

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)**

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/EP2018/000053

International filing date (day/month/year)
09.02.2018

Priority date (day/month/year)
13.02.2017

International Patent Classification (IPC) or both national classification and IPC
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B33Y40/00

Applicant
OERLIKON SURFACE SOLUTIONS AG, PFÄFFIKON

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 usually 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:



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Date of completion of this opinion

see form
PCT/ISA/210

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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 43bis.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 13ter.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 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.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:

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-4</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-4</u>
Industrial applicability (IA)	Yes: Claims	<u>1-4</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

1 **Re Item V**

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

1.1 Reference is made to the following documents:

D1 WO 2016/011290 A1 (APPLIED MATERIALS INC [US]) 21
January 2016 (2016-01-21)

1.2 The present application does not meet the criteria of Article 33(3) PCT, because the subject-matter of claim 1 does not involve an inventive step.

D1 may be regarded as being the prior art closest to the subject-matter of claim 1, and discloses (page 2, lines 19-24):

An additive manufacturing synthesis method to form a component, the method comprising the steps of:

- Reactive plasma ignition (page 4, line 5) in the chamber and simultaneously applying an electrostatic potential in the melt zone via the build platform (page 13, lines 15-20)
- Laser rastering on the target to cause molten pool formation very locally (page 9, lines 10-14)
- Electrostatically driving reactive gas ions into the molten pool,
- Causing chemical interaction between the molten feed stock and reactive gas ions to form ceramic compounds such as nitrides insitu (page 13, lines 21-27)
- Solidifying and thereby forming the component

The value of the electrostatic potential applied to the target is not explicitly disclosed. However, applying "several 100 eV" would be an obvious range to use and this range is therefore seen as implicitly disclosed in D1.

The subject-matter of claim 1 therefore differs from this known method in that the method is used to make a metal matrix nanocomposite, as opposed to a composite material comprising both metal and a ceramic.

The problem to be solved by the present invention may therefore be regarded as finding an alternative application for the method of D1.

The solution proposed in claim 1 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The method of D1 is used to form locally and in a controlled manner a composite material of a metal with a ceramic of the same metal. Therefore, a person skilled in the art would consider using the method of D1 when making a metal matrix nanocomposite of the same material choice, where the circumstances make it desirable, as the advantages thus achieved can readily be foreseen.

- 1.3 Dependent claims 2-4 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 inventive step.
- 1.3.1 Modifying the laser power, rastering speed and/or the bias voltage is known to have an effect on the plasma reactivity, hydrodynamic forces and the fluid recirculation pattern of the molten feedstock. Therefore, it comes within the scope of the customary practice followed by persons skilled in the art, to modify these factors for optimisation of the process. Consequently, claim 2 does not involve an inventive step.
- 1.3.2 In the method of D1 (page 13, lines 21-27), the metal is Ti and the reactive gas ions are N⁺ ions. Therefore, claims 3-4 do not involve an inventive step.

2 Re Item VII

Certain defects in the international application

- 2.1 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in D1 is not mentioned in the description, nor are these documents identified therein.