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DECISION
of 8 September 2004

Case Number: T 0522/01 - 3.2.7

Application Number: 95900785.7

Publication Number: 0679204

IPC: D21G 1/00

Language of the proceedings: EN

Title of invention:

Method in the calendering of a paper or of an equivalent web material and a calender that makes use of the method

Patentee:

VALMET CORPORATION

Opponent:

Voith Sulzer Papiertechnik Patent GmbH
Eduard Küsters Maschinenfabrik GmbH & Co. KG

Headword:

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Relevant legal provisions:

EPC Art. 56, 123(2)(3)

Keyword:

"Inventive step (yes)"

Decisions cited:

-

Catchword:

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Case Number: T 0522/01 - 3.2.7

D E C I S I O N
of the Technical Board of Appeal 3.2.7
of 8 September 2004

Appellant: VALMET CORPORATION
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 2 April 2001
revoking European patent No. 0679204 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: A. Burkhart
Members: K. Poalas
E. Lachacinski

Summary of Facts and Submissions

- I. The appellant (patent proprietor) lodged an appeal against the decision of the Opposition Division revoking the European patent No. 0 679 204.
- II. Oppositions were filed by respondents I and II against the patent as a whole based on Article 100(a) EPC on the ground of lack of novelty (Article 54 EPC) and lack of inventive step (Article 56 EPC).
- III. The Opposition Division found that the subject-matter of the independent claims of the main and the auxiliary requests lacked an inventive step and revoked the patent.

The Opposition Division took into consideration inter alia the following documents:

D1: DE 40 26 773 A,

D2: DE 37 02 245 C,

D3: DE 42 02 047 A and

D8: DE 37 35 438 C.

- IV. The appellant requested that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the main request filed with letter of 6 June 2003 or alternatively on the basis of the auxiliary requests filed with letter of 29 July 2004.

V. The respondents (opponents) requested that the appeal be dismissed.

VI. Oral proceedings took place on 8 September 2004 without the participation of the duly summoned respondent II, who had informed the board with letter dated 15 July 2004 that he waived his right to participate in the scheduled oral proceedings.

VII. Independent claims 1 and 11 according to the main request as filed with letter of 6 June 2003 read as follows:

"1. Method in the calendering of a paper or of an equivalent web material in a calender (10) comprising hard and soft-faced rolls, wherein the web material (W) to be calendered is passed through nips($N_1 \dots N_9$) formed by a variable-crown upper roll (13,13a), a variable-crown lower roll (14,14a), and by two or more intermediate rolls (15...22,15a...22a) arranged between said upper and lower rolls (13,14,13a,14a), said rolls (13...22,13a...22a) being arranged as a substantially vertical stack of rolls (12,12a), characterized in that, as the intermediate rolls (15...22,15a...22a), such rolls are used in which the form of the natural deflection line produced by their own gravity is substantially equal, that the nip load produced by the masses of the intermediate rolls (15...22,15a...22a) and of the auxiliary equipment (167,167a) related to same is relieved substantially completely, and that an adjustable load is applied to the calendering nips ($N_1 \dots N_9$) by means of the variable-crown upper or lower roll (13,14,13a,14a)and/or by means of an external load (134,143,143a) applied to the upper or lower roll."

"11. Calender which comprises a variable-crown upper roll (13,13a), a variable-crown lower roll (14,14a), and two or more intermediate rolls (15...22,15a...22a) fitted between the upper (13a,13a) and lower (14,14a) rolls, said rolls being arranged on the frame (11,11a) of the calender as a substantially vertical stack of hard and soft-faced rolls (12,12a) and said rolls (13...22,13a...22a), placed one above the other, being in nip contact with one another, characterized in that the intermediate rolls(15...22,15a...22a) have been chosen so that the natural deflection lines produced by the own gravity of the intermediate rolls (15...22,15a...22a) are substantially equal, that the means of suspension (151,152,153,161,162,163,151a,152a,153a,161a,162a,163a) of the intermediate rolls (15...22,15a...22a) are provided with relief devices(154,164,154a,164a), by whose means, during calendering, the nip loads produced by the masses of the intermediate rolls (15...22,15a...22a) and of the auxiliary equipment (167,167a) related to them have been relieved substantially completely, and that the calendering nips (N₁...N₉) have been arranged so that they can be loaded adjustably by means of a load produced by the variable-crown upper roll(13,13a) or lower roll (14,14a) and/or by means of an external load (134,143,143a) applied to the upper or lower roll."

VIII. Concerning claims 1 and 11 according to the main request the appellant in the written and oral proceedings argued essentially as follows:

The method according to claim 1 and the calender according to claim 11 of the main request differ from the technical teaching of document D1 in that:

- (a) both, a variable-crown upper roll and a variable-crown lower roll are used,
- (b) the natural deflection line produced by the own gravity of the intermediate rolls is substantially equal, and
- (c) the nip loads produced by the masses of the intermediate rolls and of the auxiliary equipment related to same are relieved substantially completely.

Figures 1 to 4c of document D1 showing principle illustrations are not able to serve as a basis for deriving concrete dimensions. Furthermore, the man skilled in the art is aware from the introductory part of document D1, especially from the disclosure in column 1, lines 11 to 14, that the aforementioned principle illustrations cover all kinds of rolls, which means also hard and soft rolls made of different materials, wherein the diameters of the hard and soft rolls are usually quite different. Furthermore, a reference to the own weight per length unit of the intermediate rolls is missing in document D1.

Since document D1 does not address at all either the diameter of the intermediate rolls or their own weight per length unit, both said parameters being necessary for defining the natural deflection line of a roll produced by the own gravity, no specific statement

concerning the natural deflection lines of the intermediate rolls of document D1 is derivable from said document.

Therefore, feature (b) is neither explicitly nor implicitly disclosed in document D1.

In document D1 there is no disclosure of a substantially complete relief of the weight forces (i.e. masses) of the intermediate rolls, but exactly the opposite is derivable from document D1, column 1, lines 3 to 20 where the basic features of the teaching of document D1 are described. According to this passage a "technologically desirable increase of the nip force from nip to nip" is achieved "with the support of the weight force due to the addition of own weights of the rolls".

Furthermore, no mention is to be found in document D1 that in addition to the relief of the masses of the intermediate rolls also the masses of the auxiliary equipment related to the rolls have to be relieved.

Therefore, feature (c) is neither mentioned nor implicitly disclosed in document D1.

Although documents D2, D3 and D8 disclose the feature (a), they all fail to disclose the features (b) and (c).

Therefore, a combination of the teaching of document D1 with the teachings of each of said documents failing to suggest the features (b) and (c) to a skilled person in the art cannot render obvious the subject-matter of claims 1 and 11.

IX. Concerning claims 1 and 11 according to the main request the respondents in the written and oral proceedings argued essentially as follows:

Although document D1 does not teach verbatim the use of intermediate rolls with the same natural deflection line, it is clear to the skilled person that the intermediate rolls defined in document D1 as having the same stiffness, see column 4, lines 50 to 52, the same diameter, see figures 4a-c and the same distance of the bearing points, see column 4, lines 22, 23 must have the same natural deflection line under their own gravity.

Moreover, the soft-faced rolls are actually hard-faced rolls with a plastic coating, said coating having only a minor influence to the natural deflection line under own gravity.

Therefore, feature (b) is implicitly disclosed in document D1.

Document D1 mentions in lines 31 to 34 of column 4 the relief of the gravitational forces of the intermediate rolls. For the skilled person this statement discloses implicitly the information that an optimum situation is achieved when said gravitational forces are relieved substantially completely.

Therefore, also feature (c) is implicitly disclosed in document D1.

Feature (a), being the only differentiating feature between the teaching of document D1 and the subject-

matter of claims 1 and 11 of the main request, is known from the prior art. In document D3, see column 1, lines 33 to 38, figures, a variable-crown upper roll has been used in order to enlarge the loading capacity of the calender. In document D8, see column 2, lines 51 to 53, figures, a variable-crown upper roll has been used in order to achieve a uniform linear nip load.

It is therefore obvious to a skilled person to apply a variable-crown upper roll known from document D3 or D8 with corresponding effect to the method and calender known from document D1 and thus to arrive at a method and a calender according to claims 1 and 11 of the main request.

Reasons for the Decision

1. *Main request*

1.1 Claims 1 and 11

1.1.1 Amendments

Claims 1 and 11 as granted have been amended in that the feature "comprising hard and soft-faced rolls" has been added in each of said claims.

The basis for the amendments can be found in the originally filed application on page 12, lines 26 to 30.

These amendments also restrict the scope of protection of the granted claims 1 and 11.

Therefore, the amendments do not contravene Article 123 (2) and (3) EPC.

1.1.2 Inventive step

Closest prior art

The Board considers document D1 as representing the closest prior art.

Document D1 describes a calender 1 having a variable-crown lower roll 2 and two intermediate rolls 3, 4 arranged as a substantially vertical stack of rolls, see figures 1 to 3, wherein an adjustable load is applied to the calendaring nips by means of bearing forces at the intermediate rolls and of the internal pressure of the variable-crown lower roll, see claim 1, feature (e).

The Board agrees with the opinion of the parties that feature (a) is not disclosed in document D1.

Document D1 aims to achieve an equal deflection line for all rolls having at the same time a uniform line force distribution across the width of each roll, see column 2, lines 13 to 21.

In order to achieve this goal a control device in document D1 adjusts the bearing forces at the intermediate rolls and the internal pressure of the variable-crown lower roll controlling the deflection of said roll, thereby taking into account the own gravity

forces of the intermediate rolls and the line forces acting between them, see column 4, lines 59 to 66.

In a specific embodiment according to figure 4b relieving forces a_i are applied at the bearing points of the intermediate rolls against the direction of the weight forces of the intermediate rolls, see column 4, lines 29 to 34. The amount of these forces a_i is calculated in the control device so that taking into consideration the internal pressure of the variable-crown lower roll, the gravity forces of the intermediate rolls and the line forces acting between them a certain aimed bending status similar for all rolls can be achieved, see figure 4b and column 4, lines 34 to 36 and 59 to 66.

In document D1 there is no disclosure that the purpose of applying relieving forces a_i is to substantially completely relieve the weight forces (i.e. masses) of the intermediate rolls or that such a substantially complete relieve of the weight forces (i.e. masses) of the intermediate rolls is actually accomplished. To the opposite, document D1, teaches in column 1, lines 3 to 20, that the "increase of the nip force from nip to nip" is "technologically desirable" and it is achieved "with the support of the weight force due to the addition of own weights of the rolls".

In addition to that document D1 does not mention any auxiliary equipment for the intermediate rolls or any relieve of the masses of such auxiliary equipment.

The Board cannot follow the respondent's argument that a substantially complete relief of the masses of the

intermediate rolls and of the auxiliary equipment related to same is implicitly disclosed in document D1 for the following reasons:

Document D1 discloses the teaching that the bearing forces applied at the intermediate rolls are continuously adjusted through a sophisticated control device taking under consideration the internal pressure of the variable-crown lower roll, the own gravity forces of the intermediate rolls and the line forces at the nips, see column 4, lines 59 to 66. A substantially complete relief of the gravity forces of the intermediate rolls and their auxiliary equipment as required in feature (c) of claims 1 and 11 of the main request implies that the bearing forces are correlated only to the gravitational forces of the intermediate rolls and their auxiliary equipment and not to the above mentioned parameters of document D1. Such a definition of the bearing forces is neither mentioned nor intended in document D1.

Therefore, feature (c) is not derivable from document D1.

The Board cannot agree with the respondents' argument that the intermediate rolls in document D1 all have substantially equal natural deflection line produced by their own gravity for the following reasons:

On the one hand the principle illustrations in figures 1-4c of document D1 do not allow any extraction of concrete dimensions of the diameters of the intermediate rolls used, and on the other hand no

reference to the own weight per length unit of the used intermediate rolls is to be found in document D1.

Since the diameter of the roll and the own weight per length unit are two indispensable parameters for the definition of the natural deflection line of such a roll and no information about these parameters is derivable from document D1 there is no basis for the assumption that the intermediate rolls in document D1 all have substantially equal natural deflection line produced by their own gravity.

Therefore, also feature (b) is not derivable from document D1.

Problem underlying the invention

The problem underlying the invention is to provide a method in the calendering of a paper or of an equivalent web material as well as a calender that makes use of the method, by means of which method and calender the problems arising from the own gravity of the set of rolls of the calender in the distributions of linear loads from the upper nip to the lower nip are avoided and by means of which method and calender all the nips in the set of loads of the calender can be loaded adjustably in the desired way and, if necessary, substantially with the same maximum load, see column 4, lines 17 to 26 of the patent in suit.

Solution

The above mentioned problem is solved according to claims 1 and 11 of the patent in suit in that

- (a) a variable-crown upper roll in addition to the variable-crown lower roll is used,
- (b) the natural deflection line produced by the own gravity of the intermediate rolls is substantially equal, and
- (c) the nip loads produced by the masses of the intermediate rolls and of the auxiliary equipment related to same are relieved substantially completely.

The variable-crown upper roll allows a uniform line force distribution across the width of the upper nip and is a suitable measure to solve the above mentioned problem.

Using intermediate rolls having substantially equal natural deflection lines produced by their own gravity an equal distribution of the line load across the nip is achieved.

By relieving substantially completely the nip loads produced by the masses of the intermediate rolls and of the auxiliary equipment related to same, the influence of the gravity of the rolls and their auxiliary equipment above every nip is substantially eliminated. In this case the nip load can be defined independently from the weight of the intermediate rolls and their auxiliary equipment lying above the nip. The loading capacity at the lowest nip of the calender does not define any more the loading capacity of the calender but the whole of the loading or calendaring potential

of the roll materials can be utilized and all possible increasing and decreasing alternatives of loading are available. The nip load is defined only by the external forces without any influence of the weight of the rolls and their auxiliary equipment.

This solution is not rendered obvious to the person skilled in the art by the documents under consideration for the following reasons:

Document D8 discloses a method for calendering and a calender which comprises a variable-crown upper roll, a variable-crown lower roll and intermediate rolls placed one above the other, the calendering nips being arranged so that they can be loaded adjustably by means of a load produced by the internal pressure of variable-crown rolls and/or by means of an external load applied to the upper or lower roll. The upper roll in document D8 is, prior to the closing of the uppermost nip, pre-formed into a shape corresponding to the shape of the uppermost intermediate roll, see claim 1. Thus, upon closing of the uppermost nip, the upper roll does no longer have to be bent while being supported on the second roll from the top. This prolongs the working life of the second roll from the top and prevents damaging upon insertion of the web material into the nip as well as folding or web breaks, see column 2, lines 26 to 59. In document D8, the lowest limit of the linear load in each individual nip is always determined by the weight of the rolls positioned above it and of the parts movable together with the rolls, see column 2, lines 60 to 63.

Neither a substantially complete relief of the nip loads produced by the masses of the intermediate rolls and of the auxiliary equipment related to same nor intermediate rolls having substantially equal natural deflection line produced by own gravity are mentioned in document D8.

The technical teaching of document D2 consists in that the effect of the overhanging weights produced by the roll bearings and other parts on the deflection of the intermediate rolls can be reduced. However document D2 is completely silent about the feature concerning the natural deflection lines produced by own gravity of the intermediate rolls being substantially equal. The further feature, according to which not only the mass of the auxiliary equipment but also the masses of the intermediate rolls are relieved substantially completely, is also not disclosed in document D2.

Document D3 concerns such calenders in which the line force in the nips is to be corrected as desired. In the calendering method disclosed an improved line force correction is ensured by introducing controllable forces at the axes of the intermediate rolls for supporting the line force correction profile produced by the deflection compensating rolls, see figure. For this purpose, nip relieving means that are known per se are to be controlled. As a result, the force applied to the respective intermediate roll or the moment resulting therefrom can lead to a desired deformation of the roll in order to thereby support the formation of the line force correction profile produced by the deflection compensating rolls. The latter requires that the control of the forces acting on the axes of the

intermediate rolls be effected in connection with the zone control of the line force correction profile of the deflection compensating rolls, see column 1, line 59 to column 2, line 7.

Document D3 does nowhere mention that as intermediate rolls such rolls are to be used in which the form of the natural deflection line produced by their own gravity is substantially equal or that the nip loads produced by the masses of the intermediate rolls and of the auxiliary equipment related to same are to be relieved substantially completely.

Since neither D1 nor the documents D2, D3 and D8 disclose the features (b) and (c) also a combination of the teaching of said documents fails to disclose these features and cannot render the subject-matter of claims 1 and 11 obvious.

Also assuming document D8 to be the closest prior art, as it was argued during the oral proceedings, a combination of its teaching with the teaching of one of the other documents, since once again the features (b) and (c) are nowhere mentioned, cannot render obvious the subject-matter of claims 1 and 11 of the main request of the patent in suit.

For the above-mentioned reasons, the subject-matter of claims 1 and 11 of the main request of the patent in suit involves an inventive step within the meaning of Article 56 EPC.

1.2 Claims 2 to 10 and 12 to 21

The same applies to the subject-matter of dependent claims 2 to 10 and 12 to 21, which define further embodiments of the subject-matter of claims 1 and 11.

2. *Auxiliary Requests*

Having decided that the claims according to the main request fulfil the requirements of Article 56 EPC there is no need to deal with the auxiliary requests.

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 on the basis of the following documents:

Description: Columns 1 to 8 of the patent specification,
Columns 9 to 12 as filed with letter of 6 June 2003,

Claims: 1 to 21 as filed with letter of 6 June 2003,

Drawings: Sheets 13 to 17 of the patent specification.

The Registrar:

The Chairman:

G. Nachtigall

A. Burkhart