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Datasheet for the decision of 22 April 2015

Case Number: T 0142/11 - 3.2.04

Application Number: 98940069.2

Publication Number: 1019631

IPC: F03D1/06

Language of the proceedings: EN

Title of invention:
WINDMILL ROTOR AND WIND BLADES THEREFOR

Patent Proprietor:
LM GLASFIBER A/S

Opponents:
aerodyn Engineering GmbH
Siemens Aktiengesellschaft
ENERCON GmbH

Headword:

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

Keyword:
Added subject-matter - claim 1 as granted - (no)
Inventive step - claim 1 as granted - (yes)

Decisions cited:

Catchword:

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Beschwerdekammern
Boards of Appeal
Chambres de recours

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 0142/11 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 22 April 2015

Appellant: (Patent Proprietor)	LM GLASFIBER A/S Rolles Moellevej 1 6640 Lunderskov (DK)
Representative:	Kitchen, Steven Richard LM Wind Power A/S Jupitervej 6 6000 Kolding (DK)
Respondent: (Opponent 1)	aerodyn Engineering GmbH Provianthausstr. 9 24768 Rendsburg (DE)
Representative:	Tönnies, Jan G. Boehmert & Boehmert Anwaltspartnerschaft mbB Patentanwälte Rechtsanwàlte Niemannsweg 133 24105 Kiel (DE)
Respondent: (Opponent 2)	Siemens Aktiengesellschaft Wittelsbacherplatz 2 80333 München (DE)
Respondent: (Opponent 3)	ENERCON GmbH Dreekamp 5 26605 Aurich (DE)
Representative:	Eisenführ Speiser Patentanwälte Rechtsanwälte PartGmbB Postfach 10 60 78 28060 Bremen (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 24 November 2010 revoking European patent No. 1019631 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman	A. de Vries
Members:	E. Frank
	T. Bokor

Summary of Facts and Submissions

I. The appeal lies from the decision of the Opposition Division posted on 24 November 2010 to revoke the European patent No. 1 019 631 pursuant to Article 101(2) EPC. The appellant (proprietor) filed the notice of appeal on 17 January 2011, paying the appeal fee on the same day. The statement of grounds of appeal was submitted on 4 April 2011.

II. Three oppositions were filed against the patent as a whole and based on Article 100(a) in conjunction with Articles 52(1), 54, and 56, Article 100(b) in conjunction with Article 83, and Article 100(c) in conjunction with Article 123(2) EPC.

The Opposition Division held that the patent as granted did not meet the requirements of the EPC, in particular for lack of inventive step of claim 1. In its decision the division considered the following prior art, amongst others:

OI-E3: Van Hulle et al: "Wind energy, Technology and Implementation", pp 431, 432, Proceedings of the European Win Energy Conference, EWEC'91, Amsterdam, The Netherlands, October 14-18, 1991

OIII-E4: "Allgemeine Beschreibung der Windkraftanlage TW 600-e", Tacke Windtechnik, pp 1-7, Stand: 2/96

F2 : Simpson et al: "A re-appraisal of the cost of UK offshore wind energy", paper presented at Wind Energy Conservation conference of the British Wind Energy Association, April 1991

P9: Pouw: "Wieksystemen", list of contents, and pp 14-23, Kluwer Technische Boeken B.V., 1982

P10: Hallmann: "Berichte aus dem Fachbereich Flugzeug- und Triebwerkbau, Abriß ausgewählter Beiträge zur

Windenergiennutzung", pp 126-133, Fachhochschule Aachen FH-Texte Nr. 43/1995
OI-E1: US-217 067
OIII-E1: US-1 919 588

III. The further following document was cited in appeal:
OIII-E7: DE-100 22 974 A

IV. A communication pursuant to Article 15(1) RPBA was issued after a summons to attend oral proceedings, which were duly held on 22 April 2015.

V. The appellant requests that the decision under appeal be set aside and that the patent be maintained as granted or alternatively on the basis of the first to tenth auxiliary requests filed with the grounds of appeal.

The respondents (opponents I,II,III) request that the appeal be dismissed.

VI. The wording of granted claim 1 reads as follows:

"A windmill of the front-runner type and having a tower(2) serving to rotatably carry a windmill housing (4) with a substantially horizontal main shaft (6) carrying a wind rotor, which comprises a hub (8) and three blades (10) extending from the hub (8) and constructed as aerodynamic shell profile elements, the wind mill having but one such wind rotor, said wind rotor being of the type in which the blades (10) extend outwards from a securing or transition area at the rotor hub (8) to a tip area which lies at a distance in front of the normal plane (p) of the rotor hub through the blade axes intersection points with the hub

circumference, characterised in that the blades (10), which are bendable by the wind pressure, extend outwards from the hub (8) in said normal plane (p), and at a distance from the hub (8) then extend in an outwardly and forwardly curving manner at least along the outer third of the blade (10)."

VII. The appellant argued as follows:

As to the issue of original disclosure, a usual windmill comprises three blades, cf. p.1 of the application. Moreover, the application invariably refers to blades constructed as aerodynamic shell profile elements, cf. p.2-5 of the application. Thus, it is clear from the context of the description that these shell profiles can also be formed as beam-free "boxes", cf. p.5, ln.3, of the application. Finally, it is clear from claim 1 as filed and p.5, ln.21, of the application that the blades are provided with a forwardly directed curvature over their outer extent. Thus, the term "outwardly/forwardly" in claim 1 as filed does not describe two synonymous qualities, but two separate qualities "outwardly" and "forwardly" as more clearly expressed in granted claim 1. Therefore, claim 1 as granted is originally disclosed.

As for inventive step, OIII-E4 "TACKE" forms the closest prior art, which shows in the attached drawing that the rotor blades are both coned and tilted. Based on par. 0013 of the patent, with respect to OIII-E4, the characterising portion of claim 1 in any event solves the problem of overcoming substantial bending forces whilst keeping a safety distance between the blades and the tower. Although OI-E3 "WIND ENERGY" addresses the aforesaid problem, it is not clear what is meant by "moulded preconed forward" and in any case

the document shows a complete straight blade on p.432. Thus, based on the figure on p.432, a bend angle cannot be derived at any point along the blade. Moreover, the term "preconed forward" implies an angled or bent blade design rather than curvature as is required by granted claim 1. Claim 1 further defines a curvature, and not a bend as in par. 0020 of the patent. This passage of the specification does not relate to claim 1 as amended upon grant, and should have been omitted in the examination phase since it now contradicts claim 1 as granted. Finally, OI-E3 describes a teetering mechanism on p.432, section 3.2, which clearly concerns two-bladed design. Thus, the teeter hub of OI-E3 would lead away from three blades, and the blades change their angle during rotation, which also suggests a movement in and out of the normal plane. Furthermore, F2 does not address any safety distance between blades and tower, while fig.2 shows a tip brake for power limiting purposes. F2 nowhere describes why the blades are depicted in the way shown in fig.2. Finally, P9 and P10 are old fashioned, traditional windmills which would not be considered starting from OIII-E4 "TACKE". They have tilted rotors that might move in and out of the normal plane. Their figures show straight blades; the documents are silent on the form or function of their tips, which possibly serve to reduce sail rattling.

Thus, starting from OIII-E4 "TACKE", F2, P9, and P10 would not be considered in the light of the problem to be solved. Moreover, taking into consideration OI-E3 "WIND ENERGY", either in combination or as further starting point this document in any case does not suggest blades which extend outwards from the hub in the normal plane, and at a distance from the hub then extend in an outwardly and forwardly curving manner at

least the outer third of the blade. Therefore claim 1 as granted also involves an inventive step.

VIII. The respondents argued as follows:

Since three blades are only described as an introduction on p.1 of the application, the feature of (exactly) three blades are not disclosed in conjunction with the invention. Moreover, the disclosure of a beam-free "box" construction on p.5, ln.3, of the application cannot form a basis for blades constructed as "aerodynamic shell profile elements" without a beam as now defined in claim 1 as granted. Rather, the application as filed describes two different principles of construction, namely either blades having aerodynamic shell profile elements with a main beam (see p.2, ln.15-17), or blades in the form of box structures (see p.5, ln.3). Furthermore, in claim 1 as filed the formulation "outwardly/forwardly" used the terms synonymously in the same manner as on p.5, ln. 11-18 of the application (cf. patent, par. 0017) where "backwards" and "inwards" are used to describe the same direction. In granted claim 1 this has been changed to "outwardly and forwardly", giving each term a separate meaning. Thus, on its own "outwardly" can also mean some form of bending in the radial plane, which is not originally disclosed. This shift in meaning adds subject-matter in claim 1 as granted.
As regards inventive step, the closest prior art OIII-E4 "TACKE" discloses the preamble of claim 1, since a slightly sloped main shaft as shown in its attached drawing can be understood as "substantially horizontal". Thus, in order to keep a safety clearance between blades and tower and also to avoid substantive bending forces, cf. patent par. 0013, because of the negative coning shown in the left figure of OIII-E4's

drawing, the skilled person would turn to p.432 of OI-E3 "WIND ENERGY". This document explicitly suggests that the shape of the blade must be moulded preconed forward to solve the afore-mentioned problem, see p. 432, left column, 2nd paragraph. As can be derived from figure 1 of OI-E3, see the cross-section below to the right, the bolts of the blade root extend in a straight direction. Thus, OI-E3 teaches that the blades extend straight, i.e. outwardly from the hub in the normal plane as in claim 1 as granted, and at a distance from the hub then in an outwardly and forwardly curving manner, when the blades are to be moulded preconed forward. Consequently, OI-E3's hub is not influenced by substantial bending forces, since no inclined retaining parts in the blade hub are foreseen, cf. also patent, par. 0008. Even if OI-E3 had not disclosed a forward "curvature", claim 1 as granted also does not exclude a bend as a curvature, see patent, par. 0020. Finally, whether or not the rotor of OI-E3 is two-bladed is of no relevance as to its blade design, which thus is also applicable to the three blades of OIII-E4's wind turbine. Hence, starting from OIII-E4, and taking into consideration OI-E3, the skilled person would directly arrive at the subject-matter of claim 1. Moreover, figure 2 on p.214 of F2 shows forward curvature falling within the terms of claim 1 as granted. Since F2 discloses a "LS2" front-runner, see p.205, the forward curvature must also serve for the tip to tower clearance. P9 and P10 also implicitly disclose curved blades for reasons of a safety distance between the blades and the tower. P9 and P10 would be considered by the skilled person, since claim 1 as granted does not distinguish between modern and ancient types of windmills. Thus, starting from OIII-E4, the subject-matter of claim 1 would be obvious in the light of F2, P9, or P10. Alternatively, it is obvious starting from

OI-E3. Therefore claim 1 is also considered to lack an inventive step.

Reasons for the Decision

1. The appeal is admissible.

2. *Amendments*

2.1 Claim 1 as granted according to the main request is directed to a windmill with a wind rotor having "three blades", as opposed to claim 1 as filed, which does not require a particular blade number. However, since page 1, lines 3 to 6 of the application (as published), explicitly describes that the invention concerned a windmill with a rotor of the usual type, which was "normally configured with three blades", the Board considers a rotor comprising three blades to be originally disclosed.

2.2 Moreover, in granted claim 1 it has now been specified that the blades are constructed as "aerodynamic shell profile elements". As to the argument of the respondents that a beam-free "box" construction at line 3 of page 5 of the published application does not necessarily imply a beam-free "shell profile element", the Board shares the appellant's view that the application consistently refers to a profile which is invariably designed as an aerodynamic shell profile. Using normal reading skills and reading the relevant passages contextually the skilled person will readily understand that pages 3 and 4 build upon the preceding passage on page 2, lines 15 to 23, which explains by way of introduction that aerodynamic shell profile elements with a main beam are used for blades of rotors

having an upwardly-sloping main shaft, or blade "cone" formations, or outwardly curved blades, and that it is these elements that are subject to the invention. Moreover, still within this context, the blade according to the invention, i.e. the aerodynamic shell profile element, does not need a beam, and can be given the desired curvature also with hollow bodies in the form of a "box", cf. page 4, line 35 to page 5, line 3 (as published). Read in context, this informs the reader that some shell profile elements to which the invention applies can be beam-free box type constructions. That there are box structures that do not necessarily involve an aerodynamic shell may well be, but this is beside the point, as these are not the type of structures that the reader has in mind when he reads these passages contextually.

2.3 Finally, in claim 1 as granted the original wording "outwardly/forwardly curving manner" of claim 1 as filed has been replaced by the formulation "outwardly and forwardly curving manner".

2.4 Claim 1 as filed is characterised in that the blades extend "outwards from the hub in said normal plane", and "at a distance from the hub in an outwardly/ forwardly curved manner". In its preamble, the "normal plane" of claim 1 is defined as the normal plane of the rotor hub, i.e. as a plane normal to the rotation axis and that extends radially from the hub at its centre and through the blade axes´ intersection points with the hub circumference. The Board agrees with the appellant´s view that the wording of original claim 1 thus refers to a curvature which lies radially outward (as seen from the hub at the centre of the normal plane) and which projects in the horizontal or out of

plane (forward with respect to the wind, i.e. in front of the normal plane) direction.

2.5 This is also directly and unambiguously derivable from page 5, lines 20 to 35 of the application (as published), where it is stated that the blades are provided with a "forwardly-directed curvature", i.e, the tips of the blades will stand "at some distance in front of the plane p", and "preferably only over an outer extent 12", i.e., preferably radially outward from the hub, see also figs. 1 and 3 as filed. For the sake of completeness, the Board adds that the directions "forwards" and "backwards and herewith inwards" on page 5 of the application, lines 11 to 18 (as published), are to be seen in the direction of the wind towards the mill tower, i.e. relative to the normal plane p on page 5 at line 24 (as published). However, there is nothing in the application which might suggest that the blade curves in any other way than radially forwardly out of the plane p.

2.6 Contrary to the respondents´ view, therefore, the term "outwardly/forwardly" would not be understood as two synonymous features by the skilled person. As also found by the Opposition Division under point 25 of its decision, the replacement of the formulation "outwardly/forwardly curving manner" by the wording "outwardly and forwardly curving manner" in claim 1 as granted is clearly based on the application as filed, and unambiguously refers to a curvature which projects in both radial (outward) and horizontal or out of plane (forward) directions. That the terms "outwardly" and "forwardly" now appear separately in claim 1 as granted does in any case not change their meaning. In as far as this might give rise to some ambiguity or unclarity, this can be resolved by reference to the description

and figures of the patent, which are essentially unchanged (apart from inclusion of prior art citations) with respect to the description and figures as originally filed. Thus, the Board also finds that granted claim 1 read against the backdrop of the description does not impart any new information vis-a-vis the original disclosure.

2.7 To conclude, the Board holds that the subject-matter of claim 1 as granted does not extend beyond the content of the application as filed. Claim 1 as granted therefore complies with Article 100(c) EPC.

3. *Inventive step*

3.1 It is common ground that document OIII-E4 "TACKE" forms the closest prior art, which is also cited in paragraph 0009 of the patent in suit. Turning in particular to the drawing ("Massblatt") of OIII-E4, the Board accepts that the slightly upwards sloped main shaft of the "TACKE" windmill shown and indicated by hand as "ca. $3,5^0$", see the left figure, would be understood as "substantially horizontal" according to the preamble of granted claim 1 by the skilled person, as also argued by the respondents.

3.2 Moreover, the parties agree that the drawing ("Massblatt") of OIII-E4, see again the left figure, discloses rotor blades with a slight negative coning, i.e. a slight blade inclination in the forward direction towards the wind. Nor is it in dispute that the (three) rotor blades of the OIII-E4 "TACKE" windmill are bendable by the wind pressure.

3.3 The subject-matter of claim 1 as granted thus differs from OIII-E4's disclosure in that the blades extend

outwards from the hub in said normal plane, and at a distance from the hub then extend in an outwardly and forwardly curving manner at least along the outer third of the blade.

It is common ground that the associated objective problem underlying theses distinguishing features vis-à-vis OIII-E4 "TACKE" has to be seen as overcoming substantial bending forces originating from the effect of centrifugal force on the blades, whilst keeping a safety distance between the blades and the tower. See patent, paragraph 0013.

3.4 In order to solve the afore-stated problem, document OI-E3 "WIND ENERGY" suggests negative coning, which increases the tip to tower clearance without significantly affecting root moments. See OI-E3, page 432, right column, 2nd paragraph. However, contrary to the respondents' view, the skilled person cannot glean from figure 1 of OI-E3 exactly how the cone formation in the forward direction may be achieved. It is certainly not clear from this document that this would be for example by inclined retaining parts on the blade hub, cf. patent in suit, paragraph 0008, i.e. that the blade attaches to the hub via a bent attachment section, or in any other way. Thus, as argued by the appellant, the Board holds that in any case OI-E3 does not disclose or hint at placing a curvature, i.e. the point at which the blade is bent or angled with respect to the hub, away from the attachment means, merely based on the drawings shown in figure 1 on page 432 of OI-E3.

3.5 Hence, starting from OIII-E4 "TACKE" the skilled person faced with the above stated problem and taking into consideration OI-E3 "WIND ENERGY"'s disclosure on page

432 would not arrive at blades of a rotor hub extending outwards from the hub in said normal plane, and at a distance from the hub then extending in an outwardly and forwardly curving manner at least along the outer third of the blade.

3.6 Consequently, the question of whether or not OI-E3 "WIND ENERGY" actually disclosed "bent" or "curved" blades, and also the question of whether a teetering mechanism as in OI-E3 "WIND ENERGY" (see page 432, left column, 2nd paragraph), which is usually applied for rotors with two blades only, would lead the skilled person away from a three-blade turbine and, because of the teeter motion, away from blades invariably extending outwards from the hub in the normal plane, or not, can be left undecided by the Board.

3.7 Furthermore, as argued by the appellant, document F2 does not address the problem at hand, i.e. the provision of a safety distance between blade and tower. Rather, figure 2 on page 214 suggests an aerodynamic tip brake for power limiting. Otherwise F2 gives no detail as to the exact design of the blades shown. Cf. F2, e.g., page 206, left column 2nd paragraph, and page 208, left column 2nd paragraph. As regards documents P9 and P10, these describe ancient post mills that date as far back as 1817. Thus, if the windmill of OIII-E4 "TACKE" is to be considered the closest prior art, it can be questioned whether the skilled person would even take P9 or P10 into consideration to improve the design of a modern "TACKE" wind turbine in the first place. But even so, neither P9 or P10 provides any information as to form and function of the blade tips shown in the figures as also advanced by the appellant, nor is this evident from general considerations. Therefore, F2, P9, and P10 are considered of limited relevance by the

Board for assessing inventive step. Further OI-E1, OII-E7 (irrespective of its admissibility) also describe old fashioned, pre-generator) type wind mills, while OIII-E1 which does show a wind generator, does not show any curving whatsoever. Thus this further prior art cited in the written submissions also fails to suggest the claimed blade curvature as a measure to address the stated problem.

3.8 In summary, starting from OIII-E4 "TACKE", the skilled person faced with the problem of avoiding substantial bending forces whilst keeping a safety distance between the blades and the tower would not find a solution to the stated problem in F2, P9, P10, OI-E1, OII-E7 or OIII-E1. Nor would he receive any hint or motivation from OI-E3 "WIND ENERGY" such that he would arrive, without hindsight, at a windmill according to the characterising portion of claim 1 as granted.

3.9 The Board is also satisfied that documents and lines of arguments otherwise presented in the written procedure are not more relevant for the assessment of inventive step than those discussed by the respondents during the oral proceedings. Thus even if starting from OI-E3, that document and the other prior art cited above fail to teach curving the blade outwardly and forwardly at a distance from the hub, in order to overcome bending forces due to centrifugal forces on the blades, whilst keeping a safety distance between the blades and the tower. Thus the skilled person would also then not arrive at the claimed subject-matter. The Board concludes, therefore, that the subject-matter of claim 1 as granted involves an inventive step, Articles 100 (a) and 56 EPC.

4. The Board concludes that none of the opposition grounds raised in first instance and also examined in appeal prejudice the maintenance of patent, Article 101(2) EPC. Since the main request is allowable, there is no need for the Board to consider the auxiliary requests.

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:

D. Magliano A. de Vries

Decision electronically authenticated