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**Declarations under Rule 4.17:**

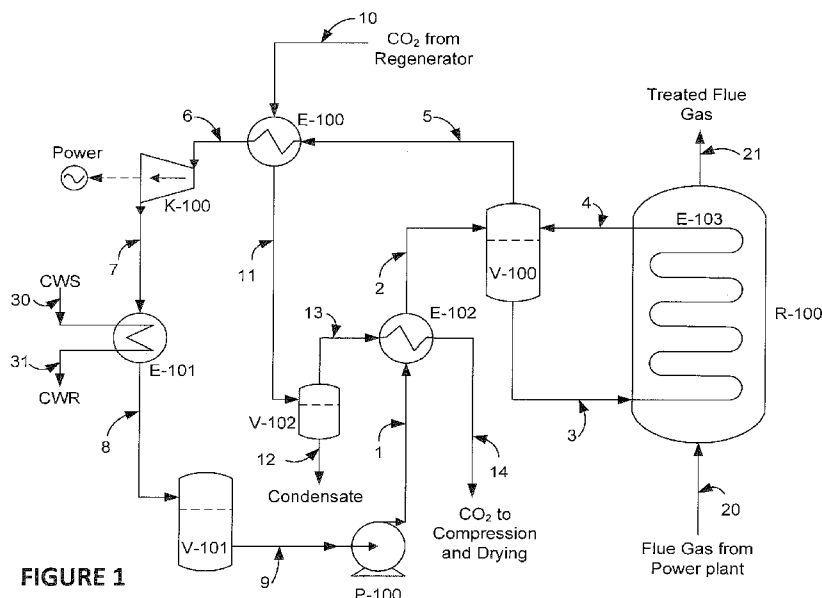
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

**Published:**

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[Continued on next page]

(54) Title: HEAT RECOVERY FROM SORBENT-BASED CO<sub>2</sub> CAPTURE



(57) Abstract: The present invention provides a method of increasing the efficiency of exothermic CO<sub>2</sub> capture processes. The method relates to withdrawing heat generated during the exothermic capture of CO<sub>2</sub> with various sorbents via heat exchange with a working fluid. The working fluid is provided at a temperature and pressure such that it is in the liquid state, and has a vaporization temperature in a range such that the heat arising from the reaction of the CO<sub>2</sub> and the sorbent causes a phase change from liquid to vapor state in whole or in part and transfers heat from to the working fluid. The resulting heated working fluid may subsequently be used to generate power.



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7 September 2012

## INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER  
 INV. B01D53/04 B01D53/62  
 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)  
 B01D

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	JP 2010 088982 A (TOSHIBA CORP) 22 April 2010 (2010-04-22) paragraph [0076] - paragraph [0082]; figures 4,5	1
A	----- US 4 336 159 A (WINTER KARL) 22 June 1982 (1982-06-22) column 4, lines 9-39; figure 1	1
A	----- EP 1 275 429 A1 (COMMISSARIAT ENERGIE ATOMIQUE [FR]) 15 January 2003 (2003-01-15) the whole document -----	1



Further documents are listed in the continuation of Box C.



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

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"P" document published prior to the international filing date but later than the priority date claimed

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"&" document member of the same patent family

Date of the actual completion of the international search

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2011/065340

Patent document cited in search report	Publication date	Publication date	Patent family member(s)	Publication date
JP 2010088982	A	22-04-2010	NONE	
<hr style="border-top: 1px dashed black;"/>				
US 4336159	A	22-06-1982	CA 1144909 A1	19-04-1983
			FR 2464744 A1	20-03-1981
			GB 2067917 A	05-08-1981
			GB 2134005 A	08-08-1984
			US 4336159 A	22-06-1982
<hr style="border-top: 1px dashed black;"/>				
EP 1275429	A1	15-01-2003	AT 265883 T	15-05-2004
			DE 60200437 D1	09-06-2004
			DE 60200437 T2	07-04-2005
			EP 1275429 A1	15-01-2003
			FR 2827189 A1	17-01-2003
<hr style="border-top: 1px dashed black;"/>				