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Blattzuführgerät

Appareil pour l'alimentation en feuilles

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Description

The present invention relates to a sheet feeding apparatus according to the preambles of claims 1 and 13 used with an image forming system such as a copying machine, printer, facsimile, word processor and the like, or other equipments utilizing sheets. More particularly, it relates to a sheet feeding apparatus for feeding a sheet (transfer sheet, photosensitive sheet, electrostatic recording sheet, print sheet, OHP sheet, envelope, post card, sheet original or the like) rested in a sheet containing portion such as a sheet supply cassette one by one to a sheet receiving portion such as an image forming station, exposure station, treating station or the like with a one-side reference.

For convenience' sake, the related art will be described with reference to examples of laser beam printers shown in Figs. 11A to 11C.

Figs. 11A, representing prior art corresponding to Japanese Patent Laid-open No. 63-41328, 11B, representing prior art corresponding to Japanese Patent Laid-open No. 61-106359, and 11C, representing prior art which is similar to EP-A-0 282 158, show laser beam printers having sheet paths, i.e., sheet feeding paths (extending from a sheet containing portion to a sheet ejecting portion) of straight type, U-shaped type and S-shaped type, respectively.

The printer having the sheet path of straight or linear type as shown in Fig. 11A has a sheet supply cassette inlet 51 formed in a side surface of a frame 50 of the printer, and a sheet ejection opening 62 formed in the other side surface of the frame. A sheet supply cassette (sheet containing portion) 52 is mounted within the inlet 51, and an ejection tray 63 is mounted within the ejection opening 62 and extends outwardly therefrom. When a sheet supply signal is emitted, a sheet supply roller 53 is rotated to afford a feeding force to an uppermost sheet (recording medium) P on a sheet stack rested in the sheet supply cassette 52, thereby separating the uppermost sheet from the other sheets with the aid of separating pawls 54 and feeding the sheet into the printer.

The fed sheet is conveyed between guide plates 55, 56 and through a path (sheet path) including a pair of regist rollers 57, on image transferring portion 58, a convey belt device 59, an image fixing device 60, ejector rollers 61 and the ejection opening 62, whereby the sheet on which an image was formed (print) is ejected on the ejection tray 63.

An electrophotographic photosensitive member of drum type (referred to as "photosensitive drum" hereinafter) 64 is driven at a predetermined peripheral speed (process speed) around its own axis in a clockwise direction and is provided at its peripheral surface with a photosensitive body consisting of an organic or inorganic photoconductive layer. The reference numeral 65 denotes a charger for uniformly charging the peripheral surface of the photosensitive drum with the predetermined potential having a predetermined polarity; 66 denotes a beam scanner for scanning and exposing the charged surface of the photosensitive drum to write the aimed information thereon; 66a denotes a beam reflection mirror; 67 denotes a developing device for developing, with toner, an electrostatic latent image formed on the drum surface by the exposure; 68 denotes a transfer roller acting as a transfer means for transferring the toner image on the drum surface to the recording sheet P; and 69 denotes a cleaning device for cleaning the drum surface after the toner image is transferred to the recording sheet.

Since the principle and process for forming the image is well known, the explanation thereof will be omitted. Incidentally, in the illustrated printer, the photosensitive drum 64, charger 65, developing device 67 and cleaning device 69 are constituted as a single removable process cartridge 70.

In this printer, the sheet path extending from the sheet supply cassette 52 to the ejection tray (sheet ejecting portion) 63 is substantially straight, so that the reliability of the sheet feeding operation is increased. However, since the sheet supply cassette 52 and the sheet ejection tray 63 are protruded from both sides of the printer frame outwardly, the installation space for the printer will be greatly increased.

In order to reduce the substantial installation space of a printer, there has been proposed laser beam printers having sheet paths of U-shaped type or S-shaped type, as shown in Fig. 11B or Fig. 11C.

The printer having the sheet path of U-shaped type as shown in Fig. 11B has a sheet supply cassette inlet 51 and a sheet ejection opening 62 and is designed so that a sheet supply cassette 52 is wholly inserted into the printer from the inlet 51 and a recording sheet P supplied from the cassette by means of a sheet supply roller 53 is inverted by inversion guides 71a, 71b and convey rollers 72a, 72b to direct the sheet toward a direction opposite to a sheet feeding direction from the cassette 52 above the latter and is fed through a path including an image transferring portion 58, a convey belt device 59, an image fixing device 60, ejector rollers 61 and the ejection opening 62 and then is ejected onto an ejection tray 63. With this arrangement, since only the ejection tray 63 is protruded from the printer outwardly, the installation space for the printer is reduced in comparison with that for the printer of Fig. 11A.

On the other hand, the printer having the sheet path of S-shaped type as shown in Fig. 11C is designed similar to the printer of Fig. 11B, but the sheet ejected from the ejector rollers 61 is inverted again upwardly by an invertion guide 73 to be ejected onto an ejection tray 75 formed on a top plate of the printer by means of second ejector rollers 74. With this arrangement, since there is no member or element protruding from the printer outwardly, the installation space for the printer is further reduced in comparison with that for the printer of Fig. 11B.

Although the installation space for the printer can be reduced by forming the sheet path as the U-shaped

configuration (Fig. 11B) or S-shaped configuration (Fig. 11C), the height of the printer will be increased in comparison with that of the printer having the straight sheet path as shown in Fig. 11A. To eliminate this drawback, there has been proposed to reduce the radii of the inversion guides as long as possible.

However, if the radii of the inversion guides are reduced, for example, in an inverting portion C in Fig. 11B, the sheet will be clogged or slacked between the inversion guides 71a, 71b due to the difference in speed between the convey rollers 72a, 72b, thus worsening the reliability of the feeding operation. Further, in the image forming system, when the recording sheet is not properly fed to the recording portion, the image formed on the recording sheet will be distorted.

Thus, there has been proposed that the sheet was fed by skew-feed rollers so that one lateral edge of the sheet was guided along a one-side feeding reference formed in an image forming system to prevent the skew-feed of the sheet. However, if the radii of the inversion guides for inverting the sheet are decreased, the skew-feed of the sheet will occur at the first skew-feed roller due to the feeding load in the inversion guide at a side opposite to the feeding reference side, thus damaging the edge of the sheet abutted against the one-side feeding reference.

Further, in view of the manufacturing technique, it is very difficult to completely coincide a position of a regulating member (formed on a sheet supply cassette) for regulating a lateral edge (at the reference side) of a recording sheet with a position of a feeding reference guide formed on an image forming system, wit the result that the recording sheet will frequently be damaged. Explaining such inconvenience with reference to Fig. 12A, when the position of the regulating member 89 is deviated from the position of the feeding reference guide 90 by a distance Δ_1, as the recording sheet 92 is fed while being biased toward a direction shown by the arrow by means of the skew-feed roller 91, the lateral edge of the sheet 92 will be bent or scratched at a position B in Fig. 12A.

On the other hand, as shown in Fig. 12B, when the feeding reference guide 90 is displaced inwardly from the position of the regulating member 89 by a distance Δ_2, a corner of a leading end of the recording sheet 92 will be struck against the feeding reference guide 90 at a position C in Fig. 12C, thus scratching that corner.

From the document US-A-4 432 541 a sheet feeding apparatus is known, comprising a feeding means for feeding a sheet, a regulating member for regulating a position of a lateral edge of the sheet fed by the feeding means, a first rotary member disposed at a downstream side of the feeding means in a sheet feeding direction and adapted to feed the sheet, and a second rotary member adapted to feed the sheet while urging the lateral edge thereof against the regulating member.

The first and second rotary members are positioned about a large freely rotatable member so as to form a nip therebetween. This large freely rotatable member is inclined so that one time it urges the sheet against the regulating member and the other time it urges the rotary member away from the regulating member. Furthermore, the first rotary member urges the paper sheet away from the reference edge of the regulating member and only the second rotary member urges the lateral edge of the paper sheet against the reference edge of the regulating member.

The urging force of the first rotary member is smaller than that of the second rotary member in order to ensure that the lateral edge of the sheet is urged against the regulating member. However, this is a complicated and costly structure and if the paper qualities of the sheets fed by the feeding means vary in a high extent, then it is not guaranteed that skew-feed or damage of the lateral edge of the sheet can be avoided.

Therefore, it is an object of the present invention to provide a sheet feeding apparatus which can correctly feed a sheet without any skew-feed and damage of the sheet by a simple structure.

This object is solved by a sheet feeding apparatus according to the claims 1 and 13. Further improvements of the sheet feeding apparatus are the subject-matter of the appended dependent claims.

By means of the present invention, it can be achieved that a sheet feeding apparatus for an image forming system is provided, which does not generate the excessive tension or slack in a sheet that may worsen the reliability of the feeding of the sheet even when the radius of an inversion path for inverting the sheet is made smaller in order to reduce the height of the image forming system, and which does not bent and/or damage the sheet by a regulating member even when a position of the regulating member on a sheet supply cassette is deviated from a position of a feeding reference guide on the image forming system.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is an elevational sectional view of an image forming system incorporating a sheet feeding apparatus according to the present invention therein;

Fig. 2 is a perspective view of a sheet inverting portion of the sheet feeding apparatus;

Figs. 3A and 3B are elevational and plan views, respectively, showing a feed roller and a skew-feed roller;

Fig. 4 is a perspective view of the feed roller and the skew-feed roller;

Figs. 5A to 5C are development views showing the feeding of the sheet at the sheet inverting portion;

Fig. 6 is a perspective view of a feed roller or a skew-feed roller having spiral grooves at its peripheral surface;

Fig. 7 is an elevational sectional view of a laser beam printer incorporating a sheet feeding apparatus according to another embodiment of the present invention therein;

Fig. 8 is an enlarged perspective view of the sheet

feeding apparatus of Fig. 7;

Fig. 9 is an enlarged plan view of the sheet feeding apparatus of Fig. 7;

Fig. 10 is a perspective view showing the feeding of a transfer sheet fed by the sheet feeding apparatus of Fig. 7;

Figs. 11A, 11B and 11C are elevational sectional views of image forming systems having sheet paths of straight type, U-shaped type and S-shaped type, respectively; and

Figs. 12A and 12B are plan views showing a relation between a regulating member and a feeding reference guide.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 shows, in an elevational section, an example of a laser beam printer (image forming system) incorporating a sheet feeding apparatus according to a preferred embodiment of the present invention, and Fig. 2 is a perspective view of a sheet inverting portion of the sheet feeding apparatus. Constructural members or elements same as or similar to those of the printer described in connection with Fig. 11 are designated by the same reference numerals, and the detailed explanation thereof will be omitted.

A sheet supply cassette 52 comprises a cassette housing 20, an intermediate plate 23 biased upwardly by means of a compression spring 24, sheet separating pawls 54, and a sheet edge regulating member 22 (Fig. 2) for guiding one lateral edge of a recording sheet P. The recording sheets P stacked in the sheet supply cassette 52 are separated by a feeding force directing to the right (Fig. 1) and applied to an uppermost sheet on the sheet stack due to the rotation of a sheet supply roller 53 in such a manner that only the uppermost sheet is separated from the other sheets by means of the separating pawls 54. The separated sheet is fed in the right direction shown by the arrow A. In this case, the recording sheets P are being urged against the sheet supply roller 53 with a predetermined pressure by the action of the intermediate plate 23 and the compression spring 24.

The separated sheet P is fed by rightwardly and upwardly along an upper guide 20a of the sheet supply cassette 52 to be entered between a feed roller 27 and a first skew-feed roller (first urging means) 25. Then, the recording sheet P is fed in synchronous with a rotation speed from a drive source (not shown) so that the sheet is advanced along an inversion guide 31 and is passed between the feed roller 27 and a second skew-feed roller (second urging means) 26. As a result, the sheet P is inverted to be fed in a direction B opposite to the feeding direction A from the cassette 52. The inverted recording sheet P is then passed through a path including a guide plate 32, an image transferring portion 58, a guide plate 75, an image fixing device 60, ejector rollers 61 and a sheet ejection opening 62, and is lastly ejected onto an ejection tray 63 disposed at the left side of a frame 50 of the system.

The transferring of a toner image from a surface of a photosensitive drum 64 to the recording sheet P can be effected by the fact that a back surface of the recording sheet P is charged by means of a transfer roller 68 with a charge polarity opposite to that of the toner image. And, the recording sheet P passed through the image transferring portion 58 is separated from the surface of the photosensitive drum 64 by removing the charge from the sheet by means of a separating and discharging probe 9.

In Fig. 2, the reference numeral 33 denotes a one-side feeding reference guide for the recording sheet P supplied from the sheet supply cassette 52, which reference guide is provided on the image forming system. The feed roller 27 is disposed adjacent to the one-side feeding reference guide.

The first and second skew-feed rollers 25, 26 are urged against the feed roller 27 by means of first and second skew-feed arms 28, 29 (Fig. 1) and a compression spring 30 (Fig. 1) at skew-feeding angles θ_1 (= 1°), θ_2 (= 4°), as shown in Figs. 3A and 3B, respectively, so that a feeding reference lateral edge Pa of the recording sheet P supplied from the sheet supply cassette 52 is abutted against the surface of the one-side feeding reference guide 33.

By selecting the skew-feeding angle of the first skew-feed roller 25 to be smaller than that of the second skew-feed roller 26 in this way, as shown in Fig. 4 (perspective view of the sheet inverting portion) and Figs. 5A to 5C (development views of a sheet feeding path at the sheet inverting portion), the excessive skew-feeding force is not applied to the recording sheet P. Thus, by a combination of a feeding load FH due to the friction between the invertion guide 31 and a leading end of the recording sheet P and a skew-feeding force FS1 generated by the-first skew-feed roller 25, a reaction force Fg acting between the recording sheet P and the one-side feeding reference guide 33 can be reduced, with the result that the recording sheet P can be fed without damaging the feeding reference lateral edge Pa of the sheet (Fig. 5A).

Further, as shown in Fig. 5B, when the recording sheet P reaches the second skew-feed roller 26, since the skew-feeding angle of the second skew-feed roller 26 is relatively great, an adequate skew-feeding force FS2 is applied to the recording sheet P by the second skew-feed roller 26, so that the lateral edge Pa of the recording sheet P is immediately and uniformly abutted against the feeding reference guide 33 by a momental force M around the first skew-feed roller 25 (Figs. 5B and 5C).

After the lateral edge Pa of the recording sheet P is uniformly abutted against the feeding reference guide 33 (Fig. 5C), the recording sheet P is stably skew-fed while maintaining the uniform abutment between the sheet and the reference guide, by the combination of the skew-feeding force FS1 of the first skew-feed roller

25 and the skew-feeding force FS2 of the second skew-feed roller 26.

Incidentally, Δ, Δ' indicate amounts of the delay in the feeding of the sheet P at a non-reference side with respect to the reference side, which are generated by the feeding loads FH, FH' due to the invertion guide 31.

So long as the relative relation between the skew-feeding angle of the first skew-feed roller 26 and that of the second skew-feed roller 26 is maintained, the skew-feeding angle θ_1 of the first skew-feed roller 25 may fall within a range between 0° to 4°, and the skew-feeding angle of the second skew-feed roller 26 may fall within a range between 0° to 10°. Incidentally, the skew-feed rollers 25, 26 acting as the urging means are not limited to two in number, but three or more skew-feed rollers may be used. Further, the sheet feeding force may be applied to the skew-feed rollers 25, 26, rather than the feed roller 27.

In the illustrated embodiment, while the skew-feed rollers 25, 26 were used as the urging means for skew-feeding the sheet, as shown in Fig. 6, a feed roller 27A or skew-feed rollers 25A, 26A having spiral grooves S at its peripheral surface may be used to skew-feed the sheet toward the one-side feeding reference guide. Further, while the separating pawls were used to separate the sheet one by one, other sheet separating means may be used. Furthermore, the sheet containing portion is not limited to the sheet supply cassette, but may comprise a sheet supply deck, manual sheet supply platform or tray. In addition, the sheet may be proposed by sequentially cutting a sheet having a required length from a sheet roll.

Next, another embodiment of the present invention will be explained with reference to the accompanying drawings.

Fig. 7 shows an electrophotographic laser beam printer (LBP) incorporating a sheet feeding apparatus according to another embodiment of the present invention therein.

In Fig. 7, an electrophotographic photosensitive member of drum type (referred to as "photosensitive drum" hereinafter) 101 is housed in a process cartridge 102 and is driven at a predetermined peripheral speed around its own axis 101a, and is provided at its peripheral surface with a photosensitive body consisting of an organic or inorganic photo-conductive layer.

During the rotation of the photosensitive drum 101, it is uniformly charged with a predetermined positive or negative potential by means of a primary charger (not shown) disposed in the process cartridge 102, and then, the aimed image information is written on the photosensitive drum at an exposure portion 103 by a scanning and exposure laser beam L from a laser scanner 105. As a result, electrostatic latent images corresponding to the aimed image information are sequentially formed on the peripheral surface of the photosensitive drum 101.

The reference numeral 106 denotes a reflection mirror for deflecting the laser beam L emitted from the laser scanner 105 toward the exposure portion 103 on the photosensitive drum 101.

The latent image carried on the photosensitive drum is then visualized with visualizing agent (toner) by means of a developing device (not shown) disposed in the process cartridge 102 to obtain a toner image. Then, when the toner images on the photosensitive drum sequentially reach a transfer station including a transfer roller 107, the toner images are sequentially transferred onto a transfer sheet (recording medium) P fed between the transfer roller 107 and the photosensitive drum 101 by means of a sheet supply mechanism 108.

The transferring of each toner image on the photosensitive drum to the transfer sheet P is effected by charging the sheet with the charge polarity opposite to that of the toner image by means of the transfer roller 107 disposed at a back side of the transfer sheet P. After passing through the transfer roller 107, the transfer sheet P is separated from the photosensitive drum by removing the charge from the sheet by means of a separating and discharging probe 109 charged with the charge polarity opposite to that of the transfer roller 107. The separated transfer sheet is then sent to a fixing device 110, where a non-fixed toner image transferred to the transfer sheet P is permanently fixed to the sheet. Thereafter, the transfer sheet P on which the image was fixed is fed by a pair of ejector rollers 111 and is ejected onto an ejection tray 112.

On the other hand, after the toner image has been transferred onto the transfer sheet, the photosensitive drum is cleaned by a cleaning device (not shown) disposed in the process cartridge 102 to remove the residual toner from the surface of the drum, thus preparing for the next image formation.

Next, the sheet feeding apparatus according to another embodiment of the present invention will be fully described with reference to Fig. 8.

Recording sheets P stacked in a sheet supply cassette 113 which is removably mounted within an image forming system are separated by a feeding force applied to an uppermost sheet on the sheet stack due to the rotation of a sheet supply roller 115 in such a manner that only the uppermost sheet is separated from the other sheets by means of the separating pawls 116. The separated sheet is fed in the right direction shown by the arrow a. In this case, the recording sheets P are being urged against the sheet supply roller 115 with a predetermined pressure by the action of an intermediate plate 117 and a compression spring 119.

The separated sheet P is fed by rightwardly and upwardly along an arcuted guide 113a of the sheet supply cassette 113 to be entered between a feed roller 121 and a first skew-feed roller 120. Then, the recording sheet P is fed in synchronous with a rotation speed from a drive source (not shown) so that the sheet is passed between the feed roller 121 and a second skew-feed roller 122 to reach an image forming portion between the photosensitive drum 101 and the transfer roller 107.

When the transfer sheet P is fed around a peripheral surface of the feed roller 121, it is inverted by the radius of the feed roller 121. In this case, the other portions of the transfer sheet P are guided by an inversion guide 131.

As shown in Fig. 9, the first and second skew-feed rollers 120, 122 are urged against the feed roller 121 with predetermined pressures by means of first and second skew-feed arms 126, 127 (Fig. 7) and a compression spring 130 (Fig. 7) at skew-feeding angles θ_1 (= 1°), θ_2 (= 4°), respectively, so that a feeding reference lateral edge Pa of the recording sheet P is abutted against the surface of the one-side feeding reference guide 125 formed on a frame 123 of the printer (image forming system).

As shown in Fig. 9, a position of the feeding reference guide 125 is deviated from a position of an edge regulating member 132 formed on the sheet supply cassette 113 by a distance Δ (= 1.5 mm).

With this arrangement, according to the sheet feeding apparatus of this embodiment, even when there is the clearance Δ_3 between the feeding reference guide 125 of the printer frame 123 and the edge regulating member 132 of the sheet supply cassette 113, the recording sheet P can be prevented from being bent or scratched, because, as shown in Fig. 10, even if the recording sheet P is pinched and caught between the first skew-feed roller 120 and the feed roller 121 at a position P_1, since the recording sheet P has a radius R of curvature, it is possible to absorb the clearance Δ_3 by this radius R, thus reducing a force F of the regulating member 132 of the sheet supply cassette 113 acting on the lateral edge of the recording sheet P. If the recording sheet P is straightened so that it is caught at a position P_2, the resiliency of the recording sheet P will be stronger and the force F will be increased sufficient to damage the rateral edge of the recording sheet P, thus bending or folding and/or scratching the sheet.

Further, in this embodiment, since the feeding reference guide 125 of the printer frame 123 and the edge regulating member 132 of the sheet supply cassette 113 have no positional relation as shown in Fig. 12B, the corner of the recording sheet P is not bent or folded at the position C (Fig. 12B). Further, since the inversion of the recording sheet P is effected on the peripheral surface of the single feed roller 121, during the inversion of the sheet, the feeding speed of the sheet is constant. Thus, there is no tension and slack in the recording sheet P.

Incidentally, in the illustrated embodiment, while the separating pawls were used as the separating means, it should be noted that other separating means may be used. Further, although the skew-feed rollers 120, 122 are used as the urging means for skew-feeding the recording sheet P, these skew-feed rollers may be provided at their peripheral surfaces with spiral grooves S as shown in Fig. 6. Such spiral grooves may be provided on the feed roller 121.

Further, the skew-feed rollers 120, 122 acting as the urging means are not limited to two in number. In addition, the feeding force for the recording sheet P may be applied to the skew-feed rollers 120, 122, rather than the feed roller 121. Further, while the clearance Δ_3 between the feeding reference guide 125 of the printer frame 113 and the edge regulating member 132 of the sheet supply cassette 113 was set to have a value of 1.5 mm, for example, even when the clearance is set to have a value of 0 to 8 mm, it was found that the sheet can be properly fed without bending and scratching the sheet P.

Claims

1. A sheet feeding apparatus, comprising:

   - a feeding means (53) for feeding a sheet (P),
   - a first regulating member (33) for regulating a position of a lateral edge (Pa) of the sheet fed by said feeding means (53),
   - a first rotary member (25) disposed at a downstream side of said feeding means (53) in a sheet feeding direction and adapted to feed the sheet fed by said feeding means (53);
   - a second rotary member (26) adapted to feed the sheet while urging said lateral edge (Pa) of the sheet against said first regulating member (33),

   characterized in that

   - said first rotary member (25) is adapted to urge said lateral edge (Pa) of the sheet against said first regulating member (33), and in that
   - said second rotary member (26) is disposed at a downstream side of said first rotary member (25) in the sheet feeding direction, and
   - wherein an urging force of said first rotary member (25) by which the sheet is urged against said first regulating member (33) is set to be equal to or smaller than an urging force of said second rotary member (26) by which the sheet is urged against said first regulating member (33).

2. A sheet feeding means according to claim 1, **characterized in that** it further comprises guide means (31) for guiding the sheet in such a manner that it is curved beween said feeding means (53) and said first rotary member (25).

3. A sheet feeding apparatus according to claims 1 or 2, further including a third rotary member (27) cooperating with said first and second rotary members (25, 26) to feed the sheet (P).

4. A sheet feeding apparatus according to any of the preceding claims, **characterized in that** said first rotary member (25) is disposed in an inclined con-

dition.

5. A sheet feeding apparatus according to any of the preceding claims, **characterized in that** said second rotary member (26) is disposed in an inclined condition.

6. A sheet feeding apparatus according to the preceding claims 4 and 5, **characterized in that** said inclined angle of said first rotary member (25) is smaller than that of said second rotary member (26).

7. A sheet feeding apparatus according to any of the preceding claims 3 to 6, **characterized in that** said guide means (31) guides said sheet along an outer peripheral surface of said third rotary member (27).

8. A sheet feeding apparatus according to any of the preceding claims, **characterized in that** said feeding means (53) includes a supply means for feeding out the sheet from a sheet stack.

9. A sheet feeding apparatus according to any of the preceding claims, further comprising a second regulating member (22) for regulating the positions of lateral edges of the sheets stacked in stacking means, wherein a regulating surface of said first regulating member (33) is deviated from that of said second regulating member (22), away from the sheet to be regulated.

10. A sheet feeding apparatus according to claim 9, **characterized in that** said first and second regulating members (22, 33) guide the same lateral edge of the sheet.

11. A sheet feeding apparatus according to any of the preceding claims, **characterized in that** the sheet feeding direction is inverted by feeding the sheet around a peripheral surface of said third rotary member (27, 121).

12. A sheet feeding apparatus according to any of the preceding claims, further comprising an image forming means for forming an image on the sheet fed by said second rotary member (26).

13. A sheet feeding apparatus, comprising:

a feeding means (53) for feeding a sheet (P),
a regulating member (33) for regulating a position of a lateral edge (Pa) of the sheet fed by said feeding means (53),
a first rotary member (25) disposed at a downstream side of said feeding means (53) in a sheet feeding direction and adapted to feed the sheet fed by said feeding means (53);
a second rotary member (26) adapted to feed the sheet while urging said lageral edge (Pa) of the sheet against said regulating member (33),

characterized in that

said first rotary member (25) is adapted to urge said lateral edge (Pa) of the sheet against said regulating member (33),

said second rotary member (26) is disposed at a downstream side of said first rotary member (25) in the sheet feeding direction,

said first rotary member (25) is disposed in an inclined condition,

said second rotary member (26) is disposed in an inclined condition, and

wherein said inclined angle of said first rotary member (25) is smaller than that of said second rotary member (26).

Patentansprüche

1. Blattzuführgerät, das folgende Bauteile aufweist:

eine Zuführeinrichtung (53) zum Zuführen eines Blatts (P),

ein erstes Regulierelement (33) zum Regulieren einer Position einer seitlichen Kante (Pa) des durch die Zuführeinrichtung (53) zugeführten Blatts,

ein erstes Drehelement (25), das an einer stromabwärtigen Seite der Zuführeinrichtung (53) in einer Zuführrichtung des Blatts angeordnet ist und angepaßt ist, um das durch die Zuführeinrichtung (53) zugeführte Blatt zuzuführen;

ein zweites Drehelement (26), das angepaßt ist, um das Blatt zuzuführen, während es die seitliche Kante (Pa) des Blatts gegen das erste Regulierelement (33) drückt,

dadurch gekennzeichnet, daß
das erste Drehelement (25) angepaßt ist, um die seitliche Kante (Pa) des Blatts gegen das erste Regulierelement (33) zu drücken, und daß
das zweite Drehelement (26) an einer stromabwärtigen Seite des ersten Drehelements (25) in der Zuführrichtung des Blatts angeordnet ist, und
wobei eine Druckkraft des ersten Drehelements (25), durch die das Blatt gegen das erste Regulierelement (33) gedrückt wird, so eingerichtet ist, daß sie gleich oder kleiner als eine Druckkraft des zweiten Drehelements (26) ist, durch die das Blatt gegen das erste Regulierelement (33) gedrückt wird.

2. Blattzuführeinrichtung nach Anspruch 1, **dadurch gekennzeichnet, daß** sie des weiteren eine Füh-

rungseinrichtung (31) aufweist, um das Blatt in einer derartigen Weise zu führen, daß es zwischen der Zuführeinrichtung (53) und dem ersten Drehelement (25) gekrümmt ist.

3. Blattzuführgerät nach Anspruch 1 oder 2, das des weiteren ein drittes Drehelement (27) umfaßt, das zum Zuführen des Blatts (P) mit dem ersten und zweiten Drehelement (25, 26) zusammenarbeitet.

4. Blattzuführgerät nach einem der vorangestellten Ansprüche, **dadurch gekennzeichnet, daß** das erste Drehelement (25) in einem geneigten Zustand angeordnet ist.

5. Blattzuführgerät nach einem der vorangestellten Ansprüche, **dadurch gekennzeichnet, daß** das zweite Drehelement (26) in einem geneigten Zustand angeordnet ist.

6. Blattzuführgerät nach den vorangestellten Ansprüchen 4 und 5, **dadurch gekennzeichnet, daß** der Neigungswinkel des ersten Drehelements (25) kleiner als der des zweiten Drehelements (26) ist.

7. Blattzuführgerät nach einem der vorangestellten Ansprüche 3 bis 6, **dadurch gekennzeichnet, daß** die Führungseinrichtung (31) das Blatt entlang einer äußeren Umfangsfläche des dritten Drehelements (27) führt.

8. Blattzuführgerät nach einem der vorangestellten Ansprüche, **dadurch gekennzeichnet, daß** die Zuführeinrichtung (53) eine Fördereinrichtung zum Zuführen des Blatts von einem Blattstapel umfaßt.

9. Blattzuführgerät nach einem der vorangestellten Ansprüche, das des weiteren eine zweites Regulierelement (22) aufweist, um die Positionen von seitlichen Kanten der in der Stapeleinrichtung gestapelten Blätter zu regulieren, wobei eine Regulierfläche des ersten Regulierelements (33) von der des zweiten Regulierelements (22) von dem Blatt weg abweicht, das zu regulieren ist.

10. Blattzuführgerät nach Anspruch 9, **dadurch gekennzeichnet, daß** das erste und zweite Regulierelement (22, 23) dieselbe seitliche Kante des Blatts führen.

11. Blattzuführgerät nach einem der vorangestellten Ansprüche, **dadurch gekennzeichnet, daß** die Zuführrichtung des Blatts durch Führen des Blatts um eine Umfangsfläche des dritten Drehelements (27, 121) umgekehrt wird.

12. Blattzuführgerät nach einem der vorangestellten Ansprüche, das des weiteren eine Bilderzeugungseinrichtung zum Erzeugen eines Bilds auf dem Blatt aufweist, das durch das zweite Drehelement (26) zugeführt wird.

13. Blattzuführgerät, das folgende Bauteile aufweist:

eine Zuführeinrichtung (53) zum Zuführen eines Blatts (P),

ein Regulierelement (33) zum Regulieren einer Position einer seitlichen Kante (Pa) des durch die Zuführeinrichtung (53) zugeführten Blatts,

ein erstes Drehelement (25), das an einer stromabwärtigen Seite der Zuführeinrichtung (53) in einer Zuführrichtung des Blatts angeordnet ist und angepaßt ist, um das durch die Zuführeinrichtung (53) zugeführte Blatt zuzuführen;

ein zweites Drehelement (26), das angepaßt ist, um das Blatt zuzuführen, während es die seitliche Kante (Pa) des Blatts gegen das erste Regulierelement (33) drückt,

dadurch gekennzeichnet, daß
das erste Drehelement (25) angepaßt ist, um die seitliche Kante (Pa) des Blatts gegen das Regulierelement (33) zu drücken,
das zweite Drehelement (26) an einer stromabwärtigen Seite des ersten Drehelements (25) in der Zuführrichtung des Blatts angeordnet ist,
das erste Drehelement (25) in einem geneigten Zustand angeordnet ist,
das zweite Drehelement (26) in einem geneigten Zustand angeordnet ist, und
wobei der Neigungswinkel des ersten Drehelements (25) kleiner als der des zweiten Drehelements (26) ist.

Revendications

1. Appareil d'alimentation en feuilles, comportant :

- des moyens (53) d'alimentation pour faire avancer une feuille (P),
- un premier élément (33) de régulation destiné à réguler une position d'un bord latéral (Pa) de la feuille avancée par lesdits moyens d'alimentation (53),
- un premier élément tournant (25) disposé en aval desdits moyens (53) d'alimentation dans un sens d'alimentation en feuilles et destiné à faire avancer la feuille avancée par lesdits moyens d'alimentation (53) ;
- un deuxième élément tournant (26) destiné à faire avancer la feuille tout en poussant ledit bord latéral (Pa) de la feuille contre ledit premier élément de régulation (33),

caractérisé en ce que

- ledit premier élément tournant (25) est destiné à pousser ledit bord latéral (Pa) de la feuille contre ledit premier élément de régulation (33), et en ce que
- ledit deuxième élément tournant (26) est disposé en aval dudit premier élément tournant (25) dans le sens d'alimentation en feuilles, et
- dans lequel une force de poussée dudit premier élément tournant (25), par laquelle la feuille est poussée contre ledit premier élément de régulation (33), est établie de façon à être égale ou inférieure à une force de poussée dudit deuxième élément tournant (26) par laquelle la feuille est poussée contre ledit premier élément (33) de régulation.

2. Moyens d'alimentation en feuilles selon la revendication 1, caractérisés en ce qu'ils comportent en outre des moyens de guidage (31) destinés à guider la feuille d'une manière telle qu'elle se courbe entre lesdits moyens d'alimentation (53) et ledit premier élément tournant (25).

3. Appareil d'alimentation en feuilles selon la revendication 1 ou 2, comprenant en outre un troisième élément tournant (27) coopérant avec lesdits premier et deuxième éléments tournants (25, 26) pour faire avancer la feuille (P).

4. Appareil d'alimentation en feuilles selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit premier élément tournant (25) est disposé dans un état incliné.

5. Appareil d'alimentation en feuilles selon l'une quelconque des revendications précédentes, caractérisé en ce que ledit deuxième élément tournant (26) est disposé dans un état incliné.

6. Appareil d'alimentation en feuilles selon les revendications précédentes 4 et 5, caractérisé en ce que ledit angle d'inclinaison dudit premier élément tournant (25) est inférieur à celui dudit deuxième élément tournant (26).

7. Appareil d'alimentation en feuilles selon l'une quelconque des revendications précédentes 3 à 6, caractérisé en ce que lesdits moyens de guidage (31) guident ladite feuille le long d'une surface périphérique extérieure dudit troisième élément tournant (27).

8. Appareil d'alimentation en feuilles selon l'une quelconque des revendications précédentes, caractérisé en ce que lesdits moyens d'alimentation (53) comprennent des moyens d'introduction destinés à faire sortir la feuille d'une pile de feuilles.

9. Appareil d'alimentation en feuilles selon l'une quelconque des revendications précédentes, comportant en outre un second élément de régulation (22) destiné à réguler les positions de bords latéraux des feuilles empilées dans des moyens d'empilage, une surface de régulation dudit premier élément de régulation (33) s'écartant de celle dudit second élément de régulation (22), en s'éloignant de la feuille devant être régulée.

10. Appareil d'alimentation en feuilles selon la revendication 9, caractérisé en ce que lesdits premier et second éléments de régulation (22, 33) guident le même bord latéral de la feuille.

11. Appareil d'alimentation en feuilles selon l'une quelconque des revendications précédentes, caractérisé en ce que le sens de l'alimentation en feuilles est inversé par l'avance de la feuille autour d'une surface périphérique dudit troisième élément tournant (27, 121).

12. Appareil d'alimentation en feuilles selon l'une quelconque des revendications précédentes, comportant en outre des moyens de formation d'image destinés à former une image sur la feuille avancée par ledit deuxième élément tournant (26).

13. Appareil d'alimentation en feuilles, comportant :

des moyens (53) d'alimentation pour faire avancer la feuille (P),
un élément de régulation (33) destiné à réguler une position d'un bord latéral (Pa) de la feuille avancée par lesdits moyens d'alimentation (53),
un premier élément tournant (25) disposé en aval desdits moyens d'alimentation (53) dans un sens d'alimentation en feuilles et destiné à faire avancer la feuille avancée par lesdits moyens d'alimentation (53),
un deuxième élément tournant (26) destiné à faire avancer la feuille tout en poussant ledit bord latéral (Pa) de la feuille contre ledit élément de régulation (33),

caractérisé en ce que

ledit premier élément tournant (25) est destiné à pousser ledit bord latéral (Pa) de la feuille contre ledit élément de régulation (33),

ledit deuxième élément tournant (26) est disposé en aval dudit premier élément tournant (25) dans le sens d'alimentation en feuilles,

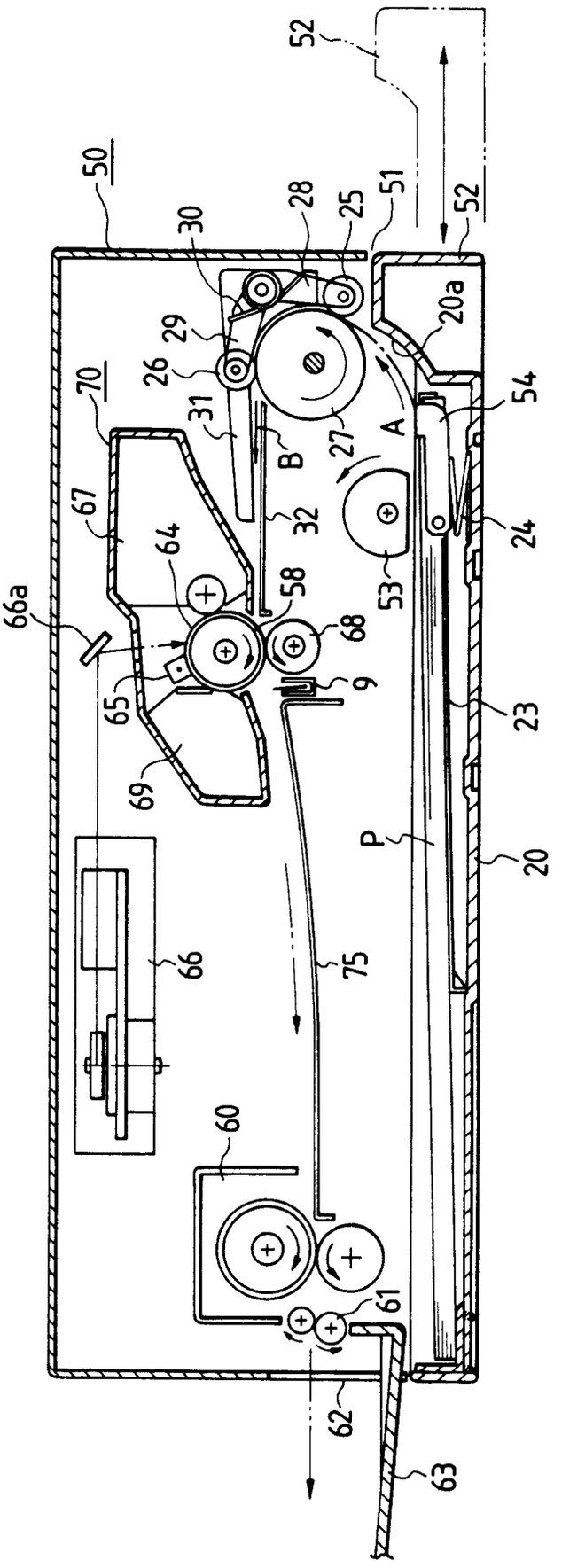
ledit premier élément tournant (25) est disposé dans un état incliné,

ledit deuxième élément tournant (26) est disposé dans un état incliné, et

ledit angle d'inclinaison dudit premier élément tournant (25) est inférieur à celui dudit

deuxième élément tournant (26).

FIG. 1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29
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31
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A
B
54
67
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58
66a
68
9
65
23
69
P
20
66
75
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62
63

FIG. 2

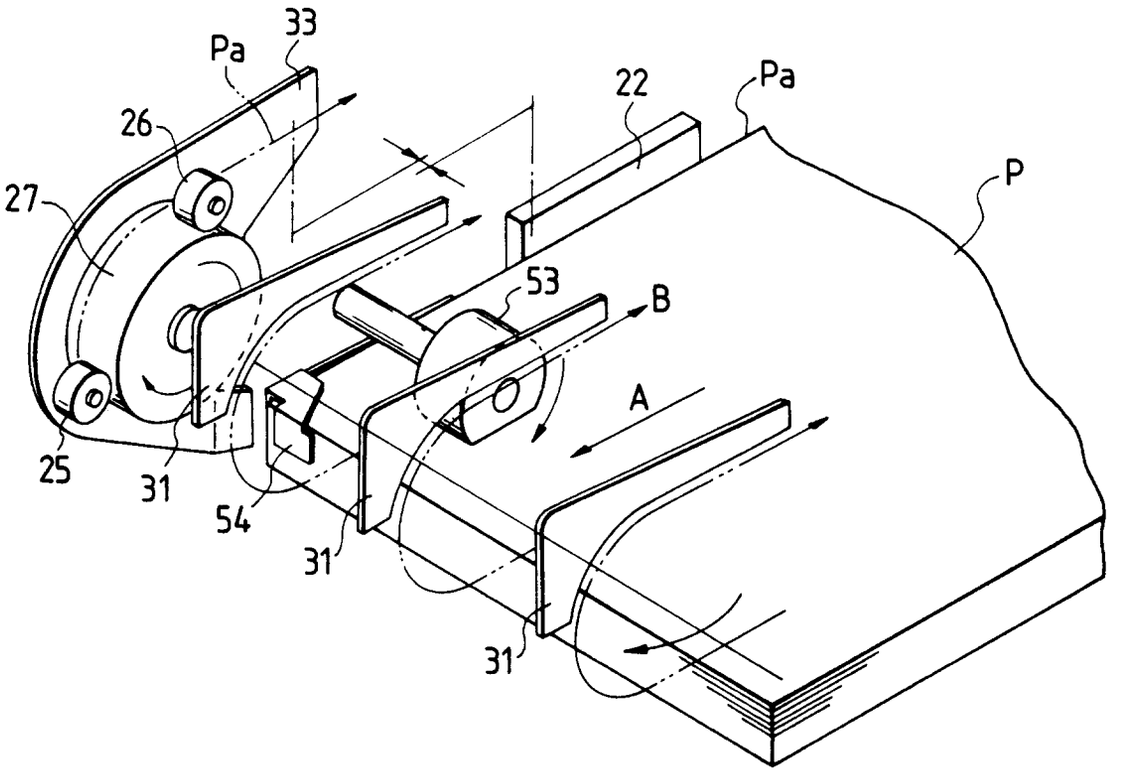


FIG. 3A

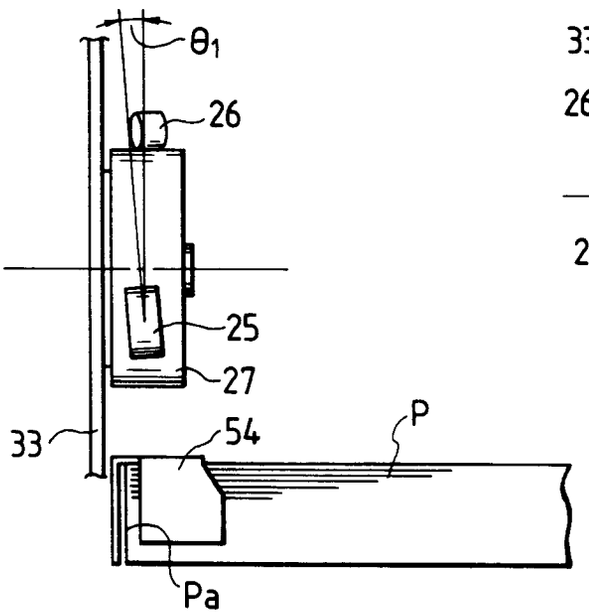


FIG. 3B

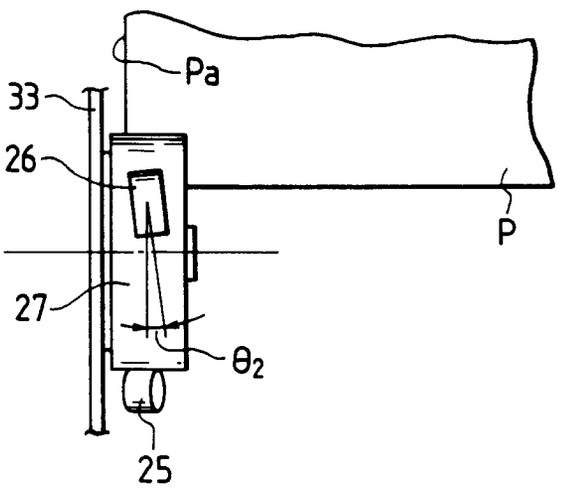


FIG. 4

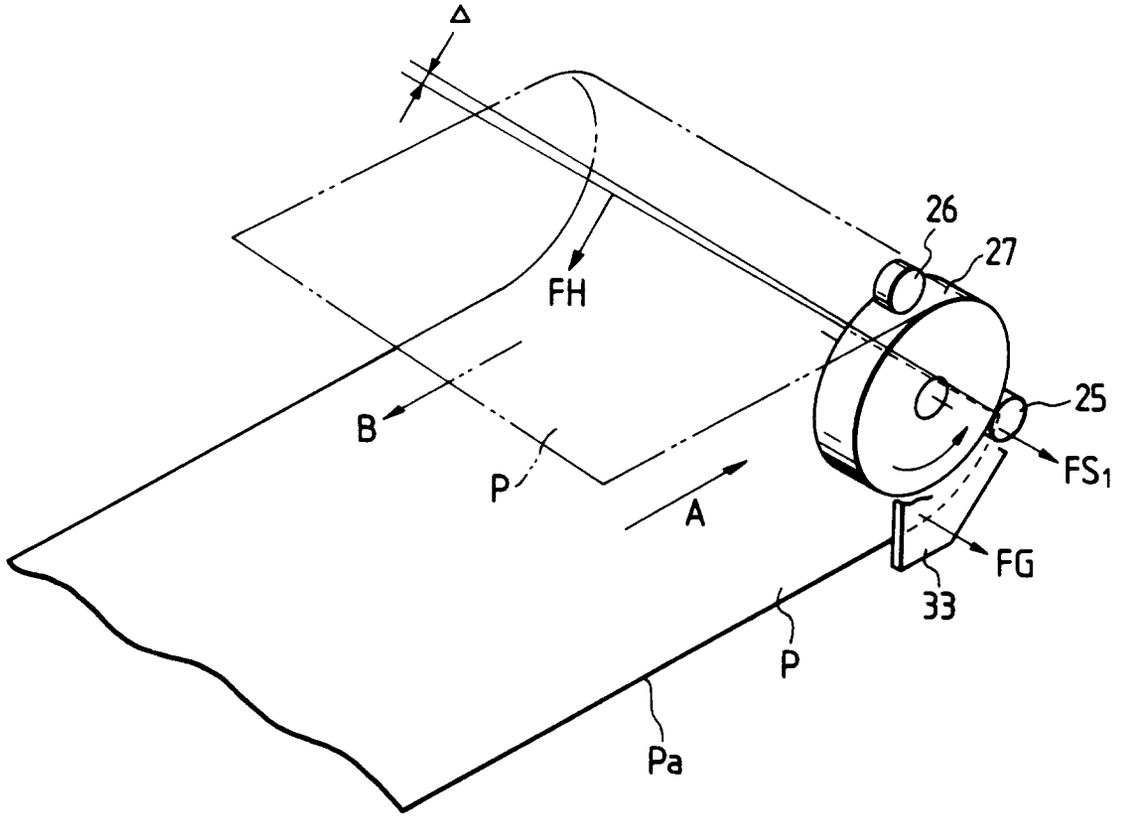


FIG. 6

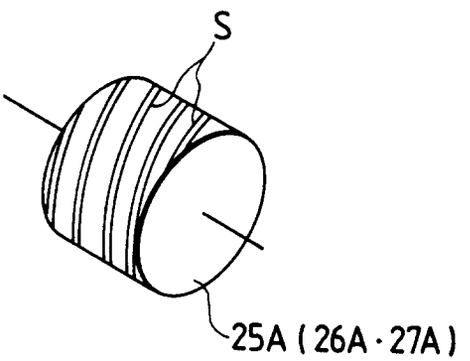


FIG. 5C

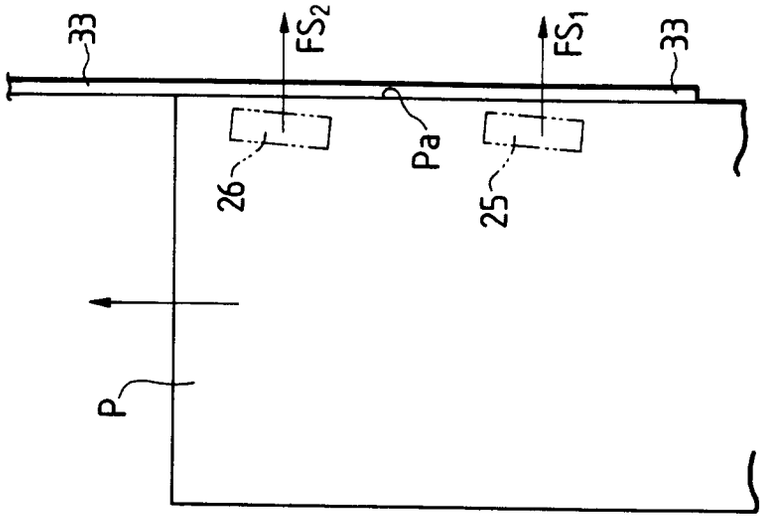


FIG. 5B

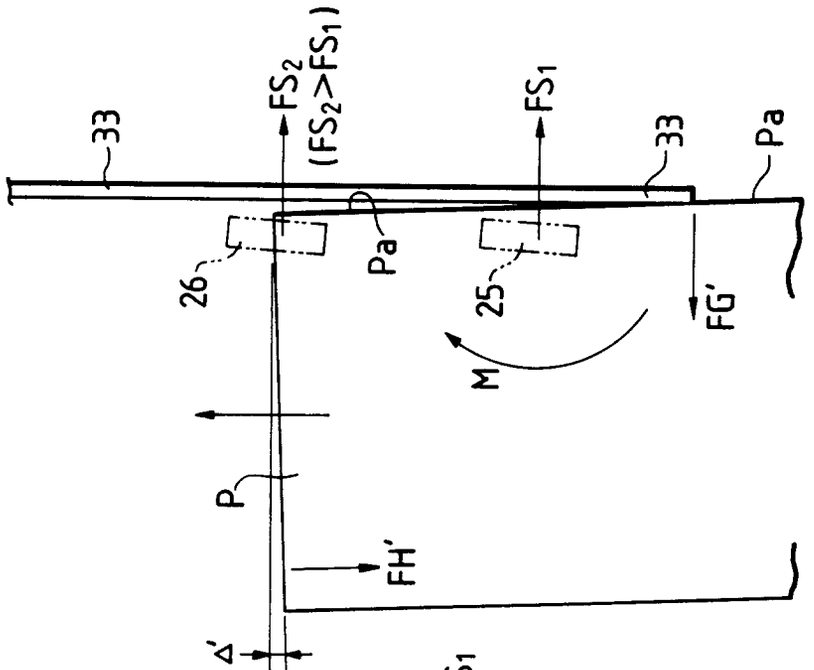


FIG. 5A

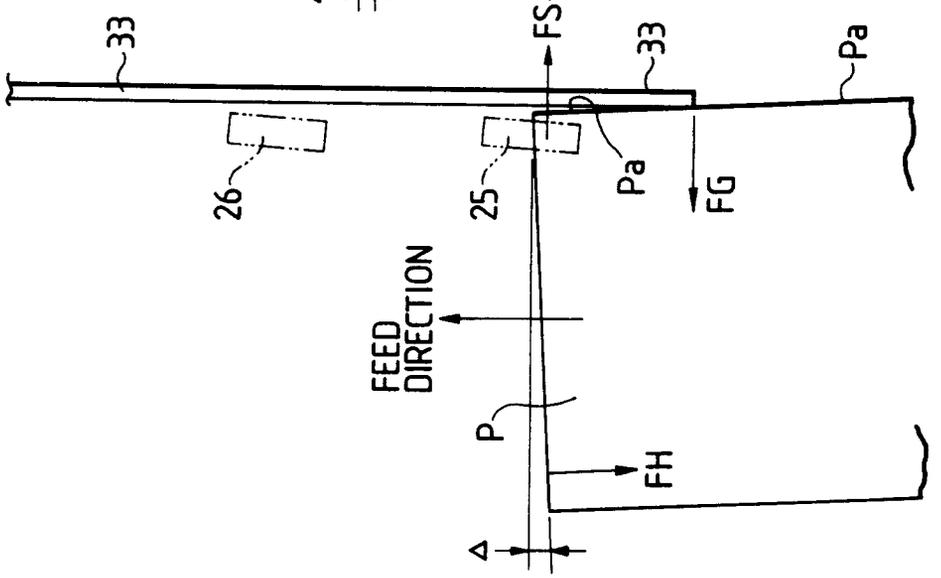
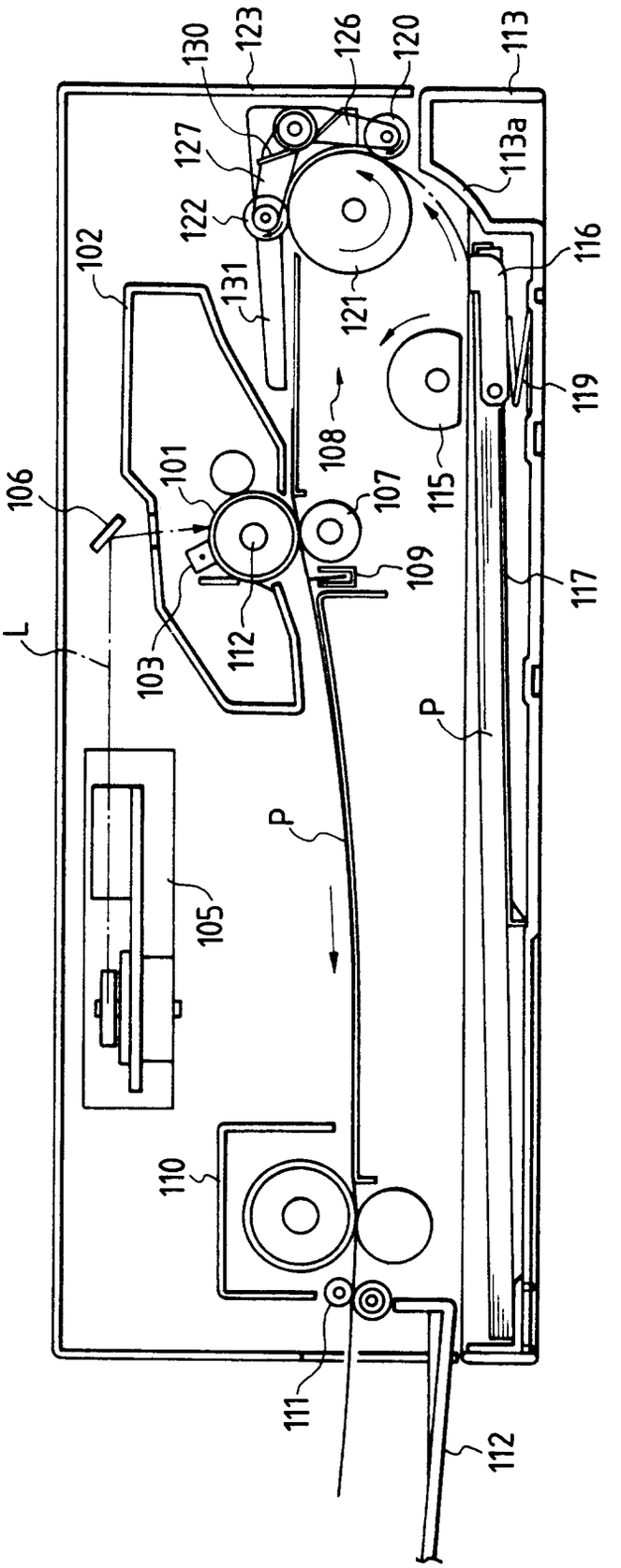


FIG. 7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103
L
P
105
P
110
111
112

FIG. 8

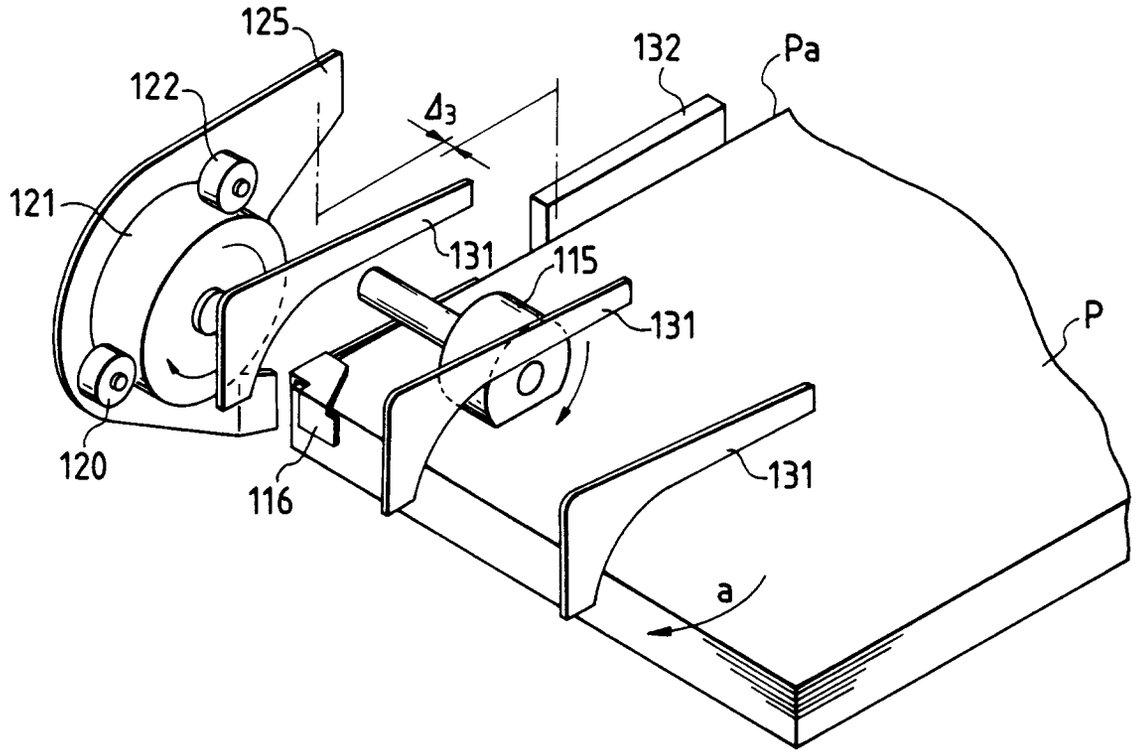
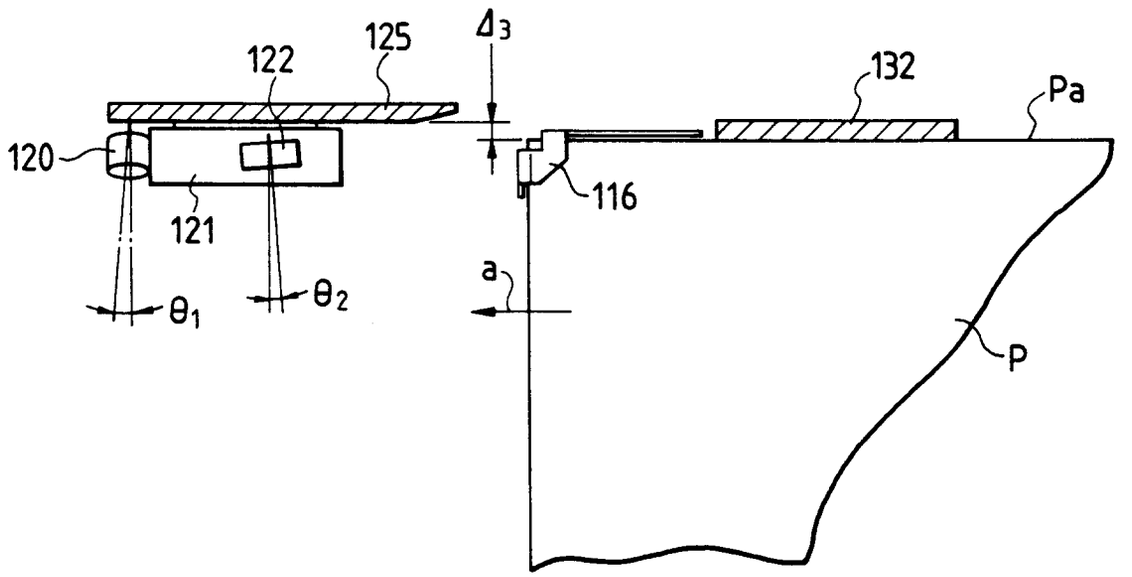

125
122
Δ3
132
Pa
121
131
115
131
P
120
116
131
a

FIG. 9


Δ3
125
122
132
Pa
120
116
121
a
θ1
θ2
P

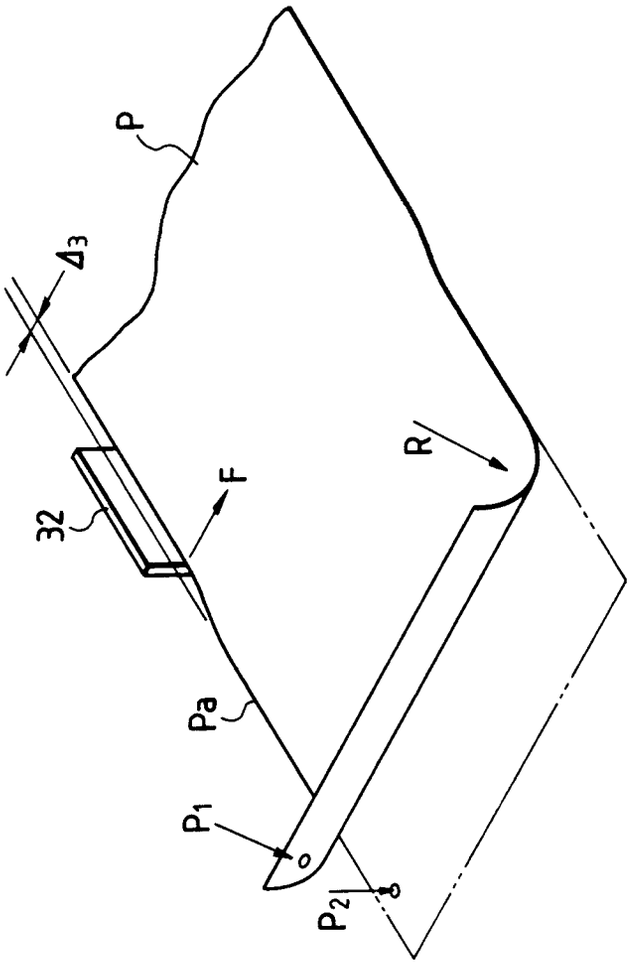


FIG. 10

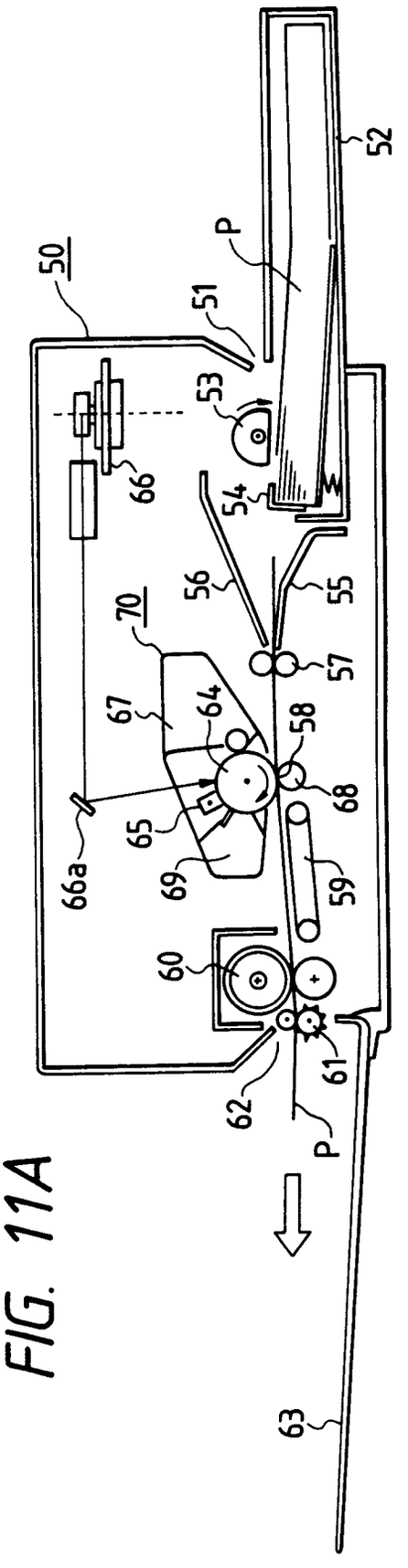


FIG. 11A

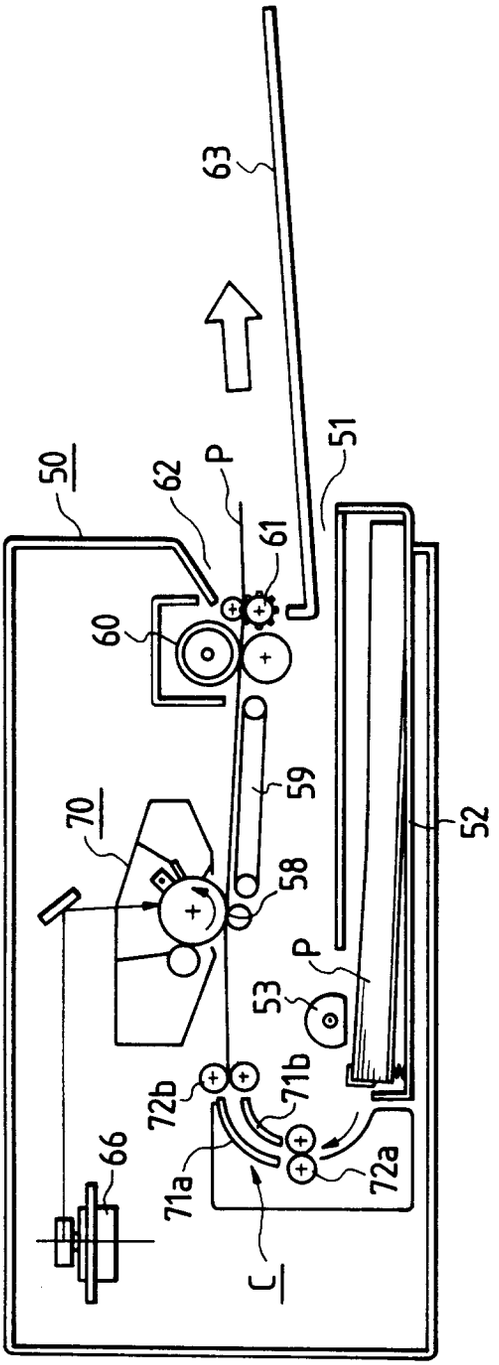


FIG. 11B

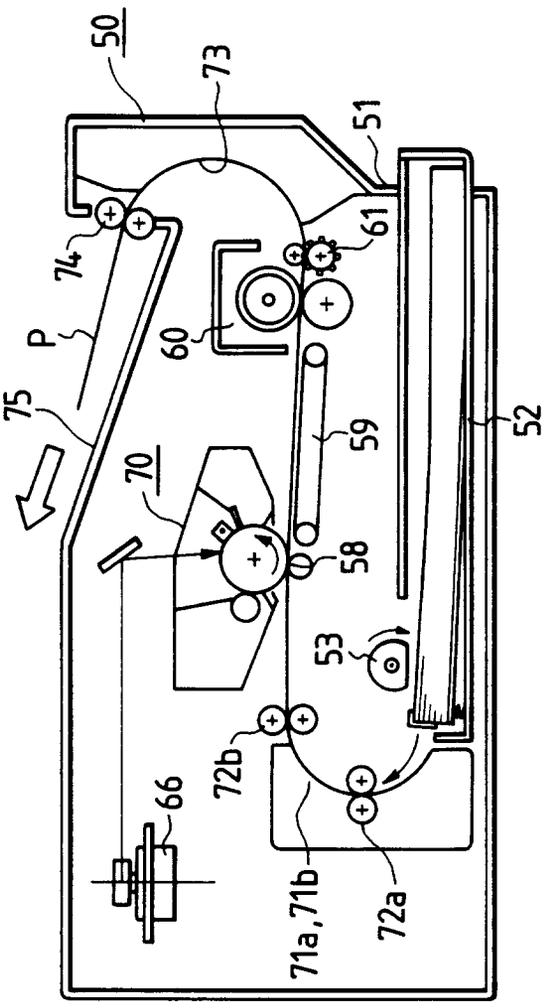


FIG. 11C

FIG. 12A

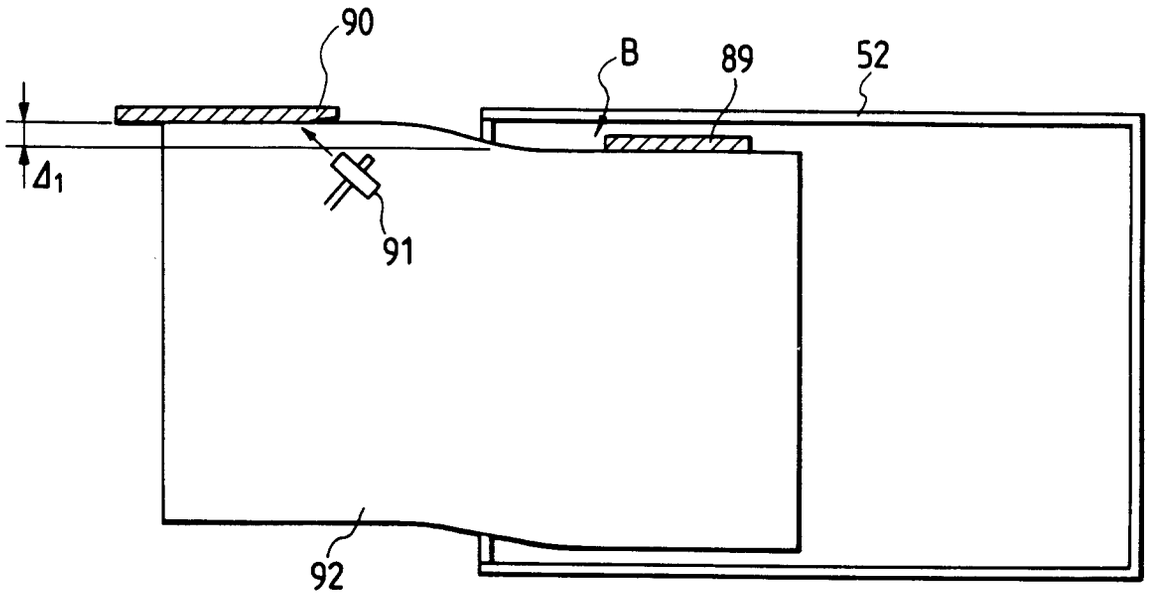


FIG. 12B