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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

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))*

[Continued on next page]

(54) Title: HEAT EXCHANGER

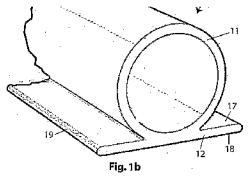


Fig. 1b

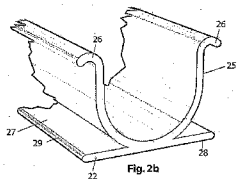


Fig. 2b

(57) Abstract: The invention relates to a heat exchanger which facilitates the transfer of heat from a heat transfer fluid flowing in a tube to a flat or curved surface and vice versa. One embodiment of the heat exchanger (1) comprises an integral piece of metal having at least one tube (11) with the or each of the tubes (11) integrally connected longitudinally to the top surface (17) of a bar (12) and with the bottom surface (18) of the bar (12) in good thermal contact with the flat or curved surface where heat is to be transferred onto from the heat transfer fluid flowing there through the or each of the tubes (11) of the heat exchanger (1). In another embodiment, the heat exchanger (2) comprises an integral piece of metal having at least a pair of wings (25), with the or each pair of wings (25) integrally connected longitudinally to the top surface (27) of a bar (22) and with the wings (25) rising from the top surface (27) of the bar (22), forming a substantially U- shaped channel (23) between each pair of wings (25). In this embodiment, a tube or a tubular electric heating element (10) may be circumferentially enclosed in a chamber (24) formed by pressing the pair of wings (25) towards one another when the tube or the tubular electric heating element (10) is placed in the substantially U-shaped channel (23). The heat exchanger of this invention can have numerous possible combinations of tubes and wings connected to the bars to transfer heat to or from a flat or curved surface.

WO 2009/008698 A3

WO 2009/008698 A3

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International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. F28D1/06 F28F1/16 F28F1/20 F28F21/08

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)
F28F F28D F24J

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 practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 498 373 A (LUGHAUSEN WERNER) 3 March 1970 (1970-03-03) figures 1,4	1-5,7,8
X	US 3 384 167 A (SIMON JAVKIN) 21 May 1968 (1968-05-21) column 1, lines 21-27, column 2, lines 11-12;figures 1-6	1-5,7-9
X	US 4 311 131 A (SABAT FARAMARZ M) 19 January 1982 (1982-01-19) column 3, lines 58-66;figure 7	1,10
X	US 5 960 869 A (TIPPMANN JOSEPH R [US] ET AL) 5 October 1999 (1999-10-05) column 2, lines 49-56;figures 1-3,16	1-5

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[X] Further documents are listed in the continuation of Box C.

[X] 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 document but published on or after the international filing date

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"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	Date of mailing of the international search report
12 December 2008	04/08/2009

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/MY2008/000068

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 518 791 A (SAUERMANN FRANZ [DE]) 30 March 2005 (2005-03-30) paragraph [0022]; figures 2,5	1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY2008/000068

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 allsearchable 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 reportcovers only those claims for which fees were paid, specifically claims Nos.:

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.:

see additional sheet(s)

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: 1-11, 23

Claims 1 to 11 and 23 are directed to a heat exchanger and the use thereof, the heat exchanger comprising a tube integrally connected to the top surface of a bar.

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2. claims: 12-22

Claims 12 to 22 are directed to heat exchanger comprising a pair of wings integrally connected to the top surface of a bar, the wings raising from the top surface of the bar forming a U-shape channel. Such a heat exchanger may not be provided with any tube for the passage of fluid. According to some dependent claims a tubular electric heating element may be here provided.

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3. claim: 24

Claim 24 is directed to a heat exchanger comprising an integral piece having a tube and a pair of wings raising from top surface, forming a U-shaped channel between each pair of wings.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/MY2008/000068

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