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Datasheet for the decision of 14 October 2022

Case Number: T 3223/19 - 3.2.04

Application Number: 13763280.8

Publication Number: 2901010

IPC: F03D1/06

Language of the proceedings: EN

Title of invention:
A WIND TURBINE BLADE WITH AN ELASTIC DEFORMABLE TRAILING EDGE

Patent Proprietor:
Blade Dynamics Limited

Opponent:
Vestas Wind Systems A/S

Headword:

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (no)

Decisions cited:

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 3223/19 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 14 October 2022

Appellant: (Opponent)	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)
Respondent: (Patent Proprietor)	Blade Dynamics Limited Saunders Drive Cowes, Isle Of Wight PO31 8HU (GB)
Representative:	COPA Copenhagen Patents Rosenørns Allé 1, 2nd floor 1970 Frederiksberg C (DK)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 21 October 2019 rejecting the opposition filed against European patent No. 2901010 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	A. de Vries
Members:	S. Oechsner de Coninck
	K. Kerber-Zubrzycka

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal against the decision of the Opposition Division of the European Patent Office rejecting the opposition filed against European patent No. 2901010 pursuant to Article 101(2) EPC.

II. The Opposition Division held that the grounds for opposition mentioned in Articles 100 (a) and (b) EPC did not prejudice the maintenance of the patent as granted having regard inter alia to the following documents:

E1: WO 2008/003330 A1
E8: W.Callister, Jr: "Materials Science and Engineering An Introduction", Fourth Edition, 1997, Wiley & Sons: pages 466-468

III. Oral proceedings were held on 14 October 2022 by means of videoconference.

IV. The appellant-opponent requests that the decision be set aside and the patent be revoked.

V. The proprietor-respondent requests dismissal of the appeal.

VI. The auxiliary requests 1-8 were withdrawn during the oral proceedings.

VII. The independent claim 1 according to the main request (patent as granted) reads as follows:

"A wind turbine blade (10) comprising a fairing having an aerodynamic profile, the fairing comprising:
a rigid structural component (12) which forms the majority of the aerodynamic profile; and
a non-actively controllable elastically deformable trailing edge component (14) mounted on the structural component to complete the aero dynamic profile,
characterised in that the trailing edge component is formed from a material having an elastic modulus in the range of 0.5 to 2.5 GPa such that it will elastically buckle when loading on the trailing edge component exceeds a predetermined threshold, and
in that the structural component comprises a unidirectional reinforcing layer (34) adjacent to the trailing edge component, the unidirectional reinforcing layer comprising at least one layer of unidirectional fibres extending in a substantially spanwise direction."

VIII. The appellant argues as follows:
- E1 discloses a trailing edge component made of material falling within the claimed range of elastic modulus. It would have been obvious for the skilled person to realise the trailing edge reinforcement disclosed therein to include at least one layer of unidirectional fibers.

IX. The respondent argues as follows:
- Starting from E1, the skilled person would have no obvious incentive to provide a trailing edge component that completes the aerodynamic profile and is able to buckle under certain loads. No teaching exists for providing a layer of unidirectional fibers to reinforce the trailing edge of the structural component.

Reasons for the Decision

1. The appeal is admissible.

2. Main request - inventive step

2.1 E1 as starting point discloses a wind turbine blade equipped with a deformable trailing edge to provide active load control (page 2, lines 17-19; 31-37). The wind turbine comprises a main blade 2 as a rigid structural component, and a trailing edge component 3 mounted on that rigid structural component 2. The trailing edge component 3 is explained in relation to figure 3 on page 9, lines 10 to 21, and is made of active sub-sections 3a, allowing the active load control, and of passive subsections 3b which cannot be controlled and are thus non-actively controllable in the words of claim 1. The passive section 3b of the trailing edge can be made flexible from a deformable material (page 9, lines 18-19). Thus the wind turbine blade depicted in figure 3 of E1 is made of a structural component 2 and passive sections 3b mounted thereon that complete the aerodynamic profile of the blade according to the first three pre-characterising features of claim 1.

2.2 The respondent submits that the passive sub section does not extend on the whole length of the blade and together with the structural component cannot complete the aerodynamic profile of the blade as required by claim 1.

2.3 The Board first observes that the wording of claim 1 does not require a particular longitudinal extension along the blade of the non-actively deformable trailing edge, much less that it extends the whole length of the blade. Indeed the patent itself, see figure 6 and paragraph 0051, considers a trailing edge component that does not extend the whole length of the blade. Rather, the claim wording requires that the trailing edge component completes the *aerodynamic profile*, the majority of which is formed by the rigid structural component, on which the trailing edge component is mounted.

In the field of aerodynamics, an *aerodynamic profile* will be understood using the normal understanding of the term profile - "A representation of the outline of an object; a silhouette. Also: a drawing or other representation of the side view of something.." (Oxford dictionary I.1.a)) - as the cross sectional shape of the blade, which provides the pressure distribution generating lift and drag of a blade or wing. Reading claim 1 contextually, the rigid structural component that provides the majority of the aerodynamic profile of the fairing comprises the leading edge region and mid region of the profile or cross section, while the trailing edge component provides the rest of the profile in the region of the trailing edge. The forward major portion and the rear trailing edge region both complement each other to form the aerodynamically effective shape of the profile. This applies also to E1, where the passive sub section 3b when mounted on the trailing edge side of the structural component - main blade 2- completes the full aerodynamic shape or profile of the wind turbine blade as is apparent from figure 4b showing the trailing edge component 3 mounted on the blade main body 2.

2.4 The structure of the passive sub-section is explained on page 9, lines 14 to 16 to be optionally provided with the same cavities as the active sub-sections and to be connected with them, with a shape accordingly adapted for that connection. The material of the passive sub section is further disclosed on page 9, lines 18 to 19 to be deformable having a continuous change on the trailing edge 4. In order to ensure the continuous change, the skilled person thus infers that both active and passive sub-sections may be made of the same deformable material. A list of materials foreseen for the deformable trailing edge is disclosed on page 4, lines 10-14 with particular reference to the actively deformable section. The list of materials includes polypropylene, which, see for example table 16.1 on page 468 of textbook E8, has a modulus of elasticity of 1,14 to 1,55 GPa within the claimed range of 0.5 to 2.5 GPa. Thus E1 also discloses this feature.

2.5 The question arises whether the immediately following wording of claim 1 "such that it will elastically buckle ..." implies any further structural limitations of the trailing edge component. At the oral proceedings the respondent acknowledged that the material properties of the deformable trailing edge determines its ability to elastically buckle under increased loads. They rather argued in reference to page 4, lines 19 to 20, that due to the presence of stiffening members embedded in the deformable material, the trailing edge is not formed of a single material and would therefore not buckle.

Firstly, the claim does not require that the trailing edge component is formed of a single material. It only requires that it is formed of material with elastic

modulus in a given range, which according to the respondent is enough for it to buckle as claimed. Moreover, the Board observes that the passage referred to concerns the possibility ("can be ...") of forming the material of the deformable material by molding or extrusions as a composite, in which case fiber reinforcements are enclosed within a matrix. This possibility is only considered in E1 as optional. E1 perforce thus also considers forming the edge section without such reinforcement. In that case also the mere fact that it is made of a material of elastic modulus within the claimed range is enough for the component to exhibit the desired buckling under load. The Board concludes that this part of the feature is thus also disclosed in E1.

2.6 E1 furthermore discloses an assembly element 12 as shown in figure 4b and explained on page 11, lines 7-8 on which the trailing section 3 is attached. It is undisputed that the structure of this element is unspecified in E1, in particular it is not stated from what material it is formed. Thus the subject-matter of claim 1 differs from E1 in that a unidirectional reinforcing layer is provided adjacent to the trailing edge component and that comprises at least one layer of unidirectional fibres extending in a substantially spanwise direction.

2.7 The at least one layer of unidirectional fibers in the spanwise direction provides the advantage explained in column 2, lines 23-27 of increasing the rigidity, in particular its ability to resist compression caused by edgewise loading i.e. loads parallel to the chord (paragraph 0002)). Because the assembly element 12 of E1 serves to receive and support the trailing edge element 3 which extends in the edgewise direction, it

must already have a certain stiffness in that direction, that is to resist loads parallel to the chord. Indeed this can be concluded from its U shaped cross section with the opening of the U oriented towards the chord. The objective technical problem may be formulated as how to realise such a structural component with appropriate structural stiffness.

2.8 Striving to realise such an element on a composite wind turbine blade, the person skilled in the manufacture of wind turbine blades necessarily considers materials common to that field that are used to provide rigidity. As recognized in section 2 of the decision under appeal, and not disputed, these include as a matter of common general knowledge, composite fibre reinforcements mats, either unidirectional or multidirectional, normally applied in one or more layers, as used for example, as is also undisputed, in spars and other load bearing components of wind turbine blades. In this case, as will be apparent to the skilled person designing wind turbine blades it would be obvious to consider mats that are fibre reinforced with the fibres extending in the main edgewise direction of the element 12 to give it the required edgewise rigidity along the edge, i.e. spanwise. The Board is unconvinced by the argument that it would require some special insight on the part of the skilled person regarding the load distribution within the blade or how best to match material properties to the load distribution. As stated it will be apparent to the skilled person that the element 12 of U shaped cross-section provided at the edge of the main body is designed to withstand edgewise loads, parallel to the chord. It is then a matter of simple routine design practice to match the reinforcement to expected load, in this case with the reinforcing fibres oriented along

the element's length and thus parallel to the edge, i.e spanwise, perpendicular to its U shaped cross-section and the direction of expected load. In so doing the skilled person using common general knowledge to realize the element 12 of E1 would arrive at a wind turbine blade of claim 1 in obvious manner.

3. For the above reasons, and contrary to the opposition division's positive conclusion, the Board finds that the subject-matter of claim 1 of the main request does not involve an inventive step over E1 and the skilled person's common knowledge, and therefore does not fulfill the requirements Article 52(1) and 56 EPC.

4. The Board concludes that the decision wrongly found that none of the opposition grounds prejudiced maintenance of the granted patent; it must therefore set the decision aside. As there are no other requests (since auxiliary requests 1-8 were withdrawn during the oral proceedings) it must revoke the patent pursuant to Article 101(2) and (3)(b) EPC.

Order

For these reasons it is decided that:

1. **The decision under appeal is set aside.**

2. **The patent is revoked.**

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated