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[Continued on next page]

(54) Title: DYNAMIC ELECTRIC BRAKE FOR A VARIABLE SPEED WIND TURBINE HAVING AN EXCITER MACHINE AND A POWER CONVERTER NOT CONNECTED TO THE GRID

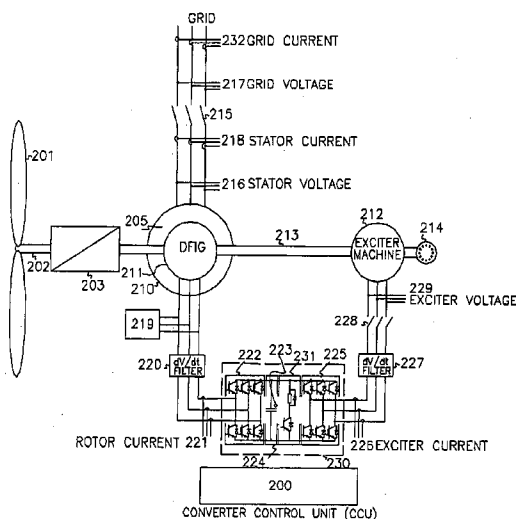


FIGURE 2

(57) Abstract: A variable speed, wind turbine having a doubly fed induction generator (DFIG), includes an exciter machine (212) mechanically coupled to the DFIG and a power converter (230) placed between a rotor (211) of the DFIG and the exciter machine. Thus, the power converter is not directly connected to the grid avoiding the introduction of undesired harmonic distortion and achieving a better power quality fed into the utility grid. The system also comprises on electric brake circuit (231). Moreover, the variable speed wind turbine includes a power control and a pitch regulation.

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INTERNATIONAL SEARCH REPORT

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H02P F03D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	<p>BAUER P ET AL: "Evaluation of electrical systems for offshore windfarms" INDUSTRY APPLICATIONS CONFERENCE, 2000. CONFERENCE RECORD OF THE 2000 IEEE 8-12 OCTOBER 2000, PISCATAWAY, NJ, USA, IEEE, vol. 3, 8 October 2000 (2000-10-08), pages 1416-1423, XP010521303 ISBN: 0-7803-6401-5 *page 1418 paragraph 3) Double Fed Induction Generator*figure 3 page 1417</p> <p align="center">----- -/--</p>	1-14

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- *&* document member of the same patent family

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International application No

PCT/IB2007/002680

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2004/070936 A (VESTAS WIND SYS AS [DK]; NIELSEN JOHN GODSK [DK]) 19 August 2004 (2004-08-19)	1-14
A	abstract figure 1 page 4, lines 8-10 page 5, lines 7-20	15-21
A	----- NISHIO T ET AL: "CONTROL CHARACTERISTICS OF AN ADJUSTABLE SPEED GENERATION SYSTEM WITH A FLYWHEEL EXCITED BY A DC LINK CONVERTER" EPE '97. 7TH. EUROPEAN CONFERENCE ON POWER ELECTRONICS AND APPLICATIONS. TRONDHEIM, SEPT. 8 - 10, 1997, EPE. EUROPEAN CONFERENCE ON POWER ELECTRONICS AND APPLICATIONS, BRUSSELS, EPE ASSOCIATION, B, vol. VOL. 2 CONF. 7, 8 September 1997 (1997-09-08), pages 2695-2700, XP000792358 ISBN: 90-75815-02-6 abstract *page 2696, 1st column, last sentence* page 2696 figure 2	1-14
A	----- PATIN N ET AL: "Analysis and control of a cascaded doubly-fed induction generator" INDUSTRIAL ELECTRONICS SOCIETY, 2005. IECON 2005. 32ND ANNUAL CONFERENCE OF IEEE RALEIGH, NC, USA 6-10 NOV., 2005, PISCATAWAY, NJ, USA, IEEE, 6 November 2005 (2005-11-06), pages 2481-2486, XP010876268 ISBN: 0-7803-9252-3 page 2487	1-14
X	----- US 2003/151259 A1 (FEDDERSEN LORENZ [DE] ET AL FEDDERSEN LORENZ [DE] ET AL) 14 August 2003 (2003-08-14) abstract paragraphs [0037] - [0051] figure 1	15,19,21
A	----- US 5 907 192 A (LYONS JAMES PATRICK [US] ET AL) 25 May 1999 (1999-05-25) abstract figure 1 column 2, lines 61-67 -----	1-21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2007/002680

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.

2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-14

A variable speed wind turbine comprising: a rotor including at least one blade; a drive train coupled to the rotor, the drive train including at least a doubly fed induction generator (DFIG), said DFIG having at least a stator connectable to a power grid; at least an exciter machine coupled to the drive train; and at least a power conversion device isolated from the grid and electrically coupled to a rotor of the doubly fed induction generator and to the exciter machine to transfer electrical power between the rotor and the exciter machine; and an electric braking circuit placed in the power conversion device between the rotor and the exciter machine.

2. claims: 15-21

A method for braking using an electric brake in a variable speed wind turbine, the method comprising: sensing a braking condition for activating the electric brake; determining if the sensed braking condition exceeds a threshold; and activating the electric brake to drain braking power from at least one of an exciter machine and a rotor of a doubly fed induction generator (DFIG) to a dissipative element in response to the sensed braking condition exceeding the threshold.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/IB2007/002680

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