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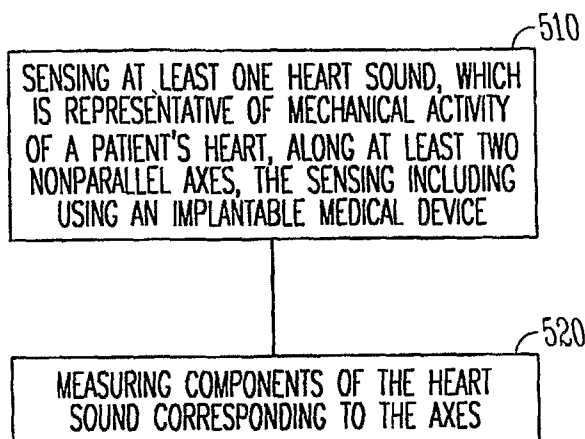
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(88) Date of publication of the international search report:
22 March 2007

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.

(54) Title: SYSTEMS AND METHODS FOR MULTI-AXIS CARDIAC VIBRATION MEASUREMENTS



(57) Abstract: A system to monitor heart sounds, such as to detect a worsening condition of heart failure decompensation. The system comprises a medical device that includes an implantable multi-axis heart sound sensor, operable to produce, for each of at least two nonparallel axes, an electrical signal representative of at least one heart sound, the heart sound associated with mechanical activity of a patient's heart. The device further includes a controller circuit coupled to the heart sound sensor. The controller circuit measures components of the heart sound that respectively correspond to each of the axes.

WO 2006/127594 A3

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2006/019729

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61B5/02

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)

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, 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	EP 1 247 485 A (COLIN CORP [JP]) 9 October 2002 (2002-10-09) paragraphs [0009] - [0012], [0015] - [0020], [0042], [0043], [0054]; figures 1,3,4,8,9	1-17
A	EP 1 179 317 A (COLIN CORP [JP]) 13 February 2002 (2002-02-13) the whole document	1-17



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 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

7 November 2006

Date of mailing of the international search report

17/11/2006

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2006/019729

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.: 18-30
because they relate to subject matter not required to be searched by this Authority, namely:
Due to the implicit step of implanting an implantable medical device present in the process step of "the sensing including using an implantable medical device", independent claim 18 relates to a method for treatment of the human or animal body by surgery (Rule 39.1(iv) PCT).
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/US2006/019729

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1247485	A	09-10-2002	JP 3587798 B2	10-11-2004
			JP 2002301035 A	15-10-2002
			US 2002147401 A1	10-10-2002
EP 1179317	A	13-02-2002	JP 2002051997 A	19-02-2002
			US 2002035337 A1	21-03-2002