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D E C I S I O N
of 10 May 1995

Case Number: T 0739/90 - 3.2.2

Application Number: 83101427.9

Publication Number: 0092652

IPC: C21C 7/00

Language of the proceedings: EN

Title of invention:
Apparatus for treating molten metal and method refining steel metls

Patentee:
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Opponent:
PAUL WURTH S.A.
Mannesmann Aktiengesellschaft

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0739/90 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 10 May 1995

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Decision under appeal: **Decision of the Opposition Division of the European Patent Office dated 13 July 1990 rejecting the opposition filed against European patent No. 0 092 652 pursuant to Article 102(2) EPC.**

Composition of the Board:

Chairman: H. Seidenschwarz
Members: R. Lunzer
M. Aúz Castro

Summary of Facts and Submissions

I. European patent No. 92 652 was granted on 16 September 1987 on the basis of application No. 83 101 427.9, filed on 15 February 1983, claiming a priority date of 12 April 1982 based on US application No. 367 796. The patent as granted has four claims, all directed to apparatus, Claim 1 being in the following form:

"1. Apparatus for treating molten metal comprising in combination a ladle intended to contain the molten metal to be treated and a hood (4) arranged above the ladle, said hood comprising a heat shield (6) which essentially covers the ladle completely, where a gap (9) is left between the heat shield and the upper edge (8) of the ladle; a screen (10) which extends over and underneath the said gap so that a circumferential opening (16)is formed between the screen and the ladle underneath the said gap, said circumferential opening defining an inlet opening for ambient air to a chamber (17) under said screen, at least one lance for introducing at least gas into the melt in the ladle and/or to the ladle chamber above the molten metal, at least one exhaust pipe (18) communicating with the chamber (17) under the said screen for sucking out exhaust gases which pass from the ladle chamber (26) out into the said space (17) through the said gap (9) and also air which is sucked from the ambient atmosphere into the said space (17) mainly through the circumferential opening (16) between the screen and the outside of the ladle, at least one aperture (19-22) which is provided in the hood for at least one lance (23, 25) which can be lowered into the ladle chamber underneath the heat shield and/or into the melt in the ladle, that means are provided for maintaining an inert gas overpressure in said ladle chamber (26) during said

injection and thereafter prior to casting, and that means are provided for maintaining a sub-atmospheric pressure - i.e. an underpressure with reference to the ambient atmosphere - in said space under said screen."

II. Within the prescribed time limit oppositions were filed by the two Appellants (Opponents O1 and O2) on the ground of Article 100(a) EPC, alleging essentially lack of any inventive step (Article 56 EPC). The Appellants relied on the following documents:

(1) US-A-4 309 025
(2) GB-A-1 395 556
(3) Aciers speciaux, No. 48, 11.79, page 14
(4) AT-B-362 412
(5) DE-B-1 508 175
(6) DE-C-2 239 307.

III. By its decision issued in writing on 13 July 1990, the Opposition Division maintained the patent as granted. It regarded document (1) as the closest prior art. In the apparatus there disclosed, a collar 8 in the form of an open ended cylinder has a diameter smaller than the ladle. It is immersed in the melt at one end, while the other end opens into a hood. That arrangement differed from the heat shield according to the patent in suit to the extent that the inert gas overpressure, required by the patent in suit, could not be maintained by such a collar. The Opposition Division held further that it would not have been obvious to the skilled worker to have replaced the collar by the heat shield of the patent in suit. It acknowledged that the object of the patent in suit was to achieve the exclusion of oxygen from the ladle, and that this objective was achieved by maintaining an inert gas overpressure in the ladle underneath the heat shield. This had the effect that

steels having an extremely low oxygen content, down to not more than 5 or preferably 2 ppm, could be attained at reasonable cost.

The Opposition Division dealt also with the other cited documents, including document (5), which it did not regard as particularly relevant because it disclosed a lid set on the edge of the ladle, as distinct from a gap being left between the lid and the upper edge of the ladle, and did not disclose a heat shield, nor any gas injection lance.

IV. Appeals against that decision was filed respectively by the Appellants O1 and O2 on 10 and 12 September 1990, the appeal fees were paid on the same dates, and the Statements of Grounds of Appeal were filed respectively on 3 and 8 November 1990. The Appellants argued that the alleged invention was not the attainment of low oxygen contents, but rather the provision of an apparatus which prevented reoxidation through access of ambient air to the already deoxidised molten steel. The solution of that problem, by providing an inert gas kept at an overpressure above the melt, so as to prevent the ingress of air, was trivial and could not involve any inventive step. The need for such an overpressure was inevitable in the eyes of the skilled worker in a situation where a treatment lance needed to protrude into the ladle, and ingress of air had to be prevented.

V. By a communication dated 5 August 1994 the Board drew the attention of the Respondent to the fact that although it might be argued that, as had been found by the Opposition Division, the alleged invention could not be said to be obvious having regard to the cited prior art, nevertheless it could be said to be obvious in the light of common general knowledge in the industry, more particularly the general knowledge that control over the

entry or escape of gases can readily be achieved by suitable control over their pressures, while the prevention of contamination of molten metal by the use of an overpressure of an inert gas was exemplified in the common practice of protected arc welding. Although invited to reply to that communication, the Respondent did not do so.

VI. The Appellants requested that the decision under appeal should be set aside, and the patent in suit revoked. The Respondent (Patentee) did not file any submissions or request.

Reasons for the Decision

1. The appeal is admissible.

2. *Novelty*

Novelty was not in issue on appeal. Having reviewed the cited documents, the Board is satisfied that none of them discloses an apparatus having all the features defined in Claim 1. Therefore the subject matter of Claim 1 is considered to be novel within the meaning of Article 54 EPC.

3. *The alleged invention*

Although Claim 1 is long, and introduces a great many features, the alleged invention resides in the combination of two simple ideas in an apparatus intended to secure the production of steels having very low oxygen contents. Those ideas are (i) the prevention of contamination of the melt by the atmosphere by the provision of one or more lances for introducing gas into

the metal, and/or into the ladle chamber (i.e. the space between the surface of the metal and a cover over the ladle, termed a "heat shield") which is filled with an inert gas at an overpressure with respect to atmospheric pressure, and (ii) the provision of an extraction hood (termed a "screen") extending over and below the top of the ladle which permits the maintenance of sub-atmospheric pressure within that hood.

4. *Inventiveness*

4.1 The Board agrees with the Opposition Division in rejecting an argument of obviousness based on document (1). That citation relates to a pig iron refining ladle, provided with a funnel-shaped lid or cover 4, having an edge 5 which overlaps and extends below the edge 2 of the ladle. There is an exhaust connection piece 7 attached to the top of the cover 4, so that the effect of the cover is to prevent noxious fumes evolved from the ladle escaping into the atmosphere. A large vertical collar 8, extends from below the level of the liquid melt to well above, and is intended to reduce the effect of splashing. That collar bears no resemblance to the heat shield 6 of the patent in suit, and the Board agrees with the Opposition Division in concluding that this disclosure would not render the alleged invention obvious.

4.2 Turning to document (5), whereas in the decision under appeal attention was directed to column 2 lines 19 and 20 of document (5), where it is stated that the lid 1 lies **on** the rim of the ladle 6, the skilled reader of that document could hardly fail to observe (as pointed out in the statement of opposition by Appellant O2 at page 4 middle paragraph) that Figure 2 of document (5) shows clearly a gap between the rim and the lid. Furthermore, the skilled reader of that document would

observe that as it is concerned with making spheroidal graphite cast iron (column 1 line 2). He would therefore expect that some volatilised magnesium would create an overpressure, which would need to escape, such as through the gap shown in Figure 2 between the rim of the ladle and its lid, from which it would pass through the slotted holes 13 into the chamber 17, before being removed into the hollow support arm 3 under the influence of a suction pump 12.

4.3 Document (5) in fact relates to an apparatus having all the features of the subject-matter of Claim 1 in suit, save only that it does not disclose the use of a lance to supply an overpressure of an inert gas in the zone above the surface of the melt. That concept is expressed by the three requirements of the Claim, of having:

(i) "at least one lance, for introducing gas into the melt in the ladle and/or into the ladle chamber above the molten metal,"

(ii) the corresponding, "at least one aperture in the hood for at least one lance", and

(iii) "means for maintaining an inert gas overpressure in said ladle chamber".

In comparison with the proposal of document (5) it is noted that although the lid 1 is integral with an external collar 14, which has the equivalent effect of what is termed the "screen 10" of the patent in suit, the outer surface of the lid 1 extends over and underneath the gap shown in Figure 2 of document (5) between the ladle 6 and lid 1.

4.4 Accordingly, the issue is whether a skilled worker, confronted with the task of preventing access of air to steel which is being deoxidised, and having before him the apparatus of document (5), would have needed to exercise any inventive ingenuity by modifying it to the extent of providing a lance penetrating the hood, through which an inert gas could be blown so as to afford an overpressure of an inert gas above the surface of the metal.

4.5 The Board holds that this question has to be answered in the negative. The use of an inert gas at super-atmospheric pressure to prevent oxidation by atmospheric oxygen is part of the common practice known to every metallurgist, as pointed out in the statement of opposition by the Appellant O2 at page 5, second half, and as exemplified by the Board in its communication of 5 August 1994 by reference to the well known practice in protected arc welding. When seeking to provide such an inert atmosphere above the melt, the skilled person would readily make use of such commonplace means as a lance used in association with an aperture in a lid, termed in this case the "heat shield 6", which maintains the atmosphere above the melt where it is needed. The subject-matter of Claim 1 in suit therefore involves no inventive step over the disclosure of document (5).

5. As the subject-matter of Claim 1 is obvious, the dependent Claims 2 to 4 fall with it.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent in suit is revoked.

The Registrar: The Chairman:

S. Fabiani H. Seidenschwarz

RAL 29.5.95

AC 29.5.95