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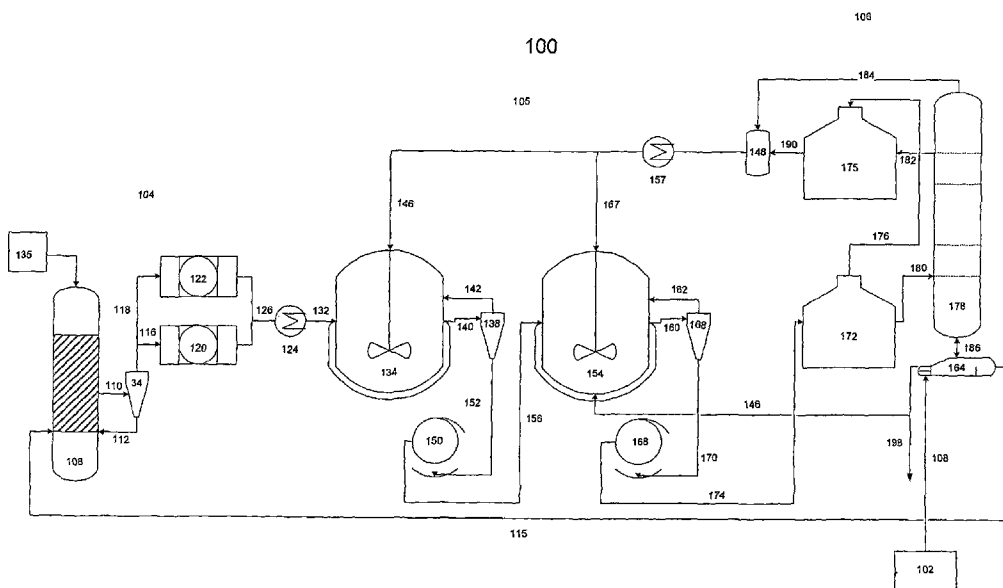
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(54) Title: PROCESSES AND SYSTEMS FOR THE SEQUESTRATION OF CARBON DIOXIDE UTILIZING EFFLUENT STREAMS



(57) Abstract: Disclosed are processes and systems for sequestering carbon dioxide from a flue gas effluent from a parent process such as a coal-fired electric power plant. In one non-limiting embodiment of the invention, a mineral having a metal is dissolved with an acid to provide a solution having a predetermined pH. Carbon dioxide from the flue gas effluent and a base are added to the solution to provide a metal carbonate reaction to precipitate a metal carbonate, e.g., magnesium carbonate, from the solution. Heat, which may be supplied by the flue gas effluent, is used to power a base management system for recovering used base from the process. A process for producing metal salt from a mineral (such as olivine or serpentine) is also disclosed.

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INTERNATIONAL SEARCH REPORT

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B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) B01D C01F		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2005/180910 A1 (PARK ET AL) 18 August 2005 (2005-08-18) cited in the application page 1, paragraph 2 - page 4, paragraph 37 -----	1-26, 28-41, 43-45
X	WO 2005/108297 A (THE TRUSTEES OF COLUMBIA UNIVERSITY) 17 November 2005 (2005-11-17) page 7, line 8 - page 15, line 28 ----- -/--	1-3,6,8, 10-13, 16, 19-21, 31-34, 36,38
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> 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 document 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 <p style="text-align: center; font-weight: bold;">10 August 2007</p>	Date of mailing of the international search report <p style="text-align: center; font-weight: bold;">24/08/2007</p>	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer <p style="text-align: center; font-weight: bold;">Doolan, Gerard</p>	

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	LACKNER ET AL: "Carbon dioxide disposal in carbonate minerals" ENERGY, vol. 20, no. 11, 1995, - 31 December 1995 (1995-12-31) pages 1153-1170, XP002446528 Great Britain the whole document -----	1-45
A	US 338 667 A (PUNDSACK) 29 August 1967 (1967-08-29) column 1, line 10 - column 3, line 51; claim 1 -----	1-45
A	US 2004/213705 A1 (BLENCOE ET AL) 28 October 2004 (2004-10-28) page 2, paragraph 15 - page 6, paragraph 58 -----	1-45

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2007/064054

Patent document cited in search report	Publication date	Patent family member(s)	Publication date																
US 2005180910	A1	18-08-2005	NONE																
WO 2005108297	A	17-11-2005	NONE																
US 338667	A		NONE																
US 2004213705	A1	28-10-2004	<table style="width: 100%; border: none;"> <tr> <td style="width: 10%;">AU</td> <td style="width: 30%;">2004233317</td> <td style="width: 10%;">A1</td> <td style="width: 50%;">04-11-2004</td> </tr> <tr> <td>CA</td> <td>2523135</td> <td>A1</td> <td>04-11-2004</td> </tr> <tr> <td>EP</td> <td>1617933</td> <td>A2</td> <td>25-01-2006</td> </tr> <tr> <td>WO</td> <td>2004094043</td> <td>A2</td> <td>04-11-2004</td> </tr> </table>	AU	2004233317	A1	04-11-2004	CA	2523135	A1	04-11-2004	EP	1617933	A2	25-01-2006	WO	2004094043	A2	04-11-2004
AU	2004233317	A1	04-11-2004																
CA	2523135	A1	04-11-2004																
EP	1617933	A2	25-01-2006																
WO	2004094043	A2	04-11-2004																