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(54) **Suction box for paper making machines**

(57) A suction box (1) for drying a film containing suspended cellulose fibers (3) spread on the upper side of a filtering surface (2) of a paper making machine is disclosed, comprising a plurality of generally vertical ducts (4) provided with openings (A) directed to the lower side (2b) of the filtering surface (2). The ducts (4) comprise a plurality of first ducts (5) with corresponding first

openings (5a) for feeding a heating fluid against the filtering surface (2) and a plurality of second ducts (6) with corresponding second openings (6a) for a suction action at the filtering surface (2). Each first duct (5) is coupled to a corresponding second duct (6) so as to arrange each first opening (5a) adjacent to a corresponding second opening (6a).

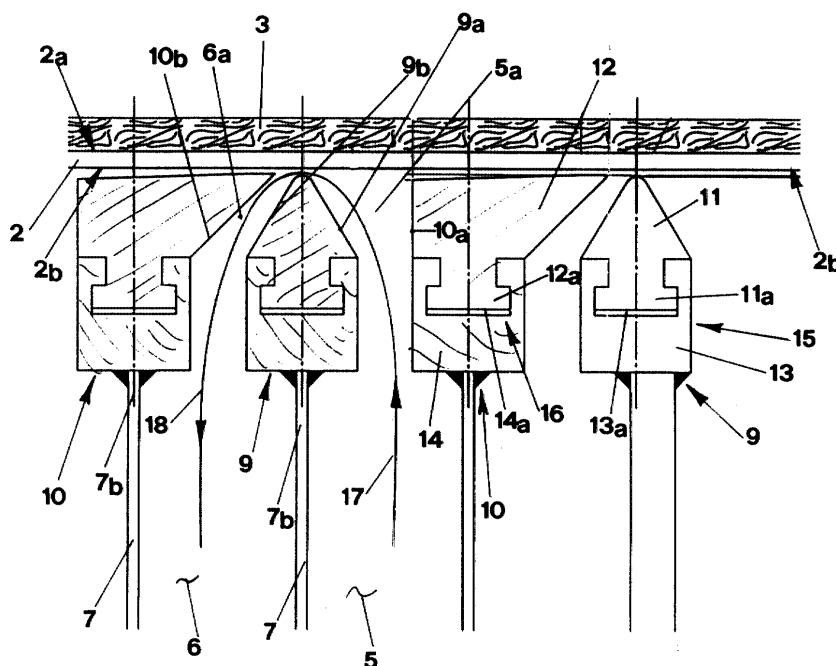


FIG.2

Description

[0001] The present invention relates to a suction box for paper making machines.

[0002] It is well known that in paper making machines the sheet is formed on a movable filtering surface generally called fourdrinier wire, on which a suitable distribution device called head box, spreads a fluid film containing suspended cellulose fibers.

[0003] On movement through the filtering surface the drainage of the fluid film occurs, releasing water contained in the film and increasing its consistency.

[0004] The drainage occurs in a spontaneous way by gravity and when the fluid film reaches a density of about 8%, water extraction must be enhanced through suitable suction devices called suction boxes arranged under the filtering surface.

[0005] According to the prior art, the suction boxes comprise a plurality of generally vertical ducts provided with ducts arranged transversally to the filtering surface and directed to its lower side.

[0006] The ducts are connected to a vacuum plant that sucks water contained in the fluid film enhancing its drying.

[0007] The drawback shown by the suction boxes of the mentioned prior art consists in that they produce a strong vacuum that in case of production of papers of small thickness, generates pin holes in the fluid film remaining as defects in the dried sheet.

[0008] The present invention aims at overcoming said drawback, carrying out a suction box for drying a fluid film containing suspended cellulose fibers spread on the upper side of a filtering surface of a paper making machine, that according to the main claim comprises a plurality of generally vertical ducts provided with openings directed to the lower side of said filtering surface and is characterized in that said ducts comprise a plurality of first ducts with corresponding first openings for feeding a heating fluid against said filtering surface and a plurality of second ducts with corresponding second openings for the suction at said filtering surface, each of said first ducts being coupled to a corresponding second duct so as to arrange each first opening adjacent and communicating with a corresponding second opening.

[0009] Advantageously the suction box of the present invention carries out water suction from the fluid film under conditions of less depression relative to the known suction boxes. This allows to obtain a final product of better quality.

[0010] The suction box of the invention is described with reference to the accompanying sheets of drawings in which:

- Fig. 1 is a longitudinal sectional view of the suction box of the invention; and
- Figs. 2 and 3 show a detail of Fig. 1.

[0011] As one can see in Fig. 1, the suction box of the

invention generally indicated with reference numeral 1, is applied to a paper making machine of which also in Fig. 1 a part of the filtering surface 2 can be seen, on whose upper side 2a the film to be dried indicated with reference numeral 3 and containing the suspended cellulose fibers is spread.

[0012] With reference now to Figs. 2 and 3 one can also see that the suction box 1 comprises a plurality of substantially vertical ducts generally indicated with reference numeral 4, provided with openings generally indicated with A, directed to the lower side 2b of the filtering surface 2 and arranged transversally thereto.

[0013] According to the invention said ducts 4 comprise a plurality of first ducts 5 with first openings 5a for feeding a heating fluid against said filtering surface 2 and a plurality of second ducts 6 with corresponding second openings 6a for the suction operation at said filtering surface 2, each of said first ducts 5 being coupled to a corresponding second duct 6 so as to arrange each first opening 5a adjacent to a corresponding second opening 6a.

[0014] As seen in greater detail in Figs 2 and 3, each first opening 5a has a sectional shape 5b diverging to the filtering surface 2 and each second opening 6a on the contrary has a sectional shape 6b convergent to said filtering surface 2.

[0015] The first ducts 5 and the second ducts 6 are coupled to each other so that the end section 5c of the first opening 5a is adjacent and in communication with the start section 6c of the second opening 6a.

[0016] The first 5 and second 6 ducts are defined by a plurality of generally vertical plain walls 7 spaced from one another, having the lower ends 7a bent and joined one after the other so as to create a continuous surface defining the bottom 8 of the suction box 1.

[0017] Each plain wall 7 at the end 7b facing the filtering surface 2 is provided with shaped elements P having a development transversal to the filtering surface 2 to define the shape of said openings A.

[0018] More particularly said shaped elements comprise a plurality of symmetrical members 9 with a cross section in the form of an isosceles triangle and a plurality of asymmetrical members 10 with cross section in the form of rectangular trapezium, where each symmetrical shaped member 9 is included between a couple of asymmetrical members 10.

[0019] Thus it can be seen that each first opening 5a is included between the orthogonal side 10a of the cross section in the form of rectangular trapezium of each asymmetrical member 10 and the inclined side 9a of the cross section in the form of isosceles triangle of the corresponding symmetrical member 9.

[0020] In a similar way each second opening 6a is included between the oblique side 10b of the cross section in the form of rectangular trapezium of each asymmetrical member 10 and the further oblique side 9b of the cross section in the form of isosceles triangle of the corresponding symmetrical member 9.

[0021] Each symmetrical member 9 and each asymmetrical member 10 consists of a shaped bar with longitudinal development 11, 12 respectively, which through a prismatic coupling 15, 16 is coupled to a corresponding support element 13, 14 fixed to the end 7b of each corresponding plain wall 7 defining the ducts 5, 6.

[0022] The prismatic coupling 15, 16 consists of a T shaped male element 11a, 12a belonging to the relevant shaped bar 11, 12, received in a seat 13a, 14a of the corresponding support element 13, 14.

[0023] In operation during movement of the filtering surface 2 in the direction V shown by the arrow, in each first duct 5 a hot fluid is being fed, for instance steam, that passing through the first opening 5a with a traveling direction indicated by arrow 17, flows along the lower surface 2b of the filtering surface 2. The hot fluid is then sucked according to the traveling direction indicated by arrow 18 through the second opening 6a and along the second duct 6, by the sucking action carried out by a vacuum unit not shown in the drawings and connected to each second duct 6.

[0024] In such a way the heating fluid is spread under the filtering surface 2 through the first opening 5a and dries the fluid film 3, so as to evaporate water contained in said film.

[0025] This evaporating effect is integrated by the suction effected by the vacuum unit in each second duct 6, so as to complete drying and removing at the same time the steam.

[0026] In such a way under the fluid film 3 a condition of vacuum is established, which is less than that existing in the suction boxes of the prior art and this avoids formation of pin holes in the fluid film thus obtaining a final product of better quality.

[0027] In view of the foregoing it is to be understood that the suction box of the present invention attains the intended object.

[0028] It is clear that in the constructional stage modifications may be resorted to the suction box of the invention, for instance consisting of different configurations of the openings and the ducts.

[0029] It is however to be understood that such variation and other possible modifications are intended to be protected by the present patent as falling within the scope of the appended claims.

Claims

1. A suction box (1) for drying a film containing suspended cellulose fibers (3) spread on the upper side of a filtering surface (2) of a paper making machine, comprising a plurality of generally vertical ducts (4) provided with openings (A) directed to the lower side (2b) of the filtering surface (2), **characterized in that** said ducts (4) comprise a plurality of first ducts (5) with corresponding first openings (5a) for

feeding a heating fluid against said filtering surface (2) and a plurality of second ducts (6) with corresponding second openings (6a) for a suction action at said filtering surface (2), each of said first ducts (5) being coupled to a corresponding second duct (6) so as to arrange each first opening (5a) adjacent to a corresponding second opening (6a).

2. The suction box (1) according to claim 1) **characterized in that** each said first opening (5a) has a sectional shape (5b) divergent to said filtering surface (2) and each said second opening (6a) has a sectional shape (6b) convergent to the filtering surface (2), the end section (5c) of each said first opening (5a) being in communication with the start section (6c) of a corresponding second opening (6a).

3. The suction box(1) according to claim 1) **characterized in that** each said first (5) and second (6) duct is defined by a couple of generally vertical plain walls (7) spaced to one another, having the lower ends (7a) bent and joined one after the other so as to create a continuous surface defining the bottom (8) of said suction box (1).

4. The suction box (1) according to claim 3) **characterized in that** each said plain wall (7) at the end (7b) facing said filtering surface (2) is provided with shaped elements (P) arranged transversally to the filtering surface (2) and adjacent to one another, thus defining said first (5a) and second (6a) openings.

5. The suction box (1) according to claim 4) **characterized in that** said shaped elements (P) comprise a plurality of symmetrical members (9) with cross section in the form of isosceles triangle and a plurality of asymmetrical members (10) with cross section in the form of rectangular trapezium, each said symmetrical member (9) being included between a couple of said asymmetrical members (10) to define said first (5a) and second (6a) openings.

6. The suction box (1) according to claim 5) **characterized in that** each said first opening (5a) is included between the orthogonal side (10a) of said section in the form of rectangular trapezium of said asymmetrical member (10) and the inclined side (9a) opposite thereto of said section in the form of isosceles triangle of said symmetrical member (9).

7. The suction box (1) according to claim 5) **characterized in that** each said second opening (6a) is included between the oblique side (10b) of said section in the form of rectangular trapezium of said asymmetrical member (10) and the inclined side (9b) opposite thereto of said section in the form of isosceles triangle of said symmetrical member (9).

8. The suction box (1) according to claim 5) **characterized in that** each said shaped elements (P, 9, 10) consists of a shaped bar with longitudinal development (11, 12) arranged transversally to said filtering surface (2) and movably connected to a support element (13, 14), said support element (13, 14) being fixed to the end (7b) facing said filtering surface (2) of each relevant plain wall (7). 5
9. The suction box (1) according to claim 8) **characterized in that** each shaped bar (11, 12) is coupled to the corresponding support element (13, 14) through a prismatic coupling (15, 16). 10
10. The suction box (1) according to claim 9) **characterized in that** said prismatic coupling (15, 16) comprises a T shaped male element (11a, 12a) belonging to a corresponding shaped bar (11, 12), said male element being received in a seat with T shaped cross section (13a, 14a) made in the corresponding support element (13, 14). 15 20

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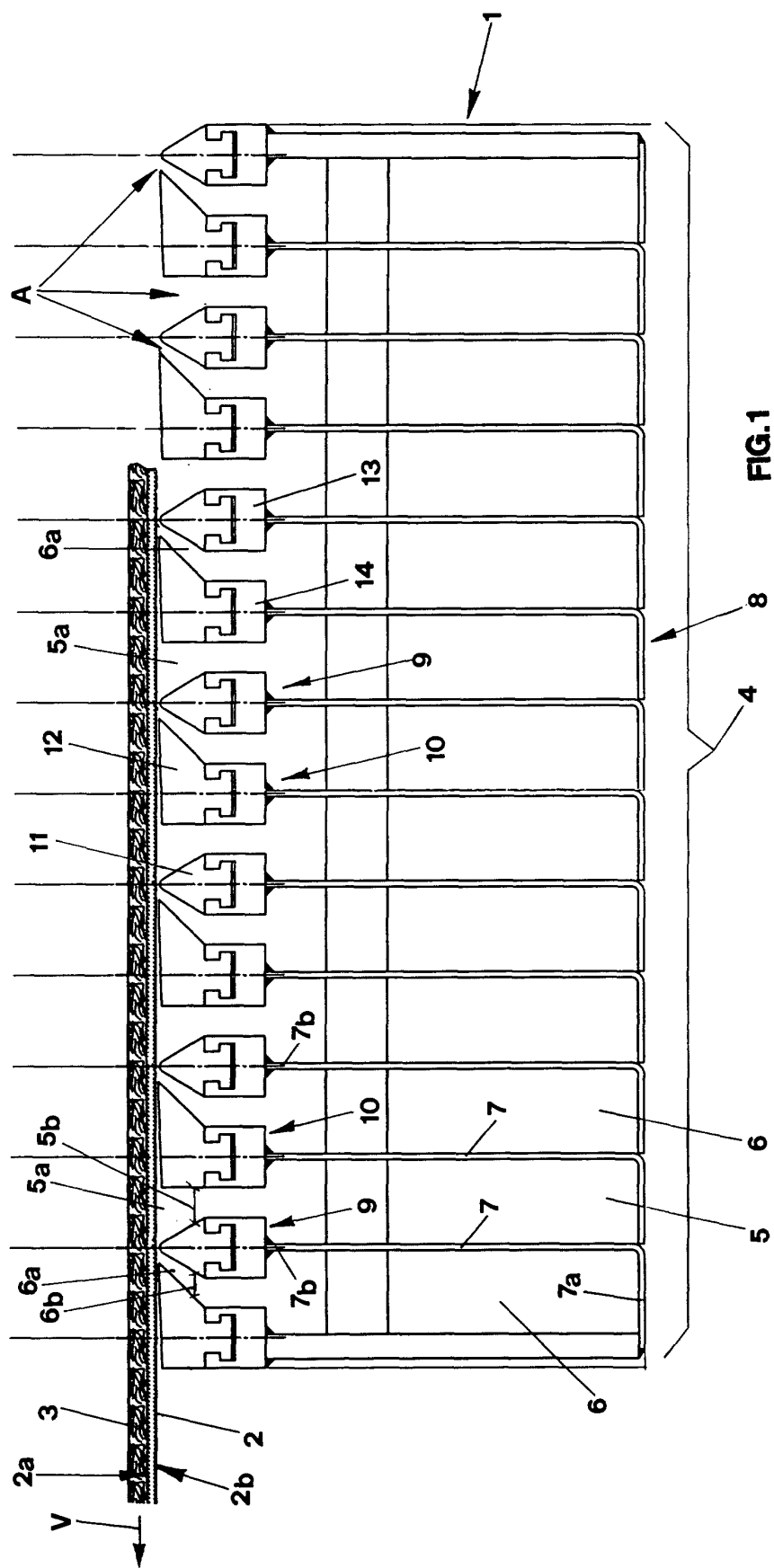
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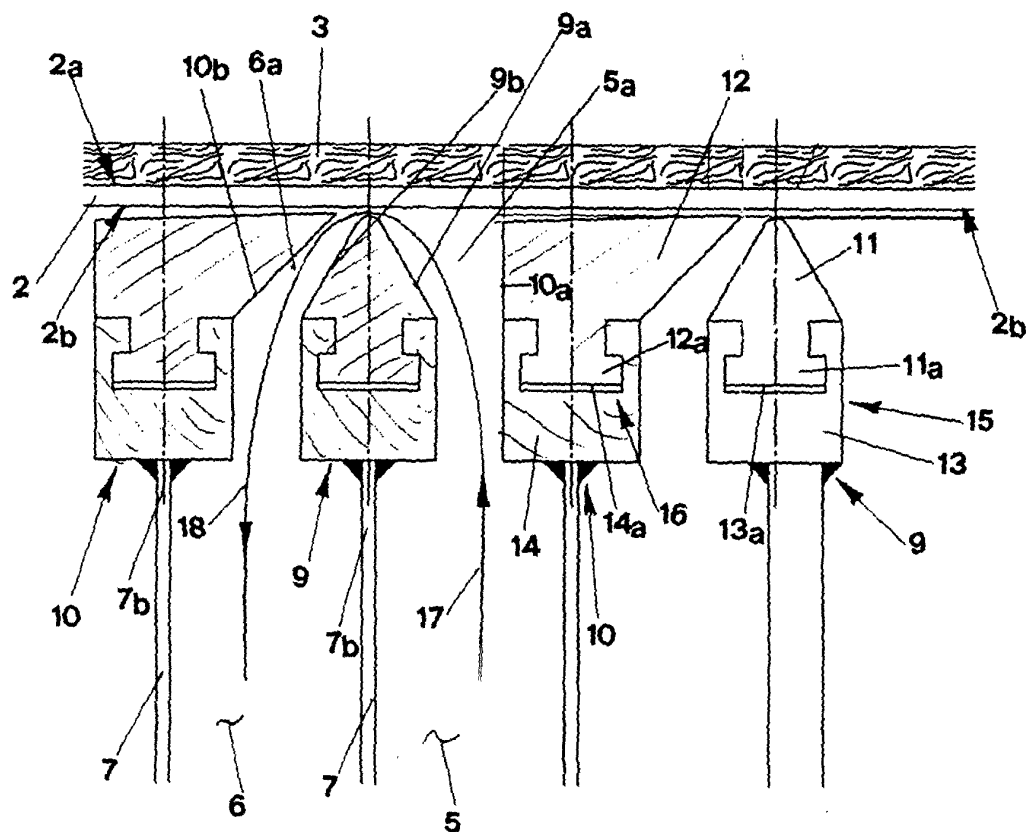


FIG. 2

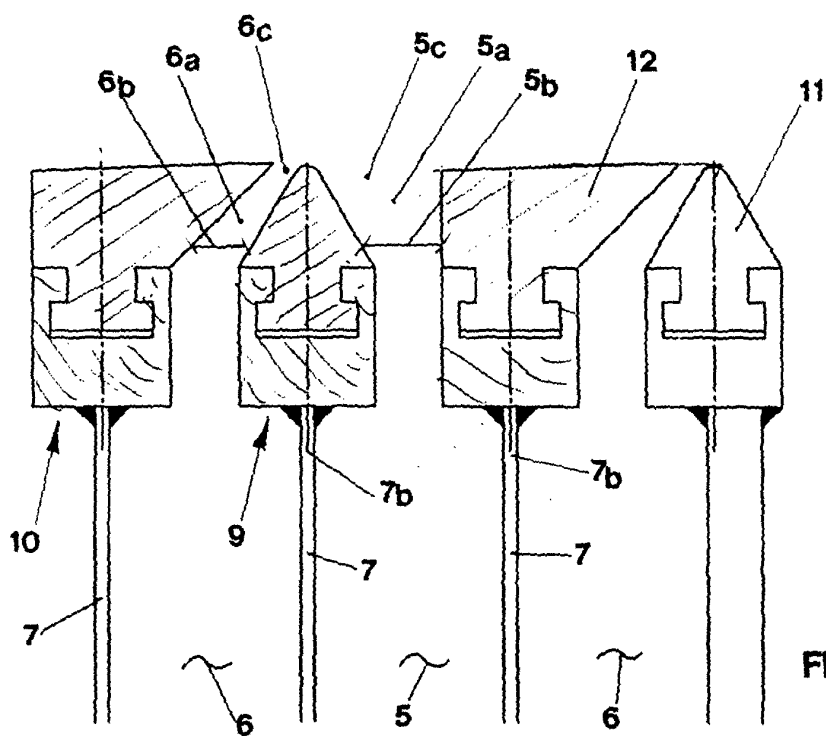


FIG. 3