

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference K 23444 WO	FOR FURTHER ACTION		See item 4 below
International application No. PCT/EP2017/070653	International filing date (<i>day/month/year</i>) 15 August 2017 (15.08.2017)	Priority date (<i>day/month/year</i>) 22 August 2016 (22.08.2016)	
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237			
Applicant VOLKSWAGEN AKTIENGESELLSCHAFT			

<p>1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.</p>																								
<p>3. This report contains indications relating to the following items:</p> <table> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. I</td> <td>Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table> <p>4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).</p>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input type="checkbox"/>	Box No. VIII	Certain observations on the international application
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<p align="center">The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. +41 22 338 82 70</p>	<p>Date of issuance of this report 26 February 2019 (26.02.2019)</p>
	<p>Authorized officer</p> <p align="center">Nora Lindner</p> <p>e-mail: pct.team5@wipo.int</p>

From the INTERNATIONAL SEARCHING AUTHORITY

To:

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing <i>(day/month/year)</i> 01 December 2017	
Applicant's or agent's file reference K 23444 WO	FOR FURTHER ACTION See paragraph 2 below
International application No. PCT/EP2017/070653	International filing date <i>(day/month/year)</i> 15 August 2017
Priority date <i>(day/month/year)</i> 22 August 2016	
International Patent Classification (IPC) or both national classification and IPC B25J 9/16(2006.01)i; B25J 13/08(2006.01)i; G05B 19/042(2006.01)i; G06F 3/01(2006.01)i	
Applicant VOLKSWAGEN AKTIENGESELLSCHAFT	

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/	Date of completion of this opinion	Authorized officer
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WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2017/070653

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - the international application in the language in which it was filed.
 - a translation of the international application into _____ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
 - on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2017/070653

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement		
1. Statement			
Novelty (N)	Claims	1-9	YES
	Claims	_____	NO
Inventive step (IS)	Claims	_____	YES
	Claims	1-9	NO
Industrial applicability (IA)	Claims	1-9	YES
	Claims	_____	NO
2. Citations and explanations :			
See Supplemental Box			

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box V**Reasoned statement with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement**

Reference is made to the following documents:

D1	US 2010/094461 A1 (ROTH MICHAEL [AT] ET AL) 15 April 2010 (2010-04-15)
D2	US 2014/207285 A1 (SAKABE KOUJI [JP]) 24 July 2014 (2014-07-24)
D3	WO 2014/093822 A1 (ABB TECHNOLOGY AG [CH]; BOCA REMUS [US]; NIDAMARTHI SRINIVAS [US]; FUH) 19 June 2014 (2014-06-19)

[1] Dependent claims

The present application fails to comply with the requirements of PCT Article 33(3) because the subject matter of claim 1 does not involve an inventive step.

- [1.1] D1 is considered to be the prior art closest to the subject matter of claim 1 and discloses (the references between parentheses relate to said document) a method for controlling robot-aided machining of a workpiece by means of an end effector within a workspace, in which method the robot controller of the robot guiding the end effector is equipped with a human-robot collaboration interface (HRC interface) for interaction between the human and the robot, wherein the execution of the work program by the robot is only enabled by the robot controller if no operator is located within the workspace, wherein

(i) the robot is programmed by the interaction with the operator through the HRC interface within the workspace, after removal and/or deactivation of the end effector (see figure 4, wherein "FIG. 4 shows an oblique view of the free end of a jointed arm 14 of a robot 10 [...] Holding handles 28 are attached to the end effector 20 [...] This arrangement allows manual guidance of the end effector 20 from both sides, and thereby makes it possible to carry out manual teaching in a simple manner" in paragraph [0054], wherein the tool is removed from the last link of the robot so that the operator can program the robot inside the workspace).

- [1.2] The subject matter of claim 1 therefore differs from the teaching of D1 in that

(ii) the work program is executed without interaction with an operator if there is no operator within the workspace.

The subject matter of claim 1 is therefore novel.

- [1.3] The technical effect of feature (ii) is that the robot does not move, or no workpiece is machined, if an operator is detected within the robot's workspace.

- [1.4] The problem to be solved by the present invention can therefore be considered that of improving the safety of the operator of a robot.

- [1.5] The solution proposed in claim 1 of the present application cannot be considered inventive (PCT Article 33(3)) for the following reasons: the execution of a work program for a robot only in the event that no user is detected within the workspace of the robot is an obvious safety implementation step which is known in the field of robotics (see for instance document D2, paragraph [0062], wherein "The monitoring system 10 performs the monitoring process to monitor the entry of an object into the surrounding area of the robot 100 and stop the movement of the robot 100 as necessary").

- [1.6] The subject matter of claim 1 is not inventive in relation to document D1 and common general knowledge in the art.

[2] Dependent claims

Supplemental Box

Dependent claims 2-9 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step.

- [2.1] The additional features of claim 2 relate to the deactivation of the HRC interface during the execution of the work program which is an obvious implementation option which a person skilled in the art of robotics seeking to avoid disrupting the execution of the programmed task would choose, according to the circumstances, without exercising inventive skill. The subject matter of claim 2 cannot therefore contribute to an inventive step.
- [2.2] The additional features of claim 3 are disclosed in document D1 (see "Holding handles 28 are attached to the end effector 20 and are arranged diametrically opposite one another on both sides of the end effector 20. This arrangement allows manual guidance of the end effector 20 from both sides, and thereby makes it possible to carry out manual teaching in a simple manner" in paragraph 0054]). The subject matter of claim 3 cannot therefore contribute to an inventive step.
- [2.3] The additional features of claims 4 and 5 relate to the programming of the robot by the operator marking reference points on the workpiece, particularly by means of an optical sensor. Marking of reference points on the workpiece, particularly by means of an optical sensor, is one of several obvious programming possibilities from which a person skilled in the art of robotics seeking to define the machining operations on the workpiece would choose, according to the circumstances, without exercising inventive skill (see document D3, pages 3-4 and figures 2a-2k, for instance and see also figure 6 and the corresponding description). For this reason, the subject matter of claims 4 and 5 cannot contribute to an inventive step.
- [2.4] The additional features of claim 6 relate to the programming of the robot by means of an optical sensor which is used to detect the gestures of an operator. Programming a robot by detection of the gestures made by an operator is one of several obvious programming possibilities from which a person skilled in the art seeking to define the machining operations on the workpiece would choose, according to the circumstances, without exercising inventive skill (see document D3, pages 3-4 and figures 2a-2k, for instance and see also figure 6 and the corresponding description). The subject matter of claim 6 cannot therefore contribute to an inventive step.
- [2.5] The additional features of claim 7 relate to the deactivation of the end effector during the programming of the robot which is one of several obvious options from which a person skilled in the art seeking to guarantee the safety of the operator during the programming of the robot would choose, according to the circumstances, without exercising inventive skill. The subject matter of claim 7 cannot therefore contribute to an inventive step.
- [2.6] The additional features of claim 8 relate to the use of a placeholder for the end effector during the programming of the robot. The use of a placeholder for the end effector during the programming of the robot is one of several obvious programming possibilities from which a person skilled in the art seeking to increase the precision of the machining of the workpiece would choose, according to the circumstances, without exercising inventive skill (see figure 4 in document D4, for instance, or see D5, figures 20a-20d and the corresponding description on pages 32-33). The subject matter of claim 8 cannot therefore contribute to an inventive step.
- [2.7] The additional features of claim 9 are disclosed in document D1 (see "obtain a movement path from path coordinate data items after completion of the teaching process" in paragraph [0014] and "the detected co-ordinates of the respective position can be transformed to co-ordinate data which can be processed electronically and from which the movement path can later be derived" in paragraph [0025]). The subject matter of claim 9 cannot therefore contribute to an inventive step.

[3] **Industrial applicability**

The invention relates to an industrial robot having a plurality of movable links, wherein at least one image-recording sensor is mounted on a link which is not the last link in order to calibrate the industrial robot. The subject matter of the present application is therefore industrially applicable.