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D E C I S I O N
of 16 January 2003

Case Number: T 1161/00 - 3.2.3
Application Number: 92117271.4
Publication Number: 0539784
IPC: B22D 11/12, B21B 1/46, B21B 37/62

Language of the proceedings: EN

Title of invention:

Assembly for the controlled prerolling of thin slabs leaving a continuous casting plant

Patentee:

DANIELI & C. OFFICINE MECCANICHE S.p.A.

Opponent:

I: SMS Schloemann-Siemag AG
II: VOEST-ALPINE Industrieanlagenbau GmbH

Headword:

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Relevant legal provisions:

EPC Art. 56

Keyword:

"Inventive step - (yes - after amendment)"

Decisions cited:

-

Catchword:

-



Case Number: T 1161/00 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 16 January 2003

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Decision under appeal: Decision of the Opposition Division of the
European Patent Office dated 16 October 2000
revoking European patent No. 0 539 784 pursuant
to Article 102(1) EPC.

Composition of the Board:

Chairman: C. T. Wilson

Members: F. Brösamle
J. P. Seitz

Summary of Facts and Submissions

I. With decision of 16 October 2000 the opposition division revoked European patent No. 0 539 784 in the light of

(D1) Patent Abstracts of Japan, vol. 14, No. 33 (M-923), 22 January 1990 & JP-A-1271047

(D1a) English translation of JP-A-1271047 (D1)

(D5) Stahl und Eisen, vol. 109, No. 9, 10, 16 May 1989, pages 453 to 462.

In the Communication of the opposition division dated 6 October 1999 reference was made to

(D3) JP-A-63-242 452

(D3a) is an English translation of (D3); and

(D4) EP-A-0 444 420 is cited in the patent specification.

II. Against the above decision of the opposition division the patentee - appellant in the following - lodged an appeal on 6 December 2000 paying the fee on the same day and filing the statement of grounds of appeal on 12 February 2001.

III. Following the board's Communication pursuant to Article 11(2) RPBA in which the board expressed its provisional opinion of the case with respect to inventive step, oral proceedings were held on 16 January 2003 in which the appellant submitted new claims 1 and 2.

IV. Claim 1 reads as follows:

"1. Pre-rolling assembly for the controlled pre-rolling of thin slabs (20) leaving a continuous casting mould (11) including foot rolls (12), the assembly comprising facing rolling sectors having stationary sector parts (13) and therewith cooperating movable sector parts (22), the rolling sectors being operatingly disposed along the two wide faces of the thin slab, and including respective pre-rolling rolls (14, 114, 214-16, 116, 216), the assembly being positioned immediately downstream of the foot rolls (12), and being characterized in that the rolls (14, 114, 214) of the stationary sector parts (13) are associated at least one by one with a load cell (15) while the rolls (16, 116, 216) of the movable sector parts (22) are associated at least one by one with a hydraulic capsule (17) governed by a servovalve (19), each hydraulic capsule (17) being associated with a transducer indicating pressure and position (18), and wherein the load cells (15), the servovalves (19) and the pressure and position transducers (18) are associated with a control and data processing unit (21) comprising means for setting pre-rolling parameters and the characteristics of the liquid core and means to compare signals received from the load cells and transducers with said pre-rolling parameters"

V. In the oral proceedings before the board the appellant and opponents I and II - respondents I and II in the following - essentially argued as follows:

(a) appellant:

- the subject-matter of claim 1 is clearly supported by the originally filed documents (corresponding to the patent specification) see column 2, lines 21 to 27, and column 3, lines 23 to 25, wherefrom means to compare actual and pre-set rolling parameters could be seen; from the patent specification it was also clear that rolling parameters had to be seen either as actual or pre-set parameters;
- the only document dealing with casting of thin slabs is (D5) aiming at pre-rolling of a cast slab with almost the final thickness by accelerated cooling to reduce the tendency of segregation; contrary to the claimed invention (D5) was based on piston/cylinder units combined with distance holders/spacers and not on hydraulic capsules as claimed; the dynamic guidance of the cast strand according to (D5) did not relate to pre-rolling thereof, rather to controlling the velocity of the slab instead of the claimed parameters of the roll's pressure and position and their control via hydraulic capsules;
- from (D4) hydraulic capsules were known *per se*, however, not in the context of casting thin slabs; these elements achieved small displacements of the rolls and high adjustment pressures so that a pre-

rolling assembly based on them was able to enhance the quantity and quality of cast products;

- (D1/D1a) and (D3/D3a) had to be seen as documents relating to thick slabs and their specific problems such as slow cooling, high thermal shrinkage and reduced tendency of segregation; under these circumstances there existed no incentive to envisage combinations thereof with (D5);
- summarising, the subject-matter of claim 1 is both novel and inventive.

(b) respondent I:

- the subject-matter of claim 1 did not meet the requirements of Article 123(2) EPC since comparing actual with pre-set parameters was not originally disclosed;
- nearest prior art is (D5) broadly dealing with all kinds of slabs, not only with thin slabs; its dynamic guidance of the slab lead to small, controlled deformation steps and to a soft reduction of the slab as claimed; the known principle of slab control achieved a reduced tendency of segregation and occurrence of cracks inside the slab;
- controlling a cast slab had to be carried out by a skilled person in the technical field of process controlling; from (D3/D3a) a control unit for carrying out a soft reduction of a cast slab was known, in which control unit pre-set and actual

parameters were compared;

- since hydraulic capsules had to be seen as equivalent means to piston/cylinder units achieving the same advantages as set out in the patent specification this feature was obvious for a skilled person; apart therefrom the configuration of a hydraulic capsule was missing in claim 1 and even if a skilled person addressed (D4) it had to be considered that the reference to (D4) was made by way of example only in the patent specification;
- (D5) and (D1/D1a) and (D3/D3a) being closely related a skilled person confronted with the problem of soft reduction of cast slabs combined these documents to directly achieve its claimed subject-matter without the exercise of an inventive endeavour as outlined in the impugned decision of the opposition division.

(c) respondent II:

- claim 1 is open to an objection under Article 123(2) EPC since the patent specification did not clearly define the comparing means and its related parameters;
- there cannot be acknowledged a remarkable difference in the casting of thin or thick slabs since both processes entailed the same problems with respect to controlling the pre-rolling step following the casting step;
- from (D5) a casting and pre-rolling assembly could

be seen, however, not detailing the controlling step; what could, however, be seen from (D5) was the necessity to control the deformation process by prescribing a dynamic guidance of the cast slab;

- this gap of (D5) could be directly filled by a person skilled in the technical field of process control and aware of central process units and their functions;
- since the features of claim 1 with respect to "associated" are undefined a skilled person turned to (D3/D3a) and its Figure 3 disclosing a pressure regulator which is linked to a central processing unit and to hydraulic elements to adjust the roll's position;
- it was obvious that under these circumstances the construction of the hydraulic element whether a hydraulic capsule as claimed or a piston/cylinder unit was irrelevant since the hydraulic capsule is not clearly restricted in its structure in claim 1 and since its obvious advantage lies in its structural features not crucial for the function to achieve small displacements under high pressure;
- carrying out the standard approach for the assessment of inventive step the solution of the problem set out in the patent specification had to be considered obvious as in the decision of the opposition division.

VI. The appellant requested that the decision under appeal

be set aside and that the patent be maintained on the basis of claims 1 and 2 filed during the oral proceedings together with an amended column 1 of the description.

VII. Respondents I and II requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

2.1 Claim 1 is based on a combination of features laid down in granted claims 1 and 2 plus features **unambiguously** derivable from the description for the following reasons.

2.2 The feature that the pre-rolling assembly is positioned "immediately downstream of the foot rolls (12)" can be seen from EP-B1-0 539 784, column 2, lines 47 to 49, and the feature "means to compare signals..." is derivable from EP-B1-0 539 784, column 2, lines 21 to 23. The comparison is carried out on the basis of **actual** parameters produced by the load cells "15" and the transducers "18" and **set or pre-set** parameters stored in the data processing unit "21". Reference is made in this respect to granted Figure 1 and to the description according to column 3, lines 23 to 25, where the word "set" is directly linked to the control and data processing unit "21" where the comparison between pre-set or set and actual parameters is carried out as clearly described in EP-B1-0 539 784, column 2,

lines 21 to 27.

2.3 Summarising, there is a reliable basis for the features of claim 1 in the originally filed documents so that the requirements of Article 123(2) EPC are clearly met.

2.4 Since the features of granted claim 2 and the newly incorporated features of claim 1 have to be seen as restricting the scope of protection of granted claim 1 the requirements of Article 123(3) EPC are also met.

2.5 Claim 2 corresponds to granted claim 3 being related either to granted claim 1 or 2. Claim 2 is therefore not open to an objection under Article 123 EPC.

3. *Novelty*

The issue of novelty was not disputed by the parties and the board so that it is not necessary to deal with it in detail. The crucial issue to be decided is therefore inventive step.

4. *Inventive step*

4.1 Nearest prior art is (D5) which for the board is the only document dealing with casting of **thin** slabs in that a rapid cooling is carried out to reduce the effect of segregation.

In (D5), see page 455, left column, it is set out that the **velocity** of the cast strand is measured and controlled; downstream thereof the **traction** on the strand is controlled. According to Figure 5 and 6 of (D5) only the **inner** segment of rolls is adjustable via piston/cylinder units. These rolls are biased by

springs which act against spacers. For a skilled person **not knowing the invention** the information of (D5) with respect to "dynamische Strangführung" (dynamic control of the cast strand) has to be seen in the light of the above background of (D5), namely controlling the strand's velocity and traction and adjusting the inner rolls via piston/cylinder units which act against spacers.

- 4.2 The disadvantages/shortcomings of (D5) are detailed in EP-B1-0 539 784, column 1, lines 25 to 28, in that an optimum regulation and pre-rolling of a desired value are not possible, nor could the actual parameters of the strand be continuously controlled along the strand's path, so that the problem to be solved by the invention is to obviate the shortcomings of the state of the art and to achieve further advantages, see EP-B1-0 539 784, column 1, lines 47 to 49.
- 4.3 This problem is solved by the combination of features laid down in claim 1 basically in that the stationary rolls are associated with load cells for measuring the roll's pressure, and in that the opposing movable rolls are associated with hydraulic capsules governed by servovalves and linked to transducers so that pressure and position of the movable rolls are measured. The above parameters are fed into control and data processing means in which set pre-rolling parameters are compared with the above actual parameters and signals are fed to the servovalves linked to the hydraulic capsules to adjust the movable rolls as wished.
- 4.4 The crucial elements of the combination of features laid down in claim 1 are the selection of pre-rolling

parameters in form of the roll's pressure on **both** sides of the cast slab and of the position of the movable rolls, furthermore the use of hydraulic capsules which enable "even the smallest movement to be carried out in a controlled and controllable manner while providing a considerable force at the same time", see EP-B1-0 539 784, column 3, lines 14 to 17.

- 4.5 Hydraulic capsules are *per se* known from (D4) in which document the **shortcomings** of hydraulic devices **including pistons** are clearly set out in its column 1, lines 49 to 57, namely problematic adjustment when the piston axis is inclined, leakage of hydraulic fluid, reduced speed of response, wear and maintenance inconvenience, and in which the advantages of hydraulic capsules are indicated in its column 2, lines 32 to 46, namely reduced friction, tightness of the system, reliable even in case of misalignment, reduced height and above all its quicker speed of response making it evident that hydraulic capsules are by no means simple equivalents to piston/cylinder units.

Respondent I, see letter dated 16 December 2002, page 2, last and page 3, first three paragraph(s) pointed to the known use of hydraulic capsules in combination with **heavy** rolling mills and denied its possible use for slightly adjusting the movable rolls of a pre-rolling assembly. This is a clear sign that a skilled person would **not combine** the teachings of (D4) with documents dealing with casting.

It is true that the structure of the hydraulic capsules is not detailed in claim 1; it is however, made clear that **one example** thereof could be seen from (D4), mentioned on column 2, lines 4 to 6, of the patent

specification, so that the requirements of Articles 84 (clarity) and 83 EPC (enabling disclosure) are met.

The fact that hydraulic capsules according to claim 1 could be used in an assembly for the **soft reduction** of a cast strand is not rendered obvious by the prior art to be considered and has to be seen as a **surprising step** even admitted by respondent I in his above cited letter.

- 4.6 As already communicated to the parties in the Communication pursuant to Article 11(2) RPBA (D1/D1a) does not relate to **thin** slabs, see also (D3/D3a), so that their specific problems are different from those dealt with in (D5). Not knowing the claimed invention, no incentive can be seen to consider (D1/D1a) and (D3/D3a) and combine them with the teaching of (D5) constituting the starting point of the invention.
- 4.7 Even if such a combination were carried out by a skilled person it has to be emphasized that (D5) is restricted to casting of **thin** slabs, see its title and see its Table 1 under remark "Abmessungen" making it evident that all tests were carried out on **thin** slabs in the order of 60 and 70 mm. The contrary statement of respondent I, namely that (D5) had to be seen as a document dealing with **all kinds of slabs** is therefore the result of an *ex post facto* analysis. As set out above, the **control philosophy** of (D5) is based on the slab's velocity and traction and not on the roll's pressure and position even if in (D5) a soft reduction and the reduction of segregation *per se* may be carried out, albeit, without making use of the parameters linked to **both rows of rolls** and detailed in claim 1, nor of hydraulic capsules, nor a means to compare these

actual parameters with pre-set data parameters.

4.8 Structural elements such as servovalves, a pressure regulator and a central processing unit are clearly derivable from (D3/D3a), see its Figure 1, however, **in another context**. Since claim 1 is based on a **combination** of features it is irrelevant whether single features are known *per se* from the prior art.

4.9 Respondent II argued that no remarkable difference existed between casting/pre-rolling of **thin and thick slabs** and that in (D5) controlling was not specified, inviting a person skilled in the art of process control to fill this gap by turning to (D3/D3a).

As can be seen from (D5) segregation is a question of cooling (cooling rate), namely in that quick cooling, see paragraph bridging the columns of page 457 of (D5), reduces the tendency of segregation. **Thick** slabs cannot be cooled as quickly as **thin** slabs as detailed in the above cited part of (D5), namely 16 minutes instead of 1 minute, so that respondent II's findings are not supported by the facts and (D5) **could not** be combined with prior art documents such as (D1/D1a) and (D3/D3a).

4.10 The argument that the absence of any discussion of a control unit in (D5) - "gap" as stated by respondent II - is an incentive to involve a person skilled in the technical field of process control is a clear **ex post facto analysis** not supported by the circumstances of (D5). As set out above any control unit requires the definition of **which parameters** had to be controlled.

4.11 (D5) is silent about the necessity to control

parameters of the roll's pressure and position on both sides of the strand, but rather favours completely different control parameters such as the strand's velocity and traction to carry out a dynamic control of the cast strand or in German to carry out a "dynamische Strangführung", see (D5), Abstract, page 454, left column, and page 462 remark "Ausblick". The parameters laid down in claim 1 are **not controlled** in (D5), so that a skilled person would have had to completely redesign any control unit used in (D5) as a first mental act; under these circumstances it is an **ex post argument** and not a standard approach (respondent II) that a skilled person confronted with finding the solution to the above problem of the invention would turn for instance to (D3/D3a) to achieve the subject-matter of claim 1 even if (D3/D3a) might disclose an hydraulic pressure regulator linked to a central processing unit, see its Figure 3, reference signs "42" and "40". Summarising, the subject-matter of claim 1 is novel and inventive so that this claim 1 is valid. This is also true for claim 2 as a dependent claim.

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 grant a patent with the following documents:
 - (1) Claims 1 and 2 filed during the oral proceedings held on 16 January 2003;
 - (2) Description: column 1 filed during the oral proceedings held on 16 January 2003, columns 2 and 3 as granted;
 - (3) Figures: 1 to 3 as granted.

The Registrar:

The Chairman:

A. Counillon

C. T. Wilson