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(11) **EP 0 989 218 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
29.03.2000 Bulletin 2000/13

(51) Int. Cl.⁷: **D03J 1/18**, B65H 69/02,
B65H 69/06

(21) Application number: **99117663.7**

(22) Date of filing: **07.09.1999**

(84) Designated Contracting States:
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU
MC NL PT SE**
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **24.09.1998 JP 26962598**

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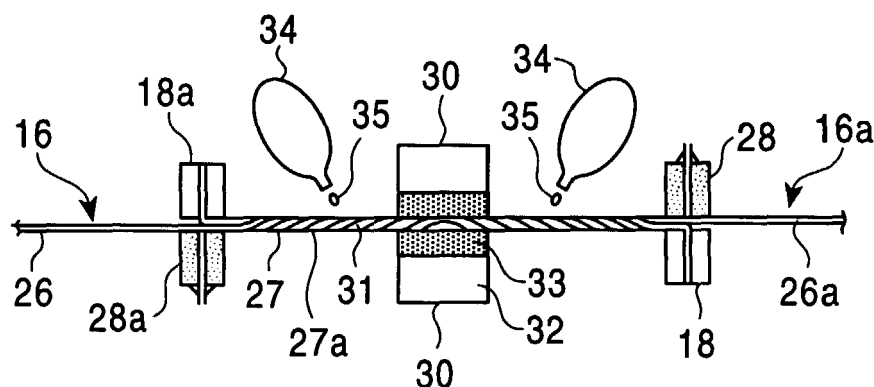
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(54) **Warp-splicing method and warp-splicing apparatus**

(57) The present invention provides a warp-splicing method that increases the splicing strength between the end and starting parts of warps. A method for splicing the end part 27 of one warp 16 to the starting part 27a of another warp 16a wherein the ends part 27 of the yarns 26 of warp 16 are overlapped with the starting part 27a of the yarn 26a of warp 16a, a twist 31 is

applied to the overlapped yarns 26 and 26a of warps 16 and 16a by pinching the yarns by using twist bars 30 and moving them widthwise with respect to each other, and the yarns are bonded together using a bonding agent 35 to splice the yarns 26 and 26a.

FIG. 3B



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Description

Field of the Invention

[0001] The present invention relates to warp splicing performed as part of a warping method for warp sample for making short warps used in a fabric sample, and to a method for warp splicing, which is a preparatory step in weaving.

Background of the Invention

[0002] In Japanese Patent Application Number 10-25994 (title of the invention: Warping Method for Warp Sample and Warper for Warp Sample, date of application: February 6, 1998), the applicant presented a warping method for warp sample for producing short warp for a fabric sample by winding many yarns between separable drums having circumferential grooves in a ribbon-like fashion.

[0003] The length of the warp sample can freely be changed by changing the spacing between the drums.

[0004] To make a fabric sample from the sample warp, the step of splicing the end part of warp sample to the starting part of other warp sample must be repeated while the warp is wound around a warper drum.

[0005] When a warp beam is switched over in a warp or fabric production process, the step of splicing the end part of the warp which has been woven to the starting part of the other warp must be repeated. As disclosed in Unexamined Japanese Patent Application Publication Number (Tokkai-shou) 60-185848 and Unexamined Japanese Patent Application Publication Number (Tokkai-hei) 4-100956, to splice warp together, the starting and end parts of the warps are overlapped and bonded together using a bonding agent (paste, adhesive, etc.).

[0006] However, bonding the warp together by using a bonding agent does not offer satisfactory splicing strength.

[0007] It is an object of the present invention to solve the above problem by providing a warp-splicing method that increases the jointing strength of the splicing part between the end of one warp and the start of another warp.

Summary of the Invention

[0008] To attain the above object, the present invention provides a warp-splicing method for splicing the end part of a warp to the starting part of other warp, wherein the end part of a warp and the starting part of a warp to be spliced are overlapped, the overlapped warps are pinched using twist bars and moved widthwise with respect to each other to twist them, and the warps are bonded together using a bonding agent.

[0009] The present invention provides a warp-splicing method, wherein the end part of one warp and the start-

ing part of the warp to be spliced are each clamped using a clamp, the warps are overlapped, comb guides that separate the warps from each other are inserted between the warps, and the warps are twisted together using twist bars.

[0010] The present invention provides a warp-splicing method, wherein the warps between clangs are spliced by turning the clamps by 90 degrees and positioning bonding-agent feeders opposite to the clamps across the warps, the clamps are separated, the end parts of warps pinched by the clamps are pressed along their respective warps, and the end part of warps are bonded to the warps by feeding a bonding agent from the bonding-agent feeders.

[0011] The present invention provides a warp-splicing method, wherein the warp is divided into two groups of odd-numbered and even-numbered, and the end part of the divided warps and the starting end parts of the other warps are overlapped.

Brief Description of the Drawing

[0012]

Figure 1 is a schematic perspective view illustrating an embodiment according to the present invention.

Figure 2 is a schematic perspective view illustrating another embodiment of the present invention.

Figure 3 illustrates a process for splicing end parts of warps according to Figure 1.

Figure 4 illustrates a process for forming a warp sample according to a invention of a senior application.

Figure 5 is a schematic perspective view showing a state before splicing in an embodiment of the present invention.

Figure 6 is a schematic perspective view showing a warp which is being cut in an embodiment of the present invention.

Figure 7 is a schematic perspective view showing a cut warp which is overlapped in an embodiment of the present invention.

Figure 8 is a schematic perspective view showing a warp which is overlapped in an embodiment of the present invention, with twisting rollers brought close to the warp.

Figure 9 is a schematic perspective view showing an overlapped warp which is being introduced between twisting rollers in an embodiment of the present invention.

Figure 10 is a schematic perspective view showing an overlapped warp which is being twisted together using twisted rollers in an embodiment of the present invention.

Figure 11 is a schematic perspective view showing the next warp which is being twisted together using twisting rollers in an embodiment of the present invention.

Figure 12 is a schematic perspective view showing all warps which are twisted together using twisting rollers in an embodiment of the present invention.

Figure 13 is a schematic perspective view showing the relationship between the twisting rollers and a rotating belt in an embodiment of the present invention.

Figure 14 is a side view of Figure 13.

Detailed Description of the preferred Embodiments

[0013] Referring now to the drawings, a preferred embodiments according to the present invention are described below.

[0014] First, a warping method for warp sample described in Japanese Patent Application Number 10-25994 filed by the applicant is outlined by using Figure 4.

[0015] In Figure 4, 10 is a winding unit comprising a pair of separable drums 11 and 12 with peripheral grooves. The drums 11 and 12 have as many peripheral grooves 13 as the warp formed on them and are adapted so that the drums rotate in synchronization with each other to wind a yarn Y from a supplying bobbin 14 in a ribbon-like fashion.

[0016] At the circumference of the winding unit 10, a traverse head 15 is provided which holds the starting end of the yarn Y from the supplying bobbin 14 and moves one pitch axially every revolution while traveling along the circumference of the winding unit 10.

[0017] Only one supplying bobbin 14 is shown in Figure 4, however, a plurality of supplying bobbins are actually provided. The traverse head 15 is adapted to hold the yarn Y from each supplying bobbin 14 and wind it around the winding unit 10 in a ribbon-like fashion.

[0018] To form a warp 16, the yarn Y from the supplying bobbin 14 is threaded through a yarn guide 17 and then wound in a ribbon-like fashion over the grooved drums 11 and 12 while being tensioned using the traverse head 15, as shown in Figure 4A. Each yarn Y fits into the groove 13 in the drums 11 and 12, and for every revolution the traverse head 15 axially moves as many pitches as the number of yarns Y so as to provide a predetermined number of warps 16 wound in the axial direction of the drums 11 and 12. After the predetermined number of warps 16 are formed, the drums 11 and 12 are stopped. Then the warp 16, extending between the drums 11 and 12, is clamped using a pair of clamps 18, then cut between these clamps 18 by using a cutter 19, and finally removed from the drums 11 and 12 to form a warp sample 20, as shown in Figure 4D.

[0019] After the warp 16 is removed, the traverse head 15 is returned to its starting position, the yarn Y is held at its starting tip by the traverse head 15 and threaded through the yarn guide 17 to resume winding the yarn Y in a ribbon-like fashion, as shown in Figure 4C.

[0020] Referring now to Figures 1 and 3, the present

invention, which is intended to wind warp sample 20 around a warper drum and splice them together one after another.

[0021] In Figure 1, 21 is a warper drum which feeds warps to a weaving machine and that splices a warp 16 clamped by clamps 18 into a long warp so that a plurality of fabric samples can be woven at a time. The warp 16, with its end tip clamped by the clamp 18, is wound around the warper drum 21, and then the clamp 18 is turned by 90 degrees downward. On the other hand, a clamp 18a on the spliced side of the warp 16a to be spliced is turned by 90 degrees upward and secured just over the clamp 18, clamping the warp 16 wound around the warper drum 21, and the warp 16a is threaded at an intermediate point thereof through a roller 22 and tensioned by suspending a tension weight 23 from a clamp 18b that clamps the end tip of the warp 16a. The end part of the warp 16 wound around the warper drum 21 and the starting part of the warp 16a are twisted together and bonded.

[0022] Splicing the warp 16 together one after another in the same way allows a plurality of fabric samples to be woven at the same time.

[0023] Referring to Figure 3, a procedure for splicing the warp 16 is described in detail below.

[0024] As shown in Figure 3A, the end part 27 of a yarn 26 of the warp 16 wound around the warper drum side and the starting part 27a of a yarn 26a of the warp 16a to be spliced are overlapped, and then the yarns 26 and 26a are clamped using the clamps 18 and 18a applied to the warps 16 and 16a, and bonding-agent feeders 28 and 28a are positioned opposite to each other to clamp the yarns 26 and 26a using the clamp 18a on the starting side and the bonding-agent feeder 28a and using the clamp 18 on the end part side and the bonding-agent feeder 28 also.

[0025] To separate the yarns 26 and 26a with their starting part 27a and end part 27 overlapped from each other, comb guides 29 and 29a are inserted between the adjacent yarns 26 and 26a.

[0026] A pair of twist bars 30 is positioned in the middle of the yarns 26 and 26a between the clamps 18 and 18a, and by moving the twist bars 30 in the opposite widthwise directions, a twist 31 is applied to the yarns 26 and 26a whose starting part 27a and end part 27 overlap. The twist bars 30 are formed by applying a twist material 33 having a high coefficient of friction, such as rubber, to a bar body 32. To impart a twist 31 to the yarns 26 and 26a, the twist bars 30 have to be moved in the opposite widthwise directions only once. To impart another twist 31 to the yarns 26 and 26a, the twist bars 30 are separated from the yarns 26 and 26a, returned to their original positions, and moved in the same way as described above. While this is done, the guides 29 and 29a remain inserted between the yarns 26 and 26a to prevent the adjacent yarns 26 and 26a from being entangled when the twist bars 30 applies a twist to the yarns 26 and 26a.

[0027] After the twist 31 is applied to the overlapped end parts 27 and 27a of the yarns 26 and 26a, a main bonding-agent feeding means 34 feed a bonding agent 35 to the end parts 27 and 27a on both sides of the twist bars 30 to bond the twisted end parts 27 and 27a together.

[0028] As shown in Figure 3C, with end parts 27 and 27a pinched by using the twist bars 30, the clamps 18 and 18a are opened to free an end tip 37 and a starting tip 37a, thus winding one of the end parts 27 and 27a around the warper drum 21. Because the other of the end parts is tensioned using the tension weight 23, an excessive twist is removed, and it is slightly extended. After the claws 18 and 18a place the end tip 37 and the starting tip 37a along the yarns 26 and 26a, the bonding-agent feeders 28 and 28a feed a bonding agent to bond the end tip 37 and the starting tip 37a to the yarns 26 and 26a, thus completing the work of splicing together yarn 26 of warp 16 and the yarn 26a of warp 16a together as shown in Figure 3D.

[0029] As described above, according to the present invention, overlapping the end part 27 of the warp 16 and the starting part 27a of the warp 16a, giving the twist 31 to these parts, and bonding them together and moreover, bonding the end tip 37 of the end part 27 and the starting tip 37a of the starting part 37 together increases the splice strength. In addition, bonding the end tip 37 and the starting tip 37a along the yarns 26 and 26a prevents the splice from posing a problem when the warp is woven using a weaving machine.

[0030] Referring now to Figure 2, another embodiment according to the present invention is described.

[0031] The embodiment of Figure 1 is described using an example of splicing the warp 16 to the new warp 16a by winding each yarn 26 of the warp 16 around the warper drum 21 as is. However, if warp 16 has many yarns, this reduces the spacing between the yarns and makes warp splicing difficult. To prevent this problem, the yarns of the warp 16 wound around the warper drum 21 are threaded through drums 40o and 40e in two groups of odd-numbered row 16o and even-numbered row 16e to splice the end parts of the odd-numbered and even-numbered rows to the warp 16a to be spliced in the same way as in Figure 3.

[0032] Dividing the warp 16 into two groups of the odd-numbered and even-numbered rows 16o and 16e facilitates splicing.

[0033] To divide the warp 16 into the odd-numbered row 16o and even-numbered row 16e, the yarn needs to be clamped using the clamp 18 in two groups of the odd-numbered and even-numbered rows 16o and 16e when winding the yarn around the winding unit 10 as shown in Figure 4.

[0034] Conversely, the two groups of the odd-numbered and even-numbered rows of the warp 16, obtained as shown in Figure 4, can be wound around the warper drum 21 to double the number of yarns of the warp 16.

[0035] Taken together, according to the present invention, twisting and bonding the end part and starting part of the warp together makes a strong splice when the warp is wound around a warper drum.

[0036] Referring to the drawings, yet another embodiment according to the present invention is described below.

[0037] Figure 5 illustrates an example of splicing the starting part of the warp 111 wound around a warper drum or the like to the end part of the warp 110 supplied to, for example, a weaving machine. Many warps 110 and 111 are disposed in parallel, and the warps 110 and 111 are clamped at their ends by using clamps 112, and further clamped at the distance of a length L predetermined in consideration of the splice length using intermediate clamps 113. Splicing parts 114 and 115 from the intermediate clamps 113 to the clamps 112 on the end side are installed vertically on a splicing device (not shown in the drawing), as shown in Figure 5.

[0038] Starting in Figure 5, one warp from each of warps 110a and 111a is mechanically removed by a conventional leasing method. That is, as shown Figure 6, one warp from each of warps 110a and 111a to which the splicing parts 114 and 115 are spliced is cut by using a cutter 116, immediately under the clamps 112 on the end side. As shown in Figure 7, the cut yarns Y10 and Y11 are overlapped and held. With the cut warps kept overlapping, upper and lower twisting rollers 117 and 118 are positioned as shown in Figure 8, and rotated in opposite directions, as indicated by arrows 119 and 120, as shown in Figure 9 to introduce the yarns Y10 and Y11 between the twisting rollers 117 and 118. Then the lower twisting roller 118 is rotated in the direction indicated by the arrow 119, as is the upper twisting roller 117, to twist the yarns Y10 and Y11 into twisted yarn 121.

[0039] As shown in Figure 11, the yarns Y10 and Y11 of the adjacent warps 110 and 111, twisted into the twisted yarn 121, are cut and overlapped as explained in Figure 2. The twisting rollers 117 and 118 are moved one pitch for the warps 110 and 111, being rotated in opposite directions, as indicated by the arrows 119 and 120, to discharge the twisted yarn 121. The next yarns Y10 and Y11 are introduced in between the twisting rollers 117 and 118 to twist them as described with reference to Figure 10.

[0040] In the same way as described above, all of warps 110a and 111a are cut successively, and their yarns Y10 and Y11 are overlapped and twisted into twisted yarn 121 as shown in Figure 12. As shown in Figure 13, upper and lower rotating belts 122 and 123 are provided at both ends of the twisted yarn 121 near the upper and lower twisting rollers 117 and 118, though these are omitted in Figures 8 through 12. The rotating belts 122 and 123 move together with the twisting rollers 117 and 118 to pinch the twisted yarn 121.

[0041] Once the warps 110 and 111 are twisted together, bonding agent is applied to one yarn or a plu-

ality of yarns of the twisted yarn 121 at one time, using the roller 125 of a bonding agent applicator 124, as shown in Figure 14. Because the spacing between the warps 110 and 111 is small, at 0.2 mm, bonding agent film is formed between the twisted yarn 121. Thus, using a bonding agent remover 126, compressed air is blown to remove excessive bonding agent.

[0042] Then hot air is blown from a dryer 128 against the pasted twisted yarn 121 to dry the bonding agent, thus providing spliced yarn 130.

[0043] The spliced yarn 130 obtained by applying bonding agent to the spliced yarn 121 and drying it is successively discharged through the rotating belts 122 and 123. A warp separating roller 132, provided on the discharge side of the rotating belts 122 and 123, is used to separate the spliced yarn 130 into individual yarns.

[0044] The warp separation roller 132 is adapted so that it has a higher peripheral speed than, for example, the rotating belts 122 and 123, and thus can remove one yarn of the spliced yarn pinched between the rotating belts 122 and 123. This makes it possible to easily separate the pasted yarns of the spliced yarn 130 from each other.

[0045] Taken together, according to the present invention, applying bonding agent to a plurality of yarns of the twisted yarn which is obtained by overlapping two warps and then twisting them using upper and lower twisting rollers, removing excessive bonding agent using compressed air, and drying the yarn enables warp to be spliced quickly without fail.

Claims

1. A warp-splicing method for splicing warps together, characterized in that the warps to be spliced are overlapped and twisted, and bonding agent is applied to the twisted part to splice the warps.
2. A warp-splicing method according to claim 1 wherein the end part of the warp is spliced to the starting part of another warp, said method being characterized in that the end part of a yarn of the warp and the starting part of a yarn of the warp to be spliced are overlapped, the overlapped yarns of the warps are pinched by using twist bars and moved in the widthwise direction with respect to each other to twist them, and the yarns are bonded together by using a bonding agent.
3. A warp-splicing method according to claim 2, wherein the end part of the warp and the starting part of the warp to be spliced are each clamped by using a clamp, the yarns of the warps are overlapped, comb guides that separate the yarns from each other are inserted between the yarns, and the yarns are twisted together by using twist bars.
4. A warp-splicing method according to claim 3, wherein the yarns between the clamps are spliced by turning the clamps by 90 degrees and positioning bonding-agent feeders opposite to the clamps across the warps, the clamps are separated, the yarn ends pinched by the clamps are pressed along their respective yarns of the warps, and the yarn ends are bonded to the yarns by feeding a bonding agent from the bonding-agent feeders.
5. A warp-splicing method according to claim 2, wherein warps are divided into two groups of odd-numbered warps and even-numbered warps, and the end part of the divided warp and the starting part of the warp are overlapped to splice them.
6. A warp-splicing method which splices each yarn of warps together, characterized in that the warps to be spliced together are overlapped on a one-to-one basis and twisted, bonding agent is applied over a plurality of the warps twisted together, and then compressed air is blown against the bonding agent surface to remove excessive bonding agent and dry the warps.
7. A warp-splicing apparatus that splices each yarn of warps, characterized in that it comprises twisting rollers that twist each overlapped warp, bonding agent applicators that apply bonding agent to a plurality of the warps, a bonding agent remover that removes excessive bonding agent applied to the warp using compressed air, a dryer that dries pasted warps, and upper and lower rotating belts that pinch the warp during the entire process from twisting to drying.
8. A warp-splicing apparatus according to claim 7, wherein a warp separating roller that divides the warp into individual warps is disposed on the warp discharge side of the rotating belts.

FIG. 1

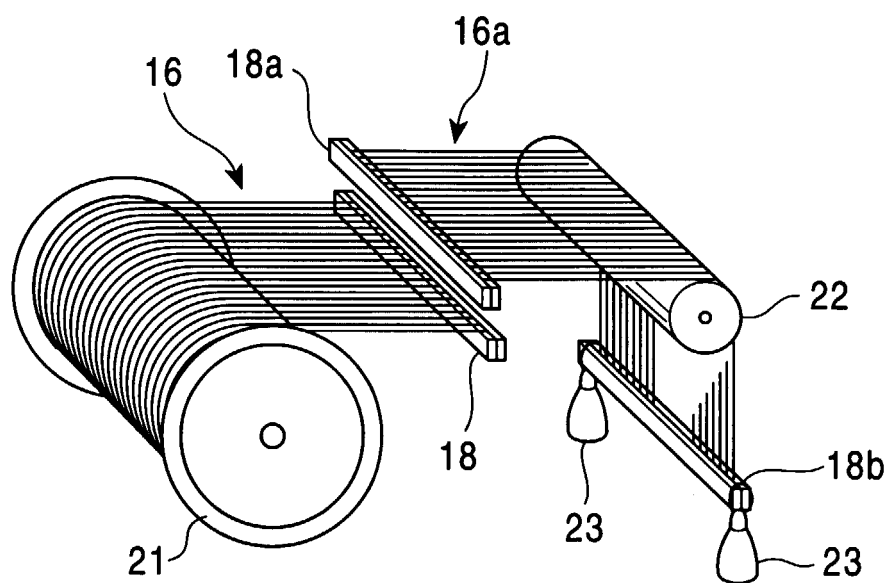


FIG. 2

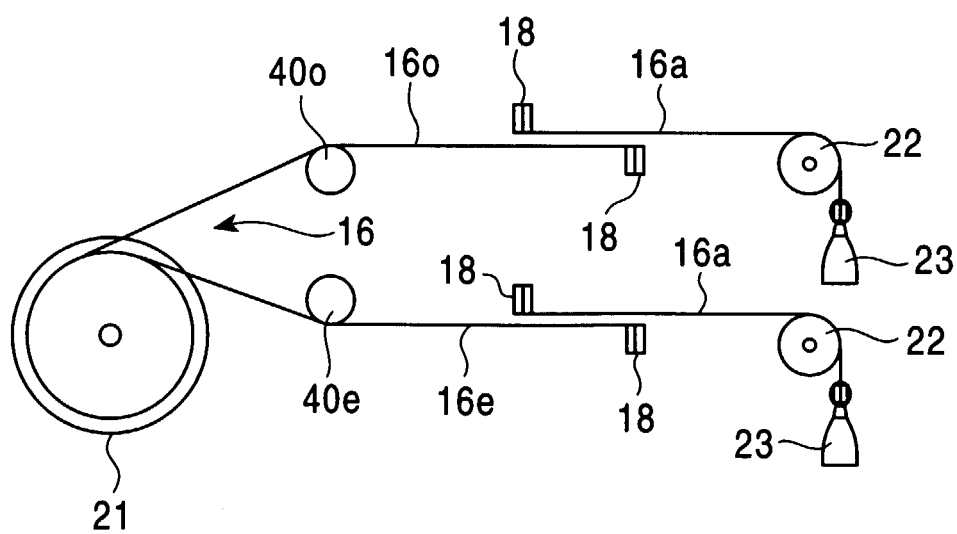


FIG. 3A

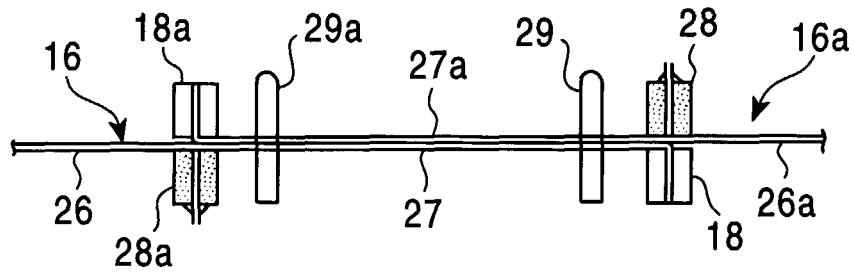


FIG. 3B

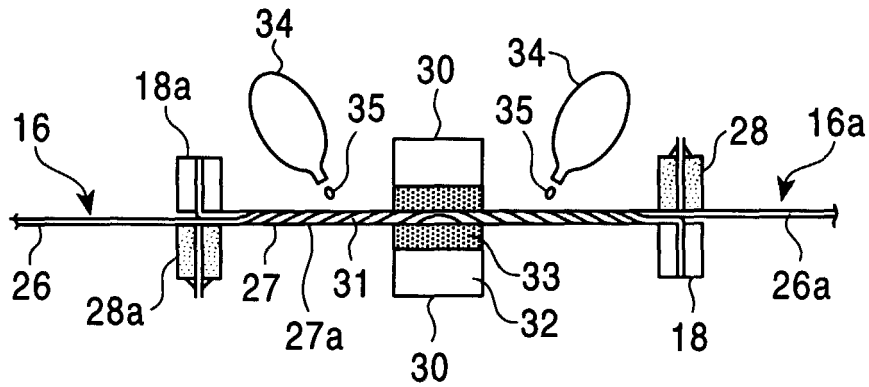


FIG. 3C

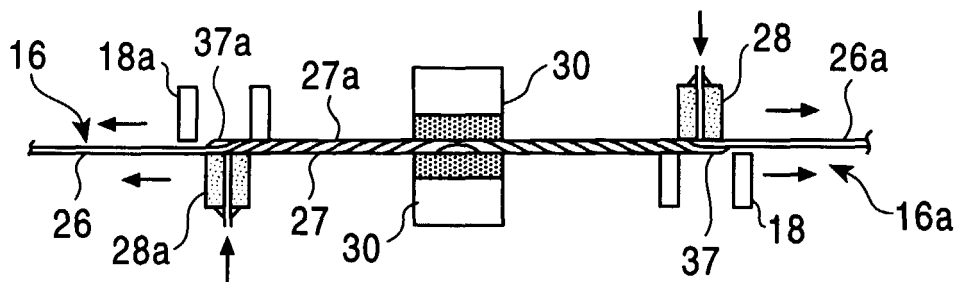


FIG. 3D

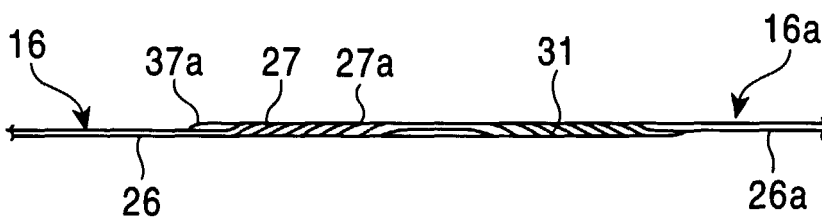


FIG. 4A

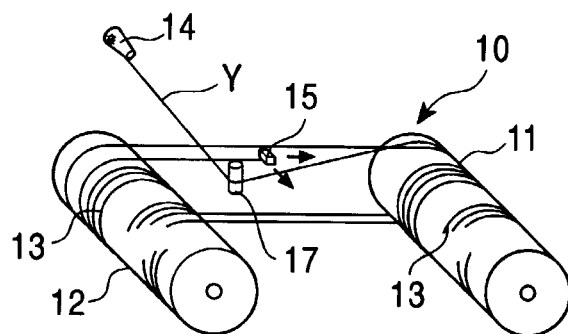


FIG. 4B

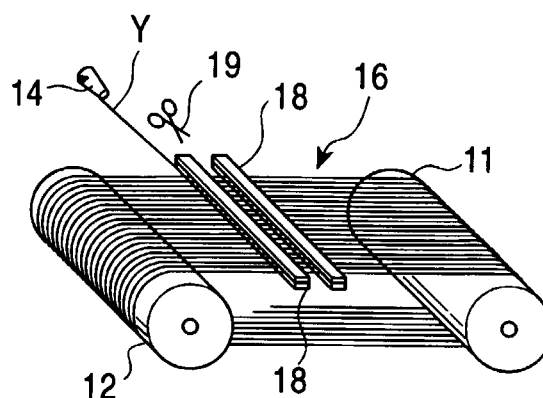


FIG. 4C

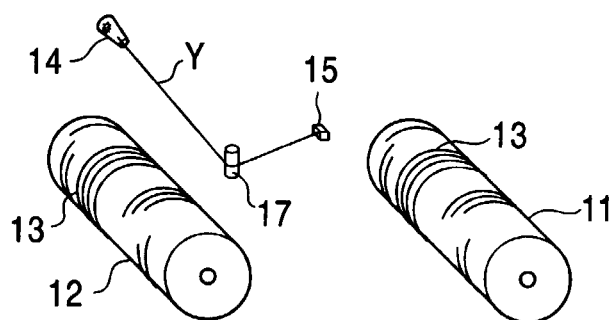


FIG. 4D

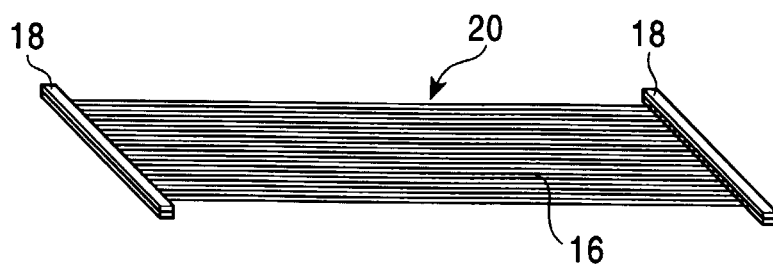


FIG. 5

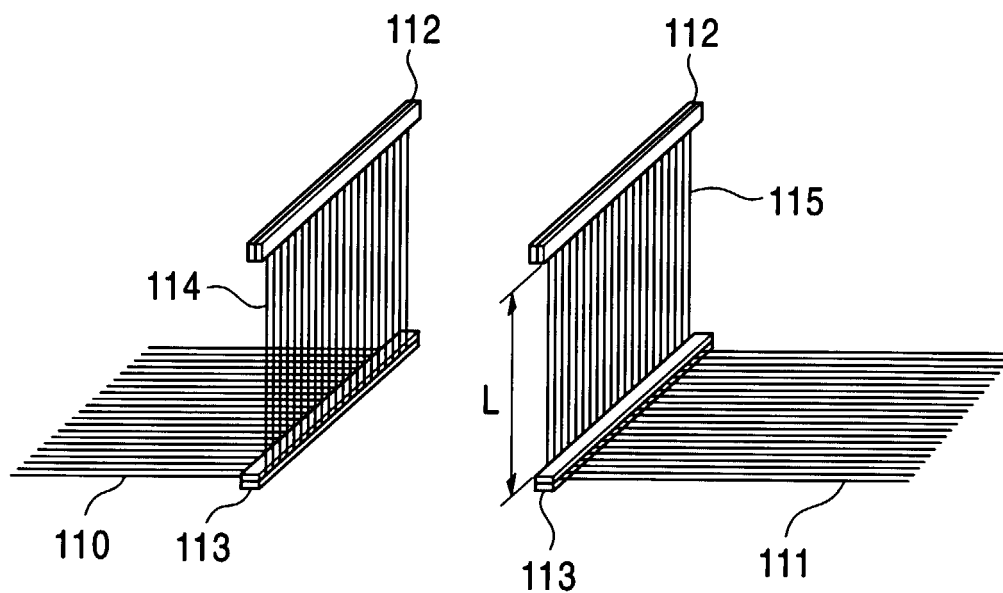


FIG. 6

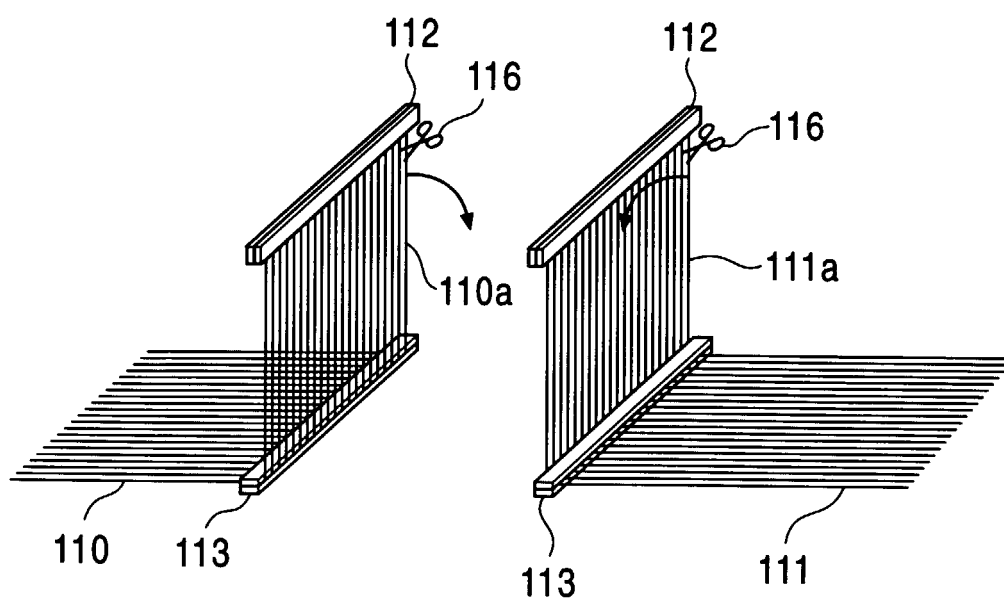


FIG. 7

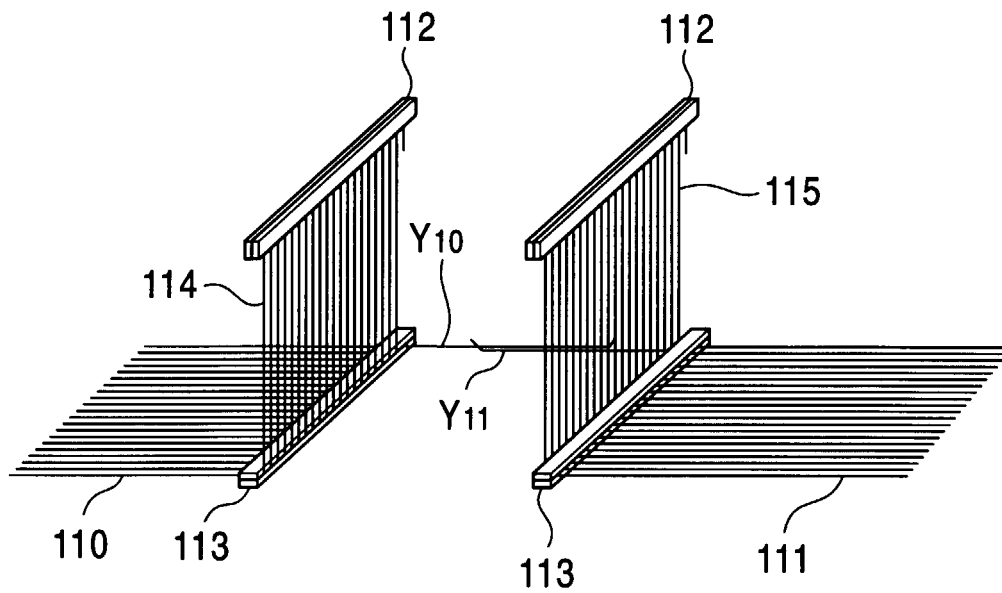


FIG. 8

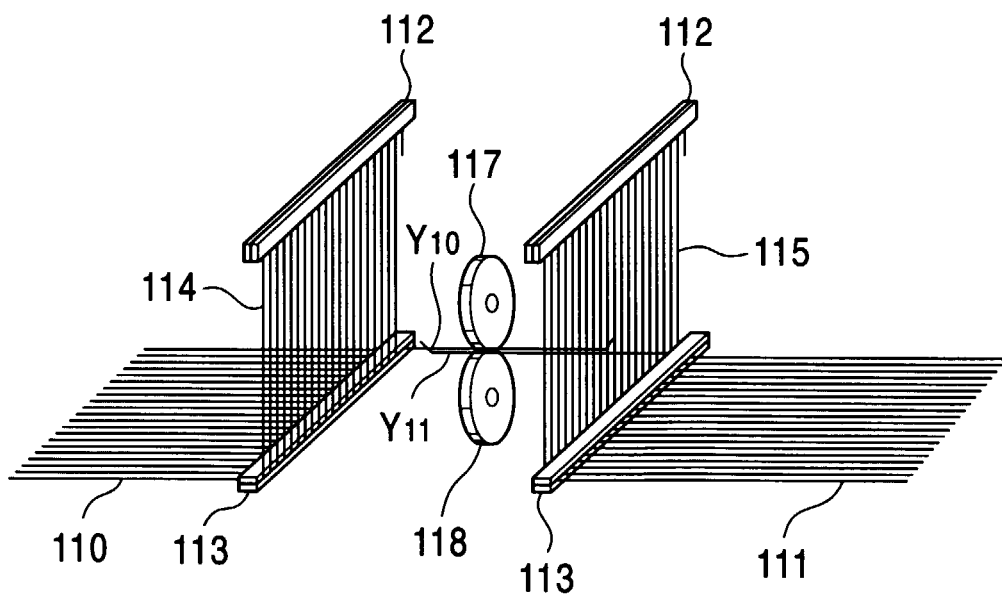


FIG. 9

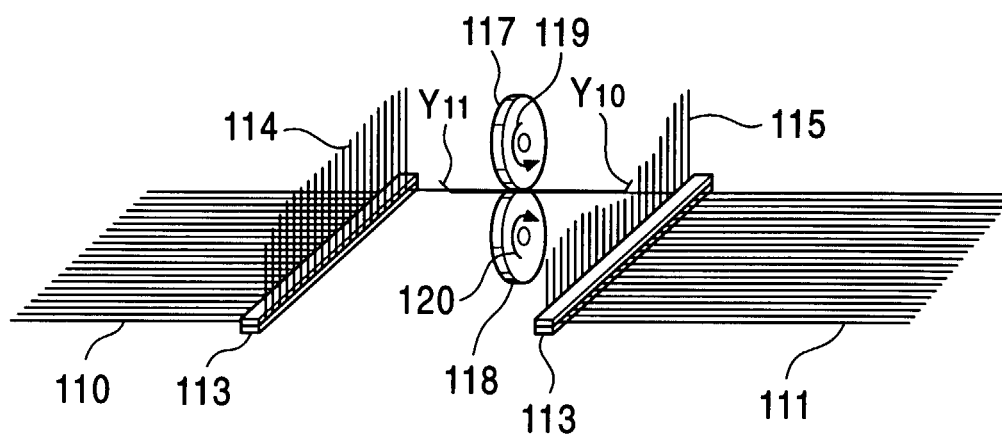


FIG. 10

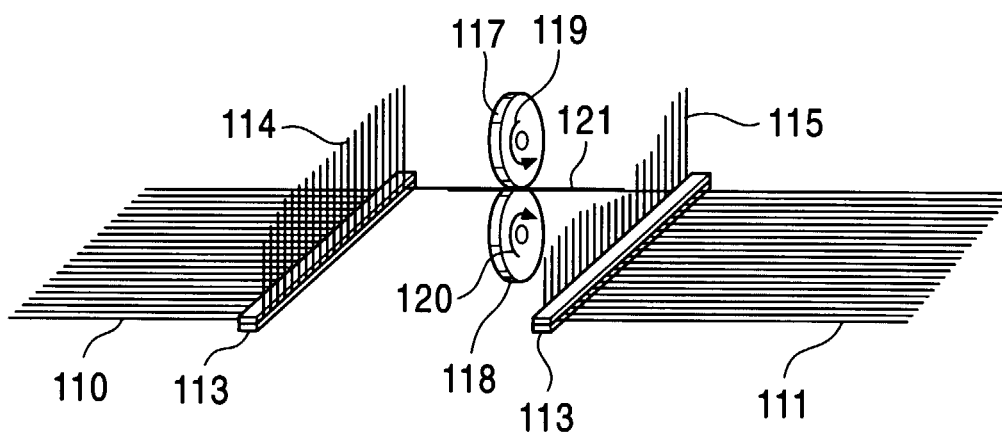


FIG. 11

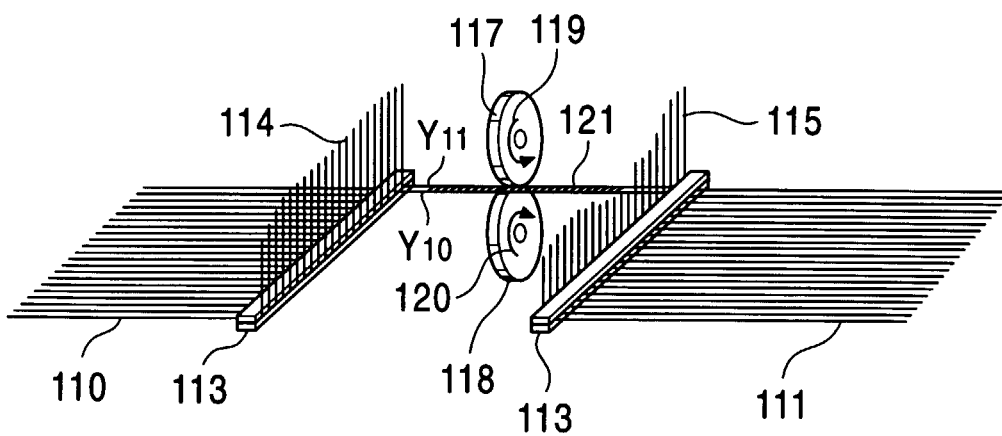


FIG. 12

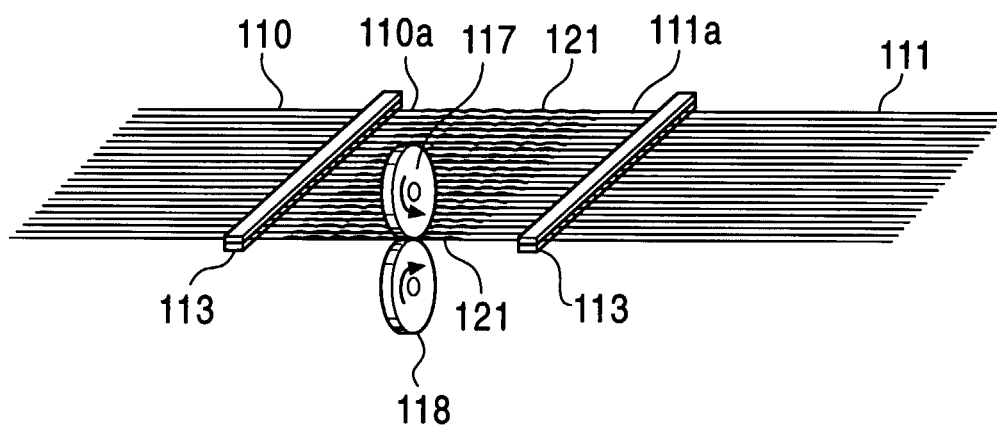


FIG. 13

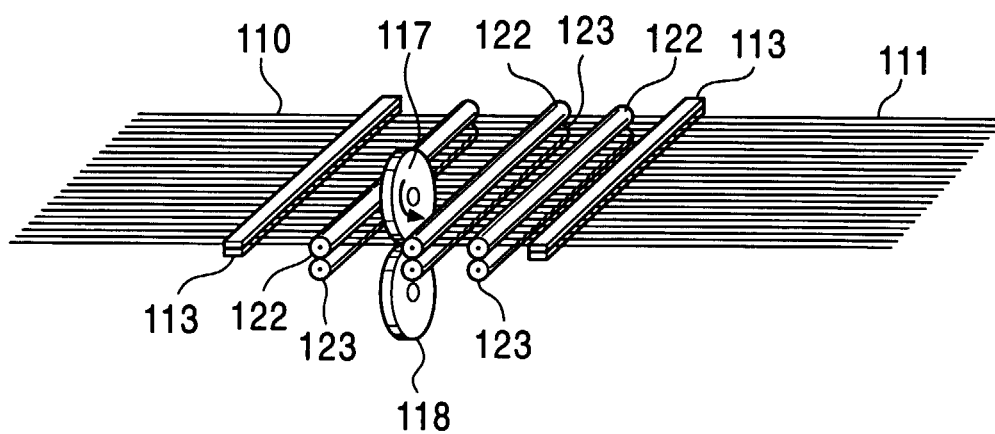
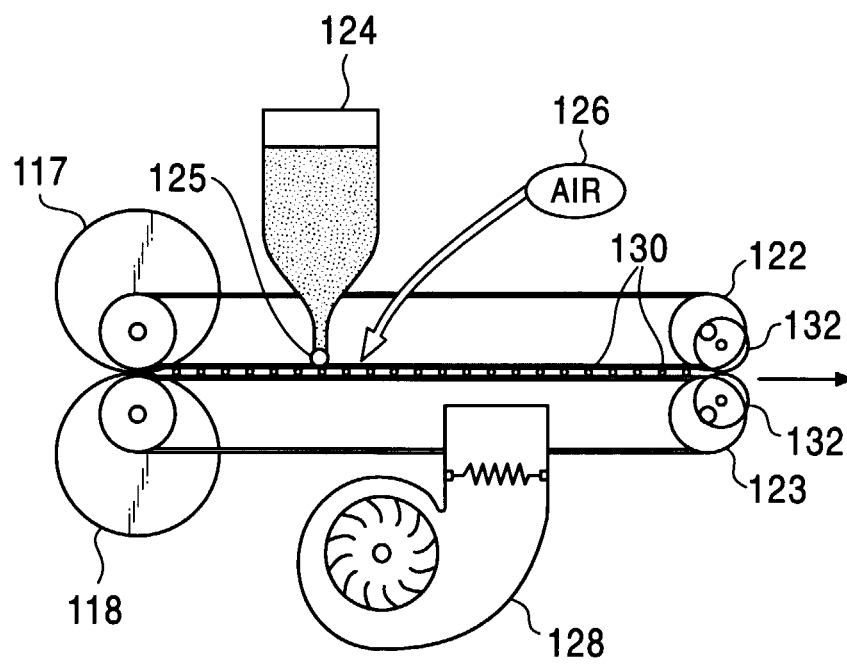


FIG. 14





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 99 11 7663

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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Place of search THE HAGUE		Date of completion of the search 17 December 1999	Examiner Rebiere, J-L
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 99 11 7663

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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