

**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 C28583WO1	<b>FOR FURTHER ACTION</b>		See item 4 below
International application No. PCT/JP2016/088545	International filing date ( <i>day/month/year</i> ) 22 December 2016 (22.12.2016)	Priority date ( <i>day/month/year</i> ) 25 December 2015 (25.12.2015)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant HITACHI INDUSTRIAL EQUIPMENT SYSTEMS CO., LTD.			

<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 7 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
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<input type="checkbox"/>	Box No. VIII	Certain observations on the international application																						

	Date of issuance of this report 26 June 2018 (26.06.2018)
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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:

Date of mailing (day/month/year)	<b>21.03.2017</b>
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Applicant's or agent's file reference <b>C28583WO1</b>
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<b>FOR FURTHER ACTION</b> See paragraph 2 below
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International application No. <b>PCT/JP2016/088545</b>	International filing date (day/month/year) <b>22.12.2016</b>	Priority date (day/month/year) <b>25.12.2015</b>
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International Patent Classification (IPC) or both national classification and IPC <b>F04C29/04 (2006.01) i, F04B39/06 (2006.01) i</b>
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Applicant <b>HITACHI INDUSTRIAL EQUIPMENT SYSTEMS CO., LTD.</b>
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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.

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Box No. I	Basis of this opinion
	<p>1. With regard to the <b>language</b>, this opinion has been established on the basis of:</p> <p><input checked="" type="checkbox"/> the international application in the language in which it was filed</p> <p><input type="checkbox"/> 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)).</p> <p>2. <input type="checkbox"/> This opinion has been established taking into account the <b>rectification of an obvious mistake</b> authorized by or notified to this Authority under Rule 91 (Rule 43bis.1(a))</p> <p>3. <input type="checkbox"/> With regard to any <b>nucleotide and/or amino acid sequence</b> disclosed in the international application, this opinion has been established on the basis of a sequence listing:</p> <p>a. <input type="checkbox"/> forming part of the international application as filed:</p> <p><input type="checkbox"/> in the form of an Annex C/ST.25 text file.</p> <p><input type="checkbox"/> on paper or in the form of an image file.</p> <p>b. <input type="checkbox"/> 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.</p> <p>c. <input type="checkbox"/> furnished subsequent to the international filing date for the purposes of international search only:</p> <p><input type="checkbox"/> in the form of an Annex C/ST.25 text file (Rule 13ter.1(a)).</p> <p><input type="checkbox"/> on paper or in the form of an image file (Rule 13ter.1(b) and Administrative Instructions, Section 713).</p> <p>4. <input type="checkbox"/> 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.</p> <p>5. Additional comments:</p>

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International application No. PCT/JP2016/088545
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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			
Novelty (N)	Claims	2-4	YES
	Claims	1, 5	NO
Inventive step (IS)	Claims		YES
	Claims	1-5	NO
Industrial applicability (IA)	Claims	1-5	YES
	Claims		NO
2. Citations and explanations:			
<p>Document 1: JP 2010-38385 A (MIURA CO., LTD.) 18 February 2010, paragraphs [0023]-[0050], fig. 1 (Family: none)</p> <p>Document 2: JP 2015-38354 A (MIURA CO., LTD.) 26 February 2015, paragraphs [0023]-[0040], fig. 1 (Family: none)</p> <p>Document 3: JP 2014-145273 A (HITACHI INDUSTRIAL EQUIPMENT SYSTEM CO., LTD.) 14 August 2014, paragraphs [0048]-[0051], fig. 1, 2 &amp; US 2015/0362212 A1, paragraphs [0058]-[0061], fig. 1, 2 &amp; WO 2014/115616 A1 &amp; EP 2949939 A1 &amp; CN 104968942 A</p> <p>Document 4: JP 1-315690 A (HITACHI, LTD.) 20 December 1989, page 2, upper right column, line 2 to page 3, upper left column, line 3, fig. 1 (Family: none)</p> <p>Document 5: Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 093339/1979 (Laid- open No. 13607/1981) (ISHIKAWAJIMA-HARIMA HEAVY INDUSTRIES CO., LTD.) 05 February</p>			

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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

1981, specification, page 9, line 4, fig. 1

(Family: none)

The invention as in claims 1 and 5 lacks novelty and does not involve an inventive step with respect to document 1 cited in the ISR.

<Claim 1>

Document 1 discloses a gas compressor provided with a housing (unit 6) and a compressor body (compressor 5) disposed inside the housing, a waste heat recovery heat exchanger (air cooling part 32) being disposed inside the housing, and the waste heat recovery heat exchanger performing heat exchange between a waste heat recovery liquid that is sent from the use-side of the waste heat generated by the compressor body and compressed air discharged from the compressor body.

<Claim 5>

The gas compressor disclosed in document 1 is a displacement-type (screw) air compressor.

The invention as in claim 2 does not involve an inventive step with respect to documents 1 and 2 cited in the ISR.

Document 2 discloses a gas compressor in which a heat exchanger (first air cooler 8) for cooling is disposed inside a housing (compressor unit 18), the heat exchanger for cooling performing heat exchange between a cooling liquid sent from the outside (cooling water cooler 17) and compressed gas discharged from a compressor body (compressor 2), and waste heat recovery piping (water supply channel 22) in which a waste heat

**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**

recovery liquid circulates and cooling liquid piping (piping from the cooling water cooler 17 to the first air cooler 8) which is disposed inside the housing and in which the cooling liquid circulates are separately independent channels.

A person skilled in the art could easily have configured the invention disclosed in document 1 so that the heat exchanger for cooling and the cooling liquid piping, which are disclosed in document 2, are disposed inside the housing as independent channels.

The invention as in claim 3 does not involve an inventive step with respect to documents 1-3 cited in the ISR.

Document 3 discloses an exhaust heat recovery system in an oil-cooled gas compressor, wherein the temperature inside a hot-water storage tank 19 is caused to rise to 93°C by multi-pass flushing being performed.

A person skilled in the art could easily have also configured the invention disclosed in document 1 so that multi-pass flushing is performed. In such a case, the temperature of the waste heat recovery liquid sent from the use-side (makeup water tank 21) would be in the range of 70-90°C once a certain number of flushing cycles have been performed.

The invention as in claim 4 does not involve an inventive step with respect to documents 1 and 4 cited in the ISR.

Document 4 indicates that: a plurality of waste heat recovery heat exchangers (intermediate stage primary-side air cooler 4, intermediate stage air cooler 5, discharge

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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

stage primary air cooler 6, and discharge stage air cooler 7) are provided, a plurality of waste heat recovery liquid pipelines in which waste heat recovery liquids circulate are provided to correspond to the plurality of waste heat recovery heat exchangers, and the plurality of waste heat recovery liquid pipelines are each disposed as a separately independent channel (channel passing through high-temperature hot water recovery unit 14, and channel passing through hot water recovery unit 13).

A person skilled in the art could easily have configured the invention disclosed in document 1 so that two systems of heat recovery channels are disposed as disclosed in document 4.