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Datasheet for the decision of 17 February 2017

Case Number: T 1906/12 - 3.2.04

Application Number: 01983863.0

Publication Number: 1327073

IPC: F03D9/00, F03D11/00

Language of the proceedings: EN

Title of invention:
WINDMILL

Patent Proprietor:
GE Wind Energy (Norway) AS

Opponent:
Siemens Aktiengesellschaft

Headword:

Relevant legal provisions:
EPC Art. 123(2), 54, 56

Keyword:
Amendments - extension beyond the content of the application as filed (no)
Novelty - (yes)
Inventive step - (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 1906/12 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 17 February 2017

Appellant: (Patent Proprietor)	GE Wind Energy (Norway) AS Moholt Terasse Vegamot 4 7048 Trondheim (NO)
Representative:	Bedford, Grant Richard GPO Europe GE International Inc. The Ark 201 Talgarth Road Hammersmith London W6 8BJ (GB)
Respondent: (Opponent)	Siemens Aktiengesellschaft Wittelsbacherplatz 2 80333 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 2 July 2012 revoking European patent No. 1327073 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	A. de Vries
Members:	J. Wright
	C. Heath

Summary of Facts and Submissions

I. The appellant-proprietor lodged an appeal, received 30 August 2012, against the decision of the opposition division, posted on 2 July 2012, revoking European patent No. 1327073. The appeal fee was paid at the same time. Their statement setting out the grounds of appeal was filed on 2 November 2012.

II. Opposition was based on lack of inventive step (Article 100(a) EPC together with Articles 52(1) and 56 EPC) and on added subject matter (Article 100(c) EPC, with Article 123(2) EPC).

The Opposition Division held that the proprietor's then main request (patent as granted) was inadmissible. Furthermore, that the proprietor's auxiliary requests either did not meet the requirements of Article 123(2) EPC, or 52(1) EPC (lack of novelty or lack of inventive step). In its decision the opposition division considered the following documents:

E1: W0 00/60719 A
E2: DE 2822993 A
E3: EP 0627805 B

III. Oral proceedings before the Board were duly held on 17 February 2017. During the oral proceedings, the appellant-proprietor withdrew their main and auxiliary requests 1 to 3 and made their then auxiliary request 4 the main request.

IV. The appellant-proprietor requests that the decision under appeal be set aside and the patent be maintained in amended form with claims according to a main request

filed as auxiliary request 4 with their grounds of appeal.

The respondent-opponent requests that the appeal be dismissed

V. Claim 1 of the main request reads as follows:

"Wind power plant with a wind turbine comprising a rotatable turbine shaft (8) and a generator shaft (22), which can be extension of the turbine shaft (8), and which is connected to the rotor (12) of an electric generator (11), wherein the rotor (12) is radially surrounded by a stator (19), the turbine shaft (8) is journalled in two bearing housings (6,7) with bearings (9,10) arranged on a base (4) at the top of a tower (1), and the generator shaft (22) is integrated with or rigidly connected to the rotatable turbine shaft (8) to flex with turbine shaft under bending moments acting on the turbine shaft from its hub, characterised in that, the stator (19) and rotor (12) are carried by the rotatable generator/turbine shaft (22,8), to allow the generator (11) to follow the flexing movement of the turbine shaft (8), and the stator (19) is locked against turning by a non-rotatable coupling (20) which transfers substantially no bending moment or axial force acting against the flexing of the turbine shaft (8), the bearings (9, 10) being provided to allow flexing of the turbine shaft (8)".

VI. The appellant-proprietor argued as follows:

Added subject matter

The features of a pivoting base and motor effecting pivoting are not essential features of the invention so

can be omitted without adding subject matter. The invention relates only to the turbine/generator combination. This does not need to have a pivoting base, as is evidenced by the fact that it can be separately tested. There is no synergy between having a pivoting base and the remaining claim features; the invention would work in the same way whether or not the base pivoted.

Novelty

E1 discloses a non-rotatable coupling in the form of moment supports, not torque supports. Nothing is said in E1 as to whether they transfer substantially no bending moment or axial force as claimed. It is possible they could be a stiff coupling. Therefore there is no direct and unambiguous disclosure of this feature and E1 consequently does not prejudice novelty of claim 1.

Inventive step

Starting from E1, the above difference means a smaller air-gap between rotor and stator can be achieved, which makes for a more efficient generator, so the objective technical problem is to improve efficiency. Nothing in E3 relates to this problem. The skilled person would not consider combining E1 and E3, since the wind power plant of E3 is supported on load-bearing rubber springs, which is completely different from E1 and the invention, both of which are supported on a journaled shaft.

Nor would the skilled person consider E2 because it is in a different technical field. The motor of E2 is not susceptible to wind induced bending moments. It also

does not disclose a non-rotatable coupling for a stator, rather it discloses a load bearing support.

VII. The respondent-opponent argued as follows:

Added subject matter

The features of a pivoting base and motor effecting pivoting are essential features for the kind of wind power plant claimed. Omitting these features vis-à-vis claim 1 as originally filed adds subject matter. Since a wind power plant as a whole is claimed, it is not relevant that parts of it can be tested without the pivoting base. The pivoting base and its motorisation work synergically with the remaining claim features in solving the underlying problem of bending moments acting on the generator shaft. The term "generator shaft" in original claim 1 has been changed to "generator/turbine shaft", which also adds subject matter.

Novelty

E1 discloses all features of claim 1. In particular it discloses a non-rotatable coupling in the form of torque supports. The skilled person would make these flexible so that they would transfer substantially no bending moment or axial force as claimed, so the feature is implicitly present in E1.

Inventive step

Even if the feature of the non-rotatable coupling transferring substantially no bending moment or axial force were considered not known from E1, it would be obvious for the skilled person to arrive at this

feature from E3 or E2. The objective technical problem is to reduce the susceptibility of the wind power plant to bending moments.

The skilled person will look for a suitable coupling to achieve this. E3 is from the same technical field as E1 and the invention and discloses non-rotatable couplings in the form of rubber springs. The skilled person would immediately see that these solve the problem, because they damp movement in all directions. Therefore they would use these couplings in the wind power plant of E1 and so arrive at the invention in an obvious manner.

Combining E1 with E2 gives the same result. A generator and motor are the same basic electro-mechanical transducer, so the same design considerations apply to each. E2 gives a solution to the problem of bending moment, as induced by the rolls of a pipe mill, and considers its effect on the air-gap as does the patent. Therefore the skilled person would, as a matter of obviousness, take the hinged supports that lock the stator of the motor against turning in E2 and use them as the non-rotatable coupling of E1 and thereby arrive at the invention.

Reasons for the Decision

1. Admissibility of the appeal

During the oral proceedings before the Board, the respondent withdrew their objection to the admissibility of the appeal. Nor indeed is any deficiency apparent to the Board that might warrant the rejection of the appeal as inadmissible under Rule 101

EPC. Therefore the Board concludes that the appeal is admissible.

2. Background of the invention

The invention (see specification, paragraph [0002] and granted claim 1) relates to a wind power plant with a wind turbine of the kind where the shaft of the turbine is integrally formed or rigidly attached to the generator shaft, thus with no intermediate gearbox. The generator has a rotor and a stator. A challenge with such wind power plants, is ensuring that the bending moment acting on the turbine hub from the blades does not create damaging deformations in the remaining structure, in particular deformations which may influence the air-gap between the rotor and the stator.

As stated in the patent, a main object of the invention is to provide a wind power plant of this kind where the mutual distance (air-gap) between the stator and the rotor is constant during operation, independent of the deflection of the turbine shaft due to the bending moment acting on the hub of the wind turbine (see the specification, paragraph [0007] and all versions of claim 1).

3. Added subject matter

3.1 Any amendment to a European patent can only be made within the limits of what a skilled person would derive directly and unambiguously, using common general knowledge from the whole of these documents as filed, see in particular see Case Law of the Boards of Appeal, 8th edition, 2016 (CLBA), II.E.1.2.1, and in particular G2/10, reasons 4.3.

Furthermore, according to established jurisprudence (see CLBA, II.E.1.10.1), in cases where a feature is removed from a claim, the claim might not be in breach of Article 123(2) EPC if the skilled person would directly and unambiguously recognise that (1) the feature was not explained as essential in the disclosure, (2) it was not, as such, indispensable for the function of the invention in the light of the technical problem it served to solve, and (3) the replacement or removal required no real modification of other features to compensate for the change.

3.2 Claim 1 according to the main request is broader than original claim 1 in that it does not contain the features from original claim 1 in that the features "wherein the base (4) is pivotable around a vertical axis, and wherein a motor (3) is provided to effect the pivoting". Therefore the Board must consider whether the deletion of these features vis-à-vis original claim 1 constitutes an extension of subject matter. The Board considers it appropriate to apply the above test, as indeed the impugned decision did (reasons, page 5, to page 6, line 2).

3.3 The Board first notes that, other than in original claim 1, the only mention of the wind turbine's base being pivotable, in other words rotatable, and that this is effected by a motor, is on page 3, lines 29 to 34 with reference to figure 1. There the elements are merely described, without suggestion that they might have any special significance for the invention, let alone explaining them to be essential.

3.4 Nor, in the Board's view, are the features indispensable for the functioning of the invention in the light of the technical problem. The main features

of claim 1 according to the main request relate to the wind turbine, generator and the shaft or shafts connecting the two. These elements are all mounted on a base at the top of a tower. As explained above, the main object of the invention relates to maintaining a constant air-gap between rotor and stator of the generator, independent of deflections of the turbine shaft due to bending moment acting on the hub (published application, page 2, lines 6 to 12). Whether or not the base turns, and if so how it is driven, has no influence on how the air-gap is to be made independent of shaft deflections, since shaft, turbine and generator are all in fixed positions relative to the base. Indeed, the wind turbine and generator arrangement can be a ready-made unit and tested before being mounted on the tower (published application, page 5, lines 6 to 8). Thus the arrangement is functionally independent of any ability of its mounting base to turn relative to the tower. This conclusion does not change merely because a wind power plant is claimed, whether or not such plant might typically have a motor driven base.

Nor does the Board see the idea of a pivotable motor driven base as synergically contributing to the underlying aim of keeping the air-gap constant. Turning the base would allow to optimally orientate the turbine with respect to the wind. It may be that when so turned, there would be fewer or no shaft deflecting bending moments act on the turbine. However, at best, thus eliminating shaft deflection might avoid the underlying problem, since there will be no consequential compromising of the air-gap in the generator. However, avoiding a problem in the first place is not to contribute to its solution but merely to work around it.

Thus, the Board considers the invention can be carried out whilst dispensing with a pivotable base, however driven. In other words the deleted features (pivotable base, motor driven) are not indispensable for carrying out the invention.

3.5 Furthermore, since the turbine, shaft and generator are mounted on the base, and can be tested without the tower (published application, page 5, lines 6 to 8), these require no modification where the base is not pivotable.

3.6 Therefore, applying the above test, the Board concludes that no subject matter has been added by removal of features vis-à-vis claim 1 as originally filed.

3.7 Lastly, the Board sees no added matter due to the change of "generator shaft" in original claim 1 to "generator/turbine shaft". Claim 1 as originally claimed, and in its present version, defines the generator shaft as integrated with or rigidly connected to the turbine shaft, therefore the term "generator/turbine shaft" merely rephrases the original "generator shaft" term, in a way that is consistent with the rest of the claim, namely by acknowledging that the turbine and generator shaft are one and the same or rigidly connected. Therefore the term does not add subject matter.

3.8 From the above, in contrast to the impugned decision's findings in this respect, the Board finds that the subject matter of claim 1 according to the main request (as granted), contains no added subject matter.

4. Novelty

4.1 E1 (abstract, page 7, line 29 to page 8, line 4, figures 2 and 3) discloses a wind power plant with a wind turbine comprising a rotatable turbine shaft 8 and a generator shaft 14. The generator shaft is connected to the rotor 15, 16 of an electrical generator 12, which is radially surrounded by a stator 20. The turbine shaft 8 is journaled in two bearing housings with bearings 9 and 10 arranged on a base at the top of the tower (see figure 2). The journal bearings 9 and 10 are, just as in certain embodiments of the patent, provided in-between turbine-hub and generator, thus they allow flexing of the turbine shaft (see E1, figure 2, cf. specification figures 1, 3 and 5 and last feature of claim 1).

The generator shaft 14 is rigidly connected (by flange 11) to the turbine shaft 8, so inevitably it must flex with the turbine shaft under bending moments acting on the turbine shaft from its hub.

Furthermore, the stator and rotor are both carried by the generator/turbine shaft. Whereas the rotor 17 is directly attached to the shaft, the stator 20 is mounted to the shaft by bearings 19 and stator housing 18 (see figure 3). That the bearings 19 run on a single shaft, rather than separate shafts separated by a gap as the appellant opponent has speculated, is confirmed for example by E1's claim 6 ("the generator is mounted on a shaft"). Thus the generator 12 can but follow the flexing movement of the turbine shaft.

4.2 It is common ground that, when in operation, the stator 20 of E1 must be locked against turning, otherwise it would rotate on the shaft and no electricity would be generated. Therefore the generator 12 has some kind of

stator locking arrangement, whether this be the elements referred to as "moment supports" (page 6, lines 23 to 25) or those referred to as "torque supports 36" (page 8, lines 22 to 27, figure 6).

Such a locking arrangement must couple the stator to some non-rotating part of the wind power plant. Therefore the Board considers that E1 discloses a non-rotatable coupling that locks the stator against turning.

4.3 Therefore, the question of novelty hinges on whether the non-rotatable coupling of E1 transfers substantially no bending moment or axial force acting against the flexing of the turbine shaft. In the Boards opinion E1 contains no direct and unambiguous disclosure of such a non-rotatable coupling.

4.4 E1 gives no information as to how the moment supports or the torque supports might behave when subjected to bending moment or axial force, or when the turbine shaft flexes. The moment supports are merely said to absorb torque (page 6, lines 23 to 25), whereas nothing is said about what forces the torque supports might absorb or pass on.

4.5 Nor, in the Board's opinion, is it implicit that the non-rotatable coupling of E1 will transfer substantially no bending moment or axial force as the respondent-opponent has asserted. In this context "implicit disclosure" means a disclosure which any person skilled in the art would objectively consider as directly and unambiguously implied by the explicit content.

4.6 The Board holds that the non-rotatable coupling of E1 could, for example, be a stiff coupling, in which case it would transfer all bending and axial forces. Therefore E1 does not unambiguously disclose a wind power plant with a non-rotatable coupling which transfers substantially no bending moment or axial force acting against the flexing of the turbine shaft. Consequently, the Board finds the subject matter of claim 1 to be novel vis-à-vis E1.

4.7 Since this is the sole novelty objection raised in appeal, the Board finds that the subject matter of claim 1 satisfies the requirements of Article 52(1) with 54 EPC.

5. Inventive step

5.1 The respondent-opponent has argued that the subject matter of claim 1 lacks inventive step vis-à-vis E1 with E2 and E1 with E3. The Board disagrees.

5.2 Before developing the objective technical problem, the Board considers expedient to consider the context of the invention in detail. As already explained (see above, section 2, and specification, column 2, lines 27 to 33), the main object of the invention is to keep the air-gap between the generator's stator and rotor constant.

To a large extent this is achieved by mounting the stator on bearings directly carried on the generator shaft, so if the shaft moves, the stator and rotor should be displaced by the same amount (see patent specification, paragraphs [0017], [0020], [0025] and claim 1). Furthermore, by journaling the shaft on the base, bending moment on the shaft is reduced, also

contributing to keeping the air-gap small and constant (see patent specification, paragraphs [0009] and [0010]). As has also already been explained (see above, section 5), these features are known from E1 where they must play the same role in keeping the air-gap constant.

5.3 Following on from the findings of the Board with respect to novelty, the effect of the sole difference between the subject matter of claim 1 and E1 (coupling transfers substantially no bending moment or axial force), is self explanatory: the coupling does not transfer, in other words dampens, bending moment or axial force which would otherwise act against the turbine shaft flexing. The description also confirms this. In some embodiments (figures 1 to 4, specification paragraph [0020]) the coupling is an annular dish with a circumferential fold which increases pliability in an axial direction, in other words dampens axial movement. In a further embodiment (paragraph [0028], figure 5) damping elements 28 are provided for the same purpose.

Therefore, if the generator shaft moves relative to the base, the damping coupling buffers tension between stator and base, which, if otherwise passed on, would risk the stator being displaced by a different amount to the rotor and so change the air-gap between them.

5.4 In the Board's opinion, the problem should not be formulated as broadly as to increasing efficiency, since this problem would cover many more possible effects than are realised by the differing feature. Nor should the problem contain elements of the solution itself, as, in the Board's opinion, the respondent-opponent's proposed formulation does (reducing the

susceptibility of the wind power plant to bending moments). Rather, in the context of E1, which already goes some way in keeping the air-gap constant, the Board sees the above effects as concerned with keeping the air-gap more constant.

Thus the objective technical problem can be formulated as follows: in a wind power plant of the kind where turbine shaft and generator shaft are integrated or rigidly connected, where the turbine shaft is journaled between two bearings and the rotor and stator of the generator are both carried by the generator/turbine shaft, such as that of E1, how to keep a more constant air-gap between the rotor and stator.

5.5 Tasked with this problem, the Board considers that the skilled person would not look to a solution in E3 or E2.

E3 (column 4, lines 38 to 50 and figures 1 and 2) discloses a wind power plant with a turbine 18, attached by a shaft 16 to a generator 14. The generator has a rotor surrounded by a stator, which has circular end plates 31. The generator 14 is supported by two pairs of rubber springs 22, connected to the end plates.

Firstly, the Board notes that E3 does not propose how an air-gap between rotor and stator might be kept constant. E3 merely states that an [air] gap exists between rotor 30 and stator 28 (column 5, lines 33 to 37 with figure 2). For this reason alone the skilled person would not combine E1 and E3 to solve the above problem.

Secondly, starting from E1, even if the skilled person were, as a matter of obviousness, to think that coupling stator to base with a different kind of non-rotatable coupling might offer a solution to the above problem (the Board holds this not to be so), they would not consider the rubber spring mountings of E3. This is because in E3 the rubber spring mountings 22 support the entire weight of wind turbine, generator and shaft. Thus, the skilled person, looking for a suitable non-rotatable coupling arrangement in a wind power plant whose weight is entirely supported by journaling the main shaft to a base, would not consider the load bearing rubber springs 22 of E3, whose principle function is to support the entire weight of a wind power plant on its base, rather than merely to act as a coupling.

Put differently, at best, the skilled person might see E3 as offering an alternative way of mounting a wind power plant to the base. It might, for whatever reason, be obvious to modify E1 by substituting the load bearing journal bearings 9 and 10 (see E1 figure 2) with the mountings 22 of E3 (see figure 1), and thereby arrive at load supports with a damping function (mountings 22 are rubber springs and therefore damping, column 4, lines 45 to 50). However, this would not result in some hybrid arrangement with journaled shaft and a non-rotatable coupling with a damping function as claimed.

5.6 Turning now to E2, this document discloses a motor for a pipe mill, with stator 5 and rotor 4 (page 1, first paragraph, claim 1 and figure 1).

The Board considers that the skilled person, starting from E1, would not look to the solution to the objective technical problem in E2.

It is true that a motor, being an electro-mechanical transducer, can be driven as a generator. However, E1 is concerned (as is the patent) with a wind power plant mounted on top of a tower, where wind induced bending moments may detrimentally influence the air-gap. By contrast E2 relates to a motor in a steel mill, thus not only a different device but also a very different technical field of application. Whilst the mill rolls may subject a pipe mill motor to axial and radial displacements (page 4, second paragraph), such a motor is not subjected to bending moments due to wind.

Thus, in the Board's view, the technical fields of E1 and E2 are too remote for the skilled person to contemplate combining their teaching to solve the objective technical problem, irrespective of E2's teaching that constructive measures should ensure the the air-gap in the motor can be kept as small as possible (page 4, second paragraph).

Furthermore, starting from E1, even if the skilled person were, as a matter of obviousness, to think that coupling stator to base in a new way might offer a solution to the above problem (as already stated, the Board holds this not to be so), they would not look to the hinged supports 7 of E2 to provide such a coupling (see page 6, middle paragraph, "Pendelstütze" and figure). Supports 7 are not merely couplings but load bearing elements that carry the weight of the pipe-mill motor 4, 5. Therefore the skilled person would not consider them when seeking a coupling which is to lock against turning without supporting significant weight.

5.7 From the above, the Board considers, that neither E1 combined with E3 nor combined with E2 take away inventive step of claim 1. These are the sole challenges to inventive step in appeal. Therefore the Board finds that claim 1 meets the requirements of Article 52(1) with 56 EPC.

6. In appeal, the respondent-opponent has challenged added subject matter of only claim 1 of the main request. As explained above (section 3), the Board finds claim 1 not to add subject matter. No other objections have been put forward, nor does the Board see any other compelling reason that might prejudice maintenance of the patent according to the main request.

6.1 In this respect the Board notes that the remaining dependent claims, 2 to 5, are word-for-word as originally filed. In particular claim 5 restores features from original claim 5 that were not present in granted claim 5, thus overcoming objections made in opposition against claim 5 as granted, whilst also narrowing its scope. Therefore the Board considers the amended claims neither add subject matter, nor extend the protection conferred.

6.2 Amendments made to the description are either deletions or clarifications as to which embodiments belong to the invention, therefore add no subject matter. Thus the requirements of Article 123(2) and (3) EPC are met.

7. Therefore, taking into account the amendments made to the patent according to the respondent's main request, including amendments made to the description during the oral proceedings of 17 February 2017, the Board finds that the patent and the invention to which it relates

meet the requirements of the EPC, so that pursuant to Article 101 (3)(a) EPC, the patent can be maintained as amended.

Order

For these reasons it is decided that:

1. The decision under appeal be set aside.

2. The case is remitted to the department of first instance with the order to maintain the patent in the following version:

Claims: 1 – 5 of the Main Request as filed during the oral proceedings before the Board,

Description: Pages 2 – 4 as filed during the oral proceedings before the Board, and

Figures :1 to 7 of the patent specification.

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated