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Datasheet for the decision of 20 December 2024

Case Number: T 0772/23 - 3.2.04

Application Number: 17745249.7

Publication Number: 3491242

IPC: F03D80/30, F03D1/06

Language of the proceedings: EN

Title of invention:
WIND TURBINE BLADE HAVING A LIGHTNING TIP RECEPTOR

Patent Proprietor:
Vestas Wind Systems A/S

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

Headword:

Relevant legal provisions:
EPC 1973 Art. 54, 56

Keyword:
Novelty (yes)
Inventive step (yes)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

Boards of Appeal

Chambres de recours

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Case Number: T 0772/23 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 20 December 2024

Appellant: (Patent Proprietor)	Vestas Wind Systems A/S Hedeager 42 8200 Aarhus N (DK)
Representative:	Kent, Peter Joseph Keltie LLP No.1 London Bridge London SE1 9BA (GB)
Appellant: (Opponent)	LM WP Patent Holding A/S LM Wind Power A/S Jupitervej 6 6000 Kolding (DK)
Representative:	COPA Copenhagen Patents Rosenørns Allé 1, 2nd floor 1970 Frederiksberg C (DK)
Decision under appeal:	**Interlocutory decision of the Opposition Division of the European Patent Office posted on 4 April 2023 concerning maintenance of the European Patent No. 3491242 in amended form.**

Composition of the Board:

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

Summary of Facts and Submissions

I. The opponent and the proprietor both appeal against the decision of the Opposition Division of the European Patent Office concerning maintenance of the European Patent No. 3491242 in amended form.

II. The Opposition Division held that the patent and the invention to which it related according to the auxiliary request 1 met the requirements of the EPC, having regard in particular to the following documents:

D2 WO 2012/031976 and its translation D2T
D3 EP 3 037 655
D4 EP 2 589 803
D5 EP 1 154 537 and its translation D5T
D6 DK 164294 B and its translation D6T
D7 WO 96/07825
D8 US 2014/0186175

III. In a communication in preparation for oral proceedings the Board gave a provisional opinion on the relevant issues.

IV. Oral proceedings were held on 20 December 2024 by mixed-mode videoconference.

V. At the end of the oral proceedings the appellant-opponent requested that the decision be set aside and the patent be revoked.

VI. The appellant-proprietor requested that the decision under appeal be set aside and that the patent be maintained as granted, or be maintained on the basis of

one of the auxiliary request 1 to 11 filed during opposition and refiled with the reply to the opponent's statement setting out the grounds of appeal, or one of auxiliary requests 1A - 11A filed with the reply to the opponent's statement setting out the grounds of appeal.

VII. The independent claim 1 according to the main request read as follows (features numbering and amendments added by the Board):

F1 "A wind turbine blade (12) comprising:
F1.1 a main blade portion (11) having a root end (14) and a tip end (16), wherein a leading edge (13) and a trailing edge (15) extend between the root end and the tip end;
F1.2 a conductive blade tip module (20) connected to a blade tip interface (29) at the tip end (16) of the main blade portion (11);
F1.3 wherein the conductive blade tip module (20) comprises an elongate body (32) defining a longitudinal axis transverse to a spanwise axis of the main blade portion (11), and
F1.4 wherein the conductive blade tip module has a length in a direction along said longitudinal axis that is greater than a chord length of the blade tip interface (29), characterised in that
F1.5 a leading edge (34) of the blade tip module (20) extends at least about 10 mm beyond the leading edge (13) of the main blade portion at the blade tip interface (29)."

VIII. The appellant-opponent argues as follows:
- The subject-matter of claim 1 lacks novelty, especially with respect to either one of D6, D7 or D3.
- The subject-matter of claim 1 lacks an inventive step starting from D7 in combination with the skilled person's

common general knowledge or with D6, or starting from D4 or D6 in combination with the skilled person's common general knowledge, or starting from D5 in combination with D6 or starting from D6 in combination with D3 or D7.

IX. The appellant-proprietor argues as follows:
- The subject-matter of claim 1 is novel over the prior art cited.
- The subject-matter of claim 1 involves an inventive step starting from D7 or D4.

Reasons for the Decision

1. Interpretation of claim 1

1.1 The interpretation of some features defined in claim 1 plays a significant role in the present case. Especially the interpretation of the "blade tip interface" in feature 1.2, the nature of the "conductive blade tip module" in features 1.2 and 1.3 and the expression "extends at least about 10mm beyond the leading edge" in feature 1.5 which all are relevant for the question of novelty.

1.2 The skilled person reading the whole claim contextually first derives from feature 1.1 that a main blade portion has root end and a tip end, leading edge and trailing edge which all together define boundary lines of the main blade portion. This tip end of the main blade body serves in the following feature 1.2 to define a blade tip interface on which a conductive blade tip module should be connected. Bearing in mind the definition of an interface, a contact surface at the tip end of the main blade portion should be clearly identifiable, that comes into contact with an opposite surface of the blade tip module such that the blade tip

module can be connected thereon. Being at the tip end, therefore at the main blade body upper boundary line or surface, as understood from feature 1.1, this interface at the tip end extends in the upper boundary and should have an overall transverse direction with respect to the spanwise direction of the blade so that it may form the upper boundary surface linking the leading edge to the trailing edge of the blade. Thus the skilled person person expects to recognise a module mounted at the tip end of the main blade body, that forms its uppermost transverse boundary and that furthermore has conductive properties, interpreted in its broadest sense to have at least some conductive part allowing conduction of electric current.

1.3 The same contextual reading of feature 1.5 has to be done taking into account that the module previously defined in features 1.3 and 1.4 is elongate and has a length in a direction transverse to the spanwise axis of the main blade portion which is longer than a chord length at the tip. Bearing in mind such main direction of the module transverse to the spanwise axis, its leading edge point or line has to be identified in connection with its length longer than the chord. The skilled person therefore adopts a technically sensible interpretation of feature 1.5 that locates the module upstream end transversally offset and further away from the leading edge of the blade, understood to be the boundary line at the upstream side of the blade main body. In this context at the tip of the blade's leading edge a reference point is mentally defined by the skilled person which serves to measure the minimum projecting distance of 10mm defined in feature 1.5. Such a reference point should be at the intersection between the leading edge of the blade and its transverse interface with the blade tip module to

comply with the requirement "beyond the leading edge of the main blade portion at the blade tip interface" expressed in feature 1.5.

1.4 The Board therefore also concurs with the opposition division's interpretation expressed in item 17.1 of its decision. The interpretation submitted by the appellant opponent of a co-linear or pre-bent extension of a portion of a blade tip module does not reflect the whole context of the geometry and main direction expressed in features 1.3, 1.4 and 1.5, in particular the extension of an elongate body of a blade tip module transverse to the blade spanwise axis, and the configuration of a possible interface to set the above mentioned reference point. As concerns the extension of 10mm beyond the leading edge of the main blade portion at the interface in the sense of feature 1.5 it may neither correspond to an axial extension in the spanwise direction of the blade, nor to an extension in the flapwise direction, towards the pressure or suction sides.

1.5 The above interpretation made using contextual reading of the claim language also arrives at a technically sensible interpretation supported by the overall disclosure of the patent that discloses an elongate body 32 that defines a longitudinal axis ’A’ that is transverse to the spanwise axis B’ of the blade 12 and aligned with the chord of the blade, paragraph 026, and a blade tip interface 29 effectively located at the tip and forming its upper boundary and substantially aligned with the axis "A", paragraph 024 and figure 2.

2. Main request - Novelty

2.1 Using the above interpretation of the claim language, none of the documents submitted against novelty anticipates a wind turbine blade with a blade tip module as claimed.

2.2 D6

2.2.1 In its preliminary opinion the Board indicated that it was not convinced that D6 deprives of novelty the subject-matter of claim 1 as follows:

"D6 discloses a cap ("hætte 3") for retrofitting onto existing wind turbine blades ("vindmølleblade 1 ") that achieves noise reduction and improved aerodynamic efficiency, see page 4 lines 24-31 of the translation. An embodiment shown in figure 4 and disclosed on page 6 lines 8-30 relates to the cap 3 further provided with a droplet- or torpedo shaped part 9 made of polyurethane foam, rubber and thus non conductive. This cap equipped with the added part forms a module made of these two parts which should be compared with the one defined in claim 1. The Board rather agrees with the appellant proprietor's opinion that the location of the interface between the main blade body and the module is not directly and unambiguously derivable from figure 4, therefore any identification of an extension beyond the leading edge of the blade main body does not appear direct and unambiguous, thus failing to show features F1.4 and F1.5. The Board adds that elongate body of such a conductive module made of the conductive cap and added torpedo shaped part, would have a longitudinal axis along the spanwise axis, rather than tranverse to it, thus also failing to disclose a module according to feature F1.3, as observed by the appellant proprietor on page 6 of their grounds."

2.2.2 At the oral proceedings, further deepening their line of argument, the appellant-opponent argued that the exact location of the interface to compare the extension beyond the leading edge of D6 according to feature 1.5 would not be important, instead some point of the tip of the torpedo shaped part 9 would always extend beyond the blade leading edge at the interface between the inner portion of the cap 3 and the blade , in particular in view of the claimed extension of 10mm.

2.2.3 This also fails to convince the Board. Using the interpretation of the claim presented under point 1 above, an intersection between a transverse interface at the upper tip of the main blade body and its leading edge should be identified that forms a direct and unambiguous reference point for assessing an extension distance of any point of the tip of the torpedo shaped part 9 beyond this reference point. In D6 the skilled person is neither able to identify a contact surface between the tip of the blade and the cap, nor an intersection between the cap 3 and the leading edge of the main blade body. This is in particular so because the radially inner end of the cap 3 is not disclosed. In the schematic figures 3a and 3b it is located somewhere between the two interrupted lines visible therein, and it is thus impossible to directly and unambiguously derive any possible intersection between the main body of the blade and the cap.

2.2.4 Since no interface is directly and unambiguously derivable for D6 the Board adds that it also fails to recognise features 1.2 and 1.4 of claim 1 that require to clearly identify a connection of the cap to the blade at said interface and to compare a longitudinal length of the cap with the chord length at said interface.

2.3 D7

2.3.1 In its preliminary opinion the Board indicated that it was not convinced that D7 deprives of novelty the subject-matter of claim 1 as follows:

"D7 discloses a lightning arrester arrangement for mounting on a wind turbine blade 1. In an embodiment according to Figure 4, a lightning conductor 4' is placed in the tip 1' of a windmill blade and can be identified as a module according to claim 1, which has an elongate body having a length in a direction along its longitudinal axis that is greater than a chord length of the blade tip interface. It appears undisputed that D7 discloses features 1.1 to 1.4 of claim 1. The appellant opponent considers that an alternative disclosed on page 2, lines 30-33 with the lightning conductor arranged on the surface of the blade cannot be in a flush arrangement, which for a rounded nose would necessarily imply some extension beyond the leading edge of the blade. The Board however does not recognise such an implicit disclosure. The statement on which the appellant opponent relies is made for all different embodiments, including the one "arrester 4" of Figure 5 for which the qualification "mounted on" applies. For the relevant embodiment of figure 4, the lightening conductor is shown flush with the leading edge with the additional indication that it is streamlined, without any clear indication that different positions or any positioning criteria are foreseen for this embodiment. Thus no indirect or deliberate positioning beyond the leading edge can directly and unambiguously be inferred. The opposition division appears to have correctly found F1.4 lacking from D7."

2.3.2 At the oral proceedings the appellant-opponent, deepening its line of argument, further argued that D7 also comprises a disclosure of a lightning arrester that is streamlined, preferably torpedo shaped or guttiform in lines 25 to 27 of page 3 and in claim 4. When configuring the lightning arrester 4' at the tip end of the blade shown in figure 4 of D7 with such a torpedo shape the resulting embodiment should necessarily exhibit a leading edge of the arrester extending at some distance beyond the leading edge 1'.

2.3.3 The Board is not convinced. The embodiment of figure 4 is disclosed in the second paragraph on page 7 as already exhibiting a streamlined configuration. This streamlined configuration would be considered as being the same one as described earlier in the general disclosure on page 3 and in claim 4, and on which the appellant-opponent relies. The configuration of the depicted lightning arrester can objectively be qualified as streamlined, so that the other terms used "torpedo shaped" or "guttiform" rather appear as synonyms or further specification of the streamlined configuration of the arrester 4' rather than additional not explicitly disclosed embodiments. Regardless of the above, no direct and unambiguous information on a possible offset of the leading edge of the arrester with respect to the leading edge of the blade that are depicted flush can be derived. Even whenever figuring out a possible additional not explicitly disclosed embodiment, as submitted, the skilled person has no reason to consider a different spatial configuration for the flush arrangement shown in figure 4. Thus, a direct and unambiguous disclosure for at least feature 1.5 of claim 1 is lacking from D7.

2.4 D3

2.4.1 For D3 the appellant-opponent relies on a particular combination of claims to suggest that the outer pre bent portion of the rotor blade extension has a longitudinal axis that extends in a direction transverse to the spanwise axis of the blade by the angle α as shown in figure 4 (feature 1.3), the length being more than the chord of the blade tip interface (feature 1.4) and its tip also projecting at least 10mm beyond the leading edge of the blade (feature 1.5). Furthermore, in their view the tip of the blade extension would also extend beyond the leading edge of the blade in the spanwise direction.

2.4.2 The Board is not convinced. Again using the interpretation expressed under point 1 above, the body of the rotor blade extension disclosed in D3 is co-linear with the spanwise direction of the blade and fails to disclose a specific configuration of its interface with the blade, less so an intersection between the leading edge of the blade and any "transverse" interface with the blade tip module, therefore lacking a clear disclosure of the reference point as interpreted in point 1.3 above, so that feature 1.3 is not shown in D3. For that reason at least feature 1.5 is also lacking because contrary to the appellant-opponent's view the extension of the tip end of the pre-bent portion in D3 does not extend in a transverse upstream direction but rather in a flapwise direction.
Further also considering the combination of claims 1,3,4 and 12 as a disclosed embodiment of the invention, as argued by the opponent and contested by the proprietor, this would not change the above

assessment that the tip of the blade extension with pre-bend does not extend transversally upstream of any identifiable interface between the main blade portion and this blade extends beyond the leading edge about 10mm. as required by feature 1.5.

2.5 D2, D4, D5

2.5.1 In its written submissions the appellant-opponent argued that documents D2, D4, and D5 deprive of novelty the subject-matter of claim 1 in particular by arguing that the decision of the opposition division is based on the assumption that the expression "extend ...beyond" in feature 1.5 only relates to a chordwise offset and not to a spanwise offset. The appellant-opponent argued that with the correct interpretation of the term "extend...beyond" such that it includes a co-linear, i.e. a spanwise, extension of the leading edge, feature 1.5 is disclosed by these documents and they thus deprive of novelty the subject-matter of claim 1.

2.5.2 Since the Board concurs with the interpretation of the term "extends ...beyond" given by the opposition division as outlined in point 1 above, the arguments of the opponent of lack of novelty in view of D2, D4 and D5 are not convincing.

2.6 It follows form the above that the decision's finding that D6 anticipates the subject-matter of claim 1 must be reversed, while the positive findings expressed with respect to the other prior art cited must be confirmed.

3. Main request - inventive step

3.1 Document D7 alone or in combination with D6

3.1.1 On this issue, the Board gave its preliminary opinion as follows:

"*Starting from D7, the appellant-opponent considers that the patent does not show an effect related to improved lightning protection for the claimed open-ended range of feature F1.5, and therefore the objective technical problem should be formulated in a broader way.*

Paragraphs 008 and 011 of the patent indeed associate the nose (and tail) displacement from the blade leading edge (or trailing edge) of the module with the result that lightning is less likely to attach to or "jump" onto the composite structure of the blade. Paragraph 029 of the patent further elaborates on the magnitude of the displacement already understood to provide the above protective effect with a minimum distance of 10mm according to F1.5. The last sentence associates a more modest separation distance with less adverse effects on aerodynamics or loading of the blade.

The contention by the appellant-opponent that the improved lightening effect is rather related to the nose and tail, torpedo shape and curvature of the module of the blade tip module which are not in claim 1 has no bearing on the skilled person's recognition that the distance according F1.5 between the leading edge of the module with the leading edge of the blade may provide the technical effect at least in the upstream part of the module.

Thus, the problem to improve the protection against lightening in a wind turbine blade formulated in item

27.3 of the appealed decision appears correctly based on advantages credibly expressed in the patent.

The critical question to be debated is whether the skilled person with their own common technical knowledge or based on the configuration of the non-conductive torpedo shaped tip of D6 would derive an incentive or other teaching to work on finding an appropriate distance between the leading edge of the blade tip module and the leading edge of the main blade portion to improve protection against lightening. In D7, the streamlined shape of the lightening conductor 4' in the embodiment of Figure 4 improves efficiency and noise, and no particular reason for repositioning this conductor with a protruding leading edge beyond the leading edge of the blade appears to be obvious. In D6, the torpedo shaped tip is adapted and positioned for aerodynamic considerations and provides a pointer for that reason as submitted by the appellant-opponent, page 19, last paragraph of their grounds, however it is unclear why the skilled person would seek a solution to improve lightening protection."

3.1.2 The Board is thus not convinced by the arguments submitted in the written proceedings as outlined above.

3.1.3 During oral proceedings before the Board, the appellant-opponent refined their argumentation starting from D7 alone or in combination with D6.
The opponent argued that starting from D7 the person skilled in the art would implement the lightning conductor 4' of figure 4 of D7 as "droplet or torpedo shaped" in view of its common general knowledge and the teaching of D7 itself or of the teaching of figure 4 of D6.

3.1.4 The Board is also not convinced by this refined line of argument.

3.1.5 As explained here above in relation to novelty, the Board concurs with the appellant-proprietor that D7 already disclosed a streamlined torpedo shaped lightning arrester in its embodiment of figure 4. Therefore, contrary to the appellant-opponent's view the skilled person lacks any obvious reason to implement an embodiment with a torpedo shape since this would not represent a further embodiment. Nevertheless associating the torpedo shape with the kind disclosed in D6 or any other known shape, the Board fails to recognise any obvious reason to depart from the flush arrangement of both leading edges of the blade and arrester depicted in figure 4. Indeed changing the relative thickness of the torpedo shape thereby rendering its leading edge somewhat more pointed does not require to offset its location with respect to the leading edge of the blade, especially as a conventional interface would require cooperating flat surfaces, for example such a tip surface of the blade could easily be sunk in a recess of the torpedo's body.

3.1.6 The further reliance by the appellant-opponent on the fact that the improvement of lightening protection would also be related to considerations in terms of aerodynamics or noise does not change the above assessment. Indeed faced with the flushed configuration depicted in figure 4 of D7, the skilled person would not see any benefit in terms of aerodynamic or noise by offsetting the nose of a modified torpedo shape from the leading edge of the blade. In D6 the achieved improvements in terms of aerodynamics are related to the flexible character of the material used, foam or

rubber, allowing its inclination to change page 3, lines 8-15. This however does not appear obviously compatible with the rigid nature of the arrester of D7 made of conductive material with high stiffness.

3.2 Document D6 alone

Starting from D6 the opponent formulates the objective technical problem as to optimize the performance of the tip attachment and argues that "since the claimed distance of 10mm is so small compared to the dimensions of the blade tip area, the skilled person would inevitably arrive within the claimed subject-matter when starting from D6" (see the opponent reply, page 8, second and third paragraph).
However this is seen by the Board as an unsubstantiated allegation and thus not convincing. Furthermore, as indicated by the Board in its preliminary opinion (see page 7, second paragraph, last sentence) no reason appears to exist for the skilled person to work on a distance between a torpedo shaped part and the conductive cap on which it is attached to form a blade tip module according to claim 1, at least because the torpedo shaped part is non-conductive.

3.3 Document D5 + D6

3.3.1 In its preliminary opinion the Board indicated that

"D5 again as further starting point is likewise more remote. It also lacks features F1.3, 1.4 as well as the feature 1.5 (see also the appealed decision, point 33.3), which the appellant-opponent considers to be the sole distinguishing feature. Assuming this would indeed be the case, considering the above observations on the credible technical effect on lightening protection and

associated problem formulation, the teaching of D6 would not be considered by the skilled person as suitable to improve lightning protection (see also the proprietor's reply to the opponent's appeal, page 18, first paragraph). This argumentation also fails to convince the Board."

3.3.2 Since no further argument had been submitted by the appellant-opponent, after having reconsidered all the aspect of the case, the Board sees no reason to change its preliminary opinion.
Furthermore, since none of D5 and D6 discloses feature 1.5 (see point 2.2 and 2.5 above) the combination of their teaching would also not present that feature of granted claim 1 so that also for this reasons the argument of the appellant-opponent is not convincing.

3.4 Document D4 alone

3.4.1 Starting from D4, the lightning protrusion 4 disclosed therein is located at the rear side of the blade, therefore opposite its leading edge, column 7, lines 20-22. The appellant-opponent relies on alternative positions, not limited to the rear side expressed further down in lines 27-30 of the same column. Whereas the skilled person may indeed contemplate alternative locations of this stick like protrusion, no obvious reason to locate it at the leading edge is apparent to the Board. Such more upstream location as discussed at the oral proceedings would rather impair aerodynamic properties without any apparent benefit on its ability to catch lightning currents. Regardless, positioning this protrusion anywhere would still lack features 1.3 and 1.4 because the elongate body of the blade tip module 31 disclosed in D4 is aligned with the blade spanwise axis and also fails to exhibit a length longer

than the chord of the blade at the boundary 32a depicted in figure 4.

3.5 Document D6 in combination with D3 or D7

3.5.1 In its reply to the statement of grounds of the appellant-patent proprietor, the appellant-opponent also argues (see page 8, second paragraph) that its objection of lack of inventive step in relation to the auxiliary request 1 (patent as maintained) also apply to claim 1 of the patent as granted also referring to the combination of D6 with D3 and D6 with D7. Independently from the reasoning used against inventive step of the subject-matter of claim 1 as granted, the Board notes that, since none of D3, D6 and D7 discloses feature 1.5 (see point 2.2, 2.3 and 2.4 above) the combination of their teaching would also not present that feature of granted claim 1 so that the argument of the appellant-opponent can not be convincing.

3.6 It follows from the above that the subject-matter of claim 1 as granted also involves an inventive step over the prior art cited, Art 52(1) with 56 EPC.

4. Since the lack of novelty finding of the decision cannot be confirmed, the decision must be set aside. Since otherwise the lack of inventive step objections brought against the subject-matter of claim 1 as granted fails to convince, the patent may be maintained as granted.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The patent is maintained as granted.

The Registrar: The Chairman:

G. Magouliotis A. Pieracci

Decision electronically authenticated