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(54) Title: METHOD OF CONTROLLING A ROBOTIC ARM

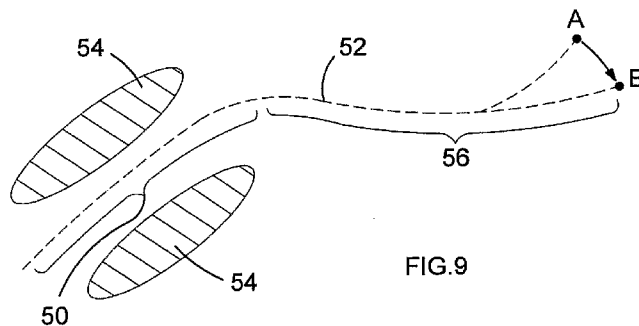


FIG.9

(57) Abstract: The invention relates to a method of controlling the position of an elongate robotic arm comprising articulated segments. An actuator is associated with each segment to control its position, and a control system operates the actuators. Data representing the position of the arm is gathered and compared to input data that represents a required new position of a part of the arm. Data representing the required new position of the arm is then calculated, attempting to keep the remainder of the arm as close as possible to its previous position. The actuators are operated to move the arm into the new position. In tip following, the data representing the new position may define a path, and the arm may be fitted to the path by matching the position and orientation of a point on each pair of adjacent segments to that of the path.

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER INV. G05B19/19 B25J18/06 B25J9/16		
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) G05B B25J		
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, 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 2008/068478 A2 (OLIVER CRISPIN ROBOTICS LTD [GB]; BUCKINGHAM ROBERT OLIVER [GB]; GRAH) 12 June 2008 (2008-06-12) abstract page 2, lines 12-15 page 4, lines 1-20 page 5, lines 14-17 page 10, lines 16-20 figures 1,3b ----- -/--	1-16, 22-23
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C.		
<input checked="" type="checkbox"/> 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 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. *Z* document member of the same patent family	
Date of the actual completion of the international search 20 January 2010	Date of mailing of the international search report 26/01/2010	
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 Dörre, Thorsten	

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.
X	BUCKINGHAM R; GRAHAM A: "Snaking around in a nuclear jungle" INDUSTRIAL ROBOT, MCB UNIVERSITY PRESS, GB, vol. 32, no. 2, 1 January 2005 (2005-01-01), pages 120-127, XP007909927 ISSN: 0143-991X last paragraph -----	1-16, 22-23
X	EP 0 107 968 A1 (TOKYO SHIBAURA ELECTRIC CO [JP]) 9 May 1984 (1984-05-09) abstract page 1, lines 1-4 page 2, lines 9-27 page 7, lines 3-29 page 8, lines 1-5 figures 3,4 -----	19-21,23
X	JP 2000 167789 A (MITSUBISHI HEAVY IND LTD) 20 June 2000 (2000-06-20) abstract claim 1 -----	19-21,23
X	CONKUR E S: "Path following algorithm for highly redundant manipulators" ROBOTICS AND AUTONOMOUS SYSTEMS, ELSEVIER SCIENCE PUBLISHERS, AMSTERDAM, NL, vol. 45, no. 1, 31 October 2003 (2003-10-31), pages 1-22, XP004463285 ISSN: 0921-8890 abstract figure 9 -----	19-21,23

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2009/001631

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.:
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 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.:

1-16, 19-22(completely); 23(partially)

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

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

1. claims: 1-16, 22(completely); 23(partially)

Method for controlling the position of a robotic arm, wherein parts of the arm are moved into a new position and the remainder of the arm is maintained in its initial position

2. claims: 17-18(completely); 23(partially)

Method for defining desired positions of a robotic arm

3. claims: 19-21(completely); 23(partially)

Method for calculating a position in which a robotic arm is to be placed, as a function of data representing a required position of the robotic arm

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	
WO 2008068478	A2	12-06-2008	EP 2101961 A2	23-09-2009
			US 2009326714 A1	31-12-2009
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