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D E C I S I O N
of 26 July 2000

Case Number: T 1114/96 - 3.2.2

Application Number: 88112259.2

Publication Number: 0352355

IPC: C22B 21/06

Language of the proceedings: EN

Title of invention:
Improved two-stage aluminum refining vessel

Patentee:
FOSECO INTERNATIONAL LIMITED

Opponent:
Pechiney Service Brevets

Headword:
-

Relevant legal provisions:
EPC Art. 56, 123(2)

Keyword:
"Original disclosure (no) - main and first auxiliary requests"
"Inventive step (no) - second auxiliary request"

Decisions cited:
-

Catchword:
-

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Case Number: T 1114/96 - 3.2.2

D E C I S I O N
of the Technical Board of Appeal 3.2.2
of 26 July 2000

Appellant: (Proprietor of the patent)
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Representative:
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Respondent: (Opponent)
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Representative:
-

Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 28 October 1996 revoking European patent No. 0 352 355 pursuant to Article 102(1) EPC.

Composition of the Board:

Chairman: W. D. Weiß
Members: S. S. Chowdhury
J. C. M. De Preter

Summary of Facts and Submissions

I. The Appellant (the patent proprietor, Foseco Int.) lodged an appeal against the decision of the Opposition Division dated 28 October 1996 to revoke the patent No. 0 352 355 on 18 December 1996 and paid the appeal fee on the same day.

The statement setting out the grounds of appeal was received on 5 March 1997.

The Opposition Division had decided that amended claims submitted during the opposition procedure did not meet the novelty and inventive step requirements of Article 52(1) EPC.

The following prior art documents among those regarded as relevant by the Opposition Division have been taken into account as relevant documents during the appeal proceedings:

D1: US-A-4 373 704

I: Light Metal 1986 (Proceedings of the 115th AIME Annual Meeting 2 to 6 March 1986, New Orleans) p. 861 - 866

K: Drawing of the Alpur refining vessel D 5002 of Servimétal

Document K relates to the prior use of the Alpur 5000 aluminium refining system, which prior use was established at the opposition stage and not contested by the Appellant in the appeal procedure.

II. Oral proceedings before the Board took place on 26 July 2000.

The day before the oral proceedings the Appellant requested postponement of the proceedings. The Respondent was telephoned but did not give its consent to a postponement, so the Appellant was informed that the oral proceedings would take place as scheduled. The Appellant then informed the office by telefax that it would not attend the proceedings, and filed a further auxiliary request. Consequently, only the Respondent was represented at the oral proceedings.

The requests of the Appellant on file are that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of claims of a main request or a first auxiliary request filed on 26 June 2000, or on the basis of the patent as granted, as a second auxiliary request.

The Respondent (opponent, Pechiney) requested that the appeal be dismissed.

III. Claim 1 of the main request reads as follows:

"A two-stage gas sparging-aluminum refining vessel (1, 31) having an insulated cover (39) and an outer shell (15, 32) with insulation (34) positioned on the inner side thereof to form a front end (7, 35), bottom (36), back end (17, 37) and outer side walls of said vessel (1, 31) impervious to molten aluminum, wherein

(a) a central baffle (11, 47, 53) is positioned so as to separate the space within said vessel (1, 31) into two sections, said central baffle extending from the

front end to the back end of said vessel and from the bottom of said vessel space to the underside of said insulated cover (39);

(b) one of said vessel sections defines a first refining stage compartment (2, 40, 51), the front and back ends (35, 37) of the vessel (1, 31) constitute front and back ends, respectively, of said first refining stage compartment, one of the outer side walls of the vessel constitutes the outer side wall of said first refining stage compartment, and said central baffle (11, 47, 53) constitutes the inner side wall of said first refining stage compartment;

(c) inlet means (6, 38, 54) is located at the front end of said first refining stage compartment for introducing molten aluminum thereto;

(d) the other of said vessel sections defines a second refining stage compartment (3, 52), the front and back ends (35, 37) of the vessel (1, 31) constitute front and back ends, respectively, of said second refining stage compartment, the other outside wall of the vessel constitutes the outer side wall of said second refining stage compartment, and said central baffle (11, 47, 53) constitutes the inner side wall of said second refining stage compartment, said first and second refining stage compartments thus being positioned in a side-to-side relationship within said vessel and separated from each other by said central baffle (11, 47, 53), the front end of said second refining stage compartment being located at the same side of the vessel as said front end of the first refining stage compartment;

(e) outlet means (8, 55) is located at the front end of

said second refining stage compartment for withdrawing molten aluminum therefrom;

(f) a cross-over opening (12, 48) is provided in said central baffle to enable passage of molten aluminum from said first refining stage compartment to said second refining stage compartment during continuous aluminum refining operations within said vessel, and said cross-over opening (12, 48) is positioned in said central baffle (11, 47, 53) so that the top portion thereof is below the minimum design operating level (45) of molten aluminum in the vessel;

(g) both said first and second refining stage compartments are designed to receive therein gas distribution means (41) for distributing sparging gas in the molten aluminum in the first and second stages of said refining vessel;

(h) means (9, 49, 59) for separating floating dross from the molten aluminum stream that is treated in said vessel is positioned in said outlet means (8, 55); and

(i) the direction of flow of molten aluminum through the vessel is adapted to be readily reversed by only changing the location of said floating dross separating means (9, 49, 59) from said outlet to said inlet means, the first and second refining stage compartments and the inlet and outlet means thereby mutually changing their functions."

Claim 1 of the first auxiliary request reads as follows:

"A two-stage gas sparging-aluminum refining vessel (1,

31) having an insulated cover (39) and an outer shell (15, 32) with insulation (34) positioned on the inner side thereof to form a front end (7, 35), bottom (36), back end (17, 37) and outer side walls of said vessel (1, 31) impervious to molten aluminum, wherein

(a) a central baffle (11, 47, 53) is positioned so as to separate the space within said vessel (1, 31) into two sections, said central baffle extending from the front end to the back end of said vessel and from the bottom of said vessel space to the underside of said insulated cover (39);

(b) one of said vessel sections defines a first refining stage compartment (2, 40, 51), the front and back ends (35, 37) of the vessel (1, 31) constitute front and back ends, respectively, of said first refining stage compartment, one of the outer side walls of the vessel constitutes the outer side wall of said first refining stage compartment, and said central baffle (11, 47, 53) constitutes the inner side wall of said first refining stage compartment;

(c) inlet means (6, 38, 54) is located at the front end of said first refining stage compartment for introducing molten aluminum thereto;

(d) the other of said vessel sections defines a second refining stage compartment (3, 52), the front and back ends (35, 37) of the vessel (1, 31) constitute front and back ends, respectively, of said second refining stage compartment, the other outside wall of the vessel constitutes the outer side wall of said second refining stage compartment, and said central baffle (11, 47, 53) constitutes the inner side wall of said second refining

stage compartment, said first and second refining stage compartments thus being positioned in a side-to-side relationship within said vessel and separated from each other by said central baffle (11, 47, 53), the front end of said second refining stage compartment being located at the same side of the vessel as said front end of the first refining stage compartment;

(e) outlet means (8, 55) is located at the front end of said second refining stage compartment for withdrawing molten aluminum therefrom;

(f) a cross-over opening (12, 48) is provided in said central baffle to enable passage of molten aluminum from said first refining stage compartment to said second refining stage compartment during continuous aluminum refining operations within said vessel, and said cross-over opening (12, 48) is positioned in said central baffle (11, 47, 53) so that the top portion thereof is below the minimum design operating level (45) of molten aluminum in the vessel;

(g) both said first and second refining stage compartments are designed to receive therein gas distribution means (41) for distributing sparging gas in the molten aluminum in the first and second stages of said refining vessel;

(h) means (9, 49, 59) for separating floating dross from the molten aluminum stream that is treated in said vessel is positioned in said outlet means (8, 55), said floating dross separating means comprising baffle means (9, 49, 59) extending from above the level (45) of said molten aluminum stream to below the level thereof, said baffle means serving to hold back said floating dross

and prevent its being carried along with the molten aluminum stream; and

(i) the direction of flow of molten aluminum through the vessel is adapted to be readily reversed by only changing the location of said floating dross separating means (9, 49, 59) from said outlet to said inlet means, the first and second refining stage compartments and the inlet and outlet means thereby mutually changing their functions."

Claim 1 of the second auxiliary request (claim 1 as granted) reads as follows:

"A two-stage gas sparging-aluminum refining vessel having an insulated shell (15) with bottom and side walls impervious to molten aluminum, comprising:

(a) a central baffle (11, 47, 53) positioned so as to separate the space within said vessel into two sections;

(b) a first stage compartment (2, 40, 51) within said vessel and having a front end (7, 35), a back end (17, 37) and an outer side wall, said central baffle comprising the inner side wall of said compartment;

(c) inlet means (6, 38, 54) located at the front end of said first stage compartment for introducing molten aluminum thereto;

(d) a second stage compartment (3, 52) within said vessel and having a front end (7, 35), back end and outer side wall, said central baffle means comprising the inner side wall of said compartment, said first and

second stage compartments thus being positioned in a side-to-side relationship within said vessel, the front end of said second stage compartment being located at the same side of the vessel as said front end of the first stage compartment;

(e) outlet means (8, 55) located at the front end of said second stage compartment for withdrawing molten aluminum therefrom;

(f) a cross-over opening (12, 48) in said central baffle to enable passage of molten aluminum from said first stage compartment to said second stage compartment during continuous aluminum refining operations within said vessel;

(g) both said first and second stage compartments being designed to receive therein gas distribution means (41) for distributing sparging gas in the molten aluminum in the first and second stages of said refining vessel; and

(h) means (9, 49, 59) for separating floating dross from the molten aluminum stream that is treated in said vessel."

IV. The Appellant, in its written submissions, presented the following arguments in respect of the main request and the first auxiliary request:

Admissibility of the requests

The amendments to the claims of the main request and the first auxiliary request were supported by the original description and no objections arose under

Articles 123(2) or (3) EPC. In particular, section (i) of claim 1 was supported by column 3, lines 49 to 52 and column 7, lines 25 to 31 of the granted patent.

Novelty

In claim 1 of the opposed patent the central baffle separated the space within the vessel into two sections, which meant complete separation of the vessel into two mutually isolated sections, apart from the cross-over opening, so that there was no common gas space above the molten metal. The two refinement compartments of the claimed apparatus were in a side-by-side arrangement without any relative offset.

In contrast thereto, the baffle in Document I separated the vessel into four compartments, and there was a common overhead gas space associated to all four compartments. Moreover, the compartments were offset relative to each other in the length direction. Other differences from the apparatus of Document D1 concerned the position of the cross-over opening in feature (f) and the metal flow reversal means in feature (i). These features rendered the claimed apparatus clearly novel.

Inventive step

The central baffle and its cross-over opening prevented floating dross from moving from the first to the second refining compartment and also prevented mixing of the metals in the two compartments. Moreover, the claimed vessel allowed treatment by two different gases because of the presence of isolated overhead spaces. The apparatus of Documents I and K, owing to the common overhead gas space, did not have these advantages.

The above advantages together with the possibility of allowing instant reversal of the metal flow direction were not achieved in the prior art. Nor were the advantages of compactness, less complexity and ease of cleaning and maintaining the apparatus attained in the prior art.

V. The Respondent presented the following arguments:

Admissibility of the requests

Not only was the last part of claim 1 of the main request and first auxiliary request, regarding the mutual changing of functions of the first and second refining stage compartments and the inlet and outlet means, unjustifiably broader than the supporting disclosure, but also parts (b) and (d) of these claims were unclear, particularly since the expression "readily reversed" was ambiguous and was not explained in the description. Furthermore, the feature (i) was a method step in a device claim and, therefore, unclear.

Novelty

Document I disclosed the combination of all the features of claim 1 as granted, in particular that the central baffle extended from the bottom of the vessel up to the cover and from the front to the back of the vessel.

Inventive step

The Document D1 disclosed a two-stage aluminum refining system using two spinning gas nozzles in separate chambers. It was intended in this apparatus to employ

two different gases in the two chambers. The improvement over this apparatus provided by the claimed apparatus was the compact structure created by the side-by-side arrangement of chambers so that the metal inlet and outlet were at the same end, but this teaching was already disclosed in Document I.

The fact that a common space may be present over the two chambers in the apparatus of Document I was of no significance to the refining process since it was only the gas injected into the metal that reacted with it, the gas above the metal surface had no significant effect on the metal. Therefore, if the two different gases from the two nozzles did mix, this was not important for the refining process, this would only be of importance if the gases were to be recycled.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

2.1 Main request

The expression "the first and second refining stage compartments and the inlet and outlet means thereby mutually changing their functions" in the last part of the feature (i) of claim 1 is objectionable for the following reasons: The only function disclosed for the first and second refining stage compartments is that the molten aluminium is refined therein, and the only function disclosed for the inlet and outlet means is that they supply and remove the molten aluminium,

respectively, and that floating dross is separated in the outlet means. Since the term "function" may include other actions that may be performed on molten aluminium, but which are not disclosed in the patent specification, the claim is unjustifiably broader than the supporting disclosure in this respect, and consequently objectionable under Articles 123(2) EPC.

The subject-matter of claims 2 and 3 was comprised in a single claim as granted, viz. claim 4. That this subject-matter has now been split up into two claims is not in response to a ground of opposition, so that an objection to this amendment arises under Rule 57a EPC.

For these reasons, the main request is not allowable.

2.2 First auxiliary request

This request is open to the same objections as the main request above, and is also not allowable.

2.3 Second auxiliary request

This request reverts to the patent as granted and no formal objections arise against the granted claims. In view of the foregoing, only this request is admissible, and only this request is to be examined as to its substantial merits.

3. *Novelty*

The Board accepts the Appellant's argument, that the expression "the central baffle is positioned so as to separate the space within said vessel into two sections" in feature (a) of claim 1, defines the

central baffle as extending from the bottom to the top and from the front to the back of the refining compartments, thereby completely mutually isolating the two compartments, apart from the cross-over opening. This is shown clearly in Figure 2 and consistent with the fact that the refining vessel is a two-stage vessel in which it is possible to employ two different sparging gases in the two refining compartments.

At the oral proceedings M. Château, a technical expert of the Respondent, upon being questioned by the Board on this point, stated that the cover of the vessel in Document I "may" be directly mounted on the vessel so as to touch the cover and define two completely isolated compartments. On the other hand, the configuration whereby the cover does not touch the central baffle, and there is a common space above the two compartments defined by the baffle, would also be a possibility in this apparatus.

For this reason, the Board considers feature (a) of claim 1 as not being clearly and unambiguously disclosed in Document I. No other document discloses the combination of features of claim 1, so that the vessel defined by the claim is novel.

4. *Inventive step*

4.1 The opposed patent relates to the refining of aluminum in a two-stage aluminum refining system, i.e. a system in which molten aluminium is treated with sparging gas in two separate compartments in order to remove dissolved hydrogen and non-metal particles therefrom. The opening passages of the description state the advantages of a two-stage system over a single-stage

system, and further advantages that arise from the use of two spinning gas nozzles in separate chambers. A yet further advantage is gained upon the employment of two different gases from the two nozzles. The patent seeks to improve such a system yet again.

The only document that describes a system as described above is Document D1. This discloses a two stage aluminum refining system having two spinning gas nozzles in respective chambers that are defined by baffles 7 and 9 in a vessel 20, 21, which baffles respectively extend to the bottom and top of the vessel to separate it into two isolated compartments. A cover, together with the baffles, ensures that the molten aluminium can flow only in one direction and between the baffles from the first to the second compartment, see column 4, lines 23 to 28, 41 to 43, and 51 to 54.

This document represents the closest prior art, accordingly.

4.2 The technical problem stated in the patent is to improve such a two-stage vessel for refining aluminium, in particular to provide simplified installation, operation and maintenance features (see column 2, lines 52 to 58). The Board considers this to correctly represent the technical problem with respect to the disclosure of Document D1.

The statement of the problem itself is not considered to involve an inventive step since the above are general desiderata in all industrial apparatus.

4.3 Claim 1 of the opposed patent defines a side-by-side arrangement of refining compartments, whereby a central

baffle separates the space within the refining vessel into two compartments, and the baffle has a cross-over opening to enable passage of molten aluminum from the first compartment to the second compartment during continuous aluminum refining, such that the aluminium flows in U-shaped path and exits from the same end that it enters the system.

This arrangement does, indeed, meet the objects of the invention in that the system, by virtue of the side-by-side arrangement of the compartments, is more compact than the D1 system, and installation and operation are simplified since both the inlet and outlet for molten aluminium are at the same end.

4.4 The Board considers the same solution to have been used to the same end in the apparatus of Document I. Using the annotated copy of Figures 4 and 5 of this document submitted by the Appellant with its letter dated 3 March 1997, this document is seen to disclose a two-stage gas sparging-aluminum refining vessel wherein a central baffle 9 is positioned so as to separate the vessel into two sections having respective gas distribution means 16, with inlet and outlet means both located at the front end of the vessel, and a cross-over opening 20 provided in the central baffle 9 to enable passage of molten aluminum from the first refining compartment to the second refining compartment during continuous aluminum refining operations.

This is the modification made to the apparatus of Document D1 and for the same purpose. Therefore, the combination of the teachings of Documents I and K leads to the subject-matter of claim 1 as an obvious combination.

The Board is aware that the apparatus of Document I does not necessarily have two completely isolated compartments since the central baffle does not clearly extend all the way up to the cover. Nevertheless, the Appellant's argument that it would not be possible to use the apparatus of Document I with two different gases is not valid for the following reasons:

In the apparatus of Document I a lance with a spinning nozzle may be inserted into each refining compartment for introducing a respective treatment gas deep below the surface of the molten metal, where it reacts with the metal on its way to the surface. As soon as it escapes from the surface any reaction with the metal becomes insignificant. For this reason it is also possible to treat the metal in the two compartments of the apparatus of Document I with different gases, regardless of whether or not the gases mix together. Keeping the gases separate is of significance only from the standpoint of re-cycling the gases, which point is not discussed in the patent.

Furthermore, in this respect the Board notes that claim 2 of the opposed patent defines the cross-over opening to be "positioned so that the top portion thereof is below the minimum design operating level of molten aluminum in the vessel". This means that the positioning of the opening, as defined in claim 1, is optional. In particular, it need not be below the metal surface, it could equally be situated at the upper edge of the baffle, for example, as in Document I. In such case there would, indeed, be communication between the compartments and hence a common space present above the two compartments.

It would appear to have been the intention that claim 1 should cover both the case where the cross-over opening is situated below the metal level, and the case where it is at the upper edge of the baffle, safe in the knowledge that mixing of the gases in the common space, in the second case, would not significantly affect the refinement operation.

4.5 The presently claimed aluminium refining vessel includes a combination of known technical features for achieving their known advantages, which is not considered inventive activity, so that the apparatus of claim 1 does not involve an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

V. Commare W. D. Weiß