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D E C I S I O N
of 12 May 1998

Case Number: T 0088/95 - 3.2.3

Application Number: 88901398.3

Publication Number: 0334899

IPC: D21F 5/04

Language of the proceedings: EN

Title of invention:
Apparatus for sequentially drying both sides of a paper web

Patentee:
Beloit Technologies, Inc.

Opponents:
J. M. Voith GmbH
Valmet Paper Machinery Inc.

Headword:
-

Relevant legal provisions:
EPC Art. 54, 56, 123

Keyword:
"Priority right (valid) - specific feature disclosed in more general terms in the claims of the patent in suit - the meaning of said specific feature is that at the priority date of the patent in suit"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
T 0073/88

Catchword:
-

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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0088/95 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 12 May 1998

Appellant: (Proprietor of the patent)
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Decision under appeal: Decision of the Opposition Division of the European Patent Office posted 28 November 1994 revoking European patent No. 0 334 899 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: C. T. Wilson
Members: J. du Pouget de Nadaillac
M. K. S. Aúz Castro

Summary of Facts and Submissions

I. The present appeal is directed against the decision of the Opposition Division of the European Patent Office dated 28 November 1994, revoking the European patent EP-B1-0 334 899, against which two oppositions had been filed, on the ground of lack of inventive step. The European patent application was filed on 12 November 1987 claiming priority from a Japanese patent application filed on 2 December 1986.

II. The patentee - hereinafter the appellant - lodged the appeal on 24 January 1995 and paid the appeal fee on the same date. The Statement of grounds was received on 10 April 1995 together with four new sets of claims as auxiliary requests, the main request concerning the claims as granted.

III. In response, opponent II - hereinafter the respondent - contested the validity of the claim to priority of the patent in suit and, as a consequence, the novelty of the subject-matter of all independent claims of the various requests of the appellant in view of the disclosure of document D0 (Tappi Journal 70, September 1987, No. 9. pages 65 to 69). He moreover alleged that Article 123(2) EPC was infringed and that, even if the priority right was considered to be valid, the subject-matter of these claims would lack inventive step, having regard to the following prior art documents:

D1: DE-A-23 55 397 (or D1': US-A-3 868 780)

D2: US-A-4 359 827

D4: Wochenblatt für Papierfabrikation, Ende August 1986, Nr.16, J.Linderot :"Zehn Jahre Erfahrung mit Geschlossener Bahnführung in der Trockenpartie", pages 623 to 628.

D5: DE-A1-3 132 040 (or D20: WO-A-8300514)

D16: JP-A-61-217673 with an English translation

D17: US-A-4 483 083

Documents D16 and D17 were filed during the appeal proceedings.

IV. In a communication accompanying the summons to oral proceedings, the Board of Appeal notified the parties of its provisional evaluation that the priority right was valid, that the objections under Article 123(2) were apparently not justified and that the foraminous cylinders according to D2 were not to be considered as suction rolls of a BEL RUN dryer section and apparently were drying cylinders.

On 23 February 1998, the appellant filed, as main and auxiliary requests, two sets of new claims with adapted descriptions, each set of claims comprising an independent apparatus claim and an independent method claim.

On 30 April 1998, the respondent (opponent II) withdrew its opposition.

Opponent I, the other respondent, had withdrawn its opposition already on 13 September 1995 without having forwarded any allegations in the appeal proceedings.

V. Claim 1 of the main request filed on 23 February 1998 reads as follows:

"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, 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 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)."

The independent method Claim 7 of this request reads as follows:

"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 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)."

Claim 1 of the auxiliary request differs from Claim 1 of the main request only by the wording of the last paragraph, which reads as follows:

"said felt guiding means including 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 a further suction transfer roll (7A) disposed downstream relative to said first suction transfer roll (3A"') 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)."

Claim 6 of the auxiliary request differs from the above Claim 7 of the main request by the replacement of the last paragraph of said Claim 7 by the two following paragraphs:

"guiding a joint run of the web (1A) and said first dryer felt (4A) around a first suction transfer roll (3A"') which is disposed downstream relative to the dryer drums (2A, 2A', 2A") of said first single-tier dryer group (A1); and thereafter
guiding a joint run of the web (1A) and 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 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)."

VI. Oral proceedings took place on 12 May 1998.

The Appellant argued substantially as follows:

Figure 10 on page 628 of document D4 represents the closest prior art, and the contested invention concentrates on the single-felted drying section shown in this known drying apparatus of a paper machine. Said drying section comprises three dryer groups of the BEL-RUN type, namely a single felt and a single tier of drying cylinders. These dryer groups initiate the drying of the paper web, all groups drying one and the same side of the paper web. Then a fourth group of dryer cylinders follows, which is also single-felted, however is a two-tier dryer group, also called UNO-RUN dryer group, in which the paper web is dried from both sides. As shown by Figure 10 of D4, this whole single-felted section comprising all four dryer groups was at the priority date of the patent in suit followed

by conventional two-felt, two-tier dryer sections, which continue the drying process on both sides of the paper web. This whole arrangement shows drawbacks. The fact that, at the beginning of this drying process, only one side of the paper web is dried by several BEL-RUN dryer groups, leads to non-uniform characteristics of both surfaces of the paper web, which cannot be compensated by the subsequent drying of both sides of said web. Moreover, the drying in the lower tier of dryers of the UNO-RUN type group is not efficient, since the web is not in direct contact with the dryers. Until the present invention, BEL-RUN dryer groups were not involved for drying the opposite side of the paper web, since, in order to reverse the web, it would have had to be transferred from one BEL-RUN group to the next group in an open draw, which causes fluttering and breaking of the web.

Therefore, the technical problem to be solved is to provide an apparatus and a method which overcome these inadequacies of the prior art. This problem is solved by providing a positive transfer of the web between adjacent BEL RUN type dryer groups drying alternate sides of the web, this solution being based on the realisation that the characteristics of the paper are improved if drying takes place from both sides at the beginning of the drying process.

The expression "Geschlossene Bahnführung" used in the closest prior art D4 cannot suggest this solution. Contrary to the respondent's opinion, at the priority date of the patent, this expression did not mean any kind of single-felted dryer group, but was only used for designating the conventional single-felted, two-tier dryer group, namely the UNO-RUN type dryer group. In this closest prior art, a clear distinction is made between the BEL-RUN type dryer group and the conventional single-felted dryer group and, further,

between suction rolls and cylinders, which can be grooved and heated or not. Therefore, the suggestion made in this document to use alternating top- or bottom-felted successive dryer groups to avoid two sidedness can only concern the UNO-RUN groups.

The drying apparatus disclosed in document D2 is a two-tier, single-felted drying apparatus. The main object of this prior art is to avoid the higher heating needed in certain dryers of a UNO-RUN dryer group, and the solution consists in the replacement of the conventional dryers by dryers provided with grooves, each associated with a vacuum box. The heat transfer between the lower drying cylinder and the web is therefore increased. The respondent has particularly considered the transfer means between two single-felted dryer groups disclosed by Figure 6 of this document. However, the object of the embodiment described in this figure is to operate the second group at a lower rotational speed than that of the first group for shrinkage purposes. The idea of reversing the web is not mentioned, and no reversal takes place in the two other transfer means disclosed by Figures 5 and 7 respectively. The objects of this prior art are therefore quite different. Moreover, the teaching of this document is that only vacuum boxes act on the web to effect the transfer. No suction rolls are implicated. The modification proposed at the top of column 14 concerns the embodiments of Figures 2 to 4, not that of Figure 5. Moreover, foraminous cylinders are not vacuum rolls and can be electrically heated, so that this proposal still concerns drying cylinders and, as a consequence the reversal of UNO-RUN dryer groups for drying both sides of a web.

The transfer of the web between two successive dryer groups shown by Figure 9 of document D1 cannot suggest the claimed transfer, since at the top of the almost vertically disposed dryer rows the web partly runs below the felt and, thus, is not supported. At the bottom of the rows, a web support is not shown during the transfer of the web between two dryer groups. The guiding rolls disclosed in this prior art are not vacuum rolls.

The other mentioned documents are less relevant: D5, which wishes to improve the drying groups according to D1, describes only one single-felted, one-tier dryer group with vacuum rolls between the dryers. This group is followed by conventional two-tier, two-felted dryer groups, so that only one side of the web is dried by the single-felted dryer group. Moreover, the web is transferred in an open draw to the following dryer groups. Thus, this prior art does not suggest the provision of a subsequent inverted single-felted dryer group. Document D16 concerns a conventional two-tier dryer group and teaches to transfer the web between two felts inside this group, and not between different groups. Document D17 discloses only one dryer group, which apart from the first dryer, essentially dries the same side of a paper web. No transfer means between successive dryer groups is disclosed.

Therefore, none of these prior art documents suggests the present invention.

Reasons for the Decision

1. The appeal is admissible.

2. *Validity of the priority right*

This objection of the respondent was raised for the first time in the appeal proceedings and results from the fact that in both independent Claims 1 and 8 of the patent the "means for guiding said first and second felt means" are defined in general terms, whereas in the priority document these means are disclosed as the vacuum rolls of the transfer means. Therefore, according to the respondent, a considerable number of different guiding means embodiments are encompassed within the above granted claims, which consequently do not claim the same invention as that disclosed in the priority document. The patent in suit is not therefore entitled to the priority right and consequently document D0, which is a technical journal of the paper industry published during the priority interval, is state of the art under Article 54(2) EPC. Its Figure 13 shows a drying apparatus which, with respect to the essential features, corresponds to the present invention as shown in Figure 2 of the patent in suit. Therefore, the respondent, referring to decision T 73/88, OJ EPO 1990, 557, has alleged that this document is novelty-destroying.

The Board cannot follow this opinion: There is no doubt that the subject-matter of the two mentioned granted claims is disclosed in the priority document, even if expressed in more specific terms. Contrary to this, in the case of decision T 73/88, a feature not disclosed in the priority document had been added in the claim. Therefore, this decision does not apply to the present case. Moreover, care should be taken to clearly

distinguish between the question whether the same invention is being claimed and the consideration of the extent of generalization which is permissible in claiming the same invention. The latter consideration is to be examined in the light of the prior art, when the question of novelty is concerned. However, when this question arises during the priority interval, as is the case here, only the content of European patent applications published during this period are to be considered according to Article 54(3) EPC, and not other kinds of document, such as document D0.

Consequently, the priority claim is valid, and document D0 does not form part of the state of the art according to Article 54(1) and (2) EPC.

3. *Article 123(2) EPC*

Two objections in respect of this article were raised, concerning respectively the expressions "smaller in diameter" and "vacuum drawn from the interior..of the suction rolls" of the claims.

3.1 As to the terms "smaller in diameter", the respondent argued that on the one hand it is known that suction transfer rolls of a conventional BEL-RUN dryer configuration do not have diameters above 40 % of the diameter of the dryer cylinders and that, on the other hand, the diameter of the suction rolls as shown in Figures 2 and 3 of the patent in suit is approximately 30% of that of the dryer drums. The respondent concluded that only a diameter of suction rolls in the range from 30% to 40% of the dryer drum diameter could have been disclosed either by the drawing of the patent or by the use of BEL-RUN dryer groups, so that the above contested expression is not admissible, extending as it does beyond this range.

Undoubtedly, the expression "smaller in diameter" is supported by Figure 2 of the patent in suit as originally filed. However, the Board holds that a more exact dimension or dimension range of the diameter of the suction rolls cannot be supported by measuring the schematic representation of this figure, the description of the patent in suit providing no information as to the diameter. In fact, it is the limitation proposed by the respondent which would infringe Article 123(2) EPC. The objection is, therefore, to be rejected.

3.2 The second objection concerning the expression "vacuum drawn from the interior of the suction rolls" results from one main issue under discussion between the parties in the present case, namely the interpretation of the term "suction rolls". According to the respondent, in the original documents of the patent in suit, these rolls are only defined by way of their function, which is to hold the web by means of vacuum against the felt while the web and the felt wrap said transfer roll. Therefore, any kind of roll which fulfills this function, like for example a grooved or foraminous roll cooperating with an external vacuum box, is meant by the patent in suit. Moreover, the patent application is silent about the method of drawing a vacuum for the suction rolls and, thus, does not indicate that it is essential to draw it from the interior of the roll, so that this last expression introduced in the claims is not allowable.

The Board would first point out that there is no requirement under the EPC that the original documents should contain a reference that this litigious feature is essential for the alleged invention. Important is only to examine whether or not, this feature "extends beyond the content of the application as filed (of the patent in suit)", cf. Article 123(2) EPC.

It is true that the term "suction rolls" is only mentioned as such in the original specification of the patent in suit. However, the board cannot follow the respondent's opinion for the following reasons:

(a) Evidence provided by the appellant, namely D12: "Thesaurus of pulp and Paper Terminology, 1990, pages 459 and 506" and Appendix B: "Paper Vocabulary", 1st Edition, Swedish Standard Institution, Stockholm, 1980, page 258", defines a "vacuum" or "suction roll" as a hollow perforated cylinder with built-in suction box.

(b) Document D1' describes small perforated rolls having the same guiding or transfer function as the suction rolls according to the present invention, and nevertheless it does not use the contested term. Document D2 makes a clear distinction between suction rolls used either for the pickup function or for a web transfer between two dryer groups in this prior art and grooved dryer cylinders associated with external vacuum boxes.

(c) The description of the patent in suit indicates that the dryer groups of the present invention correspond to the BEL-RUN kind. For a person skilled in the art, it implies suction rolls having the vacuum drawn from the interior. Also the symbol used for designating these rolls in the drawing of the patent in suit shows a limited sealed internal portion of the roll shell, which corresponds to a suction box. The same symbol is used for vacuum rolls in D2 and other documents.

(d) Publications of the respondent himself, like "Dryer section for high speed paper machines", Valmet Paper machinery, and US-A-5 022 163, both published after the priority date of the patent in suit, distinguish vacuum or suction rolls from grooved cylinders with vacuum boxes. The last document even defines in column 1 the suction roll as a roll with a suction box requiring inner sealing seals.

Even if the respondent has introduced with this last patent publication a new kind of vacuum roll, the so called VAC roll, this was at a date posterior to the priority date of the patent in suit. Another document filed by the respondent and published before this date, namely D9 (Taschenlexikon der Papierherstellung, Dr.R.Schulz, 1973) indicates that the German term "Saugwalze", which corresponds to "vacuum rolls", could have, besides the above given meaning, another meaning, namely "cellular suction rolls". However, these rolls have the function of sucking water collected in the roll cells and, thus, do not correspond to transfer rolls in dryer groups.

Therefore, at the priority date of the patent in suit, the person skilled in the art would have directly and unambiguously deduced from the term "vacuum rolls" the meaning of perforated rolls with built-in suction boxes, excluding grooved or foraminous rolls with external vacuum boxes.

3.3 All other amendments of the claims have their support in the application as originally filed. Moreover, since the subject-matter of the two independent claims of each request has been restricted by the introduction of several new features, the requirement of Article 123(3) is met. Thus, the new claims are admissible.

The amendments in the description are also not open to objection, the closest prior art being acknowledged and the whole description being adapted to the wording of the new claims

Main request

4. As seen above, document D0 is not state of the art under Article 54 EPC, so that the novelty objection of the respondent is groundless. Since none of the other cited documents, insofar as they belong to the state of the art under Article 54 EPC, discloses all the features of the two independent claims, the subject-matter of these claims is novel.

5. Brief review of the dryer groups development explaining the terms "BEL-RUN" or "UNO-RUN" dryer groups.

For many years, a drying section essentially was made of successive two-tier, two-felted dryer groups, often called the conventional two-tier configuration, in which each group comprises two superposed tiers (horizontal rows) of drying cylinders, each row having its own felt travelling in a serpentine way around the cylinders with the help of a guiding roll between each pair of cylinders. The cylinders of one row are situated in alignment with the spaces between the cylinders of the other row, and the paper web also travels in a serpentine way from the drum of one row to the next drum of the other row, being sandwiched between a felt and the surface of each drying cylinder when wrapping said cylinder. Each side of the web is thereby alternately dried by the upper and lower cylinders. A drawback of this configuration is that the

web is not supported by a felt during its transit between top and lower cylinders, so that breaks of the paper web often occur, in particular in the first part of the drying section, where the web is wet and, thus, substantially weak.

A first development was the UNO-RUN concept, in which the two felts are replaced by a single felt. The guiding rolls of the previous configuration are omitted, and the felt supports the web from one row to the other. The main advantage was the increase of the speeds of the paper machines. However, the felt, when travelling about a lower cylinder, is sandwiched between the paper web and the cylinder, so that the heating transfer to the web is not effective. Both sides of the web are also not dried uniformly. With the increasing speeds of the machines, air or vacuum boxes were introduced in the felt pockets to control the tendency of the web to separate from the felt.

The subsequent important advance in this technology was the BEL-RUN concept, which concerns the present invention, since it corresponds to the dryer groups as described in Claim 1. In this concept, the heating cylinders of the bottom row, which were inefficient in the preceding arrangement, are replaced by vacuum rolls of smaller diameters located adjacent the top drying cylinders. Since the web is kept against the felt by vacuum as it travels around the bottom roll, there are no free draws, allowing an increase in the machine speeds. The drawback is that only one side of the web is dried by a dryer group.

Inventive step

6. According to the respondent, documents D1, D2 and D4 (Figure 10) can each represent the nearest prior art. However, the respondent had mainly adopted this approach because of the broader meaning it gave to the term "suction rolls". As seen above, this interpretation is not appropriate and, furthermore, in the new claims the suction rolls are more precisely defined. Moreover, the new independent claims of the present main request concern a substantially horizontally extending single-felted, single-tier drying section. Among the three above cited documents, only one, namely D4, shows in its Figure 10 such a drying section. In contrast thereto, D1 discloses in all its embodiments at least two rows of drying cylinders (also called "dryers") either horizontally superposed or almost vertically arranged, and D2 concerns a two-tier drying system. Therefore, document D4, in particular page 628 with Figure 10, is to be considered as the nearest prior art.

6.1 In the configuration disclosed in Figure 10 of D4 and according to the disclosure on page 628 of this document, the paper web leaving the press section is first transferred to three successive dryer groups of the BEL-RUN configuration, each group comprising three dryers. Then, three other dryer groups follow, the fourth group being a UNO-RUN arrangement, while the fifth and sixth groups are of the old conventional two-felted, two-tier configuration. The three BEL-RUN dryer groups are all top-felted groups (or top dryer groups), meaning that the bottom surface of the web contacts the dryers or, in other words, that the top part of the felt loop, which is the return part, is

above the dryer row. Located at the beginning or wet end of a drying section, in which most of the web breaks occur, this arrangement is advantageous, since the free room under these groups allows a quick removal of the broken web portions.

Moreover, web transfer means are provided between two successive BEL-RUN groups. These web transfer means comprise the downstream dryer of the first of the two successive groups, since this dryer still supports the web from the point where it leaves the felt of said first group, up to the point, where it is contacted by the felt of the second group. This second felt associated with the web then leaves the dryer of the first group and reaches an upstream suction transfer roll of the second group. Thus, a positive transfer of the web between two successive dryer groups is realized.

A disadvantage of the drying section according to this closest prior art is the non-uniform surface characteristics of the paper product, such as smoothness and strength. The reason is that, even though the paper web in the last two two-felted dryer groups is dried alternately on each side by direct contact with the dryer surface of the dryers, this cannot undo the damage created in the preceding single-felted section, in which only one first side of the web is dried through the initial three BEL-RUN groups. In the following UNO-RUN group, both sides are indeed alternately dried. However, only the second side is dried by direct contact with the upper dryers, the other side being indirectly dried on the lower dryers due to the interposition of the felt. Because of these different drying steps, which are not uniform as to each web side, the paper product tends to curl. Another

disadvantage results from the direct contact of the felts with the drying surfaces of the dryers in the UNO-RUN group, which causes the felts to rapidly deteriorate and, also, makes the heat transfer inefficient.

7. The above document D6, which is an article published in August 1986 about the development of the single-felted concept (thus, covering the UNO-RUN and BEL-RUN configurations and other known alternatives), indicates in a paragraph concerning future possible developments that for certain kinds of paper it may also be necessary to alternate top and bottom dryer groups in order to avoid this two sidedness problem mentioned above, that is to say the problem of having the two sides of the web not uniformly dried.

As to the respective text of document D6, the appellant's argument, that the term "Geschlossene Bahnführung" (closed guidance) was not equivalent to "Einfilzführung" (single-felted) and thus designates only a UNO-RUN configuration, is not followed by the Board, having regard to the aforementioned object of this article and the fact that it discloses the BEL-RUN concept as part of the described development. However, the Board also cannot follow the opponent's view that this passage prompts the skilled person to alternate top- and bottom-felted BEL-RUN dryer groups, since it only mentions the single-felted concept in general and does not indicate a particular kind of single-felted dryer group.

In fact, despite the above suggestion, no practical example has been disclosed. The possible reasons may be some drawbacks of each concept, for example the greater length and thus the need of long buildings in the case of the BEL-RUN configuration, compared to a two-tier concept. A weak point was also the transfer of the web

from one felt of a dryer group to the felt of the subsequent dryer group, which implies open draws with inverted dryer groups, impeding the positive transfer of the web already obtained within each dryer group. Avoidance of these open draws was required at the beginning or wet end of a drying section, where the web is still weak, but, as soon as the web had obtained sufficient strength by drying, an unsupported web was accepted, as shown by the last dryer groups according to the closest prior art.

8. Thus, the technical problem to be solved by the present invention is to provide an apparatus and a method which overcome the above-mentioned inadequacies of the prior art drying apparatuses having BEL-RUN and single-felted dryer groups, and which thus 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 characteristics, surface strength and smoothness, and no tendency to curl.

9. As seen from above, the present invention only deals with the single-felted section, which in the above described nearest prior art comprised the three BEL-RUN dryer groups and the subsequent UNO-RUN dryer group.

According to Claims 1 (apparatus) and 8 (method) of the main request, the problem is solved in that:

(i) the successive BEL-RUN dryer groups alternately dry the web from either side directly, and

(ii) transfer means are provided between two successive BEL-RUN dryer groups by sandwiching the web between both felts of these groups, a further suction transfer roll facilitating the reversal of the felt during said transfer.

The advantages of this solution are various: Both sides of the web are alternately dried in the successive groups and equally subjected to the suction forces of the vacuum rolls, so that these sides are uniformly treated. The resultant paper product has less tendency to curl. The heat transfer also is more efficient, since it is always transferred by direct contact between the web and the dryers. Moreover, the web transfer is positive without open draw, although the dryer groups are inverted. High speeds are therefore possible for the whole single-felted section.

10. It remains to be decided whether this solution involves an inventive step or not.

11. Document D1 , or its American equivalent D1':

11.1 This prior art is an attempt to eliminate the disadvantages of the UNO-RUN concept. The key idea of the solution according to this prior art is the provision of guiding rolls disposed "between and below or above adjacent dryer cylinders", as are the vacuum rolls of the present invention according to Claim 1. Preferably, according to this prior art, these guiding rolls may be perforated, so that a vacuum created inside of the felt loop by an external suction duct maintains the web against the felt when it turns around each guiding roll. Each perforated guiding roll may also be provided with a heating blow box or can be replaced by perforated drying cylinders. In this document, several embodiments of a dryer group or of a

plurality of dryer groups are disclosed, comprising either two superposed horizontally extending dryer rows inside a single dryer group or a plurality of vertical or inclined dryers rows, each row in this case forming a dryer group with its own felt.

11.2 The respondent has more particularly referred to the embodiment according to Figure 9 of this prior art, since it shows a drying apparatus made of a plurality of one-felted, one-row dryer groups arranged parallel to each other, in an almost vertical position. Having regard to the wording of Claim 1 of the patent in suit, the opponent has pointed out that the dryers of any dryer group rotate in a first direction and dry a first side of the web, the intermediate guiding (or "transfer") rolls rotating in the opposite or second direction. The dryers of the following dryer group rotate in the second direction and dry the second side of the web, the guiding rolls rotating in the first direction. Between two successive groups, transfer means are provided at the top and at the bottom of the rows and comprise means for guiding approximately horizontal or slightly inclined portions of the respective felts of both dryer groups in close proximity to each other with the web arranged between them.

Therefore, according to the respondent, this prior art discloses an apparatus for drying a paper web comprising a single-felted dryer section which is made up of a plurality of dryer groups having a configuration quite identical to the one claimed by the present invention and which moreover alternately dries both sides of the paper web. Moreover, it comprises identical transfer means for the reversal of the web. The same object as the one underlying the present invention is also disclosed, since this prior art indicates that said web reversal is useful for the

paper gloss, which is one characteristic of a paper product. Perforated transfer rolls with vacuum means are to be considered as suction rolls. Even if they were not considered as such, then this would be the only difference between this prior art and the present invention and it cannot involve an inventive step, since at the priority date of the patent in suit, it was known to replace the guiding rolls of D1 by vacuum rolls, as shown by document D5.

11.3 The Board disagrees with this opinion of the respondent for the following reasons:

- The whole construction or configuration of the single-felted dryer section according to D1 is different from that of a dryer section made of BEL-RUN dryer groups. There is no suggestion in D1 to have a single-felted section made of a plurality of successively arranged, substantially horizontally extending single-tier dryer groups, as are the BEL-RUN dryer groups. In any embodiment of D1, in which one horizontal row of dryers can be seen, a dryer group comprises at least a second horizontal row of dryers placed above the first, so that the configuration of the UNO-RUN concept is maintained or at least imitated. As to the dryer rows of the embodiment according to Figure 9, all are indeed single-felted, but the one-row dryer groups are almost vertically disposed. It is indeed indicated in this prior art that the positioning of the rows can be arbitrary, however none of the eight disclosed embodiments shows a horizontal extending single-tier dryer group. Therefore, it is not clear how the broad outline of the configuration disclosed in D1 would have directed a person skilled in the art towards an improvement of a BEL-RUN configuration.

- Moreover, as pointed out by the appellant, one consequence of the configuration described in D1 is that the heat released by dryers of the bottom row will affect the heat transfer from the dryers in the top rows, especially as each dryer group is located in an enclosed space for the maintenance of the vacuum. Thus, the drying is not uniform, so that, contrary to the respondent's assertion, at least certain surface characteristics of the paper product provided by the apparatus according to D1 cannot be uniform, even if the paper gloss itself is said to be.

- The transfer means according to D1 do not avoid open draws. By pointing out an identity between the transfer means described in this prior art and those of the present invention, the respondent seems to have selected with hindsight a portion of the transfer means according to D1. As a matter of fact, Figure 9 of D1 shows that, when the web is transferred between the tops of two dryer groups, it is disposed on the underside of the felt during the whole transfer time, thus apparently unsupported, along a portion, which runs from the last dryer of the first group to the "sandwich" portion selected by the respondent. At the bottom of the almost vertical dryer rows, the web, when transferred, is also not actually sandwiched between the felts and has to pass unsupported from one felt to the other. Thus, the skilled person would not find any suggestion of a positive transfer between two dryer groups without open draw from the mechanical design of this embodiment.

- Suction rolls were known a long time before the filing date of this document and were not unknown to its author, since, in the embodiment of Figure 1 of D1, such a roll is used for the transfer between the press and drying sections. Nevertheless, the author, although recommending the use of perforated rolls associated with vacuum means inside the dryer groups for transferring the web, did not mention or suggest suction rolls for this purpose. Moreover, even if at the priority date of the patent in suit, it was known to replace guiding rolls such as those disclosed in this prior art by vacuum rolls, the skilled person would nevertheless have been refrained from applying such an idea in the drying sections according to D1. The reason is that the real teaching of this document is to use vacuum in a space enclosing one or several dryer groups in order to hold the web on the felt not only along the surface of the guiding rolls, as vacuum rolls do, but also all other runs of the felt, where it is needed, in particular during the web transfer between dryer groups, explaining therefore the real solution in this document relating to the transfer means.

Therefore, the person skilled in the art, who looks for a solution to the problem underlying the present invention, was not led to take account of the teaching of this document D1 because of the whole construction described therein, which substantially differs from a BEL-RUN configuration, and because of the solution itself, which does not solve the problems of the present invention. Further, assuming he would have considered it, he would have been directed to a solution different from that claimed in the patent in suit.

12. Document D2

In this prior art, the edge fluttering, the curling and the breakages of the paper web are considered in relation to the increasing speeds of the papermaking machines. The main object is therefore to control the velocity stresses created by these speeds. This prior art also seeks to avoid the heating drawback of the UNO-RUN concept and the complexity of the embodiments according to D1.

12.1 The basic idea of this prior art is the need for the web to be supported throughout the drying section until it has attained sufficient strength to be self-supporting. The solution consists of drying cylinders arranged in a two-tier, single-felted drying section with the web and felt assembly following a serpentine path along the dryers: The web is therefore in direct contact with a dryer of one row and in indirect contact with the subsequent dryer of the other row. All dryers of this last row, namely those with which the web is in indirect contact, have circumferential grooves in their mantle surfaces and are each provided with an adjacent vacuum box located in the pocket formed between the two rows by the serpentine felt and web assembly and the dryer itself. This vacuum box is divided into different suction zones, at least one covering the portion of the dryer not wrapped by the felt and the others being adjacent the felt on the lateral sides of the pocket up to the adjacent dryers of the other row. By means of these suction zones, one adjusted vacuum is induced in the grooves of the dryer and other vacuums differently adjusted operate on the adjacent runs of the felt. Thus, pressure differential forces acting perpendicularly to the web ensure that it is held onto the felt, independently of the velocity forces. This permits the web to be held in closer contact with the

felt around the grooved dryers, so that more heat can be transferred to the web through the felt, overcoming thereby the drawback of the UNO-RUN concept, and this without using the complex system described in D1.

Transfer means are also described for transferring the web from one dryer group to a subsequent dryer group. In one embodiment of these transfer means, namely that according to Figure 6, the two dryer groups are inverted, that is to say one is top-felted and the other bottom-felted. The first group ends with a grooved dryer, whereas the subsequent group begins with a grooved dryer. The respective felts of both groups, as soon as they leave said respective grooved dryers, are brought into close proximity to each other in the transfer zone, sandwiching the web between them. The adjacent vacuum box of the subsequent dryer group provides pressure differential forces sufficient to transfer the web from one felt to the other. During this transfer, the web is therefore reversed, so that each side of the web is dried by a dryer group, and that in direct contact with the dryers. Uniform characteristics of the paper product are thereby obtained.

12.2 In the first lines of column 14 of this document D2, an alternative is proposed, drafted as follows:

"The grooved, heated lower cylinders may, as an alternative, be replaced with cylinders having foraminous major surfaces. For example, the bottom of the grooves of the cylinders may be apertured about their circumference. A vacuum on the cylinder interior then evacuates the grooves thereby holding the web and fabric combination together onto the cylinder outer

surface, independent of centrifugal forces or other velocity stresses. The foraminous cylinder may be of relatively light weight construction since it does not have to withstand conventional steam pressure." No corresponding drawing is provided.

12.3 The respondent has argued that this prior art teaches to divide the drying system into different dryer groups, each having its own felt in order to make the paper sheet less prone to curl (column 14, line 55 of D2). A positive web support without open draw is also wanted, in particular during the transfer of the web from one dryer group to another. Moreover, each side of the web is alternately dried in the successive dryer groups. Thus, at least three objects underlying the invention according to the patent in suit are solved, and the person skilled in the art, who wanted to improve the above mentioned closest prior art according to D4, would have found in Figure 6 of D2 the solution of the present invention, having in mind that all the grooved transfer rolls shown in this figure, including the downstream last transfer roll of the first dryer group and the upstream transfer roll of the subsequent group, are of the same kind. The application of the teaching of the aforementioned passage of column 14 to a drying section according to D4 necessarily results in that these transfer rolls are vacuum rolls.

Document D2 itself could, in the respondent's opinion, represent the closest prior art and, in such a case, the subject-matter of Claim 1 differs from this prior art only by the feature that the heated transfer rolls of the first and second dryer groups are replaced by vacuum rolls. Other documents, such as D5, teach the

use of vacuum rolls as transfer rolls, and the passage of D2 in column 14 also suggests this. By making this substitution, the dryer groups according to D2 become single-tier dryer groups, so that the subject-matter of Claim 1 is obtained.

12.4 The Board is not convinced by these arguments, even if - once seen a posteriori - some similarities between the solution of this prior art and the present invention are apparent.

12.5 All the drawings of this document show a two-tier, single-felted drying apparatus and in the part of its description summarizing the invention, it is clearly mentioned that the drying cylinders are arranged in a double row series. All the claims of D2 require two rows of drying cylinders. The heating problem existing in the UNO-RUN concept is here solved by holding the web more firmly against the grooved dryers, which are not eliminated in contrast to the solution according to D1. Although the teaching of document D1 was known and also vacuum rolls as such, since they are used in this prior art D2 as transfer rolls for other purposes, there is no suggestion of transfer rolls or vacuum rolls which may replace some dryers. The author of this citation has criticised the disclosure of D1 in that heat is only applied to one side of the sheet, and, therefore, he has relied on the older UNO-RUN configuration, in which both web sides are dried in each dryer group, improving only the old ineffective heating of certain dryers. Thus, the disclosure of D2 concerns exclusively a UNO-RUN arrangement.

As far as the objects involved in document D2 are concerned, the respondent has in fact made a selection with the benefit of hindsight, choosing secondary objects without considering their solution or mentioning objects which are not disclosed, and above

all neglecting the main object of this prior art. For example, the property that the paper sheet obtained by the drying section according to this prior art is less prone to curl is disclosed as the result of driving successive dryer groups at different speeds. This solution has nothing to do with that of the patent in suit as claimed. Having now regard to the drying of both sides of the web, this object is not disclosed as such, since, as seen above, for the author of the citation, such a double drying was an inherent property of each dryer group of the UNO-RUN configuration. An alternate drying process by inverted dryer groups is indeed a consequence of the transfer embodiment according to Figure 6 of document D2. However, it is not present in the two other transfer examples disclosed by Figures 5 and 7. There is no passage in D2 which draws the attention of the person skilled in the art to this particular result of one disclosed transfer means. This aspect is in fact not relevant in this prior art, since both sides of the web are dried uniformly by the improved heating solution within each dryer group.

For these reasons, in particular having regard to the two-tier configuration of this prior art, it is difficult to imagine that a skilled person, who looks for an improvement of a BEL-RUN system, which itself is already an improvement of the UNO-RUN system with regard to the machine runnability, the uniform sheet properties and heat effectiveness, would have considered this document D2, which brings him back to the UNO-RUN concept with the known disadvantages, such as the quick wear of the felts, the complex use of vacuum boxes and above all the dryer pockets, which create problems having regard to the uniform characteristics of the paper product.

12.6 Considering the main object of this prior art, namely to reduce the velocity stresses, the disclosed solution leads the person skilled in the art away from the solution according to Claim 1: The key to the solution according to D2 is to provide pressure differential means holding the web on its supporting felt on all portions of its run in which velocity-related stresses occur, that is to say not only around the grooved drying cylinders, but also on the runs from one cylinder to the next one. The vacuum boxes with their different suction zones constitute the solution for this principal object and, therefore, they form an essential element of the solution according to D2. Thus, when pressure differential means are mentioned in D2, this expression, contrary to the respondent's assertion, does not mean only the combination of the grooved dryers with vacuum boxes. It also includes the vacuum boxes alone with their function of holding the web on the felt runs, which are not in contact with the dryers. Such a function is not fulfilled by vacuum rolls, which therefore are not equivalent to the pressure differential means according to D2. Moreover, the similarity referred to by the respondent between a vacuum transfer roll of BEL-RUN dryer groups and the grooved dryers and vacuum means assembly of D2 is artificial. The respondent has equated the grooved dryers to transfer rolls, which is not suggested in D2. As a consequence, the knowledge of the person skilled in the art that transfer rolls may be vacuum rolls, as disclosed in D5, is of no relevance.

The vacuum boxes also have an important role in the transfer means between successive dryer groups, particularly in the case of the embodiment according to Figure 6 of D2: It is explicitly explained that the web when sandwiched between the felts, is transferred from one felt to the other by using the vacuum boxes, although cylinders with grooves under vacuum are used

at both ends of this sandwich portion. The skilled person finds no hint or suggestion to rely on suction rolls to effect said transfer. Therefore, even if a partial similarity appears in respect to the sandwiched portion of the web, the whole transfer solution according to D2 does not correspond to the solution of the transfer means according to the present invention as claimed.

12.7 Having this in view, the litigious passage in the first lines of column 14 of D2 can be interpreted in various ways, so that this passage is at least to be considered as quite ambiguous and thus cannot be used as evidence of lack of inventive step. As seen above in Point 3.2, this passage does not suggest suction rolls. Moreover, the last lines of this passage do not necessarily indicate that the foraminous rolls are not heated, but only that they are not steam heated. Foraminous cylinders may be heated by other means, for example electrically or even by means of blowing hoods as shown by D1. The whole content of D2 leads therefore to the most plausible interpretation that these "cylinders" remain heated cylinders. Otherwise, the criticism of D1 in this document would make no sense.

To conclude, the person skilled in the art would have no valid reason for consulting citation D2 when searching to improve a drying section including BEL-RUN dryer groups. Furthermore, assuming that he would have consulted this document, he would have been directed to a completely different solution from that claimed, namely a solution implying suction boxes.

13. The other citations, to which the respondent referred during the proceedings, are less relevant:

Document D5 teaches to replace the guiding rolls of the dryer group known from D1 by suction rolls, so that the vacuum space enclosing the whole dryer group is no more needed. However, it teaches that the dryer group thereby obtained should be placed as the first dryer group of a drying section and should be followed by conventional two-tier, two-felted dryer groups. Such a teaching, which is less relevant than that of the nearest prior art according to D4, cannot suggest the present solution.

Likewise, the teaching of document D17 concerns the use of suction rolls in the place of the lower drying cylinders of a UNO-RUN dryer group. Since the dryers of the single disclosed dryer group are vertically stacked by pairs, this teaching goes away from the BEL-RUN concept.

Document D16 discloses a very particular arrangement of a two-tier, two-felted dryer group, which comprises two suction rolls between each dryer of the upper tier and each dryer of the lower tier. The web during each of its transfers between two dryers inside the group is sandwiched between the two felts and reversed by following a serpentine path around both suction rolls. The respondent has emphasized the sandwich aspect of the transfer and the simultaneous reversal of the web. However, the transfer in this citation occurs inside a dryer group and moreover requires two felts for this group and two suction rolls between the dryers. Transfer means between two dryer groups are not considered in this prior art, so that the main object underlying the patent in suit and concerning successive dryer groups is not envisaged. Thus, already by considering both the objects of the present invention

which relates to BEL-RUN dryer groups and the two-tier, two-felted configuration of this prior art, it is quite doubtful whether a skilled person would take into account the teaching of this prior art. Moreover, the use of two felts and two suction rolls inside a dryer group cannot without hindsight constitute a hint to join the respective felts of successive dryer groups to each other and to use suction rolls outside the dryer groups.

14. *Conclusion*

The subject-matter of the independent claims under discussion thus involves an inventive step as required by Article 56 EPC. Claims 2 to 7 and 9 concern particular embodiments of the apparatus or method according to Claims 1 and 7 and thus are not open to objection. Since the main request is allowable, the auxiliary request does not need to be considered.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the first instance with the order to maintain the patent as amended in the following version:

   Claims 1 to 9 with adapted description, both filed as main request on 23 February 1998, and Figures 1 to 13 of the patent specification.

The Registrar: The Chairman:

N. Maslin C. T. Wilson