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(54) **METHOD FOR FABRICATING CLEANING CLOTHS FOR PRINTING CYLINDERS**

VERFAHREN ZUR HERSTELLUNG VON REINIGUNGSTÜCHERN FÜR DRUCKZYLINDER

PROCÉDÉ DE FABRICATION DE TISSUS DE NETTOYAGE POUR CYLINDRES D'IMPRESSION

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Description**TECHNICAL FIELD**

[0001] The present invention relates to cleaning of printing cylinders and more specifically to a method for fabricating a nonwoven cleaning cloth for printing cylinders.

BACKGROUND

[0002] In the art of large scale printing, such as e.g. offset printing, the material that is to be printed is often fed through a system of rollers and cylinders at high speed. The material can be both sheet-fed and web-fed. The ink that is to be printed onto the material is generally applied to the material through contact between a number of ink rollers and contact between a printing cylinder, a blanket cylinder and finally the material that is to be printed. For the quality of the printing, the rollers of the system should be kept clean and ink residues should be avoided. Any other paper residues (e.g. paper lint) also need to be removed during the cleaning. Oftentimes cleaning is performed at regular intervals and especially when a printing series is changed.

[0003] For cost efficiency, it is preferred to use automatic cleaning systems which are able to clean the cylinders or rolls that need cleaning while reducing down time in the printing system. Generally, this means applying a cloth that is soaked in a solvent to a rotating cylinder, such that ink and paper residues are removed. It is known in the art of cleaning printer cylinders that the cloth can be applied by a cleaning system that rolls or transfers the cloth as the portion contacting the cylinder is saturated with ink and/or paper, thereby ensuring continued performance of the cloth.

[0004] As the nature of usage of cloths for cleaning printer cylinders is very demanding, purpose engineered nonwoven textiles are often used due to their high strength and suiting properties. The cloths may be provided with characteristics for increasing abrasion and/or be soaked in solvents that contribute to the removal of ink residues. Market demands are developing towards further enhanced cleaning systems, which means that there is room for improvements.

[0005] As to background art, WO2008045340A1 and WO2006089179A1 could be mentioned as examples. Furthermore, applicant's recent WO2015067392A1 should be mentioned as well.

SUMMARY

[0006] It is an object of the present invention to provide a new type of cloth intended for use in cleaning of printer cylinders and hence a method for fabricating a nonwoven cleaning cloth for printing cylinders that is improved over prior art. This object is achieved by a concept having the features set forth in the appended independent claim;

preferred embodiments thereof being defined in the related dependent claims.

[0007] The present invention provides a method for fabricating a nonwoven cleaning cloth for printing cylinders according to claim 1.

[0008] A cloth produced according to the first aspect is thus hydroentangled, apertured and calendered in the specified order which gives the cloth improved characteristics over prior art. The apertures increase the abrasive properties of the cloth and allow fluid to easier flow through the cloth during cleaning. Furthermore, the apertures also increase the ability of the web to remove paper residues such as lint from a roller.

[0009] The calendering can have the effect of smoothing the surface of the cloth, reducing the thickness and reducing the air content, and in combination with the apertures previously formed it is still possible to achieve an abrasive cloth. Furthermore, by varying the shape and quantity of apertures it is possible to control the abrasive properties of the cloth. In addition, the calendering may also provide the advantage of improving bonding of the fibers of the web together thus providing the advantage of reducing the risk of linting, i.e. that fibers are released during cleaning. The calendering also provides compression and extension of the web while reducing air content.

[0010] According to one embodiment of the first aspect, the web is embossed after calendering by embossing rollers at least one of which has an impression pattern. The resulting nonwoven, apertured, calendered and embossed cloth is an improved product in relation to prior art. The apertures provide improved abrasive properties while they also let water flow or seep through the cloth during cleaning. Furthermore, the apertures also provide increased ability to remove paper residues (such as lint) from a roller. The calendering results in a compressed cloth and may efficiently bond the fibers of the web together. The durability and high quality of the embossing can also be ensured since the embossing is the last step after calendering when preparing the cloth before impregnation with a cleaning agent and packaging.

[0011] In another embodiment of the first aspect, the thickness of the web after hydroentangling and aperturing is in the range of 0,4-1,0 mm and the thickness after calendering the web is preferably in the range of 0,2-0,5 mm. It is advantageous that the finished cloth is neither too dense nor too soft and that the finished cloth thickness of the cloth is kept low without risking breakage or loss of function. As the web is fed through the steps in the process, its thickness will decrease and the defined thickness ranges are favorable in regards to achieving an end result which is highly suited for the application at hand.

[0012] In a second aspect, which is not part of the present invention, there is provided a method for fabricating a nonwoven printer cylinder cleaning cloth from a web comprising synthetic fibers evenly distributed in the web. The method comprises the steps of (i) hydroentangling and aperturing of the web and (ii) embossing of the

web by embossing rollers at least one of which has an impression pattern. An advantage of this apertured and embossed cloth is that both characteristics increase the cleaning properties of the cloth, and the embossing particularly reduces the risk of stripes formed due to possible defects in the cloth or because of the apertures. The embossing may also provide bonding of the fibers of the web together such that no fibers are released while cleaning.

[0013] According to one embodiment, the synthetic fibers in the web are polyester and/or copolyester and/or olefin fibers. By providing a web comprising one or more of the synthetic fiber materials above, the properties of the web may be controlled. The olefin and copolyester fibers may have a lower melting temperature than polyester fibers.

[0014] According to the invention, the web comprises two components, the first being synthetic fibers and the second component being an absorbing material such as wood pulp or viscose. The absorbing material increases the ability for the finished cloth to absorb cleaning agent and/or ink residues. By controlling the relation between the amount of synthetic fibers and the absorbing fibers, the finished cloth may be adapted for advantageous cleaning properties in various printing applications.

[0015] In one embodiment, the synthetic fibers has a lower melting temperature than the absorbing material which means that the temperature of the embossing can be controlled to only melt and/or deform synthetic fibers.

[0016] According to the invention, the web comprises between 30% to 70% synthetic fibers, preferably about 50% synthetic fibers. By varying the proportions of synthetic fibers and absorbing fibers, the cloth can be adapted to fit various applications. The synthetic fibers will partly melt during the bonding steps in the process, thereby adhering to the absorbing fibers. The above mixture has proven advantageous in absorption of ink and paper residues and release of cleaning agent and in that the finished cloth will not release any fibers onto the roller or cylinder that it is cleaning.

[0017] In yet another embodiment, the embossing is performed by impression rollers having a temperature in the range of 150 - 190°C, preferably 160 - 180°C and most preferred about 170°C. Embossing in the specified temperature intervals results in a beneficial combination of high bonding of the fibers in the web and high speed of the embossing.

[0018] According to one embodiment, the calendering is performed by rollers having a temperature in the range of 10°C - 80°C, preferably 20°C - 30°C.

[0019] In one embodiment, the finished cloth has a basis weight in the range of 60g/m² - 120 g/m². A cloth with a basis weight in the mentioned range has beneficial properties, combining high absorption and beneficial thickness with durability and ability to release cleaning agent onto the cylinder/roller that is cleaned.

[0020] In a third aspect, which is not part of the present invention, a printing cylinder cleaning cloth is provided

which is fabricated according to the method of the teachings herein. An advantage with the obtained cloth is superior cleaning properties in comparison with prior art and improved release of cleaning agent and absorption of ink and paper residues. Furthermore, the cloth can be manufactured more rapidly and/or by using less energy.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] Embodiments of the present invention will be described in further detail in the following with reference to the accompanying drawings which illustrate non-limiting examples on how the embodiments can be reduced into practice and in which:

Fig. 1 shows a process line for fabricating a cloth according to a first embodiment of the teachings herein,

Fig. 2 shows a process line for fabricating a cloth according to a second embodiment which is not part of the present invention, and

Fig. 3 shows a process line for fabricating a cloth according to a third embodiment of the teachings herein.

DETAILED DESCRIPTION OF EMBODIMENTS

[0022] With reference to Fig. 1, a process line for manufacturing a nonwoven cleaning cloth 10 for printing cylinders is presented. The web material 1 travels from left to right as seen in Fig. 1 through the steps in the process line as it is being refined into cloth 10 material with properties suited for cleaning of printing cylinders.

[0023] The fibers that will constitute the web 1 are evenly distributed such that the density of the web 1 will not vary to any considerable extent throughout the web. The web 1 comprises as a first component synthetic fibers, such as polyester and/or copolyester and/or olefin fibers. The synthetic fibers are made of low temperature melting polyester and constitute a first component of the web 1. The low melting temperature of olefin fibers may facilitate processing by enabling the temperature of the embossing and the calendering to be reduced.

[0024] The web 1 comprises a second component in the shape of absorbing fibers, such as wood pulp (cellulose) or viscose. Hence, the web 1 comprises one component being synthetic fibers or two or more components where 30% - 70% are synthetic fibers, more preferably about 50% synthetic fibers, and the remainder absorbing fibers, such as wood pulp or viscose. The finished cloth 10 may have a basis weight in the range of 60g/m² - 120 g/m². By varying the basis weight of the cloth 10, it can be adapted to various cleaning applications. The basis weight affects the ability of the cloth 10 to release cleaning agent and to absorb ink and paper residues.

[0025] In the process, the web 1 comprising the fibers

mentioned above is fed into the hydroentangling and aperturing stage where the web 1 is subject to a plurality of high power water jets 2. As shown in Figs 1 to 3, the web 1 is applied to a roller 3 during the hydroentanglement process. However, the roller 3 could equally be a flat conveyor belt (not shown). Water jets 2 intertwine the fibers of the web 1 such that a nonwoven web 1 is formed. Hydroentanglement, or spunlacing as it is also called, is usually performed with the web 1 having an underlying conveying belt (not shown) contributing to the entangling of the web 1. To achieve an apertured cloth, the belt will have to be perforated accordingly. The perforations of the belt will result in that the high pressure water jets 2 can travel straight through the web 1 and continue through the belt as well, leaving small apertures in the web 1 that correspond to the perforations in the belt.

[0026] The apertures in a printing cylinder cleaning cloth 10 provide the advantage of increased abrasiveness of the cloth 10 in comparison with regular cloths, and the perforated belt is known in the art as a mesh, the mesh size defining a number of perforations per surface area unit. The mesh size may be in the range of 10-25, and a preferred mesh size is mesh 13. The thickness of the web 1 is reduced by the hydroentangling stage to a thickness of between 0,4 mm and 1,0 mm.

[0027] After the hydroentangling step, the fibers of the web 1 are entangled but they may not yet be sufficiently bonded together. Since it is beneficial that linting is avoided, i.e. that no fibers are detached from the cloth 10 during cleaning, a step further bonding the fibers of the web securely together may be needed. As can be seen in Fig. 1, this may be performed by calendering rollers 4 forming a nip through which the web 1 is fed. The calendering also provides the advantage of reducing the thickness and air content of the web 1.

[0028] The calendering step may be performed at temperatures in the range of 10°C - 80°C, or more preferably in the range of 20°C - 30°C.

[0029] A benefit of the apertured and calendered web 1 is that it will be compressed such that the thickness is reduced, which reduces the size of the final product when the cloth 10 is rolled onto bobbins for packaging. The thickness after calendering is in the approximate range of 0,2 to 0,5 mm corresponding to the thickness of the final product. As mentioned previously, the air content of the cloth 10 will also be reduced due to the compressing of the web 1.

[0030] Turning to Fig. 2, a variant of the process line is presented. The fibers that will constitute the web 1 are applied evenly distributed onto the conveyor belt (not shown). The web 1 is fed into the hydroentangling step where the web 1 is subjected to a plurality of high power water jets 2.

[0031] The water jets 2 partly intertwine the fibers of the web 1 such that a nonwoven web 1 is formed. The web 1 is apertured during the hydroentangling stage as described in relation to Fig. 1. After hydroentangling, the web 1 is fed to and between a pair of embossing rollers

5 forming a nip through which the web 1 is passed. At least one of the embossing rollers 5 is provided with an impression pattern that is a negative of the pattern that will be embossed onto the web 1. The embossing is performed by heated rollers 5 which melt some of the fibers in the web 1 when the web 1 is put into contact with the impression pattern.

[0032] Preferably, some of the synthetic fibers of the web 1 are melted, thus bonding the fibers of the web together and forming a stable embossing pattern which will increase the abrasive properties of the finished cloth. The temperature at which embossing is performed is preferably in the range of 150-190°C, more preferably in the range of 160°C-180°C and even most preferred approximately 170°C.

[0033] The thickness of web 1 as it is processed decreases from the unprocessed thickness (i.e. before hydroentangling and aperturing), to a hydroentangled thickness of between 0,4 and 1,0 mm. The embossing will not affect the overall thickness of the web 1 more than in areas which come into contact with the impression roller(s).

[0034] Thereby, a cloth 10 is obtained which is both apertured and embossed, combining the advantages from both properties and increasing the ability of the cloth 10 to collect and remove ink and paper residues from a printer cylinder. Generally, the pattern that is applied to the web 1 when embossing extends essentially perpendicular to the lengthwise direction of the cloth. This will ensure that no stripes form on the cylinders during wiping from the apertures or from possible defects in the cloth 10 material.

[0035] In Fig. 3 a third process line is shown, in which the steps of Figs 1 and 2 have been combined to provide a cleaning cloth 10. As fibers of the web 1 are the same as described in Figs 1 and 2, they will not be presented in further detail. Before hydroentangling and aperturing, the fibers of the web 1 are distributed evenly on the conveyor belt/process line. Hydroentangling and aperturing bond the fibers of the web together but for further improved bonding, the web 1 is calendered by calendering rolls 4 after hydroentangling and aperturing. The calendering improves surface smoothness of the web 1 and decreases the thickness by 50-60%, from the hydroentangled thickness of in the range of 0,4-1,0 mm to a thickness in the range of 0,2-0,5 mm after calendering. The air content of the web 1 is also reduced. The decreased thickness results in longer sections of cloth 10 can be rolled onto a bobbin (not shown) without increasing the diameter of the finished roll.

[0036] The third step in the fabrication of the cloth 10 shown in Fig. 3 is the step of embossing the web 1 by the embossing rollers 5. The embossing will not affect the overall thickness of the web 1 since only the portions of the web 1 that come in contact with the protruding impression pattern on the embossing rollers 5 will be compressed.

[0037] The sequence of the steps in the process of Fig.

3 is favorable since calendering before embossing is preferred to ensure that the highest possible definition of the embossed pattern in the web 1 is maintained. The opposite sequence would be possible, given that the process parameters are correctly chosen. It is also possible to combine the steps of calendering and embossing.

[0038] The process in Fig. 3 will thus result in a cloth 10 that is hydroentangled, apertured, calendered and embossed in the specified order giving the cloth 10 superior properties in relation to prior art. Hence, there is provided a method for manufacturing a nonwoven cleaning cloth 10 for printing cylinders from a web 1 comprising synthetic fibers, wherein the web 1 is fed into a process line in which it is hydroentangled and apertured in a first step (roller nip 4) and then calendered in a second step (roller nip 5).

[0039] Generally, following the final step of all processes described in Figs 1 - 3, the web 1 is impregnated with a cleaning agent (e.g. a solvent), rolled onto a bobbin and packed in a sealed package (not shown). The sealed package will ensure that the cloth 10 is less likely to be damaged, that the cleaning agent is contained in the cloth 10 and that transportation of the cloth is facilitated.

[0040] It is not necessary that the process line is continuous. In fact, this is not always the case since storage of the web 1 between the steps in the process is common. For instance, it might be necessary to dry the web 1 after hydroentangling to ensure that no water remains in the web 1 when the calendering or embossing is performed. Therefore, a drying step (not shown) can be added between the hydroentangling and the calendering/embossing. The steps of the process can even be performed at completely separate locations with temporary storage of the web 1 between the steps of the process.

[0041] It should be mentioned that the improved concept is by no means limited to the embodiments described herein, and several modifications are feasible without departing from the scope of the appended claims. For instance, a third or even a fourth component of the web is possible. For instance, such components could be binder fibers, such as olefin fibers, which further increases bonding of the fibers in the web or other fiber materials that increase the abrasive properties of the finished cloth.

Claims

1. A method for fabricating a nonwoven cleaning cloth (10) for printing cylinders from a web (1) comprising synthetic fibers evenly distributed in the web (1), wherein the web (1) comprises two components, the first one being the synthetic fibers and the second one being an absorbing material in the shape of absorbing fibers, such as wood pulp or viscose, and wherein the web (1) comprises between 30% and 70% synthetic fibers, said method comprising the steps of:

- hydroentangling and aperturing of the web (1), and
- calendering of the web (1) by compression between calendering rollers (4) to reduce thickness and air content of the web (1).

2. The method according to claim 1, wherein the thickness of the web (1) after hydroentangling and aperturing is in the range of 0.4 - 1.0 mm.
3. The method according to claim 1, wherein the thickness of the web (1) after hydroentangling and aperturing is in the range of 0.4 - 1.0 mm and the thickness after calendering the web (1) is in the range of 0.2 - 0.5 mm.
4. The method according to any one of the preceding claims, wherein the synthetic fibers are polyester and/or copolyesters and/or olefin fibers.
5. The method according to any one of the preceding claims, wherein the synthetic fibers have a lower melting temperature than the absorbing material.
6. The method according to any one of the preceding claims, wherein the calendering is performed by rollers (4) having a temperature in the range of 10°C - 80°C, preferably 20°C - 30°C.
7. The method according to any one of the preceding claims, wherein the finished cloth (10) has a basis weight in the range of 60g/m² - 120 g/m².
8. The method according to any one of the preceding claims, further comprising a step of further bonding the fibers of the web (1) securely together by calendering rollers (4) forming a nip through which the web (1) is fed.
9. The method according to any one of the preceding claims, wherein the aperturing of the web (1) is performed by a mesh with a mesh size in the range of 10 - 25.

Patentansprüche

1. Verfahren zur Herstellung eines Reinigungsvlies-tuchs (10) für Druckzylinder aus einer Bahn (1) mit synthetischen Fasern, die gleichmäßig in der Bahn (1) verteilt sind, wobei die Bahn (1) zwei Komponenten umfasst, wobei die erste die synthetischen Fasern ist und die zweite ein Absorptionsmaterial in Form von Absorptionsfasern wie z. B. Zellstoff oder Viskose ist, und wobei die Bahn (1) zwischen 30 % und 70 % synthetische Fasern umfasst, wobei das Verfahren die Schritte umfasst:

- Wasserstrahlverfestigen und Perforieren der Bahn (1), und
 - Kalandrieren der Bahn (1) durch Kompression zwischen Kalandrierwalzen (4), um die Dicke und den Luftgehalt der Bahn (1) zu verringern.
2. Verfahren nach Anspruch 1, wobei die Dicke der Bahn (1) nach dem Wasserstrahlverfestigen und Perforieren im Bereich von 0,4 - 1,0 mm liegt.
3. Verfahren nach Anspruch 1, wobei die Dicke der Bahn (1) nach dem Wasserstrahlverfestigen und Perforieren im Bereich von 0,4 - 1,0 mm liegt und die Dicke nach dem Kalandrieren der Bahn (1) im Bereich von 0,2 - 0,5 mm liegt.
4. Verfahren nach einem der vorangehenden Ansprüche, wobei die synthetischen Fasern Polyester- und/oder Copolyester- und/oder Olefinfasern sind.
5. Verfahren nach einem der vorangehenden Ansprüche, wobei die synthetischen Fasern eine niedrigere Schmelztemperatur als das Absorptionsmaterial aufweisen.
6. Verfahren nach einem der vorangehenden Ansprüche, wobei das Kalandrieren durch Walzen (4) mit einer Temperatur im Bereich von 10 °C - 80 °C, vorzugsweise 20 °C - 30 °C, durchgeführt wird.
7. Verfahren nach einem der vorangehenden Ansprüche, wobei das fertige Tuch (10) ein Flächengewicht im Bereich von 60 g/m² - 120 g/m² aufweist.
8. Verfahren nach einem der vorangehenden Ansprüche, das ferner einen Schritt zum weiteren sicheren Zusammenbinden der Fasern der Bahn (1) durch Kalandrierwalzen (4) umfasst, die einen Walzenspalt bilden, durch den die Bahn (1) vorgeschoben wird.
9. Verfahren nach einem der vorangehenden Ansprüche, wobei das Perforieren der Bahn (1) durch ein Netz mit einer Maschenweite im Bereich von 10 - 25 durchgeführt wird.
- Revendications**
1. Procédé de fabrication d'une toile de nettoyage non tissée (10) pour des cylindres d'impression à partir d'une bande (1) comprenant des fibres synthétiques uniformément distribuées dans la bande (1), dans lequel la bande (1) comprend deux composants, le premier étant les fibres synthétiques et le deuxième étant un matériau sous la forme de fibres absorbantes, tel que la pâte de bois ou la viscose, et dans lequel la bande (1) comprend entre 30 % et 70 % de fibres synthétiques, ledit procédé comprenant les
- étapes de :
- hydroenchevêtrement et perforation de la bande (1), et
 - calandrage de la bande (1) par compression entre des rouleaux de calandrage (4) pour réduire l'épaisseur et la teneur en air de la bande (1).
2. Procédé selon la revendication 1, dans lequel l'épaisseur de la bande (1) après hydroenchevêtrement et perforation est dans la plage de 0,4 à 1,0 mm.
3. Procédé selon la revendication 1, dans lequel l'épaisseur de la bande (1) après hydroenchevêtrement et perforation est dans la plage de 0,4 à 1,0 mm et l'épaisseur après calandrage de la bande (1) est dans la plage de 0,2 à 0,5 mm.
4. Procédé selon l'une quelconque des revendications précédentes, dans lequel les fibres synthétiques sont des fibres de polyester et/ou de copolyesters et/ou d'oléfine.
5. Procédé selon l'une quelconque des revendications précédentes, dans lequel les fibres synthétiques ont une température de fusion plus basse que le matériau absorbant.
6. Procédé selon l'une quelconque des revendications précédentes, dans lequel le calandrage est effectué par des rouleaux (4) ayant une température dans la plage de 10 °C à 80 °C, de préférence 20 °C à 30 °C.
7. Procédé selon l'une quelconque des revendications précédentes, dans lequel la toile finale (10) a une masse surfacique dans la plage de 60 g/m² à 120 g/m².
8. Procédé selon l'une quelconque des revendications précédentes, comprenant en outre une étape de liaison supplémentaire des fibres de la bande (1) solidement ensemble par des rouleaux de calandrage (4) formant un pincement à travers lequel la bande (1) est alimentée.
9. Procédé selon l'une quelconque des revendications précédentes, dans lequel la perforation de la bande (1) est effectuée par une maille avec une taille de maille dans la plage de 10 à 25.

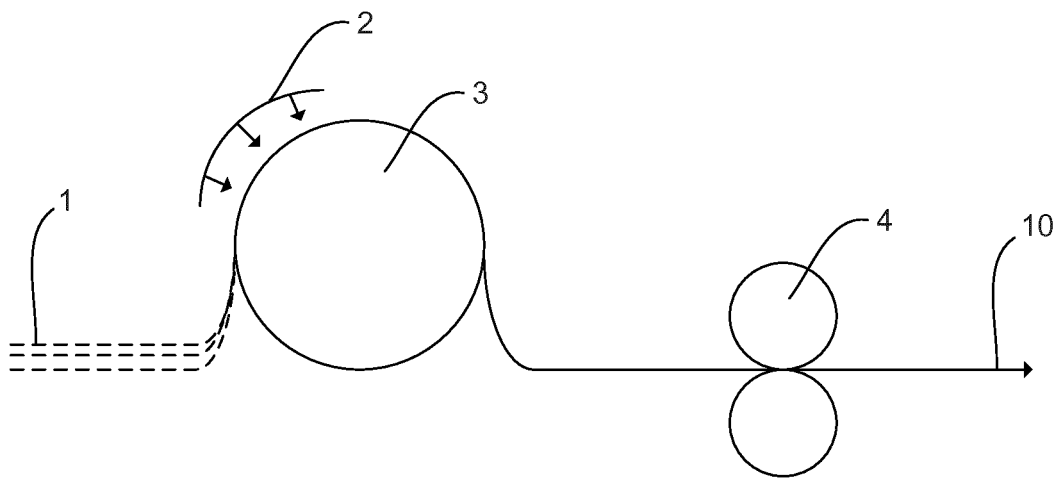


Fig. 1

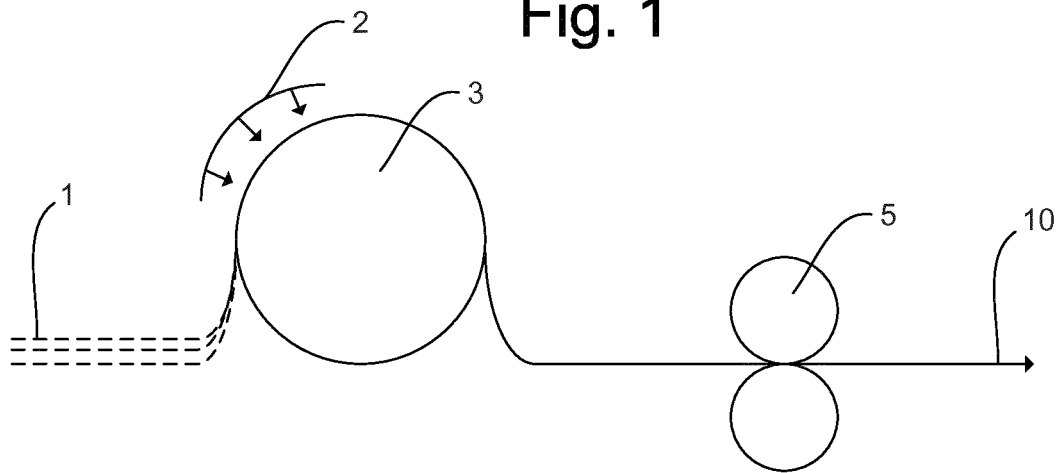


Fig. 2

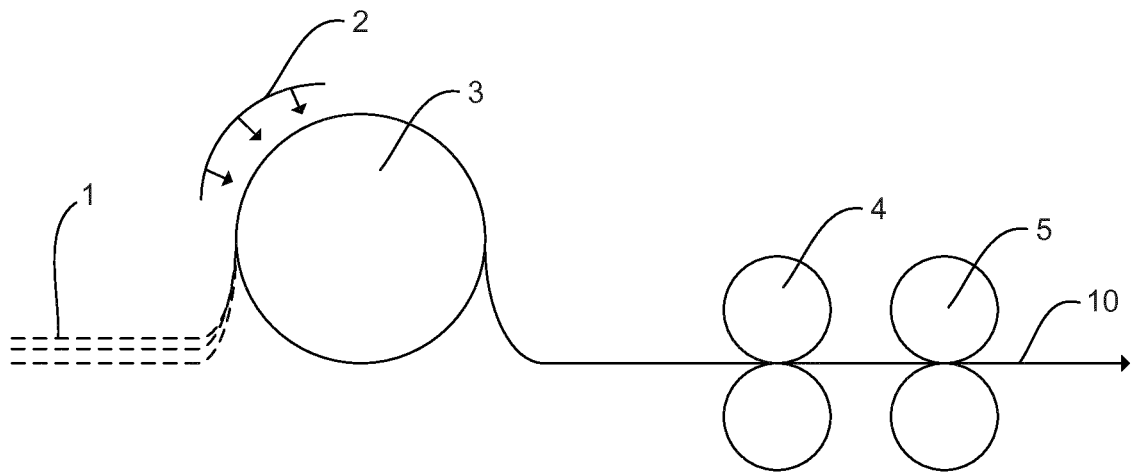


Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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