



(12) **EUROPEAN PATENT APPLICATION**

(88) Date of publication A3:
11.04.2018 Bulletin 2018/15

(51) Int Cl.:
F28D 9/00 (2006.01) **F04D 29/58 (2006.01)**
F28F 3/08 (2006.01)

(43) Date of publication A2:
07.08.2013 Bulletin 2013/32

(21) Application number: **13151567.8**

(22) Date of filing: **17.01.2013**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

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(30) Priority: **31.01.2012 JP 2012018128**

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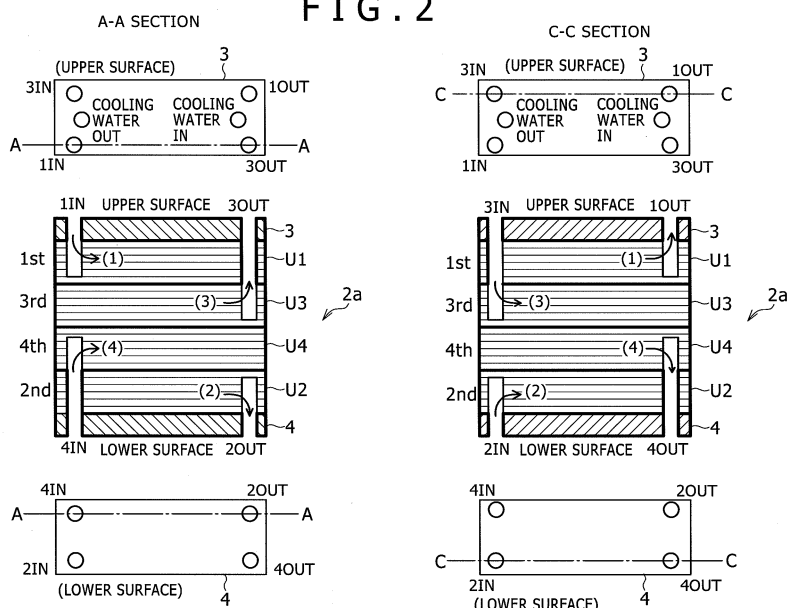
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(54) **Multilayer heat exchanger and heat exchange system**

(57) In a multilayer heat exchanger of the present invention, a plurality of heat exchange units for performing heat exchange of a fluid fed from a plurality of compressors is stacked. Each of the heat exchange units has a structure that pluralities of flow passage plates and cooling plates are stacked. Concave grooves formed on surfaces are formed as flow passages of the fluid in the

flow passage plates and cooling plates. The flow passage plates and cooling plates are made of metal, the flow passages are formed by chemical etching, and the stacked metal flow passage plates and cooling plates are bonded to each other by diffusion-bonding. Further, each of the heat exchange units is in one-to-one correspondence with each of the compressors.

FIG. 2





EUROPEAN SEARCH REPORT

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EP 13 15 1567

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2007/125527 A1 (FLIK MARKUS [DE] ET AL) 7 June 2007 (2007-06-07)	1-5	INV. F28D9/00 F04D29/58 F28F3/08
Y	* page 1, paragraphs 2, 14; figure 1 *	6	
X,D	JP 2000 283668 A (EBARA CORP) 13 October 2000 (2000-10-13)	1-5	
Y	* figures 1, 2 *	6	
Y	US 5 137 558 A (AGRAWAL RAKESH [US]) 11 August 1992 (1992-08-11) * figure 2 *	6	
A	WO 2011/139425 A2 (CARRIER CORP) 10 November 2011 (2011-11-10) * figure 2 *	1-6	
			TECHNICAL FIELDS SEARCHED (IPC)
			F28D F04D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 March 2018	Examiner Delaitre, Maxime
<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>			

EPO FORM 1503 03.02 (P04C01)

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

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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02-03-2018

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007125527 A1	07-06-2007	BR PI0411930 A	15-08-2006
		CN 1813164 A	02-08-2006
		DE 10328746 A1	13-01-2005
		EP 1642076 A1	05-04-2006
		JP 2007506928 A	22-03-2007
		MX PA05014018 A	17-03-2006
		US 2007125527 A1	07-06-2007
		WO 2004113815 A1	29-12-2004

JP 2000283668 A	13-10-2000	JP 4030219 B2	09-01-2008
		JP 2000283668 A	13-10-2000

US 5137558 A	11-08-1992	FR 2675890 A1	30-10-1992
		JP 2675715 B2	12-11-1997
		JP H05149677 A	15-06-1993
		US 5137558 A	11-08-1992

WO 2011139425 A2	10-11-2011	CN 103124885 A	29-05-2013
		EP 2564130 A2	06-03-2013
		HK 1185654 A1	23-12-2016
		SG 184789 A1	29-11-2012
		US 2013031934 A1	07-02-2013
		WO 2011139425 A2	10-11-2011
