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(71) Applicant: **Valmet Technologies, Inc.**
02150 Espoo (FI)

(72) Inventor: **Vatanen, Heikki**
FI-04410 Järvenpää (FI)

(74) Representative: **Berggren Oy Ab**
P.O. Box 16
Antinkatu 3 C
00101 Helsinki (FI)

(54) Coating or sizing device for applying treatment substance on a fiber web

(57) The invention relates to a coating or sizing device for applying treatment substance on a fiber web, which device comprises an application unit with an application module (10) for applying the treatment substance onto the fiber web or onto the a roll (11) for transferring the treatment substance onto the fiber web, which application unit comprises a support beam (12), on which the application module (10) is supported. The application module (10) is attached to the support element (12) by a floating mounting (30, 31).

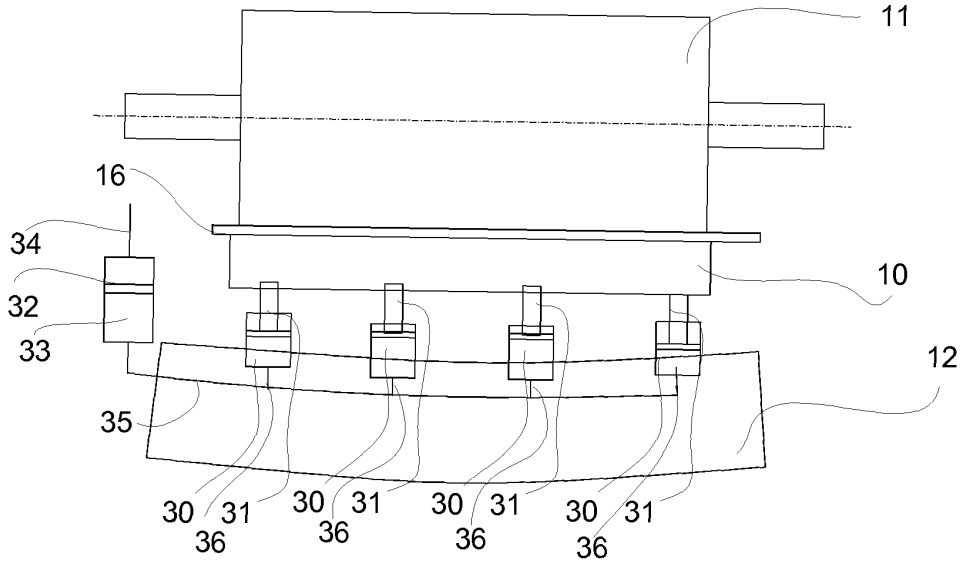

Fig. 1

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Description

[0001] The invention relates to a coating or sizing device for applying treatment substance on a fiber web, which device comprises an application unit with an application module for applying the treatment substance onto the fiber web or onto a roll for transferring the treatment substance onto the fiber web. More especially the invention relates to an application unit according to the preamble of claim 1.

[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 also comprises at least one winder for forming customer rolls as well as a 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, treatment substances are added onto the fiber web directly or by first applying the treatment substance onto a surface of a roll that then transfers the treatment substance onto the fiber web. Sizing is used to alter the properties of a fiber web by adding sizing agents (sizing medium), for example glue chemicals onto the surface of the fiber web at the fiber web machine. In coating onto surface of a fiber web, is added a layer or layers of coating color (coating medium) at a coating station followed by drying.

[0004] The coating or the sizing of a fiber web typically utilizes a coating device - a coater - or a sizing device - a sizer. In connection with the coaters and sizers different kinds of application technology for application of the coating medium or the sizing medium on the fiber web are employed, for example curtain technology or blade coating technology or film transfer technology or rod coating technology or air brush coating technology or spray coating technology. In some types of coaters and sizers, for example film transfer coaters, an application module of an application unit is utilized for applying the treatement substance on to a coating roll for then transferring it onto the fiber web of for applying the treatment substance directly onto the fiber web. Typically the application unit and the application module supported on a support beam of the application unit extend over the whole width of the fiber web and can thus be even over 10 meters long. The application module is slender and its own stiffness is not enough to provide the required loading force for the application element, such as a doctor blade or a rod, and therefore the required stiffness is provided by the stiff support beam or element. The treatment substance is fed to the application module at one of its longitudinal ends and applied through feed openings located spaced apart in longitudinal direction of the application module and at the other longitudinal end is provided a flow-through.

[0005] In cases when applying the treatment substance indirectly onto the fiber web i.e. by first applying the treatment substance onto a surface of a roll from the application module, the treatment substance is applied onto the surface of the roll, for example the sizing or the coating roll, just before the application element, for example the doctoring blade or the rod. The space before the blade or the rod is delimited by a dam blade or by an over-flow edge to create a space filled with the treatment substance in order to ensure that no areas without the treatment substance exists.

[0006] In order to provide even and desired treatment substance application one i m-portant requirement of the application module is straightness, which is accomplished by straightness of the support element of composite material or of steel structure with a cooling liquid space for uniform temperature or with pneumatic devices or the steel structure may be without cooling liquid and/or temperature isolated and/or sheathed. Independent of the material of the support element deflection of the support element due to application forces of the application element causes geometric error and undesired variation of application force in cross direction of the application i. e. in cross direction of the fiber web. In order to minimize the geometric error very stiff support beams with large cross section and very strict operational temperature adjustment have been required.

[0007] In the coating or sizing based on blade or film transfer technology the application element, i.e. the blade or the rod is attached to a holder, for example to a rod-bed. The holder with accompanying support and fastening means is in turn attached to a beam or corresponding support structure arranged on the frame of the machine. Typically the beam or corresponding support structure of a coating / sizing rod/blade is arranged movable by loading means arranged at each end of the beam or corresponding support structure by which the main loading of the blade or rod is provided. In cross direction of the web to be coated or sized the loading of the blade or rod is typically arranged by profiling loading means for example by spindles that load cross-directional means for example a loading hose (a hose-loaded blade) and/or by a rigid loading plate, which spindles are spaced apart at certain, typically short intervals at the cross direction of the fiber web to be coated or sized. Thus as many as 150 spindles are needed in cross direction of the fiber web. In a hose-loaded blade or rod in a fiber web machine in coating or sizing devices, the contact force of the blade or rod on the opposing surface is increased by means of loading hoses acting on the blade or rod holder. Loading hoses normally have an oval cross-section. The loading hose is set between the holder and its support. For example a couple of millimeters deflection of the application module may create a 10% change in loading of the load-

ing hose, which will cause visible changes in treatment application on the fiber web when grooved application rod is used and in cases a smooth surfaced application rod is used even smaller deflections will cause visible changes in application of the treatment substance. Furthermore when there are changes in loading may cause problems in the function of the dam blade or the overflow edge since the lubrication conditions of the blade/edge may decrease and air may enter to the space before the application element.

[0008] An object of the invention is to create a coating or sizing device for applying treatment substance on a fiber web, in which the above problems and disadvantages are eliminated or at least minimized.

[0009] An object of the invention is to create in which the problems relating to the deflection of the application module and/or of the support element of the application module of the coating or sizing device are eliminated or at least minimized.

[0010] Another object of the invention is to provide an application unit of a coating or sizing device, which is producible cost-effectively.

[0011] In order to achieve the above objects the coating or sizing device for applying treatment substance on a fiber web according to the invention is mainly characterized by the features of claim 1.

[0012] According to the invention the coating or sizing device for applying treatment substance on a fiber web, which device comprises an application unit with an application module for applying the treatment substance onto the fiber web or onto a roll for transferring the treatment substance onto the fiber web, which application unit comprises a support beam, on which the application module is supported and which application module is attached to the support element by a floating mounting.

[0013] Advantageously the floating mounting comprises an adjustment cylinder system comprising fluid filled adjustment cylinders with pistons, which are connected to each other by their infeed lines via the fluid channel. The adjustment cylinders are spaced apart in the cross direction of the fiber web. Advantageously the adjustment cylinder system also comprises an expansion container, for example a short stroke cylinder or a hydraulic accumulator.

[0014] Advantageously the application module is supported on the support element by an articulated attachment or by gliding surfaces in tangential direction of the roll of the coating device and by fluid filled adjustment cylinders of the adjustment cylinder system, which cylinders in the system are connected to each other. The articulated fixing point of the articulated attachment is advantageously positioned close to or at a tangent of the roll at the contact point of the application element, for example a rod or a blade, such that the angular difference between the tangent and a straight line passing through the application element and the articulated fixing point is less than 50°. The articulated fixing point of the application module is positioned advantageously such that perpendicular displacement in respect of the tangent executes the equation: angular change of the application module < 0,5 °/ 1 mm.

[0015] According to an advantageous aspect of the invention in the coating or sizing device the floating mounting application unit the floating mounting located between the application module and the support element compensates and corrects the deflection of the application module and/or the support element and keeps the application element perpendicularly against the roll. Furthermore advantageously the articulated attachment positioned on the tangent of the roll at the application point of the application element perpendicular to the roll surface compensates the movement in direction of the tangent. By this the reach of the loading hose of the application element does not change and desired loading, advantageously constant loading in cross direction can be provided without profiling spindles.

[0016] Advantageously the adjustment cylinders are spaced apart in the cross direction of the fiber web and the distance between the cylinders is defined based on the stiffness of the support element so that the loading force remains constant, advantageously the distance between two cylinders next to each other is 500 - 2000 mm. Thus only about 3-10 cylinders are needed.

[0017] Advantageously the expansion container is automatically controlled based on the position of the application module, for example in home i.e. non-operating and the operating position.

[0018] Advantageously the adjustment cylinder system may be provided with automatic filling function via infeed line of the expansion container to be used for example in case of leaks of the system.

[0019] According to an advantageous feature the motion sensitivity and speed of the adjustment cylinders can be controlled by providing each infeed line of each adjustment cylinder a throttle and/or by choice of viscosity of the fluid.

[0020] In the operation the cylinders of the adjustment cylinder system are first actuated to home position, advantageously by using the expansion container when the application module is not in operation position. When the application module is moved to operating position, pressure in the expansion container is removed or the pressure of the expansion container or expansion cylinder is set to be significantly lower than the pressure in the system during operation stage and the adjustment cylinders of the system will adjust positions of their pistons until the pressure has evened out or advantageously the piston of the cylinder of the expansion system has reached the end of the stroke. After this the adjustment cylinders form a closed system, in which each cylinder has the same support force. When the application unit and/or the support element deflect, the corresponding adjustment cylinder/-s adapts new position maintaining the constant support force in relation to the application module. Thus the adjustment system provides that the application element load against the roll is constant in cross direction

of the fiber web i.e. in longitudinal direction of the roll.

[0021] By the invention the requirements of the support element of the application module can be reduced and simultaneously a very constant force of the application element is reached.

[0022] According to another aspect of the invention the adjustment cylinders are replaced by adjustment screws that are manually or automatically operated. This requires good conditioning of the operating environment.

[0023] The application unit is utilized for applying the treatment substance directly onto the fiber web or on to a coating roll or on to a sizing roll for then transferring it onto the fiber web. The application unit extends over the whole width of the fiber web and can be over 10 meters long. The treatment substance is fed to the application module of the application unit at one of its longitudinal ends and applied from a feed chamber through feed openings located spaced apart in longitudinal direction of the application module and at the other longitudinal end is provided a flow-through.

[0024] In the following the invention is described in more detail with reference to the accompanying drawing, in which

Figure 1 is a schematic example of one advantageous application unit according to the invention seen from above of the treatment substance applying device.

Figure 2 is a schematic example of one advantageous application unit according to the invention seen from side of the treatment substance applying device as a schematical cross section.

[0025] In the schematic example of figure 1 an application module 10 of an application unit is provided for applying treatment substance onto surface of a roll 11 of a coating or sizing device (not shown). The treatment substance is dosed by a rod 16 of the application module 10. The application module 10 is supported by the support element 12 of the application unit. The application unit comprising the support element 12 and the application module 10 and the application module 10 is supported on the support element 12 by a floating mounting comprising in this example is an adjustment cylinder system comprising fluid filled adjustment cylinders 30 with pistons 31, which are connected to each other by their infeed lines 36 via the fluid channel 35. The adjustment cylinders 30 are spaced apart in the cross direction of the fiber web. Advantageously the adjustment cylinder system also comprises an expansion container 33, which in this example is a short stroke cylinder.

[0026] In as shown in the example of figure 2 the connecting element 17 connects the rod-bed 15 of the rod 16 to the application module 10. The rod-bed 15 and thus the rod 16 are loaded by the pneumatic loading hose 14, the pressure of which is controlled by a pressure regulator (not shown). The pneumatic loading hose is supported by connecting and adjusting means 13, which can be profiling, to connecting element 17. A dam blade 18 is attached to the application module 10 by attachment means 19 to create a space filled with the treatment substance. The application module 10 is also supported on the support element by an articulated attachment at an articulated fixing point 21 in tangential direction T of the roll 11 at the application point of the application element, for example a rod 16 via the support arm 22. The adjustment cylinder system is provided with filling inlet 34.

[0027] The support arm 22 and the adjustment cylinder 30, 31 comprise attachment shafts (not shown) that provide a gliding attachment to the support element 12 in cross direction of the fiber web and provide a tolerance, for example 10 mm, for longitudinal variation caused by thermal expansion for the application module 10 in relation to the support element 12.

[0028] As can be seen from figures 1 and 2 the application module 10 is adjustable about the articulated attachment 21 in perpendicular direction S in relation to the roll 11 by the adjustment cylinder system. The cylinders of the adjustment cylinder are of their one end connected to the support arm 22 of the application module 10 at fixing point 39 and of their other end by fixing point 38. In this example the fixing points 38, 39 are provided at corresponding lugs 37, 27 of the support element 12.

[0029] In the operation the cylinders 30 of the adjustment cylinder system are first actuated to out-position, advantageously by using the expansion container 33 when the application module 10 is not in operation position. When the application module 10 is moved to working position, pressure in the expansion container 33 is removed and the adjustment cylinders 30 of the system will adjust positions of their pistons 31 until the pressure has evened out or advantageously the piston 32 of the cylinder 33 of the expansion container has reached the end of the stroke. After this the adjustment cylinders 30 form a closed system, in which each cylinder 30 has the same support force. When the application module 10 deflects, the corresponding adjustment cylinder/-s 30 adapts new position maintaining the constant support force in relation to the application module 10. Thus the adjustment system provides that the application element i.e. rod the 15 load against the roll 11 is constant in cross direction of the fiber web i.e. in longitudinal direction of the roll 11. Advantageously the expansion container 33 is automatically controlled based on the position of the application module 10, for example in home i.e. non-operating and the operating position.

[0030] The application module 10 is utilized for applying the treatement substance on to the roll 11 for then transferring it onto the fiber web of for applying the treatment substance directly onto the fiber web (not shown). The application unit extends over the whole width of the fiber web and can be over 10 meters long. The treatment substance is fed to the application module 10 at one of its longitudinal ends and applied from a feed chamber through feed openings (not shown) located spaced apart

in longitudinal direction of the application module 10 and at the other longitudinal end is provided a flow-through. The application module comprises for example 240 feed openings at 50mm distance in a 12 meters long application module 10. In the example of the figures 1 and 2 the cross section of the application module 10 and of the support beam 12 is substantially round but also other forms can be utilized.

Reference signs used in the drawing

[0031]

10	application module
11	roll
12	support element, or support beam
13	connecting and adjusting means
14	pneumatic loading hose
15	holder or rod-bed
16	rod or application element
17	connecting element
18	dam blade / over-flow edge
19	attachment means for the dam blade
21	articulated attachment, or articulated fixing point
22	support arm
27	lug
30	adjustment cylinder
31	piston of an adjustment cylinder
32	piston of an expansion container
33	expansion container
34	filling fluid inlet
35	fluid channel
36	infeed line
37	lug
38	fixing point
39	fixing point
S	direction
T	tangent

Claims

1. Coating or sizing device for applying treatment substance on a fiber web, which device comprises an application unit with an application module (10) for applying the treatment substance onto the fiber web or onto a roll (11) for transferring the treatment substance onto the fiber web, which application unit comprises a support beam (12), on which the application module (10) is supported, **characterized in that** the application module (10) is attached to the support element (12) by a floating mounting (30, 31).

2. Coating or sizing device according to claim 1, **characterized in that** the floating mounting comprises an adjustment cylinder system comprising fluid filled adjustment cylinders (30) each with a piston (31), which cylinders (30) are connected to each other by their infeed lines (36) via the fluid channel (35).

3. Coating or sizing device according to claim 1, **characterized in that** the adjustment cylinders (30) are spaced apart in the cross direction of the fiber web and **that** the distance between two cylinders next to each other is 500-2000 mm.

4. Coating or sizing device according to claim 2 or 3, **characterized in that** the adjustment cylinder system also comprises an expansion container (33), for example a short stroke cylinder a hydraulic accumulator.

5. Coating or sizing device according to claim 1, **characterized in that** the application module (10) is further supported on the support element (12) by an articulated attachment or by gliding surfaces in tangential direction of the roll (11) of the coating device and **that** the articulated attachment (21) is positioned close to or at a tangent (T) of the roll (11) at the contact point of an application element (16), for example a rod or a blade, of the application module (10) such that perpendicular displacement in respect of the tangent executes the equation: angular change of the application module < 0,5 °/ 1 mm.

6. Coating or sizing device according to any of previous claims 1 - 5, **characterized in that** in the coating or sizing device the floating mounting application unit the floating mounting (30, 31) located between the application module (10) and the support element (12) is provided to compensate and correct the deflection of the application module (10) and/or the support element (12) and to keep the application element of the application module (10) perpendicularly against the roll (11) and **that.** the articulated attachment (21) of the application module (10) to the support element (12) positioned on the tangent (T) of the roll (11) at the application point of the application element (16) perpendicular to the roll (11) surface is provided to compensate the movement in direction of the tangent.

7. Coating or sizing device according to claim 4, **characterized in that** the expansion container (33) is automatically controlled based on the position of the application module (10).

8. Coating or sizing device according to claim 2, **characterized in that** the adjustment cylinder system is provided with automatic filling function via infeed line (36).

9. Coating or sizing device according to claim 2, **characterized in that** motion sensitivity and speed of the adjustment cylinders (30) of the adjustment cylinder system is controlled by providing each infeed line

(36) of each adjustment cylinder (30) a throttle.

10. Coating or sizing device according to claim 2, **characterized in that** motion sensitivity and speed of the adjustment cylinders (30) of the adjustment cylinder system is controlled by choice of viscosity of the fluid.

11. Coating or sizing device according to claim 1, **characterized in that** the floating mounting is provided by adjustment screws that are manually or automatically operated.

12. Coating or sizing device according to any of previous claims 1-11,
characterized in that the application unit is utilized for applying the treatment substance on to a coating roll or on to a sizing roll for then transferring it onto the fiber web or directly onto the fiber web and **that** the application unit (10) extends over the whole width of the fiber web and that the treatment substance is fed to the application module (10) of the application unit at one of its longitudinal ends and applied from a feed chamber through feed openings located spaced apart in longitudinal direction of the application module (10) and at the other longitudinal end is provided a flow-through.

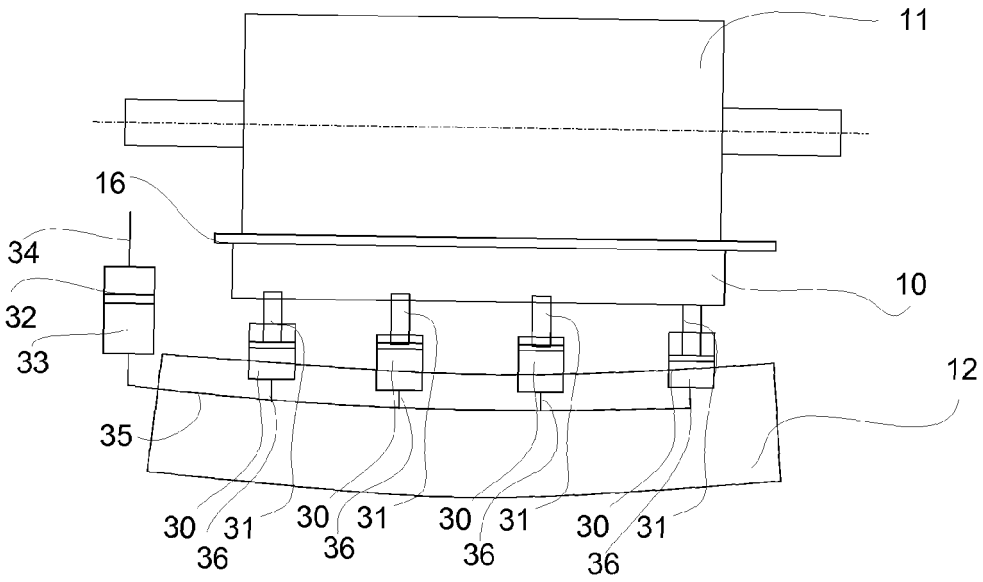
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Fig. 1

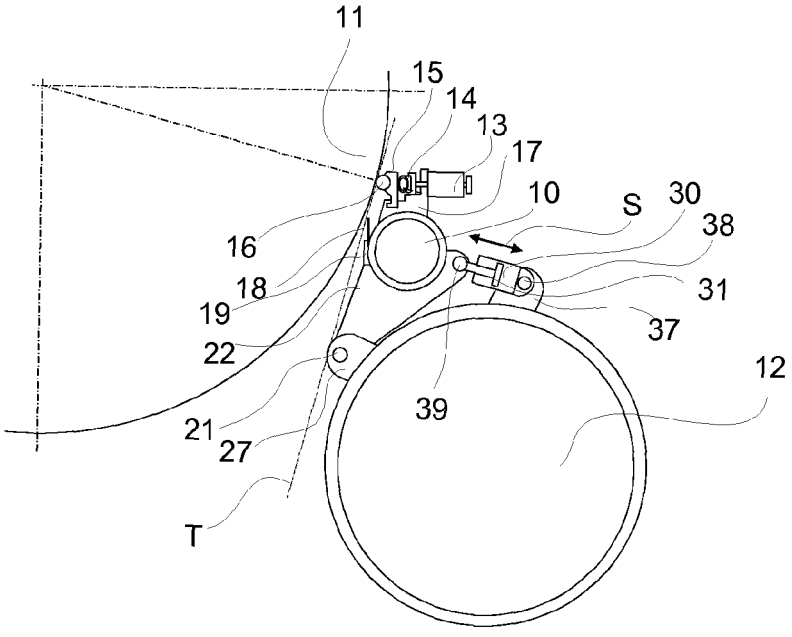
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Fig. 2

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EUROPEAN SEARCH REPORT

Application Number
EP 13 17 2058

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TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 December 2013	Naeslund, Per

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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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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