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Datasheet for the decision of 21 May 2019

Case Number: T 2250/15 - 3.2.04

Application Number: 09729071.2

Publication Number: 2286084

IPC: F03D1/06, F03D3/06, F03B3/12

Language of the proceedings: EN

Title of invention:
A WIND TURBINE BLADE WITH AN AUXILIARY AIRFOIL

Patent Proprietor:
LM GLASFIBER A/S

Opponents:
Siemens Aktiengesellschaft
Vestas Wind Systems A/S

Headword:

Relevant legal provisions:
EPC Art. 56
RPBA Art. 13(3)

Keyword:
Inventive step - (no)
Late-filed auxiliary requests - admitted (no)

Decisions cited:

Catchword:

Europäisches Patentamt
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Beschwerdekammern

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Case Number: T 2250/15 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 21 May 2019

Appellant: (Opponent 1)	Siemens Aktiengesellschaft Werner-von-Siemens-Straße 1 80333 München (DE)
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Appellant: (Opponent 2)	Vestas Wind Systems A/S Hedeager 44 8200 Aarhus N (DK)
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Respondent: (Patent Proprietor)	LM GLASFIBER A/S Jupitervej 6 6000 Kolding (DK)
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 3 November 2015 rejecting the opposition filed against European patent No. 2286084 pursuant to Article 101(2) EPC.**

Composition of the Board:

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

Summary of Facts and Submissions

I. By its decision dated 3 November 2015 the opposition division rejected the oppositions against the European patent No. 2 286 084. On 7 December 2015 the appellant-opponent 1 filed an appeal and paid the appeal fee simultaneously. The statement setting out the grounds of appeal was filed on 11 March 2016. The appellant-opponent 2 likewise lodged an appeal, received on 11 January 2016 against the decision of the Opposition Division and paid the appeal fee the same day. The statement setting out the grounds of appeal was received on 11 March 2016.

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 granted patent unamended having in particular in regard to the following document that also played a role in the appeal proceedings:

E1: WO 2007/045244 A1

III. Oral proceedings were held on 21 May 2019.

IV. Both appellants request that the decision be set aside and the patent be revoked in its entirety.

The respondent (patent proprietor) requests that the Board dismiss the appeal and maintain the patent as granted (main request), or alternatively that it set aside the decision and maintain the patent in amended form according to an auxiliary request, filed during the oral proceedings before the Board.

V. The independent claim 1 according to the main and auxiliary requests reads as follows:

Main request

"A blade (10) for a rotor of a wind turbine (2) having a substantially horizontal rotor shaft, the rotor comprising a hub (8), from which the blade (10) extends substantially in a radial direction when mounted to the hub (8), the blade (10) comprising a main blade part having:

- a profiled contour (50) comprising a pressure side (52) and a suction side (54) as well as a leading edge (56) and a trailing edge (58) with a chord (60) extending between the leading edge (56) and the trailing edge (58), the profiled contour (50) generating a lift when being impacted by an incident airflow, wherein the profiled contour (50) in the radial direction is divided into:
- a root region (30) consisting of a substantially circular or elliptical profile (90) closest to the hub (8), the substantially circular or elliptical profile (90) having a diameter (D),
- an airfoil region (34) with a lift generating profile furthest away from the hub (8), and
- a transition region (32) between the root region (30) and the airfoil region (34), the profile of the transition region (32) gradually changing in the radial direction from the circular or elliptical profile (90) of the root region (30) to the lift generating profile of the airfoil region (34), characterised in that the blade (10) further comprises:
- a first auxiliary airfoil (70) having a first pressure side (72) and a first suction side (74) as well as a first chord (76) extending between a first leading edge (78) and a first trailing edge (80), the first chord (76) having a length that is 75% or less of

the diameter (D) of the substantially circular or elliptical profile (90) in the root region (30),
- the first auxiliary airfoil (70) being arranged so that it extends in the radial direction along at least a part of the root region (30) and/or the transition region (32) of the main blade part with a distance therebetween."

Auxiliary request
Claim 1 is as in the main request with the following amendments and deletions highlighted by the Board:

"A blade (10) for a rotor of a wind turbine (2) having a substantially horizontal rotor shaft, the rotor comprising a hub (8), from which the blade (10) extends substantially in a radial direction when mounted to the hub (8), the blade (10) comprising a main blade part having:
- a profiled contour (50) comprising a pressure side (52) and a suction side (54) as well as a leading edge (56) and a trailing edge (58) with a chord (60) extending between the leading edge (56) and the trailing edge (58), the profiled contour (50) generating a lift when being impacted by an incident airflow, wherein the profiled contour (50) in the radial direction is divided into:
- a root region (30) consisting of a substantially circular or elliptical profile (90) closest to the hub (8), the substantially circular or elliptical profile (90) having a diameter (D),
- an airfoil region (34) with a lift generating profile furthest away from the hub (8), and
- a transition region (32) between the root region (30) and the airfoil region (34), the profile of the transition region (32) gradually changing in the radial direction from the circular or elliptical profile (90)

of the root region (30) to the lift generating profile of the airfoil region (34), characterised in that the blade (10) further comprises:
- a first auxiliary airfoil (70) having a first pressure side (72) and a first suction side (74) as well as a first chord (76) extending between a first leading edge (78) and a first trailing edge (80), the first chord (76) having a length that is **10-50%** ~~75% or less~~ of the diameter (D) of the substantially circular or elliptical profile (90) in the root region (30),
- the first auxiliary airfoil (70) being arranged so that it extends in the radial direction along at least a part of the root region (30) ~~and/or the transition region (32)~~ of the main blade part with a distance therebetween,
wherein the blade (10) is adapted for use in a wind turbine rotor having a direction of rotation during normal operation, and wherein ***the first*** ~~*a number of*~~ *auxiliary airfoil~~s~~ (70, 100) is arranged in the radial direction along at least a part of the root region (30) and adapted so as to alter and guide the incident airflow so so as to increase lift and/or decrease drag on the root region (30)* ~~*and/or the transition region (32)*~~ *of the main blade part.*"

VI. The appellants argue as follows:
- The chord length of the root segments disclosed in figure 9c of E1 can be inferred as being about 75%. Assuming this represents a difference defined by claim 1 of the main request, providing this value would merely rely on routine optimisation performed by the skilled person in their daily practice.
- The auxiliary request should not be admitted because it adds subject-matter and the last added limitation appears known from the disclosure of E1, therefore

claim 1 according to this request is not clearly allowable.

VII. The respondent argues as follows:
- For the main request, starting from E1 the skilled person would rather increase the length of the auxiliary airfoils in order to increase the lift provided by this profile. Contrary to the effect of increasing lift, the patent aims at improving the pressure distribution around the root portion.
- The auxiliary request although filed at a late stage addresses all concerns of the Board and should be admitted, and it is also allowable.

Reasons for the Decision

1. The appeal is admissible.

2. Main request - Inventive step

2.1 It is common ground that the document E1, see e.g. figure 2, concerns - beside less conventional blade constructions - also a conventional blade for a rotor of a wind turbine having a substantially horizontal shaft the blade having a profiled contour with an airfoil section 4, a circular root section 2 and a transition region 3 between the two. E1 discloses several embodiments of modified root areas for such turbine blades in view of improved aerodynamics especially in terms of improved lift and hence increased power production of this area close to the hub (e.g. page 6, lines 6 to 9). These modifications therefore target the same root and transition areas as in the patent with closely related technical problems of improving aerodynamics or yield of the root region.

E1 therefore represents a suitable starting point for the assessment of inventive step.

2.2 It is furthermore undisputed that the embodiment of figures 9A to 9C, considered in conjunction with page 8, final paragraph is of particular relevance as starting point. Here the wind turbine blade is provided with separately mounted blade parts 15, 16, that are mounted on the first and the second root segments 7^3 and 8^3 of a split blade. The blade parts 15 and 16 extend along the root area 2 and optionally also along the transition area 3 of the blade. Though the embodiment shown in figure 9 has a split root, the final paragraph on page 8 clearly considers mounting the two blade parts 15 and 16 to a conventional "unsplit" root segment, cf. figure 2 and pp 5, 6 describing a conventional blade.

2.3 Taking that specific configuration with the conventional "unsplit" root segment, if any difference is to be identified between the blade of claim 1 and E1, it is to be seen in the precise chordal extension of auxiliary airfoils 15,16 relative to the root. No explicit dimension is given in the description of E1, and the skilled person can only derive information on the chord approximate length from the figures. It is established case law that even though dimensions cannot normally be inferred from schematic figures as a matter of direct and unambiguous disclosure, they may be read to provide relative dimensions (see Case Law of the Boards of Appeal, 8th edition, 2016 (CLBA), I.C.4.6). Thus, the segments 15, 16 in figure 9C are visible and enclosed within the circumference of the root depicted as the circular line. These segments are shown as having a chord length that the skilled person would immediately recognise to be substantially more than

half but substantially less than the root diameter. The derivable relative dimension allowed by case law appears quite close to 75% of the root diameter, and thus to the upper limit of the claimed range of less than 75% of the root diameter.

2.4 Considering that an exact value less than 75% cannot be directly and unambiguously derived, especially in relation to the unsplit "conventional" root segment, the novelty of the claimed blade is not called into question, but the closely related question of inventive step arises. The segments of E1 are disclosed as improving the aerodynamic behaviour in the root portion in adding a beneficial contribution to the production of the wind turbine (page 2, lines 23-24). The subjective problem expressed in paragraph 9 of the patent solved by the first auxiliary airfoil also targets an improved aerodynamic in the root portion, expressed for example in terms of improving the lift-to-drag ratio. Starting from this embodiment as disclosed in E1, which must necessarily also improve drag-to-lift ratio if it is to provide a lift contributing to power production of the blade, a modified, less ambitious problem should be determined on the basis of the remaining features of the claim (see Case Law of the Boards of Appeal, 8th edition, 2016 (CLBA), I.D.4.4.1).

2.4.1 Paragraph 20, which lists increasingly narrow chord length ranges (10-70%, 10-60%, 10-50%, 10-40% or 10-30%) of which 10-75% is the broadest, states that rather than contributing to high lift in itself, the intention is to improve the pressure distribution around the root region by provision of the auxiliary air foils. In the Board's understanding however this is not simply a result of relative chord length. For

example, as stated in the specification, various parameters also contribute to the sought effect, such as: the extent along (in the direction of the blade) the root region (paragraph 18); the location of the pressure or suction side of the first auxiliary airfoil in respect of the pressure or suction side of the main blade part (paragraphs 21-24); tilting of the auxiliary airfoil towards the suction side of the main blade part (paragraph 24). It would seem also from straightforward considerations that the distance of the airfoil to the root must play a critical role if it is to influence the pressure distribution about the root rather than merely contribute to lift. In this respect the Board notes that from comparison of figure 9 of E1 and figure 4 of the patent, the distances are very similar and must be such that also in E1 not only lift is improved but also the pressure distribution about the root is affected. In any case, the Board is unable to conclude that a maximum chord length is *per se* decisive in this regard.

2.4.2 For the above reasons the Board concludes that the upper limit of chord length has been selected as distinguishing feature in claim 1 without any particular reason other than being well suited for the purpose of improving airflow behaviour around the root region. As the same or similar effect must necessarily also occur in E1, the Board can only see the claimed upper limit as the result of an optimized root design. It formulates the objective technical problem accordingly, as realizing an optimized root design of a conventional blade and additional air-profiles as in E1, figure 9 in conjunction with the final paragraph of page 8.

2.5 In accordance with established jurisprudence the parameter optimization is normally considered routine design practice, cf. CLBA, 8th edition 2016, I.D.9.15. In the present case the skilled person when putting the teaching of E1 in practice, would as a matter of obviousness select a design as defined by the relevant parameters that best meets certain requirements. In this case certainly chord length would figure amongst those parameters of the auxiliary airfoil design that they would consider. Depending on the particular requirements and other design constraints they would then in the process of routine design optimization arrive at values that are merely the result of those requirements and constraints. Absent any particular associated special or surprising effect beyond the effects discussed above, the upper limit of 75% is seen to represent the outcome of such routine design for given (unspecified) requirements and constraints.

2.6 For these reasons the Board concludes that the skilled person implementing the embodiment foreseen in the final paragraph on page 8 with a "conventional" root segment, would in a design process realise an auxiliary airfoil having several chord length around the target value 75%, and obviously select a couple under this value by straightforward routine optimisation of the chord length depicted in figure 9c. In performing such routine optimisation the skilled person merely needs to achieve -any- suitable aerodynamic gain going beyond a conventional blade without auxiliary profile (see problem formulation above).

2.7 The respondent submits that the teaching of E1 would lead the skilled person to increase the length of the chord of such an auxiliary airfoil rather than making it smaller as required by the patent. In E1 the main

thrust is the increase of lift and not the altering of the pressure distribution as in the patent, so that the skilled person would be inclined to increase chord length. Furthermore, if they were to achieve the same lift in the conventional root variant of figure 9, page 8, final paragraph, as in the split root variant shown in figure 9C, they would need to double the chord length of the 2 auxiliary foils.

The Board is unconvinced. E1 consistently shows foil chord lengths in the root region that are smaller than the root diameter, see figures 3B and 3C to 9C. In connection with figure 3B E1 states at page 6, lines 26 to 28 that "the profiles of the blade segments ... are formed such that they lie within a corresponding conventional blade with circular root part (shown with the dashed line". In figure 8C the two outer foil segments indeed appear to have a chord length closer to 50% of root diameter. Clearly therefore E1 teaches chord lengths smaller than root diameter. Finally, as noted above in how far the auxiliary foil contributes more to pressure distribution about the root than to increasing lift is not simply expressed by a maximum relative chord length but rather depends on other factors which are not in the claim. As long as the skilled person in realizing an optimized design of an auxiliary airfoil for the root variant of figure 9 of E1 can be expected to try values in the range claimed, as the Board believes they would, that range is obvious.

2.8 In view of the above the Board concludes that the subject-matter of claim 1 of the main request, contrary to the the decision's positive assessment, does not involve an inventive step in the light of the prior art cited as required by Articles 52(1) and 56 EPC.

3. Auxiliary request 1 - admission:

3.1 As it was filed in the oral proceedings before the Board this request represents an amendment to the respondent's case, the admission of which is subject to the Board's discretion under Art 13(3) RPBA. Such request shall not be admitted if they raise issues which the Board or the other party cannot reasonably be expected to deal with without adjournment. An approach frequently adopted by the Boards for such late amendment requests can be summarized as follows: unless justified by unforeseen developments in the procedure, they must be "clearly allowable" to be admitted, cf. CLBA, 8th edition 2016, IV.E.4.2.5.

3.2 This request was filed at an advanced stage of the oral proceedings before the Board. Claim 1 according to this auxiliary request in particular replaces the range of 75% or less of the diameter by the sub-range of 10-50% of the diameter and also adds as last feature "wherein the blade (10) is adapted for use in a wind turbine rotor having a direction of rotation during normal operation, and wherein the first auxiliary airfoil is arranged in the radial direction along at least a part of the root region (30) and adapted so as to alter and guide the incident airflow so so as to increase lift and/or decrease drag on the root region (30) of the main blade part."

3.3 The appellant justifies the late filing of this auxiliary request by the absence of any clear previous indication in the appeal procedure that the main request would not be allowable. Only during the discussion in the oral proceedings did it become clear which limitations were required to remedy this lack of inventive step. The amendments are presumed to address

all concerns of the Board and the request is considered clearly allowable.

3.4 The auxiliary request filed at the oral proceedings before the Board represents a new attempt to overcome the lack of an inventive step based on the same sole distinguishing feature of less than a certain percentage of the root diameter. This aspect was present in the impugned decision, argued in detail in the parties' various submissions and also highlighted in the Board's communication. Therefore the amendments proposed in this final request do not find a justification in unforeseeable developments during the appeal.

3.5 The Board therefore deems it expedient to consider whether or not these amendments are "clearly allowable".

3.6 The Board observes - and this is also conceded by the respondent - that the amended claim 1 does not result from a straightforward combination of dependent claims as the limitation of dependent claim 2 concerning a number of airfoils has been replaced by the -single- first auxiliary airfoil. This raises the question whether a - single - first auxiliary airfoil was originally disclosed in combination of chord length within a range of 10 to 50% of the root diameter. It became evident to the Board during the ensuing discussion that such a disclosure was not immediately apparent.

In addition, the Board agrees with the appellants that the last added limitation appears to be known from the disclosure of E1. In E1 the blade is obviously "adapted for use in a wind turbine rotor having a direction of

rotation during normal operation," and its first auxiliary airfoil also clearly appears "arranged in the radial direction along at least a part of the root region". Such a requirement also repeats the requirements of the last feature of granted claim 1, as it results in the same auxiliary airfoil being "adapted so as to alter and guide the incident airflow so as to increase lift on the root region of the main blade part." Otherwise it is not immediately apparent to the Board why the findings for the higher upper limit would not also apply to the lower one now claimed. Therefore, no particular contribution to inventive step appears likely.

Therefore, the Board concludes that the amended claims of the auxiliary request are not clearly allowable.

3.7 For these reasons the Board decided to use its discretion under Article 13(3) RPBA not to admit this late filed request.

4. As the patent as granted (main request) does not meet the requirements of the EPC, and no further request has been admitted, it must be revoked in accordance with Article 101(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:

M. H. A. Patin A. de Vries

Decision electronically authenticated