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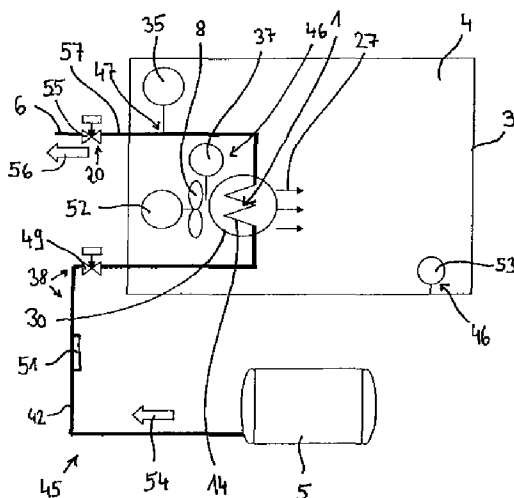
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(54) Title: METHOD FOR MONITORING THE GAS TIGHTNESS OF A COOLING SYSTEM FOR A REFRIGERATED VE-
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(57) Abstract: The invention relates to a method for monitoring the gas tightness of a cooling system (45) for a refrigerated vehicle (2) comprising the following steps: recording of a chronological temperature sequence at least at a first point (46) in the cooling system (45) and the determination of any change in the temperature at the first point (46) within a first time interval and comparison of the change with a first reference value and the triggering of a first warning signal in the event that the change exceeds the first reference value. The invention also relates to a method for operating a cooling system, a cooling system and a refrigerated vehicle, in conjunction with which use is made of the method according to the invention. The invention is characterized by high operating safety, operating reliability and economic viability.

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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 983 657 A (MURATA YOSHINORI [JP] ET AL) 16 November 1999 (1999-11-16) column 3, line 52 - column 4, line 3 column 5, line 11 - column 5, line 63 column 6, line 31 - column 6, line 58 figures 1-4	1,2,4,5, 11,12,14
Y		3,7-10, 13,15-18
Y	EP 1 270 292 A (BEHR GMBH & CO [DE] BEHR GMBH & CO KG [DE]) 2 January 2003 (2003-01-02) paragraph [0002] paragraph [0006] - paragraph [0008] paragraph [0013] - paragraph [0019] figures 1,2	3
A		4-6,12, 14,15
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* Special categories of cited documents :		
<p>*A* document defining the general state of the art which is not considered to be of particular relevance</p> <p>*E* earlier document but published on or after the international filing date</p> <p>*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>*O* document referring to an oral disclosure, use, exhibition or other means</p> <p>*P* document published prior to the international filing date but later than the priority date claimed</p>		<p>*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</p> <p>*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>* & * document member of the same patent family</p>
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Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 102 54 120 B3 (DUERR SOMAC GMBH [DE]) 5 February 2004 (2004-02-05) the whole document -----	7-10
Y	US 4 862 698 A (MORGAN PHILLIP [US] ET AL) 5 September 1989 (1989-09-05) column 1, line 17 - column 1, line 64 -----	13
Y	WO 01/53764 A (PEDOLSKY HOWARD [US]) 26 July 2001 (2001-07-26) the whole document -----	15-18
X	US 6 701 722 B1 (SEO HYEONG-JOON [KR] ET AL) 9 March 2004 (2004-03-09) abstract claims 8-15,17-24,26 figures 1-12 -----	1,2,6,12
A	-----	3-5,7-11
P,X	EP 1 659 355 A (AIR LIQUIDE DEUTSCHLAND GMBH [DE]; AIR LIQUIDE [FR]) 24 May 2006 (2006-05-24) the whole document -----	2,16,18
A	US 5 649 429 A (SCHREIBER ROLAND [DE]) 22 July 1997 (1997-07-22) abstract -----	1,2,4,5, 14,15
A	US 4 986 086 A (DE LANGAVANT BERNARD C [CA]) 22 January 1991 (1991-01-22) column 1, line 55 - column 3, line 38 -----	16-18
A	GB 2 406 174 A (LG ELECTRONICS INC [KR]) 23 March 2005 (2005-03-23) page 1, line 16 - page 1, line 22 page 3, line 12 - page 4, line 10 -----	1
A	US 6 098 412 A (PORTER KEVIN J [US] ET AL) 8 August 2000 (2000-08-08) column 2, line 5 - column 2, line 9 column 2, line 39 - column 2, line 52 -----	2

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2007/051442

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5983657	A	16-11-1999	DE 19803196 A1 JP 3733674 B2 JP 10213365 A	06-08-1998 11-01-2006 11-08-1998
EP 1270292	A	02-01-2003	DE 10130986 A1	16-01-2003
DE 10254120	B3	05-02-2004	WO 2004046675 A2 EP 1585952 A2	03-06-2004 19-10-2005
US 4862698	A	05-09-1989	CA 1335944 C DE 68910203 D1 DE 68910203 T2 EP 0350428 A2 ES 2045534 T3 JP 1954422 C JP 2054139 A JP 6078963 B MX 166592 B	20-06-1995 02-12-1993 28-04-1994 10-01-1990 16-01-1994 28-07-1995 23-02-1990 05-10-1994 20-01-1993
WO 0153764	A	26-07-2001	AT 345476 T DE 60124502 T2 EP 1252471 A1 RU 2228495 C1 UA 72306 C2 US 6345509 B1	15-12-2006 15-03-2007 30-10-2002 10-05-2004 16-09-2002 12-02-2002
US 6701722	B1	09-03-2004	CN 1455186 A KR 20030085763 A	12-11-2003 07-11-2003
EP 1659355	A	24-05-2006	NONE	
US 5649429	A	22-07-1997	DE 19524199 C1 FR 2736307 A1 GB 2302942 A IT RM960460 A1 JP 3107364 B2 JP 9011734 A	09-05-1996 10-01-1997 05-02-1997 29-12-1997 06-11-2000 14-01-1997
US 4986086	A	22-01-1991	NONE	
GB 2406174	A	23-03-2005	DE 102004044990 A1 JP 2005090953 A KR 20050028391 A US 2005056031 A1	14-04-2005 07-04-2005 23-03-2005 17-03-2005
US 6098412	A	08-08-2000	NONE	