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(54) Title: CARBON DIOXIDE AS FUEL FOR POWER GENERATION AND SEQUESTRATION SYSTEM

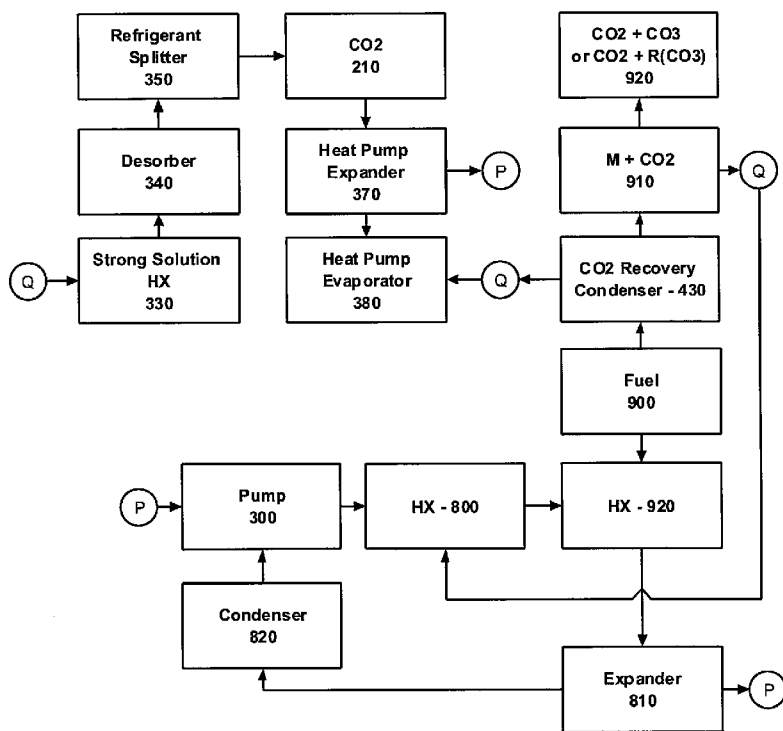


Fig. 2

(57) Abstract: An integrated energy production system and carbon dioxide reaction system for enhancing the energy efficiency and minimizing greenhouse gas emissions of thermally activated power production methods is provided. The system utilizes heat of reaction from the carbon dioxide reaction system to directly reduce the fuel requirements of the thermally activated power production method. The system, when utilizing a reverse fuel cell, achieves concurrent carbon dioxide sequestration resulting from the fuel combustion.





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— *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))*

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2008/081772

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H01M 8/04 (2009.01)

USPC - 429/17

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) - H01M 8/04 (2009.01)

USPC - 429/17

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)

MicroPatent

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2007/0161095 A1 (GURIN) 12 July 2007 (12.07.2007) entire document	1-12, 16-20, 22-25
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Y		13-15, 21, 26-33, 38-41
Y	US 2003/0180216 A1 (TEGROTENHUIS et al) 25 September 2003 (23.09.2003) entire document	13
Y	US 5,698,665 A (ODELL) 16 December 1997 (16.12.1997) entire document	14-15, 21, 29-33, 38-41
Y	US 7,201,979 B2 (MCELROY et al) 10 April 2007 (10.04.2007) entire document	26-28, 40
Y	US 6,764,663 B2 (MONAGHAN et al) 20 July 2004 (20.07.2004) entire document	28
Y	US 7,285,350 B2 (KEEFER et al) 23 October 2007 (23.10.2007) entire document	33
A	US 6,187,465 B1 (GALLOWAY) 13 February 2001 (13.02.2001) column 5, lines 2-6	1-33, 38-41

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search

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**INTERNATIONAL SEARCH REPORT**

International application No.

PCT/US2008/081772

**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 extra sheet.

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.:  
1-33, 38-41

**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.

Continuation of Box III.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I – Claims 1-33 and 38-41 reciting an energy production system including a working fluid having an enthalpy or producing waste heat and a carbon dioxide reaction having carbon dioxide and a carbon dioxide co-reactant.

Group II – Claims 34 and 35 reciting an energy production system including an endothermic chemical reaction and a carbon dioxide absorption process having carbon dioxide and a carbon dioxide absorbent.

Group III – Claims 36 and 37 reciting an energy production system including carbon dioxide and a co-reactant wherein the carbon dioxide is a supercritical fluid and at least one mineral is included to react with the carbon dioxide:

Group IV – Claims 42-51 reciting an energy production system including a fuel mixture containing carbon dioxide at levels greater than 1000 parts per million.

The inventions listed as Groups I, II, III or IV do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature of the Group I invention: a working fluid having an enthalpy or producing waste heat as claimed therein is not present in the invention of Groups II, III or IV. The special technical feature of the Group II invention: an endothermic chemical reaction and a carbon dioxide absorption as claimed therein is not present in the invention of Groups I, III or IV. The special technical feature of the Group III invention: the carbon dioxide is a supercritical fluid and at least one mineral is included as claimed therein is not present in the invention of Groups I, II or IV. The special technical feature of the Group IV invention: carbon dioxide at levels greater than 1000 parts per million as claimed therein is not present in the invention of Groups I, II or III.

Groups II, III and IV lack unity of invention because even though the inventions of these groups require the technical feature of an energy production system including carbon dioxide and a co-reactant, this technical feature is not a special technical feature as it does not make a contribution over the prior art in view of US 6,187,465 B1 (GALLOWAY) 13 February 2001, column 5, lines 2-6.

Since none of the special technical features of the Group I, II, III or IV inventions are found in more than one of the inventions, unity of invention is lacking.