

**Internal distribution code:**

- (A) [ ] Publication in OJ  
(B) [ ] To Chairmen and Members  
(C) [X] To Chairmen  
(D) [ ] No distribution

**D E C I S I O N**  
**of 29 January 2004**

**Case Number:** T 0495/02 - 3.2.3  
**Application Number:** 94904542.1  
**Publication Number:** 0679115  
**IPC:** B22D 11/10, B22D 11/04  
**Language of the proceedings:** EN

**Title of invention:**

A. C. magnetic stirring modifier for continuous casting of metals

**Patentee:**

J. Mulcahy Enterprises Inc.

**Opponent:**

Concast Standard AG

**Headword:**

-

**Relevant legal provisions:**

EPC Art. 56, 100(a)

**Keyword:**

"Inventive step - ex post facto analysis"

**Decisions cited:**

-

**Catchword:**

-



Case Number: T 0495/02 - 3.2.3

**D E C I S I O N**  
**of the Technical Board of Appeal 3.2.3**  
**of 29 January 2004**

**Appellant:** Concast Standard AG  
(Opponent II) Tödistrasse 9  
CH-8027 Zurich (CH)

**Representative:** -

**Respondent:** J. Mulcahy Enterprises Inc.  
(Proprietor of the patent) Whitby,  
Ontario L1N 7L5 (CA)

**Representative:** Beresford, Keith Denis Lewis  
BERESFORD & Co.  
16 High Holborn  
London WC1V 6BX (GB)

**Decision under appeal:** Interlocutory decision of the Opposition  
Division of the European Patent Office dated  
19 March 2002 concerning maintenance of  
European patent No. 0679115 in amended form.

**Composition of the Board:**

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

## Summary of Facts and Submissions

I. With decision of 19 March 2002 the opposition division maintained European patent No. 0 679 115 as amended pursuant to Article 102(3) EPC. The prior art dealt with in this decision was *inter alia*

D3: DE-A-3 819 492.

II. The independent claim 1 (process) as maintained by the opposition division reads as follows:

"1. A process for continuously casting billets and blooms from molten metal utilising apparatus which comprises a casting mold into which the molten metal is introduced by a process of open pouring of the molten metal and performing an induction stirring method on the molten metal in the mold, the induction stirring method comprising:

electromagnetically inducing stirring of molten metal with such intensity as normally to result in turbulence in the molten metal including its free surface, by applying a first rotating magnetic field to said molten metal, and  
applying a second rotating magnetic field produced by a source separate from that providing said first magnetic field and at a location upstream of said stirring  
wherein:

the second rotating magnetic field is rotated in the same direction as the direction of rotation of the first field to enhance stirring motion in said free surface area but applies a torque to the molten metal which is lower than that applied by the first field."

III. Against the above decision the opponent II Concast Standard AG - appellant in the following - lodged an appeal on 17 May 2002 paying the fee on the same day and filing the statement of grounds of appeal on 5 July 2002 and the requests on 11 July 2002. In his statement of grounds of appeal the appellant relied moreover on

D6: AT-B-184 313

and came to the result that the subject-matter of above claim 1 is not novel or at least not based on an inventive step.

IV. Following the board's communication pursuant to Article 11(2) RPBA in which the board expressed its provisional opinion with respect to novelty and inventive step oral proceedings were held before the board on 29 January 2004 in which the parties essentially argued as follows:

(a) appellant:

- (D6) can be seen as a piece of prior art which summarised the general technical knowledge in the technical field of continuous casting, discussing *inter alia* the influence of metal stirring in that too much rotation led to the inclusion of slag particles and too little rotation to a harmful coating of the strand with particles of slag on its outside so that (D6) taught the use of one or more coils, each being independently controllable, to create a small, visible central depression as a

prerequisite for a good strand quality, namely having small crystal and good surface properties;

- (D3) *inter alia* being based on open iron casting with an immersion tube could make use of the teaching of (D6), namely to adjust the rotation, (a synonym for the claimed parameter "torque") so that a good strand quality was achieved excluding slag and the creation of dendrites by an intense stirring effect; as in claim 1 the lower coil of (D3) is assisted in its function by the upper coil which is independently adjustable with respect to the lower coil;
- the claimed parameter of "torque" has to be seen as only one possibility out of a multitude of adjustable casting-parameters;
- the technical term of claim 1 "turbulence" not being self-explanatory was not defined in the complete patent specification and therefore not suited to distinguish the teaching of claim 1 from the prior art;
- with respect to the above prior art it was not clear which object was to be solved by the claimed invention since an additional technical effect of the "torque-teaching" of claim 1 was not to be seen so that the application of the so-called problem-solution-approach was impossible; should turbulence be a synonym for the melt's rotation the aspect of the invention's object of an accurate control of stirring was known and solved in the claimed manner:

(b) respondent (patentee):

- essential features of claim 1 were not interpreted correctly since the first rotating magnetic field acts on the molten metal "with such intensity...to result in turbulence in the molten metal including its free surface"; secondly the second rotating magnetic field enhanced the stirring motion of the first field and thirdly according to claim 1 the torque of the second field was less than the torque created by the first field;
- without defining the technical expression of "torque" in claim 1 a skilled reader was aware what had to be understood since the formula in column 5, lines 51 to 58, of EP-B1-0679115 clearly linked the magnetic torque "T" to parameters such as current, frequency, electrical conductivity, magnetic flux density and the radius of the stirred pool, see also Figure 2 as granted and its graphs "U<sub>R</sub>" ("without A.C.MSM, decreasing velocity and adding velocity", respectively);
- (D6) could not be seen as a prior art disclosing the coils' arrangement and their related torques but was rather limited to maintaining a central depression and considering its wetting angles;
- (D3) as far as dealing with an open casting process was silent about the effect of turbulence and the ratio of torques applied by the first and second coil, respectively, to the liquid metal; from the patent specification it could in contrast

to (D3) be seen that an excessive stirring was harmful; according to (D3) a strongest possible stirring motion had to be carried out, however, to effect a complete degassing of the liquid metal;

- Figures 1 and 4 as granted make it clear that the upper coil in contrast to the complete prior art was smaller in its torque (rotation effect) so that there was sufficient support of the claimed teaching in the patent specification.
- V. The appellant requested that the decision under appeal be set aside and that the European patent No. 0 679 115 be revoked.
- VI. The respondent requested that the appeal be dismissed.

### **Reasons for the Decision**

1. The appeal is admissible.
2. *Amendments*
  - 2.1 Claim 1 underlying the decision under appeal is restricted to **an open pouring process** (i.e. without a submerged entrance nozzle); according to claim 1 a first and a second rotating magnetic field are applied to the molten metal, these two rotating magnetic fields being arranged one above the other and rotating in the same direction of rotation and enhancing one another, however, the upper magnetic field applying a torque to the molten metal which is lower than that of the lower magnetic field and the first rotating magnetic field

inducing stirring of molten metal with such intensity as normally to result in turbulence in the molten metal including its free surface.

2.2 With this process it is achieved that the electromagnetic stirring intensity is flexibly controlled within a continuous casting mould with respect to stirring conditions and accuracy of stirring control.

2.3 Limiting an independent claim to only one of two previously-claimed alternatives (open casting process) is clearly allowable in opposition (and appeal) proceedings so that in the present case the requirements of Article 123(2) and (3) EPC are met.

3. *Prior art to be considered*

As a consequence of respondent's restricting claim 1 to an open pouring process the appellant cited a new document, namely (D6), which was not contested by the respondent as late-filed and was clearly discussed in the oral proceedings before the board together with (D3).

4. *Support of claim 1*

4.1 From EP-B1-0 679 115, see column 5, lines 40 to 58, and Figure 2, it is clear what is meant by "torque", namely the magnetic torque "T" being a function *inter alia* of the current frequency "f" and the magnetic flux density "B", see in particular formula "(4)" and Figure 2. From Figure 2 it is clearly derivable that the "B"-values and the directly related T-values of the second



induction coil "20" are (by far) smaller than those of the first induction coil "12" so that it is justified to derive therefrom that the torque of the second induction coil (second rotating magnetic field) "is lower than that applied by the first field", see claim 1, last feature.

- 4.2 Appellant's objection in this respect, see statement of grounds of appeal, remark 3.21 ("wegen fehlender Abstützung im Anmeldetext aus dem Anspruch 1 zu entfernen"), and remark 3.0 of "Zusammenfassung" is therefore not supported by the facts.

5. *Novelty*

Before the board the appellant did not in fact question novelty of the subject-matter of claim 1 in the light of (D6) or (D3), and, since the board is also of the opinion that neither (D3) nor (D6) discloses all features of claim 1, no detailed discussion of novelty is necessary and the crucial issue to be decided is inventive step.

6. *Inventive step*

- 6.1 Based on (D6) the appellant worked out his view of the skilled person's general knowledge in the technical field of continuous casting and concluded that a compromise had to be found between too much stirring - leading to the inclusion of particles of slag - and too little stirring - leading to a harmful coating of the strand's surface. The appellant concludes that the strand's liquid surface (melt) has to be observed and controlled to maintain a small central depression and

to safeguard favourable wetting angles on the outer surfaces of the strand by applying one or more coils being independently controllable. Appellant's further conclusion was that this general technical knowledge could be readily used in combination with the process disclosed in (D3), namely an open casting process, thereby equating the claimed torque with rotation and arguing that in (D3) the upper coil enhanced the lower coil. Since "torque" and "turbulence" were not clearly defined in the patent specification according to the appellant they are not suited to distinguish any possible inventive teaching from the prior art's teaching.

- 6.2 The board - widely in agreement with respondent's findings - cannot accept the appellant's line of arguments for the following reasons:
- 6.3 Based on formula "(4)" of EP-B1-0 679 115, see column 5, lines 48 to 58, "torque" can be understood as something which creates a rotation of liquid metal so that Figure 2 as granted is relevant for understanding the parameter (magnetic) "torque" sine this figure shows rotational speeds, respectively "without", "adding" and "decreasing" velocity to the melt by the action of the upper coil, according to granted Figure 2 reference sign "20" and titled "A.C.MSM".
- 6.4 In contrast to the teaching of (D6) claim 1 firstly relates to the first magnetic field and to the existence of **turbulence** by prescribing "inducing stirring of molten metal with such intensity as **normally to result in turbulence** in the molten metal including **its free surface**" (stress added). Nothing can

be derived from (D6) nor from (D3) about **the stirring intensity used in combination** with the first or lower coil so that any other conclusion is a conclusion with the exercise of **hindsight** i.e. knowing the claimed invention.

If a skilled person were to be confronted with the problem of finding a compromise between two extreme rates of stirring, he would not be taught by (D6) and/or (D3) firstly to adjust the first coil or lower coil with such an intensity which normally leads to **turbulence**, which technical expression is considered to be self explanatory and clearly limiting the action of the first coil with respect to the scope of protection of claim 1 and distinguishing the teaching of claim 1 over (D6) and (D3) which both are silent in this respect.

6.5 Claim 1 goes on to prescribe the **same direction** of rotation with respect to the first and second coils in that the stirring motion of the first coil **is enhanced** by the second coil and limiting the second coil to induce less torque to the molten metal than the first coil.

Even if (D6) teaches two coils which are independently adjustable this document is not only silent about the **separated influence** of the first coil, the **directions of rotation** caused by the first and the second coil and by the ratio of torque produced by the one or the other coil, namely the upper/second coil being less effective than the lower/first coil with respect to inducing stirring of molten metal as prescribed in claim 1.

6.6 The crucial issue to be decided in this context is therefore what **would** a skilled person have done rather than what **could** he have done. In the present case the board comes to the result that the appellant has only demonstrated that a skilled person **could** achieve the subject-matter of claim 1 when considering in particular the teaching of (D6) which approach is clearly based on the knowledge of the claimed invention. The appellant failed to convince the board that the skilled person starting from (D6) and considering also (D3) **would** achieve the subject-matter of claim 1 under the precondition of not knowing the claimed subject-matter. In the present case the independent claim 1 is a **process-claim** so that the conclusion from any known **apparatus** to the claimed invention - such as from (D6) or (D3) - is only allowable when the known apparatus is used as claimed, namely in that the first stirrer firstly is operated with such intensity as normally to result in turbulence in the molten metal including its free surface, secondly that the second stirrer operates in the same direction of rotation as the first stirrer thereby enhancing the stirring motion and that it is thirdly safeguarded that the torque applied by the second stirrer is lower than that applied by the first stirrer. Even if the prior art relied already on more than one stirrer, operated independently from one another, this apparatus **has not necessarily been operated** with the three above features of claim 1 so that any different findings are no more than speculation not supported by the facts.

6.7 Appellant's further arguments with respect to the objectively remaining object to be solved by the invention and to the non-applicability of the so-called

problem-solution-approach cannot be followed either by the board since column 3, lines 52 to 58, underlying the impugned decision makes clear that a method should be provided in which the accuracy of stirring control is achieved. The prior art according to (D6) and (D3) **is silent** about this aspect of the object to be solved by the claimed invention and these pieces of prior art do not disclose a solution of this aspect of the object to be solved by the invention so that the subject-matter of claim 1 has to be seen as a patentable contribution to the prior art, Articles 56 and 100(a) EPC, resulting in the validity of claim 1.

6.8 Claims 2 to 6 relate to embodiments of claim 1 and are likewise valid.

## **Order**

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

The appeal is dismissed.

The Registrar:

The Chairman:

A. Counillon

C. T. Wilson