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(54) **Two stage transcritical refrigeration system**

(57) The invention provides a refrigeration system (100) including a plurality of refrigerated display cases (115). Each display case has a dedicated evaporator assembly (165) that cools return air by evaporating a refrigerant, and a first stage compressor assembly (120) that is in fluid communication with the respective evaporator assembly to compress the refrigerant to a first pressure corresponding to a first temperature of the refrigerant prior to discharge of the compressed refrigerant. The refrigeration system also includes a second stage

compressor assembly (125) that is in fluid communication with the first stage compressor assemblies (120) to compress the refrigerant to a second pressure that is higher than the first pressure, and that corresponds to a second temperature of the refrigerant. The refrigeration system (100) further includes a heat exchanger (130) that is in fluid communication with the second stage compressor assembly (125) to receive the refrigerant from the second stage compressor assembly to reject heat from the refrigerant.

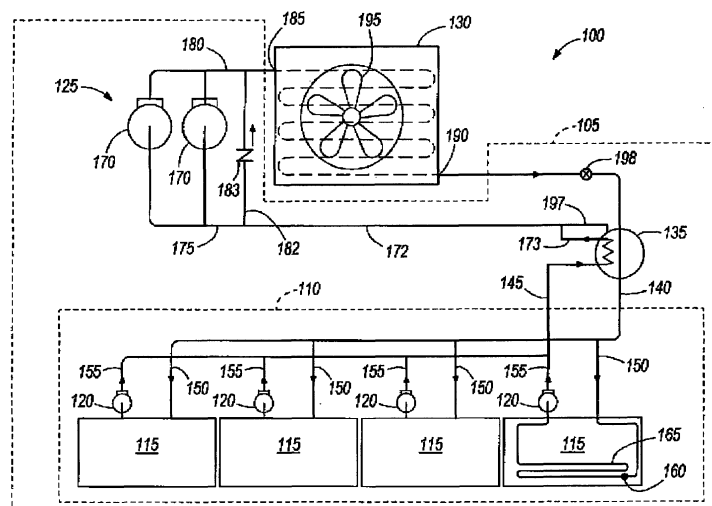


FIG. 2A



EUROPEAN SEARCH REPORT

Application Number
EP 07 25 4445

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	EP 0 126 673 A1 (BONNET ETS [FR]) 28 November 1984 (1984-11-28)	1,10	INV. F25B1/10
Y	* page 2 - page 4; figure 1 *	2,9	F25B5/02 F25B7/00 F25B9/00
Y	WO 2006/022829 A1 (CARRIER CORP [US]; DURASAMY SURESH [US]) 2 March 2006 (2006-03-02) * sentence 186 - sentence 283; figure 1 *	2,9	ADD. F25B25/00 F25B40/00 F25B43/00
X	EP 0 431 797 A2 (LABRECQUE JAMES C [US]) 12 June 1991 (1991-06-12) * column 2, line 25 - column 6, line 16; figure 1 *	1,10	
X	US 5 522 233 A (NARES TERRY [US] ET AL) 4 June 1996 (1996-06-04) * column 2, line 11 - column 4, line 7; figure 1 *	1,10	
X	US 4 947 655 A (SHAW DAVID N [US]) 14 August 1990 (1990-08-14) * figure 7 *	1,10	TECHNICAL FIELDS SEARCHED (IPC) F25B
~~The present search report has been drawn up for all claims~~			
Place of search Munich		Date of completion of the search 2 November 2009	Examiner Szilagyi, Barnabas
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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EPO FORM 1503 03.82 (P04C01)



Application Number

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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

see additional sheet(s)

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



**LACK OF UNITY OF INVENTION
SHEET B**

Application Number

EP 07 25 4445

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-2, 9-10

Refrigeration system with CO₂ as refrigerant

2. claims: 1, 3-8, 19-21

Refrigeration system comprising a vessel positioned in fluid communication with the fluid main between the refrigerated display cases and the heat exchanger

3. claims: 11-18

Refrigeration system with a high temperature refrigeration circuit

4. claim: 22

Refrigeration system with a transcritical refrigeration circuit and a closed coolant loop connected to the heat exchanger which rejects heat to the loop

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

EP 07 25 4445

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
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02-11-2009

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
EP 0126673	A1	28-11-1984	DE	3460111 D1		05-06-1986
			ES	8502778 A1		16-04-1985
			FR	2545913 A1		16-11-1984

WO 2006022829	A1	02-03-2006	AU	2005270472 A1		16-02-2006
			AU	2005278162 A1		02-03-2006
			CN	101040153 A		19-09-2007
			CN	101014815 A		08-08-2007
			EP	1782001 A1		09-05-2007
			EP	1794510 A1		13-06-2007
			EP	1789732 A1		30-05-2007
			KR	20070050046 A		14-05-2007
			KR	20070046847 A		03-05-2007
			RU	2362096 C2		20-07-2009
			US	2008078203 A1		03-04-2008
			US	2008104981 A1		08-05-2008

EP 0431797	A2	12-06-1991	CA	2030288 A1		23-05-1991
			JP	3251662 A		11-11-1991
			US	5042268 A		27-08-1991

US 5522233	A	04-06-1996	NONE			

US 4947655	A	14-08-1990	NONE			
