

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
26 April 2007 (26.04.2007)

PCT

(10) International Publication Number
WO 2007/045677 A1

(51) International Patent Classification:
F25B 39/02 (2006.01) *F28D 1/00* (2006.01)

(21) International Application Number:
PCT/EP2006/067576

(22) International Filing Date: 19 October 2006 (19.10.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
VE2005U000033 20 October 2005 (20.10.2005) IT

(71) Applicant (for all designated States except US): **I.R.C.A. S.p.A. - INDUSTRIA RESISTENZE CORAZZATE E AFFINI** [IT/IT]; Viale Venezia, 31, I-31020 San Vendemiano (IT).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **DAL COL, Ivano** [IT/IT]; Via F. Fabbri, 36/c, I-31050 Solighetto (IT). **TOR-MENA, Giosuè** [IT/IT]; C/o I.r.c.a. S.p.a. - Industria Resistenze Corazzate E Affini, Viale Venezia, 31, I-31020 San Vendemiano (IT). **PEROZZO, Gianangelo** [IT/IT]; Via Redentore, 8, I-31040 Pederobba (IT).

(74) Agent: **PIOVESANA, Paolo**; Via F. Baracca, 5/a, I-30173 Venezia Mestre (IT).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

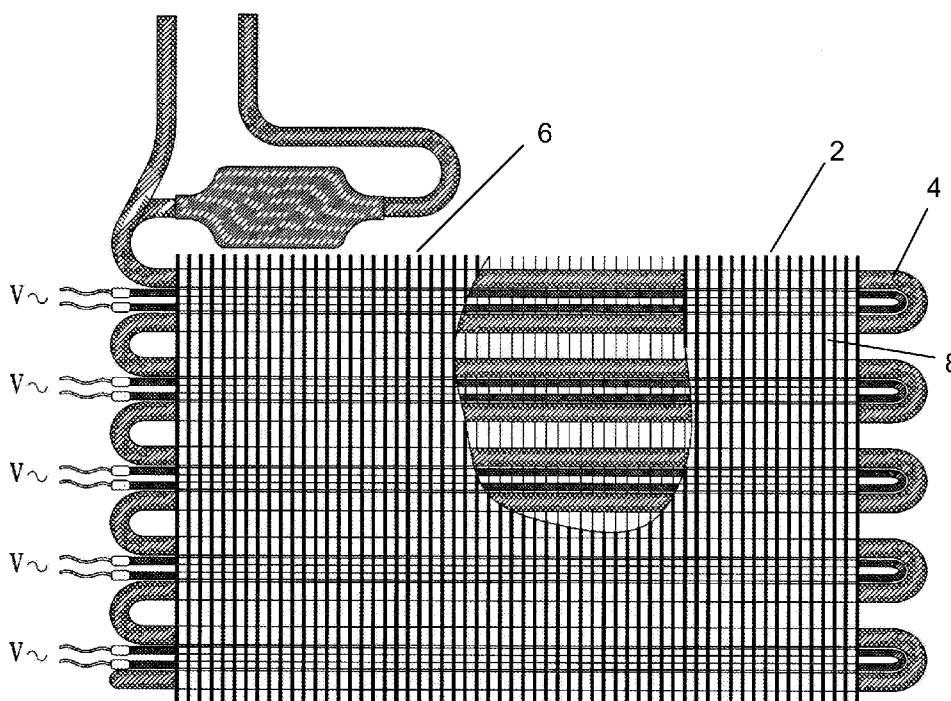
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: FINNED EVAPORATOR FOR REFRIGERATION PLANTS WHICH IS PROVIDED WITH A DEFROSTING DEVICE.



(57) Abstract: A finned evaporator for refrigeration plants comprising a serpentine tube (4) within which the refrigerant fluid passes, and a finned pack (6), characterised in that at least one resistance element (12) is inserted into the 5 pack and is supported by the fins (8) themselves.

WO 2007/045677 A1

FINNED EVAPORATOR FOR REFRIGERATION PLANTS WHICH IS PROVIDED WITH A DEFROSTING DEVICE

The present invention relates to a finned evaporator for refrigeration plants which is provided with a defrosting device.

5 The finned pack of refrigeration units is defrosted using heating elements which embrace the finned pack. Said heating elements consist of resistance elements which are activated at predetermined times, and/or are controlled by suitable control devices. In the case of excessive heat, a safety device ensures that the material housed in the refrigeration unit is preserved
10 by blocking activation of the heating elements.

These known devices present however certain drawbacks and in particular high energy consumption as the heating element has to operate for a certain time (20 min) in order to reach a predetermined temperature (about 120°C), with a considerable energy outlay, part of which is directed towards
15 the environment external to the evaporator and hence within the refrigeration system itself.

An object of the invention is to eliminate these drawbacks by providing a finned refrigerator evaporator comprising a defrosting device providing better heat transfer than those systems currently in use.

20 This and other objects which will be apparent from the ensuing description are attained according to the invention by a finned evaporator for refrigeration plants as claimed in claim 1.

The present invention is clarified hereinafter with reference to the accompanying drawings, in which:

25 Figure 1 is a side view of a refrigerator evaporator of bank type with a defrosting device of the invention,

Figure 2 is a cross-section therethrough, and
Figure 3 shows the heating element.

As can be seen from the figures, the device of the invention is inserted into a bank-type evaporator 2 consisting of a serpentine tube 4 through which the refrigerant fluid flows and which is inserted into a finned pack 6. The fins 8 which support the tube 4 are provided with axial holes 10 with their cross-sections longitudinally aligned to form a plurality of channels for the insertion of heating elements 12 consisting of a flexible conductor cable electrically insulated by a fluorocarbon resin and inserted into a U-bent aluminium sheath.

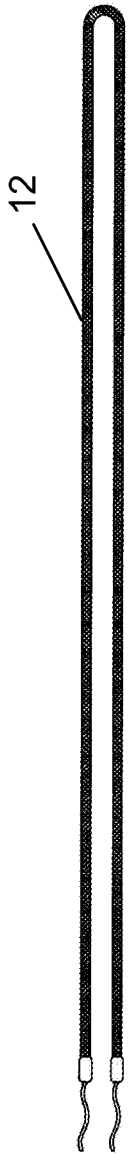
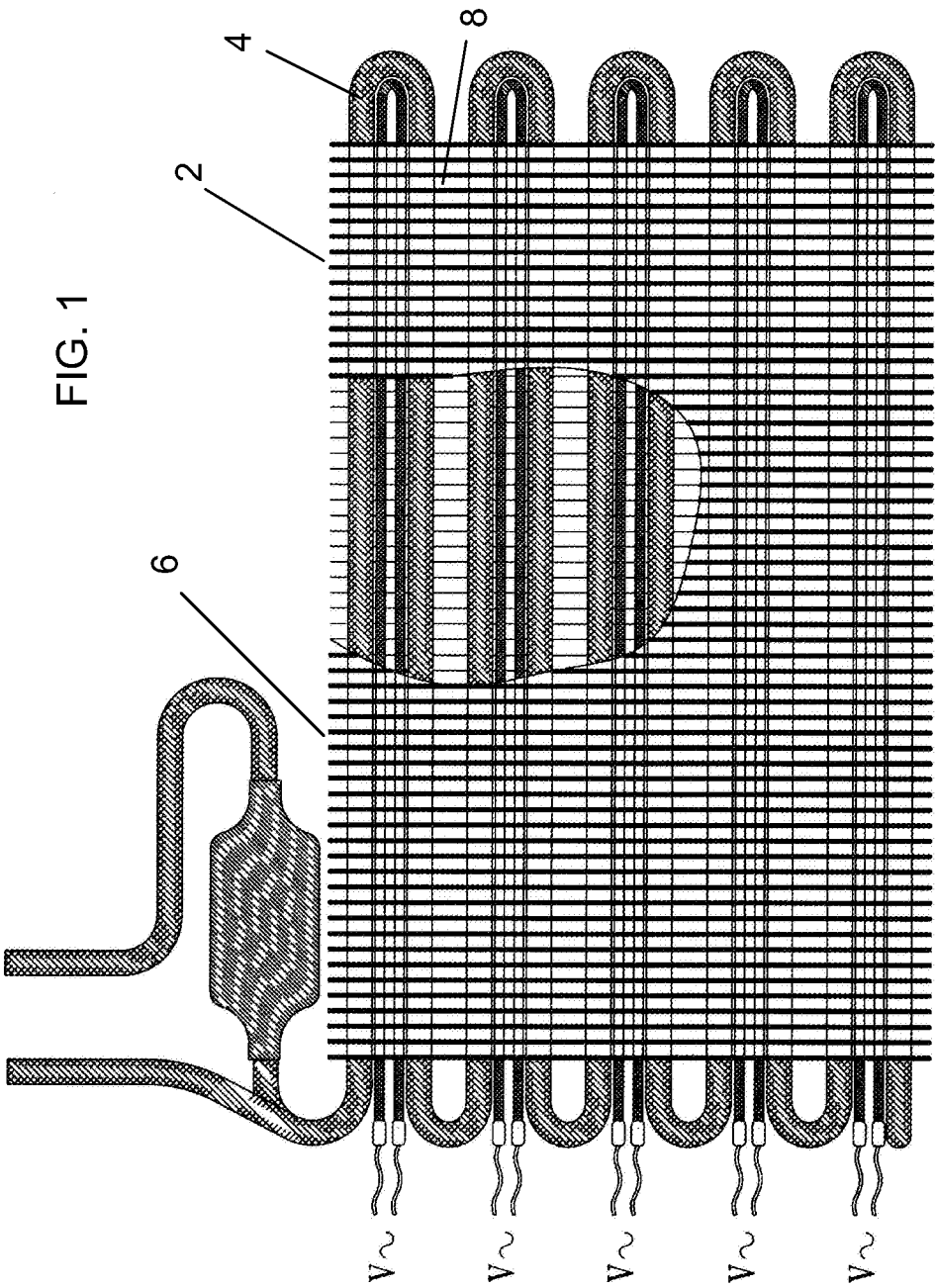
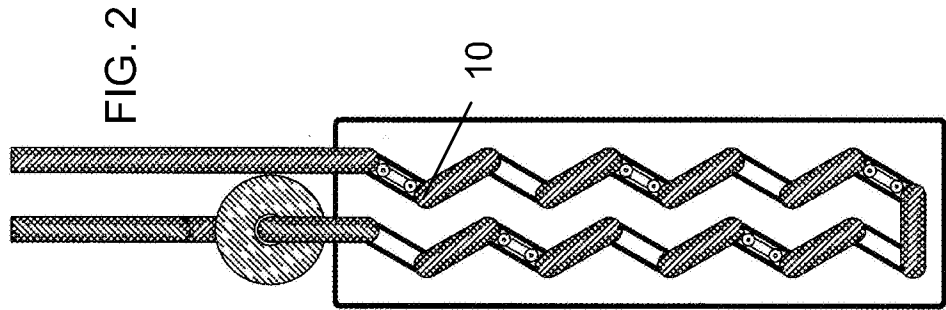
10 The heating elements 12 are disposed substantially parallel to the rectilinear portions of the tubes 4.

The expedient of inserting the heating element into the evaporator body ensures more reliable heat transfer towards those parts involved in ice formation and lesser heat dispersion outwards as in traditional evaporators with a wound resistance element.

15 The heating elements can also be dimensioned, configured and powered to deliver different energy patterns by supplying heat only where necessary, hence reducing energy wastage.

C L A I M S

1. A finned evaporator for refrigeration plants comprising a serpentine tube (4) within which the refrigerant fluid passes, and a finned pack (6), characterised in that at least one resistance element (12) is inserted into the
5 pack and is supported by the fins (8) themselves.
2. An evaporator as claimed in claim 1, characterised in that the fins are provided with slotted holes (10) through which the resistance element (12) is inserted.
3. An evaporator as claimed in claim 1, characterised in that the
10 resistance element (12) consists of a U-bent flexible tube, the arms of which are parallel to the arms of the serpentine tube (4).



INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2006/067576

A. CLASSIFICATION OF SUBJECT MATTER
INV. F25B39/02 F28D1/00

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)
F25B F28D F28F F24F

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	FR 1 422 987 A (M. JEAN EMILE LALAUZE) 3 January 1966 (1966-01-03) page 1, column 1, line 40 - page 2, column 1, line 28; figures 3-5 -----	1-3
X	DE 202 03 571 U1 (LINDE AG [DE]) 29 May 2002 (2002-05-29) page 2, line 9 - page 3, line 6; figures 2,3 -----	1-3
X	US 2002/023744 A1 (KIM KWANG-IL [KR] ET AL) 28 February 2002 (2002-02-28) paragraph [0060]; figure 13 -----	1-3
X	US 2 529 215 A (HICKE GERALD E) 7 November 1950 (1950-11-07) the whole document -----	1-3
	-/--	

☒ 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 document 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

22 January 2007

Date of mailing of the international search report

26/01/2007

Name and mailing address of the ISA/
European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Ritter, Christoph

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2006/067576

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 0 955 508 A2 (CARRIER CORP [US]) 10 November 1999 (1999-11-10) abstract; figure 5 -----	1-3
X	WO 03/099487 A (ARCELIK AS [TR]; KARATAS HAKAN [TR]) 4 December 2003 (2003-12-04) abstract; figure 2 -----	1-3
A	JP 61 240099 A (MATSUSHITA REFRIGERATION) 25 October 1986 (1986-10-25) abstract -----	1-3
A	JP 61 191892 A (MATSUSHITA REFRIGERATION) 26 August 1986 (1986-08-26) abstract -----	1-3
A	JP 63 180091 A (MATSUSHITA REFRIGERATION) 25 July 1988 (1988-07-25) abstract -----	1-3

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2006/067576

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
FR 1422987	A	03-01-1966	NONE	
DE 20203571	U1	29-05-2002	EP 1342966 A1	10-09-2003
US 2002023744	A1	28-02-2002	NONE	
US 2529215	A	07-11-1950	NONE	
EP 0955508	A2	10-11-1999	US 6298680 B1	09-10-2001
WO 03099487	A	04-12-2003	AU 2003241263 A1 TR 200402804 T2	12-12-2003 21-04-2005
JP 61240099	A	25-10-1986	NONE	
JP 61191892	A	26-08-1986	NONE	
JP 63180091	A	25-07-1988	NONE	