

(12) **United States Patent**  
**Hsu et al.**

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(54) **FLEXIBLE TRANSPARENT TOUCH SENSING SYSTEM FOR ELECTRONIC DEVICES**

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**G09G 5/08** (2006.01)

(52) **U.S. Cl.** ..... **345/173; 345/179; 178/18.06**

(58) **Field of Classification Search** ..... **345/173; 345/172; 156, 179, 174, 18.05, 18.06, 176; 178/18.01, 18.09, 19.01, 20.01, 18.04, 18.05, 178/18.06; 341/33, 34; 200/211; 463/37; 173/18.01**

See application file for complete search history.

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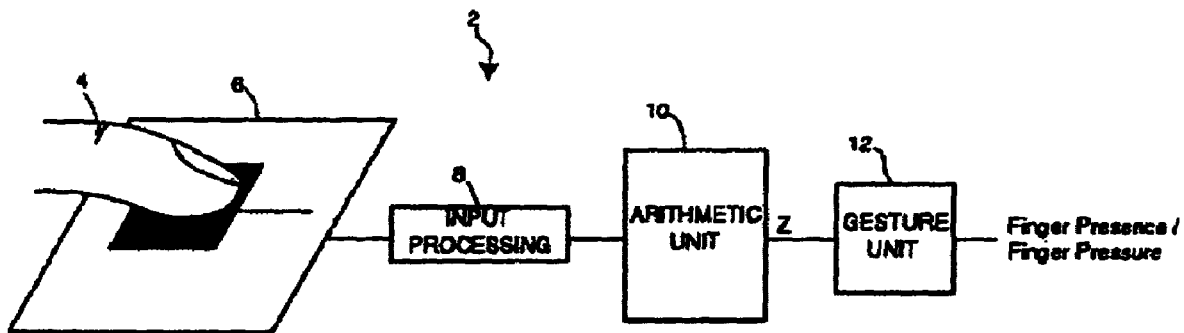
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(57) **ABSTRACT**

A transparent, capacitive sensing system particularly well suited for input to electronic devices is described. The sensing system can be used to emulate physical buttons or slider switches that are either displayed on an active display device or printed on an underlying surface. The capacitive sensor can further be used as an input device for a graphical user interface, especially if overlaid on top of an active display device like an LCD screen to sense finger position (X/Y position) and contact area (Z) over the display. In addition, the sensor can be made with flexible material for touch sensing on a three-dimensional surface. Because the sensor is substantially transparent, the underlying surface can be viewed through the sensor. This allows the underlying area to be used for alternative applications that may not necessarily be related to the sensing system. Examples include advertising, an additional user interface display, or apparatus such as a camera or a biometric security device.

**30 Claims, 5 Drawing Sheets**



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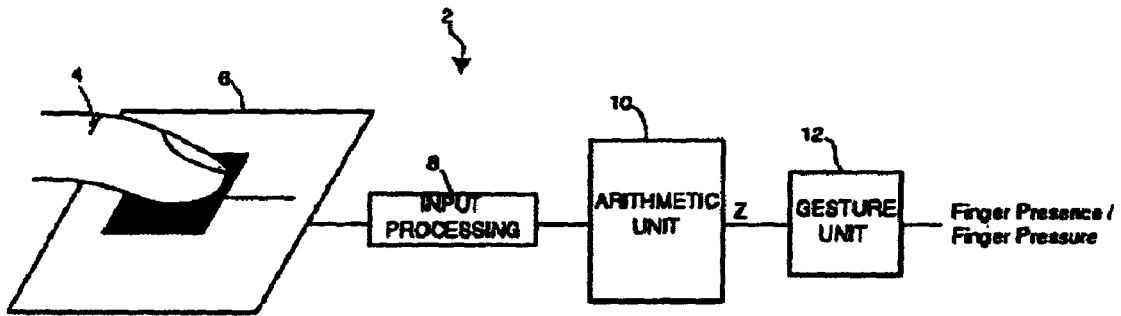


Figure 1

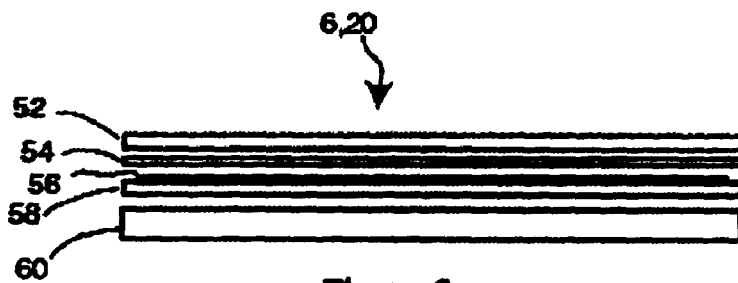


Figure 2

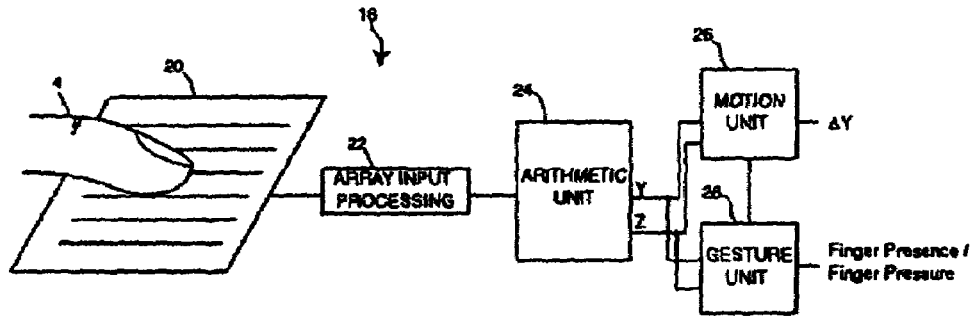


Figure 3

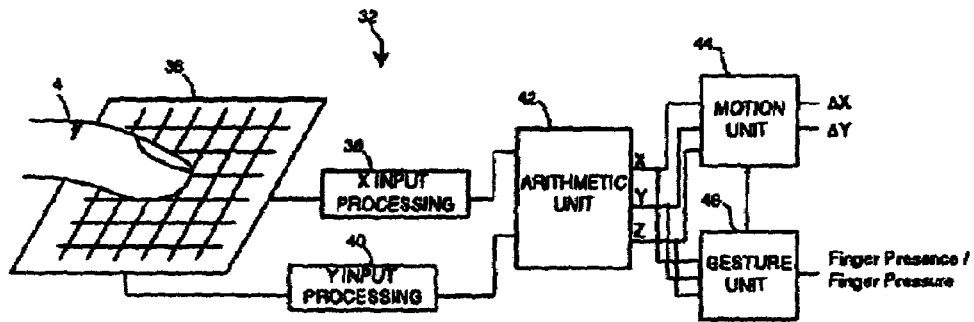


Figure 4

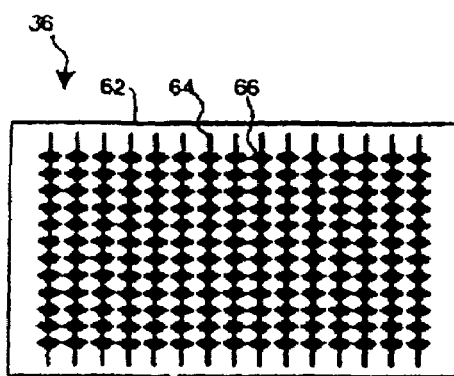


Figure 5A

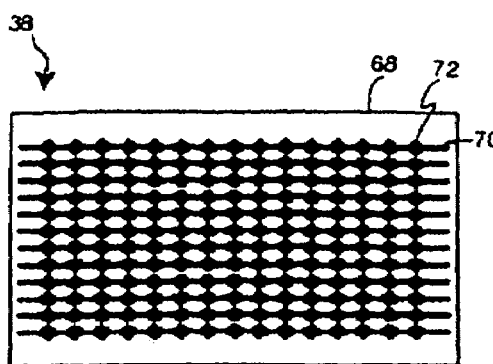


Figure 5B

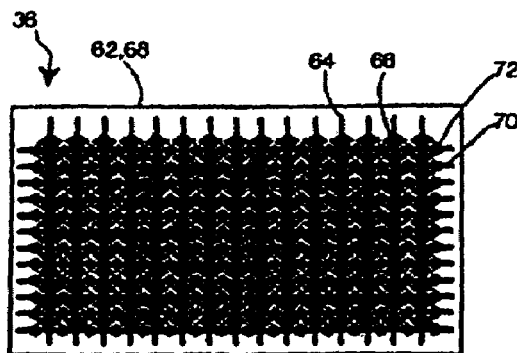


Figure 5C

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