

[54] **MULTIPLE CYLINDER DRIER IN A PAPER MACHINE**

[75] Inventor: **Matti Kankaanpää**, Tapiola, Finland

[73] Assignee: **Valmet Oy**, Helsinki, Finland

[22] Filed: **Mar. 21, 1973**

[21] Appl. No.: **343,469**

[52] U.S. Cl. **162/290, 34/115, 34/116, 34/159, 162/207**

[51] Int. Cl. **F26b 13/08**

[58] Field of Search 162/290, 207, 206, 351, 162/359, 364, 368, 306; 34/155, 159, 161, 115, 116, 16, 18, 23, 123

[56] **References Cited**

UNITED STATES PATENTS

1,615,210	1/1927	Asten	34/116 X
1,767,889	6/1930	Jurgensen	162/290 X
1,844,658	2/1932	Holcomb	34/159
2,091,805	8/1937	Chuse	162/290 X
3,318,017	5/1967	Smith, Jr.	34/116
3,320,675	5/1967	Chaikin et al.	34/115 X
3,576,078	4/1971	Holt	34/159 X
3,671,389	6/1972	Wahlstrom et al.	162/306
3,685,167	8/1972	Loveday et al.	34/155 X
3,733,711	5/1973	Haythornethwaite	34/155 X
3,816,941	6/1974	Hulik et al.	162/207 X

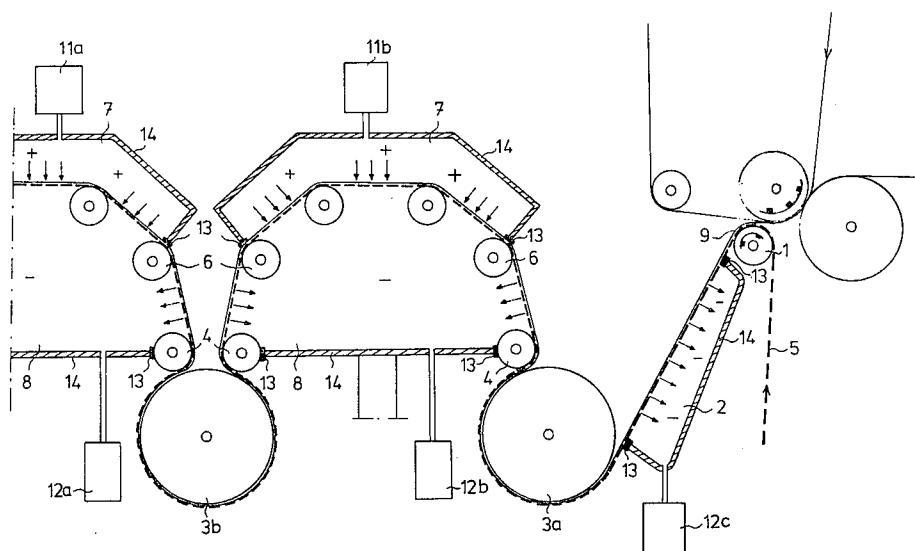
Primary Examiner—Robert L. Lindsay, Jr.
Assistant Examiner—Richard V. Fisher
Attorney, Agent, or Firm—Richards & Geier

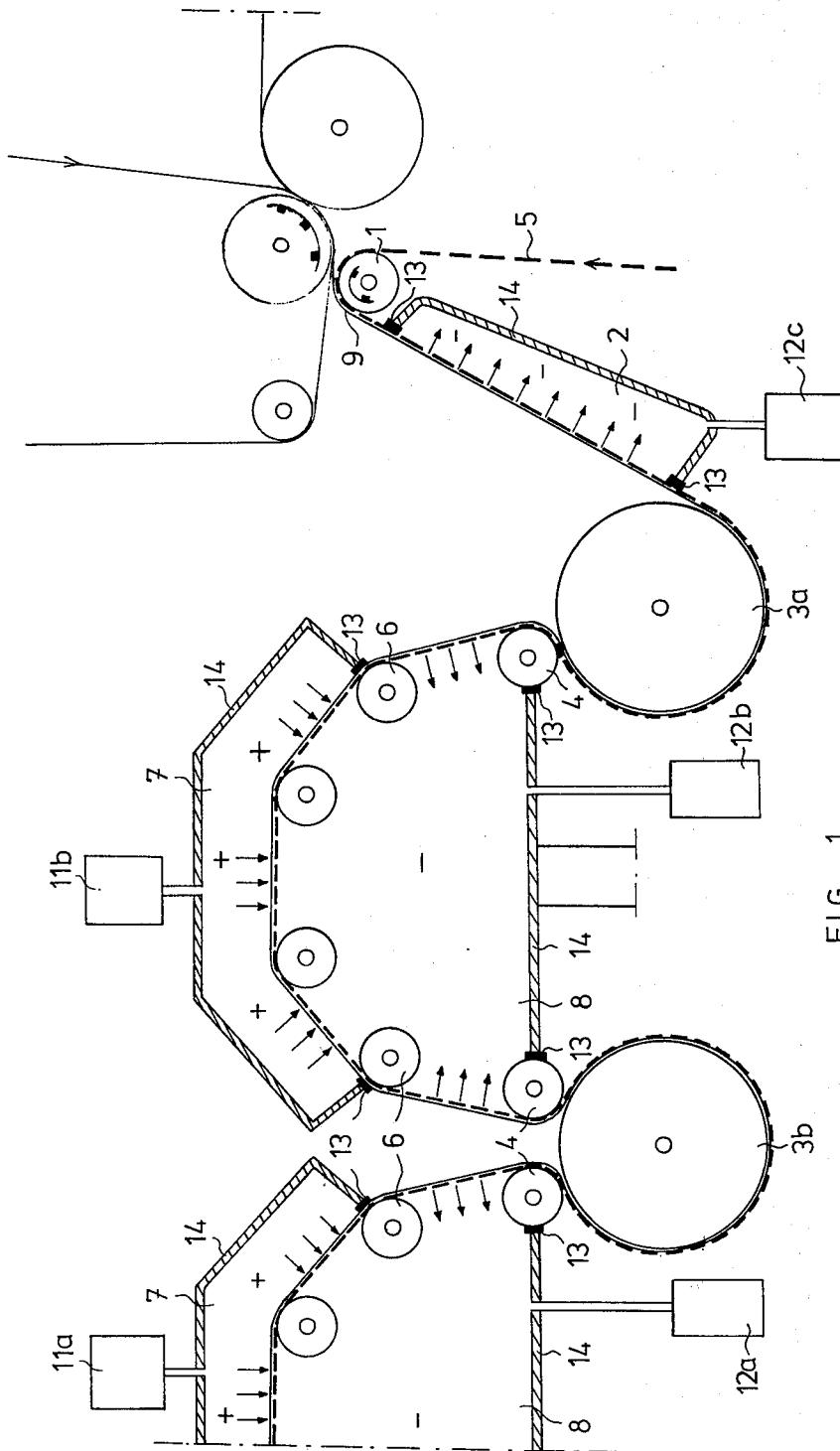
[57] **ABSTRACT**

An improvement in the multiple cylinder drier unit of a paper making machine, each drying group of which consists of a number of driers disposed in two rows, one above the other, and lapped by the paper web running through the group in zigzag fashion, supported by a drying wire. The suggested improvement is particularly characterized in that the driers in one row of the drying group are permeable to air and that the multiple cylinder drier also comprises additional driers for creating differential pressures on both sides of the paper web, whereby passage of air through the web is achieved, with the web pressed into contact with the drying wire.

According to further, optional features of the invention, the drying means permeable to air are cylindrically shaped drying cylinders, or they consist of a suction chamber substantially confined by the drying wire moving on a support of guiding rolls. In addition, hot air blowing hoods may be arranged around the drying means permeable to air and, within them, suction chambers. The paper web arriving from the press section of the paper machine may be arranged to be attached to the drying wire by the aid of suction means exerting suction through this wire.

4 Claims, 2 Drawing Figures





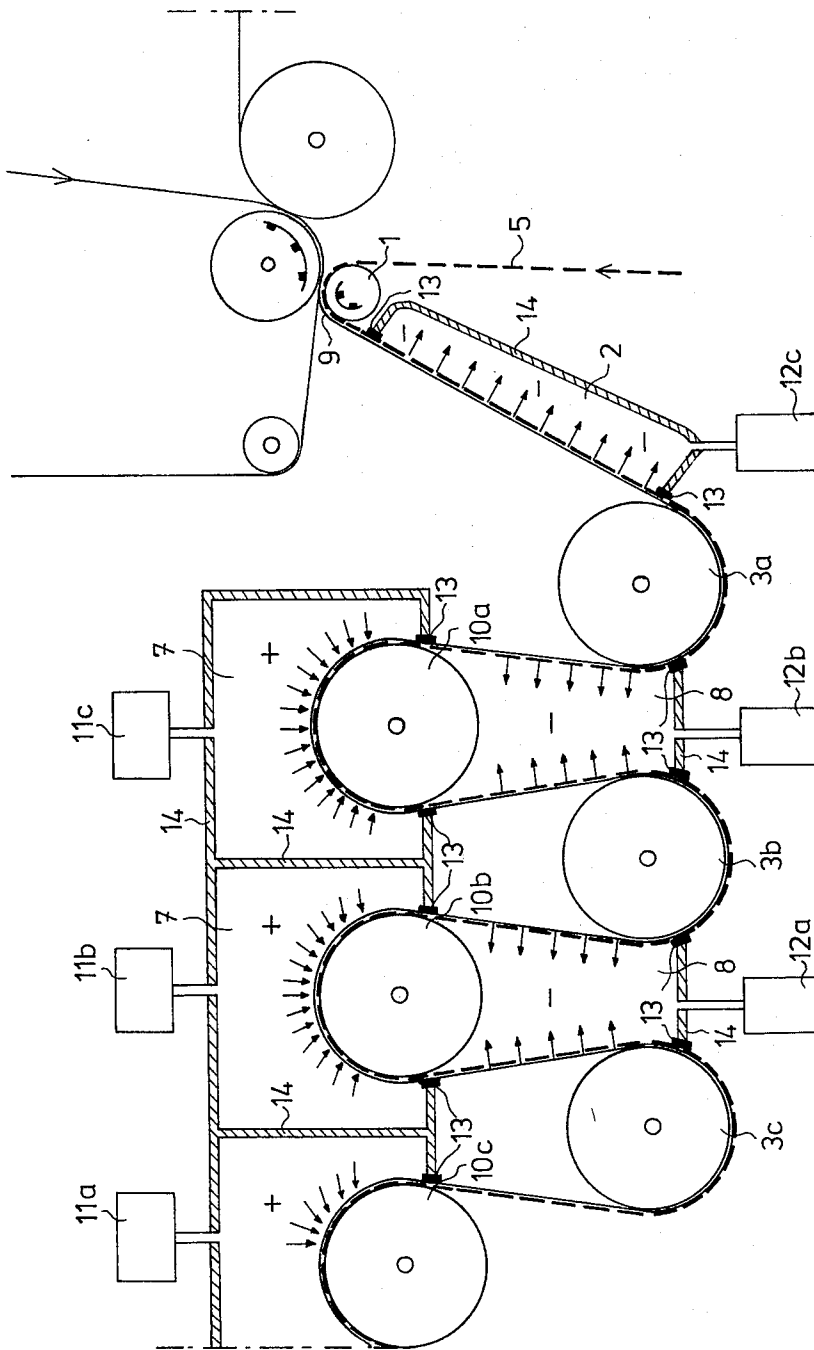


FIG. 2

MULTIPLE CYLINDER DRIER IN A PAPER MACHINE

The present invention concerns, in a paper making machine, a multiple cylinder drier having one or several drying groups or drying sections composed of drying means disposed in two rows, one above the other, over which the paper web travels along a zigzag path from one row to the other, through the group and is supported by a drying wire permeable to air. In multiple cylinder driers of this kind, all drying means have previously been so constructed that the drying has taken place according to the contact drying method. As a result, the efficiency of the drier has not been as high as it could be. Since paper machines are nowadays run at high speed and the speed is increased all the time, the multiple cylinder drier is required to be more efficient in order that a desired degree of drying of the paper web might be achieved. Consequently, the multiple cylinder drier has to be very large indeed, which has its own drawbacks.

The object of the present invention is to provide a more efficient multiple cylinder drier, in order that the above-mentioned drawback could be eliminated. The invention is characterized in that in a multiple cylinder drier of the kind described the drying means of one row are permeable to air and that the multiple cylinder drier also comprises means for creating differential pressures on both sides of the paper web, whereby the drying air can be made to pass through the paper web, while this paper web is urged into contact with the drying wire. Since the multiple cylinder drier according to the invention has alternating contact drying means and perfusion drying means, the advantages of the contact drying method and of the perfusion drying method can be combined. It follows that the drying efficiency of a multiple cylinder drier according to the invention is considerably superior to that of multiple cylinder driers of prior art.

The drying means permeable to air may be cylinders permeable to air such as those provided with a cylinder mantle. The drying means permeable to air may also consist of suction chambers substantially confined by the drying wire, moving on the support of guiding rolls. In order to create differential pressures, around the drying means permeable to air a hot air blowing hood may be arranged, and inside it a suction chamber.

The invention is more thoroughly described with reference to the embodiment examples presented in the attached drawings.

In the drawing,

FIG. 1 shows schematically a multiple cylinder drier according to an embodiment example of the invention, in elevational view.

FIG. 2 shows a multiple cylinder drier according to another embodiment example of the invention, similarly in schematical presentation and in elevational view.

In the multiple cylinder drier of FIG. 1 the drying means have been disposed, interspaced, in two rows one above the other. The drying means in the lower row are conventional heatable drying cylinders 3a, 3b. Each drying means in the upper row comprises suction rolls 4 and guiding rolls 6 disposed between these, and which constitute a curved path, along which the drying wire 5 permeable to air travels. The drying wire consists most appropriately of a plastic wire or equivalent, which does not take up water. Over the curved path a

heavy-duty hot air drying hood 7 has been fitted, and under it, within the curved part, a suction chamber 8. In addition, there are means for conducting the paper web to the multiple cylinder drier. These means consist of a suction roll 1, followed by a suction box 2.

The paper web 9 arriving from the press section of the paper machine is drawn against the drying wire 5 by the use of the suction roll 1, and its attachment to this wire is aided by the suction box 2. Subsequently, the paper web 9 travels, impacted between the drying cylinder 3a and the drying wire 5, up to the press nip 3a/4 defined by the drying cylinder 3a and the suction roll 4. Since the roll 4 is a suction roll, the paper web 9 follows along with the drying wire 5 in the passage of this wire along the curved path defined by the guiding rolls 6. Here, the paper web 9 is urged against the drying wire by differential pressure created by the hot air drying hood 7 above the curved path and the suction chamber 8 within the curved path, and the drying air flows through the paper web 9 and drying wire 5. Since another suction roll 4 has been placed at the end of the curved path, the paper web 9 is transferred to the second drying cylinder 3b. From this drying cylinder 3b the paper web 9 continues to another curved drying means of the kind described (not shown in its entirety). The drawing also shows blowing devices 11a and 11b used to blow hot air into the hoods 7 to produce pressure which is higher than atmospheric pressure. Suction means 12a and 12b are used to produce a vacuum in the suction chambers 8, while suction means 12c produce vacuum in the suction box 2. The walls of the hoods 7, suction chambers 8 and suction box 2 are indicated by the numeral 14 in the drawing, while sealing strips associated with these walls are indicated by the numeral 13.

In the embodiment example of FIG. 2 the drying means are likewise arranged in two rows, one above the other, interspaced with each other. The drying wire 5 runs along a zigzag path over the said drying means, from one row to the other. The drying means in the lower row are conventional heatable drying cylinders 3a, 3b, 3c, etc. The drying means in the upper row are drying cylinders 10a, 10b, etc. permeable to air. As has been said above, the drying wire 5 travels together with the paper web along a zigzag path from one row to the other. Similarly as in the preceding embodiment, in this design, too, and for the same reasons, heavy-duty hot air blowing hoods 7 and suction chambers 8 have been provided. From the drawing it is understood that impingement drying is effected in the region of the blowing hoods 7. For conduction of the paper web 9 from the press section to the drying cylinder 3a, a suction roll 1 and suction box 2 have been provided as in the preceding embodiment example. The paper web travels over the drying cylinders 3a, 3b and 3c in the lower row, pressed against them by the drying wire 5. In its travel over the drying cylinders 10a and 10b, permeable to air, in the upper row, the paper web 9 is urged against the drying wire 5 by effect of the hot air drying hood 7 and the suction chamber 8. In addition to blowing devices 11a and 11b, FIG. 2 also shows a blowing device 11c applied to the third hood 7.

In both embodiment examples presented in the foregoing, the paper web is alternately subjected to contact drying and to perfusion drying. This results in a faster drying of the paper web than in prior art.

The invention is by no means confined merely to the embodiment examples presented here; these may rather be modified in many ways within the scope of the invention.

I claim:

1. In a paper machine, a dryer assembly for the drying of a paper web, comprising a row of drying cylinders rotatable about their horizontal axes; perfusion drying means disposed at a vertical distance from the row of drying cylinders and located between said drying cylinders in their interstices; a drying wire permeable to air, the paper web traveling in contact with and supported by said wire from the beginning to the end of the dryer assembly all the way zigzagging from the preceding drying cylinder to the next perfusion drying means, the paper web being disposed on that side of the drying wire where, when running upon a drying cylinder, the paper web is interposed between the drying wire and the mantle surface of the drying cylinder so that hereby, the drying of the paper web by contact drying takes place; said perfusion drying means further comprising, on the side facing the drying wire and adjacent to it, a hot air blowing hood, and on the other side of the drying wire and paper web opposite thereto, a suction chamber extending and limited to the entire joint run of web and wire from one drying cylinder to the next, so that perfusion drying of the paper web takes place substantially on the whole distance of travel of the paper web from the preceding to the next drying cylinder, and so that drying furthermore takes place by impingement drying in the region of the blowing hood; a suction roll at the beginning of the dryer assembly and at a vertical distance from the first drying cylinder so that, by means of said suction roll, the paper web is

transferred to be supported by the drying wire; a joint run of the paper web and drying wire between said suction roll and first drying cylinder; a suction box on said joint run on the side facing the drying wire, the effect of the vacuum in this suction box being used to make the paper web adhere to the drying wire.

2. Dryer assembly according to claim 1, wherein the perfusion drying means comprise a plurality of guiding rolls, the axes of which lie on a curved surface between mutually adjacent drying cylinders, and whereby, under guidance of said guiding rolls, the drying wire travels from one row of drying cylinders to the next row, the perfusion drying means further comprising, adjacent to the outermost guiding rolls, a wall which, together with the drying wire guided by the guiding rolls, confines and encloses said suction chamber.

3. Dryer assembly according to claim 2, wherein the outermost guiding rolls are suction rolls and are so placed to define a press nip together with the drying cylinders adjacent to them.

4. Dryer assembly according to claim 1, wherein the perfusion drying means comprises a row of cylinders permeable to air and rotatable about their horizontal axes, said row being disposed at a vertical distance from the row of drying cylinders and said hot air blowing hood covering said permeable-to-air cylinders on a sector of substantially 180°, and a confining wall located adjacent to the plane defined by the row of drying cylinders and which, together with the runs of the drying wire between the drying cylinders and the cylinder permeable to air, confine and enclose said suction chamber.

* * * * *

35

40

45

50

55

60

65