

United States Patent [19]

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Shaw et al.

[45] **Date of Patent:** **Oct. 8, 1996**

- [54] **MICROELECTROMECHANICAL LATERAL ACCELEROMETER**
- [75] Inventors: **Kevin A. Shaw; Scott G. Adams; Noel C. MacDonald**, all of Ithaca, N.Y.
- [73] Assignee: **Cornell Research Foundation, Inc.**, Ithaca, N.Y.
- [21] Appl. No.: **67,264**
- [22] Filed: **May 26, 1993**
- [51] **Int. Cl.^o** **G01P 15/08**
- [52] **U.S. Cl.** **73/514.18; 73/514.24**
- [58] **Field of Search** 73/517 R, 514, 73/515, 516 R, 517 B, 514.18, 514.21, 514.24, 514.32, 514.35, 514.38, 514.36, 514.17

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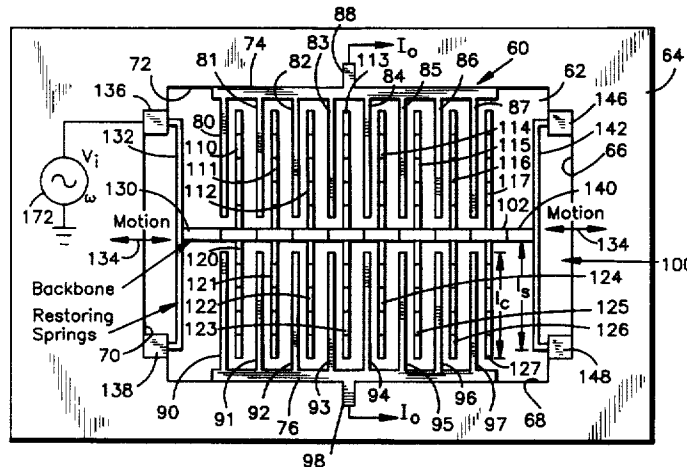
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Primary Examiner—Hezron E. Williams
Assistant Examiner—Christine K. Oda
Attorney, Agent, or Firm—Jones, Tullar & Cooper, P.C.

[57] **ABSTRACT**

A microelectromechanical accelerometer having submicron features is fabricated from a single crystal silicon substrate. The accelerometer includes a movable portion incorporating an axial beam carrying laterally-extending high aspect ratio released fingers cantilevered above the floor of a cavity formed in the substrate during the fabrication process. The movable portion is supported by restoring springs having controllable flexibility to vary the resonant frequency of the structure. A multiple-beam structure provides stiffness in the movable portion for accuracy.

52 Claims, 5 Drawing Sheets



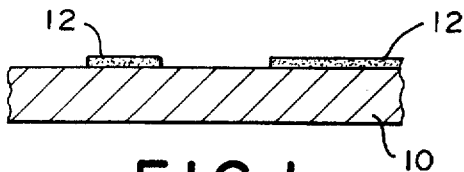


FIG. 1

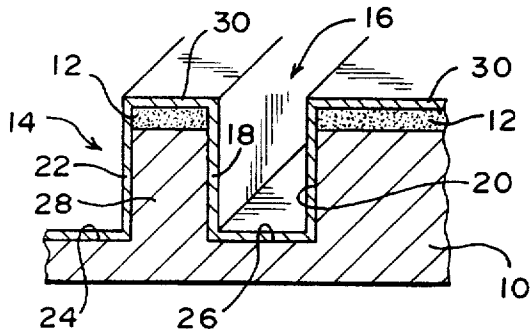


FIG. 2

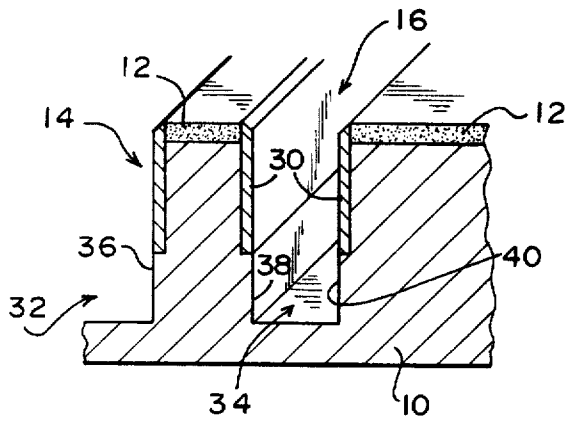


FIG. 3

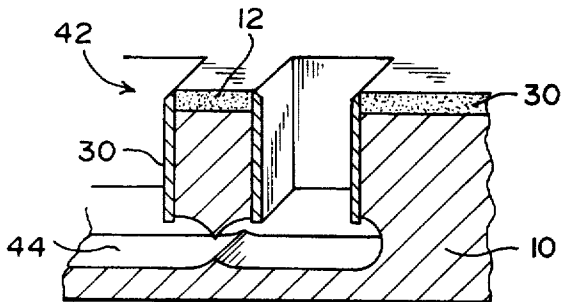


FIG. 4

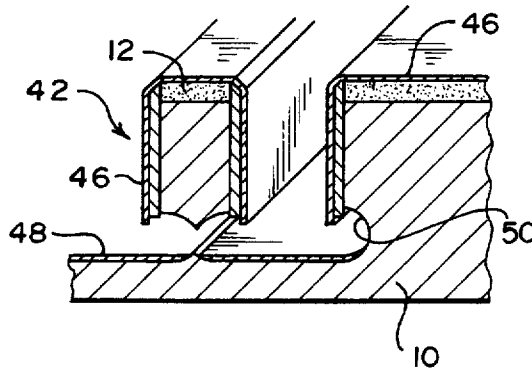


FIG. 5

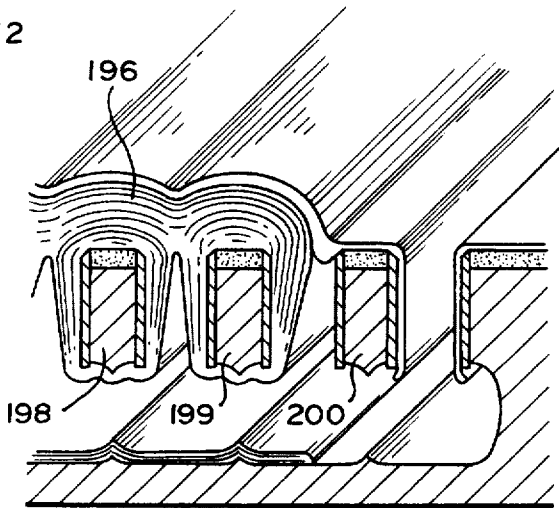


FIG. 9

FIG. 6

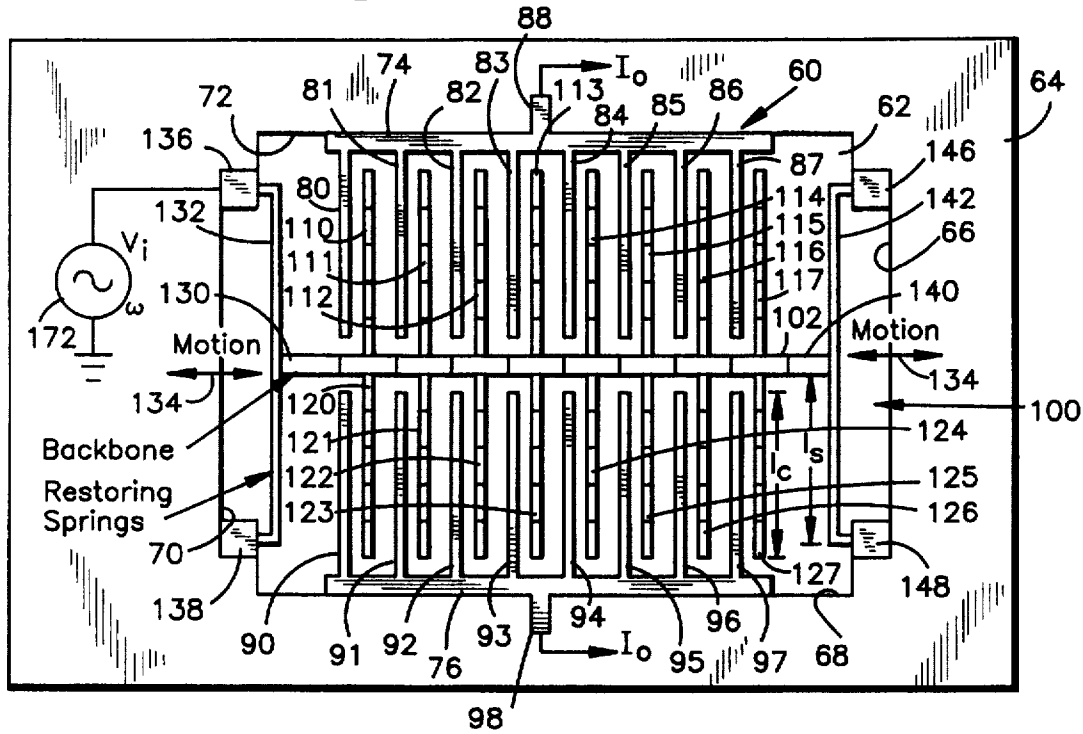


FIG. 7

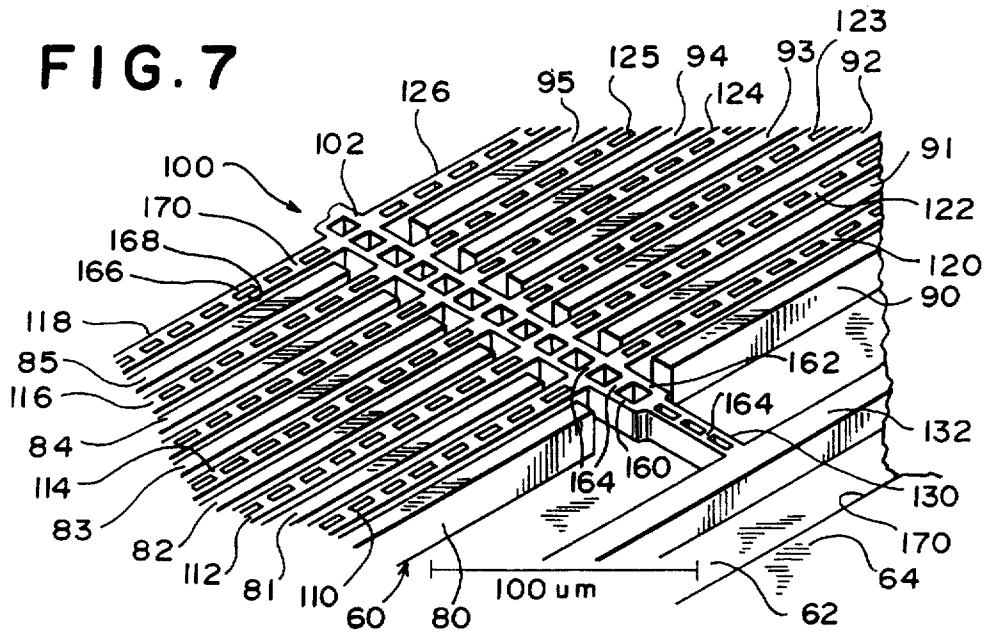


FIG. 8

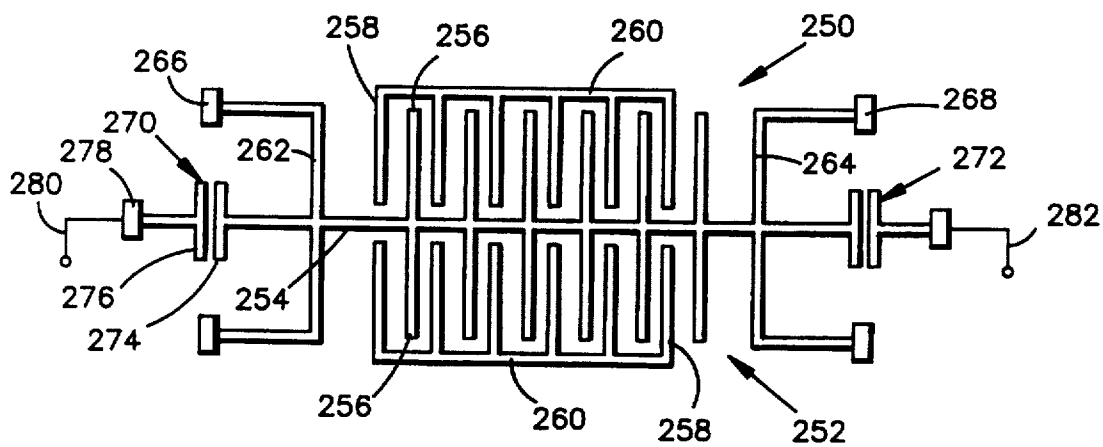
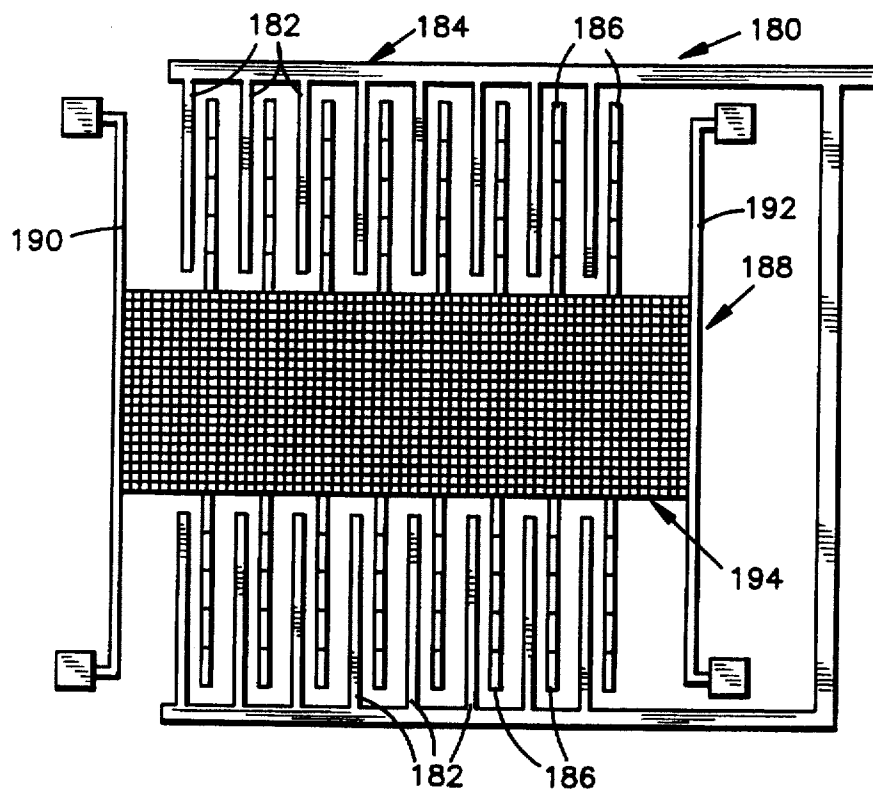


FIG. 11

FIG. 10

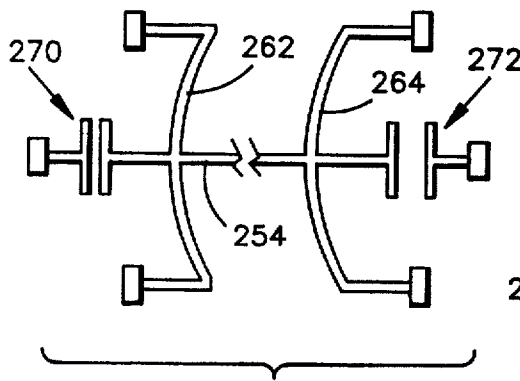
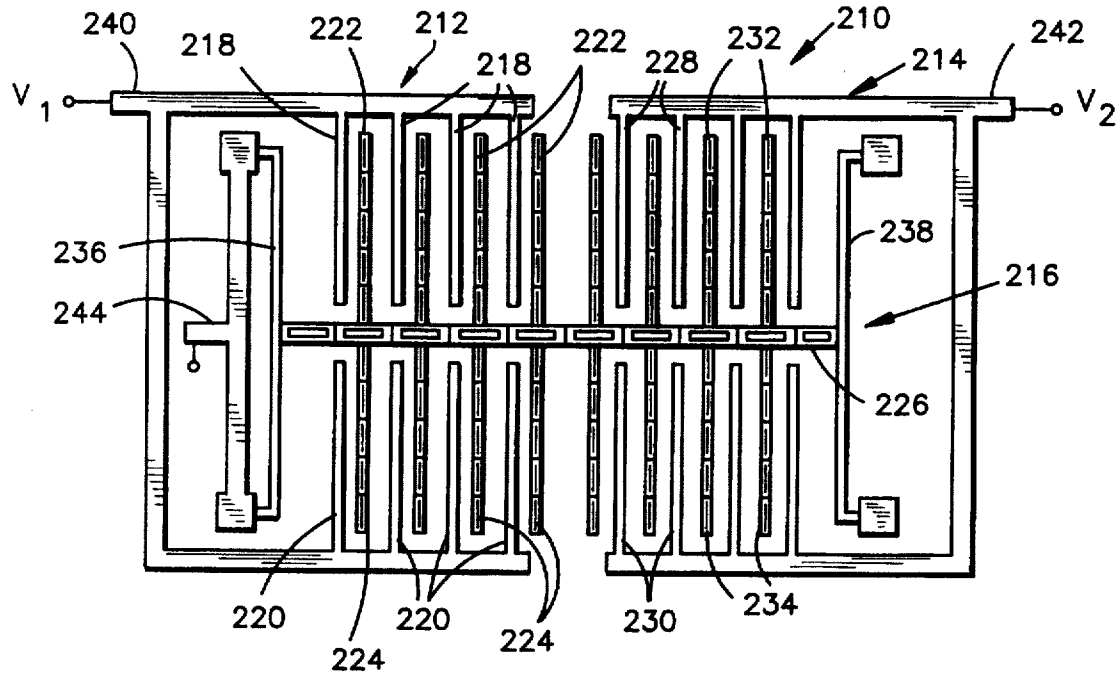


FIG. 12

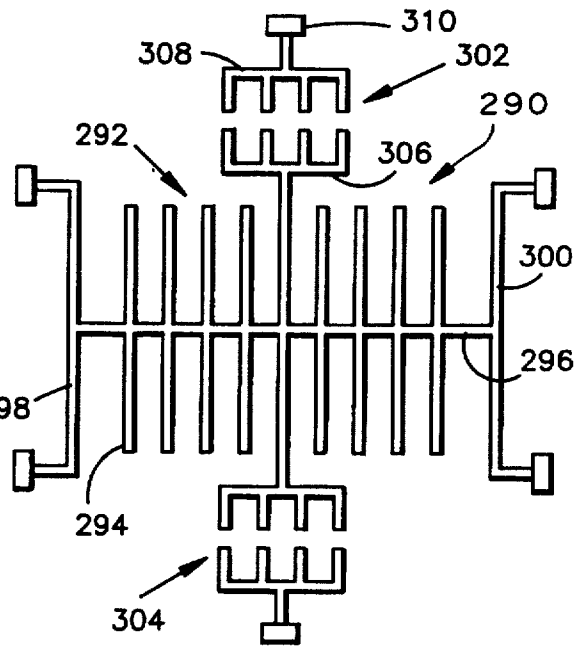


FIG. 13

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