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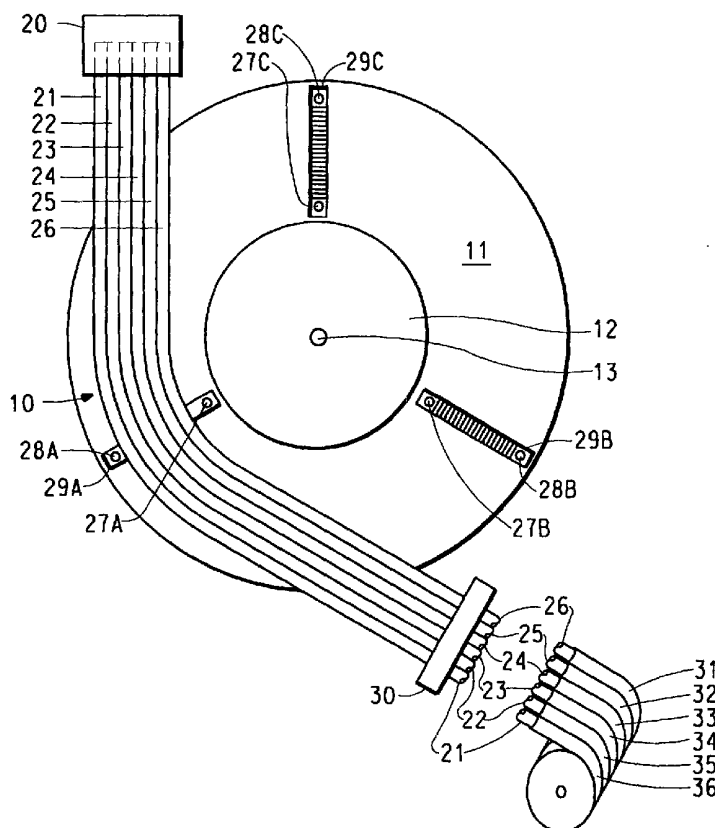
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(54) Title: HEAT EXCHANGER MADE FROM BENDABLE PLASTIC TUBING



(57) Abstract: A plastic tube heat exchanger suitable for refrigerant use is provided by wrapping a layer of tubes (10) around a curved surface (12), on a base (11) which is generally perpendicular to the surface (12). Several to many tubes (10) can be in each layer. Then, further layers can be wrapped continuously by overlaying the first layer. Heat exchangers, including refrigerant apparatus, condensers and evaporators, can be made in this configuration. Processes and articles of manufacture are parts of the invention.



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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.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/CA 01/01291A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F28F21/06 F28D1/047

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)
IPC 7 F28F B23B C08G C09K F28D B29C

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, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 98 10927 A (DU PONT CANADA) 19 March 1998 (1998-03-19) page 5, line 4 -page 8, line 19; claims 1,8,10,12	1-3
Y	US 5 997 765 A (FURUTA MOTONOBU ET AL) 7 December 1999 (1999-12-07) cited in the application claims 1,2	1-3
A	WO 00 43722 A (CESARONI ANTHONY JOSEPH ;CESARONI TECH INC (CA); MAGNETI MARELLI C) 27 July 2000 (2000-07-27) page 3, line 37 -page 8, line 18	1
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 Further documents are listed in the continuation of box C. Patent family members are listed in 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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"P" document published prior to the international filing date but later than the priority date claimed

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 00 53991 A (CESARONI ANTHONY JOSEPH ;CESARONI TECH INC (CA)) 14 September 2000 (2000-09-14) page 2, line 17 -page 5, line 44 ---	1
A	WO 99 52978 A (DU PONT) 21 October 1999 (1999-10-21) abstract ---	1
A	US 5 262 473 A (COTTIS STEVE ET AL) 16 November 1993 (1993-11-16) abstract ---	1
A	US 4 605 059 A (PAGE MICHAEL J) 12 August 1986 (1986-08-12) column 3, line 59 -column 4, line 48; figures ---	4,21
A	US 5 109 920 A (MERRYFULL ALBERT E) 5 May 1992 (1992-05-05) column 5, line 9 -column 6, line 39; figures 1-7 ---	4,21
A	US 4 313 491 A (MOLITOR VICTOR D) 2 February 1982 (1982-02-02) column 3 -column 4, line 36; figures 1,2 ---	4,21
A	US 4 981 171 A (TIPPMANN ROBERT T) 1 January 1991 (1991-01-01) column 3, line 46 -column 4, line 43; figures -----	4,21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/CA 01/01291

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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 II Observations where unity of invention is lacking (Continuation of item 2 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 fee, this Authority did not invite payment of any additional fee.

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.:

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.
- 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: 1-3

Heat exchanger with a layered plastic tube

2. Claims: 4-32

Heat exchanger with plastic tubes wound in layers around a closed surface

INTERNATIONAL SEARCH REPORT

International Application No

PCT/CA 01/01291

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9810927	A	19-03-1998	WO 9810927 A1 EP 0925182 A1 JP 2001500242 T	19-03-1998 30-06-1999 09-01-2001
US 5997765	A	07-12-1999	JP 10060236 A JP 10087967 A JP 10101909 A JP 10158493 A CN 1167127 A DE 69712551 D1 EP 0790279 A2 JP 9286907 A TW 459037 B JP 10081810 A	03-03-1998 07-04-1998 21-04-1998 16-06-1998 10-12-1997 20-06-2002 20-08-1997 04-11-1997 11-10-2001 31-03-1998
WO 0043722	A	27-07-2000	WO 0043722 A1 EP 1147356 A1 US 6364008 B1	27-07-2000 24-10-2001 02-04-2002
WO 0053991	A	14-09-2000	WO 0053991 A1 EP 1159575 A1	14-09-2000 05-12-2001
WO 9952978	A	21-10-1999	CA 2327674 A1 CN 1296508 T EP 1068264 A1 JP 2002511513 T WO 9952978 A1 US 6294618 B1 US 2002013424 A1	21-10-1999 23-05-2001 17-01-2001 16-04-2002 21-10-1999 25-09-2001 31-01-2002
US 5262473	A	16-11-1993	IT 1280028 B1	23-12-1997
US 4605059	A	12-08-1986	DE 3466061 D1 EP 0146817 A2	15-10-1987 03-07-1985
US 5109920	A	05-05-1992	AT 127072 T AU 614087 B2 AU 1800388 A WO 8809261 A1 CA 1318663 A1 DE 3854399 D1 DE 3854399 T2 EP 0485373 A1 HU 207814 B JP 3022407 B2 JP 10170171 A JP 2704988 B2 JP 3501103 T NZ 224777 A	15-09-1995 22-08-1991 21-12-1988 01-12-1988 01-06-1993 05-10-1995 23-05-1996 20-05-1992 28-06-1993 21-03-2000 26-06-1998 26-01-1998 14-03-1991 26-10-1990
US 4313491	A	02-02-1982	WO 8505576 A1 US 4529032 A	19-12-1985 16-07-1985
US 4981171	A	01-01-1991	NONE	