

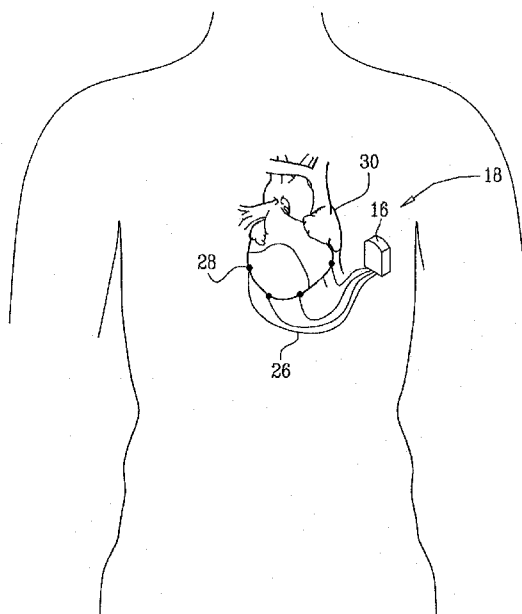


- (51) International Patent Classification:
A61N 1/365 (2006.01) A61N 1/362 (2006.01)
- (21) International Application Number:
PCT/IL2011/000952
- (22) International Filing Date:
20 December 2011 (20.12.2011)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
12/973,484 20 December 2010 (20.12.2010) US
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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, 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, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, 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.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: PACEMAKER WITH NO PRODUCTION

FIG. 1



(57) Abstract: Apparatus and methods are provided for use with a heart of a subject, including a set of one or more electrodes (28). A control unit (16) paces the heart by driving a first electric current via the electrode set into tissue of the subject, in accordance with a first set of parameters. The control unit stimulates nitric oxide production by a portion of the heart by driving a second electric current via the electrode set into the portion of the heart, in accordance with a second set of parameters. Other embodiments are also described.





Published:

(88) Date of publication of the international search report:

13 September 2012

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL 11/00952

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A61N 1/365 (2012.01)

USPC - 607/9

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(8) - A61N 1/365 (2012.01)

USPC - 607/9

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

IPC(8) - A61N 1/365 (2012.01)

USPC - 607/1, 2, 9, 11, 16, 17, 18, 19, 22, 25, 26

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

PubWEST (PGPB, USPT, EPAB, JPAB); Google (Patents, Scholar, Web)

Search Terms: Heart, electrode, pace, pacing, maker, heart, cardiac, electrode, current, nitric oxide, stimulare, produce, create, yield, amplitude, excite, below, under, second, period, interval, refract, millisecond, ms, initiate, start, frequency, pulse, train, sequence, pattern

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 7,292,886 B1 (KROLL) 06 November 2007 (06.11.2007) Fig. 3-5, 7A-7B; col 2, ln 52-58, col 4, ln 1 to col 5, ln 47, col 6, ln 49-61, col 8, ln 37 to col 9, ln 19, col 10, ln 15-49, col 11, ln 13-33	1-74
Y	US 2008/0119898 A1 (BEN-DAVID et al.) 22 May 2008 (22.05.2008) Fig. 1, 14A-14C; Abstract; Para [0123]-[0136], [0200]-[0202], [0206]-[0207], [0291]-[0298], [0437], [0439]-[0440], [0442], [0448], [0452]-[0453], [0455]-[0456], [0458]-[0467], [0470]-[0471], [0484], [0506], [0508], [0513], [0531], [0536], [0574]-[0575]	1-74
Y	US 2002/0032468 A1 (HILL et al.) 14 March 2002 (14.03.2002) para [0037], [0039]-[0040], [0043], [0050], [0060]	2-4, 23/(2-4)-38/(2-4), 40-42, 57/(40-42)-74/(40-42)

Further documents are listed in the continuation of Box C.

* Special categories of cited documents:	"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
"A" document defining the general state of the art which is not considered to be of particular relevance	"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
"E" earlier application or patent but published on or after the international filing date	"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
"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)	"&" document member of the same patent family
"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	

Date of the actual completion of the international search 25 June 2012 (25.06.2012)	Date of mailing of the international search report 05 JUL 2012
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Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US, Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-3201	Authorized officer: Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774
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INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL 11/00952

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-74; directed to apparatus and method for treating a heart of a subject, comprising pacing the heart.

Group II: Claims 75-110; directed to apparatus and method for treating a heart of a subject, comprising implanting a set of one or more electrodes into an outer surface of the heart.

Group III: Claim 111; directed to a method for treating a heart of a subject, comprising identifying the subject as having diastolic heart failure.

Group IV: Claim 112; directed to a method for treating a heart of a subject, comprising identifying the subject as having ischemic cardiac tissue.

Group V: Claim 113; directed to a method for treating a heart of a subject, comprising identifying the subject as having reduced coronary artery perfusion.

The inventions listed as Groups I-V do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical feature of Group I is pacing the heart, which is not present in Groups II-V. The special technical feature of Group II is implanting a set of one or more electrodes into an outer surface of the heart, which is not present in Groups I or III-V. The special technical feature of Group III is identifying the subject as having diastolic heart failure, which is not present in Groups I, II, IV, or V. The special technical feature of Group IV is identifying the subject as having ischemic cardiac tissue, which is not present in Groups I-III, or V. The special technical feature of Group V is identifying the subject as having reduced coronary artery perfusion, which is not present in Groups I-IV.

The only element of commonality between groups I-V is that of treating a heart of a subject by stimulating nitric oxide production by a portion of the heart, by driving an electric current into the portion of the heart, which is known in the prior art (ref. US 2009/0005845 A1 to David et al.; Abstract--"A method is provided, including implanting in an atrial wall of a subject, from within an atrium, a first electrode contact in a vicinity of a parasympathetic epicardial fat pad of the subject, and implanting a second electrode contact in a body of the subject outside of a heart and a circulatory system. A current is driven between the first and second electrode contacts, and configured to cause parasympathetic activation of the fat pad"; para [0451]--"the stimulation is applied to regular the production of nitric oxide (NO) (e.g., by changing the level of at least one NO synthase, e.g., increase a level of eNOS)").

Accordingly, unity of invention is lacking under PCT Rule 13.1.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL 11/00952

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 extra 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 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.:
Claims 1-74

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.