

PATENT COOPERATION TREATY

TRANSLATION

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

Date of mailing (day/month/year)	See form PCT/ISA/210
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Applicant's or agent's file reference 11685OLC744F	FOR FURTHER ACTION See paragraph 2 below
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International application No. PCT/FR2013/050339	International filing date (day/month/year) 19.02.2013	Priority date (day/month/year) 20.02.2012
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International Patent Classification (IPC) or both national classification and IPC
F01D17/06 F01D17/08 F02K9/48

Applicant
SNECMA

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 or 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.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/EP	Date of completion of this opinion	Authorized officer
Facsimile No.		Telephone No.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/FR2013/050339

Box No. I	Basis of this opinion
1.	<p>With regard to the language, this opinion has been established on the basis of:</p> <p><input checked="" type="checkbox"/> the international application in the language in which it was filed</p> <p><input type="checkbox"/> 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)).</p>
2.	<p><input type="checkbox"/> 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))</p>
3.	<p>With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:</p> <p>a. type of material</p> <p><input type="checkbox"/> a sequence listing</p> <p><input type="checkbox"/> table(s) related to the sequence listing</p> <p>b. format of material</p> <p><input type="checkbox"/> on paper</p> <p><input type="checkbox"/> in electronic form</p> <p>c. time of filing/furnishing</p> <p><input type="checkbox"/> contained in the international application as filed</p> <p><input type="checkbox"/> filed together with the international application in electronic form</p> <p><input type="checkbox"/> furnished subsequently to this Authority for the purposes of search</p>
4.	<p><input type="checkbox"/> In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.</p>
5.	<p>Additional comments:</p>

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No. PCT/FR2013/050339
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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
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1. Statement			
Novelty (N)		Claims <u>1-12</u>	YES
		Claims _____	NO
Inventive step (IS)		Claims <u>1-12</u>	YES
		Claims _____	NO
Industrial applicability (IA)		Claims <u>1-12</u>	YES
		Claims _____	NO

2. Citations and explanations:	
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Reference is made to the following document:

D1 US 6 321 525 B1 (ROGERS DAVID MARK [US]) 27
November 2001 (2001-11-27)

1 Claim 1

1.1 D1 (column 1, lines 36-39 and column 2, lines 21-30), which is considered to be the prior art closest to the subject matter of claim 1, discloses a method for ensuring the safety of operation of a rotary assembly of a turbomachine (22), which rotary assembly comprises a turbine (28) the rotation of which is brought about by the expansion of a driving fluid which is intended to flow through the turbine (28), and a rotary machine (24) which is mechanically driven in rotation by the turbine (28) so as to displace a driven fluid which is intended to flow through the

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rotary machine (24).

Therefore the subject matter of claim 1 differs from this known method in that the crossing of a predetermined speed threshold by the rotary assembly is anticipated by repetitively carrying out a prediction cycle during which:

- the following parameters are measured in a predetermined time interval:

* an actual rotational speed of the rotary assembly at a given observation instant within said time interval;

* at least one fluid/turbine interaction parameter which is indicative of the interaction between the turbine and the driving fluid;

* at least one fluid/rotary machine interaction parameter which is indicative of the interaction between the rotary machine and the driven fluid;

- the driving torque applied by the turbine to the rotary assembly is estimated from said actual rotational speed and said at least one fluid/turbine interaction parameter;

- independently of the estimate of said driving torque, the resistant torque applied by the rotary machine to the rotary assembly is estimated, from said actual rotational speed and from said at least one fluid/rotary machine interaction parameter;

- a value indicative of the difference between said driving torque and said resistant torque is formulated;

- a predicted rotational speed of the rotary assembly at a prediction instant subsequent to

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said observation instant is calculated from said actual rotational speed, said indicative value and the difference in time between the prediction instant and the observation instant;

- a first condition is determined to have been satisfied if said predicted rotational speed crosses the predetermined speed threshold, and in that an action is carried out on the operation of the turbomachine in order to limit the extent to which the rotary assembly thereof exceeds, in terms of speed, said threshold if, during the prediction cycle, it is determined that at least the first condition is met; therefore it is novel.

- 1.2 The problem addressed by the present invention can be considered that of providing a turbomachine with overspeed protection.

The solution to this problem, as proposed in claim 1 of the present application, is considered to involve an inventive step, for the following reasons: none of the cited documents describes, alone or in combination, all of the features of claim 1. Also, the subject matter of claim 1 is not obvious to a person skilled in the art.

- 2 Claims 2-12 are dependent on claim 1 and as such likewise meet the requirements of novelty and inventive step.