

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**
(PCT Rule 43*bis*.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/US2017/018053

International filing date (day/month/year)
16.02.2017

Priority date (day/month/year)
17.02.2016

International Patent Classification (IPC) or both national classification and IPC
INV. H01M10/36 H01M12/08

Applicant
EOS ENERGY STORAGE, 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 43*bis*.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 66.1*bis*(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>7, 8, 11-20, 24-43, 50, 51, 54</u>
	No: Claims	<u>1-6, 9, 10, 21-23, 44-49, 52, 53</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-54</u>
Industrial applicability (IA)	Yes: Claims	<u>1-54</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

1 **Re Item V**

1.1 The following documents, cited in the I.S.R., have been considered as relevant for the examination of the present application. Their numbering will be adhered to for the rest of the procedure.

D1 JP 2001 110461 A (MEIDENSHA ELECTRIC MFG CO., LTD.) 20 April 2001 (2001-04-20)

D2 CN 103 413 992 A (SHANGHAI HUADING TECHNOLOGY AND EDUCATION EQUIPMENT CO., LTD.) 27 November 2013 (2013-11-27)

D3 WO 2013/168145 A1 (BROMINE COMPOUNDS LTD.) 14 November 2013 (2013-11-14)

D4 US 4 510 218 A (MEIDENSHA ELECTRIC MFG CO., LTD.) 9 April 1985 (1985-04-09)

D5 US 4 473 625 A (FURUKAWA ELECTRIC CO., LTD.) 25 September 1984 (1984-09-25)

D6 US 4 058 651 A (GENERAL ELECTRIC CO.) 15 November 1977 (1977-11-15)

1.2 **Novelty**

1.2.1 Document D1 discloses an electrolyte for zinc-bromine battery consisting in an **aqueous solution of zinc bromide, methylethyl pyrrolidinium bromide and ammonium chloride**, to which **graphite** and silica have been added. Hence, this electrolyte falls into the scope of the claimed subject-matter, and, **in particular, the subject-matter of present claims 1-6, 9, 10, 21-23, 44-49, 52 & 53 cannot be considered as novel over the content of D1.**

1.2.2 Documents D2-D6 all describe **aqueous electrolyte compositions** for zinc-halide batteries comprising **zinc bromide** or **zinc chloride** and one or more **additives** selected from tetraethylammonium bromide (D2), a quaternary ammonium salt (D3, D4), tin or lead salts (D4, D5), thallium compounds (D5), bismuth compounds (D5) or ethylene glycol compounds (D6). However, none of these documents discloses the addition of a **carbon powder material**

within the electrolyte composition as presently claimed, and **therefore the novelty of the subject-matter of present claims 1-54 can be acknowledged with respect to D2-D6.**

- 1.2.3 As a conclusion, claims 1-6, 9, 10, 21-23, 44-49, 52 & 53 presently on file do not meet the requirements of Art. 33(2) PCT, whereas all the other claims (i.e. claims 7, 8, 11-20, 24-43, 50, 51 & 54) fulfil the novelty criteria defined therein.

To overcome the pending objection, the Applicant is for instance invited to reformulate the claimed subject-matter in order to render it novel with respect to document D1. This could only be achieved by clearly delimiting the scope of the claimed subject-matter from the products disclosed in said document. Alternatively, the Applicant is requested to submit further information as to how a skilled person may distinguish the claimed products from those of D1. In other words, the Applicant should show that the claimed products provide additional technical features with respect to the products disclosed in the cited references.

1.3 **Inventive step**

- 1.3.1 At present the question of inventive step concerning the subject-matter of independent claims 1 & 44 cannot be assessed, since it has not been considered as novel. The same applies to dependent claims 2-6, 9, 10, 21-23, 45-49, 52 & 53 presently on file.
- 1.3.2 It has further to be noted that the additional features of dependent claims 7, 8, 11-20, 24-43, 50, 51 & 54 presently on file are regarded either as trivial or conventional in the art or within the common understanding of a skilled man seeking to improve the prior art compositions described in the cited documents. Hence, the subject-matter of said claims are also considered as devoid of inventive step.
- 1.3.3 Should the Applicant provide, with respect of the requirements of Art. 34(2)(b) PCT, a new set of claims which would meet the requirements of Article 33(2) PCT, he would also be invited to furnish an appropriate argumentation or technical evidence to show that the novel products provide an unexpected advantage or surprising feature when compared to their prior art counterparts as disclosed in the above mentioned documents.

2 **Re Item VII**

- 2.1 To meet the requirements of Rule 5.1(a)(ii) PCT, the documents D1-D6 should be identified in the description and the relevant background art disclosed therein should be briefly discussed.
- 2.2 The description should be adapted to any reformulation of the claims drafted by the Applicant in response to this communication.
- 2.3 Whilst carrying out any amendment or correction, care should be taken that the requirements of Art. 34(2)(b) PCT are not transgressed.

In order to facilitate the examination of the conformity of the amended application with the requirements of Art. 34(2)(b) PCT, the Applicant is requested to clearly identify the amendments carried out, irrespective of whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based (see also Rule 66.8(a) PCT). If the Applicant regards it as appropriate these indications could be submitted in handwritten form on a copy of the relevant parts of the application as filed.

3 **Re Item VIII**

- 3.1 Present claims 3, 4, 6, 8, 44, 46, 47, 49 & 51 lack clarity due to the use of the expression "further comprising" (emphasis added) in their wording, since it conveys the impression that the indicated compound is an *additional constituent* of the claimed electrolyte, which is actually not the case. For the sake of clarity, the word "further" should thus preferably be deleted from the wording of all these claims (Art. 6 PCT).
- 3.2 The relative term "about" used in present claims 3, 4, 6, 8-10, 15, 16, 20, 25-33, 35, 37-43, 46, 47, 49 & 51-53 has no well-recognized meaning and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claim unclear (Art. 6 PCT).
- 3.3 Present claim 19 refers to the use of "hexalene glycol" as one of the possible glycols to be added in the claimed electrolyte. However, this expression does not correspond to any known existing molecule, thereby leading to a lack of clarity (Art. 6 PCT). As a matter of fact, it seems that it was actually the

compound "hexylene glycol" (emphasis added) that was meant. For the sake of clarity, a correction is requested, both in the claim and in the corresponding part of the description (see P. 2, paragraph [0010]).

- 3.4 Present claim 38 lacks clarity as the lower value of the concentration range of nitric acid is greater than the higher value, thereby leading to confusion (Art. 6 PCT). A similar error is observed in the corresponding part of the description (see P. 4, paragraph [0015]). For the sake of clarity a correction is requested in all occurrences.