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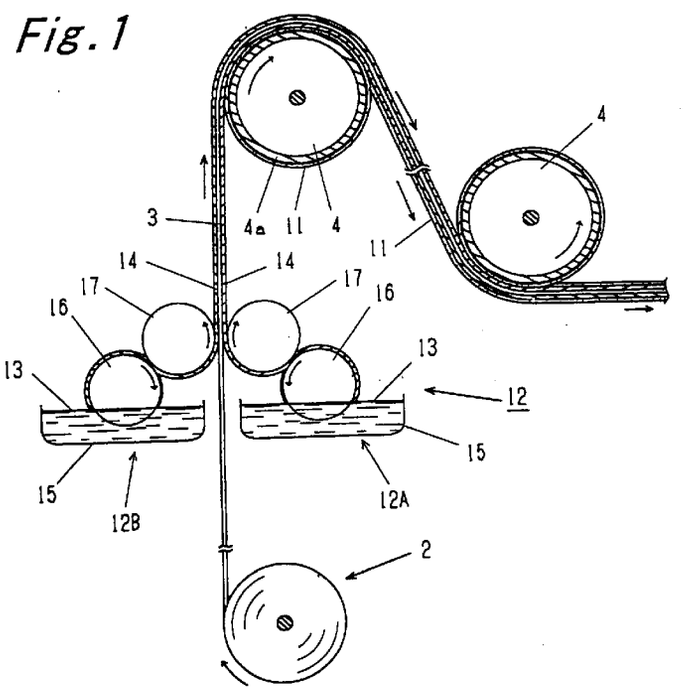
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(54) Web guide roller cleaning method and apparatus

(57) According to web guide roller cleaning method and apparatus, adhesive 13 is coated on the surface of a web 3 to remove ink and other contaminants attached onto the surface of a guide roller 4 for guiding the web 3, and then the adhesive coated surface 14 of the web is brought into contact with the surface of the guide roller to adhesively transfer a ink and other contaminants layer on the guide roller to the adhesive layer of the web, thereby cleaning the surface of the guide roller.

Fig. 1



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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a cleaning system for a web guide roller (hereinafter referred to as "guide roller") which is used for a web fed press, a paper converting machine, a textile printing machine, etc., and particularly to guide roller cleaning method and apparatus which is suitably used to clean stain such as ink and other contaminants which adheres to the surfaces of many guide rollers.

2. Description of the Related Art

Many guide rollers in a predetermined direction are installed in an apparatus which is used in a technical field such as a web fed press technique, a paper converting technique or the like. These guide rollers will be described by using the case of a web fed press for newspaper as shown in Fig. 4.

In a normal print operation, a paper web 3 which is fed from a web roll 2 of a sheet supply stand 1 is guided through many guide rollers 4 to a impression cylinder 6 of a print portion 5. Printing ink which is fed from a plate cylinder 8 to a blanket cylinder 7 while pressed against the impression cylinder 6 by the blanket cylinder 7 is transferred onto the web 3. The printed web is guided to the many guide rollers, and pulled by a drag roller 9 and folded by a folding machine 10. Thereafter, the web is fed to the other processes by a delivery conveyor (not shown).

The guide rollers are more and more stained with printing ink and dust as the printing operation progresses. When the print is carried out in this state, the stain on the guide rollers are transferred onto the surface of a print sheet, and thus the quality of products is reduced. Therefore, in the case of the web fed press for newspaper, the printing work must be interrupted to clean the stain of the guide rollers. In the cleaning work, each guide roller is manually cleaned with waste absorbed with cleaning oil or the like.

On the other hand, an automatic cleaning apparatus for guide rollers has been proposed. For example, according to a guide roller automatically cleaning apparatus disclosed in Japanese Patent Laid-open No. Sho 62-149449, the rotation of a guide roller is controlled by a rotational speed control device to make a difference between the rotational circumferential speed of the guide roller and the travel speed of the web, and the slip between the web and the guide roller due to the difference in speed enables the surface of the guide roller to be cleaned by the web.

Besides, according to another guide roller automatically cleaning apparatus disclosed in Japanese Patent Laid-open No. Hei 4-21445, first liquid is coated on a part of the surface of a web to solve and/or soften an stain layer adhering onto the surface of a guide roller, and then second liquid having an adsorption transition property to the stain layer solved and/or softened by the first liquid is coated on the residual surface of the web (excluding the first-liquid coated surface). Thereafter, the first liquid coated surface is brought into contact with the surface of the guide roller to solve and/or soften the stain layer on the guide roller, and then the solved and/or softened stain layer is reacted with the second liquid on the second liquid coated surface to absorb and transit the stain layer to the web, thereby cleaning the guide roller.

It is an extremely large labor to clean each guide roller by hand work in a machine such as a newspaper web fed press having guide rollers whose number exceeds one hundred in a sequence, and a cleaning work for guide rollers at high places involves a risk. Further, guide rollers may be disposed at such a place that an operator cannot reach the guide rollers or at a place which is too narrow to perform the cleaning work, so that there are problems in operability and safety.

Furthermore, the conventional guide roller automatically cleaning apparatus needs a roller driving mechanism and a brake mechanism to make a difference in speed between the paper and the guide rollers, and also it is necessary to correct variation of the tension of the paper because paper cutting is liable to occur due to unbalance of the tension of the paper, so that the construction and the operability of the apparatus become complicated. In addition, the supply operation of solvent must be controlled in accordance with the variation of the rotational speed of the guide rollers to the motion of the web, and thus a control device containing a control program for the solvent supply operation is needed.

Further, in the method using the two kinds of cleaning liquid, plural cleaning liquid supply devices are required, and the operation timing between the respective cleaning liquid supply devices, that is, the supply conditions of the two kinds of cleaning livid to the web must be controlled in accordance with the driving conditions and the stain conditions of the machines. Therefore, the control device is complicated and high in price.

SUMMARY OF THE INVENTION

An object of the present invention is to provide guide roller cleaning method and apparatus which can automatically clean guide rollers with high operability and at low cost while making a relative speed difference between a web and the guide rollers.

In order to attain the above object, a web guide roller cleaning method according to the present invention is characterized by comprising the steps of coating the surface of a web with adhesive for removing a layer of ink and other contaminants from the surface of the guide rollers, and bringing the adhesive-coated web into contact with the surface of the guide rollers to adhe-

sively transfer the ink and other contaminants onto the adhesive-coated web, thereby cleaning the surfaces of the guide rollers.

Further, A web guide roller cleaning apparatus for cleaning a group of guide rollers disposed in a web path, comprising; an adhesive coating apparatus for coating the surface of a web with adhesive coating apparatus for coating the surface of a web with adhesive for removing a layer of ink and other contaminants which contaminates the surface of guide rollers; wherein the adhesive coating apparatus is disposed at the upstream side to the guide rollers to be cleaned.

Preferably, the surfaces of the guide rollers are treated with a material having low surface energy, or subjected to having finely uneven face. As the adhesive is used a material having adhesiveness to oily substance. Further, after the web passes over the last roller of the guide roller group to be cleaned, the adhesive of the web is subjected to such a treatment as to prevent the stain adhesively-transferred to the adhesive of the web from being re-transferred to a member which is located at the downstream side of the last roller of the guide roller group and is brought into contact with the adhesive of the web.

Such a re-transfer preventing treatment can be performed by providing a non-adhesive property to the adhesive-coated surface of the web or covering the adhesive-coated surface of the web with a non-adhesive material.

According to the present invention, the adhesive coating apparatus is actuated to coat a predetermined length of adhesive on the web surface which will be brought into contact with the guide rollers while the web is slowly traveled by a slow-operation of the machine. When the adhesive-coated surface of the web reaches a guide roller, the ink layer on the guide roller is adhesively attached to the adhesive-coated surface of the web during the running of the web along the surface of the guide roller while the stain layer on the guide roller is brought into contact with the adhesive on the web, and the stain layer is transferred onto the web when the web is separated from the guide roller, thereby cleaning the guide roller.

According to the present invention, only one adhesive coating apparatus is provided, and thus the construction of the apparatus is simple. In addition, the control program for coating the adhesive can be simplified. Therefore, a cost of manufacturing and maintenance can be cut down, and the maintenance of the apparatus is easily performed because the apparatus itself is simple. Particularly, by forming the surface of the guide roller of a material having low surface energy or subjecting the surface of the guide roller having finely uneven face, the adhesive force of the stain layer to the surface of the guide roller can be extremely weakened, and thus the stain layer can be easily adhesively transferred to the adhesive layer of the web. Therefore, the amount (length) of the web to be used for the cleaning work can be reduced, and the cleaning time can be shortened.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a diagram showing web guide roller cleaning method and apparatus according to the present invention;

Fig. 2 is a diagram showing a treatment for a web to which stain is adhesively transferred;

Fig. 3 is a diagram showing an embodiment of an adhesive layer treatment apparatus; and

Fig. 4 is a diagram showing a newspaper web fed press.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A preferred embodiment according to the present invention will be described hereunder with reference to the accompanying drawings.

In order to make the understanding of the present invention clear, a cleaning work for one guide roller will be described with reference to Fig. 1.

By adhesive coating apparatuses 12 of this embodiment, adhesive 13 is coated on the surface of a web 3 to remove a stain layer 11 which is attached to the surface of guide roller 4 in the progress of the operation of the machine. The adhesive coating apparatuses 12 (12A, 12B) are disposed at the upstream side of the web feeding path of the web 3 passing over guide roller to be cleaned so that the adhesive is coated on both sides of the web 3. The adhesive coating apparatus 12 starts to operate at the cleaning operation start time, and coats the adhesive 13 on the surface of the web 3 which is fed from a web roll 2, thereby forming an adhesive layer 14.

The adhesive coating apparatus 12 comprises a liquid tank 15 for stocking adhesive 13, an initial roller 16 which is partially immersed in the liquid tank 15, and a coating roller 17 for receiving the adhesive 13 from the initial roller 16 and coating the adhesive on the surface of the web 3. The coating rollers 17 of the adhesive coating apparatuses 12 are disposed to confront each other. The adhesive coating apparatus 12 of this embodiment uses a roll coater type coating system to coat the adhesive, however, it may use another type coating system using a knife coater, a bar coater or the like.

Acrylic adhesive is used as the adhesive. The acrylic adhesive is subjected to the same treatment as adhesive tape for packaging, or subjected to the treatment and further added with oil absorbent polymer.

With the above construction, the stain layer 11 on the guide roller 4 adheres to the surface of the adhesive layer of the web 3 during the running of the web 3 along the surface of the roller while the stain layer 11 is brought into contact with the adhesive layer 14, and the

stain layer 11 is transferred to the web 3 when the web 3 is separated from the guide roller 4, thereby cleaning the guide roller 4.

Next, the construction of the guide roller to facilitate the transfer of the stain attached to the guide roller 4 to the adhesive layer surface of the web to thereby efficiently clean the guide roller will be described.

The whole surface of the guide roller 4 is treated with a material having low surface energy or subjected to having finely uneven face by treatment to have a surface layer 4a to which foreign matters such as stain are hardly attached. Here, the low surface energy material is defined as the material which has an extremely weak adhesive force to the stain layer. That is, the provision of the low surface energy material reduces the adhesive force between the surface of the guide roller and the stain layer. The low surface energy property as described above may be inherent to the material constituting the guide roller, or may be provided by the surface shape of the guide roller. For example, low surface energy resin such as fluorocarbon resin or the like may be coated on the surface of the guide roller.

For example, fluorocarbon resin, silicon resin, steel (chrome) or the like may be used as the low surface energy material constituting the surface of the guide roller, and the surface of the guide roller is coated with the above material. Particularly, in the case of steel, the surface of the guide roller is subjected to chrome plating. Further, in order to design the shape of the surface of the guide roller to which foreign matters such as stain are hardly attached, satin-finish chrome plating or ceramics having finely uneven surface is used.

The length of the adhesive coated surface of the web in the web travel direction is determined by the number of rollers to be cleaned, the properties of the surfaces of the guide rollers, the level of the stain. In some instances, the thickness of the adhesive coating layer is controlled to form the adhesive coating layer which is optimum to the above situation. Further, there is provided a control system for selecting one of cleaning programs in accordance with such a situation that the guide roller can be perfectly cleaned in one-web-pass operation, that is, the operation in which the outer peripheral surface of the guide roller only once comes into contact with the adhesive layer surface of the web, or by using plural-web-pass operation, that is, the operation in which the outer peripheral surface of the guide roller must come into contact with the adhesive layer surface of the web at plural times.

Next, the cleaning method will be described.

The adhesive coating apparatus is actuated to coat a predetermined length of adhesive on the web surface coming into contact with the guide roller while the web is slowly traveled by the slow-operation of the machine. The web 3 continues to travel and the adhesive coating surface of the web reaches each guide roller. At this time, the web 3 runs along the surface of the guide roller while the stain layer on the guide roller comes into contact with the adhesive layer surface of the web. During the travel of the web 3, the stain on the guide rollers is successively transferred to the adhesive layer 14 of the web 3, and it is carried to the end portion of the machine while the web 3 runs, thereby completing the cleaning work of the surfaces of all the guide rollers.

The cleaning method of this embodiment was tested under the following conditions.

Ink composition (%) : pigment 25, resin 25, dry oil 10, solvent of high boiling point36, and others 4
The surface of the guide roller: coating of fluorocarbon resin (Trade Name: Dupon TFP)
Adhesive : acrylic adhesive which is subjected to the same treatment as adhesive tape for packaging

Through the above test, it has been proved that the stain layer attached to the guide roller is perfectly transferred to the adhesive layer side of the web.

Next, the treatment of the web after the stain is transferred will be described.

In the web fed press, the web which is subjected to a printing operation in a print portion is guided to a folding machine disposed at the rearmost stage of the web fed press to be folded in a predetermined fold style, and then discharged to the outside of the web fed press. In place of the folding machine, a sheeter maybe used to discharge the web as cut sheets. In any case, the printed surface of the web is rubbed by a fixed web guide member or the like. However, it is general that the print ink on the web is dried by a drying device or the like which is disposed in front of the folding machine, and fixed onto the web, so that the print image on the web is little damaged and the guide member is hardly stained with ink.

According to the present invention, the web to which the stain of the guide roller is adhesively transferred is discharged through the folding machine, the sheeter or the like to the outside. In this case, the adhesive layer comes into contact with the fixed guide or the rollers 20 of the folding machine 10 as shown in Fig. 2, and thus the stain as well as the adhesive layer of the web to which the stain is attached may be re-transferred to the folding machine when the adhesive layer of the web passes through the folding machine. Reference numeral 21 represents a folding cylinder, and reference numeral 22 represents a delivery.

Means of preventing the re-transfer of the stain from the web to the folding machine will be described.

Fig. 2 shows the process of the treatment for the web to which the stain is adhesively transferred. Here, the last guide roller 4A to be cleaned is the guide roller which is located at the most downstream side in the guide rollers which come into contact with the adhesive layer of the web. For the guide roller that is mounted in the machine as corresponding to a product all or a portion is used. Therefore, the last portion (guide roller) of the guide roller group to be cleaned is not necessarily

limited to the last guide roller located at the most downstream side of the guide roller group. At an aforementioned product, the inside roller of useful guide rollers, guide roller to have the most downstream been located in gets last portion.

According to a first embodiment, the surface of a member, for example, a guide member or a roller which comes into contact with the adhesive layer of the web after passing through the last guide roller 4A to be cleaned is formed of a low surface energy material like the guide rollers of the machine, or subjected to having finely uneven face, thereby designing the surface of the member so that stain are hardly attached to the guide member.

According to a second embodiment, the web after passing through the last guide roller to be cleaned is not directed to an normal sheet pass such as the folding machine or the like, but is guided to a bypass 60, and then wound by a specially-installed rewinder 61 to be treated.

According to a third embodiment, adhesive layer treating means 50 for treating the adhesive of the web so that the adhesively-transferred stain, .. are prevented from re-transferred is provided between the last guide roller of the machine and the folding machine. The adhesiveness of the adhesive layer is nullified by the adhesive layer treating means 50, and the web is normally discharged through the folding machine, the sheeter or the like.

Fig. 3 shows an example of the adhesive layer treating means. The adhesive layer treating means 50 is disposed between the last guide roller 4A of the guide roller group and a member 70 which is brought into contact with the adhesive layer surface of the web 3 after passing through the last guide roller 4A, and it comprises an adhesive layer treating device 51 and a drying device 56. In this embodiment, the adhesive layer treating means is adapted to make the adhesive layer surface of the web non-adhesive, and it coats the adhesive layer surface of the web with varnish and then subjected to a dry treatment.

The adhesive layer treating device 51 comprises a varnish coater for coating varnish on the adhesive layer surface of the web. The varnish coater comprises a varnish tank 52 for stocking varnish 53, an initial roller 54 which is partially immersed in the varnish tank 52, and a coating roller 55 for receiving the varnish 53 from the initial roller 54 through an intermediate roller 54a to coat the adhesive layer surface of the web 3 with the vanish. The same kinds of varnish as used for the overcoat on the print surface is used as the varnish 53.

The drying device 56 comprises a far infrared radiation device for irradiating far infrared radiation to the varnish coated on the adhesive layer surface of the web to dry (harden) the varnish. The varnish coated on the adhesive layer surface of the web is exposed to far infrared radiation to be dried, whereby a non-adhesive and extremely thin varnish dried coating is formed on the adhesive layer of the web.

As another embodiment of the adhesive treating means, the adhesive is added with an additive for promoting the hardening of the adhesive, and then ultraviolet rays, electromagnetic wave or radio frequency wave is irradiated to adhesive.

According to the present invention, it is unnecessary to make a speed difference between the web and the guide roller, so that the construction of the apparatus can be simplified. Further, it is sufficient to coat the adhesive on the surface of the web by a predetermined length, so that no complicated control program is required unlike the method for coating the first liquid and the second liquid. Therefore, the control device can be simplified. Further, the amount of web which is required to remove the stain layer from the surface of the guide roller is reduced, so that the running length of the web is shortened and thus the cleaning time can be also reduced.

Claims

1. A web guide roller cleaning method comprising the steps of:

   coating the surface of a web with adhesive for removing a layer of ink and other contaminants from the surface of the guide rollers, and
   bringing said adhesive-coated web into contact with the surface of the guide rollers to adhesively transfer the ink and other contaminants onto said adhesive-coated web, thereby cleaning the surfaces of the guide rollers.

2. The web guide roller cleaning method as claimed in claim 1, wherein the surface of the guide roller is treated with a low surface energy material.

3. The web guide roller cleaning method as claimed in claim 1, wherein the surface of the guide roller has finely uneven face.

4. The web guide roller cleaning method as claimed in claim 1, wherein the adhesive has adhesiveness to oily substance.

5. The web guide roller cleaning method as claimed in claim 1, wherein a treatment for preventing said adhesively-transferred ink and other contaminants of the web from contaminating parts of a machine other than guide rollers is applied on the web after it has passed the last guide roller in the web path.

6. A web guide roller cleaning apparatus for cleaning a group of guide rollers disposed in a web path, comprising;

   an adhesive coating apparatus for coating the

surface of a web with adhesive coating apparatus for coating the surface of a web with adhesive for removing a layer of ink and other contaminants which contaminates the surface of guide rollers;

wherein said adhesive coating apparatus is disposed at the upstream side to the guide rollers to be cleaned.

7. The web guide roller cleaning apparatus as claimed in claim 6, wherein the surface of said guide roller treated with a low surface energy material.

8. The web guide roller cleaning apparatus as claimed in claim 6, wherein the surface of said guide roller has finely uneven face.

9. The web guide roller cleaning apparatus as claimed in claim 6, further including adhesive layer treating means for preventing said adhesively-transferred ink and other contaminants of the web from contaminating parts of a machine other than guide rollers is disposed after it has passed the last guide roller in the web path.

10. The web guide roller cleaning apparatus as claimed in claim 9, wherein said adhesive layer treating means performs a treatment of providing the adhesive layer surface of the web with a non-adhesive property.

11. The web guide roller cleaning apparatus as claimed in claim 9, wherein said adhesive layer treating means performs a treatment of covering the adhesive layer surface of the web with a non-adhesive material.

Fig. 1

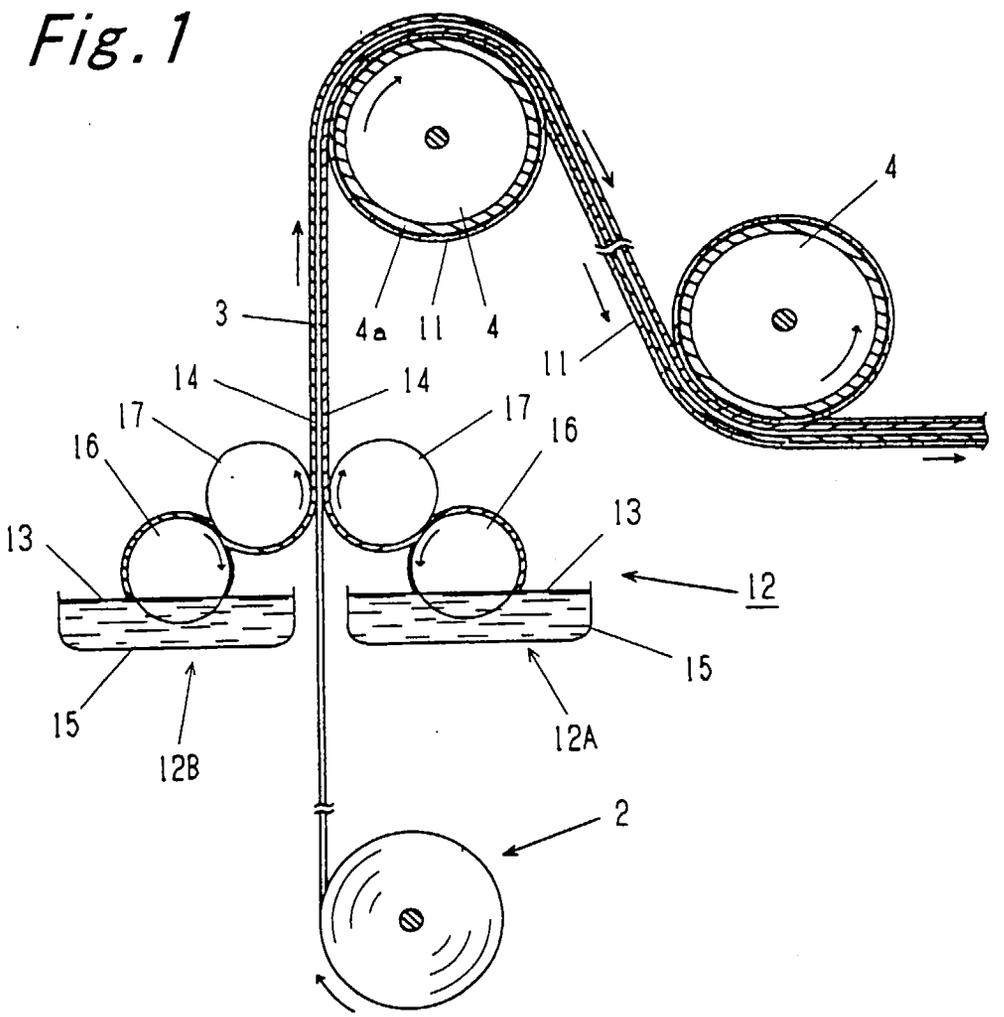


Fig. 2

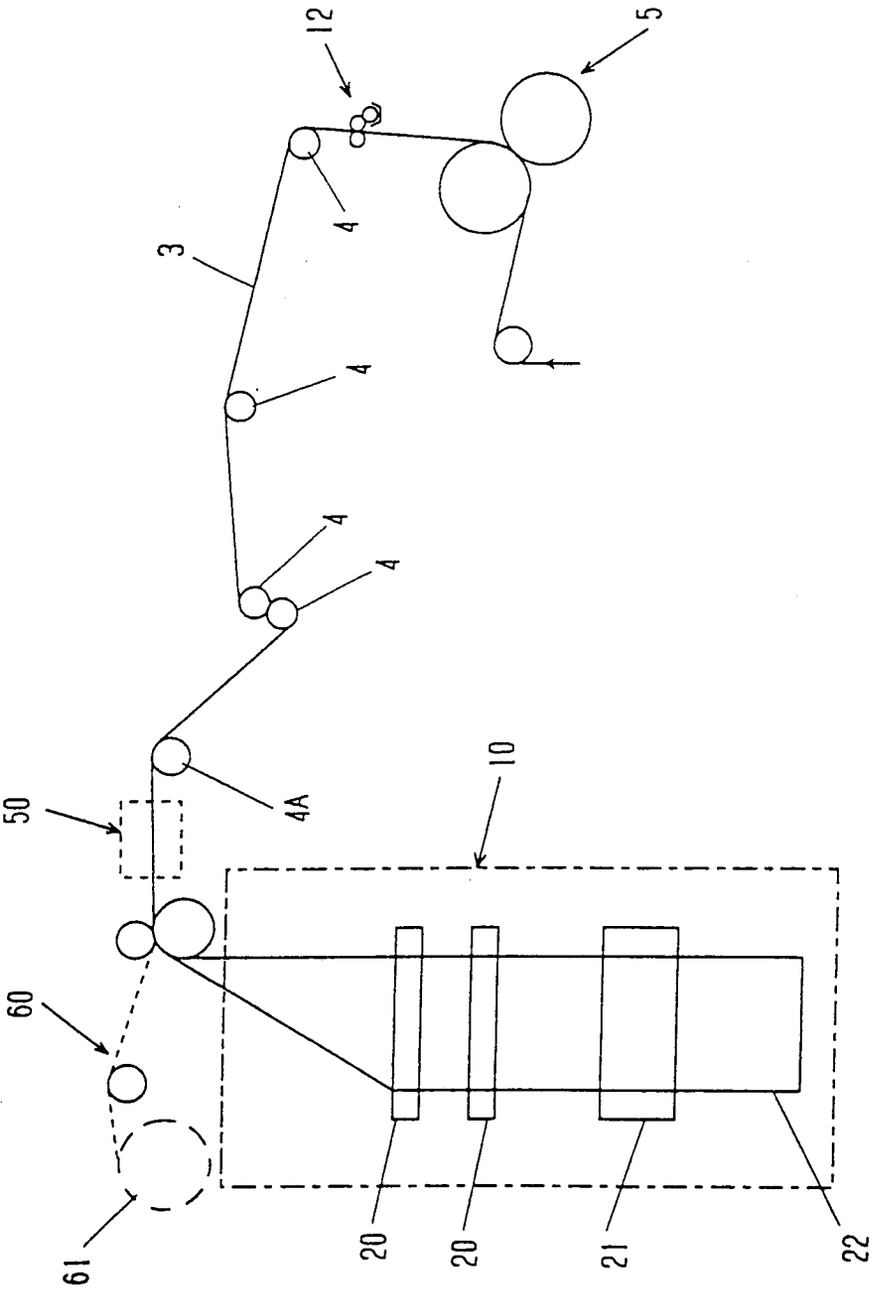


Fig. 3

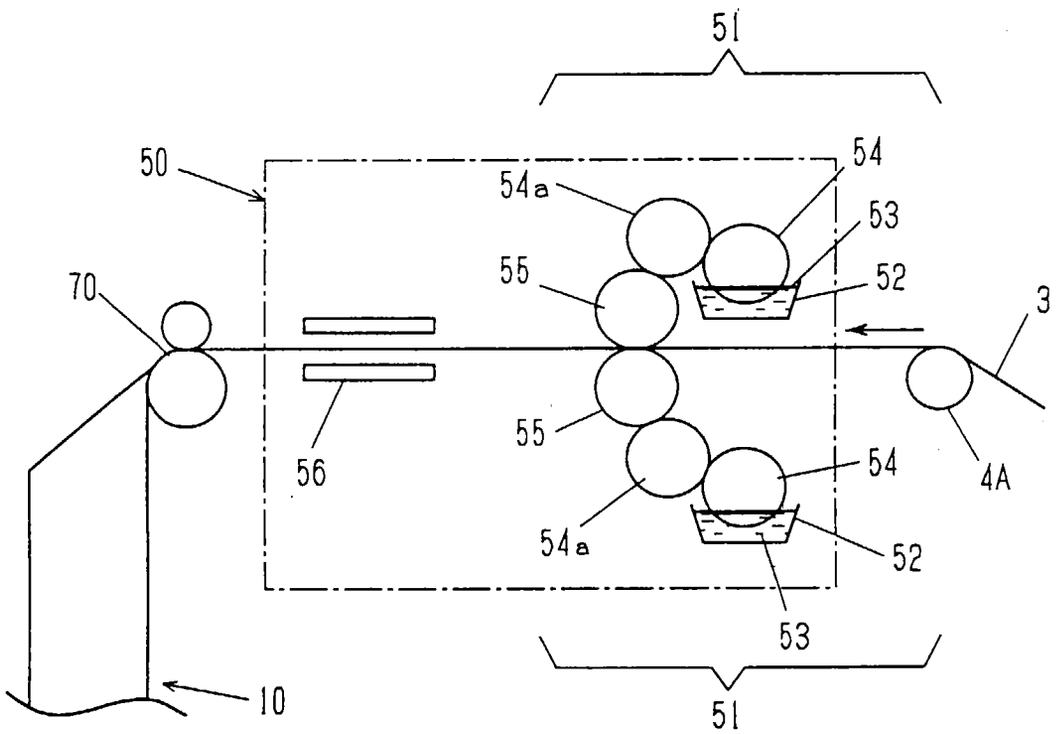
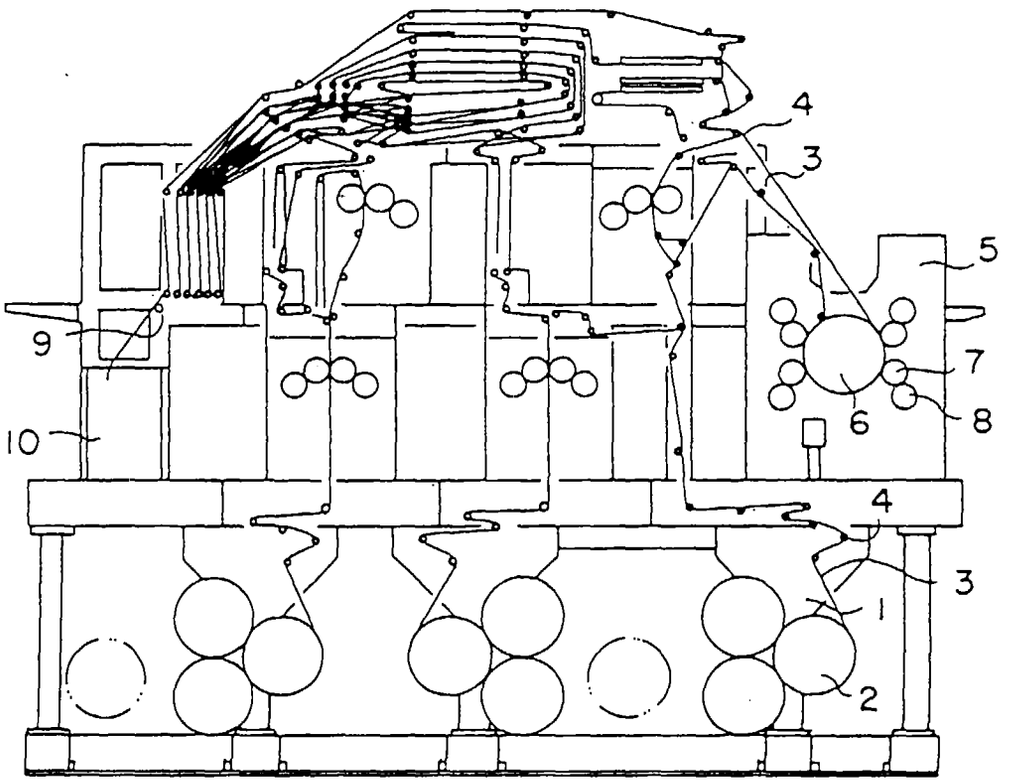


Fig. 4



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EUROPEAN SEARCH REPORT

Application Number
EP 97 11 0918

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	GB 2 081 181 A (UNILEVER PLC) * the whole document *	1,4,6	B41F35/00
X	PATENT ABSTRACTS OF JAPAN vol. 14, no. 251 (M-0979), 29 May 1990 & JP 02 070440 A (TAIHO IND CO LTD), 9 March 1990, * abstract *	1,4,6	
A	US 5 080 015 A (HANSSON ET AL.)		
A	DE 39 00 660 A (GEORG)		
A	US 4 774 886 A (KERTZMAN)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B41F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	7 October 1997	DIAZ-MAROTO, V

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