



- (51) International Patent Classification:
G01N 3/32 (2006.01)
- (21) International Application Number:
PCT/US2012/025383
- (22) International Filing Date:
16 February 2012 (16.02.2012)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/446,845 25 February 2011 (25.02.2011) US
- (71) Applicant (for all designated States except US): **BOARD OF SUPERVISORS OF LOUISIANA STATE UNIVERSITY AND AGRICULTURAL AND MECHANICAL COLLEGE** [US/US]; Office of Intellectual Property, 206 Emerging Technology Center, Baton Rouge, LA 70803 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **KHONSARI, Michael, M.** [US/US]; 6926 Highland Road, Baton Rouge, LA 70808 (US). **ABADI, Mehdi, Naderi** [IR/US]; 1361 Millerville Road, Baton Rouge, LA 70816 (US).
- (74) Agent: **RUNNELS, John, H.**; Taylor, Porter, Brooks & Phillips, P.O. Box 2471, Baton Rouge, LA 70821-2471 (US).

- (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, 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, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, 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.
- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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:
17 October 2013

(54) Title: FATIGUE MONITORING FOR COMPOSITE MATERIALS

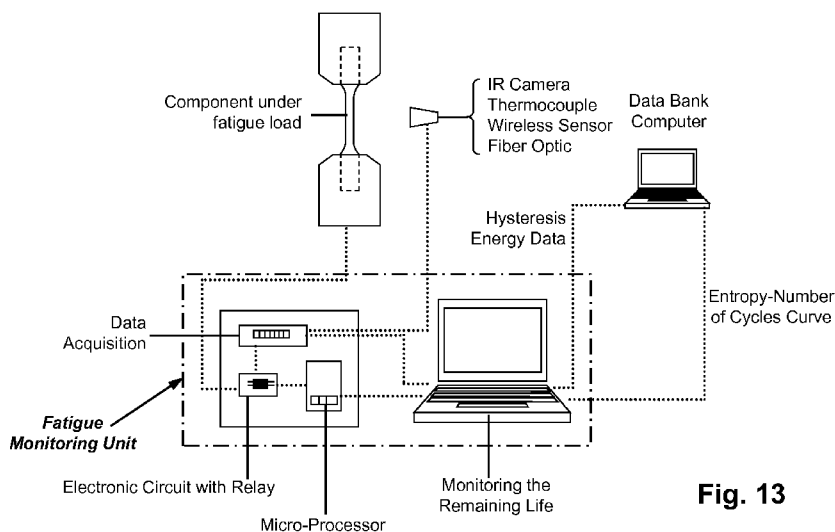


Fig. 13

(57) Abstract: Fatigue failure in composite materials can be successfully modeled and predicted by monitoring irreversible gains in entropy. Permanent degradations in composites are marked by irreversible processes that are characterized by increases in entropy. By measuring changes in entropy, one can model and predict the deterioration and failure of composites. The technique may be used to predict the deterioration and failure of composites under essentially any type of loading - constant, variable, bending, torsion, tension, compression, or other.



INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 2012/025383

A. CLASSIFICATION OF SUBJECT MATTER		<i>G01N 3/32 (2006.01)</i>	
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)			
G01N 3/00, 3/02, 3/08, 3/10, 3/12, 3/32, 3/34, 3/36, 19/00, 19/08, 29/00, 29/04, 29/14			
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)			
PatSearch (RUPTO internal), USPTO, PAJ, Esp@cenet, Information Retrieval System of FIPS (http://www.fips.ru)			
C. DOCUMENTS CONSIDERED TO BE RELEVANT			
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	
A	RU 2167420 C2 (PETROV VALENTIN ALEKSEEVICH) 20.05.2001	1-2	
A	SU 1744585 A1 (D. A. POSPELOV) 30.06.1992	1-2	
A	WO 1993/022651 A1 (CENTER FOR INNOVATIVE TECHNOLOGY) 11.11.1993	1-2	
A	US 2009/0000382 A1 (UNIVERSITY OF DAYTON) 01.01.2009	1-2	
<input type="checkbox"/> Further documents are listed in the continuation of Box C.		<input type="checkbox"/> See patent family annex.	
* Special categories of cited documents:		"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	
"A"	document defining the general state of the art which is not considered to be of particular relevance	"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	
"E"	earlier document but published on or after the international filing date	"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	
"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)	"&" document member of the same patent family	
"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		
Date of the actual completion of the international search		Date of mailing of the international search report	
25 June 2013 (25.06.2013)		08 August 2013 (08.08.2013)	
Name and mailing address of the ISA/ FIPS Russia, 123995, Moscow, G-59, GSP-5, Berezhkovskaya nab., 30-1		Authorized officer	
Facsimile No. +7 (499) 243-33-37		Y. Osipov	
		Telephone No. (499) 240-25-91	