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[Continued on next page]

(54) Title: AUTOMATED PLY LAYUP SYSTEM AND METHOD OF LAYING UP

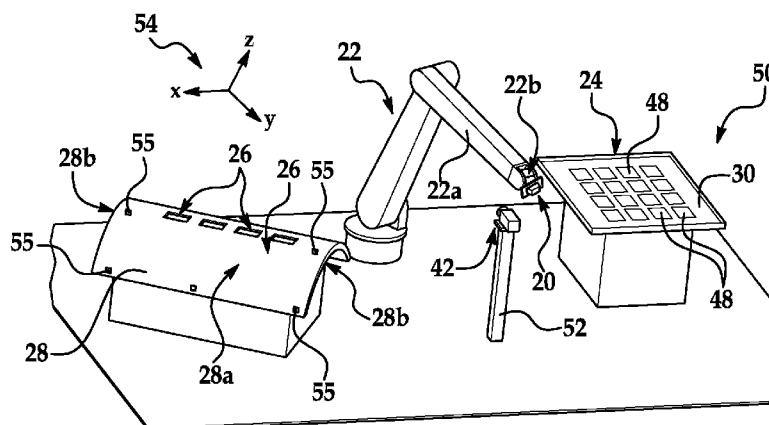


FIG. 2

(57) Abstract: An automated ply layup system and method using a robot (22) and an end effector (20) for picking plies (48) from a kit and placing the plies at predetermined locations on a tool (28).

**Declarations under Rule 4.17:**

- *as to the identity of the inventor (Rule 4.17(i))*
- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

Published:

- *with international search report (Art. 21(3))*

(88) Date of publication of the revised international search report:

14 February 2013

(15) Information about Correction:
see Notice of 14 February 2013

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/038139

A. CLASSIFICATION OF SUBJECT MATTER

INV. B29C70/38 B25J9/16 B25J13/08 B25J15/06 B25J19/02
B25J15/00

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)

B29C 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 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	DE 20 2007 006528 U1 (KUKA SYSTEMS GMBH [DE]) 18 September 2008 (2008-09-18) paragraphs [0010], [0012], [0013], [0014], [0019], [0035], [0046] figure 1	1,2,5, 10,12
X,P	DE 10 2010 044721 A1 (DAIMLER AG [DE]) 8 March 2012 (2012-03-08) paragraphs [0026], [0034]	1,2,5, 10,12 3,4,11
X	DE 10 2008 032574 A1 (BROETJE AUTOMATION GMBH [DE]) 14 January 2010 (2010-01-14) paragraphs [0001], [0009], [0010], [0013], [0015], [0031], [0035], [0054], [0055], [0057], [0058], [0065]	1,2,10, 12 3-5,11
Y		
	----- -/-	



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

"Z" document member of the same patent family

Date of the actual completion of the international search

10 September 2012

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28/11/2012

Name and mailing address of the ISA/

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2012/038139

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.:

1-5, 10-12

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

International application No
PCT/US2012/038139

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 10 2007 061431 A1 (AIRBUS GMBH [DE]) 25 June 2009 (2009-06-25) paragraphs [0015], [0016] -----	3,4,11
Y	HOSODA K ET AL: "Adaptive hybrid visual servoing/force control in unknown environment", INTELLIGENT ROBOTS AND SYSTEMS '96, IROS 96, PROCEEDINGS OF THE 1996 IEEE/RSJ INTERNATIONAL CONFERENCE ON OSAKA, JAPAN 4-8 NOV. 1996, NEW YORK, NY, USA, IEEE, US, vol. 3, 4 November 1996 (1996-11-04), pages 1097-1103, XP010212561, DOI: 10.1109/IROS.1996.568956 ISBN: 978-0-7803-3213-3 page 1097 figures 2,5 -----	5
Y	NELSON B J ET AL: "Integrating force and vision feedback within virtual environments for telerobotic systems", ROBOTICS AND AUTOMATION, 1997. PROCEEDINGS., 1997 IEEE INTERNATIONAL C ONFERENCE ON ALBUQUERQUE, NM, USA 20-25 APRIL 1997, IEEE, NEW YORK, NY, USA, vol. 2, 20 April 1997 (1997-04-20), pages 1588-1593, XP010235542, DOI: 10.1109/ROBOT.1997.614367 ISBN: 978-0-7803-3612-4 page 1588 -----	5

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/038139

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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: 1-5, 10-12

Gripping of the ply

1.1. claims: 3, 4, 11

Electroadhesive gripping

2. claims: 1, 6, 10, 12, 15

Identifying the ply

3. claims: 1, 7, 8, 10, 12, 13

Feature location detection

4. claims: 1, 9, 10, 12, 14

Sensing the compaction force
