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**Patent Number:** 

## United States Patent [19]

Judy [45] Date of Patent: Aug. 17, 1999

[11]

### [54] APPARATUS AND METHOD FOR MULTI-AXIS CAPACITIVE SENSING

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Mass.

[73] Assignee: Analog Devices, Inc., Norwood, Mass.

[21] Appl. No.: **08/878,192** 

[22] Filed: Jun. 18, 1997

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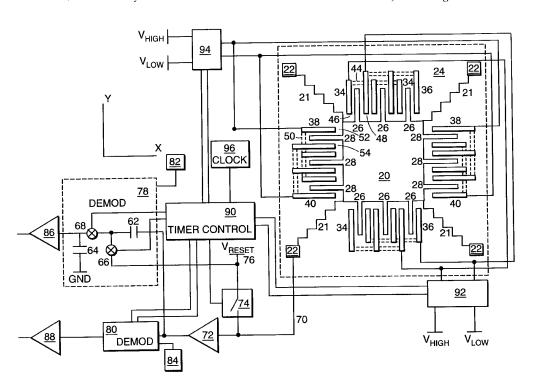
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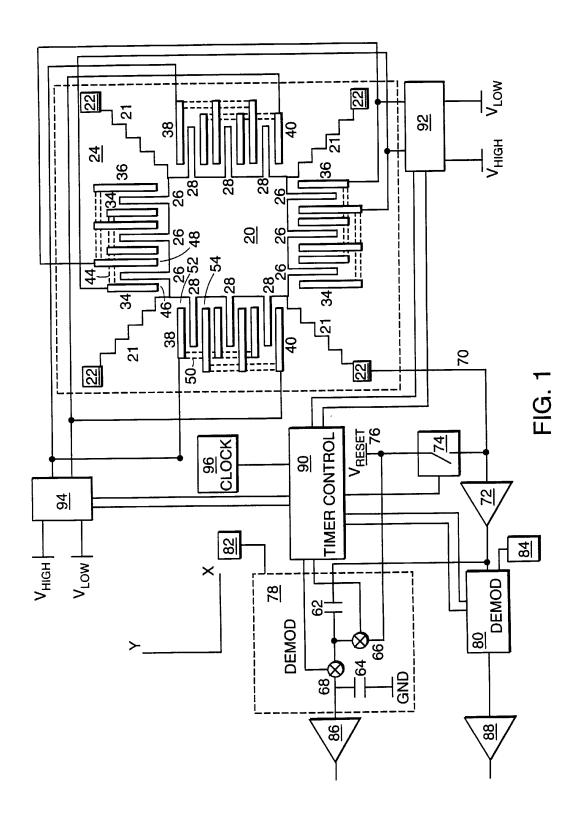
### [57] ABSTRACT

A device for detecting with differential capacitors accelerations in more than one orientation through time-division multiplexing. A micromachined mass is movable along or about any axis in response to a force. The mass forms the common electrode of a set of differential capacitors, wherein the other electrodes of each differential capacitor are fixed. With each differential capacitor, one fixed electrode is set to one voltage and the other fixed electrode is set to a second voltage. The mass is connected to the input of an amplifier and to a switch for connecting the mass to a fixed voltage. The output of the amplifier is coupled to a demodulator for each orientation. A timing circuit activates one demodulator at a time. By toggling the voltages on the fixed electrodes of the differential capacitor corresponding to the active demodulator, the movement of the mass in the orientation corresponding to the active demodulator can be determined.

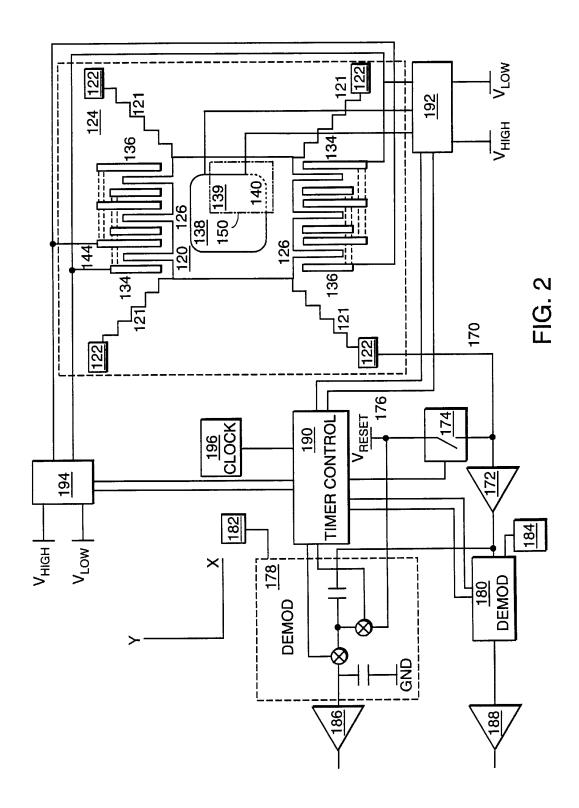
### 27 Claims, 4 Drawing Sheets





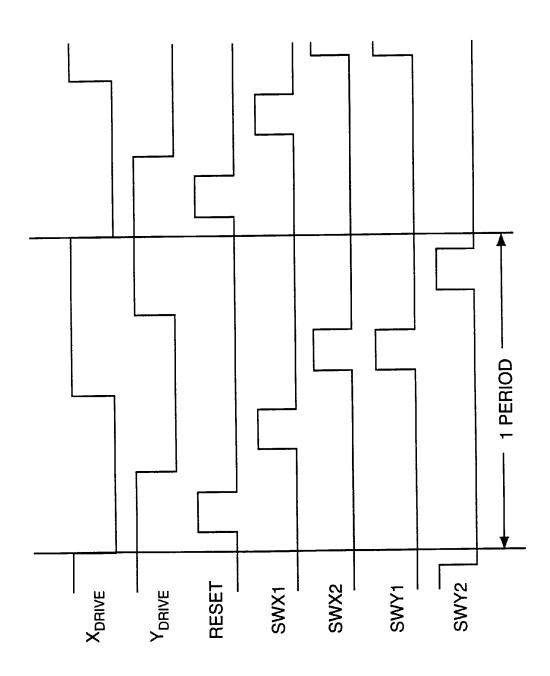






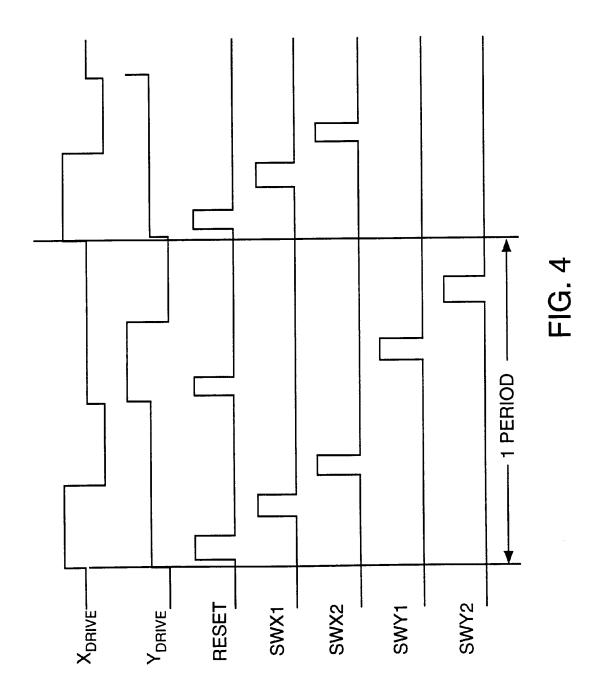


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