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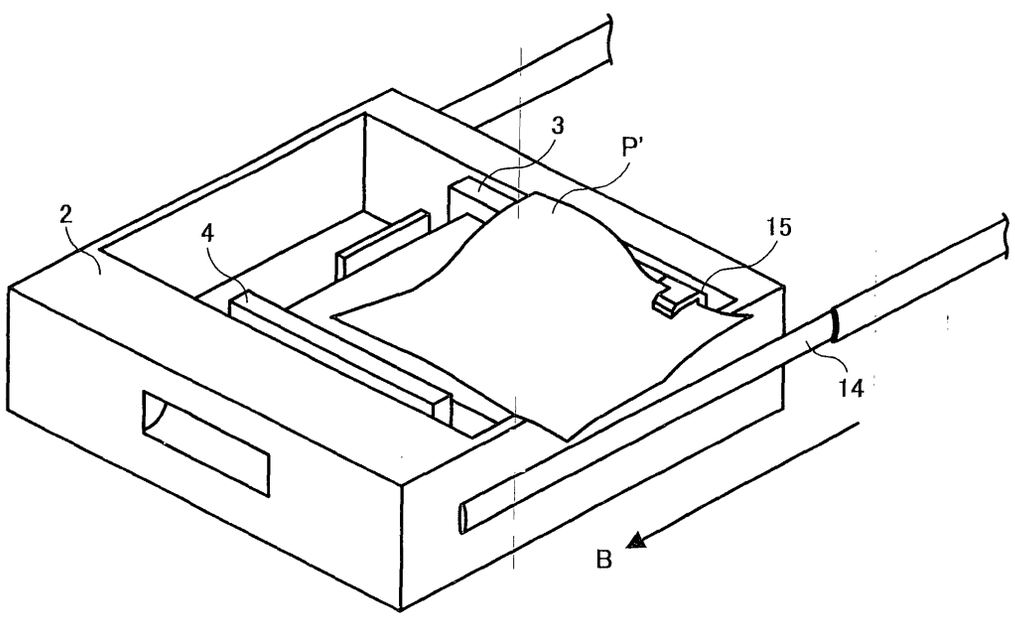
(54) Sheet feeding and image forming apparatus and method

(57) A sheet feeding apparatus includes a sheet containing tray (2) withdrawable from a housed position to a front side of an apparatus body. A sheet-feeding device is provided so as to feed sheets on the sheet containing tray in a direction perpendicular to a withdrawal direction (B) of the sheet containing tray. A pair of side aligning members (3,4) is also provided so as to align widthwise ends of the sheets. A rear side-aligning member (3) mounts a hitching member (15) so as to hitch and prevent a jam sheet from remaining in an apparatus body when the sheet containing tray is withdrawn. The hitching member includes a horizontally protruding plate so as to overhang the uppermost sheet (P') set on the sheet containing tray at a position a prescribed length downstream of a downstream end of the rear side-aligning member. A joining portion is also provided so as to join the projection plate and the rear side-aligning member. The joining portion positions a prescribed length behind a rear side end of the sheets.

FIG.6



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Description

CROSS REFERRENCE TO RELATED APPLICATIONS

[0001] This application claims priority under 35 USC §119 to Japanese Patent Application No. 13-172860 filed on June 07, 2001, the entire contents of which are herein incorporated by reference.

BACKGROUND OF THE INVENTION

Field of the Invention:

[0002] The present invention generally relates to a sheet feeding apparatus for use in an image forming apparatus, such as a copier, a facsimile, a printer, etc., and more particularly to a sheet feeding apparatus including a sheet containing tray having a side guide member that aligns side ends of sheets set on the sheet containing tray and withdrawable from the image forming apparatus in a direction perpendicular to a sheet feeding direction.

Discussion of the Background:

[0003] A so-called front loading type sheet feeding apparatus has been known in the past. Specifically, it includes a sheet containing tray withdrawable from a housed position to a front side of the apparatus body, a sheet feeding device for feeding sheets in a direction almost perpendicular to the withdrawal direction of the sheet containing tray, and a pair of side guide members extending in parallel to a sheet feeding direction for aligning side ends of the sheets. As illustrated in Fig. 7, a pair of side fences 101 and 102 is arranged and aligns side ends of sheets (P) in a widthwise direction (B) perpendicular to the sheet feeding direction (A) on a sheet containing tray 100 of such a type of a sheet feeding apparatus. Also provided is an end fence 103 so as to align a sheet-trailing end in an upstream side of the sheet feeding direction (A).

[0004] The sheets (P) are raised by a bottom plate lifting apparatus (not shown) and then fed by the sheet feeding device such as a feeding roller when the uppermost sheet reaches a sheet feeding position located at a prescribed height for the sheet feeding device. In the sheet feeding apparatus, when the sheets are fed and sheet jam occurs on the sheet containing tray, a leading end of a jam sheet possibly remains in the vicinity of the feeding roller. Thus, when a user draws the sheet containing tray 100 in the direction (B) in order to remove the jam sheet P, the jam sheet P can unfortunately climb over a rear side fence 101. In particular, when a small size sheet is utilized, a problem sometimes arises such that the small size sheet sneaks through a gap (s) formed between a right side wall 100' of the sheet containing tray and the rear side fence 101, and remains in the apparatus body as illustrated by a dotted line in Fig. 7. When the jam sheet P' having climbed over the side fence 101 remains in the apparatus body, it is difficult for a user to remove the same, and "call jam" requiring a request to a service person arises. Accordingly, a prompt jam recovery operation is disadvantageously not achieved. As a result, a working ratio is lowered.

[0005] Japanese Patent Application Laid Open No. 9-77291 refers to a sheet remaining avoiding mechanism used for the similar purpose. Specifically, a protruding section is upwardly formed from the rear side fence 101, and is setback from a rear side of a sheet setting range (i.e., a rear side end of a sheet). Thus, when the sheet containing tray is withdrawn, the jam sheet P' collides the rear side-fence 101 and is largely bent. However, it is not blocked by the protruding section and climbs over the side fence and protruding section. If the protruding section hangs over at a position certainly higher than a side fence upper surface, a jam sheet climbing over can surely be blocked. However, due to multi-step tendency in sheet containing trays of an image forming apparatus of recent date, a height per a step is suppressed, and as a result, that of the vertically protruding section can not sufficiently be assigned.

[0006] Further, the sheet remaining avoiding mechanism of Japanese Patent Application Laid Open No. 9-175677 has a complex configuration. Specifically, sheet replenishment is disadvantageously difficult because a pair of sheet suppressing members largely horizontally protrudes from respective rear side and front side fences 101 and 102 toward a sheet stack range.

SUMMARY OF THE INVENTION

[0007] Accordingly, an object of the present invention is to address and resolve the above-noted and other problems and provide a new sheet feeding apparatus. The above and other object are achieved according to the present invention by providing a novel sheet feeding apparatus including a sheet containing tray withdrawable from a housed position to a front side of an apparatus body. A sheet-feeding device is provided so as to feed a sheet on the sheet containing tray in a direction perpendicular to the withdrawal direction of the sheet containing tray. A pair of side aligning members is also provided so as to align widthwise ends of the sheets on the sheet containing tray. The aligning member of the rear side in the withdrawal direction includes a hitching member horizontally protruding toward a sheet setting range and hitch and prevent sheet from remaining when the sheet containing tray is withdrawn. The hitching member includes a protruding plate so as to overhang the uppermost sheet set on the sheet containing tray at a position a prescribed length downstream of a downstream end of the rear side-aligning member. A joining member is also provided so as to join the protruding plate and the rear side aligning member. The joining member positions a prescribed length behind a rear side

end of the sheets aligned by the rear side-aligning member.

[0008] In another embodiment, the protruding plate slightly protrudes from the rear side end of the sheets.

[0009] In yet another embodiment, the protruding plate includes a slant and bending portion at its front side or rear side.

BRIEF DESCRIPTION OF DRAWINGS

[0010] A more complete appreciation of the present invention and many of the attendant advantages thereof will be readily obtained as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings, wherein:

Fig. 1 is a schematic diagram illustrating an image forming apparatus employing sheet feeding apparatus according to the present invention;
Fig. 2 is a plan view for illustrating the sheet feeding apparatus according to the present invention;
Figs. 3A and 3B are enlarged explanatory charts illustrating a main section and a cross sectional view along the I-I line of Fig. 2;
Fig. 4 is a cross sectional view along the II-II line of Fig. 2 for illustrating a bending condition of a sheet on a sheet containing tray;
Figs. 5A and 5B are enlarged explanatory charts for illustrating a main section and a cross sectional view along the III-III line of Fig. 2;
Fig. 6 is a perspective view for illustrating a sheet containing tray in the sheet feeding apparatus;
Fig. 7 is perspective view for illustrating a conventional- sheet feeding apparatus;
Fig. 8 is a schematic chart for illustrating a second hitching member according to the present invention; and
Fig. 9 is a chart for illustrating a condition when a jam sheet climbs over a first-hitching member in the sheet feeding apparatus.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0011] Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, and in particular to Fig. 1, a schematic front view of an image forming apparatus having an exemplary sheet feeding apparatus is illustrated. In the drawing, a sheet containing tray attaching section may be formed in an apparatus body of the image forming apparatus 1 so as to attach a sheet containing tray 2 or the like. Three sheet containing trays 2 may be typically arranged and are enabled to slide back and forth on rails 14 as illustrated in Fig. 6. Thus the sheet containing tray 2 may be withdrawable from the apparatus body 1 in a forward direction shown by an arrow (B) from a front side of the apparatus body 1 as illustrated in Fig. 2.

[0012] One of sheet containing trays 2 is now described with reference to Figs. 3 to 5 illustrating cross sectional views along I-I, II-II, III-III lines of Fig. 2, respectively. In Figs. 2 to 4, the sheet containing tray 2 may include a pair of side fences 3 and 4 serving as side aligning members for aligning both side ends of a sheet P in a widthwise direction almost perpendicular to a sheet feeding direction shown by an arrow A. Also included may be an end fence 5 for aligning a trailing end of the sheet P directing the sheet feeding direction A. Such a sheet P may be set onto a bottom plate 6 as illustrated in Fig. 3. A bottom plate elevation apparatus may be provided and include an elevation arm 7 for lifting the bottom plate 6 and an elevation shaft 8 for rotating the elevation arm 7 below the bottom plate 6,. An elevation motor 9 may be provided in the apparatus body 1 and transmit rotational driving force to the elevation shaft 8. When the sheet containing tray 2 is set to the apparatus body 1, a setting detection device (not shown) may detect the tray, and then the elevation motor 9 may rotate. A coupling 10 may mesh and transmit the driving force to the elevation shaft 8. Thus, the elevation arm 7 may lift the bottom plate 6. When the uppermost sheet P reaches a prescribed sheet feeding position, the elevation motor 9 may stop driving, and thereby a sheet feeding available condition may be entered. In contrast, when the sheet containing tray 2 is withdrawn from the apparatus body 1, the coupling 10 may disengage with the elevation shaft 8. As a result, the sheets P and bottom plate 6 may be lowered by gravity.

[0013] The sheet-feeding device provided in the apparatus body 1 may be a publicly known friction separation type and mainly include a pickup roller 11, a feed roller 12, and a reverse roller 13. These pickup roller 11 and feed roller 12 may be engaged with an idler (not shown). The reverse roller 13 may always be oppositely rotated to a feeding direction so as to separate sheets P one by one. Among the side fences 3 and 4 in the sheet feeding apparatus, a hitching member 15 may be mounted on the rear side-fence 3 while directing in the direction B that sheet containing tray 2 is withdrawn so as to hitch and prevent a sheet from remaining in the apparatus body. The hitching member 15 may include a horizontally protruding plate 17 overhanging a sheet setting range, and a connecting member 16 for connecting the rear side-fence 3 and the horizontally protruding plate 17.

[0014] In a first embodiment of the present invention, as illustrated in Figs. 3A and 3B, the protruding plate 17 may overhang the uppermost sheet, and is disposed downstream of a downstream end of the rear side fence 3. Thus, a gap "r1" (i.e., a space where the protruding plate is omitted) may be formed between the protruding plate 17 and the down streamside of the rear side fence 3. Further, a connecting member 16 may maintain the gap "r1" and is set back from the sheet setting range of

the sheets stacked in front of the rear side fence 3. Thus, another gap "r2" may be formed as illustrated in Fig. 5B. Further, the horizontally protruding plate 17 of Fig. 3A may be maintained at a prescribed height "h" not to contact the uppermost sheet P when the bottom plate is lifted.

[0015] Driving may be immediately stopped in order to prevent progression of the disease of a jam condition when jam occurs in the apparatus body. In such a case, jam treatment is performed while opening a vertical sheet conveyance path as illustrated by a dotted line in Fig. 1. However, a jam sheet P' whose leading end is stopped in the vicinity of the feed roller 12 can not be treated because a jam portion is too far from the opening section to reach, and then the sheet containing tray 2 is withdrawn to the front side by an operator. The jam sheet P' necessarily collides the rear side fence 3 and thereby sometimes is largely bent by the rear side fence 3 as illustrated in Fig. 4 when the sheet containing tray is withdrawn in the direction (B) as mentioned earlier. In this situation, if the hitching member 15 positions at a middle portion of the rear side fence 3 in the sheet feeding direction and upwardly extends there, the jam sheet P' highly probably climbs over the rear side fence 3 and the hitching member 15 from its largely bending portion. In contrast, since the hitching member 15 is located downstream of the downstream side end of the rear side fence 3 as in the present invention, the jam sheet P' may not collide or sometimes slightly collides the rear side fence 3. Specifically, the jam sheet having less bending amount at its downstream side end than the other portion of the sheet may enter into the gaps "r1" and "r2" in this order, and is then hitched by the hitching member 15.

[0016] Further, since the hitching member 15 is located downstream of the downstream end of the rear side fence 3, a jam sheet having a small size may be prevented from remaining, which is generally caused because its trailing end tends to sneak a gap formed between the right side wall 2' and rear side fence 3.

[0017] As illustrated in Fig. 5A, since a front side end of the protruding plate 17 horizontally protrudes toward the sheet setting range by a slight amount of "d", the jam sheet P' may more easily enter into both the gaps "r1" and "r2". Specifically, it may credibly be hitched and withdrawn together with the sheet containing tray 2. The slight amount of "d" may not spoil a sheet setting performance in view of sheet bending when the sheet stack is set from the above. Since the hitching member 15 protrudes toward the sheet setting range by the slight amount of "d", a sheet can be damaged depending upon a setting manner in the above described embodiment. Then, as illustrated in Fig. 5B, since the leading section (i.e., a front side end) of the protruding plate 17 includes a slant and bending portion 17a, the slant and bending portion 17a may guide a sheet stack when it is loaded and prevent the same from being damaged.

[0018] In addition, since the other leading section (i.e., a rear side end) of the protruding plate 17 also includes a slant and bending portion 17b, these slant and bending portions 17a and 17b may guide a sheet stack to the housed position while preventing the sheet containing tray 2 from collision to either the apparatus body or a upper sheet containing tray. In addition, sheet damage may also be prevented.

[0019] For the friction separation roller type sheet-feeding apparatus described earlier, a friction pad type sheet feeding apparatus can be employed. The above-described hitching section integral with the rear side fence can be separated therefrom. Further, the above-described sheet feeding apparatus integral with the image forming apparatus can be separated therefrom and employ the present invention.

[0020] Further, as illustrated in Figs. 8 and 9, a second hitching section 218 can be provided in addition to and in an upstream position of the hitching section 218 on the rear side fence 3. The second hitching section may also include a horizontally protruding plate 220 at a rear side of the sheet setting range on the sheet containing tray 2, a connecting portion 219 for connecting the protruding plate 220 to the side fence 203, and an eave 221 projecting downstream from the protruding plate 220.

[0021] A height of the side fence 203 may be lowered at a portion attaching the hitching section 218 than the remaining portion of the side fence 203. Thus, a gap "r3" may be formed between the protruding plate 220 and side fence 203.

[0022] Thus, even when the jam sheet P' rarely climbs over the hitching member 15, an upstream portion of the jam sheet P' can possibly be hitched by the second hitching section 218 and enter into the gap "r3". Thus, the jam sheet P' can be withdrawn together with the sheet containing tray 202.

[0023] Since the side fence 203 is lowered at the hitching section 218 attaching portion, the gap "r3" can be large enough to hitch a jam sheet. In addition, the second hitching section 218 may also be set back from the sheet setting range, the sheet stack may not collide the hitching section 218 and avoid damage therefrom when set on the sheet containing tray. Further, the second hitching section 218 may preferably be positioned substantially at the center of a side of the smallest sheet among various sizes of sheets. In such a situation, it surely hitches the jam sheet P' having the smaller size.

[0024] Obviously, numerous additional modifications and variations of the present invention are possible in light of e above teachings. It is therefore to be understood that within the scope of the appended claims, the present invention may be practiced otherwise than as specifically described herein.

[0025] The hitching member is preferably arranged above the rear side member, preferably at least with respect to a part of the rear side member. Preferably, there is a gap between the hitching member and the rear side member. Preferably, the gap is wider than the thickness of a sheet such that a sheet may enter the gap. Prefer-

ably, the hitching member is formed such that a sheet is gripped or hitched by the hitching member, in particular, when the sheet enters via afore-mentioned gap. Preferably, the hitching member projects from the aligning member in order to block a movement of a sheet beyond the rear side aligning member such that the sheet may not pass the rear side aligning member. Preferably, the hitching member is arranged above the top sheet of a sheet stack arranged in the sheet containing tray. Preferably, a hitching member is arranged at a height with respect to the bottom of the sheet containing tray which is higher than the height of the outlet for the sheet to be set. Preferably, the hitching member has a hook like shape in order to hook sheets which tend to pass the rear side aligning member. Preferably, the hitching member is arranged and constituted such that a movement of the sheet towards the rear side of the sheet containing tray is hindered or blocked if the sheet is above the afore-mentioned sheet outlet. Preferably, the hitching member is arranged downstream of the upstream end of the rear side aligning member, preferably, around or more preferably downstream of a mid portion of the rear side aligning member such that a mid portion or more preferably a downstream portion of a sheet is prevented to pass the rear side aligning member.

[0026] A sheet feeding apparatus includes a sheet containing tray withdrawable from a housed position to a front side of an apparatus body. A sheet-feeding device is provided so as to feed sheets on the sheet containing tray in a direction perpendicular to a withdrawal direction of the sheet containing tray. A pair of side aligning members is also provided so as to align widthwise ends of the sheets. A rear side aligning member mounts a hitching member so as to hitch and prevent a jam sheet from remaining in an apparatus body when the sheet containing tray is withdrawn. The hitching member includes a horizontally protruding plate so as to overhang the uppermost sheet set on the sheet containing tray at a position a prescribed length downstream of a downstream end of the rear side-aligning member. A joining portion is also provided so as to join the projection plate and the rear side-aligning member. The joining portion positions a prescribed length behind a rear side end of the sheets.

Claims

1. A sheet feeding apparatus, comprising:

a sheet containing tray withdrawable from a housed position to a front side of an apparatus body;
a sheet feeding device configured to feed a sheet on the sheet containing tray in a direction perpendicular to a withdrawal direction of the sheet containing tray;
a pair of side aligning members configured to align widthwise ends of the sheets set within a sheet setting range on the sheet containing tray; and
a hitching member mounted on the sheet containing tray behind a rear side of the sheets, wherein said hitching member is positioned on the sheet containing tray a prescribed length downstream of a downstream end of the rear side aligning member and/or wherein said hitching member is at least partly arranged above and/or downstream of an upstream end of the rear side aligning member and/or constituted such that it hinders a sheet about to be fed passing the rear side aligning member.

2. The sheet feeding apparatus according to claim 1, wherein said hitching member is secured to the rear side aligning member.

3. The sheet feeding apparatus according to any one of claims 1 and 2, wherein said hitching member includes a horizontally protruding plate configured to protrude toward the sheet setting range and overhang the uppermost sheet set on the sheet containing tray.

4. The sheet feeding apparatus according to claim 3, wherein said hitching member includes a joining member configured to join the protruding plate and the rear side aligning member, said joining member positioning a prescribed length behind a rear side end of the sheet aligned by the rear side-aligning member.

5. The sheet feeding apparatus, according to claim 4, wherein said protruding plate forwardly slightly protrudes from the rear side end of the sheets so that sheet replenishment from above is substantially not interfered by the protruding plate.

6. The sheet feeding apparatus, according to claim 4, wherein said protruding plate includes a slant portion configured to guide the sheets to be replenished at its front side end when sheets are replenished from the above.

7. The sheet feeding apparatus, according to claim 3, wherein said protruding plate includes a slant portion configured to form a guiding portion at its rear side end when the sheet feeding apparatus is housed.

8. An image forming apparatus including:

a visual image forming and transferring device configured to forming and transferring a visual image onto a sheet; and
a sheet feeding device configured as claimed

in any one of claims 1 to 7 for feeding a sheet to receive the visual image.

9. A method for hitching a jam sheet jamming on a sheet containing tray, comprising the steps of:

providing a pair of side aligning members configured to align widthwise ends of the sheets set on the sheet containing tray;
providing a hitching member on the sheet containing tray behind a rear side of the sheets and downstream of a downstream end of the rear side aligning member; and
withdrawing a sheet containing tray from a housed position to a front side of an apparatus body when a jam occurs;
hitching a relatively smaller bending portion of the jam sheet jamming in the vicinity of an outlet of the sheet containing tray with the hitching member when said step of withdrawing a sheet feeding tray is performed.

FIG. 1

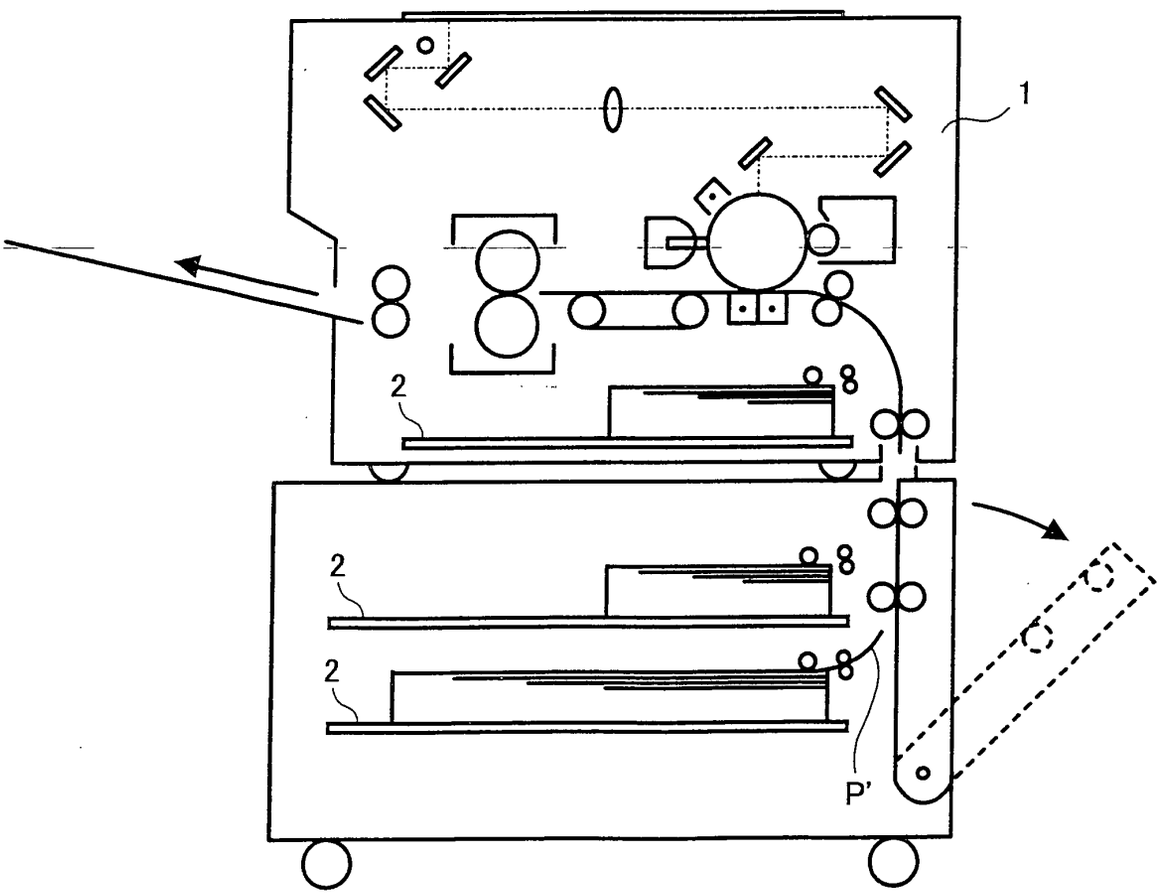


FIG. 2

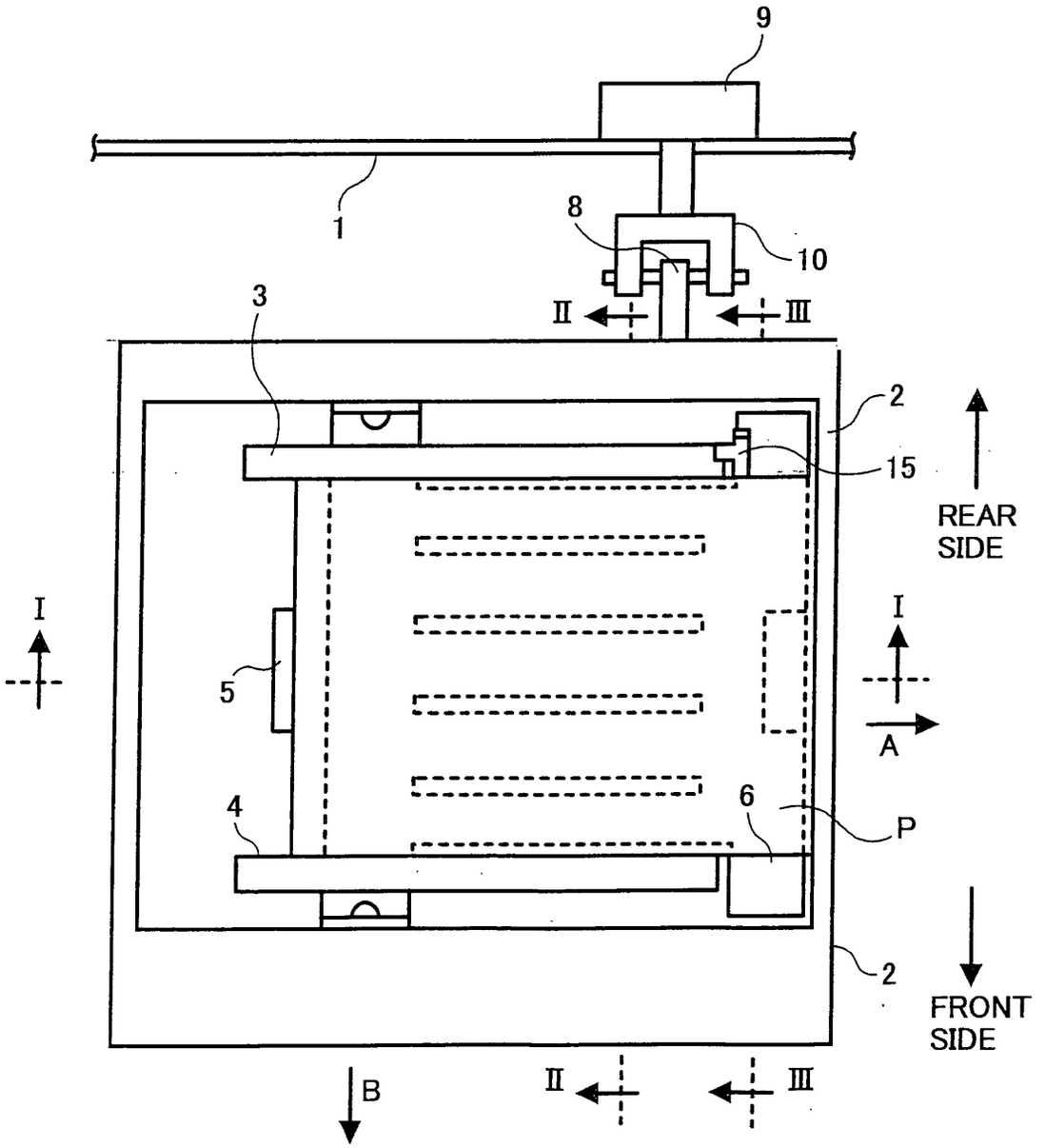


FIG. 3A

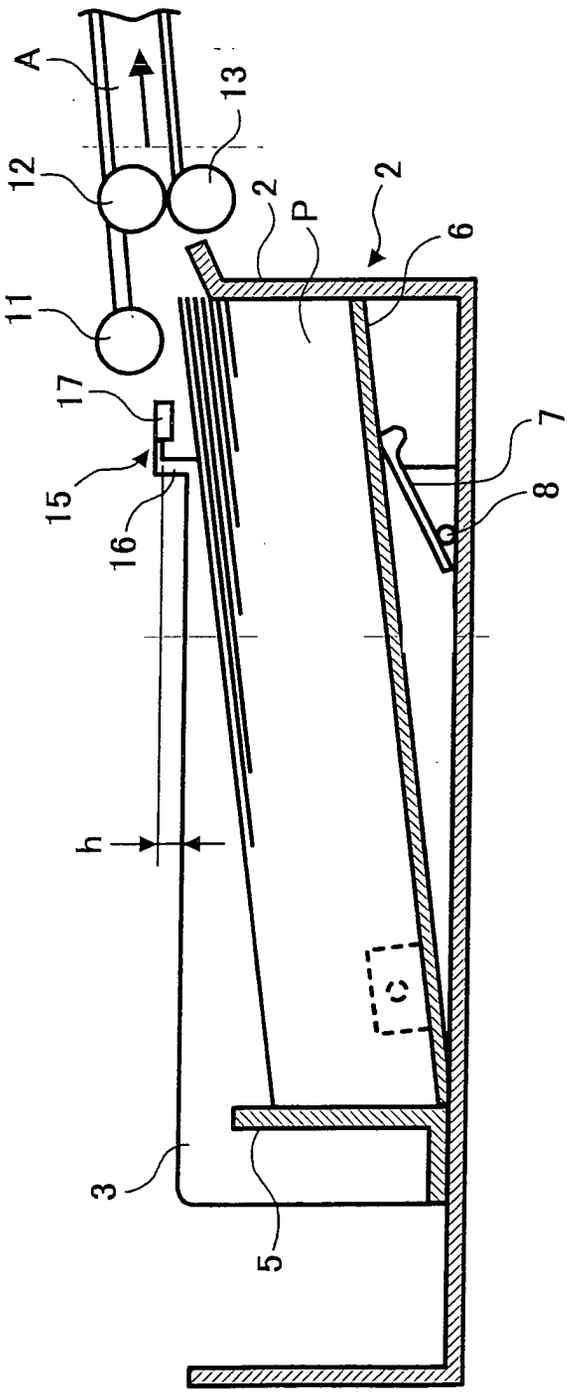


FIG. 3B

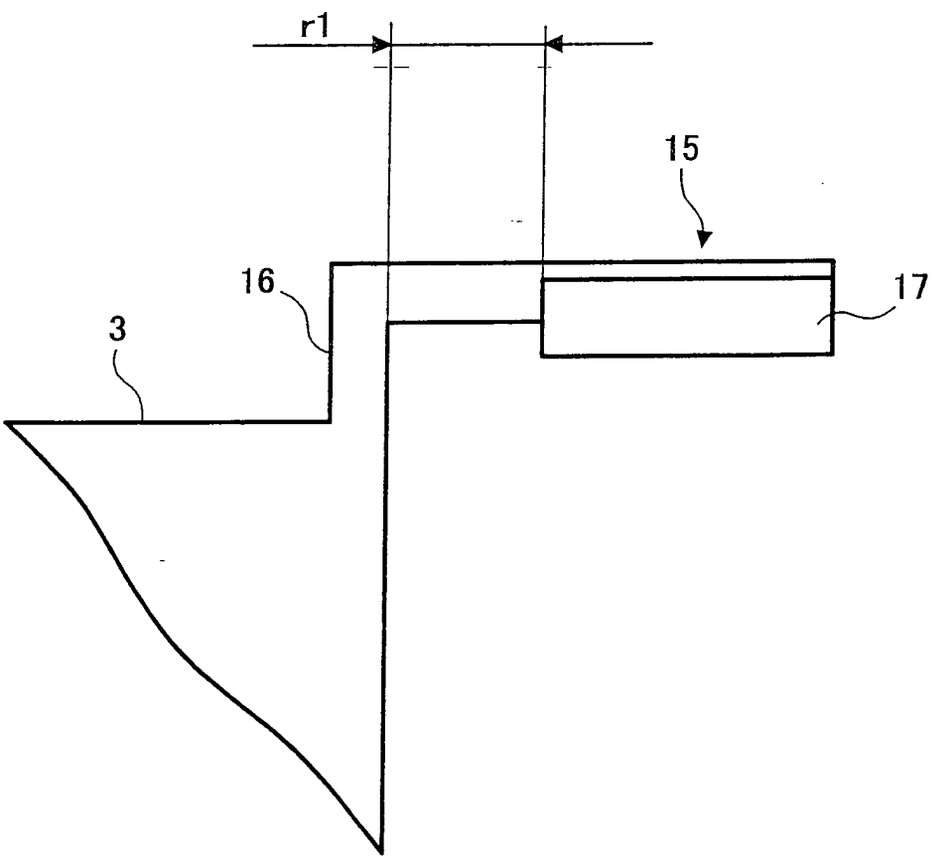


FIG. 4

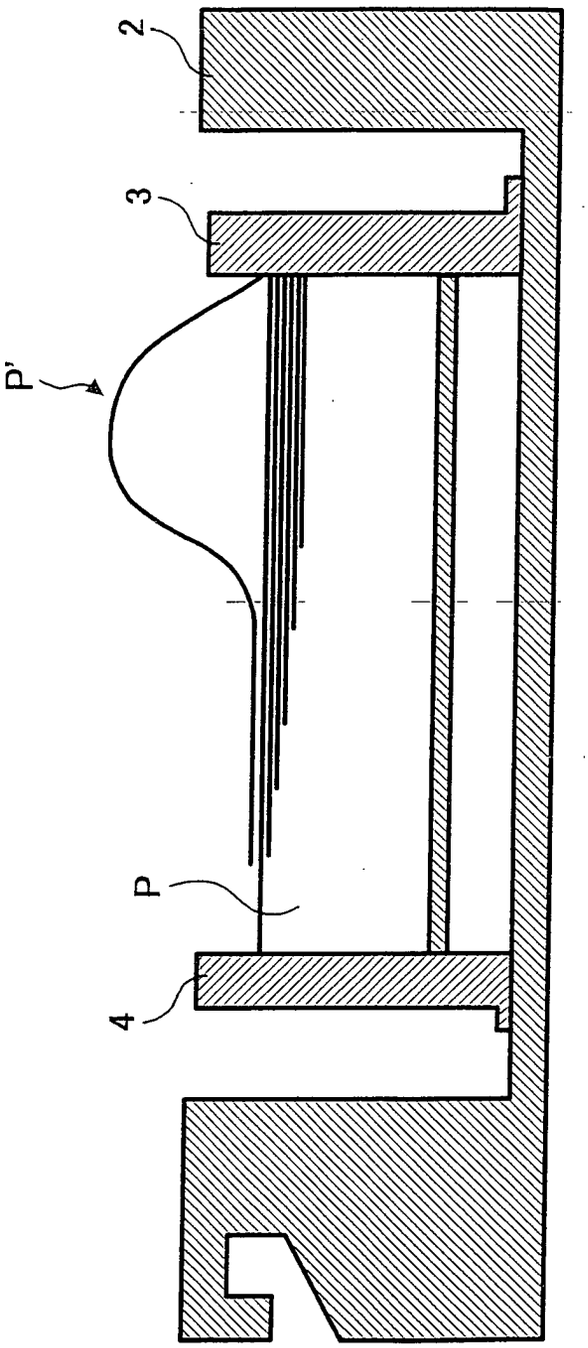


FIG.5A

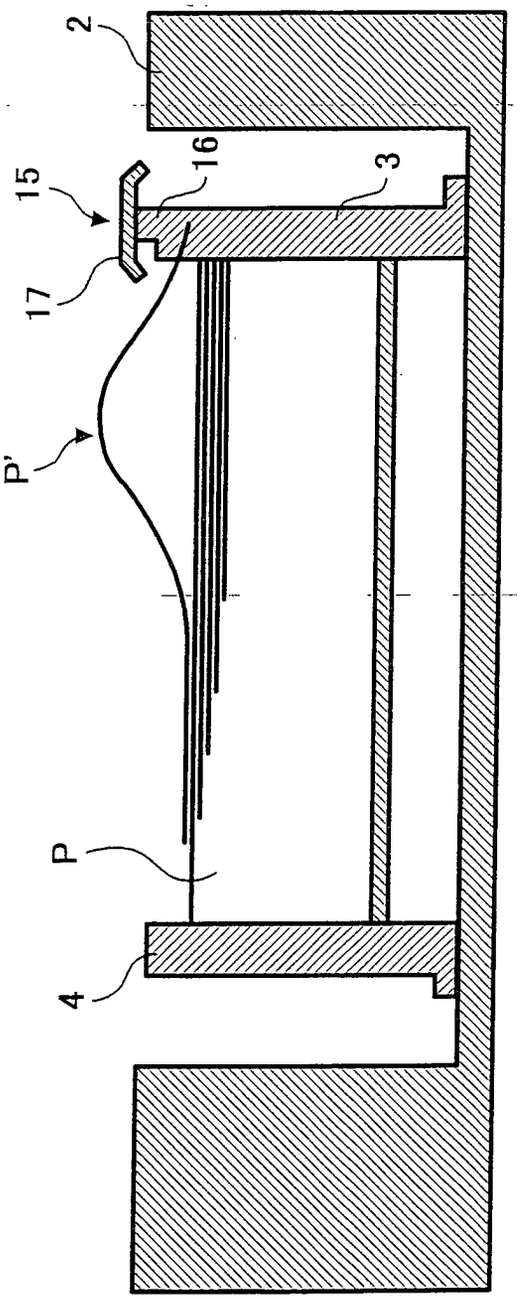


FIG. 5B

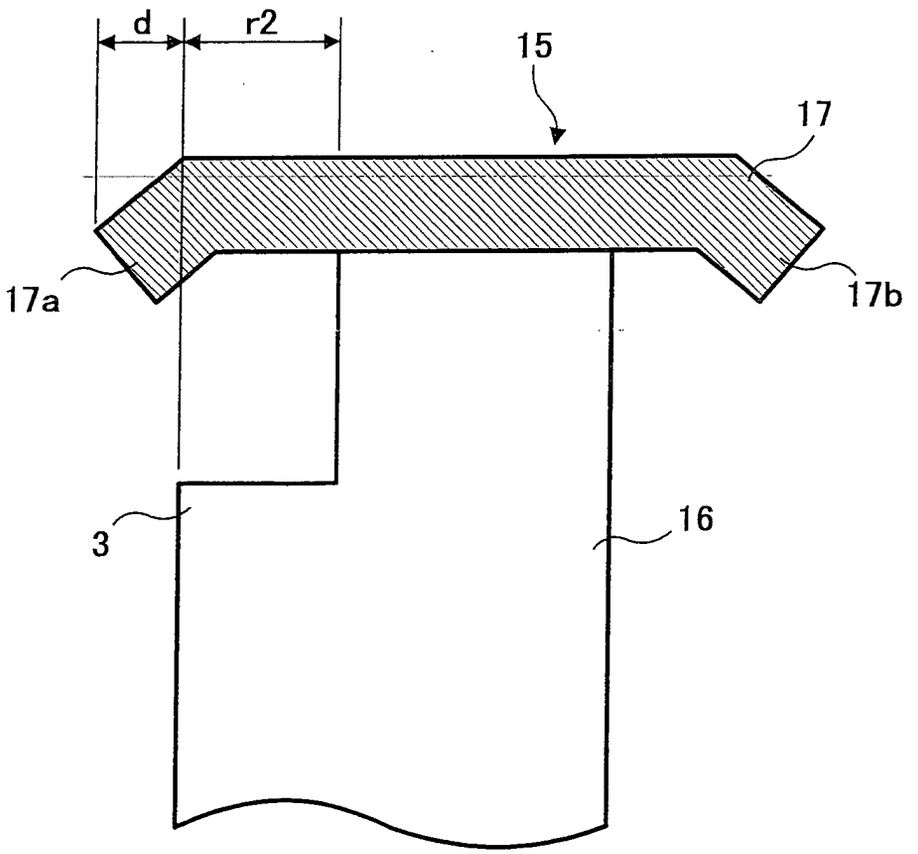


FIG.6

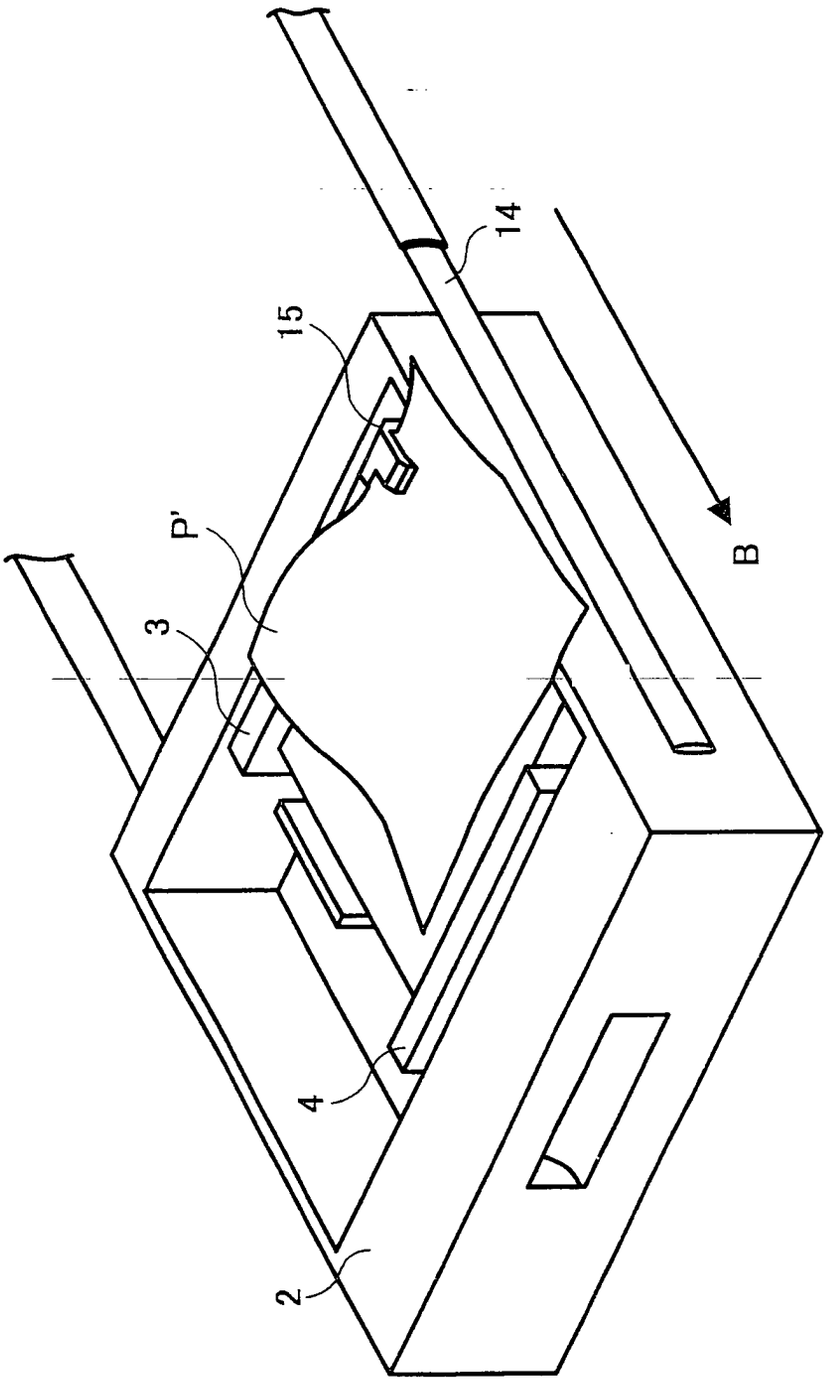


FIG.7

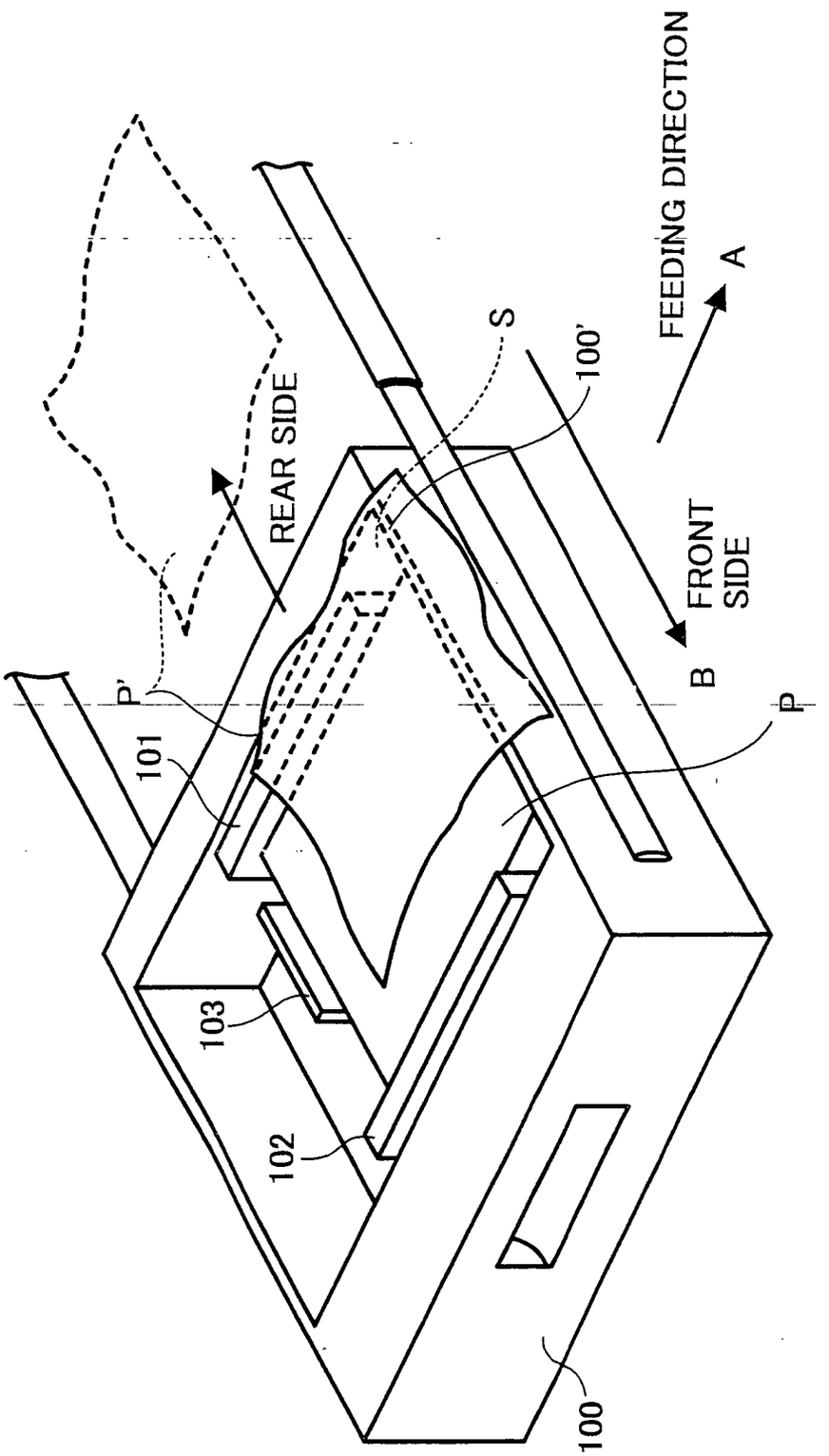

FEEDING DIRECTION
A
B
FRONT SIDE
REAR SIDE
S
100'
P'
P
101
103
102
100

FIG. 8

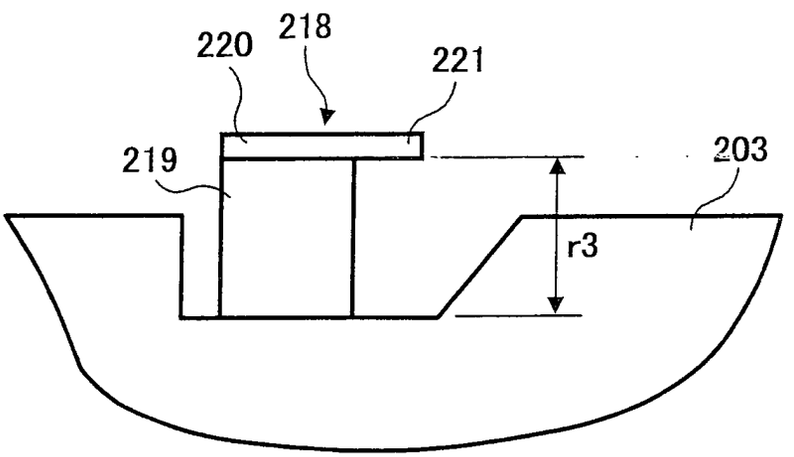
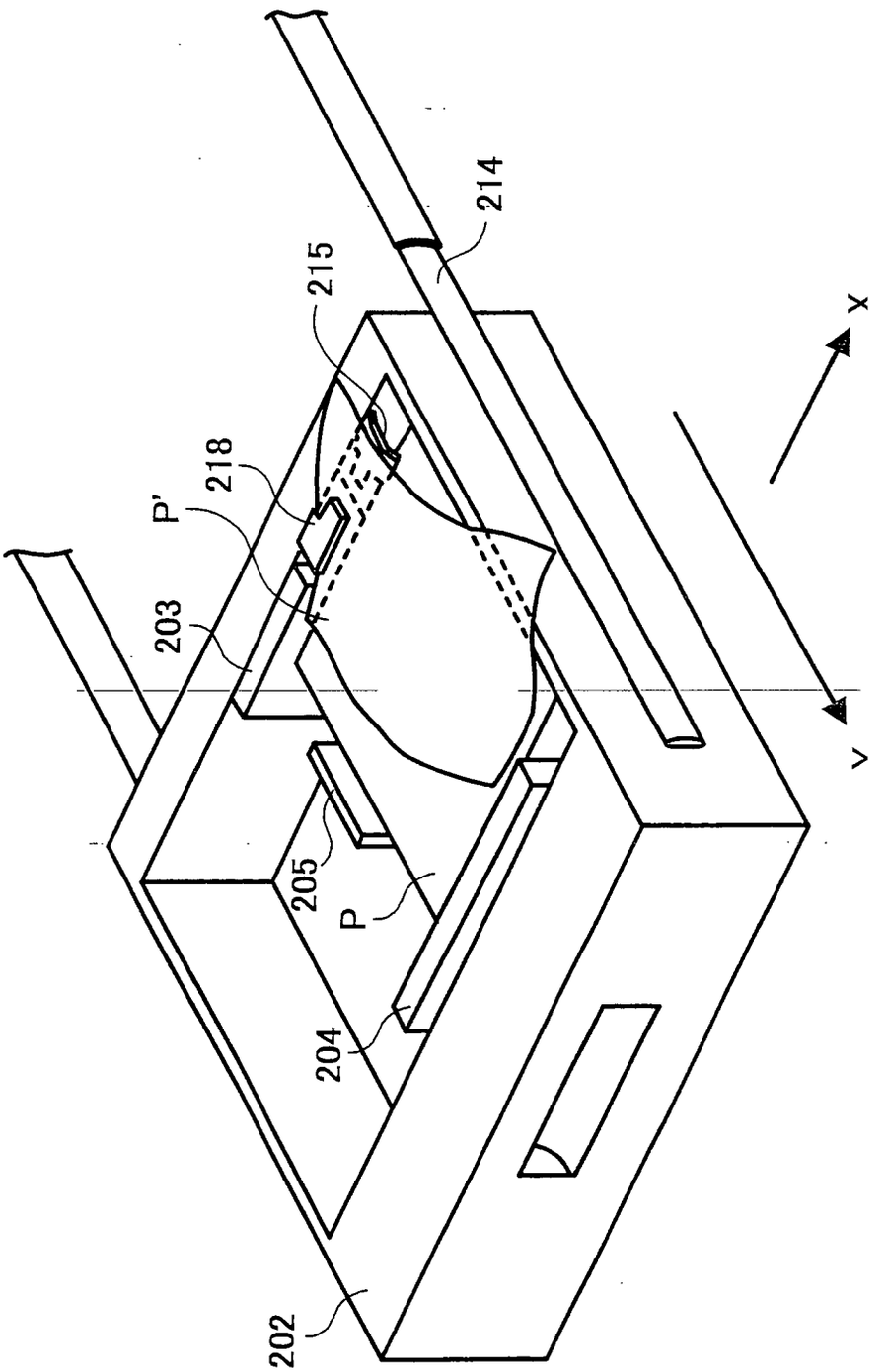


FIG. 9



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EUROPEAN SEARCH REPORT

Application Number
EP 02 01 2347

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
D,X	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 07, 31 July 1997 (1997-07-31) & JP 09 077291 A (RICOH CO LTD), 25 March 1997 (1997-03-25) * abstract *	1,2,8	B65H1/04 B65H1/26
D,A	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 11, 28 November 1997 (1997-11-28) & JP 09 175677 A (RICOH CO LTD), 8 July 1997 (1997-07-08) * abstract *		

TECHNICAL FIELDS SEARCHED (Int.Cl.7)

B65H
G03G

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	28 August 2002	Pussemier, B

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 02 01 2347

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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28-08-2002

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 09077291 A	25-03-1997	NONE	
JP 09175677 A	08-07-1997	NONE	

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