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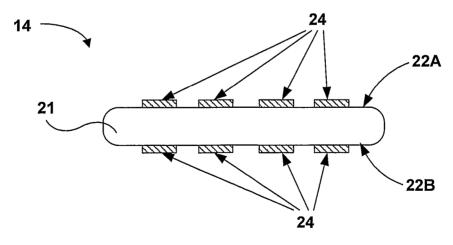
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(54) Title: IMPLANTABLE MEDICAL DEVICE WITH ELECTRODES ON MULTIPLE HOUSING SURFACES



(57) Abstract: An implantable medical device (IMD) with a housing and electrodes on at least two surfaces of the housing is described. The surfaces may be, for example, opposed, substantially parallel surfaces, e.g., top and bottom surfaces. Location of electrodes on multiple surfaces of the housing may allow the IMD to deliver stimulation to a variety of tissues and with a variety of current field configurations. For example, the IMD may deliver peripheral nerve field stimulation (PNFS) to one or more tissue areas via electrodes selected from one or both of the surfaces to, for example, reduce the sensation of pain in a tissue area proximate to an implantation site of the IMD without targeting a specific nerve. The IMD may be implanted between or within intra-dermal, deep dermal, or subcutaneous layers of the tissue of the patient to deliver PNFS to any one or more of these layers.



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A. CLASSIFICATION OF SUBJECT MATTER INV. A61N1/375 A61N1/34 ADD. A61N1/05 According to International Patent Classification (IPC) or to both national classification and IPC 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 practical, search terms used) EPO-Internal C. DOCUMENTS CONSIDERED TO BE RELEVANT Citation of document, with indication, where appropriate, of the relevant passages Category* Relevant to claim No. χ US 5 954 757 A (GRAY NOEL DESMOND [AU]) 1.5-15.21 September 1999 (1999-09-21) 17 Α 2-4,16,18 column 9, line 30 - column 13, line 57; figures 1-3,5-7,9 US 2003/004549 A1 (HILL MICHAEL R S [US] χ 1,5-12, ET AL) 2 January 2003 (2003-01-02) 17,18 paragraphs [0017], [0095] - [0100]; Α 2-4: figures 6A-B.7 13-16 X US 2004/122477 A1 (WHITEHURST TODD K FUST 1-8, 12,ET AL) 24 June 2004 (2004-06-24) 17,18 Α 10,11, 13 - 16paragraphs [0050] - [0058]; figures 4-6 X Further documents are listed in the continuation of Box C. See patent family annex. Special categories of cited documents: 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 "A" document defining the general state of the art which is not considered to be of particular relevance invention "E" earlier document but published on or after the international "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 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) 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 document published prior to the international filing date but later than the priority date claimed "&" document member of the same patent family Date of the actual completion of the international search Date of mailing of the international search report 11 January 2007 23/01/2007 Name and mailing address of the ISA/ Authorized officer 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

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INTERNATIONAL SEARCH REPORT

International application No
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Category* Citation of document, with indication, where appropriate, of the relevant passages A US 2004/098074 A1 (ERICKSON JOHN H [US] ET AL) 20 May 2004 (2004-05-20). paragraphs [0010], [0011], [0025] - [0043]; figures 1-4D A DE 197 58 114 A1 (BIOTRONIK MESS & THERAPIEG [DE]) 1 July 1999 (1999-07-01) column 2, line 21 - column 3, line 49; figures 1-3	C/Conti-	Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT			
A US 2004/098074 A1 (ERICKSON JOHN H [US] ET AL) 20 May 2004 (2004-05-20). paragraphs [0010], [0011], [0025] - [0043]; figures 1-4D A DE 197 58 114 A1 (BIOTRONIK MESS & 1-18 THERAPIEG [DE]) 1 July 1999 (1999-07-01) column 2, line 21 - column 3, line 49; figures 1-3 A US 2003/078633 A1 (FIRLIK ANDREW D [US] ET 1-18 AL) 24 April 2003 (2003-04-24)					
AL) 20 May 2004 (2004-05-20). paragraphs [0010], [0011], [0025] - [0043]; figures 1-4D A DE 197 58 114 A1 (BIOTRONIK MESS & 1-18 THERAPIEG [DE]) 1 July 1999 (1999-07-01) column 2, line 21 - column 3, line 49; figures 1-3 A US 2003/078633 A1 (FIRLIK ANDREW D [US] ET 1-18 AL) 24 April 2003 (2003-04-24)	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
THERAPIEG [DE]) 1 July 1999 (1999-07-01) column 2, line 21 - column 3, line 49; figures 1-3 US 2003/078633 A1 (FIRLIK ANDREW D [US] ET 1-18 AL) 24 April 2003 (2003-04-24)	A	AL) 20 May 2004 (2004-05-20). paragraphs [0010], [0011], [0025] -	1-18		
AL) 24 April 2003 (2003-04-24)	A	THERAPIEG [DE]) 1 July 1999 (1999-07-01) column 2, line 21 - column 3, line 49;	1–18		
	A	US 2003/078633 A1 (FIRLIK ANDREW D [US] ET AL) 24 April 2003 (2003-04-24)	1-18		

INTERNATIONAL SEARCH REPORT

Information on patent family members

international application No
PCT/US2006/022718

Patent document cited in search report	1	Publication date	Patent family member(s)	Publication date
US 5954757	Α	21-09-1999	NONE	
US 2003004549	A1	02-01-2003	CA 2426944 A1 EP 1339451 A2 JP 2004512105 T WO 0234330 A2	02-05-2002 03-09-2003 22-04-2004 02-05-2002
US 2004122477	A1	24-06-2004	NONE	
US 2004098074	A1	20-05-2004	AU 2003291079 A1 EP 1575662 A1 WO 2004045707 A1	15-06-2004 21-09-2005 03-06-2004
DE 19758114	A1	01-07-1999	NONE	
US 2003078633	A1	24-04-2003	NONE	