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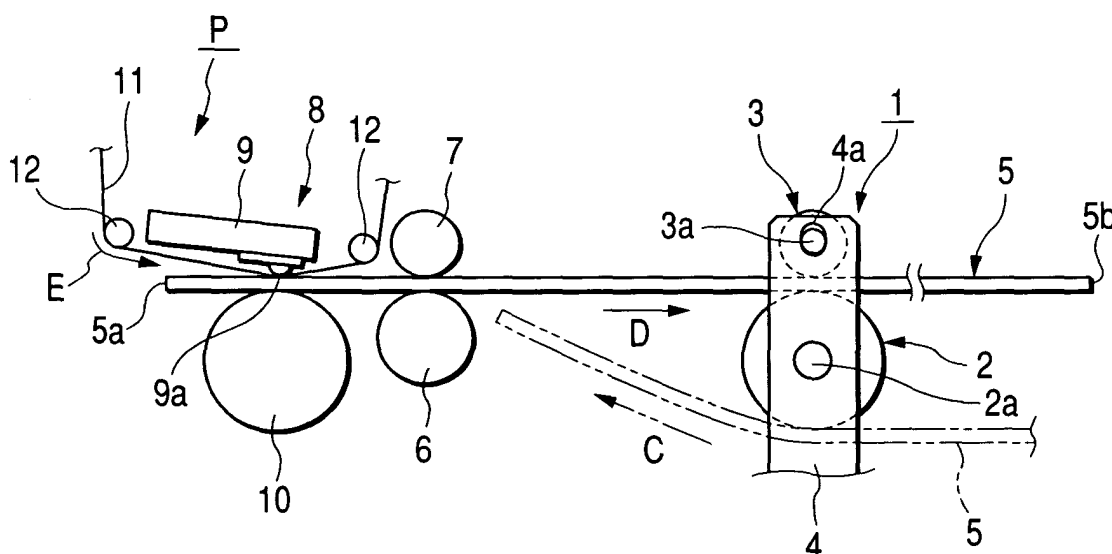
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(54) **Paper carrying mechanism**

(57) The present invention is directed to providing a paper carrying mechanism (1) for a printing device, in which the number of parts and assembly processes can be reduced, and which the carrying deviation does not occur even if a recording medium is reciprocally carried. The paper carrying mechanism for a printer comprises a rotatable carrying roller (2), and a rotatable pressing

roller (3) arranged above the carrying roller (2). The pressing roller (3) is arranged to have a gap (G) of 1/2 of the thickness of a recording medium (5), between the pressing roller (3) and the carrying roller (2). When the recording medium (5) is carried to the gap (G), the pressing roller (3) is pushed up so that the carrying roller (2) is pressed against the recording medium (5) due to the weight of the pressing roller (3).

FIG. 1



Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a paper carrying mechanism used for a printing device such as a printer that is capable of suitably carrying a recording medium by a carrying roller and a pressing roller.

2. Description of the Related Art

[0002] A conventional paper carrying mechanism is arranged on the printer to feed a recording medium received in a paper feeding tray (not shown) or to feed back the recording medium on which an image has been printed in a printing section to discharge the recording medium to the outside of the printer.

[0003] Such a conventional paper carrying mechanism 51 will now be explained with reference to Fig. 3. The paper carrying mechanism has arranged therein a carrying roller 52 rotatable by the rotation of a motor (not shown) and a pressing roller 53 pressed against the carrying roller 52 and rotated in such a manner to follow the rotation of the carrying roller 52.

[0004] The pressing roller 53 is supported by a leaf spring 55 mounted on a casing on the printer side with a small screw 54, and it is elastically biased against the carrying roller 52 by the leaf spring 55. Further, a recording medium 56 having contained with a thick paper, such as a printing paper, received in a paper feed tray is pressure-contacted with the lower part of the carrying roller 52.

[0005] Also, the recording medium 56 can be carried in the direction of an arrow A by the rotation of the carrying roller 52 in its clockwise direction.

[0006] Further, a printing section (not shown) having a printhead is arranged on the left side of the paper carrying mechanism 51 in the drawing, and a paper feed roller (not shown) and a pressure-contact roller (not shown) which are capable of securely gripping the recording medium 56 are arranged between the printing section and the paper carrying mechanism 51. The recording medium 56 is carried in the direction of the arrow A by the rotation of the carrying roller 52 to carry the recording medium to the printing section.

[0007] Also, the recording medium 56 gripped by the paper feed roller and the pressure-contact roller is capable of being reciprocally carried in the printing section by the reciprocal rotation of the paper feed roller.

[0008] The operation of the conventional paper carrying mechanism 51 used for, for example, a thermal transfer printer to perform color printing, will now be explained. First, the recording medium 56 received in the paper feed tray is carried in the direction of the arrow A by the rotation of the carrying roller 52 in its clockwise direction, and is carried to the printing section (not

shown) on the left side in the drawing.

[0009] The recording medium 56 at this time is gripped by the paper feed roller and the pressing roller, which are arranged near the printing section, and is carried to the printing section whose thermal head is in a head-up state.

[0010] After carrying a part of the recording medium 56 to the printing section, a rear end 56b of the recording medium 56 is detected to perform the heading at the start of printing. The recording medium 56 at this time is in a state that is released from the pressure-contact by the carrying roller 52, and is gripped by the paper feed roller and the pressure-contact roller.

[0011] After the heading of the recording medium 56, a thermal head is headed down to pressure-contact an ink ribbon with the recording medium 56, and the rotation of the paper feed roller causes the recording medium 56 to be pulled and fed back in the direction of an arrow B opposite to the direction the arrow A.

[0012] At this time, the selective heat generation by heat generating elements of the thermal head allows first color ink of the ink ribbon to be thermally transferred to the recording medium 56, thereby printing a first color image onto the recording medium 56.

[0013] The recording medium 56 that is being pulled and fed back in the direction of the arrow B by the paper feed roller is fed back in the direction of the arrow B with the rear end 56b thereof nipped between the carrying roller 52 and the pressing roller 53.

[0014] Thereafter, a recording medium 56 is repeatedly carried to the printing section so that a second color ink can be overprinted on the first color image, and a third color ink can be overprinted on the second color image, thereby printing a desired color image on the recording medium 56.

[0015] Japanese Unexamined Patent Application Publication No. 7-19777 and Japanese Unexamined Patent Application Publication No. 8-259030 disclose examples of conventional paper carrying mechanisms.

[0016] However, in the conventional paper carrying mechanism, since the pressing roller 53 is supported by the leaf spring 55 and the leaf spring 55 is mounted on the casing side with a small screw 54, there was a problem in that a greater number of parts and assembly processes is required, hence increasing the manufacturing cost.

[0017] Further, when the recording medium 56 that is being printed is fed back in the direction of the arrow B, as shown in Fig. 4, the rear end 56b of the recording medium 56 bumps against the carrying roller 52 and the pressing roller 53, and when the recording medium 56 is pushed up the pressing roller 53, there is also a problem in that deviation occurs in the carrying process.

[0018] When such deviation in the carrying process occurs in the recording medium 56, there is a subsequent problem in that printing deviation occurs, when different colors are overprinted to perform color printing, which results in falling short of obtaining desired printing

requests.

SUMMARY OF THE INVENTION

[0019] The present invention has been made in consideration of the above-mentioned problems. It is therefore an object of the present invention to provide a paper carrying mechanism in which the number of parts and assembly processes can be reduced, and the carrying deviation does not occur when a recording medium is reciprocally carried.

[0020] As the first aspect to accomplish the object, a paper carrying mechanism of the present invention comprises: a carrying roller rotationally driven by the driving force of a drive motor, and a rotatable pressing roller arranged above the carrying roller. The pressing roller, by its own weight, is adapted to be capable of pressing a recording medium carried between the pressing roller and the carrying roller.

[0021] Preferably, a gap smaller than the thickness of the recording medium is formed between the pressing roller and the carrying roller.

[0022] Preferably, a rotating shaft of the carrying roller is rotatably supported by a casing on the side of a printing device, and a rotating shaft of the pressing roller is supported in a vertically elongated supporting hole formed in the casing so as to be vertically movable. When the recording medium is carried to the gap, the pressing roller is pushed up so that the rotating shaft thereof ascends in the elongated hole, and the recording medium is pressed against the carrying roller by the weight of the pressing roller.

[0023] Preferably, the gap is formed to have 1/2 of the thickness of the recording medium.

[0024] An embodiment of the present invention will now be described, by way of example only, with reference to the accompanying diagrammatic drawings, in which:

Fig. 1 is a schematic diagram for explaining a printing device having a paper carrying mechanism according to the present invention;

Fig. 2 is an enlarged view of the paper carrying mechanism according to the present invention;

Fig. 3 is a schematic diagram for explaining a conventional paper carrying mechanism; and

Fig. 4 is a schematic diagram for explaining problems of the conventional paper carrying mechanism.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0025] Hereinafter, a paper carrying mechanism of the present invention will be explained with reference to Figs. 1 and 2. First, Fig. 1 is a schematic diagram for explaining a printing device using a paper carrying mechanism according to the present invention, and Fig.

2 is an enlarged view of the paper carrying mechanism according to the present invention.

[0026] First, a paper carrying mechanism 1 of the present invention is incorporated in a printing device P so that a recording medium 5 can be carried to between a paper feed roller 6 and a pressure-contact roller 7, which will be described below.

[0027] The paper carrying mechanism 1, as shown in Figs. 1 and 2, is arranged such that a carrying roller 2 having its outer circumferential portion coated with a high frictional member, such as rubber, is rotatably connected to a motor (not shown) via a transmission mechanism (not shown).

[0028] Further, a rotatable pressing roller 3 is arranged above the carrying roller 2. The pressing roller 3 is made of metal having large specific gravity.

[0029] Further, rotating shafts 2a and 3a of the carrying roller 2 and the pressing roller 3 are respectively supported by a part of a casing 4 on the printing device P side.

[0030] Further, a supporting hole 4a that supports the rotating shaft 3a of the pressing roller 3 is formed in the shape of a vertically elongated hole. Therefore, the rotating shaft 3a of the pressing roller 3 is vertically movable along the elongated supporting hole 4a.

[0031] Also, as shown in Fig. 2, a predetermined size of a gap G is formed between the pressing roller 3 at the time of being supported by the supporting hole 4a and being descended by its own weight, and the carrying roller 2. The gap G between the carrying roller 2 and the pressing roller 3 is formed to have about 1/2 of the thickness T of the recording medium 5 having contained with comprising a thick paper, such as a printing paper.

[0032] Further, the recording medium 5, during printing in a printing section 8 or after printing has been completed therein, which will be described below, is introduced into the gap G between the carrying roller 2 and the pressing roller 3 so that the recording medium can be pressed against the carrying roller 2 due to the weight of the pressing roller 3.

[0033] Further, the recording medium 5 received in a paper feed tray (not shown) is pressure-contacted with the lower part of the carrying roller 2 so that it can be carried in the direction of an arrow C by the rotation of the carrying roller 2 in its clockwise direction.

[0034] A thermal transfer printer will now be explained as an example of the printing device P using such a paper carrying mechanism 1 of the present invention. Downstream of the paper carrying mechanism 1 in the direction of the arrow C that the recording medium 5 is carried, are arranged the cylindrical paper feed roller 6 and the pressure-contact roller 7 disposed above the paper feed roller 6, in the drawing, and pressure-contacted with the paper feed roller 6 with a coil spring (not shown), etc.

[0035] Also, the recording medium 5 that has been carried in the direction of the arrow C by the rotation of the carrying roller 2, is pressure-contacted with and

gripped between the paper feed roller 6 and the pressure-contact roller 7.

[0036] The recording medium 5 that has been gripped by the paper feed roller 6 and the pressure-contact roller 7, can be carried to the printing section 8 located near the downstream of the paper feed roller 6 by the rotation of the paper feed roller 6 in its counterclockwise direction.

[0037] A thermal head 9 is arranged in the printing section 8 above the recording medium 5 that is being carried, and a rotatable platen roller 10 is arranged below the thermal head 9. Also, the thermal head 9 is movable toward or away from (head-up/head-down) the platen roller 10.

[0038] Further, an ink ribbon 11 is drawn between the thermal head 9 and the platen roller 10. For example, a color ink ribbon on which different kinds of color inks are formed in order is provided on one side of the ink ribbon 11 (for example, lower side in the drawing). The thermal head 9 overprints color inks on the recording medium 5 in order that printing of a color image can be performed.

[0039] Further, the ink ribbon 11 can be wound in the direction of an arrow E such that one end thereof is wound on a take-up reel (not shown) and the other end thereof is wound on a supply reel (not shown). Further, a pinch roller 12 is arranged on a path along which the ink ribbon 11 is carried.

[0040] The operation of printing a desired color image on the recording medium 5 using such a printing device P will now be explained. First, the thermal head 9 is headed up to separate from the platen roller 10 by a predetermined distance so that it is in a standby state before printing.

[0041] In the standby state, the recording medium 5 carried in the direction of the arrow C by the paper carrying mechanism 1 is pressure-contacted with and gripped between the paper feed roller 6 and the pressure-contact roller 7, and the recording medium 5 is further carried in the direction of the arrow C between the thermal head 9 in a head-up state and the platen roller 10 by the rotation of the paper feed roller 6.

[0042] Then, when the recording medium 5 is carried in the direction of the arrow C by a predetermined distance and the rear end 5b of the recording medium 5 is detected by the paper sensor (not shown), the heading of the recording medium 5 before the start of printing is performed, and the recording medium 5 stops being carried.

[0043] When the heading of the recording medium 5 is performed, the thermal head 9 is headed down and the ink ribbon 11 is pressure-contacted with the recording medium 5 located on the platen roller 10.

[0044] At the same time, heat is selectively generated from a plurality of heat generating elements 9a of the thermal head 9 on the basis of printing information, and the paper feed roller 6 is rotated in a clockwise direction in the drawing, thereby pulling and feeding back the recording medium 5 in the direction of the arrow D.

[0045] Then, the rear end 5b of the recording medium 5, as shown in Fig. 2, contacts with the carrying roller 2 and the pressing roller 3.

[0046] The carrying roller 2 at this time rotates in the same clockwise direction as the feeding direction of a paper. Further, the pressing roller 3 descends in the supporting hole 4a due to its own weight so that the gap G is formed between the pressing roller 3 and the carrying roller 2.

[0047] Then, the rear end 5b of the recording medium 5 that is being fed back in the direction of the arrow D pushes the pressing roller 3 so that the carrying roller 2 rotates in its clockwise direction. As a result, the recording medium 5 that is being fed back in the direction of the arrow D is drawn between the carrying roller 2 and the pressing roller 3 so that it can be further fed back in the direction of the arrow D.

[0048] Since the pressing roller 3 descends due to its own weight, the pressing roller 3 can be easily pushed up using the recording medium 5 having contained with a thick paper, such as the printing paper that is being fed back in the direction of the arrow D.

[0049] In this way, cyan color ink of the ink ribbon 13 is thermally transferred onto one side of the recording medium 5 that is being fed back in the direction of the arrow D (the top face in the drawing), thereby performing a first color image printing.

[0050] Then, when the first color image printing has been completed, the rotation of the carrying roller 2 and the paper feed roller 6 is reversed, and the recording medium 5 is returned to the recording start position again. Similar to the image printing in cyan color ink, a second color image printing is performed by overprinting magenta color ink on the first cyan color image.

[0051] Thereafter, the similar operation is repeated so that a third color image printing is performed by overprinting yellow color ink on the second magenta color image. As a result, a desired color image can be printed on the recording medium 5.

[0052] The recording medium 5 during the color printing is reciprocally carried in a state gripped by the paper feed roller 6 and the pressure-contact roller 7, and when the printing is performed, the rear end 5b of the recording medium 5 contacts with the carrying roller 2 and pressing roller 3 of the paper carrying mechanism 1 of the present invention. However, the pressing roller 3 that descends due to its own weight can be smoothly pushed up by the rear end 5b of the recording medium 5.

[0053] Thus, according to the present invention, the carrying deviation can be prevented in the recording medium 5 that is being carried, and a high quality image printing having no color deviation can be obtained in color printing.

[0054] Then, the recording medium 5, onto which printing of a desired color image has been completed, is released from gripping by the paper feed roller 6 and the pressure-contact roller 7, is fed back in the direction of the arrow D by the carrying roller 2 and the pressing

roller 3, and is discharged to the outside of the printing device P.

[0055] Further, in the paper carrying mechanism 1 of the present invention, since the recording medium 5 is pressed against the carrying roller 2 due to the weight of the pressing roller 3, a leaf spring 55, a small screw 54, etc., become unnecessary unlike the conventional paper carrying mechanism. As a result, the number of parts and assembly processes can be reduced.

[0056] In addition, color printing has been described an example of printing in the embodiment of the present invention. However, monochromatic image printing may be performed using the ink ribbon 11 to which monochromatic ink is applied.

[0057] Further, a thermal transfer printer is used as the recording device P. However, a thermal printer using a recording medium having a heat-sensitive paper may be used.

[0058] As described above, since the pressing roller according to the present invention can be pressed against a recording medium that is being carried between the pressing roller and the carrying roller, due to the weight of the pressing roller, a leaf spring, a small screw, or etc., becomes unnecessary unlike the conventional paper carrying mechanism. As a result, the number of parts and assembly processes can be reduced to provide a paper carrying device capable of reducing the manufacturing cost.

[0059] Further, since a gap smaller than the thickness of a recording medium is formed between the pressing roller and the carrying roller, a recording medium that is being fed back can be smoothly drawn between the carrying roller and the pressing roller so that the pressing roller can be easily pushed up without difficulty.

[0060] Therefore, even if a recording medium is repeatedly and reciprocally carried, a high quality color image can be printed without the occurrence of having carrying deviation.

[0061] Further, when a recording medium is carried to the gap, the pressing roller is pushed up so that a rotating shaft thereof ascends in an elongated hole, and the recording medium is pressed against the carrying roller due to the weight of the pressing roller. Therefore, the pressing roller can be easily pushed up by the rear end of the recording medium that is being fed back, and the recording medium can be repeatedly and reciprocally carried without the occurrence of carrying deviation.

[0062] Further, since the gap is formed to have 1/2 of the thickness of a recording medium, the pressing roller can be easily pushed with a small feedback force of a recording medium, and the recording medium can be easily pressed due to the weight of the pressing roller exerted at the pushed-up states.

a carrying roller rotationally driven by a driving force of a drive motor, and
a rotatable pressing roller arranged above the carrying roller,

wherein the pressing roller, by its own weight, is adapted to be capable of pressing a recording medium carried between the pressing roller and the carrying roller.

2. The paper carrying mechanism according to claim 1,

wherein a gap smaller than the thickness of the recording medium is formed between the pressing roller and the carrying roller.

3. The paper carrying mechanism according to claim 2, wherein the gap is formed to have 1/2 of the thickness of the recording medium.

4. The paper carrying mechanism according to claim 2, wherein a rotating shaft of the carrying roller is rotatably supported by a casing on the side of a printing device, and a rotating shaft of the pressing roller is supported in a vertically elongated supporting hole formed in the casing so as to be vertically movable, and

wherein when the recording medium is carried to the gap, the pressing roller is pushed up so that the rotating shaft thereof ascends in the elongated hole, and the recording medium is pressed against the carrying roller due to the weight of the pressing roller.

5. The paper carrying mechanism according to claim 4,

wherein the gap is formed to have 1/2 of the thickness of the recording medium.

Claims

1. A paper carrying mechanism comprising:

FIG. 1

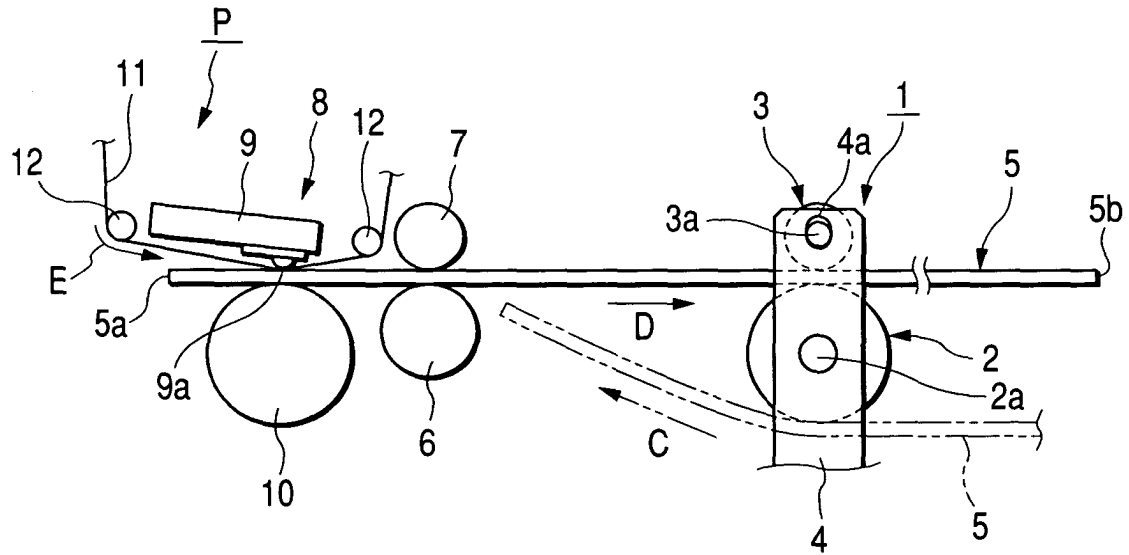


FIG. 2

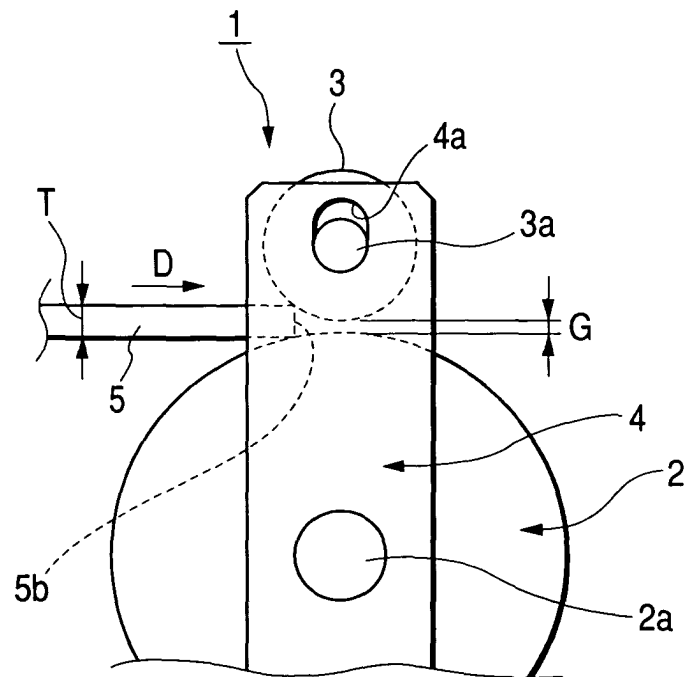


FIG. 3

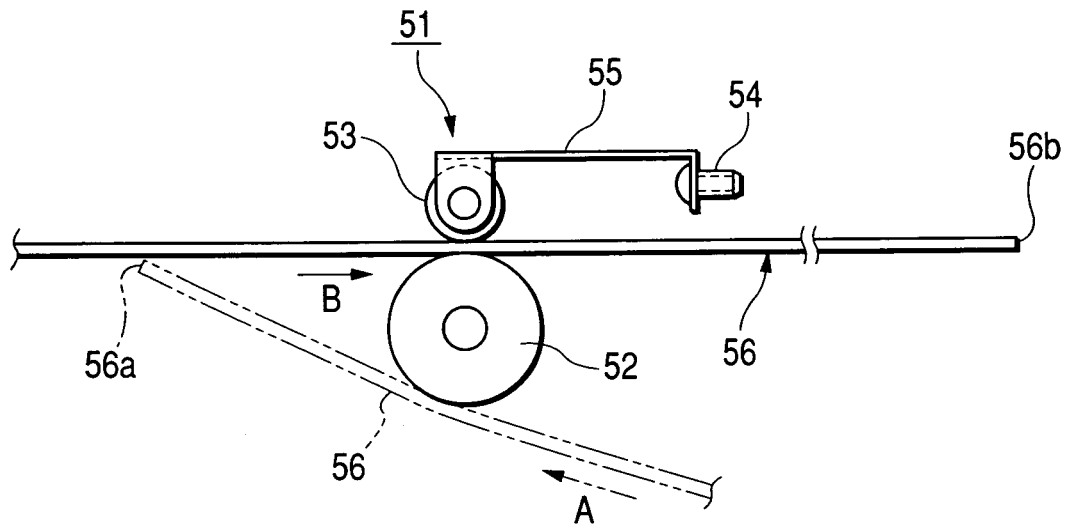
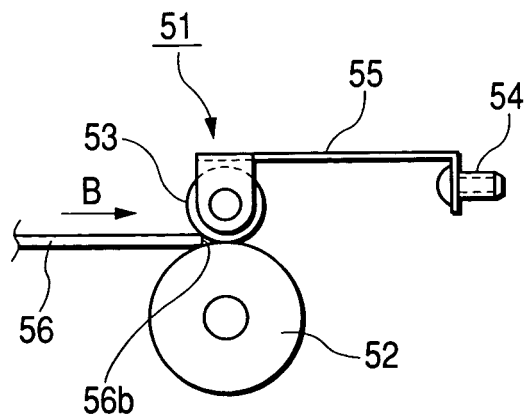


FIG. 4





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 04 25 3998

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)
X	US 3 674 194 A (MOESSER WILHELM) 4 July 1972 (1972-07-04) * column 2, line 60 - column 3, line 34; figures 3,6,7 *	1	B65H5/06
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B65H
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		15 October 2004	Fachin, F
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 25 3998

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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