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**Datasheet for the decision
of 31 January 2017**

Case Number: T 0386/15 - 3.2.08
Application Number: 08831788.8
Publication Number: 2199417
IPC: C22B1/248, B01J2/22, B09B3/00,
B30B11/16, C22B1/244, C22B7/02
Language of the proceedings: EN

Title of invention:

METHOD FOR PRODUCING BRIQUETTES WITH CARBONACEOUS MATERIAL
INCORPORATED THEREIN BY USE OF OIL-CONTAINING IRON AND
STEELMAKING PLANT DUSTS

Patent Proprietor:

Kabushiki Kaisha Kobe Seiko Sho

Opponent:

ARCELORMITTAL FRANCE

Headword:

Relevant legal provisions:

EPC Art. 100(b), 100(a), 56

Keyword:

Sufficiency of disclosure
Inventive step

Decisions cited:

Catchword:



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D E C I S I O N
of Technical Board of Appeal 3.2.08
of 31 January 2017

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Decision under appeal:

**Decision of the Opposition Division of the
European Patent Office posted on 23 December
2014 rejecting the opposition filed against
European patent No. 2199417 pursuant to
Article 101(2) EPC.**

Composition of the Board:

Chairman I. Beckedorf
Members: M. Alvazzi Delfrate
 M. Foulger

Summary of Facts and Submissions

- I. By its decision posted on 23 December 2014 the opposition division rejected the opposition against the European patent No. 2199417.
- II. The appellant (opponent) lodged an appeal against that decision in the prescribed form and within the prescribed time limits.
- III. Oral proceedings before the Board of Appeal were held on 31 January 2017. For the course of the oral proceedings reference is made to the minutes.
- IV. 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 (*i.e.* that the patent be maintained as granted) or, alternatively, that when setting aside the decision under appeal the patent be maintained in amended form on the basis of one of the sets of claims filed as auxiliary requests 1 and 2 with letter of 4 August 2015 and as auxiliary request 3 with letter of 30 December 2016.

- V. Claims 1 and 12 of the main request read as follows:

"A method of producing carbon composite briquettes, using steel mill dust containing oil, comprising:

adding at least a carbonaceous material (B) and a binder (D) to steel mill dust (A) containing oil, optionally adding thereto an iron oxide-containing material and a CaO-containing material (C) and mixing them to form a powdery mixture;

compacting the powdery mixture by means of a pressure roll (1) of a double roll-type briquette machine (17) to produce briquettes (F);

recognizing an increase/decrease in an oil content of the powdery mixture; and

adjusting a rotation speed of the pressure roll (1) according to the recognized increase/decrease in the oil content so as to lower the rotation speed of the pressure roll along with an increase in the oil content, wherein the oil content of the powdery mixture is a value defined as a mass ratio of oil to a total mass of the steel mill dust, the carbonaceous material, an iron oxide-containing material and a CaO-containing material, in the powdery mixture (including a case where a mass of at least one of the iron oxide-containing material and the CaO-containing material is zero)."

"A method of producing carbon composite briquettes, using steel mill dust containing oil, comprising:

adding at least a carbonaceous material (B) and a binder (D) to steel mill dust (A) containing oil, optionally adding thereto an iron oxide-containing material and a CaO-containing material (C) and mixing them to form a powdery mixture;

compacting the powdery mixture by means of a pressure roll (1) of a double roll-type briquette machine to produce briquettes (F);

screening (12) compacts produced by means of the pressure roll, into an oversize fraction and an

undersize fraction, and conveying (22), the oversize fraction to a reducing furnace (20) while mixing the undersize fraction (J) with a feed material to be fed to the pressure roll;

recognizing an increase/decrease in an oil content of the powdery mixture; and

increasing a weight ratio of the undersize fraction included in the feed material, to the feed material, along with an increase in the oil content, wherein the oil content of the powdery mixture is a value defined as a mass ratio of oil to a total mass of the steel mill dust, the carbonaceous material, an iron oxide-containing material and a CaO-containing material, in the powdery mixture (including a case where a mass of at least one of the iron oxide-containing material and the CaO-containing material is zero)."

The auxiliary requests are not relevant for the present decision.

VI. The following documents have been cited in appeal:

D1: DE -A- 41 01 584;
D2: US -A- 2005/0050996; and
D4: EP -A- 0 861 909.

VII. The arguments of the appellant can be summarised as follows:

Sufficiency of disclosure

The claimed invention related to the production of briquettes using "steel mill dust". However, it was not clear what a steel mill dust was. The normal

understanding of "dust" did not apply because the description, paragraph [0049], seemed to include in this definition also non-powdery materials such as mill sludge. Hence, the claimed invention was not sufficiently disclosed.

Moreover, the variations of the parameters disclosed in paragraph [0036] were not effective ways of recognizing an increase/decrease of the oil content, because the parameters could also vary as a result of other factors, such as the binder or water content. Hence, an increase or decrease of the oil content could only be recognised by a measure of said oil content. The patent, however, disclosed, in paragraphs [0024], [0026] and [0038], three different and contradictory ways of measuring the oil content. Thus, also in this respect the invention was not sufficiently disclosed.

Finally, there was no evidence that the invention could be carried out over its whole range: Figures 3-5 showed that only a limited oil content was acceptable and the table on page 9 demonstrated the importance of the water content. Since no limitation of the oil content was present in the claim, the disclosure of the patent was also insufficient for this reason.

Inventive step - Claim 1

D1 disclosed a method of producing briquettes using steel mill dust containing oil by rolling. Since the binder used in the process of D1 comprised carbon, it could be regarded as a carbonaceous material. A portion of the binder could be seen as being the claimed binder, while another part could be regarded as being the carbonaceous material. Hence, D1 disclosed adding a carbonaceous material and a binder to the steel mill

dust, as required by claim 1. As a consequence, the claimed method was distinguished from the method of D1 solely by the recognition of the variation of the oil content and the adaptation of the roll speed.

D2 disclosed that the strength of the briquettes could be increased by decreasing the speed of the rolls. Thus, it was obvious to measure the strength of the briquettes, which was equivalent to recognise the oil content, and reduce the speed in case of insufficient strength.

Therefore, the subject-matter of claim 1 did not involve an inventive step in view of D1 and D2.

Inventive step - Claim 12

D4 also related to a method of producing briquettes using steel mill dust. In the fourth embodiment disclosed in column 7 the starting powder mixture comprised, in addition to the binder and further components, cupola-furnace top-gas dust and grinding shop dust. The cupola furnace top-gas dust comprised carbon and was thus to be seen as a carbonaceous material. The grinding-shop dust inherently comprised oil. Hence, the powdery mixture was in accordance with claim 12. After rolling, the compacts produced by means of the pressure roll were screened into an oversize fraction and an undersize fraction (fine particles). The undersize fraction was mixed with the material to be fed to the pressure roll. Hence, in case of an increase in the oil content, which implied an increase in the sieved undersize fraction, the weight fraction of the undersize fraction in the feed material was automatically increased. Therefore, the sole difference of the claimed process in view of D1 was that the

variation of the oil content was recognised. No technical effect was associated with this feature, which, as a consequence, was to be disregarded.

In case that the speed of the rolls was also to be considered, its adaptation was rendered obvious by D2.

Thus, the subject-matter of claim 12 lacked an inventive step in view of D4 alone or D4 in combination with D4.

VIII. The arguments of the respondent can be summarised as follows:

Sufficiency of disclosure

The description of the patent in suit provided examples of the steel mill dust to be used, of ways of recognising a variation in the oil content by directly measuring it via a known method or by measuring parameters linked to it, and of the choices to be made for the other process parameters. It was well within the competences of the person skilled in the art to modify these parameters, if necessary. Thus, the invention was sufficiently disclosed.

Inventive step - Claim 1

Neither D1 nor D2 rendered it obvious to recognise the oil content of the briquettes and adapt the roll speed accordingly.

Moreover, D1 did not disclose any carbonaceous material in addition to the binder. Nor was it obvious to provide a carbonaceous material in the briquettes of

D1, because they were not used in a direct reduction process.

Therefore, the subject-matter of claim 1 involved an inventive step.

Inventive step - Claim 12

D4 did not mention the presence of oil in the powder or its effect. There was no disclosure or teaching that the weight fraction of the sieved fine material was increased as a reaction to an increased oil content. Indeed, none of the prior art documents rendered obvious this measure, whose effect was to maintain sufficient strength of the briquettes. Thus, the subject-matter of claim 12 involved an inventive step.

Reasons for the Decision

1. Sufficiency of disclosure
 - 1.1 The person skilled in the art knows what steel mill dust is, namely dust resulting as by-product from steel production. Examples disclosed in the patent are electric arc furnace dust, mill scale or mill sludge (paragraphs [0009] and [0049]). The fact that the term "dust" used in the claims would not normally be used to refer to sludge is a matter of clarity, which is not a ground of opposition, and not of sufficiency of disclosure. Hence, the person skilled in the art would have no problem in selecting a "steel mill dust" for carrying out the claimed method.
 - 1.2 The claimed method does not require the oil content to be measured but merely "recognizing" an increase/

decrease in an oil content of the powdery mixture. As explained in paragraph [0036] of the patent, the recognition of a variation of the oil content does not require the measurement of this content but can be obtained from some other information such as

- (1) decrease in a ratio of partial compacts sorted out as the oversize fraction G to the total compacts F
- (2) increase in a ratio of partial compacts sorted out as the undersize fraction H to the total compacts F
- (3) decrease in an amount of briquettes in the briquette feed hopper
- (4) reduction in a strength of each of the briquettes contained in the oversize fraction.

Even if these parameters may also be influenced by changes in other process variables they can, in the absence of said changes, be used to recognise a variation in the oil content.

In addition to that it would also be possible to measure the oil content itself by the known hexane extract method disclosed in paragraph [0038]. As to paragraphs [0024] and [0026], contrary to the appellant's view, they are not in contradiction with paragraph [0038] but rather complement its information because they do not disclose other methods of measurement but only specify in respect of what the oil content is to be expressed.

Thus, the person skilled in the art had sufficient information to recognise an increase or decrease in the oil content as required by claims 1 and 12.

1.3 Finally, the description discloses some preferred oil contents (see for instance Figures 3 and 5), together with the preferred values for other process variables, such as the roll speed or the water content. The person

skilled in the art would know how to vary these values, depending also on the acceptable strength of the briquettes (no requirement in this respect is stipulated by the independent claims). Since claims 1 and 12 do not specify any range for the oil content, there is no reason to conclude that the invention cannot be carried out for some specific claimed oil content. Thus, the information provided by the patent is sufficient to carry out the invention over the whole claimed scope.

1.4 Therefore, the patent discloses the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art (Article 100(b) EPC).

2. Inventive step - Claim 1

2.1 D1 relates a method of producing briquettes using steel mill dust (Walzenzunder) containing oil (abstract). In the process of D1 a binder with a composition comprising carbon (Melasse) is added to the steel mill dust containing oil (column 1, lines 42-52) and the powdery mixture is compacted by means of a pressure roll of a double roll-type briquette machine to produce briquettes (column 1, line 67 - column 2, line 6).

2.2 It is undisputed that D1 does not disclose the step of adjusting a rotation speed of the pressure roll which is stipulated by present claim 1.

Claim 1 also stipulates "adding at least a carbonaceous material (B) and a binder (D) to steel mill dust (A) containing oil". The natural and ordinary reading of this sentence is that two different materials, namely the binder and the carbonaceous material, are added to

the steel mill dust. This is also in accordance with the disclosure of the description (paragraphs [0016], [0052] and [0053]). Hence, this is also the interpretation of claim 1 given by the person skilled in the art. By contrast, in D1 only one material comprising carbon, *i.e.* the binder, is added to the steel mill dust. Therefore, contrary to the appellant's opinion, the method of claim 1 is distinguished from the method of D1 also by the addition of a carbonaceous material (further to the binder).

2.3 The effect of this feature is that the briquettes, when used in a direct reduction process, reduce the cost of the process and ease the geographical restrictions on plant location because no natural gas as reducing agent is needed (paragraph [0002] of the patent in suit).

2.4 Starting from D1, without the knowledge of the claimed invention, the person skilled in the art would have had no reason to add a carbonaceous material to the starting powdery mixture, because the briquettes of D1 are not to be used in a direct reduction process but rather fed to a blast furnace or a converter (claims 5 and 6).

D2 does not teach in this direction either, because it is completely silent on carbon addition and its role in direct reduction.

Hence, for this reason alone it was not obvious to arrive at the method of claim 1 starting from D1. Therefore, there is no need to consider whether it was obvious or not to adjust the rotation speed of the pressure roll starting from D1. Consequently, the subject-matter of claim 1 involves an inventive step.

3. Inventive step - claim 12

3.1 D4 also relates to a method of producing briquettes using steel mill dust. The method comprises compacting a powdery mixture by means of a pressure roll (8) of a double roll-type briquette machine to produce briquettes (Figure 1). After the rolling step the compacts produced by means of the pressure roll are screened (10) into an oversize fraction and an undersize fraction (fine particles). The undersize fraction is mixed with the material to be fed to the pressure roll (Figure 1 and column 7, lines 48-52).

3.2 It is undisputed that D4 does not disclose recognizing an increase/decrease in an oil content of the powdery mixture. Indeed, neither the presence of oil nor a parameter associated with it is measured in D4. Hence, even if some oil is present in the starting material, an increase or decrease in its content is not recognised.

D4 does not disclose any detail in respect of the amount of the weight ratio of the undersize fraction in the feed material. In fact, D4 merely states that the undersize material "may be reused in the process" (column 8, lines 7-13). Hence, no information is given as to whether, in case the undersize fraction increases, its weight ratio in the feed material is kept constant, increased or decreased. Therefore, contrary to the the appellant's view, D4 does not disclose increasing a weight ratio of the undersize fraction included in the feed material, to the feed material, along with an increase in the oil content.

3.3 By means of said distinguishing features the strength of the briquettes is maintained at sufficient level

(paragraphs [0046]-[0048]). Thus, the problem of providing a production method capable of producing high strength briquettes, even when using steel mill powder comprising oil, is solved.

3.4 D4 does not teach towards the claimed solution because it is silent both in respect of the effect of oil and of varying the weight ratio of the undersize fraction in the feed material.

D2 also does not contain any hint to the claimed solution because it is completely silent in respect of screening the compacts in an undersize and an oversize fraction.

Thus, the method of claim 12 is not rendered obvious by the prior art and involves an inventive step.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



C. Moser

I. Beckedorf

Decision electronically authenticated