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- (71) Applicant: **MEDTRONIC, INC.** [US/US]; MS LC340, 710 Medtronic Parkway NE, Minneapolis, MN 55432 (US). — Published:
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- (72) Inventors: **BURNES, John, E.**; 1442 159th Avenue Northwest, Andover, MN 55304 (US). **CHO, Yong, K.**; 11849 65th Avenue North, Maple Grove, MN 55369 (US). (88) Date of publication of the international search report: 21 April 2005
- (74) Agents: **WOLDE-MICHAEL, Girma** et al.; MS LC340, 710 Medtronic Parkway NE, Minneapolis, MN 55432 (US). For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.



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(54) Title: METHOD AND APPARATUS FOR THE TREATMENT OF SLEEP APNEA USING BIVENTRICULAR PACING

(57) Abstract: An apparatus and method for treating sleep apnea includes control unit in electrical communication with a lead. The control unit is capable of outputting a sleep apnea interruption pulse to stimulate at least one of a phrenic nerve and a diaphragm. Specifically, an implanted medical device (IMD) such as an implantable cardioverter-defibrillator (ICD) or a pacemaker paces the heart and a mode switch algorithm changes the pacing output to stimulate at least one of a phrenic nerve and diaphragm when sleep apnea is detected by the control unit. The method includes determining if the patient is experiencing sleep apnea and outputting a sleep apnea interruption pulse to the at least one of a phrenic nerve and a diaphragm. The control unit may be incorporated with the IMD. In another embodiment, the control unit may be in wireless communication with the IMD and positioned outside a patient's body.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/11202

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61N1/36

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 7 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 practical, search terms used)

EPO-Internal, PAJ, 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	WO 01/41868 A (CARDIAC PACEMAKERS, INC) 14 June 2001 (2001-06-14) abstract; figures 1-8 page 2, line 11 - page 3, line 4 page 3, column 25 - page 16, column 6	1-6, 8, 9, 11-13, 15-33
Y A	----- WO 99/63926 A (CPRX, LLP) 16 December 1999 (1999-12-16) abstract; figure 8 page 20, line 5 - line 28	10, 14, 34 7
Y	----- US 6 314 324 B1 (LATTNER STEFANIE ET AL) 6 November 2001 (2001-11-06) abstract; figure 6 column 15, line 17 - line 44	34
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Further documents are listed in the continuation of box C.



Patent family members are listed in 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 document 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

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Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Wetzig, T

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 03/11202

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
E	US 2003/153953 A1 (PARK EULJOON ET AL) 14 August 2003 (2003-08-14) the whole document -----	1,3,7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/11202

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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.: 35-49
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy
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 II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this International application, as follows:

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 fee, this Authority did not invite payment of any additional fee.
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.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest.
- No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 03/11202

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