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D E C I S I O N
of 9 September 2003

Case Number: T 0155/02 - 3.2.3

Application Number: 93115552.7

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Title of invention:
Mould for the continuous casting of thin slabs

Patentee:
Daniele & C. Officine Mecchaniche S.p.A.

Opponent:
SMS Demag AG

Headword:
-

Relevant legal provisions:
EPC Art. 56, 100(a)

Keyword:
"Inventive step - non-obvious combination of known features"

Decisions cited:
-

Catchword:
-



Case Number: T 0155/02 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 9 September 2003

Appellant: SMS Demag AG
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office dated 26 November 2001,
posted on 18 December 2001, rejecting the
oppositions filed against European patent
No. 0611619 pursuant to Article 102(2) EPC.

Composition of the Board:

Chairman: C. T. Wilson
Members: F. Brösamle
J. P. Seitz

Summary of Facts and Submissions

I. European patent application No. 93 115 552.7 was granted with sixteen claims on 12 August 1998. Claim 1 thereof reads as follows:

"1. Mould for the continuous casting of thin slabs having a thickness between 30 mm. and 90 mm. and of medium slabs having a thickness between 90 mm. to 150 mm., comprising a crystalliser (10) with movable sidewalls (13) to adjust the width of the slab and containing means (24) and transverse rolls (18) defining a possible first assembly of rolls (19), a second assembly of rolls (28) and a third assembly of rolls (29), the crystalliser (10) including an enlarged casting chamber (11) extending along the length of the crystalliser (10) the casting chamber (11) containing a progressively reduced enlargement provided by a central curve defined by a first equivalent radius R , the central curve at the inlet (16) of the casting chamber (11) being defined by the specific first equivalent radius R' and by a width L of at least 500 mm. with a value of the lateral half-enlargement A between 30 mm. and 90 mm., the mould being characterized in that the casting chamber (11) comprises within its length a first segment (26) and a terminal segment (27), a zone of curved connection (23) being included between the first segment (26) and the terminal segment (27), the terminal segment (27) being equal to between one quarter and one sixth of the overall length of the crystalliser (10), the terminal segment (27) comprising a first terminal portion (27') defined

in the respective curved connection zone (23) and a second terminal portion (27"), the second terminal portion (27") having a constant section of its passage at least 120 mm. long with a lateral half-enlargement B having a value between 1 mm. and 12.5 mm. and defined by a central curve with a specific first equivalent radius R".

II. In the oral proceedings of 26 November 2001 the opposition division rejected the oppositions against European patent No. 0 611 619; the written decision was issued on 18 December 2001.

III. Against the above decision of the opposition division opponent I "SMS Demag AG" - appellant in the following - lodged an appeal on 8 February 2002 paying the fee on the same day and filing the statement of grounds of appeal on 24 April 2002.

IV. Opponent II "Mannesmann AG" did not appeal and its former representative informed the board with letter of 20 August 2003 that this company no longer existed and that it would not therefore take part in the oral proceedings.

V. On the basis of

(D1) WO-A-89/12516

(D9) DE-A-4131829 and

(D0) "Das Stranggießen von Stahl", Dr. Thomas Wasmuth, Verlag Stahleisen M.B.H. Düsseldorf 1975

the parties essentially argued as follows:

(a) appellant

- (D1) is not a novelty destroying document, however, discloses a mould for continuous casting of thin slabs with an adjustable mould cavity with respect to the width of the slab, with an enlarged casting chamber which is reduced in the second segment combined by a curved connection zone and a terminal portion of constant section adapted to allow the introduction of a starting bar (dummy bar);

- (D9) relates to the same problem as (D1), namely the avoidance of cracks and a breakthrough of the cast surface, so that they can be directly combined since (D9) also addresses a mould for continuously casting thin slabs and since (D9) discloses adjustable lateral parts of the mould (Figures 1/2), a cavity with bent side walls (Figure 1) from its top to its bottom (Figure 3) and with three sections in the casting direction without sharp edges inbetween; even if (D9) is silent about containing means and assemblies of rolls following the mould to contain the cast slab and to further reduce its cross-section such rolls are clearly known from (D1) and its Figures 2, 4 and 6; the advantageous effect that the cast slab is centred by the mould when leaving it is mentioned in (D9) on the other hand so that the combination of (D1) and (D9) achieves the subject-matter of claim 1 as granted if the general technical knowledge of the skilled person is

considered with respect to the starting/dummy bar, see (D0), necessitating an exit configuration of the mould which allows an introduction and extraction of such a bar, namely by providing a constant section on the exit side of the mould and allowing to provide for means to seal the system of mould and cast slab against any outflow of liquid metal;

- even if the figures of (D1) are not drawn to scale and are only schematic drawings it is clear for a skilled person that the final zone is by far shorter in the direction of the cast slab than its above section encouraging a skilled person to make use of the geometrical conditions laid down in granted claim 1;
- summarizing, a combination of two documents and of general technical knowledge could and would render obvious the subject-matter of granted claim 1, namely to improve the geometric configuration of a mould laid down in (D1).

(b) respondent

- (D1) as the nearest prior art document covers all features of the preamble of granted claim 1, however, none of its four characterising features (a) to (d), namely (a) to provide for a first, a second segment and a zone of curved connection inbetween, (b) to restrict the second/terminal segment in its length to 1/4 to 1/6 of the mould's height, (c) to provide for a constant section of its passage in the terminal

zone which zone is at least 120 mm long and (d) has a lateral half-enlargement between 1 to 12,5 mm;

- feature (a) is not derivable from (D9), see its Figures 6/7, disclosing an abrupt change of the mould's cavity; this is also true for features (b) and (c) since (D9) is based on a mould for **curved** casting, see Figures 3/5;
- without knowing the claimed invention (D9) taken as a whole does not disclose a half-enlargement as claimed since for example its embodiments according to Figures 5, 6 and 7 exclude a half-enlargement and are silent about the axial extension of any constant cross-section of the mould;
- it is admitted that not only (D1) and (D9) are relevant for the assessment of inventive step rather general technical knowledge has to be considered; (D0) can, however, not be accepted as helpful for deciding on the importance of a constant cross-section in the final zone of the mould since the appellant could not set out the relevance of (D0) with respect to above feature (c) of claim 1;
- contrary to appellant's arguments it has to be considered that (D9) aims at achieving a **final** cross-section of the cast slab leaving the mould, whereas claim 1 clearly prescribes a containment zone and sets of transverse rolls following the

mould in the casting direction for reducing the slab;

- not knowing the claimed invention a skilled person would therefore not combine (D1) with (D9) and even if he did could not directly achieve the mould according to granted claim 1 irrespective of the issue of general technical knowledge raised by the appellant.

VI. The appellant requested that the decision under appeal be set aside and that the European patent No. 0 611 619 be revoked.

VII. The respondent requested that the appeal be dismissed.

Reasons for the Decision

1. The appeal is admissible.
2. Since opponent II informed the board that its company no longer existed, see letter of 20 August 2003, it can no longer be a party to the proceedings, and the oral proceedings were therefore carried out without opponent II.

3. *Novelty*

Novelty was not disputed by the opposition division, 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 In agreement with the appellant (D1) is seen as the nearest prior art and as the starting point of the invention. From (D1) the features of the preamble of claim 1 are known, namely a mould with adjustable sidewalls for continuous casting of thin or medium slabs, the mould having a progressively reduced enlarged casting chamber extending along the length of the mould and having a lateral half-enlargement between 30 and 90 mm on its entry side and having containing means and transverse rolls following the mould in the casting direction.

4.2 As can be seen from Figures 2 and 6, in particular, (D1) does not unambiguously disclose a curved connection zone between the zones defined by reference signs "l₂" and "L- l₂", see Figures 1/2 of (D1), or any clear ratio between the axial length of the above zones since the figures of (D1) are schematic figures only. Furthermore (D1) is silent about any provisions in the lower part of the mould to temporarily house a so-called starter/dummy bar and obviously does not provide for a half-enlargement having a value of 1 to 12,5 mm and being defined by a specific radius.

Globally (D1), see Figures 2, 4 and 6, relates to a mould construction which is **straight** (in contrast to a **curved** mould, see for instance (D9)).

4.3 The objectively remaining technical problem to be solved by the invention when starting from (D1) is seen in enhancing the mould's geometry to avoid surface cracks in the cast slab and to allow a safe operation

of the mould without break-outs of molten material from the not yet completely solidified cast slab.

It is admitted that this object is a fundamental and widely known requirement of any modern casting mould/apparatus and is as such not based on an inventive endeavour - in contrast to the **solution** laid down in granted claim 1.

4.4 The above solution according to granted claim 1 is based on the four features constituting the characterizing clause thereof, namely

- (a) the provision of a clearly curved connection between a first and terminal segment of the mould
- (b) an axial length of the terminal segment between one quarter to one sixth of the overall length of the mould
- (c) the provision of a constant section in the mould's lower part for at least 120 mm in combination with a lateral half-enlargement
- (d) the latter having a value between 1 to 12,5 mm and being defined by a specific radius.

4.5 It has now to be assessed whether or not this solution to the above objectively remaining problem of the invention is based on an inventive step within the meaning of Articles 56 and 100(a) EPC.

4.5.1 Appellant's arguments were based on a combination of documents (D1) and (D9) **and** on "general technical knowledge of a person skilled in the art". It is without any doubt that general technical knowledge has to be considered when assessing the issue for instance of inventive step by any body of the proceedings before the EPO. Under these circumstances the board allowed late-cited handbook (D0) into the proceedings could, however, not be convinced by the appellant that its consideration was an element against the validity of granted claim 1 since (D0) deals with the starter bar as such, however, does not discuss its requirements with respect to the mould's geometry according to above feature (c) prescribing an axial length of a constant section of its passage of at least 120 mm and also according to feature (d) prescribing a half-enlargement between 1 and 12,5 mm necessitating specific arrangements with respect to the use of a starter bar not being derivable from (D0). Under these circumstances the further discussion of the issue of inventive step can be reduced to the combination of (D1) and (D9).

4.5.2 As outlined above (D1) relates to a mould of the "straight" - type whereas (D9) represents the "**curved**" - type, see its Figures 3 and 5.

Not knowing the claimed invention this difference in construction would constitute an obstacle for a skilled person to consider (D1) and (D9) **in combination**. Even if, however, such a combination were considered a skilled person would have **to redesign** the mould and not only to improve its geometry as argued by the appellant.

4.5.3 (D9) is restricted firstly to a **curved** mould and to the mould's construction itself since structural elements following the mould in the casting direction are not to be seen from (D9), see column 3, lines 24 to 29, and are clearly not to be provided for since the mould of (D9) delivers a cast slab of its **final dimensions** without envisaging a subsequent soft reduction prescribed in claim 1 and its precharacterising features "containing means/first, second, third assembly of rolls" which complete the cast slab's reduction. Not knowing the claimed invention a skilled person was therefore confronted with the question of whether or not to provide for a soft-reduction after the reduction of the slab within the mould. Since furthermore **no incentive** could be derived from (D1) and (D9) to be considered in combination appellant's findings to the contrary are clearly the result of an **ex post facto - analysis** not to be applied in combination with the assessment of inventive step.

4.5.4 Summarizing the above observations it is irrelevant that (D9) discloses single features of claim 1 *per se*, namely a **curved** enlarged casting chamber - both on the entry and exit side of the mould - and three, however, **bent** zones connected by a curved intermediate zone. With respect to the claimed values for the half-enlargement on the entry side of the mould (D9) and its column 2, lines 18 to 24, these appear to be by far outside the claimed value of 30 to 90 mm, namely 12 mm, so that the irrelevance of (D9) cannot be compensated by a partial overlap of the half-enlargement on the mould's exit side i.e. claimed 1 to 12,5 mm and known 0,5 to 2 mm since a skilled person would not pick out

- some individual values of the mould's geometry and not others without knowing the claimed invention.
- 4.5.5 In addition to the above findings it has to be considered that (D9) leads away from the principles laid down in granted claim 1, see its embodiments according to Figures 6 and 7, being clearly based on an **abrupt** transition zone between neighbored segments, a principle contrary to the claimed **curved** connection zone. This is also true with respect to the claimed ratio between the lengths of the terminal segment and the overall extension of the mould which ratio obviously is of no importance in (D9) for a skilled person not knowing the claimed invention.
- 4.5.6 The above considerations can be summarized in that even a combination of (D1) and (D9) could not and would not directly achieve the subject-matter of granted claim 1 so that the requirements of Articles 56 and 100(a) EPC are met and claim 1 is valid.
- 4.5.7 This is also the case for the dependent granted claims 2 to 16 which relate to embodiments of valid claim 1.
- 4.5.8 Appellant's argument that the centering effect of the mould is known from (D9), see its column 3, line 41 to 46, is only partly convincing since (D9) in contrast to the subject-matter of valid claim 1 is not based on a mould having a half-enlargement on its exit side of the cast slab, see Figures 5 to 7, which disclose **flat** long sides of the mould on its bottom. Even if claim 4 of (D9) is considered it is noticed that claim 1 is based

on bigger half-enlargements (up to 12,5 mm) than are to be seen from (D9), namely only up to 2 mm.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

A. Counillon

C. T. Wilson