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(54) Title: METHOD AND APPARATUS FOR ESTABLISHING PARAMETERS FOR CARDIAC EVENT DETECTION

(57) Abstract: A pacemaker having a motion sensor is configured to set atrial event sensing parameters used for sensing atrial systolic events from a motion signal produced by the motion sensor. The pacemaker sets at least one atrial event sensing parameter by identifying ventricular electrical events and setting a sensing window following each of the ventricular electrical events. The pacemaker may determine a feature of the motion signal produced by the motion sensor during each of the sensing windows and set the atrial event sensing parameter based on the determined features.

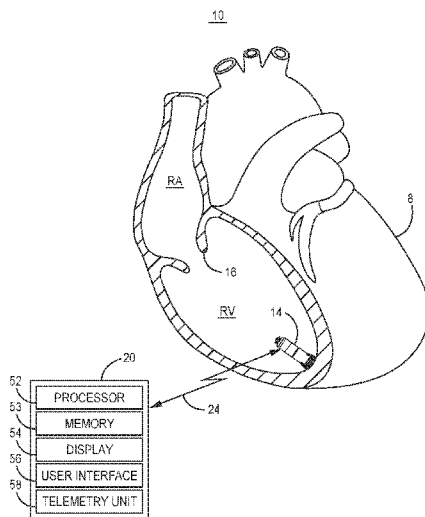


FIG. 1



TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

**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))*
- *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))*

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

30 July 2020 (30.07.2020)

INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2019/064653

A. CLASSIFICATION OF SUBJECT MATTER  
INV. A61N1/365 A61N1/375  
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.
X	US 2018/154154 A1 (SHELDON TODD J [US] ET AL) 7 June 2018 (2018-06-07)	1,16,20
Y	figures 1, 3, 5 paragraph [0028] - paragraph [0033] paragraph [0050] - paragraph [0097]	2,3
Y	----- WO 2018/165289 A1 (CARDIAC PACEMAKERS INC [US]) 13 September 2018 (2018-09-13) paragraph [0061]	2,3
A	----- US 2018/161580 A1 (DEMME WADE M [US] ET AL) 14 June 2018 (2018-06-14) the whole document -----	1-3,16, 20

Further documents are listed in the continuation of Box C.

See patent family 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 application or patent 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 <b>21 February 2020</b>	Date of mailing of the international search report <b>24/06/2020</b>
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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, Fax: (+31-70) 340-3016	Authorized officer <b>Ließmann, Frank</b>
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2019/064653

## 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 additional 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 an 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.:

1-3, 16, 20

### 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.

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-3, 16, 20

A pacemaker configured to determine a median or a distribution of the determined features and to set the atrial event sensing parameter based on the median or a percentile of the distribution.

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2. claim: 4

A pacemaker configured to set a non-atrial tracking pacing mode prior to identifying the plurality of ventricular electrical events and to sense the atrial systolic event from the motion signal during an subsequent atrial tracking pacing mode using the atrial event sensing parameter set in the non-atrial tracking pacing mode.

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3. claim: 5

A pacemaker configured to determine the feature of the motion signal by determining a maximum amplitude of each one of a plurality of vector signals of an multi-axis motion sensor.

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4. claims: 6-9

A pacemaker configured to determine the feature of the motion signal by determining a latest crossing time of a first threshold amplitude by the motion signal during each of the sensing windows.

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5. claims: 10-15

A pacemaker configured to set a passive ventricular filling window following each of the plurality of ventricular electrical events.

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6. claim: 17

A pacemaker configured to start the determination of the feature of the motion signal during each of the sensing windows after a time delay after receiving a communication signal from another medical device.

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7. claims: 18, 19

A pacemaker configured to abort determination of the feature

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

of the motion signal in response to detecting an abort  
condition.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2019/064653

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
US 2018154154	A1	07-06-2018	CN 110022933 A	16-07-2019
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			WO 2018111993 A1	21-06-2018
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