(11) EP 2 241 848 A3

(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3: **25.05.2011 Bulletin 2011/21**

(51) Int Cl.: F28B 1/02 (2006.01) F28D 7/06 (2006.01)

F28B 9/08 (2006.01)

(43) Date of publication A2: **20.10.2010 Bulletin 2010/42**

(21) Application number: 10154807.1

(22) Date of filing: 26.02.2010

(84) Designated Contracting States:

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 SE SI SK SM TR

Designated Extension States:

AL BA RS

(30) Priority: 15.04.2009 JP 2009099386

(71) Applicant: TLV Co., Ltd. Kakogawa-shi, Hyogo 675-8511 (JP)

(72) Inventor: Fujiwara, Yoshiyasu Kakogawa-shi Hyogo 675-0102 (JP)

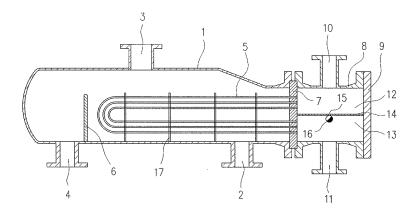
(74) Representative: Hatzmann, Martin Vereenigde Johan de Wittlaan 7 2517 JR Den Haag (NL)

(54) Heat exchanger

(57) A heat exchanger is provided in which steam locking is prevent and which allows steam condensate generated in heat transfer tubes to quickly flow down into a condensate outlet chamber. The heat exchanger includes a shell (1) in which a plurality of heat transfer tubes (5) are disposed. The shell (1) has an inlet (2) for fluid to be heated through which fluid to be heated flows in and an outlet (3) for heated fluid through which heated fluid flows out. The heat transfer tubes (5) are penetratingly fixed, at their ends, to a tube plate (7). The tube plate (7) has an end face covered by partition chamber cases (8) and (9) provided with a top steam inlet (10) through which steam flows in and a bottom condensate outlet (11)

through which condensate flows out. The tube plate (7) and the partition chamber cases (8) and (9) form, between them, a partition chamber having a partition plate (14) partitioning the partition chamber into a steam inlet chamber (12) having the steam inlet (10) and a condensate outlet chamber (13) having the condensate outlet (11). The partition plate (14) has an opening (15) through which the steam inlet chamber (12) and the condensate outlet chamber (13) are communicated with each other, and a steam trap (16) for draining steam condensate from the steam inlet chamber (12) into the condensate outlet chamber (13) is connected to the opening (15) of the partition plate (14).

Fig. 1





EUROPEAN SEARCH REPORT

Application Number EP 10 15 4807

Category	Citation of document with ind of relevant passa		Relevan to claim		
Y,D	JP 5 034084 A (ONODA ENG) 9 February 1993 * abstract; figures		1	INV. F28B1/02 F28B9/08 F28D7/06	
Υ	JP 9 089486 A (HISAI 4 April 1997 (1997-0 * abstract; figures	04-04)	1	12357733	
Α	US 2007/137706 A1 (SAL STAMATAKIS E MICH 21 June 2007 (2007-0 * paragraph [0001] -	06-21)	1		
А	6 January 1981 (1983	DHULL JR IVAN D ET AL) L-01-06) - column 4, line 35;	1		
А	US 4 141 410 A (TAK/ 27 February 1979 (19 * column 2, line 13 figures 1,2 *	ADA MASAHURA) 979-02-27) - column 4, line 29;	1	TECHNICAL FIELDS SEARCHED (IPC) F28B F28D	
А	13 July 1982 (1982-0	TTTEK FRIEDRICH ET AL) 07-13) - column 3, line 32;	1	1200	
A	JP 10 002493 A (TLV 6 January 1998 (1998 * abstract; figure 3	3-01-06)	1		
А	DE 11 80 544 B (GERI 29 October 1964 (196 * column 1, line 1 figures 2-4 *	54-10-29)	1		
		-/			
	The present search report has be	•			
Place of search The Hague		Date of completion of the search 20 April 2011	В	Examiner eltzung, Francis	
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		L : document cited	ocument, but pu ate I in the applicati for other reaso	ublished on, or on	
		& : member of the s	& : member of the same patent family, corresponding document		



EUROPEAN SEARCH REPORT

Application Number EP 10 15 4807

	DOCUMENTS CONSIDERE			
Category	Citation of document with indicat of relevant passages	ion, where appropriate,	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Α	EP 0 473 888 A1 (FREUD 11 March 1992 (1992-03 * column 3, line 4 - c figures 1-3 *	-11)	1	
A	JP 7 218180 A (ISHIKAW IND) 18 August 1995 (1 * abstract; figures 1-	1		
A	US 5 009 079 A (ZINSME 23 April 1991 (1991-04 * column 2, line 63 - figures 1-3 *	1		
A	JP 56 107198 U (UNKNOW 20 August 1981 (1981-0 * figures 1-5 *		1	
				TECHNICAL FIELDS SEARCHED (IPC)
	The present search report has been	drawn up for all claims Date of completion of the search	1	Examiner
The Hague		20 April 2011	Be1	tzung, Francis
X : part Y : part docu	ATEGORY OF CITED DOCUMENTS icularly relevant if taken alone icularly relevant if combined with another iment of the same category inological background	T : theory or princip E : earlier patent do after the filing da D : document cited i L : document cited f	cument, but publiste n the application or other reasons	

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

EP 10 15 4807

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.

20-04-2011

	atent document d in search report		Publication date		Patent family member(s)	Publication date
JP	5034084	Α	09-02-1993	NONE		'
JP	9089486	Α	04-04-1997	NONE		
US	2007137706	A1	21-06-2007	NONE		
US	4243094	Α	06-01-1981	NONE		
US	4141410	A	27-02-1979	BE DE FR GB IT NL	853753 A1 2717543 A1 2348725 A1 1572471 A 1080363 B 7704291 A	16-08-1977 03-11-1977 18-11-1977 30-07-1980 16-05-1985 24-10-1977
US	4339075	A	13-07-1982	AU BE BR CA DE ES FI FR GB HU JP JP NL SE ZA	6655981 A 887165 A1 8100343 A 1149703 A1 3002294 A1 8204121 A1 803764 A 2474140 A1 2067741 A 183289 B 1170637 B 1590332 C 2015760 B 56150697 A 8100125 A 8008720 A 8100431 A	30-07-1981 14-05-1981 11-08-1981 12-07-1983 30-07-1981 16-07-1982 24-07-1981 24-07-1981 28-04-1984 03-06-1987 30-11-1990 13-04-1990 21-11-1981 17-08-1981 24-07-1981 31-03-1982
JP	10002493	Α	06-01-1998	NONE		
DE	1180544	В	29-10-1964	NONE		
EP	0473888	A1	11-03-1992	DE JP US	4027835 A1 4227442 A 5141048 A	05-03-1992 17-08-1992 25-08-1992
JP	7218180	Α	18-08-1995	NONE		
US	5009079	Α	23-04-1991	AR AU BR	244875 A1 6840590 A 9006594 A	30-11-1993 04-07-1991 01-10-1991

FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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

EP 10 15 4807

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.

20-04-2011

Patent document cited in search report		Publication date		Patent family member(s)	Publication date
US 5009079	Α		EP JP MX	0435814 A2 4270865 A 165565 B	03-07-1991 28-09-1992 23-11-1992
JP 56107198	U	20-08-1981	NONE		

 $\stackrel{ ext{O}}{ ext{dil}}$ For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

FORM P0459