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(81) Designated States (unless otherwise indicated, for every kind of national protection available):

AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- as to applicant's entitlement to apply for and be granted a patent (Rule 4.1 7(H))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.1 7(in))

[Continued on nextpage]

(54) Title: INTEGRATION OF FIBER OPTIC SHAPE SENSING WITHIN AN INTERVENTIONAL ENVIRONMENT

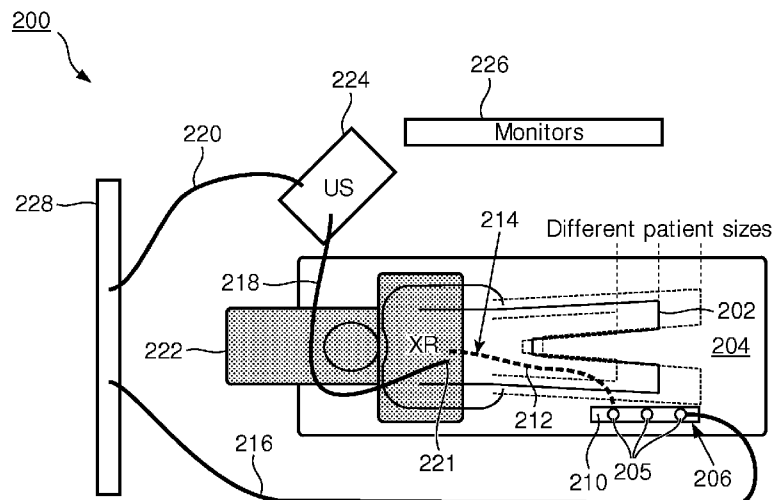


FIG. 2A

(57) Abstract: An integrated optical shape sensing system and method include an arrangement structure (132) configured to receive a fiber port or connector. A platform (130) is configured to provide a distance relationship with the arrangement structure such that the fiber port or connector is trackable to provide a location reference. The platform secures a patient in proximity to the arrangement structure. An optical shape sensing enabled interventional instrument (102) has a first optical fiber cable connectable to the fiber port or connector. An optical interrogation module (108) is configured to collect optical feedback from the instrument and has a second optical fiber cable connectable to the fiber port or connector such that a known reference position is provided for accurate shape reconstruction.

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18 October 2012

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/IB2012/050296

A. CLASSIFICATION OF SUBJECT MATTER  
**INV. A61B19/00**  
**ADD. A61M25/01 G01B11/16**

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 , 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 Y	US 2010/030063 AI (LEE NATHAN TYLER [US] ET AL) 4 February 2010 (2010-02-04) figures 1,2,2A	1,7,8, 10, 17 10, 11, 13, 14, 17
X Y	US 2009/137952 AI (RAMAMURTHY BHASKAR S [US] ET AL) 28 May 2009 (2009-05-28) figures 20-22	1,2,4,5 , 7,8 10, 11, 13, 14, 17
X,P	Wo 2011/100124 AI (INTUITIVE SURGICAL OPERATIONS [US] ) 18 August 2011 (2011-08-18) figures 1,3 paragraph [0039]	1,4

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 <b>15 May 2012</b>	Date of mailing of the international search report <b>24/07/2012</b>
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer <b>Schi eßl , Werner</b>
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IB2012/050296

## 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.: 18-21  
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 (in claim 18 the step of shape sensing the instrument encompasses the movement of an interventional instrument within the body of a patient; see for instance para, bridging pp. 7 and 8)
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. :  
1-8, 10-15, 17

### 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.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2012/050296

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010030063	AI 04-02-2010	NONE	
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US 2009137952	AI 28-05-2009	EP 2187830 AI	26-05-2010
		US 2009137952 AI	28-05-2009
		Wo 2009023801 AI	19-02-2009
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Wo 2011100124	AI 18-08-2011	US 2011202069 AI	18-08-2011
		wo 2011100124 AI	18-08-2011
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## FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-8, 10-15, 17

An integrated optical shape sensing system wherein specific connections of the arrangement structure to the platform (see claims 2, 5, 11, 14) are provided. This allows a simple and reliable registration of the instrument shape with a patient / image coordinate system without interference with the working space or compromising the function of the imaging device.

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2. claims: 9, 16

An integrated optical shape sensing system wherein a reference arm length control module is configured to adjust a reference arm length of an interferometer for maximum length and resolution of the shape sensing activated fiber (claims 9 and 16).

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