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(88) Date of publication of the international search report:
28 July 2005

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: MRI PROBE DESIGN AND TRACKING, AND EFFICIENT MRI RECONSTRUCTION AND DEBLURRING

(57) Abstract: A probe suitable for attachment to, or incorporation in, a medical interventional device, such as a catheter, and which may be employed for tracking, imaging, or both, includes a first material having an MR resonance frequency distinct from a resonance frequency of a second material adjacent to the first material.

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INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/014128

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G01R33/28

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 G01R

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, INSPEC, 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	WO 01/75465 A (MERKLE ELMAR M ; UNIV CASE WESTERN RESERVE (US); CHUNG YIU CHO (US); W) 11 October 2001 (2001-10-11) page 3, paragraphs 3,4 - page 8, paragraph 2	1-9
X	US 2003/065267 A1 (SMITH SCOTT RAYMOND) 3 April 2003 (2003-04-03)	1
A	page 3, paragraph 32	2-9
A	US 5 715 822 A (DUMOULIN CHARLES LUCIAN ET AL) 10 February 1998 (1998-02-10) the whole document	1-9

☐ 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

"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	Date of mailing of the international search report
23 November 2004	10. 05. 2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Dragomir, A

Form PCT/ISA/210 (second sheet) (January 2004)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2004/014128

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.:
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 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 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.:

1-9

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ 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: 1-9

An active invasive device used for tracking and imaging comprising either: 1) a coil made up of two coil sections wound in opposite direction with respect to each other or 2) two separate coils wound in opposite directions connected to two different RF channels.

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2. claims: 10-32

A passive wireless invasive device used for tracking comprising either: 1) two different materials resonating at different MR resonant frequencies one of the comprising a liquid contrast agents.

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3. claims: 33-42

A MRI method of reconstructing an MRI image from rectilinearly-sampled k-space data involving INNG algorithm.

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4. claims: 43-60

A method of adaptively adjusting at least one MRI parameter for an interventional procedure.

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US2004/014128

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