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(54) Title: MICROWAVE ANTENNA APPARATUS, SYSTEMS AND METHODS FOR LOCALIZING MARKERS OR TISSUE STRUCTURES WITHIN A BODY

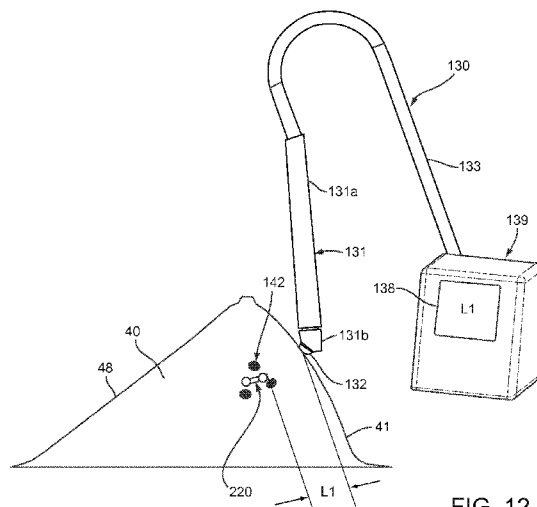
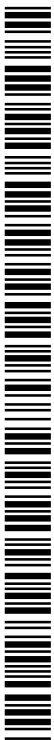


FIG. 12

(57) Abstract: Apparatus, systems, and methods are provided for localizing lesions within a patient's body, e.g., within a breast. The system includes a microwave antenna probe for transmitting and receiving electromagnetic signals to detect one or more markers that are implanted within or around the target tissue region. During use, the marker(s) are implanted into a target tissue region, and the microwave antenna probe is placed against the patient's skin to transmit a signal to the marker(s) and to receive the reflected signal from the marker(s) in order to determine the location of the marker(s). A tissue specimen, including the lesion and the marker(s), is then removed from the target tissue region based at least in part on the location information from the microwave antenna probe.



# INTERNATIONAL SEARCH REPORT

International application No <b>PCT/US2014/013239</b>
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**A. CLASSIFICATION OF SUBJECT MATTER**

INV. A61B5/05  
ADD. A61B19/00

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 practicable, search terms used)

**EPO-Internal**

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/313288 A1 (CHI SING EDUARDO [US] ET AL) 22 December 2011 (2011-12-22)	11-16, 22,23, 26-31, 37,38, 41-46, 63-69, 76-89
Y	abstract; figures 1,10 paragraphs [0081], [0154] - [0161], [0088] - [0093], [0101] - [0102], [0107] - [0109], [0113] - [0114], [0123], [0125] - [0001]	1-10, 17-21, 24,25, 32-36, 39,40, 47-53, 63, 70-76, 81,90
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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

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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.
Y	<p>US 6 061 589 A (BRIDGES JACK E [US] ET AL) 9 May 2000 (2000-05-09)</p> <p>abstract; figures 20,21,26 column 2, lines 9-26 column 8, line 9 - column 9, line 8 column 25, line 43 - column 26, line 18 column 26, lines 47-57 column 29, lines 1-10</p> <p>-----</p>	<p>1,2,5, 10,17, 18,20, 21,25, 32,33, 35,36, 40,47, 48,50, 51,53, 55,57,90</p>
Y	<p>XING YUN ET AL: "Broadband cross-polarized bowtie antenna for breast cancer detection", IEEE ANTENNAS AND PROPAGATION SOCIETY INTERNATIONAL SYMPOSIUM. 2003 DIGEST. APS. COLUMBUS, OH, JUNE 22 - 27, 2003; [IEEE ANTENNAS AND PROPAGATION SOCIETY INTERNATIONAL SYMPOSIUM], NEW YORK, NY : IEEE, US, vol. 3, 22 June 2003 (2003-06-22), pages 1091-1094, XP010746493, DOI: 10.1109/APS.2003.1220101 ISBN: 978-0-7803-7846-9 the whole document</p> <p>-----</p>	<p>1,2,5, 17,18, 32,33, 47,48, 55,57,90</p>
Y	<p>US 2012/212380 A1 (THEOBOLD DAVID M [US] ET AL) 23 August 2012 (2012-08-23)</p> <p>abstract; figures 2-4,8 paragraphs [0018], [0028], [0030], [0033], [0039], [0040], [0059] - [0061]</p> <p>-----</p>	<p>9,10,19, 24,25, 34,39, 40,49, 52,53</p>
Y	<p>SHANNON C J ET AL: "Dielectric-filled slotline bowtie antenna for breast cancer detection", ELECTRONICS LETTERS, IEE STEVENAGE, GB, vol. 41, no. 7, 31 March 2005 (2005-03-31) , pages 388-390, XP006023800, ISSN: 0013-5194, DOI: 10.1049/EL:20057336 the whole document</p> <p>-----</p>	<p>56,58-61</p>
Y	<p>US 2009/015832 A1 (POPOVIC MILICA [CA] ET AL) 15 January 2009 (2009-01-15) abstract; figures 9,14 paragraphs [0004], [0005], [0010], [0032], [0033]</p> <p>-----</p>	<p>56,58-61</p>
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INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2014/013239

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2003/036713 A1 (BOUTON CHAD [US] ET AL) 20 February 2003 (2003-02-20)  paragraphs [0081], [0082], [0091], [0092], [0098] - [0101], [0104] -----	3-8,18, 33,48, 55-61, 70-75,90
X	US 6 492 933 B1 (MCEWAN THOMAS E [US]) 10 December 2002 (2002-12-10) cited in the application	64,65, 67,69, 76-79, 81,83
Y	column 12, lines 25-56; figure 10A column 13, line 66 - column 14, line 9; figure 12b  -----	63,76, 81,90
X	EP 1 374 793 A1 (BIOSENSE INC [US]) 2 January 2004 (2004-01-02)	11,26,41
Y	abstract; figure 2 paragraphs [0001], [0011], [0013], [0026] - [0028], [0030] - [0038] -----	63,76,81
X	SIVANAND KRISHNAN ET AL: "UWB-IR active reflector for high precision ranging and positioning applications", COMMUNICATION SYSTEMS (ICCS), 2010 IEEE INTERNATIONAL CONFERENCE ON, IEEE, PISCATAWAY, NJ, USA, 17 November 2010 (2010-11-17), pages 14-18, XP031848086, ISBN: 978-1-4244-7004-4 sections "I.Introduction" and "II. Description", first three paragraphs; figure 1  -----	76-80,85

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2014/013239

## 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.: 54, 62, 91, 92  
because they relate to subject matter not required to be searched by this Authority, namely:  
see FURTHER INFORMATION sheet PCT/ISA/210
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.:

### 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**

Continuation of Box II.1

Claims Nos.: 54, 62, 91, 92

The methods of claims 54, 62 and 91 reciting methods for localizing a target tissue region within a patient's body comprise either the step of "introducing a target into a target region"(claim 54), or the step of "introducing a marker into a patient's body"(claim 62), or the step of "implanting a tag within a patient's body"(claim 91). The introduction of such a target or the implantation of such a tag into the patient's body is considered to encompass different kinds of substantial physical interventions practised on the human body, which are considered to be of surgical nature, by means of which the claimed methods as a whole are considered to be methods for treatment of the human body by surgery, thereby falling within the provisions of Rule 39.1(iv)/67.1(iv) PCT. Therefore no opinion is given on the subject-matter of claims 54, 62,91 and 92.

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Continuation of Box II.2

The methods of claims 54, 62 and 91,92 reciting methods for localizing a target tissue region within a patient's body comprise either the step of "introducing a target into a target region"(claim 54), or the step of "implanting a marker within a patient's body"(claim 62), or the step of "implanting a tag within a patient's body"(claim 91). The introduction of such a target or the implantation of such a marker or tag within the patient's body is considered to encompass different kinds of substantial physical interventions practised on the human body, which are considered to be of surgical nature, by means of which the claimed methods as a whole are considered to be methods for treatment of the human body by surgery, thereby falling within the provisions of Rule 39.1(iv) PCT.

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

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

1. claims: 1-53, 55-61(completely); 90(partially)

Probes with a tip configured to be placed adjacent to a patient's body, said tip comprising at least a transmit antenna to transmit a signal to the body and a receive antenna to receive a signal reflected from a target/marker within the body; and systems comprising said probes.

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2. claims: 63-89(completely); 90(partially)

Passive tags for introduction into a target tissue within a region of a patient's body, comprising an energy converter and a switch to modulate, upon reflection, energy pulses striking the tag; and systems comprising such a passive tag.

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/013239

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2011313288	A1	22-12-2011	NONE
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