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[Continued on next page]

(54) Title: NANOCCLAY SORBENTS FOR DIALYSIS DEVICE

(57) Abstract: Dialysis is enhanced by using nanoclay sorbents to better absorb body wastes in a flow-through system. Nanoclay sorbents, using montmorillonite, bentonite, and other clays, absorb significantly more ammonium, phosphate, and creatinine, and the like, than conventional sorbents. The clays may be used in wearable systems, such as a wearable peritoneal dialysis system, in which the dialysis fluid is circulated through a filter with nanoclay sorbents. Waste products are absorbed by the nanoclays and the dialysis fluid is recycled to the patient's peritoneum. Using the ion-exchange capability of the nanoclays, waste ions in the dialysis fluid are replaced with desirable ions, such as calcium, magnesium, and bicarbonate. The nanoclay sorbents are also useful for refreshing dialysis fluid used in hemodialysis and thus reducing the quantity of dialysis fluid needed for hemodialysis.

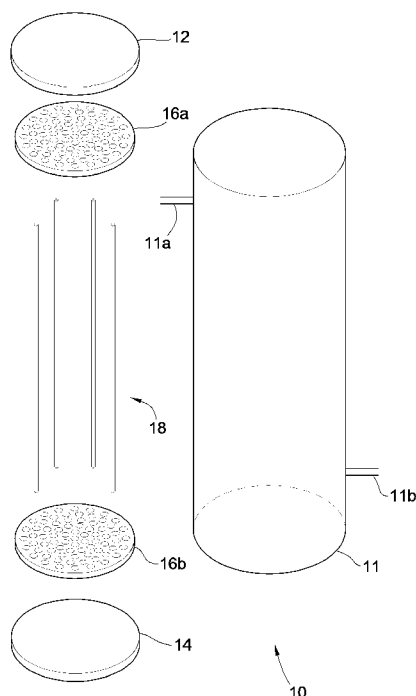


FIG. 1



SE, SG, SK, SL, SM, ST, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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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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22 April 2010

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2009/049152

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61M1/16 A61M1/34 A61M1/28

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)

A61M

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 practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 2008/075951 A1 (TNO [NL]; SCHILTHUIZEN STEPHANUS FRANCIS [NL]; BATENBURG LAWRENCE FABI) 26 June 2008 (2008-06-26) abstract page 4, line 26 - page 5, line 17 page 13, line 4 - page 15, line 30 page 16, line 27 page 17, line 18 - line 25 page 19, line 20 - line 28 page 22, line 7 - line 10 page 23, line 8 - line 13 page 27, line 3 - line 5 page 29, line 15 - line 25 ----- -/-</p>	1-12, 29-35

☒ 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 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

23 November 2009

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INTERNATIONAL SEARCH REPORT

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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.
X	EP 1 935 441 A1 (TNO [NL]) 25 June 2008 (2008-06-25) abstract paragraphs [0005], [0007], [0013], [0014], [0018], [0024], [0025], [0031], [0036], [0037], [0039] figures 1-5	1-12, 29-35
A	----- US 6 579 460 B1 (WILLIS RICHARD R [US] ET AL) 17 June 2003 (2003-06-17)	1-12, 29-35
A	----- US 2003/114787 A1 (GURA VICTOR [US]) 19 June 2003 (2003-06-19)	1-12, 29-35
A	----- WO 02/43859 A2 (SOUTHERN IONICS INC [US]; WONG RAYMOND J [US] RENAL SOLUTIONS INC [US]) 6 June 2002 (2002-06-06)	1-12, 29-35
A	----- US 5 284 470 A (BELTZ ALEX D [US]) 8 February 1994 (1994-02-08)	1-12, 29-35

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2009/049152

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.: 13-28, 41-45
because they relate to subject matter not required to be searched by this Authority, namely:
see FURTHER INFORMATION sheet PCT/ISA/210
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.:
1-12, 29-35

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 13-28, 41-45

The present application does not meet the requirements of Rules 39.1(iv) and 67.1(iv) PCT, method for treatment of the human or animal body by therapy or surgery.

The subject-matter of method claims 13-28 and 41-45 refers to methods for treatment of the human or animal body by therapy and/or surgery. In the light of the description it is clear that the removal of body wastes from dialysis fluid is performed with the intention or possibility to treat a patient. Therefore the subject-matter of these claims covers also medical therapy treatments.

Moreover, collecting and returning blood to a patients requires a surgical step (plebotomy) and therefore the methods described in these claims are considered to involve a surgical step.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-12, 29-35

A device for removing body waste from dialysis fluid by use of a replaceable filter containing nanoclay.

2. claims: 36-40

A method for making hollow fibers with nanoparticles in the lumen of the fiber.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2009/049152

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