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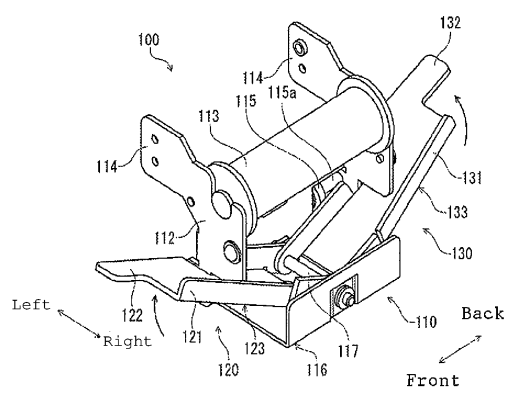
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(54) **PAPER SHEET PROCESSING DEVICE**

(57) To provide a paper sheet processing device that can smoothly send paper sheets into a machine body. The banknote processing device 1 is a banknote processing device 1 that presses banknotes S placed in an intake section 5 towards a feed roller 9 by means of a bill press 100 and takes in the banknotes S into a machine body 4, wherein the bill press 100 comprises a main pressing section 110 that is provided to be movable up and down in the intake section 5 and can press the substantial center of the banknotes S, and a first auxiliary pressing section 120 and a second auxiliary pressing section 130 that are provided independently of the main pressing section 110 and can press regions of the banknotes S other than the substantial center.

[Fig. 7]



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Description

Technical Field

[0001] The invention relates to a paper sheet processing device.

Background Art

[0002] There are paper sheet processing devices wherein paper sheets are stacked in an inserting section of a base machine, wherein the stacked paper sheets are taken in from an intake port of the inserting section, wherein the taken-in paper sheets are identified and counted by means of an identifying section, and wherein the identified and counted paper sheets are conveyed to a connecting unit connected to the base machine whereupon the connecting unit performs various processes (see, for instance, Patent Literature 1).

Citation List

Patent Literature

[0003] Patent Literature 1: Japanese Patent Application Laid-Open No. 2017-178509

Summary of Invention

Technical Problem

[0004] Some of the inserting sections of those paper sheet processing devices comprise a bill press for horizontally pressing the stacked paper sheets. As shown in Fig. 10, the paper sheets might be banknotes S formed with fine protrusions B for identifying types by touching them with fingers and for preventing counterfeiting. When such banknotes S are stacked in the inserting section, portions at which the protrusions B overlap become higher than the other portions, which causes uneven abutment in which the bill press only abuts the overlapping portions of the protrusions B of the banknotes S so that there was a risk that the banknotes S could not be accurately pressed and smoothly sent into the machine body.

[0005] Accordingly, the present invention provides a paper sheet feeding device that can smoothly send paper sheets into the machine body.

Solution to Problem

[0006] For achieving the above subject, the paper sheet processing device according to the present invention is a paper sheet feeding device that presses paper sheets placed in an intake section towards a feed roller by means of a bill press and takes the paper sheets in into a machine body, wherein the bill press comprises a main pressing section that is provided to be movable up and down in the intake section and can press the sub-

stantial center of the paper sheets, and auxiliary pressing sections that are provided independently of the main pressing section and can press regions of the paper sheets other than the substantial center.

[0007] According to this configuration, even if there are height variations in the paper sheets stacked in the intake section in which portions of the paper sheets at which protrusions overlap become locally higher, the main pressing section presses the substantial center of the paper sheets while the auxiliary pressing sections can press the paper sheets in a swinging state in accordance with heights of the paper sheets, which restricts uneven abutment in which the bill press only abuts a part of the paper sheets so that the paper sheets are stably pressed towards the feed roller over a wide range and the paper sheets can be smoothly sent into the machine body.

Advantageous Effect of Invention

[0008] According to the present invention, paper sheets are stably pressed towards the feed roller over a wide range so that the paper sheets can be smoothly sent into the machine body.

Brief Description of Drawings

[0009]

[Figure 1] Figure 1 is a front view showing a banknote processing device according to an embodiment of the present invention.

[Figure 2] Figure 2 is a perspective view showing a base machine.

[Figure 3] Figure 3 is a plan view showing an inserting section with an installation distance of a pair of guide members being set to be closest.

[Figure 4] Figure 4 is a plan view showing the inserting section with the installation distance of the pair of guide members being set to be furthest.

[Figure 5] Figure 5 is a perspective view showing a bill press in which a first and second auxiliary pressing sections are in a horizontal state.

[Figure 6] Figure 6 is a side view showing the bill press in which the first and second auxiliary pressing sections are in the horizontal state.

[Figure 7] Figure 7 is a perspective view showing the bill press in which the first and second auxiliary pressing sections are in a swinging state.

[Figure 8] Figure 8 is a side view showing the bill press in which the first and second auxiliary pressing sections are in the swinging state.

[Figure 9] Figure 9 is a side view showing a situation in which the stacked banknotes of uneven height are pressed by the bill press.

[Figure 10] Figure 10 is a perspective view showing a banknote with protrusions being formed at an end in the longitudinal direction.

Description of Embodiment

[0010] A banknote processing device 1 according to an embodiment of the present invention will be explained based on the drawings. It should be noted that, hereinafter, when reference is made to numbers, numerical values, amounts, ranges, or the like of components, it does not mean that those particular numbers are restrictive, and they might be greater or less than those particular numbers unless specifically indicated or they are theoretically clearly limited to particular numbers.

[0011] Further, when reference is made to shapes or positional relationships of components or the like, it shall include shapes or the like that substantially approximate or resemble unless specifically indicated or that can be theoretically considered apparently not to be.

[0012] Further, drawings might exaggerate, by for instance, enlarging characteristic portions for ease of understanding features, and dimensional proportions or the like of the components are not necessarily identical to those in reality.

<Structure of the Banknote Processing Device>

[0013] As shown in Fig. 1, the banknote processing device 1 comprises a base machine 2 and a connecting unit 3. The connecting unit 3 is configured by selecting at least of the number and type of units that respectively have different functions and by combining them with the base machine 2 in an appropriate order.

<Configuration of the Base Machine>

[0014] The base machine 2 identifies and counts a banknotes S inserted from outside by an operator. The base machine 2 comprises an intake section 5 on a right-hand surface 4a of a machine body 4 when seen from the operator of the banknote processing device 1.

[0015] The banknotes S are inserted into the intake section 5 from outside by an operator. The intake section 5 comprises a bottom surface section 6 onto which the banknotes S are placed, and a back wall surface section 7 provided upward of a left end of the bottom surface section 6 in the left-right direction. The bottom surface section 6 and the back wall surface section 7 are formed to be substantially in a plane in the front-back direction.

[0016] The banknotes S are vertically stacked and placed on the bottom surface section 6 with their short sides extending along the left-right direction and their long sides along the front-back direction (direction perpendicular to the image plane of Fig. 1). Further, the bottom surface section 6 is inclined downward to the left with respect to the horizontal plane when seen from the front of the machine body 4, and the banknotes S stacked on the bottom surface section 6 abut with each of their long sides against the back wall surface section 7 along the inclination of the bottom surface section 6 and are collected on one side so that positions in the short direction

are aligned.

[0017] An intake port 8 that pierces through the back wall surface section 7 in the thickness direction is provided in the vicinity of the bottom surface section 6. The length of the intake section 8 in the front-back direction is set to be longer than the long sides of the banknotes S.

[0018] The intake section 5 comprises a feed roller 9 provided at the bottom surface section 6, an intake roller 10 provided in vicinity of the intake port 8, a separating roller 11 provided to oppose the intake roller 10, and a detecting section 12 for sensing taken-in banknotes S and for detecting taking-in states.

[0019] The feed roller 9 is provided on a lower side of the bottom surface section 6 and partially projects upward from the bottom surface section 6. The feed roller 9 separates each of the banknotes S stacked on the bottom surface section 6 one by one from the lowermost layer and sends them into the interior of the machine body 4 upon passing the intake port 8. The intake roller 10 takes in the banknotes S kicked out from the feed roller 9 and delivers them to an identifying and conveying section 13. The separating roller 11 separates the banknotes S taken in by the intake roller 10 one by one. The banknotes S are moved such that their short sides extend along the conveying direction, fed out to the left of the machine body 4, and are moved in the banknote processing device 1 while maintaining a posture with their long sides extending along the front-back direction.

[0020] The intake section 5 comprises a bill press 100 that is vertically movable along the back wall surface section 7. The bill press 100 presses the banknotes S stacked on the bottom surface section 6 towards the feed roller 9 from above. Accordingly, in the intake section 5, the banknote S of the lowermost layer from among the stacked banknotes S sticks to the feed roller 9 and is kicked out smoothly.

[0021] The base machine 2 comprises the identifying and conveying section 13 that receives and conveys the banknotes S fed out from the intake section 5, and an identifying section 14 that identifies the banknotes S that are being conveyed by the identifying and conveying section 13. The identifying and conveying section 13 extends horizontally from the intake section 5 towards the left side in the left-right direction and then extends upward in the vertical direction. The identifying section 14 is provided at a portion that extends upward of the identifying and conveying section 13.

[0022] The base machine 2 comprises a connecting and conveying section 15 that extends from an upper end of the identifying and conveying section 13 towards a lefthand surface 4b of the machine body 4 and opens to the lefthand surface 4b. The connecting and conveying section 15 receives from the identifying and conveying section 13 the banknotes S that have been identified by the identifying section 14 as objects of processing by the connecting unit 3 and conveys them from the base machine 2 towards the connecting unit 3.

[0023] The base machine 2 comprises a rejecting and

conveying section 17 that extends from an upper end of the identifying and conveying section 13 towards the right side and is connected to a rejecting section 16 that is provided upward of the intake section 5. The rejecting and conveying section 17 conveys the banknotes S that have not been identified by the identifying section 14 as objects of processing by the connecting unit 3 to the rejecting section 16.

[0024] The rejecting section 16 stacks the banknotes S fed out from the end of the rejecting and conveying section 17 so that they can be taken out to the outside. The rejecting section 16 drops the banknotes S fed out from the rejecting and conveying section 17 towards a bottom surface 19 by means of an impeller 18, and the fed out banknotes S are stacked on the bottom surface 19 in a state in which each of their long sides abut a wall surface 20 along an inclination of the bottom surface 19 and are collected on one side.

[0025] The base machine 2 comprises in its interior a controlling section 21 that controls components comprising the base machine 2. The controlling section 21 controls the overall base machine 2 and is also connected to the connecting unit 3 via an interface in a communicable manner to output control commands.

[0026] In this way, in the base machine 2, the feed roller 9 kicks out the banknotes S inserted into the intake section 5 towards the intake port 8 side, and the intake roller 10 and the separating roller 11 separate them one by one and hand them over to the identifying and conveying section 13. Then, the identifying and conveying section 13 conveys the banknotes S and the identifying section 14 counts them while identifying them. Thereafter, the banknotes S that have been identified by the identifying section 14 as objects of processing are conveyed to the connecting unit 3 by the connecting and conveying section 15 while the banknotes S that have not been identified by the identifying section 14 as objects of processing are conveyed to the rejecting section 16 by means of the rejecting and conveying section 17.

<Configuration of the Connecting Unit>

[0027] The connecting unit 3 receives the banknotes S conveyed by the connecting and conveying section 15. The connecting unit 3 is configured by combining a stacking unit 3a that sorts the banknotes S according to their denominations and that stacks them so that they can be taken out to the outside, and a bundling unit 3b that stacks the banknotes S by a predetermined number (for instance, 100 sheets) and binds them with a bundling tape into bundles. It should be noted that the operator can arbitrarily choose which of the stacking process by the stacking unit 3a or the bundling process by the bundling unit 3b shall be executed.

[0028] The connecting unit 3 is not limited to one comprising each of the stacking unit 3a and the bundling unit 3b, and it could be provided with only either one of the stacking unit 3a or the bundling unit 3b. Also, the instal-

lation number of the stacking unit 3a and the bundling unit 3b is not limited to one, and it is possible to provide two or more of the units.

[0029] The stacking unit 3a comprises a connecting and conveying section 22a that is connected to the connecting and conveying section 15, and a processing and conveying section 22b that branches from an intermediate position of the connecting and conveying section 22a and extends downward. The connecting and conveying section 22a receives the banknotes S from the connecting and conveying section 15 and conveys them. The stacking unit 3a can be connected to another stacking unit 3a on a side opposite to the base machine 2, and in this case, the connecting and conveying section 22a conveys the banknotes S to the other stacking unit 3a.

[0030] The processing and conveying section 22b comprises a conveying main section 22c that receives the banknotes S from the connecting and conveying section 22a and conveys them downward, and branching sections 22d to 22g that branch from the conveying main section 22c into four.

[0031] The stacking unit 3a comprises stacking sections 23a to 23d that respectively perform stacking processes of receiving and stacking the banknotes S fed out from the conveying main section 22c. The stacking sections 23a to 23d correspond to the branching sections 22d to 22g and are arranged on the right side thereof and are provided such that their positions in the left-right direction are substantially identical and aligned in the vertical direction.

[0032] The stacking section 23a comprises a bottom surface 24a that slightly inclines downward to the right with respect to the horizontal, a wall plate section 24b that is arranged on the upper side of the bottom surface 24a to be perpendicular therewith, and an impeller 24c that is arranged on the left of the bottom surface 24a so as to make the banknotes S fed out from the branching section 22d abut against the bottom surface 24a and to push them towards the wall plate section 24b. It should be noted that the stacking sections 23b to 23d have the same structure as the stacking section 23a.

[0033] Further, the stacking sections 23a to 23d open to a front surface of the stacking unit 3a so that the banknotes S can be taken out to the outside from the front surface. That is, the stacking section 23a stacks the banknotes S fed out from the branching section 22d so that they can be taken out to the outside, the stacking section 23b stacks the banknotes S fed out from the branching section 22e so that they can be taken out to the outside, the stacking section 23c stacks the banknotes S fed out from the branching section 22f so that they can be taken out to the outside, and the stacking section 23d stacks the banknotes S fed out from the branching section 22g so that they can be taken out to the outside.

[0034] The stacking unit 3a is provided in its interior with a controlling section 25 that controls the stacking unit 3a upon receiving control commands from the controlling section 21.

[0035] In this manner, the stacking unit 3a conveys the banknotes S that have been received from the base machine 2 to the stacking sections 23a to 23d by means of the connecting and conveying section 22a and the processing and conveying section 22b. Then, the stacking sections 23a to 23d perform stacking processes of the banknotes S that have been identified as objects of processing.

[0036] The bundling unit 3b comprises a connecting and conveying section 26a that is connected to the connecting and conveying section 22a, and a processing and conveying section 26b that branches from an intermediate position of the connecting and conveying section 26a and extends downward. The connecting and conveying section 26a receives the banknotes S from the connecting and conveying section 22a and conveys them. The bundling unit 3b can be connected to another bundling unit 3b on a side opposite to the stacking unit 3a, and in this case, the connecting and conveying section 26a conveys the banknotes S to the other bundling unit 3a.

[0037] The processing and conveying section 26b comprises a conveying main section 26c that receives the banknotes S from the connecting and conveying section 26a and conveys them downward, and a branching section 26d that branches from the conveying main section 26c.

[0038] An aligning and stacking section 27a is provided at an end of the conveying main section 26c, and an aligning and stacking section 27b is provided at an end of the branching section 26d. The aligning and stacking sections 27a, 27b perform aligning and stacking processes in which they respectively receive the banknotes S fed out from the processing and conveying section 26b and align and stack them in a horizontal posture in the vertical direction into a predetermined number of bundling units.

[0039] The bundling unit 3b comprises a bundling section 28 that stacks and bundles the banknotes S by a predetermined number. The bundling section 28 comprises a descending and conveying section 29 that places the stacked banknotes S sent out from the aligning and stacking sections 27a, 27b in a horizontal state and descends them downward in the vertical direction. Downward of the aligning and stacking section 27a, the bundling section 28 also comprises a bundling mechanism section 30 for creating bundled banknotes, which are loose banknotes S that have been gathered by only a predetermined number of bundling units and united with a bundling tape, obtained by bundling stacked banknotes S, which have been descended and conveyed by the descending and conveying section 29 and sent out from the descending and conveying section 29 in a horizontal state, by a bundling tape.

[0040] Moreover, the bundling section 28 comprises an outwardly discharging section 31 for discharging the bundled banknotes created in the bundling mechanism section 30 to the outside. The outwardly discharging sec-

tion 31 is, for instance, configured in that bundled banknotes can be received and pulled out from a front surface of a machine body 32 of the bundling unit 3b. It should be noted it could be a configuration in which the outwardly discharging section 31 is provided at a front surface of the bundling mechanism section 30, in which the bundled banknotes are conveyed to a bundled banknote outlet (not shown) provided at a front surface of the machine body 32, and in which the bundled banknotes can be discharged to the outside from the bundled banknote outlet.

[0041] The bundling unit 3b is provided in its interior with a controlling section 33 that controls the bundling unit 3b upon receiving control commands from the controlling section 21.

[0042] In this manner, the bundling unit 3b conveys the banknotes S received from the stacking unit 3a to the aligning and stacking sections 27a, 27b by means of the connecting and conveying section 26a and the processing and conveying section 26b, and conveys the banknotes S from the aligning and stacking sections 27a, 27b to the bundling section 28 by means of the descending and conveying section 29. Then, the bundling section 28 performs bundling processes of the banknotes S that have been identified as objects of processing.

<Configuration of the Intake Section >

[0043] As shown in Fig. 2, there is provided, at a front surface 34 of the base machine 2, a touch panel type operation displaying section 35 that enables inputs of operations by an operator and provides displays to the operator. Further, the base machine 2 comprises a gesture sensor 36 that detects movements of the operator.

[0044] The feed roller 9 comprises a pair of roller bodies 9a that are spaced apart from each other by a predetermined distance in the front-back direction. The pair of roller bodies 9a rotate about the same axis extending along the front-back direction. Between the pair of roller bodies 9a, the intake section 5 is provided with a residual sensor 37 that senses residual of banknotes S on the bottom surface section 6.

[0045] A pair of guide grooves 38, which extend in the perpendicular direction of the bottom surface section 6, are formed on the back wall surface section 7. The pair of guide grooves 38 are arranged to be spaced apart from the central position of the back wall surface section 7 in the front-back direction each at equal distances in the front-back direction.

[0046] There is a residual amount sensor 39 at a position between the pair of guide grooves 38 arranged apart from the bottom surface section 6 by a predetermined distance. The residual amount sensor 39 senses whether a height of the banknotes S placed on the bottom surface section 6 is equal to or higher than the position of the residual amount sensor 39 or it is lower than the position of the residual amount sensor 39. Hereinafter, the amount of banknotes S corresponding to a height of

the banknotes S that is sensible by the residual amount sensor 39 is referred to as "sensible amount".

[0047] The intake section 5 is comprised with a pair of guide members 40, 41 that are configured such that the distance between each other is variable in a plurality of steps and position the banknotes S placed on the bottom surface section 6 in the front-back direction.

[0048] As shown in Fig. 3 and Fig. 4, the guide member 40 comprises a flat plate-like guide wall section 40a, a flat plate-like mounting section 40b that extends in a width direction of the guide wall section 40a, and a flat plate-like expanding section 40c that expands while inclining with respect to the guide wall section 40a. The mounting section 40b is formed with a plurality of mounting holes in form of elongated holes (not shown).

[0049] The guide wall section 40a is formed in a substantially L shape with an upper section projecting further to the left side in the left-right direction than the mounting section 40b so that an opening section 40d is formed into which an end of the bill press 100 is inserted.

[0050] The guide member 41 has substantially the same configuration as the guide member 40 except that it has a difference size and that it is formed to be symmetrical. The guide member 41 comprises a flat plate-like guide wall section 41a, a flat plate-like mounting section 41b that extends in a width direction of the guide wall section 41a, and a flat plate-like expanding section 41c that expands while inclining with respect to the guide wall section 41a. The mounting section 41b is formed with a plurality of mounting holes in form of elongated holes (not shown) that are formed to match positions of the plurality of mounting holes of the mounting section 40b in the front-back direction.

[0051] The guide wall section 41a is formed in a substantially L shape with an upper section projecting further to the left side in the left-right direction from the mounting section 41b so that an opening section 41d is formed into which an end of the bill press 100 is inserted.

[0052] Four lower guide positioning openings 42 to which a lower end of the guide wall section 40a is mounted are provided at the bottom surface section 6 in the vicinity of a front end in the front-back direction. Further, four lower guide positioning openings 43 to which the lower end of the guide wall section 40a is mounted are provided at the bottom surface section 6 in the vicinity of a rear side end in the front-back direction. The lower guide positioning openings 42, 43 are either through holes piercing through the bottom surface section 6 or concave grooves that dent from the bottom surface section 6. The lower guide positioning openings 42, 43 are respectively arranged symmetrically with respect to the center of the bottom surface section 6 in the front-back direction.

[0053] Fig. 3 shows a state in which the guide wall sections 40a, 41a are respectively mounted to the innermost ones of the four lower guide positioning openings 42, 43, and Fig. 4 shows a state in which the guide wall sections 40a, 41a are respectively mounted to the outermost ones

of the four lower guide positioning openings 42, 43.

[0054] The intake section 5 comprises a front upright wall 44 that rises to the right side in the left-right direction from a front edge of the back wall surface section 7 in the front-rear direction, and a rear upright wall 45 that rises to the right in the left-right direction from a rear edge of the back wall surface section 7 in the front-rear direction. The front upright wall 44 and the rear upright wall 45 are formed to be perpendicular to the bottom surface section 6 and the back wall surface section 7.

[0055] The front upright wall 44 is provided with a guide mounting section 46 for mounting the mounting section 40b. The guide mounting section 46 extends forward in the front-rear direction from a right edge of the front upright wall 44 in the left-right direction. The guide mounting section 46 is formed with a plurality of screw holes (not shown). In a state the mounting section 40b is overlapped onto the guide mounting section 46, the mounting holes of the mounting section 40b and the screw holes of the guide mounting section 46 are fastened by means of mounting screws (not shown) to mount the guide member 40 to the guide mounting section 46.

[0056] Further, the rear upright wall 45 is provided with a guide mounting section 47 for mounting the mounting section 41b. The guide mounting section 47 extends forward in the front-rear direction from a right edge of the rear upright wall 45 in the left-right direction. The guide mounting section 47 is provided with a plurality of screw holes (not shown) that are formed to match positions of the plurality of screw holes of the guide mounting section 46 in the front-back direction. In a state the mounting section 41b is overlapped onto the guide mounting section 47, the mounting holes of the mounting section 41b and the screw holes of the guide mounting section 47 are screwed by means of mounting screws (not shown) to mount the guide member 41 to the guide mounting section 47.

[0057] In this manner, the distance between the guide members 40, 41 mounted to the lower guide positioning openings 42, 43 is suitably adjustable in accordance with any of the longitudinal dimensions of the banknotes S that are processable by the banknote processing device 1 as shown in Fig. 3 and Fig. 4. It should be noted that upper ends of the guide wall sections 40a, 41a are respectively supported by upper guide positioning openings 48, 49 formed at the back wall surface section 7 (see Fig. 9).

<Bill Press 100>

[0058] Next, the configuration of the bill press 100 will be explained in detail. As shown in Fig. 3 and Fig. 4, the bill press 100 comprises a main pressing section 110, a first auxiliary pressing section 120 and a second auxiliary pressing section 130. The main pressing section 110 comprises a cover 111 that covers a frame 112.

[0059] As shown in Fig. 5 and Fig. 6, the main pressing section 110 comprises the frame 112, and a weight 113

detachably attached to the frame 112. A pair of supporting arms 114 protrude from a left end of the frame 112 in the left-right direction. The supporting arms 114 pass through the pair of guide grooves 38 and are connected to a pressing and driving mechanism (not shown) in the base machine 2. The pressing and driving mechanism slides the bill press 100 up and down along the back wall surface section 7 by driving the pair of supporting arms 114 up and down.

[0060] A supporting roller 115 that is rotatable on the back wall surface section 7 is provided on a rear surface of the frame 112. The supporting roller 115 is rotatably supported about a rotating shaft 115a extending along the front-rear direction. A bottom surface 116 of the frame 112 is formed to be substantially flat and can contact the substantial center of a banknote S. It should be noted that while in this embodiment, the substantial center of a banknote S means a region including the center of a banknote S when the banknote S is equally divided into three regions in the longitudinal direction, the present invention is not limited to this.

[0061] The first auxiliary pressing section 120 and the second auxiliary pressing section 130 are respectively provided on opposite sides in the front-rear direction with the main pressing section 110 interposed therebetween. Both ends, a base end of the first auxiliary pressing section 120 and a base end of the second auxiliary pressing section 130, are pivotally supported by the frame 112 and are respectively supported to be swingable about a rotating shaft 117 extending along the left-right direction.

[0062] The first auxiliary pressing section 120 has a substantially flat wing shape that is formed such that the width gradually narrows from the center in the front-rear direction towards the front. The first auxiliary pressing section 120 is formed to have a L-shaped cross section from the center to the middle, and a bent section 121 is formed at a right end in the left-right direction for improving the strength. A tip end 122 formed to have a width that can pass through the opening section 40d is provided at a tip end of the first auxiliary pressing section 120. A bottom surface 123 of the first auxiliary pressing section 120 is formed to be substantially flat and can contact a front region of a banknote S. It should be noted that while in this embodiment, the front region of a banknote S means a front region in the front-rear direction when the banknote S is equally divided into three regions in the longitudinal direction, the present invention is not limited to this.

[0063] The second auxiliary pressing section 130 has a substantially flat wing shape that is formed such that the width gradually narrows from the center in the front-rear direction towards the rear. The second auxiliary pressing section 130 is formed to have a L-shaped cross section from the center to the middle, and a bent section 131 is formed at a right end in the left-right direction for improving the strength. A tip end 132 formed to have a width that can pass through the opening section 41d is provided at a tip end of the second auxiliary pressing

section 130. A bottom surface 133 of the second auxiliary pressing section 130 is formed to be substantially flat and can contact a rear region of a banknote S. It should be noted that while in this embodiment, the rear region of a banknote S means a rear region in the front-rear direction when the banknote S is equally divided into three regions in the longitudinal direction, the present invention is not limited to this.

[0064] The length in the front-rear direction from the tip end 122 of the first auxiliary pressing section 120 to the tip end 132 of the second auxiliary pressing section 130 is set to be substantially identical to the distance between the front upright wall 44 and the rear upright wall 45. The length in the front-rear direction from the bending section 121 of the first auxiliary pressing section 120 to the bending section 131 of the second auxiliary pressing section 130 is set to be substantially identical to the minimum distance between the guide members 40, 41.

[0065] When the bill press 100 is on standby, the first auxiliary pressing section 120 and the second auxiliary pressing section 130 are configured to maintain a horizontal posture during standby by their own weight or by biasing force of a coil spring (not shown) directed downward in the vertical direction, wherein the bottom surfaces 116, 123, and 133 are substantially flush.

[0066] On the other hand, when an upward force acts on the bottom surface 123, the first auxiliary pressing section 120 swings about the rotating shaft 117 clockwise in Fig. 8 as shown in Fig. 7 and Fig. 8. Further, when an upward force acts on the bottom surface 123, the second auxiliary pressing section 130 swings about the rotating shaft 117 counterclockwise in Fig. 8 as shown in Fig. 7 and Fig. 8.

[0067] It should be noted that in the present embodiment, the first auxiliary pressing section 120 and the second auxiliary pressing section 130 are provided to align in the front-rear direction in order to stably press the banknotes S that are elongated in the front-rear direction over a wide range. However, in case the banknote S have, for instance, a relatively short longitudinal dimension and the banknotes S can be stably pressed by only either one of the first auxiliary pressing section 120 or the second auxiliary pressing section 130, the other one of the first auxiliary pressing section 120 or the second auxiliary pressing section 130 can be omitted.

<Operations>

[0068] Next, operations of the banknote processing device 1 will be explained. First, the distance between the guide members 40, 41 is adjusted according to a width dimension of the banknotes S to be taken into the connecting unit 3.

[0069] As shown in Fig. 3 and Fig. 4, the tip section 122 passes through the opening section 40d and extends up to the vicinity of the front upright wall 44 without interfering the guide member 40, and the tip end 132 passes

through the opening section 41d and extends up to the vicinity of the rear upright wall 45 without interfering the guide member 41. That is, the main pressing section 110, the first auxiliary pressing section 120 and the second auxiliary pressing section 130 are provided to cover the bottom surface section 6 in the front-rear direction when seen in a planar view.

[0070] The bill press 100 is arranged at a predetermined retracted position that is located substantially intermediate of the back wall surface section 7 in the vertical direction. At this time, the bottom surfaces 116, 123, and 133 are located further upward than the residual amount sensor 39.

[0071] When the banknotes S that are objects of processing are placed in a stacked state by the operator between the guide members 40, 41 and onto the bottom surface section 6, the banknotes S are positioned in the intake section 5 to be substantially central in the front-rear direction by means of the guide members 40, 41.

[0072] Next, when an "up-down" button (not shown) displayed on the operation displaying section 35 is pressed by the operator, the controlling section 21 makes the residual amount sensor 39 detect the amount of banknotes S placed on the intake section 5 on the condition that the residual sensor 37 has detected the banknotes S and that the gesture sensor 36 has detected that the position of a hand of the operator has separated from the gesture sensor 36 by a predetermined distance.

[0073] When the amount of banknotes S is less than the sensible amount, the controlling section 21 moves the bill press 100 downward by means of the pressing and driving mechanism (not shown) to press the banknotes S with the bill press 100. At this time, when the banknotes S are stacked substantially horizontally, the main pressing section 110, the first auxiliary pressing section 120 and the second auxiliary pressing section 130 abut the banknotes S with the bottom surfaces 116, 123, and 133 which are flush with each other and uniformly press the banknotes S downward.

[0074] However, when fine protrusions B for identifying types or for preventing counterfeiting are formed at ends in the longitudinal direction of the banknotes S and banknotes S of uneven thicknesses are stacked as shown in Fig. 10, height variations are caused at which portions at which the protrusions B of the stacked banknotes S overlap (right side of the image plane in Fig. 9) become locally higher as shown in Fig. 9.

[0075] Therefore, the second auxiliary pressing section 130 swings about the rotating shaft 117 in accordance with the height variations of the stacked banknotes S. Accordingly, the main pressing section 110 and the first auxiliary pressing section 120 press the banknotes S in horizontal postures while the second auxiliary pressing section 130 presses the banknotes S in an inclined posture so that the banknotes S are pressed on the entire surfaces in the front-rear direction.

[0076] On the other hand, when the amount of banknotes S is equal to or larger than the sensible amount,

the controlling section 21 does not perform pressing with the bill press 100 but leaves the bill press 100 at the retracted position.

[0077] Next, when the "start" button (not shown) displayed on the operation displaying section 35 is pressed by the operator, the controlling section 21 causes the banknotes S stacked in the intake section 5 be taken in through the intake port 8 by means of the feed roller 9, the intake roller 10 and the separating roller 11.

[0078] At this time, when the amount of banknotes S is less than the sensible amount, the controlling section 21 causes the banknotes S to be taken in while pressing the banknotes S with the bill press 100 to the bottom surface section 6 side. The controlling section 21 descends the bill press 100 by means of the pressing and driving mechanism in accordance with the taking-in progress of the banknotes S.

[0079] On the other hand, when the amount of banknotes S is equal to or larger than the sensible amount, the controlling section 21 first causes the banknotes S to be taken in through the intake port 8 in a state in which the bill press 100 located at the retracted position is not pressing the banknotes S, and thereafter, when the amount of banknotes S placed on the bottom surface section 6 becomes less than the sensible amount, the bill press 100 is moved downward by means of the pressing and driving mechanism to cause the banknotes S to be taken in through the intake port 8 while pressing the banknotes S with the bill press 100.

[0080] Then, the controlling section 21 cooperates with the controlling sections 25, 33 to make the identifying section 14 identify and count the banknotes S taken into the interior of the banknote processing device 1 while conveying them by means of the identifying and conveying device 13, conveys the identified and counted banknotes S that are objects of processing in the connecting unit 3 to the connecting unit 3 by means of the connecting and conveying section 15, and makes the connecting unit 3 perform stacking processes or bundling processes. On the other hand, banknotes S other than the objects of processing in the connecting unit 3 are conveyed to the rejecting section 16 by means of the rejecting and conveying section 17.

[0081] It should be noted that in case banknotes S are reinserted (additionally inserted), the controlling section 21 moves the bill press 100 upward by a predetermined distance by means of the pressing and driving mechanism when the gesture sensor 36 detects that a hand of the operator is within a predetermined distance from the gesture sensor 36.

[0082] When banknotes S are reinserted (additionally inserted) to the intake section 5 by the operator, the banknote processing device 1 operates similarly to the above-described steps, and the controlling section 21 makes the residual amount sensor 39 detect the amount of banknotes S placed on the intake section 5 on the condition that the residual sensor 37 has detected the banknotes S and that the gesture sensor 36 has detected

that the position of a hand of the operator has separated from the gesture sensor 36 by a predetermined distance.

[0083] Then, when the amount of banknotes S is less than the sensible amount, the bill press 100 is moved downward by means of the pressing and driving mechanism to press the banknotes S with the bill press 100 towards the bottom surface section 6 side.

[0084] On the other hand, when the amount of banknotes S is equal to or larger than the sensible amount, pressing with the bill press 100 is not performed but the bill press 100 is located at the retracted position. It should be noted that in case banknotes S are reinserted while banknotes S are being taken in at the intake section 5, this is performed without temporarily stopping the taking-in of banknotes S. When the residual sensor 37 stops sensing banknotes S with the progressing of the taking-in of banknotes S at the intake section 5, the controlling section 21 moves the bill press 100 upward by means of the pressing and driving mechanism back to the retracted position.

[0085] In this manner, the banknote processing device 1 according to the present embodiment has been configured to be the banknote processing device 1 that presses banknotes S placed on the intake section 5 by means of the bill press 100 towards the feed roller 9 and takes in the banknotes S into the machine body 4, wherein the bill press 100 comprises the main pressing section 110 that is provided to be movable up and down in the intake section 5 and can press the substantial center of the banknotes S, and the first auxiliary pressing section 120 and the second auxiliary pressing section 130 that are provided independently of the main pressing section 110 and can press regions of the banknotes S other than the substantial center.

[0086] With this configuration, also in case there are height variations in banknotes S stacked in the intake section 5 caused through overlapping protrusions B of the banknotes S, uneven abutment with the bill press 100 partially abutting the banknotes S is restricted and the banknotes S are stably pressed towards the feed roller 9 over a wide range since the main pressing section 110 presses the substantial center of the banknotes S while the first auxiliary pressing section 120 and the second auxiliary pressing section 130 can press the banknotes S in a swinging state in accordance with the height of the banknotes S so that the banknotes S can be smoothly sent into the machine body 4.

[0087] Further, the banknote processing device 1 has been configured in that the first auxiliary pressing section 120 and the second auxiliary pressing section 130 are respectively arranged in the front-rear direction that extends along the longitudinal direction of the banknotes S with the main pressing section 110 being the reference.

[0088] With this configuration, banknotes S that are elongated in the front-rear direction can be stably pressed over a wide range since the first auxiliary pressing section 120 and the second auxiliary pressing section 130 are arranged on both sides of the main pressing sec-

tion 110 so that the banknotes S can be smoothly sent into the machine body 4.

[0089] Further, the banknote processing device 1 has been configured in that the first auxiliary pressing section 120 and the second auxiliary pressing section 130 are configured to be connected to the main pressing section 110 via a rotating shaft 117 provided to extend along the left-right direction and to be movable up and down in the intake section 5 in conjunction with the main pressing section 110 and to be swingable about the rotating shaft 117.

[0090] With this configuration, uneven abutment of the bill press 100 can be restricted with a simple configuration and banknotes S can be smoothly sent into the machine body 4 since the first auxiliary pressing section 120 and the second auxiliary pressing section 130 are movable up and down in the intake section 5 in conjunction with the main pressing section 110 and swing about the rotating shaft 117 in accordance with heights of the banknotes S.

<Modifications>

[0091] The bill press 100 is not limited to the above-described configuration, and it could be any one unless the configuration can locally press banknotes S according to heights of the banknotes S in case the heights of the stacked banknotes S are not even.

[0092] For instance, the first auxiliary pressing section 120 and the second auxiliary pressing section 130 are not limited to those that are connected to the main pressing section 110 via the rotating shaft 117 and move up and down in the intake section 5 in conjunction with the main pressing section 110, and they could be configured to be movable up and down in the intake section 5 independently of the main pressing section 110. The configuration might, for instance, be that such a first auxiliary pressing section 120 and a second auxiliary pressing section 130 are connected to the pressing and driving mechanism (not shown) similarly to the main pressing section 110 to slide up and down along the back wall surface section 7.

[0093] According to this configuration, it is possible to cope with height variations in banknotes S stacked in the intake section 5 since the first auxiliary pressing section 120 and the second auxiliary pressing section 130 move up and down in the intake section 5 independently of the main pressing section 110 so that the banknotes S can be accurately sent into the machine body 4.

[0094] Further, in case of processing banknotes S formed with protrusions B at ends in the short direction, it is possible to provide a third auxiliary pressing section on the right side in the left-right direction extending along the short direction of the banknotes S with the main pressing section 110 being the reference. In this case, the configuration might, for instance, be that a left end of the third auxiliary pressing section is supported by the frame 112 to be swingable about a rotating shaft (not shown)

extending along the front-rear direction, that the third auxiliary pressing section maintains a horizontal posture when it is on standby by its own weight or by biasing force of a coil spring (not shown) directed downward in the vertical direction and, in case the stacked banknotes S are locally higher on the right side in the left-right direction, that the right side in the left-right direction of the banknotes S is locally pressed.

[0095] According to this configuration, the third auxiliary pressing section arranged on the right side in the left-right direction of the main pressing section 110 can stably press banknotes S formed with protrusions at ends in the short direction and sent them smoothly into the machine body 4.

[0096] Further, the present invention can be modified in various ways as long as it does not depart from the spirit of the present invention, and it is obvious that the present invention covers such modifications. Moreover, any of the above-mentioned embodiments and modifications can be combined or all of them can be combined.

[0097] Objects of processing of the paper sheet processing device according to the present invention are applicable to devices processing all types of paper sheets besides banknotes, such as notes like gift certification, checks, and bills or securities.

Reference Signs List

[0098]

- 1: banknote processing device
- 2: base machine
- 3: connecting unit
- 4: machine body
- 5: intake section
- 6: bottom surface section
- 7: back wall surface section
- 8: intake port
- 9: feed roller
- 100: bill press
- 110: main pressing section
- 111: cover
- 112: frame
- 113: weight
- 114: supporting arm
- 115: supporting roller
- 116: bottom surface
- 117: rotating shaft
- 120: first auxiliary pressing section
- 121: bent section (of first auxiliary pressing section)
- 122: tip section (of first auxiliary pressing section)
- 123: bottom surface (of first auxiliary pressing section)
- 130: second auxiliary pressing section
- 131: bent section (of second auxiliary pressing section)
- 132: tip section (of second auxiliary pressing section)
- 133: bottom surface (of second auxiliary pressing section)

section)
S: banknote

5 Claims

1. A paper sheet feeding device that presses paper sheets placed in an intake section towards a feed roller by means of a bill press and takes in the paper sheets into a machine body,
wherein the bill press comprises:

a main pressing section that is provided to be movable up and down in the intake section and can press the substantial center of the paper sheets, and

auxiliary pressing sections that are provided independently of the main pressing section and can press regions of the paper sheets other than the substantial center.

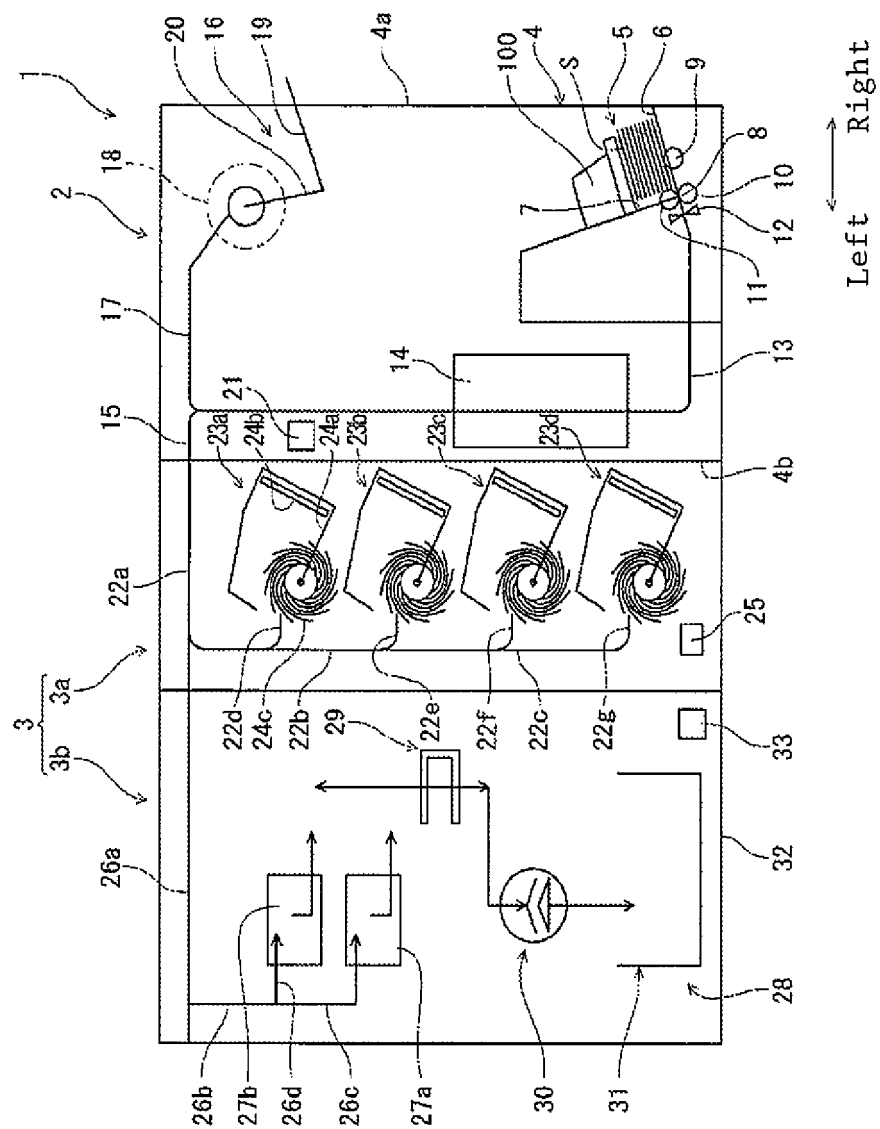
2. The paper sheet feeding device as claimed in claim 1, wherein the auxiliary pressing sections are respectively arranged in the front-rear direction extending along the longitudinal direction of the paper sheets with the main pressing section being the reference.

3. The paper sheet feeding device as claimed in claim 2, wherein the auxiliary pressing sections are configured to be connected to the main pressing section via a rotating shaft provided to extend along a left-right direction perpendicular to the front-rear direction and to be movable up and down in the intake section in conjunction with the main pressing section and to be swingable about the rotating shaft.

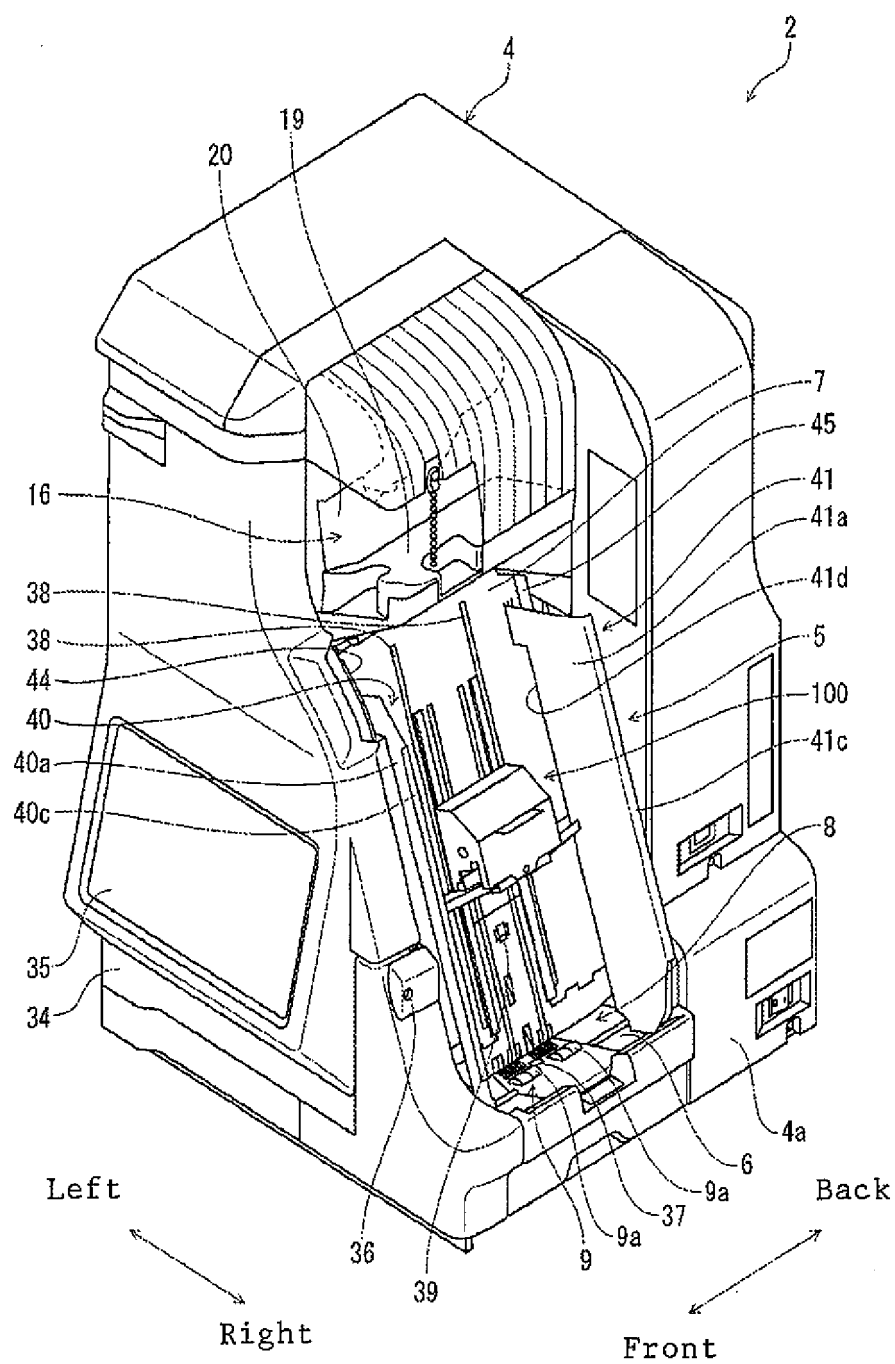
4. The paper sheet feeding device as claimed in claim 2, wherein the auxiliary pressing sections are configured to be movable up and down in the intake section independently of the main pressing section.

5. The paper sheet feeding device as claimed in claim 1, wherein the auxiliary pressing sections are arranged in a left-right direction extending along the short direction of the paper sheets with the main pressing section being the reference.

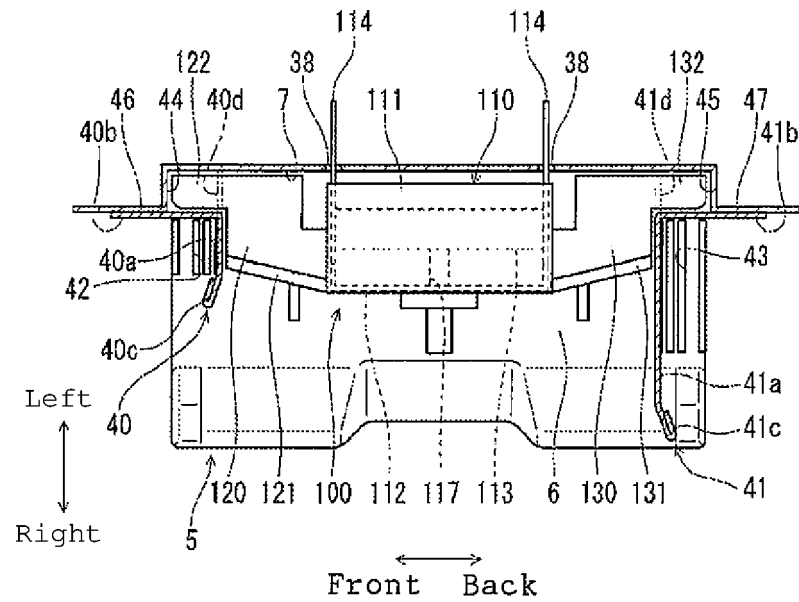
[Fig.1]



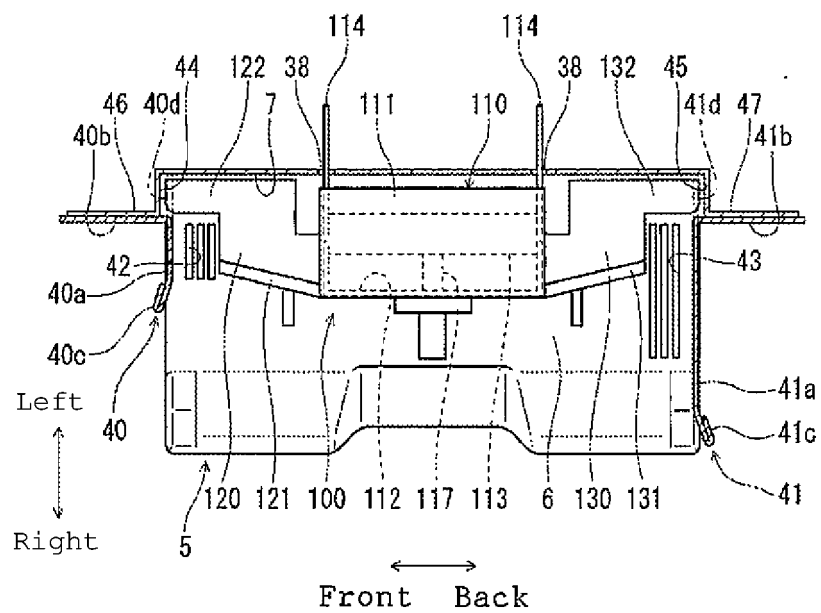
[Fig. 2]



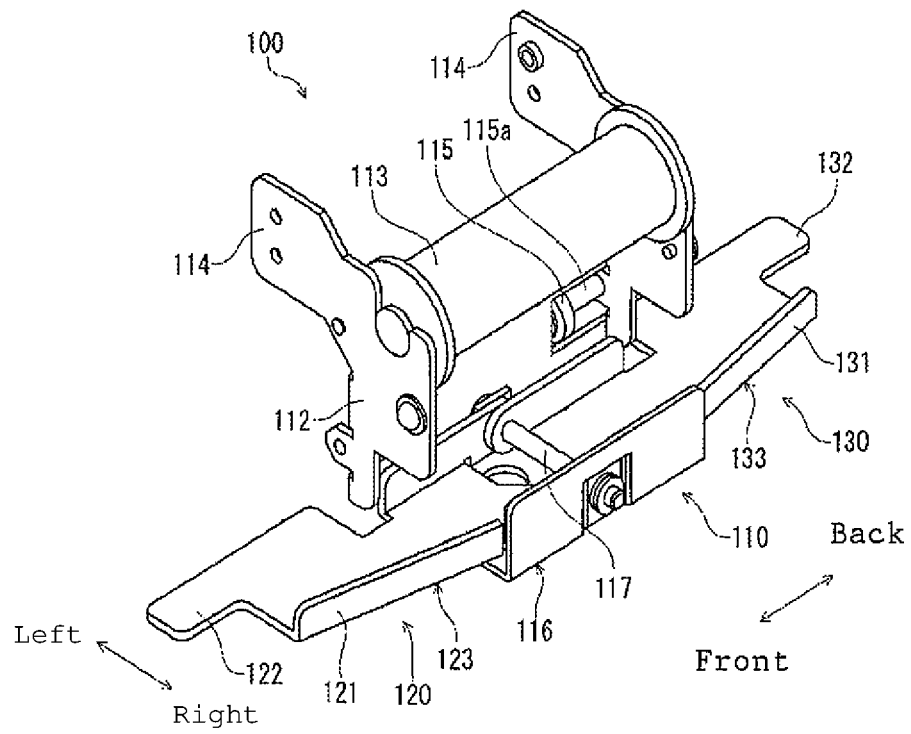
[Fig.3]



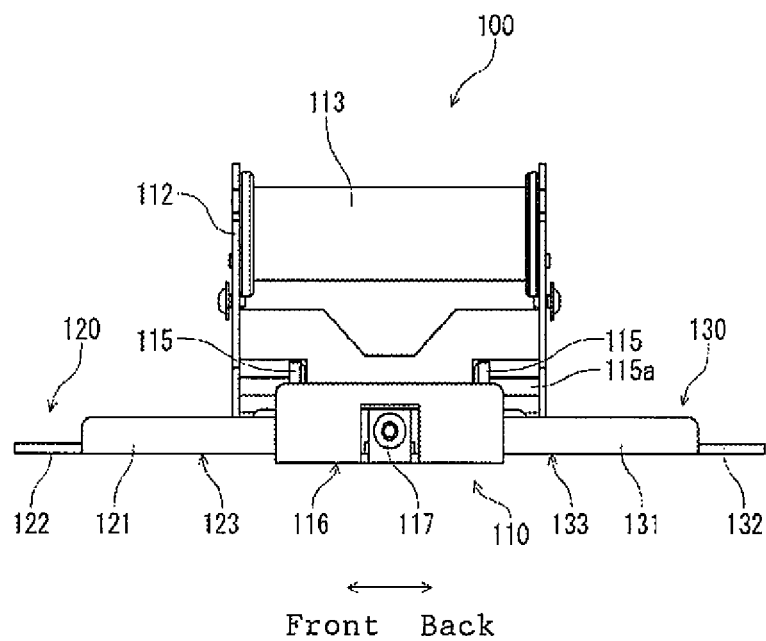
[Fig.4]



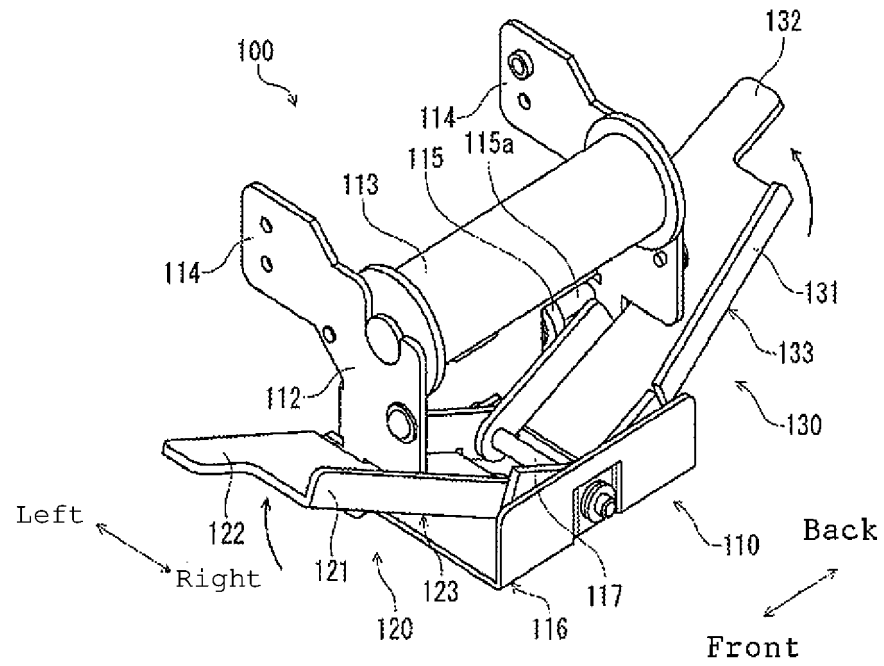
[Fig.5]



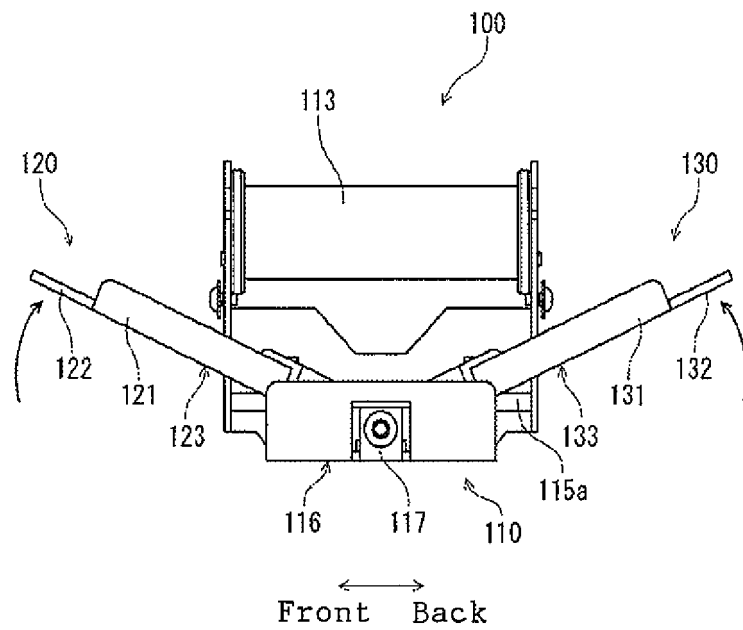
[Fig.6]



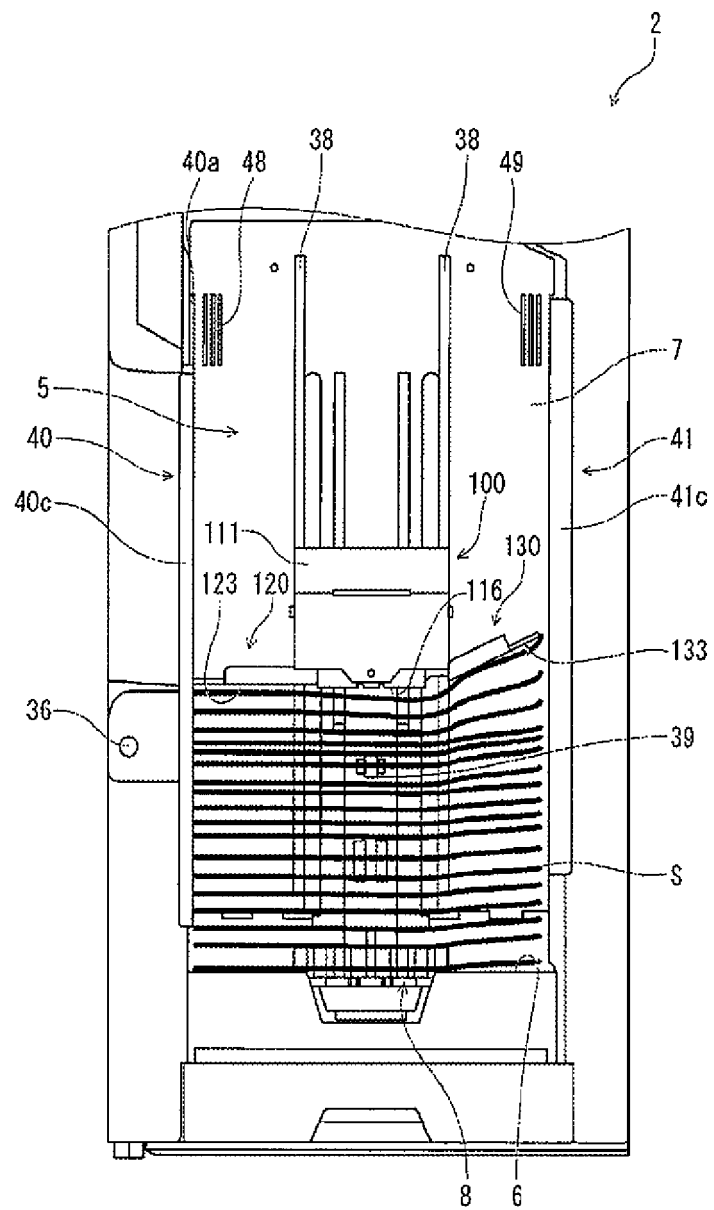
[Fig.7]



[Fig.8]

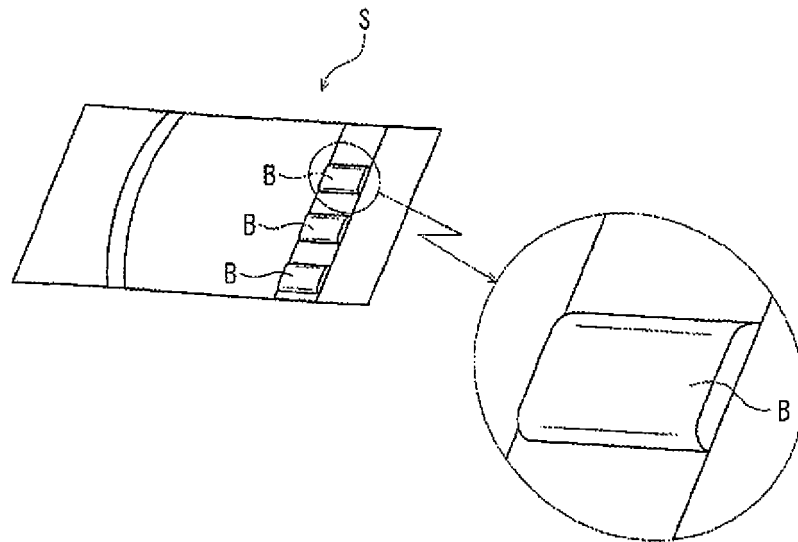


[Fig.9]



Front Back

[Fig.10]



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2021/042000

A. CLASSIFICATION OF SUBJECT MATTER

B65H 1/06(2006.01)i; **B65H 1/18**(2006.01)i; **B65H 1/26**(2006.01)i
FI: B65H1/06 C; B65H1/18 A; B65H1/26 B

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B65H1/00-3/68; G03G15/00; G07D11/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
Published unexamined utility model applications of Japan 1971-2021
Registered utility model specifications of Japan 1996-2021
Published registered utility model applications of Japan 1994-2021

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 10-329954 A (SANYO ELECTRIC CO LTD) 15 December 1998 (1998-12-15) paragraphs [0015]-[0024], fig. 1-2	1-2, 4-5
A		3
X	JP 04-159927 A (TEC CO LTD) 03 June 1992 (1992-06-03) publication gazette, p. 2, upper right column, line 17 to p. 3, upper left column, line 14, fig. 1-2	1-2, 5
Y		3-4
Y	JP 11-180410 A (FURUKAWA MFG CO LTD) 06 July 1999 (1999-07-06) paragraph [0014], fig. 4	3
A		1-2, 4-5
Y	JP 04-179632 A (MITA IND CO LTD) 26 June 1992 (1992-06-26) publication gazette, p. 4, upper left column, lines 2-16, fig. 7	4
A		1-3, 5
A	JP 2012-158450 A (RICOH CO LTD) 23 August 2012 (2012-08-23) entire text, all drawings	1-5

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Telephone No.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP2021/042000

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 10-329954 A	15 December 1998	(Family: none)	
JP 04-159927 A	03 June 1992	(Family: none)	
JP 11-180410 A	06 July 1999	(Family: none)	
JP 04-179632 A	26 June 1992	(Family: none)	
JP 2012-158450 A	23 August 2012	(Family: none)	

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REFERENCES CITED IN THE DESCRIPTION

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