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- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*



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(54) **Title:** ELECTROCHEMICAL RECOVERY OF CARBON DIOXIDE FROM ALKALINE SOLVENTS

(57) **Abstract:** The present invention relates to methods for recovering a hydroxide based sorbent from carbonate or another salt by electrochemical means involving separation schemes that use bipolar membranes and at least one type of cationic or anionic membrane. The methods can be used in an air contactor that removes carbon dioxide from the air by binding the carbon dioxide into a solvent or sorbent.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 05/32848

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B01D 17/06 (2007.01)

USPC - 205/762

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)

USPC - 205/762

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
IPC(8) - B01D 17/06, 53/62 (2007.01) - see keywords below; USPC - 205/762, 210/187- see keywords below; Google Patent Internet - see keywords below

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Electronic Databases Searched: carbon dioxide, hydroxide, sodium hydroxide, electrochemical, membrane, bipolar membrane, brine, cell stack, electro dialysis, bicarbonate, carbonate, alkaline, toroidal.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,238,305 A (Gancy) 09 December 1980 (09.12.1980), entire document, especially col. 2, ln 31-54.	32
X	US 4,475,448 A (Shoaf et al.) 09 October 1984 (09.10.1984), entire document, especially col. 7, ln 22-34 and col. 8, ln 66 - col. 9 ln 7.	28-30
Y	US 6,221,225 B1 (Mani) 24 April 2001 (24.04.2001), entire document., especially col. 4, ln 62 - col. 5, ln 4.	1-6 and 31
Y	US 4,246,241 A (Mathur et al.) 20 January 1981 (20.01.1981), col. 2, ln 3-47.	1-6 and 31
Y	US 5,955,043 A (Neuman et al.) 21 September 1999 (21.09.1999), col. 8, ln 7-14	1
Y	US 3,915,822 A (Veltman) 28 October 1975 (28.10.1975), col. 10, ln 6-25 and Figure 7.	4
A	US 1,482,367 A (Elledge) 29 January 1924 (29.01.1924), entire document, page 2, ln 4-29.	28-30

 Further documents are listed in the continuation of Box C.

* 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

17 May 2007 (17.05.2007)

Date of mailing of the international search report

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Name and mailing address of the ISA/US

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 05/32848

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.: 7-27, 33 and 34
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:

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.:

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.