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[Continued on next page]

(54) Title: IRON BASED FLOW BATTERIES

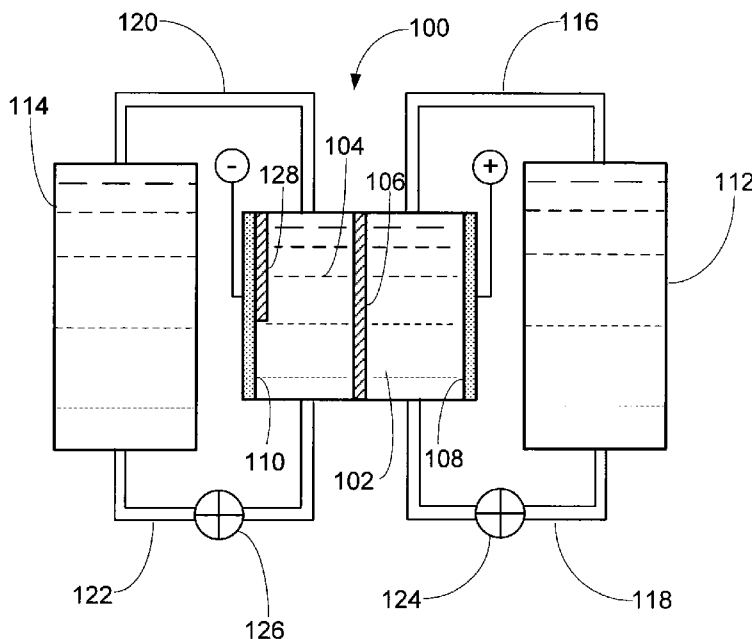


FIG. 1

(57) Abstract: An iron based redox flow cell. The redox flow cell comprises a first half-cell comprising a first electrolyte providing a source of Fe²⁺ ions and an electrode disposed within the first half-cell; a second half-cell comprising a second electrolyte providing a source of Fe²⁺ and Fe³⁺ ions and an electrode disposed within the second half-cell; and a separator between the first and second half-cells, where (a) the second electrolyte comprises a Fe³⁺ stabilizing agent; (b) the first electrolyte comprises a hydrogen evolution suppressing agent; or (c) the first electrolyte comprises a hydrogen evolution suppressing agent, and the second electrolyte comprises a Fe³⁺ stabilizing agent.

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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/US 12/40429

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - H01M 4/36 (2012.01)

USPC - 429/109; 429/105

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 4/36 (2012.01)

USPC - 429/109; 429/105

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)

PatBase - flow battery cells iron Fe3+ stabilizing stabilizer oxidation state ferric amino cyanide sucrose glycerol DMSO glycol acetate oxalate citrate acetonate fluoride Savinell

Google - battery Fe3+ hydrogen evolution suppressing agent; iron flow-batteries stabilize amino cyanide sucrose glycerol

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	HRUSKA, ET AL., "Investigation of Factors Affecting Performance of the Iron-Redox Battery." J. Electrochem. Soc. 1981 volume 128, issue 1, 18-25 (1981), pg 19, Fig. 1; pg 22, col 1, para 3; pg 22, col 1, para 5	1
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Y		2-6
Y	US 2001/0028977 A1 (KAZACOS, ET AL.) 11 October 2001 (11.10.2001), para [0314], [0466] [0448]-[0450]	2-6
Y	WEN, ET AL., "Studies on Iron .Fe3+/Fe2+-Complex/Bromine (Br2/Br-) Redox Flow Cell in Sodium Acetate Solution." Journal of The Electrochemical Society. 153 (5) A929-A934 (2006), pg A931, col 2	2
A	US 2010/0003586 A1 (SAHU) 07 January 2010 (07.01.2010), entire document	1-6
A	US 2011/0070483 A1 (KESHAVARZ, ET AL.) 24 March 2011 (24.03.2011), entire document	1-6
A	US 5,256,524 A (YOSHIMOTO, ET AL.) 26 October 1993 (26.10.1993),	1-6

 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

06 November 2012 (06.11.2012)

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Name and mailing address of the ISA/US

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/40429

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
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.