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D E C I S I O N
of 5 March 1997

Case Number: T 0207/95 - 3.2.5

Application Number: 88112099.2

Publication Number: 0352346

IPC: B22D 41/08

Language of the proceedings: EN

Title of invention:
A submerged nozzle for steel casting

Patentee:
TOSHIBA CERAMICS CO., LTD.

Opponent:
Didier-Werke AG

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (yes - after amendment)"

Decisions cited:
-

Catchword:
-



Case Number: T 0207/95 - 3.2.5

D E C I S I O N
of the Technical Board of Appeal 3.2.5
of 5 March 1997

Appellant:
(Opponent)

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Representative:

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Respondent:
(Proprietor of the patent)

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Decision under appeal:

Interlocutory decision of the Opposition Division
of the European Patent Office posted
30 January 1995 concerning maintenance of
European patent No. 0 352 346 in amended form.

Composition of the Board:

Chairman: G. O. J. Gall
Members: A. Burkhart
W. D. Weiß

Summary of Facts and Submissions

- I. The appellant (opponent) lodged an appeal against the interlocutory decision of the opposition division on the amended form in which the patent No. 0 352 346 can be maintained.

Opposition was filed against the patent as a whole and based on Article 100(a) EPC in conjunction with Article 54 and 56 EPC (lack of novelty and inventive step).

The opposition division held that the grounds for opposition mentioned in Article 100(a) EPC did not prejudice the maintenance of the patent as amended, having regard to the following documents

- D1: DE-C-3 524 372
- D2: FR-A-2 500 773
- D3: DE-B-2 936 480
- D4: JP-U-89 648/1984 (partly translated into English)

- II. Oral proceedings were held on 5 March 1997.

- (i) The appellant (opponent) requested that the decision under appeal be set aside and the European patent be revoked.
- (ii) The respondent (patent proprietor) requested that the appeal be dismissed and the patent be maintained as amended on the basis of a new claim 1 presented during the oral proceedings.

(iii) Claim 1 reads as follows:

"1. A nozzle submersible into molten metal during steel casting, comprising a nozzle body (1), a nozzle passage (1a) formed through the nozzle body (1) so as to extend from an upper end of the nozzle body (1) to a lower portion of the nozzle body (1) in its longitudinal direction, and further comprising a plurality of discharge ports (2) formed in the lower portion of the nozzle body (1) so as to face outwardly, the discharge ports (2) being connected to the nozzle passage (1a), wherein a projecting part (4) is provided at an upper end of the discharge ports (2) and having a first slanting surface (4a) which is located from the upper end of the discharge ports (2) and inclined upwardly in a positive direction, said projecting part (4) is provided around the nozzle body (1), the discharge ports (2) each have a second slanting surface (2a) which is inclined continuously downward in a negative direction, the lower end of the first slanting surface (4a) of the projecting part (4) meeting the lower end of the second slanting surface (2a) at the upper end of the discharge port (2) on the outer surface of the nozzle body (1), said downwardly inclined second slanting surface (2a) serves for directing downwardly a stream of molten metal together with a gas bubble flow contained therein, and said upwardly inclined first slanting surface (4a) allows said gas bubble flow moving upwardly smoothly."

(iv) The appellant argued essentially as follows:

The amended claim 1 did not fulfill the requirements of Article 84 and 123(2) EPC. The features defining the arrangement of the slanting surfaces (2a and 4a) were not disclosed in the originally filed description, but were only derivable from the drawings. The functional feature in the last three lines of claim 1 "and said upwardly ... smoothly" was unclear, since it indicated only a desirable result without giving a solution for achieving this result.

The nozzle of claim 1 did not involve an inventive step,

- since it was obvious for the person skilled in the art to shorten or to cut the projecting part 8 of the nozzle of figure 3 of document D4, if he wanted to avoid negative consequences of the impingement of the steel flow on the projecting part, like damage of the projecting part or generation of turbulent flow,
- since it was obvious for the person skilled in the art to adapt the form of the projecting part to the configuration which was necessarily obtained due to wear of the projecting part of the nozzle of document D4, figure 3, and
- since already the nozzle of document D1, cf. figure 1, showed the arrangement of slanting surfaces as defined in claim 1.

(v) The respondent argued essentially as follows:

Claim 1 was not objectionable with respect to Article 123(2) EPC, since the amendments were clearly derivable from the drawings and the corresponding parts of the description of the originally filed application documents.

The functional feature objected to by the appellant was already contained in claim 1 as granted. Since Article 84 EPC was no ground for opposition, the respective objection under Article 84 EPC was not admissible.

The nozzle of claim 1 was not obvious in the light of the teachings of the prior art documents referred to by the appellant.

There was no hint in document D4 to shorten or to cut the projecting part, let alone to choose an arrangement of the slanting surfaces as defined in claim 1. The contention of the appellant that such an arrangement was obtained due to wear of the nozzle of figure 3 of document D4 was by no means proven and was contested. The nozzle of figure 1 of document D1 did not show the arrangement of the slanting surfaces as defined in claim 1.

Reasons for the Decision

1. *Amendments*

Claim 1 has been amended with respect to the granted claim 1 by the addition of the indications

- that the second slanting surface (2a) is inclined "continuously downward", and
- "that the lower end of the first slanting surface (4a) of the projecting part meets the lower end of the second slanting surface (2a) at the upper end of the discharge port on the outer surface of the nozzle body".

These amendments, by which the scope of protection of claim 1 as granted is restricted, are based on figures 1 to 3 in connection with page 8, third and fifth paragraph, and page 9, first and third paragraph, of the originally filed application documents.

The description has been adapted to the amended claim 1.

Therefore, the amendments to claim 1 and to the description do not contravene Article 123 EPC.

2. *Clarity*

With respect to the contention of the appellant that the functional feature of claim 1 "said upwardly inclined first slanting surface allows said gas bubble flow moving upwardly smoothly" was not clear, the board states that this feature was already contained in

claim 1 of the granted patent, and therefore, this feature cannot be attacked with respect to clarity in opposition proceedings, since lack of clarity (Article 84 EPC) is not a ground for opposition under Article 100 EPC.

Besides, the board is satisfied that the amended claim 1 as a whole gives a clear definition of the essential constructional elements of the claimed nozzle and that, therefore, claim 1 fulfills the requirements of Article 84 EPC.

3. *Novelty*

None of the prior art documents referred to during the opposition and appeal proceedings discloses a nozzle comprising the feature that the lower ends of a first and a second slanting surface provided at the upper end of a discharge port meet each other on the outer surface of the nozzle body.

This applies also to document D1, cf. figure 1, which does not disclose the afore-mentioned feature. In fact, in the nozzle of figure 1 of document D1, the slanting surfaces meet at a location offset of the outer surface of the nozzle body.

Therefore, the subject-matter of claim 1 is novel.

4. *Inventive step*

4.1 Closest prior art

The closest prior art is the nozzle according to figure 3 of document D4, which is discussed in the patent specification in column 2, lines 9 to 39 with respect to figure 4.

This known nozzle is used as an submersible nozzle for introduction of molten steel containing a gas into a mould and comprises a nozzle body, a nozzle passage formed through the nozzle body so as to extend from an upper end of the nozzle body to a lower portion of the nozzle body in its longitudinal direction, whereby a plurality of discharge ports is formed in the lower portion of the nozzle body so as to face outwardly, each discharge port being connected to the nozzle passage, and a projecting part being provided around the nozzle body at an upper end of the discharge ports for guiding both the molten steel and the gas bubbles. The projecting part has a slanting surface having a negative angle to a horizontal line so that the slanting surface is inclined downwardly, whereby the slanting surface of the projecting part and a slanting surface of the discharge ports constitute a common surface which is inclined downwardly in a negative direction for directing downwardly a stream of molten metal.

While this known nozzle is effective to keep the gas bubbles away from the powder line section, it suffers from the disadvantage that the gas bubbles ejected from the discharge port collide directly with the slanting surface of the projecting part and that a turbulent flow is created. Consequently, the projecting part is damaged, resulting in a reduced life-time of the nozzle, and, furthermore, negative agitation effects within the molten steel occur (see column 2, lines 33 to 39 and column 2, line 55 to column 3, line 6 of the patent specification).

4.2 Problem underlying the invention

Therefore, the problem to be solved by the invention of the patent in suit consists in modifying the nozzle known from document D4 in the sense that the stream of molten steel and gas bubbles ejected from the discharge ports is smoothly guided laterally, thus avoiding the danger of damaging the projecting part and of creating turbulences within the molten steel.

4.3 Solution

This problem is solved in that the nozzle known from document D4, cf. figure 3, is modified in that an upwardly inclined slanting surface is provided on the projecting part which is located from the upper end of the discharge ports and that the lower end of the downwardly inclined slanting surface of the discharge port and the lower end of the upwardly inclined slanting surface of the projecting part meet each other at the upper end of the discharge port on the outer surface of the nozzle body.

Due to this solution, the gas bubbles ejected from the discharge port do not impinge on the projecting part but are smoothly guided by the upwardly inclined slanting surface upwardly and away from the outer surface of the nozzle body, thus avoiding the danger of damaging the projecting part and of turbulences being created within the molten steel.

4.4 The prior art documents referred to by the appellant do not render obvious the nozzle according to claim 1, for the following reasons.

The appellant contends that it was obvious for a person skilled in the art to shorten or to cut the projecting part of the nozzle according to figure 3 of document D4 and thus to arrive at the nozzle of claim 1.

The board does not concur with this contention, since the teaching of document D4 requires guide projections 8 for deflecting gas bubbles from the nozzle. Therefore it would be contrary to this teaching to shorten or to cut that guide projections 8 to such an extent that the guide projections were no longer present at the upper ends of the discharge ports 5 on the outer surface of the nozzle body 1. Moreover, document D4 does not provide any guidance to provide the guide projection 8 with an upwardly inclined slanting surface which meets the downwardly inclined slanting surface of the discharge port at the upper end of the discharge port on the outer surface of the nozzle body.

The appellant further asserts that the natural wear occurring during operation would automatically shape the guide projections 8 of the nozzle according to figure 3 of document D4 after a certain operation time into a configuration as depicted in figure 2 of the patent in suit, and that therefore, it was obvious for the person skilled in the art to adopt such a wear configuration of the projecting part as a feature of its original design. Since, however, the appellant has not presented any proof for this assertion, the argumentation of the respondent has not been refused that it was unlikely that the specific design of the projecting part as depicted in figure 2 of the patent in suit and claimed in claim 1 was obtained after a certain operating time of the nozzle depicted in figure 3 of document D4 due to wear or damage of the guide projection 8.

Under point 3 above it was already stated that in the nozzle of figure 1 of document D1 the downwardly inclined slanting surface of the discharge port and the upwardly inclined slanting surface of the projecting part meet each other at a location **offset** of the outer surface of the nozzle body. Therefore, document D1 cannot suggest the important feature of claim 1 that the slanting surfaces 2a and 4a meet each other **on** the outer surface of the nozzle body.

Likewise, none of the documents D1 or D3 discloses the feature "the downwardly inclined slanting surface of the discharge port and the upwardly inclined slanting surface of the projecting part meet each other on the outer surface of the nozzle body". Therefore, also these documents cannot incite the person skilled in the art to the specific design of the nozzle as claimed in claim 1.

4.5 Therefore, claim 1 is allowable with respect to Article 52(1) in conjunction with Article 54 and 56 EPC.

The same applies to the dependent claims 2 to 9, which define further embodiments of the subject-matter of claim 1.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the first instance with the order to maintain the patent as amended in the following version:

Claim 1 as presented during oral proceedings of
5 March 1997,

claims 2 to 9 as granted,

the description as granted with the following
amendments:

- (a) In column 1, line 16 after "... direction" is added ", said projecting part is provided around the nozzle body."
- (b) In column 3, the paragraph in lines 17 to 28 "This object ... smoothly." is replaced by "This object is achieved by a nozzle comprising the features of claim 1."

drawings as granted.

The Registrar:



A. Townend

The Chairman:



G. Gall

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