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D E C I S I O N
of 4 July 2003

Case Number: T 0237/00 - 3.2.3

Application Number: 92117842.2

Publication Number: 0539829

IPC: B22D 11/04

Language of the proceedings: EN

Title of invention:
Crystalliser, or inner portion, of a mould for the continuous curved casting of thin slabs

Patentee:
Danieli & C, Officine Meccaniche S.p.A.

Opponent:
SMS Schloemann-Siemag AG

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - ex post facto analysis"

Decisions cited:
-

Catchword:
-

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Case Number: T 0237/00 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 4 July 2003

Appellant: (Opponent I)
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Respondent: (Proprietor of the patent)
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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dated 7 October 1999, posted on 8 February 2000, rejecting the opposition filed against European patent No. 0 539 829 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: C. T. Wilson
Members: F. Brösamle
M. Aúz Castro

Summary of Facts and Submissions

I. European patent application No. 92 117 842.2 was granted with claims 1 to 12 as European patent No. 0 539 829.

II. Granted claim 1 reads as follows:

"1. "Crystalliser of a mould having opposed extrados/intrados plates (10, 110) with curved inner surfaces (12, 112) for the continuous curved casting of thin slabs, said crystalliser having a casting chamber for receiving a discharge nozzle, said casting chamber being formed by an enlargement hollow (11) present at least in the extrados plate (10), said hollow having a profile with a form and depth **characterised by the fact that** the hollow has a lenticular shape defined by an angle "α" and an angle "ß", said angles being defined respectively on a vertical plane perpendicular to the longitudinal axis of the mould and on a horizontal plane, the angle "α" being the angle between the generating line of the hollow and the line tangent to the curve of the crystalliser plate in the area where the generating line of the hollow intersects said curve, with angle "ß" being the angle between a line tangent to a horizontal section of the hollow and a line parallel to the longitudinal axis of the mould, where angle "α" must not exceed a maximum value of 5° and may vary, moving from the centre line to the sides , according to a linear development (15) contained within a field limited at the upper end by said maximum value and at the lower end by zero; and where angle "ß" must not exceed the value 4.5° and may vary, moving from

the upper plane (13) to the lower point (H), according to a linear development (17) contained within a field limited at the upper end by said maximum value and at the lower end by zero."

III. In the oral proceedings of 7 October 1999 the opposition division rejected the oppositions of the then two opponents SMS Schloemann-Siemag AG and Mannesmann AG against European patent No. 0 539 829; the written decision was issued on 8 February 2000.

IV. Against the above decision only SMS Schloemann-Siemag AG - appellant in the following - lodged an appeal on 17 February 2000 paying the fee on the same day and filing the statement of grounds of appeal on 15 June 2000. Mannesmann AG withdrew its opposition on 6 July 2000.

V. The appellant argued that granted claim 1 did not restrict the crystalliser to being curved "over the entire height of the crystalliser" and that combinations of

(D1) EP-A-0 300 953

(D2) WO-A-89/12 516

(D6) EP-A-0 230 886

rendered obvious a lenticular shape of the enlargement hollow present at least in the extrados plate of the crystalliser since a skilled person was aware that there existed no fundamental difference between a straight and a curved crystalliser with respect to the casting conditions and that (D1) disclosed an enlargement hollow with a lenticular shape even if in

(D1) this shape is created by concave and convex areas.

From (D2) a skilled person could derive an exact lenticular shape defined by horizontal and vertical angles "ß" and "α" which angles could be optimized according to the teaching of (D6) which document moreover discloses the shape of a lens and allows to derive a range for the above angles between 0° and 10°. Restricting the ranges for the angles under discussion is considered to be obvious since a skilled person would combine (D6) with the teachings of documents (D1) and / or (D2) to directly arrive at the subject-matter claimed. Summarizing, claim 1 does not define patentable subject-matter.

VI. The patentee - respondent in the following - essentially argued as follows:

Moulds having straight, partly straight, partly curved or totally curved containing plates for the liquid metal react completely differently with respect to the ferrostatic pressure of the liquid metal, the speed of descent on their intrados and extrados and the change of direction of the cast strand. Contrary to a casting chamber according to (D6), formed by rectangular and triangular elements the claimed lenticular shape has a continuous curved configuration; the curved shape on the upper side of the mould according to (D1) is only formed in the straight upper part of the mould, contrary to the claimed teaching being based on a completely curved mould/crystalliser, so that the specific problems thereof did not exist in (D1). In the absence of an unambiguous disclosure with respect to angles in (D1) it was not allowable to deduce from its schematic drawings specific values. Appellant's observations with respect to angles being disclosed in

(D1) are nothing more than an *ex post facto* analysis not allowable when assessing the disclosure of a prior art document by a skilled person. Summarizing, claim 1 defined novel and inventive subject-matter.

VII. The appellant requested to set aside the decision under appeal and to revoke European patent No. 0 539 829.

VIII. The respondent requested to dismiss the appeal (main request) or to dismiss the appeal with the proviso that the patent be maintained on the basis of an auxiliary request including the restriction that the curved inner surfaces extend "over the entire height of the crystalliser", the respondent leaving it to the discretion of the board whether to treat this auxiliary request as the main request.

Reasons for the Decision

1. The appeal is admissible.

Main request

2. In the light of the comments in the upper half of page 2 of the respondent's reply to the statement of grounds of appeal, namely that he thinks the proposed restriction " over the entire height of the crystalliser" is "useless" and that "we leave it to the discretion of the Appeals Commission to decide whether or not to take the enclosed proposal as the main claim" the board is convinced that a more logical attitude should consider the granted claim1 as the main request.

3. In granted claim 1, see its preamble, a mould is set out having "opposed extrados/intrados plates...with curved inner surfaces" (stress added). It is true that it is not literally prescribed in claim 1 that the curved inner surfaces extend over the entire height of the crystalliser; a consideration of the discussion of prior art (D1) in the patent and of Figures 1a, 4a and 7 and the corresponding text leads the skilled person, however, inevitably to consider only completely curved inner surfaces when reading the preamble of granted claim 1.

4. *Novelty*

Novelty not being disputed by the appellant and the board - see the board's Communication pursuant to Article 11(2) RPBA, remark 6 - this issue needs no detailed discussion. The crucial issue to be decided is therefore inventive step in the light of (D1), (D2) and (D6).

5. *Inventive step*

5.1 (D1) can be seen as the starting point of the invention; it is obvious that from (D1) completely curved inner surfaces of the extrados/intrados plates are not disclosed since in (D1), see for instance its claim 1 and Figures 2 to 4 reference signs 8" and 8' for a straight upper and a curved lower part of the crystalliser, the inner surfaces are not completely curved "over the entire height of the crystalliser" as to be understood from granted claim 1.

(D1) discloses different enlargement hollows, namely V-shaped according to Figure 2, or curved as in Figures 3 and 4, without, however, disclosing a

lenticular shape as claimed since a lenticular shape cannot be achieved by concave and convex curves according to the teachings of Figures 3/4 of (D1).

The drawbacks of the crystalliser of (D1) are discussed in the opening of EP-B1-0 539 829, see column 1, lines 28 to 42, in that the cast strand undergoes a change of direction when leaving the straight area and entering the curved area which change "creates problems for the skin being formed owing to separations, interruptions in the surface, localized melting and reduced extraction speeds". (D1) is completely silent about angles of its enlargement hollow in the crystalliser.

5.2 Starting from (D1) the objectively remaining problem to be solved by the invention is to avoid the above problems and to optimise the crystalliser's enlargement hollow for casting of thin slabs.

5.3 This problem is solved by the features laid down in granted claim 1 in which the angles of the enlargement hollow are clearly defined both in the horizontal and vertical plane, namely being smaller than 4.5° for angle "beta" and 5° for angle "alpha".

5.4 With the provisions of a lenticular shape of the enlargement hollow in combination with an entirely curved crystalliser and the restriction of the angles alpha and beta of the enlargement hollow to the above values it is achieved that the above problems with respect to separations, interruptions in the surface and localized melting are overcome, see EP-B1-0 539 829, Figures 2/3 and 5/6 and corresponding text, in which the importance of the angles' upper limits is clearly discussed.

5.5 Starting from (D1) a skilled person confronted with the solution of the above technical problem had to turn away from the teaching of (D1) by providing a completely curved crystalliser and a lenticular shape of the enlargement hollow which is defined by angles in a horizontal and vertical plane not to be exceeded. Since (D1) does not at all consider the importance of upper limits for the angles under discussion (D1) could be seen relevant only by hindsight i.e. knowing the claimed invention.

5.6 (D2) and (D6) are in some respect less relevant than (D1) since both documents disclose crystallisers being based on completely straight inner surfaces, see (D2) and Figures 2, 4 and 6 and see (D6) and its Figure 6.

5.7 Apart from the crystalliser's cross section (D6) could be seen relevant with respect to the shape of the enlargement hollow which can be curved, see claim 4 thereof ("bogenförmig") without, however, defining the geometrical shape of the enlargement hollow by excluding angles alpha and beta exceeding 5° and 4.5°, respectively.

5.8 The angle disclosed in (D6) for alpha, see page 4, second paragraph, is well outside the upper limit according to new claim 1; in Figures 2/3 of the patent specification EP-B1-0 539 829 it is clearly shown that making the angle "alpha" too big leads to poor results (see "field of nonadmissibility" beyond "alpha-max."). Not knowing the claimed invention a skilled person could not derive from (D6) the claimed angle(s) of the enlargement hollow. Deriving any angles from schematic

drawings - as carried out by the appellant - is not admissible so that appellant's argument with respect to a simple restriction of a known angle-range is not to be followed since it is the result of an *ex post facto* analysis.

5.9 The board cannot see any incentive in (D1), (D2) and (D6) to combine the teachings of these documents in order to achieve the subject-matter of new claim 1 so that appellant's argument that the combination of prior art leads directly to the claimed subject-matter must also fail.

5.10 Under these circumstances it is observed that the subject-matter of granted claim 1 is novel and inventive within the meaning of Articles 54, 56 and 100(a) EPC.

5.11 The granted dependent claims 2 to 12 relate to embodiments of granted claim 1; they are also to be maintained.

Auxiliary request

6. The main request being allowable there is no need to discuss the merits of the auxiliary request.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

A. Counillon C. T. Wilson