



- (51) International Patent Classification:
B01D 63/04 (2006.01)
- (21) International Application Number:
PCT/US2012/028018
- (22) International Filing Date:
7 March 2012 (07.03.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
13/044,147 9 March 2011 (09.03.2011) US
- (72) Inventor; and
- (71) Applicant : **HERSCHMAN, Zvi** [US/US]; 346 Wilson Street, West Hempstead, NY 11552 (US).
- (74) Agent: **KOCHKA, Michael, P.**; Amster Rothstein & Ebenstein LLP, 90 Park Avenue, New York, NY 10016 (US).
- (81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

- (84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

[Continued on next page]

- (54) Title: IMPLANTABLE SYSTEMS AND METHODS FOR REMOVING SPECIFIC IMPURITIES FROM FLUIDS SUCH AS BLOOD

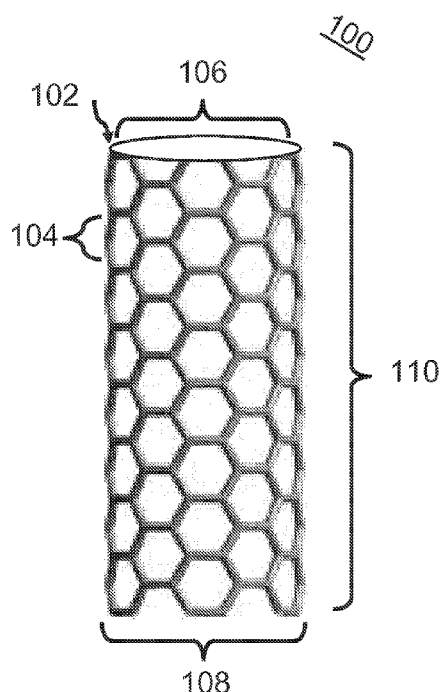


FIG. 1

(57) Abstract: Systems and methods utilize semipermeable nanotubes in conjunction with application of controlled electrical potentials across semipermeable nanotube walls allow selective transport of charged impurities (e.g., charged impurities, ions, etc.) from a fluid into these nanotubes. Impurities collected in these nanotubes can then be removed from the fluid, (e.g., blood) as a waste stream. A collection of semipermeable nanotubes each carrying a waste stream can be aggregated and merged into a ureter for excretion thereby providing an artificial kidney system. Sensors that detect/measure various impurities may be included in the system to feed information to a microprocessor to inform on concentrations of impurities, and thereby control electrical potentials applied to the system.



(88) Date of publication of the international search report:

17 April 2014

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 12/28018

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - B01D 63/04 (2012.01)

USPC - 210/500.23

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): B01D 63/04 (2012.01); USPC: 210/500.23

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

USPC: 210/500.23,645,646,650;604/6.09;977/742

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

Google Scholar, Google Patents, PubWEST (PGPB,USPT,EPAB,JPAB) (Nanostructure, semipermeable, filter, impurities, waste, electric, field, parallel, nanotube, microprocessor, voltage, waveform, polymer, cross-linked, blood, kidney, artificial, battery, glucose, potential, pore, ureter, anticoagulants)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2008/0223795 A1 (Bakajin, et al.) 18 Sep 2008 (18.09.2008) paragraphs [0045], [0084]-[0089], [0103]-[0105], [0114], [0134], [0140]	1-40
Y	US 2008/0107739 A1 (Kraft) 08 May 2008 (08.05.2008) Figures 2, 3, paragraphs [0013]-[0015], [0029]-[0037]	1-40
Y	US 2008/0004712 A1 (Humes, et al.) 03 Jan 2008 (03.01.2008) paragraph [0064]	40

☐ 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

12 Jun 2012 (12.06.2012)

Date of mailing of the international search report

19 JUN 2012

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450

Facsimile No. 571-273-3201

Authorized officer:

Lee W. Young

PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774