



(11) **EP 2 860 312 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
22.05.2019 Bulletin 2019/21

(51) Int Cl.:
D21H 23/50^(2006.01) B05B 12/14^(2006.01)

(21) Application number: **13187694.8**

(22) Date of filing: **08.10.2013**

(54) **ARRANGEMENT OF A FIBER WEB PRODUCTION LINE AND METHOD OF A FIBER WEB PRODUCTION LINE**

ANORDNUNG EINER FASERBAHNHERSTELLUNGSLINIE AND VERFAHREN EINER FASERBAHNHERSTELLUNGSLINIE

ARRANGEMENT DANS UNE LIGNE DE PRODUCTION DE TOILE FIBREUSE ET PROCEDE DE PRODUCTION DE TOILE FIBREUSE

(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

(43) Date of publication of application:
15.04.2015 Bulletin 2015/16

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Description

[0001] The invention relates to an arrangement of a fiber web production line and to a method in a fiber web production line. Especially the invention relates to an arrangement and to a method of a coating or sizing section of a fiber web production line, in which section the coating or sizing medium is applied on the fiber web by spray means. More especially the invention relates to an arrangement according to the preamble part of claim 1 and to a method according to the preamble part of claim 6.

[0002] As known from the prior art in fiber web producing processes typically comprise an assembly formed by a number of apparatuses arranged consecutively in the process line. A typical production and treatment line comprises a head box, a wire section and a press section as well as a subsequent drying section and a reel-up. The production and treatment line can further comprise other devices and sections for finishing the fiber web, for example, a sizer, a calender, a coating section. The production and treatment line typically also comprises a reel-up and at least one winder for winding customer rolls as well as at least one roll packaging apparatus. In this description and the following claims by fiber webs are meant for example paper and board webs.

[0003] In production of fiber webs, for example of paper or board webs, sizing is used to alter the properties of a fiber web by adding sizing agents (sizing medium), for example glue chemicals. Sizing can be divided to internal sizing and surface sizing. In internal sizing the sizing agent is added to pulp in the wet end of the fiber web machine before forming. In surface sizing the sizing agent is added onto the surface of the fiber web at the dry end of the fiber web machine.

[0004] In production of fiber webs, for example of paper or board webs, in coating, especially the surface of a fiber web is formed with a layer of coating color (coating medium) at a coating station followed by drying. The formation of a coating in direct coating applications can be divided in supplying the coating color onto the web surface, which is called the application of the coating color, as well as in the adjustment of final amount of coating color. In indirect coating applications the adjustment of the color amount is controlled already when supplying the color and therefore an additional adjustment is not needed.

[0005] The coating or the sizing of a fiber web typically utilizes a coating device - a coater - or a sizing device - a sizer, which together with for example drying devices following the coater/sizer form the coating / sizing section of a fiber web production line. In connection with the coaters and sizers different kinds of application technology for application of the coating or the sizing medium on the fiber web are employed in prior art arrangements, for example curtain technology or blade application technology or rod application technology or air brush application technology or spray application technology. The present invention relates to spray application technology.

[0006] In WO publication 2006/058961 A1 is disclosed

a method and arrangement for processing a paper or board web or similar fiber web. In this prior art method a processing mixture is applied on the surface of the web with spray nozzles. In WO publication 02/072953 is disclosed an assembly for treating a moving web of paper of board with web treatment substance which assembly comprises an application chamber located in at close vicinity of the moving web and facing the web and at least one linear nozzle array incorporating at least one nozzle for spraying the web treatment substance on the web. In FI utility model registration 9401 is disclosed a device for treating a fiber web, which comprises an application device, in particular a spraying device, for applying treatment substance on a moving fiber web.

[0007] In US 2005/098291 is disclosed an apparatus for paper making and paper surface enhancement, in which nozzles are located in several rows in cross-direction i.e. in width direction of the paper web.

[0008] US 2003/120303 discloses a distribution pipe structure from steel industry, in which the pipes are located within each other and the innermost pipe is for glue and in the two outer pipes there is water for controlling the temperature of the glue and for cleaning the nozzles.

[0009] In US 2007/029411 is disclosed an air atomizing nozzle system for medical industry in which substance is distributed to all nozzles by one pipe.

[0010] US 2118212 discloses a process and apparatus for coating paper in which several rows of nozzles are used.

[0011] The coating and sizing units can be located in different positions in the fiber web production line, for example at a wire section, or at a press section, or at a drying section comprising drying cylinders. However, the typical location is after the pre-dryer section, when the web moisture is typically between 2-12 %. The nozzles or nozzle units of a spray coating or sizing unit are as known from prior art attached to a distributor pipe that extends in cross direction over the width of the fiber web and that delivers the treatment substance to the nozzles. In figure 1 is shown side projection one schematical example of prior art arrangement of spraying device for applying treatment substance on a moving fiber web W. The spraying device according to prior art comprises a distributor pipe 10 extending in cross direction over the width of the fiber web W. The distributor pipe 10 comprises several at a distance in the cross direction spaced apart from each other located nozzles 20 in one row, which nozzles 20 creating one nozzle row 21 are typically supported by a support element 15 extending in the cross direction. Into all nozzles 20 of the nozzle row 21 the treatment substance is supplied via channels 11 from the distributor pipe 10. In this prior art arrangement large changes in application amounts of the treatment substance to be sprayed onto the fiber web W via the nozzles have not been possible without changing the nozzles or without using several successive nozzle rows in the running direction of the web. Typical flow amount window for a nozzle in pressure range 3-12 bar is set point ± 30

%. Typical sizing amount as dry for woodfree copy and special papers is 0.5-1.5 g/m² and for different board grades 1-3 g/m². The prior art arrangement is also problematic in cases in which different substance components are used simultaneously to form the treatment substance since the substances, for example hydrophobic chemicals and color agents may react with each other or with impurities of return-flow and thus plugging may occur for example in the nozzles.

[0012] An object of the invention is to create an arrangement in a fiber web production line and a method in a fiber web production line in which the disadvantages of known arrangements and methods relating to changes in application amounts of the treatment substance are eliminated or at least minimized.

[0013] An object of the invention is to provide an arrangement of a fiber web production line and a method of a fiber web production line in which problems with treatment substance component reacting with each other creating plugging problems are eliminated or at least minimized.

[0014] Further objects of the invention is to provide an arrangement of a fiber web production line and a method of a fiber web production line in which new possibilities of amount adjusting of the treatment substance and of substance component selection are available.

[0015] In order to achieve the above objects the arrangement according to the invention is mainly characterized by the features of claim 1 and the method according to the invention is mainly characterized by the features of claim 6.

[0016] According to an advantageous aspect of the invention the arrangement of a coating or sizing section of a fiber web production line, in which section a treatment substance, in particular a coating or sizing medium, is applied onto the fiber web by spraying, which arrangement comprises nozzles located in one nozzle row extending in cross-direction i.e. in width direction of the fiber web for spraying the treatment substance onto the fiber web and at least two distributor pipes connected to the nozzles for supplying treatment substance to the nozzles in the one nozzle row and the at least two distributor pipes are each connected to alternate nozzles of the one nozzle row.

[0017] The nozzles in the one nozzle row do not necessarily need to be on straight line and center lines of the nozzles, in particular for different distribution pipes, can be offset +/- 20 mm in the nozzle row, advantageously +/- 10 mm. The offset depends on distribution of the nozzles and on desired coverage of the treatment substance on the fiber web.

[0018] Advantageously the arrangement comprises two distributor pipes each connected to alternate nozzles of the one nozzle row.

[0019] Advantageously the arrangement comprises control means to selectively supply treatment substance from the distributor pipes, for example from only one distributor pipe. The control means are for example ar-

ranged as valves before inlet of each distributor pipe. The treatment substance is supplied by one machine circulation via one inlet channel and just before the inlets to the distributor pipes the inlet channel is divided to channels with valves leading to each of the inlets to the distributor pipes. Each distributor pipe may also have a machine circulation of its own, for example in cases where the treatment substances are not to be mixed at this stage, and thus each distribution pipe has own inlet channel, pump and optional valve. In this arrangement the inlet is controlled by the pump or by the optional valve.

[0020] The dimensions of the distributor pipes can be same or different. Wet treatment substance amounts applied by nozzles of the distributor pipes vary from 5 g/m² to 50 g/m² and the speed of the fiber web depending on the production line varies from 300 m/min to 2000 m/min and the width of the fiber web from 3 m to 10 m, thus the total inlet amount of treatment substance amount to each distribution pipe varies from 10 kg/min to 1100 kg/min. Desired flow rate at inlet to distribution pipe varies from 2 m/s to 10 m/s and thus needed inside diameter of one distributor pipe, if only one distributor pipe is used, is from 10 mm to 80 mm and thus according to an advantageous feature the inside diameter of each distributor pipe is from 8 mm to 56 mm taking in account that the diameters of the distributor pipes can be different from each other in the arrangement according to the invention.

[0021] The feed into each distributor pipe can be from the same or different ends of the distributor pipes. The outlet from each distributor pipe can be from the same or different ends of the distributor pipes. In cases where the feed to the distributor pipes is at different ends and the outlet correspondingly at different ends of the distributor pipes an inclined profile of the sprayed substance amount of one distributor pipe caused by pressure loss between the ends of the distributor pipe can easily be corrected.

[0022] According to one advantageous feature the outlet flow from one distributor pipe can be led to another distributor pipe and the fresh treatment substance flow to the one distributor pipe.

[0023] According to the invention the method of a coating or sizing section of a fiber web production line, in which method a treatment substance, in particular a coating or sizing medium, is applied onto the fiber web by spraying by nozzles located in one nozzle row extending in cross-direction i.e. in width direction of the fiber web for spraying the treatment substance onto the fiber web, characterized in that in the method the treatment substance is supplied to the nozzles by at least two distributor pipes and in the method the treatment substance is supplied by the at least two distributor pipes, which are each connected to alternate nozzles of the one nozzle row, alternatingly to the nozzles of the one nozzle row.

[0024] Advantageously in the method the treatment substance is supplied by two distributor pipes alternatingly to the nozzles of the one nozzle row.

[0025] According to an advantageous feature of the

invention different treatment substances or components of the treatment substance can be supplied via different distributor pipes. By this it is possible to use substances that when reacting with each other before nozzles would cause plugging. Furthermore two-component substances can be used by supplying one component by one distributor pipe and one component by another distributor pipe. The different substances or components of the substance can be for example a combination: color substance -hydrophobic substance, one color substance - another color substance, substances with different viscosity and solids content, water - chemical substance etc. **[0026]** By the invention the amount of treatment substance can be controlled without any need for changing the nozzles. Also in case the undesired plugging occurs in one distributor pipe the other one can be used. **[0027]** In the following the invention is explained in more detail with reference to the accompanying drawing in which

Figure 1 shows as side projection one schematical example of prior art.

Figures 2 - 3 show as side projection schematically one advantageous example of the invention.

Figure 4 shows as a longitudinal view in the width direction of a fiber web schematically one advantageous example of the invention.

Figures 5A - 5B show very schematically examples of one nozzle row.

[0028] In the figures the corresponding elements, parts and part components of the arrangement are denoted by same reference signs in the figures unless otherwise mentioned.

[0029] In figure 1 is shown side projection one schematical example of prior art arrangement of spraying device for applying treatment substance on a moving fiber web W. The spraying device according to prior art comprises a distributor pipe 10 extending in cross direction over the width of the fiber web W. The distributor pipe 10 comprises several at a distance in the cross direction spaced apart from each other located nozzles 20 in one row, which nozzles 20 creating one nozzle row 21 are typically supported by a support element 15 extending in the cross direction. Into all nozzles 20 of the nozzle row 21 the treatment substance is supplied from the distributor pipe 10 via channels 11.

[0030] In figures 2 - 3 is shown side projection one advantageous example of an arrangement of a spraying device for applying treatment substance on a moving fiber web W according to the invention. The spraying device comprises two distributor pipes 10A, 10B extending in cross direction over the width of the fiber web W. The spraying device further comprises several at a distance in the cross direction spaced apart from each other lo-

cated nozzles 20A, 20B in one nozzle row 21, which nozzles 20A, 20B creating the one nozzle row 21 are supported by a support element 15 extending in the cross direction. The two distributor pipes 10A, 10B are alternatingly connected to the nozzles 20A, 20B for supplying treatment substance to the nozzles 20A, 20B in the one nozzle row. Each distributor pipe 10A, 10B are connected to alternate nozzles 20A, 20B of the one nozzle row 21. As shown in figure 2 from distributor pipe 10A the treatment substance is led to nozzles 20A via channels 11A. Each nozzle 20A having its own channel 11A. As shown in figure 3 from distributor pipe 10B the treatment substance is led to nozzles 20B via channels 11AB. Each nozzle 20aB having its own channel 11B.

[0031] As shown in figure 4, where feeds and outlets are indicated by arrows, the feed 12A, 12B, into each distributor pipe 10A, 10B is in this example arranged from the same end of the distributor pipes 10A, 10B. Correspondingly in this example the outlet 13A, 13B, as indicated by arrows, from each distributor pipe 10A, 10B from the same of the distributor pipes 10A, 10B. The feed 12A, 12B and correspondingly the outlet 13A, 13B of the distributor pipes 10A, 10B can also be at different ends of the distributor pipes 10A, 10B as shown by dashed arrows. From distributor pipes 10A, 10B via channels 11A, 11B correspondingly the treatment substance is supplied correspondingly to the alternate nozzles 20A, 20B to be sprayed onto the passing fiber web.

[0032] In figures 5A - 5B is very schematically, not in scale, shown examples of one nozzle row 21. The nozzle row comprises nozzles 20A, 20B located in the one nozzle row. The nozzles can be located offset O +/- 20 mm, advantageously +/- 10 mm. The offset O depends on distribution of the nozzles 20A, 20B i.e. the cross-directional distance between the nozzles and on desired coverage of the treatment substance on the fiber web. The coverage of the treatment substance spray of one nozzle is typically 300 mm on the fiber web and when the distance between two nozzles next to each other is advantageously 50 mm (i.e. 50 mm distribution of the nozzles) and when the nozzles are at an advantageous angle of 7-15 ° in relation to the plane perpendicular of the fiber web surface and at adjacent nozzle a fan creating the treatment substance spray is located about 4 -14 mm above the nozzle center line, a six-fold coverage of the treatment substance on the fiber web W is achieved but the treatment substance sprays are not disturbed by treatment substance sprays of the adjacent nozzles 20A, 20B. The center lines of adjacent nozzles 20A, 20B can be located from 0 to 10 mm from the center line of adjacent nozzle 20B, 20A. The nozzles 20A, 20B, in particular for different distribution pipes 10A, 10B, can thus be offset O +/- 10 mm in the nozzle row 21, when the distribution is 50 mm, and offset O +/- 20 mm, when the distribution is 100 mm, as shown in figures 5A and 5C. In the example of figure 5B center lines of all nozzles 20A, 20B are in the one nozzle row 21 on same straight line.

Reference signs used in the drawing:

[0033]

10, 10A, 10B distribution pipe 5
 11, 11A, 11B channel from distribution pipe to nozzle
 12A, 12B inlet to distribution pipe
 13A, 13B outlet from distribution pipe
 15 support element
 20, 20A, 20B nozzle 10
 21 nozzle row
 W web
 O offset

Claims

1. Arrangement in of a coating or sizing section of a fiber web production line, in which section a treatment substance, in particular a coating or sizing medium, is applied onto the fiber web by spraying, which arrangement comprises nozzles (20A, 20B) located in one nozzle row (21) extending in cross-direction i.e. in width direction of the fiber web for spraying the treatment substance onto the fiber web, **characterized in that** the arrangement comprises at least two distributor pipes (10A, 10B) connected to the nozzles (20A, 20B) for supplying treatment substance to the nozzles (20A, 20B) in the one nozzle row (21) and that in the arrangement the at least two distributor pipes (10A, 10B) are each connected to alternate nozzles (20A, 20B) of the one nozzle row (21). 20
2. Arrangement according to claim 1, **characterized in that** the center lines of the nozzles (20A, 20B), in particular for different distribution pipes (10A, 10B), are offset (O) +/- 20 mm, advantageously +/- 10 mm in the one nozzle row (21). 25
3. Arrangement according to any of claims 1 or 2, **characterized in that** the arrangement comprises two distributor pipes (10A, 10B) each connected to alternate nozzles (20A, 20B) of the one nozzle row (21). 30
4. Arrangement according to any of claims 1 - 3, **characterized in that** the arrangement comprises control means to selectively supply treatment substance from the distributor pipes (10A, 10B). 35
5. Arrangement according to any of claims 1 - 4, **characterized in that** inside diameter of each distributor pipe (10A; 10B) is from 8 mm to 56 mm. 40
6. Method for a coating or sizing section of a fiber web production line, in which method a treatment substance, in particular a coating or sizing medium, is applied onto the fiber web by spraying by nozzles (20A, 20B) located in one nozzle row (21) extending 45

in cross-direction i.e. in width direction of the fiber web for spraying the treatment substance onto the fiber web, **characterized in that** in the method the treatment substance is supplied to the nozzles (20A, 20B) in the one nozzle row by at least two distributor pipes (10A, 10B), and that in the method the treatment substance is supplied by the at least two distributor pipes (10A, 10B), which are each connected to alternate nozzles (20A, 20B) of the one nozzle row (21), alternatingly to the nozzles (20A, 20B) of the one nozzle row (21). 50

7. Method according to claim 6, **characterized in that** in the method the treatment substance is supplied by two distributor pipes (10A, 10B) alternatingly to the nozzles (20A, 20B) of the one nozzle row (21). 55
8. Method according to claim 6, **characterized in that** in the method different treatment substances or components of the treatment substance are be supplied via different distributor pipes (10A, 10B). 60
9. Method according to claim 8, **characterized in that** in the method different substances or components of the substance are selected from the combinations: color substance -hydrophobic substance, one color substance - another color substance, substances with different viscosity and solids content. 65
10. Method according to claim 6, **characterized in that** in the method different amount of the treatment substance is supplied by different distributor pipes (10A, 10B). 70

Patentansprüche

1. Anordnung in einer Beschichtungs- oder Leimungspartie einer Faserbahnherstellungslinie, wobei in der Partie eine Behandlungssubstanz, insbesondere ein Beschichtungs- oder Leimungsmittel, mittels Sprühen auf die Faserbahn aufgebracht wird, wobei die Anordnung Düsen (20A, 20B) aufweist, die in einer Düsenreihe (21) angeordnet sind, die sich in Querrichtung, d. h. in der Breitenrichtung der Faserbahn erstreckt, um die Behandlungssubstanz auf die Faserbahn zu sprühen, **dadurch gekennzeichnet, dass** die Anordnung wenigstens zwei Verteilleitungen (10A, 10B) aufweist, die mit den Düsen (20A, 20B) verbunden sind, um die Behandlungssubstanz zu den Düsen (20A, 20B) in der einen Düsenreihe (21) zuzuführen, und dass in der Anordnung die wenigstens zwei Verteilleitungen (10A, 10B) jeweils mit abwechselnden Düsen (20A, 20B) der einen Düsenreihe (21) verbunden sind. 75
2. Anordnung nach Anspruch 1, 80

- dadurch gekennzeichnet, dass** die Mittellinien der Düsen (20A, 20B), insbesondere für unterschiedliche Verteilungen (10A, 10B), um +/- 20 mm, vorzugsweise +/- 10 mm, in der einen Düsenreihe (21) versetzt (O) sind.
3. Anordnung nach einem der Ansprüche 1 oder 2, **dadurch gekennzeichnet, dass** die Anordnung zwei Verteilungen (10A, 10B) aufweist, die jeweils mit abwechselnden Düsen (20A, 20B) der einen Düsenreihe (21) verbunden sind.
4. Anordnung nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Anordnung eine Steuereinrichtung zum selektiven Zuführen von Behandlungssubstanz von den Verteilungen (10A, 10B) aufweist.
5. Anordnung nach einem der Ansprüche 1 bis 4, **dadurch gekennzeichnet, dass** der Innendurchmesser von jeder Verteilung (10A, 10B) von 8 mm bis 56 mm beträgt.
6. Verfahren für eine Beschichtungs- oder Leimungspartie einer Faserbahnherstellungslinie, wobei in dem Verfahren eine Behandlungssubstanz, insbesondere ein Beschichtungs- oder Leimungsmittel, mittels Sprühen durch Düsen (20A, 20B), die in einer Düsenreihe (21) angeordnet sind, die sich in einer Querrichtung, d. h. in der Breitenrichtung der Faserbahn erstreckt, aufgebracht wird, um die Behandlungssubstanz auf die Faserbahn zu sprühen, **dadurch gekennzeichnet, dass** in dem Verfahren die Behandlungssubstanz zu den Düsen (20A, 20B) in der einen Düsenreihe mittels wenigstens zweier Verteilungen (10A, 10B) zugeführt wird, und dass in dem Verfahren die Behandlungssubstanz mittels der wenigstens zwei Verteilungen (10A, 10B) zugeführt wird, die jeweils mit abwechselnden Düsen (20A, 20B) der einen Düsenreihe (21) verbunden sind, die sich mit den Düsen (20A, 20B) der einen Düsenreihe (21) abwechseln.
7. Verfahren nach Anspruch 6, **dadurch gekennzeichnet, dass** in dem Verfahren die Behandlungssubstanz mittels zweier Verteilungen (10A, 10B) abwechselnd zu den Düsen (20A, 20B) der einen Düsenreihe (21) zugeführt wird.
8. Verfahren nach Anspruch 6, **dadurch gekennzeichnet, dass** in dem Verfahren unterschiedliche Behandlungssubstanzen oder Bestandteile der Behandlungssubstanz mittels unterschiedlicher Verteilungen (10A, 10B) zugeführt werden.

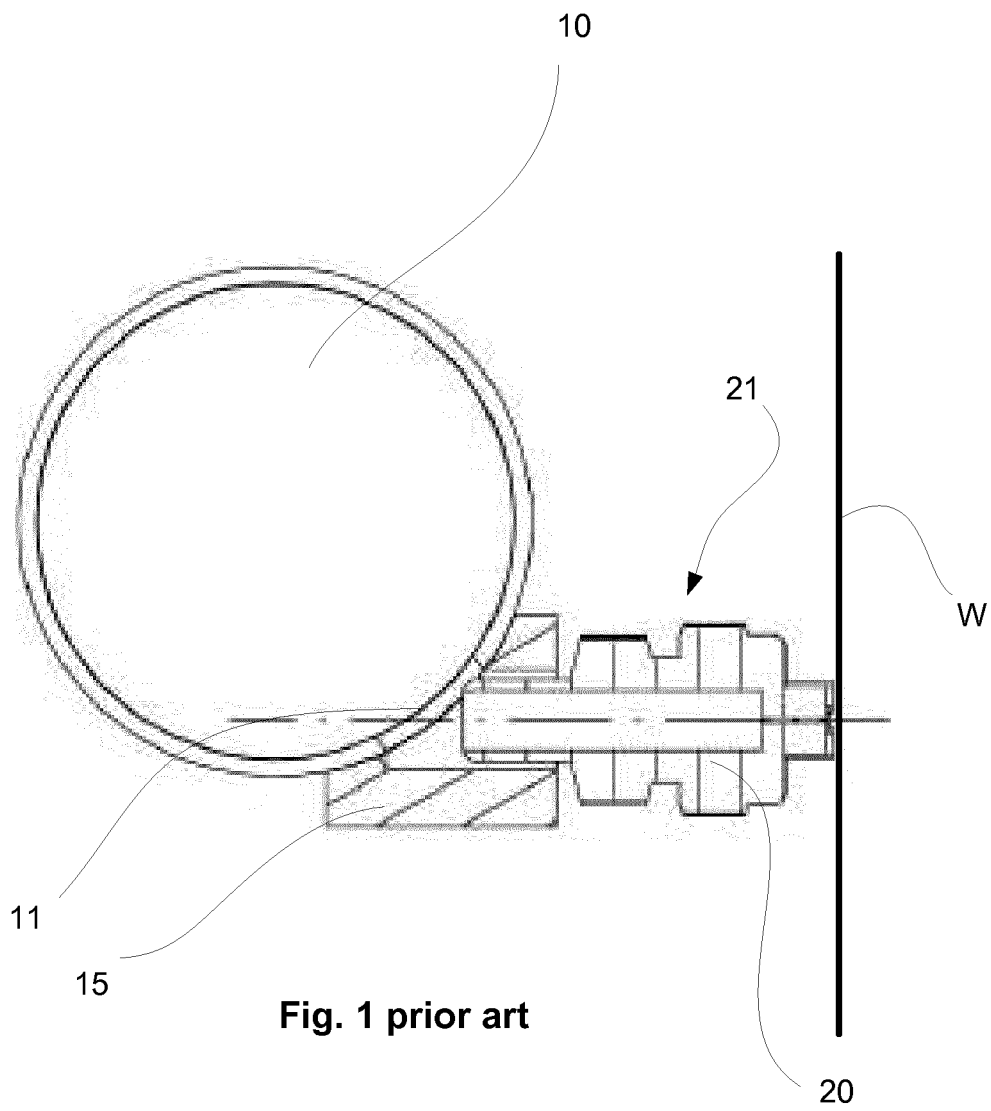
9. Verfahren nach Anspruch 8, **dadurch gekennzeichnet, dass** in dem Verfahren unterschiedliche Substanzen oder Bestandteile der Substanzen aus den folgenden Kombinationen ausgewählt werden: Farbsubstanz - hydrophobe Substanz, eine Farbsubstanz - eine andere Farbsubstanz, Substanzen mit unterschiedlicher Viskosität und Feststoffgehalt.
10. Verfahren nach Anspruch 6, **dadurch gekennzeichnet, dass** in dem Verfahren eine unterschiedliche Menge der Behandlungssubstanz durch unterschiedliche Verteilungen (10A, 10B) zugeführt wird.

Revendications

1. Agencement dans une section de revêtement ou d'encollage d'une ligne de production de bande fibreuse, dans laquelle section de la substance de traitement, en particulier un fluide de revêtement ou d'encollage, est appliquée sur la bande fibreuse par pulvérisation, lequel agencement comprend des buses (20A, 20B) situées dans une rangée de buses (21) s'étendant dans un sens transversal, c'est-à-dire dans le sens de la largeur de la bande fibreuse, pour pulvériser la substance de traitement sur la bande fibreuse, **caractérisé en ce que** l'agencement comprend au moins deux tuyaux de distribution (10A, 10B) connectés aux buses (20A, 20B) pour fournir de la substance de traitement aux buses (20A, 20B) dans l'une des rangées de buses (21) et que, dans l'agencement, les au moins deux tuyaux de distribution (10A, 10B) sont chacun connectés à des buses alternées (20A, 20B) de cette rangée de buses (21).
2. Agencement selon la revendication 1, **caractérisé en ce que** les lignes centrales des buses (20A, 20B), en particulier pour différents tuyaux de distribution (10A, 10B), sont décalées (O) de +/- 20 mm, avantageusement de +/- 10 mm dans la rangée de buses (21).
3. Agencement selon l'une quelconque des revendications 1 ou 2, **caractérisé en ce que** l'agencement comprend deux tuyaux de distribution (10A, 10B), chacun connecté à des buses alternées (20A, 20B) de la rangée de buses (21).
4. Agencement selon la revendication 1 à 3, **caractérisé en ce que** l'agencement comprend un moyen de commande pour fournir sélectivement de la substance de traitement en provenance des tuyaux de distribution (10A, 10B).
5. Agencement selon la revendication 1 à 4, **caracté-**

risé en ce que le diamètre intérieur de chaque tuyau de distribution (10A ; 10B) va de 8 mm à 56 mm.

6. Procédé de revêtement ou d'encollage d'une ligne de production de bande fibreuse, dans lequel procédé une substance de traitement, en particulier un fluide de revêtement ou d'encollage, est appliquée sur la bande fibreuse en pulvérisant par des buses (20A, 20B) situées dans une rangée de buses (21) s'étendant dans un sens transversal, c'est-à-dire dans le sens de la largeur de la bande fibreuse, pour pulvériser la substance de traitement sur la bande fibreuse, **caractérisé en ce que**, dans ce procédé, la substance de traitement est apportée aux buses (20A, 20B) dans la rangée de buses par au moins deux tuyaux de distribution (10A, 10B) et que, dans le procédé, la substance de traitement est fournie par les au moins deux tuyaux de distribution (10A, 10B) qui sont chacun connectés à des buses alternées (20A, 20B) de la rangée de buses (21), en alternance aux buses (20A, 20B) de la rangée de buses (21). 5
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7. Procédé selon la revendication 6, **caractérisé en ce que**, dans ce procédé, la substance de traitement est fournie par deux tuyaux de distribution (10A, 10B) en alternance aux buses (20A, 20B) de la rangée de buses (21) . 25
8. Procédé selon la revendication 6, **caractérisé en ce que**, dans ce procédé, différents substances de traitement ou composants de la substance de traitement doivent être fournis via différents tuyaux de distribution (10A, 10B). 30
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9. Procédé selon la revendication 8, **caractérisé en ce que**, dans ce procédé, différents substances ou composants de la substance sont sélectionnés parmi les combinaisons suivantes : substance en couleur - substance hydrophobe, une substance de couleur - une autre substance de couleur, substance ayant une viscosité et une teneur en solides différents. 40
10. Procédé selon la revendication 6, **caractérisé en ce que**, dans ce procédé, un volume différent de substance de traitement est fourni par différents tuyaux de distribution (10A, 10B). 45
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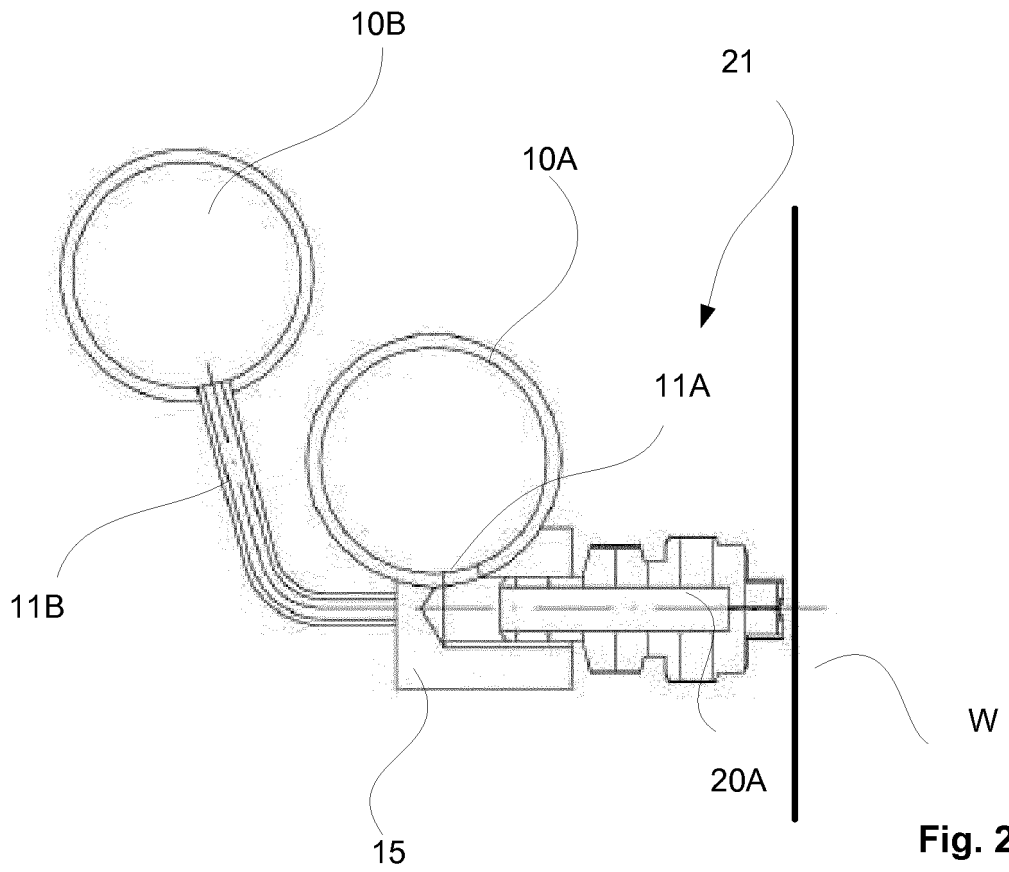


Fig. 2

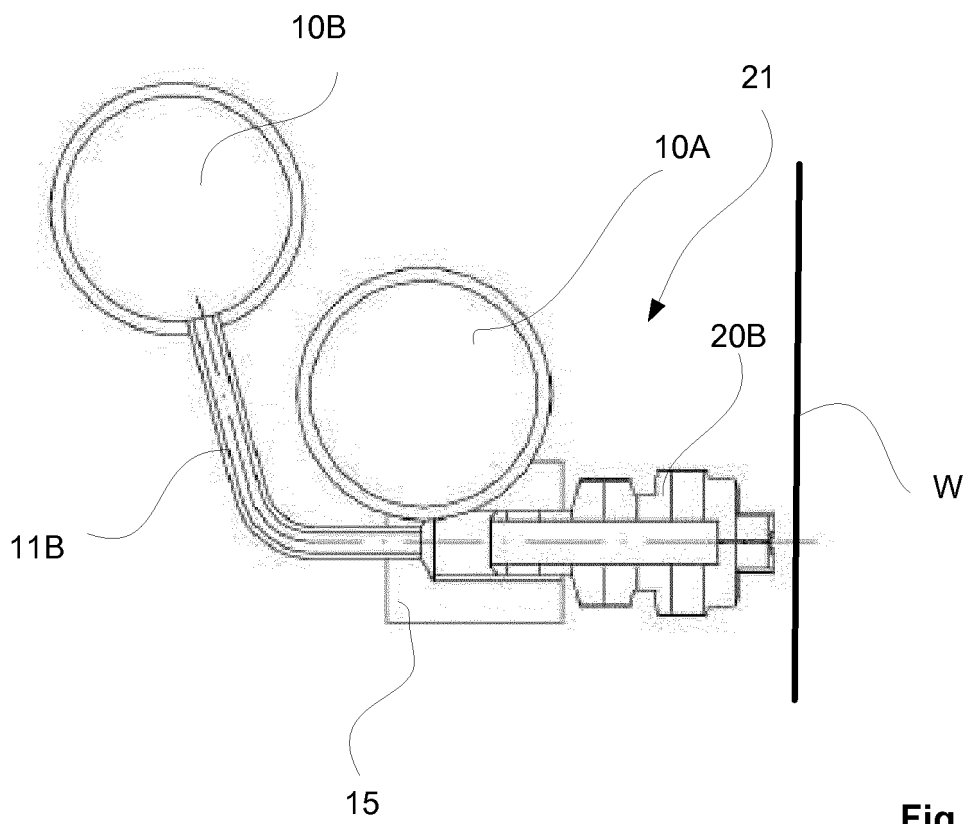


Fig. 3

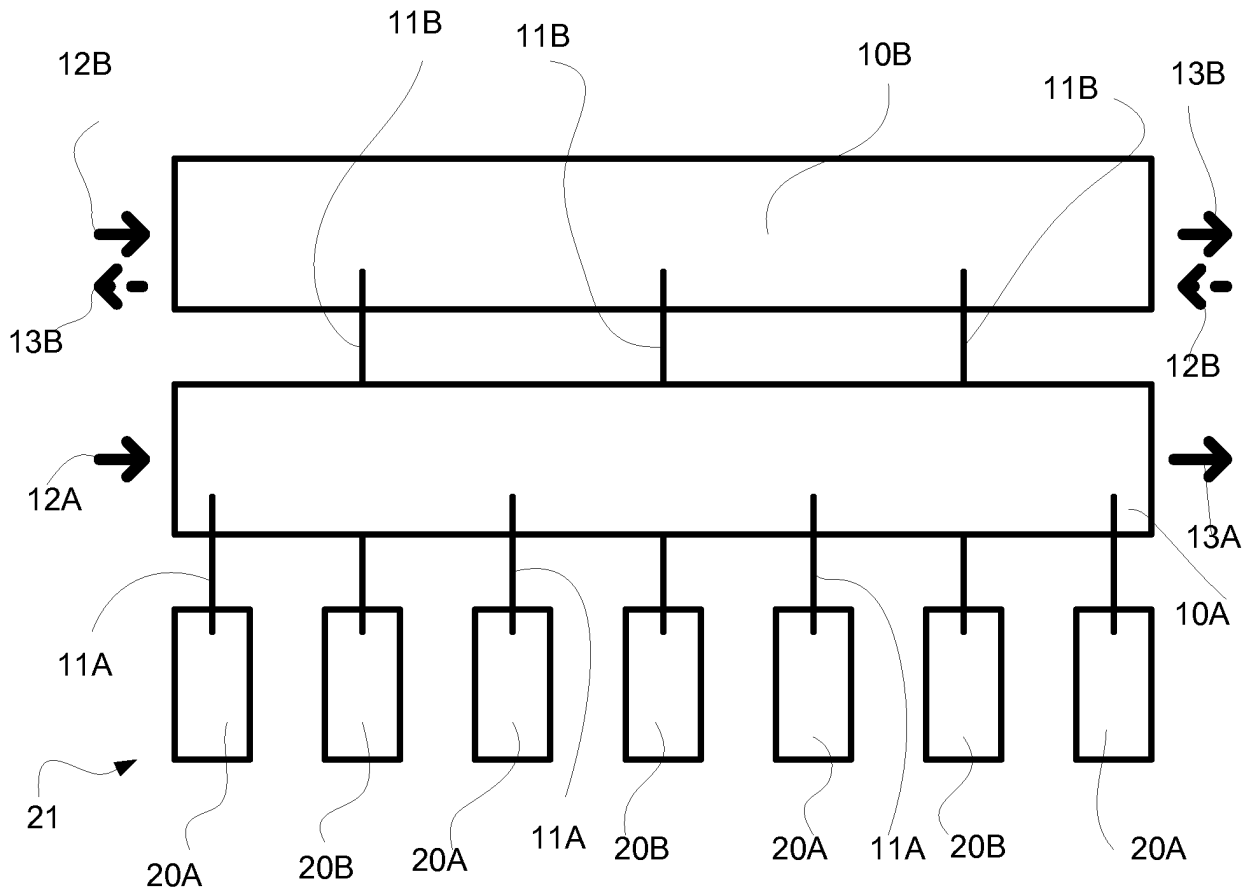


Fig. 4

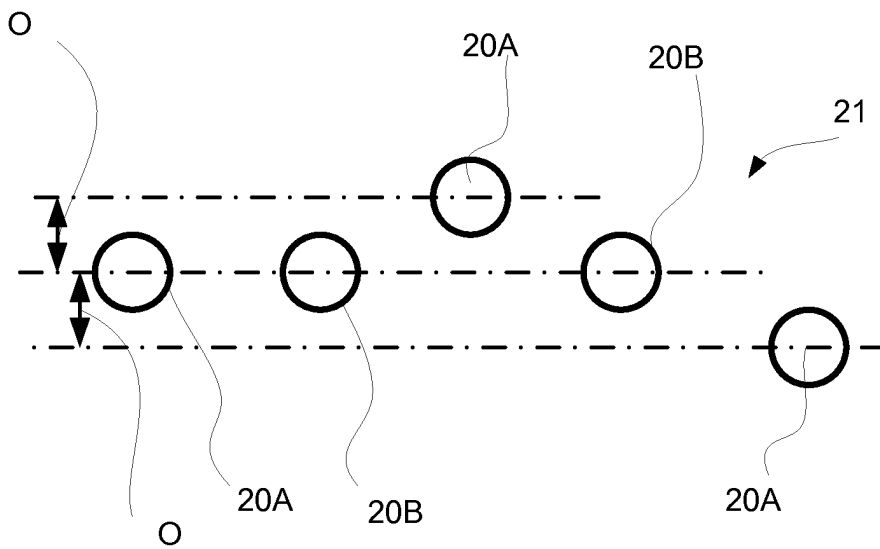


Fig. 5A

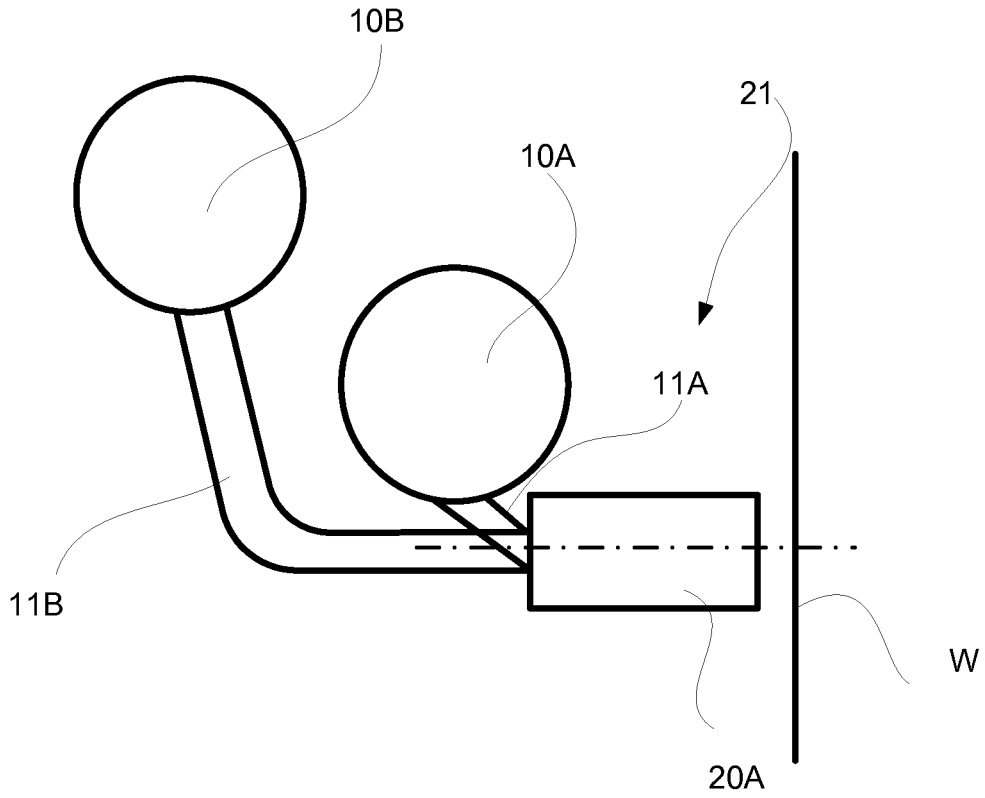


Fig. 5B

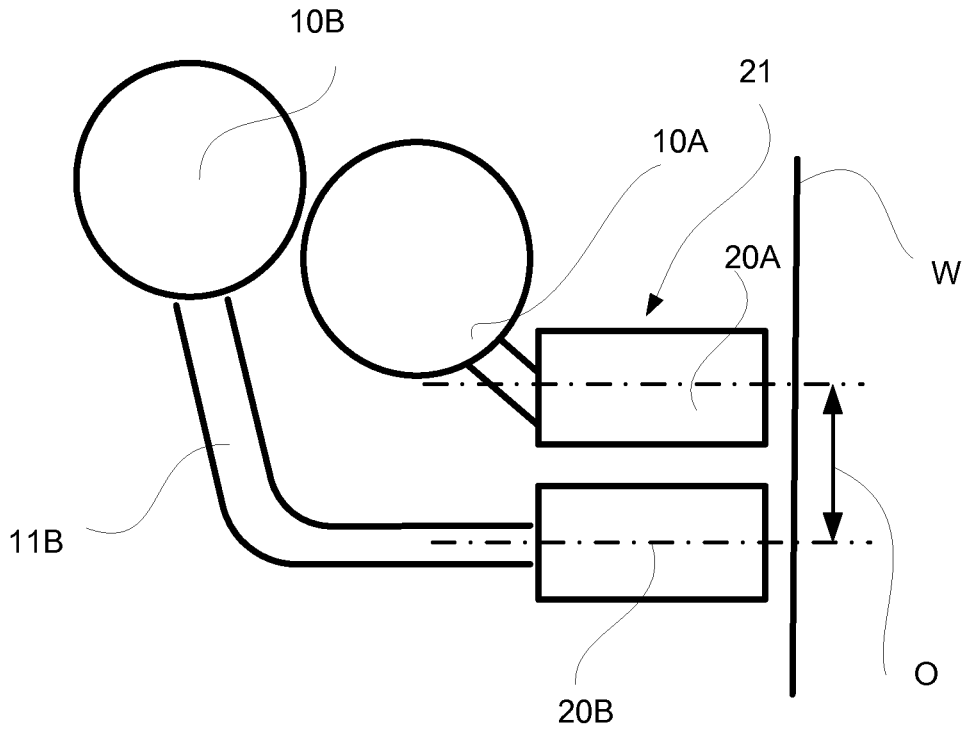


Fig. 5C

REFERENCES CITED IN THE DESCRIPTION

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