

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To: LUNDQUIST, Steve D. Caterpillar Inc. 100 NE Adams Street - AH9510 Peoria, IL 61629-9510 USA		Date of mailing (day/month/year) 31 October 2018 (31.10.2018)	
Applicant's or agent's file reference 170659-68162		FOR FURTHER ACTION See paragraph 2 below	
International application No. PCT/US2018/043715	International filing date (day/month/year) 25 July 2018 (25.07.2018)	Priority date(day/month/year) 29 August 2017 (29.08.2017)	
International Patent Classification (IPC) or both national classification and IPC F02B 29/04(2006.01)i, F28D 1/053(2006.01)i, F28F 9/10(2006.01)i, F28F 1/12(2006.01)i			
Applicant CATERPILLAR INC.			

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 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/KR International Application Division Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea Facsimile No. +82-42-481-8578	Date of completion of this opinion 31 October 2018 (31.10.2018)	Authorized officer HWANG, Chan Yoon Telephone No. +82-42-481-3347
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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US2018/043715

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 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:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/US2018/043715

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)	Claims	<u>1-4</u>	YES
	Claims	<u>NONE</u>	NO
Inventive step (IS)	Claims	<u>NONE</u>	YES
	Claims	<u>1-4</u>	NO
Industrial applicability (IA)	Claims	<u>1-4</u>	YES
	Claims	<u>NONE</u>	NO

2. Citations and explanations :

Reference is made to the following documents:

D1: WO 2014-010673 A1 (ISUZU MOTORS LIMITED) 16 January 2014

D2: US 5348082 A (VELLUET et al.) 20 September 1994

D3: US 4735442 A (BURLI, KURT) 05 April 1988

1. Novelty and Inventive Step

1.1 Independent Claim 1

D1, which is considered to be the closest prior art to the subject matter of independent claim 1, discloses a vehicle intercooler (1) comprising: a header (22, 32), disposed at an end of the intercooler (1), adapted to receive hot air from a turbocharger, the header (22, 32) comprising a plurality of slots; and a plurality of core tubes (11) (see paragraphs [0013]-[0014] and figures 1-2).

Claim 1 differs from D1 in that an air-to-air aftercooler (ATAAC) comprises: a plurality of core tubes, each of the plurality of core tubes having a flared end portion (hereinafter, difference 1); and a plurality of joint assemblies coupling each of the plurality of core tubes with the header, the each of plurality of joint assemblies comprising: an adapter comprising a first section threadedly engaged with one of the plurality of slots, a tapered section inserted inside the flared end portion of one of the plurality of core tubes, and a second section defined between the tapered section and the first section, a sleeve disposed around the one of the plurality of core tubes, the sleeve engaged with the flared end portion of the one of the plurality of core tubes, and a nut engaged with the sleeve and the second section of the adapter, wherein the engagement of the nut with the sleeve and the second section facilitates retention of the tapered section of the adapter within the flared end portion of the one of the

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plurality of core tubes (hereinafter, difference 2). However, D2 discloses a heat exchanger comprising a plurality of tubes (10), each of the plurality tubes (10) having a flared mouth (14), which corresponds to difference 1 (see column 3, lines 63-64, column 5, lines 16-21 and figure 3). In addition, relating to difference 2, D3 discloses a connector comprising: a connecting piece (2; adaptor) having a conical end portion (2b; tapered section) and an external thread (2a; second section); a coupling sleeve (3) disposed around a pipe (1; core tube), the coupling sleeve engaged with a flared pipe end (1a); and a nut (4) engaged with the coupling sleeve (3) and the external thread (2a; second section) of the connecting piece (2; adapter), wherein the engagement of the nut (4) with the coupling sleeve (3) and the external thread (2a; second section) facilitates retention of the conical end portion (2b; tapered section) of the connecting piece (2; adapter) within the flared pipe end (1a) of the pipe (1; core tube) (see column 2, line 20 - column 3, line 21 and figures 4-7), and the first section threadedly engaged with the plurality of slots is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill. Although D3, which is related to a pipe connection, is not exactly in the same technological field as D1 and D2, there is no reason to restrict its usefulness in one narrow, specific industry.

Accordingly, it would be obvious for a person skilled in the art to apply D3 including the pipe connection to D1 and D2 without difficulty to solve the subject proposed in the present invention. Therefore, claim 1 does not involve an inventive step under PCT Article 33(3).

1.2 Dependent Claims 2-4

The additional feature of claim 2 is identical to the feature of D3 in that an inner portion of the flared pipe end (1a) abuts an outer surface of the conical end portion (2b; tapered section) of the connecting piece (2; adapter) (see figure 7). Accordingly, claim 2 would have been obvious over D1 in view of D2, and further in view of D3. Therefore, claim 2 does not involve an inventive step under PCT Article 33(3).

The additional feature of claim 3, characterized in that the adapter further comprises a flange section defined between the first section and the second section, is merely a variation of the connecting piece (2; adaptor) in D3 (see figure 7). Accordingly, claim 3 would have been obvious over D1 in view of D2, and further in view of D3. Therefore, claim 3 does not involve an inventive step under PCT Article 33(3).

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The additional feature of claim 4, characterized in that the sleeve comprises a first portion engaged with the flared end portion and a second portion, the first portion having an outer diameter larger than an outer diameter of the second portion to define a first step between the first portion and the second portion, would be easily conceived from D3 considering that the coupling sleeve (3) has a stepped portion (see near the numeral 3b in figures 6-7). Accordingly, claim 4 would have been obvious over D1 in view of D2, and further in view of D3. Therefore, claim 4 does not involve an inventive step under PCT Article 33(3).

2. Industrial Applicability

Claims 1-4 have industrial applicability under PCT Article 33(4).