

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/US2018/057866

International filing date (day/month/year)
26.10.2018

Priority date (day/month/year)
29.10.2017

International Patent Classification (IPC) or both national classification and IPC
INV. H02J7/00

Applicant
RIVIAN IP HOLDINGS, LLC

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. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

the entire international application

claims Nos. 11-30

because:

the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search (*specify*):

the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):

no international search report has been established for the whole application or for said claims Nos. 11-30

a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

furnish a sequence listing in the form of an Annex C/ST.25 text file, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.

furnish a sequence listing on paper or in the form of an image file complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.

pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rule 13ter.1(a) or (b).

See Supplemental Box for further details

Box No. IV Lack of unity of invention

1. In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:
- paid additional fees
 - paid additional fees under protest and, where applicable, the protest fee
 - paid additional fees under protest but the applicable protest fee was not paid
 - not paid additional fees
2. This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- complied with
 - not complied with for the following reasons:
see separate sheet
4. Consequently, this report has been established in respect of the following parts of the international application:
- all parts.
 - the parts relating to claims Nos. 1-10

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 | |
| | No: Claims | <u>1-10</u> |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | <u>1-10</u> |
| Industrial applicability (IA) | Yes: Claims | <u>1-10</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

Re Item IV

Lack of unity of invention

1 Reference is made to the following documents:

D1 DE 10 2016 223470 A1 (BOSCH GMBH ROBERT [DE]) 22 June 2017 (2017-06-22)

2 This Authority considers that the application does not meet the requirements of unity of invention and that there are four inventions covered by the claims indicated as follows:

claims: 1-10

1. A configurable battery system in which connection of two batteries can be switched between a series and a parallel connection.

claims: 11-20

2. A method for managing battery charging of two battery modules, in which an electric load is coupled to a first or a second battery module based on the battery characteristics of these batteries.

claims: 21-23

3. A method for managing a fault in a battery system, in which a battery module of a plurality of battery modules coupled in parallel with each other and with a load is de-coupled from the parallel connection if it has a fault occurrence.

claims: 24-30

4. A method for managing battery charging of a battery pack having two battery modules and a switch selectively connecting the battery modules in parallel or in series, wherein the battery modules are connected in series based on the capabilities of the charging system, e.g. when it is detected that a battery charging system is capable of fast charging.

3 The reasons for which the inventions are not so linked as to form a single general inventive concept, as required by Rule 13.1 PCT, are as follows:

The prior-art has been identified as D1: DE102016223470A1. With reference to this document, the following features are known: A configurable battery system in which connection of two batteries can be switched between a series and a parallel connection (see e.g. Fig. 3 and corresponding text passages of the description).

1.1 From comparison, all features of claim 1 are known from this document. The first claim in the order of claims that can be seen to make a contribution over this prior-art in the sense of a special technical feature (STF) according to Rule 13.2 PCT is claim 2, which defines the use of two single pole double throw switches to switch between parallel and series connection.

1.2 The application fails to explicitly indicate what technical problem is to be solved by this STF. However, it seems that the objective problem to be solved by the first invention in view of this STF can be formulated as how to modify the known configurable battery system to provide alternative switching means

2.1 By comparing the second invention (claims 11-20) with the same prior-art, the following STF make a contribution over this prior-art: determining battery characteristics of the first and second batteries during charging and applying a switch configuration to the battery switch based on the battery characteristics.

2.2 The application fails to explicitly indicate what technical problem is to be solved by these STF. However, it seems that the objective problem to be solved by the second invention in view of these STF can be formulated as how to modify the known method to allow changing the power supply from one battery module to the other during charging.

3.1 By comparing the third invention (claims 21-23) with the same prior-art, the following STF make a contribution over this prior-art: coupling the batteries and the load in parallel and de-coupling a faulty battery from the load and the other batteries.

3.2 From these STF, the objective problem to be solved by the third invention in view of this STF can be formulated as how to modify the known method to manage a fault occurrence in a battery module without having to disconnect the load or cause a different voltage to be applied to the load (see para. [0004] of the application).

4.1 By comparing the fourth invention (claims 24-30) with the same prior-art, the following STF make a contribution over this prior-art: the battery modules are connected in series based on the capabilities of the charging system, e.g. when it is detected that a battery charging system is capable of fast charging.

4.2 From these STF, the objective problem to be solved by the fourth invention in view of this STF can be formulated as how to modify the known method to make use of fast charging when available (see para. [0106] of the application).

The above analysis shows that the STF of the first, second, third and fourth inventions are not the same or similar to each other. A comparison of the objective technical problems addressed by these STF, as seen in the light of the description and drawings of the present application, indicates that there is no technical correspondence between these technical problems, nor do they show any corresponding technical effect, such that the STF of the first, second, third and fourth invention fail to demonstrate a mutual correspondence with each other as required by Rules 13.1 and 13.2 PCT.

Re Item V

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

4 Reference is made to the following documents:

- | | |
|----|--------------------------------------------------------------------------|
| D1 | DE 10 2016 223470 A1 (BOSCH GMBH ROBERT [DE]) 22 June 2017 (2017-06-22) |
| D2 | US 2014/184162 A1 (TAKAHASHI MINORU [JP] ET AL) 3 July 2014 (2014-07-03) |
| D3 | JP 2008 278635 A (MITSUBISHI MOTORS CORP) 13 November 2008 (2008-11-13) |

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

5.1 **D1** discloses (the indications in brackets refer to D1):

A configurable battery system (see Fig. 3), comprising:
a first battery module (R1) having a positive terminal (P1) and a negative terminal (P2);
a second battery module (R2) having a positive terminal (P1) and a negative terminal (P2); and
at least one switch (S11, S12, S21, S22, S31), wherein the at least one switch comprises at least two poles (contacts of each switch) and wherein:
in a high voltage configuration of the at least one switch, the first battery module and the second battery module are connected in series (see para. [0043]), and
in a low voltage configuration of the at least one switch, the first battery module and the second battery module are connected in parallel (see para. [0044]).

- 5.2 The feature combination of claim 1 is further disclosed in **D2** (see, in particular, Fig. 2-6 with first battery module 100_1, second battery module 100_2 and switch 51, 61, and corresponding text passages from the description) and **D3** (see, in particular, Fig. 1, 3, 4 with battery modules 21 and switches 22, and corresponding text passages from the description).
- 6 Dependent **claims 2-10** do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, the reasons being as follows:
- 6.1 Claim 2: Switch comprising two SPDT switches, see e.g. D3, switches 22 Fig. 3. Also starting from D1 or D2, using SPDT switches would have been an obvious alternative as SPDT switches are among the commonly used switch types (see e.g. Wikipedia entry for the keyword "Switch" as example for the skilled person's common general knowledge).
- 6.2 Claim 3: Switch comprising SPST switches, see e.g. D1, Fig. 3, and D2, Fig. 2.
- 6.3 Claim 4: Charger switch, see e.g. D1, switches 108 in Fig. 3.
- 6.4 Claim 5: Device load is connected to first battery module in high-voltage configuration, see e.g. D1, para. [0044]: "*Der erste erste Schalter S11 und der erste zweite Schalter S21 können sich dabei in geschlossenem oder geöffneten Zustand befinden, je nachdem, ob eine oder mehrere über den*

ersten Ausgang A1 und den zweiten Ausgang A2 angeschlossene elektrische Komponenten auch während des Ladebetriebs mit Energie versorgt werden sollen."

- 6.5 Claim 6: In the high-voltage configuration, the load is connected to the first or second battery module using a load switch, see e.g. D1, Fig. 5 with load switches S11, S21, S12, S22; see also D2, Fig. 2-6 with switches 61 and 62.
- 6.6 Claim 7: Setting load switch position based on status information from battery modules, see e.g. D1, para. [0047] and [0053].
- 6.7 Claims 8, 9: Configuration for use in electrical vehicle, see e.g. D1, para. [0043]. D1 further discloses a value of 450V for the normal operation voltage. Since e.g. Fig. 3 shows two such batteries connected in parallel, this results in 900V for the charging mode when the two batteries are connected in series.
- 6.8 Claim 10: Battery management module to select between high voltage and low voltage configuration, see e.g. D1, para. [0027].

Re Item VII

Certain defects in the international application

- 7 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in D1 and D2 is not mentioned in the description, nor are these documents identified therein.
- 8 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
- 9 Independent claim 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art being placed in the preamble (Rule 6.3(b)(i) PCT) and the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).