

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)**

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/EP2018/071129

International filing date (day/month/year)
03.08.2018

Priority date (day/month/year)
08.08.2017

International Patent Classification (IPC) or both national classification and IPC
INV. H02M7/5387 H02P21/00

Applicant
SIEMENS WIND POWER A/S

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. FURTHER ACTION

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA:



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Date of completion of this opinion

see form PCT/ISA/210

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Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed.
 - a translation of the international application into , which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1 (b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13ter.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|-----------------------|
| Novelty (N) | Yes: Claims | <u>3, 12, 14</u> |
| | No: Claims | <u>1, 2, 4-11, 13</u> |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | <u>1-14</u> |
| Industrial applicability (IA) | Yes: Claims | <u>1-14</u> |
| | No: Claims | |

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following documents:

D1: Full Utilization of the Inverter in Split-Phase Drives by Means of a Dual Three-Phase Space Vector Classification Algorithm (XP011229422)

D2: PWM Strategy With Minimum Harmonic Distortion for Dual Three-Phase Permanent-Magnet Synchronous Motor Drives Operating in the Overmodulation Region (XP011670450)

D3: Phase shifted PWM with third harmonic injection for over-modulation range operation

D4: Current Regulator Instabilities on Parallel Voltage-Source Inverter (XPI011022531)

D5: US2014008912

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claim 1 is not new.

The IEEE paper D1 discloses a six-phase voltage-source-inverter-fed split-phase machine (Fig.1) comprising a first three-phase winding (AS, BS, CS), a second three-phase winding (as, bs, cs) separated by $\pi/6$ rad from each other, and two inverters (A, B, C; a, b, c).

Thus, the subject-matter of claim is anticipated by D1 and since apparatus claim 13 corresponds to method claim 1 it also not new in view of D1.

The features contained in claims 2 and 4 to 11 seem obvious from each of D1 (abstract; I INTRODUCTION; IV SIMPLE AND UNIFIED SVM TECHNIQUE FOR SPLIT-PHASE INDUCTION MOTOR DRIVES) and D2 (abstract; I INTRODUCTION; figure 1).

The features contained in claims 3 and 12 seem obvious from the documents D3, D4 and D5 (abstract; I INTRODUCTION; figure 1).

Claim 14 seems to constitute an obvious application of the claimed invention which is supported by the patent application publication D5 (paragraphs [0005] - [0007], [0049] - [0051]; figures 2, 6).

Re Item VII

Certain defects in the international application

Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in D1 is not mentioned in the description, nor is this document identified therein.

Re Item VIII

Certain observations on the international application

The features of claim are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).