



(11)

EP 1 388 720 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3:
13.09.2006 Bulletin 2006/37

(51) Int Cl.:
F28D 7/10 (2006.01)

(43) Date of publication A2:
11.02.2004 Bulletin 2004/07

(21) Application number: **03018139.0**

(22) Date of filing: **08.08.2003**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PT RO SE SI SK TR**
Designated Extension States:
AL LT LV MK

(30) Priority: **08.08.2002 JP 2002230780**
08.08.2002 JP 2002230779

(71) Applicant: **MAHLE Filter Systems Japan
Corporation
Toshima-ku
Tokyo (JP)**

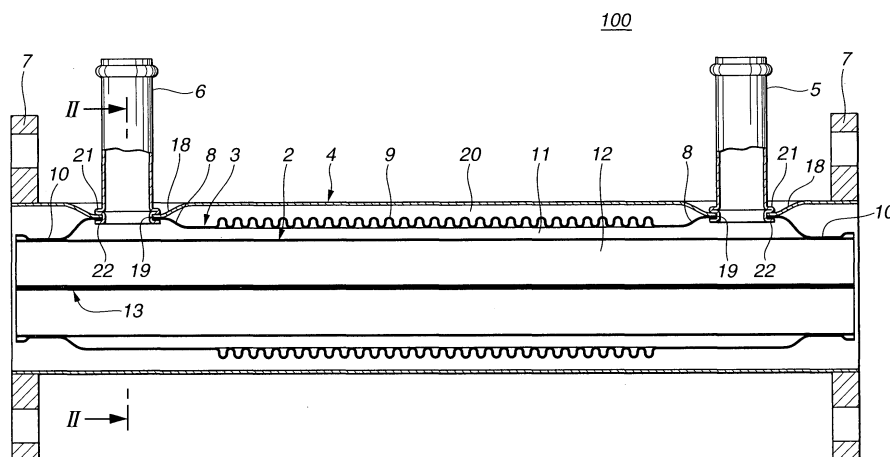
(72) Inventors:
• **Sakurai, Tokuhisa**
Fujimi-shi,
Saitama 354-0032 (JP)
• **Isoda, Katsuhiro**
Sayama-shi,
Saitama 350-1332 (JP)

(74) Representative: **Grünecker, Kinkeldey,
Stockmair & Schwanhäusser
Anwaltssozietät
Maximilianstrasse 58
80538 München (DE)**

(54) Triple-tube type heat exchanger and method of producing same

(57) Outer (4), middle (3) and inner (2) tubes are arranged to define between the outer (4) and middle (3) tubes a first cylindrical space (20) and between the middle (3) and inner (2) tubes a second cylindrical space (11). The inner tube (2) has a third cylindrical space (12) defined therein. Radially depressed two portions (18) of the outer tube (4) are respectively mated with radially raised two portions (8) of the middle tube (3) so that openings (19) formed in the radially depressed two portions (8,18) are merged with openings formed in the radially raised two portions respectively. Inlet and outlet pipes (5,6) are inserted at their base ends into the merged openings (19) of the radially depressed and raised portions (8,18) to connect with the second cylindrical space (11), and the base ends (22) are caulked to peripheral edges of the merged openings. Diametrically reduced end portions of the middle tube (3) intimately contact and hold axially spaced end portions of the inner tube (2), so that the second cylindrical space has an isolated part which is defined between the diametrically reduced end portions and communicated with only the input and output pipes (5,6).

FIG.1



100

EP 1 388 720 A3



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 01 8139

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	DE 35 15 830 A1 (GERCKEN, KARL) 6 November 1986 (1986-11-06) * page 11 - page 12, paragraph 1; figures 3,4 *	1-3,12, 13,15,16 14,17,19	INV. F28D7/10
Y	----- PATENT ABSTRACTS OF JAPAN vol. 015, no. 081 (M-1086), 25 February 1991 (1991-02-25) -& JP 02 301616 A (CALSONIC CORP), 13 December 1990 (1990-12-13) * abstract; figures *	1-3,12, 13,15,16	
A	----- PATENT ABSTRACTS OF JAPAN vol. 1996, no. 06, 28 June 1996 (1996-06-28) -& JP 08 049534 A (YANMAR DIESEL ENGINE CO LTD), 20 February 1996 (1996-02-20) * abstract; figures *	1,16	
A	----- PATENT ABSTRACTS OF JAPAN vol. 1995, no. 01, 28 February 1995 (1995-02-28) -& JP 06 280565 A (NIPPONDENSO CO LTD), 4 October 1994 (1994-10-04) * abstract; figures *	1	TECHNICAL FIELDS SEARCHED (IPC) F28D F28F F02M
A	----- PATENT ABSTRACTS OF JAPAN vol. 015, no. 182 (M-1111), 10 May 1991 (1991-05-10) -& JP 03 043653 A (NIPPONDENSO CO LTD), 25 February 1991 (1991-02-25) * abstract; figures *	1	
A	----- FR 1 162 651 A (MODINE MANUFACTURING COMPANY) 16 September 1958 (1958-09-16) * the whole document *	1	
	----- -/--		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 8 August 2006	Examiner Van Dooren, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- & : member of the same patent family, corresponding document	

2
EPO FORM 1503 03.82 (P04C01)



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 01 8139

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 3 889 746 A (LAFFRANCHI ET AL) 17 June 1975 (1975-06-17) * abstract; figures *	1	
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 02, 29 February 2000 (2000-02-29) -& JP 11 315721 A (TOYO RADIATOR CO LTD), 16 November 1999 (1999-11-16) * abstract; figures *	1	
A	WO 01/63197 A (YOO-O T & C CORPORATION LIMITED; CHOI, YEON, MOOK) 30 August 2001 (2001-08-30) * abstract; figures *	4-11,18	
A	US 2 929 408 A (WEATHERWAX KENNETH A ET AL) 22 March 1960 (1960-03-22) * the whole document *	4-11,18	
			TECHNICAL FIELDS SEARCHED (IPC)
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 8 August 2006	Examiner Van Dooren, M
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document</p>			

2
EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 03 01 8139

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

08-08-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 3515830 A1	06-11-1986	NONE	
JP 02301616 A	13-12-1990	JP 2875281 B2	31-03-1999
JP 08049534 A	20-02-1996	JP 3333638 B2	15-10-2002
JP 06280565 A	04-10-1994	JP 3227876 B2	12-11-2001
JP 03043653 A	25-02-1991	NONE	
FR 1162651 A	16-09-1958	NONE	
US 3889746 A	17-06-1975	NONE	
JP 11315721 A	16-11-1999	NONE	
WO 0163197 A	30-08-2001	AU 6185100 A KR 2000024564 A	03-09-2001 06-05-2000
US 2929408 A	22-03-1960	NONE	