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Datasheet for the decision of 26 July 2021

Case Number: T 2280/18 - 3.2.04

Application Number: 06254721.1

Publication Number: 1788237

IPC: F03D7/02, F03D9/00

Language of the proceedings: EN

Title of invention:
Method and apparatus for wind turbine braking

Patent Proprietor:
GENERAL ELECTRIC COMPANY

Opponent:
Vestas Wind Systems A/S

Headword:

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

Keyword:
Grounds for opposition - insufficiency of disclosure (no) - added subject-matter (no) - lack of patentability (no)

Decisions cited:

Catchword:

Europäisches Patentamt
European Patent Office
Office européen des brevets

Beschwerdekammern

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Case Number: T 2280/18 - 3.2.04

D E C I S I O N
of Technical Board of Appeal 3.2.04
of 26 July 2021

Appellant: (Opponent)	Vestas Wind Systems A/S Hedeager 42 8200 Aarhus N (DK)
Representative:	Inspicos P/S Kogle Allé 2 2970 Hørsholm (DK)
Respondent: (Patent Proprietor)	GENERAL ELECTRIC COMPANY 1 River Road Schenectady, NY 12345 (US)
Representative:	Zimmermann & Partner Patentanwälte mbB Josephspitalstr. 15 80331 München (DE)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 6 July 2018 rejecting the opposition filed against European patent No. 1788237 pursuant to Article 101(2) EPC.**

Composition of the Board:

Chairman	A. de Vries
Members:	G. Martin Gonzalez
	C. Heath

Summary of Facts and Submissions

I. The appeal was filed by the appellant (opponent) against the decision of the Opposition Division to reject the opposition filed against the patent in suit.

II. The Opposition Division decided that the patent disclosed the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art, that the subject-matter of the claims as granted did not extend beyond the content of the application as filed and that claim 1 as granted was novel and involved an inventive step, taking account inter-alia to the following documents:

D5 US 4,462,753
D6 US 2003/0116970 A1
D7 US 6,420,795 B1

III. In preparation for oral proceedings the Board issued a communication, dated 22 October 2020, setting out its provisional opinion on the relevant issues.

Oral proceedings by videoconference before the Board were duly held on 26 July 2021.

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

The respondent-proprietor requests dismissal of the appeal, or maintenance of the patent according to one of auxiliary requests A, 1, 2, 2A, 2B or 2C all filed with letter dated 1 April 2019, or 1*, 2*, 2A*, 2B*, 2C*, 3, 3A, all filed with letter dated 30 December 2019.

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

"A wind turbine with an aerodynamic braking system, the wind turbine being configured to couple to a power grid, comprising:
a rotor (18) comprising at least one rotor blade(24);
a blade pitch actuator (38); and
a processor (42) coupled to said blade pitch actuator, said processor selectively controlling an angle of pitch of said at least one rotor blade with respect to a wind direction based at least in part on a design parameter of a component of said wind turbine to brake said rotor and to facilitate reducing a force induced to the wind turbine component; characterised by
said processor (42) changing, using said blade pitch actuator (38), the pitch angle of said at least one rotor blade (24) from a first position towards a second position with respect to a wind direction at a first rate of change of the rotor blade pitch angle (62), and, once a rotation of rotor (18) has been slowed by a predetermined amount, the processor (42) changing, using said blade pitch actuator (38), the pitch angle of said at least one rotor blade (24) at second rate of change of the rotor blade pitch angle (64) until the at least one rotor blade (24) is in the second position; wherein
the second rate is less than the first rate."

VI. The appellant argues as follows:

The patent does not sufficiently disclose the invention for it to be carried out by a person skilled in the

art. Granted claim 1 contains subject-matter in the form of an intermediate generalisation that extends beyond the contents of the originally filed application. Claim 1 lacks novelty over D5 and D6. Its subject-matter does not involve an inventive step starting from either D5 or D6 in combination with common general knowledge or D7.

VII. The respondent argues as follows:

The patent specification discloses the claimed invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art. Granted claim 1 does not contain added subject-matter. It is also new and involves an inventive step in the light of the cited prior art.

Reasons for the Decision

1. The appeal is admissible.

2. Background

The invention relates to a wind turbine with an aerodynamic braking system, see patent specification paragraph [0001]. The system uses a blade pitch actuator to change the pitch angle of the rotor blade with respect to a wind direction from a first position towards a second position for aerodynamically braking the rotor. The system changes the pitch angle at a first rate of change, and once a rotation of the rotor has been slowed down by a predetermined amount, at a second slower rate, see specification paragraph [0004]. The first rate can facilitate reducing the speed and/or torque of the rotor as quickly as possible, while the reduced second rate facilitates reducing vibrational

stresses and/or forces into the components of the wind turbine at the end of the braking process, by for instance reducing damping oscillation of the tower, see paragraph [0019]. The system thus facilitates reducing damage or failure of the wind turbine while still obtaining efficient braking, see paragraph [0020].

3. Main request - Sufficiency of disclosure

3.1 The appellant-opponent contests the conclusions of the Opposition Division in respect of sufficiency of disclosure, see section 3 of the impugned decision.

In this regard, the Board set out its preliminary opinion in its written communication as follows:

3.2 "5 Main request - Sufficiency of disclosure

5.1 The appellant-opponent contests the positive finding of the Opposition Division in respect of sufficiency, see section 3 of the impugned decision. The Division held that the skilled person will know exactly how to find for each particular embodiment the adequate values for the claimed first and second rates of change or the predetermined amount of slow-down for achieving the braking effect as described in the specification by routine trial and error. The Board adds that they may also use ordinary mechanical analysis and calculations. The handling of a variety of mutually dependent parameters and also of possible meteorological conditions to find the disputed values does not appear to the Board to represent an undue burden on the skilled person in the field. Such handling of a variety of mutually dependent parameters and possible meteorological conditions is a matter of routine in the field of wind turbines.

5.2 The appellant-opponent also contests sufficiency of disclosure for the feature of "controlling an angle of pitch... based at least in part on a design parameter... to brake said rotor". The Board notes in this respect that the invention is not based on the selection of any unusual design parameter for the brake control, but rather on the application of a specific braking sequence. The exemplary design parameters cited in the description - in paragraph [0016]: a component size, shape, stiffness, tension, compression, strength, including any safety factors - are well-known parameters in the art on which a braking control may be based. The Board has thus no reason to doubt that the skilled person is able without undue burden to put into practice the described brake control for one of those well known parameters without the need of further guidance in the form of a specific real example.

5.3 The specification indicates several examples of a "grid anomaly" in paragraph [0013] such as a power failure, an undervoltage condition, an overvoltage condition, and/or an out-of-frequency condition. These appear to be regular parameters monitored during routine power grid and turbine control operations. The Board thus holds at present that finding suitable sensors for measuring any of these parameters does not pose the skilled person, an engineer involved in the design and development of wind turbines who also has common general knowledge of power grid management, any difficulty beyond their common general knowledge and skills.

5.4 It appears, contrary to the submissions of the appellant-opponent, that figures 5,6 and associated description in paragraph [0019] support the achievement

of the technical effect of reduction of tower moment by the claimed invention.

5.5 In sum the invention according to claims 1,2,3 and 5 appears to be sufficiently disclosed in the sense of Article 100(b) EPC."

3.3 At the oral proceedings before the Board the appellant-opponent merely referred to their written submissions, refraining from further comment. Absent any further submissions from the appellant-opponent the Board sees no reason to change its point of view. It thus holds that the invention according to claims 1,2,3 and 5 is sufficiently disclosed in the sense of Article 100(b) EPC.

4. Main request - Added subject-matter

In their written submissions the appellant-opponent contests the findings of the Opposition Division in section 4 of its decision, that granted claim 1 does not contain added subject-matter, Article 100(c) EPC. At the oral proceedings before the Board they refrained from further comment. The Board noted the following in its written communication:

"6 Main request - Added subject-matter

The appellant-opponent objects that the use of the predetermined amount of slowing of the rotor rate of rotation or RPM as governing control parameter for switching the pitch angle rate of change to a lower rate has been extracted in isolation, without including the inextricably linked feature that rotor braking is triggered by a grid anomaly, from the embodiment described in original disclosure at page 11, lines

17-22. It however appears that the cited passage explicitly describes the occurrence of a grid anomaly as an example of triggering condition "..., and for example, when control system(s) 28 detects a grid anomaly...". This clearly implies that the braking method may also be used with other non described triggering conditions. The Board thus considers, as also held by the Opposition Division (see section 4 of the impugned decision), that a use of ΔRPM as governing control parameter does not represent an unallowable intermediate generalisation.

It thus appears that the subject-matter of claim 1 does not extend over the contents of the originally filed application."

4.1 Absent any further submissions from the appellant-opponent the Board sees no reason to change its point of view. It thus holds that the subject-matter of granted claim 1 does not extend over the contents of the originally filed application.

5. Main request - Novelty

The appellant-opponent objects in their written submissions that contrary to the findings of the Opposition Division in section 1 of the grounds for the decision, granted claim 1 is not new over D5 or D6. As noted by the Board in this regard in its written preliminary opinion:

"7 Main request - Novelty

7.1 In several decisions the boards have stated that terms used in patent documents should be given their normal meaning in the relevant art, unless the

description gives them a special meaning, see Case Law of the Boards of Appeal, 9 edition 2019 (CLBA), II.A. 6.3.3. The skilled person would thus read the claim feature "once a rotation of rotor (18) has been slowed by a predetermined amount" in its normal sense, as requiring a value or quantity (an amount) of rotor RPM previously fixed in the system (predetermined), excluding therefore interpretations where the changing to the slower rate is governed by any other parameter (e.g. after a certain pitch angle is achieved) when some indetermined amount of RPM slowing down has taken place. Moreover, the description does not suggest otherwise.

7.2 Neither document D5 nor D6 describes the above feature. D5 discloses changing the feathering rate after achieving a certain pitch angle "for example, 20°", see figure 1 and description column 6, lines 15-47, the amount of RPM reduction being indetermined, since it depends on further parameters as for instance wind speed or wind direction fluctuations. As regards D6, the cited embodiment of paragraph [0042] and figure 2 discloses a stepwise feathering (line 24), where changing to each next step with a lower change rate occurs after achieving a corresponding blade angle, similarly as in D5. The amount of RPM reduction is thus also indetermined for the same reasons.

7.3 Therefore claim 1 appears to be new over D5 and D6."

5.1 At the oral proceedings, both parties merely referred to their written submissions. They refrained from further comment on the Board's preliminary opinion. Absent any further submission the Board sees no reason

for deviating from its provisional opinion. It thus holds that claim 1 is new over D5 and D6.

6. Main request - Inventive step

6.1 Either D5 or D6 is regarded as a suitable starting point.

The aerodynamic braking systems of D5 and D6 achieve efficient braking by allowing an initial rapid feathering at a high pitch rate while limiting damage and/or failure of the wind turbine components by changing to a lower feathering rate after achieving a certain condition (e.g. "limiting blade stresses" in D5, column 2, lines 8-10, or "To reduce the load on the tower" in paragraph [0015] of D6). D5 describes this condition as being met when a certain pitch angle is achieved, for example 20°, see D5, column 1, line 64 to column 2, line 10 and column 6, line 38. D6 similarly describes the achievement of a certain pitch angle as a condition governing the switch of pitch rates for the embodiment of figure 2, described in paragraph [0042] and [004]. D6 additionally teaches the possibility of using time or the distance of adjustment as an equivalent to pitch angle. This is however in the context of a more general disclosure without specifying the type or shape of the controlling function, see D6, paragraph [0015].

Neither document discloses switching to the slower braking action once the rotation of the rotor has been slowed down by a predetermined amount.

6.2 The technical effect achieved by the use of the amount by which the rotor has slowed down as condition, over that obtained by D5 or D6, is in dispute. It is common

ground that D5 and D6 also achieve efficient braking while facilitating the reduction of damage or failure of the wind turbine by switching to a slower pitch rate at the end of the braking sequence. The Appellant Opponent contends that using slowing rate rather than pitch angle or position as in D5 or D6 makes no difference, and is an obvious alternative for achieving the same effect.

6.2.1 The Board disagrees. It stands to reason that - as argued by the respondent proprietor at the oral proceedings - using a different unrelated variable (rate at which rotor rotation slows down rather than pitch angle or rotor position) to decide when to change pitching rate must necessarily have an effect on braking action. This is all the more so where that variable is the time derivative of the parameter (rotor rotation) that is to be reduced to zero. The Board agrees that such a control will necessarily be more dynamic than when changing pitching rate based on simple static value such as a given pitch angle or rotor position. It is therefore credible for the Board that, as explained by the respondent, the claimed control can better take into account or respond to external changing conditions, for instance wind gusts or an unexpected counter-torque surge or fall of the electrical generator, which translate into changes in rotor speed during braking. Indeed, using the time derivate of the control parameter (rotor rotation) in the braking control of the rotor effectively introduces feedback in what is then a closed loop control. Vis-a-vis the seemingly open loop schemes of D5 and D6 (the threshold pitch angle is not related to rotor rotation) such a closed loop scheme is, as is typical for closed loop control, likely to produce a more stable and accurate response.

6.2.2 In the light of the above the Board finds it to be credible that the use of the slowing rate of the rotor as condition in pitch controlled braking improves braking. This effect can be deduced from the patent in the light of cited prior art using general considerations as explained above. The objective technical problem can thus be formulated as how to improve a pitch controlled braking system.

In this regard, the technical problem formulated by the appellant-opponent as how to provide an alternative condition for effecting the change of pitch rate for allowing a more efficient braking method, would not be correct. This formulation contains a pointer to the solution insofar as it is focused on the relevant specific parameter that is modified with respect to the prior art. Problems containing pointers or partially anticipating the solution are generally regarded as incorrectly formulated, see CLBA I.4.3.1.

6.3 D5 and D6 teach either pitch angle, as discussed above, or alternatively to control the pitch angle adjustment rate as a function of time or of the distance of adjustment, see D6, paragraph [0015]. Those are parameters that do not correlate with what is to be controlled, namely rotation of the rotor, and there is no hint or suggestion there of using a parameter that provides a more dynamic response. Nor does the Board consider the use of such a parameter in this specific context as common general knowledge. The idea of seeking for a parameter that can take into account changing external conditions, without any indication pointing in that direction, is in the Board's view beyond the routine skills of the person skilled in the art.

6.4 The appellant-opponent also cites D7 as a combination document. While D7 teaches to set a pitch rate limit value as a function of the rotor speed, see column 18, lines 4-5, this is however not for braking but to regulate and maintain the rotor RPM speed for energy production, see section heading "RPM Regulation Mode" in columns 16-19. The relevant teaching in D7 in section "Dynamic braking", column 19, only generally describes a soft brake consisting in pitching the blades to 90 degrees without further detail as to how that pitching movement is controlled or what parameters are of relevance for governing that movement, see column 19, lines 39-40. It therefore neither suggests the use of a governing parameter that can take account of external conditions nor of the specific governing parameter of a predetermined amount of rotor rotation reduction for changing a pitch rate during braking.

6.5 In sum, the Board finds that none of the submitted combination of teachings would lead the skilled person in an obvious manner to the claimed subject-matter. It is thus not convinced by the appellant-opponent's submissions that the Opposition Division was wrong to conclude that granted claim 1 involves an inventive step.

7. As all appellant's arguments against the findings in the Opposition Division's decision fail to convince, the Board upholds the Opposition Division's decision.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Magouliotis A. de Vries

Decision electronically authenticated