

**PATENT COOPERATION TREATY**

**PCT**

**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

|  |  |   |                  |
|--|--|---|------------------|
| Applicant's or agent's file reference<br>FP14-0636-00  | <b>FOR FURTHER ACTION</b>  |   | See item 4 below |
| International application No.<br>PCT/JP2015/054852   | International filing date ( <i>day/month/year</i> )<br>20 February 2015 (20.02.2015) | Priority date ( <i>day/month/year</i> )<br>10 March 2014 (10.03.2014) |                  |
| International Patent Classification (8th edition unless older edition indicated)<br>See relevant information in Form PCT/ISA/237 |  |   |                  |
| Applicant<br>KABUSHIKI KAISHA TOYOTA JIDOSHOKKI  |  |   |                  |

|   |                                     |   |                     |                          |            |          |                          |             |  |                          |            |                            |                                     |           |   |                          |            |                         |                          |             |  |                          |              |   |
|---|-------------------------------------|---|---------------------|--------------------------|------------|----------|--------------------------|-------------|--|--------------------------|------------|----------------------------|-------------------------------------|-----------|---|--------------------------|------------|-------------------------|--------------------------|-------------|--|--------------------------|--------------|---|
| <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 8 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   |                     |                          |            |          |                          |             |  |                          |            |                            |                                     |           |   |                          |            |                         |                          |             |  |                          |              |   |

|   |   |
|---|---|
|   | Date of issuance of this report<br>13 September 2016 (13.09.2016) |
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland | Authorized officer<br><br>Mineko Mohri                            |
| Facsimile No. +41 22 338 82 70  | e-mail: pt08.pct@wipo.int   |

**PATENT COOPERATION TREATY**

**TRANSLATION**

From the  
INTERNATIONAL SEARCHING AUTHORITY

**PCT**

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

|                                     |                   |
|-------------------------------------|-------------------|
| Date of mailing<br>(day/month/year) | <b>19.05.2015</b> |
|-------------------------------------|-------------------|

|  |  |
|--|--|
| Applicant's or agent's file reference<br><b>FP14-0636-00</b> | <b>FOR FURTHER ACTION</b><br>See paragraph 2 below |
|--|--|

|   |   |   |
|---|---|---|
| International application No.<br><b>PCT/JP2015/054852</b> | International filing date (day/month/year)<br><b>20.02.2015</b> | Priority date (day/month/year)<br><b>10.03.2014</b> |
|---|---|---|

International Patent Classification (IPC) or both national classification and IPC  
**F28D20/00 (2006.01) i, F28F19/06 (2006.01) i**

Applicant  
**KABUSHIKI KAISHA TOYOTA JIDOSHOKKI**

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.

|  |                                    |                    |
|--|------------------------------------|--------------------|
| 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/JP2015/054852

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.<br>PCT/JP2015/054852 |
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| <b>Box No. V</b>               | <b>Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</b>  |             |                   |     |  |              |    |                     |              |     |  |                   |    |                               |                   |     |  |              |    |
|--------------------------------|--|-------------|-------------------|-----|--|--------------|----|---------------------|--------------|-----|--|-------------------|----|-------------------------------|-------------------|-----|--|--------------|----|
| 1. Statement                   | <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20%; vertical-align: top; padding: 2px;">Novelty (N)</td> <td style="padding: 2px;">Claims <u>1-3</u></td> <td style="text-align: right; padding: 2px;">YES</td> </tr> <tr> <td></td> <td style="padding: 2px;">Claims _____</td> <td style="text-align: right; padding: 2px;">NO</td> </tr> <tr> <td style="vertical-align: top; padding: 2px;">Inventive step (IS)</td> <td style="padding: 2px;">Claims _____</td> <td style="text-align: right; padding: 2px;">YES</td> </tr> <tr> <td></td> <td style="padding: 2px;">Claims <u>1-3</u></td> <td style="text-align: right; padding: 2px;">NO</td> </tr> <tr> <td style="vertical-align: top; padding: 2px;">Industrial applicability (IA)</td> <td style="padding: 2px;">Claims <u>1-3</u></td> <td style="text-align: right; padding: 2px;">YES</td> </tr> <tr> <td></td> <td style="padding: 2px;">Claims _____</td> <td style="text-align: right; padding: 2px;">NO</td> </tr> </table> | Novelty (N) | Claims <u>1-3</u> | YES |  | Claims _____ | NO | Inventive step (IS) | Claims _____ | YES |  | Claims <u>1-3</u> | NO | Industrial applicability (IA) | Claims <u>1-3</u> | YES |  | Claims _____ | NO |
| Novelty (N)                    | Claims <u>1-3</u>  | YES         |                   |     |  |              |    |                     |              |     |  |                   |    |                               |                   |     |  |              |    |
|                                | Claims _____   | NO          |                   |     |  |              |    |                     |              |     |  |                   |    |                               |                   |     |  |              |    |
| Inventive step (IS)            | Claims _____   | YES         |                   |     |  |              |    |                     |              |     |  |                   |    |                               |                   |     |  |              |    |
|                                | Claims <u>1-3</u>  | NO          |                   |     |  |              |    |                     |              |     |  |                   |    |                               |                   |     |  |              |    |
| Industrial applicability (IA)  | Claims <u>1-3</u>  | YES         |                   |     |  |              |    |                     |              |     |  |                   |    |                               |                   |     |  |              |    |
|                                | Claims _____   | NO          |                   |     |  |              |    |                     |              |     |  |                   |    |                               |                   |     |  |              |    |
| 2. Citations and explanations: | <p>Document 1: JP 2011-58678 A (NGK INSULATORS, LTD.) 24 March 2011, paragraphs [0007]-[0009], [0022]-[0027], [0039]-[0045], fig. 6-8 (Family: none)</p> <p>Document 2: JP 2013-242053 A (TOYOTA INDUSTRIES CORPORATION) 05 December 2013, paragraph [0020], fig. 1-2 &amp; WO 2013/172422 A1 &amp; CN 104303005 A</p> <p>Document 3: JP 62-112995 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 23 May 1987, page 2, upper right column, line 9 to lower right column, line 9, fig. 1-5 (Family: none)</p> <p>Document 4: JP 62-9195 A (MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD.) 17 January 1987, page 2, upper right column, line 2 to lower left column, line 11, fig. 1-4 (Family: none)</p> <p>Document 5: JP 2008-64399 A (DENSO CORPORATION) 21 March 2008, paragraphs [0003], [0031]-[0034], fig. 4 (Family: none)</p> <p style="text-align: center; margin-top: 20px;">The invention as in claim 1 does not involve an</p>  |             |                   |     |  |              |    |                     |              |     |  |                   |    |                               |                   |     |  |              |    |

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

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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**

inventive step in light of documents 1-4 cited in the ISR.

Document 1 describes a heat storage structure wherein first structures 22A, in which a first flow path 18A circulating a first fluid 16A (for example, exhaust gas) is formed, and second structures 22B, in which second flow paths 18B circulating a second fluid 16B are formed, are stacked alternately, and the interior of hollow parts 36 of the second structures 22B is filled with chemical heat storage bodies 20.

When the invention as in claim 1 and the invention described in document 1 are compared, they differ in the following points.

Difference 1

Whereas invention as in claim 1 has a "storage device storing a reaction medium" and the "storage device" is connected to a "reactor", it is not clear whether the invention described in document 1 has a storage device storing a reaction medium.

Difference 2

Whereas the invention as in claim 1 specifies that "the reactor includes...a metal heat exchange unit", and "the heat generation unit has...a metal case storing the heat storage material, and the metal case and the heat exchange unit are joined to each other", in the invention described in document 1 it is not clear what the material of the "first structures 22A" and the "second structures 22B" is, and it is not clear whether the "first structures 22A" and the "second structures 22B" are joined to each other.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2015/054852

**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

Next, difference 1 will be examined.

Document 2 describes a heat storage device 10 equipped with a reactor 11 and an ammonia storage device 13 storing ammonia (NH<sub>3</sub>) and connected to the reactor 11 via a conduit 12.

The inventions described in documents 1 and 2 both pertain to a heat storage device for storing heat from vehicle exhaust gas. Accordingly, it would be easy for a person skilled in the art to apply the storage device of document 2 to the invention described in document 1.

Next, difference 2 will be examined.

Document 3 describes a heat exchanger equipped with heat transfer medium flow path body wall plates 11, first heat transfer medium flow path bodies 12, working substance storage bodies 16 storing a working substance, and second heat transfer medium flow path bodies 18, wherein these components are sequentially stacked, and the individual surfaces in close contact are surface-bonded by brazing.

Document 4 describes a stack-type heat exchanger wherein heat transfer medium flow path bodies 2, working substance storage bodies, and heat transfer medium flow path body partition plates 3 are alternately stacked and the individual surfaces in close contact are surface-bonded by brazing.

The inventions described in documents 1, 3 and 4 all pertain to heat storage devices having a stacked structure, and in regard to constructing said devices by means of stacking, improving heat transfer between parts thereof is a well-known matter to a person skilled in the art. Accordingly, it would be easy for a person skilled in the art to apply the invention described in document 3

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/JP2015/054852

**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

or document 4 to the invention described in document 1, and to join the "first structures 22A" and the "second structures 22B" described in document 1 by means of brazing. In consideration of thermal conductivity and the like, to manufacture the "first structures 22A" and the "second structures 22B" from metal is a design matter that can be addressed, as appropriate, by a person skilled in the art.

From the above, the invention as in claim 1 could easily be invented by a person skilled in the art by applying the inventions described in documents 2-4 to the invention described in document 1.

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

Document 3 indicates that the second heat transfer medium flow path bodies 18 are arranged on the outermost side in the stacking direction (see figure 1).

The invention as in claim 3 does not involve an inventive step in light of documents 1-4 and document 5 cited in the ISR.

Document 5 describes a heat exchanger used in a corrosive environment such as exhaust gas, wherein pure copper, which has high thermal conductivity, is used as a core material 44a, and tin-plated layers 44b, which have high corrosion resistance, are applied to both surfaces of the core material, thereby improving corrosion resistance while maintaining heat exchange performance.

The inventions described in documents 1 and 5 pertain to a device for circulating exhaust gas.

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

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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

Accordingly, it would be easy for a person skilled in the art to apply the invention described in document 5 to the invention described in document 1, and to use the materials described in document 5 in the first flow paths 18A through which exhaust gas passes in the invention described in document 1.