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Published:

— with international search report (Art. 21(3))
— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) **Date of publication of the international search report:**

2 August 2012

(54) **Title:** ALUMINUM FIN AND TUBE HEAT EXCHANGER

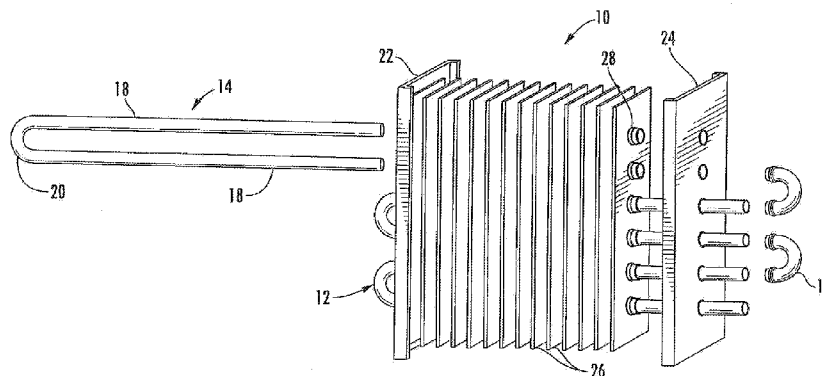


FIG. 1

(57) **Abstract:** A heat exchanger (10) is provided including at least one aluminum alloy tube (12) and a plurality of aluminum fins (26) arrayed on the aluminum alloy tube. The aluminum tube may be supported by tube sheets (24) made of aluminum alloy.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2011/044788

A. CLASSIFICATION OF SUBJECT MATTER
INV. F28F19/00 F28F1/32
ADD.

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)
F28D F28F

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

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

EP0-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005/155750 A1 (MITCHELL PAUL L [US] ET AL) 21 July 2005 (2005-07-21)	1-3
Y	paragraphs [0014] - [0019]; figures	4-11, 16-19
Y	----- EP 1 211 473 A2 (DENSO CORP [JP]) 5 June 2002 (2002-06-05) abstract paragraph [0033]	4
X	----- EP 2 184 549 A2 (MITSUBISHI ELECTRIC CORP [JP]) 12 May 2010 (2010-05-12)	1,2
Y	abstract	12-15
A	paragraphs [0024] - [0028]; figures 4,5	3,4
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Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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

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"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

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"&" document member of the same patent family

Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2011/044788

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP 1 887 304 A1 (BEHR GMBH & CO KG [DE]; FRAPE BEHR SA [ES]) 13 February 2008 (2008-02-13) the whole document	5-19
X	CA 1 164 450 A1 (KOBÉ STEEL LTD) 27 March 1984 (1984-03-27) the whole document	1,2
A		3,4
X	JP 57 097820 A (FUJII HEAVY IND LTD) 17 June 1982 (1982-06-17) abstract; figures	1
Y		2
A		3,4
Y	US 2008/041571 A1 (MINAMI KAZUHIKO [JP] ET AL) 21 February 2008 (2008-02-21) abstract	2
X	US 4 716 959 A (AOKI HISAO [JP]) 5 January 1988 (1988-01-05) the whole document	1
A		2-4
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2011/044788

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. ☒ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

1-19
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- ☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- ☒ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-4

Heat exchanger with specific choice of aluminium materials
for tube and fins

2. claims: 5-19

Heat exchanger with fins having interlocking collars

3. claims: 20, 21

Heat exchanger heving specific dimensions

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2011/044788

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