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- with international search report (Art. 21(3))
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[Continued on next page]

(54) Title: SYSTEMS AND METHODS FOR ROBOTIC MEASUREMENT OF PARTS

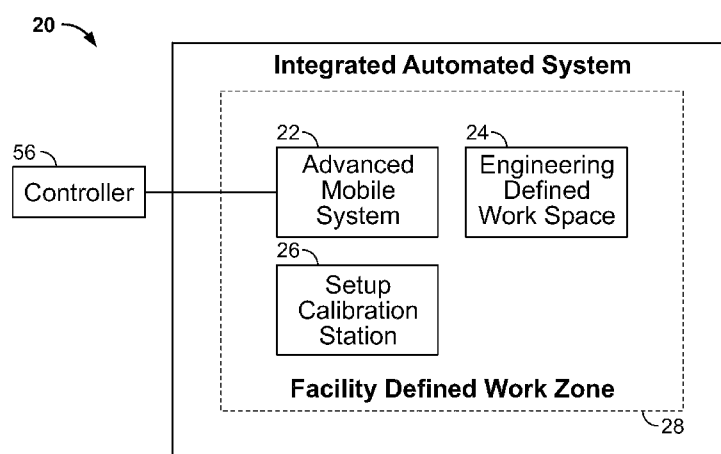


FIG. 1

(57) Abstract: Systems and methods for robotic measurement of parts are provided. One system includes one or more omni-directional ground vehicles configured to move within a facility defined work zone to a setup calibration station and an engineering defined work space, wherein the engineering defined work space includes a part to be measured. The system also includes a multi-axis robot removably coupled to each of the omni-direction ground vehicles and configured to move a laser scanner, wherein the laser scanner of each of the multi-axis robots is configured to move in at least two linear directions and one rotational direction. The system further includes a processor configured to automatically generate a surface ready output file from measurement data received from the laser scanners, wherein the surface ready output file is configured to command a machine to manufacture a mating component to the part.



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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. G05B19/401 B25J9/16 G01B5/008 G01B11/03
ADD.

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 G01B

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, COMPENDEX, INSPEC, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	DE 10 2010 032467 A1 (ZEISS CARL AG [DE]) 2 February 2012 (2012-02-02) the whole document	16-19 1-15,20, 21
Y A	----- WO 2009/086495 A2 (STATHIS SAM [US]) 9 July 2009 (2009-07-09) the whole document	16-19 1-15,20, 21
Y A	----- US 2008/235970 A1 (CRAMPTON STEPHEN JAMES [GB]) 2 October 2008 (2008-10-02) the whole document	16-19 1-15,20, 21
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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

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"O" document referring to an oral disclosure, use, exhibition or other means

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"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

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INTERNATIONAL SEARCH REPORT

International application No

PCT/US2014/038088

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y A	US 2007/063500 A1 (EATON HOMER [US]) 22 March 2007 (2007-03-22) the whole document -----	16-19 1-15,20, 21
Y A	US 2005/150123 A1 (EATON HOMER [US]) 14 July 2005 (2005-07-14) the whole document -----	16-19 1-15,20, 21
Y	EP 2 533 167 A2 (BOEING CO [US]) 12 December 2012 (2012-12-12) the whole document -----	16-19

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/038088

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.:
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: 1-15, 20, 21

Robot measurement system comprising first and second multi-axis robots and an omni-directional ground vehicle coupled to each of the first and second multi-axis robots;

2. claims: 16-19

Method for measuring an aircraft part, comprising controlling an omni-directional ground vehicle, controlling a multi-axis robot removably coupled to the ground vehicle and automatically generating a surface ready output file configured to command a machine to manufacture a mating component for the aircraft part.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/038088

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