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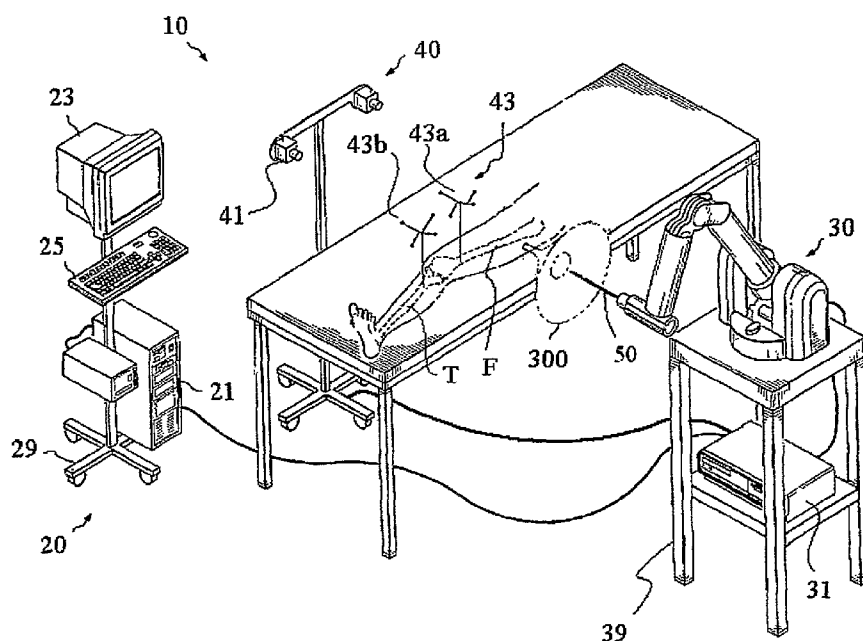
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(54) Title: METHOD AND APPARATUS FOR CONTROLLING A HAPTIC DEVICE



(57) Abstract: A method of compensating for motion of objects during a surgical procedure is provided. The method includes determining a pose of an anatomy of a patient; determining a pose of a surgical tool of a surgical device; defining a relationship between the pose of the anatomy and a position, an orientation, a velocity, and/or an acceleration of the surgical tool; associating the pose of the anatomy, the pose of the surgical tool, and the relationship; and updating the association in response to a motion of the anatomy and/or a motion of the surgical tool without interrupting operation of the surgical device during the surgical procedure.

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## INTERNATIONAL SEARCH REPORT

International application No

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A. CLASSIFICATION OF SUBJECT MATTER  
INV. 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 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	US 5 408 409 A (GLASSMAN EDWARD [US] ET AL) 18 April 1995 (1995-04-18) columns 4,5; figures 1,6	17-33
X	WO 2004/075987 A (KONINKL PHILIPS ELECTRONICS NV [NL]; FRASER JOHN [US]) 10 September 2004 (2004-09-10) figure 1	17-19, 21-23, 25,27-33
X	EP 1 059 067 A (SHERWOOD SERV AG [CH]) 13 December 2000 (2000-12-13)  paragraphs [0050], [0053], [0055], [0068]; figures 1,4,5  ----- -/--	17-19, 21-25, 28-33



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

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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

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\*Z\* document member of the same patent family

Date of the actual completion of the international search

4 December 2007

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## INTERNATIONAL SEARCH REPORT

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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.
X	US 5 676 673 A (FERRE MAURICE R [US] ET AL) 14 October 1997 (1997-10-14)  columns 4,5,6,9 - column 11; figures 1,3,22,29  -----	17,18, 21-25, 27-33
X	US 6 322 567 B1 (MITTELSTADT BRENT D [US] ET AL) 27 November 2001 (2001-11-27) cited in the application figures 1,2  -----	17-19, 21,22, 24,25,27
X	US 2004/034283 A1 (QUAID ARTHUR E [US]) 19 February 2004 (2004-02-19) cited in the application figures 1,4a  -----	17-21, 26-33
A	WO 95/01757 A (BORST CORNELIUS [NL]) 19 January 1995 (1995-01-19) abstract; figures 1,6  -----	17
A	WO 02/061371 A (Z KAT INC [US]) 8 August 2002 (2002-08-08) figures 2,3  -----	17,23
A	US 6 434 416 B1 (MIZOGUCHI MASAKAZU [JP] ET AL) 13 August 2002 (2002-08-13)  figures 6-8,10  -----	17-19, 21-25, 27-33

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2007/011940

### 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.: **1-16**  
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**
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:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable 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.

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5408409	A	18-04-1995	NONE	
WO 2004075987	A	10-09-2004	JP 2006519048 T US 2006293598 A1	24-08-2006 28-12-2006
EP 1059067	A	13-12-2000	CA 2310822 A1 DE 60019195 D1 DE 60019195 T2 ES 2239964 T3	11-12-2000 12-05-2005 09-03-2006 16-10-2005
US 5676673	A	14-10-1997	AT 252349 T CA 2199973 A1 DE 69531994 D1 DE 69531994 T2 EP 0782413 A2 JP 3325533 B2 JP 11318937 A US 2006036151 A1 US 5829444 A US 2004024309 A1 US 5803089 A US 2007083107 A1 US 5800352 A US 5873822 A US 6687531 B1 US 6694167 B1 US 6738656 B1 US 6341231 B1 US 5967980 A	15-11-2003 21-03-1996 27-11-2003 22-07-2004 09-07-1997 17-09-2002 24-11-1999 16-02-2006 03-11-1998 05-02-2004 08-09-1998 12-04-2007 01-09-1998 23-02-1999 03-02-2004 17-02-2004 18-05-2004 22-01-2002 19-10-1999
US 6322567	B1	27-11-2001	AU 2181500 A WO 0035366 A1	03-07-2000 22-06-2000
US 2004034283	A1	19-02-2004	NONE	
WO 9501757	A	19-01-1995	AU 7468494 A	06-02-1995
WO 02061371	A	08-08-2002	CN 1511249 A EP 1364183 A1 JP 2004529679 T	07-07-2004 26-11-2003 30-09-2004
US 6434416	B1	13-08-2002	JP 2000139949 A	23-05-2000