United States Patent [19]

Petersen et al.

[11] **4,342,227**

[45] **Aug. 3, 1982**

[54] **PLANAR SEMICONDUCTOR THREE DIRECTION ACCELERATION DETECTING DEVICE AND METHOD OF FABRICATION**

[75] Inventors: **Kurt E. Petersen; Anne C. Shartel,** both of San Jose, Calif.

[73] Assignee: **International Business Machines Corporation,** Armonk, N.Y.

[21] Appl. No.: **219,685**

[22] Filed: **Dec. 24, 1980**

[51] **Int. Cl.**[3] **G01P 15/125**

[52] **U.S. Cl.** ..... **73/510;** 73/517 R

[58] **Field of Search** ..... 73/514, 510, 515, 516 R, 73/517 R, 517 B, 862.48

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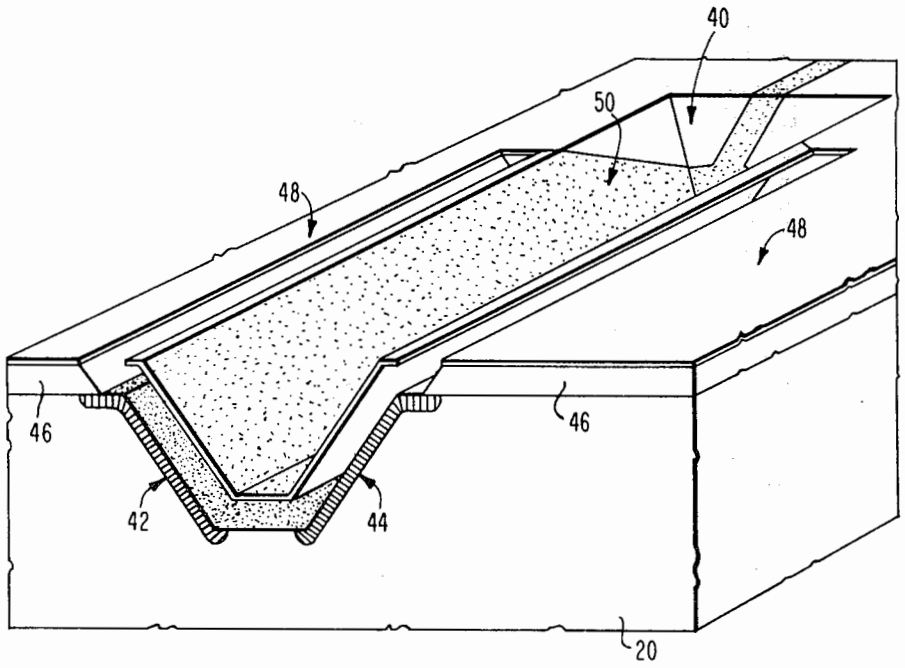
Attorney, Agent, or Firm—George E. Roush

[57] **ABSTRACT**

This device comprises a v-shaped cavity in a planar semiconductor substrate having a substantially thin-walled v-shaped cantilever beam inset therein. The beam is movable in directions normal to and laterally of the plane of the substrate, whereby acceleration is sensed in both of these directions. A planar substrate of n-type silicon is arranged with the major face oriented in the (100) plane. A v-shaped groove is anisotropically etched in the substrate and capacitor electrode regions are diffused into the sloping walls. An epitaxial layer is grown over this substrate, and over that a layer of insulation is added. A layer of conductive material is laid down on the insulation to define an electrode. The substrate is again subjected to an anisotropic etchant for cutting the epitaxial layer from under the cantilever beam formed of the insulating layer and the conducting layer. The electrodes form two variable capacitors which are connected in parallel or differentially to simple circuitry laid down on the same substrate for resolving the bidirectional movement of the beam. Three such devices appropriately oriented, and compatible electronic circuitry, enable all three spatial coordinates to be probed with a single substrate assembly.

10 Claims, 8 Drawing Figures



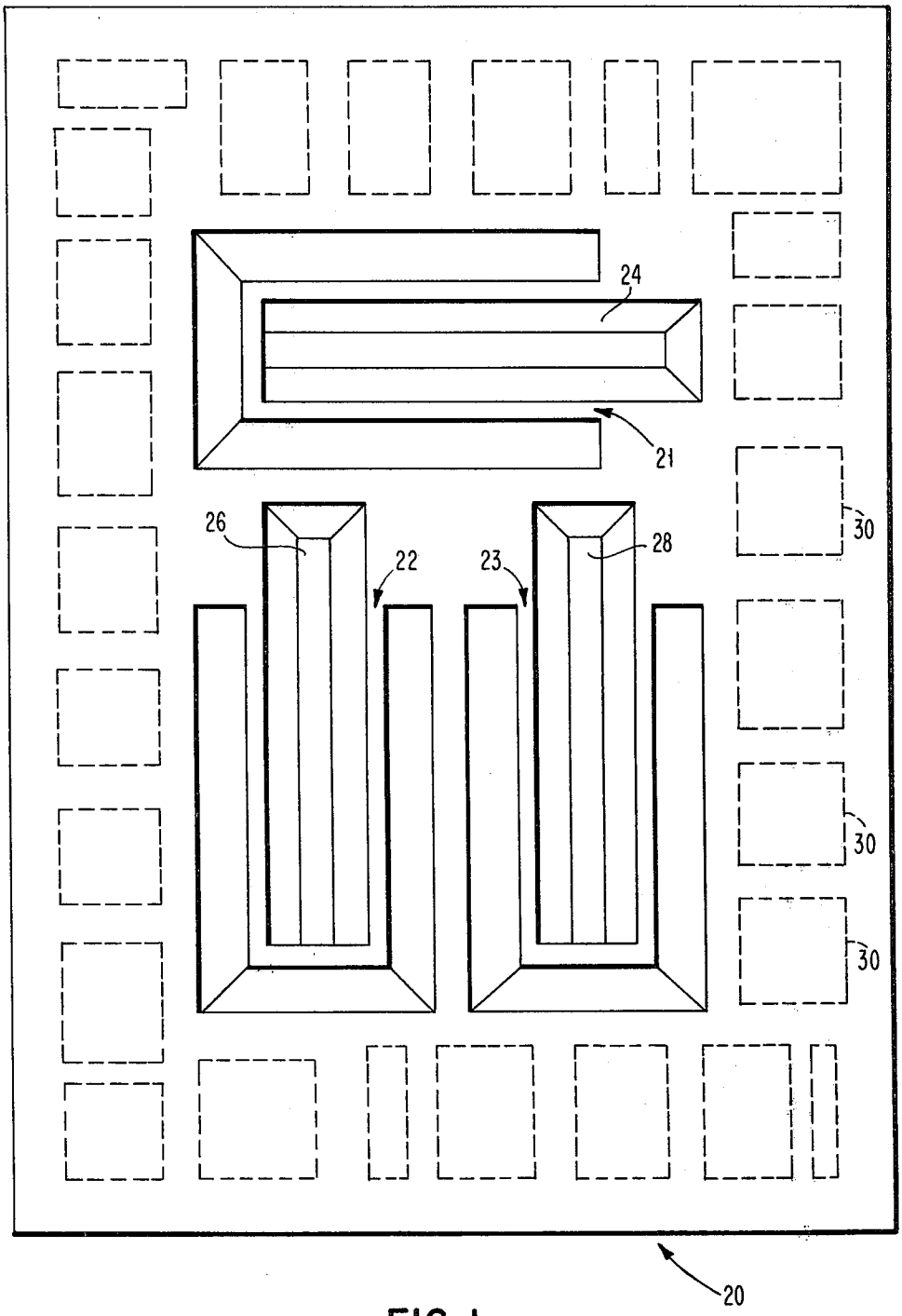


FIG. 1

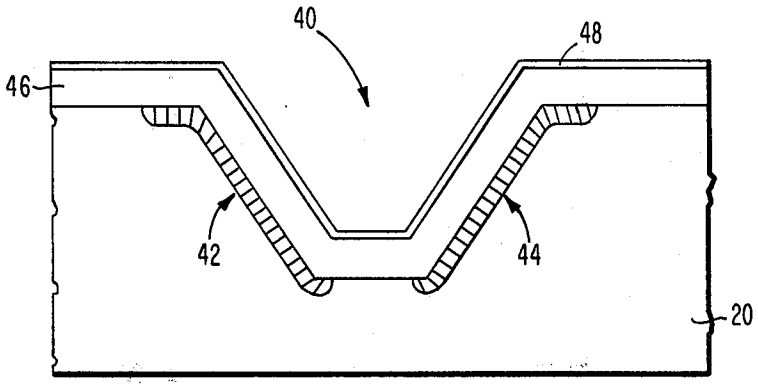


FIG. 3

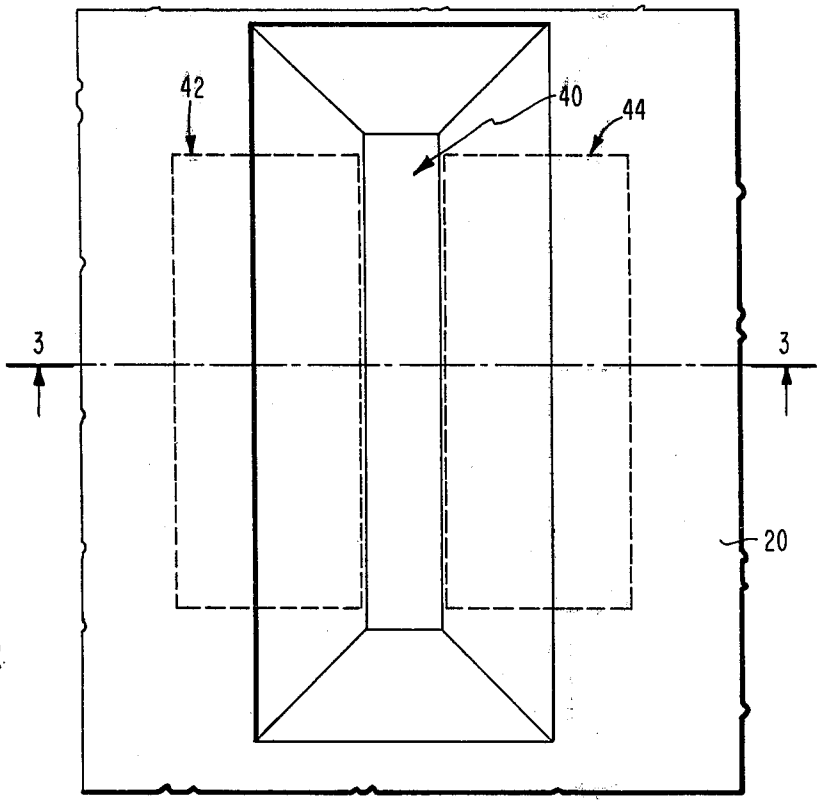


FIG. 2

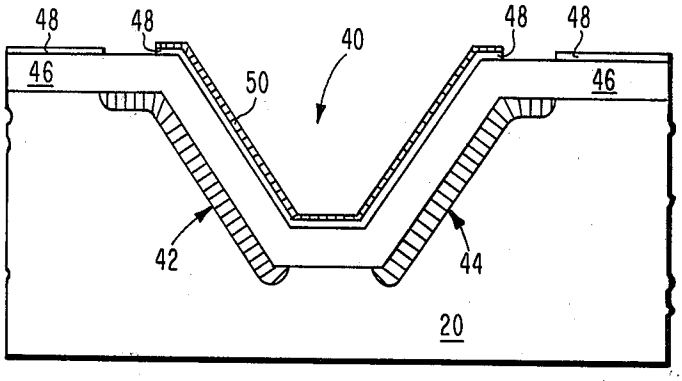


FIG. 4

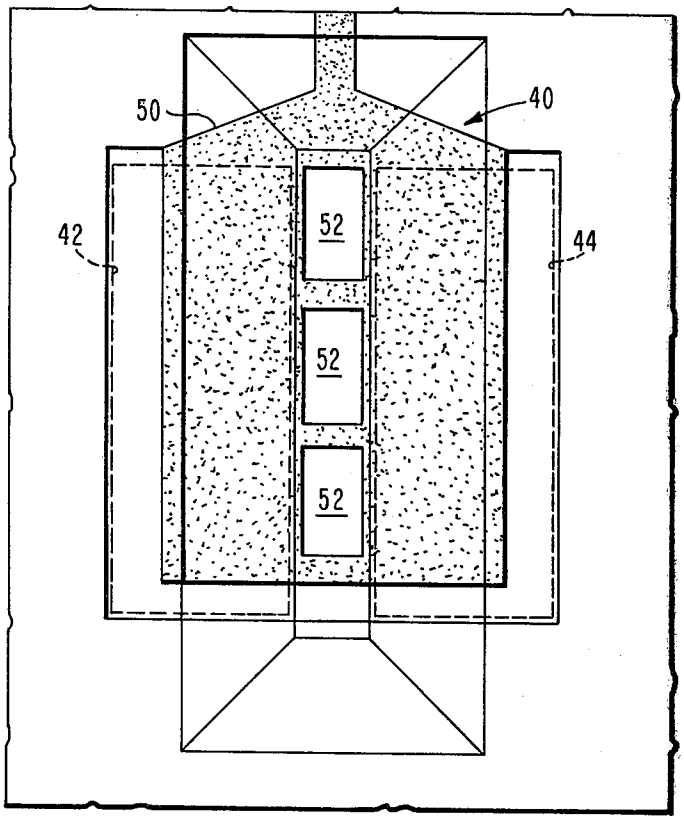


FIG. 5

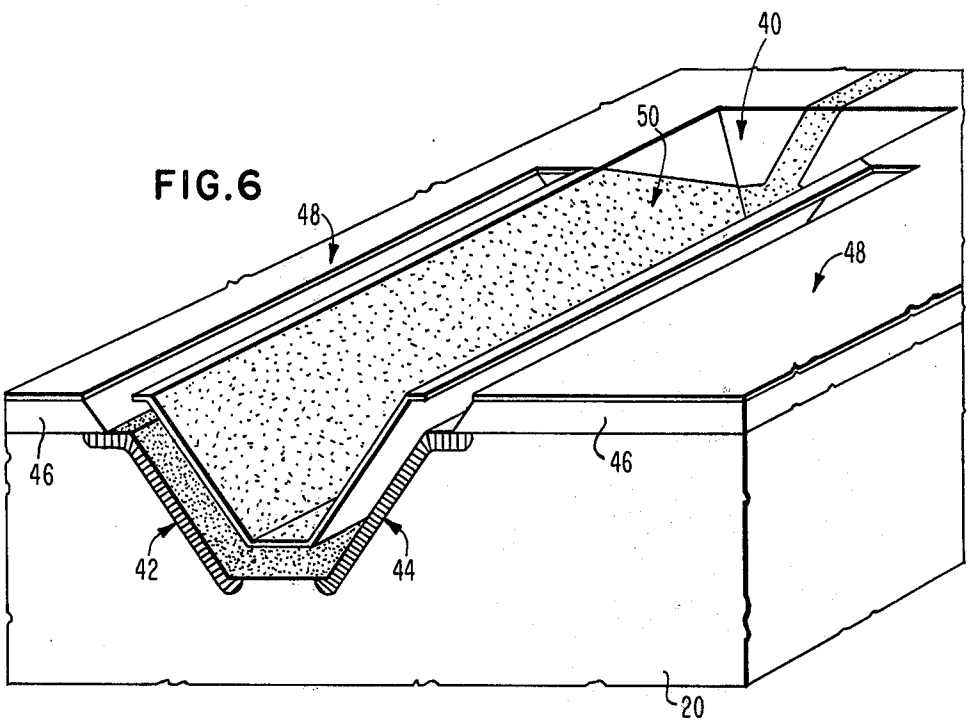


FIG.6

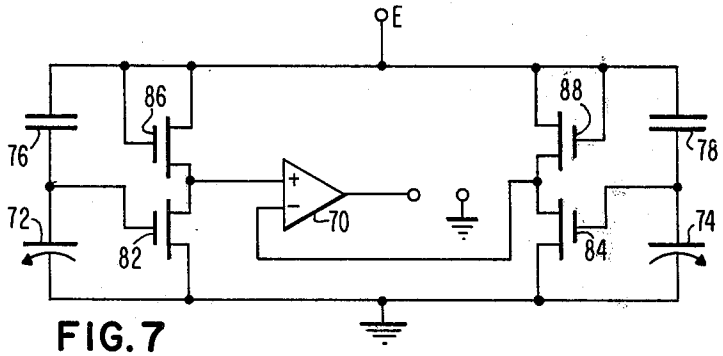


FIG.7

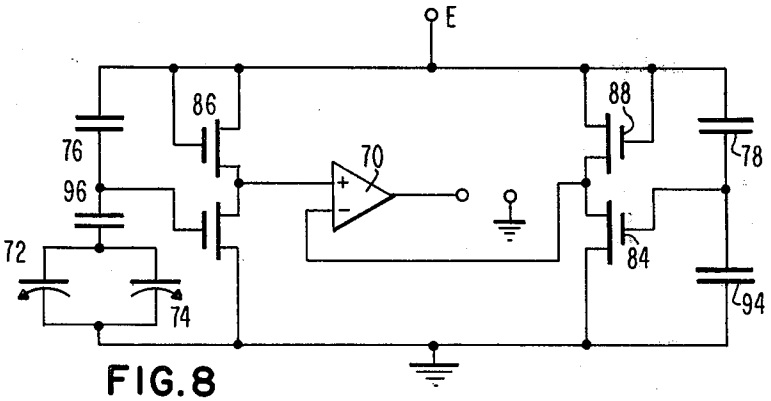


FIG.8

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