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(54) **Refrigeration circuit for vehicular air conditioning systems**

(57) A vehicular air conditioning system (10) includes a compressor (110) having a crank chamber (138), a suction chamber (120), and a discharge chamber (122). A refrigerant mixture includes carbon dioxide and oil. A conduit (13) connects the discharge chamber (122) of the compressor (110) directly with an oil separator (14) to route the refrigerant mixture directly to the

oil separator (14). Only a restricted orifice (16) is provided between the oil separator (14) and the crank chamber (138) of the compressor (110) to throttle oil as it travels directly to the crank chamber (138) of the compressor (110).

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EUROPEAN SEARCH REPORT

Application Number
EP 01 30 1484

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
Y	US 5 694 784 A (OBRIST FRANK ET AL) 9 December 1997 (1997-12-09) * the whole document *	1-17	F04B39/16 F04B39/06 F25B1/02
Y	PATENT ABSTRACTS OF JAPAN vol. 006, no. 240 (M-174), 27 November 1982 (1982-11-27) & JP 57 137670 A (HITACHI SEISAKUSHO KK), 25 August 1982 (1982-08-25) * abstract *	1-17	
A	US 5 337 572 A (LONGSWORTH RALPH C) 16 August 1994 (1994-08-16) * column 3, line 10-22; figure 1 *	1-17	
A	US 3 945 216 A (SCHIBBYE HJALMAR) 23 March 1976 (1976-03-23) * the whole document *	1-17	
A	EP 0 978 693 A (SANDEN CORP) 9 February 2000 (2000-02-09) * the whole document *	1-17	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			F04B F25B
The present search report has been drawn up for all claims			
Place of search MUNICH		Date of completion of the search 4 February 2003	Examiner Olona Laglera, C
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			

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

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04-02-2003

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5694784	A	09-12-1997	CH 689826 A5	15-12-1999
			DE 59607858 D1	15-11-2001
			EP 0742116 A2	13-11-1996
			JP 3323736 B2	09-09-2002
			JP 9101063 A	15-04-1997

JP 57137670	A	25-08-1982	NONE	

US 5337572	A	16-08-1994	DE 69421357 D1	02-12-1999
			EP 0650574 A1	03-05-1995
			JP 8500177 T	09-01-1996
			WO 9427099 A1	24-11-1994

US 3945216	A	23-03-1976	GB 1479451 A	13-07-1977
			AU 7027874 A	08-01-1976
			BE 816537 A1	18-12-1974
			DD 116896 A5	12-12-1975
			DE 2429466 A1	09-01-1975
			DK 323574 A	10-02-1975
			ES 427374 A1	16-07-1976
			FI 185974 A	19-12-1974
			FR 2233508 A1	10-01-1975
			IT 1015160 B	10-05-1977
			NL 7408141 A	20-12-1974
			SE 7407840 A	19-12-1974

EP 0978693	A	09-02-2000	JP 2000055488 A	25-02-2000
			EP 0978693 A2	09-02-2000
			US 6185955 B1	13-02-2001

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