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(54) **METHOD AND SYSTEM FOR THE OPTIMIZATION OF PROPERTIES OF A MULTILAYER FIBER WEB IN FIBER WEB MANUFACTURE**

VERFAHREN UND SYSTEM ZUM OPTIMIEREN DER EIGENSCHAFTEN EINER MEHRSCHICHTIGEN FASERSTOFFBAHN IN DER FASERBAHNHERSTELLUNG

PROCÉDÉ ET SYSTÈME POUR L'OPTIMISATION DES PROPRIÉTÉS D'UNE BANDE DE FIBRES MULTICOUCHE PENDANT LA FABRICATION DE BANDES DE FIBRES

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Description

[0001] The present invention relates to a method for the optimization of the properties of a multilayer fiber web in the manufacture of a fiber web, in which method the multilayer fiber web is formed by feeding at least two stock suspensions that form a layer of the fiber web to a forming section from two or more headboxes divided into parallel feed zones, where those properties of the stock suspensions that affect the strength of the finished fiber web differ from each other, and the basis weight profile of the stock suspensions is adjusted in two or more headboxes by feeding dilution water in zones in the cross direction of the fiber web machine into each stock suspension.

[0002] The present invention also relates to a corresponding system.

[0003] In multilayer board machines such as liner machines, the cross-directional strength properties of the fiber web are critical in terms of the quality of the product. The objective is to minimize the variation of the cross-directional strength properties of the fiber web in the cross direction of the fiber web. The uneven contraction of the fiber web in the dryer section leads to a deterioration of the cross-directional strength properties on the edges of the fiber web, since there is more contraction on the edges of the fiber web than in the center. Poorer cross-directional strength on the edges of the fiber web may even cause the rejection of edge rolls in quality control, if the edge rolls do not fulfill the strength requirements of the order. The strength problem can be solved by increasing the basis weight of the fiber web on the edges, but in this case expensive raw material is lost when the required basis weight is exceeded in the edge rolls. One prior art solution is disclosed in FI 121888 B, which presents a method for the optimization of the cross-directional profile of the fiber web. In this method, the headbox of the fiber web machine is divided into several parallel feed zones, and at least two different stock suspensions are fed into each of these feed zones. The different stock suspensions contain fractions with different fiber lengths, advantageously the first stock suspension contains short-fiber fraction and the second stock suspension contains long-fiber fraction. In this way, by feeding a stock suspension that contains more long-fiber fraction to the edges of the fiber web than to the center of the fiber web, it is possible to raise the strengths of the edges after drying to the same level as the strengths in the center part of the fiber web. In other words, an even strength profile can be attained by means of the method.

[0004] However, the problem with the method in accordance with FI 121888 B is that the different fiber fractions are mixed with each other as late as in the headbox, which makes the design of the headbox complicated and complicates the functioning of the adjustment system of the cross-directional basis weight of the fiber web.

[0005] US 6 284 100 B1 discloses a method and apparatus for controlling the mixing proportions of feed streams being supplied to a headbox, using devices for sampling two or more of the feed streams upstream of the headbox and devices for measuring concentration of constituents in or other properties of those samples. A method of regulating one or more properties of a moving web, and especially a paper web during manufacture, employing the aforesaid method and apparatus are also disclosed.

[0006] DE 195 14 236 A1 discloses a box for a paper machine for producing two- or multi-layer paper having a number of distributors corresponding to the number of layers. Each of them features a number of connections for the discharge of sub-currents. The sub-currents coming from one distributor are staggered in relation to the currents coming out of another distributor. The staggering occurs transversely to the machine direction.

[0007] DE 10 2009 028 135 A1 discloses a method involving dividing a head box in multiple parallel food zones. Each food zone is charged with two different material suspensions that are obtained by the fractionation of a material suspension which is introduced in a short fiber fraction and a long fiber fraction. The long fiber fraction contains the long and stiff fibers, where the cross profile of the fiber web is optimized by the regulation of add-on ratio of the short fiber fraction to the long fiber fraction in the individual parallel food zones.

[0008] WO 2004/109010 A1 discloses a method for manufacturing a multilayer paper or board web containing recycled fiber. The method comprises forming the multilayer web of at least two layers having stock compositions different from each other and diluting the pulp suspension in the formation of each layer with wire water into headbox consistency and feeding it by means of a headbox to a wire section, where the web is dewatered, and joining these layers to form a multilayer web. The method also comprises the step of passing the wire water removed from the wire section in the forming of each layer to be used in the dilution of a pulp suspension, to be fed, of another layer.

[0009] The object of the present invention is to accomplish a method that is more cost effective than the prior art methods for the optimization of the properties of a multilayer fiber web, and to accomplish a system for the optimization of the properties of a multilayer fiber web, which system is more advantageous to use than prior art systems.

[0010] The object of the invention is achieved by a method having the features of claim 1 and by a system having the features of claim 5.

[0011] Further advantageous developments of the present invention are defined in the dependent claims.

[0012] According to the invention, a method for the optimization of the properties of a multilayer fiber web in the manufacture of a fiber web is provided, in which method the multilayer fiber web is formed by feeding at least two stock suspensions that form a layer of the fiber web to a forming section from two or more headboxes divided into parallel feed zones, where those properties of the

stock suspensions that affect the strength of the finished fiber web differ from each other. The basis weight profile of the stock suspensions is adjusted in two or more headboxes by feeding dilution water in zones in the cross direction of the fiber web machine into each stock suspension. In the method, the cross-directional basis weight profile and strength of the formed fiber web are adjusted in the cross direction of the fiber web machine by adjusting the amount of dilution water in zones separately in each stock suspension fed. By using the dilution of two different stock suspensions, it is possible to adjust the ratio between two different layers in the basis weight profile of a finished fiber web, and in this way the cross-directional basis weight profile and cross-directional strength properties of the finished fiber web can be made essentially even over the entire width of the fiber web.

[0013] The cross-directional strength of the fiber web can refer to the cross-directional compression strength or flat crush resistance. In the case of a multilayer fiber web, these strengths are usually more important strength indicators than tensile strength, which is naturally high in a product like this.

[0014] One of the two layers in the fiber web is a core layer and the other layer is a surface layer with better strength properties than in the core layer. The strength properties of the layers of the fiber web differ from each other, which enables a change in the strength properties in the fiber web by changing the mutual ratio of the layers.

[0015] Advantageously, the dilution of the stock suspensions fed can be adjusted independently of each other, in other words the dilution equipment used for the dilutions is not in an adjustment relation with respect to each other. In practice, however, the adjustment of dilution is restricted by a goal to a certain desired basis weight in the fiber web.

[0016] In the method, the basis weight profile of the fiber web is adjusted to an essentially even profile over the width of the fiber web by means of the dilution of the stock suspension that forms the core layer. In this case, it is possible to make the basis weight even by using the more advantageous stock suspension of the core layer. The dilution of the stock suspension that forms the thicker core layer also gives a greater adjustment response than the adjustment of the stock suspension that forms the thinner surface layer.

[0017] In the method, the strength profile of the fiber web is adjusted to an essentially even profile over the width of the fiber web by means of the dilution of the stock suspension that forms the surface layer. By means of the dilution of the surface layer, it is possible to dilute the stock suspension that comes to the center of the fiber web more than the stock suspension that comes to the edges, and in this way savings can be achieved in the raw material costs.

[0018] In this context, an essentially even basis weight profile means that the variation of basis weight in the cross direction of the fiber web is less than ± 1 g/m^2. Essentially even strength properties mean that the cross-directional strength properties of the fiber web vary no more than ± 2 %.

[0019] According to one embodiment, the basis weight profile of the fiber web is measured as an online measurement, and on the basis of the measurement result the dilution of the stock suspension that forms the core layer is adjusted in individual feed zones. In this case, the adjustment works as a feedback control circuit, and the basis weight profile can be adjusted easily in order to change the basis weight of the finished fiber web when shifting over from one grade to another.

[0020] Advantageously, the stock suspension fed to the core layer is diluted more in those feed zones of the headbox that form the edge area of the core layer of the fiber web than in those feed zones that form the center part of the fiber web. In this way, a greater part of the total basis weight of the fiber web on the edges can be composed of a surface layer that has better strength properties than the core layer, which surface layer produces the effect that improves the strength properties of the edges of the fiber web.

[0021] According to the invention, two or more headboxes are used, each adapted to feed one stock suspension. The use of separate headboxes enables a conventional design of the fiber web machine, where the different layers of a finished multilayer fiber web are formed initially on their own forming sections and are combined later into a uniform fiber web on the forming section.

[0022] According to another advantage of the present invention, a system for the optimization of the properties of a multilayer fiber web in the manufacture of a fiber web is provided, where the system includes two or more headboxes for the feeding of at least two different stock suspensions to form at least two layers of the fiber web, the strength properties of which differ from each other such that one of said two layers of the fiber web is a core layer and the other layer is a surface layer with better strength properties than in said core layer, and a dilution equipment divided into feed zones in the cross direction of each headbox, adapted in connection with the two or more headboxes for the dilution of the stock suspensions in zones in the cross direction of each headbox in at least some of the feed zones for the optimization of the properties of the fiber web. The dilution equipment is adapted to adjust separately in zones the amount of dilution water in each stock suspension fed for the adjustment of the cross-directional basis weight profile and strength of the formed fiber web in the cross direction, to adjust the basis weight profile of the fiber web to an essentially even profile over the width of the fiber web by means of the dilution of the stock suspension that forms said core layer, and to adjust the strength profile of the fiber web to an essentially even profile over the width of the fiber web by means of the dilution of the stock suspension that forms said surface layer. The system according to the invention is very advantageous to implement, because the system can be implemented without a complex headbox design and control system.

[0023] According to one embodiment, the system includes two headboxes, each for feeding one stock suspension, in which system the dilution equipment is adapted in connection with both headboxes. This enables the implementation of the system according to the invention in a relatively easy manner also in existing fiber web machines that produce multilayer fiber web.

[0024] The dilution equipment of the different stock suspensions is advantageously independent of each other. In this case, the dilution of the stock suspensions can be adjusted independently of each other, in other words the dilution equipment used for the dilutions is not in an adjustment relation with respect to each other. In practice, however, the adjustment of dilution is restricted by a goal to a certain desired basis weight in the fiber web.

[0025] More specifically, a characteristic feature of the method according to the invention is that the cross-directional basis weight profile and strength of the formed fiber web in the cross direction of the fiber web machine are adjusted in the method by adjusting the amount of dilution water in zones separately in each stock suspension fed.

[0026] More specifically, a characteristic feature of the system according to the invention is that the dilution equipment is adapted to adjust separately in zones the amount of dilution water in each stock suspension fed for the adjustment of the cross-directional basis weight profile and strength of the formed fiber web in the cross direction of the fiber web machine.

[0027] The advantage to be achieved with the method and system according to the invention is an essentially straight basis weight profile in the cross direction of the fiber web and an essentially straight strength profile in the cross direction.

[0028] Essentially straight in this context means that the profile is either completely straight or at least considerably straight with a deviation of only one per cent. This advantage can be achieved without increasing the raw material costs by changing the mutual ratio of layers equipped with different strength properties. At the same time, it is possible to reduce the proportion of fiber web going to broke in manufacture, which decreases the production costs and increases the efficiency of the fiber web machine.

[0029] The invention is described below in detail by making reference to the enclosed drawings that illustrate some embodiments of the invention, in which:

Figure 1 shows the system according to the first embodiment of the invention viewed from the side as a figure in principle,

Figure 2 shows the system according to the second embodiment of the invention viewed from the side as a figure in principle,

Figure 3 shows a headbox of the system according to the invention in the direction of the fiber web as a figure in principle,

Figure 4 shows the cross section of the basis weight profiles of the different layers of the fiber web attainable with the method according to the invention.

[0030] In accordance with Figure 1, a system 100 according to the invention includes at least two headboxes 12 for the feeding of at least two different stock suspensions onto a forming section 50 of a fiber web machine 200 to form a fiber web 10. According to the invention, two or more separate headboxes 12 each have dilution adjustment for one stock suspension. In principle, there can be dilution adjustments in more numerous feeds of stock suspensions fed, but in its simplest configuration the invention can be implemented by means of two dilution adjustments. So that the dilution adjustment gives the desired outcome, in other words even basis weight profile and strength profile in the cross direction of the fiber web, the dilution adjustments must be in stock suspensions where the properties of the stock suspensions differ from each other. In general, the core layer that forms the core of the fiber web in a multilayer fiber web contains a cheaper raw material than the surface layer, which cheaper raw material contains more short fiber than the surface layer and which has a poorer strength than the surface layer. The surface layer, in turn, is composed of a more expensive raw material than the core layer, in which more expensive raw material the proportion of long fibers is greater than in the core layer, and consequently also the strength of the layer of the fiber web formed is better than in the core layer.

[0031] Figure 1 shows the first embodiment of the system according to the invention, in which first embodiment two separate headboxes 12 are used, each equipped with dilution adjustment. In practice, the dilution adjustment is implemented by means of dilution equipment 32 placed in connection with the headboxes 12. The dilution equipment 32 can be, in accordance with Figure 4, feed lines coming to the headbox 12, which feed lines feed into the headbox water or a stock suspension with a considerably higher water content than in the stock suspension fed on the headbox for the dilution of the fed stock suspension in zones in the cross direction of the fiber web.

[0032] The dilution water is typically white water. In the embodiment of Figure 1, each layer of the finished fiber web is formed on its own wire 42 and 44, which combine the layers into a finished fiber web 10 in a later stage. The fiber web machine can also include a separate top wire cycle 40 in accordance with Figure 1. In the figures, reference number 46 refers to the press section of the fiber web machine.

[0033] Figure 2 shows the second embodiment of the system 100 according to the invention, in which embodiment the multilayer fiber web produced consists of three separate layers. In this case, the system has three headboxes 12, and there is dilution equipment in connection with at least two of these headboxes. In the embodiment of Figure 2, the left-hand side headbox 12 feeds the stock

suspension of the core layer, the middle headbox 12 feeds the stock suspension of the intermediate layer, and the right-hand side headbox 12 feeds the stock suspension of the surface layer. In this case, the dilution equipment is advantageously in the headboxes that form the core and surface layers and the intermediate layer can be without dilution, because the cross-directional adjustment of the basis weight profile and strength profile according to the invention can be done by means of two dilution adjustments.

[0034] In accordance with Figure 3, each headbox 12 used in the system according to the invention is divided into several feed zones 18 in the cross-direction of the fiber web. In general, the width of an individual feed zone is 40 - 120 mm, in which case the headbox is divided into dozens, even to more than one hundred feed zones, each of which can be adjusted for dilution independently of each other. In other words, each headbox equipped with dilution adjustment includes dozens, even hundreds of control valves 66 and their control devices (not shown in the figures) for adjusting the dilutions.

[0035] With reference to Figures 1 - 3, in the method according to the invention at least two different stock suspensions are fed from two or more headboxes 12 for the forming of a multilayer fiber web 10. A certain basis weight, such as 100 g/m^2, has been specified for the produced multilayer fiber web in the order, which basis weight is the minimum basis weight of the fiber web in all reels. The objective is that the basis weight of the fiber web produced comes as close to the target as possible; however, so that the basis weight of the entire fiber web is above the minimum basis weight specified in the order. The feed ratio of the stock suspensions is defined initially and the flows are adapted so that the total basis weight of the layers that form the fiber web exceeds the target. As an example, the basis weight of the core layer can be 75 g/m^2 and the basis weight of the surface layer can be 25 g/m^2, in which case the basis weight of the two-layer fiber web is 100 g/m^2. Initially, the fiber web is formed using rough settings, and the strengths and basis weight of the finished fiber web are measured. The measurement of basis weight can be carried out as an online measurement 24 shown in Figures 1 and 2, but the strengths must be calculated from samples taken from the fiber web using a laboratory analysis. The measurement instrument used for the online measurement of basis weight can be a basis weight scanner of the type known from prior art. However, the basis weight of the surface layer is advantageously at least 25 g/m^2 so that a surface layer essential for the appearance and printability of the fiber web is formed on the fiber web.

[0036] The system advantageously includes programmatic equipment for controlling dilution. The programmatic equipment can be a part of a computer or a part integrated into or connected to the control system of the fiber web machine, by means of which programmatic equipment the functioning of the dilution equipment can be controlled. The dilution equipment can include valves for restricting the flow of dilution water or corresponding medium, and valve control equipment, which can advantageously be controlled via a field bus by means of the programmatic equipment. The valve control equipment is advantageously electric actuators. The programmatic equipment can be automatic equipment, which controls, on the basis of pre-set criteria, the valves of the dilution equipment to adjust the dilution flows. The selected criteria can include the difference between the strength measured on the basis of individual feed zones of the headbox and the target, the difference between the measured basis weight and the target, or some other corresponding criterion. In dilution, it is also possible to use the filtrates of wires or other corresponding waters that do not contain much fibers.

[0037] The measurement results of the basis weight and strengths of the fiber web are advantageously fed to the programmatic equipment, which studies how close to the target the evenness of the cross-directional basis weight profile and strength profile of the fiber web are. Initially, the programmatic equipment can be adapted to adjust the basis weight profile on the basis of the measured difference by only adjusting the dilution equipment of the stock suspension that forms the core layer. In this way, the basis weight profile is adjusted by increasing or decreasing the dilution of the core layer with respect to the target. The dilution of the core layer can be adjusted by individual feed zones using the feed zones of the headbox, until an even/straight basis weight profile is achieved in the cross direction of the fiber web.

[0038] After this, the goal is to achieve the set strength target by using the programmatic equipment. At this point, a new strength measurement is carried out in terms of the fiber web that has a straight cross-sectional basis weight profile. In the cross direction of the fiber web, the dilution of the stock suspension coming to the surface layer is decreased on the basis of the differences in the strengths at different points in those zones where the strength of the fiber web is too low. On the other hand, at the same time the decrease in dilution increases the amount of fiber coming to the surface layer in this feed zone of the headbox and increases the basis weight. Dilution can be added by means of the programmatic equipment to compensate for this change in those feed zones of the headbox that form the core layer and that correspond to the adjustable feed zones of the surface layer. This changes the ratio between the basis weights of the finished core layer and surface layer in the basis weight of the finished fiber web. By increasing the percentual proportion of the surface layer in the basis weight, better strengths are achieved. In the initial situation, at least the stock suspension that is fed to the core layer can be diluted a little, in which case there is an adjustment possibility in terms of dilution in both directions in both stock suspensions fed.

[0039] The fiber web achieved after the change is measured again, and the adjustment of the dilutions is continued on the basis of the difference between the

measurement results and the target until even basis weight and strength profiles in the cross direction of the fiber web are achieved. In accordance with Figure 4, the stock suspension fed to the core layer 20 is generally diluted more in those feed zones of the headbox that form the edge area 26 of the core layer 20 of the fiber web 10 than in those feed zones 18, shown in Figure 4, that form the center part 28 of the fiber web 10. In this way, more long-fiber fiber fraction of the surface layer 22 can be brought to the edge areas 26, which long-fiber fiber fraction reinforces the edge areas, which become naturally weaker during the drying of the fiber web. In other words, the mutual relationship of the basis weights of the layers 16 varies in the cross direction of the fiber web 10.

[0040] The cross-directional optimization of the basis weight profile and strength profile of the fiber web can be carried out by means of the method according to the invention by using separate headboxes equipped with dilution adjustment. The dilutions of the stock suspensions fed, forming the various layers, can be adjusted independently of each other.

[0041] Advantageously, the multilayer fiber web manufactured by means of the method and system according to the invention is board used in exterior packaging, where the core layer of the board is formed from a raw material which results in a layer that has a poorer strength and cheaper costs than the surface layer, and the surface layer, in turn, is more expensive and stronger than the core layer.

[0042] The invention relates to a method for the optimization of the properties of a multilayer fiber web (10) in the manufacture of a fiber web (10), in which method the multilayer fiber web (10) is formed by feeding at least two stock suspensions that form a layer (16) of the fiber web (10) to a forming section (50) from two or more headboxes (12) divided into parallel feed zones (18), where those properties of said stock suspensions that affect the strength of the finished fiber web differ from each other, and the basis weight profile of said stock suspensions is adjusted in two or more headboxes (12) by feeding dilution water in zones in the cross direction of the fiber web machine into each stock suspension. In the method, the cross-directional basis weight profile and strength of the formed fiber web (10) are adjusted in the cross direction of the fiber web machine by adjusting the amount of dilution water in zones separately in each stock suspension fed.

[0043] The invention also relates to a corresponding system.

Claims

1. A method for the optimization of the properties of a multilayer fiber web (10) in the manufacture of a fiber web (10), in which method the multilayer fiber web (10) is formed by feeding at least two stock suspensions that form a layer (16) of the fiber web (10) to a forming section (50) from two or more headboxes (12) divided into parallel feed zones (18), where those properties of said stock suspensions that affect the strength of the finished fiber web differ from each other, and the basis weight profile of said stock suspensions is adjusted in two or more headboxes (12) by feeding dilution water in zones in the cross direction of the fiber web machine into each stock suspension, wherein, in the method, the cross-directional basis weight profile and strength of the formed fiber web (10) are adjusted in the cross direction of the fiber web machine by adjusting the amount of dilution water in zones separately in each stock suspension fed, one of said two layers (16) of the fiber web (10) is a core layer (20) and the other layer is a surface layer (22) with better strength properties than in said core layer (20), in the method, both the basis weight profile of the fiber web (10) is adjusted to an essentially even profile over the width of the fiber web (10), i.e. the variation of basis weight in the cross direction of the fiber web is less than +- 1g/m^2, J by means of the dilution of the stock suspension that forms said core layer (20) and the strength profile of the fiber web (10) is adjusted to an essentially even profile over the width of the fiber web, i.e. the cross-directional strength properties of the fiber web vary no more than +-2%, by means of the dilution of the stock suspension that forms said surface layer (22).

2. A method according to claim 1, wherein the basis weight profile of the fiber web (10) is measured as an online measurement (24), and on the basis of the measurement result the dilution of the stock suspension that forms the core layer (20) is adjusted in individual feed zones (18).

3. A method according to claim 1 or 2, wherein the stock suspension fed to said core layer (20) is diluted more in those feed zones (18) of the headbox that form the edge area (26) of the core layer (20) of the fiber web (10) than in those feed zones (18) that form the center part (28) of said fiber web (10).

4. A method according to any one of claims 1 - 3, wherein two headboxes (12) are used, each headbox (12) adapted to feed one stock suspension.

5. A system for the optimization of the properties of a multilayer fiber web in the manufacture of a fiber web, including two or more headboxes (12) for the feeding of at least two different stock suspensions to form at least two layers (16) of the fiber web (10), the strength properties of which differ from each other such that one of said two layers (16) of the fiber web (10) is a core layer (20) and the other layer is a surface layer (22) with better strength properties than in said core layer (20), and a dilution equipment (32) divided into feed zones (18) in the cross direction of

each headbox (12), adapted in connection with the two or more headboxes (12) for the dilution of the stock suspensions in zones in the cross direction of each headbox (12) in at least some of said feed zones (18) for the optimization of the properties of the fiber web (10), wherein said dilution equipment (32) is adapted to adjust separately in zones the amount of dilution water in each stock suspension fed for the adjustment of the cross-directional basis weight profile and strength of the formed fiber web in said cross direction, to adjust the basis weight profile of the fiber web (10) to an essentially even profile over the width of the fiber web (10), i.e. the variation of basis weight in the cross direction of the fiber web is less than +- 1g/m^2, by means of the dilution of the stock suspension that forms said core layer (20), and to adjust the strength profile of the fiber web (10) to an essentially even profile over the width of the fiber web (10), i.e. the cross-directional strength properties of the fiber web vary no more than +-2%, by means of the dilution of the stock suspension that forms said surface layer (22).

6. A system according to claim 5, wherein the headbox system includes two headboxes (12), each for feeding one stock suspension, in which system said dilution equipment (32) is adapted in connection with both headboxes (12).

Patentansprüche

1. Verfahren für die Optimierung der Eigenschaften einer mehrschichtigen Faserstoffbahn (10) bei der Herstellung einer Faserstoffbahn (10), wobei in dem Verfahren die mehrschichtige Faserstoffbahn (10) durch Zuführen von zumindest zwei Stoffsuspensionen, die eine Schicht (16) der Faserstoffbahn (10) ausbilden, zu einer Formierpartie (50) aus zwei oder mehreren Stoffaufläufen (12), die in parallele Zufuhrzonen (18) unterteilt sind, ausgebildet wird, wo sich diejenigen Eigenschaften der Stoffsuspensionen, die die Festigkeit der fertigen Faserstoffbahn beeinflussen, voneinander unterscheiden, und das Flächengewichtsprofil der Stoffsuspensionen in zwei oder mehreren Stoffaufläufen (12) durch Zuführen von Lösungswasser in Zonen in der Querrichtung der Faserbahnmaschine in jede Stoffsuspension eingestellt wird, wobei in dem Verfahren das Querrichtungsflächengewichtsprofil und die Festigkeit der ausgebildeten Faserstoffbahn (10) in der Querrichtung der Faserstoffbahn durch Einstellen der Menge des Lösungswassers in Zonen separat in jeder zugeführten Stoffsuspension eingestellt wird, wobei eine der zwei Schichten (16) der Faserstoffbahn (10) eine Kernschicht (20) ist und die andere Schicht eine Oberflächenschicht (22) ist, die bessere Festigkeitseigenschaften hat als die Kernschicht (20), wobei in dem Verfahren sowohl das Flächengewichtsprofil der Faserstoffbahn (10) auf ein im Wesentlichen gleichmäßiges Profil über die Breite der Faserstoffbahn (10), das heißt die Variation des Flächengewichts in der Querrichtung der Faserstoffbahn beträgt weniger als ± 1g/m^2, mittels der Lösung der Stoffsuspension, die die Kernschicht (20) ausbildet, eingestellt wird als auch das Festigkeitsprofil der Faserstoffbahn (10) auf ein im Wesentlichen gleichmäßiges Profil über die Breite der Faserstoffbahn, das heißt die Querrichtungsfestigkeitseigenschaften der Faserstoffbahn variieren nicht mehr als ± 2%, mittels der Lösung der Stoffsuspension, die die Oberflächenschicht (22) ausbildet, eingestellt wird.

2. Verfahren nach Anspruch 1, wobei das Flächengewichtsprofil der Faserstoffbahn (10) als eine Onlinemessung (24) gemessen wird, und auf der Grundlage des Messergebnisses die Lösung der Stoffsuspension, die die Kernschicht (20) ausbildet, in individuellen Zufuhrzonen (18) eingestellt wird.

3. Verfahren nach Anspruch 1 oder 2, wobei die Stoffsuspension, die zu der Kernschicht (20) zugeführt wird, in denjenigen Zufuhrzonen (18) des Stoffauflaufs stärker gelöst wird, die den Randbereich (26) der Kernschicht (20) der Faserstoffbahn (10) ausbilden, als in denjenigen Zufuhrzonen (18), die den mittleren Teil (28) der Faserstoffbahn (10) ausbilden.

4. Verfahren nach einem der Ansprüche 1 bis 3, wobei zwei Stoffaufläufe (12) verwendet werden, wobei jeder Stoffauflauf (12) angepasst ist, um eine Stoffsuspension zuzuführen.

5. System für die Optimierung der Eigenschaften einer mehrschichtigen Faserstoffbahn bei der Herstellung einer Faserstoffbahn, das zwei oder mehrere Stoffaufläufe (12) zum Zuführen von zumindest zwei unterschiedlichen Stoffsuspensionen, um zumindest zwei Schichten (16) der Faserstoffbahn (10) auszubilden, wobei sich die Festigkeitseigenschaften dieser Schichten voneinander derart unterscheiden, dass eine der zwei Schichten (16) der Faserstoffbahn (10) eine Kernschicht (20) ist und die andere Schicht eine Oberflächenschicht (22) ist, die bessere Festigkeitseigenschaften hat als die Kernschicht (20), und eine Lösungsanlage (32) aufweist, die in Zufuhrzonen (18) in der Querrichtung jedes Stoffauflaufs (12) unterteilt ist, die in Verbindung mit den zwei oder mehreren Stoffaufläufen (12) für die Lösung der Stoffsuspensionen in Zonen in der Querrichtung jedes Stoffauflaufs (12) in zumindest einigen der Zufuhrzonen (18) für die Optimierung der Eigenschaften der Faserstoffbahn (10) angepasst sind, wobei die Lösungsanlage (32) angepasst ist, um die Menge des Lösungswassers in jeder zuge-

führten Stoffsuspension für die Einstellung des Querrichtungsflächengewichtsprofils und der Festigkeit der ausgebildeten Faserstoffbahn in der Querrichtung in Zonen separat einzustellen, um das Flächengewichtsprofil der Faserstoffbahn (10) auf ein im Wesentlichen gleichmäßiges Profil über die Breite der Faserstoffbahn (10), das heißt die Variation des Flächengewichts in der Querrichtung der Faserstoffbahn beträgt weniger als $\pm$ 1g/m^2, mittels der Lösung der Stoffsuspension, die die Kernschicht (20) ausbildet, einzustellen und um das Festigkeitsprofil der Faserstoffbahn (10) auf ein im Wesentlichen gleichmäßiges Profil über die Breite der Faserstoffbahn, das heißt die Querrichtungsfestigkeitseigenschaften der Faserstoffbahn variieren nicht mehr als $\pm$ 2%, mittels der Lösung der Stoffsuspension, die die Oberflächenschicht (22) ausbildet, einzustellen.

6. System nach Anspruch 5, wobei das Stoffauflaufsystem zwei Stoffaufläufe (12) aufweist, die jeweils eine Stoffsuspension zuführen, wobei in dem System die Lösungsanlage (32) in Verbindung mit beiden Stoffaufläufen (12) angepasst ist.

Revendications

1. Procédé pour l'optimisation des propriétés d'une bande de fibres multicouche (10) pendant la fabrication d'une bande de fibres (10), dans lequel procédé, la bande de fibres multicouche (10) est formée par l'alimentation d'au moins deux suspensions de pâte qui forment une couche (16) de la bande de fibres (10) jusqu'à une section de formage (50) à partir de deux caisses d'arrivée (12) ou plus divisées en zones d'alimentation (18) parallèles, où ces propriétés desdites suspensions de pâte qui affectent la résistance de la bande de fibres finie diffèrent l'une de l'autre, et le profil de poids de base desdites suspensions de pâte est ajusté dans deux caisses d'arrivée (12) ou plus en fournissant de l'eau de dilution dans des zones dans le sens travers de la machine de bande de fibres dans chaque suspension de pâte, dans lequel, dans le procédé, le profil de poids de base dans le sens travers et la résistance de la bande de fibres (10) formée sont ajustés dans le sens travers de la machine de bande de fibre en ajustant la quantité d'eau de dilution dans des zones séparément dans chaque suspension de pâte alimentée, l'une desdites deux couches (16) de la bande de fibres (10) est une couche centrale (20) et l'autre couche est une couche de surface (22) avec de meilleures propriétés de résistance que dans ladite couche centrale (20), dans le procédé, à la fois le profil de poids de base de la bande de fibres (10) est ajusté sur un profil essentiellement régulier sur la largeur de la bande de fibres (10), c'est-à-dire que la variation du poids de base dans le sens travers de la bande de fibres est inférieure à +/- 1 g/m^2, au moyen de la dilution de la suspension de pâte qui forme ladite couche centrale (20) et le profil de résistance de la bande de fibres (10) est ajusté sur un profil essentiellement régulier sur la largeur de la bande de fibres, c'est-à-dire que les propriétés de résistance dans le sens travers de la bande de fibres varient selon une valeur non supérieure à +/- 2%, au moyen de la dilution de la suspension de pâte qui forme ladite couche de surface (22).

2. Procédé selon la revendication 1, dans lequel le profil de poids de base de la bande de fibres (10) est mesuré comme une mesure en ligne (24), et sur la base du résultat de mesure, la dilution de la suspension de pâte qui forme la couche centrale (20), est ajustée dans les zones d'alimentation (18) individuelles.

3. Procédé selon la revendication 1 ou 2, dans lequel la suspension de pâte amenée à ladite couche centrale (20) est diluée davantage dans ces zones d'alimentation (18) de la caisse d'arrivée qui forment la zone de bord (26) de la couche centrale (20) de la bande de fibres (10) que dans ces zones d'alimentation (18) qui forment la partie centrale (28) de ladite bande de fibres (10).

4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel on utilise deux caisses d'arrivée (12), chaque caisse d'arrivée (12) étant adaptée pour fournir une suspension de pâte.

5. Système pour l'optimisation des propriétés d'une bande de fibres multicouche pendant la fabrication d'une bande de fibres, comprenant deux caisses d'arrivée (12) ou plus pour l'alimentation d'au moins deux suspensions de pâte différentes pour former au moins deux couches (16) de la bande de fibres (10), dont les propriétés de résistance diffèrent l'une de l'autre de sorte que l'une desdites deux couches (16) de la bande de fibres (10) est une couche centrale (20) et l'autre couche est une couche de surface (22) avec de meilleures propriétés de résistance que dans ladite couche centrale (20), et un équipement de dilution (32) divisé en zones d'alimentation (18) dans le sens travers de chaque caisse d'arrivée (12), adapté par rapport aux deux caisses d'arrivée (12) ou plus pour la dilution des suspensions de pâte dans des zones dans le sens travers de chaque caisse d'arrivée (12) dans au moins certaines desdites zones d'alimentation (18) pour l'optimisation des propriétés de la bande de fibres (10), dans lequel ledit équipement de dilution (32) est adapté pour ajuster séparément la quantité d'eau de dilution dans chaque suspension de pâte fournie pour l'ajustement du profil de poids de base dans le sens travers et de la

résistance de la bande de fibres formée dans ledit sens travers, afin d'ajuster le profil de poids de base de la bande de fibres (10) à un profil essentiellement régulier sur la largeur de la bande de fibres (10), c'est-à-dire que la variation du poids de base dans le sens travers de la bande de fibres est inférieure à +/- 1 g/m^2, au moyen de la dilution de la suspension de pâte qui forme ladite couche centrale (20) et pour ajuster le profil de résistance de la bande de fibres (10) à un profil essentiellement régulier sur la largeur de la bande de fibres (10), c'est-à-dire que les propriétés de résistance dans le sens travers de la bande de fibres varient selon une valeur non supérieure à +/- 2%, au moyen de la dilution de la suspension de pâte qui forme ladite couche de surface (22).

6. Système selon la revendication 5, dans lequel le système de caisse d'arrivée comprend deux caisses d'arrivée (12), chacune pour fournir une suspension de pâte, dans lequel système, ledit équipement de dilution (32) est adapté par rapport aux deux caisses d'arrivée (12).

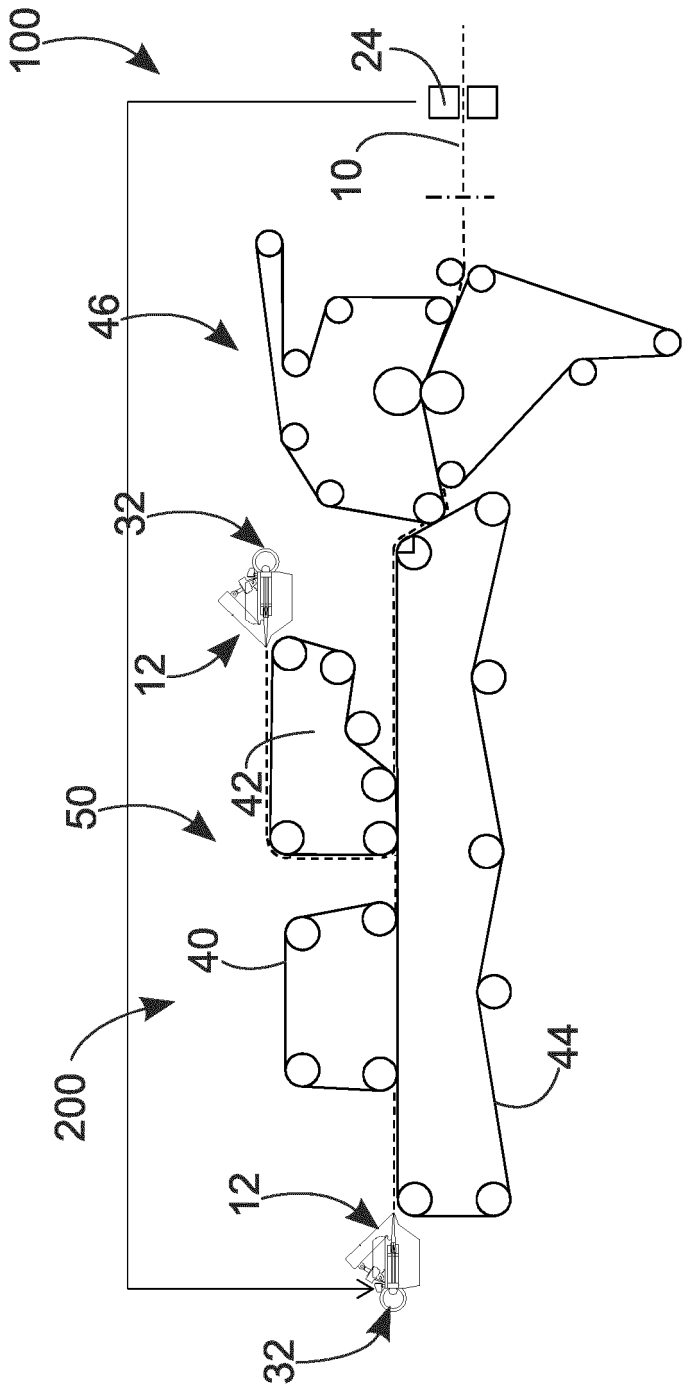

Fig. 1

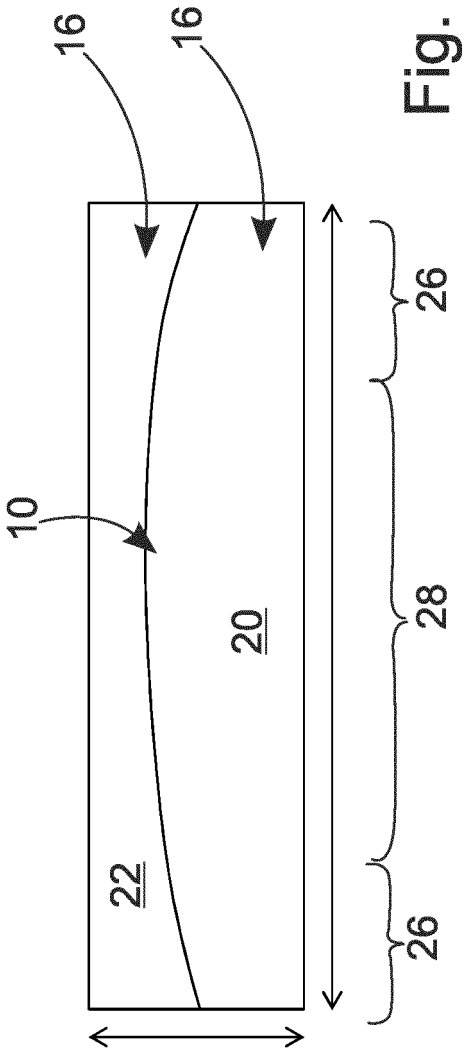

Fig. 4

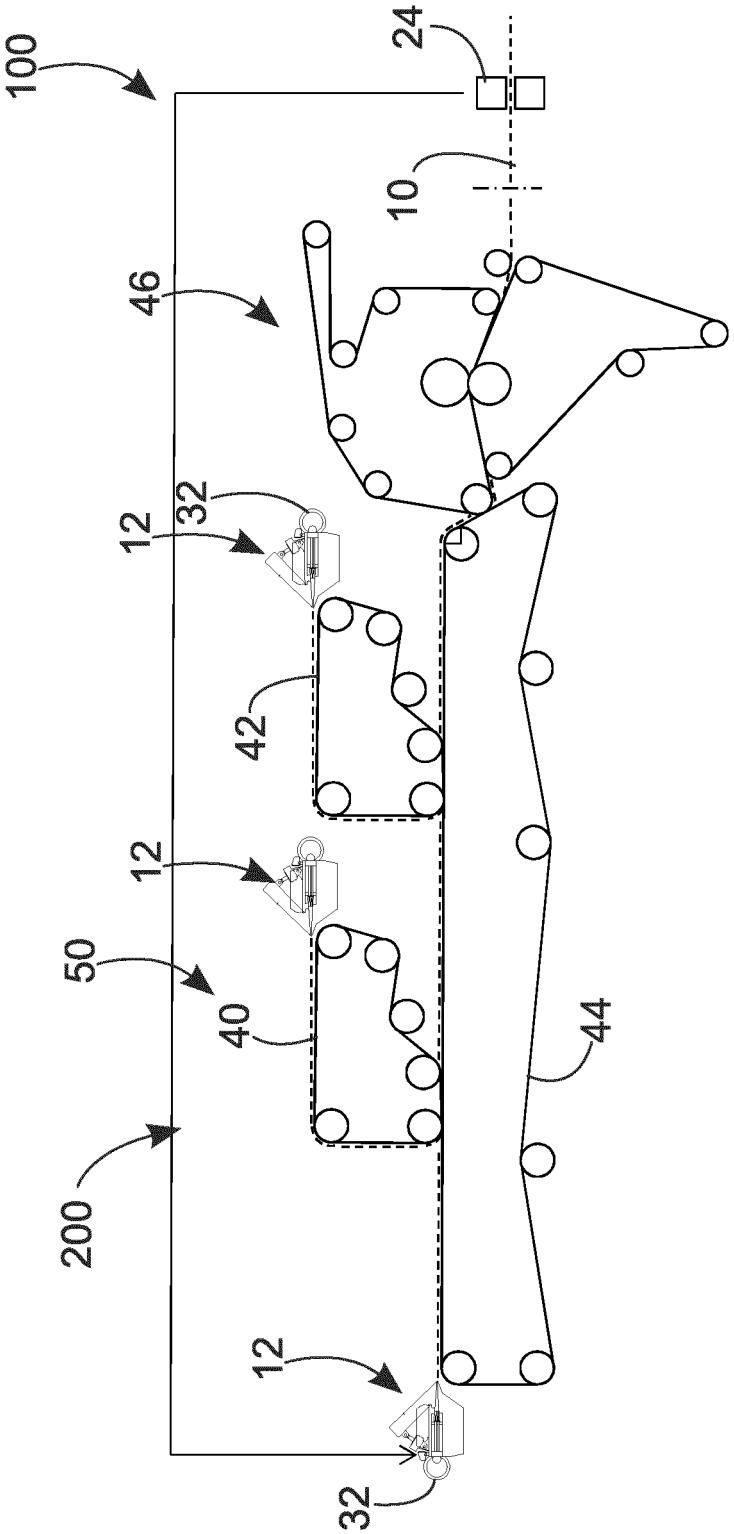

Fig. 2

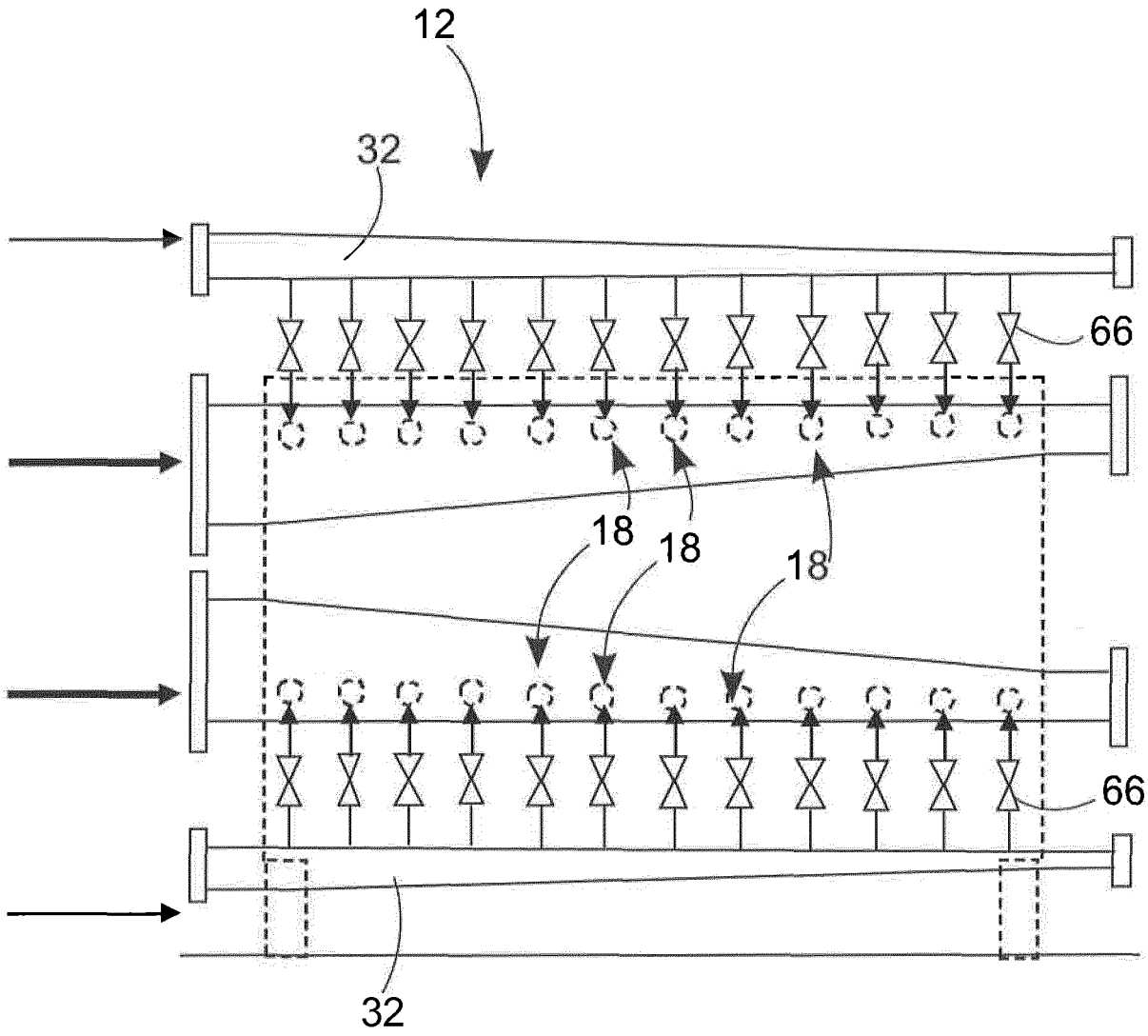

Fig. 3

REFERENCES CITED IN THE DESCRIPTION

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