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(54) **FIBER WEB MACHINE AND METHOD OF FORMING A MULTI-PLY WEB**

FASERBAHNMASCHINE UND VERFAHREN ZUR HERSTELLUNG EINER MEHRLAGIGEN BAHN

MACHINE À BANDE FIBREUSE ET PROCÉDÉ DE FORMATION D'UNE BANDE MULTICOUCHE

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Description

[0001] The invention pertains to a fiber web machine and to a method of forming a multiply web.

[0002] Document WO 99 / 40 256 A1 discloses an arrangement of three forming sections each of which having a wire guided about rolls in a closed loop and a multi-layer headbox. The closed loops of the wire are guided such that liquid layers ejected on and conveyed by the wires are dewatered to form plies and then are merged such that the at least three plies occurring from the liquid layers ejected by the multi-layer headbox are sandwiched between the at least two other plies. Moreover, document WO 99 / 40 256 A1 discloses a web forming method using the above-described arrangement.

[0003] Document EP 2 784 213 B1 discloses a multi-layer headbox structure for a fiber web machine which serves to supply mainly liquid substances such as water and/or a pulp suspension liquid in a layered manner onto a wire of a forming section. Additives such as refined fibers, fillers, cationic polymers such as cationic starch, etc. are added to the water and/or pulp suspension liquid. These liquid substances are fed to the headbox by means of a water supply or feed water supply. A central diffuser of the headbox is connected with feeding means feeding fresh water, dilution water, and/or white water into the central diffuser In the forming section, the substances applied onto a forming wire are then dewatered to form a web. This is then further transferred to a press section for additional dewatering and a dryer section in which the formed web is dried to form a paper or board web. Further treatment depends on the respective requirements of the product. Fig. 1 shows an example of such a headbox structure.

[0004] It is the main task of a headbox to evenly distribute these liquid substances in the width direction (CD for "cross direction") of the machine as well as in the running direction (MD for "machine direction") on the wire. In this regard, it is also an important issue to supply the liquid substances in a layered manner in order to ensure the required properties and quality of the later paper or board.

[0005] It has shown that a web produced by using such a prior art headbox at the forming section requires improvement regarding internal strength, in particular for producing Folding Boxboard.

[0006] Thus, in the prior art there a problem that in with multiply products a middle layer stock has to be prepared so that it's properties are optimized based on bulk and internal bond strength. Bulk improvement improves stiffness and saves refining energy, but also remarkably decreases internal bond strength. Typically, in prior art solutions it was necessary to refine fibers in a freeness level of 400 to 450 ml to obtain a required internal bond level. Moreover, since a top side of the multiply product in general is used as printing surface, it is necessary to bleach the middle layer stock in order to have a not too large difference between the color of the middle layer and the color of the top ply.

[0007] It is the object of the invention to provide a fiber web machine and a method of forming a multi-ply web in a fiber web machine capable if improving internal strength of a web.

[0008] The object of the invention is achieved by a fiber web machine according to claim 1 and by a method according to claim 4. Advantageous embodiments are carried out according to the dependent claims.

[0009] According to the invention, a fiber web machine comprises at least three forming sections. Each of these forming sections has a wire guided about rolls in a closed loop, and a headbox adapted to eject at least one layer of liquid onto the respective wire. At least one of the headboxes is a multi-layer headbox adapted to eject at least three liquid layers onto the respective wire. A center diffuser of the multi-layer headbox is connected with feeding means for feeding fresh water, dilution water and/or white water. The closed loops of the wire are guided such that liquid layers ejected on and conveyed by the wires are dewatered to form plies and then are merged such that the at least three plies occurring from the liquid layers ejected by the multi-layer headbox are sandwiched between the at least two other plies.

[0010] Thereby, in an advantageous manner a web having middle plies formed by the multi-layer headbox and top and back plies formed respectively formed by the other two headboxes can be provided.

[0011] The feeding means supplying the center diffuser of the multi-layer headbox can be additionally connected with a starch storage in order to supply starch with the fresh water, dilution water and/or white water.

[0012] Here, in order to control the internal strength it is in particular possible to supply a certain amount of starch with the water layer (Aqua layer) ejected by the multi-layer headbox. Thereby, the middle layer plies can be optimized in order to maximize the bulk of the web. Moreover, the middle layer can be divided in two separate stock layers separated by the water layer.

[0013] Furthermore, it is possible to use coarser fibers in the middle layer. Accordingly, less refining is required for the fibers and the bulk can be increased. Moreover, a fibers refining level can be dropped to 500 to 600 ml freeness level. Thus, a considerable amount of refining energy can be saved.

[0014] It is even possible to use different refining rates between the top and back ply sides. Also, brightness levels of the layers can be individually adapted. Thus, for example when applying higher brightness to the ply next to the top ply, less bleaching is required. Thus, increase of the bulk is possible. For instance, the increase of the bulk can be in a range of about 15% to 30%.

[0015] Advantageously, the fiber web machine can be used for manufacturing Folding Boxboard.

[0016] According to the invention, a method of forming a multi-ply web in a fiber web machine, comprises the steps:

- feeding of fresh water, dilution water, and/or white water into a central diffuser of a multi-layer headbox,
- feeding pulp suspensions to respective adjacent diffusers of the central diffuser,
- guiding the fresh water, dilution water, and/or white water and the different pulp suspensions through the diffuser to eject them onto a wire of a forming section, the wire forming a closed loop,
- dewatering the liquid substances to form a web,
- merging the web with a second web formed at a second head box ejecting pulp suspension on a wire of a second forming section, and
- merging the web with a third web formed at a third head box ejecting pulp suspension on a wire of a third forming section, wherein the third web is arranged on a side of the web opposite to that where the second web is arranged.

[0017] Thereby, a web can be formed which has middle plies the properties of which can be advantageously adapted as desired by means of one multi-layer headbox, while the web is completed by separately formed top and back plies, respectively.

[0018] In the above method, advantageously, starch can be added to the fresh water, dilution water, and/or white water guided through the central diffuser of the multi-layer headbox.

[0019] By adapting the starch level, properties of the middle layer's stocks can be advantageously optimized with regard to the bulk. Thereby, the middle layer plies can be optimized in order to maximize the bulk of the web. Moreover, the middle layer can be divided in two separate stock layers separated by the water layer.

[0020] Additionally, coarser fibers can be used in the middle layer. Accordingly, less refining is required for the fibers and the bulk can be increased. It is even possible to use different refining rates between the top and back ply sides. Also, brightness levels of the layers can be individually adapted. Thus, for example when applying higher brightness to the ply next to the top ply, less bleaching is required. Thus, increase of the bulk is possible.

[0021] According to the method, the starch can be preferably added with an amount of 1 to 20 kg per ton of water, and most preferably with an amount of 2 to 10 kg per ton of water.

[0022] Thereby, the bulk of the middle layer(s) can be maximized.

[0023] According to the method, the pulp suspension comprise BCTMP (Bleached Chemi Thermo Mechanical Pulp), CTMP (Chemi Thermo Mechanical Pulp), TMP (Thermo Mechanical Pulp), PGW (Pressurized Ground Wood) and/or GW (Ground Wood), wherein the pulp suspensions guided to the one or more of the adjacent diffusers of the multi-layer headbox have a different composition.

[0024] According to the method, broke can be added to the pulp suspensions fed to one or more of the adjacent diffusers of the multi-layer headbox, wherein the amount of broke preferably differs in the individual pulp suspensions.

[0025] According to the method, a brightness of one of the plies of the web is higher than a brightness of the other one of the plies of the web.

[0026] According to the method of the invention as described above, when forming a fiber web it is advantageously possible to control the internal strength of one or more of the middle stock layers by adding starch with the water supplied to the central diffuser of the multi-layer headbox. Thereby, it is possible to maximize the bulk of the middle layer(s).

[0027] Moreover, since the middle layer can be divided into two layers, both of these layers can be given different properties, e.g. by using different refining rates for the added fibers. Thereby, coarser fibers can be used which advantageously leads to a higher bulk. Also, different brightness levels can be assigned to the middle layers, leading to that less bleaching is required which is also advantageous with regard to the bulk.

[0028] According to the invention, it is possible to reduce the manufacturing cost of such kinds of multiply products. This is achieved by dividing the middle ply stock in two layers, and feeding chemicals to between these two layers by means of the aqua layer. Then it is possible to use coarser fibers in the middle ply (which means less refining and therewith smaller energy consumption) and to also reduce bleaching chemicals consumption (the bottom side stock of the middle layer can have a smaller brightness than the top side stock). Mainly this is achieved by feeding starch between to these two layers and starch feeding happens by this central diffuser by water (fresh water, white water, or dilution water).

[0029] The invention can be preferably used in FBB (folding box board) production. Typically FBB is sold based on the thickness, so if it is possible to increase bulk, the basis weight of the product decreases. Thus, production can be increased while production costs will decrease.

[0030] Further advantages of the invention will Further advantages of the invention will become apparent from a study of the enclosed drawings showing currently preferred embodiments of the invention.

Fig. 1 schematically shows an example of a prior art headbox structure which is applied with a fiber web machine according to the invention.

Fig. 2 schematically shows an arrangement of forming sections of a fiber web machine according to the invention.

Fig. 3a to 3c schematically show section views of individual webs formed by means of the respective forming sections of Fig. 2.

Fig. 4 schematically shows a section view of a web

achieved after merging the individual webs shown in Fig. 3a to 3c.

Fig. 5 shows a diagram showing the relation of starch dosages with regard to Huygen bond.

[0031] Fig. 1 schematically shows an example of a multi-layer headbox 1 as is for example disclosed in document EP 2 784 213 B1. Thus, regarding the features of such a headbox it is referred to this document, the contents of which is herewith incorporated in its entirety. Merely the features necessary for understanding the invention will be now described.

[0032] That is, the multi-layer headbox 1 has plural diffusers, one of them being a central diffuser 13 connected with feeding means 7 feeding fresh water, dilution water, and/or white water into the central diffuser 13. The adjacent diffusers are connected with stock header feeding means 3, 5.

[0033] Additional dilution water can be supplied from a dilution water feeding means 9 connectable via dilution water valves 11 with a pipe feeding stock header from stock header feeding means 5 to the diffuser being arranged above the central diffuser 13 in Fig. 1 for controlling the cross machine direction basis weight profile. The dilution water valves 11 are arranged in 30mm to 150 mm intervals in the headbox cross machine direction. Thus, the multi-layer headbox 1 is capable of ejecting stock layers in a layered manner onto a web of a forming section.

[0034] Fig. 2 is a schematic view of a fiber web machine according to the invention. The fiber web machine has three forming sections 21, 25 and 29. A first forming section 21 of these three forming sections 21, 25 and 29 is provided with the multi-layer headbox 1 shown in Fig. 1.

[0035] The forming section 21 (also referred to as first forming section) comprises a wire guided in a closed loop via guiding rollers 210, 211 and 213. Other well-known forming means such as suction boxes, suction rolls, etc. are provided with the forming section 21. Thus, the stock layers and central water layer ejected by the multi-layer headbox 1 become dewatered and are guided away from the headbox towards a merging section provided between guiding rollers 211 and 213.

[0036] In this merging section, the web formed in this first forming section 21 is merged with another web referred to a top web.

[0037] The top web is formed in a second forming section 25 which basically comprises a headbox 23 (also referred to as top ply headbox) and a wire guided in a closed loop about guiding rollers 250, 251, 253 and 255. The headbox 23 is a single layer headbox and, thus, ejects a single stock layer onto the wire. The stock layer is also dewatered by means of well-known forming means to form the top web. In a merging section provided between the guiding rollers 251 and 253, the wire is guided in a manner contacting the wire of the first forming section 21 such that the web formed in the first forming section 21 is merged with the top web.

[0038] The web merged with the top web is then guided further by the wire of the second forming section 25 to a second merging section defined between guiding rollers 253 and 255. In the second merging section, the web merged with the top web is merged with a third web formed in a third forming section 29. The third web is also referred to as back web.

[0039] The back web is formed in the third forming section which basically comprises a headbox 27 (also referred to as back ply headbox) and a wire guided in a closed loop about guiding rollers 291, 293, and 290. The headbox 27 is also a single layer headbox ejecting a single stock layer onto the wire of the third forming section 29. As is the case with the web and the top web, the stock layer is also dewatered by well-known means to form the back web.

[0040] The wire of the third forming section 29 is guided such that it approaches the wire of the second forming section 25 and contacts the same in the section between the guiding rollers 253 and 255, thereby merging the back web with the web on a side opposite of the top web.

[0041] The web merged with the top and back webs is then guided further and handed over at a take-over roller 31 to a wire 33 of a press section for further treatment.

[0042] Thus, according to the invention an enhanced web can be produced in which middle plies of the web (also referred to as filler ply (plies)) are then covered from both sides by a top ply occurring from the top web and a back ply occurring from the back web.

[0043] It is to be noted that, while the top ply headbox and the back ply headbox are each described as single layer headboxes, one or both of them can be embodied as multi-layer headboxes.

[0044] Figs. 3a to 3c schematically show a section view of the filler plies, top ply and back ply, respectively. As can be seen from Fig. 3a, the filler plies comprise two layers 51 and 53 which are connected via a starch layer 55. The starch layer occurs from the central water layer having starch added. The top ply is referred to by 57 and the back ply is referred to by 59.

[0045] By adding starch in a predetermined amount, the internal strength of the filler plies can be remarkably enhanced. In particular, the starch is added into water forming a water layer arranged between the stock layers. An amount of the starch added is in a range from 1 to 20 kg/t and preferably in a range from 2 to 10 kg/t.

[0046] Fig. 5 is a diagram showing the effect of the added starch amount with respect to the Scott Bond (J/m^2). The _Huygen Scott Bond test is the most commonly used test method for quantifying the delamination resistance of paper and board.

[0047] As can be seen from Fig. 5, when adding the starch directly to the water layer ejected through the central diffuser 13 of the multi-layer headbox 1 (dashed-dotted line), a remarkable increase of the Huygen Bond is achieved in comparison with a case, where the starch is added in the course of the forming process, i.e. at the

machine chest (dashed line).

[0048] Moreover, according to the invention, coarser fibers and an increased amount of broke can be supplied to the stock layers forming the filler plies. Thereby, it is possible to advantageously adapt brightness levels of the filler plies as well as to improve the bulk.

[0049] For example, in a preferred example using 75% of TCMP and 25% of Broke, brightness between 65% and 80% and bulk between 3cm^3/g and 3.4 cm^3/g is achieved. However, it is a matter of course that the invention is not limited to these example values. In general, the pulp suspension comprise BCTMP, CTMP, TMP, PGW and/or GW. It is also noted that the pulp suspensions guided to the one or more of the adjacent diffusers of the multi-layer headbox preferably have a different composition.

[0050] Since it is possible to provide the filler plies in a layered manner, the individual plies can be provided with different properties. For example, in a case where FBB is produced, the filler ply 51 arranged directly adjacent to the top ply 57 can have a higher brightness than the other filler ply 53.

[0051] The invention has been described by means of a preferred example, however, the scope of the invention is merely defined by the attached claims.

Claims

1. A fiber web machine comprising

at least three forming sections (21, 25, 29), each of them having
a wire guided about rolls in a closed loop, and
a headbox (1, 23, 27) adapted to eject at least one layer of liquid onto the respective wire, wherein
at least one of the headboxes (1) is a multi-layer headbox adapted to eject at least three liquid layers onto the respective wire, and
the closed loops of the wire are guided such that liquid layers ejected on and conveyed by the wires are dewatered to form plies and then are merged such that the at least three plies (51, 53, 55) occurring from the liquid layers ejected by the multi-layer headbox are sandwiched between the at least two other plies
characterized in that
a center diffuser (13) of the multi-layer headbox (1) is connected with feeding means (7) for feeding fresh water, dilution water and/or white water.

2. The fiber web machine according to claim 1, wherein the feeding means (27) supplying the center diffuser of the multi-layer headbox is additionally connected with a starch storage in order to supply starch with the fresh water, dilution water and/or white water.

3. The fiber web machine according to claim 2, wherein the fiber web machine is used for manufacturing Folding Boxboard.

4. Method of forming a multi-ply web in a fiber web machine, comprising

feeding of fresh water, dilution water, and/or white water into a central diffuser (13) of a multi-layer headbox (1),
feeding pulp suspensions to respective adjacent diffusers of the central diffuser (13),
guiding the fresh water, dilution water, and/or white water and the different pulp suspensions through the central diffuser (13) to eject them onto a wire of a forming section (21), the wire forming a closed loop,
dewatering the liquid substances to form a web,
merging the web with a second web formed at a second head box (23) ejecting pulp suspension on a wire of a second forming section (25), and
merging the web with a third web formed at a third head box (27) ejecting pulp suspension on a wire of a third forming section (29), wherein the third web is arranged on a side of the web opposite to that where the second web is arranged.

5. The method according to claim 4, wherein
starch is added to the fresh water, dilution water, and/or white water guided through the central diffuser (13) of the multi-layer headbox (1).

6. The method according to claim 5, wherein
the starch is preferably added with an amount of 1 to 20 kg per ton of water, and most preferably with an amount of 2 to 10 kg per ton of water.

7. The method according to any of claims 4 to 6, wherein
coarse fibers are added to the pulp suspensions fed to one or more of the adjacent diffusers of the multi-layer headbox.

8. The method according to any of claims 4 to 7, wherein
the pulp suspension comprise BCTMP, CTMP, TMP, PGW and/or GW, wherein the pulp suspensions guided to the one or more of the adjacent diffusers of the multi-layer headbox (1) have a different composition.

9. The method according to any of claims 4 to 8, wherein broke is added to the pulp suspensions fed to one or more of the adjacent diffusers of the multi-layer headbox, wherein the amount of broke preferably differs in the individual pulp suspensions.

10. The method according to any of claims 4 to 9, wherein a brightness of one of the plies of the web is higher than a brightness of the other one of the plies of the web.

Patentansprüche

1. Faserbahnmaschine mit

mindestens drei Formgebungsabschnitten (21, 25, 29), von denen jeder aufweist
ein Sieb, das in einer geschlossenen Schleife um Walzen geführt wird, und
einen Stoffauflauf (1, 23, 27), der geeignet ist, mindestens eine Flüssigkeitsschicht auf das jeweilige Sieb auszustoßen, wobei
mindestens einer der Stoffaufläufe (1) ein Mehrschicht-Stoffauflauf ist, der dazu geeignet ist, mindestens drei Flüssigkeitsschichten auf das jeweilige Sieb auszustoßen, und
die geschlossenen Schleifen des Siebs so geführt werden, dass auf die Siebe ausgestoßene und von ihnen geförderte Flüssigkeitsschichten entwässert und zu Lagen ausgebildet werden, und dann so zusammengeführt werden, dass die mindestens drei Lagen (51, 53, 55), die aus den von dem Mehrschicht-Stoffauflauf ausgestoßenen Flüssigkeitsschichten entstehen, zwischen den mindestens zwei anderen Lagen eingeschlossen sind,
dadurch gekennzeichnet, dass
ein Mitteldiffusor (13) des Mehrschichtstoffauflaufs (1) mit Zuführungsmitteln (7) zur Zuführung von Frischwasser, Verdünnungswasser und/oder Siebwasser verbunden ist.

2. Faserbahnmaschine nach Anspruch 1, wobei
die den Mitteldiffusor des Mehrschichtstoffauflaufs versorgende Zuführeinrichtung (27) zusätzlich mit einem Stärkespeicher verbunden ist, um mit dem Frischwasser, Verdünnungswasser und/oder Siebwasser Stärke zuzuführen.

3. Faserbahnmaschine nach Anspruch 2, **dadurch gekennzeichnet, dass**
die Faserbahnmaschine zur Herstellung von Faltschachtelkarton verwendet wird.

4. Verfahren zur Herstellung einer mehrlagigen Bahn in einer Faserbahnmaschine, umfassend

Einspeisung von Frischwasser, Verdünnungswasser und/oder Siebwasser in einen Mitteldiffusor (13) eines mehrlagigen Stoffauflaufs (1),
Zuführen von Pulpesuspensionen zu jeweils benachbarten Diffusoren des Mitteldiffusors (13),
Führen des Frischwassers, des Verdünnungswassers und/oder des Siebwassers und der verschiedenen Zellstoffsuspensionen durch den Mitteldiffusor (13), um sie auf ein Sieb eines Formabschnitts (21) auszustoßen, wobei das Sieb eine geschlossene Schleife bildet,
Entwässerung der flüssigen Substanzen, um eine Bahn auszubilden,
Vereinigen der Bahn mit einer zweiten an einem zweiten Stoffauflauf (23) ausgebildeten Bahn, der die Pulpesuspension auf ein Sieb eines zweiten Formabschnitts (25) ausstößt, und
Vereinigen der Bahn mit einer dritten an einem dritten Stoffauflauf (27) ausgebildeten Bahn, der die Zellstoffsuspension auf ein Sieb eines dritten Formabschnitts (29) ausstößt, wobei die dritte Bahn auf einer Seite der Bahn angeordnet ist, die derjenigen gegenüberliegt, auf der die zweite Bahn angeordnet ist.

5. Verfahren nach Anspruch 4, wobei
dem Frischwasser, Verdünnungswasser und/oder Siebwasser, das durch den zentralen Diffusor (13) des Mehrschichtstoffauflaufs (1) geleitet wird, Stärke zugesetzt wird.

6. Verfahren nach Anspruch 5, wobei
die Stärke vorzugsweise in einer Menge von 1 bis 20 kg pro Tonne Wasser und besonders bevorzugt in einer Menge von 2 bis 10 kg pro Tonne Wasser zugegeben wird.

7. Verfahren nach einem der Ansprüche 4 bis 6, wobei den Zellstoffsuspensionen, die einem oder mehreren der benachbarten Diffusoren des Mehrschichtstoffauflaufs zugeführt werden, grobe Fasern zugesetzt werden.

8. Verfahren nach einem der Ansprüche 4 bis 7, wobei die Zellstoffsuspension BCTMP, CTMP, TMP, PGW und/oder GW umfasst, wobei die Zellstoffsuspensionen, die dem einen oder den mehreren benachbarten Diffusoren des Mehrschichtstoffauflaufs (1) zugeführt werden, eine unterschiedliche Zusammensetzung aufweisen.

9. Verfahren nach einem der Ansprüche 4 bis 8, wobei den Stoffsuspensionen, die einem oder mehreren der benachbarten Diffusoren des Mehrschichtstoffauflaufs zugeführt werden, Ausschuss zugesetzt wird, wobei die Menge an Ausschuss in den einzelnen Stoffsuspensionen vorzugsweise unterschiedlich ist.

10. Verfahren nach einem der Ansprüche 4 bis 9, wobei die Helligkeit einer der Lagen der Bahn höher ist als die Helligkeit der anderen der Lagen der Bahn.

Revendications

1. Machine à bandes de fibres comprenant

au moins trois sections de formation (21, 25, 29), chacune d'entre elles ayant une toile guidée autour de rouleaux en boucle fermée, et
une caisse d'arrivée (1, 23, 27) conçue pour éjecter au moins une couche de liquide sur la toile respective, dans laquelle
au moins une des caisses d'arrivée (1) est une caisse d'arrivée multicouche conçue pour éjecter au moins trois couches de liquide sur la toile respective, et
les boucles fermées de la toile sont guidées de telle sorte que des couches de liquide éjectées sur et transportées par les toiles soient déshydratées pour former des jets et soient ensuite fusionnées de telle sorte que les au moins trois jets (51, 53, 55) provenant des couches de liquide éjectées par la caisse d'arrivée multicouche soient pris en sandwich entre les au moins deux autres jets
caractérisée en ce que
un diffuseur central (13) de la caisse d'arrivée multicouche (1) est relié à des moyens d'alimentation (7) pour l'alimentation en eau fraîche, en eau de dilution et/ou en eaux collées.

2. Machine à bandes de fibres selon la revendication 1, dans laquelle
les moyens d'alimentation (27) alimentant le diffuseur central de la caisse d'arrivée multicouche sont en outre reliés à un stockage d'amidon afin de fournir de l'amidon à l'eau fraîche, à l'eau de dilution et/ou aux eaux collées.

3. Machine à bandes de fibres selon la revendication 2, dans laquelle
la machine à bandes de fibres est utilisée pour la fabrication de carton pour boîtes pliantes.

4. Procédé de formation d'une bande multijet dans une machine à bandes de fibres, comprenant

l'introduction d'eau douce, d'eau de dilution et/ou d'eaux collées dans un diffuseur central (13) d'une caisse d'arrivée multicouche (1),
l'introduction de suspensions de pâte dans des diffuseurs adjacents respectifs du diffuseur central (13),
le guidage de l'eau douce, de l'eau de dilution et/ou des eaux collées et des différentes suspensions de pâte à travers le diffuseur central (13) pour les éjecter sur une toile d'une section de formation (21), la toile formant une boucle fermée,
la déshydratation des substances liquides pour former une bande,
la fusion de la bande avec une deuxième bande formée au niveau d'une deuxième caisse d'arrivée (23) éjectant la suspension de pâte sur une toile d'une deuxième section de formation (25), et
la fusion de la bande avec une troisième bande formée au niveau d'une troisième caisse d'arrivée (27) éjectant la suspension de pâte sur une toile d'une troisième section de formation (29), dans lequel la troisième bande est agencée sur un côté de la bande opposé à celui où est agencée la deuxième bande.

5. Procédé selon la revendication 4, dans lequel l'amidon est ajouté à l'eau fraîche, à l'eau de dilution et/ou aux eaux collées guidées à travers le diffuseur central (13) de la caisse d'arrivée multicouche (1).

6. Procédé selon la revendication 5, dans lequel l'amidon est de préférence ajouté avec une quantité de 1 à 20 kg par tonne d'eau, et plus préférablement avec une quantité de 2 à 10 kg par tonne d'eau.

7. Procédé selon l'une quelconque des revendications 4 à 6, dans lequel
des fibres grossières sont ajoutées aux suspensions de pâte introduites dans un ou plusieurs des diffuseurs adjacents de la caisse d'arrivée multicouche.

8. Procédé selon l'une quelconque des revendications 4 à 7, dans lequel
la suspension de pâte comprend de la pâte chimico-thermo-mécanique blanchie (BCTMP), de la pâte chimico-thermo-mécanique (CTMP), de la pâte thermo-mécanique (TMP), de la pâte mécanique de défibreur sous haute pression (PGW) et/ou de la pâte mécanique de défibreur (GW), dans lequel les suspensions de pâte guidées vers les un ou plusieurs diffuseurs adjacents de la caisse d'arrivée multicouche (1) ont une composition différente.

9. Procédé selon l'une quelconque des revendications 4 à 8, dans lequel un cassé de fabrication est ajouté aux suspensions de pâte introduites dans un ou plusieurs des diffuseurs adjacents de la caisse d'arrivée multicouche, dans lequel la quantité de cassé de fabrication diffère de préférence dans les suspensions de pâte individuelles.

10. Procédé selon l'une quelconque des revendications 4 à 9, dans lequel une luminosité de l'un des jets de la bande est supérieure à une luminosité de l'autre des jets de la bande.

FIG. 1

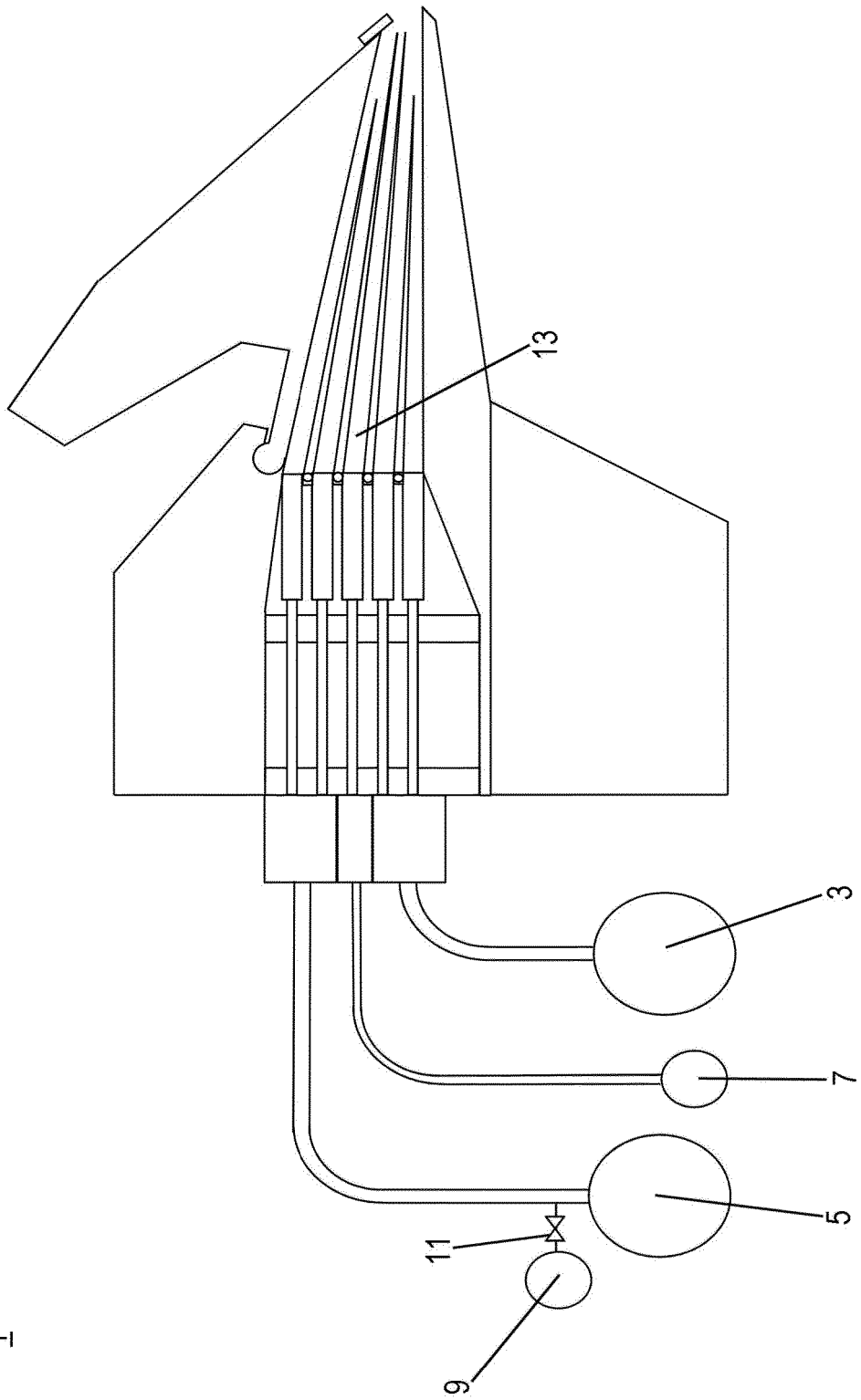

FIG. 2

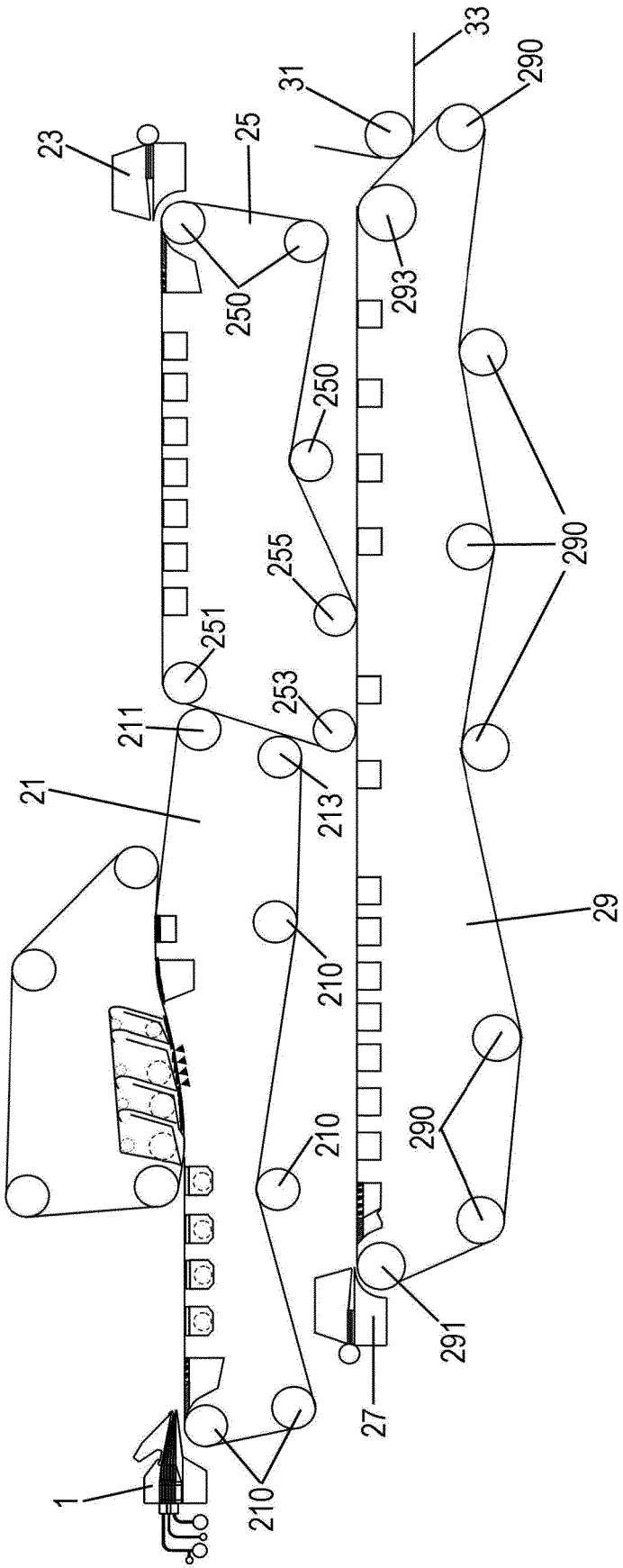
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FIG. 3C

FIG. 3B

FIG. 3A

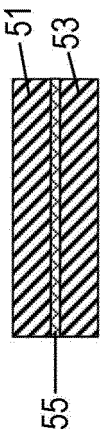


FIG. 4

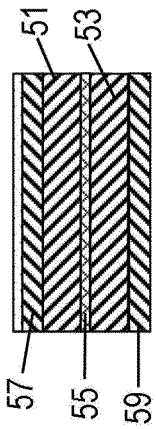
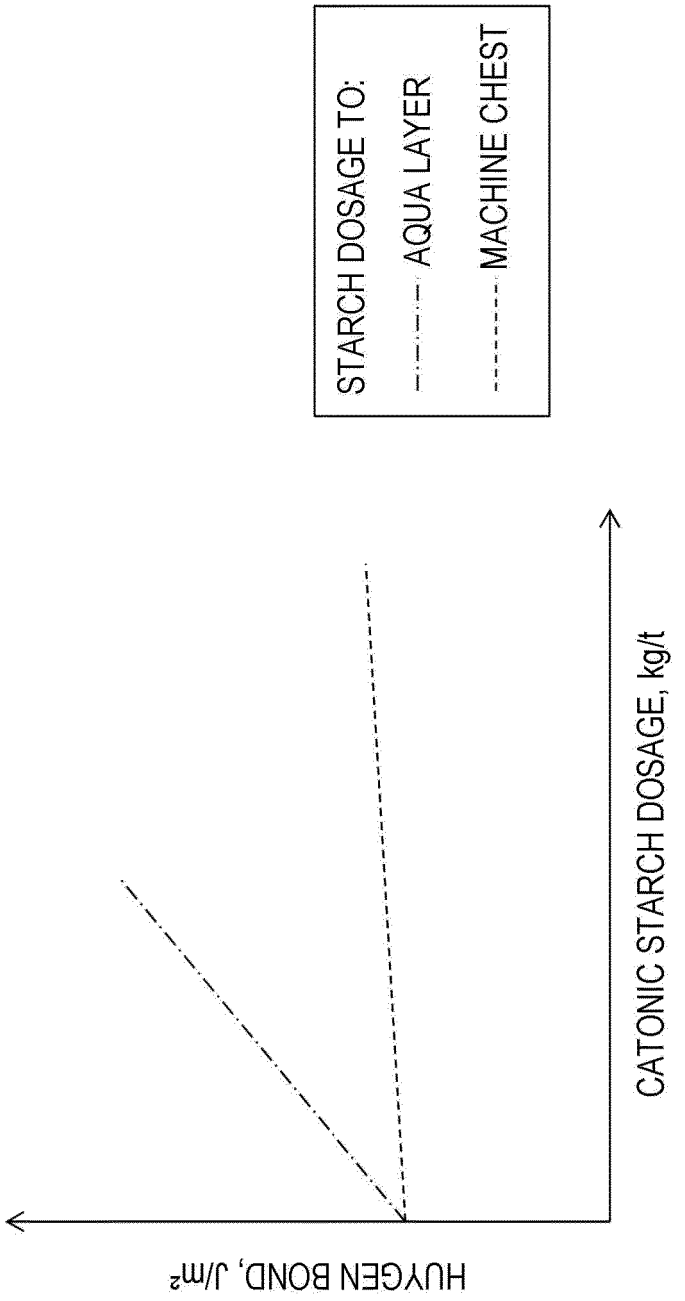


FIG. 5


STARCH DOSAGE TO:
AQUA LAYER
MACHINE CHEST
CATONIC STARCH DOSAGE, kg/t
HUYGEN BOND, J/m²

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 9940256 A1 **[0002]**
- EP 2784213 B1 **[0003] [0031]**