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(12) United States Patent

Yanagawa et al.

(54) LIQUID CRYSTAL DISPLAY DEVICE WITH SPACERS FORMED ON A PLANARIZING FILM DISPOSED OVER COLOR FILTERS

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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.
- (21) Appl. No.: 10/228,320
- (22) Filed: Aug. 27, 2002

(65) **Prior Publication Data**

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Related U.S. Application Data

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(30) Foreign Application Priority Data

- (51) Int. Cl.⁷ G02F 1/1343; G02F 1/1339
- (58) Field of Search 349/106, 139,
 - 349/156

(56) **References Cited**

(10) Patent No.:

(45) Date of Patent:

U.S. PATENT DOCUMENTS

| 5,949,511 | Α | * | 9/1999 | Park 349/139 | |
|-----------|------------|---|---------|-------------------------|--|
| 6,097,467 | Α | * | 8/2000 | Fujimaki et al 349/155 | |
| 6,211,937 | B1 | * | 4/2001 | Miyachi et al 349/156 | |
| 6,317,188 | B1 | * | 11/2001 | Shibahara 349/155 | |
| 6,411,360 | B 1 | * | 6/2002 | Matsuyama et al 349/156 | |

FOREIGN PATENT DOCUMENTS

| JP | 08076131 | 3/1996 |
|----|----------|--------|
| JP | 08114809 | 5/1996 |
| JP | 10048636 | 2/1998 |

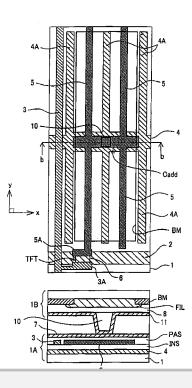
* cited by examiner

Primary Examiner—Huyen Ngo (74) Attorney, Agent, or Firm—Reed Smith LLP; Stanley P. Fisher, Esq.; Juan Carlos A. Marquez, Esq.

(57) ABSTRACT

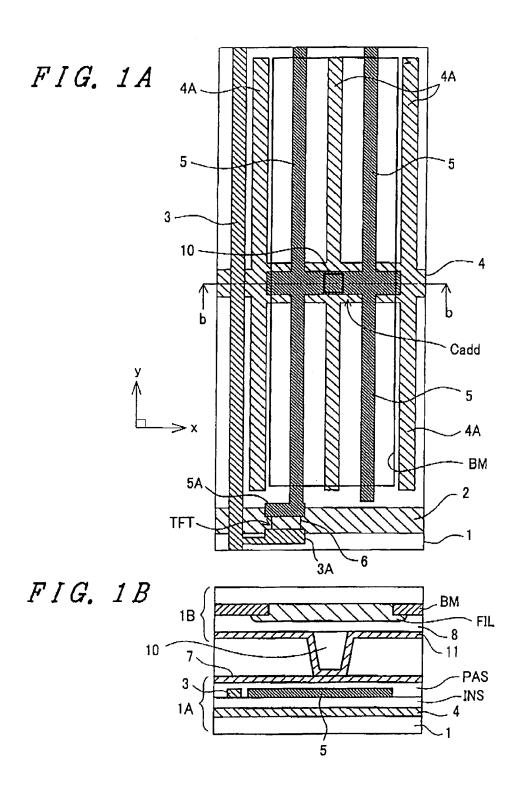
A liquid crystal display device includes a pair of opposing substrates, a liquid crystal layer sandwiched between the opposing substrates, plural scanning signal lines disposed on one of the opposing substrates, plural video signal lines intersecting the plural scanning signal lines and disposed on the one of the opposing substrates, plural pixels arranged in a matrix formed by the plural scanning signal lines and the plural video signal lines, plural spacers for establishing a spacing between the opposing substrates, color filters disposed on another of the opposing substrates, and a planarizing film disposed over the color filters.

5 Claims, 25 Drawing Sheets

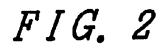


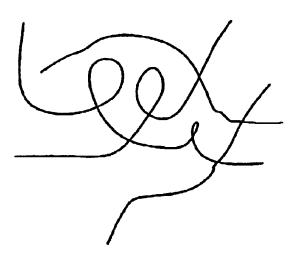
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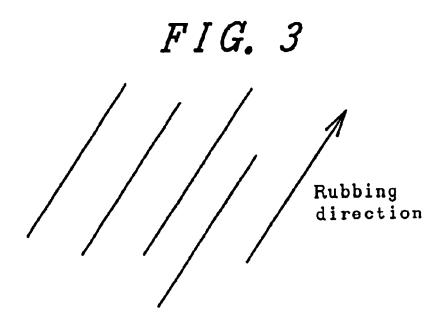
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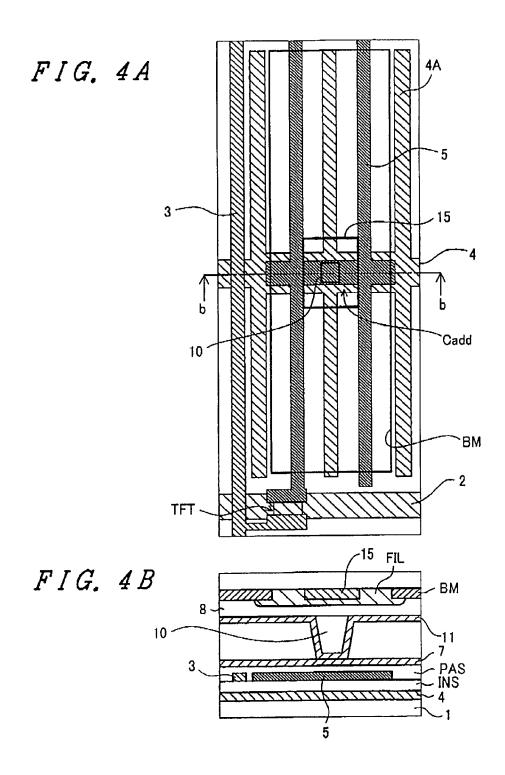
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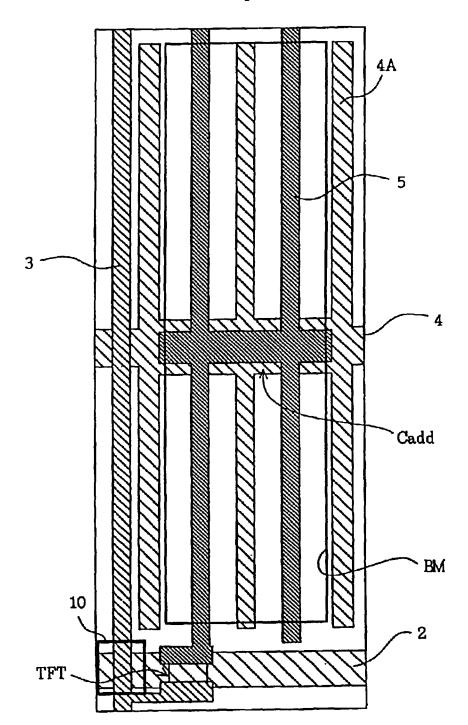


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FIG. 5



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