

**(12) United States Patent  
Philipp**

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**(54) CAPACITIVE SENSOR AND ARRAY**

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**(\*) 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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**(22) Filed: Jan. 26, 2000**

**Related U.S. Application Data**

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**(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**

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**(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..

**10 Claims, 7 Drawing Sheets**

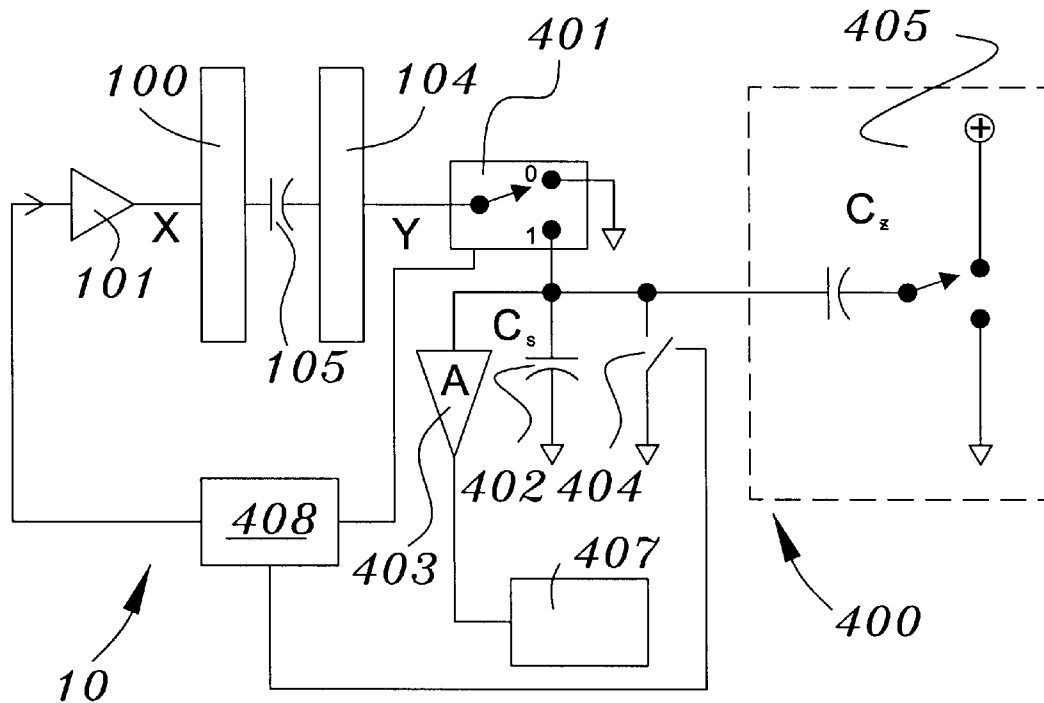


FIG. 1a

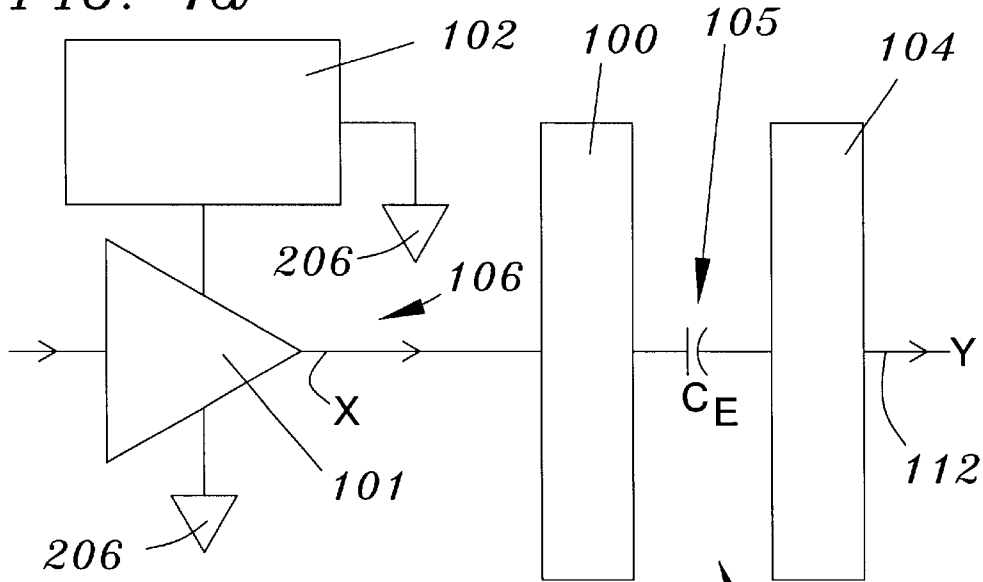


FIG. 1b

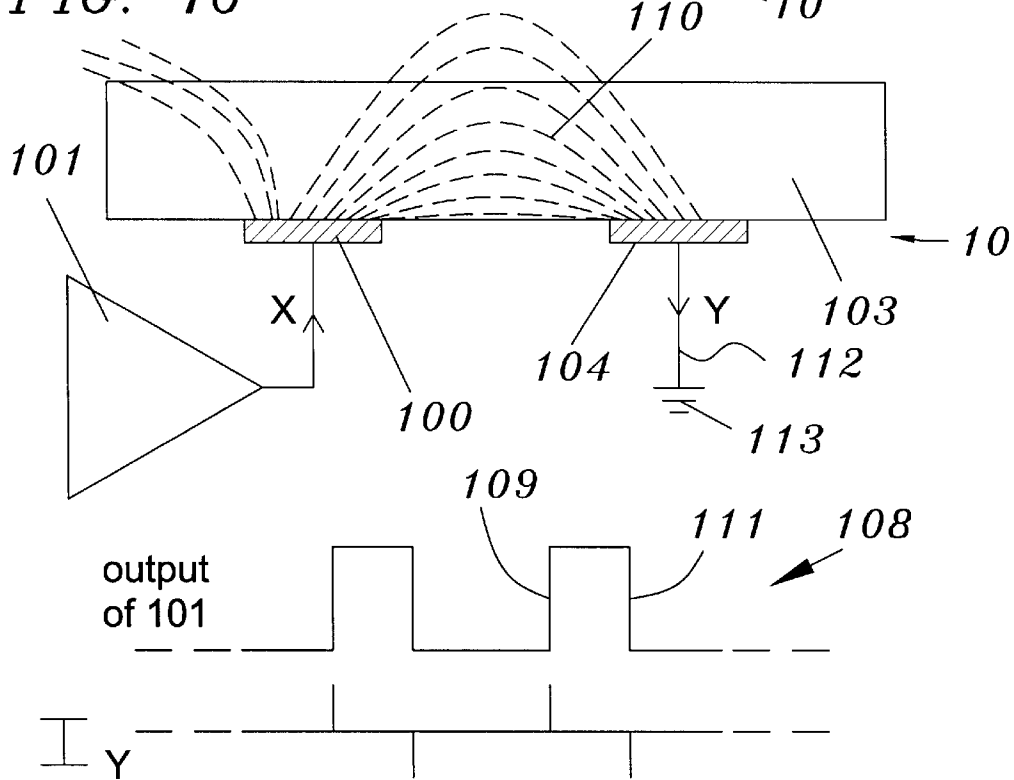


FIG. 1c

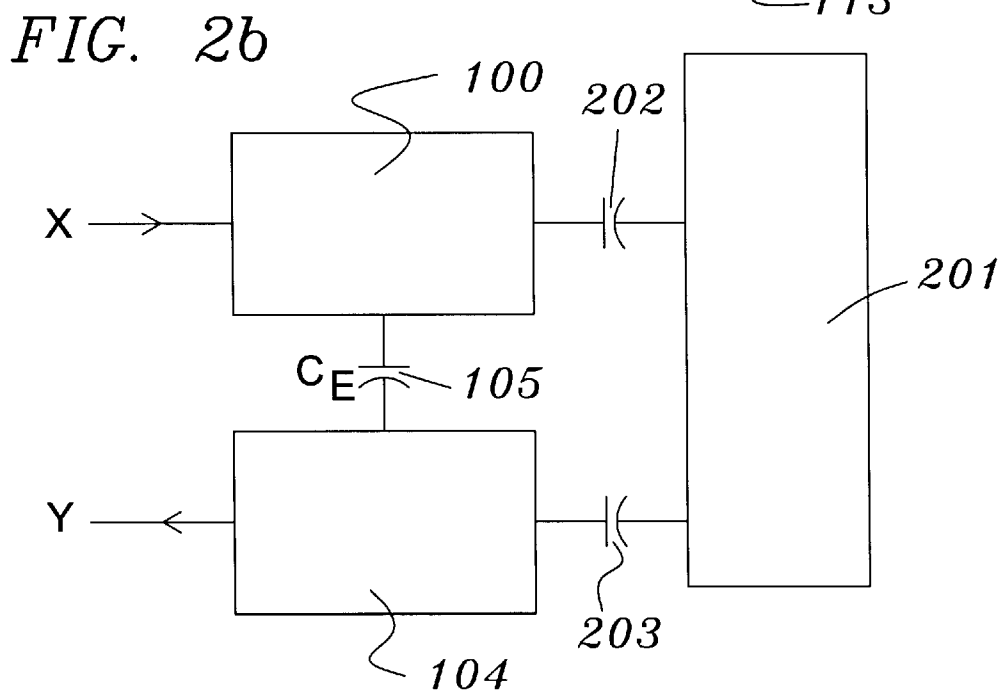
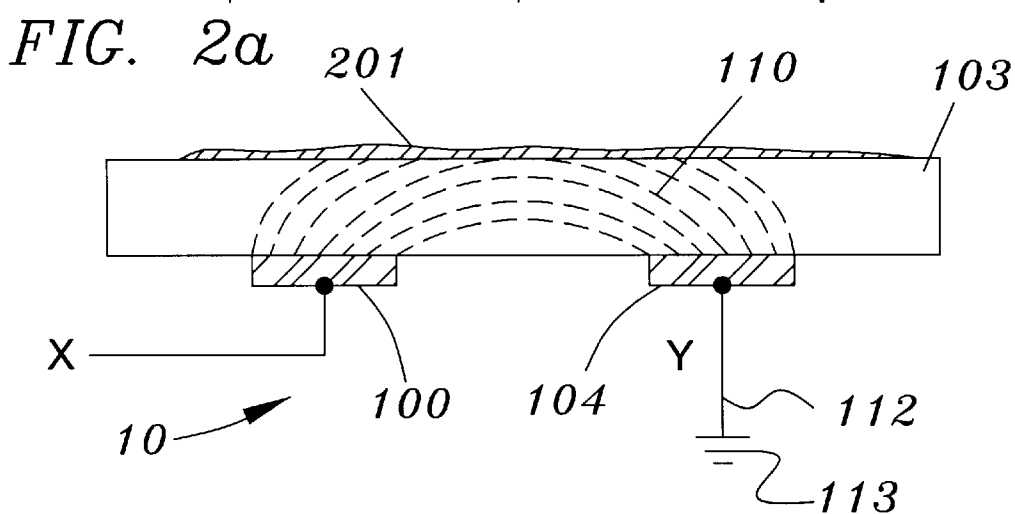
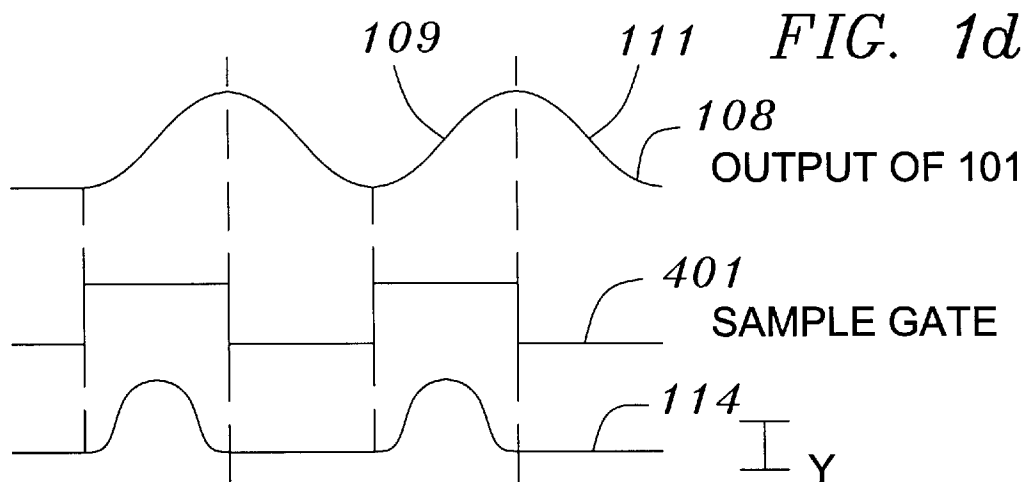


FIG. 3a

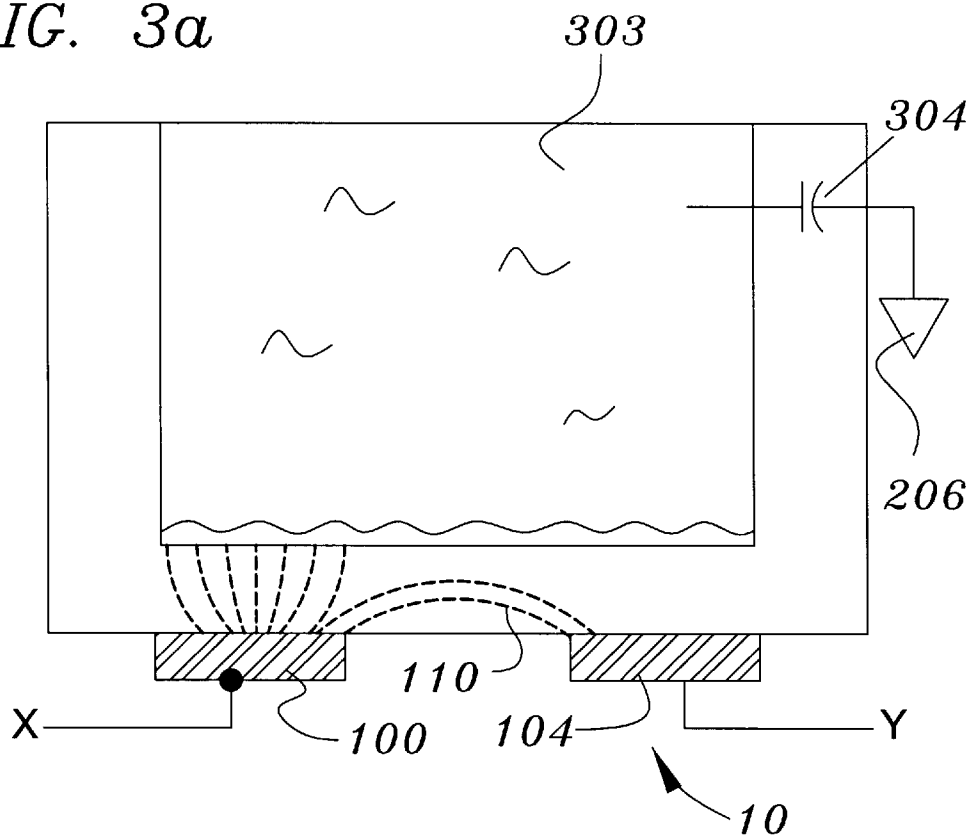
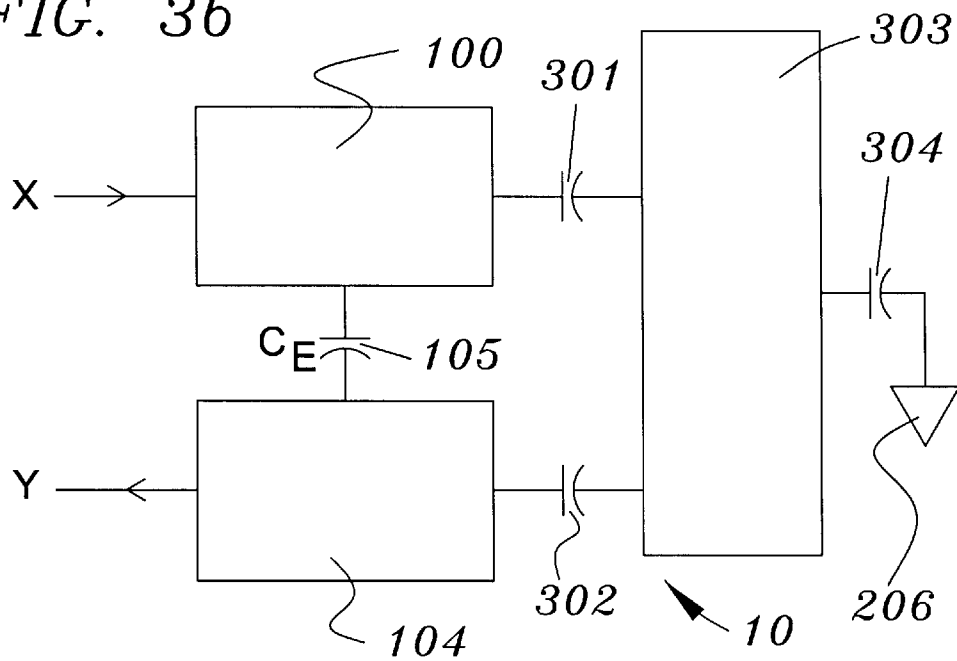
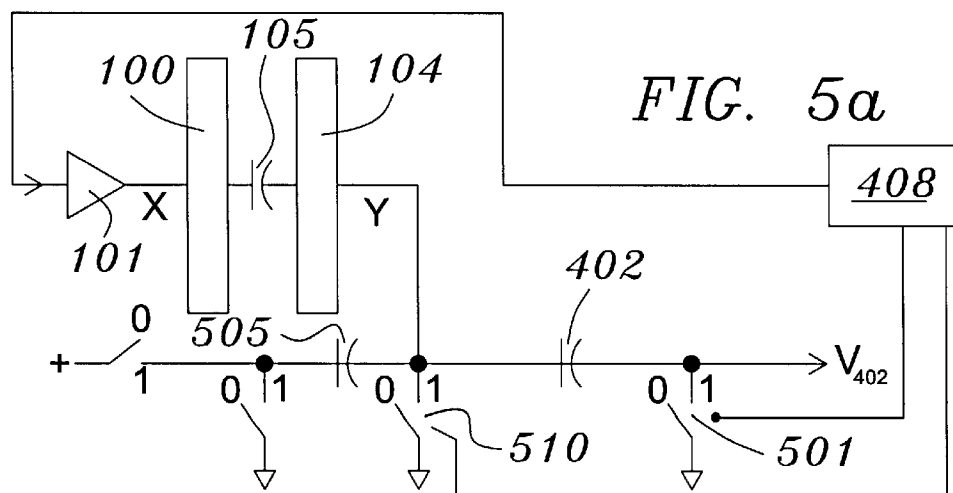
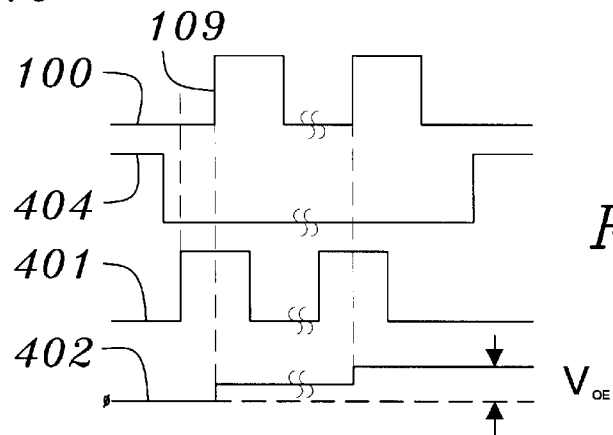
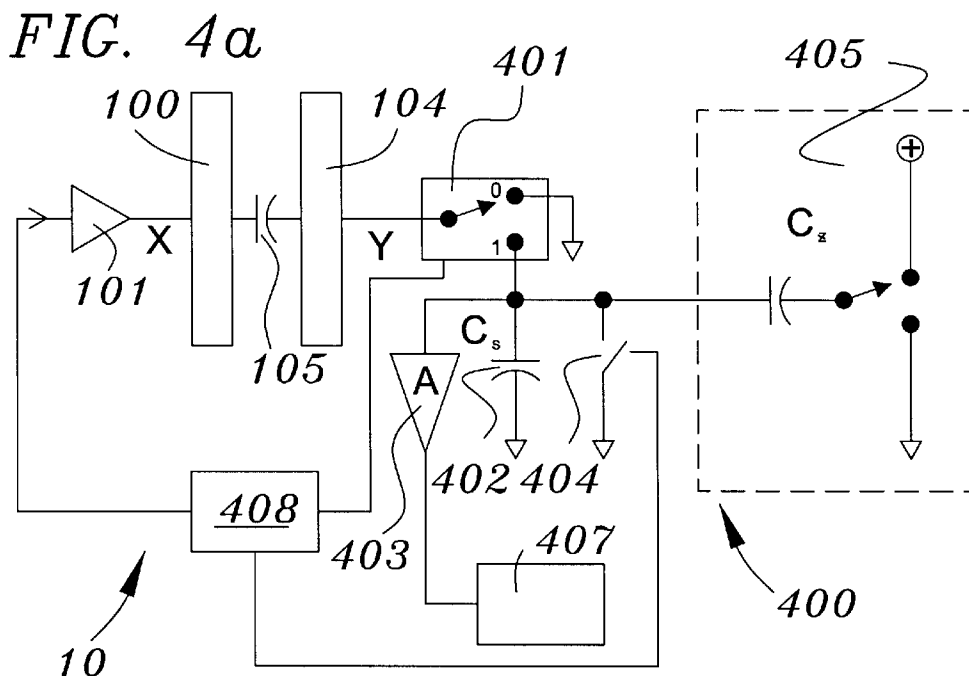


FIG. 3b





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