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- (71) **Applicant: CYBERONICS, INC.** [US/US]; 100 Cyberonics Blvd., Houston, Texas 77058 (US).
- (72) **Inventor; and**
- (71) **Applicant: JOSHI, Himanshu** [US/US]; 100 Cyberonics Blvd., Houston, Texas 77058 (US).
- (74) **Agents: SCOTT, Timothy, L.** et al.; 100 Cyberonics Blvd., Houston, Texas 77058 (US).
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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, 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.

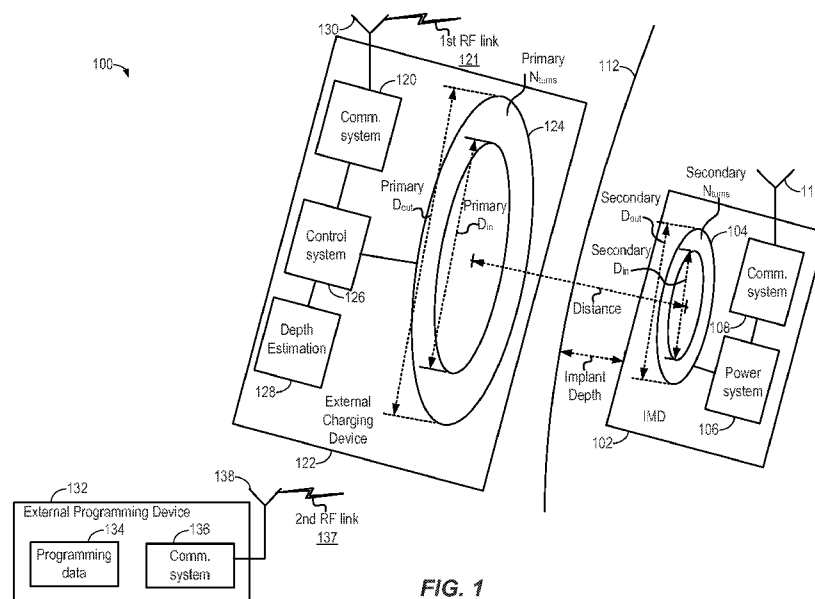
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- with international search report (Art. 21(3))
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(88) **Date of publication of the international search report:**

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(54) **Title: IMPLANTABLE MEDICAL DEVICE DEPTH ESTIMATION****FIG. 1**

(57) **Abstract:** A method includes applying a signal to a primary coil of an external charging device. The signal causes the primary coil to inductively couple to a secondary coil of an implantable medical device that is implanted within tissue of a patient. The method also includes measuring a current at the primary coil. The method further includes estimating a depth of the implantable medical device within the tissue of the patient based on the measured current.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/010915

A. CLASSIFICATION OF SUBJECT MATTER INV. A61N1/378 A61N1/372 ADD.		
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		
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) EP0-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 2010/137948 A1 (AGHASSIAN DANIEL [US] ET AL) 3 June 2010 (2010-06-03) abstract; figures 4,7 paragraphs [0011] - [0013], [0045], [0055]	1,3,11, 13,19
X	----- US 2006/016452 A1 (GOETZ STEVEN M [US] ET AL) 26 January 2006 (2006-01-26) abstract; figures 1,3 paragraphs [0002], [0035] - [0038]	1,2, 10-12, 18-20
A	----- WO 00/66221 A1 (ABIOMED INC [US]) 9 November 2000 (2000-11-09) abstract page 2, line 23 - page 4, line 18 -----	1-3, 10-13, 18-20
☐ 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 17 April 2014		Date of mailing of the international search report 29/08/2014
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 Pfeiffer, Uwe

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/010915

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.:
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.:

1-3, 10-13, 18-20

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: 1-3, 10-13, 18-20

Estimation of the depth of an implanted medical device,
wherein the estimation is further based on the dimension of
the primary or secondary coil.

2. claims: 4, 14

Notification of charge cycle extension if medical device is
implanted deeper than a threshold

3. claims: 5, 6, 15

Increasing the distance between primary and secondary coil
if medical device is implanted shallower than a threshold.

4. claims: 7-9, 16, 17

Tuning of a matching network based on the depth of the
implanted medical device.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/010915

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010137948 A1	03-06-2010	NONE	

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