(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 706 142 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
12.03.2014 Bulletin 2014/11

(21) Application number: **12183667.0**

(22) Date of filing: **10.09.2012**

(51) Int Cl.:
D21H 19/84 *(2006.01)* ***D21H 23/56*** *(2006.01)*
D21H 23/70 *(2006.01)* ***B05C 1/08*** *(2006.01)*
B05C 9/04 *(2006.01)*

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(54) **A method for surface treating a coated fiber web and a coating station**

(57) The invention relates to a method for surface treating a coated fiber web in a fiber web machine and to a coating station (1). A surface treating agent (6) is applied to the second surface (2b) of the travelling fiber web (2) such that the surface treatment agent (6) is applied to the fiber web (2) at the same coating station (1) as the coating is applied. The coating station (1) comprises means for applying surface treatment agent (6) to the second surface (2b) of the travelling fiber web (2).

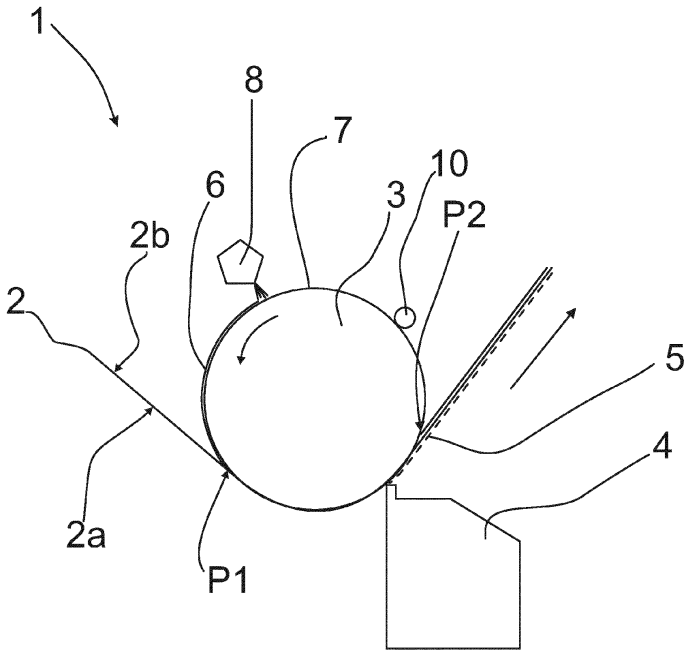

Fig. 2

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Description

Field of the invention

[0001] The invention relates to a method for surface treating a coated fiber web in a fiber web machine as defined in the preamble of the independent claim 1.

[0002] The invention also relates to a coating station as defined in the preamble of the independent claim 9.

[0003] A blade coater or a rod coater is a typical coating station used for coating fiber webs in an online or offline coating machine. In blade or rod coating, an excess amount of coating color is applied to the fiber web surface and final coat weight is controlled by a metering blade or by a rod. The blade coater is located underneath a backing roll and the fiber web passing by the backing roll is coated such that the coating is applied to the surface of the web and metered by the blade during the time when the web is in contact with the backing roll. The coating color is applied to the surface of the web by a jet, a short-dwell or an applicator roll. Applying coating in a rod coater is arranged the same way as in a blade coater except that a metering blade is replaced by a metering rod. A spray coater or a curtain coater can also be used for coating fiber webs.

[0004] The invention relates to controlling curling of a coated fiber web. The term curling refers to bending of a fiber web such that when the fiber web is positioned on a horizontal plane it bends upwards or downwards towards its edges in comparison with the center of the fiber web in width direction. Bending of a fiber web usually occurs when the fiber web is coated on one side only as it is usually the manner with fiber webs. In following the term fiber web covers both board web and specialty paper web that has similar runnability characteristics as board web. This means that the specialty paper web is moderately light and may have problems with breaks in a production process.

[0005] The invention also relates to preventing dust formation by applying starch or PVA adhesive to the surface of the fiber web.

[0006] US 4,853,255 disclose a device and a method for controlling curling of coated paper. With this method one surface of the paper is coated with a coating composition applied at a coating station and water is applied to the back surface of the coated paper by a wetting apparatus in another station. The wetting apparatus comprises an applicator roll and a pick-up roll. In other words the coating station and the water applying apparatus are two separate stations. The water applying device is composed of two superimposed kiss rolls, between which a nip is formed. The lower roll is partly sunk in a water basin, from which it receives water on its surface while rotating. Excess water is pressed out in the nip, and the rest of the water is conveyed to the surface of the web on the surface of the upper roll, the travel direction of the web being opposite to the direction of rotation of the roll. Water carried in the form of a thin film on the surface of the applicator roll slips on the coated paper. US 4,853,255 further discloses that the method can be adopted such that the wetting with water can be carried out on the back surface first and the front surface of the paper can then be coated with the coating composition or the method can be adopted the other way round too.

[0007] WO 01/61108 A1 discloses an apparatus for controlling the curling of paper or paperboard. The apparatus comprises members for bringing liquid on a paper or paperboard web and members for spreading the amount of liquid evenly, in such a manner that the members for bringing liquid on the paper or paperboard web are in the travel direction of the web placed before the members for spreading the amount of liquid evenly. In other words the liquid is brought on the paper or paperboard and spread out evenly. WO 01/61108 A1 further discloses that the moistening by means of liquid can be conducted in a conventional coating station or outside the coating station and that the curling can be eliminated in the web by treating one side of the web while the other side is coated. The apparatus for controlling the curling of the current publication is based on bringing liquid on the surface of the web and spreading it evenly. It is further disclosed that while the web travels on the surface of a counter roll a pipe for bringing liquid to the web surface is fixed to a mounting in a blade bearer in the coating station. WO 01/61108 A1 discloses that the paper or paperboard web is coated from one side and the coating is dried in the first coating section. Thereafter the web is guided to a second coating section, which comprises a coating unit and a drying unit. The coating unit comprises a doctor blade and a counter roll. In the second coating section liquid, such as water is sprayed on the web within a suitable distance from the doctor blade. The amount of water is spread evenly by means of the doctor blade and the web is then guided to the dryer section of the second coating section. This manner the first side of the web is coated in one coating station and in following second coating station the second side of the web is moistened. The coating and moistening happens in separate stages and in separate station, not simultaneously in a same station.

[0008] Problem with the state of the art is that the layout of the coating section becomes long. Separate stations for coating and moistening require space which is often needed for other purposes or there just is not enough space. Separate stations are also a question of a bigger investment.

Objective of the invention

[0009] The object of the invention is to simplify the coating section layout in a fiber web machine and to control the curling of a fiber web more efficiently. The object of the invention is also to treat the background of the fiber web to prevent dust formation. The background of the fiber web is that side of the fiber web that is not coated.

Short description of the invention

[0010] The method of the invention is characterized by the definitions of the independent claim 1.

[0011] Preferred embodiments of the method are defined in the dependent claims 2 to 8.

[0012] The coating station of the invention is correspondingly characterized by the definitions of independent claim 9.

[0013] Preferred embodiments of the coating station are defined in the dependent claims 10 and 15.

[0014] The invention is based on coating a fiber web on an online or an offline coating station having a coating applicator and a backing roll such that the fiber web travels on the surface of the backing roll. The coating station may also comprise the opposing roll supporting the travelling fiber web before the travelling fiber web is in area of the backing roll. The opposing roll is on an opposite side of the travelling fiber web than the backing roll. The backing roll rotates to the same direction as the web travels to move the web toward the direction where the coating applicator is. The surface of the fiber web facing toward the backing roll is surface treated simultaneously or almost simultaneously as the coating is applied to the opposite surface of the fiber web. The surface of the fiber web is surface treated with a surface treatment agent being a moistening agent or size, starch or adhesive.

[0015] The moistening is applied to the surface of the fiber web in the coating station either by applying the moistening agent to the surface of the backing roll and then transferring it from the backing roll to the fiber web and/or by applying the moistening agent straight to the fiber web before the backing roll in a machine direction. The moistening is applied to the backing roll or straight to the fiber web by a spray applicator or by a curtain applicator. The fiber web is preferably a board web or a specialty paper web being moderately light. In a preferred embodiment of the invention the fiber web is a board web. Specialty papers comprise for example wood free papers including label papers and thermal papers, which are one-sided coated products with back side treatment for curl and dust control purposes. Typically the basis weight of label papers is between 45-100 gsm and thermal (POS=Point of sales) papers is between 45-80 gsm.

[0016] Another embodiment of the invention is that size, starch and/or adhesive is applied to the surface of the fiber web facing toward the backing roll simultaneously or almost simultaneously as the coating is applied to the opposite surface of the fiber web. The starch and/or adhesive is applied to the surface of the fiber web in the coating station either by applying the starch and/or adhesive to the surface of the backing roll and then transferring it from the backing roll to the fiber web and/or by applying the starch and/or adhesive straight to the fiber web in before the backing roll in a machine direction. The starch and/or adhesive is applied to the backing roll or straight to the fiber web by a spray applicator or by a curtain applicator.

[0017] In other words the invention is based on a method for surface treating a coated fiber web in a fiber web machine. The method comprises the steps of providing a coating station arranged to the fiber web machine for coating one surface of a travelling fiber web, said coating station comprising a rotatable backing roll and a coating applicator, supporting the travelling fiber web by the rotatable backing roll, said fiber web having a first surface and a second surface, said second surface being in contact with the rotatable backing roll when travelling by the backing roll and said second surface being on opposite side to the first surface, and applying coating directly to the first surface of the travelling fiber web with the coating applicator. The surface treatment agent is applied to the second surface of the travelling fiber web before the coating is applied to the first surface of the travelling fiber web such that the surface treatment agent is applied to the fiber web in the same coating station as the coating is applied.

[0018] The invention is also based on a coating station comprising a backing roll for supporting a travelling fiber web, said fiber web having a first surface and a second surface, said second surface being in contact with the rotatable backing roll when travelling by the backing roll and said second surface being on opposite side to the first surface, and a coating applicator for applying coating directly to the first surface of the travelling fiber web, the coating station further comprising means for applying surface treatment agent to the second surface of the travelling fiber web.

[0019] The surface treatment agent is a moistening agent such as water or water based fluid or size, starch or adhesive. The adhesive is preferably a PVA-adhesive.

[0020] In a preferred embodiment of the invention surface treatment agent is applied to the surface of the backing roll by a spray applicator or a curtain applicator. The backing roll rotates to the same direction which the fiber web travels and when contacting the fiber web the surface treatment agent is transferred from the backing roll to the travelling fiber web. In an advantageous embodiment of the invention the backing roll is equipped with a scraper, i.e. a doctor knife or a doctor rod or similar, to clean the surface of the backing roll from the rest of the surface treatment agent which is not transferred from the backing roll to the fiber web before the surface treatment applicator applies new layer of the surface treatment agent to the backing roll. In another advantageous embodiment of the invention the travelling web is transferred from the coating station in which the one side of the fiber web is surface treated and the other side is coated to a dryer. The dryer can be a one-sided air dryer or two sided air dryer.

[0021] The advantage of the invention is that the surface treatment of one side of the fiber web is arranged at the same time as the coating of the other side of the fiber web so that the layout of the coating section becomes shorter and the curling of the coated fiber web is prevented efficiently. The investment costs for a coating

section in which one side of a fiber web is coated and still curling is controlled are lower compared to the traditional coating section and a separate moistening or starch/adhesive applying section. The need for rolls, tail threading devices, etc. is less. Another advantage of the invention is that by applying surface treatment agent to one side of the fiber web at the same time when applying coating to the other side of the fiber web, the fiber web can be dried after the coating station with two-sided air dryers. In other words the need for dryers is less, too.

List of figures

[0022] In the following the invention will be described in more detail by referring to figures 1 to 4, in which

Fig. 1 shows a prior art blade coater station,

Fig. 2 shows a first embodiment of the invention,

Fig. 3 shows a second embodiment of the invention, and

Fig. 4 shows a third embodiment of the invention.

Detailed description of the invention

[0023] The figure 1 shows a prior art blade coater in which the travelling fiber web 2 having a first side 2a and a second side 2b travels on the direction shown by the arrow. In the coating station 1 the fiber web 2 passes by the backing roll 3 such that the second surface 2b of the fiber web 2 contacts the backing roll 3 while passing it. The coating 5 is applied to the first surface 2a of the fiber web 2 by a coating applicator 4. The excess amount of coating is metered by a blade which is not shown in the figure.

[0024] The figure 2 shows a first embodiment of the invention in which the coating 5 is applied to the first surface 2a of the travelling fiber web 2 by a coating applicator 4, preferably a blade coater. The fiber web 2 is supported by the backing roll 3 such that when the coating applicator 4 has supplied coating 5 to the first surface 2a of the web 2 the metering blade engages the fiber web 2 and presses it against the backing roll 3 (not shown in the figure). The backing roll 3 rotates (shown as an arrow inside the backing roll 3) to move the fiber web 2 in the direction shown by the arrow. A means for applying surface treatment agent 6 is in this embodiment a spray applicator 8 but it can be a curtain applicator as well. The spray applicator 8 is arranged to apply the surface treatment agent 6 to the surface 7 of the backing roll 3 such that the surface treatment agent 6 travels on the surface 7 of the backing roll 3 to a point where the backing roll 3 and the travelling fiber web contact. This contact point is shown in the figure with a reference sign P1. In other words the surface treatment agent 6 is applied onto the surface of the backing roll 3 for transferring the surface treatment agent 6 from the backing roll 3 to the second surface 2b of the travelling fiber web 2 in a contact point P1 between the backing roll 3 and the fiber web 2.

[0025] After the surface treatment agent 6 is transferred from the backing roll 3 to the second surface 2b of the travelling fiber web 2 the surface 7 of the backing roll may contain some remains of the surface treatment agent so it is preferably but not necessarily cleaned with a scraper 10 arranged in an area between a separation point P2 and the spray applicator 8. The scraper 10 is arranged in contact with the backing roll 3 to clean the surface of the backing roll after the surface treatment agent 6 is transferred from the backing roll 3 to the travelling fiber web 2. The separation point P2 is the point where the travelling fiber web 2 and the backing roll 3 loose the contact between them. The surface treatment agent 6 is preferably leveled against the backing roll 3 with a rod or a blade before the contact point P1 such that the surface treatment agent 6 is applied to the second surface 2b of the travelling fiber web 2 evenly.

[0026] The figure 3 shows a second embodiment of the invention in which the coating 5 is applied to the first surface 2a of the travelling fiber web 2 by a coating applicator 4 in the same way as in figure 2. The backing roll 3 rotates (shown as an arrow inside the backing roll 3) to move the fiber web 2 in the direction shown by the arrow. A means for applying surface treatment agent 6 is in this embodiment a curtain applicator 9. The curtain applicator 9 is arranged to supply surface treatment agent 6 to the surface 7 of the backing roll 3 as a free falling curtain. The surface treatment agent 6 travels then on the surface 7 of the backing roll 3 to the contact point P1 in which the backing roll 3 and the travelling fiber web 2 contact each other. In the contact point P1 the surface treatment agent 6 is transferred from the backing roll 3 to the second surface 2b of the travelling fiber web 2 and the backing roll 3 levels the surface treatment agent 6 during the way from the contact point P1 to the separation point P2 in which the travelling fiber web 2 is separated from the backing roll 3. In this embodiment a scraper 10 is arranged to clean the surface 7 of the backing roll 3 from the rest of the surface treatment agent 6 which may have not transferred form the surface 7 of the backing roll 3 to the second surface 2b of the travelling fiber web 2. The scraper 10 is not obligatory for this embodiment. The scraper 10 is arranged in contact with the surface 7 of the backing roll 3 in the area between the separation point P2 and the curtain applicator 9 to clean the surface 7. Arrangements for further leading the removed surface treatment agent 6 from the scraper 10 to a container or other possible endpoint are not shown in the figure. The surface treatment agent 6 applied by the curtain applicator 9 can be leveled the same way as described above in figure 2.

[0027] In other words in figures 2 and 3 the means for applying surface treatment agent 6 is arranged to apply surface treatment agent 6 to the surface of the backing roll 3.

[0028] The figure 4 shows a third embodiment of the invention in which the surface treatment agent 6 is applied directly to the second surface 2b of the travelling fiber web 2. In this embodiment the coating 5 is applied to the first surface 2a of the travelling fiber web 2 by a coating applicator 4 in the same way as in figures 2 and 3, but the surface treatment agent 6 is not applied to the surface 7 of the backing roll 3 but instead directly to the second surface 2b of the travelling fiber web 2 before the backing roll 3. The figure shows that the surface treatment agent 6 is applied by a spray applicator 8 but a curtain applicator can be used as well. An opposing roll 11 is preferably arranged to support the travelling fiber web 2 on the opposite site of the web when the surface treatment agent 6 is applied. In this embodiment a scraper 10 is also arranged in contact with the backing roll 3 in the area between the separation point P2 and the contact point P1. It is not necessary to arrange the scraper 10 in this kind of embodiment such that it cleans the surface 7 of the backing roll 3 all the time so it may be arranged to clean the surface 7 also temporarily or not at all.

[0029] In a preferable embodiment the surface treatment agent 6 is applied directly to the second surface 2b of the travelling fiber web 2 in an area between a previous drying section (not shown in the figure) and the contact point P1 between the backing roll 3 and the travelling fiber web 2 such that the backing roll 3 is arranged to spread the surface treatment agent 6 to the surface of the travelling fiber web 2. In other words the means for applying surface treatment agent 6 is arranged to apply surface treatment agent 6 to the second surface 2b of the travelling fiber web 2 in an area between a previous drying section and a contact point P1 between the backing roll 3 and the travelling fiber web 2.

[0030] In another embodiment of the invention the method comprising the step that the surface treatment agent 6 is applied directly to the second surface 2b of the travelling fiber web 2 in an area between an opposing roll 11 supporting the travelling fiber web 2 before the backing roll 3 and a contact point P1 between the backing roll 3 and the travelling fiber web 2. The opposing roll 11 is preferably the last roll before the backing roll 3 but in the opposite side of the fiber web than the backing roll 3.

[0031] In another embodiment the surface treatment agent 6 is applied directly to the second surface 2b of the travelling fiber web 2 in an area where the opposing roll 11 is supporting the travelling fiber web 2.

[0032] Yet in another embodiment of the invention the method comprising the step that the surface treatment agent 6 is applied directly to the second surface 2b of the travelling fiber web 2 0,5 - 1 meter before a contact point P1 between the backing roll 3 and the travelling fiber web 2. At maximum the surface treatment agent 6 is applied directly to the second surface 2b of the travelling fiber web 2 2 meter before a contact point P1 between the backing roll 3 and the travelling fiber web 2.

[0033] The surface treatment agent 6 can also be applied between the backing roll 3 and a contact point P1 such that the surface treatment agent 6 is applied toward the contact point P1. In this embodiment the means for applying surface treatment agent 6 is arranged to apply surface treatment agent 6 to a contact point P1 between the backing roll 3 and the travelling fiber web 2. This can for example be achieved by a spray applicator 8 spraying the surface treatment agent 6 straight to the contact point P1.

[0034] In another embodiment of the invention the surface treatment agent 6 is applied both directly to the second surface 2b of the travelling fiber web 2 and to the surface of the backing roll 3. In other words the coating station 1 comprises means for applying surface treatment agent 6 both to the backing roll 3 and directly to the second surface 2b of the travelling fiber web 2. The same surface treatment agent 6 can be applied to the backing roll 3 and directly to the second surface 2b of the fiber web or there can be different surface treatment agents 6 that are to be applied to the backing roll 3 and straight to the second surface 2b of the fiber web 2. In other words the coating station 1 can further comprise means for applying another surface treatment agent 6 to the second surface 2b of the travelling fiber web 2. In other words the method comprising the step that the surface treatment agent 6 is applied both to the second surface 2b of the travelling fiber web 2 and to the backing roll 3. The coating station 1 comprising means for applying surface treatment agent 6 both to the backing roll 3 and directly to the second surface 2b of the travelling fiber web 2.

[0035] The method according to the invention comprises the step of applying surface treatment agent 6 by a spray applicator or a curtain applicator. The coating station is preferably a blade coater, a rod coater or a curtain coater.

[0036] It is apparent to a person skilled in the art that as technology advanced, the basic idea of the invention can be implemented in various ways. The invention and its embodiments are therefore not restricted to the above examples, but they may vary within the scope of the claims.

Claims

1. A method for surface treating a coated fiber web in a fiber web machine, the method comprising the steps of:

   providing a coating station (1) arranged to the fiber web machine for coating one surface of a travelling fiber web (2), said coating station (1) comprising a rotatable backing roll (3) and a coating applicator (4),
   supporting the travelling fiber web (2) by the rotatable backing roll (3), said fiber web (2) having a first surface (2a) and a second surface (2b), said second surface (2b) being in contact with the rotatable backing roll (3) when travelling by

the backing roll (3) and said second surface (2b) being on opposite side to the first surface (2a), and

applying coating (5) directly to the first surface (2a) of the travelling fiber web (2) with the coating applicator (4),

characterized in that the method further comprising the step of

applying surface treatment agent (6) to the second surface (2b) of the travelling fiber web (2) before the coating (5) is applied to the first surface (2a) of the travelling fiber web (2) such that the surface treatment agent (6) is applied to the fiber web (2) at the same coating station (1) as the coating (5) is applied.

2. The method according to claim 1, **characterized in that** the surface treatment agent (6) is applied onto the surface (7) of the backing roll (3) for transferring said surface treatment agent (6) from the backing roll (3) to the second surface (2b) of the travelling fiber web (2) in a contact point (P1) between the backing roll (3) and the fiber web (2).

3. The method according to claim 2, **characterized in that** a scraper (10) is arranged in contact with the backing roll (3) to clean the surface (7) of the backing roll (3) after the surface treatment agent (6) is transferred from the backing roll (3) to the travelling fiber web (2).

4. The method according to any of the previous claims, **characterized in that** surface treatment agent (6) is leveled against the backing roll (3) with a rod or a blade before the contact point (P1).

5. The method according to claim 1, **characterized in that** the surface treatment agent (6) is applied directly to the second surface (2b) of the travelling fiber web (2) in an area between a previous drying section and a contact point (P1) between the backing roll (3) and the travelling fiber web (2) such that the backing roll (3) is arranged to spread the surface treatment agent (6) to the surface of the travelling fiber web (2).

6. The method according to claim 1, **characterized in that** the surface treatment agent (6) is applied directly to the second surface (2b) of the travelling fiber web (2) in an area where the opposing roll (11) is supporting the travelling fiber web (2).

7. The method according to claim 1, **characterized in that** the surface treatment agent (6) is applied between the backing roll (3) and a contact point (P1) such that the surface treatment agent (6) is applied toward the contact point (P1).

8. The method according to any of the previous claims, **characterized in that** said surface treatment agent (6) is water, size, starch or PVA -adhesive and said surface treatment agent (6) is applied by a spray applicator (8) or a curtain applicator (9).

9. A coating station (1) comprising

a backing roll (3) for supporting a travelling fiber web (2), said fiber web (2) having a first surface (2a) and a second surface (2b), said second surface (2b) being in contact with the rotatable backing roll (3) when travelling by the backing roll (3) and said second surface (2b) being on opposite side to the first surface (2a), and

a coating applicator (4) for applying coating (5) directly to the first surface (2a) of the travelling fiber web (2),

characterized in that the coating station (1) further comprising means for applying surface treatment agent (6) to the second surface (2b) of the travelling fiber web (2).

10. The coating station (1) according to claim 9, **characterized in that** the means for applying surface treatment agent (6) is arranged to apply surface treatment agent (6) to the surface of the backing roll (3).

11. The coating station (1) according to claim 9, **characterized in that** the means for applying surface treatment agent (6) is arranged to apply surface treatment agent (6) to a contact point (P1) between the backing roll (3) and the travelling fiber web (2).

12. The coating station (1) according to claim 9, **characterized in that** the means for applying surface treatment agent (6) is arranged to apply surface treatment agent (6) to the second surface (2b) of the travelling fiber web (2) in an area between a previous drying section and a contact point (P1) between the backing roll (3) and the travelling fiber web (2).

13. The coating station (1) according to any of the claims 9 to 12, **characterized in that** the coating station (1) further comprising means for applying another surface treatment agent (6) to the second surface (2b) of the travelling fiber web (2).

14. The coating station (1) according to any of the claims 9 to 13, **characterized in that** the means for applying surface treatment agent (6) is a spray applicator (8) or a curtain applicator (9) and said surface treatment agent (6) is water, size, starch or PVA -adhesive.

15. The coating station (1) according to any of the claims 9 to 14, **characterized in that** the coating station (1) is a blade coater, a rod coater or a curtain coater.

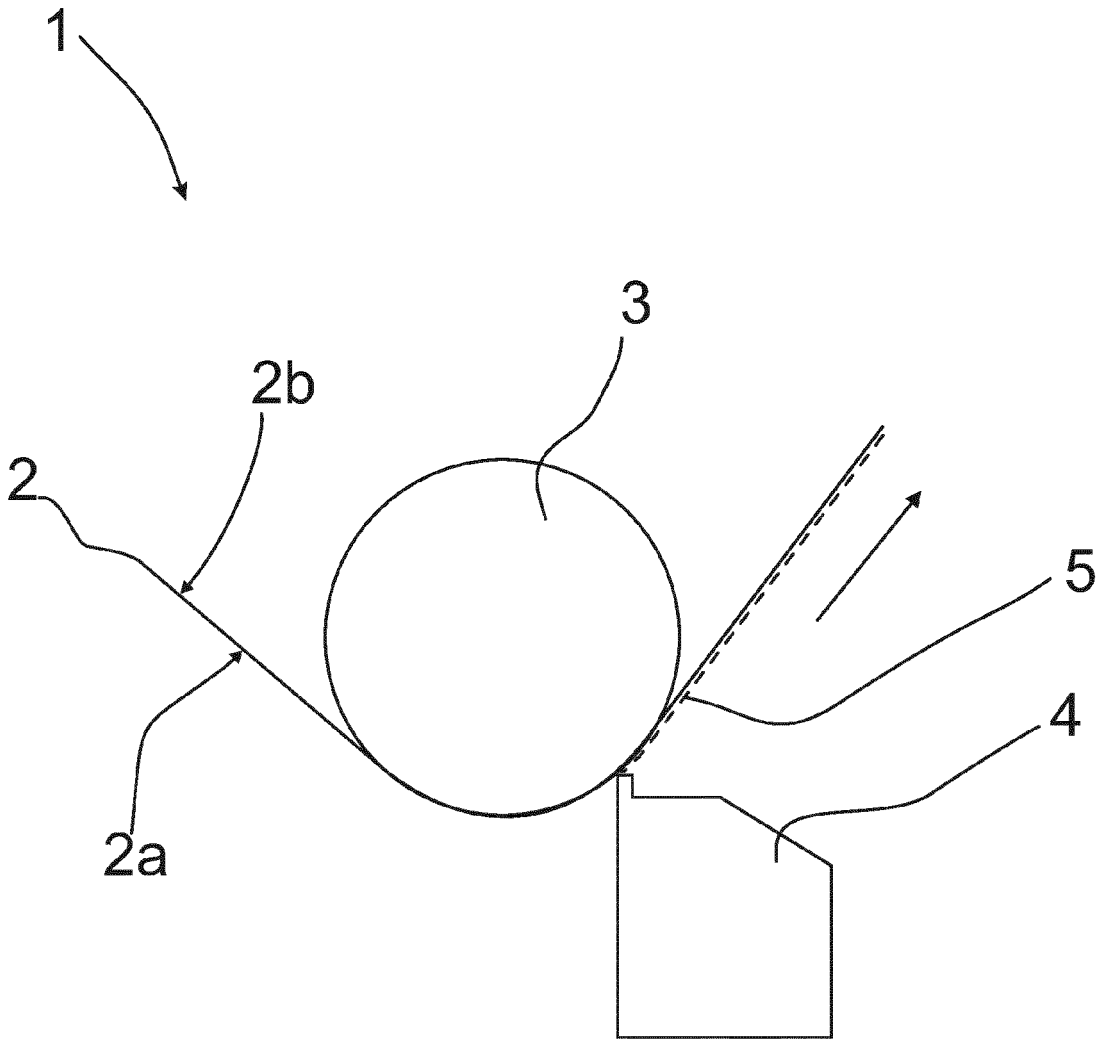

Fig. 1

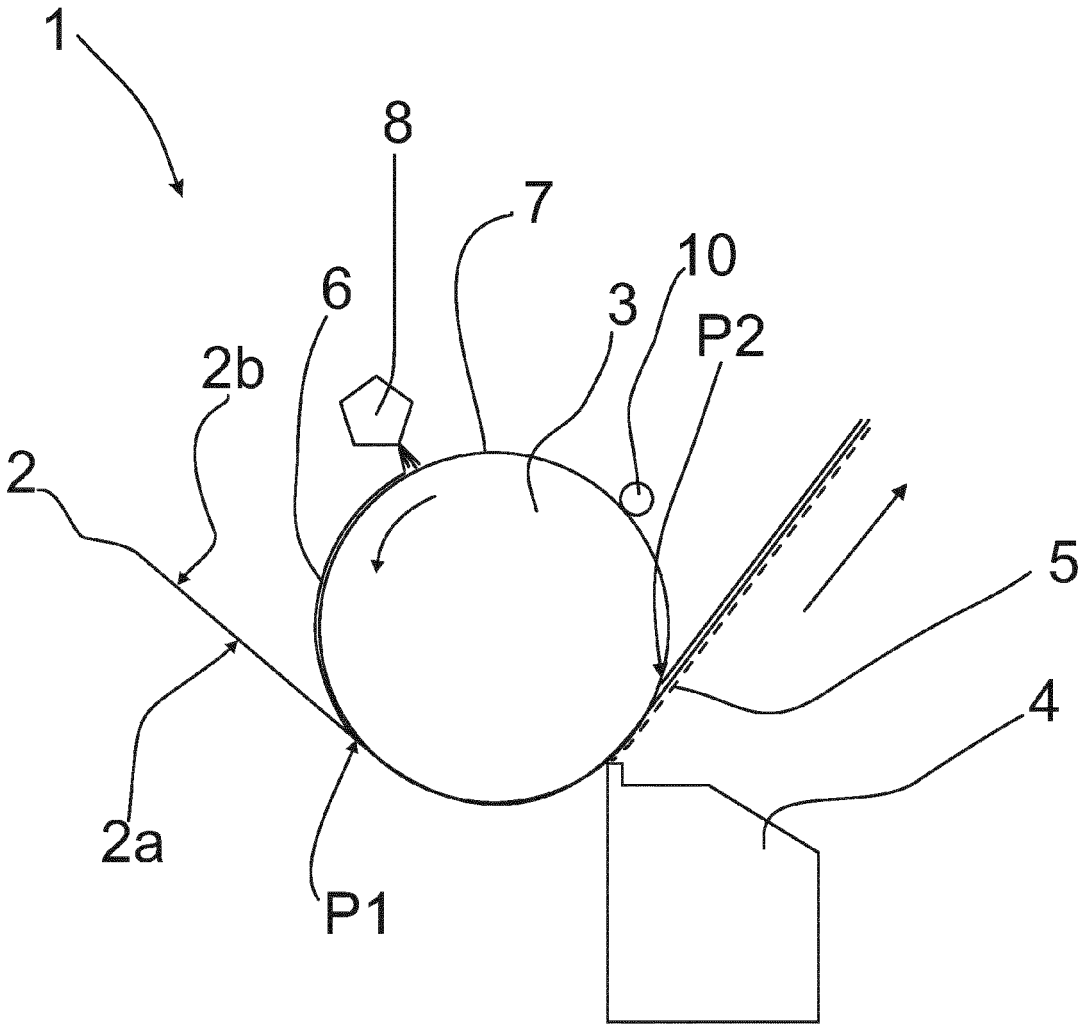

Fig. 2

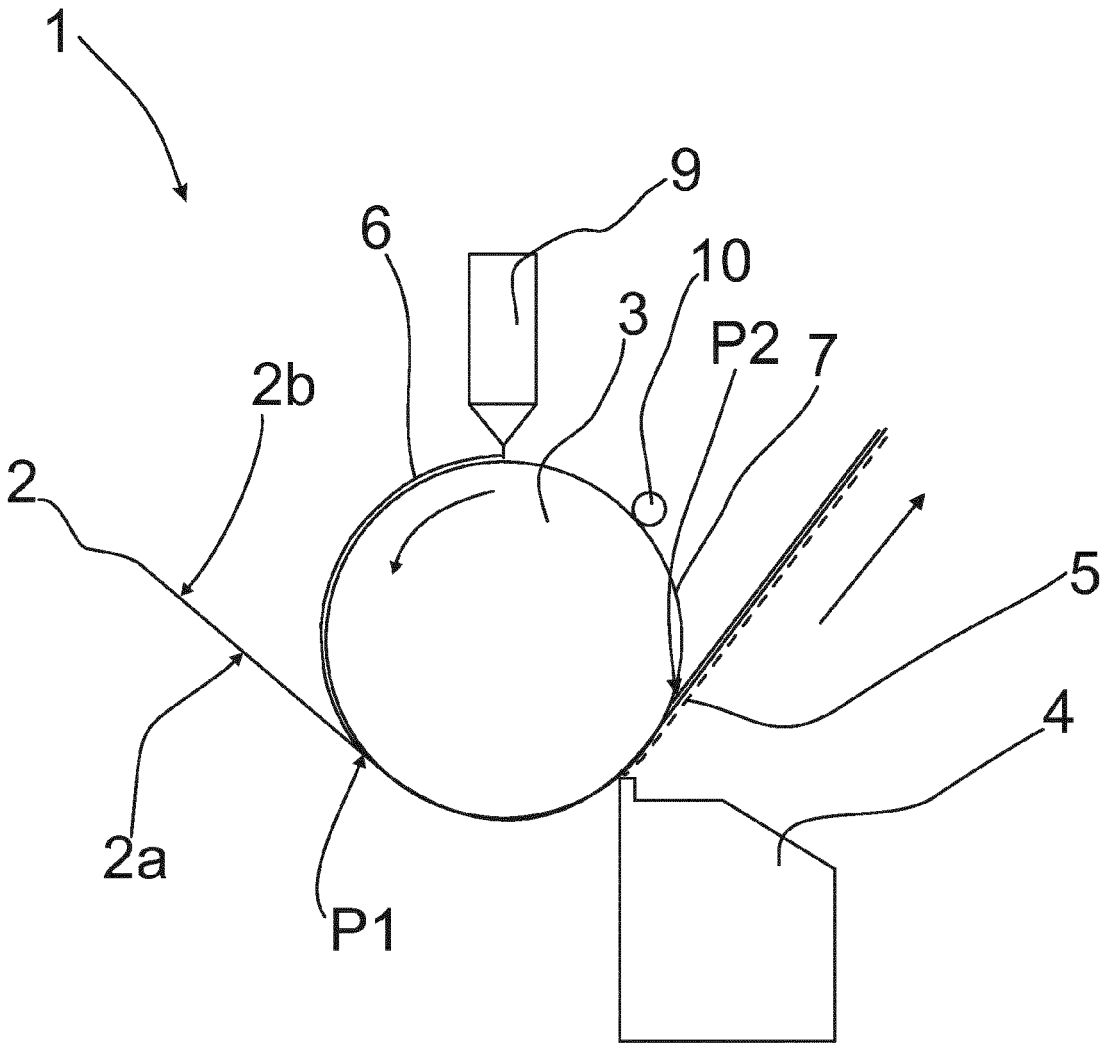

Fig. 3

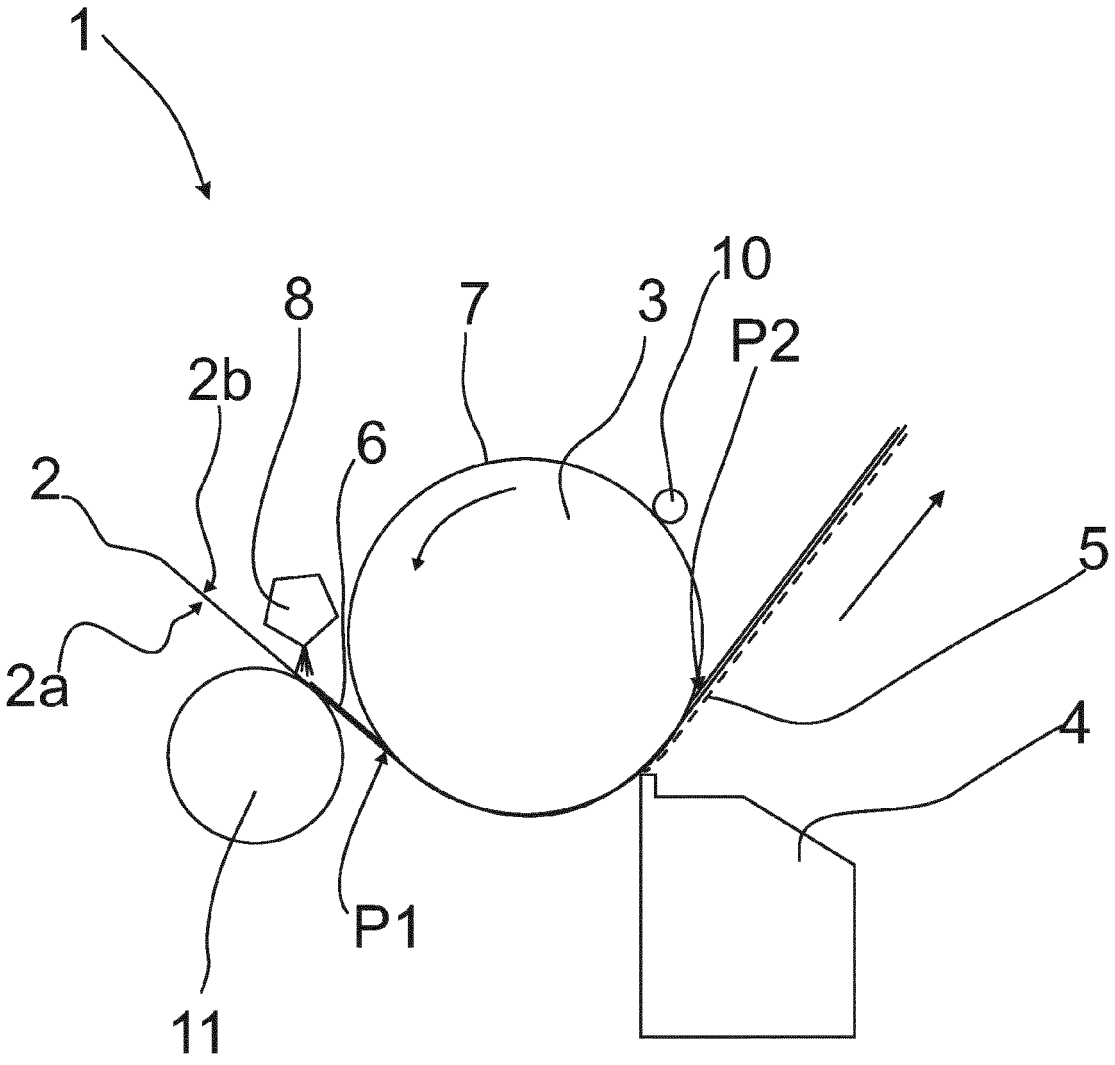

Fig. 4

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European Patent Office
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EUROPEAN SEARCH REPORT

Application Number
EP 12 18 3667

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 4 357 370 A (ALHEID ROBERT J) 2 November 1982 (1982-11-02) * figure 1 * * claims 1-10 * -----	1,2, 9-11,15 1-15	INV. D21H19/84 D21H23/56 D21H23/70 B05C1/08
X Y	US 2 645 201 A (MUGGLETON GERALD D) 14 July 1953 (1953-07-14) * figure 1 * * claims 1-3 * -----	1,9 1-15	B05C9/04
X Y	US 2012/204787 A1 (NAKAHATA MASAOMI [JP] ET AL) 16 August 2012 (2012-08-16) * figure 1a * * claims 1-5 * -----	1,9 1-15	
X Y	US 4 198 446 A (GOETZ WILLIAM J [US]) 15 April 1980 (1980-04-15) * figures 2,5 * -----	1,9 1-15	
X Y	US 4 455 327 A (YOSHIDA TETSUO [JP] ET AL) 19 June 1984 (1984-06-19) * figure 1 * -----	1,9 1-15	TECHNICAL FIELDS SEARCHED (IPC) D21H B05C
X Y	EP 0 153 029 A1 (WIGGINS TEAPE GROUP LTD [GB]) 28 August 1985 (1985-08-28) * figures 1,2 * -----	1,9 1-15	
X Y	US 2002/090447 A1 (YAMAGUCHI MASATO [JP]) 11 July 2002 (2002-07-11) * figure 1 * -----	1,9 1-15	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	4 February 2013	Ponsaud, Philippe

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 18 3667

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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