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Declarations under Rule 4.17:

— *of inventorship (Rule 4.17(iv))*

Published:

— *with international search report (Art. 21(3))*

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

[Continued on next page]

(54) Title: HOT GAS BYPASS FOR TWO-STAGE COMPRESSOR

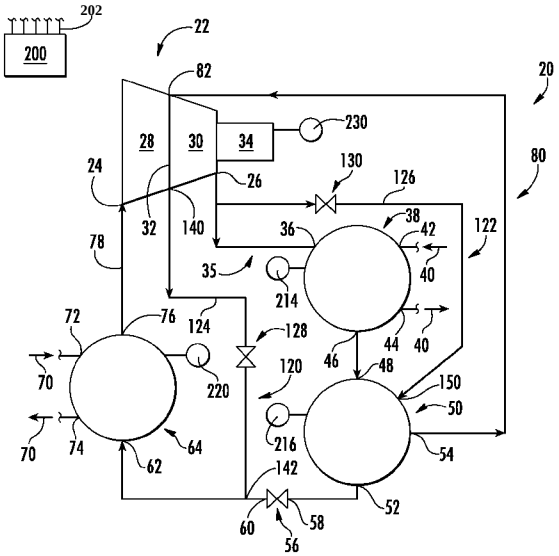

FIG.1

(57) Abstract: A vapor compression system comprising a centrifugal compressor (22) having: an inlet (24); an outlet (26); a first impeller stage (28); a second impeller stage (30); and a motor (34) coupled to the first impeller stage and second impeller stage. A first heat exchanger (38) is downstream of the outlet along a refrigerant flowpath. An expansion device (56) and a second heat exchanger (64) are upstream of the inlet along the refrigerant flowpath. A bypass flowpath (120; 320) is positioned to deliver refrigerant from the compressor bypassing the first heat exchanger. A valve (128) is positioned to control flow through the bypass flowpath, wherein: the bypass flowpath extends from a first location (140) intermediate the inlet and outlet to a second location (142; 342) downstream of the first heat exchanger along the refrigerant flowpath.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
INV. F25B1/053 F25B1/10 F25B49/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
F25B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal , WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2012/145156 Al (CARRIER CORP [US] ; HUFF HANS-JOACHIM [DE]) 26 October 2012 (2012-10-26)	1,3,8,9
A	paragraph [0013] - paragraph [0040] ; figures 1-3	2, 11-13

X	EP 2 677 252 Al (LG ELECTRONICS INC [KR]) 25 December 2013 (2013-12-25)	1-5 , 19
Y	paragraph [0025] - paragraph [0057] ;	6-9
A	figures 1-3	10-13 , 20,21

X	US 2003/188544 Al (YAMASAKI HARUHISA [JP] ET AL) 9 October 2003 (2003-10-09) paragraph [0024] - paragraph [0048] ; figures 1-4	1-5 , 19

	-/- ·	

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" documentwhich may throw doubts on priority claim(s) orwhich is cited to establish the publication date of another citation or other special reason (as specified)

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"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
1 October 2015	13/10/2015

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Szi l agyi , Barnabas

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2015/011940

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. [1] As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. [ ] As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.

3. [X] As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

1-13, 19-21

4. [ ] No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

[X] No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2015/011940

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2006/050434 A2 (CARRIER CORP [US] ; TARAS MICHAEL F [US] ; LIFSON ALEXANDER [US]) 11 May 2006 (2006-05-11) paragraph [0018] - paragraph [0031] ; figures 1-5	1-5 , 19
X	WO 2010/117973 A2 (CARRIER CORP [US] ; SCARCELLA JASON [US] ; LIFSON ALEXANDER [US] ; LI DAQ) 14 October 2010 (2010-10-14) paragraph [0016] - paragraph [0040] ; figure 1	1 , 3
Y	WO 2012/166858 AI (CARRIER CORP [US] ; SISHTLA VISHNU M [US] ; BRASZ JOOST [US]) 6 December 2012 (2012-12-06) paragraph [0017] - paragraph [0034] ; figure 1	6-9

2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2015/011940

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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		US 2014182317 A1	03-07-2014
		WO 2012166858 A1	06-12-2012

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 2, 8, incompletely) ; 1, 3(partially)

   Vapor compression system wherein the second location is downstream of the expansion device along the refrigerant flowpath.

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2. claims: 4-7, 19-21 (completely) ; 1, 3(partially)

   Vapor compression system wherein the bypass flowpath is a first bypass flowpath; and a second bypass flowpath extends from a third location between the first location downstream of the first location to a fourth location upstream of the expansion device.

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3. claims: 14-18

   Vapor compression system ,wherein the bypass flowpath extends from a first location to a second location downstream of the first heat exchanger but at the economizer along the refrigerant flowpath..

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4. claims: 10-13 (completely) ; 1, 3(partially)

   Vapor compression system comprising a controller configured to calculate at least one pressure parameter; and responsive to the calculated pressure parameter, control flow along the bypass flowpath.
