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**Datasheet for the decision
of 5 January 2009**

Case Number: T 1593/06 - 3.2.03
Application Number: 98402112.1
Publication Number: 0899041
IPC: B22D 11/10, C21C 7/076
Language of the proceedings: EN

Title of invention:

Mold powder for continuous casting and method of continuous casting using this powder

Patentee:

Sumitomo Metal Industries Limited

Opponent:

SMS Demag AG

Headword:

-

Relevant legal provisions:

EPC Art. 54, 56

Relevant legal provisions (EPC 1973):

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Keyword:

"Novelty (yes)"
"Inventive step (yes)"

Decisions cited:

-

Catchword:

-



Case Number: T 1593/06 - 3.2.03

D E C I S I O N
of the Technical Board of Appeal 3.2.03
of 5 January 2009

Appellant:
(Opponent)

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Decision under appeal:

Decision of the Opposition Division of the
European Patent Office posted 16 August 2006
rejecting the opposition filed against European
patent No. 0899041 pursuant to Article 102(2)
EPC.

Composition of the Board:

Chairman: U. Krause
Members: G. Ashley
K. Garnett

Summary of Facts and Submissions

- I. European patent EP-B-0 899 041 concerns a mold powder for continuous casting of steel and a continuous casting method that uses the mold powder. Grant of the patent was opposed on the grounds that the claimed subject-matter lacked novelty and/or inventive step (Article 100(a) EPC), in particular in light of an alleged public prior use. The Opposition Division concluded that the prior use had not been sufficiently substantiated by the Opponent, and that the claimed subject-matter was novel and inventive with respect to the remaining cited prior art. Hence the decision was taken to reject the opposition.
- II. The decision was posted by the Opposition Division on 16 August 2006. The Appellant (Opponent) filed notice of appeal on 29 September 2006, paying the appeal fee at the same time. A statement containing the grounds of appeal was filed on 21 December 2006.
- III. In accordance with Article 15(1) of the Rules of Procedure of the Boards of Appeal, the Board issued a preliminary opinion together with a summons to attend oral proceedings, setting out its view, amongst other things, on novelty and inventive step. In response, the Appellant stated that it would not file any further arguments and withdrew its request for oral proceedings (letter dated 6 August 2008). The Respondent also requested cancellation of the oral proceedings (letter dated 26 August 2008). Since the Board was in a position to arrive at a decision without recourse to oral proceedings, the appointed oral proceedings were cancelled.

IV. Requests

The Appellant requests that the contested decision be set aside and the patent be revoked in its entirety.

The Respondent requests that the appeal be rejected.

V. Claims

Claim 1 of the granted patent reads as follows:

"1. A mold powder for continuous steel casting, containing CaO, SiO₂ and fluoride as the main components, wherein the ratio by weight of CaO', represented by the following Equation (X), to SiO₂, ie CaO'/SiO₂, is 0.9 - 2.8 and the CaF₂ content, represented by the following Equation (Y), satisfies either of the following Condition (A) or (B), and further containing Na₂O in an amount of 0 - 25 wt.% and C in an amount from greater than 0 - 10 wt. %:

(A) if CaO'/SiO₂ is not less than 0.9 and not greater than 1.9, the CaF₂ content is 15 - 60 wt. %;

(B) if CaO'/SiO₂ is greater than 1.9 and not greater than 2.8, the CaF₂ content is 5 - 60 wt. %,

wherein

$$\text{CaO}' = \text{T} \cdot \text{CaO} - \text{F} \times (56/38) \quad (\text{X})$$

$$\text{CaF}_2 = \text{F} \times (78/38) \quad (\text{Y})$$

T.CaO: the total Ca content in the mold powder as converted to CaO (wt.%), and
F: the total F content in the mold powder (wt.%)."

Independent claim 8 concerns a method for continuously casting steel by use of the mold powder defined in claim 1. Dependent claims 2 to 7 and 9 to 13 concern preferred embodiments of the mold powder and the method respectively.

VI. Prior Art

The following documents, amongst others, were cited in the opposition proceedings as evidence of a prior use of a mold powder:

D2: Analysis sheet 08.92 from Metallurgica relating to mold powders Scorialit SPH-SL 622;
D3: Analysis sheet 03.96 from Metallurgica relating to mold powders Scorialit SPH-SL 622/F;
D4: Analysis sheet 07.96 from Metallurgica relating to mold powders Scorialit SPH-SL 622/F 1;
D15: Analysis sheet 09.96 from Metallurgica relating to mold powders Scorialit SPH-SL 1188/DT 1-A;
D19: Analysis sheet 05.92 from Metallurgica relating to mold powders Scorialit XL 34/C.
D26: Copy of a facsimile sent from Metallurgica to SMS Demag AG, 04.12.1996.

The following patent documents were referred to in the contested decision.

D32: JP-A-0 3193248

D32A: Translation in English of D32

D35: GB-A-2 000 198

The Appellant filed the following witness statements together with the grounds of appeal.

EV1: Eidesstattliche Versicherung from
Herrn V. Mossdorf, dated 18 December 2006.

EV2: Eidesstattliche Versicherung from Herrn Moßner,
dated 18 December 2006.

VII. Submissions of the Parties

(a) Novelty (Articles 100(a) and 54 EPC)

The Appellant submitted witness statements EV1 and EV2 as evidence of the public availability of datasheets D1, D3, D4, D15 and D19. According to the Appellant's calculations, casting powders 622 of D2, 622/F of D3, 622/F1 of D4, 1188/DT1-A of D15 and XL34/C of D19 all meet the requirements of claim 1. In particular, the CaO'/SiO_2 ratios lie are in the range 0.9 to 1.9, and the CaF_2 contents are in the range 15 to 60 wt%.

The Respondent maintains that D2, D3, D4, D15 and D19 do not belong to the state of the art for the reasons given by the Opposition Division, namely that there is insufficient proof that they were made available to the public. In this context, the Respondent submits that the statements by Herr Mossdorf and Herr Moßner should not be admitted into the appeal proceedings, as they have been produced late, when they could have been filed earlier in the proceedings; in addition, they do

not clearly add anything further to the documents to which they refer.

The Respondent also argues that the calculations provided by the Appellant are based on combinations of upper and lower values of the ranges, without justifying such choices and considering the effects on remaining components of the powders.

(b) Inventive Step (Articles 100(a) and 56 EPC)

The Appellant alleges that the mold powder of claim 1 lacks an inventive step in light of the documents D32 and D35.

The Appellant argued that D32 discloses a mold powder containing 38.7 wt% CaO, 31.0 wt% SiO₂ and 7.2 wt% F, to which 3 wt% of an oxide from groups IIIA or IVA of the periodic table can optionally be added. The CaO/SiO₂ ratio for this composition is 0.91 which, according to claim 1, requires the CaF₂ content to be within the range 15 to 60 wt%. The CaF₂ content of the powder of D32 is 14.8 wt%, and since this lies within the mathematical accuracy of "15 wt%" given in claim 1, this feature is disclosed in D32.

The mold powder thus differs from that of D32 only in that it contains more than 0 to 10% carbon. Starting from D32, the objective problem to be solved is the provision of an alternative mold powder that is suitable for high speed casting without the formation of defects. Since D35 discloses a mold powder having the required amount of carbon, it would be obvious for the skilled person to add such an amount to the

composition of D32. Hence the claimed mold powder lacks an inventive step.

The Respondent, along with the Opposition Division, consider D32 to be the closest prior art. The Respondent argues that, according to D32, 3 wt% of an additive having a very high solidification temperature, such as ZrO_2 , is added to a conventional mold powder in order to cast at high speed. The composition of D32 must therefore be read as containing ZrO_2 . This gives a CaF_2 content of 14.37 wt%, which is outside the range given in claim 1. The claimed mold powder is thus novel over D32 in terms of the CaF_2 content, without the necessity to consider the carbon content.

In D32 continuous casting is carried out at 2 m/min. The aim of the invention set out in the disputed patent is to increase casting speed to about 5 m/min, whilst avoiding crack formation. The high casting speed of D32 is obtained by using a mold powder having a high solidification point, achieved by the addition of the group IIIA or IVA oxides, which is crystallized on solidification. This is a completely different solution to that set out in claim 1 of the disputed patent and cannot be derived from reading D32. Hence the claimed mold powder has an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty (Article 54 EPC)*

2.1 Powders Marketed by Metallurgica

There is no evidence of any actual sale of mold powders having taken place. However, the Appellant alleges that the subject-matter of claim 1 is not new with respect to D2, D3, D4, D15 or D19, these being data sheets for various molding powders from a company called "Metallurgica", and according to the Appellant were made available to potential customers before the priority date of the disputed patent.

2.2 Public Availability of the Data Sheets

2.2.1 In support of the Appellant's submission that data sheets D2, D3, D4, D15 or D19 form part of the prior art, witness statements EV1 and EV2 were filed with the grounds of appeal. The Respondent submits that these statements should not be admitted into the proceedings, as they have been filed late and add nothing further to the existing evidence.

Documents D2 to D26 were all submitted in time within the nine month opposition period, as evidence of the availability before the priority date of the contested patent of mold powders having the features of claim 1. The decision under appeal is based on the fact that the Opposition Division felt that this evidence was insufficient to substantiate a prior disclosure, as the date and circumstances of the alleged prior use were not sufficiently clear; the witness statements EV1 and EV2 were not available to the Opposition Division. On appeal, it is proper to allow the Appellant to

supplement the evidence, which has been submitted in due time, with witness statements EV1 and EV2. Consequently EV1 and EV2 are admitted into the proceedings.

- 2.2.2 The Appellant refers to figures printed under the company's logo on the data sheets as referring to the date of publication, such as 05.92 (D19) and 09.96 (D15). In EV1 Herr Mossdorf, an employee of Metallurgica, testifies that these figures correspond to the date from which the both the powder and the data sheet were made available.

Herr Mossdorf explains in EV1 that the data sheets were sent to potential customers in order to inform them of the latest powders. Should a customer place an order, they would then receive an analysis certificate confirming that their powder met the specification on the data sheet. In his statement, Herr Mossdorf mentions two customers who had ordered powders corresponding to the specifications given in D2 and D19.

D26 is a copy of a facsimile sent from Metallurgica to SMS Demag AG (the Appellant) as a follow-up to a telephone conversation between Herr Mossdorf from Metallurgica and Herr Moßner from SMS Demag AG, in which three mold powders, including that of D2 (Scorialit SPH-SL 622), are offered for sale. The facsimile refers to three data sheets annexed to the facsimile as providing technical data, and in EV2 Herr Moßner states that datasheet D2 was attached to the fax.

The Respondent argues that data sheets such as those tendered by the Appellant are usually kept secret, however there is no evidence to support this assertion.

2.2.3 The Board has no reason to doubt the statements made in EV1 and EV2. It seems that, on the basis of the evidence before the Board, in particular the fax (D26) concerning the offer to sell the powder Scorialit SPH-SL 622, that at least data sheet D2, which gives the composition of Scorialit SPH-SL 622, was made available to the public before the relevant date of the disputed patent.

2.3 Novelty in light of the Data Sheets

Moving on from the publication of the data sheets, the issue of substantive novelty is assessed as follows.

2.3.1 As set out above, of all the various data sheets provided by the Appellant, there is documentary evidence (D26) of data sheet D2 having been sent to a prospective customer, and Herr Mossdorf indicates in his statement (EV1) that D19 was sent to a steel company in England. Novelty is therefore assessed only in respect of the composition of mold powders Scorialit-SPH-SL 622 (D2) and Scorialit XL 34/C (D19).

2.3.2 Scorialit-SPH-SL 622 (D2)

D2 is a fact sheet describing the properties of Scorialit-SPH-SL 622 which includes a chemical analysis of the powder. The Appellant has taken the upper limit of the range given in D2 for the combined (CaO + MgO) content as being the CaO value and, together with the

lower limit of the defined F range, has shown that the CaO'/SiO_2 ratio and the CaF_2 value meet the requirements of claim 1.

The combined ($\text{CaO} + \text{MgO}$) content is said in D2 to lie in the range 37.5 to 39.5. The MgO content is not known, and in such molding powders it might merely be at impurity level (see paragraph [0058] of the disputed patent) or it could be a deliberate addition (paragraph [0055]). Without knowing the MgO content, the CaO content cannot be derived with any degree of certainty from D2; hence the calculated CaO'/SiO_2 ratio is also not derivable from D2. The subject-matter of claim 1 is thus novel with respect to D2.

2.3.3 Scorialit XL 34/C (D19)

The chemical analysis given in D19 for the powder Scorialit XL 34/C requires that the ratio CaO/MgO lies in the range 37.0 to 39.0, from which the Appellant has taken the CaO content to be 39.0. As in the case of D2, this ignores the amount of MgO in the composition and hence the CaO content is not certain. The claimed relationships involving CaO cannot therefore be derived from D19 and the powder of claim 1 is novel in light of this document.

2.3.4 In summary, irrespective of any doubt about public availability of the datasheets, the claimed mold powder is novel because it differs from both D2 and D19 in that the CaO content, and hence the claimed ratios involving CaO, cannot be derived unambiguously from these documents.

3. *Inventive Step (Article 56 EPC)*

3.1 The Appellant argues that there is a lack of inventive step in light of documents D32 and D35.

3.2 D32 relates to mold powders and addresses the same problem as that of the disputed patent, namely to provide a powder that is effective at increased casting speeds (see paragraph [0008] of the contested patent). D32 is considered by the Respondent and the Opposition Division to be closest prior art, and the Board also sees this document as an appropriate starting point for the assessment of inventive step. Reference is made to the English language translation of D32 (D32A), which was provided by the Respondent during the examination phase.

D32 discloses a base composition of a mold powder, to which oxide(s) of Group IIIA or IVA elements are added (see page 5 of D32A). The following example of the base composition is given in Table 1 (page 6 of D32A):

31.0% SiO₂, 38.7% CaO, 4.7% Al₂O₃, 6.2% Na₂O, 2.4% MgO, 9.8% Li₂O, 7.2% F.

3% ZrO₂ or TiO₂ is added to this composition (Figure 3 and page 9, second paragraph) in order to raise the solidification temperature of the powder (page 5, last paragraph) and provide a powder suitable for casting at higher speeds without surface defects (Figure 3).

The Appellant calculates a value of 14.8 for the CaF₂ content of the mold powder of D32, but this figure is based just on the composition given in Table 1, which

ignores the addition of ZrO_2 or TiO_2 . Since the clear teaching of D32 is that Group IIIA or IVA oxides must be added when casting at high speeds, the calculation of the Respondent, which takes account of a 3% addition of ZrO_2 , provides a more accurate figure of 14.37%.

- 3.3 Concerning the CaO/SiO_2 ratio, this is calculated using either the Appellant's or the Respondent's figures, to be 0.91. For this value claim 1 requires a minimum CaF_2 content of 15 wt%. Since the CaF_2 content of the D32 powder is 14.37%, the powder of claim 1 differs from D32 in that it contains more CaF_2 .
- 3.4 Starting from D32, the problem to be solved can be seen as how to increase further the casting speed, whilst preventing the formation of surface defects.
- 3.5 As set out above, the powder of claim 1 differs from that of D32 in that it contains more CaF_2 . A minimum amount of CaF_2 is defined in the powder of claim 1 in order to ensure that a sufficient amount of crystallisation occurs when the molten slag is cooled and solidifies (see paragraph [0041] of the disputed patent). This results in higher heat resistance and uniform cooling of the solidified steel shell through the slag film, which prevents the formation of longitudinal cracks (paragraphs [0023] to [0026]). It can be seen from Figure 3 of the disputed patent that for a CaO/SiO_2 ratio of not less than 0.9 and not greater than 1.9, a CaF_2 content of 15% marks a distinct boundary beyond which there is a significant increase in the crystallisation index (paragraph [0047]).

3.6 As argued by the Respondent, the powder of the disputed patent allows for a casting speed of 5 m/min or higher, whereas D32 relates to a casting speed of only 2 m/min (see the bottom of page 6). The higher casting speed is achieved as a result of increased crystallisation, which is a result of limiting the composition to the regions (a) and (b) of the ternary diagram shown in Figure 1, which are defined in claim 1.

3.7 Since there is no indication in D32 that higher casting speeds can be achieved by increasing crystallisation through a higher CaF_2 content, and document D35 also does not provide any hint of the solution, the claimed powder has an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:

A. Counillon

U. Krause