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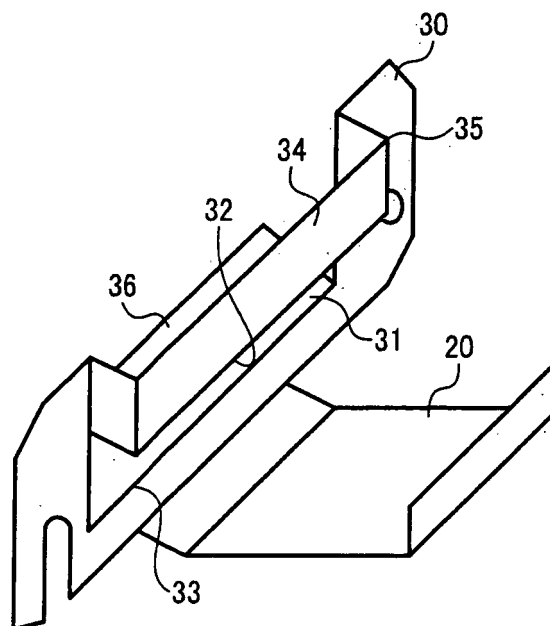
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(54) **Sheet feeder and image forming apparatus**

(57) A sheet feeder (2) including a first tray (10) arranged to be provided at a paper feeding mouth of the main body (1) of an image forming apparatus, a second tray (20) to support a rear portion of a long sheet (50), the second tray (20) adapted to be positioned above the

first tray (10), a guiding member (30) to guide the long sheet (50) at setting or sheet feeding, the guiding member (30) adapted to be positioned above the second tray (20) while facing an outside of the main body (1) of the image forming apparatus.

FIG. 2



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Description

[0001] The present invention relates to a sheet feeder and an image forming apparatus including the sheet feeder.

[0002] In an image forming apparatus such as a photocopier, a printer, a facsimile machine and a multi-functional machine having at least two functions thereof, a recording medium (sheet) of a normal kind having a regular size is automatically fed from a sheet feeder cassette. However, a sheet of a special kind or having an irregular size is not fed by using a paper feeder cassette. Therefore, a manual sheet feeder (manual tray) is provided to guide such an irregular or special sheet into the middle of a sheet feeding path in the image forming apparatus.

[0003] Such a manual sheet feeder is generally set to be movable between the storage position and the operation position and be small from a structural point of view. Therefore, with regard to a long sheet, only a part thereof can be placed on such a manual sheet feeder and the remainder of the long sheet runs off the edge of the manual sheet feeder. Thus, an operator is required to hold the remainder of the long sheet until the long sheet is completely fed into an image forming apparatus. Otherwise, the long sheet slides off from the mouth of the manual sheet feeder due to the weight of the remainder of the long sheet, resulting in no sheet on the manual sheet feeder.

[0004] There is a technology describing a long sheet paper feeder (manual tray) which holds a long sheet in a curved state. This long sheet paper feeder is detachably attachable to the outside of the main body of an image forming apparatus and includes a first holding portion which holds the front portion of a long sheet and a rear portion holding member which holds the rear portion of the long sheet.

[0005] However, this long sheet paper feeder has a drawback that the long sheet paper feeder bears the entire weight of a long sheet, which easily leads to a break of the long sheet paper feeder and requires a reinforcement device separately to prevent such a break.

[0006] Furthermore, the long sheet paper feeder (manual tray) has a structure in which the rear portion holding member is over the top of the manual tray. Due to this structure, the manual tray is hidden from the direct sight of an operator so that it is difficult to place a long sheet on the manual tray. In addition, the operability of the side fence is bad, which tends to cause a problem with sheet feeding such as skewing and paper jamming.

[0007] To relieve these drawbacks, there is another technology describing a manual tray for a long sheet. In this technology, the weight of a long sheet is separately borne by the first holding portion provided to the manual tray and the second holding portion provided to the main body of an image forming apparatus. Thus, the load on the manual tray is relieved, which eliminates the necessity of providing a reinforcement device.

[0008] In addition, the second holding portion is openable and closable so that an operator can set a long sheet whilst having a direct sight of the manual tray, thereby improving the operability. Therefore, the operator can set a long sheet while scanning the side fence provided to the manual tray, which restrains the occurrence of skewing or paper jamming caused by bad setting of the long sheet.

[0009] With regard to the tray of this technology, there are provided side fences to the manual tray portion and the first holding member by which the setting position of a sheet is regulated in the direction perpendicular to the sheet feeding direction. However, the second holding member does not have a regulating member and thereby a long sheet is set skewed in some cases. A long sheet that is set skewed causes a problem with sheet feeding, which may result in production of abnormal images and occurrence of paper jamming.

[0010] Furthermore, the second holding member of this technology is attached to a lateral side of an image forming apparatus, meaning it is necessary to secure the strength for the attachment of the second holding member. Thus, the second holding member is fastened to the side of an image forming apparatus at several places.

[0011] For these reasons, the present inventors recognize that a need exists for a sheet feeder, on which a long sheet can be properly and easily set and for which the strength for installment is secured and an image forming apparatus using the sheet feeder.

[0012] Accordingly, an object of the present invention is to provide a sheet feeder on which a long sheet can be properly and easily set and to which the strength for installment is secured and an image forming apparatus using the sheet feeder. Accordingly, the present invention provides a sheet feeder including a first tray arranged to be at a paper feeding mouth of the main body of an image forming apparatus, a second tray to support a rear portion of a long sheet, the second tray adapted to be positioned above the first tray, a guiding member to guide the long sheet at setting or sheet feeding, the guiding member adapted to be positioned above the second tray while facing an outside of the main body of the image forming apparatus.

[0013] It is preferred that, in the sheet feeder mentioned above, the guiding member includes a regulating portion to regulate the long sheet, the regulating portion including a mouth through which the long sheet passes.

[0014] It is still further preferred that, in the sheet feeder mentioned above, the guiding member includes a sheet guiding member to guide the long sheet, the sheet guiding member provided above the regulating portion while facing the outside of the main body of the image forming apparatus with a gap therebetween.

[0015] It is still further preferred that, in the sheet feeder mentioned above, the guiding member includes a bottom face guiding portion to guide the bottom face of the long sheet, the bottom face guiding portion provided to the lower part of the regulating portion.

[0016] It is still further preferred that, in the sheet feeder mentioned above, the guiding member includes a top face guiding portion configured to guide the top face of the long sheet, the top face guiding portion provided to the upper part of the regulating portion.

[0017] It is still further preferred that, in the sheet feeder mentioned above, the regulating portion is formed with the upper part protruding away from the main body of the image forming apparatus with an angled U shape relative to the lower part of the regulating portion when seen from the top.

[0018] It is still further preferred that, in the sheet feeder mentioned above, the bottom face guide portion is formed with steps (38) corresponding to a sheet width.

[0019] It is still further preferred that, in the sheet feeder mentioned above, the bottom face guiding portion includes a marking (39) indicating a sheet size corresponding to the sheet width.

[0020] It is still further preferred that, in the sheet feeder mentioned above, the bottom face guiding portion includes a bottom face guide board slanted toward a direction in which the rear end of the long sheet is guided to the second tray.

[0021] It is still further preferred that, in the sheet feeder mentioned above, the guiding member is supported by the main body of the image forming apparatus and supports the second tray.

[0022] It is still further preferred that, in the sheet feeder mentioned above, the guiding member is rotatably attached to the main body of the image forming apparatus with one end of the guiding member via a hinge.

[0023] It is still further preferred that, in the sheet feeder mentioned above, the guiding member is structured to shrink in a length direction thereof when another end of the guiding member is rotated upward.

[0024] As another aspect of the present invention, an image forming apparatus including the sheet feeder mentioned above is provided.

[0025] Various other objects, features and attendant advantages of the present invention will be more fully appreciated as the same becomes better understood from the detailed description of exemplary embodiments and the accompanying drawings, in which like reference characters designate like corresponding parts throughout and wherein:

Fig. 1 is a schematic diagram illustrating an example of the image forming apparatus to which the sheet feeder of the present invention is provided;

Fig. 2 is a perspective view illustrating an example of the long sheet guide provided to the image forming apparatus illustrated in Fig. 1;

Fig. 3 is a perspective view illustrating another example of the long sheet guide;

Fig. 4 is a perspective view illustrating another example of the long sheet guide;

Fig. 5 is a perspective view illustrating another example of the long sheet guide;

Fig. 6 is a perspective view illustrating another example of the long sheet guide;

Fig. 7 is a side view illustrating the sheet feeder illustrated in Fig. 1;

Fig. 8 is a side view illustrating a state in which the sheet feeder illustrated in Fig. 7 is rotated;

Fig. 9 is a side view illustrating another example of the long sheet guide;

Fig. 10 is a perspective view illustrating a variation of the long sheet guide illustrated in Fig. 9;

Fig. 11 is a perspective view illustrating an example of the foldable long sheet guide;

Fig. 12 is a perspective view illustrating another example of the foldable long sheet guide;

Fig. 13 is a diagram illustrating another example of the long sheet guide;

Fig. 14 is a side view illustrating a state in which the sheet feeder illustrated in Fig. 11 is rotated; and

Fig. 15 is a side view illustrating a state in which the sheet feeder illustrated in Fig. 11 is rotated and shortened.

[0026] The present invention will be described below in detail with reference to several embodiments and accompanying drawings.

[0027] Fig. 1 is a diagram illustrating the exterior of an image forming apparatus having an example of the sheet feeder of the present invention.

[0028] In Fig. 1, the reference numeral 1 represents the main body of an image forming apparatus which forms an image on a sheet. On the right outside of the main body 1, a sheet feeder 2 is provided. The sheet feeder 2 includes a manual tray 10 as a first tray, a long sheet tray 20 as a second tray, a long sheet guide 30 where a long sheet 50 is set and which guides the long sheet 50 when the long sheet is fed. The manual tray 10 is used for a sheet having a size different from that of the sheets accommodated in the paper feeder cassette (not shown) in the main body 1 of the image forming apparatus or a sheet of a special kind. The long sheet tray 20 is only used when a long sheet 50 having a special size is fed.

[0029] There is provided a long sheet guide 30 as a guiding member above the long sheet tray 20 which guides a long sheet when the long sheet is set or fed. Figs. 2 to 6 are perspective views illustrating examples of a long sheet guide 30 having a different form.

[0030] In Fig. 2, the long sheet guide 30 has an oblong shape with a horizontal length L1 having approximately the same length as that of the width of the main body 1, which is perpendicular to the sheet of Fig. 1, longer than a perpendicular length L2. This long sheet guide 30 includes a regulating portion having a mouth 31 through which the rear end of the long sheet 50 passes. The mouth 31 has a width through which the long sheet 50 illustrated in Fig. 1 having the widest size for image formation can be inserted. The long sheet tray 20 has a width narrower than the width of the mouth 31.

[0031] The upper part of the mouth 31 is formed by a top face guiding portion 32 and the lower part is formed by a bottom face guiding portion 33. The top face guiding portion 32 and the bottom face guiding portion 33 guide the top face of the long sheet 50 and the bottom face thereof, respectively. Furthermore, a guide board 34 situated above the mouth 31 is a sheet guide for the long sheet 50.

[0032] The upper part of the mouth 31 illustrated in Fig. 2 is formed of a bent portion 35 which is bent to form an angled U-shape when seen from the top so that the long sheet 50 is easily inserted into the mouth 31. In addition, a bottom face guide board 36 which guides the bottom face of the long sheet 50 is provided to the bottom face guiding portion 33. One end of the bottom face guide board 36 starts from the bottom face guiding portion 33 while the other end is a free end protruding towards the right outside of the main body 1. In addition, the bottom face guide board 36 slants downward from the free end towards the one end.

[0033] Furthermore, as illustrated in Fig. 7, one end of the long sheet guide 30 in the width direction is rotatably attached to a spindle 3 provided to the main body 1 and a concave portion 37 which fits with an axis 4 provided to the main body 1 is formed on the other end of the long sheet guide 30. Therefore, the longitudinal direction of the long sheet guide 30 is horizontally held when the concave portion 37 fits with the axis 4. When the sheet feeder 2 is used but the long sheet guide 30 is not, the long sheet tray 30 rotates and is upheld as illustrated in Fig. 8 so that the manual tray 10 is easy to use.

[0034] In addition, the long sheet tray 20 is supported by the long sheet guide 30. Since the long sheet guide 30 is supported in a relatively wide range in comparison with the case in which the long sheet tray 20 is directly supported by the main body 1 of an image forming apparatus, a sufficient strength is expected to support the long sheet tray 20.

[0035] In the thus structured long sheet guide 30, when the long sheet 50 is set on the sheet feeder 2, the front end of the long sheet 50, i.e., the downstream side of the long sheet 50 relative to the feeding direction, is set on the manual tray 10 and the width direction of the long sheet 50 is regulated by the side fence provided to the manual tray 10. Thereafter, the rear end of the long sheet 50 is inserted to the mouth 31. Since the bent portion 35 having an angled U-shape portion when seen from the top is provided to the mouth 31, it is easy to insert the long sheet 50 into the mouth 31 at this point. The rear end of the long sheet 50 inserted into the mouth 31 is supported by the long sheet tray 20 while guided by the bottom face guide board 36 provided to the lower part of the mouth 31. Thus, the long sheet 50 is set on the sheet feeder 2 in a state in which the entire portion of the long sheet 50 is greatly bent.

[0036] Next, with regard to a long sheet guide 30-1 illustrated in Fig. 3, no bent portion 35 is provided thereto. Also, no bottom face guide board 36 is provided to the

lower part of a mouth 31-1. As a result, the long sheet guide 30-1 has a simple structure. Other structural members are the same as the long sheet guide 30 illustrated in Fig. 2.

[0037] The thus structured long sheet guide 30-1 is relatively disadvantageous in comparison with the long sheet guide 30 illustrated in Fig. 2 in terms of the operability of inserting the long sheet 50 into the mouth 30 (30-1) but advantageous in terms of weight and simplicity of the structure, which lead to cost reduction and securing strength.

[0038] With regard to a long sheet guide 30-2 illustrated in Fig. 4, the upper part of a mouth 31-2 is cut off so that the mouth 31-2 is not a hole but forms an angled U-shape slit. Therefore, in this embodiment, there is no top face guiding portion 32 or the guide board 34 which forms the upper part to the mouth 31 illustrated in Fig. 2. Other structural members are the same as those for the long sheet guide 30-1 illustrated in Fig. 3.

[0039] The thus structured long sheet guide 30-2 has a relatively good operability in comparison with the long sheet guide 30-1 illustrated in Fig. 3 in terms of inserting the long sheet 50 into the mouth 31-1 (31-2).

[0040] A long sheet guide 30-3 illustrated in Fig. 5 is different from the long sheet guide 30 illustrated in Fig. 2 in that there is no bottom face guide board 36 provided to the lower part of a mouth 31-3. Other structural members are the same as those for the long sheet guide 30 illustrated in Fig. 2.

[0041] The thus structured long sheet guide 30-3 is relatively disadvantageous in comparison with the long sheet guide 30 illustrated in Fig. 2 in terms of the operability of inserting the long sheet 50 into the mouth 30 (31-1) but advantageous in terms of weight and furthermore simplicity of the structure, which lead to cost reduction and securing strength.

[0042] With regard to a long sheet guide 30-4 illustrated in Fig. 6, no bent portion 35 is provided thereto. Other structural members are the same as the long sheet guide 30 illustrated in Fig. 2.

[0043] The thus structured long sheet guide 30-4 is relatively disadvantageous in comparison with the long sheet guide 30 illustrated in Fig. 2 in terms of the operability of inserting the long sheet 50 into the mouth 30 (31-4) but advantageous in terms of weight and simplicity of the structure, which lead to cost reduction and securing strength.

[0044] Next, a variation of the sheet feeder 2 related to the present invention is described.

[0045] A long sheet 30-5 illustrated in Fig. 9 has steps 38 regulating the long sheet 50 having a particular size in the width direction on the lower part of a mouth 31-5. These steps 38 are formed at, for example, 212 mm (A4 across), 259 mm (B4 vertical), 299 mm (A3 across) to guide the long sheet 50 corresponding thereto. In another variation illustrated in Fig. 10, a marking 39 is provided to the steps 38 illustrated in Fig. 9 so that an operator easily sees the set positions according to the sheet size.

[0046] When a sheet other than the long sheet 50 is fed using the sheet feeder 2, the long sheet tray 20 is an obstacle because the long sheet tray 20 is situated above the manual tray 10. To deal with this, a hinge 21 is provided to the long sheet tray 20 illustrated in Fig. 11 so that the furthermore front side of the long sheet tray 20 from the hinge 21 can be fold and accommodated. To hold the folded long sheet tray 20 in the folded position, a magnetic sheet 22 is attached to the long sheet 20 as illustrated in Fig. 12. By structuring the long sheet guide 30 to have a magnetic portion corresponding to the magnetic sheet 22, the long sheet tray 20 can be held in the folded position by a magnetic force.

[0047] Furthermore, a hinge 36A is provided as illustrated in Fig. 13 so that the bottom face guide board 36 can also be folded.

[0048] In this structure, both the long sheet tray 20 and the bottom face guide board 36 can be folded so that the width thereof in the thickness direction can be reduced.

[0049] In addition, since the long sheet guide 30 is attached in such a manner that the long sheet guide 30 is rotated around the spindle 3 as illustrated in Fig. 14, the other end to the spindle 3 can be held at the upright position. It is also possible to structure the long sheet guide 30 in a manner that the long sheet guide 30 can be shortened in the up and down direction. In this structure, the protruded portion of the long sheet guide 30 from the main body 1 can be reduced as illustrated in Fig. 15.

[0050] This document claims priority and contains subject matter related to Japanese Patent Applications No. 2007-184621, filed on July 13, 2007.

Claims

1. A sheet feeder (2) comprising:

a first tray (10) arranged to be provided at a paper feeding mouth of a main body (1) of an image forming apparatus;
a second tray (20) configured to support a rear portion of a long sheet (50), the second tray (20) adapted to be positioned above the first tray (10);
a guiding member (30) configured to guide the long sheet (50) at setting or sheet feeding, the guiding member (30) adapted to be positioned above the second tray (20) while facing an outside of the main body (1) of the image forming apparatus.

2. The sheet feeder (2) according to Claim 1, wherein the guiding member (30) comprises a regulating portion configured to regulate the long sheet (50), the regulating portion comprising a mouth (31) through which the long sheet (50) passes.

3. The sheet feeder (2) according to Claim 2, wherein

the guiding member (30) comprises a sheet guiding member (34) configured to guide the long sheet (50), the sheet guiding member (34) provided above the regulating portion while facing the outside of the main body (1) of the image forming apparatus with a gap therebetween.

4. The sheet feeder (2) according to Claim 2 or 3, wherein the guiding member (30) comprises a bottom face guiding portion (33) configured to guide a bottom face of the long sheet (50), the bottom face guiding portion (33) provided to a lower part of the regulating portion.

5. The sheet feeder (2) according to Claim 4, wherein the guiding member (30) comprises a top face guiding portion (32) configured to guide a top face of the long sheet (50), the top face guiding portion (32) provided to an upper part of the regulating portion.

6. The sheet feeder (2) according to Claim 4 or 5, wherein the regulating portion is formed with an upper part protruding away from the main body (1) of the image forming apparatus with an angled U shape relative to a lower part of the regulating portion when seen from a top.

7. The sheet feeder (2) according to any one of Claims 4 to 6, wherein the bottom face guide portion (33) is formed with steps (38) corresponding to a sheet width.

8. The sheet feeder (2) according to Claim 7, wherein the bottom face guiding portion (33) comprises a marking (39) indicating a sheet size corresponding to the sheet width.

9. The sheet feeder (2) according to any one of Claims 4 to 8, wherein the bottom face guiding portion (33) comprises a bottom face guide board (36) slanted toward a direction in which a rear end of the long sheet (50) is guided to the second tray (20).

10. The sheet feeder (2) according to any one of Claims 4 to 9, wherein the guiding member (30) is supported by the main body (1) of the image forming apparatus and supports the second tray (20).

11. The sheet feeder (2) according to Claim 10, wherein the guiding member (30) is rotatably attached to the main body (1) of the image forming apparatus with one end of the guiding member (30) via a hinge (21).

12. The sheet feeder (21) according to Claim 11, wherein the guiding member (30) is structured to shrink in a length direction thereof when another end of the guiding member (30) is rotated upward.

- 13.** An image forming apparatus comprising the sheet feeder (2) of any one of Claims 1 to 12.

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FIG. 1

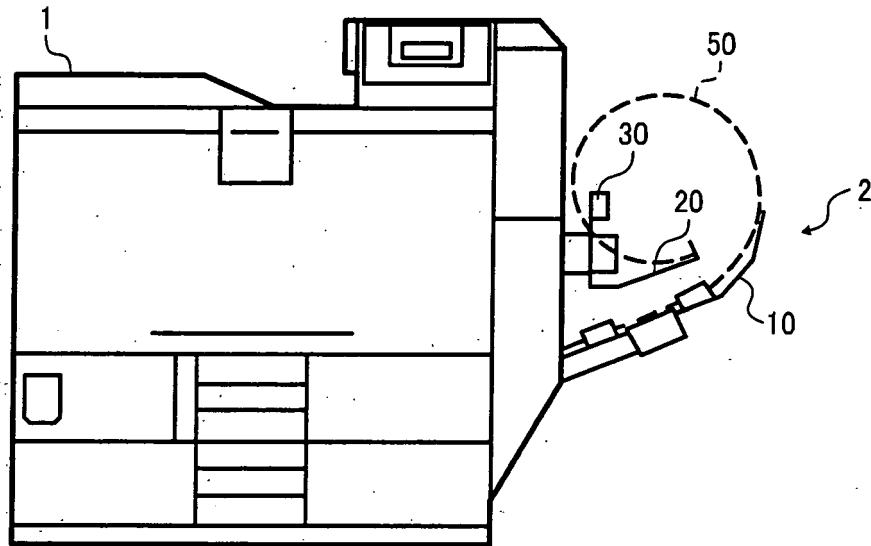


FIG. 2

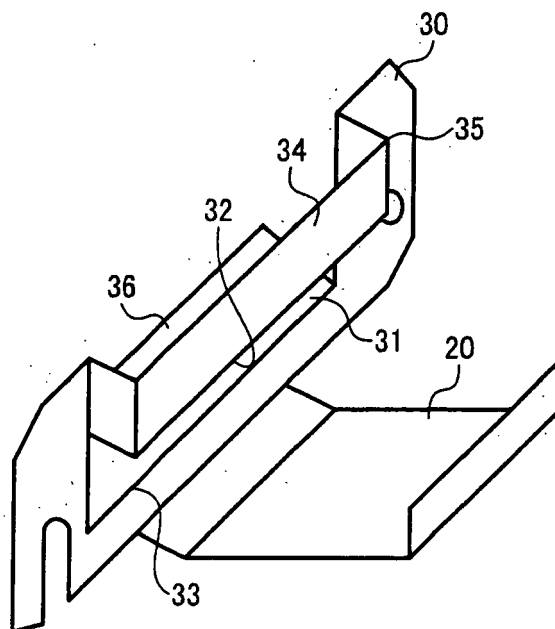


FIG. 3

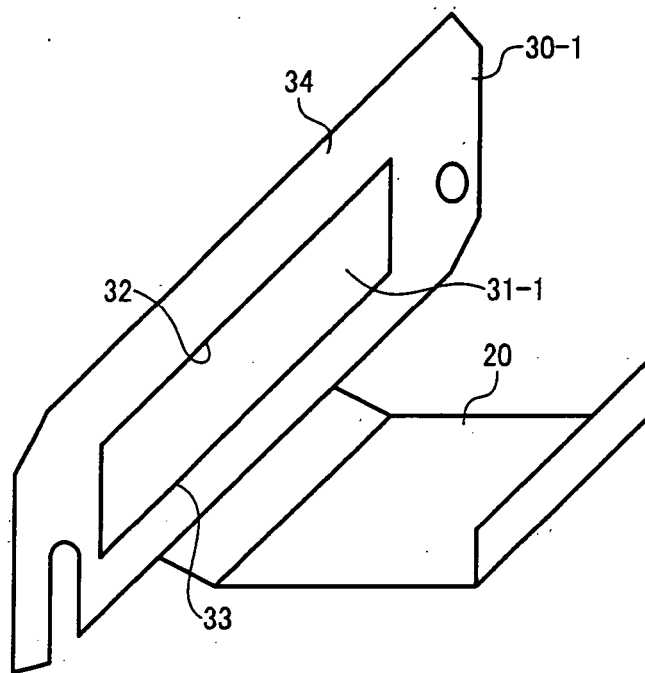


FIG. 4

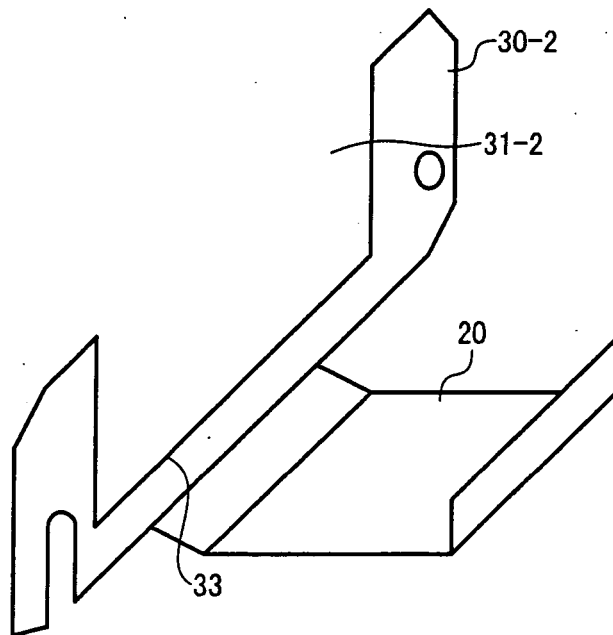


FIG. 5

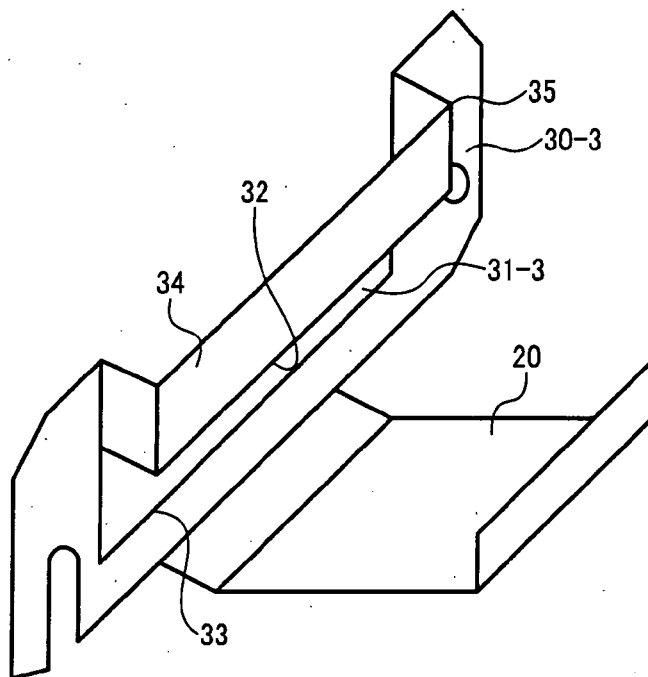


FIG. 6

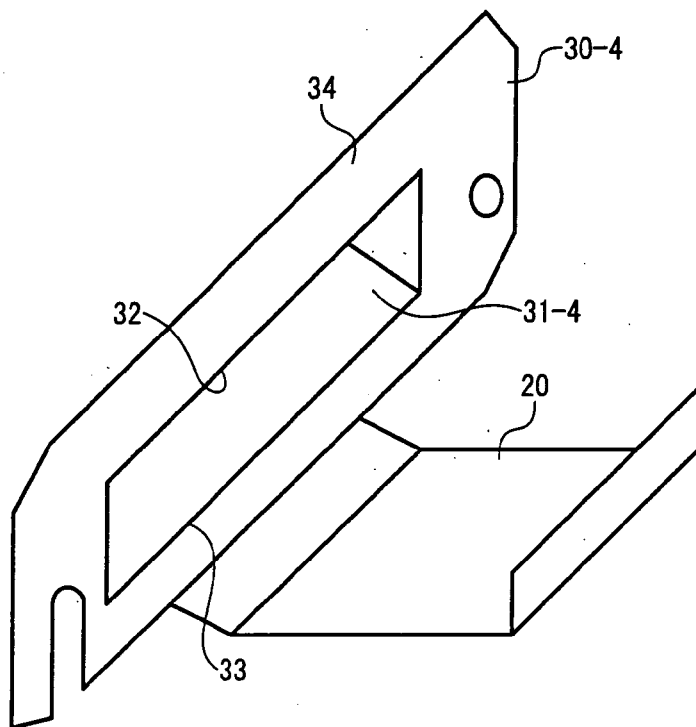


FIG. 7

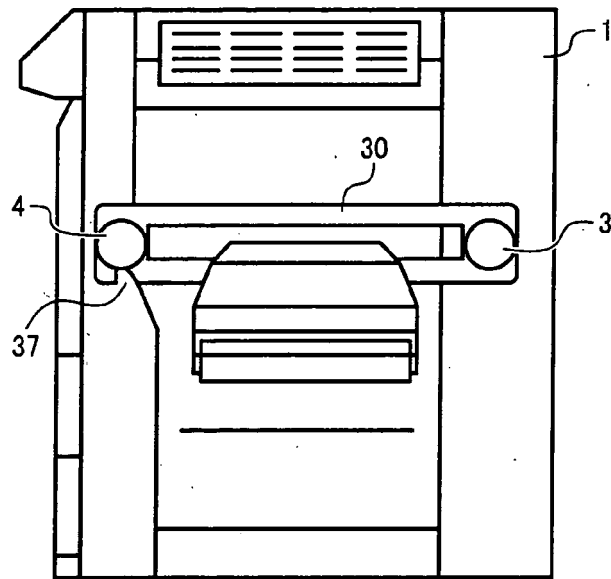


FIG. 8

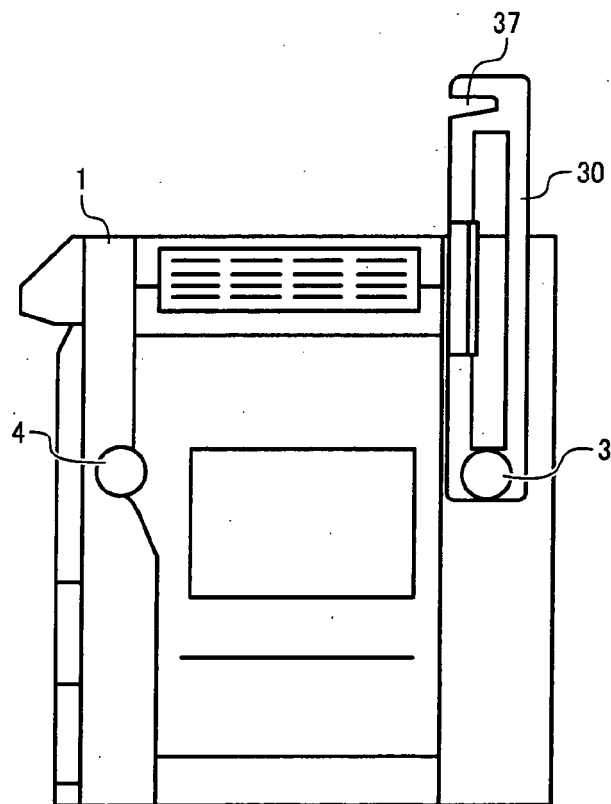


FIG. 9

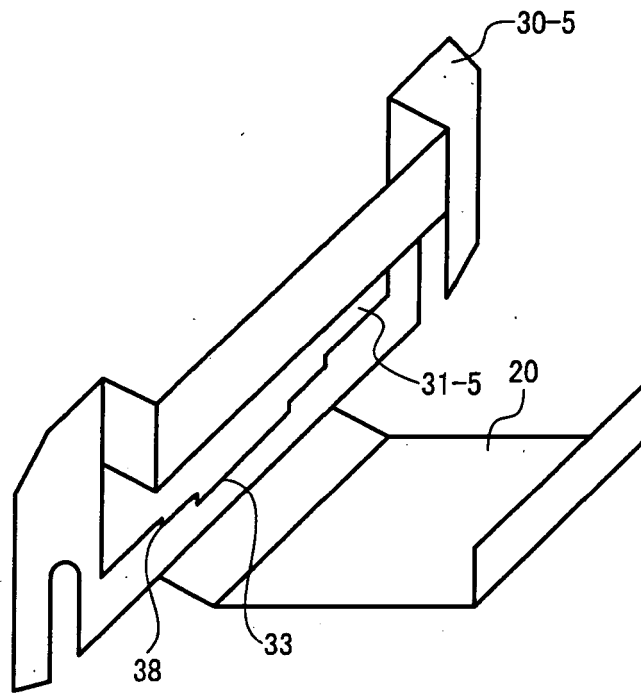


FIG. 10

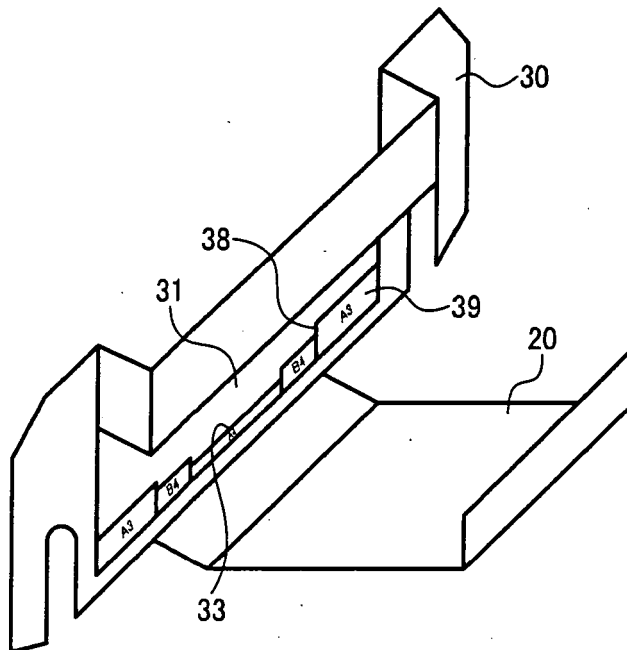


FIG. 11

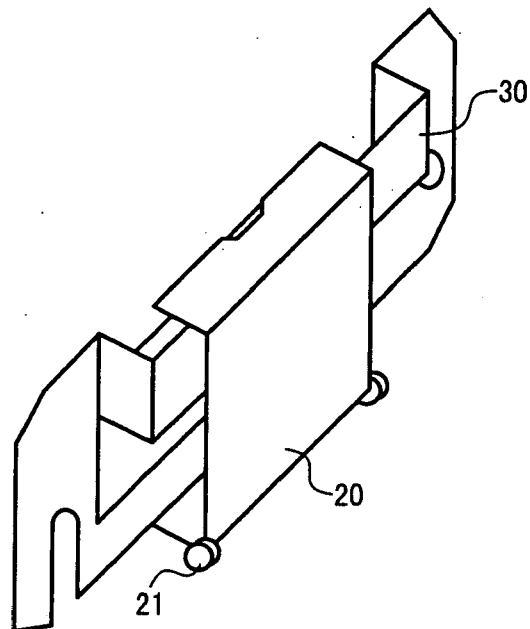


FIG. 12A

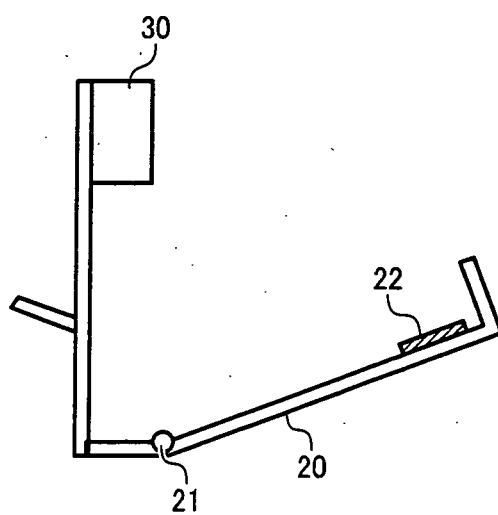


FIG. 12B

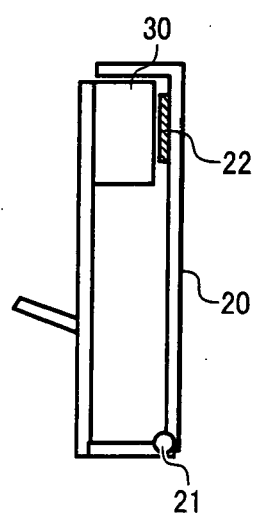


FIG. 13

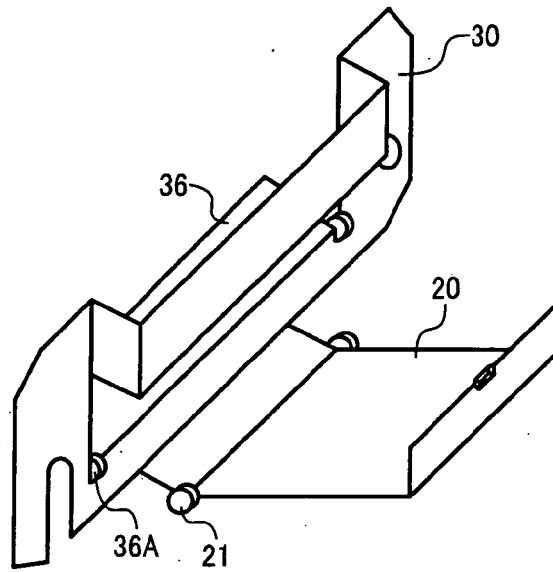


FIG. 14

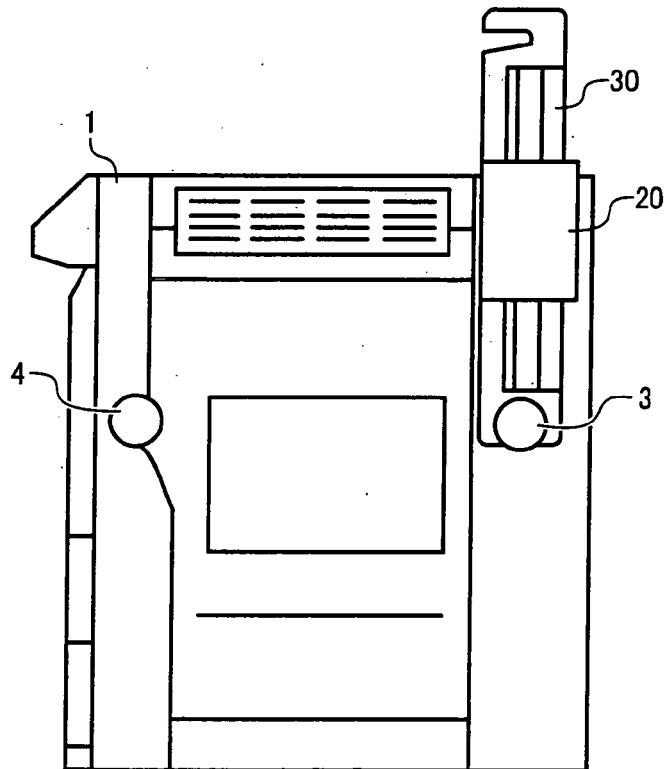
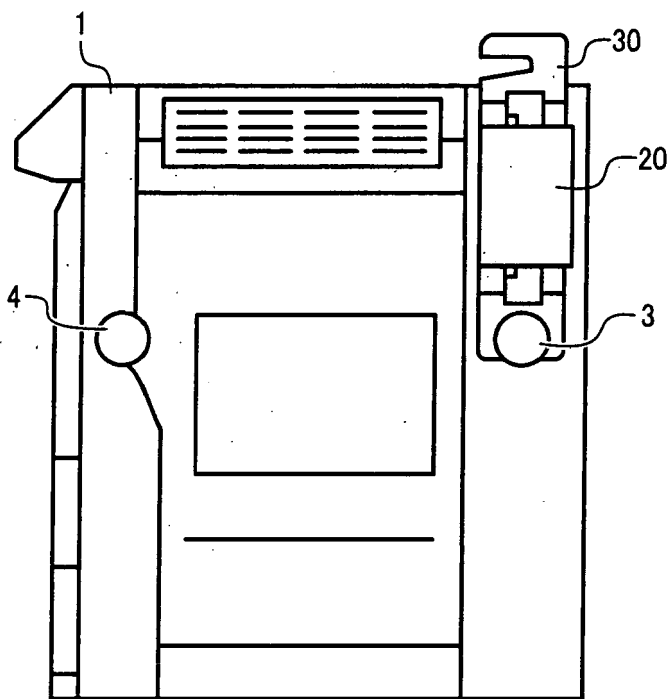


FIG. 15



REFERENCES CITED IN THE DESCRIPTION

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