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AL BA MK RS(30) Priority: **13.09.2007 JP 2007237824**(71) Applicant: **Komori Corporation****Sumida-ku****Tokyo (JP)**(72) Inventor: **Takeuchi, Tetsuya****Tsukuba-shi****Ibaraki (JP)**(74) Representative: **Samson & Partner****Widenmayerstraße 5****80538 München (DE)**(54) **Sheet guide apparatus**

(57) In a sheet guide apparatus, a rotary guide body (6) is supported to be rotatable and movable in directions to separate from and come close to the upper surface of a sheet. The outer surface of the rotary guide body (6) comes into contact with the upper surface of the sheet to guide the sheet. A rotary guide body adjusting unit (25) adjusts a position of the rotary guide body (6). A plate-like guide body (5) extends in the convey direction and lateral direction of the sheet, includes a guide surface (5d) which comes into contact with the upper surface of

the sheet to guide the sheet, and is supported to be movable in the directions to separate from and come close to the upper surface of the sheet. A plate-like guide body adjusting unit (11, 12, 14) adjusts a position of the plate-like guide body. The sheet contact portion on the outer surface of the rotary guide body is set below the guide surface of the plate-like guide body through at least one space portion (5c) which is formed in a downstream end of the plate-like guide body in the sheet convey direction to correspond to the rotary guide body.

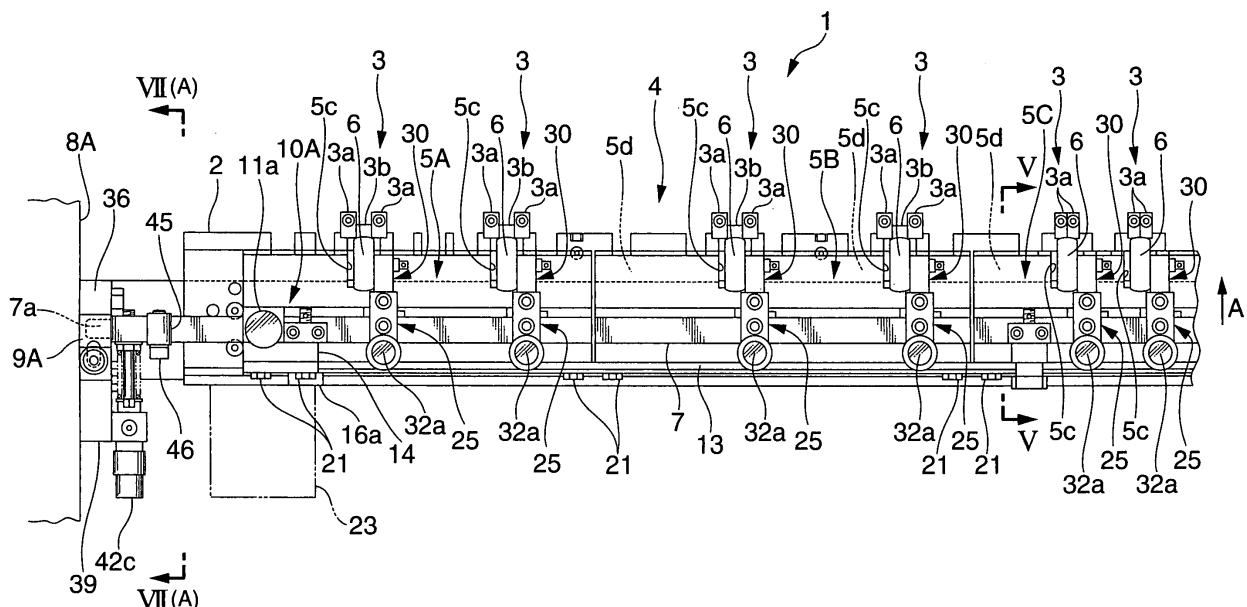
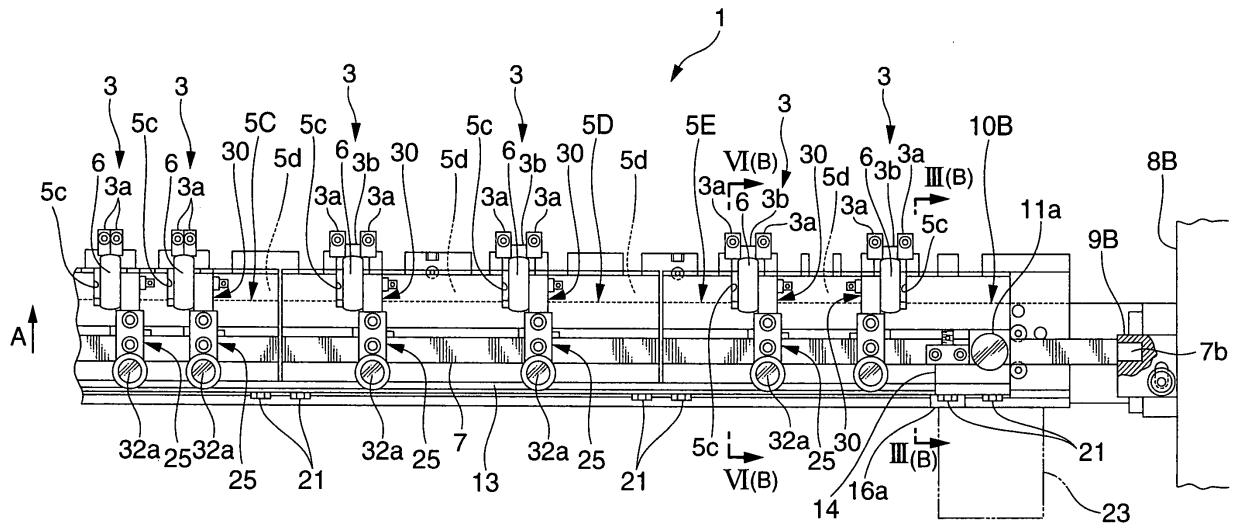
FIG.1A**EP 2 036 844 A2**

FIG.1 B



Description

Background of the Invention

[0001] The present invention relates to a sheet guide apparatus which guides a conveyed sheet to a front lay.

[0002] Generally, in a sheet guide apparatus used in a feed device or the like for a sheet-fed rotary printing press, the sheet is not always flat. For example, sometimes the front edge of the sheet may deform by, e.g., waving, warping, or curling. If the sheet deforms in this manner, it does not abut against a front lay but may ride over it. In order to prevent this, a sheet guide apparatus of this type is provided with a sheet pressing device, downstream of a feedboard in a sheet convey direction, which straightens a deforming sheet fed onto the feedboard. Hence, the sheet can be abutted against the front lay reliably, positioned by the front lay, and corrected from traveling skew, so that the sheet can be transferred to a sheet transfer device reliably.

[0003] As a sheet pressing device of this type, a sheet pressing plate made of an elastic material and a roller which comes into contact with the upper surface of a conveyed sheet are proposed, as described in Japanese Patent Laid-Open No. 2002-225228.

[0004] Assume that the sheet pressing device is a sheet pressing plate. The sheet pressing device guides a sheet within a wide range in a convey direction and a direction perpendicular to the convey direction. Hence, if the sheet is thin, deformation occurring in the thin sheet can be corrected. If the sheet is thick, when thick sheets are conveyed to overlap like scales, a preceding sheet may raise the sheet pressing plate, so that the next sheet that follows cannot be appropriately guided to the front lay. As the sheet and sheet pressing plate rub against each other, the sheet surface can be damaged easily. Particularly, when the sheet is a film or the like that can readily be damaged, this sheet pressing plate cannot be employed.

[0005] Assume that the guide member is a roller. In this case, even when thick sheets are conveyed to overlap like scales, as the roller presses a preceding sheet through point contact, the next sheet that follows can be reliably guided to the front lay. However, an impact generated upon abutment of the thin sheet against the front lay can form wrinkles in the sheet, and deformation occurring in the sheet cannot be corrected.

Summary of the Invention

[0006] It is an object of the present invention to provide a sheet guide apparatus which guides various types of sheets to be able to reliably abut against a front lay.

[0007] In order to achieve the above object, according to the present invention, there is provided a sheet guide apparatus comprising a front lay which abuts against a downstream end of a sheet in a convey direction and regulates movement of the sheet in the convey direction,

one or more rotary guide bodies each of which is supported to be rotatable and movable in directions to separate from and come close to an upper surface of a sheet and an outer surface of which comes into contact with the upper surface of the sheet to guide the sheet, a rotary guide body adjusting unit which adjusts a position of the rotary guide body in directions to separate from and come close to the upper surface of the sheet, a plate-like guide body extending in the convey direction and a lateral direction of the sheet, including a guide surface which comes into contact with the upper surface of the sheet to guide the sheet, and supported to be movable in the directions to separate from and come close to the upper surface of the sheet, and a plate-like guide body adjusting unit which adjusts a position of the plate-like guide body in the directions to separate from and come close to the upper surface of the sheet, wherein a sheet contact portion on the outer surface of the rotary guide body is set below the guide surface of the plate-like guide body through one more space portions each of which is formed in a downstream end of the plate-like guide body in the sheet convey direction to correspond to the rotary guide body.

Brief Description of the Drawings

[0008]

Figs. 1A and 1B are plan views of a sheet guide apparatus according to one embodiment of the present invention;

Fig. 2 is a plan view of the main part of a plate-like guide body shown in Fig. 1A;

Fig. 3A is a view seen from the arrow III(A) in Fig. 3B;

Fig. 3B is a sectional view taken along the line III(B) - III(B) in Fig. 1B;

Fig. 4 is a sectional view taken along the line IV - IV in Fig. 3B;

Fig. 5 is a sectional view taken along the line V - V in Fig. 1A;

Fig. 6A is a view seen from the arrow VI(B) in Fig. 6B;

Fig. 6B is a sectional view taken along the line VI(B) in Fig. 1B;

Fig. 7A is a sectional view taken along the line VII(A) in Fig. 1A; and

Fig. 7B is a view seen from the VII(B) in Fig. 7A.

Description of the Preferred Embodiment

[0009] A sheet guide apparatus according to one embodiment of the present invention will be described with reference to Figs. 1A to 7B.

[0010] As shown in Figs. 1A and 1B, a sheet guide apparatus 1 according to this embodiment comprises a feedboard 2 (sheet guide member) serving as a sheet guide member to which a sheet is conveyed from a feeder board (not shown), front lays 3 which are provided at the downstream (direction of an arrow A) end of the feed-

board 2 in the sheet convey direction and abut against the downstream edge of the sheet in the convey direction, and a guide device 4 which guides the sheet to the front lays 3. Each front lay 3 comprises a pair of lays 3a against which the leading edge (downstream edge in the sheet convey direction) of the sheet abuts, a lay hook 3b which is arranged above the sheet and guides the sheet to the lays 3a, and a lever device 3c (Fig. 3B) which supports the lays 3a and lay hook 3b. Of the front lays 3, in one front lay 3 arranged at the center in the sheet widthwise direction (a direction perpendicular to the sheet convey direction), the pair of lays 3a are disposed adjacent to each other. In each of the front lays 3 arranged at the two sides, the lay hook 3b is disposed between the pair of lays 3a.

[0011] The guide device 4 comprises five plate-like guide bodies 5A to 5E spreading along the upper surface of the sheet and extending in a direction perpendicular to the sheet convey direction, and a plurality of rotary guide bodies 6 which are supported to be rotatable and movable in directions to separate from and come close to the upper surface of the sheet and the outer surfaces of which are in contact with the upper surface of the sheet. The plate-like guide bodies 5A to 5E are supported to be movable in directions to separate from and come close to the upper surface of the sheet. Each rotary guide body 6 comprises a wheel made of a plastic material. The center of the outer surface of the rotary guide body 6 swells, as shown in Fig. 6A.

[0012] A prismatic stay 7 extends between a pair of sheet feed frames 8A and 8B. Support blocks 9A and 9B fixed to the sheet feed frames 8A and 8B rotatably support columnar two ends 7a and 7b of the stay 7.

[Support Structure for Plate-like Guide Body]

[0013] A support structure for the plate-like guide body will be described. As shown in Figs. 1A and 1B, the stay 7 is provided with support devices 10A and 10B (plate-like guide body adjusting devices) at its two ends. The support devices 10A and 10B support the plate-like guide bodies 5A to 5E to be movable and adjustable in the vertical direction (directions to separate from and come close to the upper surface of the sheet). The support devices 10A and 10B have the same structure. Hence, the support device 10B will be described hereinafter, and the support device 10A will be described where necessary.

[0014] As shown in Fig. 3B, the support device 10B comprises a first adjusting bolt 11 (support body adjusting member) which moves the plate-like guide bodies 5A to 5E vertically, a moving body 12 which moves vertically upon rotation of the adjusting bolt 11, a support body 14 which supports the plate-like guide bodies 5A to 5E through a support plate 13 and moves integrally with the moving body 12, and a fixing bolt 16 (support body fixing member) which fixes the support body 14 to the stay 7

through a first fixing block 15.

[0015] As shown in Fig. 4, in the adjusting bolt 11, a large-diameter portion 11b, threaded portion 11d, and small-diameter portion 11c are sequentially formed integrally with a knob 11a (manipulating portion) at the upper end. The threaded portion 11d threadably engages with a threaded hole 7a of the stay 7. The moving body 12 with a U-shaped section has a pair of opposing portions 12b which have insertion holes 12a where the adjusting bolt 11 is to be inserted and which oppose each other. The moving body 12 is supported by the stay 7 through the adjusting bolt 11 such that the stay 7 is located between the pair of opposing portions 12b.

[0016] A stopper 17 fixed to the small-diameter portion 11c of the adjusting bolt 11 and the large-diameter portion 11b loosely sandwich the pair of opposing portions 12b of the moving body 12. When rotating the adjusting bolt 11 clockwise/counterclockwise, the moving body 12 moves together with the adjusting bolt 11 vertically with respect to the stay 7.

[0017] As shown in Fig. 3B, bolts 18a and 18b attach the support body 14 to the pair of opposing portions 12b of the moving body 12. The support body 14 has a vertically long elongated hole 14a in which the fixing bolt 16 is to be inserted. The structure comprising the moving body 12 and support body 14 is attached to sandwich the stay 7. When manipulating the adjusting bolt 11, this structure moves vertically as it is guided by the side surface of the stay 7.

[0018] As shown in Figs. 3A and 3B, bolts 19 attach the fixing block 15 to the stay 7. The fixing block 15 has a threaded hole 15a which threadably engages with the fixing bolt 16. The support body 14 is located between a knob 16a of the fixing bolt 16 and the fixing block 15. In this arrangement, first, the knob 16a of the fixing bolt 16 is pivoted to loosen the fixing bolt 16, thus disengaging the support body 14. After that, the adjusting bolt 11 is rotated clockwise/counterclockwise to move the moving body 12 in the vertical direction. At this time, the support body 14 moves in the vertical direction to follow the moving body 12. After moving the support body 14 in the vertical direction, the fixing bolt 16 is fastened, so that a large-diameter portion 16b of the fixing bolt 16 and the fixing block 15 fix the support body 14. The elongated hole 14a of the support body 14 is formed so that the support body 14 can be fixed by the fixing bolt 16 even when the adjusting bolt 11 adjusts the position of the support body 14.

[0019] As shown in Figs. 1A and 1B, the elongated support plate 13 extends between the support devices 10A and 10B. As shown in Fig. 5, bolts 20 attach the two ends of the support plate 13 to the support bodies 14 of the support devices 10A and 10B. As shown in Fig. 5, each of the plate-like guide bodies 5A to 5E has a proximal end 5a extending perpendicularly to the upper surface of the sheet, and a guide portion 5b extending in the horizontal direction, thus forming an L shape with a curved section. The guide portion 5b comes into contact

with a sheet P to guide it to the front lays 3.

[0020] Bolts 21 attach the proximal ends 5a of the respective plate-like guide bodies 5A to 5E to the support plate 13 such that the guide portions 5b are in contact with the upper surface of the sheet P. As shown in Fig. 2, that end of each guide portion 5b which is downstream in the sheet convey direction (the direction of the arrow A) has notches 5c which form space portions opposing the plurality of rotary guide bodies 6, and guide surfaces 5d corresponding to the portions among the notches 5c.

[0021] According to this embodiment, by manipulating the adjusting bolt 11, the position of the support body 14 is adjusted, and the gap amount is adjusted between the plate-like guide bodies 5A to 5E and the feedboard 2. More specifically, the support body 14 is movable in the vertical direction, and the guide surfaces 5d of the plate-like guide bodies 5A to 5E are movable in the direction perpendicular to the upper surface of the sheet P. Hence, even when moving the plate-like guide bodies 5A to 5E, the parallel degree between the guide surfaces 5d and the upper surface of the sheet P is maintained. As a result, the entire surfaces of the guide surfaces 5d come into contact with a sheet of any thickness evenly, so that the guide surfaces 5d can guide the sheet P reliably. Wrinkles are prevented from being formed in the sheet P by an impact applied when the sheet P abuts against the front lays 3. Also, deformation of the sheet P such as wrinkles or waves existing in the sheet P before the sheet P abuts against the front lays 3 can be corrected reliably.

[0022] The adjusting bolt 11, moving body 12, and support body 14 constitute a plate-like guide adjusting device. The fixing block 15 and fixing bolt 16 constitute a plate-like guide fixing device.

[0023] Side lay devices 23 are known side lay devices serving as widthwise direction alignment devices, and align the sheet in a direction perpendicular to the sheet convey direction when the downstream end of the sheet in the sheet convey direction abuts against the front lays 3.

[Support Structure for Rotary Guide Body]

[0024] A support structure for each rotary guide body 6 will be described with reference to Figs. 6A and 6B. As shown in Fig. 6B, a bolt 26 fixes a second fixing block 25 to the stay 7. The fixing block 25 has a horizontal portion 27 with a threaded hole 27a and a vertical portion 28 with a threaded hole 28a, thus forming an L shape. A pair of opposing axial supports 28b extend downward from the lower end of the vertical portion 28.

[0025] The pair of axial supports 28b of the vertical portion 28 swingably support a shaft portion 30a projecting at the center of a lever 30 (support member). The rotary guide body 6 is rotatably supported at one end of the lever 30 through a shaft 31. A spring shoe recess 30b is formed between the end and center of the lever 30. A second adjusting bolt 32 (support member adjusting member) threadably engages with the threaded hole 27a

of the fixing block 25. The distal end of the adjusting bolt 32 abuts against the other end of the lever 30 to regulate the pivot motion of the lever 30. A knob 32a is integrally fixed to the upper end of the adjusting bolt 32. A lock nut 32b threadably engages with the adjusting bolt 32. When pivoting the lock nut 32b to come into tight contact with the surface of the horizontal portion 27 of the fixing block 25, the loosening of the adjusting bolt 32 is regulated, thus locking the adjusting bolt 32.

[0026] A spring pressure adjusting bolt 33 (biasing force adjusting member) threadably engaging with the threaded hole 28a of the fixing block 25 threadably engages with a nut 34. A compression coil spring 35 (biasing member) is elastically mounted between the distal end of the bolt 33 and the recess 30b of the lever 30. The spring force of the compression coil spring 35 biases the lever 30 about the shaft portion 30a as the pivot center in a direction to urge the rotary guide body 6 against the sheet P (a direction to urge the other end of the lever 30 against the distal end of the adjusting bolt 32).

[0027] In this arrangement, when loosening the lock nut 32b and pivoting the adjusting bolt 32 such that the distal end moves downward, the lever 30 pivots clockwise in Fig. 6B against the spring force of the compression coil spring 35. This separates the rotary guide body 6 from the upper surface of the sheet P. When pivoting the adjusting bolt 32 such that its distal end moves upward, the spring force of the compression coil spring 35 pivots the lever 30 counterclockwise in Fig. 6B. Thus, the rotary guide body 6 comes close to the upper surface of the sheet P. In this manner, by manipulating the adjusting bolt 32, the position of the lever 30 is adjusted, and the gap amount between the rotary guide body 6 and feedboard 2 is adjusted.

[0028] The rotary guide body 6 is made of a plastic material with a low coefficient of friction, and the center of the outer surface of the rotary guide body 6 forms an arc. Hence, the outer surface of the rotary guide body 6 and the sheet are in point contact with each other to reduce the frictional force generated between the rotary guide body 6 and the sheet. Consequently, when the side lay devices 23 move the sheet in the direction perpendicular to the convey direction, the rotary guide body 6 will not damage the sheet by rubbing. The lever 30, fixing block 25, compression coil spring 35, and adjusting bolt 32 constitute an individual rotary body adjusting device. [Support Structure for Stay]

[0029] A structure which pivots the stay 7 will be described with reference to Figs. 7A and 7B. As shown in Fig. 7A, bolts 36a fix a fixing block 36 to one sheet feed frame 8A. A bolt 38 fixes the support block 9A to the fixing block 36. A bolt 40 fixes a bracket 39, having an inverted-L shape when seen from the side, to the rear end face of the support block 9A. A support body 41 is pivotally mounted on the bracket 39 through a shaft 41a.

[0030] A rotary member 42, which is regulated from moving in the axial direction and rotatably supported by the support body 41, has a spring shoe 42a at one end.

A shaft 43 is axially mounted on the spring shoe 42a, and a threaded portion 43a is formed on the distal end of the shaft 43. A rotation-preventive large-diameter portion 42b with serrations on its outer surface is integrally formed on the other end of the rotary member 42. A manipulating portion 42c with a hexagonal socket integrally projects on the large-diameter portion 42b. The distal end of a leaf spring 44 attached to the support body 41 engages with the outer surface of the large-diameter portion 42b. The leaf spring 44 and the serrations constitute a rotation-preventive mechanism which prevents pivot motion caused by vibration or the like when the rotary member 42 is in operation.

[0031] As shown in Fig. 1A, a bolt 46 fixes a swing element 45 to one end of the stay 7 by split clamp. The upper portion of the swing element 45 forms a Y shape that rotatably supports a small cylindrical pivot element 45a. A threaded hole 45b which is to threadably engage with the threaded portion 43a of the rotary member 42 is formed in the pivot element 45a to extend in the radial direction. A compression coil spring 47 is elastically mounted between the swing element 45 and the spring shoe 42a of the rotary member 42.

[0032] In this arrangement, when rotating the manipulating portion 42c of the rotary member 42 with a spanner or the like to rotate the shaft 43 in one direction, the swing element 45 pivots counterclockwise in Fig. 7A about the end 7a of the stay 7 as the pivot center. When the stay 7 pivots, the plate-like guide bodies 5A to 5E pivot counterclockwise through the support body 14 (Fig. 4) integral with the stay 7. As a result, all the rotary guide bodies 6 supported by the stay 7 pivot clockwise (Fig. 6B) about the axial supports 28b as the center to separate from the upper surface of the sheet P simultaneously, thereby adjusting the gap amount between all the rotary guide bodies 6 and the feedboard 2 at once simultaneously.

[0033] When rotating the manipulating portion 42c of the rotary member 42 with the spanner or the like to rotate the shaft 43 in the other direction, the swing element 45 pivots clockwise in Fig. 7A about the end 7a of the stay 7 as the pivot center. When the stay 7 pivots, the plate-like guide bodies 5A to 5E pivot clockwise through the support body 14 (Fig. 5) integral with the stay 7. As a result, all the rotary guide bodies 6 supported by the stay 7 pivot counterclockwise (Fig. 6B) about the axial supports 28b as the center to come close to the upper surface of the sheet P simultaneously, thereby adjusting the gap amount between all the rotary guide bodies 6 and the feedboard 2 at once simultaneously. The rotary member 42, shaft 43, swing element 45, and compression coil spring 47 constitute an entire rotary guide body adjusting device. Furthermore, individual rotary guide body adjusting devices and/or entire rotary guide body adjusting device constitutes a rotary guide body adjusting device.

[0034] A method of adjusting the plate-like guide bodies 5A to 5E and rotary guide bodies 6, in the sheet guide apparatus having the above arrangement, in accordance

with the thickness and type of the sheet will be described. First, a method that does not perform adjustment with the stay 7 will be described.

5 [When Sheet Is Thin]

[0035] When guiding a thin sheet, the plate-like guide bodies 5A to 5E and rotary guide bodies 6 guide the sheet. More specifically, adjustment of setting the gap between the guide surfaces 5d of the plate-like guide bodies 5A to 5E and the upper surface of the sheet P in accordance with the sheet thickness, and adjustment of adjusting the plurality of rotary guide bodies 6 separately by the individual rotary body adjusting devices to set the gap between the outer surfaces of the rotary guide bodies 6 and the feedboard 2 in accordance with the sheet thickness, are performed.

[0036] This will be described in detail. The knobs 16a of the fixing bolts 16 of the support devices 10A and 10B are rotated to loosen the fixing bolts 16. After that, the adjusting bolts 11 (Fig. 3B) are rotated clockwise/counterclockwise. Hence, the moving bodies 12 move in the vertical direction, and the support bodies 14 also move in the vertical direction to follow the moving bodies 12. The plate-like guide bodies 5A to 5E also move in the vertical direction, and the gap between the guide surfaces 5d and the upper surface of the sheet P is set in accordance with the sheet thickness. After that, the knobs 16a are pivoted to fasten the fixing bolts 16, thus fixing the support bodies 14 to the fixing blocks 15, so that the plate-like guide bodies 5A to 5E are adjusted at positions that match the sheet thickness. At this time, as the guide surfaces 5d of the plate-like guide bodies 5A to 5E move perpendicularly to the upper surface of the sheet P, the parallel degree between the guide surfaces 5d and the upper surface of the sheet P is maintained. Therefore, a sheet of any thickness can be reliably guided to the front lays 3.

[0037] Subsequently, the fastened lock nut 32b (Fig. 6B) is loosened. After rotating the knob 32a of the adjusting bolt 32 clockwise/counterclockwise, the adjusting bolt 32 is moved forward/backward from the horizontal portion 27 of the fixing blocks 25. This adjusts the position of the distal end of the adjusting bolt 32. Accordingly, the lever 30 swings clockwise/counterclockwise to set the gap between the outer surface of the rotary guide body 6 and the upper surface of the sheet P in accordance with the sheet thickness. The lock nut 32b is then fastened to adjust the gap between the outer surface of the rotary guide body 6 and the upper surface of the sheet P to the sheet thickness, and then the lock nut 32b is fixed. This adjustment is performed for each rotary guide body 6 using each adjusting bolt 32. Hence, the plate-like guide bodies 5A and 5E and the rotary guide bodies 6 guide the sheet P in the vicinities of the front lays 3. Thus, no wrinkles are formed in the sheet P by an impact occurring when the sheet P abuts against the front lays 3, and the sheet P is reliably guided to the front lays 3.

When adjusting the rotary guide bodies 6 and/or plate-like guide bodies 5A to 5E, the plate-like guide bodies 5A and 5E do not interfere with the rotary guide bodies 6 because of the presence of the notches 5c of the plate-like guide bodies 5A to 5E.

[To Guide Easy-to-be-damaged Sheet or Thick Sheet]

[0038] When guiding a sheet such as a film the surface of which can be damaged easily, or when stiff sheets such as thick sheets are to be conveyed to overlap like scales, the sheets are guided by only the rotary guide bodies 6 and not by the plate-like guide bodies 5A to 5E. More specifically, after loosening the knobs 16a of the fixing bolts 16 of the support devices 10A and 10B by rotating, the adjusting bolts 11 are rotated to move the moving bodies 12 upward, as shown in Fig. 3B. The support bodies 14 also move upward to follow the moving bodies 12, and the plate-like guide bodies 5A to 5E also move upward. Hence, the guide surfaces 5d separate from the feedboard 2 so as not to come into contact with the sheet.

[0039] Because of the presence of the notches 5c of the plate-like guide bodies 5A to 5E, the plate-like guide bodies 5A to 5E can be moved upward without interfering with the respective rotary guide bodies 6. By this adjustment, the sheet is guided by only the rotary guide bodies 6 and accordingly is not damaged. Even when sheets are conveyed to overlap like scales, the rotary guide bodies 6 can press a preceding sheet by point contact. Thus, the next sheet can be reliably guided to the front lays 3.

[Initial Adjustment]

[0040] First, the gap between all the outer surfaces of the respective rotary guide bodies 6 and the feedboard 2 is adjusted to be constant by the adjusting bolts 32.

[Adjusting Method by Pivoting Stay 7 after End of Initial Adjustment]

[0041] When changing thin sheets (thin paper) to thick sheets (thick paper), the stay 7 is pivoted to adjust all the rotary guide bodies 6 simultaneously. More specifically, referring to Fig. 7A, the manipulating portion 42c of the rotary member 42 is rotated using the spanner or the like to rotate the shaft 43 in one direction, so that the swing element 45 is pivoted clockwise in Fig. 7A about the distal end 7a of the stay 7 as the pivot center. Upon pivot motion of the stay 7, the rotary guide bodies 6 move through the support bodies 14 (Fig. 6B) integral with the stay 7, to set the gap between the outer surfaces of the rotary guide bodies 6 and the feedboard 2 in accordance with the sheet thickness. When adjusting the rotary guide bodies 6, the plate-like guide bodies 5A to 5E are also adjusted simultaneously through the support bodies 14 integral with the stay 7.

[0042] At this time, if the sheet to be guided is an easily

damaged sheet, if thick sheets are to be conveyed to overlap like scales, or if guide by the plate-like guide bodies 5A to 5E is not necessary, further adjustment is performed so the plate-like guide bodies 5A to 5E will not come into contact with the sheet. More specifically, after loosening the knobs 16a of the fixing bolts 16 of the support devices 10A and 10B by rotation, the adjusting bolts 11 are rotated to move the moving bodies 12 upward, as shown in Fig. 3B. The support bodies 14 are also moved upward to follow the movement of the moving bodies 12, so as to move the plate-like guide bodies 5A to 5E upward, thus largely separating the guide surfaces 5d so as not to come into contact with the sheet. In this manner, all the rotary guide bodies 6 can be adjusted simultaneously by pivoting the stay 7. As a result, the adjustment time can be shortened, and the work efficiency can be improved.

[0043] When the sheet is thin, the stay 7 is pivoted to adjust all the rotary guide bodies 6 at once simultaneously.

[0044] At this time, if the gap between the plate-like guide bodies 5A to 5E and the feedboard 2 is not set in accordance with the sheet thickness, the plate-like guide bodies 5A to 5E are adjusted to match the sheet thickness. More specifically, after loosening the knobs 16a of the fixing bolts 16 of the support devices 10A and 10B by rotation, the adjusting bolts 11 are rotated to move the moving bodies 12 in the vertical direction, as shown in Fig. 3B. The support bodies 14 are also moved in the vertical direction to follow the movement of the moving bodies 12, so the plate-like guide bodies 5A to 5E are also moved in the vertical direction. Thus, the gap between the guide surfaces 5d and feedboard 2 is adjusted to match the sheet thickness.

[0045] When guiding the thin sheet with only the plate-like guide bodies 5A to 5E, first, the stay 7 is pivoted in accordance with the method described above to adjust all the rotary guide bodies 6 at once simultaneously so as not come into contact with the sheet. Subsequently, the plate-like guide bodies 5A to 5E are adjusted to match the sheet thickness. More specifically, after loosening the knobs 16a of the fixing bolts 16 of the support devices 10A and 10B by rotation, the adjusting bolts 11 are rotated to move the moving bodies 12 downward, as shown in Fig. 3B. The support bodies 14 are also moved downward to follow the moving bodies 12, so as to move the plate-like guide bodies 5A to 5E downward. Thus, the gap between the guide surfaces 5d and feedboard 2 is adjusted to match the sheet thickness.

[0046] According to this embodiment, wrinkles formed in the sheet P by the guide surfaces 5d of the plate-like guide bodies 5A to 5E can be corrected. Even if the sheets P are conveyed to overlap like scales, a preceding sheet can be pressed by the rotary guide bodies 6 by point contact, so that the next sheet can be reliably guided to the front lays 3. Since the guide surfaces 5d of the plate-like guide bodies 5A to 5E are separated from the upper surface of the sheet P and the sheet is guided by

only the rotary guide bodies 6, the sheet P will not be damaged.

[0047] In this manner, since the sheet P can be guided by the rotary guide bodies 6 and/or plate-like guide bodies 5A to 5E in the vicinities of the front lays 3, the sheet P can be reliably guided to the front lays 3. When adjusting the rotary guide bodies 6 and/or plate-like guide bodies 5A to 5E, because of the presence of the notches 5c of the plate-like guide bodies 5A to 5E, the plate-like guide bodies 5A to 5E will not interfere with the rotary guide bodies 6.

[0048] According to this embodiment, the notches 5c form space portions. Alternatively, holes may form space portions. Although the plate guide member is divided into five pieces, the plate guide member may comprise one piece or a plurality of pieces other than five pieces. Although the present invention has been described by applying a sheet guide apparatus to a printing press, the sheet guide apparatus can be applied to a coating machine, a testing machine which tests a sheet-type object, a laminate machine, an embossing machine, a punching machine, or the like.

[0049] As has been described above, according to the present invention, if an appropriate guide body is selected in accordance with the type of the sheet-type object, the sheet can be reliably guided to the front lays without being damaged.

Claims

1. A sheet guide apparatus **characterized by** comprising:

a front lay (3) which abuts against a downstream end of a sheet in a convey direction and regulates movement of the sheet in the convey direction;

one or more rotary guide bodies (6), each of which is supported to be rotatable and movable in directions to separate from and come close to an upper surface of a sheet (P) and an outer surface of which comes into contact with the upper surface of the sheet to guide the sheet;

a rotary guide body adjusting unit (25, 30, 32, 35; 42, 43, 45, 47) which adjusts a position of said rotary guide body in directions to separate from and come close to the upper surface of the sheet;

a plate-like guide body (5A - 5E) extending in the convey direction and a lateral direction of the sheet, including a guide surface (5d) which comes into contact with the upper surface of the sheet to guide the sheet, and supported to be movable in the directions to separate from and come close to the upper surface of the sheet; and

a plate-like guide body adjusting unit (11, 12,

14) which adjusts a position of said plate-like guide body in the directions to separate from and come close to the upper surface of the sheet,

wherein a sheet contact portion on the outer surface of said rotary guide body is set below said guide surface of said plate-like guide body through one or more space portions (5c), each of which is formed in a downstream end of said plate-like guide body in the sheet convey direction to correspond to said rotary guide body.

2. An apparatus according to claim 1, wherein said rotary guide bodies line up in a direction perpendicular to the sheet convey direction, and said space portions are formed to correspond to said plurality of rotary guide bodies.

3. An apparatus according to claim 2, wherein said rotary guide body adjusting unit comprises a first rotary guide body adjusting unit (42, 43, 45, 47) which adjusts all positions of said plurality of rotary guide bodies simultaneously, and a plurality of second rotary guide body adjusting units (25, 30, 32, 35) which are provided to correspond to said plurality of rotary guide bodies and adjust positions of said plurality of rotary guide bodies individually.

4. An apparatus according to claim 3, further comprising a stay (7) which is rotatably supported between a pair of frames (8A, 8B) and on which said plurality of rotary guide bodies and said plurality of second rotary guide adjusting units are supported, wherein said plurality of rotary guide bodies move simultaneously when said first rotary guide body adjusting unit rotates said stay.

5. An apparatus according to claim 4, wherein said plate-like guide body and said plate-like guide body adjusting unit are supported by said stay.

6. An apparatus according to claim 4, wherein said second rotary guide body adjusting units comprise a support member (30) which is swingably supported and rotatably supports said rotary guide body, a first adjusting member (32) which regulates a swing position of said support member and performs position adjustment to adjust a position of said support member, and a biasing member (35) which biases said first support member to abut against said adjusting member.

7. An apparatus according to claim 5, wherein said plate-like guide body adjusting unit comprises a support body (14) which is attached to said stay to be movable in directions to separate from and come

close to the upper surface of the sheet and supports said plate-like guide bodies, and a second adjusting member (11) which moves said support body in the directions to separate from and come close to the upper surface of the sheet.

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8. An apparatus according to claim 1, wherein said space portion comprises a notch of said plate-like guide body which opens downstream in the sheet convey direction.

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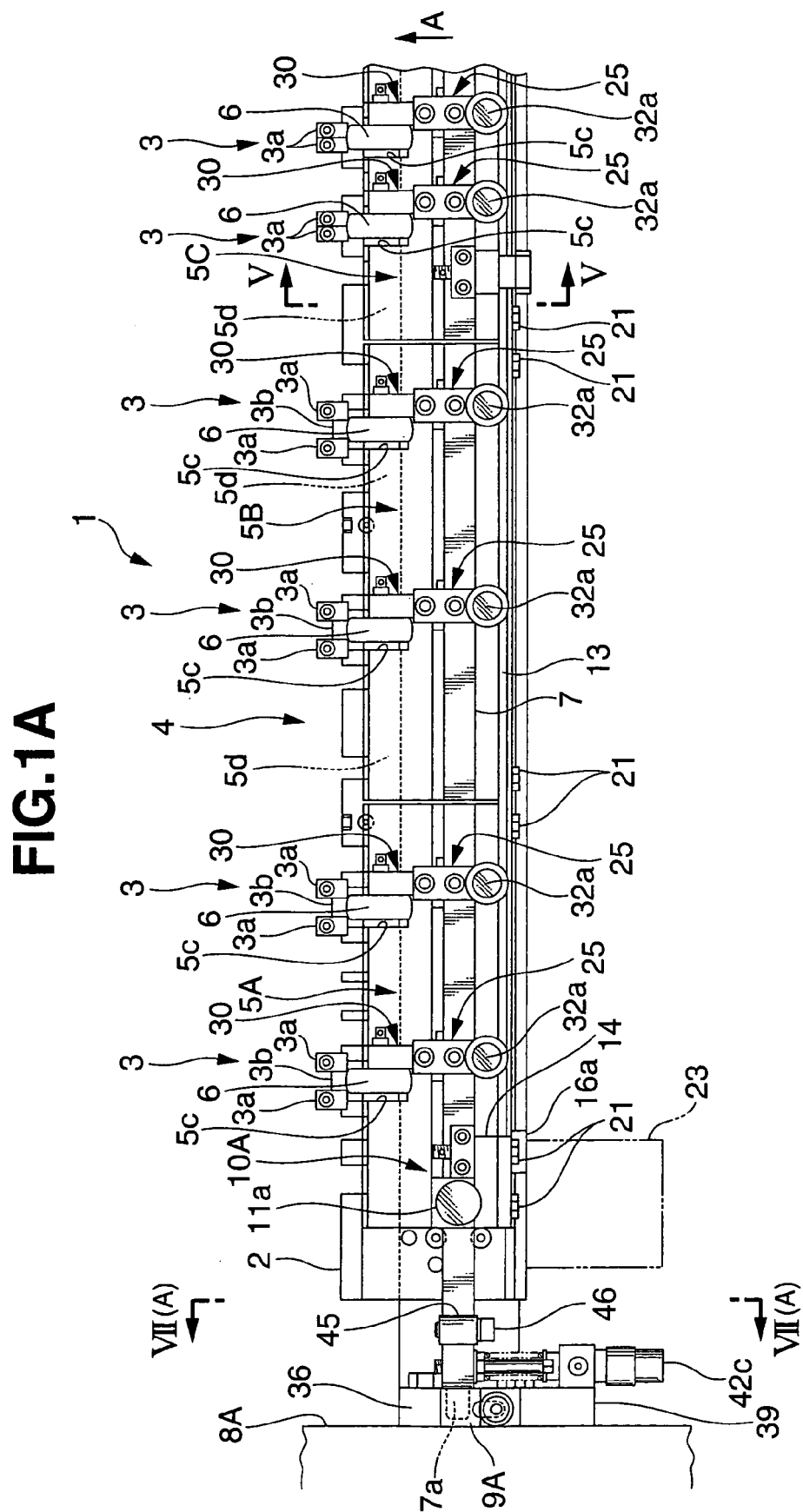


FIG. 1B

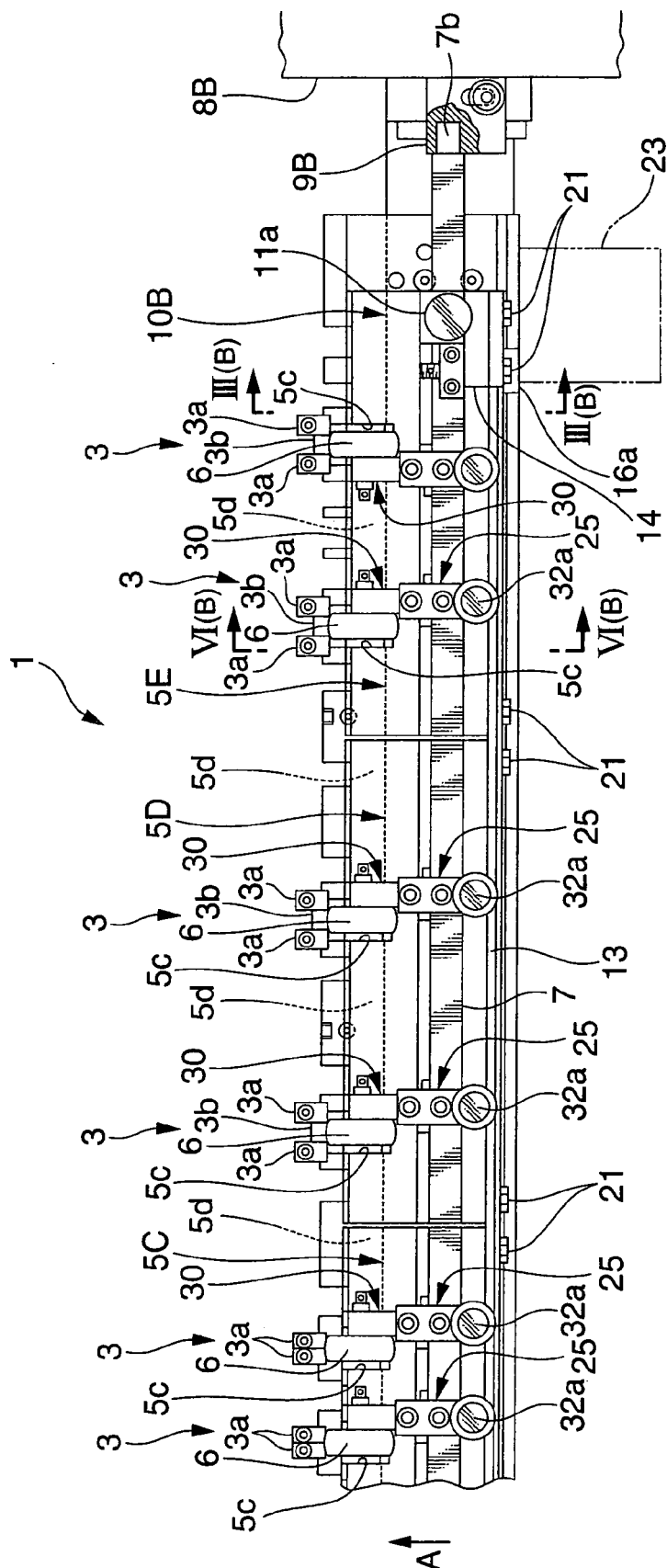


FIG. 2

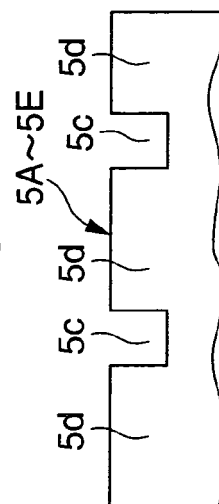


FIG.3A

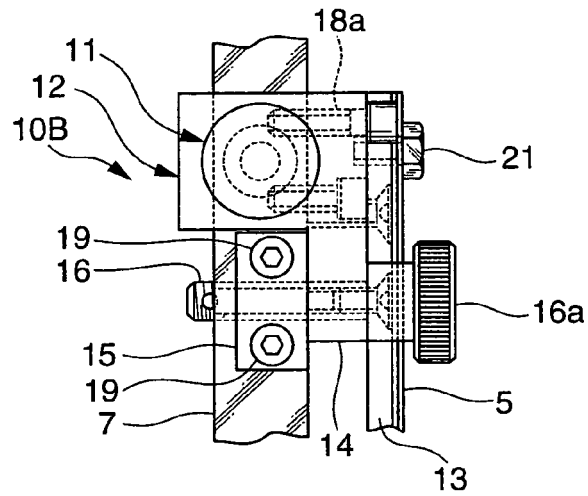


FIG.3B

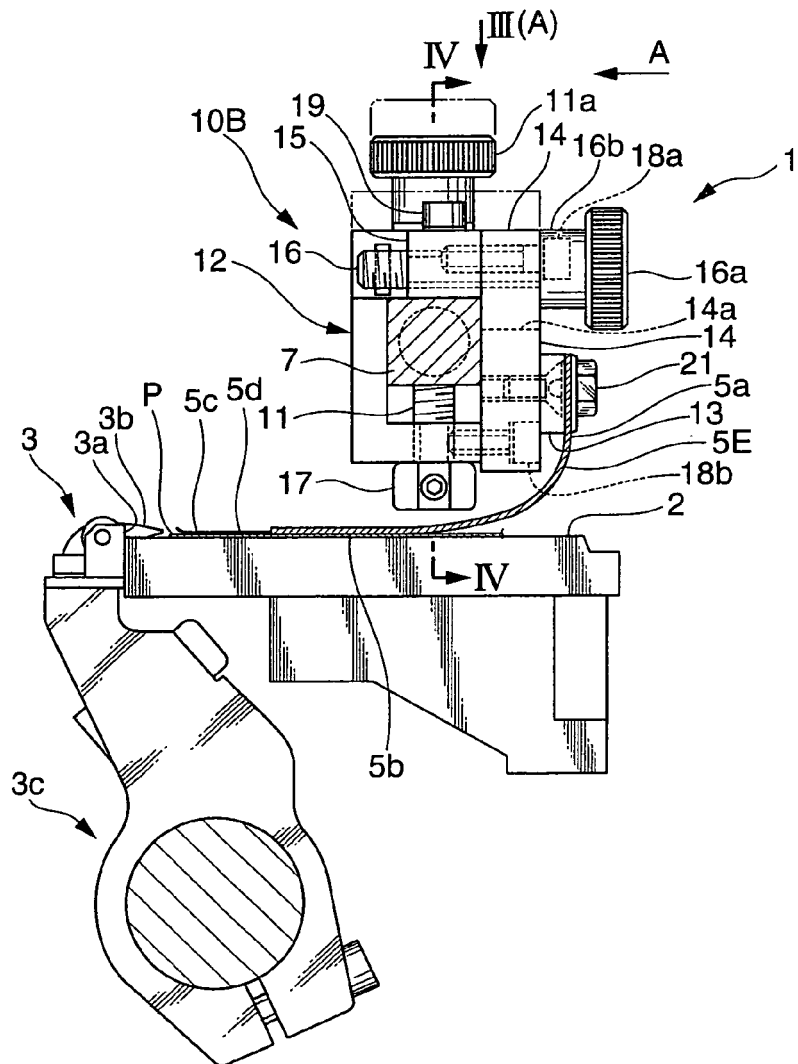


FIG.4

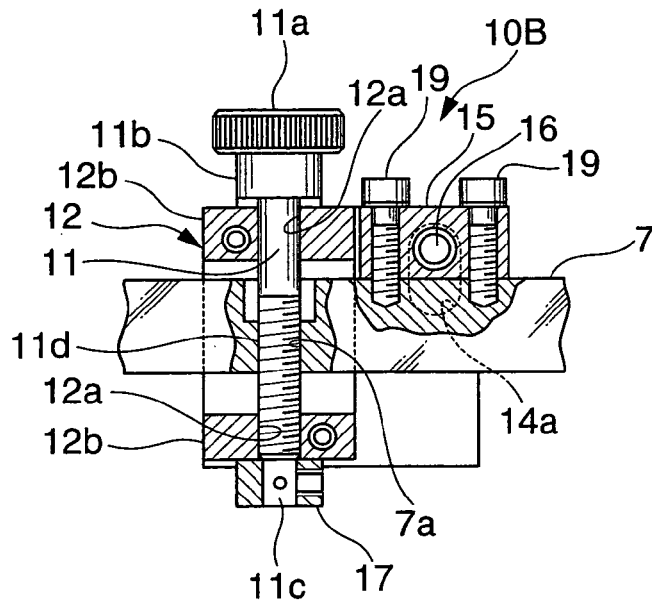


FIG.5

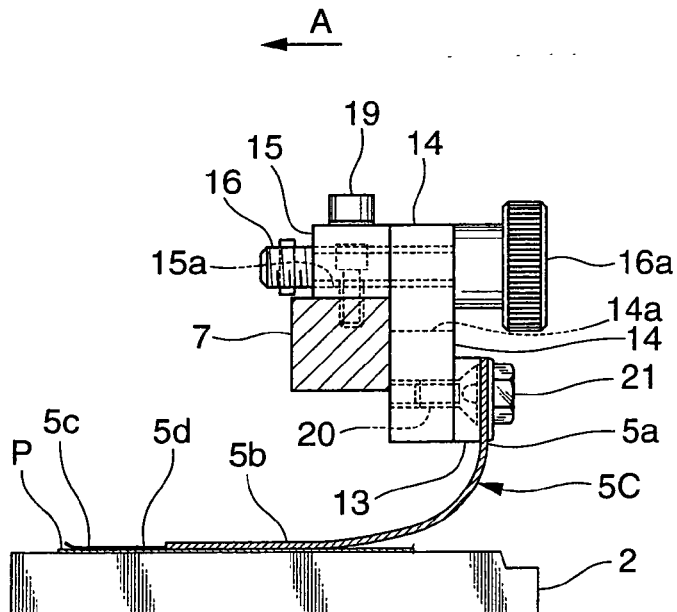


FIG. 6A

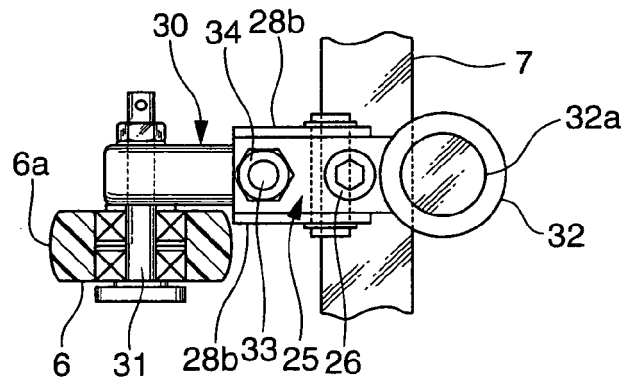


FIG. 6B

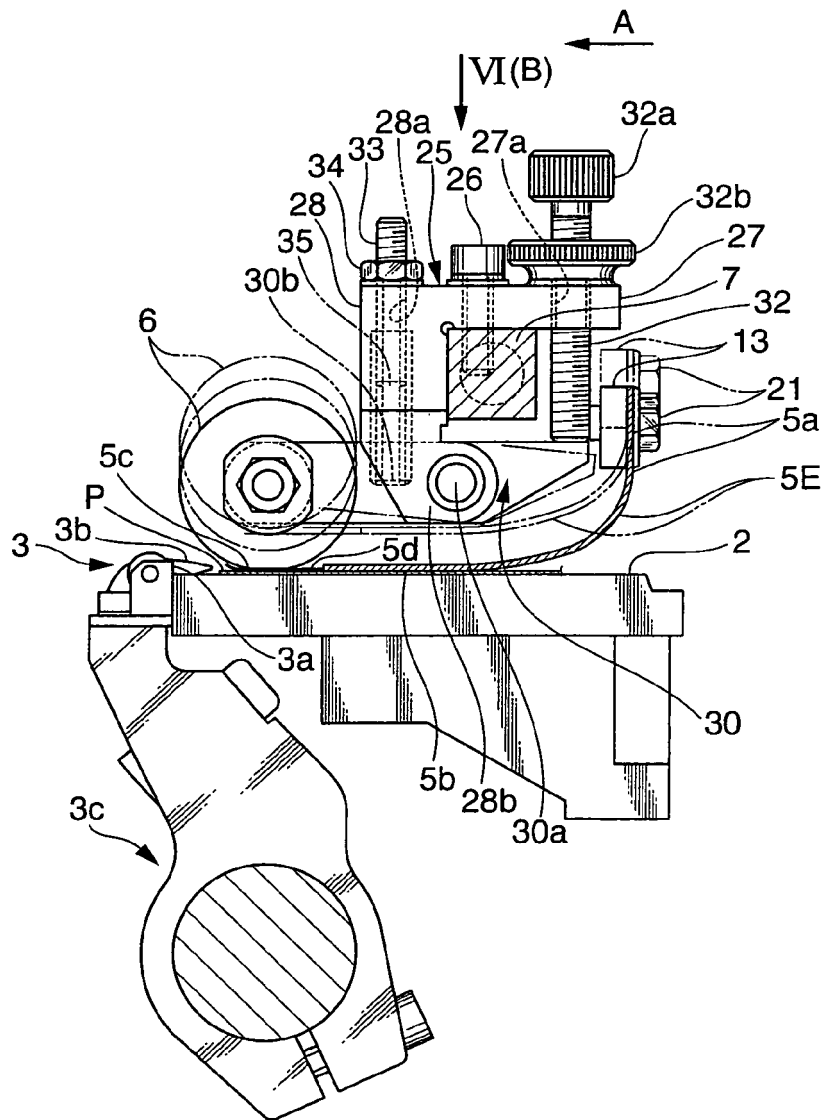


FIG.7A

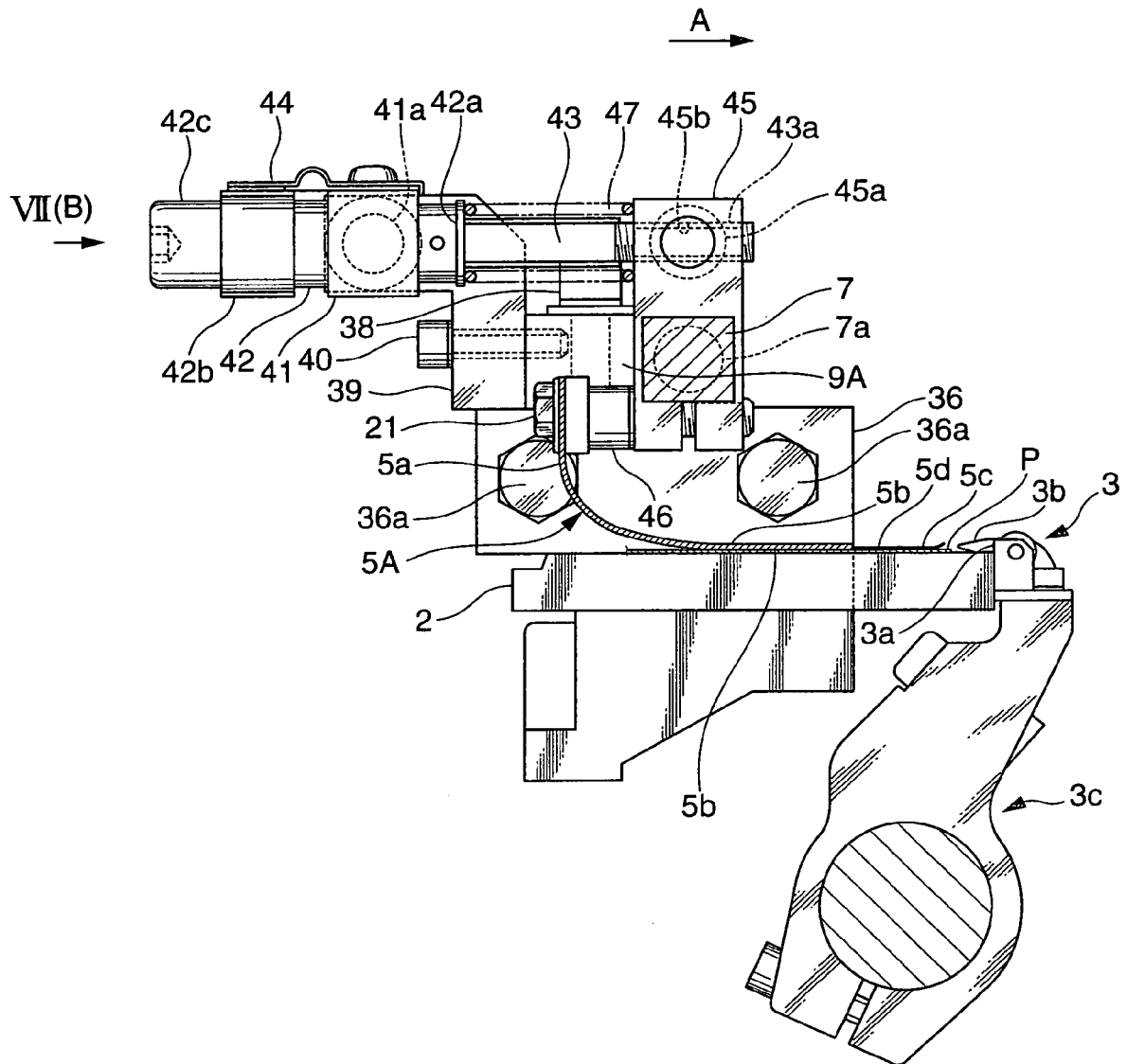
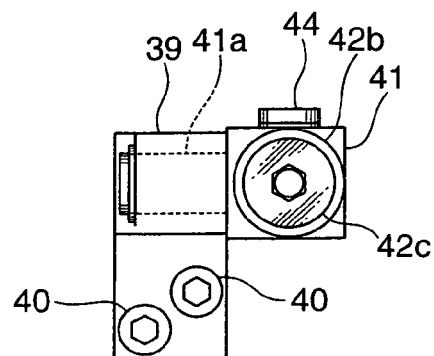


FIG.7B



REFERENCES CITED IN THE DESCRIPTION

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