

**(12) United States Patent  
Philipp**

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(45) Date of Patent: Sep. 17, 2002**

- (54) **CAPACITIVE SENSOR AND ARRAY** 5,973,623 A \* 10/1999 Gupta et al. .... 341/33  
 6,256,022 B1 \* 7/2001 Manaresi et al. .... 178/18.06  
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\* cited by examiner

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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**Related U.S. Application Data**

- (60) Provisional application No. 60/117,326, filed on Jan. 26, 1999.  
 (51) **Int. Cl.<sup>7</sup>** ..... **H03K 17/94**  
 (52) **U.S. Cl.** ..... **341/33; 341/22; 178/18.06**  
 (58) **Field of Search** ..... 341/33, 22; 178/18.06, 178/18.07; 200/343; 345/168

**(57) ABSTRACT**

Proximity of a body, which may be a user's finger, to an electrode pair is sensed by a charge transfer capacitive measurement approach. The electrode pair thus acts as a key that can be arrayed with other electrode pairs to form a keypad, keyboard, linear slider control, or liquid level sensor. In one embodiment of the invention each key is associated with an alternating voltage source and a pair of electrodes mounted on or within a solid dielectric substrate or panel so as to be separated from each other by a gap. The voltage source is connected to a driven electrode, a sampling charge detector is connected to a second, receiving, electrode, and the output of the charge detector is, in turn, fed into a signal processor. Disturbances in coupling between the two electrodes are detected through the solid substrate or panel material when a substance or object approaches or contacts the panel. The receiving electrode is a low-impedance node during the sampling phase of the process, which aids in keeping the sensor from being affected by wiring length or by extraneous objects near an output lead..

**(56) References Cited**

**U.S. PATENT DOCUMENTS**

- |             |          |                   |        |
|-------------|----------|-------------------|--------|
| 4,550,221 A | 10/1985  | Mabusth           |        |
| 4,651,133 A | 3/1987   | Ganesan et al.    |        |
| 4,879,461 A | 11/1989  | Philipp           |        |
| 5,543,591 A | 8/1996   | Gillespie et al.  |        |
| 5,572,205 A | 11/1996  | Caldwell et al.   |        |
| 5,730,165 A | 3/1998   | Philipp           |        |
| 5,841,078 A | 11/1998  | Miller et al.     |        |
| 5,861,583 A | 1/1999   | Schediwy et al.   |        |
| 5,914,465 A | * 6/1999 | Allen et al. .... | 341/33 |

**10 Claims, 7 Drawing Sheets**

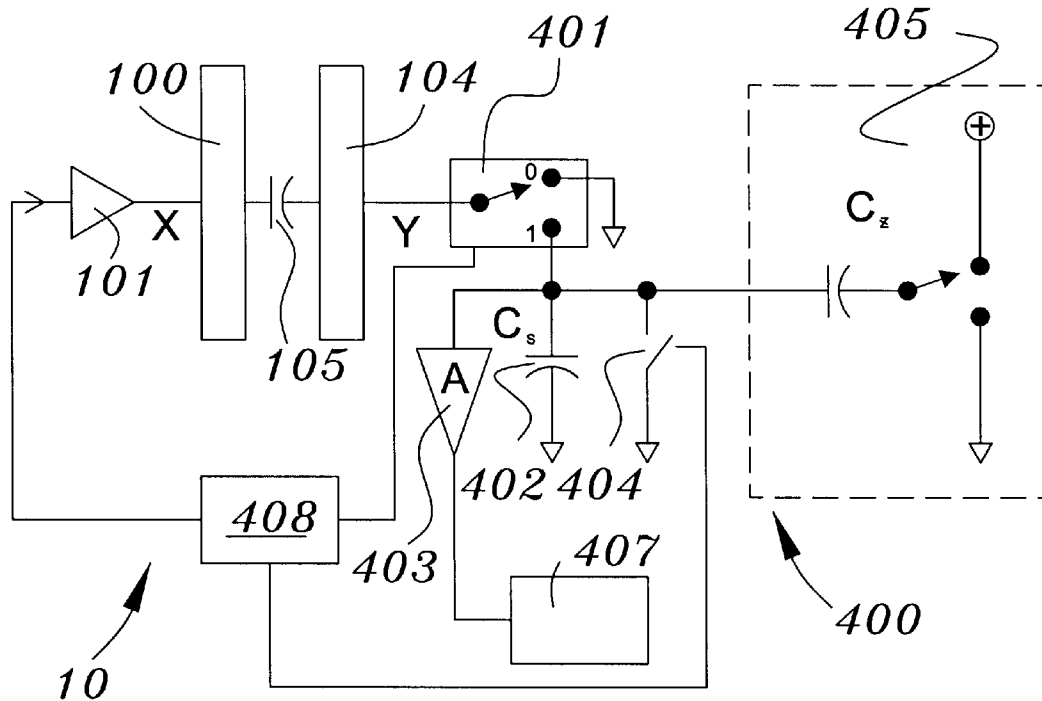


FIG. 1a

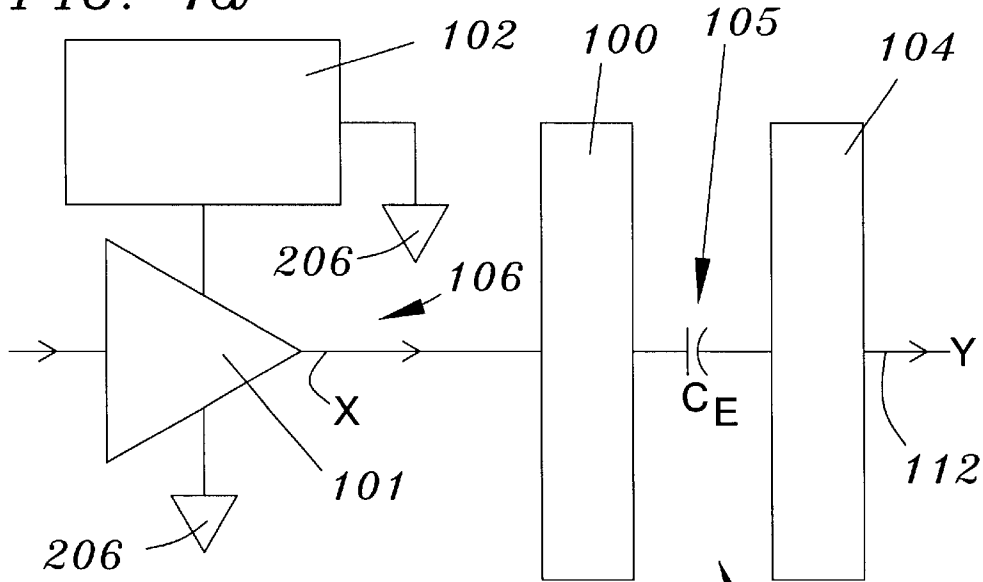


FIG. 1b

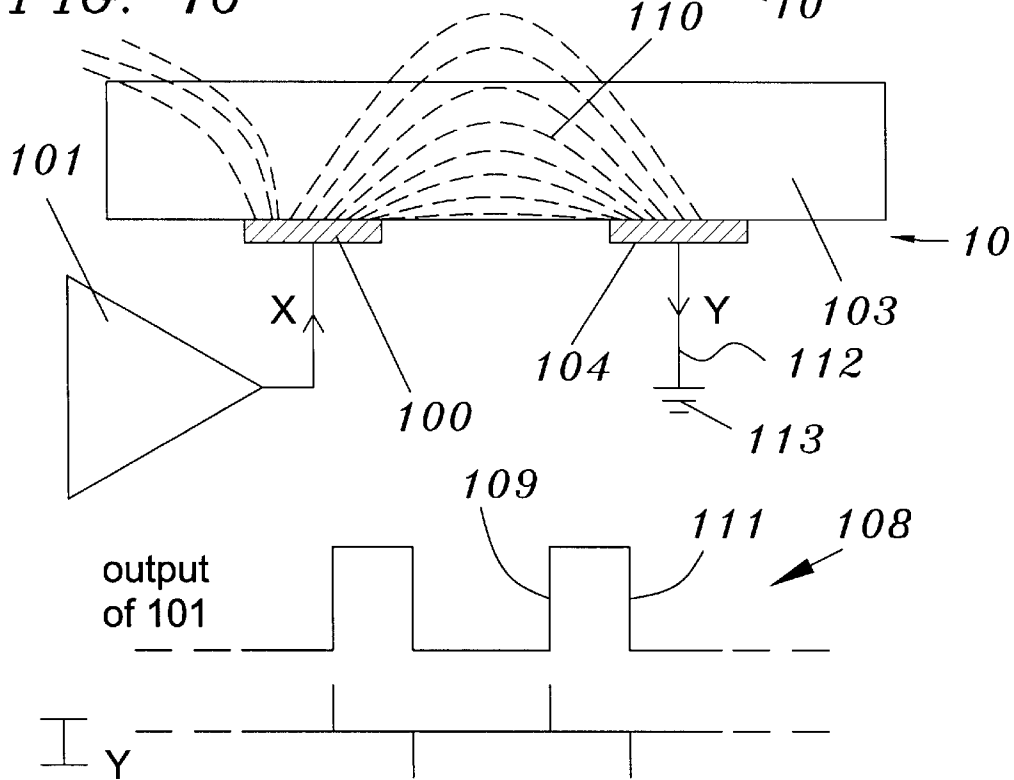


FIG. 1c

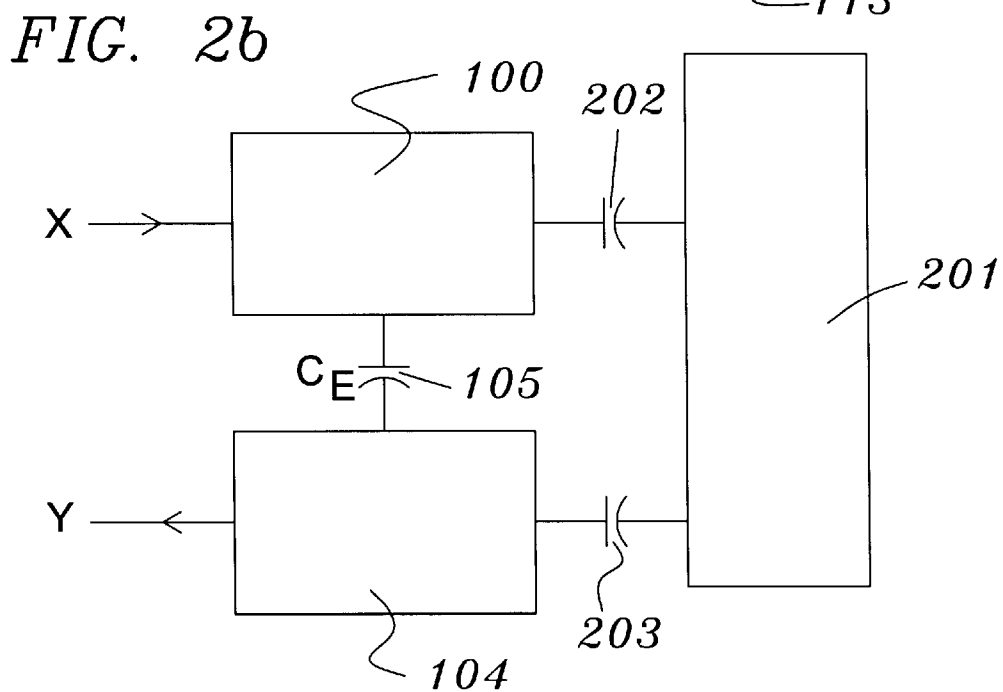
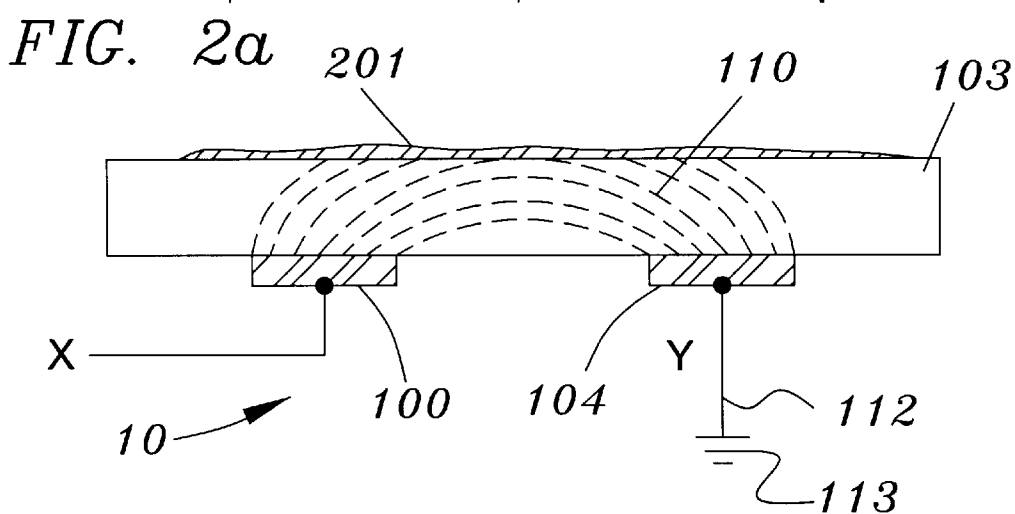
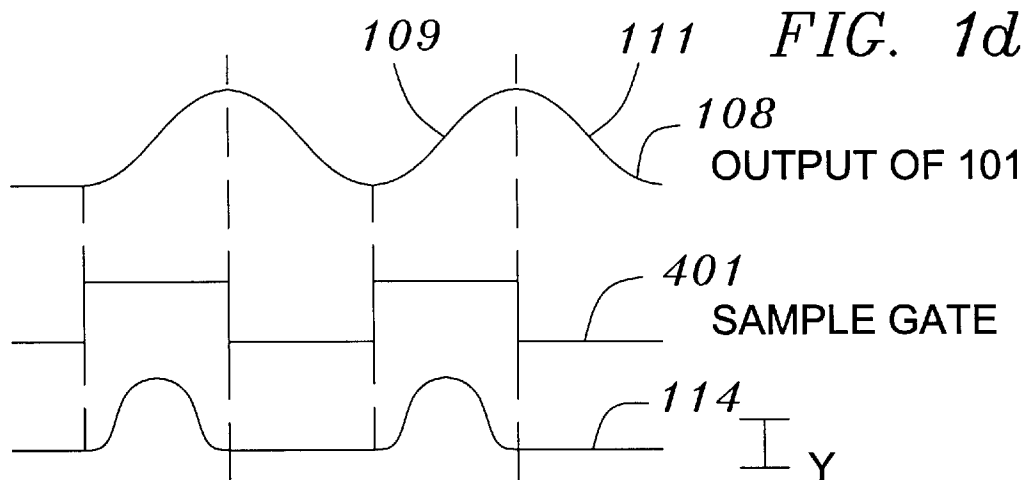


FIG. 3a

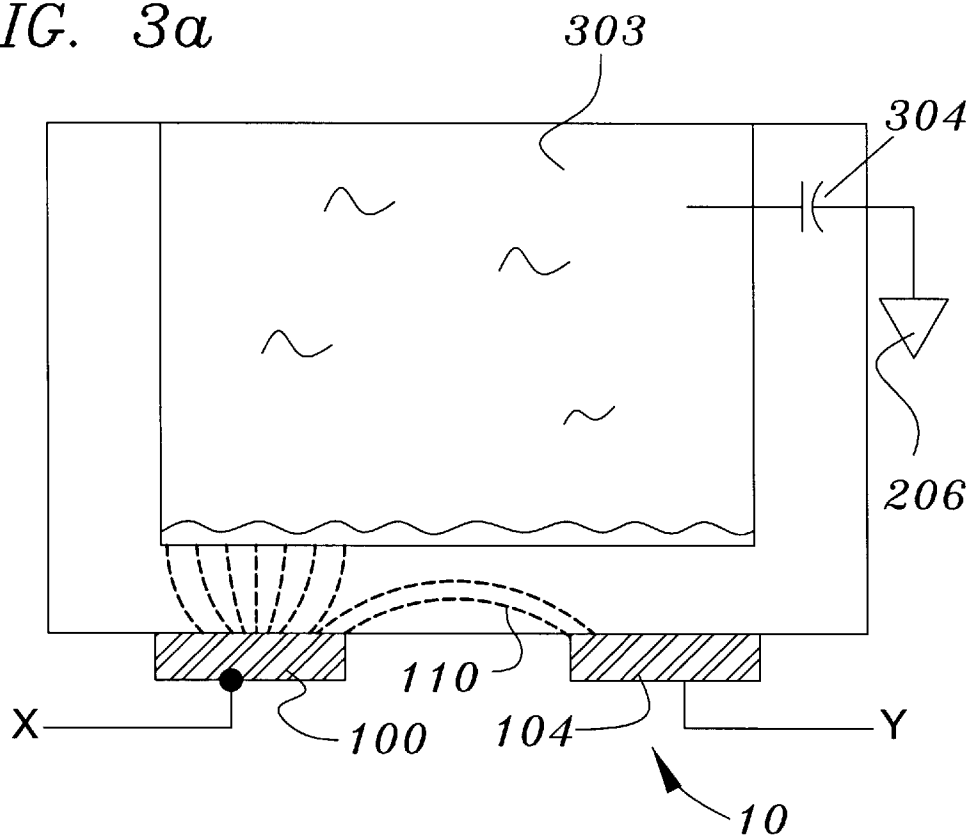
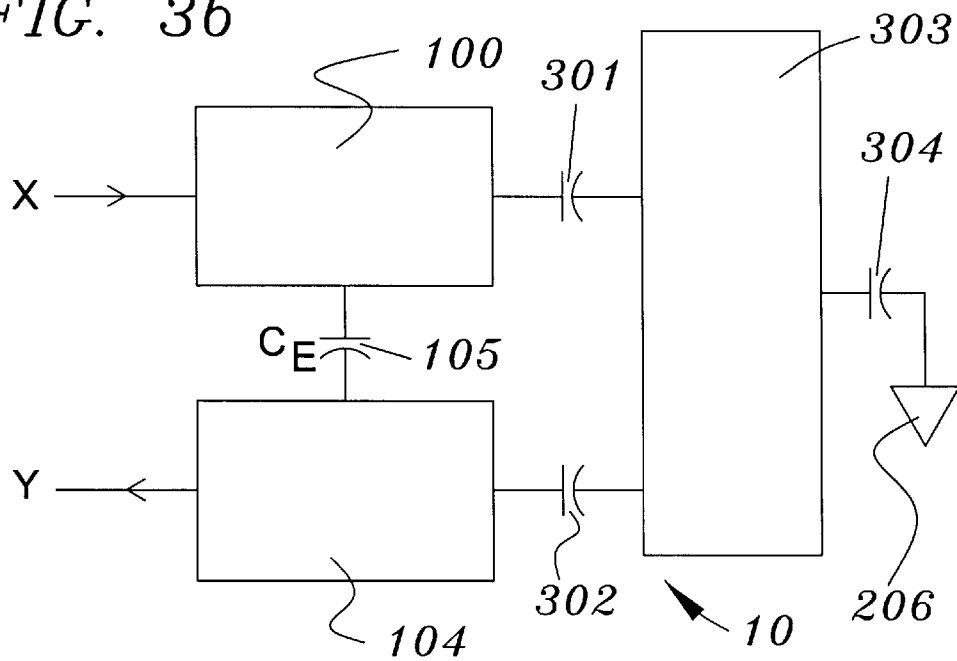
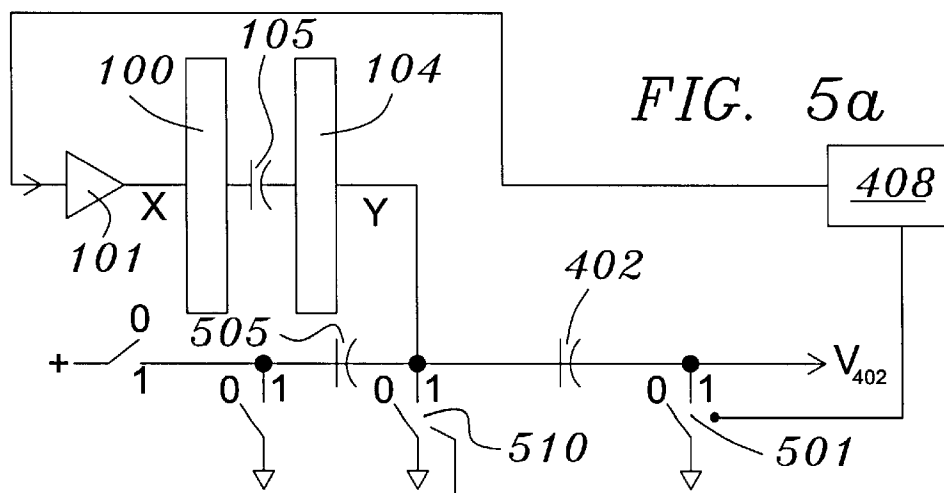
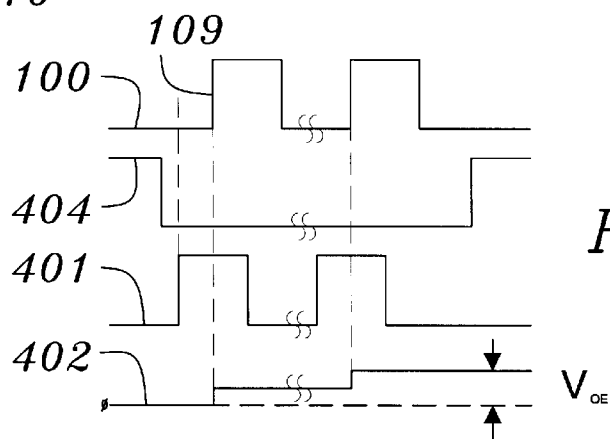
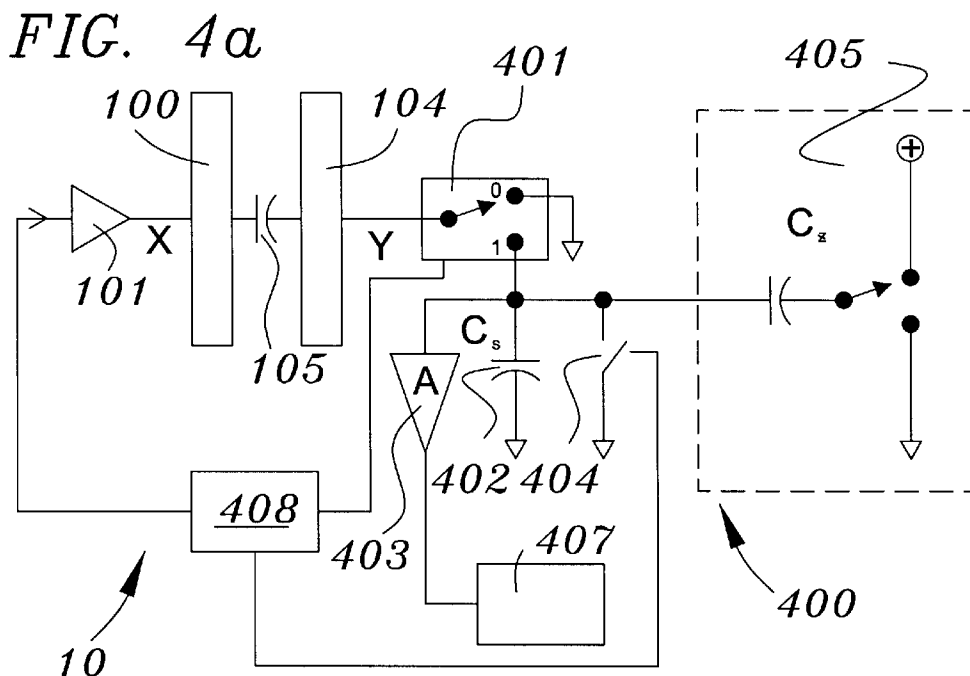


FIG. 3b





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