

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

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| Applicant's or agent's file reference PQU15002 | FOR FURTHER ACTION | | See item 4 below |
| International application No. PCT/JP2015/057183 | International filing date (<i>day/month/year</i>) 11 March 2015 (11.03.2015) | Priority date (<i>day/month/year</i>) 12 March 2014 (12.03.2014) | |
| International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237 | | | |
| Applicant AQUATECHS CO., LTD. | | | |

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|---|-------------------------------------|---|---------------------|--------------------------|------------|----------|--------------------------|-------------|--|--------------------------|------------|----------------------------|-------------------------------------|-----------|---|--------------------------|------------|-------------------------|--------------------------|-------------|--|--------------------------|--------------|---|
| <p>1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).</p> <p>2. This REPORT consists of a total of 9 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p> | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>3. This report contains indications relating to the following items:</p> <table> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> <p>4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).</p> | <input checked="" type="checkbox"/> | Box No. I | Basis of the report | <input type="checkbox"/> | Box No. II | Priority | <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability | <input type="checkbox"/> | Box No. IV | Lack of unity of invention | <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement | <input type="checkbox"/> | Box No. VI | Certain documents cited | <input type="checkbox"/> | Box No. VII | Certain defects in the international application | <input type="checkbox"/> | Box No. VIII | Certain observations on the international application |
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. II | Priority | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention | | | | | | | | | | | | | | | | | | | | | | |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. VI | Certain documents cited | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application | | | | | | | | | | | | | | | | | | | | | | |
| <input type="checkbox"/> | Box No. VIII | Certain observations on the international application | | | | | | | | | | | | | | | | | | | | | | |

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| | Date of issuance of this report 13 September 2016 (13.09.2016) |
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PATENT COOPERATION TREATY

TRANSLATION

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

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| Date of mailing (day/month/year) | 16.06.2015 |
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| Applicant's or agent's file reference PQU15002 | FOR FURTHER ACTION See paragraph 2 below |
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|---|---|---|
| International application No. PCT/JP2015/057183 | International filing date (day/month/year) 11.03.2015 | Priority date (day/month/year) 12.03.2014 |
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International Patent Classification (IPC) or both national classification and IPC
B01F7/32 (2006.01) i, B01F7/16 (2006.01) i

Applicant
AQUATECHS CO., LTD.

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 or 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 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.

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| Name and mailing address of the ISA/JP | Date of completion of this opinion | Authorized officer |
| Facsimile No. | | Telephone No. |

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2015/057183

Box No. I Basis of this 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 43*bis*.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 filed or furnished:
 - a. (means)
 - on paper
 - in electronic form
 - b. (time)
 - in the international application as filed
 - together with the international application in electronic form
 - subsequently to this Authority for the purposes of search
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 in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

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| International application No. PCT/JP2015/057183 |
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| 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 |
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|-------------------------------|--------|---------|-----|
| 1. Statement | | | |
| Novelty (N) | Claims | 5-8, 10 | YES |
| | Claims | 1-4, 9 | NO |
| Inventive step (IS) | Claims | 5-8, 10 | YES |
| | Claims | 1-4, 9 | NO |
| Industrial applicability (IA) | Claims | 1-10 | YES |
| | Claims | _____ | NO |

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|--------------------------------|--|
| 2. Citations and explanations: | |
|--------------------------------|--|

Document 1: US 2004/0234435 A1 (BICKHAM, David Robert) 25 November 2004, paragraphs [0052]-[0055], [0062], fig. 2-4 & WO 2004/105935 A1 & CA 2525898 A & KR 10-2006-0024380 A & CN 1822900 A

Document 2: WO 2010/150656 A1 (EDDYPLUS CO., LTD.) 29 December 2010, paragraphs [0200]-[0202], fig. 37(b)-37(c) & JP 2011-5349 A & JP 2011-136274 A & JP 2011-255289 A & JP 2011-255290 A & JP 4418019 B & US 2012/0081990 A1 & EP 2386350 A1 & KR 10-2011-0112879 A & CA 2763226 A & CN 102387853 A & SG 176549 A & RU 2011148952 A & TW 201114480 A

Document 3: EP 1925358 A1 (BASF SE) 28 May 2008, paragraphs [0013]-[0014], fig. 1-3 & AT 509687 T

Document 4: JP 51-008669 A (PHILIP ELPHEG DAVIS JR.) 23 January 1976, p. 3, upper right column, line 11 to p. 5, lower left column, line 6, fig. 1-3 & US 3920227 A & GB 1467620 A

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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

The invention as in claim 1 does not involve an inventive step in the light of documents 1-3 cited in the international search report.

Document 1 discloses a mixing device having a mixing element 3 and a mixing element 4, wherein the lower mixing element 3 moves a fluid in the radial direction, and the upper mixing element 4 moves the fluid in the upward direction.

Meanwhile, in regards to the "flow resistor" of the invention as in claim 1, the description of the present application states that the flow toward the mixing rotor 10 can be disrupted, as appropriate; specifically, paragraph [0035] and the like states that "the flow resistor 20 creates resistance against the flow toward the mixing rotor 10 within the fluid to be mixed, and causes the flow to change. In other words, the flow resistor 20 improves the mixing force by disrupting the flow toward the mixing rotor 10, as appropriate." In the light of the disclosure of document 1 (fig. 4 and the like), the upper mixing element 4 can be said to function as a "flow resistor" for to the lower mixing element 3.

A comparison of the invention as in claim 1 and the invention disclosed in document 1 revealed that the two inventions differ with regard to the following feature.

The mixing rotor in the invention as in claim 1 is equipped with "intake ports provided in the surface of the main body, discharge ports provided in the surface of the main body at positions farther to the outside from the rotational axis in the centrifugal direction relative to the intake ports, and flow passages that connect the intake ports and the discharge ports", whereas the mixing

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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

rotor (mixing element 3) in the invention disclosed in document 1 is configured so as to take in from the vertical direction and discharge in the centrifugal direction.

Examination of Difference

Mixing rotors equipped with "a main body that rotates around a rotational axis, intake ports provided in the surface of the main body, discharge ports provided in the surface of the main body at positions farther to the outside from the rotational axis in the centrifugal direction than the intake ports, and flow passages that connect the intake ports and the discharge ports" are well known (for example, see documents 2-3), as a mixing rotor for taking in from the vertical direction and discharging in the centrifugal direction. It would not require significant creativity for a person skilled in the art to conceive of configuring the invention defining feature associated with the abovementioned difference by adopting a well-known mixing rotor as the mixing rotor (mixing element 3) in the invention disclosed in document 1.

Even upon considering the invention as in claim 1 overall, the effect imparted thereby is not extraordinarily significant, and could have been predicted by a person skilled in the art in the light of the invention disclosed in document 1 and the well-known mixing rotors.

The invention as in claims 2-4 does not involve an inventive step in the light of documents 1-3.

For the invention as in claims 2 and 4, please see

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document 1 (fig. 2-4).

As for the invention as in claim 3, document 1 (fig. 4) indicates that the flow resistor (mixing element 4) is above the mixing rotor (mixing element 3), and that the fluid is taken in from above the mixing rotor (mixing element 3).

The invention as in claim 9 does not involve an inventive step in the light of documents 1-3.

Document 1 indicates that the ratio of the diameter DL of the mixing rotor (mixing element 3) to the diameter T of the vessel is 0.4-0.6 (paragraph [0054]), and further indicates that the ratio of the diameter Du of the flow resistor (mixing element 4) to the diameter T of the vessel is 0.4-0.6 (paragraph [0055]). Selecting values for both diameters within such a numerical range is a design matter that a person skilled in the art could address, as appropriate. Furthermore, setting the diameter Du of the flow resistor (mixing element 4) so as to be smaller than the diameter DL of the mixing rotor (mixing element 3) would pose no significant difficulty for a person skilled in the art.

The invention as in claims 1-4 and 9 lacks novelty and does not involve an inventive step in the light of document 4 cited in the international search report.

Document 4 discloses a fluid mixing device having an impeller device 1 and an anti-cavitation plate 90 such that the impeller device 1 moves a fluid in the radial direction and the anti-cavitation plate 90 prevents the fluid from swirling, wherein the impeller device 1 has an axial opening 64 formed in an upper circular plate 63, an

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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

axial opening 74 formed in a lower circular plate 73, and a crescent-shaped drive blade 62 and a crescent-shaped drive blade 72 which are respectively adhered to the upper circular plate 63 and the lower circular plate 73, and the fluid is pulled inward through the axial opening 64 and the axial opening 74, and moves in the radial direction through the passage formed by the crescent-shaped drive blade 62 and the crescent-shaped drive blade 72. Upon considering the flow of the fluid illustrated by the arrow T in document 4 (fig. 1), it is found that the anti-cavitation plate 90 is a "flow resistor," the axial opening 64 and the axial opening 74 are "intake ports," the passage formed by the crescent-shaped drive blade 62 and the crescent-shaped drive blade 72 is a "flow passage," and the outer edges of the upper circular plate 63 and the lower circular plate 73 are "discharge ports."

That being the case, the invention as in claim 1 is the invention disclosed in document 1, or a person skilled in the art could have easily arrived at the invention as in claim 1 on the basis of the invention disclosed in document 1.

Please see document 1 (fig. 1) in regards to the invention as in claims 2-3 and 9.

As for the invention as in claim 4, the anti-cavitation plate 90 is joined by an annular weld 90a illustrated by fig. 3, and is clearly capable of rotating.

The invention as in claims 5-8 and 10 is not disclosed in any of the documents cited in the international search report, and would not be obvious to a person skilled in the art.

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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**