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D E C I S I O N
of 20 December 1994

Case Number: T 0358/93 - 3.2.1

Application Number: 85630161.9

Publication Number: 0179730

IPC: F16C 13/00

Language of the proceedings: EN

Title of invention:
Heated variable crown roll

Patentee:
BELOIT CORPORATION

Opponents:
(01) Eduard Küsters Maschinenfabrik GmbH & Co. KG
(02) SULZER-ESCHER WYSS GmbH
(03) Valmet Paper Machinery Inc.

Headword:
-

Relevant legal provisions:
EPC Art. 56, 114(2)

Keyword:
"Late submitted material - admitted (no)"
"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:
-

Catchword:
-



Case Number: T 0358/93 - 3.2.1

D E C I S I O N
of the Technical Board of Appeal 3.2.1
of 20 December 1994

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(Opponent 01)

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Decision under appeal: Interlocutory decision of the Opposition Division
of the European Patent Office dated 14 January
1993, with written reasons posted on 15 February
1993 concerning maintenance of European patent
No. 0 179 730 in amended form.

Composition of the Board:

Chairman: F. A. Gumbel
Members: P. Alting van Geusau
J.-C. Saisset

Summary of Facts and Submissions

- I. European patent No. 0 179 730 was granted with effect from 14 March 1990 on the basis of European patent application No. 85 630 161.9, filed on 3 October 1985.
- II. With Notices of Opposition filed on 12 (Opponent O1) and 14 December 1990 (Opponents O2 and O3) the Appellants I to III (Opponents O1 to O3, respectively) requested revocation of the patent for the reason of non-compliance with the provisions of Article 100(a) EPC.

In support of an alleged lack of novelty (Appellant III) and inventive step (Appellants I to III) a number of prior art documents were cited with the Notices of Opposition and later on during the opposition proceedings.

- III. By decision given at oral proceedings held on 14 January 1993, with written reasons posted on 15 February 1993, the Opposition Division maintained the patent in amended form.

The Opposition Division held that, taking into account the additional prior art cited by the Appellants of which in particular the documents

D1 : US-A-4 293 988,

D2 : DE-A-3 014 891 (late cited by Appellant II but considered relevant by the Opposition Division and therefore allowed into the proceedings),

D3 : GB-A-1 059 366, and

D22: US-A-4 282 639, cited in the description of the patent and considered to disclose the prior art coming closest to the subject matter of the amended Claim 1,

were considered the most relevant,

the skilled person could find no suggestion which would lead to the provision of heat insulating means within the terms of the amended Claim 1. Therefore, in the opinion of the Opposition Division the subject-matter of Claim 1 involved an inventive step.

Present Claim 1 reads as follows:

"A controlled deflection roll for operating at a predetermined temperature comprising in combination: a rotatable roll shell (11) having a working face (24), a stationary shaft means (10) for supporting the rotatable roll shell (11), bearing means (28) at each end of the roll shell (11) between the shaft means and the roll shell (11), means (37, 51, 53) for delivering a heated fluid to the roll shell (11) to maintain the roll shell (11) at a working temperature, characterised by thermal insulating means adjacent each end of the roll shell (11), each insulating means comprising an annular fluid chamber (35) formed between a respective bearing means (28), a ring (35a attached to the stationary shaft means (10), the surface of the stationary shaft and the respective end of the inner surface of the roll shell (11) for reducing thermal transmission between the roll shell (11) and bearing means (28), and means (30, 57, 58) for delivering an insulating fluid separate from the heated fluid to each of said chambers (35) for absorbing heat from the roll shell (11) and preventing heat from the heated fluid from reaching the bearing means (28), and in that the means (30, 57, 58) for delivering an

insulating fluid directs the insulating fluid first into the bearing means (28) and then inwardly into the space (36) between the roll shell (11) and the shaft means (10) through said annular chambers (35) to control temperature of the bearing means (28)".

IV. Appeals were lodged against this decision on 15 April 1993 (Appellants I and III) and on 23 April 1993 (Appellant II), with payment of the appeal fee on the same days, respectively. The Statements of Grounds of Appeal were filed on 9 June 1993 (Appellant II), 12 June 1993 (Appellant I) and 18 June 1993 (Appellant III). With his Statement of Grounds of Appeal Appellant II filed further evidence for substantiating one of several alleged prior uses late cited in the opposition proceedings.

V. In a communication for preparation of oral proceedings the Board expressed the provisional opinion that, in addition to the documents D1 to D3 and D22 also the document

D4: "Die Walzlagerpraxis", Eschmann-Hasbargen-Weigand, R.Oldenburg Verlag München, Wien 1978, pages 217, 218, 236 and 237,

cited by Appellant III during the oral proceedings in the opposition proceedings, would appear to be relevant for the assessment of inventive step of the subject matter of the Claim 1 under consideration and should therefore be considered in the proceedings.

In the absence of such relevance of the further late cited documents - a number of documents cited after the 9-month period of Article 99 EPC -, including the

alleged prior uses introduced by Appellant II, the Board envisaged to disregard this evidence in accordance with Article 114(2) EPC.

- VI. Oral proceedings took place on 20 December 1994 with all parties present.

At the oral proceedings the Chairman announced definitely that the Board would disregard the late cited documents, apart from documents D2 and D4 and would also disregard the late cited prior uses because of lack of relevance of this evidence. Appellant II, who introduced the alleged prior uses did not challenge the Board's view in this respect.

Since novelty of the subject-matter of the amended Claim 1 was not any longer disputed, discussions at the oral proceedings essentially concentrated on the question whether the subject-matter of the amended Claim 1 of the patent in suit involved an inventive step.

- VII. The Appellants requested that the decision under appeal be set aside and that the European patent No. 0 179 730 be revoked. In support of their requests the Appellants essentially relied on the following submissions put forward in writing and orally at the oral proceedings:

Appellant I considered that the subject-matter of the amended Claim 1 of the patent in suit was obvious in view of the combined teachings of D3 and D22.

A controlled deflection roll with an annular fluid chamber essentially as defined in Claim 1 is known from D3. This roll is not heated but it is considered to be well known to the skilled person that rolls of the type shown in D3 can easily be heated in case a client wishes

so. Heating of the roll known from D3 may be provided in the manner as shown in D22 without any substantial redesign being necessary. Such an obvious combination would lead essentially to the subject-matter of Claim 1 because the annular chamber known from D3, which is in the position as defined in Claim 1 of the patent in suit, is filled with oil from a separate oil circuit for lubrication of the bearings so that when the roll is heated this known construction would also provide an heat insulation effect. The single remaining difference vis-a-vis the claimed roll construction, i.e. the use of a ring as a limiting member for the chamber, must be regarded as an obvious constructional alternative for forming an annular chamber and cannot be regarded as inventive in itself or in combination with the other features specified in Claim 1.

Appellant II considered that the disclosures of D1 and D4 together with the skilled person's usual considerations for solving a technical problem on the basis of the relevant prior art would lead in an obvious manner to the subject-matter of Claim 1.

Starting from the prior art roll known from D1, the skilled person would easily recognise the problems with respect to insufficient lubrication of the bearings encountered in case higher heating temperatures are wanted.

In this respect D4 gives the skilled person all the information necessary for solving such a particular problem in heated rolls. On page 236 and 237 of D4 examples are given in which a separate lubricating oil circuit is proposed for the bearings. The lubricating oil is cooled and the lubrication circuit can be closed or, alternatively, an open circuit. In view of the opening 30 provided in the ring known from D1, an open

circuit would obviously be selected because additional modification of the known bearing arrangement of D1 would become unnecessary.

Such a combination would not only lead in an obvious manner to a roll having substantially the constructional features of Claim 1 but also to the heat insulating function of the annular chamber. The remaining differences merely concern constructional details which cannot be regarded as inventive because they do not appear to have an appreciable effect on the functioning of the insulating chamber formed.

Appellant III took the view that the disclosures of D2, D1 and D4 would lead the skilled person in an obvious manner to the subject-matter of Claim 1. In the arrangement disclosed in D2, comprising all the features of the pre-characterising part of Claim 1, heat insulation of the ends of the roll is provided by cooling, using a separate oil stream which is led into an annular ring chamber. In view of the teachings of D4, e.g. the use of a separate cooled oil flow for the bearings so as to protect them against heat, the skilled person would obviously use the cooling oil for lubrication of the bearings and also for cooling of the roll ends, such as is proposed in D2. Considering the roll construction disclosed in D1 it would not need any inventive activity to apply the teachings of D2 and D4 for changing the direction of oil flow for the bearings in D1. Since such an obvious development would essentially give as a result the roll construction as claimed in the amended Claim 1 of the patent, the subject-matter of this claim lacks any inventive step.

VIII. The Respondent requested that the appeal be dismissed and that the patent be maintained in the form as allowed by the Opposition Division. He contested the Appellants' views and relied on the following argumentation:

Neither of the late cited prior art documents can be considered to disclose more than what is already shown in the documents cited within the time limit of Article 99 EPC. There is thus no reason to allow this additional prior art, including D4, into the present proceedings.

In accordance with the objects of the present patent cited in column 1, lines 50 to 57, the roll should be capable of operating at elevated temperatures and heat transfer from the roll to the lubricant of the bearings should be reduced so as to avoid damage to the bearings.

This problem is nowhere hinted to in the cited prior art, let alone the solution as defined in the amended Claim 1 of the patent.

In D3 there is no "insulating chamber", comparable to the chambers of Claim 1 because there is no heating of the roll.

D1 teaches oil flow from the hot interior of the roll to the bearings. Also D2 does not have any relation with the problem stated and does not even show how the bearings are lubricated. The disclosures of D4 are very general and even if its teachings are applied, for example to the roll known from D1, this would not lead to the claimed construction.

Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. It is admissible.

2. *Amendments*
 - 2.1 Present Claim 1 contains the combination of features of the granted Claims 1 and 2, which is disclosed in relation to the embodiment shown in Figures 2 and 4 of the originally filed application document and the additional feature that the insulating fluid, when leaving the insulating chamber, is directed inwardly into the space between the roll shell and the shaft means, taken from the last part of granted Claim 6. This subject-matter is also supported by the originally filed description, page 7, lines 32 to 35.

Dependent Claims 2 to 5 are adapted versions of the granted Claims 3 to 6.

Thus, no objections arise in respect of the requirements of Article 123(2) and (3) EPC.

 - 2.2 The description of the granted patent was amended to take account of the limitations to the subject-matter of granted Claim 1, which required deletion of the embodiments disclosed in relation to Figures 4 and 5 of the granted patent (description column 2, lines 12 to 18 and column 5, line 27 to column 6 line 10).

3. *Novelty*

3.1 Since none of the cited documents discloses an annular fluid chamber in the form and at the position as defined in the characterising part of Claim 1, it follows that the subject-matter of Claim 1 is novel.

Since novelty was no longer contested, further elucidations on this matter are considered unnecessary.

4. *Inventive step*

4.1 The Board agrees with the Opposition Division that the heated controlled deflection roll disclosed in the document US-A-4 282 639 (D22), cited in the present patent (column 1, line 39), forms the closest prior art. The pre-characterising part of Claim 1 is correctly based on this prior art (Rule 29(1) EPC).

4.2 A drawback of this known heated controlled deflection roll is that at higher heating temperatures excessive heat transfer to the bearings occurs which, as an effect of the elevated temperature of the bearings and the degraded lubricating abilities of the lubricating oil at these temperatures, may give rise to damage of the bearings (see column 1, lines 42 to 49 of the patent).

In accordance with the object referred to in the patent in column 1, lines 50 to 57, the objective technical problem underlying the subject-matter of Claim 1 concerns the provision of a heated controlled deflection roll which is capable of operating at an elevated temperature by reducing the heat transfer to the lubricant of the bearings.

This object is achieved by the provision of insulating means and fluid flow as defined in the characterising part of Claim 1.

- 4.3 Although D2 might also be considered to disclose the combination of pre-characterising features this document is, in the Board's opinion, not suitable as a starting point for the assessment of inventive step of the subject-matter of Claim 1. This prior art essentially deals with the heat distribution along the roll mantle length (see page 7, line 20 to page 8, line 2) and does not deal with any problems concerning the bearings; neither the bearings for the roll shaft nor the manner of lubrication of these bearings are shown or addressed in D2.

Already for this reason, D2 cannot lead the skilled person to the incorporation of heat insulating chambers for the protection of the roll supporting bearings.

- 4.4 Also considering the other cited prior art, none of the documents discloses or hints to the idea of insulating the bearings from a heated roll or a heating fluid.

Although the documents D1 and D3 might be considered to disclose annular "chambers" between the bearings and the roll mantle, these known rolls are not heated and therefore these chambers cannot give any suggestion to the wanted effect. Even if the rolls were heated, the known chambers would not provide sufficient heat insulation without further constructional modifications being provided for the reasons set out below.

In D1 a throttling disc 28 (see column 4, lines 49 to 57) is provided for limiting the infeed of oil from the inside of the roll mantle to the bearings (see column 5, lines 50 to 61). Not only is the flow direction opposite

to that of the invention also the function of the throttling disc is different from the function of keeping the chamber filled with oil attributed to the ring 35a in Claim 1 under consideration. Hence, there is no hint to the idea of providing an insulation chamber protecting the bearing from hot working fluid.

The "chamber" disclosed in D3 is rather a collecting chamber for collecting excess oil to be removed through a return line 52 at the inlet of which, for aiding in returning the oil, stationary scoops 53, extending in the "chamber", are mounted. In case the roll were heated nothing would prevent the hot oil from directly contacting the bearing support so that also here no lead to an insulating effect of the "chamber" can objectively be derived.

D4, considered to be relevant because it deals with the bearings of a heated roll and measures for protecting the bearing from becoming too hot, proposes cooling of the bearings by a closed circuit lubrication system, with high flow characteristic for dissipation of heat (see "Bild 287"). No disclosure of the provision of an insulating chamber can be derived from this document either.

4.5 Appellant I considered that the combination of the teachings of D22 and D3 would lead in an obvious manner to the subject-matter of Claim 1.

However, as is explained above the collecting chamber known from D3 does not have an insulating function. In this respect it is also noted that the known chamber does not allow delivering of the insulating fluid from the annular chamber inwardly into the space between the roll shell and the shaft means such as is defined in Claim 1 under consideration. This feature, implying an

insulating chamber filled with insulating fluid is essential for the prevention of heat transfer from the roll shell to the insulating chamber and thus for the insulating function.

- 4.6 Appellant II based his argumentation for lack of inventive step of the subject-matter of Claim 1 on the disclosures of D1 and D4.

Although D4 gives instructions to avoid overheating of bearings in a heated roll by providing closed-circuit lubrication, it does not deal with heat insulation by the provision of an insulating chamber in the manner as proposed in the patent and, in the Board's opinion, no convincing arguments have been submitted why the skilled person would arrive at the idea to provide such an insulating chamber and revert the direction of oil flow, starting from a roll construction as known from D1 and applying the teaching of D4.

Since the annular chamber shown in D1 does not comprise surfaces formed by a ring attached to the stationary shaft means, the stationary shaft and the respective end of the inner surface of the roll shell such as is defined in Claim 1 of the amended patent, even the combination of features as suggested by the Appellant II would not lead to the subject-matter of Claim 1.

Appellant II further considered that the constructional differences were of secondary importance and in respect of the fluid flow he submitted that it would, in view of the teachings of D4, be apparent to the skilled person that the cool lubricating oil be fed from the outside to the inside of the bearing. When changing the direction of oil flow the known chamber of D1 would automatically function as a insulating chamber. However, even when considering that the teachings of D4 would be applied to

D1 in order to avoid overheating of the bearings in case the roll is heated to elevated temperatures, a direct application of these teachings would rather result in a system with a separate lubricating oil circuit for the bearings such as shown in "Bild 286" of D4.

If, on the other hand as suggested by Appellant II, the skilled person would feed lubricating oil from the outside to the inside of the roll in D1 so that the "chamber" known from D1 would be filled with oil and the disc 28 would function as a throttling disc in the reverse direction as originally intended further modifications with respect to the "chamber" and also to the outflow conduit (32) arrangement would be necessary to arrive at the construction claimed.

Clearly the claimed details of the insulating means in the contested patent concern optimised reduction of thermal transmission between the roll shell and bearing means and in the absence of any teaching in the prior art of providing an insulating chamber, the Appellant's allegations that the remaining differences would be mere obvious constructional details must be considered as being based on hindsight.

- 4.7 Also Appellant's III line of argumentation, based on the combination of the teachings of D2, D1 and D4, is not considered convincing.

For the reasons referred to in paragraph 4.3 above the roll construction disclosed in D2 cannot be considered to give any hint to the skilled person for incorporating in the roll known from D1 an insulating chamber and to adapt the fluid flow in the manner as defined in Claim 1 under consideration with a view of reducing the thermal

transmission between the roll shell and the bearing means. Reference is made in this respect to the reasons set out in paragraph 4.6 above.

4.8 Except for the document D4, the content of which was taken into account in the appeal proceedings, the Board agrees with the Opposition Division that the remaining prior art documents do not extend beyond the disclosures of D1, D2 and D3. Since also the Appellants did not further rely on teachings of this prior art in the appeal proceedings it is not considered appropriate to discuss these other documents in detail.

4.9 In conclusion, in the Board's judgment, the proposed solution to the technical problem underlying the patent in suit defined in the independent Claim 1 is inventive and therefore this Claim as well as its dependent Claims 2 to 5 relating to particular embodiments of the invention in accordance with Rule 29(3) EPC, can form the basis for maintenance of the patent in amended form (Article 102(3) EPC).

5. The description and drawings are in agreement with the wording and scope of the current Claims. Hence these documents are also suitable for maintenance of the patent in amended form.

Thus the ground of opposition under Article 100(a) EPC cannot prejudice maintenance of the patent in the requested amended form.

Order

For these reasons it is decided that:

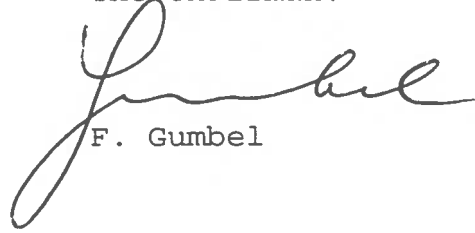
The appeal is dismissed.

The Registrar:



S. Fabiani

The Chairman:



F. Gumbel



