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**Datasheet for the decision
of 29 January 2024**

Case Number: T 0320/22 - 3.2.04

Application Number: 16001112.8

Publication Number: 3098437

IPC: F03D1/06, F03D80/30, H02G13/00

Language of the proceedings: EN

Title of invention:
LIGHTNING RECEPTOR FOR A WIND TURBINE BLADE

Patent Proprietor:
SIEMENS GAMESA RENEWABLE ENERGY INNOVATION
& TECHNOLOGY, S.L.

Opponent:
LM WP Patent Holding A/S
LM Wind Power A/S

Headword:

Relevant legal provisions:
EPC Art. 100 (c), 100 (b), 54, 56

Keyword:

Grounds for opposition - added subject-matter (no) -
insufficiency of disclosure (no)
Novelty - (yes)
Inventive step - (yes)

Decisions cited:

Catchword:



Beschwerdekammern
Boards of Appeal
Chambres de recours

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Case Number: T 0320/22 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 29 January 2024

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Decision under appeal: **Decision of the Opposition Division of the
European Patent Office posted on 7 December 2021
rejecting the opposition filed against European
patent No. 3098437 pursuant to Article 101(2)
EPC.**

Composition of the Board:

Chairman A. de Vries
Members: S. Oechsner de Coninck
C. Heath

Summary of Facts and Submissions

- I. The appellant (opponent) lodged an appeal against the decision of the Opposition Division rejecting the opposition filed against the European patent pursuant to Article 101(2) EPC.
- II. The Opposition Division held that the grounds for opposition mentioned in Article 100 (a), (b) and (c) EPC did not prejudice the maintenance of the patent as granted having regard inter alia to the following documents:
- D1: WO 2014/124642 A1
D4 WO 02/48546 A1
D6 EP 1 965 076 A1
D8: US 2014/0112787 A
D11: Industrie Anzeiger, "Schrauben schaffen ihr eigenes Gewinde", April 05, 2004 from <https://industrieanzeiger.industrie.de/allgemein/schrauben-schaffen-ihr-eigenes-gewinde/>
- III. In a communication in preparation for oral proceedings the Board gave its preliminary opinion on the relevant issues.
- IV. Oral proceedings were held on 29 January 2024 in presence of all parties.
- V. The appellant-opponent requests that the decision be set aside and the patent be revoked.
- VI. The proprietor-respondent requests dismissal of the appeal, alternatively the maintenance of the patent on

the basis of one of auxiliary requests 1 or 2 filed with the respondent's reply to the appeal.

VII. The independent claim 1 according to the relevant requests reads as follows:

Main request (with feature numbering used in the decision under appeal added by the Board):

- F1.1** "A wind turbine blade (10) comprising a lightning receptor arrangement (11,12) comprising
- F1.2** at least an external metallic receptor element for receiving a lightning strike in one side of the wind turbine blade (10) and
- F1.3** an internal element joined at least to the internal side of a shell (17) of the wind turbine blade (10) and connected to a down conductor (18) of a grounding arrangement of the wind turbine blade (10), wherein
- F1.4** - the external metallic receptor element is a self-threading screw (21) having a head (23) and a threaded shaft (25);
- F1.5** - the internal element comprises an electrically conductive block (20) configured with at least a hole for cooperating with said threaded shaft (25);
- F1.6** - there is a threaded connection (31) between the self-threading screw (21) and the hole of the electrically conductive block (20),
- F1.7** wherein the threaded connection (31) is achieved by the process of threading the self-threading screw (21) into an unthreaded hole (41) of the electrically conductive block (20);
- F1.8** - the material of the self-threading screw (21) has higher hardness and lower ductility than the

material of the electrically conductive block (20), and

F1.9 the threaded shaft (25) and the hole are dimensioned so that the threaded connection between them can transmit all lightning currents received by the self-threading screw (21);

F1.10 the internal element is joined to the shell (17) with an adhesive force capable of withstanding the torque applied to the head (23) of the self-threading screw (21) for threading it to the unthreaded hole (41)."

VIII. The appellant argues as follows:

- Granted claim 1 includes subject-matter which extends beyond the content of the application as filed.
- The patent does not sufficiently disclose self-threading screws suitable for use as a receptor, nor how these would be distinguished from a regular screw.
- The subject-matter of granted claim 1 lacks novelty with respect to the cited prior art, especially D8 or D1.
- The subject-matter of claim 1 lacks an inventive step starting inter alia from D8 and considering common general knowledge illustrated in D11.

IX. The respondent argues as follows:

- Granted claim 1 does not contain added subject-matter.
- The skilled person knows what a self-threading screw is and can easily distinguish it from a regular screw.
- The subject-matter of granted claim 1 is novel with respect to either D8 or D1.
- The subject-matter of claim 1 involves an inventive step starting from D8 and considering common general knowledge illustrated in D11.

Reasons for the Decision

1. The appeal is admissible.

2. Background

The patent concerns a lightning receptor arrangement for a wind turbine blade and seeks to ensure a correct lightning transmission and to permit the adjustment of the receptor to the outer surface of the blade's shell to meet aerodynamic and noise reduction requirements, paragraph 008. This is done by using a self threading screw which can be screwed in to a desired depth and provides a more intimate connection between screw and blade to conduct all lightning currents received by the self-threading screw into the blade.

3. Main request - added subject-matter

3.1 In its communication the Board gave the following provisional opinion regarding added subject-matter:

"2. Added subject-matter

During examination, the definition of a threaded connection was added with the following expressions (features 1.6&1.7):

"there is a threaded connection (31) between the self-threading screw (21) and the hole of the electrically conductive block (20) wherein the threaded connection (31) is achieved by the process of threading the self-threading screw (21) into an unthreaded hole (41) of the electrically conductive block (20);"

Furthermore the term "unthreaded" was deleted before each "hole" defined just above and under said expression.

The first part of this expression (feature 1.6) thus specifies the provision a threaded connection, obtained between on one side a screw that is of the self threading type, and on the other side a hole, which is provided in the electrically conductive block. Each component forming the threaded connection was already defined in claim as filed: feature 1.4 for the self threading screw, feature 1.5 for the block configured with a hole.

The second part of this expression (feature 1.7) explains how the threaded connection is achieved by threading the screw into an unthreaded hole of the electrically conductive block. From a contextual reading of granted claim 1 and using the mind willing to understand it is clear to the Board that the hole configured in the block according to feature 1.5 is the same as the unthreaded hole of the same block defined in feature 1.7. With that understanding that the hole of the block is unthreaded -before being threaded by the self threading screw- the deletion of "unthreaded" to qualify the hole in feature 1.5 and 1.9 appears to be allowable as it becomes superfluous, once this unthreaded character is present in feature 1.7.

It may be that "unthreaded" in the original claim was not ideal in describing the assembled arrangement as it qualified the hole in the block before assembly of screw and block. Once assembled the hole is of course no longer unthreaded. In this regard the Board agrees that the amendments made in the granted claim can be seen as an attempt to resolve this issue. In this regard, the Board has no doubt that the original disclosure and claims were always directed at the completed assembly as part of a wind turbine blade with the self threaded screw in place within the originally

unthreaded hole of the block, see the relevant figures showing the screw inserted. It is at present unable to see what information this clarification might have added.

The appellant relies on paragraphs 019 to 022 for its argumentation that the amendment derives from an unallowable intermediate generalisation. However since the basic components, screw, unthreaded hole and block, as well as their functional cooperation to achieve the threaded connection appear to have been within the scope of claim 1 as filed with the same level of generality, no added matter arises from the added expression.

The above comments also apply to claim 3 that also omits "unthreaded" as well as claim 6 that adds the same allowable expression."

3.2 At the oral proceedings before the Board the appellant merely reiterated points from their written submissions and refrained from further comment. Since the basic objection concerning the deletion of the term "unthreaded" for the cooperation between the self threading screw and the hole as well as the omission of certain essential features from the context of paragraphs 019 to 022 remains essentially the same, the Board does not see any reason to deviate from its provisional positive assessment on added subject-matter. It therefore confirms that the claim 1 as granted does not include subject-matter extending beyond the content of the application as originally filed, Art 100(c) EPC.

4. Main request - sufficiency.

4.1 On this question, in its communication the Board gave the following provisional opinion:

"3. Sufficiency

This objection concerns the last features of claim 1 according to which the threaded shaft and the hole are dimensioned so that the threaded connection between them can transmit all lightning currents received by the self-threading screw (F1.9) and the internal element is joined to the shell with an adhesive force capable of withstanding the torque applied to the head of the self-threading screw for threading it to the unthreaded hole (F1.10).

Dimensioning an interface between electrically conductive components, here the hole and the screw that has threaded it, so that it can transmit a given amount of current requires no special skills on the part of the skilled person who designs wind turbine blades that are protected against lightning and will have a good knowledge of the basics of conduction. In this respect paragraph 023 further explains that the threaded shaft of the screw and the hole shall be dimensioned so that their threaded connection can have for all the possible thickness variation range of the shell a length L (see Fig. 2c) that assures the strong electrical connection needed for transmitting all lightning currents. The skilled person would be able to calculate this length for a given diameter in accordance to the maximum amount of current expected. That under certain conditions arcing might occur is irrelevant. The basic principles and considerations of the claimed invention and how it improves conduction are easily understood and do not require further detail of further

refinements that might be necessary to address other incidental problems.

Nor does the skilled person need an exact indication of the adhesive force needed to join the internal element to the shell. It goes without saying, as a matter of common sense, that it should be big enough to withstand the torque applied when screwing the self threading screw into the hole of the block.

Furthermore, the skilled person is abundantly familiar from common general knowledge (and hardware shops) with self threading screws and how these differ from normal screws. Self threading screw are well known in the field of mechanical connections in general; a common type is that having a drilling tip as mentioned in paragraph 020 of the patent."

- 4.2 At the oral proceedings before the Board the appellant focused on the lack of disclosure of examples of self-threading screws suitable for use as a receptor, and the argument that, because the claim lacked essential features characterizing the self-threading screw, it was not sufficiently disclosed across its full breadth.
- 4.3 As stated in its communication, the Board disagrees that the skilled person would be unable to identify a self-threading screw or to distinguish it from a normal screw.
- 4.3.1 The term "self threading screw" is a well recognized, commonly used term denoting a special class of fasteners, illustrated by the fact that self threading screws are sold as such in hardware stores, as also acknowledged by the appellant. This class of screws are distinguished by clear structural features from other

screws that are not self threading. Those distinctive features differ depending on their particular type and field of use. Thus, those that self thread by cutting the thread and removing material (known as self-cutting screws) include at least one spiral shaped groove or flute along their length, as opposed to those that self-thread by displacing material (self-threading per se) which will feature a gimlet or drill at their tip. Both types are threaded along their entire length. These easily recognizable structural features are permanent, so that a skilled person will after disassembly be able to verify whether a screw is self-threading or not.

The appellant has argued that the figures of D11 (cited by the respondent) would show the exact opposite. These figures are micrographs meant (according to the text, bottom paragraph) to demonstrate the impressively ("eindrucksvoll") intimate, play free connection possible with self threading screws. Though these figures are only meant to illustrate the effect of the self-threading and therefore only show a small cross-section of the connection, it is immediately evident from the figure, as also expressly stated at the end of the passage, that the self-threading screw is different. It is tapered to form a self-tapping point or "Furchspitze", which as stated in the text, final paragraph, is provided with non round sections that differ from the regular circular section.

The Board concludes that the term *self threading screw* defines a type of fastener with distinct structural features that is well known to the skilled person and does not require any further explanation in the patent.

4.3.2 For this reason the fact that any screw under the right conditions may have some self-threading ability is neither here nor there. Leaving aside that this has more a bearing on claim interpretation and thus clarity than on sufficiency, a screw is not a self-threading screw because it might sometimes, under certain conditions, be able to thread its own hole. Rather, as explained above, a self-threading screw, for the skilled person at least, is a particular type of screw with distinct structural features.

4.3.3 Exactly because the term *self-threading screw* denotes a special type of screw with distinct structural features (which may vary) there is also no need to expressly state the particular structural features to ensure enablement across the entire claim scope. The skilled person, who is abundantly familiar with the term, has no problem whatsoever in determining which screws they need to realize the claimed invention: they are self-threading screws. The appellant has certainly not demonstrated, either through cogent argument or compelling evidence, that the invention would work only for a limited class of self-threading screws.

4.4 In view of the above the Board also confirms the opposition division's positive assessment of sufficiency, Article 100(b) EPC.

5. Novelty

5.1 With the above understanding of the limitations associated with a self-threading screw, none of D1, D4, D6 or D8 cited by the appellant against novelty and predicated on the argument that there would not be any visible difference between a self-threading screw and a normal screw, or their respective relevant

connections, discloses a self threading screw as required by feature F1.4 of claim 1.

5.2 This is illustrated by D8, on which the appellant mainly relied at the oral proceedings before the Board.

D8 discloses a wind turbine blade that incorporates a lightning protection system, paragraph 002, comprising a side-receptor element in the form of screw or bolt 10 (see figure 2) for receiving a lightning strike from a side of the wind turbine blade via a receptor block 12, paragraph 038 which is connected to a down-conductor 3, paragraph 042. Paragraph 025 explains that the receptor element has a threaded portion arranged to complement a threaded bushing of the receptor block, so that the receptor element can simply be screwed into the receptor block. Thus, since the bushing is explicitly disclosed to be threaded in the receptor block, the receptor element is evidently not self-threading as required by features F1.4 as there is no need to be self threading. As a consequence and contrary to the appellant's opinion the threaded connection is also not the result of threading the self threading screw into an unthreaded hole of the receptor block, as required by feature F1.7.

5.3 In addition, feature F1.9 is also lacking from D8. Although paragraph 025 further specifies that the threaded fastening provides a favourably robust physical and electrical interconnection of the receptor element and receptor block, this should be read together with the previously defined depth and angle of the threads and their sufficiently "deep" connection. In the context of a threaded bushing, the depth and angle of the threads concern both the element and block. Furthermore as visible in figure 2, the "deep"

connection allows the flat tip end of the element to contact the bottom of the bushing. The electrical interconnection cannot be directly and unambiguously related to the depth of the spiral groove of the female thread. Rather this interconnection is achieved by all contact surfaces between the element and the block, that is between the head of the element 10 and the block 12, between their threads, and between the element's flat tip and the bottom of the threaded bushing. Even if, as submitted, the implicit dimensioning of the threaded fastening in D8 is so as to allow to transmit lightning current, there is no direct and unambiguous disclosure of their threaded connection alone being responsible for transmitting all lightning currents received by the receptor element, because other contact surfaces participate in the transmission of current. Thus the requirement of feature F1.9 is also not fulfilled.

5.4 Concerning the appellant's objection that feature 1.7 is in fact drafted as a product by process requirement, the Board considers that the threaded connection obtained by threading a self threading screw into an unthreaded hole already results in a threaded connection that has distinct and identifiable characteristics. Indeed as observed above in relation to sufficiency the mere fact that a self threading screw can be distinguished from a regular one provides the necessary distinct and identifiable characteristic that is therefore also clearly identifiable in the threaded connection defined in feature F1.7.

5.5 Thus the subject-matter of claim 1 is novel over D8 as it does not disclose features F1.4, F1.7 and F1.9.

5.6 A similar finding applies for D1. D1 discloses a wind turbine provided with an electrically conductive layer. Connector block 22 and conductive cable 24 are attached to the inner surface of the blade and bolts 26 are inserted into recesses 28 through the apertures 38 in the block, where it is held in place by the cooperative screw threads. Concerning the way the thread in these apertures is obtained, contrary to the appellant's argument, the Board rather considers the passage on page 12, lines 18-19 in relation to figure 2G to clearly explain that the hole is tapped to provide a female screw, as a separate step made in a conventional way before the male screw thread of the bolt is subsequently inserted as a final step, page 12, lines 22-23; Figure 2H. Thus, neither a self threading screw (F1.4) nor a threaded connection obtained by its threaded effect (F1.7) is disclosed.

5.7 The appellant acknowledged that if the term "self threading screw" were to be given the specific interpretation above, the similar novelty objections based on documents D4 and D6 must also fail, as neither disclose such a specific type of screw, feature F1.4, and consequently no threaded connection as in feature F1.7. The Board thus confirms the opposition division's positive assessment of novelty.

6. Inventive step

6.1 In writing the appellant reiterated various attacks presented in opposition against inventive step. All of these arguments are similar and are predicated on the core argument that any bolt or screw has the ability to tap a thread in a hole and is therefore self-threading. At the oral proceedings the appellant focused on their attack starting from D8. As concluded under item 5.5

above, the wind turbine blade of claim 1 differs from this prior art at least by a self-threading screw, the threaded connection between a self threading screw and hole, and dimensioning of thread shaft and hole such that the threaded connection transmits all lightning current defined in features 1.4, 1.7 and 1.9.

- 6.2 As established by jurisprudence, the objective definition of the problem to be solved by the invention should normally start from the problem described in the contested patent (see also Case Law of the Boards of Appeal, 10th edition July 2022, I.D.4.2.2). In paragraphs 008 and 0013, the patent states its first objective to be ensuring correct lightning transmission while permitting the adjustment of the receptor elements to the outer surface of the shells to comply with aerodynamic as well as noise reduction requirements.
- 6.2.1 This is already addressed in D8. As stated in section 5.3 above, the threaded connection of thread depth and angle are chosen to ensure a sufficiently "deep" (i.e. intimate) connection for improved electrical interconnection, paragraph 025. In paragraph 0039 D8 also considers having the receptor element lie flush with the blade outer surface, paragraph 039. This arrangement requires that the screw 10 is precisely dimensioned to fit neatly in a matching, precisely dimensioned counter-sunk screw hole in the block 12.
- 6.2.2 As further explained in paragraph 0009 of the patent specification in reference to figures 1c and 3c, because of the minimal tolerances of such a precise fit, the screw may be incorrectly positioned due to unexpected variations in blade shell thickness. Because a self-threaded screw provides an intimate connection

in a hole that does not need to be precisely dimensioned but only needs to be of sufficient length to allow for expected variations in blade shell thickness, see paragraph 0023 in reference to figure 2c, alignment of the screw head and the shell outer surface can be achieved in spite of those variations while still assuring a strong electrical connection for lightning conduction via the intimate connection formed by the self-threading. Thus, vis-a-vis the prior art of D8, dimensioning constraints are released and the connection simplified. The objective technical problem can be formulated accordingly, as how to simplify the connection of screw and block as in D8 *in spite of variations in blade shell thickness*. An alternative formulation could be: how to modify the connection of screw and block of D8 *so that it takes into account blade shell variation*.

- 6.3 None of the cited prior art addresses the problem of varying blade shell thickness, let alone offers the claimed solution. Nor does the Board have any reason to believe that its use to this end might be obvious per se. Using a self threading screw is not a mere equivalent way of attaching the receptor element as submitted by the appellant, but requires from the skilled person a first insight that the intimate connection produced by a self threading screw can conduct all lightning into the block, and the insight that because this is so its exact positioning within the hole is no longer critical. This then requires the further insight that this can be used to advantage for variations in blade shell thickness. In the Board's estimation this sequence of insights lies well outside routine skill.

Thus, it is irrelevant that the skilled person might recognise that the "robust physical and electrical interconnection" as expressed in the last but one sentence of paragraph 025 of D8, could be realized alternatively via the intimate connection typical of a self-threading screw as e.g. illustrated by D11. They must still realize that this intimate contact is enough to conduct all lightning into the block, so that an accurate (depth-wise) positioning of the screw in the hole (so that the screw head and tip are also in contact with the block) is no longer critical. Then they would need to make the final jump that links this to the varying blade shell thickness. The Board can but reiterate that this is well beyond normal skill of the skilled person, even on a good day.

Therefore, also the fact that the skilled person is familiar with the properties of self threading screws and the connections they form, either from common general knowledge or from D11, makes no difference. Even if they would consider such a screw to realize in alternative fashion the robust physical and electrical connection of screw and block taught in D8, they would still not have arrived at feature F1.9 of claim 1. In particular they would have no reason to depart from the transmission of lightening current via all the contact surfaces between screw and block.

6.4 Therefore the Board concludes that the claimed subject-matter involves an inventive step over D8 and the skilled person's knowledge, illustrated by D11.

6.5 The appellant acknowledged during the oral proceedings before the Board that all other combinations cited against inventive step are based on the same considerations as when starting from D8. These thus fail for the same reasons.

The Board therefore confirms the opposition division's assessment that the subject-matter of claim 1 as granted involves an inventive step within the meaning of Article 56 EPC.

7. It follows from the above that none of the appellant's challenges to the decision's findings for granted claim 1 succeed. Their appeal against that decision therefore fails.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



G. Magouliotis

A. de Vries

Decision electronically authenticated