(12)

EUROPEAN PATENT APPLICATION

(88) Date of publication A3: 13.02.2008 Bulletin 2008/07

(51) Int Cl.: F25D 7/00 (2006.01)

F25D 3/10 (2006.01)

(43) Date of publication A2: **24.05.2006 Bulletin 2006/21**

(21) Application number: 05025113.1

(22) Date of filing: 17.11.2005

(84) Designated Contracting States:

AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

Designated Extension States:

AL BA HR MK YU

(30) Priority: 17.11.2004 DE 102004055526

(71) Applicants:

 Air Liquide Deutschland GmbH 40235 Düsseldorf (DE)
 Designated Contracting States:

DE

 L'AIR LIQUIDE, Société Anonyme pour l'Etude et l'Exploitation des Procédés Georges Claude 75007 Paris (FR)

Designated Contracting States:

AT BE BG CH CY CZ DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR

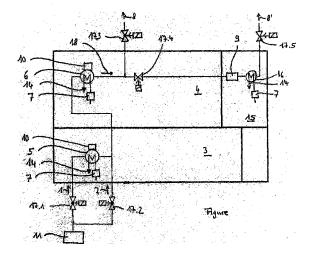
(72) Inventor: Lürken, Franz 47906 Kempen (DE)

(74) Representative: Kahlhöfer, Hermann
Patentanwälte
Kahlhöfer Neumann
Herzog Fiesser
Karlstrasse 76
40210 Düsseldorf (DE)

(54) Cooling process and cooling apparatus for refrigerated vehicles

The invention relates to a cooling process for cooling at least one refrigeration chamber (3, 4) of a refrigerated vehicle, having at least one first heat exchanger (5) in a first refrigeration chamber (3), and at least one second heat exchanger (6), the first heat exchanger (5) being flow-connected to the second heat exchanger (6), and a first stream of coolant (1), in particular of liquid and/or gaseous nitrogen, flowing firstly through the first heat exchanger (5) and then through the second heat exchanger (6), the first stream of coolant (1) releasing a refrigeration content to the refrigeration chambers (3, 4) and then itself being discharged into the open air as a waste gas, in which process a second stream of coolant (2), in particular liquid and/or gaseous nitrogen, is fed to the first stream of coolant (I) downstream of the first heat exchanger (5) and upstream of the second heat exchanger (6), and to a cooling apparatus which is suitable for carrying out the process according to the invention. The invention is distinguished by the fact that it realizes operationally safe and reliable, accurately controllable, indirect, highly effiaent cooling in

a simple way, which can be used in particular in refrigerated vehicles, even in the event of extreme fluctuations in the outside temperature.





EUROPEAN SEARCH REPORT

Application Number

EP 05 02 5113

	OCUMENTS CONSIDER		77111	Dolous	OL ADDIELOATION OF THE
Category	Citation of document with indic of relevant passage			Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 267 443 A (ROEHF AL) 7 December 1993 (* column 1, line 61 - * column 2, line 54 - * column 4, line 51 - * column 7, line 35 - * column 10, line 7 - * figure 3 *	(1993-12-07) - column 2, line - column 3, line - column 7, line - column 7, line	10 * 29 * 11 * 48 *	1-4,6,7, 9-11,13	
Υ				5,8,12	
Υ	US 3 959 982 A (DENIS AL) 1 June 1976 (1976 * column 2, line 45 - * figure 2 *	5-06-01)		5,12	
Y	US 4 862 698 A (MORGA 5 September 1989 (198 * column 1, line 23 - * column 2, line 37 -	39-09-05) - column 1, line	30 *	8	
Х	US 3 705 500 A (JEHLE 12 December 1972 (197 * column 7, line 38 - * figure 2 *	72-12-12)		1-4,9-11	TECHNICAL FIELDS SEARCHED (IPC) F25D B60P
A	riguic L			5-8,12, 13	F17C B60H F25B
Α	US 2002/174666 A1 (VI AL) 28 November 2002 * paragraphs [0046] - * figure 7 *	(2002-11-28)	US] ET	1-13	1200
Α	US 2002/129613 A1 (VI AL) 19 September 2002 * paragraphs [0031], * figure 5 *	2 (2002-09-19)	US] ET	1-13	
	The present search report has bee	-/ en drawn up for all claims			
	Place of search	Date of completion of the	ne search		Examiner
	The Hague	4 January	2008	COR	REIA DOS REIS, I
X : part Y : part docu A : tech	ATEGORY OF CITED DOCUMENTS icularly relevant if taken alone icularly relevant if combined with another iment of the same category nological background	E : earlie after i D : docu L : docui	er patent docu the filing date ment cited in ment cited for	the application other reasons	hed on, or
	-written disclosure mediate document	& : mem docui		ne patent family,	corresponding



EUROPEAN SEARCH REPORT

Application Number EP 05 02 5113

DOCUMENTS CONSIDERED TO BE RELEVANT Citation of document with indication, where appropriate, Relevant CLASSIFICATION OF THE APPLICATION (IPC) Category of relevant passages to claim US 5 396 777 A (MARTIN PATRICK S [US]) 14 March 1995 (1995-03-14) Α 1,6,7,9, 13 * the whole document * EP 0 038 673 A (UNION CARBIDE CORP [US]) 28 October 1981 (1981-10-28) * page 2, line 24 - page 3, line 3 * Α 1,5,12 Α WO 01/53764 A (PEDOLSKY HOWARD [US]) 1,9 26 July 2001 (2001-07-26) * abstract * * figure 1 * TECHNICAL FIELDS SEARCHED (IPC) The present search report has been drawn up for all claims 3

The Hague CATEGORY OF CITED DOCUMENTS

Place of search

- 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

Examiner

CORREIA DOS REIS, I

- & : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

Date of completion of the search

4 January 2008

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

EP 05 02 5113

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.

04-01-2008

Patent document cited in search report			Publication date		Publicatio date	
US	5267443	A	07-12-1993	CA EP JP MX	2110098 A1 0599626 A1 6235561 A 9307302 A1	28-05-1 01-06-1 23-08-1 31-05-1
US	3959982	Α	01-06-1976	NONE		
US	4862698	А	05-09-1989	CA DE DE EP ES JP JP JP	1335944 C 68910203 D1 68910203 T2 0350428 A2 2045534 T3 1954422 C 2054139 A 6078963 B 166592 B	20-06-1 02-12-1 28-04-1 10-01-1 16-01-1 28-07-1 23-02-1 05-10-1 20-01-1
US	3705500	Α	12-12-1972	NONE		
US	2002174666	A1	28-11-2002	DE	10223161 A1	16-01-2
US	2002129613	A1	19-09-2002	NONE		
US	5396777	Α	14-03-1995	NONE		
EP	0038673	А	28-10-1981	AU AU BR CA DE ES JP US	537376 B2 6964481 A 8102274 A 1146464 A1 3166678 D1 8204148 A1 8204624 A1 56164299 A 4296610 A	21-06-1 22-10-1 24-11-1 17-05-1 22-11-1 16-07-1 16-08-1 17-12-1 27-10-1
WO	0153764	Α	26-07-2001	AT DE EP RU UA US	345476 T 60124502 T2 1252471 A1 2228495 C1 72306 C2 6345509 B1	15-12-2 15-03-2 30-10-2 10-05-2 16-09-2 12-02-2