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**Datasheet for the decision
of 8 September 2023**

Case Number: T 1629/21 - 3.3.05

Application Number: 16700195.7

Publication Number: 3242958

IPC: C21C1/02, C21C7/064

Language of the proceedings: EN

Title of invention:

PROCESS FOR DEPHOSPHORIZATION OF MOLTEN METAL DURING A
REFINING PROCESS

Patent Proprietor:

S.A. Lhoist Recherche et Développement

Opponent:

Fels Vertriebs- und Service GmbH & Co. KG

Headword:

Dephosphorization using lime compacts/Lhoist

Relevant legal provisions:

RPBA 2020 Art. 12, 13(1)

EPC Art. 83, 54(3), 56

Keyword:

Amendment to appeal case - taken into account (no)
Sufficiency of disclosure - enabling disclosure (yes)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

T 0706/95

Catchword:



Beschwerdekammern

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Case Number: T 1629/21 - 3.3.05

D E C I S I O N
of Technical Board of Appeal 3.3.05
of 8 September 2023

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
27 July 2021 concerning maintenance of the
European Patent No. 3242958 in amended form.**

Composition of the Board:

Chairman E. Bendl
Members: S. Besselmann
R. Winkelhofer

Summary of Facts and Submissions

- I. The appeals in this case, by the patent proprietor (appellant 1) and the opponent (appellant 2), are against the opposition division's interlocutory decision that the European patent EP 3 242 958 B1 in the form of the then pending auxiliary request 9 together with the "auxiliary version" of the description filed during the oral proceedings before the opposition division met the requirements of the EPC. The patent in suit concerns a process for the dephosphorization of molten metal during a refining process.
- II. The following documents are of relevance here:
- D1 WO 2015/007661 A1 (22 January 2015)
 - D2 Schiele E., Berens L., "KALK Herstellung-Eigenschaften-Verwendung", 1972, Verlag Stahleisen mbH, Düsseldorf, pages 246, 280-355
 - D4 Komarek R., "Roll-press briquetting can help lime producers improve materials handling", Mining Engineering, December 1993, 1467-69
 - D18 Test report dated 15 May 2019, submitted with the notice of opposition
 - D22 Melecký J., 1986, "Possibility of Use of Lime Briquettes in Steelmaking", HUTNÍK No. 12, 1986 (36), certified translation into English of the Czech original (D22a)
 - D24 Melecký J., "Use of Lime Briquettes in Steelmaking in 200 t Tandem Furnaces", Hutnické listy No. 7/8, 1991, certified translation into English of the Czech original (D24a)

D25a RD Jeseník, TP No. RDJ-585-219/83, translation into English of the Czech original (D25)

III. The patent proprietor, in their statement of grounds of appeal, filed a new main request and a new auxiliary request 1, and alternatively requested that the patent be maintained on the basis of the claims found allowable by the opposition division together with the "main version" of the description, filed during the oral proceedings before the opposition division. They filed further auxiliary requests in reply to the opponent's appeal.

IV. The opponent, in their reply to the patent proprietor's appeal, raised objections of lack of novelty, lack of inventive step and lack of sufficiency of disclosure against the claims according to the main request and auxiliary request 1. In a subsequent submission of 19 April 2022, the opponent submitted test results D30, relating to a comparison of shatter test methods.

V. The independent claim of the main request relates to a dephosphorization process and reads as follows:

"1. Process for dephosphorization of molten metal during a refining process comprising the steps of

- charging a vessel with hot metal and optionally scrap*
- charging said vessel with a first lime composition*
- blowing oxygen into said vessel*
- forming slag with said first lime composition charged into said vessel*
- dephosphorization of hot metal to form a refined metal reduced in phosphorus components, and*

- discharging said refined metal reduced in phosphorus components

characterized in that said first lime composition comprises at least one first calcium-magnesium compound fitting the formula $a\text{CaCO}_3.b\text{MgCO}_3.x\text{CaO}.y\text{MgO}.ul$, wherein l represents impurities, a , b and u each being mass fractions ≥ 0 and $\leq 50\%$, x and y each being mass fractions ≥ 0 and $\leq 100\%$, with $x + y \geq 50\%$ by weight, based on the total weight of said at least one calcium-magnesium compound, said at least one calcium-magnesium compound being in the form of particles, said first lime composition having a cumulative calcium and magnesium content in the form of oxides greater than or equal to 20% by weight based on the total weight of the first lime composition, and being in the form of compacts, each compact being formed with compacted and shaped particles of calcium-magnesium compounds, said compacts having a Shatter Test Index of less than 10%, representing the mass percentage of the fines of less than 10 mm generated after 4 two-meter falls with initially 0.5 kg of product with a size of more than 10 mm, in a tube with a length of 2 m and a diameter of 40 cm with a removable receptacle, which base is a polypropylene plate with a thickness of 3 mm, said receptacle resting on a concrete ground and **in that** said dephosphorization step of hot metal leads to a refined metal reduced in phosphorus components to the extent that the refined metal reduced in phosphorus is showing a phosphorus content lower than 0.02 w% based on the total weight of the refined metal reduced in phosphorus."

Claims 2-18 relate to particular embodiments.

VI. The opponent's arguments, where relevant to the present decision, can be summarised as follows.

D30 should be taken into consideration because it was a response to the patent proprietor's assertion that the claimed Shatter Test Index was more severe than the one reported in D22.

The claimed invention according to claims 7-10 was insufficiently disclosed because it was not known how compacts having a Shatter Test Index of less than 20% after the Accelerated Ageing Test could be obtained, and in particular how this could be obtained across the entire scope of the claim. The claimed invention according to claims 2 and 4 was also insufficiently disclosed on account of the reference to "NaO₃" in these claims.

Novelty was lacking in view of D1 (prior art under Article 54(3) EPC). The fact that the claim specified a phosphorus content of the refined metal of lower than 0.02 wt% could not delimit the claim from the prior art.

An inventive step was lacking starting from D22 as the closest prior art. The skilled person would have been motivated to further improve the strength of the briquettes, in order to solve the problem of reducing lime loss. They would have found the solution in D4, which taught how to produce briquettes that were nearly as good as pebble lime. An inventive step was additionally lacking starting from D2 or D24.

VII. The patent proprietor's arguments are reflected in the reasons for the decision.

VIII. Appellant I (patent proprietor) requests that the decision under appeal be set aside and amended such that the patent be maintained on the basis of the main request or, alternatively, one of auxiliary requests 1-9, all submitted or resubmitted on 1 September 2023.

Auxiliary requests 1-4 and 6-9 were to be combined with a "main version" and an "auxiliary version" of the description which had been filed during oral proceedings before the opposition division.

Appellant II (opponent) requests that the decision under appeal be set aside and amended such that the patent be revoked.

Reasons for the Decision

Main request

2. Consideration of document D30
 - 2.1 D30 is a test report comparing the shatter test method taught in the patent in suit with the one used in D22 (i.e. the test according to TP No. RDJ-585-219/83 submitted as D25 with its English translation D25a).
 - 2.2 According to the opponent, D30 should be taken into consideration because it was a response to the patent proprietor's assertion that the claimed Shatter Test Index was more severe than the one reported in D22.
 - 2.3 However, the Shatter Test Index was a feature of claim 1 as granted, and the method for measuring it had been included in the auxiliary requests filed in reply

to the notice of opposition. The question of how the Shatter Test Index according to the patent in suit compared with the results of D22 thus had not newly arisen with the filing of auxiliary request 9 during oral proceedings before the opposition division. Even though the range of the Shatter Test Index was amended in that request, the issue has been relevant from the time D22 was filed.

D30 is intended to support the assertion that the shatter test of the patent in suit was less severe than the one known from D22 (i.e. the one detailed in D25). This in fact constitutes a change compared with the opponent's initial position that the shatter test of D22/D25 was nearly identical to the one according to the patent in suit (statement of grounds of appeal, page 11, first paragraph; "*nahezu identisch*").

The opponent should have presented their complete case based on D22 when they filed D22 with the opposition division, in particular as D22 was filed on the last day of the time limit set under Rule 116 EPC (3 February 2021), which was in fact the second such time limit due to a postponement of the oral proceedings.

- 2.4 Furthermore, while D30 raises doubts as to the comparability of the shatter test methods, it does not state the Shatter Test Index that the compacts known from D22 would have had when measured in accordance with the patent in suit. Taking D30 into consideration would thus give rise to new questions, which would be detrimental to procedural economy.

- 2.5 For these reasons, D30 is not taken into account (Article 12(4) and (6) RPBA 2020, which also apply pursuant to Article 13(1) RPBA 2020).
3. Sufficiency of disclosure
- 3.1 Two separate objections were presented, concerning claims 7-10 on the one hand and claims 2 and 4 on the other hand.
- 3.2 Claims 7-10 specify that the compacts have a Shatter Test Index of less than 20% after an Accelerated Ageing Test of Level 1-4, respectively.
- 3.3 Regarding claims 7-10, the opponent contested that the skilled person would have been able to provide lime compacts exhibiting the specified Accelerated Ageing Test performance. They provided test report D18 in support of their objection. According to the opponent, no examples were provided in the patent in suit, and it was not permissible to rely instead on the disclosure of D1, of which no specific passages had been identified either. If D1 were nevertheless to be consulted, it showed that only compacts obtained by tableting or the combination of briquetting and a certain thermal treatment showed the specified Accelerated Ageing Test performance, while compacts obtained by briquetting without the thermal treatment did not. It was thus unknown how other compacts, in particular briquettes, could be provided. In the opponent's opinion, the invention according to claims 7-10 could therefore not be carried out across the entire scope.

- 3.4 However, D18 does not support the opponent's objection because the ageing tests in D18 were not carried out on compacts having an initial Shatter Test Index of less than 10%, as stipulated in independent claim 1.
- 3.5 Examples demonstrating the subject-matter of claims 7-10 are provided in D1, which is referred to in the patent in suit (paragraph [0068]) and in the application on which the patent is based (page 15, lines 13-15). An invention is also sufficiently disclosed if reference is made to another document in the patent specification and the original description, and if the skilled person can obtain from this cross-reference the information required to reproduce the invention (Case Law of the Boards of Appeal of the EPO, 10th edn, 2022, II.C.4.2). Therefore, relying on the cross-referenced document D1 does not impair sufficiency in this case. There was no need to identify a specific passage within D1 because D1 as a whole relates to relevant compacts. Moreover, examples illustrating the Accelerated Ageing Tests, relevant to claims 7-10, can be easily and unambiguously identified within the disclosure of D1. There is no evidence that these examples cannot be reproduced.
- 3.6 It is not convincing either that D1 as referred to in the patent in suit would not enable the skilled person to carry out the invention across the entire scope of claims 7-10. These claims are directed to a process for the dephosphorization of molten metal during a refining process, in which a compacted lime composition is used. To carry out the claimed process, the skilled person needs to be able to provide the specified compacts exhibiting the relevant Accelerated Ageing Test performance. However, it is not necessary to provide such compacts by all possible preparation processes,

including by briquetting without a thermal treatment step, because the preparation of the compacts is not a feature of the claimed invention. Therefore, the case law cited by the opponent, according to which the requirements of sufficiency of disclosure are met if a person skilled in the art can carry out the claimed invention over the whole scope of the claims, without undue burden, using their common general knowledge (Case Law of the Boards of Appeal of the EPO, 10th edn, 2022, II.C.5.4), does not lead to a different conclusion.

3.7 The opponent further argued that claims 2 and 4 mentioned a compound "NaO₃" which did not exist. However, this point was raised as an objection under Article 100(b) EPC for the first time on appeal, even though it concerns a feature of the claims as granted. This objection should have been raised before the opposition division and is not taken into account (Article 12(6) RPBA 2020).

3.8 In summary, the requirements of sufficiency of disclosure are met.

4. Novelty

4.1 According to the opponent, novelty was lacking in view of D1 (prior art under Article 54(3) EPC). They argued in particular that the dephosphorization step leading to a phosphorus content of the refined metal of lower than 0.02 wt% was a result to be achieved and was obtained automatically; it was a typical phosphorus content. Furthermore, according to the opponent, this case was similar to T 706/95 and related case law which had found that discovering that the same known means

led to an additional effect when used for the same known purpose (i.e. use) could not confer novelty on this known use.

- 4.2 However, the case law referred to by the opponent is irrelevant to the claim at issue. The resulting phosphorus content in the refined metal is not governed by the chosen lime addition alone and cannot be treated as an inherent effect of the lime. It is rather a feature of the claimed process, which implies that the relevant process steps, such as the charging step (i.e. the raw materials used) and the oxygen blowing step, are carried out accordingly.

D1 is silent on specific process steps. It merely describes in general terms the suitability of the calcium-magnesium compacts for oxygen converters in steel manufacture. There is no proof that the claimed final phosphorus content would be inevitably achieved, irrespective of, for instance, the initial phosphorus content in the raw material and the duration of the oxygen blowing step. The fact that a phosphorus content of lower than 0.02 wt% may be common does not amount to direct and unambiguous disclosure.

- 4.3 The objection of lack of novelty is therefore not convincing.

5. Inventive step

- 5.1 There was agreement among the parties that D22 was the closest prior art.

- 5.2 D22 describes the use of lime briquettes in steelmaking and, *inter alia*, assesses its effect on steel

dephosphorization. The final phosphorus content is in the range of lower than 0.02%. According to D22, compacts exhibiting a Shatter Test Index of 14.4% are used, measured according to the shatter test method of D25. It is unknown what the corresponding shatter test value would have been if the measuring conditions had been identical to those stipulated in the claim at issue, but there is no proof that it would fall within the range stipulated in the claim at issue (less than 10%).

- 5.3 The patent in suit associates a lower Shatter Test Index with reduced loss of lime (paragraphs [0023] and [0027]).
- 5.4 The objective technical problem may thus be considered to be providing a process for dephosphorization with reduced loss of lime.
- 5.5 While it might be obvious for the skilled person that a lower Shatter Test Index would make it possible to reduce the loss, instructions would additionally be needed as to how this can be achieved.
- 5.6 D22 describes that the tested briquettes were produced by high-pressure press-forming of CaO particles with granularity under 10 mm without the use of binding agent (first paragraph), but it does not provide any teaching on how to adjust the Shatter Test Index.
- 5.7 The opponent submits that the skilled person could have easily pressed commercially available fine lime into briquettes. However, no evidence was provided that the skilled person would have indeed been guided towards the required shatter index.

5.7.1 Contrary to the opponent's view, it cannot be concluded from the patent itself that providing the compacts having a Shatter Test Index of less than 10% was common general knowledge. It is also incorrect that the patent in suit was silent on how the compacts can be provided. The patent in suit refers to the compacted lime exemplified in WO 2015/007661 (D1) (see paragraph [0068], corresponding to page 15, lines 13-15 of the application as originally filed) and thereby provides a method for producing the compacts. As set out with regard to sufficiency of disclosure, the skilled person may obtain the information required to reproduce the invention from this cross-referenced document.

5.7.2 The opponent further relies on the teaching of D4 as a secondary document to be combined with D22.

D4 relates to roll-press briquetting of lime and also describes a drop-shatter test (third page, left-hand column). D4 again uses different test conditions, namely subjecting 4.5 kg of each material to three 1.8-m drops onto a concrete floor and measuring the up to 4.75 mm fraction. It is again unclear on which basis the obtained result (5 wt%) can be compared with the Shatter Test Index stipulated in the claim at issue, and which Shatter Test Index value would have been obtained using the claimed measuring method. The method of D4 is less severe than the method stipulated in the claim in that only the up to 4.75 mm fraction is measured (by contrast with the less than 10 mm fraction according to the claim) and in that only three drops are carried out in D4 (four according to the claim), but it is more severe in that the drops are onto a concrete floor (a 3-mm polypropylene plate according to the claim) and in that a higher amount of material is

used. It is also unknown if a tube was used in D4 and if the fines were collected between subsequent drops.

According to the results provided in D4, based on the drop-shatter test of D4, pebble lime lost 4.4% of its weight while briquettes lost 5% (last page, left-hand column, fourth paragraph). The opponent was of the opinion that the technology of D4 thus provided a Shatter Test Index nearly as good as that of pebble lime, which proved that it was particularly strong.

- 5.7.3 In this context, the opponent's own test report D18 is relevant because it reports the Shatter Test Index of a pebble lime measured in accordance with the claim. Specifically, the pebble lime tested in D18 ("*weichgebrannter Weißstückkalk*") was found to have a Shatter Test Index of 10% measured in accordance with the claim. This means that compacts need to have a better (i.e. *lower*) Shatter Test Index than the pebble lime tested in D18 to be in accordance with the claim.

Hence, even if these results were used as the basis for an indirect comparison of D4 with the claim, which is questionable because the pebble lime may be different (e.g. may have been burnt to a different extent), it could not be concluded that the briquettes of D4 had the claimed Shatter Test Index. As indicated, the briquettes tested in D4 had a *higher* drop-shatter test value than the pebble lime.

- 5.8 It has therefore not been proven that D4 teaches how to improve the Shatter Test Index of the compacts used in D22.

- 5.9 For these reasons, it has not been convincingly shown that the skilled person, starting from D22 in

conjunction with D25, would have arrived in an obvious manner at a process using compacts having a Shatter Test Index of less than 10%.

- 5.10 The opponent cited D2 and D24 as alternative starting points for assessing inventive step (point 2.5 of the reply to the patent proprietor's appeal, referring to points III.3 and III.4 of the opponent's statement of grounds of appeal). However, it cannot be discerned that D2 or D24 would be more relevant than D22.
- 5.10.1 D2 is an excerpt from a textbook that describes different types, properties and uses of lime. Tables 64 and 66, relating to several properties of lime including its apparent density (Table 64), and to the abrasion of quicklime during transport (Table 66), concern pebble lime, not compacted lime. Furthermore, no evidence was provided that the apparent density directly correlates with the Shatter Test Index, as argued by the opponent. D2 also mentions briquettes (pages 347-348) but is silent on their properties; D2 mentions that their strength is often insufficient. D2 is less relevant than D22 because it does not disclose the use of briquettes in conjunction with a process for dephosphorizing molten metal leading to a phosphorus content of lower than 0.02%.
- 5.10.2 According to the opponent, D24 is similar to D22 in that it discloses the possibility of using lime briquettes for steel production and achieves a dephosphorization degree of 0.0145%.

However, D24 is not concerned with the mechanical stability of the briquettes and is thus less relevant than D22.

5.10.3 Starting from D2 or D24 to assess inventive step would therefore not lead to a different conclusion.

5.11 In summary, an inventive step is to be acknowledged.

5.12 The same conclusion applies to claims 2-18, which directly or indirectly depend on 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 opposition division with the order to maintain the patent on the basis of the main request as resubmitted on 1 September 2023, and the description to be adapted.

The Registrar:

The Chair:



C. Vodz

E. Bendl

Decision electronically authenticated