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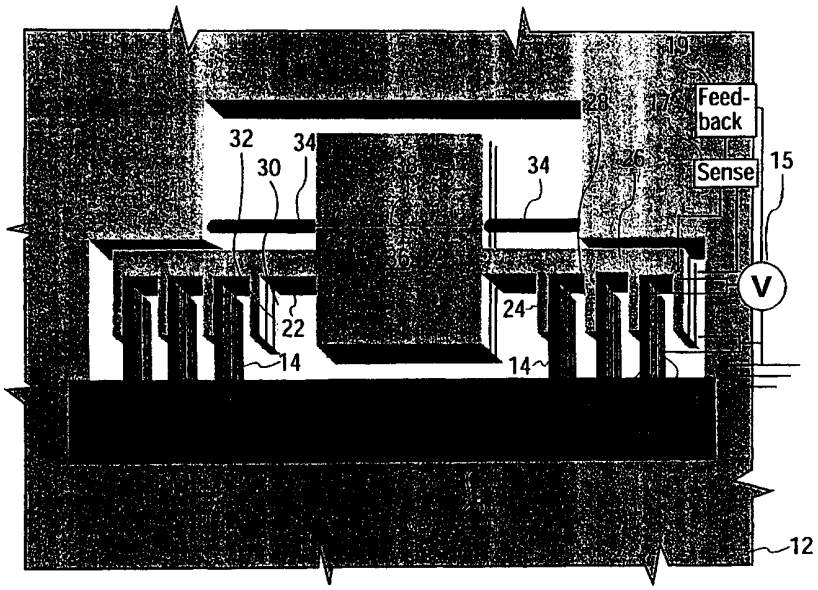
(54) Title: MULTI-LAYER, SELF-ALIGNED VERTICAL COMB-DRIVE ELECTROSTATIC ACTUATORS AND FABRICATION METHODS



(57) Abstract: A multi-layer vertical comb-drive actuator includes a first comb structure having a plurality of first comb fingers (14) and a second comb structure having a plurality of second comb fingers (24), wherein the first and second comb fingers are substantially interdigitated. The first and second comb fingers may include two or more stacked conductive layers electrically isolated from each other by an insulating layer or an air gap. Alternatively, either the first or second comb fingers may include only one conductive layer. An application of a voltage (15) between the first and second comb fingers causes the second comb structure to move relative to the first comb structure. The present invention includes a 2D-gimble configuration to rotate a movable element along two axes.

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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H02N1/00 B81B3/00 B81B5/00

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 7 B81B H02N

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 practical, search terms used)
EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	YAO Z J ET AL: "SINGLE CRYSTAL SILICON SUPPORTED THIN FILM MICROMIRRORS FOR OPTICALAPPLICATIONS" OPTICAL ENGINEERING, SOC. OF PHOTO-OPTICAL INSTRUMENTATION ENGINEERS. BELLINGHAM, US, vol. 36, no. 5, 1 May 1997 (1997-05-01), pages 1408-1413, XP000692372 ISSN: 0091-3286 figures 1,2 paragraph 'FABRICATION!	1,2,4-8, 10-14, 17,18
Y		28-30, 32,35
A		3,9,15, 16, 19-27, 31,33

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in 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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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
14 November 2001	21/11/2001

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Polesello, P

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PCT/US 01/09462

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication,where appropriate, of the relevant passages	Relevant to claim No.
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Y		28-30, 32,35
A		3,6-11, 14,21,31

X	SELVAKUMAR A ET AL: "VERTICAL COMB ARRAY MICROACTUATORS" PROCEEDINGS OF THE WORKSHOP ON MICRO ELECTRICAL MECHANICAL SYSTEMS. (MEMS). AMSTERDAM, JAN. 29 - FEB. 2, 1995, NEW YORK, IEEE, US, vol. WORKSHOP 8, 29 January 1995 (1995-01-29), pages 43-48, XP000555241 ISBN: 0-7803-2504-4 figures 1,2,6 paragraph 'FABRICATION!	1,2,4-6, 15,16
A		3,7-14, 17-35

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A		3,6, 9-11, 14-16, 19-37

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INTERNATIONAL SEARCH REPORT

Information on patent family members

Int ational Application No
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