US006204896B1

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

(10) **Patent No.: US 6,204,896 B1**
(45) **Date of Patent: Mar. 20, 2001**

(54) **DISPLAY UNIT, MANUFACTURING METHOD THEREOF AND ELECTRONIC DEVICE EQUIPPED WITH SAME**

(75) Inventors: **Tsutomu Matsuhira**; **Kimiko Munemasa**, both of Chiba (JP)

(73) Assignee: **Seiko Instruments Inc.** (JP)

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

(21) Appl. No.: **08/796,684**

(22) Filed: **Feb. 10, 1997**

(30) **Foreign Application Priority Data**

Feb. 9, 1996 (JP) 8-024377

(51) **Int. Cl.**[7] **G02F 1/1333**; G06F 3/033
(52) **U.S. Cl.** **349/12**; 349/122; 349/187
(58) **Field of Search** 349/12, 122, 155, 349/158, 187; 156/330, 276, 331.1, 274.8, 275.5, 279; 345/104, 173, 179; 178/18.03, 18.09, 19.04

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,242,388 12/1980 Kaufmann 428/35
5,386,219 * 1/1995 Greanias et al. 345/174

FOREIGN PATENT DOCUMENTS

2263009 7/1993 (GB) .

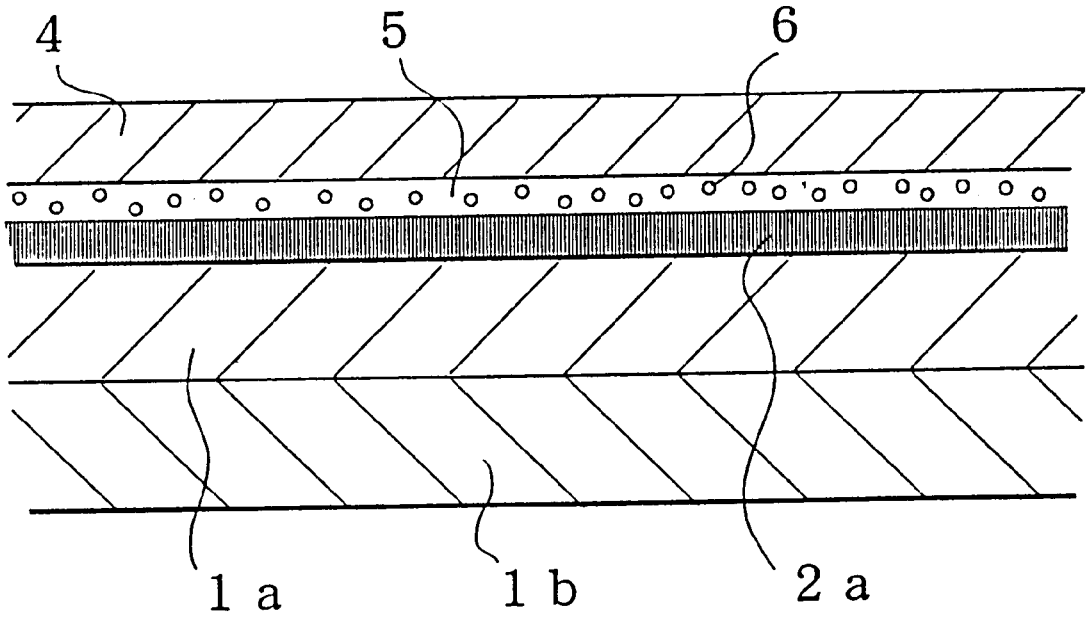
OTHER PUBLICATIONS

Patent Abstracts of Japan, vol. 006, No. 255 (P–162) Dec. 14, 1982.
Patent Abstracts of Japan, vol. 018, No. 497 (p–1801) Sep. 16, 1994.
Patent Abstracts of Japan, vol. 095, No. 008 Sep. 29, 1995.

* cited by examiner

Primary Examiner—William L. Sikes
Assistant Examiner—Tai V. Duong
(74) *Attorney, Agent, or Firm*—Adams & Wilks

(57) **ABSTRACT**

A display unit comprises a transparent touch switch and a liquid crystal display having a display surface. At least an input area of the transparent touch switch is laminated to the display surface of the liquid crystal display by clear adhesive. The clear adhesive has a permeability after hardening which is close to the permeability of the liquid crystal display and the transparent touch switch. Clear fillers are disposed in the clear adhesive to prevent warping of the transparent touch switch and the liquid crystal display.

20 Claims, 3 Drawing Sheets