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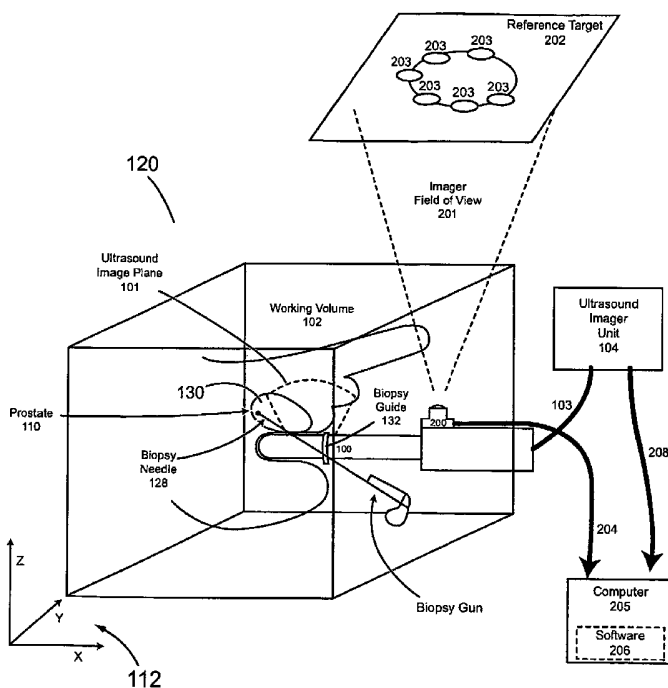
10/230,986	29 August 2002 (29.08.2002)	US
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- (63) Related by continuation (CON) or continuation-in-part (CIP) to earlier application:

US	10/230,986 (CIP)
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[Continued on next page]

(54) Title: METHODS AND SYSTEMS FOR LOCALIZING OF A MEDICAL IMAGING PROBE AND OF A BIOPSY NEEDLE

Ultrasound Image Localization



(57) Abstract: A method for determining the location of a biopsy needle within a target volume, said target volume being defined to be a space inside a patient, the method comprising: (1) generating a plurality of images of the target volume; (2) spatially registering the images; (3) generating a three-dimensional representation of the target volume from the spatially registered images; (4) determining the location of the biopsy needle in the three-dimensional target volume representation; and (5) correlating the determined biopsy needle location with the spatially registered images. Preferably, the present invention includes graphically displaying the target volume representation, the target volume representation including a graphical depiction of the determined biopsy needle location. Also disclosed herein is an inventive localization technique wherein a camera for tracking a reference target is attached to an ultrasound probe, thereby enabling precise localization of the probe in a coordinate system.

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MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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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.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 03/27239

A. CLASSIFICATION OF SUBJECT MATTER IPC 7 A61B8/08 A61B8/13 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) IPC 7 A61B G01S		
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		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/44749 A (ROKE MANOR RESEARCH ; SPARKS ED (GB); HARRIS CHRIS (GB); ROBERTS PA) 6 June 2002 (2002-06-06) page 2, lines 16-33	13-17, 22, 25-29
Y	page 8, line 4 - page 9, line 10	19, 31
Y	WO 00/63658 A (PALTIELI YOAV ; WOLF STUART (IL); ULTRAGUIDE LTD (IL)) 26 October 2000 (2000-10-26) page 10, lines 1-8; figure 2C page 13, lines 1-12; figure 4B	19, 31
A	US 5 765 561 A (MCKENNA MICHAEL A ET AL) 16 June 1998 (1998-06-16) column 11, line 7 - column 12, line 15; figure 8	13, 25
	-/--	
<input checked="" type="checkbox"/> Further documents are listed in the continuation of box C. <input checked="" type="checkbox"/> 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. *8* document member of the same patent family		
Date of the actual completion of the international search 30 August 2004		Date of mailing of the international search report 13. 09. 2004
Name and mailing address of the ISA 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		Authorized officer Kronberger, R

INTERNATIONAL SEARCH REPORT

PCT /US 03/27239

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 129 670 A (BURDETTE EVERETTE C ET AL) 10 October 2000 (2000-10-10) cited in the application column 4, lines 38-67; figures 1A,1B,5A,8 column 6, line 33 - column 7, line 17 -----	13-18, 22, 24-30,33
X	US 2001/029334 A1 (GRAUMANN RAINER ET AL) 11 October 2001 (2001-10-11) paragraphs '0034! - '0043!; figure 2	13,14, 17,20
Y	paragraphs '0040!, '0042! -----	20,21, 34,35, 42,43
X	US 5 742 263 A (O'HAGAN TIMOTHY P ET AL) 21 April 1998 (1998-04-21)	79-81
Y	column 3, line 33 - column 5, line 30; figures 1,2 -----	20,21, 34,35, 42,43
X	US 2002/087080 A1 (SLAYTON MICHAEL H ET AL) 4 July 2002 (2002-07-04)	73
A	paragraphs '0034! - '0036!, '0047! - '0058!; figures 3,6 -----	21,42,44
A	WO 01/06924 A (UNIV FLORIDA) 1 February 2001 (2001-02-01) figure 2 -----	70,71
A	WO 01/95795 A (SPECTROS CORP) 20 December 2001 (2001-12-20) page 35, line 14 - page 37, line 30 -----	23,32
A	US 6 238 342 B1 (FELEPPA ERNEST JOSEPH ET AL) 29 May 2001 (2001-05-29) column 5, lines 2-20; figures 1,3,4 column 6, lines 14-39 column 9, lines 33-41 -----	23,32

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 03/27239

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.: 1-12, 45, 55-61
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.: 13-18(partly), 20-21, 34-43, 46-54, 62-81
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:
see FURTHER INFORMATION sheet PCT/ISA/210

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

As a result of the prior review under R. 40.2(e) PCT,
no additional fees are to be refunded.

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.:
1-43, 46-54, 62-81 (partly)

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.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box I.1

Claims Nos.: 1-12,45,55-61

Rule 39.1(iv) PCT

- Method for treatment of the human or animal body by surgery
- Method for treatment of the human or animal body by therapy

Continuation of Box I.2

Claims Nos.: 13-18(partly), 20-21, 34-43, 46-54, 62-81

Regarding the group of claims mentioned under 2:

This group comprises the independent claims 13, 34, 42, 46, 62, 73 and 79. The number and also the wording of these independent claims renders it difficult, if not impossible, to determine the matter for which protection is sought.

Some of these claims (i.e. claims 42, 46 and 34, 62) appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and/or in respect of the terminology used for the features of that subject-matter.

Therefore, the present application fails to comply with the clarity and conciseness requirements of Article 6 PCT (see also Rule 6.1(a) PCT) to such an extent that a meaningful search is impossible.

Furthermore some of the claims, i.e. claim 73, are formulated in such a broad way that they effectively relate to an extremely large number of possible devices. Support within the meaning of Article 6 PCT and disclosure within the meaning of Article 5 PCT is to be found, however, for only a very small proportion of the device claimed. In the present case, the claims so lack support, and the application so lacks disclosure, that a meaningful search over the whole of the claimed scope is impossible.

Consequently, concerning the group of claims mentioned under point 2, the search was carried out for those parts of the present application which appear to define the core of the second invention, i.e. a positioning system/method as described on p.11/1.29-p.13/1.23 and p.19/1.8-p.24/1.7 of the description, corresponding i.e. to the device/method as claimed in claims 34 and 42. The additional claims of group 2 were partly searched in light of the mentioned passages of the description.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

Information on patent family members

PCT /US 03/27239

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