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Datasheet for the decision of 17 April 2012

Case Number: T 0101/10 - 3.2.08

Application Number: 02736081.7

Publication Number: 1405924

IPC: C21B 13/10, C21B 13/00, C21B 13/08

Language of the proceedings: EN

Title of invention:
Method for producing granular metal

Applicant:
KABUSHIKI KAISHA KOBE SEIKO SHO

Opponent:
Nu-Iron Technology, LLC

Headword:
-

Relevant legal provisions:
EPC Art. 56

Keyword:
"Inventive step (no)"

Decisions cited:
-

Catchword:
-

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Case Number: T 0101/10 - 3.2.08

D E C I S I O N
of the Technical Board of Appeal 3.2.08
of 17 April 2012

Appellant: (Opponent)
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Decision under appeal:
Decision of the Opposition Division of the European Patent Office posted 6 November 2009 rejecting the opposition filed against European patent No. 1405924 pursuant to Article 101(2), 2nd sentence, EPC.

Composition of the Board:

Chairman: T. Kriner
Members: R. Ries
A. Pignatelli

Summary of Facts and Submissions

I. By its decision posted on 6 November 2009 the opposition division rejected the opposition against European patent No. 1 405 924.

II. The appellant (opponent) lodged an appeal against this decision on 14 January 2010, paying the appeal fee on the same day. The statement setting out the grounds of appeal was received on 16 March 2010.

III. In an official communication, the Board gave its provisional view on the case, in particular with respect to document

D1: US-A-6 126 718.

IV. Oral proceedings took place before the Board on 17 April 2012. The following requests were made:

The appellant requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed.

V. Independent claim 1 of the patent as granted reads as follows:

"A method for making metal nuggets, comprising heating a material comprising a metal—oxide-containing substance and a carbonaceous reductant to reduce metal oxide contained in the material and further heating the resultant so as to melt metal while allowing the metal

to separate from a by-product slag component and allowing the by-product slag component to undergo cohesion,
wherein a cohesion accelerator is blended into the material to accelerate cohesion of the by-product slag, wherein the cohesion accelerator consists of at least one of calcium fluoride and boron oxide, and wherein the content of the cohesion accelerator in the material is in the range of 0.2 to 2.5 percent by mass."

VI. The appellant's arguments can be summarized as follows:

Document D1 as the closest prior art disclosed a method for producing metal nuggets comprising the steps of heating a metal-oxide-containing substance and a carbonaceous reductant to reduce and melt the metal and the by-product slag, respectively. The use of an auxiliary material such as limestone, fluorspar, serpentine, dolomite and the like that was added to the raw material for facilitating melting of the reduced metal and the slag was also disclosed in D1, column 4, lines 24 to 38. Among these materials, fluorspar was known to the expert as the mineral comprising essentially calcium fluoride (CaF_2), which was commonly used in metallurgy in small proportions along with limestone to improve the slag fluidity. The same fluxing effect which is attributed to the auxiliary material in D1, i.e. reducing the melting point of the slag and thereby increasing its fluidity, was achieved by the cohesion accelerator calcium fluoride used in the method claimed in the patent in issue. Thus, the only technical difference between the claimed process and D1 resided in the amount of 0.2 to 2.5% CaF_2 or boron oxide, which is not disclosed in D1. As to the

claimed ranges for CaF_2, the person skilled in the technical field of metallurgy was however aware that on the one hand a minimum amount of fluxing agent was required to bring about an effect on the slag's fluidity. On the other hand, the upper limit of the range for the cohesion accelerator was governed by economic reasons, given that CaF_2 or fluorspar was a rather expensive additive, as confirmed in paragraph [0038] of the patent at issue. Selecting the appropriate amount for the cohesion accelerator therefore amounted to nothing more than what would be done by a person skilled in the art.

Therefore, the process set out in claim 1 did not involve an inventive step.

VII. The respondent's arguments are summarized as follows:

The technical problem underlying the patent in suit resided in producing high-purity large nuggets having a uniform size regardless of the type and amount of the gangue component (patent specification, paragraph [0018]). This problem was solved by blending a cohesion accelerator selected from calcium fluoride or boron oxide in amounts ranging from 0.2 to 2.5% into the starting mixture. Since the fluidity of the by-product slag was increased by the cohesion accelerator, the rate at which the molten metallic iron and molten slag grow into iron nuggets was increased (patent specification, paragraph [0036]).

Although D1 was concerned with producing metal lumps, the particular object in question was not addressed in this document. Specifically, there was no teaching in

D1 that the purity and the size of the metal nuggets were significantly improved by adding to the starting material a cohesion accelerator selected from calcium fluoride and/or boron oxide. Certainly, D1 disclosed a list of auxiliary raw materials that could be added for the purpose of facilitating melting of the reduced metal and the ash ingredients, the list including steelmaking slag, limestone, fluorspar, serpentine and dolomite. However, no hint whatsoever was found that the size and purity of the nuggets could be increased by adding calcium fluoride. To the contrary, since all the examples given in Tables 4 to 6, 8 and 11 of document D1 described the addition of limestone as an auxiliary raw material and none of them was concerned with fluorspar, the skilled person would have no reason to select fluorspar from the list of additives. This selection was possible only on the basis of hindsight, and even if fluorspar was chosen, the skilled person was not taught by this document in what amount the auxiliary agent was to be added to exhibit a satisfactory effect on the melting of the components metal and slag. Consequently, the teaching of document D1 rather led away from selecting calcium fluoride in the claimed amounts. Indeed, the skilled reader of D1 was prompted to select limestone as an auxiliary agent.

Hence, the method set out in claim 1 as granted was not obvious from the teaching of document D1. The subject matter of claim 1 thus also involved an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. The closest prior art

It was common ground to the parties and the Board that document D1 qualified as representing the closest prior art. However, document D1 remains silent on the amount of the fluxing agent fluorspar in the starting material and therefore could not destroy the novelty of the subject matter of claim 1.

Like the patent at issue, document D1 is concerned with a method of producing a reduced granular metal in the form of metal lumps (nuggets) from a starting mixture comprising a metal-oxide-containing material and a solid carbonaceous reducing agent, heating the starting mixture to reduce and melt the metal and the by-product slag to form individual lumps (D1, column 2, lines 61 to column 2, line 15; column 9, lines 20 to 30; claim 1; figure 1). Document D1 further teaches in column 4, lines 24 to 28 and column 8, lines 51 to 54 that an auxiliary raw material may preferably be added to the starting raw material in order to facilitate melting of the reduced metal and the ash ingredients during melting. The auxiliary raw material may be steelmaking slag, limestone, fluorspar, serpentine, dolomite and the like. When the raw material is melted and has separated into metal and slag, the metal and the slag respectively coagulate to form individual lumps (nuggets) and are dispersed spot-wise on the surface of the solid reducing material layer because of the surface tensions of their own (D1, column 4, lines 50 to 53).

Accordingly, fluorspar, which is the mineral comprising essentially CaF_2, is expressly mentioned as a fluxing agent (or as a cohesion accelerator according to the technical term used in the patent) and exhibits the same technical effect as attributed to this additive in the patent at issue, i.e. increasing the fluidity of the by-product slag (the patent specification, paragraph [0033], first sentence).

3. The problem to be solved

Starting from the teaching of document D1, the objective problem underlying the patent at issue therefore resides in evaluating the appropriate amount of the cohesion accelerator that is to be added to the material so as to promote effectively the cohesion (coagulation) of the molten metal and the slag.

4. Inventive step

In the Board's assessment, the range of 0.2 to 2.5% is obvious to a person skilled in the art of metallurgy for the following reasons. As to the lower limit of 0.2% CaF_2, it goes without saying that a minimum amount of fluxing agent is required in order to bring about a sufficient and measurable effect on increasing the slag fluidity. Turning to the upper limit of 2.5%, the skilled person always aims at avoiding excessive amounts of an additive at least for economic and environmental reasons. To this end, he would confine the addition of the fluxing agent fluorspar and the formation of the unwanted by-product slag to their necessary minimum. In his effort to make the production process as economical as possible, the skilled person

would be merely required to carry out some routine experiments to evaluate the appropriate amount of auxiliary material, i.e. the minimum and maximum amounts of fluxing agent or cohesion accelerator which are necessary to achieve sufficient fluidity of the slag.

The Board's belief is corroborated by the statement in the patent application as originally filed on page 18, last paragraph, first sentence that "no limit is imposed as to the amount of the cohesion accelerator". Given these considerations, the solution to the identified problem is, therefore, close at hand for the person skilled in the art.

Contrary to the respondent's position, the disclosure of document D1 is not focused on, still less restricted to the exclusive use of limestone as auxiliary raw material, given that this material was predominantly added in the examples. No indication or warning is to be found anywhere in D1 that would actually prevent the skilled person from using auxiliary raw materials other than limestone which are also listed in document D1 and all exhibit the same effect of facilitating melting of the reduced metal and slag. Contrary to the respondent's views, all these materials, including steelmaking slag, dolomite and also fluorspar, are at the disposal of the skilled person and would allow him to achieve the same result. In particular fluorspar is known to the person skilled in metallurgy to be a powerful and the most commonly added fluxing agent which is used in small proportions in commercially available fluoride containing fluxes to improve the slag fluidity. It is noted in this context that

according to the patent, paragraphs [0033] and [0036], the large size and high purity of the nuggets, referred to by the respondent, are not attributed specifically to the presence of CaF_2 or boron oxide, but result from the fluidity of the slag and its ability to coagulate and separate from the coagulated liquid metallic phase. The appropriate slag fluidity is, however, achieved by adding any type of cohesion accelerator (or fluxing agent), including for instance sodium oxide or sodium carbonate, as described in claim 1, page 9, second paragraph, page 17, last paragraph, first sentence, and page 18, lines 2 to 15 of the application as originally filed. Hence, the selection of CaF_2 is not associated with a surprising technical effect unknown to the person skilled in metallurgy.

In view of the above considerations, the selection of CaF_2 in effective amounts from the auxiliary raw materials listed in D1 amounts to nothing more than what is done by the person skilled in art and is not based on hindsight, contrary to the respondent's allegation.

Consequently, the subject matter of claim 1 does not involve an inventive step with respect to the disclosure of document D1 in combination with the general technical knowledge of the person skilled in the art.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is revoked.

The Registrar: The Chairman:

V. Commare T. Kriner