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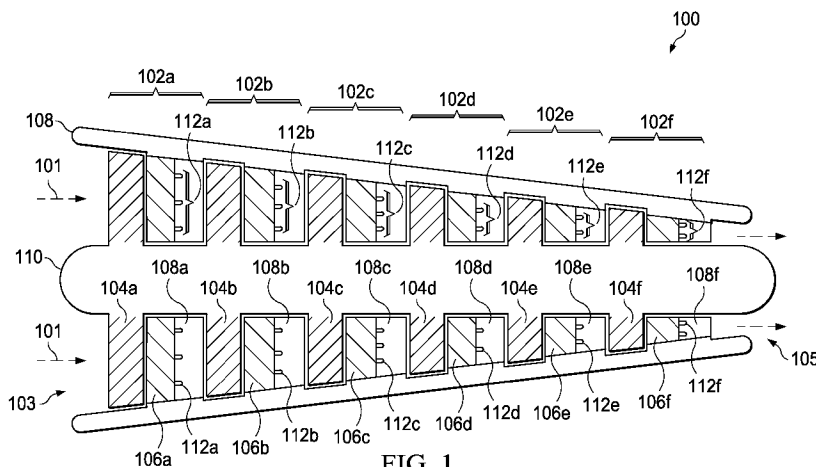
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(54) Title: GAS TURBINE SYSTEMS AND METHODS EMPLOYING A VAPORIZABLE LIQUID DELIVERY DEVICE



(57) Abstract: Systems and methods utilizing turbines, including a compressor turbine with a vaporizable liquid delivery device, are presented. A compressor turbine uses the evaporation of a vaporizable liquid at or near thermal equilibrium from the vaporizable liquid delivery device during the compression. The vapor created thereby typically carries the thermal energy discharged after the gas turbine cycle. The amount of liquid vaporized during compression, the length of time vaporization takes, the proximity to thermal equilibrium at which vaporization occurs, the amount of thermal energy recovered by recuperation, and the temperature at the inlet of the combustion chamber are generally interrelated parameters that can be controlled to increase efficiency.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2008/087817

A. CLASSIFICATION OF SUBJECT MATTER IPC(8) - F02C 7/10 (2009.01) USPC - 60/39.511 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) IPC(8) - F02C 7/10 (2009.01) USPC - 60/39.161, 39.511, 39.52, 39.53, 224 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) PatBase		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 6,606,864 B2 (MACKAY) 19 August 2003 (19.08.2003) entire document	1-46, 54-60, 66-77, 86, 96-97, 102-109
Y	US 7,200,997 B2 (CARLSON, Jr. et al) 10 April 2007 (10.04.2007) entire document	1-29, 33-35
Y	US 2005/0056001 A1 (FRUTSCHI et al) 17 March 2005 (17.03.2005) entire document	3, 5-7, 10, 12-14, 17-21, 54-60, 66-69, 98-99, 106-109, 116-127
Y	US 6,901,759 B2 (FRUTSCHI) 07 June 2005 (07.06.2005) entire document	22-26, 33-40, 70, 72
Y	US 6,293,086 B1 (REYNOLDS) 25 September 2001 (25.09.2001) entire document	25-26, 30-32, 36-46, 70-77, 79-87, 91-93, 96-99, 102-109
Y	US 5,724,805 A (GOLOMB et al) 10 March 1998 (10.03.1998) entire document	66-69, 116, 119-126
Y	US 7,107,756 B2 (ROLT) 19 September 2006 (19.09.2006) entire document	78-86
Y	US 6,644,935 B2 (INGISTOV et al) 11 November 2003 (11.11.2003) entire document	78-85
Y	US 2006/0150635 A1 (SU et al) 13 July 2006 (13.07.2006) entire document	87
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/>		
* 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" 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) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "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 "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 23 April 2009 (23.04.2009)		Date of mailing of the international search report 29 APR 2009
Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201		Authorized officer: Blaine R. Copenheaver PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2008/087817

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:

Group I, claims 1-46, 54-87, 91-93, 96-99, 102-109 and 116-127 are drawn to an open-cycle turbine system.

Group II, claims 47-50 are drawn to a turbo compressor.

Group III, claims 51-53 are drawn to a method for compressing gas.

Group IV, claims 88-90 are drawn to an open-cycle gas turbine system.

Group V, claims 94, 95, 100, 101 and 115 are drawn to a turbine system.

Group VI, claims 110-114 are drawn to a gas turbine system.

Group VII, claims 128 and 129 are drawn to a close-cycle liquification system.

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 additional fees, this Authority did not invite payment of additional fees.
3. 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.:

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.:
1-46, 54-87, 91-93, 96-99, 102-109 and 116-127

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.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2008/087817

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2003/0054214 A1 (NOELSCHER) 20 March 2003 (20.03.2003) entire document	87
Y	US 2007/0059159 A1 (HJERPE) 15 March 2007 (15.03.2007) entire document	91-93
Y	US 2005/0028529 A1 (BARTLETT et al) 10 February 2005 (10.02.2005) entire document	116-127