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D E C I S I O N
of 15 January 2002

Case Number: T 0093/00 - 3.2.3

Application Number: 95905276.2

Publication Number: 0737113

IPC: B09B 3/00, F27D 11/10, F23G 5/10

Language of the proceedings: EN

Title of invention:
Method and furnace for treatment of ash

Applicant:
ASEA BROWN BOVERI AG

Opponent:
-

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step - remote technical field"

Decisions cited:
-

Catchword:
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Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0093/00 - 3.2.3

D E C I S I O N
of the Technical Board of Appeal 3.2.3
of 15 January 2002

Appellant: ASEA BROWN BOVERI AG
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Representative: Boecker, Joachim, Dr.-Ing.
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Decision under appeal: **Decision of the Examining Division 2.3.09.113 of the European Patent Office dated 4 August 1999 refusing European patent application No. 95 905 276.2 pursuant to Article 97(1) EPC.**

Composition of the Board:

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

Summary of Facts and Submissions

I. With decision of 4 August 1999 the examining division refused European patent application No. 95 905 276.2 in the light of

(D1) EP-A-0 556 608
(D2) WO-A-93/20252 and
(D3) US-A-4 080 511.

II. Against the above decision the applicant - appellant in the following - lodged an appeal on 27 September 1999 paying the fee on the same day.

III. Since no written statement setting out the grounds of appeal was filed within the time-limit of four months after the date of notification of the impugned decision was filed, the board in a communication under Rule 65(1) EPC dated 14 February 2000, notified the appellant that the appeal would probably be rejected as inadmissible.

IV. On 29 February 2000 the appellant completed the omitted act by filing the grounds of appeal and simultaneously filed an application to have his rights re-established. The corresponding fee was paid on the same day, and the written statement setting out the grounds and facts on which said application relied was filed on 6 April 2000.

V. With decision T 0093/00 - 3.2.3 dated 21 June 2000 the board re-established the appellant in his rights.

VI. Appellant's requests are as follows:

(a) to set aside the impugned decision;

(b) to grant a patent on the basis of new claim 1 of 22 February 2000 (**main request**) or on the basis of new auxiliary claim 1 of 22 February 2000 (**auxiliary request**) in combination with claims 2 to 10 of 2 May 1996, the originally filed description and drawings.

VII. The independent claims 1 and 7 of the **main request** read as follows:

"1. A method for thermal treatment of an ash, which at least comprises pollutants in the form of metals and/or inorganic salts and/or organic compounds, in an electric furnace

- which furnace comprises at least a furnace shell (40), a furnace roof (48) and a closed furnace chamber (41) arranged above a metal melt (61) or above a metal melt and any slag (60) present or formed in the furnace,

- which furnace further comprises at least one bottom contact (34) arranged in electrical contact with any metal melt in the furnace and at least one hollow electrode (31) through which the ash is supplied into the furnace,

- with the closed furnace being sealed and reducing conditions being established within the sealed furnace,

- with the ash being heated in the furnace such that any organic compounds contained in the ash are

broken down and driven off to the furnace chamber, any inorganic salts contained in the ash are at least partially decomposed and driven off to the furnace chamber and any metals contained in the ash are partially reduced and driven off to the furnace chamber and partially reduced and molten,

- with a metal melt being formed and any molten metallic pollutants which are mixable with said metal melt being integrated into said melt and an additional melt being generated from any molten metallic pollutants which do not integrate into any metal melt present in the furnace,

- with any gaseous pollutants driven off to the furnace chamber being exhausted into a gas treatment plant where the gases are oxidized and cooled in one or more stages in a cooling chamber (51), and

- with a slag being formed by the remaining part of the ash and said slag being, upon discharge, cooled to form a glass or a material having a glasslike matrix in which any remaining harmful pollutants are, dissolved in, bonded to or enclosed in the glass in a way such that leakage of these pollutants out of the glass is essentially eliminated,

c h a r a c t e r i z e d in

- that the electric furnace is an arc furnace with the bottom contact (34) connected to the positive polarity and the electrode arranged above any metal melt in the furnace,

- that the electrode is connected to the negative polarity,

- that the ash is supplied through the channel (21) of the electrode into the furnace whereby the ash is fed from the open free end of the electrode into the arc such that the heating under reduced condition takes rapidly place to a temperature of 1350°C to 1750°C, and

- that the furnace chamber is maintained at a temperature exceeding 1200°C and at an under-pressure relative the ambient pressure of 1 to 10 mbar."

"7. A direct current arc furnace for thermal treatment of an ash, which at least comprises pollutants in the form of metals and/or inorganic salts and/or organic compounds, at least comprising a furnace shell (40), a furnace roof (48) arranged over a furnace shell, one or more bottom contacts (34), connected to positive polarity, arranged in or close to the furnace shell and one or more electrodes (31), connected to negative polarity, arranged above the furnace shell, for maintaining at least one arc (30) within the furnace, **characterized by**

- means for sealing said furnace shell (40) and said furnace roof (48) to define a closed and sealed furnace chamber (41) above any metal melt (61) and/or slag (60) present in the furnace comprising at least
- one sealing bushing (49) for an electrode,
- one or more sealed feed systems (20) for supply of ash to the furnace, in the form of a channel (21) within an electrode, one end of said channel (21) opening out into said arc,

- one or more sealed outlets (50) for metal melt(s),
- at least one sealed exhausting device (47) for discharge of gases into a gas treatment plant,
- at least one sealed outlet for slag (52) and
- means (42,43,45,47) within or adjacent to the furnace chamber for monitoring and maintaining the temperature in the furnace chamber at a temperature exceeding 1200°C and an underpressure in the furnace chamber in relation to the ambient pressure of 1 mbar to 10 mbar."

VIII. With respect to the above **main request** the appellant essentially brought forward the following arguments:

- in reworded claim 1 only an obvious inaccuracy concerning the polarity of the arc furnace was removed;

- in contrast to (D1) and (D2) claim 1 is based on an electric arc furnace with a hollow electrode;

- in case of a burning arc the hottest point is within the arc so that the material according to claim 1 is heated up directly and immediately when fed trough the hollow electrode to the electric arc whereas in (D2) the freshly supplied material takes up its heat from the slag present in the furnace after it has been heated up by resistance heating;

- (D3) discloses an electric arc furnace, however, in a completely different technical field, namely the production of iron and steel, whereas claim 1 relates to the thermal treatment of ash which is significantly lighter than fine iron ore;

- (D3) being already published in 1978 was not an incentive for the skilled man to apply its teaching when treating ash thermally;

- this is also true with respect to (D1) being based on the use of high plasma temperatures liable to high evaporation losses;

- a skilled man would therefore have turned away from methods with electric arc furnaces as exemplified in (D3) or (D1) and would not have expected that great advantages could have been achieved by using an arc furnace, namely treatment under higher reducing temperatures and in a much shorter period of time, reduction of the evaporation of noxious gases/less condensation of harmful gases; passing through the claimed electric arc of high energy density allows to mainly drive off the pollutants in the ash and their degradation.

Reasons for the Decision

1. *Admissibility*

The appellant after not filing the statement of grounds of appeal within the period prescribed in Article 108 EPC was informed by the board of this defect and has completed the omitted act on 29 February 2000. Since all conditions for re-establishment of rights were met the board with its decision T 0093/00 - 3.2.3 dated 21 June 2000 re-established the appellant in his rights so that now all requirements for an admissible appeal are met.

Main request

2. *Amendments*

Claim 1 of the **main request** is based on the features of originally filed claims 1 (including the positive polarity of the bottom contact and the negative polarity of the electrode), 7 ("additional melt ... molten metallic pollutants which do not integrate ... in the furnace"), 4 ("gases are oxidized and cooled ... cooling chamber (51)") and 2 ("is maintained at a temperature exceeding ... and at an under-pressure ... of 1 to 10 mbar") and is not open to an objection under Article 123(2) EPC.

3. *Novelty*

The issue of novelty was not challenged in the impugned decision; since the board is in agreement with these findings no detailed argument is necessary with respect to novelty of the subject-matter of claim 1 and also of claim 7 which comprises the structural features necessary to carry out the method of claim 1.

4. *Inventive step*

The subject-matter of claim 1 being novel the crucial issue to be decided is inventive step.

4.1 (D1) can be seen as the nearest prior art document; according to its column 1, lines 26 to 43, high temperatures in a furnace (plasmas) lead to high evaporation losses so that (D1) aims at reducing them, see column 2, lines 3 to 9 of (D1). In the Figure of (D1), see reference sign "1", temperatures are

indicated, namely 1350°C on the bottum up to 1500°C on top.

4.2 Not knowing the claimed invention (D1) teaches away from the high temperatures of an arc furnace and since in (D1) no values for temperatures nor any temperature range is disclosed in combination with an **arc** furnace the board is not in agreement with the findings of the examining division in the impugned decision, see page 3 first two paragraphs (ending with "... to positive polarity."), with respect to the temperatures known from (D1), namely "of over 1350°C" and "exceeding 1200°C".

4.3 This is also true for the findings of the first instance in its decision on page 3 fourth paragraph ("The particular ... an inventive step.") that the pressure range of claim 1 is implicitly known from (D1) since not knowing the claimed invention a skilled person would and could not derive an **under**-pressure of 1 to 10 mbar since column 3, lines 21 to 27 of (D1) appear to be a disclosure contrary to what is claimed. For a skilled person blowing in air and/or oxygen has to be seen as an activity to increase the furnace pressure **beyond** the atmospheric pressure.

4.4 Summarizing, the subject-matter of claim 1 is not only distinguished from (D1) by the features admitted by the examining division on page 3 of the impugned decision, namely the furnace being an arc furnace and by the polarity of the furnace-components, rather also by the claimed temperature ranges and the claimed pressure range of the arc furnace.

4.5 Starting from (D1) the objectively remaining technical

problem to be solved by the claimed invention has to be seen as set out on original page 5 second and third paragraph, namely to offer a method and a furnace for thermal treatment of ash which ensures that toxic substances and other harmful substances present in the ash are driven off and destructed and that the remaining part of the ash is also treated without damaging the environment.

4.6 The solution of the above technical problem is laid down in the independent claims 1 and 7. With respect to the teaching of (D1) it is obvious that the claimed method and furnace according to claims 1 and 7 is based on a different concept basically by the use of an electric **arc** furnace which allows the free choice of the polarity of the bottom contact and the electrode (the positive pole in an electric arc having a higher temperature than the negative pole!) respectively and by supplying the ash to be treated **directly into the arc** such that heating takes place directly and immediately during its relatively short dwelling time in the arc. This technical concept leads to a treatment in a high energy zone of an arc and as a consequence thereof to reduced evaporation of noxious gases and less condensation of harmful gases and also to less formation of harmful pollutants. It is therefore possible to mainly drive off and degrade pollutants in the ash whereby a considerable part of the ash is melted during its passage through the arc.

4.7 (D2) in contrast to the claimed invention is based on resistance heating so that the freshly supplied material, see hollow electrodes "31 to 33", is not heated in an electric arc as claimed rather is heated from the slag "62" present in the furnace, see Figure 1

and page 3, paragraphs 3/4, and page 4, paragraph 2, of (D2).

(D3) discloses an electric arc furnace, however, in a completely different technical field and for another purpose, namely reducing iron oxide for producing iron and steel. The aspects such as removing pollutants/harmful substances from ash cannot be derived from (D3) even if considered by a skilled man. In this context it is observed that ash is significantly lighter than iron ore so that the skilled man was not led to the use of an electric arc furnace in combination with the thermal treatment of ash.

4.8 **Without knowing** the invention the board cannot see any incentive to replace the resistance heating furnace of (D1) by an arc furnace as in (D3). Rather, a skilled person would have turned away from arc furnaces (including plasma furnaces) since prima facie the high arc temperatures favour evaporation of substances, see (D1), column 1, lines 26 to 43, so that a skilled person would not have envisaged a combination of (D1) and (D3).

4.9 The board is therefore convinced that it could not be expected that a thermal treatment of ash in an electric arc furnace produces advantageous effects, namely by the higher reducing temperatures of the electric arc and by the **much shorter period of time** in which the ash to be treated is within the area of high arc temperatures. It is convincing that thereby the evaporation of noxious gases and condensation of harmful gases can be reduced in that the pollutants in the ash by passing them **through the electric arc** are mainly driven off and degraded.

4.10 The teaching of claims 1 and 7 comprises moreover the maintenance of an under-pressure in the furnace chamber which safeguards that nothing can escape therefrom in an unwished manner. It is admitted that this feature per se is not inventive. It has, however, to be considered that this feature is part of the claimed thermal treatment concept laid down in claims 1 and 7 and contributes to the favourable treatment of ash.

4.11 Summarizing, the subject-matter of claims 1 and 7 is novel and not rendered obvious by the prior art to be considered, Articles 54 and 56 EPC, so that these claims are allowable.

4.12 Dependent claims 2 to 6 and 8 to 10 relate to embodiments of the independent method claim 1 and the independent furnace claim 7 and are also allowable.

4.13 As a result of the above considerations the decision under appeal cannot be upheld.

Auxiliary request

5. The **main request** being already allowable it is not necessary to deal with the **auxiliary request**.

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 grant the patent with the following documents:

- "new" claim 1 of 22 February 2000, received on 29 February 2000;

- claims 2 to 10 of 2 May 1996, received on 23 May 1996;

- originally filed description with pages 1 to 18;

- originally filed drawing sheets 1/2 and 2/2.

The Registrar: The Chairman:

A. Counillon C. T. Wilson