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United States Patent [19]
Watanabe et al.

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[45] **Date of Patent:** **Apr. 2, 1996**

[54] **LIQUID CRYSTAL DISPLAY APPARATUS WITH GAP ADJUSTING LAYERS LOCATED BETWEEN THE DISPLAY REGION AND DRIVER CIRCUITS**

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[73] Assignee: **Kabushiki Kaisha Toshiba**, Kawasaki, Japan

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[21] Appl. No.: **196,215**

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[22] PCT Filed: **Jul. 14, 1993**

IBM Technical Disclosure Bulletin, vol. 34, No. 4B, pp. 90-92, "Flat Cell Structure For Active Matrix LCD", Sep. 1991.

[86] PCT No.: **PCT/JP93/00975**

§ 371 Date: **Jul. 13, 1994**

§ 102(e) Date: **Jul. 13, 1994**

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PCT Pub. Date: **Mar. 2, 1994**

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Attorney, Agent, or Firm—Oblon, Spivak, McClelland, Maier & Neustadt

ABSTRACT

[30] **Foreign Application Priority Data**

Jul. 15, 1992 [JP] Japan 4-187908

[57] An object is to provide a liquid crystal display apparatus with an equal gap between two substrates so as to improve display image quality and display contrast. To accomplish this object, substrate gap adjusting region 33 or substrate gap adjusting layers 21, 22, 25, 27, 29, and 31 are formed so that the substrate gap in a region extending from a display region having pixel electrodes 7 to a driver circuit 11 is kept equal to the substrate gap in a region extending from the display region to a driver circuit 15. Thus, the gap between the two opposed substrates forming liquid crystal cells can be kept equal in any position.

[51] Int. Cl.⁶ **G02F 1/1343; G02F 1/1339**

[52] U.S. Cl. **359/59; 359/80; 359/81**

[58] Field of Search **359/81, 82, 83, 359/59, 80**

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8 Claims, 10 Drawing Sheets

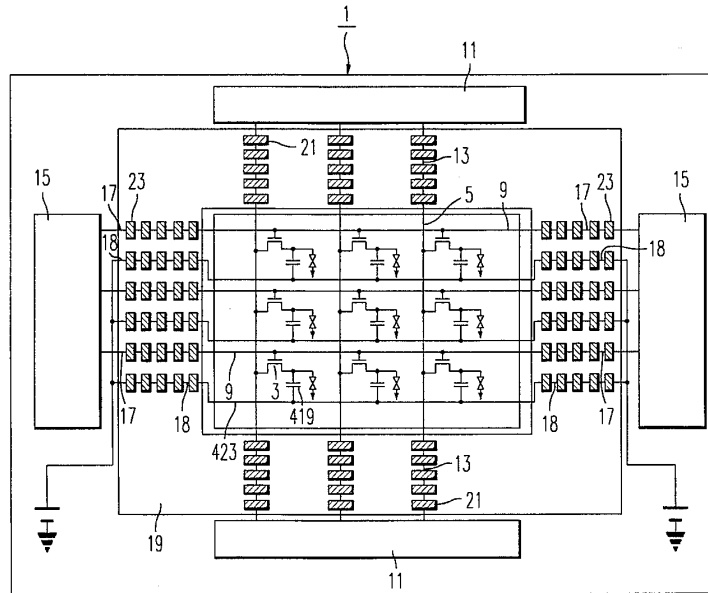
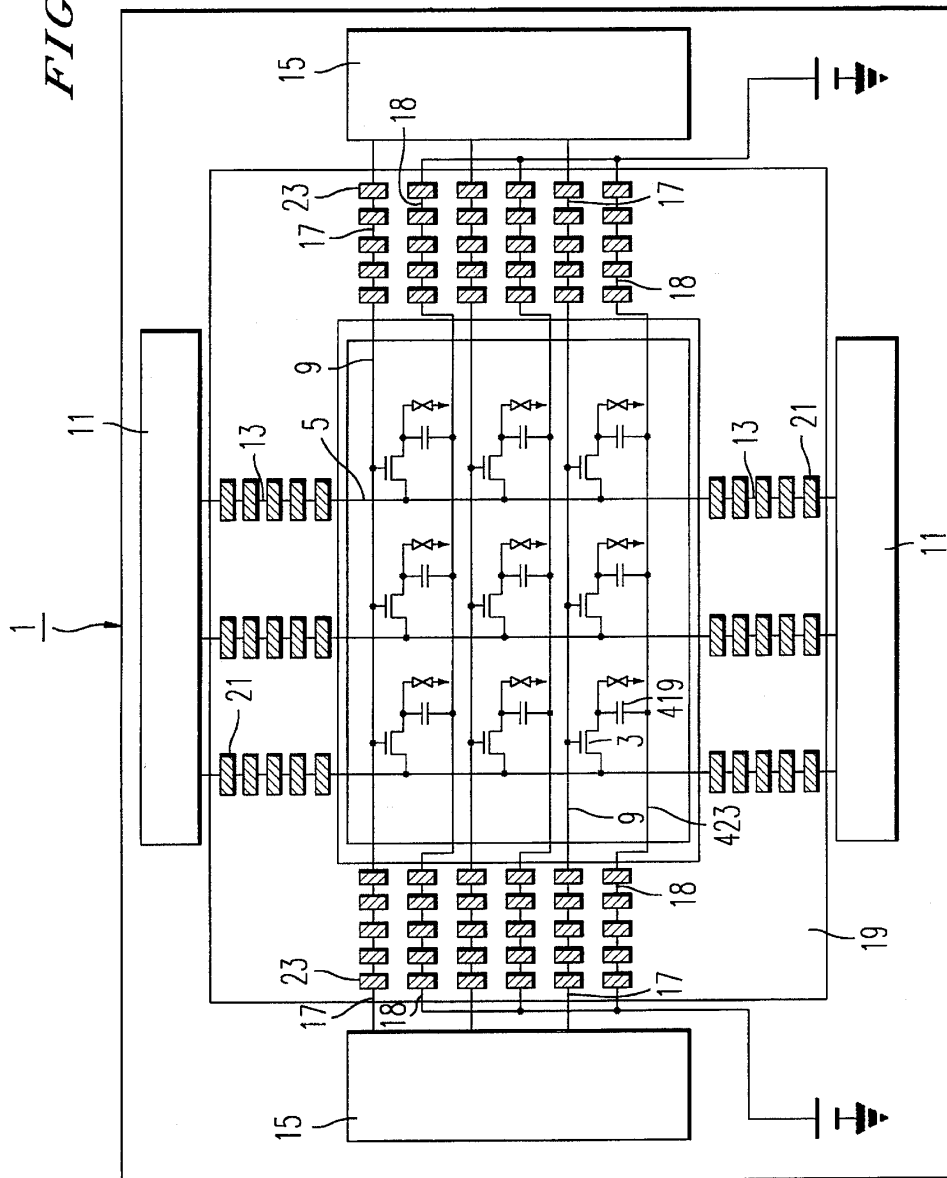


FIG. 1



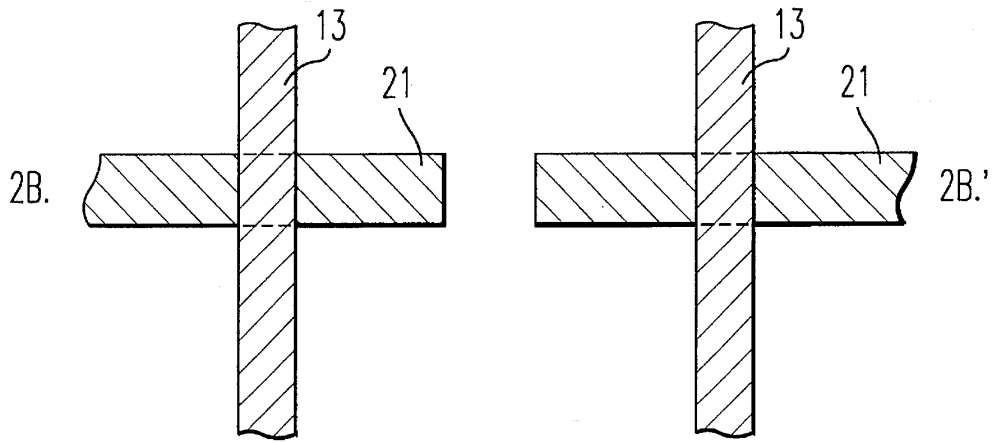


FIG. 2A

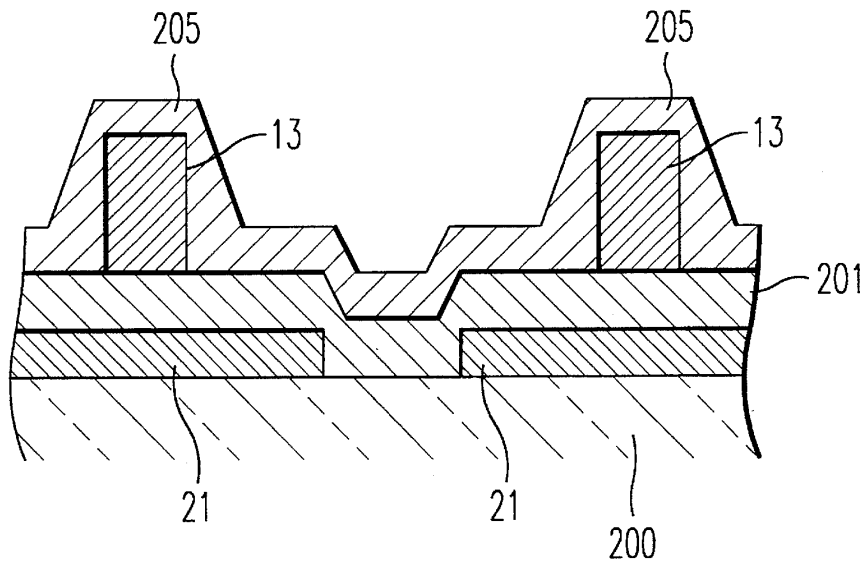
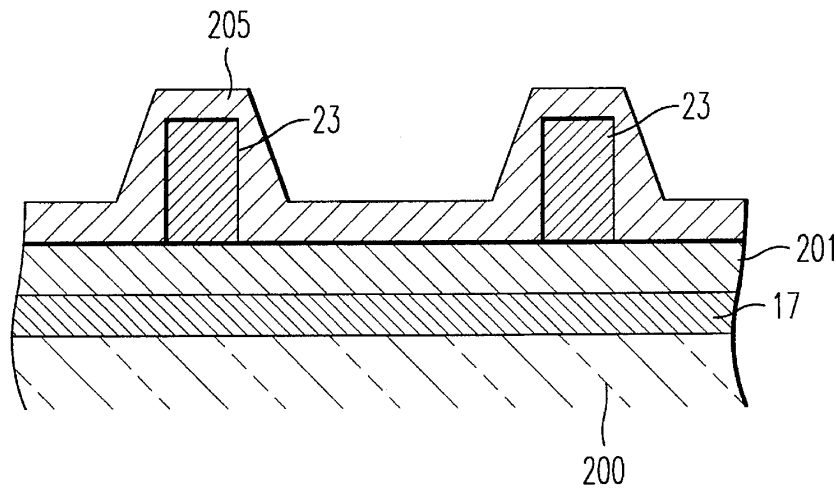
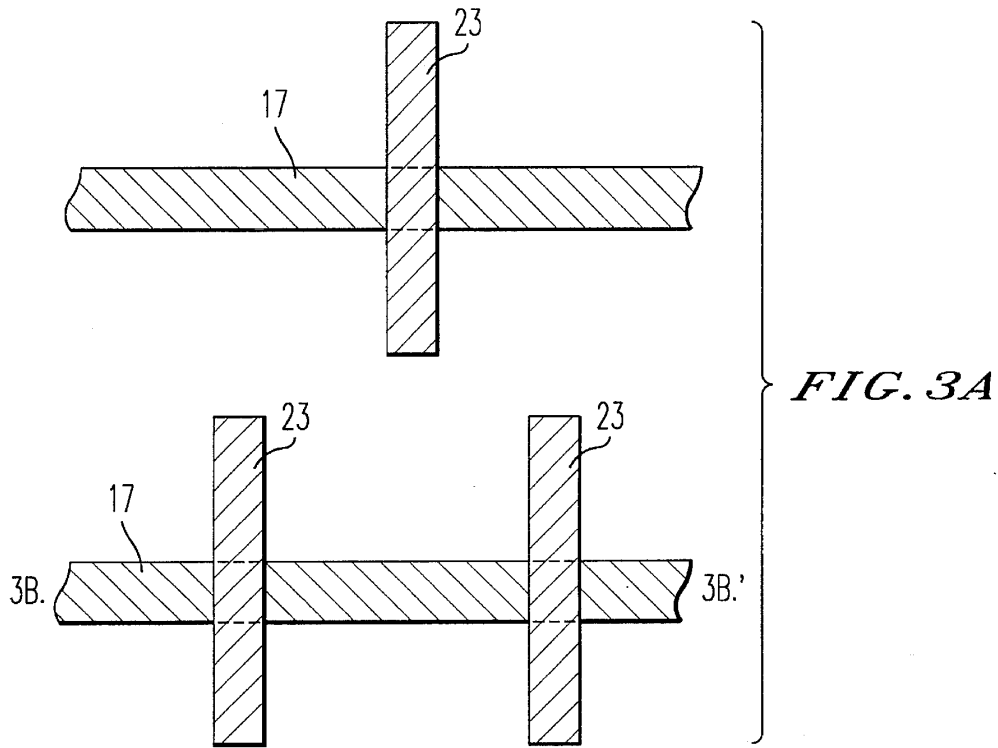


FIG. 2B



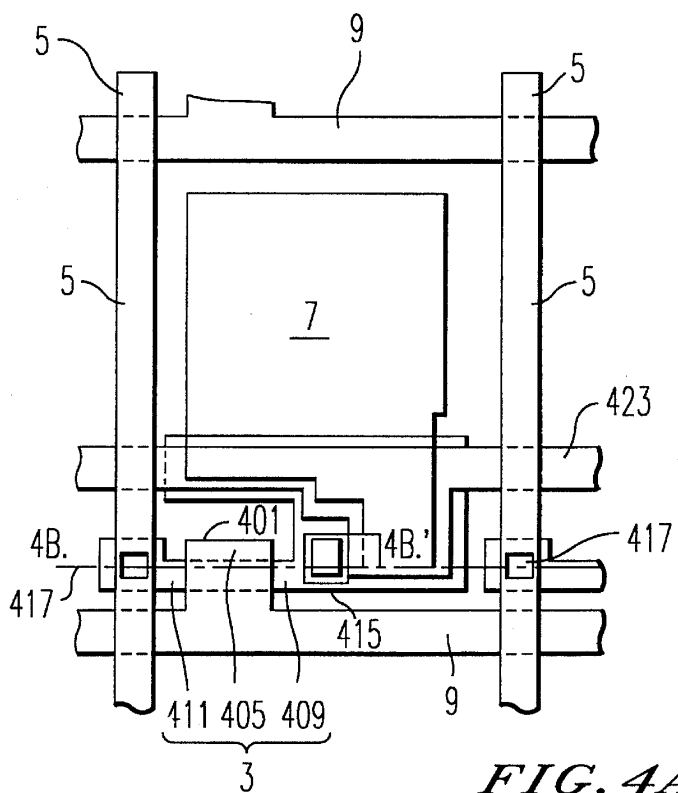


FIG. 4A

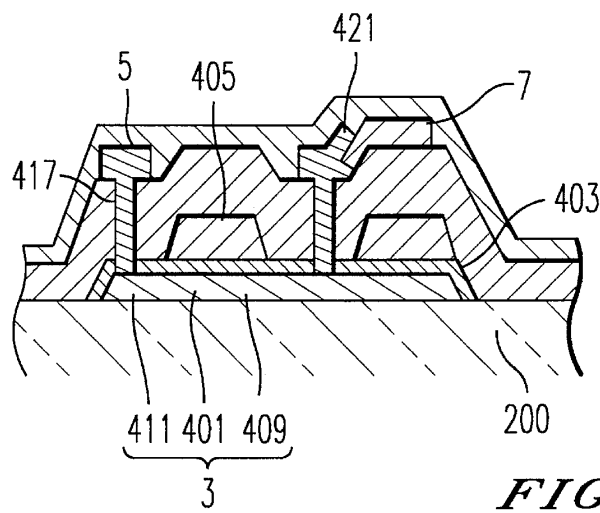


FIG. 4B

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