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(54) Recording medium supplying apparatus

(57) A recording medium supplying apparatus includes a guide unit (16') for guide a recording medium (P) from a medium sending-out unit (10), and a register unit (14) against which a leading end of the medium from the guide unit contacts. A medium passage length from the sending-out unit to the register unit via the guide unit is set shorter than a medium length in a

medium moving direction to generate a bend in the medium. A cross section of a bend contact portion of the guide unit is so structured that a central region of the portion protrudes larger than regions on both sides of the central region.

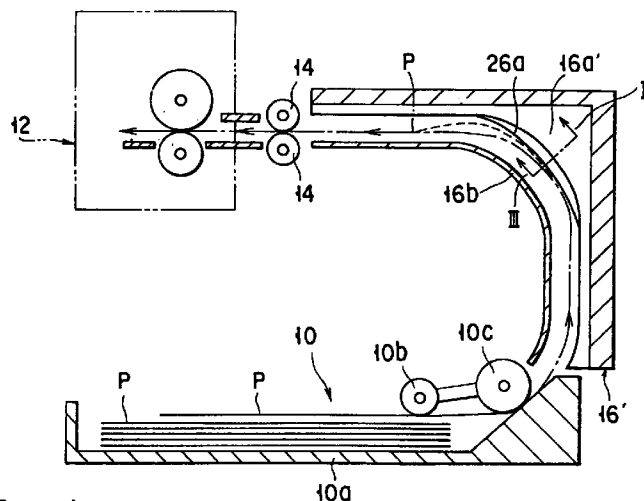


FIG. 1

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Description

The present invention relates to an apparatus for supplying a sheet-like recording medium to a register unit.

The above described apparatus is used for supplying a recording medium such as a sheet having a predetermined size to a register unit arranged in front of a printing unit in a copying machine or facsimile apparatus.

FIG. 6 schematically shows a structure of the conventional apparatus of the above described kind. As shown in the drawing, the conventional apparatus comprises a recording medium sending-out unit 10 for sending out a paper sheet P, and a recording medium transfer guide unit 16 for guiding the sheet P sent out from the sending-out unit 10 to a register unit 14 arranged in front of a printing unit 12. In the conventional apparatus of FIG. 6, the register unit 14 is structured by a pair of regist rollers.

The recording medium sending-out unit 10 comprises a recording medium cassette 10a containing a plurality of sheets P in a stacked state, a pickup roller 10b contacting a periphery of an uppermost sheet P in the plurality of the sheets in the cassette 10a at a position near an inlet opening of the recording medium transfer guide unit 16 and selectively moving the uppermost sheet P toward the inlet opening, and a sending-out roller 10c for sending out the uppermost sheet P moved toward the inlet by the pickup roller 10b, into the recording medium transfer guide unit 16 through the inlet opening.

The recording medium transfer guide unit 16 includes a pair of guide members 16a and 16b which face each other with a gap much larger than the thickness of the sheet P. The guide member 16a has a portion constantly and slidably contacting the sheet P to guide the transfer of the sheet P. A sliding contact surface of the portion of the guide member 16a has a comb-teeth like cross section as shown in FIG. 7 in order to reduce a sliding friction generating between the sliding contact surface and the sheet P. Projecting end surfaces of ribs 18, the ribs 18 structuring the sliding contact surface of the comb-teeth like cross section of the guide member 16a, are placed on the same plane so that all of the projecting end surfaces of the ribs 18 covered by the sheet P slidably contacting the sliding contact surface of the guide member 16a contact the sheet P.

The register unit 14 is arranged near an outlet of the recording medium transfer guide unit 16, and a length of a sheet transferring passage from the sending-out roller 10c to the register unit 14 via the recording medium transfer guide unit 16 is shorter than a length of the sheet P measured in its moving direction.

The sheet P discharged from the outlet of the recording medium transfer guide unit 16 abuts its leading end on a contact line of the regist roller pair of the register unit 14. If the sheet P skews in this time with

regard to the contact line as shown in FIG. 8, a moment M will be produced in the sheet P which is applied with a moving force F by the sending-out roller 10c, to turn the sheet P around at one corner L of the leading end contacting the contact line and to move another corner R of the leading end not contacting the contact line toward the contact line.

Whether the sheet P skews or not, the register unit 14 is driven to send out the sheet P toward the printing unit 12 after a sufficient time for correcting the skew of the sheet P has passed from a time when the sheet P is send out from the cassette 10a. The printing unit 12 prints an image on the sheet P reached thereto on the basis of printing information supplied to the printing unit 12 in advance.

Even after the leading end of the sheet P has reached the contact line of the regist roller pair of the register unit 14, the sheet P is still applied with the moving force F by the sending-out roller 10c, and thus the sheet P is bent due to the moving force F. The bend may easily occur, particularly in a portion at which the moving direction of the sheet P is changed in the sheet transferring passage in the recording medium transfer guide unit 16, i.e., in a bending portion of the transfer guide unit 16. A peak of the bend is pushed against the projecting end surfaces of the ribs 18 of the guide member 16a. The bend of the sheet P is shown in FIG. 6 by a dotted line.

In the conventional apparatus structured as described above, the friction produced between the sheet P and each of the projecting end surfaces of the ribs 18 is equal to each other. Therefore, if the sheet P skews, a turn of the sheet P for correcting the skew of the sheet P cannot be easily generated because the peak of the bend is pushed against the projecting end surfaces of the ribs 18 of the guide member 16a.

As a result of this, the sheet P may be supplied to the printing unit 12 without the skew of the sheet P being corrected by the register unit 14, so that an image may be printed on the sheet P in a wrong position, or wrinkles may be generated in the sheet P, which may clog the sheet transferring passage.

This invention is derived from the above described circumstances, and the object of the present invention is to provide a recording medium supplying apparatus which can always surely correct a skew of a recording medium by a register unit, and can always surely prevent a decrease in printing quality on the recording medium, generation of wrinkles in the recording medium, and clogging of the recording media in a recording medium transferring passage.

In order to achieve the object, a recording medium supplying apparatus according to the present invention comprises a recording medium sending-out unit for sending out a recording medium; a recording medium transfer guide unit for guiding a movement of the recording medium sent out from the recording medium sending-out unit; and a register unit against which a leading end of the recording medium discharged from the

recording medium transfer guide unit contacts, wherein a length of a moving passage of the recording medium from the recording medium sending-out unit to the register unit via the recording medium transfer guide unit is set shorter than a length of the recording medium measured in its moving direction to prevent the recording medium from moving by the register unit and to generate a bend in the recording medium, and a cross section of a portion of the recording medium transfer unit, with the portion a peak of the bend generated in the recording medium being in contact, in a direction crossing the moving direction of the recording medium is so structured that a central region of the recording medium contact portion in the crossing direction protrudes larger than regions arranged on both sides of the central region.

With this structure, when a bend is produced in the recording medium by that the register unit prevents the recording from moving, and a peak of the bend contacts the recording medium contact portion of the recording medium transfer guide unit, the contact occurs only at the central region of the portion and does not occur in the both sides of the central region. Accordingly, the friction force generated between the portion of the guide member of the recording medium transfer guide unit and the peak of the bend of the recording medium due to the contact is generated only between the central region of the portion of the guide member and the peak of the bend. Therefore, even if the recording medium skews, the recording medium can be easily turned to correct the skew.

In the apparatus, any recording medium skewing will not be supplied by the register unit to the recording unit such as a printing unit. As a result of this, information can be precisely recorded on the recording medium. Further, the recording medium will not be wrinkled, and thus clogging of the recording medium in the recording medium transferring passage will not occur.

In the recording medium supplying apparatus according to the invention and structured as described above, the section of the recording medium contact portion of the recording medium transfer guide unit is structured by a plurality of ribs protruding toward the recording medium and extending in the recording medium moving direction at a plurality of positions spaced apart from each other in the direction crossing the moving direction of the recording medium.

The recording medium contact portion of the recording medium transfer guide unit structured as above, further decreases the frictional force generated between it and the recording medium slidably contacting thereon.

In this case, the ribs arranged on each side of the central region of the recording medium contact portion in the crossing direction are so structured that the height of the side arranged ribs decrease as positions of the side arranged ribs are farther away from the central region. Alternatively, the ribs arranged on each side of

the central region have the same height less than that in the central region.

This invention can be more fully understood from the following detailed description when taken in conjunction with the accompanying drawings, in which:

FIG. 1 is a vertical sectional view schematically showing a recording medium supplying apparatus according to one embodiment of the present invention;

FIG. 2 is an enlarged front view of a part of one guide member of a recording medium transfer guide unit of the recording medium supplying apparatus of FIG. 1;

FIG. 3 is a cross sectional view taken along a line III-III in FIG. 1;

FIG. 4 is a perspective view schematically showing an operation of a register unit of the recording medium supplying apparatus in FIG. 1;

FIG. 5 is a sectional view showing a main portion of a modification of the recording medium supplying apparatus according to the one embodiment of the present invention, taken along the same line as indicated in FIG. 3;

FIG. 6 is a vertical sectional view schematically showing a conventional recording medium supplying apparatus;

FIG. 7 is a cross sectional view taken along a line VII-VII in FIG. 6; and

FIG. 8 is a perspective view schematically showing an operation of a register unit of the conventional recording medium supplying apparatus shown in FIG. 6.

A recording medium supplying apparatus according to one embodiment of the present invention will be described in detail with reference to FIGS. 1 to 4. Most of components of the apparatus of the present invention are the same as those of the conventional apparatus described above with reference to FIGS. 6 to 8. Therefore, the same or like components in the apparatus according to one embodiment of the present invention as those in the above described conventional apparatus are designated by the same reference numerals as those used to designate the corresponding components in the conventional apparatus, and the detailed description of the same or like components of the apparatus of the one embodiment of the present invention are omitted.

The recording medium supplying apparatus according to one embodiment of the present invention differs from the above described conventional apparatus in a shape of a cross section of a portion of one guide member 16a' of a recording medium transfer guide unit 16'. The portion is a portion of the one guide member 16a' against which a peak of a bend of a recording medium P is pushed when a leading end of the recording medium P contacts a contact line of a register roller pair of a register unit 14, moving of the record-

ing medium P by a sending-out roller 10c is stopped, and the recording medium P is bent as shown by a dotted line in FIG. 1. As stated in the description of the conventional apparatus, the bend may easily occur particularly in a portion at which the moving direction of the recording medium P is changed, of a recording medium moving passage in the recording medium transfer guide unit 16', i.e., in a bending portion. In this embodiment, the recording medium P is a paper sheet as in the above described conventional apparatus.

Also in this embodiment, as in the above described conventional apparatus, the entire of a sliding contact surface of the one guide member 16a' which faces another guide member 16b' of the recording medium transfer guide unit 16' is structured by projecting end surfaces of a plurality of ribs 18', the ribs being spaced apart from each other at substantially the same intervals in a direction along with the contact surface of the one guide member 16a' and perpendicular to the moving direction of the sheet P in the recording medium transfer guide unit 16', and extending in the moving direction of the sheet P, as shown in FIG. 2.

As is clearly shown in FIG. 3, the present invention is characterized in that a cross section of the one portion (bending portion) of the one guide member 16a' is formed such that one rib 18' arranged in the central region in the direction along with the contact surface the one guide member 16a' and perpendicular to the moving direction of the sheet P protrudes higher than the other ribs 18' arranged on the both sides of the central region. More specifically, the ribs 18' arranged on each of the both sides of the central region can be formed such that the heights of the ribs arranged on each of the both sides of the central region decrease stepwisely as the positions of the ribs being farther away from the central region. That is, in the cross section of FIG. 3, two lines each connecting the projecting end surfaces of the ribs arranged on each of the both sides of the central region are taperingly inclined with regard to a plain of the sheet P slidably contacting a projecting end surface of the rib 18' arranged in the center region.

A cross section of the other portion (a vertically raising portion extending from an inlet of the recording medium transfer guide unit 16' adjacent to a sending-out roller 10c to the bending portion, and a horizontal portion extending from the bending portion to an outlet of the transfer guide unit 16' adjacent to the regist roller pair of the register unit 14) of the guide member 16a' is formed similarly to that of the conventional apparatus. That is, projecting end surfaces of the plurality of ribs 18' structuring the sliding contact surface of the other portion of the guide member 16a' are arranged in the same plane so that all of the projecting end surfaces of the plurality of ribs 18' covered by the sheet P slidably contacting the sliding contact surface of the other portion can slidably contact the sheet P to make the sheet P move stably in the other portion.

As in the conventional apparatus, in the apparatus according to this embodiment and structured as

described above, when the sheet P is discharged from the outlet of the recording medium transfer guide unit 16', the leading end of the sheet P contacts a contact line of the regist roller pair of the register unit 14 and the movement of the sheet P by the sending-out roller 10c is stopped, if the sheet P skews with regard to the contact line, a moment M is produced in the sheet P in which a moving force F is applied by the sending-out roller 10c to turn sheet P around one corner L of the leading end contacting the contact line and to move another corner R which is not contact the contact line toward the contact line.

In the same time, since the sheet P is still applied with the moving force F by the sending-out roller 10c even after the leading end of the sheet P has contacted the contact line of the regist roller pair of the register unit 14, the sheet P is bent as shown in FIG. 1 by a dotted line, and a peak of the bend is pushed against the sliding contact surface of the bending portion of the one guiding member 16a' of the recording medium transfer guide unit 16'. In this time, the peak of the bend, however, contacts only the projecting end surface of the rib 18' arranged in the central region in the direction along with the sliding contact surface and perpendicular to the moving direction of the sheet P, and does not contact the projecting end surfaces of the ribs 18' on the both sides of the central region.

As is clearly shown in FIG. 4, a friction F2 which is generated between the projecting end surfaces of the ribs 18' arranged on the both sides of the central region and the both sides of a central region of the sheet P in its width direction corresponding to the projecting end surfaces of the ribs 18' on the both sides, is quite smaller than a friction F1 which is generated between the projecting end surface of the rib 18' arranged in the central region and the central region of the sheet P in its width direction corresponding to the projecting end surface of the rib 18' arranged in the central region. In this structure, when the sheet P skews, the sheet P can be easily turned to correct the skew of the sheet P while the peak of the bend of the sheet P is pushed only against the projecting end surface of the rib 18' arranged in the central region of the plurality of ribs 18' of the one guide member 16a' of the recording medium transfer guide unit 16' in the direction along the sliding contact surface and perpendicular to the moving direction of the sheet P.

With this manner, the sheet P is supplied by the register unit 14 to the printing unit 12 after the skew of the sheet P has been surely corrected. Therefore, the shift of the image on the sheet P will not occur, the sheet P will not be wrinkled, and clogging of the sheet P in the recording medium moving passage of the recording medium transfer guide unit 16' will not occur.

FIG. 5 is a sectional view showing a main portion of a modification of the recording medium supplying apparatus according to the one embodiment of the present invention, taken along the same line indicated in FIG. 3.

In this modification, the cross section of the portion (the bending portion) of the one guide member 16a' of

the recording medium transfer guide unit 16' is formed as shown in FIG. 5 such that the plurality of ribs 18' arranged on the both sides of the central region in the direction along the sliding contact surface and perpendicular to the moving direction of the sheet P have the same height less than that of the rib 18' in the central region. Also in this structure, the rib 18' arranged in the central region can protrude than the ribs 18' on the both sides of the central region.

Alternately, as long as the rib 18' arranged in the central region projects more than the ribs 18' arranged on both sides of the central region, the ribs 18' may be formed such that the heights of the ribs 18' arranged on the both sides of the central region decrease as the position of the rib 18' is farther away from the central region in unit of two or three ribs 18', and that the ribs 18' arranged on both sides of the central region may have various height different from each other.

The modification structured in this manner can perform the same operation and can attain the same advantage as those of the recording medium supplying apparatus according to the aforementioned one embodiment and described above with reference to FIGS. 1 to 4.

In the one embodiment and the modification, the number of the rib 18' arranged in the central region is determined as one, but it can be increased as long as the turning of the sheet P for correcting the skew can be easily performed.

Claims

1. A recording medium supplying apparatus comprising:

a recording medium sending-out unit (10) for sending out a recording medium (P);

a recording medium transfer guide unit (16') for guiding a movement of the recording medium sent out from the recording medium sending-out unit; and

a register unit (14) against which a leading end of the recording medium discharged from the recording medium transfer guide unit contacts, characterized in that a length of a moving passage of the recording medium (P) from the recording medium sending-out unit (10) to the register unit (14) via the recording medium transfer guide unit (16') is set shorter than a length of the recording medium (P) measured in its moving direction to prevent the recording medium (P) from moving by the register unit (14) and to generate a bend in the recording medium (P), and

a cross section of a portion of the recording medium transfer guide unit (16'), with the portion a peak of the bend generated in the recording medium (P) being in contact, in a direction crossing the moving direction of the recording

medium (P) is so structured that a central region of the recording medium contact portion in the crossing direction protrudes larger than regions arranged on both sides of the central region.

2. A recording medium supplying apparatus according to claim 1, characterized in that the section of the recording medium contact portion of the recording medium transfer guide unit (16') is structured by a plurality of ribs (18') protruding toward the recording medium (P) and extending in the recording medium moving direction at a plurality of positions spaced apart from each other in a direction crossing the moving direction of the recording medium (P).
3. A recording medium supplying apparatus according to claim 2, characterized in that the ribs (18') arranged on each side of the central region of the recording medium contact portion in the crossing direction are so structured that the height of the side arranged ribs decrease as positions of the side arranged ribs (18') are farther away from the central region.
4. A recording medium supplying apparatus according to claim 2, characterized in that the ribs (18') arranged on each side of the central region have the same height less than that in the central region.

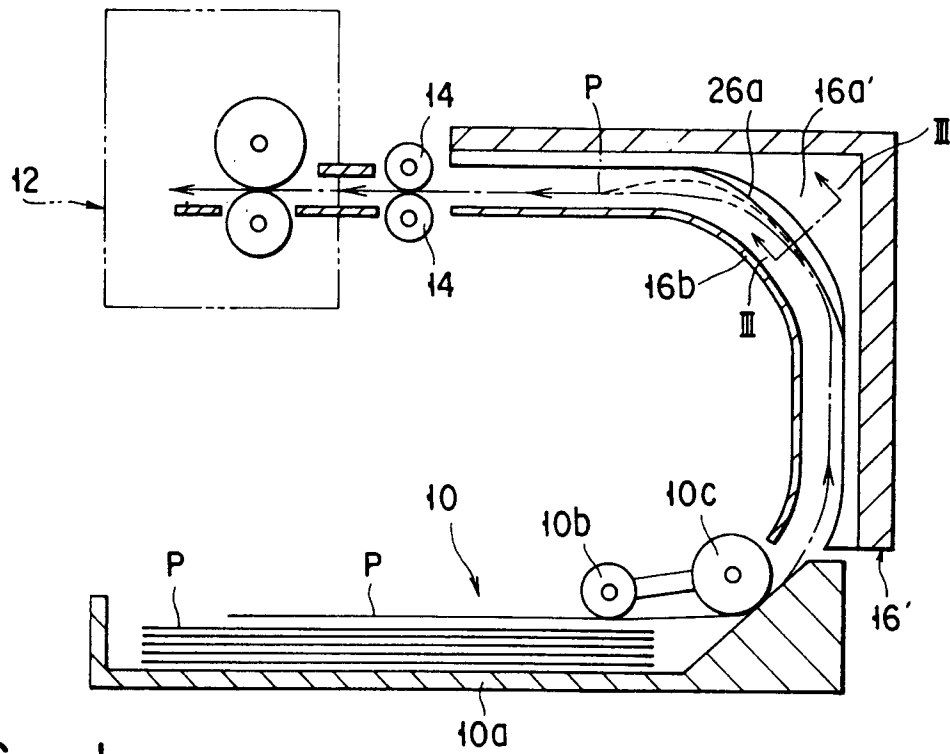


FIG. 1

FIG. 2

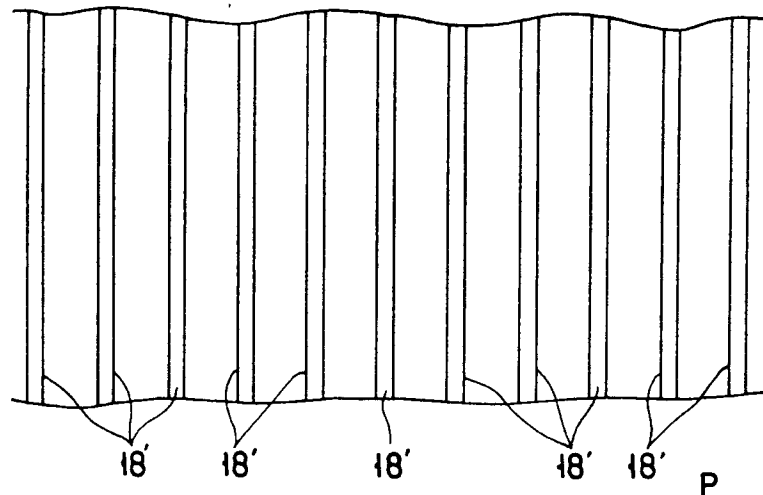
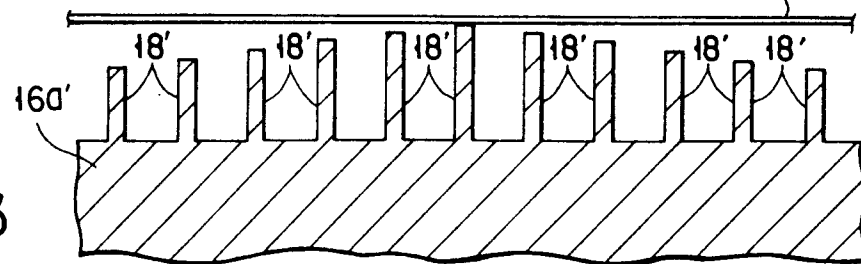


FIG. 3



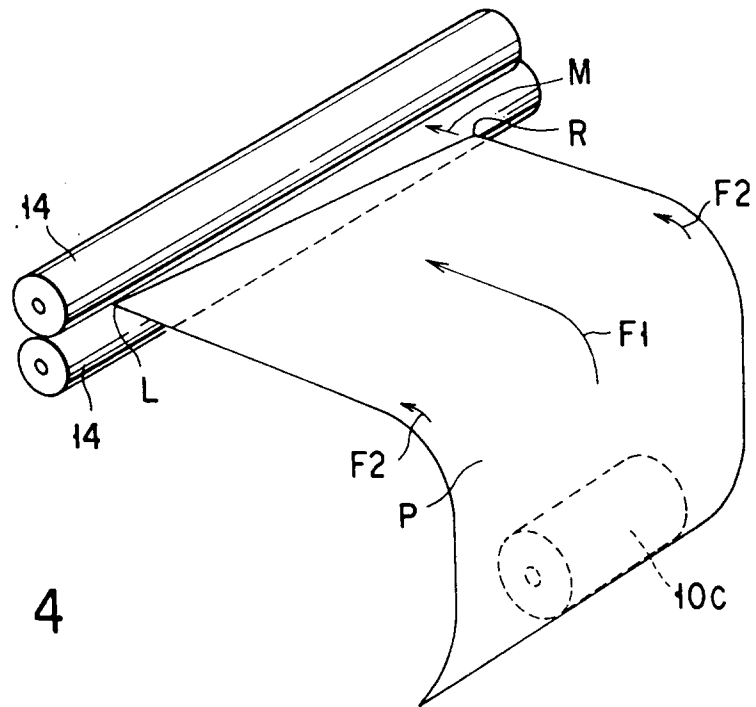


FIG. 4

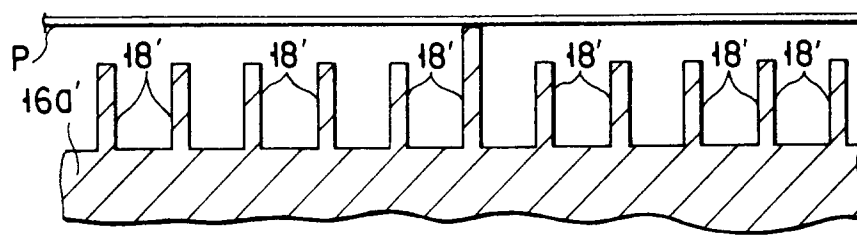


FIG. 5

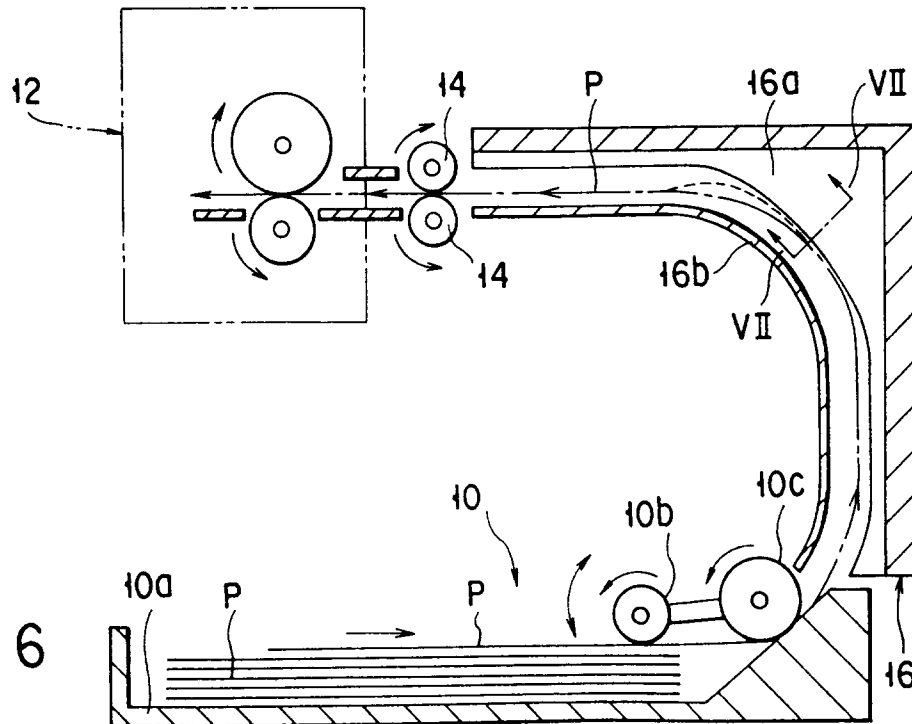


FIG. 6

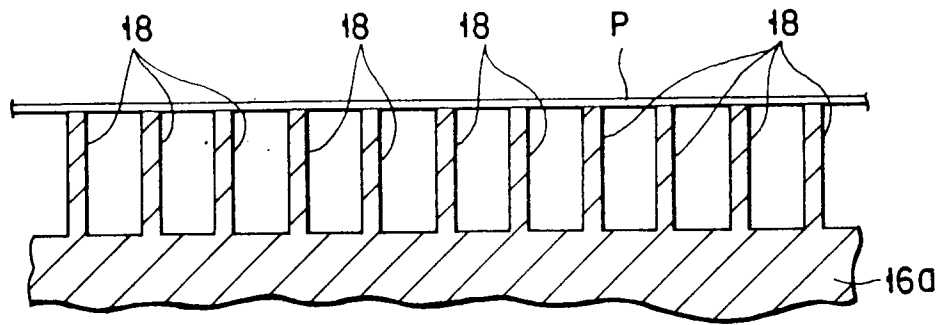


FIG. 7

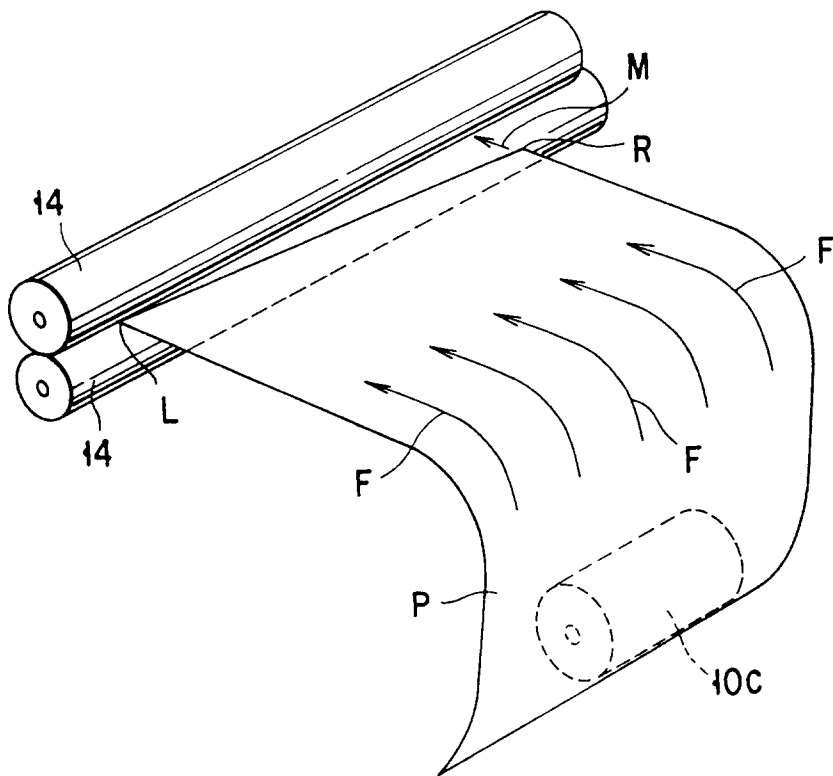


FIG. 8



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EUROPEAN SEARCH REPORT

Application Number
EP 96 10 6679

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.6)
X	EP-A-0 579 168 (MITA INDUSTRIAL CO LTD) 19 January 1994 * column 1, paragraph 1; figures 1,15,20 *	1,2	G03G15/00
A	* column 16, line 22 - column 17, line 32 *	4	
A	* column 19, line 11 - line 58 * ---	1	
A	US-A-4 994 864 (SCHIECK RICHARD A ET AL) 19 February 1991 * column 1, paragraph 1; figures 1,2 * * column 3, line 57 - column 4, line 29 * ---	3,4	
PATENT ABSTRACTS OF JAPAN vol. 018, no. 193 (M-1588), 5 April 1994 & JP-A-06 001514 (CANON INC), 11 January 1994, * abstract *			
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			G03G
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		29 July 1996	Greiser, N
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