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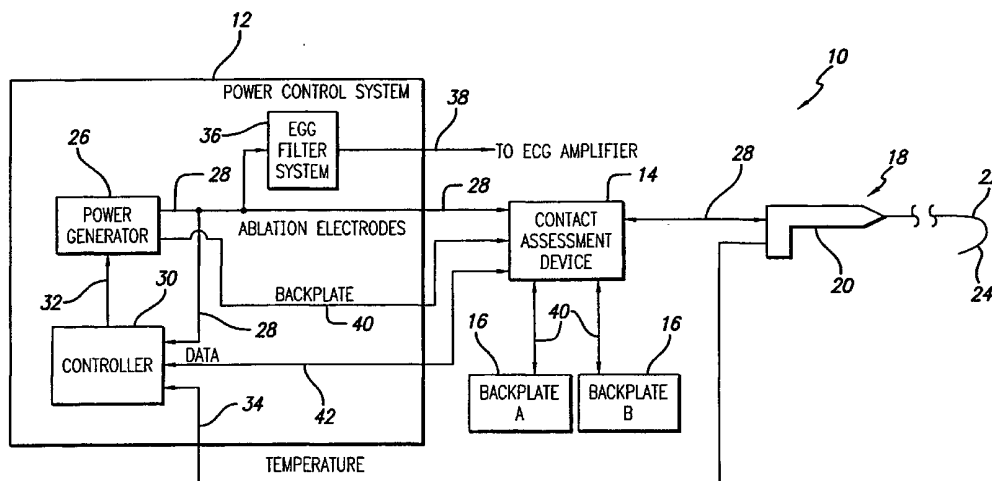
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For two-letter codes and other abbreviations, refer to the "Guid-
ance Notes on Codes and Abbreviations" appearing at the begin-
ning of each regular issue of the PCT Gazette.

(54) Title: RF ABLATION APPARATUS AND METHOD HAVING ELECTRODE/TISSUE CONTACT ASSESSMENT
SCHEME AND ELECTROCARDIOGRAM FILTERING



(57) Abstract: A method of assessing the adequacy of contact between an ablation electrode and biological tissue within a biological organ having biological fluid therein includes the steps of positioning the ablation electrode proximal the biological tissue; positioning a reference electrode a distance from the ablation electrode; measuring the impedance between the ablation electrode and the reference electrode at a first frequency and measuring the impedance between the ablation electrode and the reference electrode at a second frequency. The percentage difference between the first-frequency impedance and the second-frequency impedance provides an indication of the state of electrode/tissue contact. In general, a percentage difference of at least approximately 10 % serves as an indication of substantially complete electrode/tissue contact. A percentage difference in the approximate range between 5 % and 10 % serves as an indication of partial electrode/tissue contact. A percentage difference less than approximately 5 % serves as an indication of no electrode/tissue contact. Ratiometric measurements may also be used to assess the state of electrode/tissue contact.

INTERNATIONAL SEARCH REPORT

Inte. .onal Application No

PCT/US 00/16781

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 A61B18/12

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 7 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)

EP0-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	US 5 598 848 A (SWANSON DAVID K ET AL) 4 February 1997 (1997-02-04) the whole document	30,32, 36,40 31, 33-35, 37-39,41
X A	--- US 5 836 990 A (LI HONG) 17 November 1998 (1998-11-17) the whole document	30,32,40 31, 33-39,41
X	--- US 5 673 704 A (MARCHLINSKI FRANCIS E ET AL) 7 October 1997 (1997-10-07) claims	30,40
X A	--- US 5 341 807 A (NARDELLA PAUL C) 30 August 1994 (1994-08-30) the whole document --- -/--	30,32,40 33

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in 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
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- "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

5 October 2000

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,X	<p>WO 00 15130 A (SCIMED LIFE SYSTEMS INC) 23 March 2000 (2000-03-23) claims 1,5,9-11,17-22,29,37 -----</p>	30,40

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 00/16781

Box I Observations where certain claims were found unsearchable (Continuation of item 1 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.: **1-29, 45-48**
because they relate to subject matter not required to be searched by this Authority, namely:
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by surgery
Rule 39.1(iv) PCT - Method for treatment of the human or animal body by therapy
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 II Observations where unity of invention is lacking (Continuation of item 2 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 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.:

30-41

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

International Application No. PCT/US 00/16781

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. Claims: 30-41

Apparatus for assessing the status of contact between electrode and tissue using statistical treatment of impedance values

2. Claims: 42-44

Apparatus for assessing electrode/tissue contact status by measuring impedance at different frequencies

3. Claims: 49-53

Apparatus for generating ablation power signals with a high frequency component

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/US 00/16781

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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