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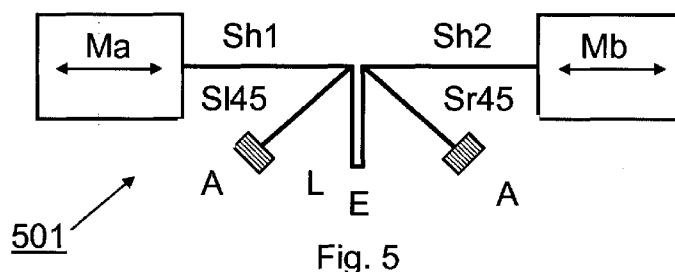


Fig. 5

(57) Abstract: The invention presents a spring structure (501), which has at least two masses (Ma, Mb) coupled in a first direction as opposite phase oscillators by means of springs (Sh1, Sh2) connected to them (Ma, Mb), via a loop (L, E) between said springs (Sh1, Sh2) connected to their coupling points, wherein oblique springs (Sl45, Sr45) are connected from said coupling points of the loop (L) to the anchors (A) of the base such that the longitudinal motion of the loop (L) is arranged to occur perpendicularly or substantially perpendicularly to said first direction, to thus attenuate opposite phase oscillation other than that of the masses (Ma, Mb). The invention also presents the use of a spring structure in a resonator and/or in a resonator array as well as in a sensor or a sensor comprising system.

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC: G01C and C01P

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
FI, SE, NO, DKElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 102009026511 A1 (SENSORDYNAMICS AG) 02 December 2010 (02.12.2010) paragraph [0065]; Fig 1	1-10
X	US 2010139399 A1 (GEIGER WOLFRAM et al.) 10 June 2010 (10.06.2010) paragraphs [0039] and [0040]; Fig 1	1-10
A	US 5908986 A (MITAMURA TAKESHI) 01 June 1999 (01.06.1999)	1-10
A	US 2010154543 A1 (DIEM BERNARD) 24 June 2010 (24.06.2010)	1-10



Further documents are listed in the continuation of Box C.



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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 members(s)	Publication date
DE 102009026511 A1	02/12/2010	CN 102449433 A EP 2435788 A1 US 2012055248 A1 WO 2010136379 A1	09/05/2012 04/04/2012 08/03/2012 02/12/2010
US 2010139399 A1	10/06/2010	JP 2010531447 A AT 537427T T RU 2009144800 A ZA 200908840 A KR 20100023045 A WO 2009003543 A1 EP 2160566 A1 CN 101688775 A CA 2690454 A1 AU 2008271666 A1 DE 102007030120 A1	24/09/2010 15/12/2011 10/08/2011 29/09/2010 03/03/2010 08/01/2009 10/03/2010 31/03/2010 08/01/2009 08/01/2009 02/01/2009
US 5908986 A	01/06/1999	JP 9236436 A	09/09/1997
US 2010154543 A1	24/06/2010	JP 2009520970 A WO 2007077353 A2 EP 1963783 A2 FR 2895501 A1	28/05/2009 12/07/2007 03/09/2008 29/06/2007

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