



(51) International Patent Classification:

A61N 1/36 (2006.01) A61B 5/055 (2006.01)
A61N 1/372 (2006.01)

(21) International Application Number:

PCT/US2014/029945

(22) International Filing Date:

15 March 2014 (15.03.2014)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/801,917 15 March 2013 (15.03.2013) US

(71) Applicant: BOSTON SCIENTIFIC NEUROMODULATION CORPORATION [US/US]; 25155 Rye Canyon Loop, Valencia, California 91355 (US).

(72) Inventors: VANSICKLE, Dennis, Allen; 3017 W. Milling Street, Lancaster, California 93536 (US). LEE, Dongchul; 11163 Lewis Hill Drive, Agua Dulce, California 91390 (US). KOTHANDARAMAN, Sridhar; 23002 Weymouth Place, Valencia, California 91354 (US).

DOAN, Que, T.; 23844 Strathem St., West Hills, California 91304 (US). ZHU, Changfang; 27941 Mariposa St., Valencia, California 91355 (US). PARRAMON, Jordi; 27631 Cobblestone Court, Valencia, California 91354 (US). HOLLEY, Justin; 1838 9th Street #204, Santa Monica, California 90404 (US). HERSHEY, Bradley, L.; 25532 Via Heraldo, Valencia, California 91355 (US). GILLESPIE, Christopher, E.; 25620 Wordsworth Lane, Stevenson Ranch, California 91381 (US). CARBUNARU, Rafael; 11916 Otsego Street, Valley Village, California 91607 (US). WAHAB, Nazim; 28455 Herrera Street, Valencia, California 91354 (US).

(74) Agent: MADDEN, Robert. B.; Schwegman, Lundberg & Woessner, P.A., P.O. Box 2938, Minneapolis, Minnesota 55402 (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, BN, 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, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,

[Continued on next page]

(54) Title: SYSTEMS FOR DELIVERING SUBTHRESHOLD THERAPY TO A PATIENT

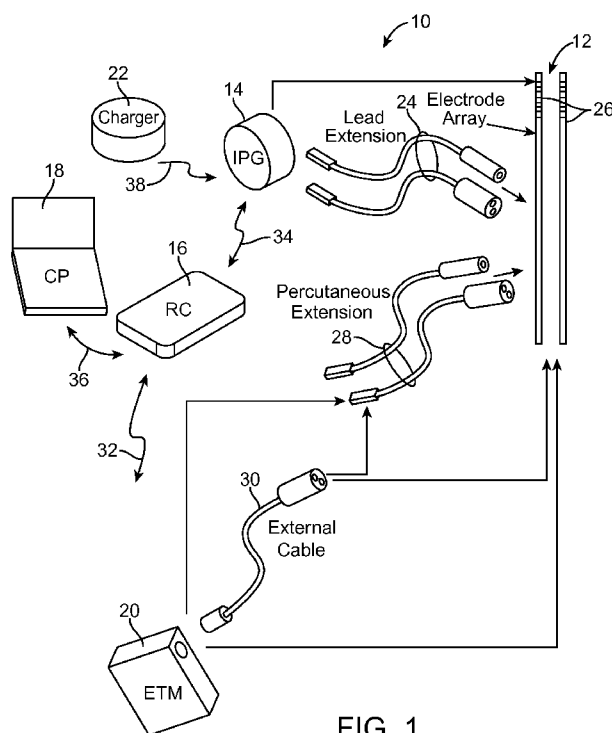


FIG. 1

(57) Abstract: An external control device for programming an implantable neuromodulator coupled to an electrode array is provided. The external control device comprises a user interface including a programming selection control element configured for allowing a user to select one of a first programming mode (e.g., a semi-automated programming mode) having a first limit on a modulation parameter and a second programming mode (e.g., a semi-automated programming mode) having a second limit on the modulation parameter different from the first limit. In one embodiment, the modulation parameter is a pulse rate, in which case, the first limit may be, e.g., an upper limit value less than 1500 Hz, and the second limit may be, e.g., a lower limit value greater than 1500 Hz. In another embodiment, the modulation parameter is a pulse width, in which case, the first limit may be, e.g., a lower limit value greater than 100 [micro]s, and the second limit may be, e.g., an upper limit value less than 100 ps. In still another embodiment, the modulation parameter is an electrode combination (e.g., a fractionalized electrode combination), in which case, the first limit may be, e.g., a range of electrode combinations having only anodic electrodes as primary modulating electrodes, and the second limit may be, e.g., a range of electrode combinations having only cathodic electrodes as primary modulating electrodes, or the first limit may be, e.g., a range of monopolar electrode combinations, and the second limit may be, e.g., a range of multipolar electrode combinations.



MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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.

SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, 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))

(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, 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,

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

31 December 2014

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2014/029945

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61N1/36 A61N1/372
 ADD. A61B5/055

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 A61B

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)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2012/239109 A1 (LEE DONGCHUL [US]) 20 September 2012 (2012-09-20) abstract; claim *; figures 1-33 paragraphs [0011] - [0012], [0024] - [0029] paragraphs [0188] - [0101] ----- -/--	1-17, 33-43, 66-77, 100-113, 141-152, 176-187, 210-223



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 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

28 May 2014

Date of mailing of the international search report

13/11/2014

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040,
 Fax: (+31-70) 340-3016

Authorized officer

Scheffler, Arnaud

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2014/029945

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2007/203521 A1 (DOBAK JOHN D [US] ET AL) 30 August 2007 (2007-08-30) the whole document -----	1-17, 33-43, 66-77, 100-113, 141-152, 176-187, 210-223

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/029945

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.: 18-32, 57-65, 89-99, 127-140, 164-175, 199-209, 240-250
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.:
1-17, 33-43, 66-77, 100-113, 141-152, 176-187, 210-223

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

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

1. claims: 1-17, 33-43, 66-77, 100-113, 141-152, 176-187, 210-223

External control device

2. claims: 44-56, 78-88, 114-126, 153-163, 188-198, 224-239

Neuromodulation system

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Claims Nos.: 18-32, 57-65, 89-99, 127-140, 164-175, 199-209, 240-250

Claims 18-32, 57-65, 89-99, 127-140, 164-175, 199-209, 240-250 relate to subject-matter considered by this Authority to be covered by the provisions of Rule 39.1(iv) PCT. Consequently, no opinion will be formulated with respect to the industrial applicability of the subject-matter of this claim. Claims 18-32, 57-65, 89-99, 127-140, 164-175, 199-209, 240-250 have not been searched, because it deals with methods of electrical treatment (Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy).

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/029945

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2012239109	A1	20-09-2012	NONE

US 2007203521	A1	30-08-2007	US 2007203521 A1 30-08-2007
			US 2010241189 A1 23-09-2010
