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(54) Title: PREAMPLIFYING CANTILEVER AND APPLICATIONS THEREOF

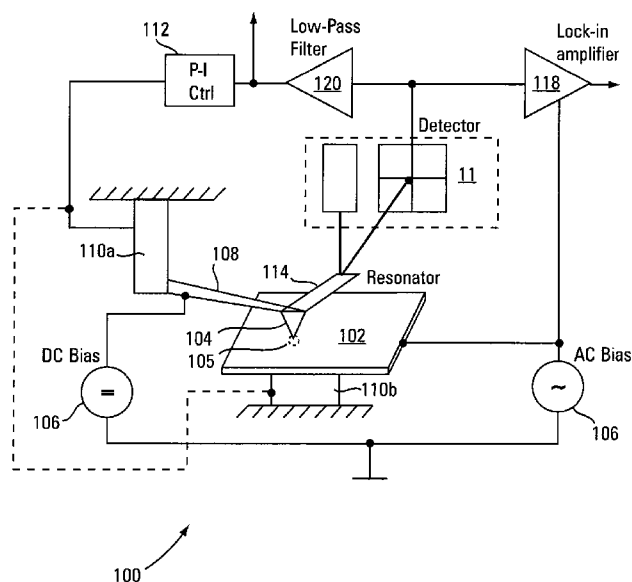


Fig. 1

(57) Abstract: Aspects of the invention are directed to piezoresponse force analysis of a material. A stimulus signal including a first frequency component is applied to a contact point on the material such that the stimulus signal actuates a portion of the material to experience a motion as a result of a piezoelectric effect. A resonant device is coupled to the contact point such that the resonant device experiences a resonant motion at the first frequency component in response to the motion of the material, the resonant motion having a greater displacement than a displacement of the motion of the material, and is substantially unaffected by mechanical properties of the material at the contact point. The resonant motion of the resonant device is detected and processed to produce a measurement representing the piezoresponse of the material at the contact point.



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**A. CLASSIFICATION OF SUBJECT MATTER****G01Q 10/00(2010.01)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)

G01Q 10/00; G01B 11/24; G01B 5/28; G01N 23/00; H01J 37/26; H01J 37/28

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Korean utility models and applications for utility models since 1975.

Japanese utility models and applications for utility models since 1975.

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS(KIPO internal) &amp; Keywords: cantilever, probe, resonance

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6249000 B1 (HIROSHI MURAMATSU et al.) 19 June 2001 See column 3, line 47 - column 8, line 4 and figures 1-12.	1-44
A	US 5625142 A1 (GAMBLE; RONALD C.) 29 April 1997 See column 4, line 55 - column 10, line 12 and figures 1-10.	1-44
A	US 5406832 A1 (GAMBLE; RONALD C. et al.) 18 April 1995 See column 5, line 55 - column 14, line 28 and figures 1-13.	1-44
A	US 5267471 A1 (ABRAHAM DAVID W. et al.) 07 December 1993 See column 3, line 52 - column 7, line 45 and figures 1-3.	1-44

 Further documents are listed in the continuation of Box C. See patent family annex.

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"A" document defining the general state of the art which is not considered to be of particular relevance

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"&amp;" document member of the same patent family

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6249000 B1	19.06.2001	EP 0896201 A1	10.02.1999
		EP 0896201 B1	02.05.2003
		JP 03511361 B2	29.03.2004
		JP 11-108940 A	23.04.1999
US 5625142 A1	29.04.1997	US 5481908 A1	09.01.1996
		US 5681987 A1	28.10.1997
US 5406832 A1	18.04.1995	US 5507179 A1	16.04.1996
US 5267471 A1	07.12.1993	JP 06-026855 A	04.02.1994
		JP 08030708 B2	27.03.1996