



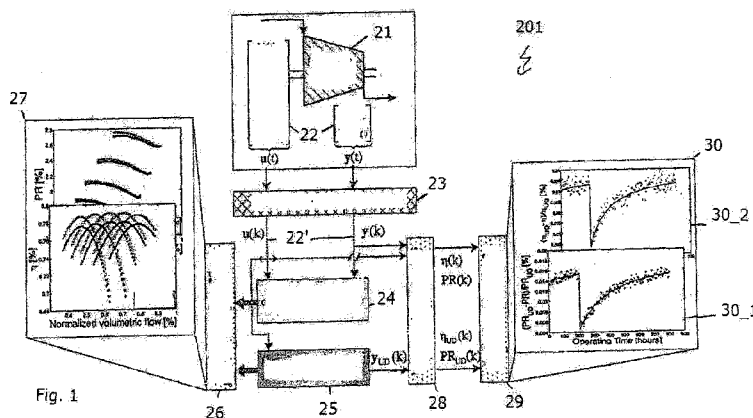
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- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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- Published:**
 - with international search report (Art. 21(3))
 - before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))
- (88) **Date of publication of the international search report:**
30 December 2015

(54) **Title:** METHOD AND DEVICE FOR ONLINE EVALUATION OF A COMPRESSOR



(57) **Abstract:** The present invention relates to a method for online evaluation of operative range and performance of a compressor, the method comprising at least the following offline steps: setting up a digital undegraded model of the compressor in an undegraded state of the compressor; calibrating and validating the undegraded model using historical data from a compressor running line; calculating at least one undegraded performance map using the undegraded model; and at least the following online steps: calculating a degradation-adaptive model by updating the undegraded model with operative data of the compressor determined by at least one sensor of the compressor; calculating at least one actual performance map of an operative state of the compressor using the degradation-adaptive model; detecting malfunctions of the compressor by comparing the at least one undegraded performance map derived by the undegraded model and the at least one actual performance map derived by the degradation-adaptive model via at least one mathematical function. The present invention also refers to a corresponding diagnosis device.



INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2015/000675

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.: 2
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:
see FURTHER INFORMATION sheet PCT/ISA/210

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:

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.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/000675

A. CLASSIFICATION OF SUBJECT MATTER
INV. G05B23/02 G05B17/02 G05B13/04
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 F02C

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	US 2013/024179 A1 (MAZZARO MARIA CECILIA [US] ET AL) 24 January 2013 (2013-01-24) paragraph [0001] paragraph [0005] - paragraph [0049]; figures 2,4	1,3-9
X	US 2004/123600 A1 (BRUNELL BRENT JEROME [US] ET AL) 1 July 2004 (2004-07-01) paragraph [0005] - paragraph [0056]; figures 4,5	1,3-9
X	EP 1 790 838 A1 (GEN ELECTRIC [US]) 30 May 2007 (2007-05-30) paragraph [0001] - paragraph [0029]; figures 2,3	1,3-9
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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

"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

"&" document member of the same patent family

Date of the actual completion of the international search 27 October 2015	Date of mailing of the international search report 09/11/2015
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Marinica, Raluca
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INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2015/000675

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>I.T. Cameron and K.M. Hantos: "Process modelling and model analysis", 23 May 2001 (2001-05-23), Academic Press, XP002747913, ISBN: 9780121569310 pages 299-334, the whole document</p> <p>-----</p>	1,8,9

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2015/000675

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
US 2013024179	A1	24-01-2013	CN 102889992 A	23-01-2013
			EP 2549415 A1	23-01-2013
			US 2013024179 A1	24-01-2013

US 2004123600	A1	01-07-2004	CA 2439462 A1	13-05-2004
			EP 1420153 A2	19-05-2004
			JP 4540955 B2	08-09-2010
			JP 2004162698 A	10-06-2004
			US 2004123600 A1	01-07-2004

EP 1790838	A1	30-05-2007	CA 2558919 A1	18-05-2007
			CN 1966955 A	23-05-2007
			EP 1790838 A1	30-05-2007
			JP 5156210 B2	06-03-2013
			JP 2007138921 A	07-06-2007
			US 2007118271 A1	24-05-2007

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 2

The wording "an optimization algorithm is performed that is based on a physical and analytical redundancy of the compressor" used in claim 2 is vague and unclear and leaves the reader in doubt as to the meaning of the technical feature to which it refers, thereby rendering the definition of the subject-matter of said claim unclear, Article 6 PCT. The description makes reference to an optimization algorithm in paragraph 26, which does not help in making clear what exactly the optimization is used for and paragraphs 51 to 59, in which model parameters are determined as the solution of an optimisation problem. Since the wording of the claim does not seem to relate to the previously mentioned problem, claim 2 is also not supported by the description.

The above mentioned deficiencies are such that claim 2 fails to comply to the prescribed requirements to such an extent that a meaningful search cannot be carried out, hence claim 2 will not be searched (Art. 17(2)(a)(ii) and (b) PCT).

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guidelines C-IV, 7.2), should the problems which led to the Article 17(2) declaration be overcome.