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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))*

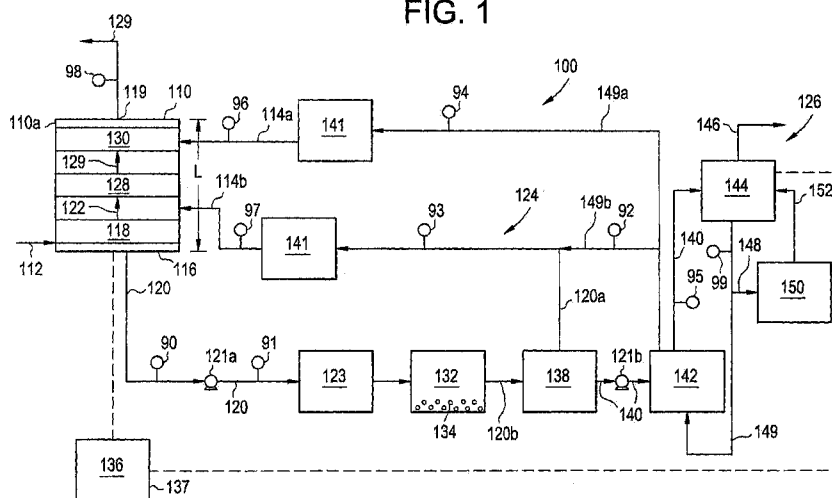
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- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

(88) **Date of publication of the international search report:**
6 October 2016

(54) Title: METHOD AND SYSTEM FOR CARBON DIOXIDE REMOVAL USING AMMONIA CONTAINING SOLVENT

FIG. 1



(57) Abstract: A system and a method is provided for removing carbon dioxide from a gas stream. One aspect of the method includes introducing a carbon dioxide-containing gas stream to an absorber. The gas stream is contacted with an ammonia-containing solvent for absorbing, with the ammonia-containing solvent, the carbon dioxide from the gas stream, thereby removing the carbon dioxide from the gas stream.

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2013/052475

A. CLASSIFICATION OF SUBJECT MATTER

INV. B01D53/62 B01D53/96
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)

EP0-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	US 2012/063975 A1 (KOSS PETER ULRICH [CH] ET AL) 15 March 2012 (2012-03-15) abstract; figures 5,7 paragraphs [0001], [0006], [0008], [0009], [0023], [0051], [0093], [0094], [0096], [0097], [0107] -----	1-10
X	US 2008/307968 A1 (KANG KI JOON [KR] ET AL) 18 December 2008 (2008-12-18) abstract; figure 1 paragraphs [0002], [0015], [0016], [0031] - [0035], [0057] -----	1-10
X	US 2011/311429 A1 (LIU KUNLEI [US] ET AL) 22 December 2011 (2011-12-22) abstract; figures 1a,1b paragraphs [0001], [0008], [0009], [0016], [0020] - [0022], [0025] ----- -/--	1-10



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

"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

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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

International application No
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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	US 2011/064636 A1 (PETIG ARLYN V [US] ET AL) 17 March 2011 (2011-03-17) abstract; figure 1 paragraphs [0005], [0006], [0008], [0010], [0012], [0028], [0041]; figure 1 -----	1-10

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2013/052475

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. ☐ 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. ☐ 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.:

see annex

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

Information on patent family members

International application No

PCT/IB2013/052475

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US 2011311429 A1	22-12-2011	NONE	
US 2011064636 A1	17-03-2011	NONE	

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-10

A method for removing carbon dioxide from a gas, the method comprising:
introducing a carbon dioxide-containing gas stream to an absorber;
contacting the gas stream with an ammonia-containing solvent, the ammonia-containing solvent having a molarity between about 0.5 molar and about 13 molar; and absorbing the carbon dioxide from the gas stream with the ammonia-containing solvent, thereby removing the carbon dioxide from the gas stream and forming a CO₂-rich stream.

2. claims: 11-16

A method for removing carbon dioxide from a carbon dioxide containing gas stream, the method comprising:
introducing a carbon dioxide-containing gas stream to an absorber having a temperature of about 45°C;
contacting the carbon dioxide-containing gas stream with an ammonia-containing solvent having a molarity between about 0.5 molar and about 13 molar;
absorbing carbon dioxide from the gas stream; and
forming a precipitate between the carbon dioxide and the ammonia-containing solvent.

3. claims: 17-20

A system for removing carbon dioxide from a gas stream, the system comprising:
an absorber configured to receive a carbon dioxide-containing gas stream and an ammonia-containing solvent, the ammonia-containing solvent having a molarity between about 0.5 molar and about 13 molar, the carbon dioxide-containing gas stream and the ammonia-containing solvent being contacted to remove carbon dioxide from the gas stream and form a carbon dioxide-rich stream; and
a regenerator fluidly coupled to the absorber, wherein the regenerator is configured to receive at least a portion of the carbon dioxide-rich stream and to remove carbon dioxide from the carbon dioxide-rich stream to form a regenerated solvent to be introduced to the absorber for further absorption and removal of carbon dioxide.
