92) zu der ersten Position bewegt.

3. Papierbogentransportvorrichtung (10) nach Anspruch 2, **dadurch gekennzeichnet, dass** das Führungselement ein erstes Führungselement (84), das auf der ersten Gleiteinheit (34) vorgesehen ist, und ein zweites Führungselement (94), das auf der zweiten Gleiteinheit (32) vorgesehen ist, so dass sie dem ersten Führungselement (84) zugewandt ist, enthält, wobei das erste Führungselement (84) oder das zweite Führungselement (94) eine erste geneigte Fläche (84a) enthält, die in Bezug auf die Richtung der Breite des Transportweges (11) geneigt ist, und das erste Führungselement (84) und/oder das zweite Führungselement (94) entlang der ersten geneigten Fläche (84a) geführt werden, um sich entlang der Richtung der Breite des Transportweges (11) zu bewegen, so dass die erste Gleiteinheit (34) und die zweite Gleiteinheit (32) aufeinander ausgerichtet sind, wenn sich die zweite Trageinheit (92) zu der ersten Position bewegt.

4. Papierbogentransportvorrichtung (10) nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Positionierungseinheit (31) ein Positionsfixierelement (96) enthält, das die Position der ersten Gleiteinheit (34) und/oder der zweiten Gleiteinheit (32) in Richtung der Breite des Transportweges (11) fixiert, wenn sich die zweite Trageinheit (92) zu der zweiten Position bewegt.

5. Papierbogentransportvorrichtung (10) nach Anspruch 4, **dadurch gekennzeichnet, dass** die Positionierungseinheit (31) ferner ein Freigabeelement (97) enthält, das einen Zustand einer fixierten Position der ersten Gleiteinheit (34) und/oder der zweiten Gleiteinheit (32) durch das Positionsfixierelement (96) freigibt, wenn sich die zweite Trageinheit (92) zu der ersten Position bewegt.

6. Papierbogentransportvorrichtung (10) nach Anspruch 5, **dadurch gekennzeichnet, dass** das Freigabeelement (97) ein Kontaktelement (97a) enthält, das auf dem Positionsfixierelement (96) vorgesehen ist und die erste Trageinheit (82) kontaktiert, wenn sich die zweite Trageinheit (92) zu der ersten Position bewegt, und
der Zustand einer fixierten Position der ersten Gleiteinheit (34) und/oder der zweiten Gleiteinheit (32) durch das Positionsfixierelement (96) freigegeben wird, wenn das Kontaktierelement (97a), das auf dem Positionsfixierelement (96) vorgesehen ist, mit der ersten Trageinheit (82) in Kontakt gebracht und gedrückt wird, und dann ein Abstand zwischen der zweiten Gleiteinheit (32) und dem Positionsfixierelement (96) zunimmt, wenn sich die zweite Trageinheit (92) zu der ersten Position bewegt.

7. Papierbogentransportvorrichtung (10) nach Anspruch 6, **dadurch gekennzeichnet, dass** eine Abdeckeinheit (90) außerhalb der zweiten Trageinheit (92) vorgesehen ist,
wobei das Positionsfixierelement (96) einen Hebel (96b), der um eine Achse (96a) drehbar ist, die auf der zweiten Trageinheit (92) vorgesehen ist und mit dem Kontaktelement (97a) ausgestattet ist, und ein elastisches Element (98), das zwischen dem Hebel (96b) und der Abdeckeinheit (90) vorgesehen ist und den Hebel (96b) in einer Richtung zu der zweiten Gleiteinheit (32) vorbelastet, während der Hebel (96b) von der Abdeckeinheit (90) angehoben wird, enthält, und
der Zustand einer fixierten Position der ersten Gleiteinheit (34) und/oder der zweiten Gleiteinheit (32) durch das Positionsfixierelement (96) freigegeben wird, wenn sich das elastische Element (98) dadurch verformt, dass das Kontaktelement, das auf dem Hebel (96b) vorgesehen ist, die erste Trageinheit (82) kontaktiert und gedrückt wird, und dann der Abstand zwischen der zweiten Gleiteinheit (32) und dem He-

bel (96b) des Positionsfixierelements (96) zunimmt, wenn sich die zweite Trageinheit (92) zu der ersten Position bewegt.

8. Papierbogentransportvorrichtung (10) nach einem der Ansprüche 4 bis 6, **dadurch gekennzeichnet, dass** das Positionsfixierelement (96) die erste Gleiteinheit (34) und/oder die zweite Gleiteinheit (32) zu einer vorbestimmten Position in Richtung der Breite des Transportweges (11) führt und fixiert, wenn sich die zweite Trageinheit (92) zu der zweiten Position bewegt.

9. Papierbogentransportvorrichtung (10) nach Anspruch 8, **dadurch gekennzeichnet, dass** das Positionsfixierelement (96) ein drittes Führungselement (96c), das auf der zweiten Gleiteinheit (32) vorgesehen ist und eine zweite geneigte Fläche (96d) enthält, die in Bezug auf die Richtung der Breite des Transportweges (11) geneigt ist, und ein viertes Führungselement (96e), das das dritte Führungselement (96c) kontaktiert, wenn sich die zweite Trageinheit (92) zu der zweiten Position bewegt, enthält, und
das vierte Führungselement (96e) mit dem dritten Führungselement (96c), das auf der zweiten Gleiteinheit (32) vorgesehen ist, in Kontakt gelangt und sich relativ entlang der zweiten geneigten Fläche (96d) bewegt, so dass sich die zweite Gleiteinheit (32) entlang der Richtung der Breite des Transportweges (11) bewegt und an der vorbestimmten Position in Richtung der Breite des Transportweges (11) fixiert ist, wenn sich die zweite Trageinheit (92) zu der zweiten Position bewegt.

10. Papierbogentransportvorrichtung (10) nach Anspruch 9, **dadurch gekennzeichnet, dass** eine Abdeckeinheit (90) außerhalb der zweiten Trageinheit (92) vorgesehen ist,
das Positionsfixierelement (96) einen Hebel (96b), der um eine Achse (96a) drehbar ist, die auf der zweiten Trageinheit (92) vorgesehen ist und mit dem vierten Führungselement (96e) ausgestattet ist, und ein elastisches Element (98), das zwischen dem Hebel (96b) und der Abdeckeinheit (90) vorgesehen ist und den Hebel (96b) in einer Richtung zu der zweiten Gleiteinheit (32) vorbelastet, während der Hebel (96b) von der Abdeckeinheit (90) entfernt gelassen wird, enthält, und
das vierte Führungselement (96e) mit dem dritten Führungselement (96c) durch das elastische Element (98), das den Hebel (96b) in Richtung der zweiten Gleiteinheit (32) vorbelastet, in Kontakt gelangt und das vierte Führungselement (96e) sich relativ entlang der zweiten geneigten Fläche (96d) bewegt, so dass sich die zweite Gleiteinheit (32) entlang der Richtung der Breite des Transportweges (11) bewegt und an der vorbestimmten Position in Richtung der Breite des Transportweges (11) fixiert ist, wenn sich die zweite Trageinheit (92) zu der zweiten Position bewegt.

11. Papierbogentransportvorrichtung (10) nach einem der Ansprüche 4 bis 7, **dadurch gekennzeichnet, dass** das Positionsfixierelement (96) ein Regulierelement enthält, das eine Bewegung der ersten Gleiteinheit (34) und/oder der zweiten Gleiteinheit (32) in Richtung der Breite des Transportweges (11) begrenzt, wenn die zweite Trageinheit (92) an der zweiten Position positioniert ist.

12. Papierbogentransportvorrichtung (10) nach einem der Ansprüche 4 bis 7, **dadurch gekennzeichnet, dass** das Positionsfixierelement (96) einen Antriebsmotor (46) enthält, der die erste Trageinheit (92) und/oder die zweite Trageinheit (92) entlang der Richtung der Breite des Transportweges (11) gleitet, und
die Positionierungseinheit (31) die Position der Trageinheit (82, 92), die durch den Antriebsmotor (46) anzutreiben ist, unter der ersten Trageinheit (82) und der zweiten Trageinheit (92) in Richtung der Breite des Transportweges (11) fixiert, wenn sich die zweite Trageinheit (92) zu der zweiten Position bewegt.

13. Papierbogentransportvorrichtung (10) nach einem der Ansprüche 1 bis 12, **dadurch gekennzeichnet, dass** die erste Gleiteinheit (34) und die zweite Gleiteinheit (32) eine Rolle (36, 38) enthalten, die den Bogen zum Transportieren des Bogens kontaktiert, wobei der Bogen zwischen der Rolle (36) der ersten Gleiteinheit (34) und der Rolle (38) der zweiten Gleiteinheit (32) transportiert wird, wenn die zweite Trageinheit (92) in der ersten Position ist, und
die Positionierungseinheit (31) die erste Gleiteinheit (34) und die zweite Gleiteinheit (32) derart positioniert, dass die Position der Rolle (36) der ersten Gleiteinheit (34) und die Position der Rolle (38) der zweiten Gleiteinheit (32) im Wesentlichen in Richtung der Breite des Transportweges (11) zusammenfallen, wenn sich die zweite Trageinheit (92) zu der ersten Position bewegt.

14. Papierbogentransportvorrichtung (10) nach einem der Ansprüche 1 bis 13, **dadurch gekennzeichnet, dass** mehrere Kombinationen der ersten Gleiteinheit (34) und der zweiten Gleiteinheit (32) so vorgesehen sind, dass sie sich entlang der Transportrichtung des Bogens in dem Transportweg (11) aufstellen, und
mehrere Positionierungseinheiten (31) so vorgesehen sind, dass sie jeder der mehreren Kombinationen entsprechen.

15. Papierbogentransportvorrichtung (10) nach einem der Ansprüche 4 bis 11, **dadurch gekennzeichnet,**

dass mehrere Kombinationen der ersten Gleiteinheit (34) und der zweiten Gleiteinheit (32) so vorgesehen sind, dass sie sich in der Transportrichtung des Bogens in dem Transportweg (11) aufstellen,
wobei das Positionsfixierelement (96) der Positionierungseinheit (31) so vorgesehen ist, dass es sich über mehrere Kombinationen erstreckt, und
das Positionsfixierelement (96) gleichzeitig die Position der ersten Gleiteinheit und/oder der zweiten Gleiteinheit (32) in jeder der mehreren Kombinationen in Richtung der Breite des Transportweges (11) fixiert, wenn sich die zweite Trageinheit (92) zu der zweiten Position bewegt.

Revendications

1. Dispositif de transport de feuille de papier (10) pour transporter une feuille de papier le long d'un trajet de transport (11), comprenant :

   une première unité de coulissement (34) qui peut coulisser le long d'une direction de largeur du trajet de transport (11) et est en contact avec une face de la feuille de papier transportée le long du trajet de transport (11) ;
   une seconde unité de coulissement (32) qui peut coulisser le long de la direction de largeur du trajet de transport (11) et est en contact avec une autre face de la feuille de papier transportée le long du trajet de transport (11) ;
   une première unité de support (82) qui supporte la première unité de coulissement (34) ;
   une seconde unité de support (92) qui supporte la seconde unité de coulissement (32), **caractérisé en ce que** la seconde unité de support (92) est mobile relativement à la première unité de support (82) pour se déplacer entre une première position dans laquelle la première unité de coulissement (34) et la seconde unité de coulissement (32) se font face l'une l'autre pour former le trajet de transport (11) entre la première unité de coulissement (34) et la seconde unité de coulissement (32) et une seconde position dans laquelle la seconde unité de coulissement (32) est séparée de la première unité de coulissement (34) pour ouvrir le trajet de transport (11) ; et dans lequel le dispositif de transport de feuille de papier (10) comprend en outre :
   une unité de positionnement (31) pour positionner la première unité de coulissement (34) et la seconde unité de coulissement (32) de telle sorte qu'une position relative de la seconde unité de coulissement (32) par rapport à la première unité de coulissement (34) dans la direction de largeur du trajet de transport (11) soit une position prédéterminée lorsque la seconde unité de support (92) se déplace jusqu'à la première position.

2. Dispositif de transport de feuille de papier (10) selon la revendication 1, **caractérisé en ce que** l'unité de positionnement (31) inclut un élément de guidage (84, 94) prévu sur au moins une de la première unité de coulissement (34) et de la seconde unité de coulissement (32) et l'élément de guidage aligne la première unité de coulissement (34) et la seconde unité de coulissement (32) dans la direction de largeur du trajet de transport (11) lorsque la seconde unité de support (92) se déplace jusqu'à la première position.

3. Dispositif de transport de feuille de papier (10) selon la revendication 2, **caractérisé en ce que** l'élément de guidage inclut un premier élément de guidage (84) prévu sur la première unité de coulissement (34) et un deuxième élément de guidage (94) prévu sur la seconde unité de coulissement (32) afin de faire face au premier élément de guidage (84),
   le premier élément de guidage (84) ou le deuxième élément de guidage (94) inclut une première surface inclinée (84a) inclinée par rapport à la direction de largeur du trajet de transport (11), et
   au moins un du premier élément de guidage (84) et du deuxième élément de guidage (94) est guidé le long de la première surface inclinée (84a) pour se déplacer le long de la direction de largeur du trajet de transport (11) pour que la première unité de coulissement (34) et la seconde unité de coulissement (32) soient alignées, lorsque la seconde unité de support (92) se déplace jusqu'à la première position.

4. Dispositif de transport de feuille de papier (10) selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** l'unité de positionnement (31) inclut un élément de fixation de position (96) qui fixe la position d'au moins une de la première unité de coulissement (34) et de la seconde unité de coulissement (32) dans la direction de largeur du trajet de transport (11) lorsque la seconde unité de support (92) se déplace jusqu'à la seconde position.

5. Dispositif de transport de feuille de papier (10) selon la revendication 4, **caractérisé en ce que** l'unité de positionnement (31) inclut en outre un élément de libération (97) qui libère un état de position fixée d'au moins une de la première unité de coulissement (34) et de la seconde unité de coulissement (32) par l'élément de fixation de position (96) lorsque la seconde unité de support (92) se déplace jusqu'à la première position.

6. Dispositif de transport de feuille de papier (10) selon la revendication 5, **caractérisé en ce que** l'élément de libération (97) inclut un élément d'entrée en contact (97a) prévu sur l'élément de fixation de position (96) et entrant en contact avec la première unité de

support (82) lorsque la seconde unité de support (92) se déplace jusqu'à la première position, et
l'état de position fixée d'au moins une de la première unité de coulissement (34) et de la seconde unité de coulissement (32) par l'élément de fixation de position (96) est libéré lorsque l'élément d'entrée en contact (97a) prévu sur l'élément de fixation de position (96) est mis en contact avec la première unité de support (82) et poussé, et puis une distance entre la seconde unité de coulissement (32) et l'élément de fixation de position (96) augmente, lorsque la seconde unité de support (92) se déplace jusqu'à la première position.

7. Dispositif de transport de feuille de papier (10) selon la revendication 6, **caractérisé en ce qu'**une unité de couverture (90) est prévue à l'extérieur de la seconde unité de support (92),
l'élément de fixation de position (96) inclut un levier (96b) rotatif autour d'un axe (96a) prévu sur la seconde unité de support (92) et pourvu de l'élément d'entrée en contact (97a), et un élément élastique (98) prévu entre le levier (96b) et l'unité de couverture (90) et sollicitant le levier (96b) dans une direction vers la seconde unité de coulissement (32) tout en laissant le levier (96b) éloigné de l'unité de couverture (90), et
l'état de position fixée d'au moins une de la première unité de coulissement (34) et de la seconde unité de coulissement (32) par l'élément de fixation de position (96) est libéré lorsque l'élément élastique (98) se déforme en raison du fait que l'élément d'entrée en contact prévu sur le levier (96b) entre en contact avec la première unité de support (82) et est poussé, et puis la distance entre la seconde unité de coulissement (32) et le levier (96b) de l'élément de fixation de position (96) augmente, lorsque la seconde unité de support (92) se déplace jusqu'à la première position.

8. Dispositif de transport de feuille de papier (10) selon l'une quelconque des revendications 4 à 6, **caractérisé en ce que** l'élément de fixation de position (96) guide au moins une de la première unité de coulissement (34) et de la seconde unité de coulissement (32) jusqu'à une position prédéterminée, et la fixe à cette dernière, dans la direction de largeur du trajet de transport (11), lorsque la seconde unité de support (92) se déplace jusqu'à la seconde position.

9. Dispositif de transport de feuille de papier (10) selon la revendication 8, **caractérisé en ce que** l'élément de fixation de position (96) inclut un troisième élément de guidage (96c) prévu sur la seconde unité de coulissement (32) et incluant une seconde surface inclinée (96d) inclinée par rapport à la direction de largeur du trajet de transport (11) et un quatrième élément de guidage (96e) qui entre en contact avec le troisième élément de guidage (96c) lorsque la seconde unité de support (92) se déplace jusqu'à la seconde position, et
le quatrième élément de guidage (96e) entre en contact avec le troisième élément de guidage (96c) prévu sur la seconde unité de coulissement (32) et se déplace relativement le long de la seconde surface inclinée (96d) pour que la seconde unité de coulissement (32) se déplace le long de la direction de largeur du trajet de transport (11) et soit fixée à la position prédéterminée dans la direction de largeur du trajet de transport (11), lorsque la seconde unité de support (92) se déplace jusqu'à la seconde position.

10. Dispositif de transport de feuille de papier (10) selon la revendication 9, **caractérisé en ce qu'**une unité de couverture (90) est prévue à l'extérieur de la seconde unité de support (92),
l'élément de fixation de position (96) inclut un levier (96b) rotatif autour d'un axe (96a) prévu sur la seconde unité de support (92) et pourvu du quatrième élément de guidage (96e), et un élément élastique (98) prévu entre le levier (96b) et l'unité de couverture (90) et sollicitant le levier (96b) dans une direction vers la seconde unité de coulissement (32) tout en laissant le levier (96b) éloigné de l'unité de couverture (90), et
le quatrième élément de guidage (96e) entre en contact avec le troisième élément de guidage (96c) en raison du fait que l'élément élastique (98) sollicite le levier (96b) vers la seconde unité de coulissement (32), et le quatrième élément de guidage (96e) se déplace relativement le long de la seconde surface inclinée (96d) pour que la seconde unité de coulissement (32) se déplace le long de la direction de largeur du trajet de transport (11) et soit fixée à la position prédéterminée dans la direction de largeur du trajet de transport (11), lorsque la seconde unité de support (92) se déplace jusqu'à la seconde position.

11. Dispositif de transport de feuille de papier (10) selon l'une quelconque des revendications 4 à 7, **caractérisé en ce que** l'élément de fixation de position (96) inclut un élément régulateur qui limite le mouvement d'au moins une de la première unité de coulissement (34) et de la seconde unité de coulissement (32) dans la direction de largeur du trajet de transport (11) lorsque la seconde unité de support (92) est positionnée à la seconde position.

12. Dispositif de transport de feuille de papier (10) selon l'une quelconque des revendications 4 à 7, **caractérisé en ce que** l'élément de fixation de position (96) inclut un moteur d'entraînement (46) qui fait coulisser au moins une de la première unité de support (82) et de la seconde unité de support (92) le long

de la direction de largeur du trajet de transport (11), et

l'unité de positionnement (31) fixe la position de l'unité de support (82, 92) destinée à être entraînée par le moteur d'entraînement (46) parmi la première unité de support (82) et la seconde unité de support (92) dans la direction de largeur du trajet de transport (11), lorsque la seconde unité de support (92) se déplace jusqu'à la seconde position.

13. Dispositif de transport de feuille de papier (10) selon l'une quelconque des revendications 1 à 12, **caractérisé en ce que** chacune de la première unité de coulissement (34) et de la seconde unité de coulissement (32) inclut un rouleau (36, 38) qui entre en contact avec la feuille pour transporter la feuille, la feuille est transportée entre le rouleau (36) de la première unité de coulissement (34) et le rouleau (38) de la seconde unité de coulissement (32) lorsque la seconde unité de support (92) est dans la première position, et

l'unité de positionnement (31) positionne la première unité de coulissement (34) et la seconde unité de coulissement (32) de telle sorte que la position du rouleau (36) de la première unité de coulissement (34) et la position du rouleau (38) de la seconde unité de coulissement (32) coïncident sensiblement dans la direction de largeur du trajet de transport (11), lorsque la seconde unité de support (92) se déplace jusqu'à la première position.

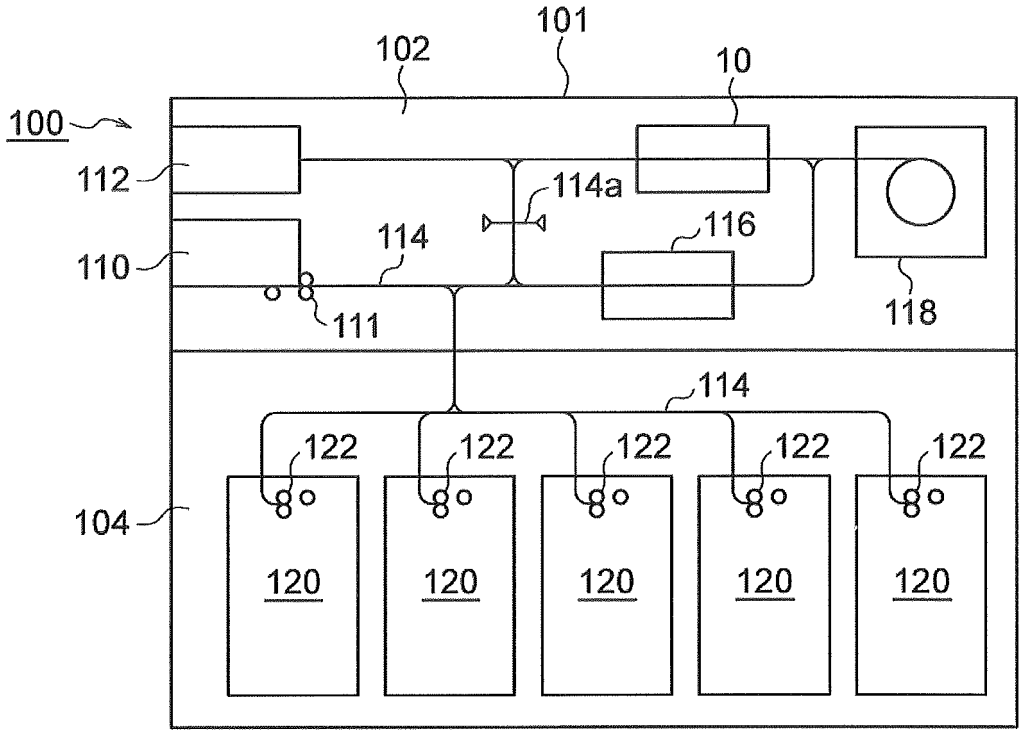
14. Dispositif de transport de feuille de papier (10) selon l'une quelconque des revendications 1 à 13, **caractérisé en ce qu'**une pluralité de combinaisons de la première unité de coulissement (34) et de la seconde unité de coulissement (32) sont prévues afin de s'aligner le long de la direction de transport de la feuille dans le trajet de transport (11), et

une pluralité d'unités de positionnement (31) sont prévues afin de correspondre à chacune de la pluralité de combinaisons.

15. Dispositif de transport de feuille de papier (10) selon l'une quelconque des revendications 4 à 11, **caractérisé en ce qu'**une pluralité de combinaisons de la première unité de coulissement (34) et de la seconde unité de coulissement (32) sont prévues afin de s'aligner dans la direction de transport de la feuille dans le trajet de transport (11),

l'élément de fixation de position (96) de l'unité de positionnement (31) est prévu pour s'étendre sur une pluralité de combinaisons, et

l'élément de fixation de position (96) fixe simultanément la position d'au moins une de la première unité de coulissement (34) et de la seconde unité de coulissement (32) dans chacune de la pluralité de combinaisons dans la direction de largeur du trajet de transport (11), lorsque la seconde unité de support (92) se déplace jusqu'à la seconde position.


101
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112
114a
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122
122
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122
104
120
120
120
120
120

FIG. 1A

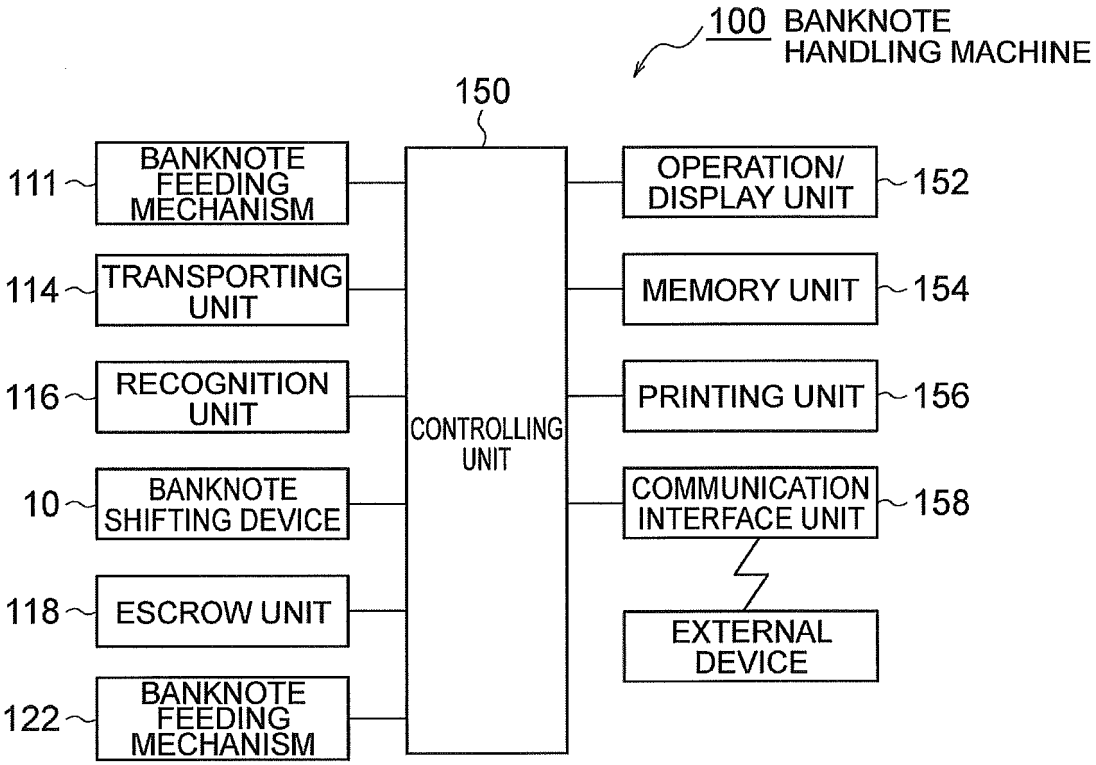
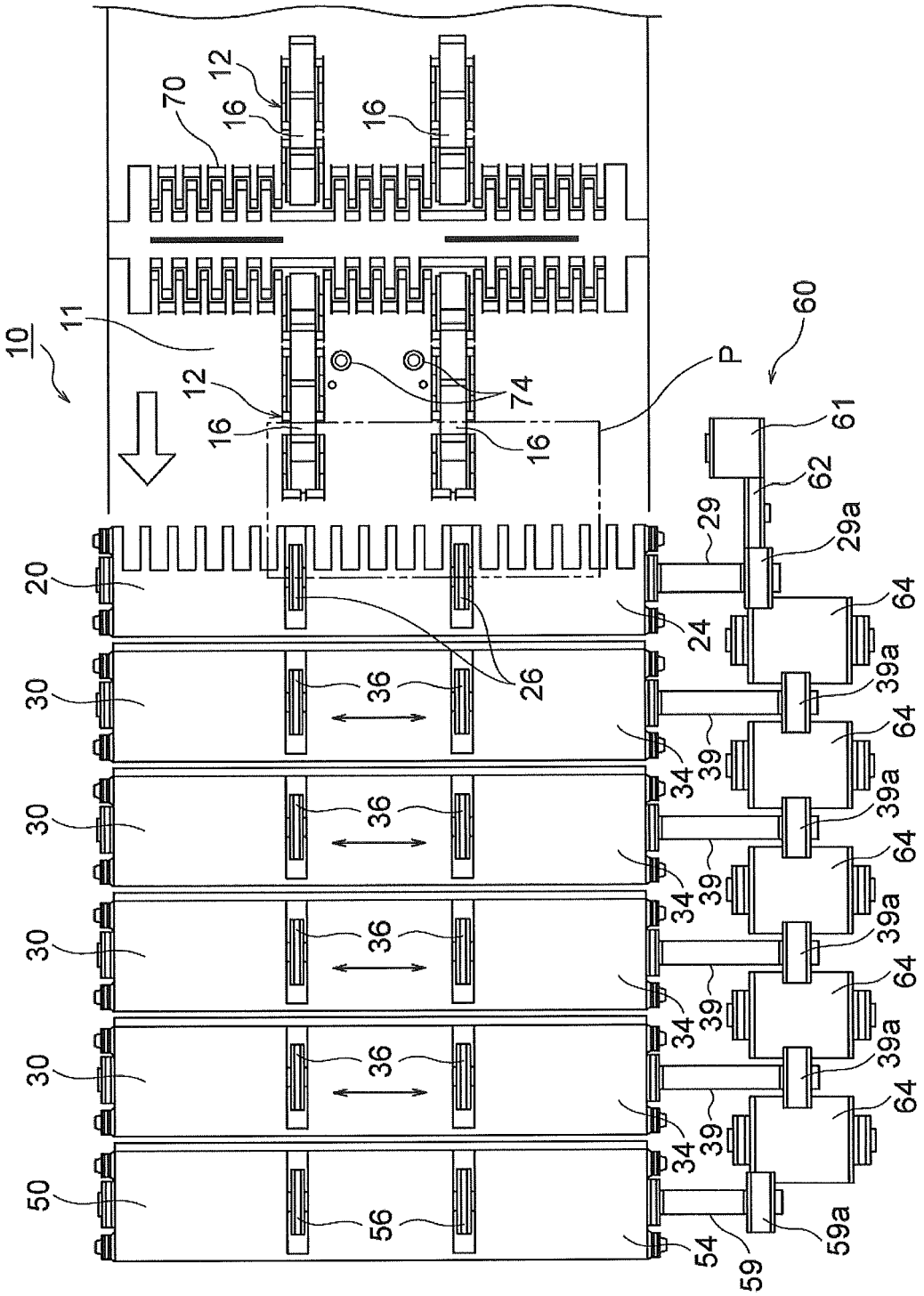

100 BANKNOTE HANDLING MACHINE
150
111
BANKNOTE FEEDING MECHANISM
114
TRANSPORTING UNIT
116
RECOGNITION UNIT
10
BANKNOTE SHIFTING DEVICE
118
ESCROW UNIT
122
BANKNOTE FEEDING MECHANISM
CONTROLLING UNIT
OPERATION/ DISPLAY UNIT
152
MEMORY UNIT
154
PRINTING UNIT
156
COMMUNICATION INTERFACE UNIT
158
EXTERNAL DEVICE

FIG. 1B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11
12
16
70
74
P
60
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29a
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24
64
30
36
26
39a
39
34
50
56
54
59
59a

FIG. 2

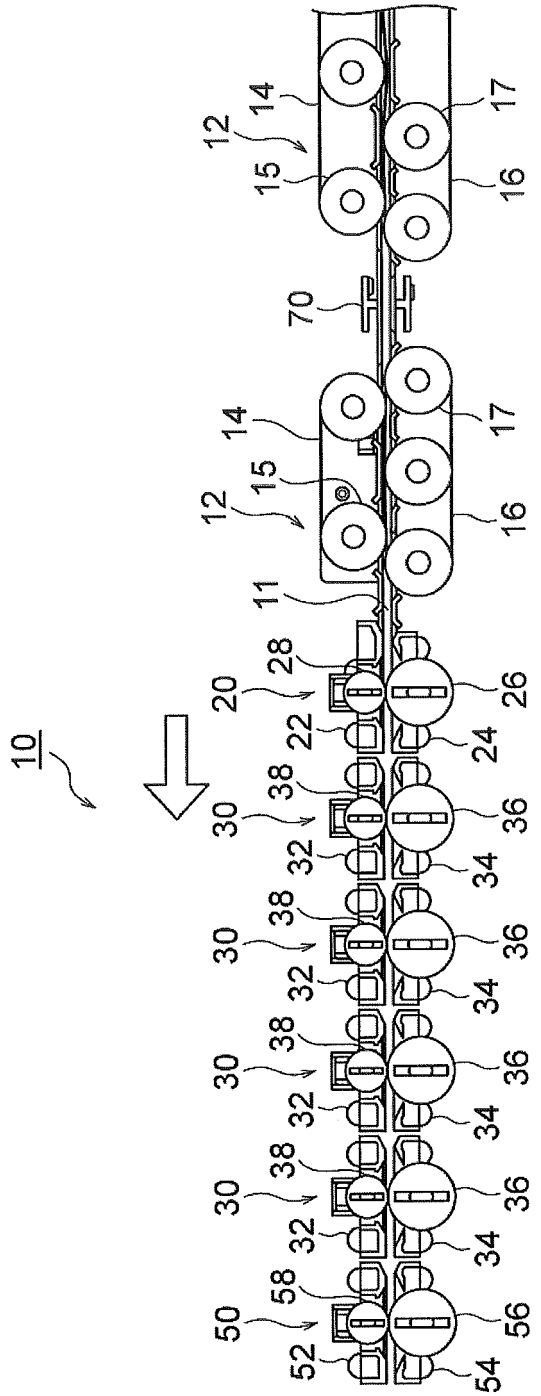
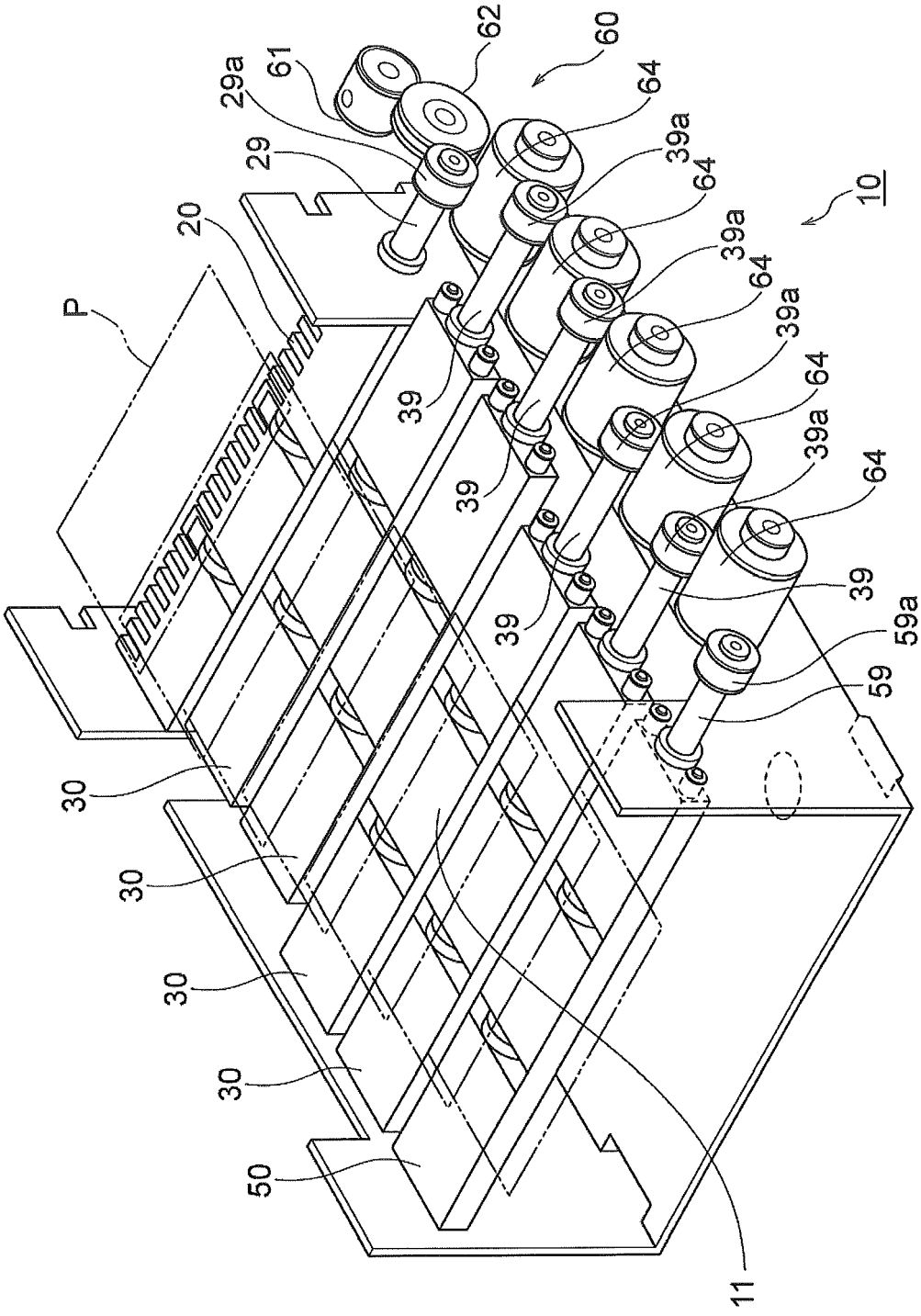


FIG. 3


62
60
61
29a
64
29
39a
64
20
10
39a
64
P
39a
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39
39a
64
39
39
64
39
59a
59
30
30
30
30
50
11

FIG. 4

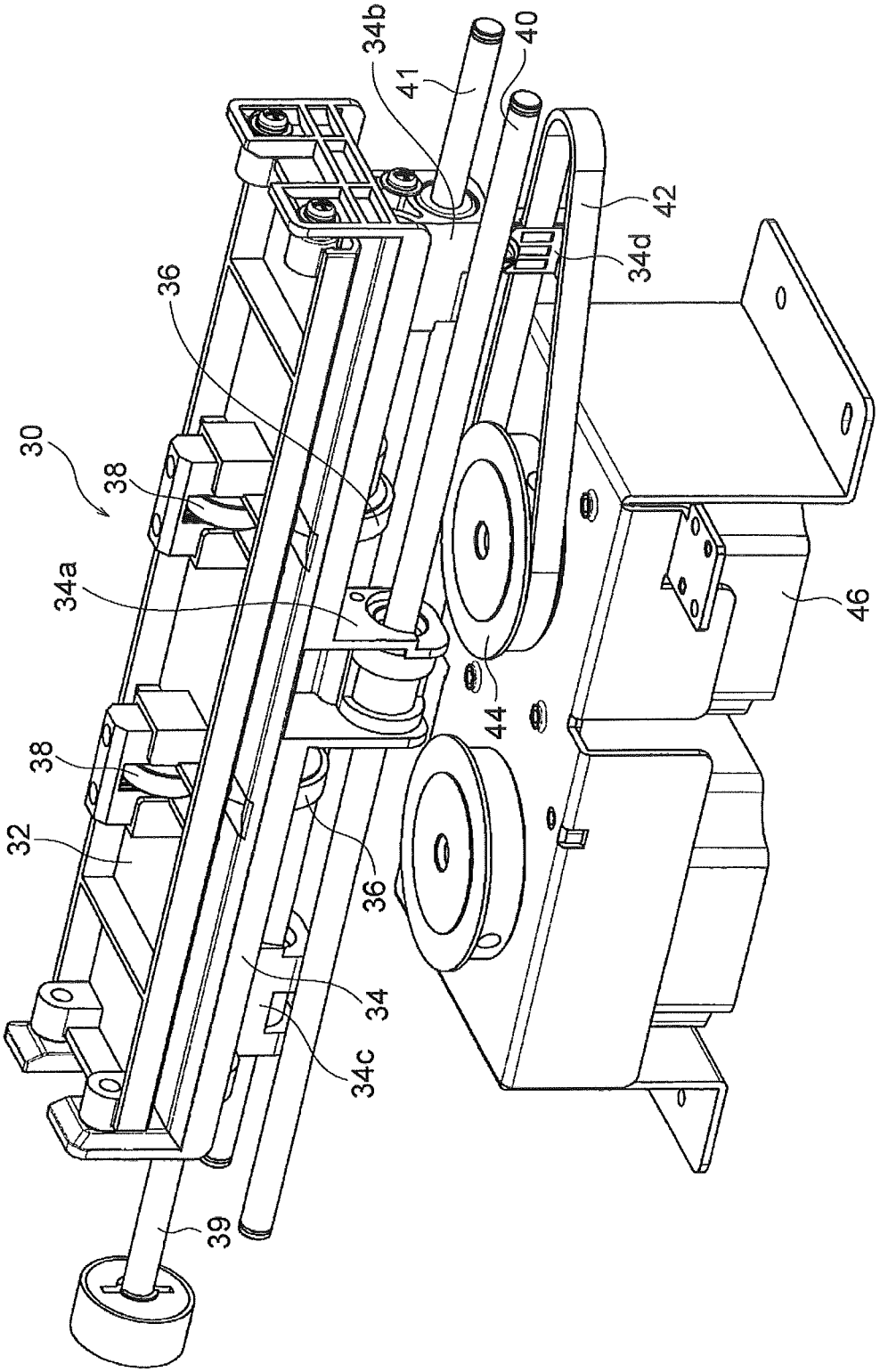
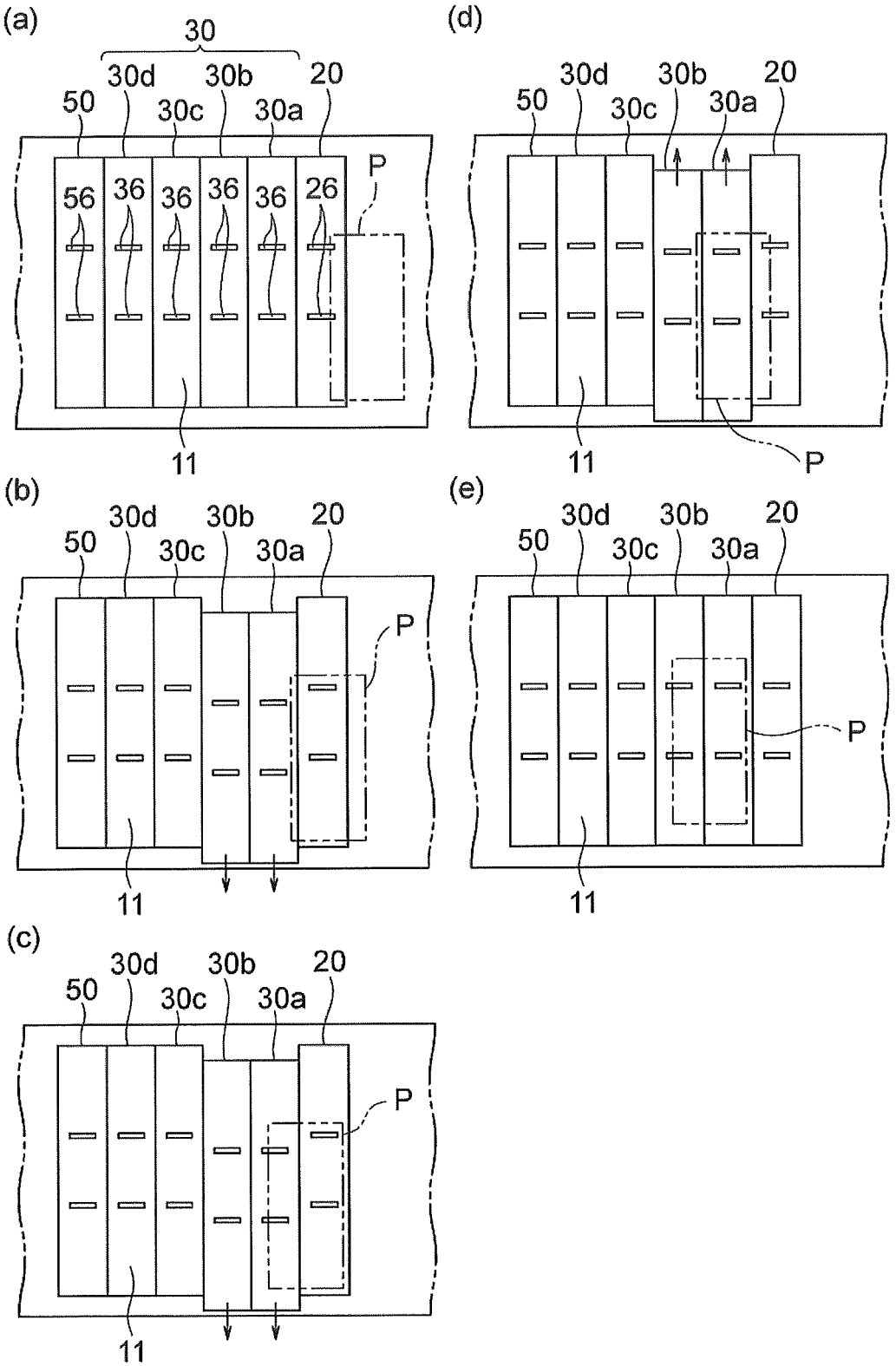


FIG. 5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30c
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36
36
36
26
P
11
(d)
30d
30b
20
50
30c
30a
11
P
(b)
30d
30b
20
50
30c
30a
P
11
(e)
30d
30b
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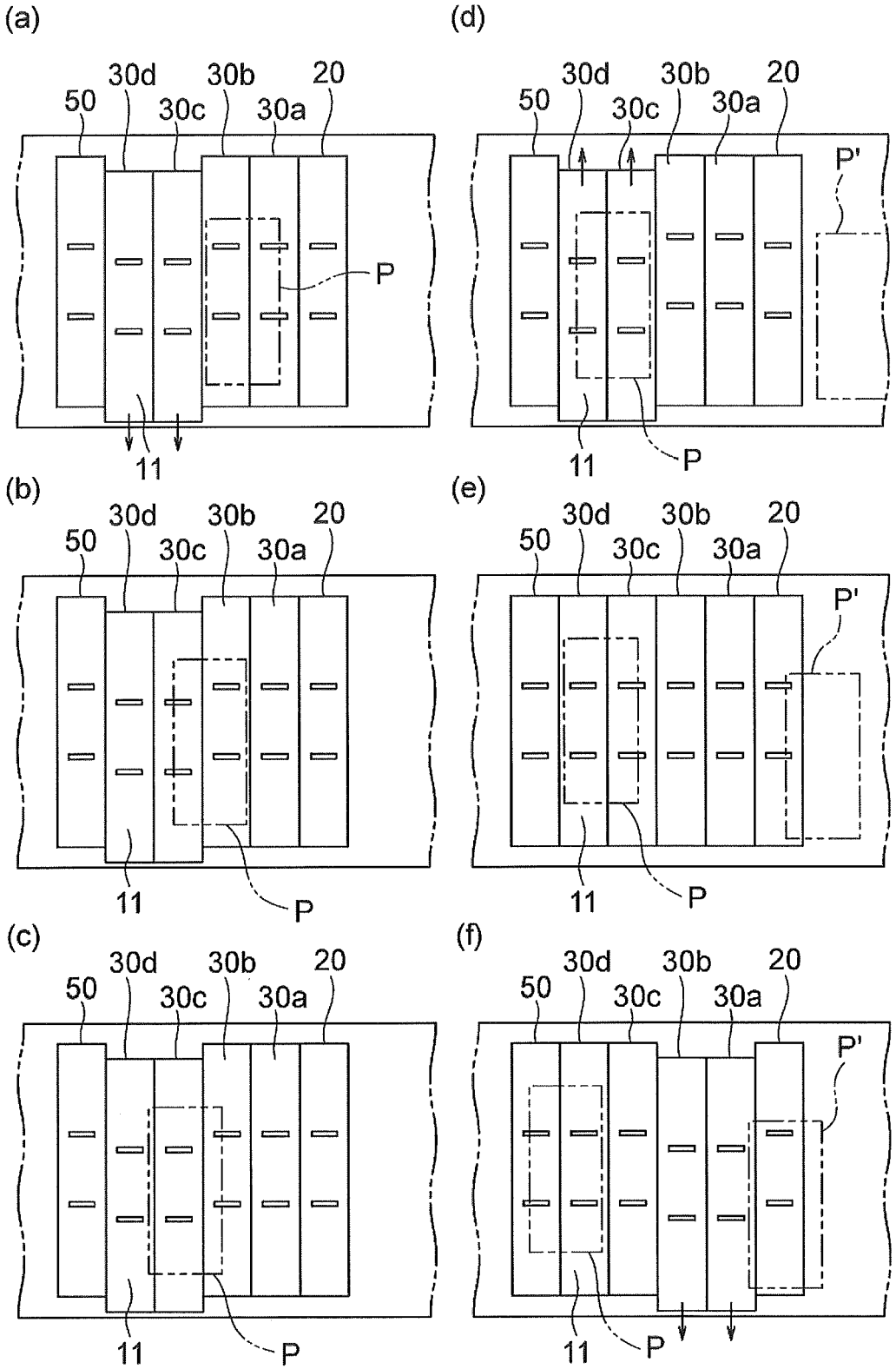
30c
30a
P
11
(c)
30d
30b
20
50
30c
30a
P
11

FIG. 6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P
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(b)
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30d
30c
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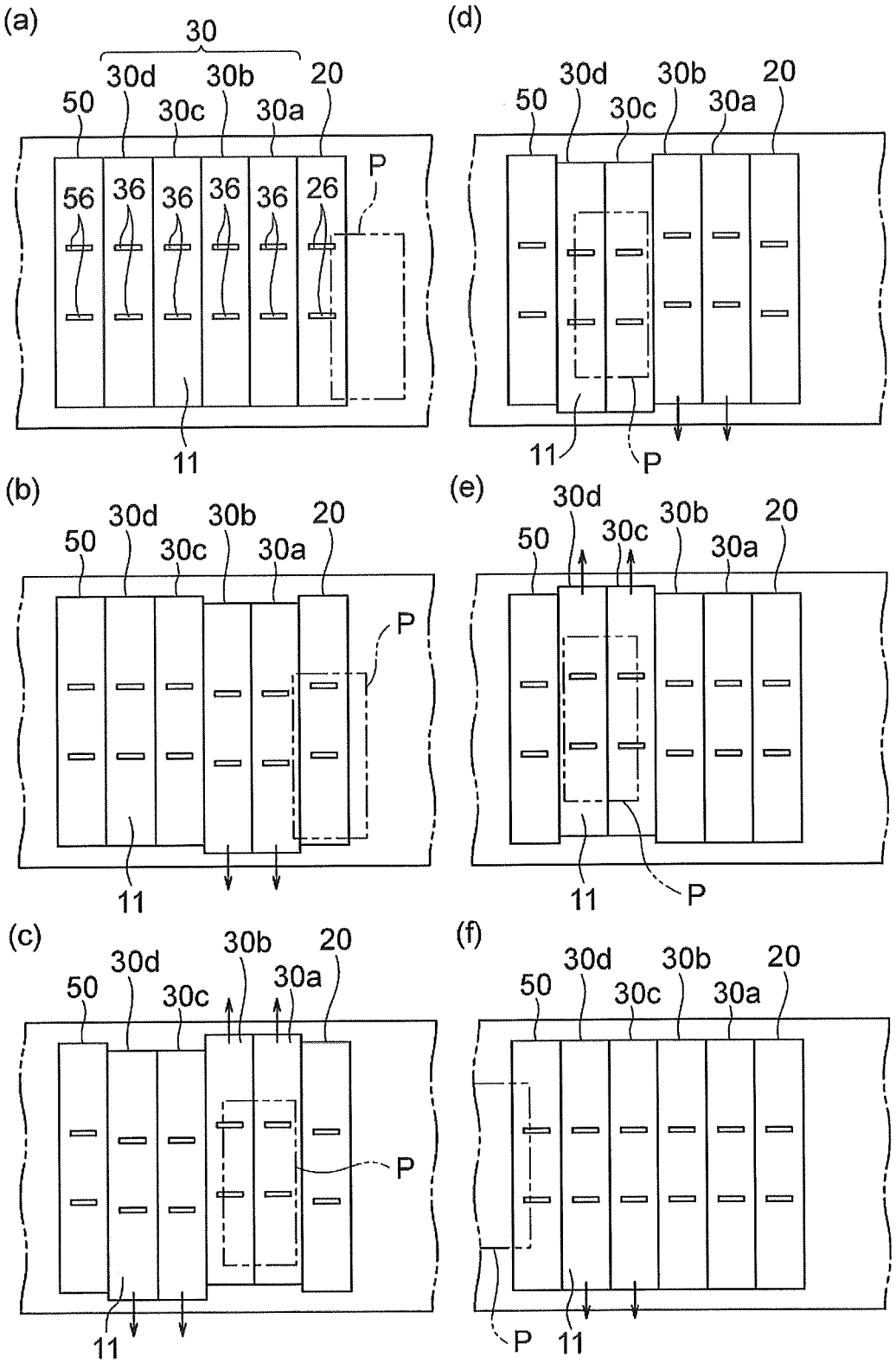
30a
20
11
P
(c)
50
30d
30c
30b
30a
20
11
P
(d)
50
30d
30c
30b
30a
20
P'
11
P
(e)
50
30d
30c
30b
30a
20
P'
11
P
(f)
50
30d
30c
30b
30a
20
P'
11
P

FIG. 7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30a
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36
36
26
P
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(d)
50
30d
30b
20
30c
30a
11
P
(b)
50
30d
30b
20
30c
30a
P
11
(e)
50
30d
30c
30b
20
30a
11
P
(c)
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(f)
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30d
30b
20
30c
30a
P
11

FIG. 8

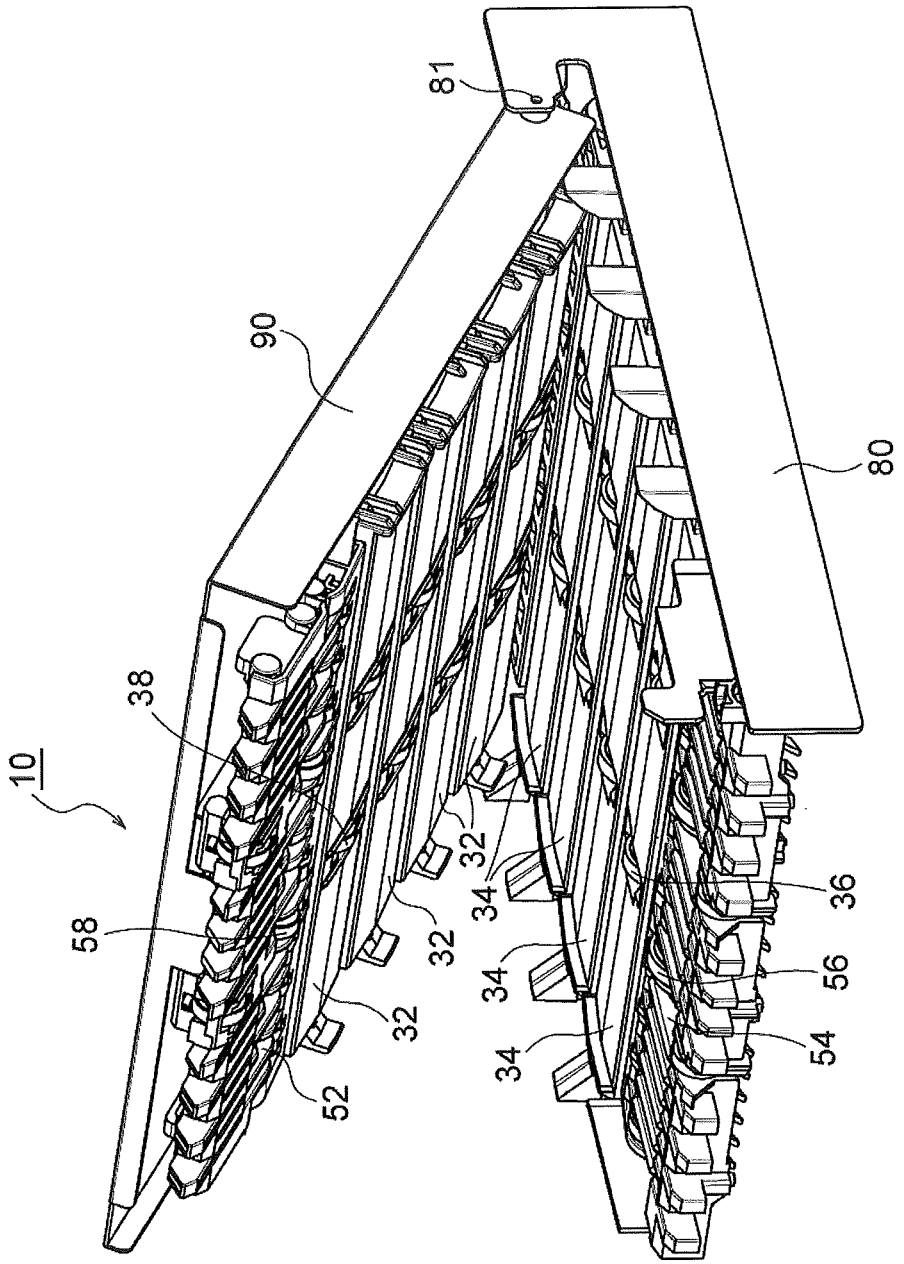
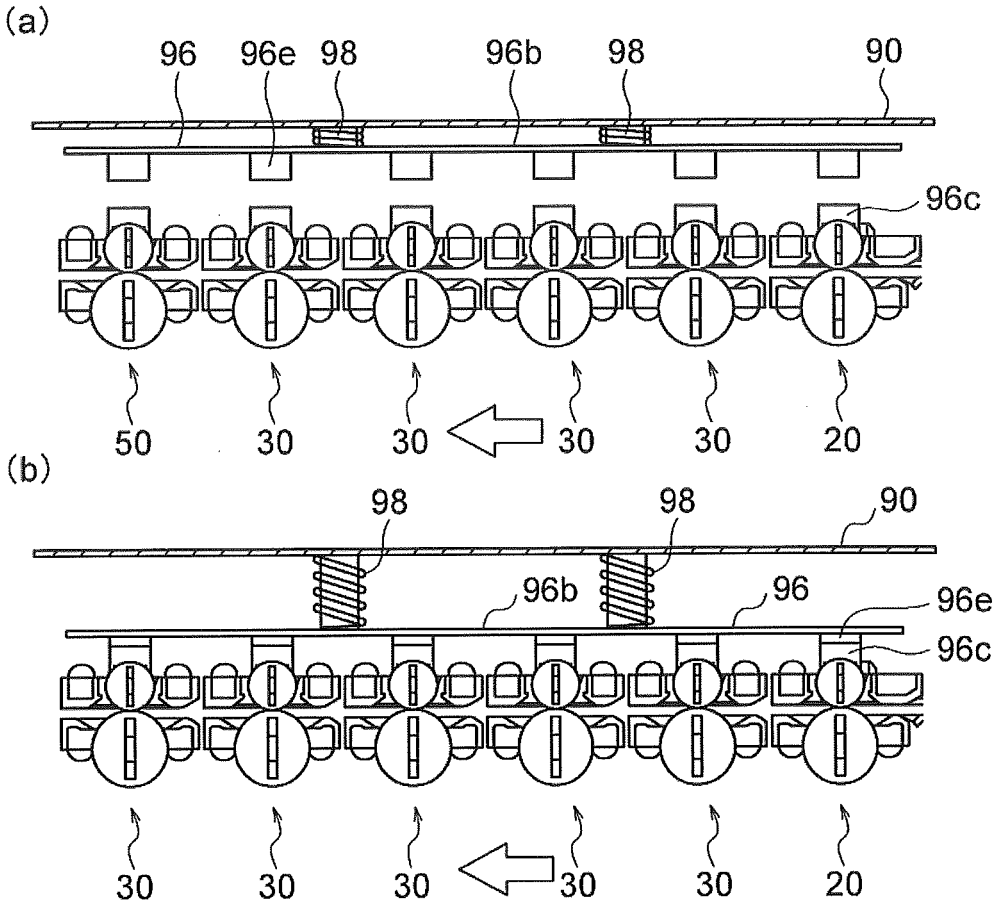


FIG. 9A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96c
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30
30
30
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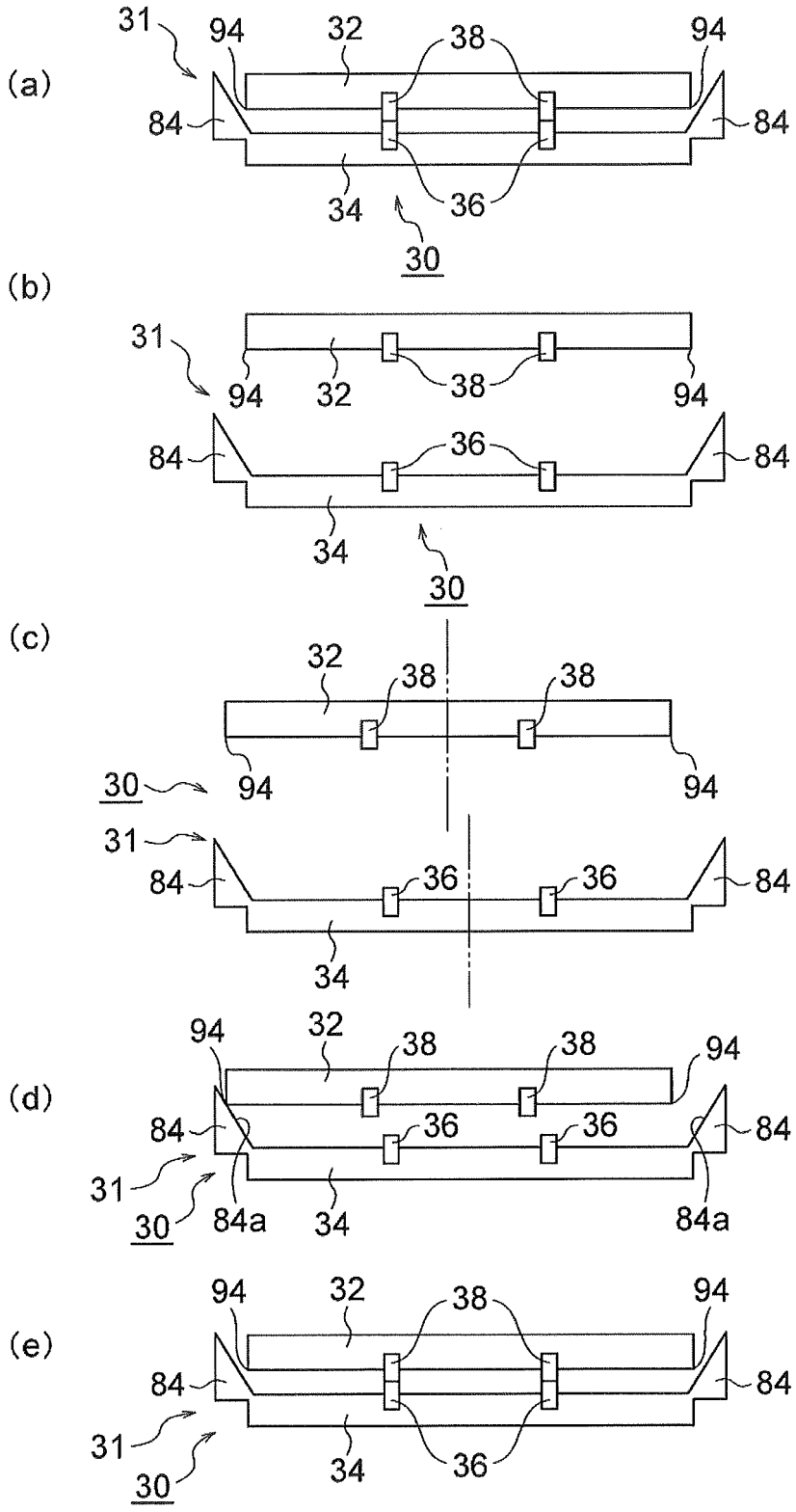
20
(b)
98
98
90
96b
96
96e
96c
30
30
30
30
30
20

FIG. 9B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(b)
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(d)
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38
38
94
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(e)
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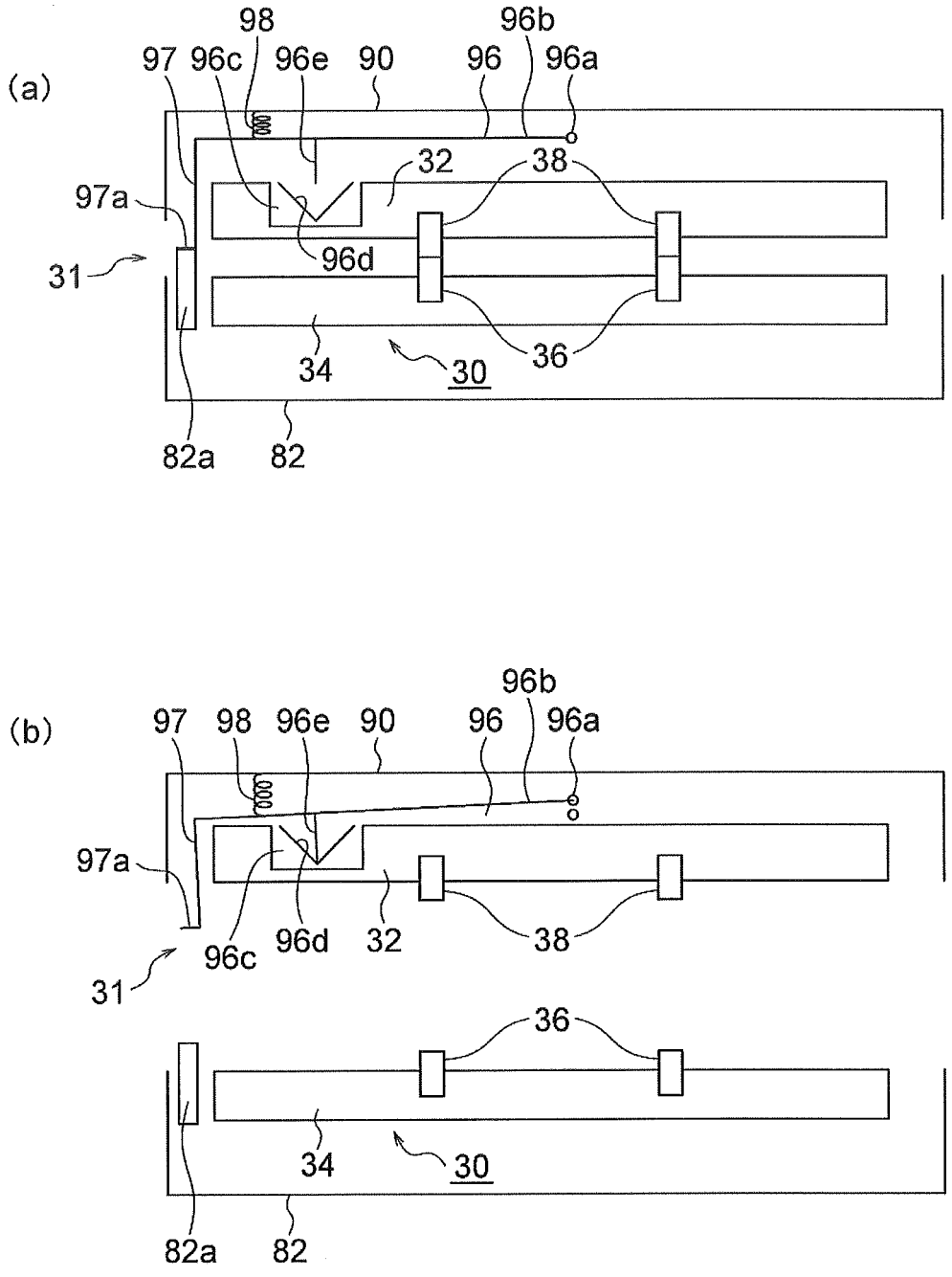
FIG. 10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82a
82
(b)
96b
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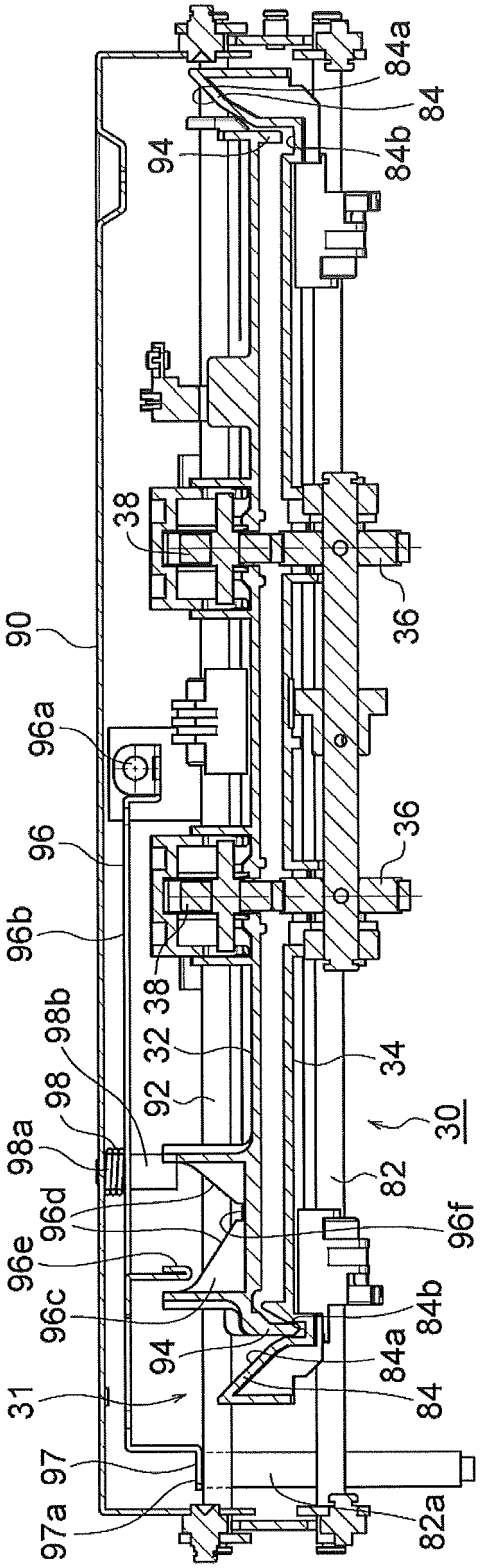
82a
82

FIG. 11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96d
96f
96e
96c
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84a
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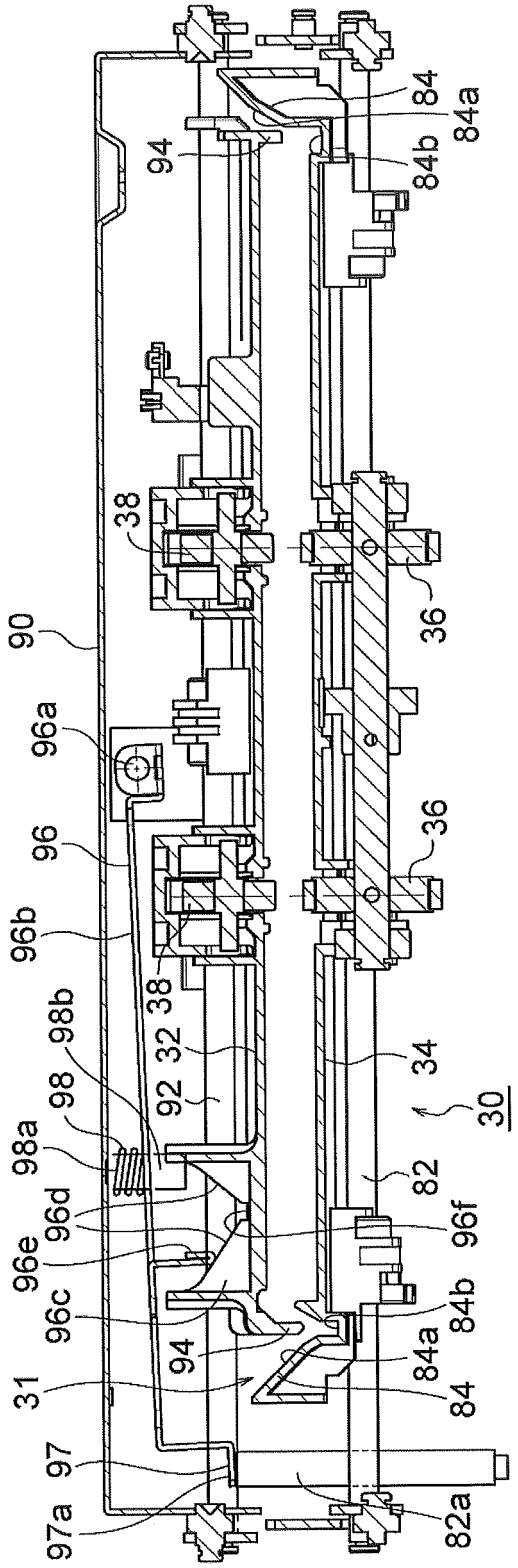
97
97a
82a

FIG. 12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96b
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98b
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34
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92
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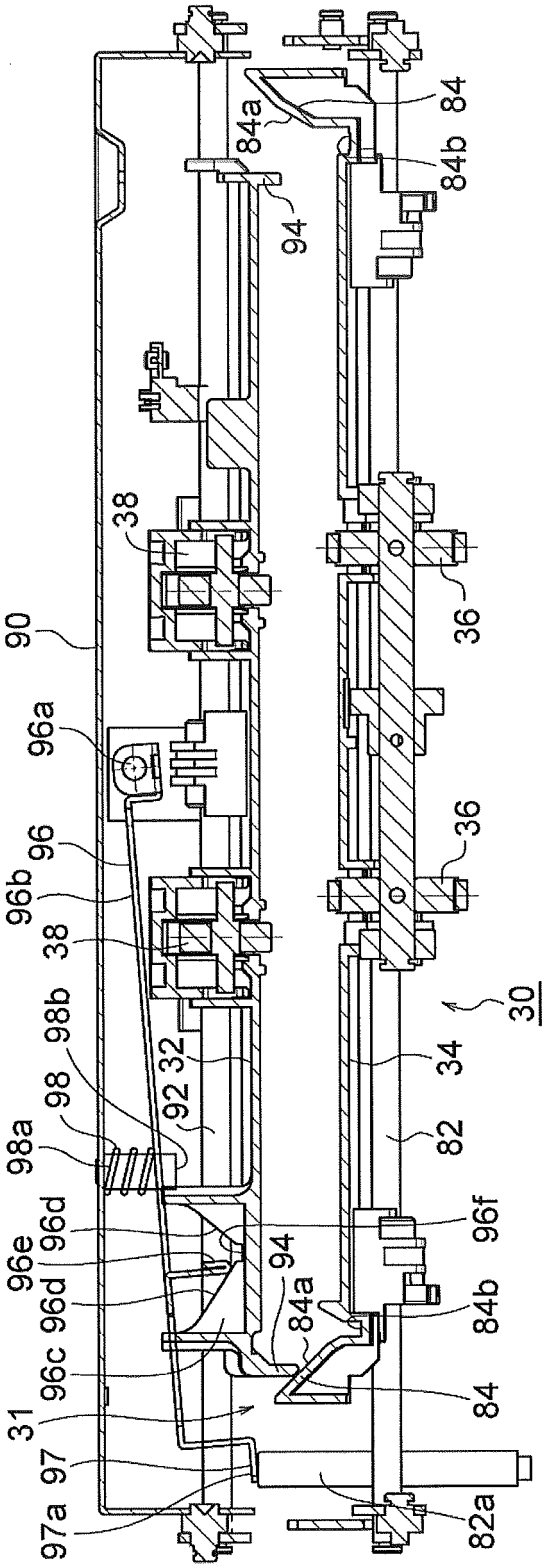
98a
82
96d
96f
96e
84b
96c
84a
94
31
84
97
97a
82a

FIG. 13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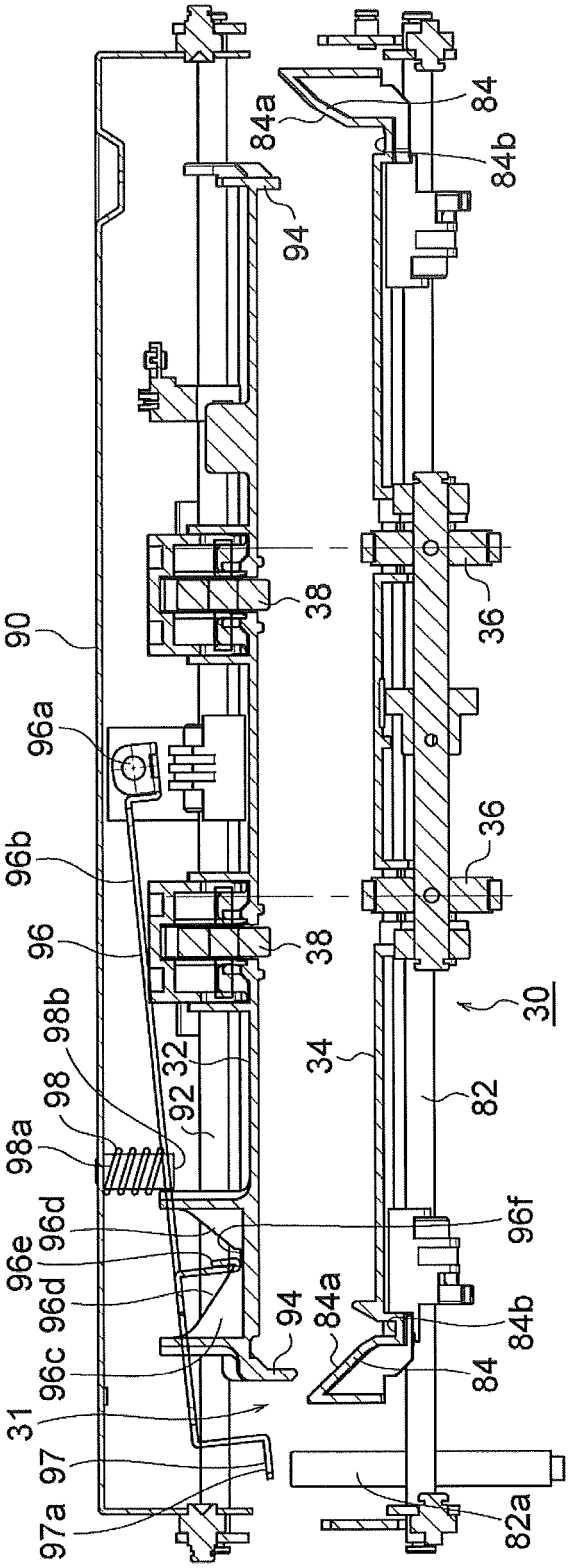
82
96d
96f
96e
96c
31
97
97a
82a

FIG. 14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98a
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97a
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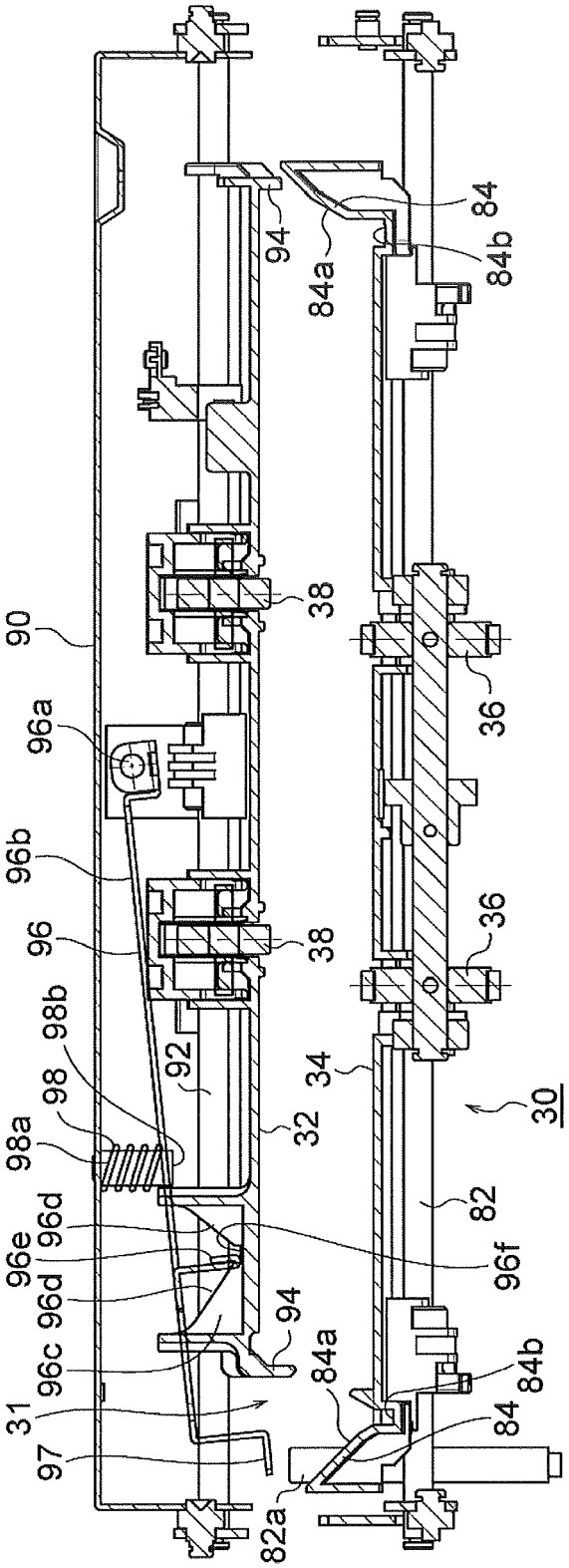
84b
84
82a

FIG. 15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96c
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84b
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34
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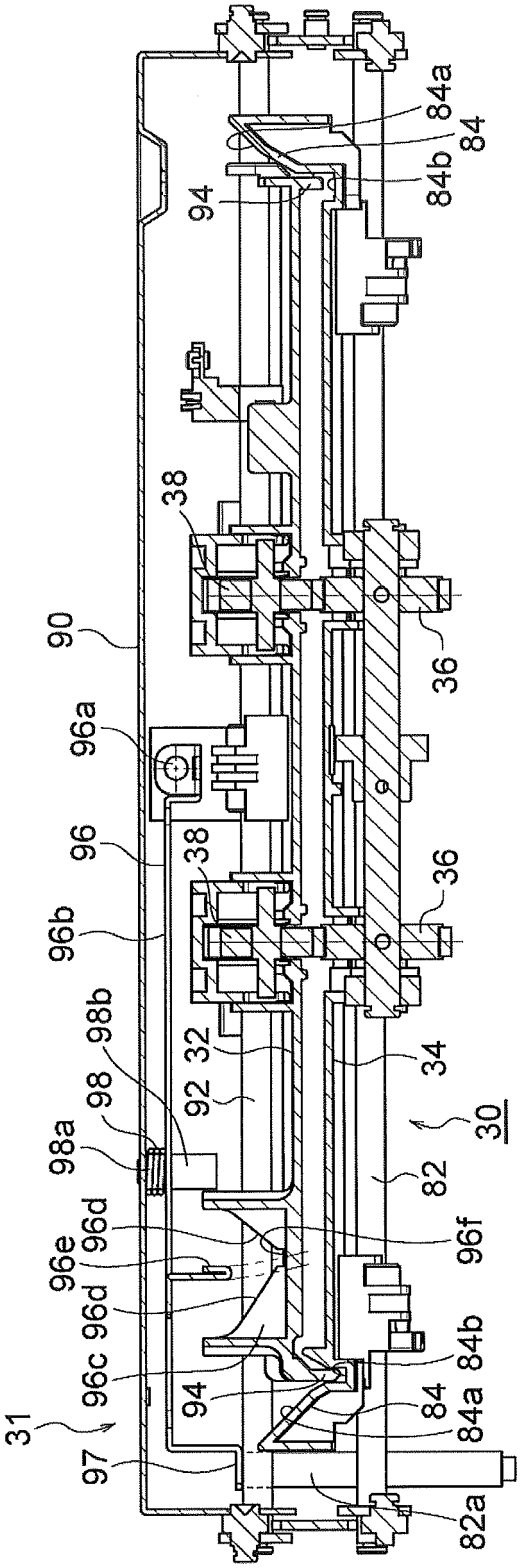
30
82
96d
96f
84b
84

FIG. 16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82a

FIG. 17

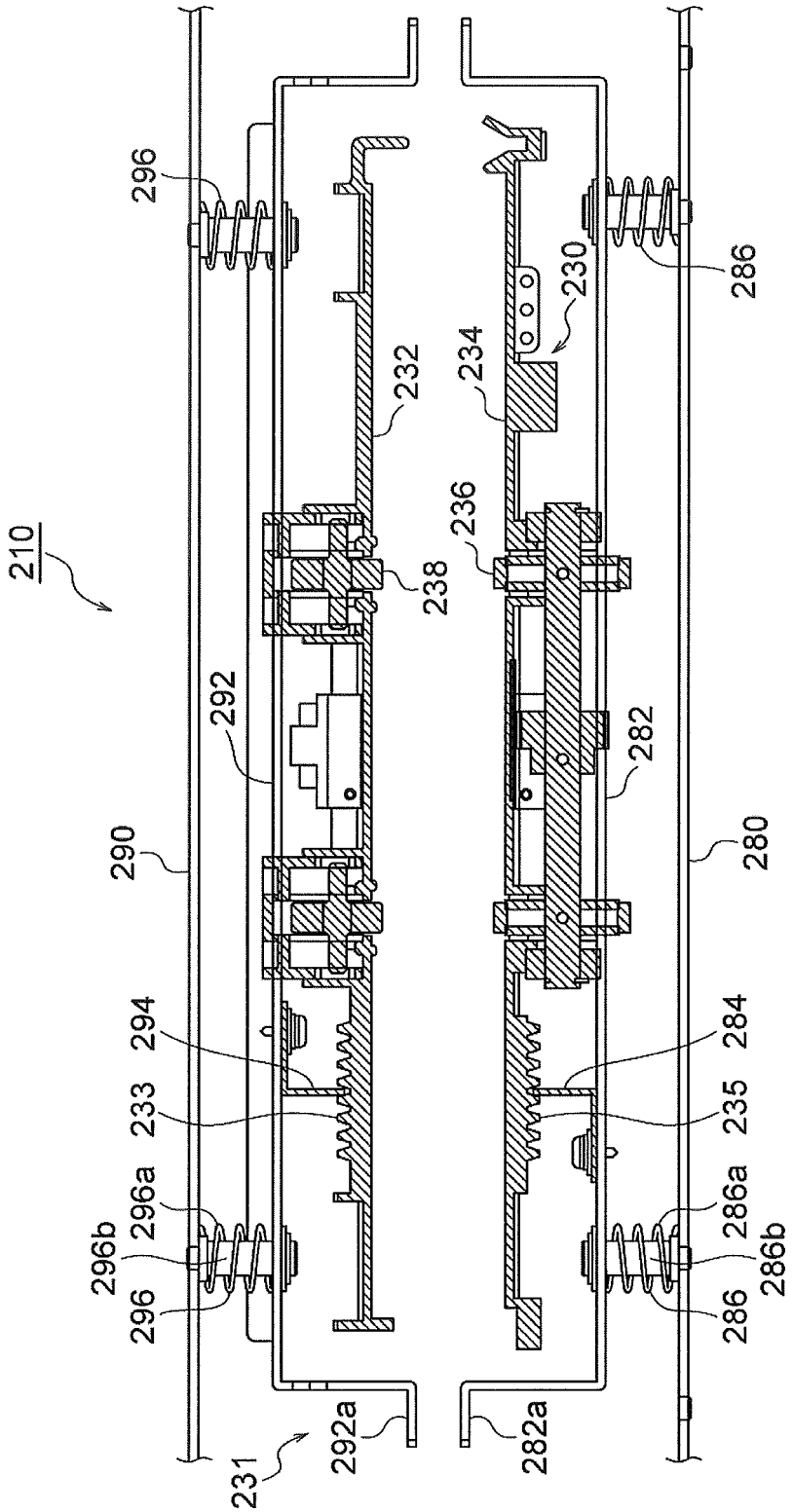
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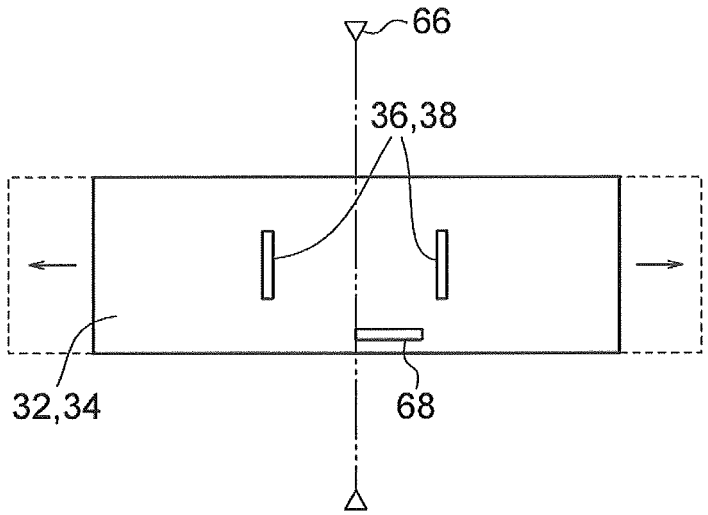
FIG. 18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36,38
32,34
68

FIG. 19

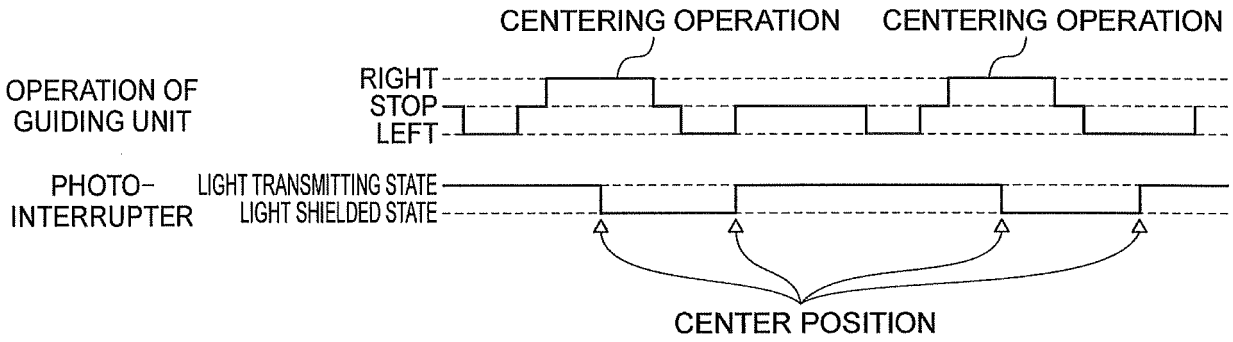
CENTERING OPERATION
CENTERING OPERATION
OPERATION OF GUIDING UNIT
RIGHT
STOP
LEFT
PHOTO-INTERRUPTER
LIGHT TRANSMITTING STATE
LIGHT SHIELDED STATE
CENTER POSITION

FIG. 20

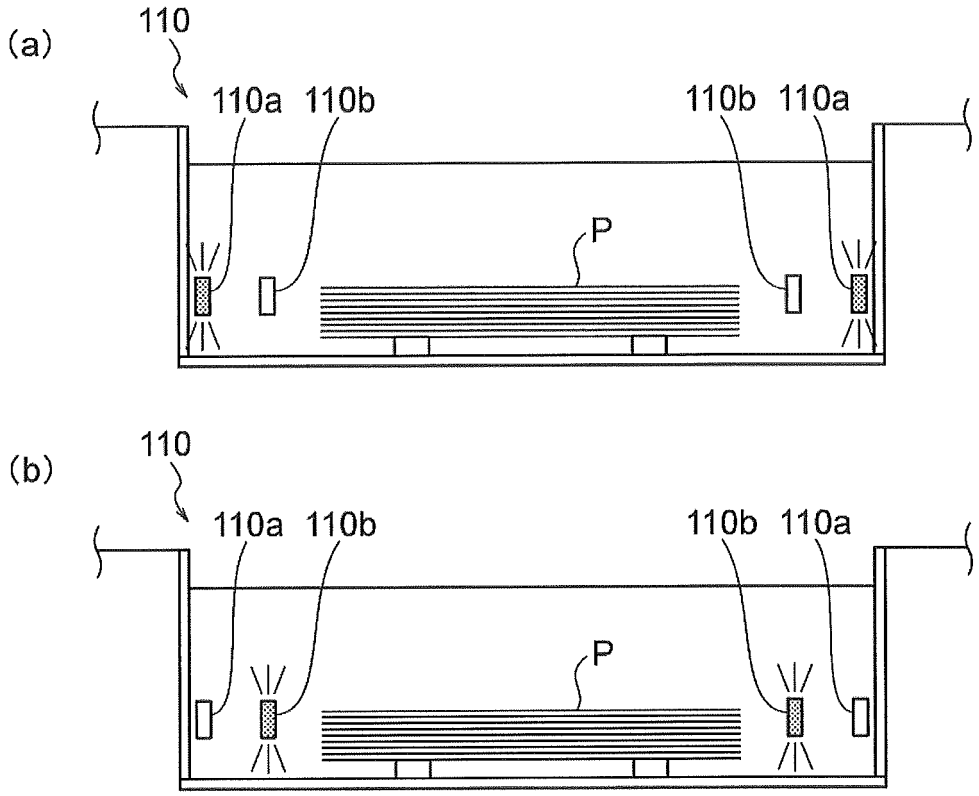

FIG. 21

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Patent documents cited in the description

- JP 2006111446 A **[0003] [0004]**
- JP 2002187667 A **[0006]**
- US 20080061499 A1 **[0006]**
- WO 2014208657 A1 **[0006]**