

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 170659-68162	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/US2018/043715	International filing date (<i>day/month/year</i>) 25 July 2018 (25.07.2018)	(Earliest) Priority Date (<i>day/month/year</i>) 29 August 2017 (29.08.2017)
Applicant CATERPILLAR INC.		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out 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))

b. This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. **Certain claims were found unsearchable** (See Box No. II)

3. **Unity of invention is lacking** (See Box No. III)

4. With regard to the **title**,

the text is approved as submitted by the applicant.

the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.

the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

a. the figure of the **drawings** to be published with the abstract is Figure No. 5

as suggested by the applicant.

as selected by this Authority, because the applicant failed to suggest a figure.

as selected by this Authority, because this figure better characterizes the invention.

b. none of the figures is to be published with the abstract.

A. CLASSIFICATION OF SUBJECT MATTER**F02B 29/04(2006.01)i, F28D 1/053(2006.01)i, F28F 9/10(2006.01)i, F28F 1/12(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F02B 29/04; F16L 19/065; F16L 25/00; F16L 33/18; F28F 9/02; F28D 1/053; F28F 9/10; F28F 1/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) & keywords: aftercooler, header, slot, core tube, flared end, adapter, tapered section, sleeve, nut

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2014-010673 A1 (ISUZU MOTORS LIMITED) 16 January 2014 See paragraphs [0013]-[0014] and figures 1-2.	1-4
Y	US 5348082 A (VELLUET et al.) 20 September 1994 See column 3, lines 63-64, column 5, lines 16-21 and figure 3.	1-4
Y	US 4735442 A (BURLI, KURT) 05 April 1988 See column 2, line 20 - column 3, line 21 and figures 4-7.	1-4
A	US 2004-0183303 A1 (WESTERMANN, PIRMIN) 23 September 2004 See paragraphs [0016]-[0018] and figure 2.	1-4
A	US 2010-0201124 A1 (DUQUETTE et al.) 12 August 2010 See paragraphs [0031]-[0033] and figures 1, 4	1-4

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

31 October 2018 (31.10.2018)

Date of mailing of the international search report

31 October 2018 (31.10.2018)

Name and mailing address of the ISA/KR

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2018/043715

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2014-010673 A1	16/01/2014	CN 104471342 A	25/03/2015
		CN 104471342 B	17/05/2017
		JP 2014-020588 A	03/02/2014
		JP 6011088 B2	19/10/2016
US 5348082 A	20/09/1994	BR 9301645 A	26/10/1993
		EP 0567410 A1	27/10/1993
		FR 2690515 A1	29/10/1993
		JP 06-129793 A	13/05/1994
		KR 10-1993-0022049 A	23/11/1993
		MX 9302405 A	31/05/1994
US 4735442 A	05/04/1988	EP 0219661 A1	29/04/1987
		EP 0219661 B1	27/03/1991
		IL 79876 A	15/01/1992
		JP 62-063296 A	19/03/1987
		KR 10-1994-0008640 B1	24/09/1994
		US 4809418 A	07/03/1989
US 2004-0183303 A1	23/09/2004	AT 321231 T	15/04/2006
		CN 1271361 C	23/08/2006
		CN 1510324 A	07/07/2004
		DE 20219884 U1	22/04/2004
		DK 1431645 T3	31/07/2006
		EP 1431645 A1	23/06/2004
		EP 1431645 B1	22/03/2006
		ES 2258179 T3	16/08/2006
		PT 1431645 E	30/06/2006
		US 7309085 B2	18/12/2007
US 2010-0201124 A1	12/08/2010	CA 2686084 A1	11/12/2008
		WO 2008-150469 A1	11/12/2008