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Datasheet for the decision of 24 October 2006

Case Number: T 0355/04 - 3.2.05

Application Number: 96109977.7

Publication Number: 0764790

IPC: F16C 13/00

Language of the proceedings: EN

Title of invention:
Method for regulating loading of an adjustable-crown roll and an adjustable-crown roll

Patentee:
Metso Paper, Inc.

Opponents:
Andritz Küsters GmbH & Co. KG
Voith Paper GmbH

Headword:
-

Relevant legal provisions:
EPC Art. 54

Keyword:
"Novelty (main request, no, auxiliary request, yes)"
"Remittal to the Opposition Division (yes)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0355/04 **-** 3.2.05

D E C I S I O N
of the Technical Board of Appeal 3.2.05
of 24 October 2006

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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 12 December 2003 revoking European patent No. 0764790 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: W. Moser
Members: P. Michel
W. Zellhuber

Summary of Facts and Submissions

I. The appellant (patentee) lodged an appeal against the decision of the Opposition Division revoking European Patent No. 0 764 790.

The Opposition Division held that the subject-matter of claims 1 and 9 for the Contracting States DE and GB of both a main request and an auxiliary request lacked novelty.

II. Oral proceedings were held before the Board of Appeal on 24 October 2006.

III. The appellant requested that the decision under appeal be set aside and that the patent be maintained on the basis of the following documents filed on 25 September 2006:

(i) claims 1 to 11 as main request respectively for the Contracting States AT, FR, IT, SE, and the Contracting States DE, GB; or
(ii) claims 1 to 11 as first auxiliary request respectively for the Contracting States AT, FR, IT, SE, and the Contracting States DE, GB; or
(iii) claims 1 to 11 as second auxiliary request respectively for the Contracting States AT, FR, IT, SE, and the Contracting States DE, GB.

Respondents I and II (opponents 01 and 02) requested that the appeal be dismissed.

IV. The following documents are referred to in the present decision:

D1: DE-A-42 03 497
D2: US-A-5,372,068
D6: WO 96/03545
D7: US-A-4,821,384
D8: WO 91/02173
D9: DE-C-33 25 385

V. Claims 1 and 9 according to the main request for the Contracting States AT, FR, IT and SE read as follows:

"1. A method for regulating loading of an adjustable-crown roll (10) in nip-defining relationship with a back-up roll (15), said adjustable-crown roll (10) having a stationary roll axle (11), a roll mantle (12) rotatingly mounted on said roll axle (11), and loading means (13) arranged on said roll axle (11) in engagement with an inner face of said roll mantle (12), comprising the steps of:
applying a loading force from said loading means (13) toward the nip in a direction of a nip plane defined as the plane passing through a central axis of said roll (10) and a central axis of said back-up roll (15) to regulate deflection of said roll mantle (12) and/or a linear load in the nip, and
applying within a backup-zone a force to the inner face of said roll mantle (12) at each of a plurality of different locations in the circumferential direction of said roll (10) to produce a sum force acting in the nip plane in a direction substantially opposite to the loading force produced by said loading means (13), characterized in that

the backup-zone is provided by arranging backup-zone elements (20, 21; 30, 31, 32; 40, 41, 42, 43, 52, 53; 54, 55) in at least two rows, where the angle (α) between the extreme rows (20, 21; 31, 32, 52, 53) or the middle rows (41, 42) is within a range from 50° to 140° in the circumferential direction of said roll (10)."

"9. An adjustable-crown roll arranged in nip-defining relationship with a backup roll (15), comprising
a stationary roll axle (11),
a roll mantle (12) rotatingly mounted on said roll axle (11),
loading means (13) supported on said roll axle (11) in engagement with an inner face of said roll mantle (12) for loading said roll mantle (12) in a nip-loading direction, and
backup force applying means (20, 21; 50, 54, 55; 50, 52, 53) supported within a backup-zone on said roll axle (11) for applying a plurality of backup forces against the inner face of said roll mantle (12) in different directions such that the sum of the backup forces is, in the nip plane, in a direction substantially opposite to the nip-loading direction,
characterized in that
the backup zone supported on the roll axle (11) is formed by means of at least two rows of backup-zone elements (20, 21; 30, 31, 32; 40, 41, 42, 43) where the angle (α) between the extreme rows is within a range from 50° to 140° in the circumferential direction of said roll (10), wherein the backup-zone elements have been arranged in the longitudinal direction with a spacing different from the spacing of the loading elements."

Claims 1 and 9 according to the main request for the Contracting States DE, GB differ from claims 1 and 9, respectively, according to the main request for the Contracting States AT, FR, IT and SE in that, in claim 1, the expression "within a range from 50° to 140°" is replaced by "within a range from about 50° to about 140°" and, in claim 9, the expression "rows is within a range from 50° to 140° in the circumferential direction of said roll (10), wherein" is replaced by "rows (31, 32) is within a range from 50° to 140° in the circumferential direction of said roll (10), and".

Claim 1 of both groups of claims according to auxiliary request 1 differs from claim 1 of the main request in that the following additional feature is introduced at the end of the claim:

"and wherein the angle and the relative magnitudes of the forces applied by the backup-zone elements are selected such that the deformation produced by these elements in the nip of a certain roll mantle is minimized".

Claim 9 of both groups of claims according to auxiliary request 1 remains substantially unamended as compared with claim 9 of the respective group of claims according to the main request. It is, however, noted that, in the version of claim 9 for the Contracting States AT, FR, IT and SE, the word "wherein" is replaced by "and wherein" and that, in the version of claim 9 for the Contracting States DE, GB, the second occurrence of the word "and" is replaced by "wherein".

VI. The appellant argued substantially as follows in the written and oral procedure:

The arrangement shown in Fig. 14 of document D9 does not relate to rows of elements extending along the length of a roll, but rather to elements provided at each end of the roll, just as in the arrangement shown in Fig. 7 and described at column 5, lines 3 to 9, of document D7. The term "row" cannot be construed as including a pair of elements, one of which is arranged at each end of the roll.

The sum of the forces produced by the backup elements in the arrangement shown in Fig. 14 of document D9 does not act in the nip plane, since it is necessary to counteract the force of gravity acting on the roll mantle.

The subject-matter of claim 1 of the main request for the Contracting States AT, FR, IT, SE is thus novel.

The concept of minimising deformation of the roll mantle at the nip is not mentioned in any of the cited documents. In the prior art, it was considered sufficient merely to regulate the net force applied in the nip.

The subject-matter of claim 1 of the first auxiliary request according to both groups of claims is thus novel.

None of the cited documents discloses an arrangement in which the backup-zone elements are arranged in the

longitudinal direction with a spacing different from the spacing of the loading elements.

The subject-matter of claim 9 of the first auxiliary request according to both groups of claims is thus novel.

VII. Respondents I and II argued substantially as follows in the written and oral procedure:

The subject-matter of claim 1 of the main request for the Contracting States AT, FR, IT, SE lacks novelty in view of the disclosure of document D9. In particular, Fig. 14 shows an embodiment in which the angle between two rows of backup-zone elements is 120° in the circumferential direction.

The subject-matter of claim 1 of the first auxiliary request according to both groups of claims lacks novelty in view of the disclosure of documents D7 as well as D9. In addition, the subject-matter of claim 1 of the first auxiliary request according to the second group of claims (for the Contracting States DE, GB) lacks novelty in view of the disclosure of document D6.

The support elements (13) shown in Fig. 7 of document D6 form rows extending over the length of the roll as described at the last paragraph on page 10 of document D6.

It is inevitable that the person skilled in that art would arrange the backup-zone elements so that deformation at the nip is minimised and the nip is optimised. This would avoid chattering and vibration as

referred to at column 3, line 22 of document D7. The problem of deformation is also addressed at column 5, lines 31 to 41 of document D9.

Since the sum force produced by the backup-zone elements must act in the nip plane, it is not possible to adjust the forces exerted by the backup-zone elements independently of one another. This is demonstrated by Fig. 7 of document D7, which shows a common oil supply line for the two backup-zone elements. Should the requirement that the relative magnitudes of the forces applied by the backup-zone elements must be chosen so as to minimize deformation in the nip give rise to the fact that different forces had to be applied to the backup-zone elements, a conflict would arise with the requirement that the backup-zone elements produce a sum force acting in the nip plane in a direction substantially opposite to the loading force produced by the loading means.

Since the angle of 120° was claimed in claim 15 of the patent in suit as granted, it follows that 120° is an ideal angle satisfying the requirements of claim 1.

The subject-matter of claim 9 of the first auxiliary request according to both groups of claims lacks novelty in view of the disclosure of document D7. The backup-zone elements are arranged at each end of the roll and thus constitute a row of elements having a different spacing from that of the loading elements. The term "row" includes a row of two elements, the term being used to refer to two numbers in a matrix and to two electrical components.

Reasons for the Decision

1. Amended Main Request

At the oral proceedings, the appellant requested that an amended main request be admitted, in which claim 9 of the main request as filed on 25 September 2006 was amended by the omission of the feature "wherein the backup-zone elements have been arranged in the longitudinal direction with a spacing different from the spacing of the loading elements".

The respondents attended the oral proceedings on the basis that the requests of the appellant filed on 25 September 2006 would form the basis of the discussions. The Board is thus of the opinion that the respondents would not have sufficient time to prepare a response to the amended claim, so that the amended main request should not be admitted.

2. Main Request

2.1 Novelty of claim 1 for the Contracting States AT, FR, IT, SE

Document D9 discloses, in connection with the embodiment of Fig. 14 and using the reference numerals of Fig. 14, an adjustable-crown roll 1 in nip-defining relationship with a back-up roll 2, the adjustable-crown roll 1 having a stationary roll axle 604, a roll mantle 3 rotatingly mounted on the roll axle 604, and loading means 608 arranged on the roll axle 604 in engagement with an inner face of said roll mantle 3.

In use of the adjustable-crown roll, a loading force is applied from the loading means 608 toward the nip in a direction of a nip plane defined as the plane passing through a central axis of the roll 1 and a central axis of the back-up roll 2 to regulate deflection of the roll mantle 3 and/or a linear load in the nip, and a force is applied within a backup-zone to the inner face of the roll mantle 3 at each of a plurality of different locations in the circumferential direction of the roll 1 to produce a sum force acting in the nip plane in a direction substantially opposite to the loading force produced by the loading means 608.

The backup-zone is provided by arranging backup-zone elements 70, 71 in two rows, where the angle between the rows is approximately 120°, that is, within a range from 50° to 140°, in the circumferential direction of the roll.

It was argued on behalf of the appellant that the backup-zone elements do not produce a force acting in the nip plane, since the forces exerted by the backup-zone elements also counteract the force of gravity acting on the mantle. In the judgement of the Board, however, the effect of gravity and other external forces acting on the mantle should be disregarded, so that the effect of the backup-zone elements is to counteract the loading force produced by the loading means and thereby reduce the sum force acting in the nip plane.

It was also argued on behalf of the appellant that the backup-zone elements shown in Fig. 14 of document D9

are not arranged in rows, but are merely provided at the ends of the roll. However, according to column 10, lines 47 to 49, of document D9, three supporting elements, that is, the loading element 608 and two backup-zone elements 70, 71 are provided in the region of each bearing segment 7 ("Lagerabschnitt"). As shown in Fig. 4 and described at column 7, lines 45 and 46, of document D9, the term "Lagerabschnitt" does not refer to the bearings at each end of the roll, but to the bearing segments which extend in an axially extending row along the roll mantle.

2.2 The subject-matter of claim 1 for the Contracting States AT, FR, IT, SE is thus not novel in view of the disclosure of document D9.

3. Auxiliary Request 1

3.1 Novelty

3.1.1 Claim 1 of both sets of claims includes the feature "wherein the angle and the relative magnitudes of the forces applied by the backup-zone elements are selected such that the deformation produced by these elements in the nip of a certain roll mantle is minimized".

The requirement that the relative magnitudes of the forces applied by the backup-zone elements must be chosen so as to minimize deformation in the nip is not in contradiction to the requirement that the backup-zone elements produce a sum force acting in the nip plane in a direction substantially opposite to the loading force produced by the loading means. Thus, it is only necessary for two rows of backup-zone elements

to apply the same force to the roll mantle when they are arranged symmetrically with respect to the nip plane. The feature that the angle and the relative magnitudes of the forces applied by the backup-zone elements are selected such that the deformation produced by these elements in the nip of a certain roll mantle is minimized is thus regarded as an additional requirement.

As illustrated in Figure 17 of the patent in suit, as the angle α between the rows of backup-zone elements is varied, the amount of deformation of the mantle at the nip ΔR varies and passes through a point at which the deformation is zero ($\alpha = 92.6^{\circ}$, cf. patent in suit, column 11, lines 35 to 44). Since the figures illustrate embodiments in which the rows of backup-zone elements are arranged symmetrically with respect to the nip plane, there is no variation in the relative magnitudes of the forces applied by the backup-zone elements. It is, however, possible to use similar figures to identify the angle and the relative magnitudes of the forces applied by the backup-zone elements for which deformation of the roll mantle at the nip is minimized.

This feature is not disclosed in any of the cited documents.

Document D1 discloses a single row of backup-zone elements 10, and accordingly does not suggest the provision of at least two rows of such elements. The passage at column 1, lines 58 to 60 refers to disadvantages of the arrangement disclosed in document D8 and does not imply that two rows of backup-zone

elements should be provided. *A fortiori* there is no disclosure of positioning the rows such that deformation of the roll mantle at the nip is minimized.

The elements 36, 45 shown in document D2 (see Fig. 2) act merely as lateral supports which do not exert a sum force acting in the nip plane in a direction substantially opposite to the loading force produced by the support elements or loading means 11.

Document D7 teaches that chattering and vibration of the roll mantle should be avoided (see column 3, lines 18 to 24). This does not, however, lead inevitably to the choice of an angle between the rows of backup-zone elements for which deformation of the roll mantle at the nip is minimized. Rather, this passage in document D7 suggests that chattering and vibration of the roll mantle are avoided by virtue of the use of unloading shoes 16 and lateral end shoes 17.

In the embodiment of Figure 14 of document D9, the angle between the rows of backup-zone elements is approximately 120°. The choice of such an angle does not, however, result in deformation of the roll mantle at the nip being minimized. Rather, as shown in Figure 17 of the patent in suit, the value of ΔR may pass through a minimum at a substantially smaller angle. The fact that the angle of 120° was claimed in claim 15 of the patent in suit as granted cannot be assumed to imply that this angle would, in fact, result in deformation of the roll mantle at the nip being minimized.

As regards claim 1 of the second group of claims, document D6 is considered to be comprised in the state of the art for the assessment of novelty pursuant to Article 54(3) and (4) EPC in respect of these claims.

However, this document also does not disclose the feature according to which the angle and the relative magnitudes of the forces applied by the backup-zone elements are selected such that the deformation produced by these elements in the nip of a certain roll mantle is minimized. It is merely indicated at page 13, lines 18 to 21 of document D6, that the spreading effect of the elements 13 increases as the angle between them increases. The effect of this angle as to deformation of the roll at the nip is not, however, mentioned, and there is no incentive to choose the angle such as to minimize such deformation.

The subject-matter of claim 1 of both sets of claims is thus novel.

3.1.2 Claim 9 of both sets of claims includes the feature that "the backup-zone elements have been arranged in the longitudinal direction with a spacing different from the spacing of the loading elements".

This feature is not disclosed in any of the cited documents. It was argued on behalf of the respondents that document D7 discloses this feature. In the press roll disclosed in this document, a shoe arrangement as shown in Figure 7 having a loading shoe 14 and two backup shoes 62, 63 is arranged at each end of the roll, the three shoes being spaced equidistantly around the roll at an angle of about 120° to each other.

It was argued that the backup shoes at each end of the roll constitute two rows of backup shoes, each row having two shoes, one at each end of the roll. In this connection, it was argued that, in the field of matrices, two numbers arranged either horizontally or vertically are regarded as forming a row. Similarly, the German term "Reihenschaltung" (series connection) may be applied to the connection in series of two components.

However, it is not accepted that, in the context of an adjustable-crown roll, two elements, provided one at each end of a roll mantle, could be regarded as forming a row as required by claim 9 of both sets of claims. As stated in the patent in suit at column 4, lines 47 to 49, the backup zone is distributed axially substantially over the entire length of the roll. Whilst the spacing of the backup shoes in the backup zone may be less dense than that of the loading shoes, the intended function of the backup shoes, that is, to reduce stresses applied to the roll mantle and thereby deformation thereof in the nip, is not achieved by two elements, provided one at each end of the roll mantle.

As regards claim 9 of the second group of claims, document D6 is considered to be comprised in the state of the art for the assessment of novelty pursuant to Article 54(3) and (4) EPC in respect of these claims.

However, as stated in document D6 at page 10, lines 8 to 15 and 24 to 27, the back-up zone elements 13 and the loading elements 9 are diametrically opposed to one another at the same spacing. There is no suggestion of

the backup-zone elements being arranged in the longitudinal direction with a spacing different from the spacing of the loading elements.

The subject-matter of claim 9 of both sets of claims is thus novel.

4. The Opposition Division has not yet had the opportunity of considering the question of whether or not the subject-matter of claims 1 and 9 of both sets of claims of auxiliary request 1 involves an inventive step. In order not to deprive the parties of the opportunity to have this issue examined by two instances, the Board exercises its discretion pursuant to Article 111(1) EPC to remit the case to the Opposition Division for further prosecution.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The main request is refused.

3. The case is remitted to the Opposition Division for further prosecution.

The Registrar: The Chairman:

D. Meyfarth W. Moser