

**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><b>S4102-WO-PCT</b>  | <b>FOR FURTHER ACTION</b>  |  | See item 4 below |
| International application No.<br><b>PCT/EP2015/056421</b>   | International filing date ( <i>day/month/year</i> )<br><b>25 March 2015 (25.03.2015)</b> | Priority date ( <i>day/month/year</i> )<br><b>13 May 2014 (13.05.2014)</b> |                  |
| International Patent Classification (8th edition unless older edition indicated)<br><b>See relevant information in Form PCT/ISA/237</b> |  |  |                  |
| Applicant<br><b>ALFA LAVAL CORPORATE AB</b>   |  |  |                  |

|   |                                     |   |                     |                          |            |          |                          |             |  |                          |            |                            |                                     |           |   |                          |            |                         |                          |             |  |                          |              |   |
|---|-------------------------------------|---|---------------------|--------------------------|------------|----------|--------------------------|-------------|--|--------------------------|------------|----------------------------|-------------------------------------|-----------|---|--------------------------|------------|-------------------------|--------------------------|-------------|--|--------------------------|--------------|---|
| <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 6 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><b>15 November 2016 (15.11.2016)</b> |
| The International Bureau of WIPO<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland | Authorized officer<br><br><b>Nora Lindner</b>                           |
| Facsimile No. +41 22 338 82 70  | e-mail: pt05.pct@wipo.int   |

# 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/EP2015/056421

International filing date (day/month/year)  
25.03.2015

Priority date (day/month/year)  
13.05.2014

International Patent Classification (IPC) or both national classification and IPC  
INV. F28F9/02 F28D9/00

Applicant  
ALFA LAVAL CORPORATE AB

**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:



European Patent Office  
D-80298 Munich  
Tel. +49 89 2399 - 0  
Fax: +49 89 2399 - 4465

Date of completion of this opinion

see form PCT/ISA/210

Authorized Officer

Bain, David

Telephone No. +49 89 2399-0



---

**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>1-17</u> |
|                               | No: Claims  |             |
| Inventive step (IS)           | Yes: Claims | <u>1-17</u> |
|                               | No: Claims  |             |
| Industrial applicability (IA) | Yes: Claims | <u>1-17</u> |
|                               | No: Claims  |             |

2. Citations and explanations

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 WO 02/16852 A1 (VAHTERUS OY [FI]; KONTU MAURI [FI]) 28 February 2002 (2002-02-28)
- D2 US 2002/174978 A1 (BEDDOME DAVID W [US] ET AL) 28 November 2002 (2002-11-28)
- D3 WO 2011/161323 A1 (VAHTERUS OY [FI]; HEINIOE TAPIO [FI]; KONTU MAURI [FI]) 29 December 2011 (2011-12-29)
- D4 DE 10 2004 004895 B3 (PRESSKO AG [DE]) 16 June 2005 (2005-06-16)
- D5 EP 2 527 775 A1 (ALFA LAVAL CORP AB [SE]) 28 November 2012 (2012-11-28)cited in the application

Positive Assesment - Articles 33(2) and 33(3) PCT

Document D1 is regarded as being the prior art closest to the subject-matter of claim 1, and discloses ***a plate heat exchanger comprising a casing (2), a number of heat transfer plates (10) with a respective first port opening (11), second port opening (12), first side and second side that is opposite the first side, wherein the heat transfer plates are arranged within the casing and joined to each other such that***

***- a first set of flow channels for a first fluid (first medium) is formed by every second interspace between the heat transfer plates, with fluid entries and fluid exits at the first and the second port openings (11, 12),***

***- a second set of flow channels for a second fluid (second medium) is formed by every other, second interspace between the heat transfer plates, with fluid entries and fluid exits at the first and second sides, wherein it further comprises a fluid outlet for the first fluid (8), a first passage (space right after 27 and before the stack) that extends along the casing and the first sides of the heat transfer plates and comprises: a fluid inlet for the second fluid (27); and a fluid outlet that faces at least a section of the second set of flow channels, such that the second fluid may leave the first passage and enter said section of the second set of flow channels, and a second passage that extends along the casing and***

***the second sides of the heat transfer plates and comprises: a fluid inlet that faces said section of the second set of flow channels, such that the second fluid may leave said section of the second set of flow channels and enter the second passage; and a fluid outlet for the second fluid (28).***

The subject-matter of claim 1 therefore differs from this known plate heat exchanger in that ***a first distribution tube that extends through the first port openings of the heat transfer plates and comprises: a fluid inlet for the first fluid; and a fluid outlet that faces at least a section of the first set of flow channels, such that the first fluid may leave the first distribution tube and enter said section of the first set of flow channels, a second distribution tube that extends through the second port openings of the heat transfer plates and comprises: a fluid inlet that faces said section of the first set of flow channels, such that the first fluid may leave said section of the first set of flow channels and enter the second distribution tube; and*** and is therefore new (Article 33(2) PCT).

The technical effect is the overall strengthening combined with a good fluid repartition.

The problem to be solved by the present invention may be regarded as how to improve the longevity of the heat exchanger.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

none of the cited docs neither discloses nor renders the subject-matter of claim 1 obvious.

Indeed, although D2 discloses the use of two distribution tubes, the combination of knowledge of these two documents would not lead to the claimed subject-matter since the known distribution do not allow the claimed fluid path, in particular, ***that the first fluid may leave the first distribution tube and enter said section of the first set of flow channels and that the first fluid may leave said section of the first set of flow channels and enter the second distribution tube***

Claims 2 to 17 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.