

(19)



Europäisches Patentamt

European Patent Office

Office européen des brevets



(11)

EP 0 334 899 B2

(12)

NEW EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the opposition decision:

25.08.1999 Bulletin 1999/34

(45) Mention of the grant of the patent:

27.12.1991 Bulletin 1991/52

(21) Application number: **88901398.3**

(22) Date of filing: **12.11.1987**

(51) Int Cl.⁶: **D21F 5/04**

(86) International application number:

PCT/US87/03087

(87) International publication number:

WO 88/04206 (16.06.1988 Gazette 1988/13)

(54) **APPARATUS FOR SEQUENTIALLY DRYING BOTH SIDES OF A PAPER WEB**

VORRICHTUNG ZUR AUF EINANDERFOLGENDEN TROCKNUNG BEIDER SEITEN EINER
PAPIERBAHN

DISPOSITIF DE SECHAGE SEQUENTIEL DES DEUX FACES D'UNE BANDE DE PAPIER

(84) Designated Contracting States:

AT DE FR GB IT SE

(30) Priority: **02.12.1986 JP 18501986**

(43) Date of publication of application:

04.10.1989 Bulletin 1989/40

(73) Proprietor: **BELOIT TECHNOLOGIES, INC.**

Wilmington, Delaware 19803 (US)

(72) Inventors:

- **SANKODA, O. Mihara Works**
Mitsubishi Heavy Ind.CoLtd
Hiroshima-ken (JP)
- **OHNISHI, I. Mihara Works**
Mihara-shi Hiroshima-ken (JP)

(74) Representative: **Haug, Dietmar, Dipl.-Ing. et al**

Andrae Flach Haug
Balanstrasse 55
81541 München (DE)

(56) References cited:

DE-A- 2 355 397	DE-A- 3 132 040
JP-A- 61 217 673	US-A- 2 537 129
US-A- 4 202 113	US-A- 4 359 827
US-A- 4 483 083	US-A- 4 677 762
US-A- 4 876 803	US-A- 4 972 608
US-A- 4 974 340	US-A- 5 022 163

- **TAPPI JOURNAL**, vol. 70, no. 9, September 1987, Norcross, GA, US, G.L. Wedel et al.: "Advances in dryer section runnability", pages 65-69
- **Wochenblatt für Papierfabrikation**, 114. Jahrgang, Nr. 16, August 1986, J. Linderot: "Zehn Jahre Erfahrung mit geschlossener Bahnführung in der Trockenpartie", pages 623-628
- **Pulp and Paper Manufacture**, 3rd Edition, Volume 7, Paper Machine Operations, 1991, pages 302-305
- **Tappi Journal 70 (1987) September**, No. 9, G.L. Wedel et. al.: "Advance in Dryer Section Runnability", pages 65-69
- **Pulp & Paper Magazine**, pages 1 and 74, November 1986

EP 0 334 899 B2

Description

[0001] This invention relates to an apparatus for and a method of drying a web of paper.

[0002] DE-A-2 355 397 discloses an apparatus for sequentially drying both sides of a paper web, said apparatus comprising a plurality of groups of dryer drums, a plurality of guide rolls each being disposed between a respective pair of adjacent dryer drums, and a plurality of single dryer felts each being associated with a respective group of dryer drums and defining a continuous loop which extends in a sinusoidal configuration past alternate dryer drums of the respective group and guide rolls with the web being sandwiched between the dryer felt and each dryer drum for heating a respective side of the web and with the dryer felt being sandwiched between the web and each guide roll. The known apparatus includes a web transfer section between two consecutive groups of dryer drums, said web transfer section comprising the downstream dryer felt associated with the downstream group of dryer drums and the upstream dryer felt associated with the upstream group of dryer drums and guide rolls for guiding said upstream dryer felt towards said downstream dryer felt with the web being supported and guided by the upstream dryer felt from the upstream group of dryer drums to the downstream group of dryer drums. The embodiments shown in figures 5, 6, 8 and 9 of the above-mentioned document do not include means for holding the web against the respective dryer felt while the dryer felt passes around the guide rolls. Thus there is a danger for the web to become separated from the respective dryer felt. Moreover the above-mentioned embodiments do not include means for completely avoiding an open draw in the web transfer sections. As a result the web in the web transfer sections is susceptible to breaks.

[0003] US-A-4 359 827 discloses an apparatus for drying a web, said apparatus comprising a series of upper dryer drums and a series of lower grooved dryer drums each being disposed between a pair of adjacent upper dryer drums, and a fabric which passes alternately around upper and lower dryer drums in a sinusoidal configuration with the web being sandwiched between the fabric and each upper drums and with the fabric being sandwiched between the web and each lower drum. Since there is no direct contact between the lower dryer drums and the web any drying of the web during passage around the lower dryer drums is greatly reduced. In order to hold the web against the fabric vacuum boxes are provided between the upper and lower dryer drums. Moreover, it is suggested that the lower drums are replaced with cylinders having foraminous major surfaces and that a vacuum is applied on the cylinder interior so that the vacuum evacuates the grooves, thereby holding the web and fabric combination together onto the cylinder outer surface. There is no suggestion that the foraminous cylinders should have a diameter smaller than the dryer drums. Thus the foraminous cylinders cannot

be placed sufficiently close to the dryer drums to avoid a long fabric draw between consecutive dryer drums. As a result of the vacuum boxes between the upper drums and the lower drums or lower foraminous cylinders fabric wear will occur whenever the fabric comes into contact with the vacuum boxes because they have a stationary rigid surface.

[0004] Another conventional drying apparatus for sequentially drying both sides of a paper web is known in practice as a BEL RUN type drying section in which a first drying section dries one side of the web and then a subsequent drying section dries the opposite side of the web. In the BEL RUN type drying section, the single felt section may be made up of four groups of rollers. Typically, these groups include drying rollers and suction rollers which provide no open draw in their configuration because the paper web is always supported by a dryer felt. As the web progresses from one group of dryers to the next, the same side of the web is always presented to the successive drying rollers. However, in order to present the opposite side of the web to a successive drying roller, it is necessary to transfer an unsupported web to a subsequent dryer felt.

[0005] A further conventional drying apparatus is the so-called single-felted dryer section in which a joint run of the web and felt successively passes around upper and lower dryer drums in a sinusoidal configuration. Although this arrangement provides felt support for the web between successive upper and lower dryer drums, the lower dryer drums are virtually redundant in that the felt is sandwiched between the web and the drying roller thereby greatly reducing any drying of the web during passage around the lower drying rollers. Furthermore, such a single-felted dryer section still does not dry from both sides.

[0006] In the aforementioned BEL RUN configurations and single-felted dryers, problems exist in that only one side of the web is dried during passage of the web through the first few groups of dryers. Consequently, such arrangement results in differences in surface strength and properties. Additionally, the smoothness of the respective surfaces of the web differ which is a problem when sheet paper is required in which both sides of the sheet must have similar characteristics. Also, curl and non-uniform response to change in humidity have been problems with the aforementioned dryer sections.

[0007] In an article published in WOCHENBLATT FÜR PAPIERFABRIKATION No. 16 of 1986, J. Linderot: "10 Jahre Erfahrung mit Geschlossener Bahnführung in der Trockenpartie", pages 623-628, reference is made, on page 628, to a drying apparatus which includes a single-felted section consisting of three BEL RUN single-tier dryer groups and a fourth dryer group which is a single-felted two-tier dryer group. Each BEL RUN group comprises a plurality of top-felted dryer drums and suction transfer rolls disposed below and between adjacent dryer drums. The fourth dryer group has top and bottom dryer drums and a single felt which is sandwiched be-

tween the web and the bottom dryer drums. A two-tier two-felt section for continuing the drying process by drying the web directly from alternate sides is disposed downstream relative to the fourth dryer group of the single-felted section of the drying apparatus referred to in the afore-mentioned article. Such a drying apparatus is also illustrated schematically in Fig. 1 of the accompanying drawing and is considered to be the closest prior art.

[0008] An object of the present invention is to provide an apparatus and a method which overcome the aforementioned inadequacies of prior art drying apparatuses having BEL RUN and single-felted dryer groups, and which permit a simple and positive transfer of the web between successive dryer groups of the single-felted section of the drying apparatus in a no-open-draw-configuration such that both sides of the web can be dried directly, thereby providing a paper product having uniform surface characteristics, surface strength and smoothness, and no tendency to curl.

[0009] According to one aspect of the invention, there is provided an apparatus for drying a web of paper comprising a substantially horizontally extending single-felted section which is made up of a plurality of successively arranged, substantially horizontally extending single-tier dryer groups each of which has a plurality of dryer drums and a plurality of suction transfer rolls which are smaller in diameter than the dryer drums and disposed between and below or above adjacent dryer drums; and means for supporting the web during its transfer between adjacent single-tier dryer groups; said plurality of single-tier dryer groups including a first single-tier dryer group having its dryer drums rotating in a first direction for drying the web from only one side thereof, and having its suction transfer rolls rotating in a second direction opposite to said first direction, and including a first dryer felt for conveying the web in a serpentine path along the dryer drums and suction transfer rolls of said first single-tier dryer group so that said one side of the web comes into physical contact with the dryer drums of said first single-tier dryer group; a second single-tier dryer group which is disposed substantially horizontally adjacent to and downstream of said first single-tier dryer group, said second single-tier dryer group having its dryer drums rotating in said second direction for drying the web only from the other side, and having its suction transfer rolls rotating in said first direction, and including a second dryer felt for conveying the web in a serpentine path along the dryer drums and suction transfer rolls of said second single-tier dryer group so that said other side of the web comes into physical contact with the dryer drums of said second single-tier dryer group; said means for supporting the web during its transfer between adjacent single-tier dryer groups including said first and second dryer felts; and felt guiding means for guiding said first and second dryer felts in close proximity to each other between said first and second single-tier dryer groups so as to sandwich the web between

said first and second dryer felts; said felt guiding means including a first suction transfer roll disposed downstream relative to the dryer drums of said first single-tier dryer group and a further suction transfer roll disposed downstream relative to said first suction transfer roll for effecting a controlled transfer of the web from said first dryer felt to said second dryer felt so that the web is reversed for bringing said other side of the web into physical contact with the dryer drums of said second single-tier dryer group.

[0010] According to another aspect of the invention there is provided a method of drying a web of paper, said method including the steps of: guiding the web through a substantially horizontally extending single-felted section which is made up of a plurality of successively arranged, substantially horizontally extending single-tier dryer groups each of which has a plurality of dryer drums and a plurality of suction transfer rolls which are smaller in diameter than the dryer drums and disposed between and below or above adjacent dryer drums; and supporting the web during its transfer between adjacent single-tier dryer groups; said step of guiding the web through a substantially horizontally extending single-felted section including the sub-steps: of guiding said web through a first single-tier dryer group having its dryer drums rotating in a first direction for drying the web from only one side thereof, and having its suction transfer rolls rotating in a second direction opposite to said first direction, conveying said web contiguously with a first dryer felt such that the web and said first dryer felt follow a serpentine path along the dryer drums and suction transfer rolls of said first single-tier dryer group so that said one side of the web comes into physical contact with the dryer drums of said first single-tier dryer group; guiding the web through a second single-tier dryer group which is disposed substantially horizontally adjacent to and downstream of said first single-tier dryer group, said second single-tier dryer group having its dryer drums rotating in said second direction for drying the web only from the other side, and having its suction transfer rolls rotating in said first direction, conveying the web contiguously with a second dryer felt such that the web and said second dryer felt follow a serpentine path along the dryer drums and suction transfer rolls of said second single-tier dryer group so that said other side of the web comes into physical contact with the dryer drums of said second single-tier dryer group; said step of supporting the web during its transfer between adjacent single-tier dryer groups including the sub-steps of: guiding said first and second dryer felts in close proximity to each other between said first and second single-tier dryer groups so as to sandwich the web between said first and second dryer felts; guiding a joint run of the web and said first dryer felt around a first suction transfer roll which is disposed downstream relative to the dryer drums of said first single-tier dryer group; and thereafter guiding a joint run of the web and said second dryer felt around a further suction transfer roll for effecting a controlled trans-

fer of the web from said first dryer felt to said second dryer felt so that the web is reversed for bringing said other side of the web into physical contact with the dryer drums of said second single-tier dryer group.

[0011] Although the present invention is described with a certain degree of particularity in the detailed description contained hereinafter, it will be apparent to those skilled in the art that many modifications and variations of the concept of the present invention can be carried out without departing the spirit and scope of the present invention. In the drawing,

Figure 1 is a side-elevational view of a prior art BEL RUN type drying section showing the first four groups of dryer drums drying a first side of a paper web,

Figure 2 is a side-elevational view of a drying apparatus according to the present invention showing the means for transferring the web without open draw from a first to a second felt means, and

Figure 3 is an enlarged side-elevational view of Figure 2 particularly showing, in detail, the web transfer section enabling the opposite side of the web to come into physical contact with a subsequent group of dryer drums.

[0012] Similar reference characters refer to similar parts throughout the various Figures of the drawing.

[0013] Figure 1 is a side-elevational view of a conventional BEL RUN type drying section including groups A, B, C and D for drying a web of paper 1. As shown in Figure 1, the web 1 is guided in sinusoidal configuration around a plurality of dryer drums 2, 2' and 2" and suction transfer rolls 3, 3' and 3". A first felt 4 loops around a plurality of guide rolls 5, 5', 5" and 5''' and supports the web 1 as the web moves alternatively past dryer drums and suction rolls 3, 2, 3', 2' and 2". A second group B of dryer drums 6, 6' and 6" has suction rolls 7, 7' and 7" disposed alternately therebetween such that a second felt 4' loops around the suction rolls and dryer drums 7, 6, 7', 6' and 6" in sinusoidal configuration. The web 1 is unsupported by the felt 4 as the web 1 supported by the dryer drum 2" rotates adjacent to the second felt 4' so that the web 1 is transferred to the second felt 4' and around the suction roll 7. However, as seen in Figure 1, the same side 8 of the web 1 is brought into contact with the heating surfaces of the dryer rolls 2, 2', 2", 6, 6' and 6" so that the same side 8 is dried.

[0014] The present invention, as shown in Figure 2, enables the web 1A to be reversed from a first single-tier dryer section or group A1 to a second single-tier dryer section or group B1 so that during passage of the web 1A through the first section A1 one or a first side 8A of the web 1A comes into physical contact with the dryer drums 2A, 2A' and 2A" rotating in a first direction 20. In the second section B1, another or a second side 9 of the web 1A comes into physical contact with the heating surface of dryer drums 6A, 6A' and 6A" rotating in a sec-

ond direction 22 opposite to said first direction 20.

[0015] Figure 3 is an enlarged, fragmentary view of the transfer section shown in Figure 2 to show how the web 1A is reversed. More particularly, with reference to Figure 3, the apparatus generally designated 10 for reversing the paper web 1A includes the last dryer drum 2A" of the first section A1 with the web extending around a portion of the circumference of the dryer drum 2A". A first felt 4A extends around a portion of the dryer drum 2A" such that the web 1A is sandwiched between the first felt 4A and the dryer drum 2A" for heating the first side 8A of the web 1A. A first suction transfer roll 3A" rotating in said second direction 22 is disposed downstream relative to the dryer drum 2A". The first suction roll 3A" has an axis of rotation which is disposed parallel and spaced relative to the rotational axis of the dryer drum 2A". The first felt 4A and the web 1A extend around a portion of the circumference of the first suction roll 3A" such that the first felt 4A is sandwiched between the web 1A and the first suction roll 3A". First guiding means 5A, as shown in Figure 2, guide the first felt 4A away from the first suction roll 3A". A second or further suction transfer roll 7A rotating in said first direction 20 is disposed adjacent to the first suction roll 3A", the second suction roll 7A having an axis of rotation parallel and spaced relative to the axis of rotation of the first suction roll 3A". A second felt 4A' extends around the second suction roll 7A, and a second guiding means 12 shown in Figure 2 guides the second felt 4A' towards the second suction roll 7A such that the first and second felts 4A and 4A' respectively define therebetween a web transfer section generally designated 14 so that the web 1A is sandwiched between the felts 4A and 4A' during passage through the transfer section 14. The first dryer drum 6A of the second section B1 is disposed downstream relative to the second suction roll 7A with the dryer drum 6A having an axis of rotation parallel to the axis of rotation of the second suction roll 7A such that the web 1A is sandwiched between the second felt 4A' and the dryer drum 6A for heating the second side 9 of the web 1A.

[0016] As shown in Figure 2, the first felt 4A is a continuous loop which extends in sinusoidal configuration past alternate dryer drums and suction transfer rolls 3A, 2A, 3A', 2A' 3A", 2A" and 3A''' of the first section A1 such that the dryer drums 2A, 2A', 2A" physically contact the first side 8A of the web 1A and the second plurality of dryer drums 6A, 6A' and 6A" physically contact the second side 9 of the web 1A so that alternate sides of the web 1A are sequentially dried.

[0017] More specifically, the first guiding means includes a first guide roll 5A for guiding the first felt 4A and the second guiding means includes a second guide roll 12 for guiding the second felt 4A'.

[0018] In operation of the apparatus according to the present invention, alternate sides 8A and 9 of the paper web 1A are sequentially dried by the following method steps:

1. The joint run of the web 1A and the first felt 4A are guided around the dryer drums 2A, 2A', 2A'' and suction rolls 3A', 3A as shown in Figure 2 such that the web 1A is sandwiched between the first felt 4A and the dryer drums 2A, 2A', 2A'' for heating the first side 8A of the web 1A.

2. Thereafter, the joint run of the web 1A and the first felt 4A are guided around a first suction roll 3A''' such that the first felt 4A is sandwiched between the web 1A and the first suction roll 3A'''.

3. The first felt 4A is guided around a first guide roll 5A, and a second felt 4A' is guided from a second guide roll 12 around a second suction roll 7A such that the first and second felts 4A and 4A' respectively define therebetween a web transfer section 14 so that the web 1A supported by the first felt 4A is guided into the web transfer section 14 with the web 1A being disposed between the first and second felts 4A and 4A' respectively.

4. The web 1A emerging from the web transfer section 14 is drawn around the second suction roll 7A such that the second felt 4A' is disposed between the web 1A and the second suction roll 7A.

5. Thereafter, the joint run of the web 1A and second felt 4A' is directed around the dryer drums 6A, 6A', 6A'' and suction transfer rolls 7A', 7A'' such that the web 1A is sandwiched between the second felt 4A' and the dryer drums 6A, 6A', 6A'' for heating the second side 9 of the web 1A.

[0019] In the first dryer section A1, the suction rolls are disposed below the dryer drums whereas in the second dryer section B1, the suction rolls are disposed above the dryer drums. This configuration enables the provision of the aforementioned simple web transfer section such that the web may be transferred from the first to the second felt.

[0020] A third single-tier dryer section or group C1 is disposed, downstream relative to the second single-tier dryer section B1 for further drying the first side 8A of the web 1A, and a fourth single-tier dryer section or group D1 is disposed downstream relative to the third single tier dryer section C1 for further drying the second side 9 of the web 1A. A further web transfer section is disposed between the second and third dryer sections B1 and C1, and yet another web transfer section is disposed between the third and fourth dryer sections C1 and D1.

Claims

1. An apparatus for drying a web of paper (1A) comprising

a substantially horizontally extending single-felted section which is made up of
a plurality of successively arranged, sub-

stantially horizontally extending single-tier dryer groups (A1, B1, C1, D1) each of which has a plurality of dryer drums (2A, 2A', 2A'', 6A, 6A', 6A'') and a plurality of suction transfer rolls (3A', 3A'', 3A''', 7A', 7A'') which are smaller in diameter than the dryer drums and disposed between and below or above adjacent dryer drums; and means (4A, 4A', 3A''', 7A, 5A, 12; 7A''') for supporting the web (1A) during its transfer between adjacent single-tier dryer groups (A1, B1; B1, C1; C1, D1);
said plurality of single-tier dryer groups including

a first single-tier dryer group (A1) having its dryer drums (2A, 2A', 2A'') rotating in a first direction (20) for drying the web (1A) from only one side (8A) thereof, and having its suction transfer rolls (3A', 3A'') rotating in a second direction (22) opposite to said first direction (20), and including a first dryer felt (4A) for conveying the web (1A) in a serpentine path along the dryer drums (2A, 2A', 2A'') and suction transfer rolls (3A', 3A'') of said first single-tier dryer group (A1) so that said one side (8A) of the web (1A) comes into physical contact with the dryer drums (2A, 2A', 2A'') of said first single-tier dryer group (A1);

a second single-tier dryer group (B1) which is disposed substantially horizontally adjacent to and downstream of said first single-tier dryer group (A1), said second single-tier dryer group (B1) having its dryer drums (6A, 6A', 6A'') rotating in said second direction (22) for drying the web (1A) only from the other side (9), and having its suction transfer rolls (7A', 7A'') rotating in said first direction (20), and including a second dryer felt (4A') for conveying the web in a serpentine path along the dryer drums (6A, 6A', 6A'') and suction transfer rolls (7A', 7A'') of said second single-tier dryer group (B1) so that said other side (9) of the web (1A) comes into physical contact with the dryer drums (6A, 6A', 6A'') of said second single-tier dryer group (B1);

said means for supporting the web (1A) during its transfer between adjacent single-tier dryer groups including

said first and second dryer felts (4A, 4A');
and
felt guiding means (3A''', 5A, 7A, 12) for guiding said first and second dryer felts (4A, 4A') in close proximity to each other between said first and second single-tier

dryer groups (A1, B1) so as to sandwich the web (1A) between said first and second dryer felts (4A, 4A'); said felt guiding means including a further suction transfer roll (7A) for effecting a controlled transfer of the web (1A) from said first dryer felt (4A) to said second dryer felt (4A') so that the web (1A) is reversed for bringing said other side (9) of the web (1A) into physical contact with the dryer drums (6A, 6A', 6A'') of said second single-tier dryer group (B1).

2. An apparatus as set forth in claim 1 wherein said felt guiding means include a first suction transfer roll (3A'') disposed downstream relative to the dryer drums (2A, 2A', 2A'') of said first single-tier dryer group (A1), and said further suction transfer roll (7A) which is disposed downstream relative to said first suction transfer roll (3A''), said first suction transfer roll (3A'') being operable to apply a vacuum to said web (1A) through said first dryer felt (4A) to hold said web (1A) against said first dryer felt (4A) while said web (1A) and said first dryer felt (4A) pass jointly around said first suction transfer roll (3A''), said further suction transfer roll (7A) being operable to apply a vacuum to said web (1A) through said second dryer felt (4A') to hold said web (1A) against said second dryer felt (4A') when said first dryer felt (4A) separates from the web (1A).
3. An apparatus as set forth in claim 2, said apparatus including a third single-tier dryer group (C1) disposed downstream relative to said second single-tier dryer group (B1) and having its dryer drums rotating in said first direction (20) for further drying said one side (8A) of the web (1A), said third single-tier dryer group (C1) having its suction transfer rolls rotating in said second direction (22) and including a third dryer felt for conveying the web (1A) in a serpentine path along the dryer drums and suction transfer rolls of said third single-tier dryer group (C1), a fourth single-tier dryer group (D1) disposed downstream relative to said third single-tier dryer group (C1) and having its dryer drums rotating in said second direction (22) for further drying said other side (9) of the web (1A), said fourth single-tier dryer group (D1) having its suction transfer rolls rotating in said first direction (20) and including a fourth dryer felt for conveying the web (1A) in a serpentine path along the dryer drums and suction transfer rolls of said fourth single-tier dryer group (D1), further felt guiding means (7A'') for guiding said second and third dryer felts (4A') in close proximity to each other between said second and third single-tier dryer groups (B1, C1) so as to sandwich the web (1A) between said second and third dryer felts (4A') to effect a further controlled transfer of the

web (1A) from said second dryer felt (4A') to said third dryer felt, and additional felt guiding means for guiding said third and fourth dryer felts in close proximity to each other between said third and fourth single-tier dryer groups (C1, D1) so as to sandwich the web (1A) between said third and fourth dryer felts to effect yet another controlled transfer of the web (1A) from said third dryer felt to said fourth dryer felt, wherein each of said further felt guiding means and said additional felt guiding means include a respective pair of suction transfer rolls disposed adjacent to each other.

4. An apparatus as set forth in claim 2 or claim 3 wherein said felt guiding means for guiding said first and second dryer felts (4A, 4A') in close proximity to each other include a first guide roll (5A) for guiding said first dryer felt (4A) away from said first suction transfer roll (3A''), and a second guide roll (12) for guiding said second dryer felt (4A) towards said further suction transfer roll (7A).
5. An apparatus as set forth in claim 3 wherein each dryer felt (4A, 4A') defines a continuous loop which extends in sinusoidal configuration past alternate dryer drums and suction transfer rolls of the respective one of said single-tier dryer groups (A1, B1, C1, D1) such that each dryer drum of said first and third single-tier dryer groups (A1, C1) physically contacts said one side (8A) of the web (1A), and each dryer drum of said second and fourth single-tier dryer groups (B1, D1) physically contacts said other side (9) of the web (1A) so that alternate sides (8A, 9) of the web (1A) are sequentially dried.
6. An apparatus as set forth in claim 5 wherein said pluralities of suction transfer rolls (3A', 3A'', 7A', 7A'') are disposed alternately below and above said pluralities of dryer drums (2A, 2A', 2A'', 6A, 6A', 6A'').
7. A method of drying a web of paper (1A), said method including the steps of:

guiding the web (1A) through a substantially horizontally extending single-felted section which is made up of a plurality of successively arranged, substantially horizontally extending single-tier dryer groups (A1, B1, C1, D1) each of which has a plurality of dryer drums (2A, 2A', 2A'', 6A, 6A', 6A'') and a plurality of suction transfer rolls (3A', 3A'', 7A', 7A'') which are smaller in diameter than the dryer drums and disposed between and below or above adjacent dryer drums; and supporting the web (1A) during its transfer between adjacent single-tier dryer groups (A1, B1; B1, C1; C1, D1); said step of guiding the

web (1A) through a substantially horizontally extending single-felted section including the sub-steps of:

guiding said web (1A) through a first single-tier dryer group (A1) having its dryer drums (2A, 2A', 2A'') rotating in a first direction (20) for drying the web (1A) from only one side (8A) thereof, and having its suction transfer rolls (3A', 3A'') rotating in a second direction (22) opposite to said first direction (20), conveying said web (1A) contiguously with a first dryer felt (4A) such that the web (1A) and said first dryer felt (4A) follow a serpentine path along the dryer drums (2A, 2A', 2A'') and suction transfer rolls (3A', 3A'') of said first single-tier dryer group (A1) so that said one side (8A) of the web (1A) comes into physical contact with the dryer drums (2A, 2A', 2A'') of said first single-tier dryer group (A1);

guiding the web (1A) through a second single-tier dryer group (B1) which is disposed substantially horizontally adjacent to and downstream of said first single-tier dryer group (A1), said second single-tier dryer group (B1) having its dryer drums (6A, 6A', 6A'') rotating in said second direction (22) for drying the web (1A) only from the other side (9), and having its suction transfer rolls (7A', 7A'') rotating in said first direction (20), conveying the web (1A) contiguously with a second dryer felt (4A') such that the web (1A) and said second dryer felt (4A') follow a serpentine path along the dryer drums (6A, 6A', 6A'') and suction transfer rolls (7A', 7A'') of said second single-tier dryer group (B1) so that said other side (9) of the web (1A) comes into physical contact with the dryer drums (6A, 6A', 6A'') of said second single-tier dryer group (B1);

said step of supporting the web (1A) during its transfer between adjacent single-tier dryer groups (A1, B1; B1, C1; C1, D1) including the sub-steps of:

guiding said first and second dryer felts (4A, 4A') in close proximity to each other between said first and second single-tier dryer groups (A1, B1) so as to sandwich the web (1A) between said first and second dryer felts (4A, 4A'); and
guiding said second dryer felt (4A') around a further suction transfer roll (7A) for effecting a controlled transfer of the web (1A) from said first dryer felt (4A) to said second dryer felt (4A') so that the web (1A) is re-

versed for bringing said other side (9) of the web (1A) into physical contact with the dryer drums (6A, 6A', 6A'') of said second single-tier dryer group (B1).

8. A method of drying a web (1A) as set forth in claim 7, said method including the steps of:

guiding a joint run of the web (1A) and said first dryer felt (4A) around a first suction transfer roll (3A'');
guiding said first dryer felt (4A) around a first guide roll (5A);
guiding said second dryer felt (4A') from a second guide roll (12) around said further suction transfer roll (7A); and thereafter
directing a joint run of the web (1A) and said second dryer felt (4A') around each dryer drum of said second single-tier dryer group (B1).

9. A method of drying a web (1A) as set forth in claim 7 or claim 8, said method including the steps of:

guiding the web (1A) through a third single-tier dryer group (C1) for further drying said one side (8A) of the web (1A); and thereafter
guiding the web (1A) through a fourth single-tier dryer group (D1) for further drying said other side (9) of the web (1A).

Patentansprüche

1. Vorrichtung zum Trocknen einer Bahn aus Papier (1A), die einen im wesentlichen horizontal sich erstreckenden einfilzigen Abschnitt, der aus einer

Vielzahl an aufeinanderfolgend angeordneten, im wesentlichen horizontal sich erstreckenden einreihigen Trockengruppen (A1, B1, C1, D1) besteht, von denen jede eine Vielzahl an Trockenzylindern (2A, 2A', 2A''; 6A, 6A', 6A'') und eine Vielzahl an Saugüberführungswalzen (3A', 3A''; 7A', 7A'') hat, die im Durchmesser kleiner als die Trockenzylinder sind und zwischen und unter oder über benachbarten Trockenzylindern angeordnet sind; und

eine Einrichtung (4A, 4A', 3A'', 7A, 5A, 12; 7A'') zum Stützen der Bahn (1A) während ihrer Überführung zwischen benachbarten einreihigen Trockengruppen (A1, B1; B1, C1; C1, D1) aufweist;
wobei die Vielzahl an einreihigen Trockengruppen folgendes einschließt

eine erste einreihige Trockengruppe (A1), deren Trockenzylinder (2A, 2A', 2A'') sich in eine erste Richtung (20) zum Trocknen der Bahn (1A) von nur einer Seite (8A) da-

von drehen, und deren Saugüberführungswalzen (3A', 3A'') sich in eine zweite Richtung (22), die zu der ersten Richtung (20) entgegengesetzt ist, drehen, und die einen ersten Trockenfilz (4A) zum Transportieren der Bahn (1A) in Schlangenform an den Trockenzyklindern (2A, 2A', 2A'') und Saugüberführungswalzen (3A', 3A'') der ersten einreihigen Trockengruppe (A1) entlang enthält, so daß diese eine Seite (8A) der Bahn (1A) in physischen Kontakt mit den Trockenzyklindern (2A, 2A', 2A'') der ersten einreihigen Trockengruppe (A1) kommt; eine zweite einreihige Trockengruppe (B1), die im wesentlichen horizontal neben und, in Laufrichtung gesehen, unterhalb der ersten einreihigen Trockengruppe (A1) angeordnet ist, wobei sich von der zweiten einreihigen Trockengruppe (B1) die Trockenzyklinder (6A, 6A', 6A'') in die zweite Richtung (22) zum Trocknen der Bahn (1A) nur von der anderen Seite (9) drehen, und von der die Saugüberführungswalzen (7A', 7A'') in die erste Richtung (20) drehen, und die einen zweiten Trockenfilz (4A') zum Transportieren der Bahn in Schlangenform an den Trockenzyklindern (6A, 6A', 6A'') und Saugüberführungswalzen (7A', 7A'') der zweiten einreihigen Trockengruppe (B1) entlang enthält, so daß diese andere Seite (9) der Bahn (1A) in physischen Kontakt mit den Trockenzyklindern (6A, 6A', 6A'') der zweiten einreihigen Trockengruppe (B1) kommt;

wobei die Einrichtung zum Stützen der Bahn (1A) während ihrer Überführung zwischen benachbarten einreihigen Trockengruppen

den ersten und zweiten Trockenfilz (4A, 4A'); und eine Filzführungseinrichtung (3A'', 5A, 7A, 12) zum Führen des ersten und zweiten Trockenfilzes (4A, 4A') in nächster Nähe zueinander zwischen der ersten und der zweiten einreihigen Trockengruppe (A1, B1) enthält, um die Bahn (1A) zwischen den ersten und zweiten Trockenfilz (4A, 4A') zu nehmen; wobei die Filzführungseinrichtung eine weitere Saugüberführungswalze (7A) zum Bewirken einer kontrollierten Überführung der Bahn (1A) von dem ersten Trockenfilz (4A) auf den zweiten Trockenfilz (4A') enthält, so daß die Bahn (1A) gewendet wird, um die andere Seite (9) der Bahn (1A) in physischen Kontakt mit den Trockenzyklindern (6A, 6A', 6A'') der zweiten einreihigen Trockengruppe (B1) zu bringen.

2. Vorrichtung nach Anspruch 1, bei welcher die Filzführungseinrichtung eine erste Saugüberführungswalze (3A''), die, in Laufrichtung gesehen, unterhalb der Trockenzyklinder (2A, 2A', 2A'') der ersten einreihigen Trockengruppe (A1) angeordnet ist, und die weitere Saugüberführungswalze (7A) enthält, die, in Laufrichtung gesehen, unterhalb der ersten Saugüberführungswalze (3A'') angeordnet ist, wobei die erste Saugüberführungswalze (3A'') in der Lage ist, einen Unterdruck auf die Bahn (1A) durch den ersten Trockenfilz (4A) hindurch aufzubringen, um die Bahn (1A) an dem ersten Trockenfilz (4A) zu halten, während sich die Bahn (1A) und der erste Trockenfilz (4A) gemeinsam um die erste Saugüberführungswalze (3A'') herum bewegen, wobei die weitere Saugüberführungswalze (7A) in der Lage ist, einen Unterdruck auf die Bahn (1A) durch den zweiten Trockenfilz (4A') hindurch aufzubringen, um die Bahn (1A) an dem zweiten Trockenfilz (4A') zu halten, wenn sich der erste Trockenfilz (4A) von der Bahn (1A) trennt.
3. Vorrichtung nach Anspruch 2, wobei die Vorrichtung folgendes einschließt eine dritte einreihige Trockengruppe (C1), die, in Laufrichtung gesehen, unterhalb der zweiten einreihigen Trockengruppe (B1) angeordnet ist, und deren Trockenzyklinder sich in die erste Richtung (20) zum weiteren Trocknen der einen Seite (8A) der Bahn (1A) drehen, deren Saugüberführungswalzen sich in die zweite Richtung (22) drehen, und die einen dritten Trockenfilz zum Transportieren der Bahn (1A) in Schlangenform an den Trockenzyklindern und Saugüberführungswalzen der dritten einreihigen Trockengruppe (C1) entlang enthält, eine vierte einreihige Trockengruppe (D1), die in Laufrichtung gesehen, unterhalb der dritten einreihigen Trockengruppe (C1) angeordnet ist, und deren Trockenzyklinder sich in die zweite Richtung (22) zum weiteren Trocknen der anderen Seite (9) der Bahn (1A) drehen, deren Saugüberführungswalzen sich in die erste Richtung (20) drehen, und die einen vierten Trockenfilz zum Transportieren der Bahn (1A) in Schlangenform an den Trockenzyklindern und Saugüberführungswalzen der vierten einreihigen Trockengruppe (D1) entlang enthält, eine weitere Filzführungseinrichtung (7A'') zum Führen des zweiten und dritten Trockenfilzes (4A') in nächster Nähe zueinander zwischen der zweiten und dritten einreihigen Trockengruppe (B1, C1), um die Bahn (1A) zwischen den zweiten und dritten Trockenfilz (4A') zu nehmen, um eine weitere kontrollierte Überführung der Bahn (1A) von dem zweiten Trockenfilz (4A) zu dem dritten Trockenfilz zu bewirken, und eine zusätzliche Filzführungseinrichtung zum Führen des dritten und vierten Trockenfilzes in nächster Nähe zueinander zwischen der dritten und vierten einreihigen Trockengruppe (C1, D1), um die Bahn (1A) zwi-

schen den dritten und vierten Trockenfilz zu nehmen, um noch eine weitere kontrollierte Überführung der Bahn (1A) von dem dritten Trockenfilz zu dem vierten Trockenfilz zu bewirken, wobei die weitere Filzführungseinrichtung und die zusätzliche Filzführungseinrichtung jeweils ein Paar Saugüberführungswalzen aufweisen, die nebeneinander angeordnet sind.

4. Vorrichtung nach Anspruch 2 oder Anspruch 3, bei welcher die Filzführungseinrichtung zum Führen des ersten und zweiten Trockenfilzes (4A, 4A') in nächster Nähe zueinander eine erste Leitwalze (5A) zum Leiten des ersten Trockenfilzes (4A) weg von der ersten Saugüberführungswalze (3A''), und eine zweite Leitwalze (12) zum Leiten des zweiten Trockenfilzes (4A') in Richtung auf die weitere Saugüberführungswalze (7A) enthält.
5. Vorrichtung nach Anspruch 3, bei der jeder Trockenfilz (4A, 4A') eine geschlossene Schleife bildet, die sich sinusförmig abwechselnd an Trockenzylindern und Saugüberführungswalzen der jeweiligen einreihigen Trockengruppe (A1, B1, C1, D1) vorbei erstreckt, derart, daß jeder Trockenzylinder der ersten und dritten einreihigen Trockengruppe (A1, C1) die eine Seite (8A) der Bahn (1A) physisch berührt, und jeder Trockenzylinder der zweiten und vierten einreihigen Trockengruppe (B1, D1) die andere Seite (9) der Bahn (1A) physisch berührt, so daß beide Seiten (8A, 9) der Bahn (1A) abwechselnd der Reihe nach getrocknet werden.
6. Vorrichtung nach Anspruch 5, bei welcher die Gruppen von Saugüberführungswalzen (3A, 3A'; 7A, 7A') abwechselnd unter und über den Gruppen von Trockenzylindern (2A, 2A', 2A''; 6A, 6A', 6A'') angeordnet sind.
7. Verfahren zum Trocknen einer Bahn aus Papier (1A), wobei das Verfahren folgende Schritte enthält:

Leiten der Bahn (1A) durch einen sich im wesentlichen horizontal erstreckenden einfilzigen Abschnitt, der aus einer Vielzahl an aufeinanderfolgend angeordneten, im wesentlichen horizontal sich erstreckenden einreihigen Trockengruppen (A1, B1, C1, D1) besteht, von denen jede eine Vielzahl an Trockenzylindern (2A, 2A', 2A''; 6A, 6A', 6A'') und eine Vielzahl an Saugüberführungswalzen (3A', 3A''; 7A', 7A'') hat, die im Durchmesser kleiner als die Trockenzylinder sind, und zwischen und unter oder über benachbarten Trockenzylindern angeordnet sind; und

Stützen der Bahn (1A) während ihrer Überführung zwischen benachbarten einreihigen Trockengruppen (A1, B1; B1, C1; C1, D1), wobei

der Schritt des Leitens der Bahn (1A) durch einen im wesentlichen horizontal sich erstreckenden einfilzigen Abschnitt folgende Unterschritte enthält:

Leiten der Bahn (1A) durch eine erste einreihige Trockengruppe (A1), deren Trockenzylinder (2A, 2A', 2A'') sich in eine erste Richtung (20) zum Trocknen der Bahn (1A) nur von einer Seite (8A) davon drehen und deren Saugüberführungswalzen (3A', 3A'') sich in eine zweite Richtung (22), die zu der ersten Richtung (20) entgegengesetzt ist, drehen, Transportieren der Bahn (1A) in Anlage mit einem ersten Trockenfilz (4A) derart, daß die Bahn (1A) und der erste Trockenfilz (4A) einem schlangenförmigen Weg an den Trockenzylindern (2A, 2A', 2A'') und Saugüberführungswalzen (3A, 3A'') der ersten einreihigen Trockengruppe (A1) entlang folgen, so daß diese eine Seite (8A) der Bahn (1A) in physischen Kontakt mit den Trockenzylindern (2A, 2A', 2A'') der ersten einreihigen Trockengruppe (A1) kommt;

Leiten der Bahn (1A) durch eine zweite einreihige Trockengruppe (B1), die im wesentlichen horizontal neben und, in Laufrichtung gesehen, unterhalb der ersten einreihigen Trockengruppe (A1) angeordnet ist, wobei die Trockenzylinder (6A, 6A', 6A'') der zweiten einreihigen Trockengruppe (B1) sich in die zweite Richtung (22) zum Trocknen der Bahn (1A) nur von der anderen Seite (9) drehen, und deren Saugüberführungswalzen (7A', 7A'') sich in die erste Richtung (20) drehen, Transportieren der Bahn (1A) in Anlage mit einem zweiten Trockenfilz (4A') derart, daß die Bahn (1A) und der zweite Trockenfilz (4A') einem schlangenförmigen Weg an den Trockenzylindern (6A, 6A'') und den Saugüberführungswalzen (7A, 7A'') der zweiten einreihigen Trockengruppe (B1) entlang folgen, so daß diese andere Seite (9) der Bahn (1A) in physischen Kontakt mit den Trockenzylindern (6A, 6A', 6A'') der zweiten einreihigen Trockengruppe (B1) kommt;

wobei der Schritt des Stützens der Bahn (1A) während ihrer Überführung zwischen benachbarten einreihigen Trockengruppen (A1, B1; B1, C1; C1, D1) folgende Unterschritte enthält:

Leiten des ersten und zweiten Trockenfilzes (4A, 4A') in nächster Nähe zueinander zwischen der ersten und zweiten einreihigen

gen Trockengruppe (A1, B1), um die Bahn (1A) zwischen den ersten und zweiten Trockenfilz (4A, 4A') zu nehmen; und Leiten des zweiten Trockenfilzes (4A') um eine weitere Saugüberführungswalze (7A) herum, um eine kontrollierte Überführung der Bahn (1A) von dem ersten Trockenfilz (4A) auf den zweiten Trockenfilz (4A') zu bewirken, so daß die Bahn (1A) gewendet wird, um die andere Seite (9) der Bahn (1A) in physischen Kontakt mit den Trockenzylindern (6A, 6A', 6A'') der zweiten einreihigen Trockengruppe (B1) zu bringen.

8. Verfahren zum Trocknen einer Bahn (1A) nach Anspruch 7, wobei das Verfahren folgende Schritte enthält:

Leiten eines gemeinsamen Laufes der Bahn (1A) und des ersten Trockenfilzes (4A) um eine erste Saugüberführungswalze (3A') herum; Leiten des ersten Trockenfilzes (4A) um eine erste Leitwalze (5A) herum; Leiten des zweiten Trockenfilzes (4A') von einer zweiten Leitwalze (12) um die weitere Saugüberführungswalze (7A) herum; und danach Lenken eines gemeinsamen Laufes der Bahn (1A) und des zweiten Trockenfilzes (4A') um jeden Trockenzylinder der zweiten einreihigen Trockengruppe (B1) herum.

9. Verfahren zum Trocknen einer Bahn (1A) nach Anspruch 7 oder Anspruch 8, wobei das Verfahren folgende Schritte enthält:

Leiten der Bahn (1A) durch eine dritte einreihige Trockengruppe (C1) zum weiteren Trocknen der einen Seite (8A) der Bahn (1A); und danach Leiten der Bahn (1A) durch eine vierte einreihige Trockengruppe (B1) zum weiteren Trocknen der anderen Seite (9) der Bahn (1A).

Revendications

1. Appareil pour sécher une nappe de papier (1A) comprenant une section à feutre unique s'étendant sensiblement horizontalement, laquelle est constituée d'une pluralité de groupes de cylindres sécheurs à un seul étage (A1, B1, C1, D1) s'étendant sensiblement horizontalement, disposés successivement, dont chacun comporte une pluralité de cylindres sécheurs (2A, 2A', 2A'') (6A, 6A', 6A'') et une pluralité de cylindres de transfert aspirants (3A', 3A'', 7A', 7A'') qui ont un diamètre plus petit que celui des cylindres sécheurs et qui sont disposés entre les cylindres sécheurs voisins et en dessous ou au-

dessus de ceux-ci, et des moyens (4A, 4A', 3A'', 7A, 5A, 12; 7A'') pour supporter la nappe (1A) pendant son transfert entre des groupes de cylindres sécheurs à un seul étage voisins (A1, B1; B1, C1; C1, D1), la pluralité de groupes de cylindres sécheurs à un seul étage comportant un premier groupe de cylindres sécheurs à un seul étage (A1) dont les cylindres sécheurs (2A, 2A', 2A'') tournent dans une première direction (20), pour sécher la nappe (1A) à partir d'un seul côté (8A) de celle-ci, dont les cylindres de transfert aspirants (3A', 3A'') tournent dans une seconde direction (22) opposée à la première direction (20), et comprenant un premier feutre sécheur (4A) pour transporter la nappe (1A), suivant un trajet sinueux, le long des cylindres sécheurs (2A, 2A', 2A'') et des cylindres de transfert aspirants (3A', 3A'') du premier groupe de cylindres sécheurs à un seul étage (A1) de telle façon que la première face (8A) de la nappe (1A) vienne en contact physique avec les cylindres sécheurs (2A, 2A', 2A'') du premier groupe de cylindres sécheurs à un seul étage (A1), un second groupe de cylindres sécheurs à un seul étage (B1) s'étendant sensiblement horizontalement et situé en aval du premier groupe de cylindres sécheurs à un seul étage (A1) et à proximité de celui-ci, dont les cylindres sécheurs (6A, 6A', 6A'') tournent dans la seconde direction (22), afin de sécher la nappe (1A) uniquement à partir de l'autre côté (9) et dont les cylindres de transfert aspirants (7A'', 7A'') tournent dans la première direction (20) et comportant un deuxième feutre sécheur (4A') pour transporter la nappe (1A), suivant un trajet sinueux, le long des cylindres sécheurs (6A, 6A', 6A'') et des cylindres aspirants (7A', 7A'') du second groupe de cylindres sécheurs à un seul étage (B1) de telle façon que l'autre face (9) de la nappe (1A) vienne en contact physique avec les cylindres sécheurs (6A, 6A', 6A'') du second groupe de cylindres sécheurs à un seul étage (B1), les moyens supportant la nappe (1A) pendant son transfert entre des groupes de cylindres sécheurs à un seul étage voisins incluant les premier et second feutres sécheurs (4A, 4A') et des moyens de guidage des feutres (3A'', 5A, 7A, 12) pour guider les premier et deuxième feutres sécheurs (4A, 4A'), à proximité l'un de l'autre, entre les premier et deuxième groupes de cylindres sécheurs à un seul étage (A1, B1), de manière à prendre en sandwich la nappe (1A) entre les premier et deuxième feutres (4A, 4A'), les moyens de guidage des feutres comportant un cylindre de transfert aspirant additionnel (7A) pour effectuer un transfert commandé de la nappe (1A) à partir du premier feutre sécheur (4A) vers le deuxième feutre sécheur (4A') de telle façon que la nappe (1A) soit inversée pour amener l'autre face (9) de la nappe (1A) en contact physique avec les cylindres sécheurs (6A, 6A', 6A'') du second groupe de cylindres sécheurs à un seul étage (B1).

2. Appareil suivant la revendication 1 caractérisé en ce que les moyens de guidage des feutres comportent un premier cylindre de transfert aspirant (3A'')
disposé en aval par rapport aux cylindres sécheurs (2A,2A',2A'') du premier groupe de cylindres sécheurs à un seul étage (A1) et le cylindre de transfert aspirant additionnel (7A) disposé en aval par rapport au premier cylindre aspirant (3A''), ce premier cylindre de transfert aspirant (3A'') pouvant être mis en oeuvre pour appliquer un vide à la nappe (1A), à travers le premier feutre sécheur (4A), afin de maintenir cette nappe (1A) contre le premier feutre sécheur (4A) tandis que cette nappe (1A) et ce premier feutre sécheur (4A) passent conjointement autour du premier cylindre de transfert aspirant (3A''), le cylindre de transfert aspirant additionnel (7A) pouvant être mis en oeuvre pour appliquer un vide à la nappe (1A), à travers le deuxième feutre sécheur (4A'), afin de maintenir la nappe (1A) contre le second feutre sécheur (4A') lorsque le premier feutre sécheur (4A) se sépare de la nappe (1A).
3. Appareil suivant la revendication 2 caractérisé en ce qu'il comporte un troisième groupe de cylindres sécheurs à un seul étage (C1) disposé en aval du deuxième groupe de cylindres sécheurs à un seul étage (B1), dont les cylindres sécheurs tournent dans la première direction (20), afin de sécher additionnellement la première face (8A) de la nappe (1A), dont les cylindres de transfert aspirants tournent dans la seconde direction (22) et incluant un troisième feutre sécheur pour transporter la nappe (1A), suivant un trajet sinueux, le long des cylindres sécheurs et des cylindres de transfert aspirants du troisième groupe de cylindres sécheurs à un seul étage (C1), un quatrième groupe de cylindres sécheurs à un seul étage (D1) disposé en aval du troisième groupe de cylindres sécheurs à un seul étage (C1), dont les cylindres sécheurs tournent dans la seconde direction (22), afin de sécher additionnellement la seconde face (9) de la nappe (1A), dont les cylindres de transfert aspirants tournent dans la première direction (20) et incluant un quatrième feutre sécheur pour transporter la nappe (1A), suivant un trajet sinueux, le long des cylindres sécheurs et des cylindres de transfert aspirants du quatrième groupe de cylindres sécheurs à un seul étage (D1), des moyens de guidage des feutres additionnels (7A''') pour guider les deuxième et troisième feutres sécheurs (4A'), à proximité immédiate l'un de l'autre, entre les deuxième et troisième groupes de cylindres sécheurs à un seul étage (B1,C1), afin de prendre en sandwich la nappe (1A) entre les deuxième et troisième feutres (4A'), en vue d'effectuer un autre transfert commandé de la nappe (1A) à partir du deuxième feutre sécheur (4A') vers le troisième feutre sécheur, et des moyens de guidage des feutres supplémentaires pour guider les troisième et quatrième feutres sécheurs, à proximité immédiate l'un de l'autre, entre les troisième et quatrième groupes de cylindres sécheurs à un seul étage (C1,D1), pour prendre en sandwich la nappe (1A) entre les troisième et quatrième feutres sécheurs et pour effectuer encore un autre transfert commandé de la nappe (1A) à partir du troisième feutre vers le quatrième feutre, chacun des moyens de guidage des feutres additionnels et des moyens de guidage des feutres supplémentaires comportant une paire respective de cylindres de transfert aspirants voisins l'un de l'autre.
4. Appareil suivant la revendication 2 ou la revendication 3 caractérisé en ce que les moyens de guidage des feutres pour guider les premier et deuxième feutres sécheurs (4A,4A'), à proximité immédiate l'un de l'autre, comportent un premier cylindre de guidage (5A) pour guider le premier feutre (4A) s'éloignant du premier cylindre de transfert aspirant (3A'') et un second cylindre de guidage (12) pour guider le deuxième feutre sécheur (4A') vers le cylindre de transfert aspirant additionnel (7A).
5. Appareil suivant la revendication 3 caractérisé en ce que chaque feutre sécheur (4A,4A') définit une boucle continue qui s'étend suivant une configuration sinusoïdale en passant alternativement sur des cylindres sécheurs et des cylindres de transfert aspirants d'un groupe respectif parmi les groupes de cylindres sécheurs à un seul étage (A1,B1,C1,D1) de telle façon que chaque cylindre sécheur des premier et troisième groupes de cylindres sécheurs à un seul étage (A1,C1) soit en contact physique avec la première face (8A) de la nappe (1A) et que chaque cylindre sécheur des second et quatrième groupes de cylindres sécheurs à un seul étage (B1,D1) soit en contact physique avec l'autre face (9) de la nappe (1A), afin que les faces alternées (8A,9) de la nappe (1A) soient séchées successivement.
6. Appareil suivant la revendication 5 caractérisé en ce que les pluralités de cylindres de transfert aspirants (3A',3A'', 7A',7A'') sont disposées alternativement au-dessus et en dessous des pluralités de cylindres sécheurs (2A,2A',2A'',6A,6A',6A'').
7. Procédé de séchage d'une nappe de papier (1A) caractérisé en ce qu'il comprend les étapes consistant à guider la nappe (1A) à travers une section à feutre unique s'étendant sensiblement horizontalement, qui est constituée d'une pluralité de groupes de cylindres sécheurs à un seul étage (A1,B1,C1,D1) s'étendant sensiblement horizontalement, disposés successivement, dont chacun comporte une pluralité de cylindres sécheurs (2A, 2A',2A'', 6A,6A'',6A'') et une pluralité de cylindres

de transfert aspirants (3A',3A'',7A',7A'') dont le diamètre est plus petit que celui des cylindres sécheurs et qui sont disposés entre des cylindres sécheurs voisins et en dessous ou au-dessus de ceux-ci, et à supporter la nappe (1A) pendant son transfert entre des groupes de cylindres sécheurs à un seul étage voisins (A1,B1;B1,C1;C1,D1), l'étape de guidage de la nappe (1A) à travers la section à feutre unique s'étendant sensiblement horizontalement comportant les sous-étapes consistant à guider la nappe (1A) à travers un premier groupe de cylindres sécheurs à un seul étage (A1) dont les cylindres sécheurs (2A,2A',2A'') tournent dans une première direction (20), pour sécher la nappe (1A) à partir d'un seul côté (8A) et dont les cylindres de transfert aspirants (3A',3A'') tournent dans une seconde direction (22) opposée à la première direction (20), à transporter la nappe (1A), en la maintenant contiguë à un premier feutre sécheur (4A), de telle façon que la nappe (1A) et le premier feutre sécheur (4A) suivent un trajet sinueux, le long des cylindres sécheurs (2A,2A',2A'') et des cylindres de transfert aspirants (3A',3A'') du premier groupe de cylindres sécheurs à un seul étage (A1) de telle façon que la première face (8A) de la nappe vienne en contact physique avec les cylindres sécheurs (2A,2A',2A'') du premier groupe de cylindres sécheurs à un seul étage (A1), à guider la nappe (1A) à travers un deuxième groupe de cylindres sécheurs à un seul étage (B1) s'étendant sensiblement horizontalement, disposé en aval par rapport au premier groupe de cylindres sécheurs à un seul étage (A1) et à proximité de celui-ci, dont les cylindres sécheurs (6A,6A',6A'') tournent dans la seconde direction (22), afin de sécher la nappe (1A) uniquement à partir de l'autre côté (9), et dont les cylindres de transfert aspirants (7A',7A'') tournent dans la première direction (20), à transporter la nappe (1A) en la maintenant contiguë à un deuxième feutre sécheur (4A') de telle façon que la nappe (1A) et le deuxième feutre sécheur (4A') suivent un trajet sinueux, le long des cylindres sécheurs (6A,6A',6A'') et des cylindres de transfert aspirants (7A',7A'') du second groupe de cylindres sécheurs à un seul étage (B1) de telle façon que l'autre face (9) de la nappe (1A) vienne en contact physique avec les cylindres sécheurs (6A,6A',6A'') du second groupe de cylindres sécheurs à un seul étage (B1), l'étape consistant à supporter la nappe (1A) pendant son transfert entre les groupes de cylindres sécheurs à un seul étage voisins (A1,B1;B1,C1;C1,D1) comportant les sous-étapes consistant à guider les premier et deuxième feutres (4A,4A'), à proximité l'un de l'autre, entre les premier et deuxième groupes de cylindres sécheurs à un seul étage (A1,B1), de manière à prendre en sandwich la nappe (1A) entre les premier et deuxième feutres (4A,4A'), et à guider le second feutre sécheur (4A') autour d'un cylindre

de transfert aspirant additionnel (7A) pour effectuer un transfert commandé de la nappe (1A) à partir du premier feutre (4A) vers le deuxième feutre (4A'). de telle façon que la nappe (1A) soit inversée pour amener l'autre face (9) de la nappe (1A) en contact physique avec les cylindres sécheurs (6A,6A',6A'') du second groupe de cylindres sécheurs à un seul étage (B1).

8. Procédé de séchage d'une nappe (1A) suivant la revendication 7 caractérisé en ce qu'il comprend les étapes consistant à guider un tronçon commun du premier feutre (4A) et de la nappe (1A) autour d'un premier cylindre de transfert aspirant (3A''), à guider le premier feutre sécheur (4A) autour d'un premier cylindre de guidage (5A), à guider le second feutre sécheur (4A'), à partir du second cylindre de guidage (12), autour du cylindre de transfert aspirant additionnel (7A) et après cela à diriger un tronçon commun de la nappe (1A) et du second feutre sécheur (4A') autour de chaque cylindre sécheur du second groupe de cylindres sécheurs à un seul étage (B1).
9. Procédé de séchage d'une nappe (1A) suivant la revendication 7 ou la revendication 8 caractérisé en ce qu'il comprend les étapes consistant à guider la nappe (1A) à travers un troisième groupe de cylindres sécheurs à un seul étage (C1) pour sécher additionally la première face (8A) de la nappe (1A) et après cela à guider la nappe (1A) à travers un quatrième groupe de cylindres sécheurs à un seul étage (D1) pour sécher additionally la seconde face (9) de la nappe (1A).

