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**D E C I S I O N**  
of 15 November 1995

**Case Number:** T 0031/94 - 3.2.1

**Application Number:** 86114521.7

**Publication Number:** 0219844

**IPC:** B21B 37/00

**Language of the proceedings:** EN

**Title of invention:**

Method of controlling the profile of sheet during rolling thereof

**Patentee:**

Nippon Steel Corporation

**Opponent:**

SMS Schloemann-Siemag AG

**Headword:**

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**Relevant legal provisions:**

EPC Art. 54, 56

**Keyword:**

"Novelty (yes)"

"Inventive step (yes)"

**Decisions cited:**

-

**Catchword:**

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Case Number: T 0031/94 - 3.2.1

**D E C I S I O N**  
of the Technical Board of Appeal 3.2.1  
of 15 November 1995

**Appellant:**  
(Opponent)

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**Representative:**

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**Respondent:**  
(Proprietor of the patent)

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**Representative:**

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**Decision under appeal:**

Decision of the Opposition Division of the  
European Patent Office posted 15 November 1993  
rejecting the opposition filed against European  
patent No. 0 219 844 pursuant to Article 102(2)  
EPC.

**Composition of the Board:**

**Chairman:** F. Gumbel  
**Members:** S. Crane  
J. Van Moer

### Summary of Facts and Submissions

- I. European patent No. 0 219 844 was granted on 23 January 1991 on the basis of European patent application No. 86 114 521.7.

Claim 1 of the granted patent reads as follows:

"A method of controlling the profile of a rolled sheet material workpiece by shifting the position of the upper and lower working rolls axially and in opposite directions comprising executing repetitively whilst rolling the steps of:

first, determining the profile of each working roll in the axial direction that varies during the time interval between one changing of the working rolls and another; second, on the basis of the determined roll profiles, determining the configuration of the gap between the upper and lower rolls in the axial direction as a function of the amount of relative axial shifting of the roll positions, so as to determine the amount of shift in the roll position that will provide the smoothest possible configuration for said gap in the axial direction within the area of contact between the working rolls; and

shifting the positions of the upper and lower working rolls axially and in opposite directions in accordance with the amount of shift determined, to provide the smoothest possible configuration for said gap in the axial direction."

Dependent Claims 2 to 6 relate to preferred embodiments of the method according to Claim 1.

- II. The granted patent was opposed by the Appellants on the grounds that its subject-matter lacked novelty and/or inventive step with respect to the state of the art (Article 100(a) EPC).

The state of the art relied upon is represented in the following documents:

- D1: DE-A-3 038 865  
D2: EP-A-0 112 969  
D3: EP-A-0 134 957  
D4: DE-A-3 115 461  
D5: JP-A-53-108 866  
D6: HITACHI REVIEW, Volume 34, No. 4, August 1985, Tokyo Japan T. NAKANISHI et. al. "Application of Work Roll Shift Mill "HCW-MILL" to Hot Strip and Plate Rolling", pages 153 to 160.

- III. The opposition was rejected by the Opposition Division by its decision given at oral proceedings on 28 October 1993 and issued in writing on 15 November 1993.

- IV. An appeal against this decision was filed on 19 January 1994 and the appeal fee paid at the same time. The Statement of Grounds of Appeal was filed on 25 March 1994. The Appellants requested that the decision under appeal be set aside and the patent revoked in its entirety.

- V. Oral proceedings before the Board were held on 15 November 1995.

- VI. The submissions of the Appellants in support of their request can be summarised as follows:

The closest state of the art was represented by document D3. In the contested decision it had been established that this document disclosed not only the features of the first paragraph of Claim 1 but also the feature that the axial profiles of the working rolls were determined in the time interval between roll changes. On a proper interpretation of what was said in this respect in document D3 it became apparent however that indeed all of the features of the claim were at least implicitly taught by the document, in other words that it was proposed there to shift the rolls in such a way, on the basis of their determined profiles, to provide the smallest possible configuration of the roll gap. Thus the subject-matter of the claim lacked novelty.

In the alternative it was possible to arrive at the subject-matter of Claim 1 in an obvious manner if document D6 was chosen as the starting point and account taken of the teachings of documents D1, D2, D4 and D5.

- VII. The Respondent (Proprietors of the patent) requested that the appeal be dismissed and the patent maintained unamended, or in the alternative, that the patent be maintained in amended form on the basis of the claims submitted as auxiliary requests I to II with their letter dated 24 October 1995. They argued that document D3 contained no suggestion to shift the rolls in dependence on their measured profiles. The purposes of measuring the roll profiles were unambiguously expressed in the document and these did not include any reference to roll shifting. The attempts of the Appellants to show otherwise were based solely on hindsight knowledge of the invention. None of the other cited documents had any relevance to the claimed invention.

## Reasons for the Decision

1. The appeal complies with the requirements of Articles 106 to 108 and Rules 1(1) and 64 EPC. The appeal is therefore admissible.
2. *Background to the invention; state of the art*
  - 2.1 When sheet material is rolled the wear on the rolls is not uniform across the width of the sheet but tends to be concentrated at its edges. Increasing differential wear of the rolls leads to deterioration in the quality of the rolled sheet material, with the formation of local projections or "high spots". Once the abnormal profile of the rolled sheet material becomes unacceptable the rolls have to be changed. The traditional method of extending the time interval between roll changes is to arrange the batches of sheet material according to a pre-planned schedule in such a way that the wider batches are rolled first and the width of subsequent batches subsequently decreases (a so-called "coffin" schedule). This serves to help distribute the wear across the width of the rolls. Where the working rolls are axially shiftable it is also known to shift them such that the position of the edges of the sheet material with respect to the rolls is changed, as disclosed for example in documents D2, D4 and D5.
  - 2.2 Document D3, which is referred to in the introductory description of the contested patent, proposes achieving an even distribution of wear across the width of the rolls in the following way: The working rolls each have a length which is at least 1.3 times as great as the length of the support rolls and are axially shiftable in opposite directions from their symmetrical central position by a distance approximately equal to half the

length of the support rolls. The batches to be rolled are organised into a schedule in such a way that the respective widths of two consecutive batches add up to substantially the full width of the working rolls, whereby for the first batch the working rolls are shifted such that first respective ends of the working rolls overlies the edges of the sheet material and for the second batch the working rolls are shifted such that their opposite respective ends overlies the edges of the sheet material.

On page 15 of document D3 it is stated that in order to negate the effects of an uneven wear distribution it is possible to monitor the profiles of the working rolls. It is indicated that the results of these measurements can be used to instigate a reworking of the rolls profiles in situ. Alternatively, if this facility is not available, the measurement signals can be directed to the control unit which then monitors the degree of differential wear and issues a warning signal when this exceeds a predetermined limit. A third alternative is to alter the rolling schedule on the basis of the measured differential wear in order to make more use of those areas of the rolls with little wear.

- 2.3 Document D1 discloses a rolling mill with working rolls that have complementary curved profiles. Axial shifting of the working rolls thus changes the shapes of the roll gap.
- 2.4 Document D6 is a report describing the basic characteristics of a mill with shiftable working rolls. The particular emphasis is on the capability of such a mill to perform "schedule free" rolling, i.e. rolling a succession of batches of substantially the same width.

Excessive localised wear is avoided by cyclically shifting the working rolls. The determination of the optimum shift pattern is described with reference to a calculation model.

3. *The claimed invention*

In accordance with the claimed invention the production of high spots and other abnormalities in the profile of the rolled sheet material is avoided by determining (by direct measurement or high precision predictive calculation) the profiles of the working rolls, on the basis of this determining the amount of relative axial shift between the working rolls which would provide the smoothest possible roll gap, and then shifting the working rolls in opposite directions accordingly.

4. *Novelty and inventive step*

The submissions of the Appellants with respect to novelty concentrated on an interpretation of what is said on page 15 of document D3, see point 2.2 above. In their view the proposed monitoring of the measured roll profiles by the control unit in order to give an alarm signal when differential wear exceeded a predetermined limit implicitly included a preliminary phase, when this limit had not been reached, in which the control unit issued signals to the roll shifting mechanism to shift the rolls in such a way to compensate for the measured wear, in other words to provide a smooth as possible configuration to the roll gap. This followed from the fact that on page 9 of document D3 it was made clear that the control unit controlled the position of the working rolls in dependence on the signals it received.

That interpretation of document D3 is imaginative but lacks any objective foundation. The proposals made on page 15 of the document concern refinements of the basic wear distribution method disclosed which are intended to cope with the situation arising when that method is not fully successful and unacceptably uneven wear is determined. There is no suggestion that the application of these refinements should entail departing from the basic concept involved, whereby the working rolls are positioned with their ends overlying the edges of the sheet material, which departure would of course be necessary if they were to be positioned as a result of a determination of the optimum relative axial shift to give a smooth roll gap. Furthermore, the determination of the optimum roll position is a complex mathematical operation, as is evidenced by the detailed description of it in the contested patent, and it is inconceivable, in the absence of any indication whatsoever as to what is involved, that the skilled person would understand document D3 as teaching such a determination. Lastly, the fact that the results of the roll profile measurement are directed to the control unit which is responsible for controlling the axial position of the rolls (in accordance with the stored rolling schedule) does not imply that the profile measurements are processed by that control unit to instigate a change in the roll positions. It is commonplace for a generally designated "control unit" (shown as a "black box" in the figures of document D3) to be responsible for supervising many and various functions with different inputs being processed separately to this end. In the present case the control unit monitors the results of the roll profile measurement and issues an alarm signal when necessary. There is no suggestion, and no technical reason to suppose, that those roll profile measurements also have some effect on the signals issued by the control unit to the roll shifting mechanism.

It therefore follows that the subject-matter of Claim 1 is novel with respect to document D3. The same is true of documents D1, D2 and D4 to D6, since none of these documents disclose a method in which the working roll profile is measured or otherwise determined between roll changes.

It also follows from the above considerations that these documents cannot give the skilled person any reason to depart from the teachings of document D3 with respect to the uses to which the roll profile measurement results are to be put. Equally it is evident that the teaching of these documents cannot be combined in such a way as to lead the skilled person to the claimed invention (this attack on inventive step was in any case never fully argued by the Appellants and not relied upon any longer at the oral proceedings).

Accordingly, the Board comes to the conclusion that the subject-matter of Claim 1 is new and involves an inventive step with respect to the state of the art (Articles 52(1), 54 and 56 EPC).

**Order**

**For these reasons it is decided that:**

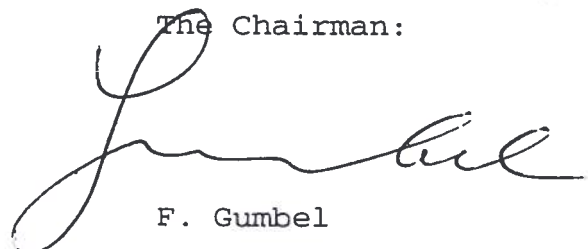
The appeal is dismissed.

The Registrar:



S. Fabiani

The Chairman:



F. Gumbel

*H. 111*

*DM*