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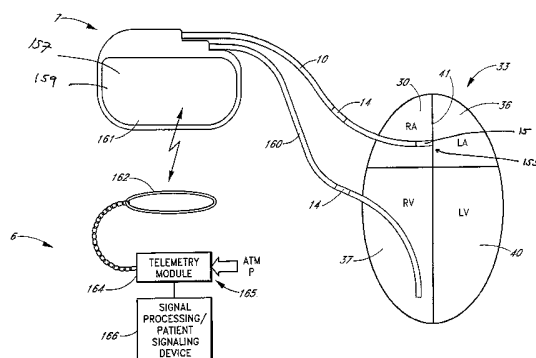
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[Continued on next page]

(54) Title: SYSTEM AND METHOD FOR DETECTING, DIAGNOSING, AND TREATING CARDIOVASCULAR DISEASE



(57) Abstract: An apparatus for treating cardiovascular disease in a medical patient includes one or more sensors (155), an implantable housing (7), at least one implantable lead (10), a signal processor (157), and a signaling device (166). The sensor (155) is operable to generate a sensor signal indicative of fluid pressure within the left atrium (36) of the heart (33). The implantable housing (7) includes a cardiac rhythm management apparatus (159), such as a pacemaker or a defibrillator. The cardiac rhythm management apparatus (159) includes an electrode (15), which is operable to deliver an electrical stimulus to a location in the heart (33). The electrical stimulus is delivered based at least in part on the sensor signal. The lead (10) is coupled to the implantable housing (7), and to the electrode (14). The signal processor (157) is operable to generate a processor output indicative of a treatment, and is based at least in part on the sensor signal. The signaling device (166) is operable to generate at least two distinct treatment signals distinguishable from one another by the patient. Each signal is indicative of a different therapeutic treatment, and is based at least in part on the processor output.



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

*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.*

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7 April 2005

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US04/16186

| <b>A. CLASSIFICATION OF SUBJECT MATTER</b><br>IPC(7) : A61N 1/362<br>US CL : 607/23<br>According to International Patent Classification (IPC) or to both national classification and IPC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                         |                                                                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>B. FIELDS SEARCHED</b><br>Minimum documentation searched (classification system followed by classification symbols)<br>U.S. : 607/23, 2, 4-6, 9, 17, 21, 32, 60<br>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched<br>Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)<br>Please See Continuation Sheet                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                         |                                                                     |
| <b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                         |                                                                     |
| Category *                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Citation of document, with indication, where appropriate, of the relevant passages                                                      | Relevant to claim No.                                               |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | US 6,381,493 B1 (STADLER et al ) 30 April 2002 (30.04.2002), Figs.1A, 1D, and 2; col.10, lines 1-9; col.34, lines 15-46, and 52.        | 36 and 42                                                           |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | US 6,480,744 B2 (FEREK-PETRIC) 12 November 2002 (12.11.2002), Figs.4, 6, and 8.                                                         | 33, 34, 36, and 40-42                                               |
| X                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | US 2002/0013613 A1 (HALLER et al) 31 January 2002 (31.01.2002), Figs.3, 4, 6A-6B, see p.7, paragraph [0058] and p.16, paragraph [0154]. | 33, 34, 36, and 40-42                                               |
| Y                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | US 2003/0055461 A1 (GIROUARD et al) 20 March 2003 (20.03.2003), Figs.1 and 2, p.5, paragraph [0041].                                    | 32-34, 36, and 40-42                                                |
| A                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | US 4,984,572 A (COHEN) 15 January 1991 (15.01.1991), all.                                                                               | 1, 17, 22, 32, 33, and 36-42                                        |
| A, P                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | US 6,580,946 B2 (STRUBLE) 17 June 2003 (17.06.2003), Figs.2-6; col.13, lines 12-28.                                                     | 1, 17, 22, 32, 36-42                                                |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                         |                                                                     |
| * Special categories of cited documents:<br>"A" document defining the general state of the art which is not considered to be of particular relevance<br>"E" earlier application or patent published on or after the international filing date<br>"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)<br>"O" document referring to an oral disclosure, use, exhibition or other means<br>"P" document published prior to the international filing date but later than the priority date claimed<br>"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<br>"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<br>"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<br>"&" document member of the same patent family |                                                                                                                                         |                                                                     |
| Date of the actual completion of the international search<br>09 November 2004 (09.11.2004)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                         | Date of mailing of the international search report<br>14 FEB 2005   |
| Name and mailing address of the ISA/US<br>Mail Stop PCT, Attn: ISA/US<br>Commissioner for Patents<br>P.O. Box 1450<br>Alexandria, Virginia 22313-1450<br>Facsimile No. (703) 305-3230                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                         | Authorized officer<br>Carl H. Layno<br>Telephone No. (571) 272-4949 |

# INTERNATIONAL SEARCH REPORT

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Continuation of B. FIELDS SEARCHED Item 3:

EAST

search terms: implantable, processor, lead, left atrium, pressure sensor