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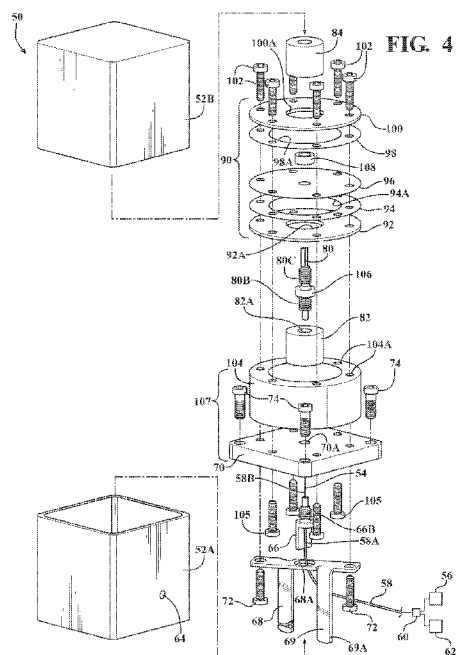
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KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,
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(54) Title: VIBRATION SENSOR



(57) Abstract: A sensor includes a housing adapted to be secured to a component within a system to be monitored by the sensor, an optical fiber, and a membrane spring assembly. The optical fiber includes a sensing portion containing a fiber Bragg grating that is able to undergo expansion and contraction resulting from movement of the optical fiber at a second location relative to a first location. The membrane spring assembly includes a membrane disc, wherein movement of a central portion thereof causes corresponding displacement of the optical fiber at the second location to cause expansion and contraction of the sensing portion of the optical fiber containing the fiber Bragg grating, which expansion and contraction effects a change in a light wavelength reflected by the fiber Bragg grating. The light wavelength reflected by the fiber Bragg grating can be used to measure movement of the central portion of the membrane disc.



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A. CLASSIFICATION OF SUBJECT MATTER
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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
G01H G01P

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)

EP0-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 6 175 108 B1 (JONES RICHARD T [US] ET AL) 16 January 2001 (2001-01-16) figures 3a,4a,5a column 5, lines 10-40 column 6, lines 1-17,25-55 column 7, lines 15-30,39-60 column 8, lines 20-28	1-20
X	US 2010/313658 A1 (ANDERSEN JAMES K [US] ET AL) 16 December 2010 (2010-12-16) figure 2a paragraphs [0024] - [0026] claims 19-24	1,2,7-11



Further documents are listed in the continuation of Box C.



See patent family annex.

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 892 860 A (MARON ROBERT J [US] ET AL) 6 April 1999 (1999-04-06) figures 4,5 column 9, line 34 - column 10, line 25 -----	1,2,5-7, 9-12,17, 18
X	WO 2010/136723 A1 (IXSEA [FR]; GROSSO GILLES [FR]; MOSCA FREDERIC [FR]) 2 December 2010 (2010-12-02) abstract claims 1,3 -----	1,2

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/024578

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6175108	B1	16-01-2001	AU 2568499 A 16-08-1999
		CA 2319347 A1 05-08-1999	
		EP 1051629 A1 15-11-2000	
		NO 20003739 A 29-09-2000	
		US 6175108 B1 16-01-2001	
		WO 9939214 A1 05-08-1999	
US 2010313658	A1	16-12-2010	US 2010313658 A1 16-12-2010
		US 2011277548 A1 17-11-2011	
		US 2012216615 A1 30-08-2012	
US 5892860	A	06-04-1999	AU 5962398 A 07-08-1998
		CA 2288957 A1 23-07-1998	
		DE 69829647 D1 12-05-2005	
		EP 0954743 A1 10-11-1999	
		NO 993551 A 27-08-1999	
		US 5892860 A 06-04-1999	
		WO 9831987 A1 23-07-1998	
WO 2010136723	A1	02-12-2010	EP 2435855 A1 04-04-2012
		FR 2946140 A1 03-12-2010	
		JP 2012528314 A 12-11-2012	
		US 2012093463 A1 19-04-2012	
		WO 2010136723 A1 02-12-2010	