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**Datasheet for the decision
of 19 October 2022**

Case Number: T 0859/19 - 3.2.03

Application Number: 11774221.3

Publication Number: 2564141

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G01S13/88, B22D2/00, F27B3/08,
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Language of the proceedings: EN

Title of invention:
MEASUREMENT OF CHARGE BANK LEVEL IN A METALLURGICAL FURNACE

Patent Proprietor:
Hatch Ltd

Opponent:
SMS group GmbH

Headword:

Relevant legal provisions:
RPBA Art. 12(4)
EPC Art. 56

Keyword:

Late-filed evidence - submitted with the statement of grounds
of appeal

Inventive step - (yes) - non-obvious modification - auxiliary
request (yes)

Decisions cited:

Catchword:



Beschwerdekammern

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Chambres de recours

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Case Number: T 0859/19 - 3.2.03

D E C I S I O N
of Technical Board of Appeal 3.2.03
of 19 October 2022

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Decision under appeal: **Interlocutory decision of the Opposition
Division of the European Patent Office posted on
21 January 2019 concerning maintenance of the
European Patent No. 2564141 in amended form.**

Composition of the Board:

Chairman C. Herberhold
Members: R. Baltanás y Jorge
E. Kossonakou

Summary of Facts and Submissions

- I. European patent No. 2 564 141 B1 relates to the measurement of charge bank level in a metallurgical furnace.
- II. An opposition was filed against the patent based on Article 100(c) EPC and Article 100(a) EPC together with Articles 54 EPC and 56 EPC.

The opposition division decided to maintain the patent in amended form according to the first auxiliary request filed during the oral proceedings.

- III. This interlocutory decision was appealed by both the opponent and the patent proprietor. For the sake of simplicity, as the parties are both appellants and respondents, they are referred to in the following as the opponent and the patent proprietor.
- IV. In a communication pursuant to Article 15(1) of the Rules of Procedure of the Boards of Appeal (RPBA), the Board indicated its preliminary opinion of the case.

Oral proceedings were held on 19 October 2022.

- V. Requests

At the end of the oral proceedings before the Board, the parties' requests were as follows.

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

The patent proprietor requested maintenance of the patent on the basis of auxiliary request 12 as its sole (main) request.

VI. The patent proprietor having withdrawn all other requests except for auxiliary request 12, the decision is restricted to examination of this sole request and the relevant issues.

VII. Method claim 1 of the main request (i.e. former auxiliary request 12), including the numbering of its features as adopted by the Board, reads as follows:

- M1** *A method of monitoring a feed material layer 120 in a metallurgical furnace 100 comprising:*
- M1.1** *providing at least one non-contact sensor 110*
- M1.1.1** *positioned above the feed material layer 120*
- M1.1.2** *contained in the furnace 100 while the furnace 100 is in use;*
- M1.2** *sensing a sensed distance 132 between a surface of the feed material layer and a reference position using the at least one non-contact sensor 110;*
- M1.3** *providing a process controller 138 communicably linked to the at least one non-contact sensor 110 to generate a control signal based on the sensed distance 132;*
- M1.4** *and outputting the control signal; characterised by*
- M1.5** *providing the at least one non-contact sensor 110 comprises*
- M1.5.1** *providing at least one transmitter 172 in a fixed position above the feed material layer 120*

- M1.5.2** *and providing at least one receiver 174 above the feed material layer 120,*
- M1.5a** *wherein sensing the sensed distance 132 between a surface of the feed material layer and a reference position using the at least one non-contact sensor 110 comprises projecting an electromagnetic signal 154 from the transmitter 172 toward a surface 126 of the feed material layer 120, collecting a reflection 156 of the electromagnetic signal off a surface 126 of the feed material layer 120 using the receiver 174 and comparing the electromagnetic signal 154 to the reflection 156,*
- M1.5b** *wherein providing the at least one non-contact sensor 110 comprises providing a plurality of transmitters 172 and a corresponding plurality of receivers 174 above the feed material layer 120,*
- M1.5c** *and wherein sensing the sensed distance comprises determining one sensed distance 132 corresponding to each transmitter 172,*
- M1.5d** *wherein generating the control signal comprises generating a plurality of control signals, each control signal based on one sensed distance 132;*
- M1.5e** *generating a surface topography based on the plurality of sensed distances 132 and generating a surface control signal based on the surface topography;*
- M1.6** *and providing a housing 134 around each non-contact sensor 110*
- M1.6.1** *to electromagnetically shield the non-contact sensor 110 from electromagnetic interference present between the non-contact sensor 110 and the feed material layer 120.*

VIII. Independent device claim 9 of the main request, including the numbering of its features as adopted by the Board, reads as follows:

- M9** *A feed control system for a metallurgical furnace 100 containing a feed material layer 120, the feed control system comprising:*
- M9.1** *at least one non-contact sensor 110 to sense a distance 132 between a surface of the feed material layer 126 and a reference position,*
- M9.1.1** *the at least one non-contact sensor 110 positioned above the feed material layer 120;*
- M9.2** *a process controller 138*
- M9.2.1** *communicably linked to the at least one non-contact sensor 110*
- M9.2.2** *and configured to output a control signal based on the distance 132;*
- M9.3** *and at least one feed supply actuator 152*
- M9.3.1** *communicably linked to the controller 138*
- M9.3.2** *to automatically regulate a flow of feed material into the furnace 100 based on the control signal, characterised in that*
- M9.4** *the at least one non-contact sensor 110 comprises*
- M9.4.1'** *at least one transmitter 172 fixedly positioned above the feed material layer 120*
- M9.4.1a** *and having an unobstructed line of sight to the feed material layer 120*
- M9.4.2** *and at least one receiver 174 positioned above the feed material layer 120,*
- M9.4a** *wherein the at least one transmitter 172 is configured to project an electromagnetic signal 154 toward the feed material layer 120,*

- M9.4b** *wherein the at least one receiver 174 is fixedly positioned to receive a reflection 156 of the electromagnetic signal 154 from a surface 126 of the feed material layer 120,*
- M9.4c** *wherein a plurality of transmitters 172 and a corresponding plurality of receivers 174 is provided above the feed material layer 120,*
- M9.4d** *wherein one sensed distance 132 corresponding to each transmitter 172 is determined,*
- M9.4e** *wherein a plurality of control signals, each control signal based on one sensed distance 132, is generated,*
- M9.4f** *wherein a surface topography is generated based on the plurality of sensed distances 132 and a surface control signal is generated based on the surface topography,*
- M9.5** *and wherein each non-contact sensor 110 is provided in a housing 134*
- M9.5.1** *to electromagnetically shield the non-contact sensor 110 from electromagnetic interference present between the non-contact sensor 110 and the feed material layer 120.*

IX. State of the art

- (a) The following documents have been cited in the grounds of appeal and during the opposition proceedings and are relevant for this decision:

D7: EP 0 633 441 A1

D8: EP 0 637 634 A1

- (b) The opponent filed the following further documents, which are relevant to the present decision, with the statement setting out the grounds of appeal:

- B4: DE 10 2004 061 082 A1
- B5: DE 101 41 889 A1
- B6: "Lueger, Lexikon der Technik, Band 2,
Grundlagen der Elektrotechnik und
Kerntechnik", Deutsche Verlags-Anstalt
Stuttgart, © 1960
- B7: EP 1 721 128 B1
- B8: EP 0 300 150 B1

X. Admittance of documents B4 to B8 was contested by the patent proprietor.

XI. The opponent's arguments can be summarised as follows.

(a) Admittance of B4 to B8 - Article 12(4) RPBA 2007

These documents attempted to close a perceived gap (lack of evidence) - explicitly addressed in point 2.2.13 of the impugned decision - in connection with shielding from electromagnetic interference in sensors belonging to metallurgical furnaces in the argument supporting the lines of attack raised by the opponent. The documents were therefore to be admitted in appeal proceedings since they were filed as a reaction to the decision of the opposition division and were *prima facie* relevant to the outcome of the case.

(b) Inventive step - Article 56 EPC

The subject-matter of claims 1 and 9 did not involve an inventive step.

Firstly, features 1.6 and 1.6.1 could not render the subject-matter of claim 1 inventive over the prior art since the provision of a shielding housing for the at

least one non-contact sensor was obvious with regard to the combination of D8 or D7 as the closest prior art with B4, B6, B7 or B8. These documents disclosed that electronic components had to be shielded against electromagnetic radiation in general, particularly in the context of electrical metallurgical furnaces.

Contrary to the view of the patent proprietor, both D8 and D7 disclosed a sensor comprising a transmitter since the level measuring device ("*Pegelmeßeinrichtung*") explicitly disclosed in this document as a high-temperature radar ("*Hochtemperatur-Radar*") inevitably required the presence of an electromagnetic transmitter.

Secondly, features M1.5b (plurality of transmitters and receivers), M1.5c (determining one sensed distance corresponding to each transmitter), M1.5d (generating a plurality of control signals, each control signal based on one sensed distance) and M1.5e (generating a surface topography based on the plurality of sensed distances and generating a surface control signal based on the surface topography) were also obvious in view of the available prior art.

The considerable inner size of the furnace (1) disclosed in D8 would have motivated the skilled person to arrange a plurality of sensors along the ceiling of the furnace to supervise the whole surface of the metal to be processed and to adjust the furnace accordingly. Using such a plurality of transmitters and receivers was part of the known repertoire of the skilled person. This would result in the generation of a surface topography for control purposes as in features M1.5d and M1.5e.

The arguments applied *mutatis mutandis* to independent claim 9.

XII. The patent proprietor's arguments can be summarised as follows.

(a) Admittance of B4 to B8 - Article 12(4) RPBA 2007

The contested decision could not have come as a surprise to the opponent since D7 and D8 had been commented on in the preliminary opinion of the opposition division. The late-filed documents should thus have been filed in reply to that preliminary opinion and not in appeal proceedings.

The decision did not invite at filing new prior art to support the alleged implicit disclosure of shielding from electromagnetic interference in D7 and D8 or to argue about the obviousness of the distinguishing features. Point 2.2.16 of the contested decision actually stated that the problem of electromagnetic interference was not discussed at all in D7 or D8.

The comments of the opponent about the *prima facie* relevance of B4, B5, B6, B7 and B8 were not persuasive.

B4 concerned a different sensor at a different location with regard to D7 or D8, namely a light sensor arranged within a cooling channel. Paragraph [0017] only disclosed that the shielding from electromagnetic interferences "can" ("*kann*") be provided. The feature was thus presented as optional.

B5 belonged to a different measurement technique (highly sensitive measurement of electromagnetic

fields) with requirements not applicable to the sensors of the electrical metallurgical furnaces of D7 or D8.

B6 had a focus on nuclear reactors which did not provide any details on the shielding of sensors as in D7 or D8. The document remained too general to be of any use to the skilled person in this case.

Figure 1 of B7 did not even clarify where "the sensor" was located since this sensor was formed by an ensemble of separate components immersed in molten metal. Furthermore, B7 was intended to measure particles within the molten metal, which lay far away from the measurement of electromagnetic signals to be sent and received as in D7 or D8.

B8 concerned the measurement of molten metal flow with a sensor comprising coils and being located at the bottom of a furnace. The skilled person had no reason to consult this document when starting from a sensor for electromagnetic signals arranged at the ceiling of the furnace, above the molten metal, as in D7 or D8.

(b) Inventive step - Article 56 EPC

Firstly, the person skilled in the art would not combine the teaching of D7 or D8 with any of the documents showing a shielding housing. Indeed, D8 did not even disclose a transmitter.

Secondly, features M1.5b (plurality of transmitters and receivers), M1.5c (determining one sensed distance corresponding to each transmitter), M1.5d (generating a plurality of control signals, each control signal based on one sensed distance) and M1.5e (generating a surface topography based on the plurality of sensed distances

and generating a surface control signal based on the surface topography) were not disclosed in D7 or D8. Their technical effect was the adaptation of the surface control to the surface topography of the material in the furnace to reach an optimum control (see paragraph [0102] of the patent specification).

The objective technical problem addressed by these distinguishing features could thus be defined as how to adapt the surface control to optimum thermal conditions in the furnace.

There was no suggestion in the prior art which could have prompted the skilled person in the direction of the invention. None of the available documents was even concerned with surface topography. Generating a surface control signal based on the surface topography thus made the subject-matter of claim 1 clearly inventive.

The subject-matter claimed was thus inventive.

Reasons for the Decision

1. Admittance of B4 to B8 - Article 12(4) RPBA 2007

1.1 B6

As a technical dictionary ("Lexikon der Technik"), B6 represents common general knowledge in the technical field to which it belongs. Even if B6 has parts dealing with nuclear reactors, the document relates to electrotechnics (see page 2, title) and contains teaching about how shielding from electromagnetic fields is carried out in general (see page 4, entry

"Abschirmung"). Thus, the Board does not deem it appropriate to exclude it from the proceedings when used as evidence of common general knowledge.

1.2 B5

The Board agrees with the patent proprietor that B5 belongs to a different technical field from the invention (highly sensitive magnetic field measurements; see paragraph [0001]) where particular requirements apply.

Consequently, B5 is not *prima facie* relevant in the current case given the fundamental differences between the magnetic field sensors used in it and the radar sensors used in the electrical metallurgical furnaces of the closest prior-art documents. Thus, the skilled person would not take B5 into consideration when addressing a technical problem in D7 or D8. Therefore, B5 is excluded from the appeal proceedings by virtue of the discretion of the Board under Article 12(4) RPBA 2007.

1.3 B4, B7 and B8

The opposition division considered that "*any document with potential to prejudice the inventive step of claims 1 and 12 would need to discuss at least the problem of electromagnetic interference in an environment at least comparable to an electromagnetic furnace and a sensor system of the type of said claims*" (point 2.2.13 of the impugned decision, see page 11, first paragraph).

This passage hints at a gap in the reasoning of the opponent. The filing of documents B4, B7 and B8, which

relate to electromagnetically shielded sensors in metallurgical furnaces, can thus be seen as a reaction to the contested decision to fill this gap. The patent proprietor's argument that this gap was hinted at in the communication issued by the opposition division in preparation of the oral proceedings before it and that point 2.3.16 of the decision referred to the problem of electromagnetic interference not being mentioned at all in D7 and D8 cannot alter this finding. It remains that the possibility to react to the final decision by filing, *inter alia*, further evidence is acknowledged in law. Therefore, on this basis alone, the Board cannot exclude the contested documents from the appeal proceedings.

The arguments of the patent proprietor about an alleged lack of *prima facie* relevance of B4, B7 and B8 are not persuasive either for the following reasons.

All three documents concern sensors in metallurgical furnaces (B4: see paragraph [0002]; B7: see paragraph [0024]; B8: see column 3, lines 33 to 35).

Document B4 deals with the influence of electromagnetic interferences in electronic components of electrical metallurgical furnaces. Even if the sensor used in B4 (light sensor) is not a radar sensor, paragraph [0017] *prima facie* suggests that the problem of electromagnetic interferences in such furnaces might be a common issue in the technical field and that its solution (shielding) might be generally applicable. The wording used in paragraph [0017] ("*kann*") corresponds to the usual formulation of a preferred embodiment in a patent document and cannot be understood as diminishing the relevance of this teaching.

Document B7 likewise deals with electrical metallurgical furnaces as in D7 or D8. The problems of electromagnetic interference in such furnaces are mentioned ("noise"), and shielding of electromagnetic components is proposed as a solution (column 2, lines 5 to 7 and paragraph [0028]). Thus, the teaching is *prima facie* relevant for the assessment of the inventiveness of features M1.6 and M1.6.1 (shielding housing), even if the location and type of the sensor are not precisely the same.

B8 also concerns the shielding of sensors from electromagnetic interference in metallurgical furnaces. The sensors comprise a transmitter and a receiver arranged within a shielding cassette (page 4, lines 6 to 16). In view of the kind of device and the problem and solution disclosed, B8 is also *prima facie* relevant for the issues at stake, even if the location and type of the sensor are not precisely the same.

Consequently, the Board sees no reason to exclude B4, B7 and B8 from the proceedings under its discretion in accordance with Article 12(4) RPBA 2007.

2. Inventive step - Article 56 EPC

2.1 Lines of attack starting from D8 against claim 1

2.1.1 The parties agree that D8 discloses a method of monitoring a feed material layer (foaming slag: "Schaumslag 9") in a metallurgical furnace (1) (feature M1) comprising:

providing at least one non-contact sensor (22) (feature M1.1) positioned above the feed material layer (9; see

Figure 1) (feature M1.1.1) contained in the furnace while the furnace is in use (feature M1.1.2)

sensing a sensed distance (see column 3, lines 25 to 28) between a surface of the feed material layer and a reference position using the at least one non-contact sensor (22) (feature M1.2)

providing a process controller (24) communicably linked to the at least one non-contact sensor (22) to generate a control signal based on the sensed distance (see column 6, lines 21 to 50) (feature M1.3)

and outputting the control signal (see column 6, lines 40 to 50) (feature M1.4)

wherein providing the at least one non-contact sensor (22) comprises (feature M1.5) providing the sensor in a position above the feed material layer (see Figure 1) and providing at least one receiver (see column 6, line 57 to column 7, line 4: a radar sensor implies a receiver) above the feed material layer (9) (feature M1.5.2)

It is thus undisputed that D8 discloses features M1, M1.1, M1.1.1, M1.1.2, M1.2, M1.3, M1.4, M1.5 and M1.5.2.

2.1.2 Even accepting the opponent's argument that a shielding housing is at least obvious (e.g. in view of D8 in combination with B7) and that the radar sensor of D8 has to be considered as implicitly disclosing a transmitter, the remaining differentiating features M1.5b (plurality of transmitters and receivers), M1.5c (determining one sensed distance corresponding to each transmitter), M1.5d (generating a plurality of control

signals, each control signal based on one sensed distance) and M1.5e (generating a surface topography based on the plurality of sensed distances and generating a surface control signal based on the surface topography) are uncontestedly not disclosed in the closest prior art.

- 2.1.3 Although the opponent did not use the problem-solution approach in its analysis (see also letter dated 15 October 2019, page 16, penultimate paragraph), the parties essentially concur and the Board agrees with them that the technical effect of these distinguishing features is that the surface topography of the material in the furnace can be better supervised (i.e. by comparing it to one or more preferred or desired surface topographies stored in a database, memory or other suitable system component, see paragraph [0102] of the patent specification) to reach an optimum control of the material in the furnace (e.g. by regulating the flow of feed material, see e.g. paragraph [0046] of the patent).

Thus, the objective technical problem can be defined as how to regulate the surface topography to optimum thermal conditions in the furnace, as suggested by the patent proprietor.

- 2.1.4 The arguments of the opponent against inventive step amount essentially to presuming that the skilled person would recognise the variability of the surface topography of the metal material across the furnace of D8 in view of its dimensions and understand the effect this variability would have on the thermal conditions and would therefore provide the claimed solution (which allegedly formed part of the known repertoire of the skilled person).

2.1.5 This is not persuasive.

None of the available documents (including the ones provided by the opponent in support of the relevant common general knowledge) discloses the provision of multiple transmitters and receivers to generate a surface topography based on the plurality of sensed distances and to generate a surface control signal based on the surface topography, let alone to address the posed objective technical problem. The opponent has not argued otherwise.

The opponent's argument that the claimed solution would be obvious from the common general knowledge thus amounts to nothing more than an unsubstantiated allegation.

Consequently, the differentiating features M1.5b to M1.5e are not obvious when starting from D8.

2.1.6 In view of the fact that at least the provision of distinguishing features M1.5b, M1.5c, M1.5d and M1.5e involves an inventive step, it is not decisive whether features M1.5a to M1.5.1 (transmitter at a fixed position) might be disclosed in D8 and whether a shielding housing (features M1.6 to M1.6.1) might be obvious in light of other prior art. This cannot change the fact that the subject-matter claimed involves an inventive step.

2.2 Lines of attack starting from D7 against claim 1

Since D7 concerns a metallurgical furnace (1) comprising a radar sensor (24) where the distinguishing features M1.5b to M1.5e are not disclosed, the same

arguments in point 2.1 above on inventive step apply *mutatis mutandis*.

2.3 Claim 9

Device claim 9 corresponds to a feed control system for a metallurgical furnace comprising all the corresponding features necessary to carry out the method of claim 1. Features M9.4c to M9.4f of claim 9 correspond to the distinguishing features M1.5b to M1.5e of claim 1.

Thus, the same reasoning for the inventiveness of claim 1 applies here *mutatis mutandis*, and the subject-matter of claim 9 involves an inventive step as well. This was also the common understanding of the parties.

3. Conclusion

In the absence of further objections against the claims or the amended description of the main request, the contested patent can be maintained in amended form according to this request (Article 101(3)(a) EPC).

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:
 - claims 1 to 9 of the sole request (former auxiliary request 12)
 - description pages 2, 3, 7, 9 and 10 as filed at the oral proceedings before the Board and pages 4 to 6, 8 and 11 to 13 of the patent specification
 - Figures 1 to 14 of the patent specification

The Registrar:

The Chairman:



C. Spira

C. Herberhold

Decision electronically authenticated