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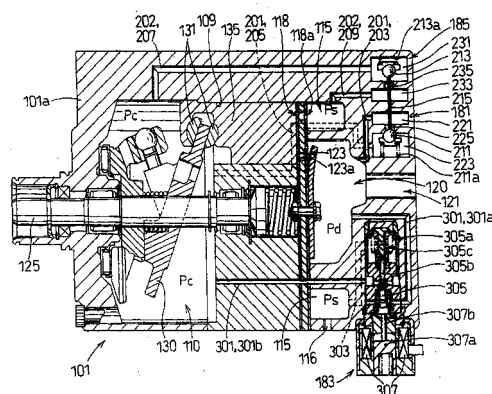
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(54) **Air conditioning systems**

(57) The air conditioning system 100 may include a compressor 101, a heating circuit 152, and a capacity controller 181. The compressor 101 has a suction port 115, a discharge port 120, a driving unit 130 provided within a driving chamber 110, a first passage 201 and a second passage 202. The driving unit 130 may decrease compressor output discharge capacity when the pressure within the driving chamber 110 increases. The first passage 201 may connect the discharge port 120 to the driving chamber 110 and the second passage 202 may connect the driving chamber 110 to the suction port 115. The capacity controller 181, 185 may open the first passage 201 when the refrigerant discharge pressure results predetermined pressure. Further, the capacity controller 181, 185 may narrow the second passage 202 in response to the opening of the first passage 201. By opening the first passage 201, the high-pressure refrigerant may be released from the discharge port 120 to the driving chamber 110 through the first passage 201. By narrowing the second passage 202, the high-pressure refrigerant released from the discharge port is difficult to be released from the driving chamber 110 to the suction port 116. Thus, the pressure within the driving chamber 110 may quickly increase, the compressor output discharge capacity can be quickly reduced, the abnormally high discharge pressure of the compressor

101 can be quickly alleviated by the reduction in the compressor output discharge capacity.





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EUROPEAN SEARCH REPORT

Application Number
EP 99 12 5415

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)
X	PATENT ABSTRACTS OF JAPAN vol. 017, no. 151 (M-1387), 25 March 1993 (1993-03-25) -& JP 04 321779 A (NIPPONDENSO CO LTD), 11 November 1992 (1992-11-11)	1-4,7-24	F25B49/02 F25B41/04 F04B27/18 B60H1/00
A	* abstract * * figures 1,2,9 *	5,25	
Y	US 5 282 329 A (TERANISHI TOSHIHIRO) 1 February 1994 (1994-02-01) * abstract * * column 5, line 64 - column 6, line 14 * * figures 5A-5C *	1,2, 16-21	
Y	US 5 291 941 A (ENOMOTO MASAYOSHI ET AL) 8 March 1994 (1994-03-08) * abstract * * column 4, line 1 - line 12 * * figure 1 *	1,2, 16-21	
A	US 5 318 410 A (KAWAMURA CHUICHI ET AL) 7 June 1994 (1994-06-07) * abstract * * figures 1,2 *	5,25	TECHNICAL FIELDS SEARCHED (Int.Cl.7) F25B F04B
A	PATENT ABSTRACTS OF JAPAN vol. 1995, no. 01, 28 February 1995 (1995-02-28) -& JP 06 280745 A (TOYOTA AUTOM LOOM WORKS LTD), 4 October 1994 (1994-10-04) * abstract *		
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 120 (M-1379), 12 March 1993 (1993-03-12) -& JP 04 303185 A (NIPPONDENSO CO LTD), 27 October 1992 (1992-10-27) * abstract *		
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 November 2001	Examiner De Graaf, J.D.
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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European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 99 12 5415

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)
A	PATENT ABSTRACTS OF JAPAN vol. 011, no. 157 (M-590), 21 May 1987 (1987-05-21) -& JP 61 286591 A (TOYODA AUTOM LOOM WORKS LTD), 17 December 1986 (1986-12-17) * abstract *		
A	PATENT ABSTRACTS OF JAPAN vol. 1997, no. 10, 31 October 1997 (1997-10-31) -& JP 09 166086 A (TGK CO LTD), 24 June 1997 (1997-06-24) * abstract *		
A	PATENT ABSTRACTS OF JAPAN vol. 017, no. 117 (M-1378), 11 March 1993 (1993-03-11) -& JP 04 301189 A (NIPPONDENSO CO LTD), 23 October 1992 (1992-10-23) * abstract *		
A	FR 2 752 020 A (TOYODA AUTOMATIC LOOM WORKS) 6 February 1998 (1998-02-06) -----		TECHNICAL FIELDS SEARCHED (Int.Cl.7)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 November 2001	Examiner De Graaf, J.D.
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.**

EP 99 12 5415

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.

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
JP 04321779	A	11-11-1992	NONE	
US 5282329	A	01-02-1994	JP 3131015 B2 JP 5288150 A DE 4310922 A1 KR 9701758 B1	31-01-2001 02-11-1993 07-10-1993 15-02-1997
US 5291941	A	08-03-1994	JP 5223357 A	31-08-1993
US 5318410	A	07-06-1994	JP 3024315 B2 JP 5106554 A DE 4234989 A1 KR 9609858 B1	21-03-2000 27-04-1993 06-05-1993 24-07-1996
JP 06280745	A	04-10-1994	JP 3094725 B2	03-10-2000
JP 04303185	A	27-10-1992	NONE	
JP 61286591	A	17-12-1986	DE 3609058 A1 DE 3614430 A1 US 4688997 A US 4685866 A	02-10-1986 02-01-1987 25-08-1987 11-08-1987
JP 09166086	A	24-06-1997	NONE	
JP 04301189	A	23-10-1992	NONE	
FR 2752020	A	06-02-1998	DE 19733099 A1 FR 2752020 A1 JP 10103249 A US 6010312 A	12-02-1998 06-02-1998 21-04-1998 04-01-2000

EPO FORM P0469

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