

(43) International Publication Date
27 September 2012 (27.09.2012)

(51) International Patent Classification:

A61N 1/36 (2006.01) A61N 1/08 (2006.01)
A61N 1/05 (2006.01)

(21) International Application Number:

PCT/US2012/030624

(22) International Filing Date:

26 March 2012 (26.03.2012)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/467,107 24 March 2011 (24.03.2011) US

(71) Applicants (for all designated States except US): CALIFORNIA INSTITUTE OF TECHNOLOGY [US/US]; 1200 East California Boulevard, Pasadena, California 91125 (US). UNIVERSITY OF LOUISVILLE RESEARCH FOUNDATION, INC. [US/US]; 201 E. Jefferson Street, Suite 215, Louisville, Kentucky 40202 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): BURDICK, Joel W. [US/US]; California Institute of Technology, 1200 East California Boulevard, Pasadena, California 91125 (US). TAI, Yu-Chong [US/US]; California Institute of Technology, 1200 East California Boulevard, Pasadena, California 91125 (US). NABER, John F. [US/US]; 10415 W. Highway 42, Goshen, Kentucky 40026 (US). KEYNTON, Robert S. [US/US]; 3500 Birchmore Place, Louisville, Kentucky 40245 (US).

(74) Agents: COLBURN, Heather M. et al.; Davis Wright Tremaine LLP, 865 S. Figueroa Street, Suite 2400, Los Angeles, California 90017 (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))
- 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))

[Continued on next page]

(54) Title: NEUROSTIMULATOR

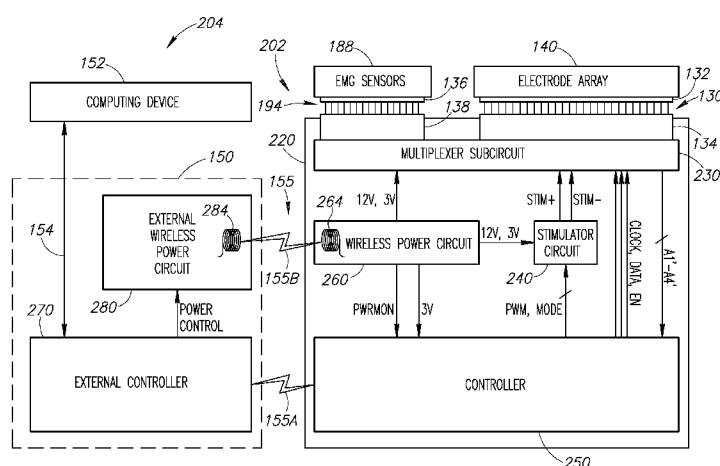


FIG.5

(57) Abstract: A neurostimulator device for use with groups (e.g., more than four groups) of electrodes. The neurostimulator may include a stimulation assembly configured to deliver different stimulation to each of the groups. The neurostimulator may also include at least one processor configured to direct the stimulation assembly to deliver stimulation to the groups. The stimulation delivered to at least one of the groups may include one or more waveform shapes other than a square or rectangular wave shape. The processor may receive data from one or more sensors and use that data to modify the stimulation delivered. The neurostimulator may be configured to communicate with an external computing device. The neurostimulator may send data to and/or receive data and/or instructions from the computing device. The computing device may use information collected by one or more sensors to at least partially determine stimulation parameters to communicate to the neurostimulator.



(88) Date of publication of the international search report:
27 December 2012

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/030624**A. CLASSIFICATION OF SUBJECT MATTER*****A61N 1/36(2006.01)i, A61N 1/05(2006.01)i, A61N 1/08(2006.01)i***

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)

A61N 1/36; A61B 5/04; A61B 18/04; A61N 1/18; A61F 11/00; A61N 1/08

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & Keywords: electrodes, sensors, stimulation, select, pattern, modify, tissue, group, network.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009-0112281 A1 (MIYAZAWA, GABRIELA C. et al.) 30 April 2009 See paragraphs [0031]-[0035], [0039]-[0040], [0044]-[0045], [0085], [0104], [0113], and [0131]; claims 1-2, 10-12, 21-23, and 38; and figures 1-2 and 12-15.	1-13, 20-33, 36-46, 50-51
Y		14-19, 35, 47-49
A		34
Y	US 2007-0016097 A1 (FARQUHAR, ALLEN et al.) 18 January 2007 See paragraphs [0059], [0089], and [0113]; claims 1 and 53; and figures 1, 3 and 11.	14-19, 35, 47-49
A	US 2004-0122483 A1 (NATHAN, ROGER H. et al.) 24 June 2004 See paragraphs [0015], [0017], [0026], [0028], [0050], [0055], and [0077]; claims 1 and 10-11; and figure 1.	1-51
A	US 7,493,170 B1 (SEGEL, PHILIP A et al.) 17 February 2009 See col. 3, lines 59-64; col. 6, lines 39-43; col. 8, lines 10-27; claims 1-4; and figures 1-3 and 5.	1-51

☐ 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 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

30 OCTOBER 2012 (30.10.2012)

Date of mailing of the international search report

31 OCTOBER 2012 (31.10.2012)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
189 Cheongsu-ro, Seo-gu, Daejeon Metropolitan
City, 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

NHO, Ji Myong

Telephone No. 82-42-481-8528



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2012/030624

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009-0112281 A1	30.04.2009	US 2011-251583 A1 US 7983757 B2 WO 2009-055127 A1	13.10.2011 19.07.2011 30.04.2009
US 2007-0016097 A1	18.01.2007	None	
US 2004-0122483 A1	24.06.2004	AU 2002-366287 A1 AU 2002-366287 B2 AU 2008-221611 A1 CA 2470677 A1 EP 1455894 A2 EP 1455894 A4 JP 2005-527256 A JP 4216725 B2 WO 03-051453 A2 WO 03-051453 A3	30.06.2003 26.06.2008 23.10.2008 26.06.2003 15.09.2004 31.05.2006 15.09.2005 28.01.2009 26.06.2003 13.11.2003
US 7,493,170 B1	17.02.2009	US 7103417 B1 US 7571005 B1 US 7835799 B1 US 7835800 B1	05.09.2006 04.08.2009 16.11.2010 16.11.2010