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(54) Title: IMPLANTABLE MEDICAL DEVICES FOR AUTOMATIC ENTRY TO AN EXPOSURE MODE OF OPERATION UPON EXPOSURE TO A MAGNETIC DISTURBANCE

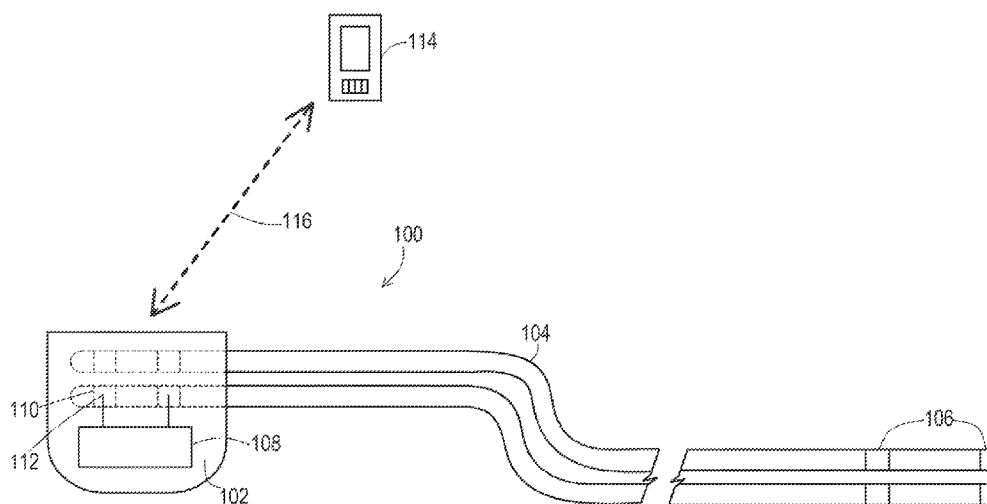


FIG. 1

(57) Abstract: Implantable medical devices automatically switch from a normal mode of operation to an exposure mode of operation and back to the normal mode of operation. The implantable medical devices may utilize hysteresis timers in order to determine if entry and/or exit criteria for the exposure mode are met. The implantable medical devices may utilize additional considerations for entry to the exposure mode such as a confirmation counter or a moving buffer of sensor values. The implantable medical devices may utilize additional considerations for exiting the exposure mode of operation and returning to the normal mode, such as total time in the exposure mode, patient position, and high voltage source charge time in the case of devices with defibrillation capabilities.



CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, 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, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, 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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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:

- *with international search report (Art. 21(3))*
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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
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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)

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.
A	WO 2012/134603 A1 (MEDTRONIC INC [US]; ELLINGSON MICHAEL L [US]; YOON HYUN J [US]; HERBER) 4 October 2012 (2012-10-04) abstract; figures 4-7 page 18, line 21 - page 22, line 28 -----	1-10
A	US 2010/198309 A1 (CABELKA LONNY V [US] ET AL) 5 August 2010 (2010-08-05) abstract; figure 4 paragraphs [0029] - [0038] -----	1-10
A	US 7 561 915 B1 (COOKE DANIEL J [US] ET AL) 14 July 2009 (2009-07-14) abstract; figures 5-9 column 8, line 61 - column 11, line 38 -----	1-10
A	US 2015/352354 A1 (DOERR THOMAS [DE] ET AL) 10 December 2015 (2015-12-10) the whole document -----	1-10



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"&" document member of the same patent family

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13/12/2017

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2012134603	A1	04-10-2012	NONE

US 2010198309	A1	05-08-2010	US 2007255332 A1 01-11-2007
			US 2010198309 A1 05-08-2010
			WO 2007127705 A1 08-11-2007

US 7561915	B1	14-07-2009	NONE

US 2015352354	A1	10-12-2015	EP 2952224 A1 09-12-2015
			US 2015352354 A1 10-12-2015
