

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
11 November 2004 (11.11.2004)

PCT

(10) International Publication Number
WO 2004/096346 A3

(51) International Patent Classification⁷: **A61N 1/37**,
A61B 5/0452, 5/0472

(21) International Application Number:
PCT/US2004/012094

(22) International Filing Date: 19 April 2004 (19.04.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/424,538 25 April 2003 (25.04.2003) US

(71) Applicant (for all designated States except US):
MEDTRONIC, INC. [US/US]; MS LC340, 710
Medtronic Parkway, Minneapolis, MN 55432 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **VAN OORT, Geeske** [NL/NL]; Berweg 38, NL-6881 LT Velp (NL).
OOSTERHOFF, Peter [NL/NL]; Ruysdaelstraat 22,

NL-7204 CD Zulphen (NL). **DE BRUYN, Henricus, W. M.** [NL/NL]; Neelandstuijnstraat 39, NL-6822 DG Amhem (NL). **SCHOLTEN, Patrick** [NL/NL]; Braamkamp 400, NL-7206 HT Zulphen (NL).

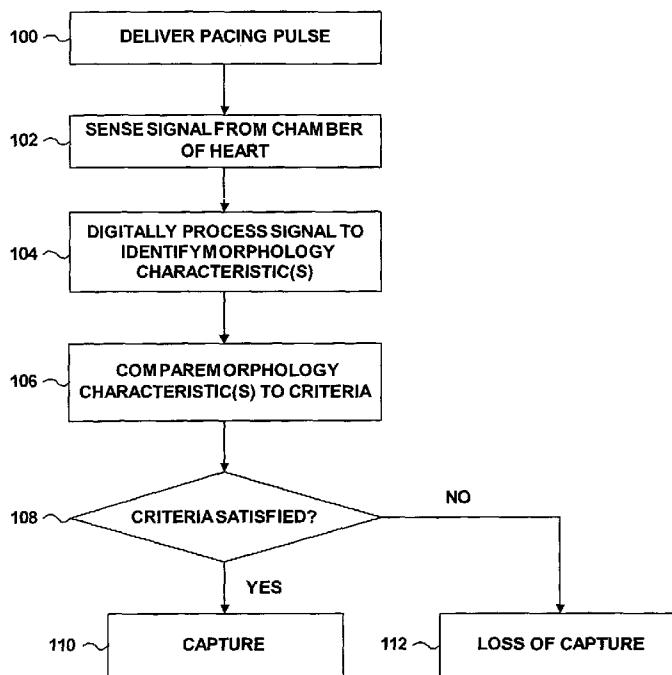
(74) Agents: **SOLDNER, Michael**, et al.; MS LC340, 710 Medtronic Parkway, Minneapolis, MN 55432 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR,

[Continued on next page]

(54) Title: FORM ANALYSIS OF A HEART SIGNAL TO DETECT EVOKED RESPONSE



(57) Abstract: Method and device for determining capture status of a heart chamber that receives a pulse from an implantable pulse generator (IPG). Signal processing can be used to improve the reliability of capture detection by transforming the sensed response signal into a set of morphological characteristics. Analysis of selected morphological characteristics serves to distinguish signals indicative of capture from signals indicative of loss of capture.

WO 2004/096346 A3



GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

(88) Date of publication of the international search report:
3 February 2005

Declaration under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for all designations*

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.

Published:

— *with international search report*

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/012094

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 A61N1/37 A61B5/0452 A61B5/0472

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 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 practical, search terms used)
 EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 029 087 A (WOHLGEMUTH WERNER PETER) 22 February 2000 (2000-02-22) cited in the application column 4, line 1 - column 8, line 62; figures 1,2A,3A-B,4,5A-D	26-54
X	US 2001/049542 A1 (BRADLEY KERRY ET AL) 6 December 2001 (2001-12-06) p. 3, '0025! - p. 9, '0113! figures 1,2,5A-C,6-8	26-54
X A	US 5 431 693 A (SCHROEPEL EDWARD A) 11 July 1995 (1995-07-11) column 2, line 44 - column 8, line 17; figures 1-9	26-32, 46,52-54 33-45, 47-51
	----- -/--	

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	*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
E earlier document but published on or after the international filing date	*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
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)	*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.
O document referring to an oral disclosure, use, exhibition or other means	*Z* document member of the same patent family
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 8 October 2004	Date of mailing of the international search report 18/10/2004
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 Fischer, O

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/012094

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 6 477 422 B1 (SPLETT VINCENT E) 5 November 2002 (2002-11-05) column 11, line 17 - column 12, line 56; figures 1-5 -----	26-32, 36,40, 42,50-54 33-35, 37-39, 41,43-49
X A	US 2002/138111 A1 (SCHALDACH MAX ET AL) 26 September 2002 (2002-09-26) p. 2, '0012! - p. 4, '0056! figures 1-3 -----	26-31, 52-54 32-51

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2004/012094

Box 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.: 1-25
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 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:

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/US2004/012094

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
US 6029087	A	22-02-2000	WO	0016852 A1		30-03-2000
			EP	1027102 A1		16-08-2000
US 2001049542	A1	06-12-2001	NONE			
US 5431693	A	11-07-1995	CA	2178485 A1		15-06-1995
			DE	69404672 D1		04-09-1997
			DE	69404672 T2		26-02-1998
			EP	0732961 A1		25-09-1996
			ES	2105882 T3		16-10-1997
			JP	9508819 T		09-09-1997
			WO	9515785 A1		15-06-1995
US 6477422	B1	05-11-2002	NONE			
US 2002138111	A1	26-09-2002	EP	1224952 A2		24-07-2002
			DE	10128982 A1		18-07-2002