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Datasheet for the decision of 28 April 2017

Case Number: T 0059/13 - 3.2.04

Application Number: 01948133.2

Publication Number: 1295032

IPC: F03D1/06

Language of the proceedings: EN

Title of invention:
BLADE OF A WIND TURBINE

Patent Proprietor:
Stichting Energieonderzoek Centrum Nederland

Opponent:
Vestas Wind Systems A/S

Headword:

Relevant legal provisions:
EPC Art. 56
RPBA Art. 13(1)

Keyword:
Inventive step - obvious combination of known features
Late-filed auxiliary requests - request clearly allowable (no)

Decisions cited:

Catchword:

Europäisches Patentamt
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Case Number: T 0059/13 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 28 April 2017

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)	Stichting Energieonderzoek Centrum Nederland Westerduinweg 3 1755 LE Petten (NL)
Representative:	Nederlandsch Octrooibureau P.O. Box 29720 2502 LS The Hague (NL)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 14 November 2012 rejecting the opposition filed against European patent No. 1295032 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	A. de Vries
Members:	S. Oechsner de Coninck
	T. Bokor

Summary of Facts and Submissions

I. The appellant (opponent) lodged an appeal, received on 2 January 2013 against the decision of the opposition division dated 14 November 2012 to reject the opposition against the patent EP 1 295 032, and paid the appeal fee the same day. The statement setting out the grounds of appeal was filed on 20 February 2013.

II. Opposition was filed against the patent as a whole and based on Article 100(a) together with Articles 52(1), 54(3) and 56 EPC.

The opposition division held that the grounds for opposition mentioned in Article 100 (a) EPC did not prejudice the maintenance of the granted patent unamended having regard to the following documents in particular:

E3: WO 00/15961 A1

E7: WA. Timmer et al.: "THE EFFECT OF STALL STRIPS, GURNEY FLAPS AND VORTEX GENERATORS ON THE PERFORMANCE OF A STALL CONTROLLED WIND TURBINE", Delft University of Technology, EWEC 94, pages 714-718,

III. The appellant (opponent) requests that the decision under appeal be set aside, and that the European patent No. 1 295 032 be revoked.

The respondent (patent proprietor) requests that the appeal be dismissed, i.e. the opposition be rejected, or alternatively that the decision under appeal be set aside and the patent be maintained in an amended form on the basis of the auxiliary request as indicated with letter dated 19 June 2008 and filed on 24 June 2008,

alternatively on the basis the auxiliary request II filed in the oral proceedings before the Board.

IV. Oral proceedings were held on 28 April 2017.

V. The independent claims of the relevant requests read as follows:

Main request (as granted)

1."Blade (1, 11, 21, 31) of a wind turbine, comprising a connection part (2, 12, 22) provided at one end with connection means, for connection to the shaft (4)/hub (3, 13, 23) of a wind turbine, and a wind-energy-absorbing profile (5, 15, 25) which is optimized for the wind flow and extends from the other end of the connection part, the connection part being provided with a member (6, 16, 26, 36) that is designed in such a way that the assembly comprising the member (6, 16, 26, 36) and the connection part can absorb wind energy, which member comprises a rib (6, 16, 26, 36) that projects from the connection part, characterized in that said rib (6, 16, 26, 36) is arranged in a plane that forms an angle, which on the pressure side lies between 45° and 135° to the chordal plane of said wind-energy-absorbing profile."

9."Method for producing a blade (1, 11, 21) of a wind turbine, comprising the provision of a blade (1, 11, 21) comprising a connection part (2, 12, 22) provided at one end with connection means, for connection to the shaft (4)/hub (3, 13, 23) of a wind turbine, and a wind-energy-absorbing profile (5, 15, 25) which is optimized for the wind flow and extends from the other end of the connection part, the connection part being provided with a member (6, 16, 26, 36) that is designed

in such a way that the assembly comprising the member (6, 16, 26, 36) and the connection part can absorb wind energy, which member comprises a rib (6, 16, 26, 36) that projects from the connection part, wherein said rib (6, 16, 26, 36) is arranged in a plane that forms an angle, which on the pressure side lies between 45° and 135° to the chordal plane of said wind-energy-absorbing profile, wherein after the provision of the connection part a rib is provided on it in such a way that the assembly comprising the rib (6, 16m 26) and the connection part can generate wind energy."

Auxiliary request I (as filed with markup indicating amendments vis-a-vis the granted version)

1. Blade of a wind turbine, the blade having a chord which increases from the free end onwards to a maximum chord, which blade comprises~~ing~~ a connection part provided at one end with connection means, for connection to the shaft/hub of a wind turbine, which connection part comprises the part beyond the maximum chord with decreasing chord, and which blade comprises a wind-energy-absorbing profile which is optimized for the wind flow and extends from the other end of the connection part, the connection part being provided with a member that is designed in such a way that the assembly comprising the member and the connection part can absorb wind energy, which member comprises a rib that projects from the connection part, **characterized in that** said rib is arranged in a plane that forms an angle, which on the pressure side lies between 45° and 135° to the chordal plane of said wing-energy-absorbing profile.

9. Method for producing a blade of a wind turbine, comprising the provision of a blade having a chord which increases from the free end onwards to a maximum chord, which blade comprises~~ing~~ a connection part provided at one end with connection means, for connection to the shaft/hub of a wind turbine, which connection part comprises the part beyond the maximum chord with decreasing chord, and which blade comprises a wind-energy-absorbing profile which is optimized for the wind flow and extends from the other end of the connection part, the connection part being provided with a member that is designed in such a way that the assembly comprising the member and the connection part can absorb wind energy, which member comprises a rib that projects from the connection part, wherein said rib is arranged in a plane that forms an angle, which on the pressure side lies between 45° and 135° to the chordal plane of said wing-energy-absorbing profile, wherein after the provision of the connection part a rib is provided on it in such a way that the assembly comprising the rib and the connection part can generate wind energy.

Auxiliary request II

1. Blade (1, 11, 21, 31) of a wind turbine, comprising a connection part (2, 12, 22) provided at one end with connection means, for connection to the shaft (4)/hub (3, 13, 23) of a wind turbine, and a wind-energy-absorbing profile (5, 15, 25) which is optimized for the wind flow and extends from the other end of the connection part, the connection part comprising a tube and being provided with a member (6, 16, 26, 36) that is designed in such a way that the assembly comprising the member (6, 16, 26, 36) and the connection part can absorb wind energy, which member comprises a rib (6, 16, 26, 36) that projects from the connection part, characterized in that said rib (6, 16, 26, 36) is arranged in a plane that forms an angle, which on the pressure side lies between 45° and 135° to the chordal plane of said wind-energy-absorbing profile.

79. Method for producing a blade (1, 11, 21) of a wind turbine, comprising the provision of a blade (1, 11, 21) comprising a connection part (2, 12, 22) provided at one end with connection means, for connection to the shaft (4)/hub (3, 13, 23) of a wind turbine, and a wind-energy-absorbing profile (5, 15, 25) which is optimized for the wind flow and extends from the other end of the connection part, the connection part comprising a tube and being provided with a member (6, 16, 26, 36) that is designed in such a way that the assembly comprising the member (6, 16, 26, 36) and the connection part can absorb wind energy, which member comprises a rib (6, 16, 26, 36) that projects from the connection part, wherein said rib (6, 16, 26, 36) is arranged in a plane that forms an angle, which on the pressure side lies between 45° and 135° to the chordal plane of said wind-energy-absorbing profile, wherein after the provision of the connection part a rib is provided on it in such a way that the assembly comprising the rib (6, 16m 26) and the connection part can generate wind energy.

VI. The appellant argues as follows:

Starting from E3 as the nearest prior art, the subject-matter of claim 1 differs by the provision of ribs instead of vortex generators in the connection part. The ribs provide the effect of an improved aerodynamic gain and the problem of improving aerodynamic performance of the blade might be formulated accordingly.

Reading the teaching of E7 the skilled person would learn from figure 7 that the lift of an aerodynamic profile would be improved by the provision of a gurney flap at the trailing edge. He would as a matter of obviousness apply the flaps on those parts of the blade that have an aerodynamic profile. In E7 this includes also the connection part inward of maximum chord where E7 has vortex generators. By applying the flaps there he would thus arrive without inventive step to the

blade of a wind turbine defined in claim 1. The same also applies when using the teaching of E4 or E1.

In respect of the auxiliary request II submitted during oral proceedings, filing it so late does not comply with Article 12(2) RPBA and also no unexpected turn of the proceedings justifies the late filing. There was no opportunity for opponent to prepare for the request only presented at such a late stage. As to its substance, it is not apparent how the amendment would distinguish the subject-matter claimed from the prior art.

VII. The respondent argues as follows:

The connection part defined in claim 1 should be interpreted as mainly having a structural function. Therefore the section depicted in figure 1 of E3 with a decreasing chord near the blade's root is not a connection part in the sense of claim 1, and thus the vortex generator is not provided in such a part. These vortex generators are furthermore attached on the suction side, and thus cannot hint to provide aerodynamic features on the pressure side as required in claim 1. None of the documents used to combine with E3, in particular E7, teaches to provide improvements to structural parts of a wind turbine blade. The gurney flaps disclosed therein are always located on aerodynamic profiles, and the skilled person does not learn that such a type of rib would increase the wind yield by providing it on a structural part.

In respect of the auxiliary request II the respondent argues that there was no occasion to file a further request, as the Board’s communication did not raise any particular issues beyond those discussed in the

previous proceedings. The discussion shed new light on the subject-matter and this was unexpected. The communication of the Board highlighted a different issue. The claim now makes it clearer that the rib is on the tube part of the connection part.

Reasons for the Decision

1. The appeal is admissible.

2. Subject-matter of the invention, interpretation of claim 1

2.1 The patent seeks to increase the output of a wind turbine blade without prohibitively increasing costs and without decreasing the blade's strength. It does so by the provision of an angled rib on the pressure side of the blade in the connection part of that wind turbine blade, specification paragraphs [0005] and [0006].

In claim 1 as granted the connection part is defined as being provided at one end with connection means, for connection to the shaft/hub of a wind turbine and delimited at the other end by a wind-energy-absorbing profile which is optimized for the wind flow. Furthermore that connection part is provided with a member comprising a rib which is defined to project from the connection part and arranged at an angle from the pressure side as recited in the characterising portion.

2.2 According to established jurisprudence on claim interpretation, the skilled person should try with synthetical propensity, to arrive at an interpretation which is technically sensible and takes into account

the whole of the disclosure of a patent (Case Law of the Boards of Appeal, 8th edition, 2016, (CLBA) II.A. 6.1). In this case the skilled person understands the "other end" of the connection part to be the one where the rotor blade starts to exhibit a substantially pure airfoil profile optimised for wind energy absorption. The particular shape and structure of the connection part is left undefined, and the skilled person knows that this may include various shapes ranging from a pure tubular part with a flange to a fully profiled shaped root. Therefore as interpreted from the claim's wording the connecting part merely represents the transition between the purely aerodynamic profile to an attachment ring or flange.

This otherwise clear interpretation on the basis of the wording of claim 1 or 9 itself is also supported by the description that specifies the term connection part in column 1, lines 50 to column 2, line 3, as meaning "that part of a blade that is optimized for the structure, and not so much optimized for the absorption of wind energy" and "compris[ing] the part beyond the maximum chord, in other words the part with decreasing or invariable chord". From the expression "not so much optimized" the skilled person infers that this connection part still can absorb wind energy to a certain degree. The connection part therefore comprises a transition area with mixed aerodynamic and structural properties.

Contrary to the respondent's opinion a limitation of the connection part to be one with a structural function only is neither inferred from the claim wording itself in the skilled person's understanding thereof, nor is it supported by what he gleans from the

rest of the patent, in particular the above cited passage of the description.

2.3 In claims 1 and 9 the rib is defined with respect to that connection part as follows: " the connection part being provided with a member..., which member comprises a rib that projects from the connection part... said rib is arranged in a plane that forms an angle, which on the pressure side lies between 45° and 135° to the chordal plane of said wind-energy-absorbing profile." Following established case law concerning the meaning of terms (CLBA, II.A.6.2) the fact that the connection part is "provided with" a member which "comprises" a rib does not exclude that this member or rib may also extend to another portion than the connection part of the same blade. This is indeed supported by the figures: Figure 1 shows a rib extending from a tubular portion on a trailing edge of an increasing chord portion; in Figure 3 shows the rib is provided on the tubular portion only, while in Figure 5, the rib extends on the whole length of the turbine blade, including the connection part.

3. Inventive step

3.1 The document E3 concerns a wind turbine blade with aerodynamic improving features in the form of vortex generators seeking to solve a similar technical problem and therefore represents a suitable starting point for the assessment of inventive step. Figure 1 of E3 depicts a wind turbine blade with vortex generators 3 and a connection portion. With the above understanding this connection portion includes the portion from the root referenced 12 in figure 4 to the aerodynamic portion in the region of the maximum chord as depicted in figure 1. It therefore includes the two lower vortex

generators shown in figure 1 located in the transition portion from maximum chord, which indisputably must have a purely aerodynamic profile, to the lower end, where there will be no or little aerodynamic profile and which is most likely substantially cylindrical.

3.2 The subject-matter of claims 1 and 9 of the main request differs from the blade of E3 by the provision of a rib in the connection part, that is furthermore located as defined in the characterising portion i.e. said rib is arranged in a plane that forms an angle, which on the pressure side lies between 45° and 135° to the chordal plane of said wind-energy-absorbing profile.

3.3 This rib improves the aerodynamic properties of the connection part and thus of the blade as a whole. The corresponding objective technical problem can thus be formulated as how to further enhance the aerodynamic properties of a wind turbine blade as in E3.

3.4 In considering how to modify the wind turbine blade of E3 to solve this problem, the skilled person will in particular turn to the disclosure of E7, a paper that considers the effect of various well known aerodynamic devices - stall strips, gurney flaps and vortex generators - on the performance of a wind turbine blade airfoil, see title and introduction. The figures show the results of wind tunnel measurements and calculations conducted on various arrangements of strips, flaps and/or generators on airfoils. Figure 7 is of particular interest as it shows the combined effect of vortex generators and gurney flaps on the performance of a particular type airfoil (DU 91-W2-250) in terms of lift coefficient (C_i) as a function of angle of attack α. The (pre-stall) maximum lift

coefficient of the airfoil with both vortex generator and gurney is clearly shown as improved with respect to the airfoil with only gurney flaps and the clean airfoil. The gurney flaps in question are described in section 4 on page 716 of E7 and consist of a flap usually 1 to 2% of chord length attached perpendicularly to the airfoil lower surface trailing edge. Figure 7 suggests to the skilled person that the combined use of vortex generators and gurney flaps enhance the aerodynamic properties of an airfoil. Therefore, tasked with improving the aerodynamic properties of a turbine blade as in E3, the skilled person would certainly - as a matter of obviousness - seriously contemplate adopting this teaching.

3.5 As vortex generators are also provided on the E3 blade in the area inward of the maximum chord , i.e. the connection part of the blade in the sense of claim 1, that area must also be of aerodynamic interest. Indeed it is undisputed that in this area the blade still has an airfoil profile. Therefore in applying the teaching of figure 7 to a E3 blade to enhance its aerodynamic properties, the skilled will also consider this area in the connection part where there are already vortex generators. He does so by providing gurney flaps in addition to the vortex generators already provided in that very same area. Nor does this present any particular difficulty as a gurney flap is a very simple aerodynamic feature that can be attached in a straight forward manner at a trailing edge of any airfoil.

As gurney flaps are moreover provided on the pressure side of the trailing edge at a 90° angle, he will thus arrive without inventive skill at the subject-matter of claim 1 as granted.

3.6 The respondent submits that the vortex generator depicted near the root portion of the rotor blade of E3 with decreasing chord are not provided on a connection part in the sense of claim 1 (or 9). Moreover these vortex generators are not located on the pressure side as defined in claim 1 but instead on the suction side of the blade. E7 teaches only to provide aerodynamic devices such as gurney flaps e on aerodynamic sections of a blade.

In the Board's opinion the connection part defined in claims 1 and 9 is not limited to merely having a structural function, see above. The area of the wind turbine blade with decreasing chord shown in figure 1 of E3, which has mixed aerodynamic and structural properties, is seen to be a connection part in the sense of claim 1. This connection part starts from the free end at the root and extends up to a portion located at or near the largest chord, in other words beyond the section in which the lower vortex generator is provided.

3.7 From the above it follows that the blade of a wind turbine of claim 1 and the corresponding method for producing a blade of claim 9 lack an inventive step in view of E3 in combination with the teaching of E7. Since the main request must fail on this sole ground, the Board does not need to decide on the other arguments put forward in respect of novelty or inventive step raised in respect of claims 1 and 9 of the main request.

4. Auxiliary request I

4.1 Claim 1 of the auxiliary request I is amended by introducing the maximum chord as the limit between the

wind-energy-absorbing profile and the connection part. This additional feature expressly states the extent of the connection part as implicit in claim 1 (and 9) from the Board's understanding of their wording. For that reason the above conclusion of lack of an inventive step also applies to the subject-matter of claim 1 containing this further limitation. Indeed the section of maximum chord depicted in figure 1 of E3 is the upper boundary of the area explained above as exhibiting both mixed aerodynamic and structural properties.

4.2 Claims 1 of 9 of the auxiliary request I must fail for the same reasons as given above in respect of the main request.

5. Auxiliary request II

5.1 Auxiliary request II was filed at an advanced stage of the oral proceedings, after the Chairman of the Board has announced that claim 1 of the main request lacked an inventive step and that this conclusion would also apply to the auxiliary request I.

5.2 The respondent proprietor argues that this late filing is justified by the discussion in the oral proceedings on the interpretation of "connection part".

The Board is however unconvinced by this justification, as the interpretation of "connection part" was already at issue in the decision under appeal (see section 3 a) introductory comments), which also held that feature to be present in E3 (section 6.1, first paragraph). The appellant had also raised this issue in his grounds for appeal (see e.g. Item 5), and the Board reprised the issue in section 3.1 of its communication. It can

therefore not have come as a surprise that the question might need to be revisited in the oral proceedings before the board.

5.3 As to the substance the respondent also submitted that by explicitly defining the tube, it would be clearer that the rib is on the tube part of the connection part, and the subject-matter of claim 1 would thus be allowable.

The Board on the contrary observes that the mere statement that the connection comprises a tube does not limit or define the location of the rib on the tube portion of the connection part. Consequently, this added feature does not further differentiate the claimed subject-matter from E3, and the conclusion for claim 1 of the main and auxiliary request I must hold also for this request, which is therefore clearly not allowable.

5.4 For the above, the Board in exercising its discretion under Article 13(1) of the Rules of Procedures of the Boards of Appeal decided not to admit Auxiliary request II into the appeal proceedings.

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