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(54) **A carding machine for preparing randomized webs for non-woven fabric**

Karde zur Vorbereitung von randomisierten Vliesen für Vliesstoffe

Carde pour la préparation de nappes aléatoires pour tissus non-tissés

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Description

[0001] The present invention relates to a carding machine for preparing randomized webs for non-woven fabric.

[0002] In particular, the invention relates to a carding machine of a type used in the wool industry and which includes:

- a final swift,
- at least two combing cylinders arranged at different heights, each operable to take from the said final swift a web of fibres predominantly orientated along a direction parallel to the direction of advance of the web,
- a randomiser cylinder which releases by condensing a thicker web of randomized fibres taken from each combing cylinder,
- a doffer cylinder which takes a randomized web from each randomiser cylinder,
- a final, perforated conveyor belt which supplies a homogenization unit with randomized webs coming from each doffer cylinder and arranged one on top of the other,
- intermediate conveyor means for conveying to the final conveyor belt the web leaving the doffer cylinder or cylinders which process the webs coming from the combing cylinders positioned at greater heights than the lowest combing cylinder,
- a plurality of finned cylinder, each driven by a variable-speed motor, which control the web along its path between a doffer cylinder and the final conveyor belt,
- the intermediate conveyor means include a pair of continuous conveyor belts the active portions of which are one above the other and adjacent.

[0003] A carding machine of the type described above is known from the European Patent Application 1 046 731 by the same applicant.

[0004] In the carding machine with two combing cylinders, described with reference to Figure 2 of the aforesaid document, as far as the upper combing cylinder (2) is concerned, the aforesaid intermediate conveyor means include:

- a main conveyor belt (5) with a horizontal active portion (5a) and an inclined active portion (5b),
- an auxiliary conveyor belt (12) having an active portion of which only the central section is adjacent to the inclined portion (5b) of the main conveyor belt (5) under the action of an adjustable cylinder (13).

[0005] The upper randomized web is released by the doffer cylinder (4) onto the active portion (5a) of the main conveyor belt and passes in succession through the two adjacent portions, which are inclined to each other, of the main and auxiliary conveyor belts before being deposited on the final conveyor belt (15).

[0006] The web carried by the horizontal active portion (5a) of the main conveyor belt (5) is controlled, at the beginning and at the end of this horizontal portion; by two finned control cylinders (6, 11), the first of which (6) is adjacent the doffer (4) and is associated with a flap (9) intended to control the abrupt difference in pressure which occurs when the web is released by the doffer (4).

[0007] Although the known arrangement described above constitutes substantial progress compared to the prior art, it does not fully solve the problem of maintaining at high speed the high degree of randomization of the web released by the doffer cylinder, while the web is being conveyed from the doffer cylinder to the final conveyor belt which leads to a cohesion-inducing station.

[0008] In fact, the randomized web has no cohesion and so, in those sections where the surface is free and in those sections where it changes in inclination, it tends to return from the randomized configuration back to the initial configuration it had when leaving the combing cylinder, in which configuration the fibres were all parallel to the direction of advance.

[0009] This phenomenon of loss of randomization also occurs, though to a small extent, with the carding machine according to the aforementioned document, in which the surface of the web is free between the two finned control cylinders 4, 11 arranged at either end of the horizontal active portion and undergoes a considerable change in inclination when passing from this horizontal active portion to the inclined active portion of the main conveyor belt.

[0010] In order to eliminate the above problem, the present invention provides a carding machine for preparing randomized webs for non-woven fabrics having the characteristics stated in Claim 1.

[0011] Further characteristics are claimed in the subsequent Claims.

[0012] The invention will now be described with reference to the appended drawings, provided purely by way of non-limitative example, in which:

Figure 1 illustrates a carding machine with two combing cylinders according to the invention,
Figure 2 shows a variant of the machine of Figure 1, and
Figure 3 shows a carding machine with three combing cylinders.

[0013] With reference to Figure 1, the final swift of a carding machine, indicated 1, is rotatable clockwise, while two output combing cylinders, indicated 2a and 2b, are arranged at different heights and are both rotatable anti-clockwise.

[0014] The lower combing cylinder 2a takes a lower web, constituted by fibres orientated parallel to the direction of advance, from the cylinder 1 in a known manner.

[0015] In a known manner, a randomiser cylinder 3 rotating clockwise takes a first web of randomized fibres, that is, fibres distributed according to a statistically ran-

dom pattern, from the combing cylinder 2a.

[0016] The cylinder 3 is doffed, in a known manner, by a doffer cylinder 4 rotating clockwise.

[0017] The conveying of the randomized fibres from the randomiser cylinder 3 to the doffer cylinder 4 is controlled by a control cylinder 5 which rotates anti-clockwise and is provided with oblique circumferential fins, like the cylinder indicated B in Figures 7 and 8 and described with reference to these figures in the aforementioned European Patent Application 1 046 731.

[0018] This set of oblique fins has proved to be particularly effective in conveying and controlling the web of randomized fibres and in conducting the air flows produced by the cylinders 3 and 4.

[0019] The restraining and compressing action exerted on the fibres by the cylinder 5 prevents the web from being deformed and stretched.

[0020] The web leaving the doffer 4 is deposited on a perforated conveyor belt 6 which conveys it to a web homogenization unit, which is not shown.

[0021] The active portion of the final perforated conveyor belt 6 has an initial section over which is arranged the adjacent active portion of a conveyor belt 13, which moves at the same speed as the belt 6. A support cylinder 6a upstream of the perforated belt 6 has radial fins and the doffer 4 delivers the lower randomized web between the belts 6 and 13.

[0022] An oblique-finned cylinder 7 acts on the active portion of the conveyor belt 6 immediately downstream of the conveyor belt 13.

[0023] This arrangement ensures the stability of the randomization of the lower web during the initial path thereof on the belt 6.

[0024] In the same way as described above with respect to the lower combing cylinder 2a, an upper randomiser cylinder 3 takes a web of randomized fibres from the upper combing cylinder 2b and is doffed by an upper doffer cylinder 4. The conveying of the randomized web from the cylinder 3 to the cylinder 4 is controlled by an oblique-finned cylinder 5, driven by an independent, adjustable-speed motor.

[0025] The upper doffer cylinder 4 delivers the upper web between the adjacent portions of two conveyor belts 8, 9 arranged the one above the other and inclined downwards. The advance speed of these two belts 8 and 9, which clamp the web between them throughput their length, is the same as the peripheral speed of the doffer cylinder 4.

[0026] The upper belt 9 is airtight, while the lower belt 8 is perforated. The cylinder 8a, which supports the perforated belt 8 upstream, that is, adjacent to the doffer cylinder 4, is provided with radial circumferential fins like the cylinder indicated A in Figures 3 and 4 of the aforementioned European Patent Application 1 046 731.

[0027] An oblique-finned control cylinder 10 acts on the top surface of the web along the path thereof from the doffer cylinder 4 to the conveyor belts 8, 9, thereby facilitating the insertion of the web between these belts.

[0028] The upper randomized web is conveyed by the two conveyor belts 8 and 9 without any loss of randomization, thanks to the perforation of the lower belt 8 and to the set of radial fins of the cylinder 8a, which enable discharge of the air turbulence produced by the cylinders rotating at high speed.

[0029] On leaving the conveyor belts 8 and 9, the upper randomized web is deposited on the lower randomized web carried by the final conveyor belt 6 downstream of the oblique-finned cylinder 7, after which an oblique-finned cylinder 11 acts on the two webs arranged one on top of the other in order to prevent any loss of randomization of the two webs before these enter the homogenization unit.

[0030] It has been experimentally confirmed that a carding machine having the characteristics described above enables to produce a non-woven fabric which is isotropic once it has been homogenized, that is, a fabric having a longitudinal strength (that is to say, in the direction of advance of the final conveyor 6) is equal or close to the transverse strength thereof.

[0031] The carding machine according to the variant illustrated in Figure 2 differs from that of Figure 1 in that two randomiser cylinders 3 and 3a are arranged in series between the upper combing cylinder 2b and the upper doffer cylinder 4 instead of the single randomiser cylinder 3 shown in Figure 1.

[0032] In this case, the randomization of the upper web is performed in two successive stages instead of in one stage only.

[0033] Since the second randomiser 3a rotates in the opposite sense to that of the first randomiser 3, the web is dragged on its top surface by the first randomiser cylinder 3 and on its bottom surface by the second randomiser cylinder 3a, whereby it moves along a sinusoidal path over these cylinders. Therefore, an upper oblique-finned control cylinder 5a is used to control the path of the web over the cylinder 3 and a second oblique-finned control cylinder 12 is used to control the path of the web over the randomiser cylinder 3a.

[0034] The perforated lower conveyor belt 8 has a free first active section, that is, a section which is not affected by the active portion of the belt 9, and the doffer cylinder 4 is arranged over this free section.

[0035] In the carding machine according to the variant illustrated in Figure 3, three combing cylinders 2a, 2b and 2c are used.

[0036] The intermediate combing cylinder 2b cooperates with a randomiser cylinder 3 and the intermediate randomized web leaving the randomiser 3 is delivered by a doffer cylinder 4, with the assistance of an oblique-finned control cylinder 10, between two inclined conveyor belts 8 and 9 which deposit it on the lower randomized web carried by the final conveyor belt 6.

[0037] The upper combing cylinder 2c cooperates with a randomiser cylinder 3 and the randomized web leaving the randomiser 3 is fed to a doffer cylinder 4. An oblique-finned control cylinder 5 controls the passage of the web

from the cylinder 3 to the cylinder 4. The doffer cylinder 4 delivers the upper randomized web between two conveyor belts 14, 15 having the same characteristics as the conveyor belts 8 and 9 described above with reference to Figure 2

[0038] The two conveyor belts 14 and 15 convey the upper randomized web to the doffer 4 associated with the intermediate web, produced by the randomiser cylinder 3 in cooperation with the intermediate combing cylinder 2b. The doffer cylinder 4 associated with the intermediate combing cylinder 2b therefore delivers two webs arranged one on top of the other between the conveyor belts 8 and 9, the webs being deposited by the belts on the lower randomized web conveyed by the final conveyor belt 6.

[0039] The assembly constituted by the upper combing cylinder 2b and the elements 3, 4, 5, 10, 15 associated therewith is advantageously carried by a support structure which can be moved between the active position shown in Figure 3 and a rest position in which only the combing cylinder 2a and 2b are operational.

Claims

1. A carding machine for preparing randomized webs for non-woven fabrics, which includes:

   - a final swift (1),
   - at least two combing cylinders (2a, 2b) arranged at different heights, each operable to take from the final swift (1) a web of fibres which are predominantly orientated in a direction parallel to the direction of advance of the web,
   - a randomiser cylinder (3) which releases by condensing a thicker web of randomized fibres taken from each combing cylinder (2a, 2b),
   - a doffer cylinder (4) which takes a randomized web from each randomiser cylinder (3),
   - a final perforated conveyor belt (6) which supplies a homogenization unit with the webs coming from each doffer cylinder (4),
   - intermediate conveyor means (8, 9) for conveying to the final conveyer (6) the webs leaving the doffer cylinder or cylinders (4) which act on the webs coming from the combing cylinders (2a, 2b) which are arranged at greater heights than the lowest combing cylinder (2a),
   - a plurality of finned cylinders (7, 10, 11), which are driven each by a variable-speed motor and control the web along its path between each doffer cylinder (4) and the final conveyor belt (6),
   - the intermediate conveyor means include a pair of continuous conveyor belts (8, 9) the active portions of which are one above the other and adjacent, **characterised in that**:

     - the upper belt (9) is airtight while the lower belt (8) is perforated,
     - the cylinder (8a) on which the lower, perforated belt (8) is wound upstream is arranged adjacent the respective doffer cylinder (4), whereby the randomized web leaving this doffer (4) is delivered directly between the two conveyor belts (8, 9).

2. A carding machine according to Claim 1, **characterised in that** it also includes an oblique-finned cylinder (10) which acts on the upper surface of the web travelling from the doffer cylinder (4) to the two conveyor belts (8, 9).

3. A carding machine according to Claims 1 or 2, **characterised in that** the cylinder (8a) over which the lower, perforated belt (8) is wound is a finned cylinder, the fins of which extend radially with respect to its axis of rotation.

4. A carding machine according to any of the preceding Claims, **characterised in that** it includes two combing cylinders (2a, 2b) and **in that** the pair of continuous conveyor belts (8, 9) take the randomized web from the doffer cylinder (4) associated with the upper combing cylinder (2b) and deposit it directly on the final conveyor belt (6).

5. A carding machine according to Claims 1 and 4, **characterised in that** a second randomiser cylinder (3a) is arranged between the randomiser cylinder (3) cooperating with the upper combing cylinder (2b) and the doffer cylinder (4).

6. A carding machine according to Claim 1, **characterised in that**:

   - the carding machine includes three combing cylinders (2a, 2b, 2c),
   - the intermediate conveyor means include two pairs (14, 15; 8, 9) of continuous conveyor belts,
   - a first pair of continuous conveyor belts (14, 15) convey a first randomized web leaving the doffer cylinder (4) associated with the upper combing cylinder (2c) to the doffer cylinder (4) associated with the intermediate combing cylinder (2b), whereby this first randomized web is deposited on top of the second randomized web coming from the intermediate combing cylinder (2b),
   - a second pair of conveyor belts (8, 9) convey the aforesaid randomized webs arranged one on top of the other from the doffer cylinder (4) associated with the intermediate combing cylinder (2b) to the final perforated conveyor belt (6), where these randomized webs are deposited on top of the randomized web coming from the lower combing cylinder (2a).

7. A carding machine according to any of the preceding Claims, **characterised in that** an oblique-finned cylinder (5) controls the web along its path from a randomiser cylinder (3) to a doffer cylinder (4).

8. A carding machine according to any of the preceding Claims, **characterised in that** an oblique-finned cylinder (7, 11) controls each web once this latter has been deposited on the final conveyor belt (6).

9. A carding machine according to Claim 5, **characterised in that** two oblique-finned cylinder (5a, 12) control the web along its path over the randomiser cylinders (3, 3a).

10. A carding machine according to any of the preceding Claims, **characterised in that**:

- the final, perforated conveyor belt (6) is supported at the end facing the carding machine by a cylinder (6a) with radial fins,
- a continuous conveyor belt (13) is arranged over the initial section of the perforated final conveyor belt (6), the active portion of the conveyor belt (13) being arranged over the active portion of the final conveyor belt (6),
- the web leaving the doffer cylinder (4) associated with the lower combing cylinder (2a) is delivered between the active portions of the aforesaid two conveyor belts (6, 13) and is controlled, once it leaves these two belts, by an oblique-finned cylinder (7).

Patentansprüche

1. Krempelmaschine für die Herstellung von zufällig angeordneten Geweben für Faservliese, wobei die Maschine aufweist:

- eine End-Haspel (1),
- zumindest zwei Kämmzylinder (2a, 2b), die in unterschiedlichen Höhen angeordnet sind, wobei jeder in Betrieb gesetzt werden kann, um von der End-Haspel (1) ein Gewebe aus Fasern abzunehmen, die vorwiegend entlang einer Richtung parallel zur Vorschubrichtung des Gewebes ausgerichtet sind,
- einen Zylinder zum Ausbilden einer zufälligen Anordnung (3), der ein dickeres Gewebe aus zufällig angeordneten Fasern durch Abscheiden abgibt, das von jedem Kämmzylinder (2a, 2b) abgenommen wird,
- einen Abnehtinerzylinder (4), der ein zufällig angeordnetes Gewebe von jedem Zylinder zum Ausbilden einer zufälligen Anordnung (3) abnimmt,
- ein mit Löchern versehenes End-Förderband (6), das eine Homogenisierungseinheit mit den Geweben beschickt, die von jedem Abnehmerzylinder (4) kommen,
- eine Zwischen-Fördereinrichtung (8, 9), um zum, End-Förderer (6) Gewebe zu transportieren, die den oder die Abnehmerzylinder (4) verlassen, die auf die Gewebe wirken, die von den Kämmzylindern (2a, 2b) kommen, die in einer größeren Höhe als der unterste Kämmzylinder (2a) angeordnet sind,
- eine Vielzahl von mit Rippen versehenen Zylindern (7, 10, 11), von denen jeder von einem Motor mit variabler Drehzahl angetrieben wird und die das Gewebe entlang seines Wegs zwischen jedem Abnehmerzylinder (4) und dem End-Förderband (6) steuern,
- wobei die Zwischen-Fördereinrichtung ein Paar von Endlosförderbändern (8, 9) aufweist, deren aktive Teile übereinander und nebeneinander angeordnet sind,

dadurch gekennzeichnet, dass
das obere Band (9) luftdicht ist, während das untere Band (8) mit Löchern versehen ist,

- der Zylinder (8a), um den das mit Löchern versehene Band (8) stromaufwärts geschlungen ist, neben dem entsprechenden Abnehmerzylinder (4) angeordnet ist, wodurch das zufällig angeordnete Gewebe, das diesen Abnehmer (4) verlässt, direkt zwischen die beiden Förderbänder (8, 9) geführt wird.

2. Krempelmaschine gemäß Anspruch 1, **dadurch gekennzeichnet, dass** die Maschine weiters einen mit schrägen Rippen versehenen Zylinder (10) aufweist, der auf die obere Fläche des Gewebes wirkt, das vom Abnehmerzylinder (4) zu den beiden Förderbändern (8, 9) läuft.

3. Krempelmaschine gemäß Anspruch 1 oder 2, **dadurch gekennzeichnet, dass** der Zylinder (8a), über den das untere mit Löchern versehene Band (8) geschlungen ist, ein mit Rippen versehener Zylinder ist, dessen Rippen radial zu seiner Drehachse verlaufen.

4. Krempelmaschine gemäß irgendeinem der bisherigen Ansprüche, **dadurch gekennzeichnet, dass** die Maschine zwei Kämmzylinder (2a, 2b) aufweist, und dass das Paar von Endlosförderbändern (8, 9) das zufällig angeordnete Gewebe vom Abnehmerzylinder (4) abnimmt, der dem oberen Kämmzylinder (2b) zugeordnet ist, und es direkt auf das End-Förderband (6) ablegt.

5. Krempelmaschine gemäß Anspruch 1 und 4, **dadurch gekennzeichnet, dass** ein zweiter Zylinder

zum Ausbilden einer zufälligen Anordnung (3a) zwischen dem Zylinder zum Ausbilden einer zufälligen Anordnung (3), der mit dem oberen Kämmzylinder (2b) zusammen arbeitet, und , dem Abnehmerzylinder (4) angeordnet ist.

6. Krempelmaschine gemäß Anspruch 1, **dadurch gekennzeichnet, dass** :

- die Krempelmaschine drei Kämmzylinder (2a, 2b, 2c) aufweist,
- die Zwischen-Fördereinrichtung zwei Paare (14, 15; 8, 9) von Endlosförderbändern aufweist,
- ein erstes Paar von Endlosförderbändern (14, 15) ein erstes zufällig angeordnetes Gewebe, das den Abnehmerzylinder (4) verlässt, der dem oberen Kämmzylinder (2c) zugeordnet ist, zum Abnehmerzylinder (4) transportiert, der dem Zwischen-Kämmzylinder (2b) zugeordnet ist, wodurch dieses erste zufällig angeordnete Gewebe auf dem zweiten zufällig angeordneten Gewebe angeordnet wird, das vom Zwischen-Kämmzylinder (2b) kommt,
- ein zweites Paar von Förderbändern (8, 9) die oben erwähnten zufällig angeordneten Gewebe, die übereinander angeordnet sind, vom Abnehmerzylinder (4), der dem Zwischen-Kämmzylinder (2b) zugeordnet ist, zu dem mit Löchern versehenen End-Förderband (6) transportiert, wo diese zufällig angeordneten Gewebe auf das zufällig angeordnete Gewebe abgelegt werden, das vom unteren Kämmzylinder (2a) kommt.

7. Krempelmaschine gemäß irgendeinem der bisherigen Ansprüche, **dadurch gekennzeichnet, dass** ein mit schrägen Rippen versehener Zylinder (5) das Gewebe längs seines Wegs von einem Zylinder zum Ausbilden einer zufälligen Anordnung (3) zu einem Abnehmerzylinder (4) steuert.

8. Krempelmaschine gemäß irgendeinem der bisherigen Ansprüche, **dadurch gekennzeichnet, dass** ein mit schrägen Rippen versehener Zylinder (7, 11) jedes Gewebe steuert, wenn dieses einmal auf das End-Förderband (6) abgelegt wurde.

9. Krempelmaschine gemäß Anspruch 5, **dadurch gekennzeichnet, dass** zwei mit Rippen versehene Zylinder (5a, 12) das Gewebe längs seines Wegs über die Zylinder zum Ausbilden einer zufälligen Anordnung (3, 3a) steuert.

10. Krempelmaschine gemäß irgendeinem der bisherigen Ansprüche, **dadurch gekennzeichnet, dass**:

- das mit Löchern versehene End-Förderband (6) an dem der Krempelmaschine gegenüber liegenden Ende auf einem Zylinder (6a) gelagert ist, der mit radialen Rippen versehen ist,
- ein Endlosförderband (13) über dem Anfangsteil des mit Löchern versehenen End-Förderbands (6) angeordnet ist, wobei der aktive Teil des Förderbands (13) über dem aktiven Teil des End-Förderbands (6) angeordnet ist,
- das Gewebe, das den Abnehmerzylinder (4) verlässt, der dem unteren Kämmzylinder (2a) zugeordnet ist, zwischen die aktiven Teile der oben erwähnten beiden Förderbänder (6, 13) geführt wird, wobei es dann, wenn es einmal diese beiden Bänder verlässt, von einem mit schrägen Rippen versehenen Zylinder (7) gesteuert wird.

Revendications

1. Machine de cardage pour la préparation de nappes aléatoires pour tissus non-tissés, qui comprend :

- un tambour final (1),
- au moins deux cylindres de peignage (2a, 2b) disposés à des hauteurs différentes, chacun pouvant être actionné pour prélever à partir du tambour final (1) une nappe de fibres qui est de façon prédominante orientée dans une direction parallèle à la direction d'avance de la nappe,
- un cylindre d'aléation (3) qui libère par condensation une nappe plus épaisse de fibres aléatoires prélevées à partir de chaque cylindre de peignage (2a, 2b),
- un cylindre peigneur (4) qui prélève une nappe aléatoires à partir de chaque cylindre d'aléation (3),
- une bande transporteuse perforée finale (6) qui alimente une unité d'homogénéisation avec les nappes provenant de chaque cylindre peigneur (4),
- des moyens de transport intermédiaires (8, 9) pour acheminer vers le transporteur final (6) les nappes quittant le ou les cylindre(s) peigneur(s) (4), qui agissent sur les nappes provenant des cylindres de peignage (2a, 2b) qui sont disposés à des hauteurs supérieures au cylindre de peignage inférieur (2a),
- une pluralité de cylindres à empennage (7, 10, 11) qui sont entraînés chacun par un moteur à vitesse variable et commandent la nappe le long de son trajet entre chaque cylindre peigneur (4) et la bande transporteuse finale (6),
- les moyens de transport intermédiaires comprennent une paire de bandes transporteuses continues (8, 9) dont les portions actives sont disposées l'une sur l'autre et de façon contiguë,

caractérisée en ce que

- la bande supérieure (9) est étanche à l'air, tandis que la bande inférieure (8) est perforée,
- le cylindre (8a) sur lequel est enroulée la bande perforée inférieure (8) en amont est disposé de façon contiguë au cylindre peigneur (4), la nappe aléatoire quittant ce peigneur (4) est délivrée directement entre les deux bandes transporteuses (8, 9).

2. Machine de cardage selon la revendication 1, **caractérisée en ce qu'**elle comprend également un cylindre à empennage oblique (10) qui agit sur la surface supérieure de la nappe et qui se déplace à partir du cylindre peigneur (4) vers les deux bandes transporteuses (8, 9).

3. Machine de cardage selon les revendications 1 ou 2, **caractérisée en ce que** le cylindre (8a) sur lequel est entourée la bande perforée inférieure (8) est un cylindre à empennage, dont les ailettes s'étendent radialement par rapport à son axe de rotation.

4. Machine de cardage selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**elle comprend deux cylindres de peignage (2a, 2b) et dans laquelle la paire de bandes transporteuses continues .(8, 9) prélève la nappe randomisée à partir du cylindre peigneur (4) associé au cylindre de peignage supérieur (2b) et la dépose directement sur la bande transporteuse finale (6).

5. Machine de cardage selon les revendications 1 et 4, **caractérisée en ce qu'**un second cylindre d'aléation (3a) est disposé entre le cylindre d'aléation (3) coopérant avec le cylindre de peignage supérieur (2b) et le cylindre. peigneur (4).

6. Machine de cardage selon la revendication 1, **caractérisée en ce que** :

- la machine de cardage comprend trois cylindres de peignage (2a, 2b, 2c),
- les moyens de transport intermédiaires comprennent deux paires (14, 15 ; 8, 9) de bandes transporteuses continues,
- une première paire de bandes transporteuses continues (14, 15) achemine une première nappe aléatoire quittant le cylindre peigneur (4) associé au cylindre de peignage supérieur (2c) vers le cylindre peigneur (4) associé au cylindre de peignage intermédiaire (2b), cette première nappe aléatoire étant déposée sur le dessus de la seconde nappe aléatoire provenant du cylindre de peignage intermédiaire (2b),
- une seconde paire de bandes transporteuses (8, 9) achemine les nappes aléatoires précitées, disposées l'une sur l'autre en provenance du cylindre peigneur (4) associé au cylindre de peigne intermédiaire (2b), vers la bande transporteuse perforée finale (6) où ces nappes aléatoires sont déposées sur le dessus de la nappe aléatoire provenant du cylindre de peignage inférieur (2a).

7. Machine de cardage selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**un cylindre à empennage oblique (5) commande la nappe le long de son trajet à partir d'un cylindre d'aléation (3) vers un cylindre peigneur (4).

8. Machine de cardage selon l'une quelconque des revendications précédentes, **caractérisée en ce qu'**un cylindre à empennage oblique (7, 11) commande chaque nappe dès que cette dernière a été déposée sur la bande transporteuse finale (6).

9. Machine de cardage selon la revendication 5, **caractérisée en ce que** deux cylindres à empennage oblique (5a, 12) commandent la bande le long de son trajet par les cylindres d'aléation (3, 3a).

10. Machine de cardage selon l'une quelconque des revendications précédentes, **caractérisée en ce que** :

- la bande transporteuse perforée finale (6) est supportée sur l'extrémité faisant face à la machine de cardage par un cylindre (6a) avec des ailettes radiales,
- une bande transporteuse continue (13) est disposée au-dessus de la section initiale de la bande transporteuse finale perforée (6), la portion active de la bande transporteuse (13) étant disposée au-dessus de la portion active de la bande transporteuse finale (6),
- la nappe quittant le cylindre peigneur (4) associé au cylindre de peigne inférieur (2a) est acheminée entre les portions actives des deux bandes transporteuses (6, 13) et est commandée dès qu'elle quitte ces deux bandes par un cylindre à empennage oblique (7).

Fig.1

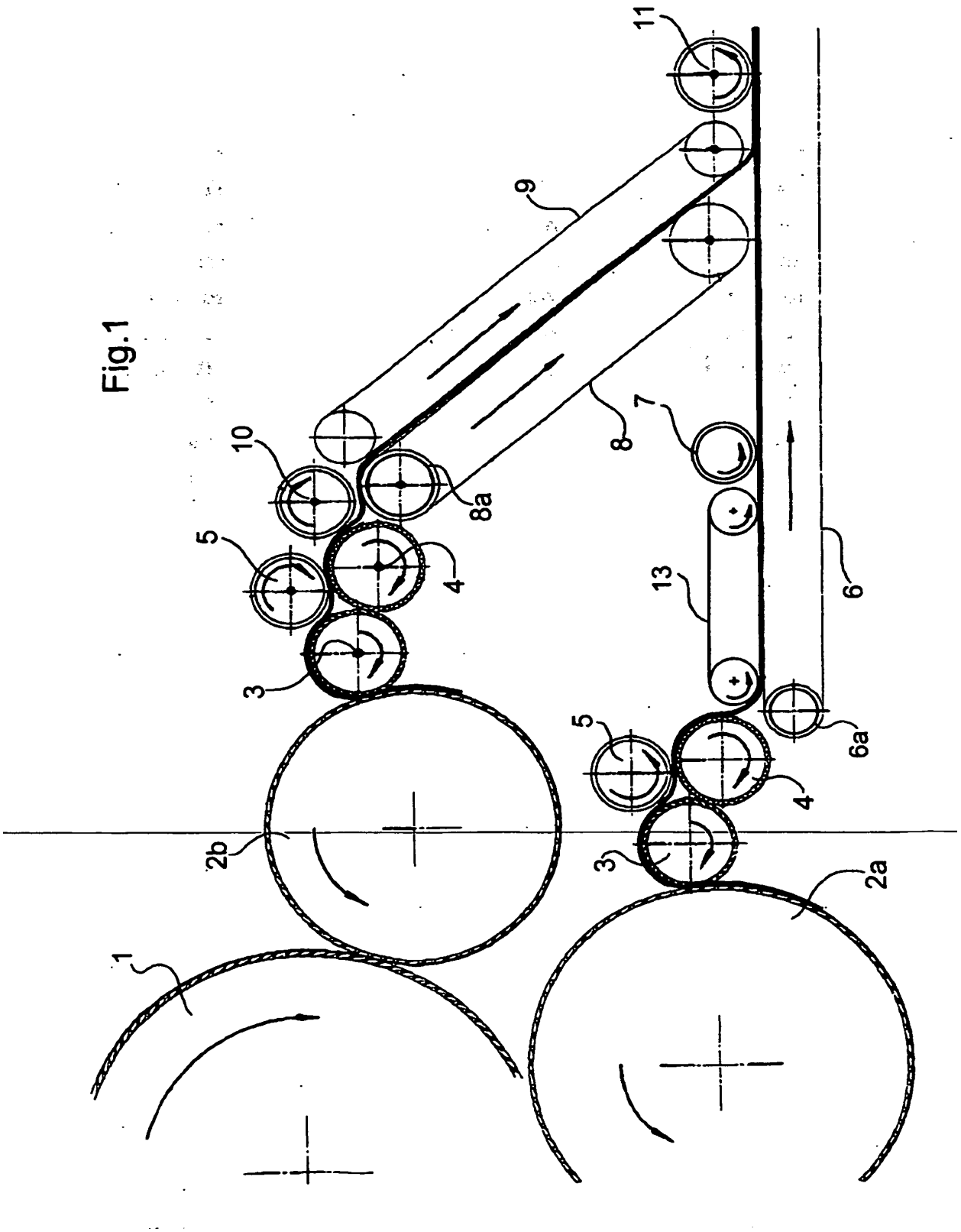

Fig.2

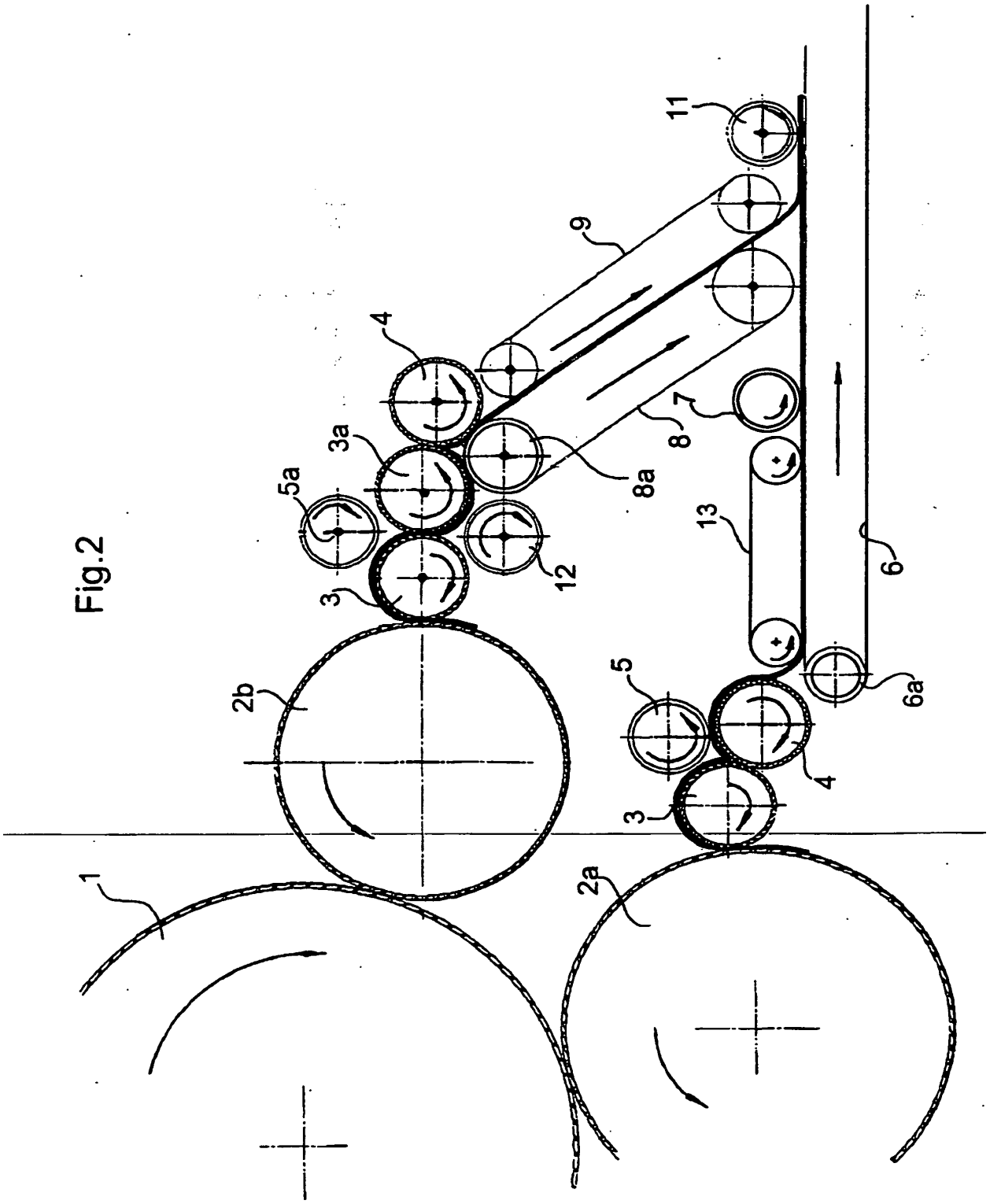

Fig.3