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(54) **Stabilizing apparatus for paper webs in the course of formation**

Vorrichtung zur Stabilisierung einer Papierbahn während deren Herstellung

Dispositif pour stabiliser une bande de papier durant sa fabrication

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(56) References cited:
EP-A- 1 101 863 WO-A-01/14233
US-A- 6 039 842 US-B1- 6 565 711

EP 1 746 207 B1

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Description

[0001] The present invention relates to a plant for producing a tissue paper web comprising a stabilizing apparatus for paper webs in the course of formation.

[0002] In particular, the present invention is suitable for use in plants for the production of tissue paper to maintain the webs stable during their advancement along the production lines.

[0003] The plants for the production of tissue paper are provided with a roller, so-called "yankee roller" over which the paper web in the course of formation is wound. The web formed on the yankee roller is subsequently sent onto a transmission roller, so-called "pope roller", to be fed to a spool for collecting the finished product.

[0004] Usually, stabilizing devices are provided between the yankee roller and the transmission roller to avoid the formation of air layers between the paper and the outer surface of the transmission roller. The formation of air layers is due to an air flow carried by the paper web and consisting of fluid threads which develop in correspondence of the same web's faces.

[0005] It occurs in fact that in some application, the paper web runs at high speed (up to 2000 meters/min) with consequent production of a substantial air flow. Moreover, also the transmission roller, during its rotation thereof, carries a flow of air around the cylindrical surface thereof.

[0006] Such formation of air layers generates a cushion effect between the web and the roller (ballooning effect) and an unstable motion of the paper web, so that the latter cannot be properly transported by the transmission roller.

[0007] Stabilizing devices for paper webs are known to be made up of a body generally of wedge shape facing the lower surface of the web, that is, the surface which enters in contact with the transmission roller, and provided with an air-delivering means located upstream of the transmission roller.

[0008] In these devices, the delivering means directs a jet of air against the lower surface of the web in order to stabilize the same web by counteracting the fluid thread being carried therealong.

[0009] A known stabilizing apparatus is described from WO 0114233 showing a roll foil to improve the stability of a moving tissue, having an air shower directed towards the transmission roller.

[0010] However, the stabilizing devices roughly described above exhibits significant drawbacks.

[0011] It must be stressed in the first place that the stabilizing devices utilize a jet of compressed air which tends to break the paper web. In fact, it is to be noted that the paper tissue results very thin and, accordingly, also breakable, especially if it is made to advance at high speeds; consequently, the jet of compressed air may tear the web.

[0012] The damage of the the paper web also implies the interruption of the production line, with imaginable

drawbacks in economical terms.

[0013] A further drawback is given by the structural complexity of the delivering means.

[0014] Besides, the compressed air delivered towards the web generates an increase of paper powders usually present in the paper-production lines.

[0015] In this context, the specific technical object of the present invention is to propose a stabilizing apparatus for paper webs in the course of formation which does not exhibit the above mentioned drawbacks.

[0016] In particular, the object of the present invention is to provide a plant for producing a tissue paper web comprising a stabilizing apparatus able to efficiently suppress the formation of air under the web without damaging the same web.

[0017] A further object of the present invention is to propose a plant for producing a tissue paper web comprising a stabilizing apparatus of simple and cost-effective structure and, capable, at the same time, of eliminating the cellulose powders carried by the web.

[0018] The above indicated technical object and specified purposes are substantially obtained by providing a stabilizing apparatus for paper webs in the course of formation which comprises the technical characteristics set forth in one or more of the attached claims.

[0019] Further characteristics and advantages of the present invention will be more evident from the indicative, and thus non-limitative, description of one preferred, but non-exclusive, embodiment of a stabilizing apparatus for paper webs in the course of formation, as illustrated in the accompanying drawings, wherein:

- Fig. 1 shows schematically a region of the paper-production plant wherein the stabilizing apparatus according to the present invention is applied, in a respective operating condition;
- Fig. 2 shows schematically the plant of Fig. 1 with the stabilizing apparatus in a respective inoperative condition.

[0020] With reference to the attached figures, numeral 1 indicates on the whole a stabilizing apparatus for paper webs 2 in the course of formation, according to the present invention.

[0021] The apparatus 1 is applied in plants for the production of tissue paper, that is, paper for disposable products of any kind.

[0022] In general, the plants, as partially illustrated in Fig. 1, are made up of a roller for driving out a paper web 2 in the course of formation.

[0023] The stabilizing apparatus 1 is housed upstream of the above cited roller 3 so as to eliminate any formation of air between the web 2 and the outer surface 3a of the same roller 3.

[0024] The stabilizing apparatus 1 comprises a movable element 4 disposed in correspondence of a lower face 2a of web 2.

[0025] The element 4 exhibits a wedge-like portion 5

having a substantially laminar conformation and presenting a leading edge 6 facing the web's advancement direction A.

[0026] The leading edge 6, having preferably a rounded profile, is disposed in correspondence of the lower face 2a of web 2 in order to intercept a first fluid thread F1 carried by the web 2.

[0027] The wedge-like portion 5 also exhibits a lower surface 7 adjacent to said leading edge 6 in order to intercept the first fluid thread F1 and divert it along a direction transverse to the feeding direction A (Fig. 1).

[0028] The lower surface 7 of the wedge-like portion 5 has a wavy development to define an aerodynamic profile able to divert the first fluid thread F1.

[0029] The wedge-like portion 5 also has a flat upper surface 8 opposite to the lower surface 7 and exhibiting a first end 8a associated with the leading edge 6, and a second end 8a opposite to the first.

[0030] Upon the deviation of the first thread F1 a depression is created in correspondence of the lower face 2a of web 2, so that the flat upper surface 8 can be associated with the lower face 2a of web 2 following the depression created in correspondence of the same lower face 2a.

[0031] In other words, the web 2 is pushed towards the upper surface 8 by sliding thereon while being driven into motion.

[0032] The second end 8b of the flat upper surface 8 is bent away from the lower face 2a of web 2 and in proximity (in use) of the external surface 3a of roller 2, thereby defining a section 9 for the passage of a second fluid thread F2 created by the rotation of roller 3.

[0033] The passage section 9 delimites, therefore, an expansion region able to create a further depression in correspondence of a portion of the external surface 3a of roller 3 in contact with the lower face 2a of web 2. The movable element 4 comprises a support arm 10 having a substantially elongated shape and exhibiting a first end 10a associated, at the bottom, with the wedge-like portion 5, and a second end 10b opposite to the first end 10a.

[0034] The first end 10a is substantially U-shaped wherein a concave region facing opposite to wedge-like portion 5 is defined.

[0035] The first end 10a of the arm 10 has a raker 11 shaped like a lamina abutting against the external surface 3a of the transmission roller 3. In particular, as illustrated in Fig. 1, in which the apparatus 1 is shown in a respective operating condition, the raker 11 is in contact with the roller 3 to slide onto the external surface and to intercept the second fluid thread F2.

[0036] In this way, the second fluid thread F2 is mostly diverted by the raker 11 and made to flow to the concave region of the first end 10a to be drawn away from the web 2.

[0037] The second end 10b of arm 10 is engaged with a linear actuator 12 able to drive the movable element 4 between an operating position, in which it is moved close to the paper web 2 (Fig. 1), and an inoperative position

in which it is moved away from the web 2 (Fig. 2).

[0038] In this way, in case of possible service operations, the movable element 4 can be moved away from the web to allow an operator to manually intervening on the same web.

[0039] The linear actuator 12 preferably exhibits a pneumatic piston. However, it will be appreciated that the actuator 12 may consist of any mechanical means known in the art for driving the movable element 4.

[0040] According to a preferred embodiment illustrated in the accompanying drawings, the apparatus 1 may also be provided with suction means 13 to be moved close to the movable element 4 in correspondence of the lower face 2a of web 2.

[0041] In particular, the means 13 exhibit a first suction mouth 13a facing the wedge-like portion 5 in order to aspirate the cited fluid threads F1 and F2 being diverted by the movable element 4.

[0042] In this way, the paper powders carried by the web 2 and roller 3 are conveyed, together with the fluid threads, F1 and F2 towards the first suction mouth 13a.

[0043] The suction means 13 also exhibit a second suction mouth 13b facing a yankee roller (not shown in the figures) generally disposed upstream of the movable element 5.

[0044] In this way, the web 2 coming from the said yankee roller encounters the leading edge 6 wherein the fluid thread F1 is diverted as above described. As a consequence, the web 2 keeps running in the direction A with the respective lower face 2a being into abutment against the upper surface 8. In addition, owing to the presence of the arm 10, also the second fluid thread F2 is diverted, thereby eliminating the air between the web 2 and roller 3.

[0045] The invention overcomes the problems of the prior art and reaches the envisaged objects.

[0046] First of all, it is to be stressed, as previously indicated, that the web 2 is stabilized and disposed on the roller 3 without interposition of air. Accordingly, the above mentioned ballooning effect is suppressed.

[0047] Besides, the wedge-like portion 5 allows eliminating the fluid thread carried by the web 2 without acting directly on the same web 2. Consequently, any damaging of the paper web 2 is avoided.

[0048] Moreover, the structure of the wedge-like portion 5, made up of a suitably shaped lamina, results of very simple construction and limited cost.

[0049] A further advantage is provided by the effect of the means 13 which make it possible to eliminate any cellulose powder present in the plant by aspirating the first and second fluid threads F1 and F2.

Claims

1. A plant for producing a tissue paper web (2), said plant comprising a transmission roller (3) disposed underneath the web (2) for driving out the web (2) in the course of formation and a web stabilizing appa-

ratus (1) housed upstream of said roller (3) to eliminate a formation of air between the web (2) and an outer surface (3a) of said roller (3), **characterized in that** the stabilizing apparatus (1) comprises at least a movable element (4) disposed in correspondence of the web (2), wherein the said movable element (4) comprises a wedge-like portion (5) having a continuous upper surface (8) of contact with a lower face (2a) of the web (2), and a lower surface (7) associated therewith for intercepting a first fluid thread (F1) carried by said lower face (2a) and diverting said first thread (F1) along a direction transverse to the feeding direction (A) of the web (2), wherein said lower surface (7) of the wedge-like portion (5) exhibits an aerodynamic profile to divert said first fluid thread (F1) and create a depression in correspondence of the lower face (2a) of the web (2), wherein said upper surface (8) of the wedge-like portion (5) is flat and said wedge-like portion (5) has a leading edge (6) disposed between said upper surface (8) and said lower surface (7), said lower surface (7), upper surface (8) and leading edge (6) all defining a continuous surface, wherein said flat upper surface (8) has a first end (8a) associated with said leading edge (6) and a second end (8b) opposite to the first end (8a) and bent away from the lower face (2a) of the web (2), said second end (8b) defining, in cooperation with the outer surface (3a) of the transmission roller (3), a section (9) for the passage of a second fluid thread (F2) carried by said roller (3), and wherein said movable element (4) further comprises a support arm (10) having a first end (10a) associated with said wedge-like portion (5), and a second end (10b) opposite to the first end (10a); said first end (10a) of the support arm (10) exhibiting a substantially U-shaped development which defines a concave region, said first end (10a) of the support arm (10) exhibiting an extension (11) shaped like a lamina and abutted against the outer surface (3a) of the transmission roller (3) in order to divert most of the second fluid thread (F2) towards the second end (10b) of said arm (10).

2. A plant according to the claim 1, **characterized in that** the said aerodynamic profile has a substantially wavy pattern.
3. A plant according to claim 1, **characterized in that** said passage section (9) forms a neck for determining the expansion of the second fluid thread (F2) and creates a depression in correspondence of a portion of the outer surface (3a) of said roller (3) in contact with the lower face (2a) of the web (2).
4. A plant according to claim 1, **characterized in that** the stabilizing apparatus comprises also a linear actuator (12) associated with the second end (10b) of

said arm (10) in order to drive the movable element (4) between an operating position in which it is moved close to the paper web (2), and an inoperative position in which it is moved away from said web (2).

5. A plant according to any of the preceding claims, **characterized in that** the stabilizing apparatus comprises also suction means (13) disposed close to said movable element (4) and disposed in correspondence of the lower face (2a) of said web (2).
6. A plant according to the preceding claim, **characterized in that** said suction means (13) comprise a first mouth (13a) facing said wedge-like portion (5) to aspirate said first fluid thread (F1) diverted by the lower surface (7), and a second suction mouth (13b) facing a yankee roller disposed upstream of said movable element (4).

Patentansprüche

1. Fertigungsanlage zum Herstellen einer Tissuepapierbahn (2), wobei die Fertigungsanlage eine Übertragungswalze (3), welche unterhalb der Bahn angeordnet ist, um während der Herstellung die Bahn (2) auszufahren, und eine Bahnstabilisierungsvorrichtung (1) aufweist, welche stromaufwärts der Walze (3) angeordnet ist, um Luft zwischen der Bahn (2) und einer äußeren Oberfläche (3a) der Walze zu eliminieren, **dadurch gekennzeichnet, dass** die Stabilisierungsvorrichtung (1) zumindest ein bewegliches Element (4) aufweist, welches mit der Bahn (2) korrespondierend angeordnet ist, wobei das bewegliche Element (4) einen keilförmigen Abschnitt (5) mit einer kontinuierlichen oberen Fläche (8) in Kontakt mit einer unteren Seite (2a) der Bahn (2) aufweist, und einer unteren Oberfläche (7), welche mit dieser zum Abfangen eines ersten Fluidfadens (F1), welcher von der unteren Seite (2a) gehalten wird, in Verbindung steht, und welcher den ersten Faden (F1) entlang einer Richtung quer zu der Vorschubrichtung (A) der Bahn umlenkt, wobei die untere Oberfläche (7) des keilförmigen Abschnitts (5) ein aerodynamisches Profil aufweist, um den ersten Fluidfaden (F1) umzulenken und um in Übereinstimmung mit der unteren Seite (2a) eine Vertiefung der Bahn (2) bereit zu stellen, wobei die obere Oberfläche (8) des keilförmigen Abschnitts (5) flach ausgebildet ist, und der keilförmige Abschnitt (5) eine Vorderkante (6), welche zwischen der oberen Oberfläche (8) und der unteren Oberfläche (7) angeordnet ist, aufweist, wobei die untere Oberfläche (7), die obere Oberfläche (8) und die Vorderkante (6) zusammen eine kontinuierliche Oberfläche bilden, wobei die flache obere Oberfläche (8) ein erstes Ende (8a) aufweist, welches mit der Vorderkante (6) und mit einem zweiten, dem ersten Ende

de gegenüberliegenden Ende (8b), welches von der unteren Seite (2a) der Bahn (2) weggebogen ist, in Verbindung steht, wobei das zweite Ende (8b) zusammen mit der äußeren Oberfläche (3a) der Übertragungswalze (3) einen Abschnitt (9) für den Durchfluss eines zweiten Fluidfadens (F2), welcher von der Walze (3) getragen ist, bildet, und wobei das bewegliche Element (4) ferner einen Haltearm (10) mit einem ersten Ende (10a), welches mit dem keilförmigen Abschnitt (5) in Verbindung steht, und mit einem zweiten Ende (10b), welches dem ersten Ende (10a) gegenüberliegt, aufweist; wobei das erste Ende (10a) des Haltearms (10) eine im Wesentlichen U-förmige Ausprägung, welche einen konkaven Bereich definiert, aufweist, wobei das erste Ende (10a) des Haltearms (10) einen Ansatz (11) aufweist, welcher wie eine Lamelle geformt ist und an der Außenfläche (3a) der Übertragungswalze anliegt, um den zweiten Fluidfaden (F2) in Richtung des zweiten Endes (10b) des Armes (10) weiterzuleiten.

2. Fertigungsanlage nach Anspruch 1, **dadurch gekennzeichnet, dass** das aerodynamische Profil ein im Wesentlichen wellenförmiges Muster aufweist.
3. Fertigungsanlage nach Anspruch 1, **dadurch gekennzeichnet, dass** der Durchflussabschnitt (9) eine Verengung für die Bestimmung der Ausdehnung des zweiten Fluidfadens (F2) bildet und eine Vertiefung entsprechend eines Abschnittes der äußeren Oberfläche (3a) der Walze (3), welche mit der unteren Seite (2a) der Bahn (2) in Kontakt steht, liefert.
4. Fertigungsanlage nach Anspruch 1, **dadurch gekennzeichnet, dass** die Stabilisierungsvorrichtung ebenfalls ein lineares Stellglied (12) aufweist, welches mit dem zweiten Ende (10b) des Armes (10) in Verbindung steht, um das bewegliche Element (4) zwischen einer Betriebsposition, in welcher dieses nahe an die Papierbahn (2) bewegt wird, und einer Nicht-Betriebsposition, in welcher dieses von der Bahn (2) weg bewegt wird, zu verfahren.
5. Fertigungsanlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Stabilisierungsvorrichtung ferner Saugmittel (13) aufweist, welche nahe des beweglichen Elements (4), entsprechend der unteren Seite (2a) der Bahn (2), angeordnet sind.
6. Fertigungsanlage nach einem der vorhergehenden Ansprüche, **dadurch gekennzeichnet, dass** die Saugmittel (13) einen ersten Mund (13a), welcher dem keilförmigen Abschnitt (5) gegenüberliegt, um den ersten Fluidfaden (F1) anzusaugen, welcher von der unteren Fläche (7) umgelenkt wird und einen zweiten Saugmund (13b) aufweisen, welcher einer Yankee-Walze gegenüberliegt, welche stromauf-

wärts des beweglichen Elements (4) angeordnet ist.

Revendications

1. Installation pour produire une nappe de papier mouseline (2), ladite installation comprenant un rouleau de transmission (3) disposé au-dessous de la nappe (2) pour faire sortir la nappe (2) en cours de formation et un dispositif stabilisateur de nappe (1) logé en amont dudit rouleau (3) pour éliminer une formation d'air entre la nappe (2) et une surface extérieure (3a) dudit rouleau (3), **caractérisée en ce que** le dispositif stabilisateur (1) comprend au moins un élément mobile (4) disposé en correspondance de la nappe (2), dans laquelle ledit élément mobile (4) comprend une portion en forme de coin (5) ayant une surface supérieure continue (8) de contact avec une face inférieure (2a) de la nappe (2), et une surface inférieure (7) associée à celle-ci pour intercepter un premier filet fluide (F1) porté par ladite face inférieure (2a) et dévier ledit premier filet fluide (F1) suivant une direction transversale à la direction d'acheminement (A) de la nappe (2), dans laquelle ladite surface inférieure (7) de la portion en forme de coin (5) présente un profil aérodynamique pour dévier ledit premier filet fluide (F1) et créer une dépression en correspondance de la face inférieure (2a) de la nappe (2), dans laquelle ladite surface supérieure (8) de la portion en forme de coin (5) est plate et ladite portion en forme de coin (5) a un bord d'attaque (6) disposé entre ladite surface supérieure (8) et ladite surface inférieure (7), ladite surface inférieure (7) ladite surface supérieure (8) et ledit bord d'attaque (6) définissant tous une surface continue, dans laquelle ladite surface supérieure plate (8) a une première extrémité (8a) associée audit bord d'attaque (6) et une deuxième extrémité (8b) opposée à la première extrémité (8a) et pliée en s'éloignant de la face inférieure (2a) de la nappe (2), ladite deuxième extrémité (8b) définissant, en coopération avec la surface extérieure (3a) du rouleau de transmission (3), une section (9) pour le passage d'un deuxième filet fluide (F2) porté par ledit rouleau (3), et dans laquelle ledit élément mobile (4) comprend en outre un bras de support (10) ayant une première extrémité (10a) associée à ladite portion en forme de coin (5) et une deuxième extrémité (10b) opposée à la première extrémité (10a); ladite première extrémité (10a) du bras de support (10) présentant un développement sensiblement en forme de U qui définit une région concave, ladite première extrémité (10a) du bras de support (10) présentant une extension (11) profilée comme une lame et en butée contre la surface extérieure (3a) du rouleau de transmission (3) de manière à dévier la plupart du deuxième filet

fluide (F2) vers la deuxième extrémité (10b) dudit bras (10).

2. Installation selon la revendication 1, **caractérisée en ce que** ledit profil aérodynamique a un motif sensiblement ondulé. 5

3. Installation selon la revendication 1, **caractérisée en ce que** ladite section de passage (9) forme un goulot pour déterminer l'extension du deuxième filet fluide (F2) et crée une dépression en correspondance d'une portion de la surface extérieure (3a) dudit rouleau (3) en contact avec la face inférieure (2a) de la nappe (2). 10
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4. Installation selon la revendication 1, **caractérisée en ce que** le dispositif stabilisateur comprend également un actionneur linéaire (12) associé à la deuxième extrémité (10b) dudit bras (10) de manière à commander l'élément mobile (4) entre une position fonctionnelle dans laquelle il est déplacé près de la nappe de papier (2) et une position de repos dans laquelle il est déplacé loin de ladite nappe (2). 20

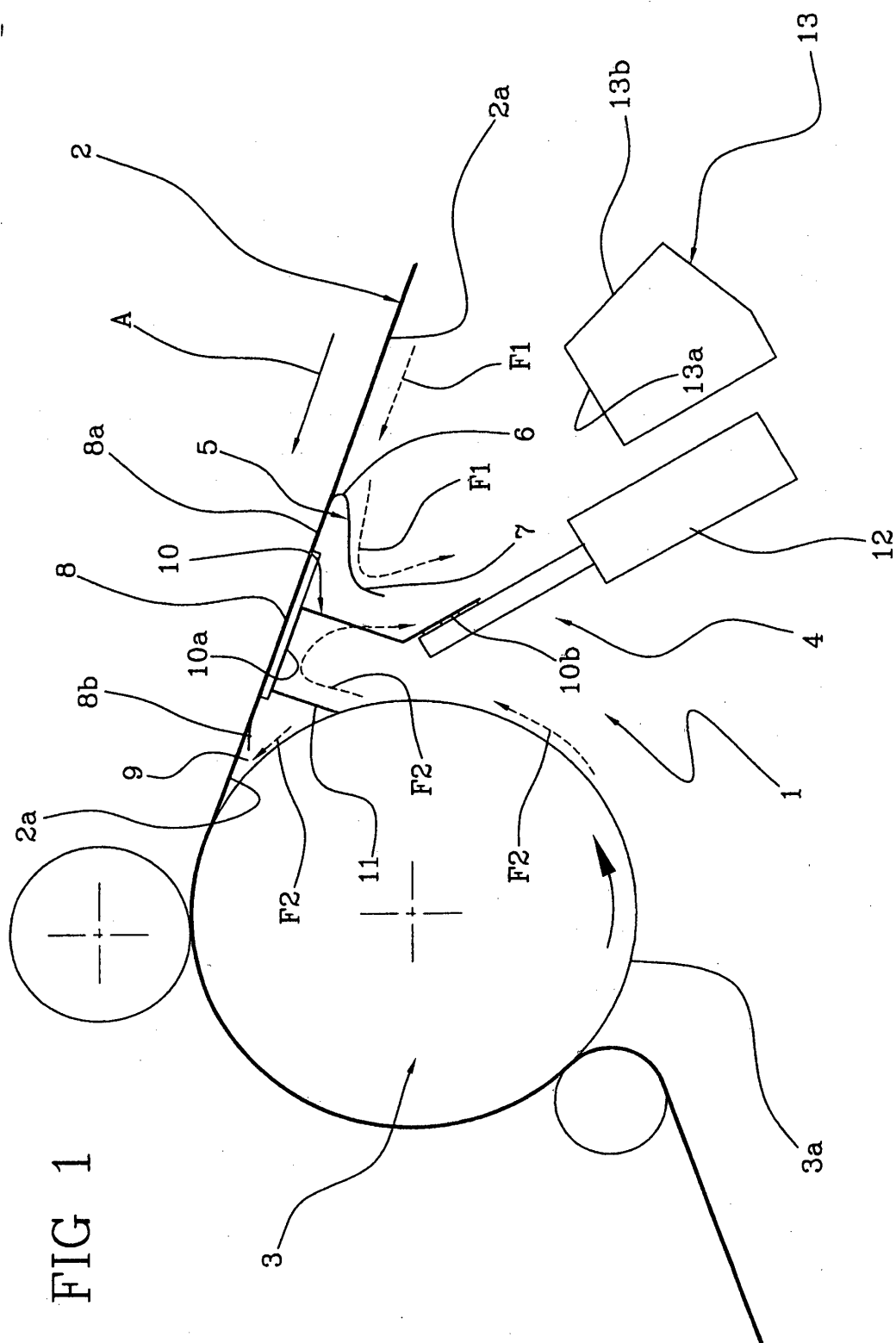
5. Installation selon l'une quelconque des revendications précédentes, **caractérisée en ce que** le dispositif stabilisateur comprend également des moyens d'aspiration (13) disposés près dudit élément mobile (4) et disposés en correspondance de la face inférieure (2a) de ladite nappe (2). 25
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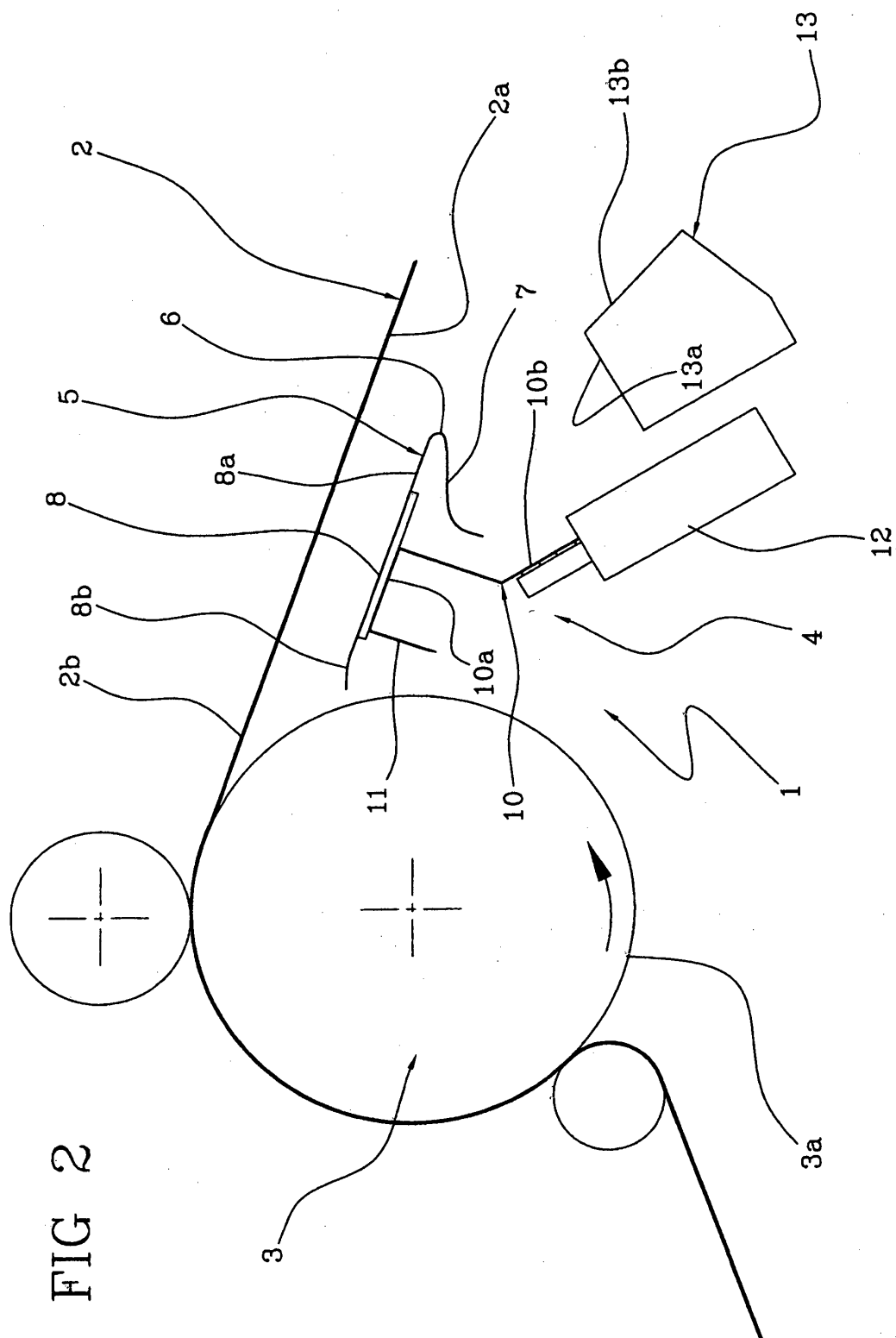
6. Installation selon la revendication précédente, **caractérisée en ce que** lesdits moyens d'aspiration (13) comprennent une première embouchure (13a) faisant face à ladite portion en forme de coin (5) pour aspirer ledit premier filet fluide (F1) dévié par la surface inférieure (7) et une deuxième embouchure d'aspiration (13b) faisant face à un cylindre frictionneur disposé en amont dudit élément mobile. 35
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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 0114233 A [0009]