

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

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(54) **TRANSPARENT TOUCH PANEL AND ELECTRONIC APPARATUS USING THE SAME**

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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 177 days.

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(22) Filed: **Apr. 11, 2003**

(65) **Prior Publication Data**

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Related U.S. Application Data

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(30) **Foreign Application Priority Data**

Jan. 18, 1999 (JP) 11-8785

(51) **Int. Cl.⁷** **G02F 1/1333; G09G 3/36**

(52) **U.S. Cl.** **349/12; 349/122; 349/137; 345/104; 345/173**

(58) **Field of Search** **349/12, 122, 137, 349/158; 345/104, 173-175, 179**

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(57) **ABSTRACT**

A transparent touch panel (TTP) comprising a fixed substrate of transparent resin, an adhesion layer disposed on the fixed substrate, an antireflection layer disposed on the adhesion layer, a first transparent conductive layer disposed on the antireflection layer, a second transparent conductive layer opposed to and spaced apart from the first transparent conductive layer, and a flexible transparent film disposed on the upper surface of the second transparent conductive layer. In one embodiment, rather than having a separate adhesion layer and antireflection layer, the adhesion layer may also serve as the antireflection layer, the rest of the above components remaining the same. The use of transparent resin in the TTP of the present invention reduces weight and increases resistance to breaking. The antireflection layer decreases the light reflection at respective boundary surfaces, thus increasing light transmittance. The adhesion layer strengthens adhesion of the antireflection layer and the first transparent conductive layer onto the fixed substrate, thus providing for even and uniform electrical resistance in the transparent conductive layer. An electronic apparatus thus comprises at least a control circuit, an LCD device for display, and a TTP disposed on the display surface of the LCD device. The TTP may comprise the TTP described above and/or may comprise a polarizing plate on an operating surface of the transparent touch panel.

16 Claims, 5 Drawing Sheets

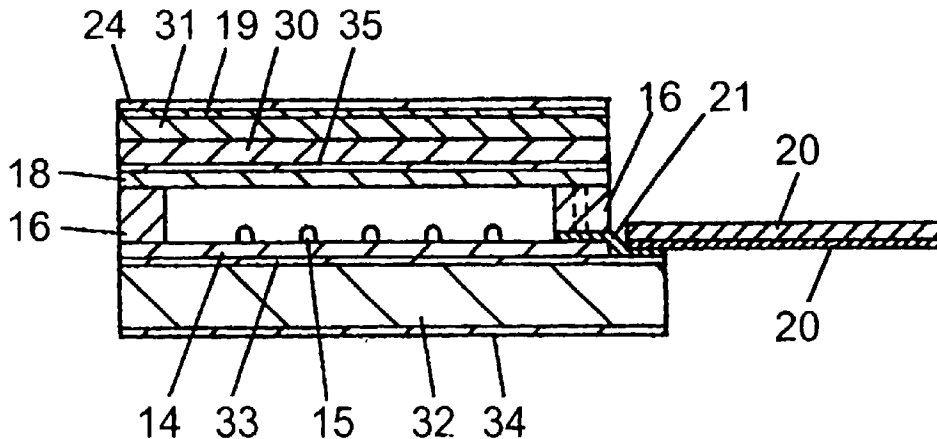


FIG. 1

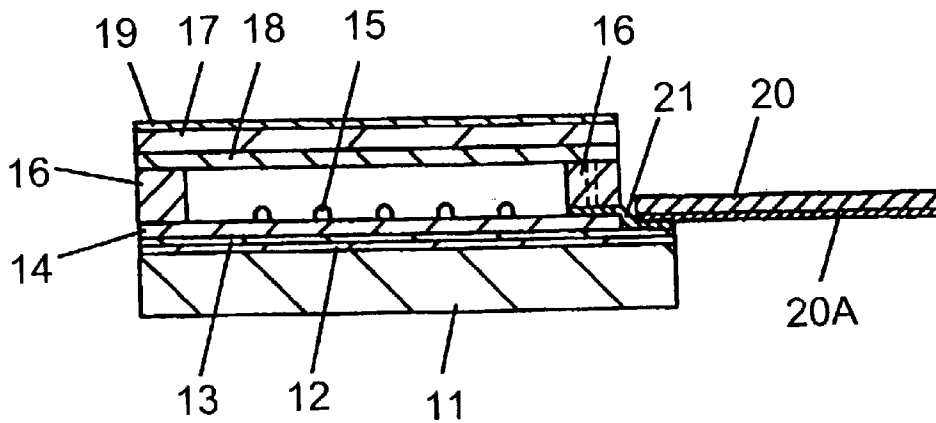


FIG. 2

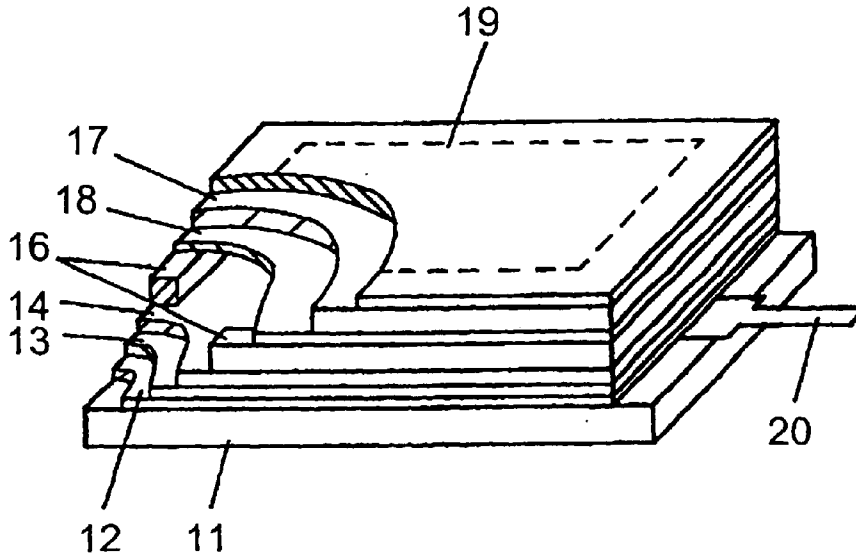


FIG. 3

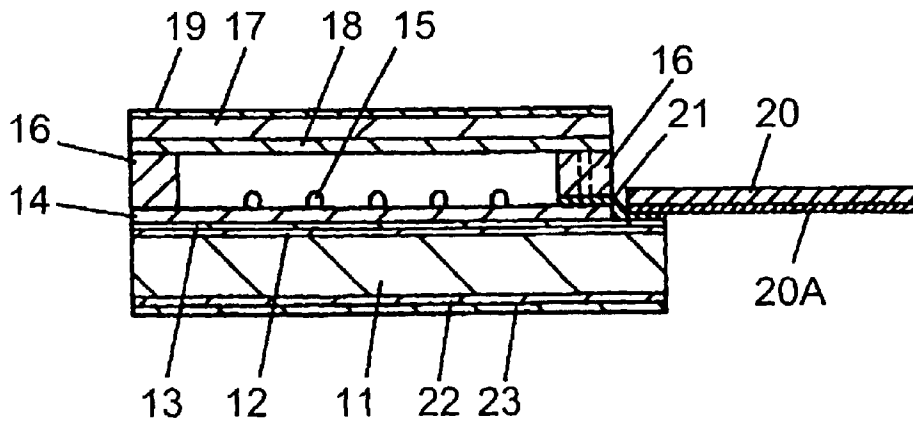


FIG. 4

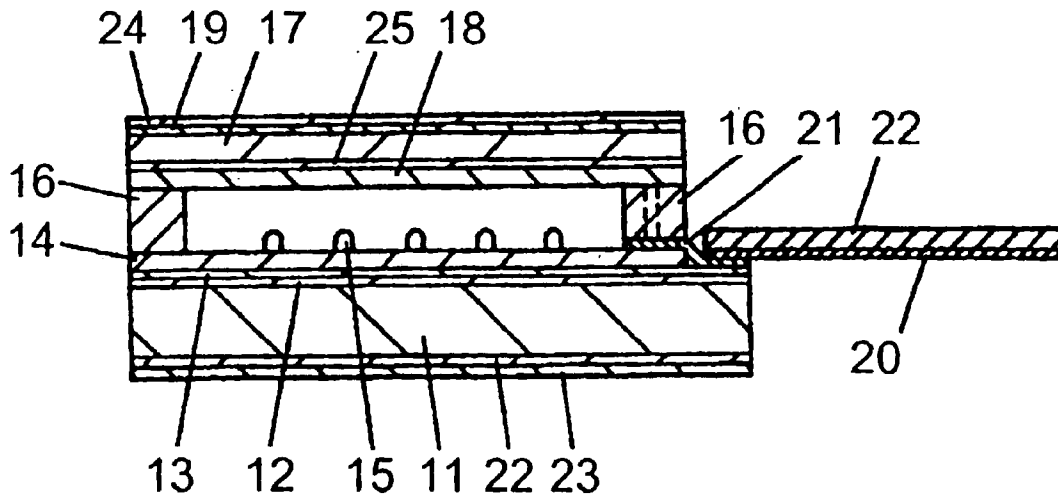


FIG. 5

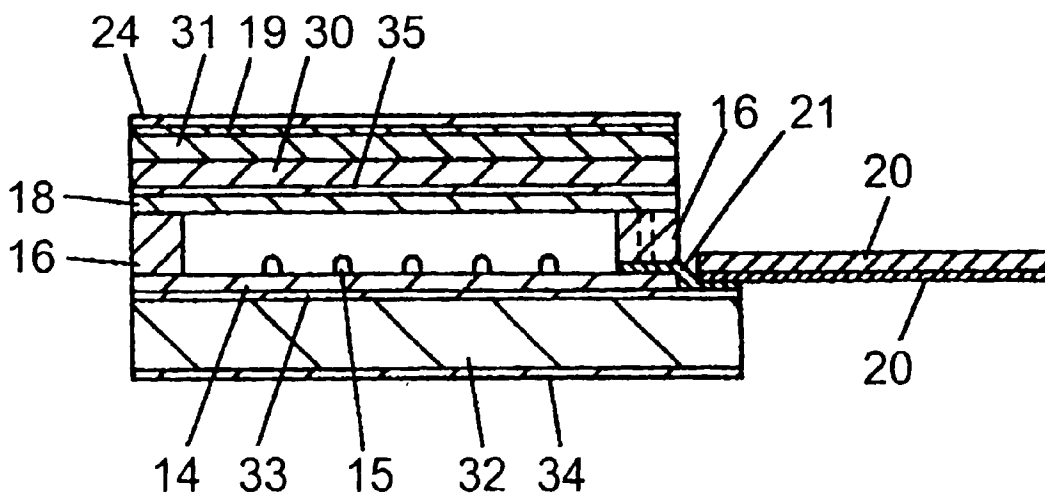
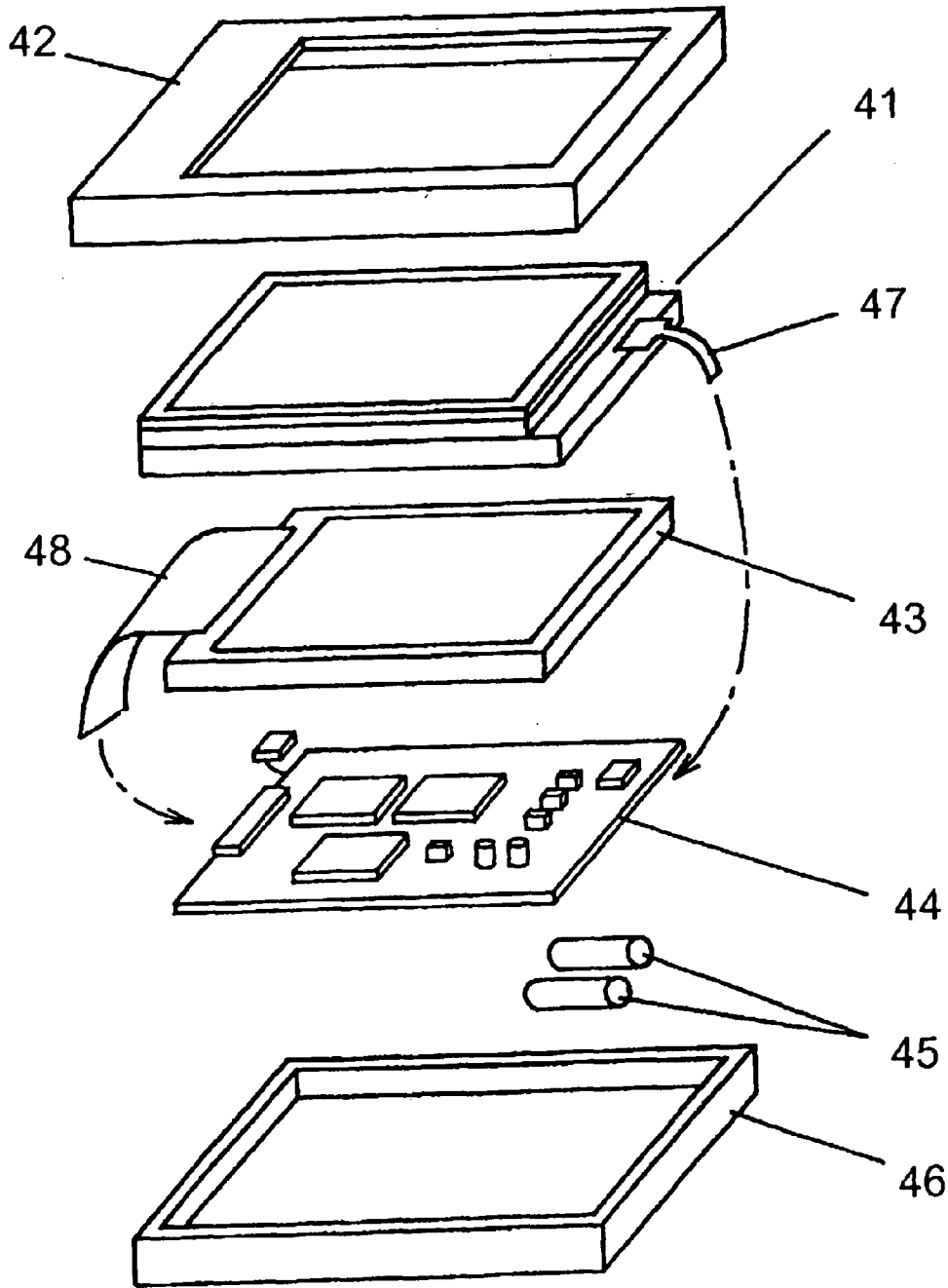


FIG. 6



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