

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/IT2015/000298

International filing date (day/month/year)
09.12.2015

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International Patent Classification (IPC) or both national classification and IPC
INV. C25B1/10 C25B9/00 H01M8/16 H01M8/1018 ADD. C02F1/461 H01M8/00 H01M8/10

Applicant
LAVANGA VITO

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

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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, 4</u>
	No: Claims	<u>1, 2, 5-11</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-11</u>
Industrial applicability (IA)	Yes: Claims	<u>1-11</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 EP 1 939 968 A1, (2008-07-02)
- D2 US 2013/256149 A1, (2013-10-03)
- D3 US 2010/190039 A1, (2010-07-29)
- D4 US 2008/213632 A1, (2008-09-04)

The applicant's attention is drawn to the fact that unclear features (see Re Item VIII) were not be taken into account for the assessment of novelty and inventive step.

1. Novelty

The documents D1-D2 disclose an apparatus comprising a plurality of tubular electrochemical cells having a PEM membrane (**D1**: claim 1; figs. 2, 3; paragraphs [0034], [0036], [0101]-[0104], [0106], [0107]; **D2**: claims 1, 14; fig. 6). Consequently, the present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of the independent claim 1 is not new in the sense of Article 33(2) PCT.

2. Inventive step

Furthermore, the below-mentioned lack of clarity (see Re Item VIII) notwithstanding, the subject-matter of claims 1-11 does not involve an inventive step in the sense of Article 33(3) PCT, and the criteria of Article 33(1) PCT are therefore not met.

2.1 The subject-matter of the independent claim 1 is directed to an apparatus comprising a plurality of tubular electrochemical cells having a PEM membrane. Such apparatus belongs to the state of the art as illustrated by document D1 which is considered to represent the closest prior art. Document D1 discloses an apparatus comprising a plurality of tubular biological power generators having an ion exchange membrane (**D1**: claim 1; figs. 2, 3; paragraphs [0034], [0036], [0101]-[0104], [0106], [0107]). Starting from the closest prior art D1, the technical problem underlying the

application can be considered to be provision of an alternative fuel cell. The solution proposed in claim 1 of the present application is obvious because the document D1 gives a clear incentive on how to solve the technical problem underlying the application. Thus, the subject-matter of the independent claim 1 lacks the required inventive step.

2.2 Dependent claims 2-11 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 with respect to novelty and/or inventive step (Article 33(2)(3) PCT). These claims are directed to alternatives which, insofar as not directly described in D1-D4, can only be regarded as obvious for the skilled person because they are not related to an unexpected technical effect. For example, the incorporation of an external light source is suggested in D3 and D4 (**D3**: claim 31; **D4**: claim 1). Features such as metallic manifold relate to normal workshop modifications.

2.3 However, if the applicant could demonstrate that due to any novelty rendering technical feature unpredictable (qualitative or quantitative) effects would be available e.g. by direct comparison of the claimed apparatus with the closest prior art, inventive step in the sense of Article 33(3) PCT could be recognised. It is noted that the modifying feature should not only characterise the invention in the claim i.e. distinguish it from the prior art, but must contribute causally to the improvement of the capability thereby achieved.

2.4 Any information the applicant may wish to submit concerning the subject-matter of the invention, for example further details of its advantages or of the problem it solves, and for which there is no basis in the application as filed, should be confined to the letter of reply and not be incorporated into the application (Articles 34(2)(b) and 19(2) PCT).

2.5 Any newly filed claims are considered to have to satisfy the criteria set forth in Article 33(1)(3) PCT. When filing amended claims the applicant should at the same time bring the description into conformity with the amended claims. Care should be taken during revision, especially of the introductory portion and of any statements of problem or advantage, not to add subject-matter which extends beyond the content of the application as originally filed (Article 34(2)(b) PCT).

2.6 In order to facilitate the examination of the conformity of the amended application with the requirements of (Article 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.

3. Industrial applicability

No objection concerning the industrial applicability of claims 1-11.

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 the documents D1-D4 is not mentioned in the description, nor are these documents identified therein. To meet the requirements of Rule 5.1(a)(ii) PCT, the documents D1-D4 should be identified in the description and the relevant disclosures therein should be briefly summarised.

Re Item VIII

Certain observations on the international application

The application does not meet the requirements of Article 6 PCT, because claims 1-4 and 9-11 are not clear.

1. It is clear from the figures 1-2 and the description on pages 3 (lines 17-29), 4 (lines 15-18, 23-25), and 5 (lines 27-31) that the following features are essential to the definition of the invention: bacteria disposed on the first layer and a light source disposed inside the pipes. Since independent claim 1 does not contain these features it does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

2. Claim 1 is not supported by the description as required by Article 6 PCT, as its scope is broader than justified by the description and drawings. The current wording of claim 1 allows any sequence of a first layer, a second layer and a third layer. However, in the description and figures the first layer is always disposed inside the pipe (3). This objection might be overcome by using the term "first inner layer" instead of "first layer" and "third external layer" instead of "third layer".

3. The features "*...dissolved hydrogen oxidizing and giving electrons to said first metallic layer (31), that is negatively charged, and the residual protons diffusing through said PEM membrane, that constitutes said second layer (32) and spreading to the outside of said pipes (3)...*" in the apparatus claim 1 relate to a method of using the apparatus rather than clearly defining the apparatus in terms of its technical features. The intended limitations are therefore not clear from this claim, contrary to the requirements of Article 6 PCT.

4. Claims 1, 3, and 9-11 do not meet the requirements of Article 6 PCT because the matter for which protection is sought is not clearly defined. The claims attempt to define the subject-matter in terms of the result to be achieved (claim 1: "*...to extract the hydrogen dissolved in a liquid mixture and to produce hydrogen by the use of bacteria...*"; claim 3: "*...to favour the biological reactions and/or to fight the proliferation of bacteria and harmful viruses...*"; claim 9: "*...means fitted to produce an electric current through a reaction with oxygen of said residual protons...*"; claim 10: "*...promoting the combination of the hydrogen with the oxygen...*"; claim 11: "*...to avoid the contact with the air of the protons that come out from said pipes (3) in such a way that said protons, not reacting with the oxygen, are reduced to molecular hydrogen...*"), which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.

5. The term "*to spread a radiation spectrum*" used in claims 3 and 4 is vague and unclear 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 claims unclear, Article 6 PCT. In the present case radiation is spread, but not a spectrum.

6. Most of the features in the apparatus claims 2, 9, and 10 relate to a method of using the apparatus rather than clearly defining the apparatus in terms of its technical features. The intended limitations are therefore not clear from these claims, contrary to the requirements of Article 6 PCT.