



US008068204B2

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

(10) **Patent No.:** **US 8,068,204 B2**
(45) **Date of Patent:** ***Nov. 29, 2011**

(54) **ELECTRONIC APPARATUS WITH A FLEXIBLE PRINTED CIRCUIT AND A TRANSPARENT CONDUCTIVE LAYER**

(75) Inventors: **Yoshiharu Hirakata**, Kanagawa (JP);
Shunpei Yamazaki, Tokyo (JP)

(73) Assignee: **Semiconductor Energy Laboratory Co., Ltd.** (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.

This patent is subject to a terminal disclaimer.

(21) Appl. No.: **13/009,980**

(22) Filed: **Jan. 20, 2011**

(65) **Prior Publication Data**
US 2011/0109865 A1 May 12, 2011

Related U.S. Application Data

(63) Continuation of application No. 12/252,793, filed on Oct. 16, 2008, now Pat. No. 7,876,413, which is a continuation of application No. 11/837,588, filed on Aug. 13, 2007, now Pat. No. 7,440,068, which is a continuation of application No. 10/384,943, filed on Mar. 10, 2003, now Pat. No. 7,268,851, which is a continuation of application No. 09/865,081, filed on May 24, 2001, now Pat. No. 6,567,146, which is a continuation of application No. 09/481,278, filed on Jan. 11, 2000, now Pat. No. 6,239,854, which is a continuation of application No. 09/165,628, filed on Oct. 1, 1998, now Pat. No. 6,072,556.

(30) **Foreign Application Priority Data**

Oct. 6, 1997 (JP) 9-289160

(51) **Int. Cl.**
G02F 1/1345 (2006.01)
G02F 1/1339 (2006.01)
G02F 1/1343 (2006.01)
(52) **U.S. Cl.** **349/149**; 349/152; 349/153; 349/143
(58) **Field of Classification Search** 349/149, 349/152, 153, 143
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS
5,148,301 A 9/1992 Sawatsubashi et al.
5,179,460 A 1/1993 Hinata et al.
5,187,604 A 2/1993 Taniguchi et al.
(Continued)

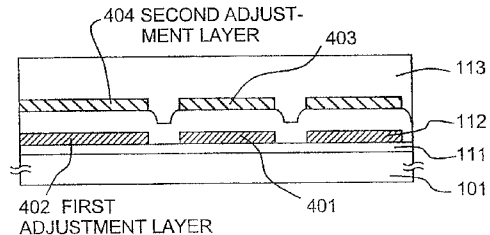
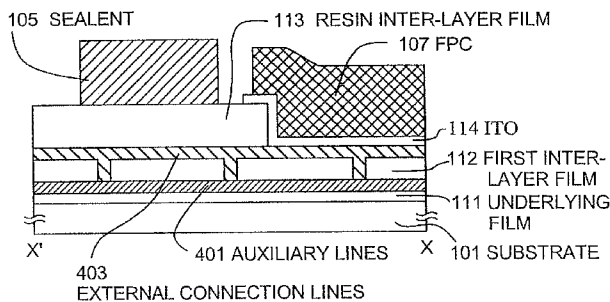
FOREIGN PATENT DOCUMENTS
JP 6-138487 5/1994
(Continued)

Primary Examiner — Mike Qi
(74) *Attorney, Agent, or Firm* — Husch Blackwell LLP

(57) **ABSTRACT**

A height difference under a sealant is reduced in a case where lines are present under the sealant. There is provided a substrate having an active matrix display circuit and peripheral driving circuits, a counter substrate having a counter electrode provided on the substrate in a face-to-face relationship therewith, a sealant provided between the substrate and the counter substrate such that it surrounds the active matrix display circuit and peripheral driving circuits, a liquid crystal material provided inside the sealant, a plurality of external connection lines provided on the substrate under the sealant with a resin inter-layer film interposed therebetween for electrically connecting the active matrix display circuit and peripheral driving circuits to circuits present outside the sealant and an adjustment layer provided in the same layer as the plurality of external connection lines.

83 Claims, 9 Drawing Sheets



U.S. PATENT DOCUMENTS

5,323,042 A 6/1994 Matsumoto
 5,396,356 A 3/1995 Fukuchi
 5,432,626 A 7/1995 Sasuga et al.
 5,483,082 A 1/1996 Takizawa et al.
 5,517,344 A 5/1996 Hu et al.
 5,572,046 A 11/1996 Takemura
 5,596,023 A 1/1997 Tsubota et al.
 5,598,283 A 1/1997 Fujii et al.
 5,619,358 A 4/1997 Tanaka et al.
 5,621,553 A 4/1997 Nishiguchi et al.
 5,636,329 A 6/1997 Sukegawa et al.
 5,684,547 A 11/1997 Park et al.
 5,684,555 A 11/1997 Shiba et al.
 5,706,069 A 1/1998 Hermens et al.
 5,745,208 A 4/1998 Grupp et al.
 5,770,349 A 6/1998 Suginoya et al.
 5,798,812 A 8/1998 Nishiki et al.
 5,835,177 A 11/1998 Dohjo et al.
 5,929,959 A 7/1999 Iida et al.
 5,936,693 A 8/1999 Yoshida et al.
 5,995,189 A 11/1999 Zhang
 6,011,607 A 1/2000 Yamazaki et al.
 6,037,005 A 3/2000 Moshrefzadeh et al.

6,055,034 A 4/2000 Zhang et al.
 6,072,556 A 6/2000 Hirakata et al.
 6,088,070 A 7/2000 Ohtani et al.
 6,115,097 A 9/2000 Yamazaki
 6,122,030 A 9/2000 Nagata et al.
 6,124,604 A 9/2000 Koyama et al.
 6,124,917 A 9/2000 Fujioka et al.
 6,163,356 A 12/2000 Song et al.
 6,198,517 B1 3/2001 Ohori et al.
 6,239,854 B1 5/2001 Hirakata et al.
 6,335,716 B1 1/2002 Yamazaki et al.
 6,567,146 B2 5/2003 Hirakata et al.
 6,630,687 B1 10/2003 Koyama et al.
 7,268,851 B2 9/2007 Hirakata et al.
 7,440,068 B2 10/2008 Hirakata et al.
 7,876,413 B2 * 1/2011 Hirakata et al. 349/149
 2004/0084675 A1 5/2004 Koyama et al.

FOREIGN PATENT DOCUMENTS

JP 6-138488 5/1994
 JP 6-250221 9/1994
 JP 9-160076 6/1997
 JP 10-198292 7/1998

* cited by examiner

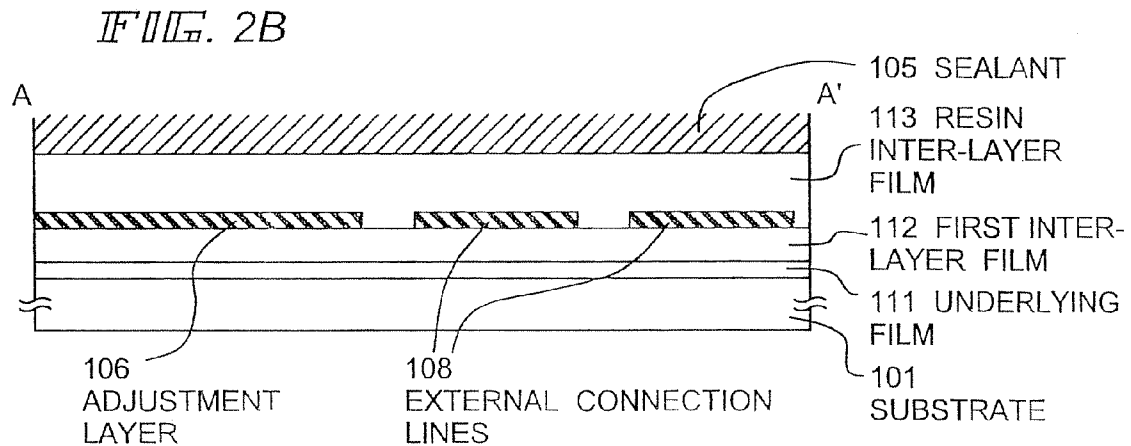
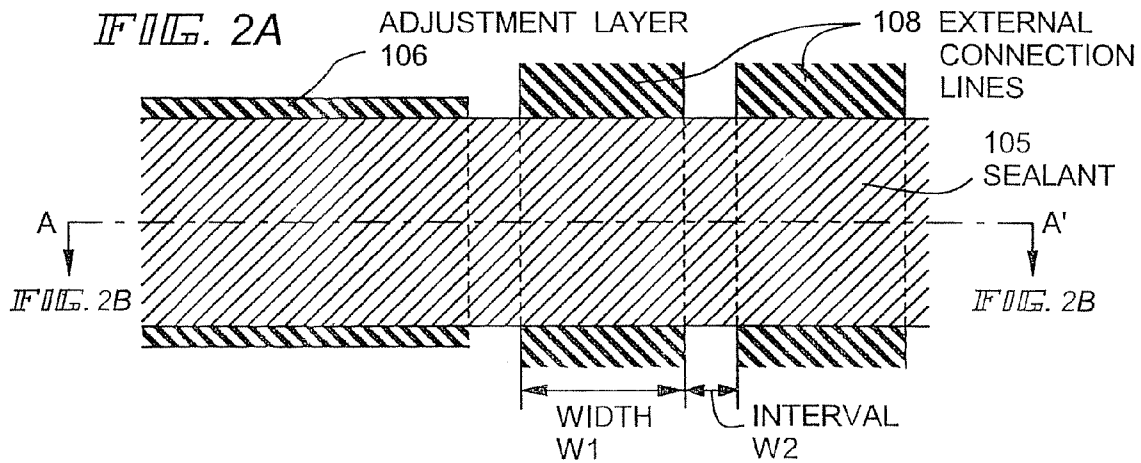
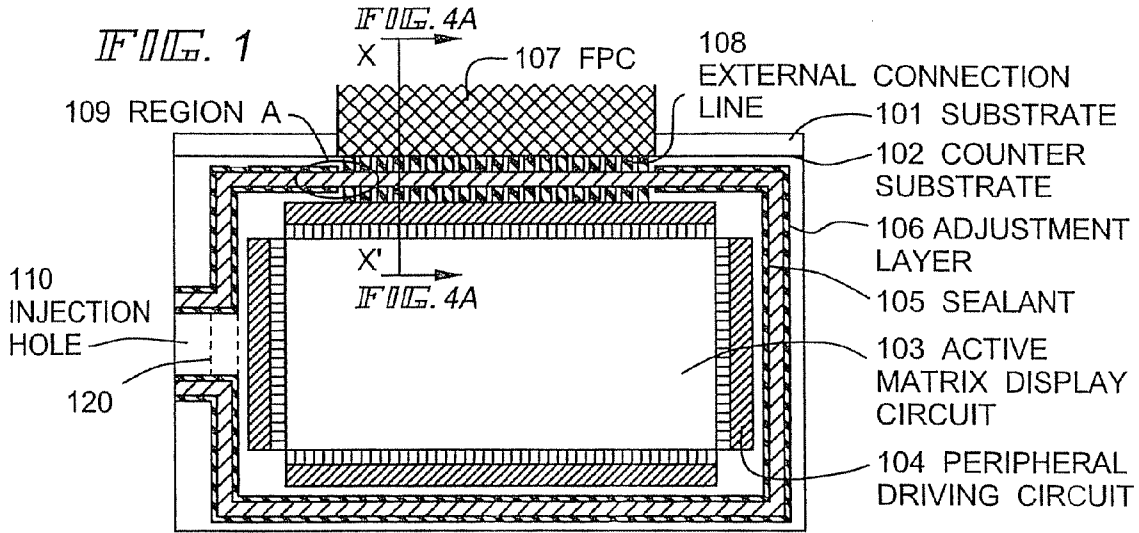


FIG. 3A

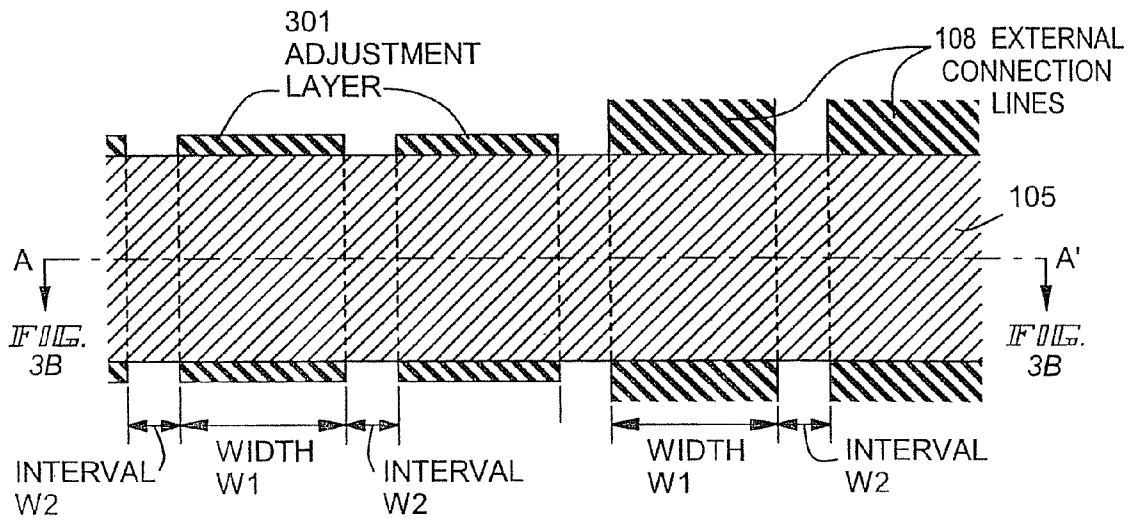
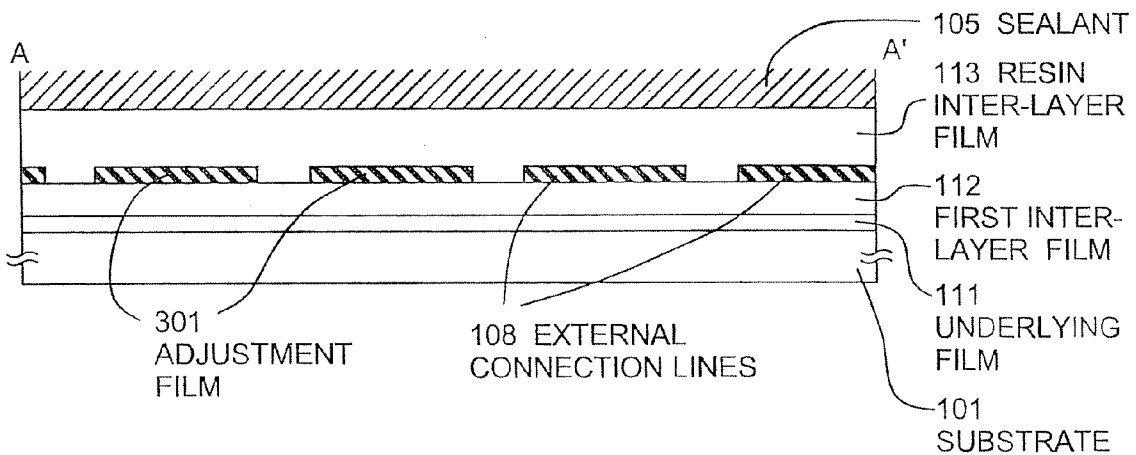
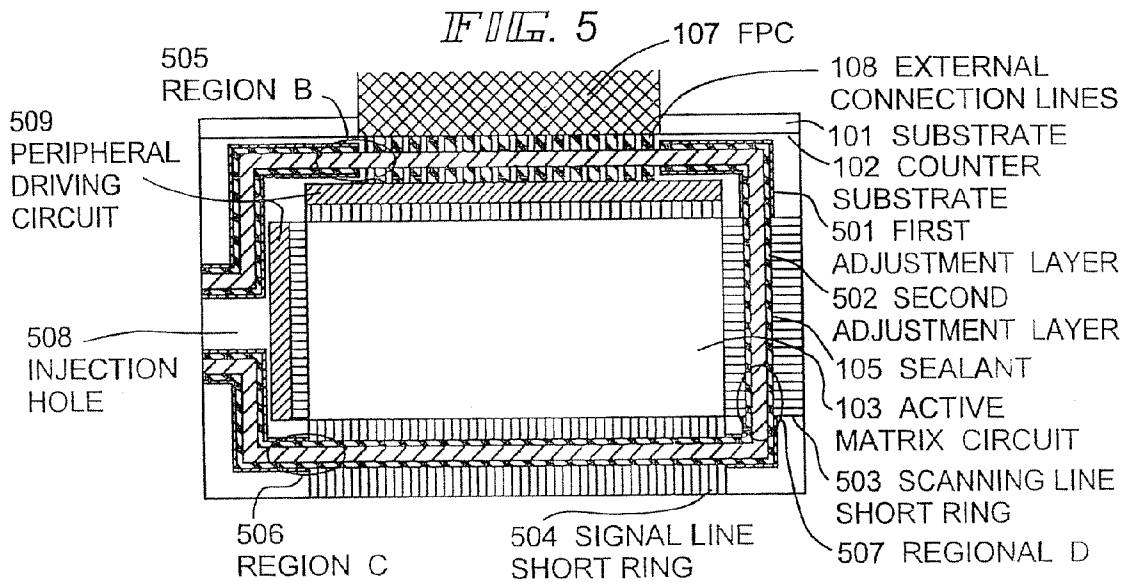
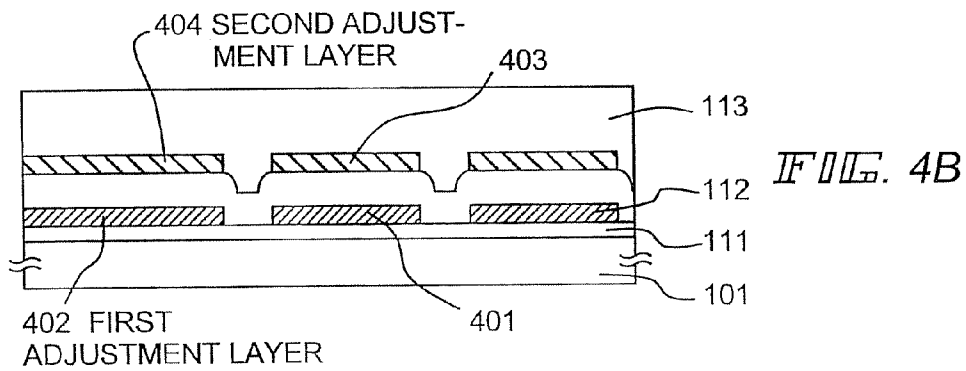
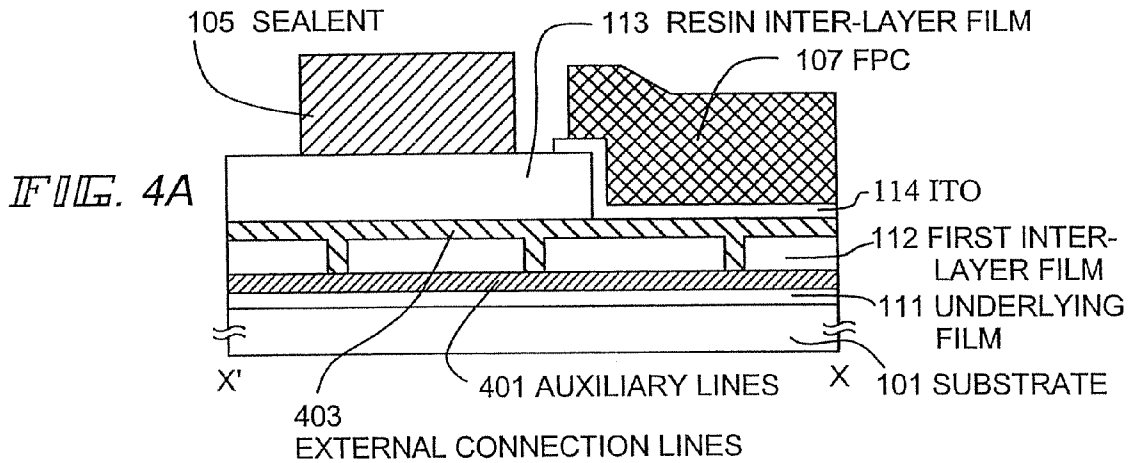


FIG. 3B





Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.