

EXHIBIT 12

US009201275B2

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

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(54) **LIQUID CRYSTAL DISPLAY DEVICE AND METHOD FOR FABRICATING THE SAME**

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(21) Appl. No.: **14/485,426**

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Related U.S. Application Data

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(51) **Int. Cl.**

G02F 1/1343 (2006.01)

G02F 1/139 (2006.01)

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(52) **U.S. Cl.**

CPC **G02F 1/134309** (2013.01); **G02F 1/139** (2013.01); **G02F 1/1337** (2013.01);

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(58) **Field of Classification Search**

CPC . G02F 1/133707; G02F 1/1337; G02F 1/139; G02F 2001/1393

See application file for complete search history.

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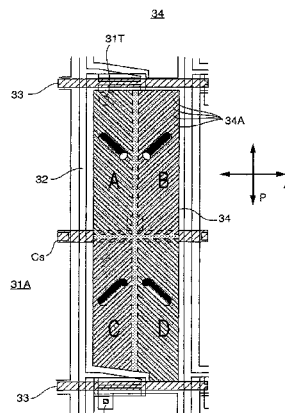
Primary Examiner — A. Sefer

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(57) **ABSTRACT**

A liquid crystal display device including first and second substrates, a liquid crystal layer, a pixel electrode, a counter electrode, a first molecule orientation film formed on the first substrate so as to cover the pixel electrode, and a second molecule orientation film formed on the second substrate so as to cover the counter electrode. The pixel electrode includes first micro-electrode patterns extending in a first direction, second micro-electrode patterns extending in a second direction, third micro-electrode patterns extending in a third direction and fourth micro-electrode patterns extending in a fourth direction, wherein the first, second, third and fourth directions are different from one another. When a driving voltage is applied between the pixel and counter electrodes, liquid crystal molecules that are located at the first, second, third and fourth micro-electrode patterns are tilted parallel to a corresponding one of the first, second, third and fourth directions, respectively, when viewed in a plan view.

14 Claims, 65 Drawing Sheets



US 9,201,275 B2

Page 2

Related U.S. Application Data

application No. 14/030,881, filed on Sep. 18, 2013, now Pat. No. 8,797,480, which is a division of application No. 13/613,836, filed on Sep. 13, 2012, now Pat. No. 8,570,477, which is a division of application No. 13/051,386, filed on Mar. 18, 2011, now Pat. No. 8,471,994, which is a division of application No. 12/268,722, filed on Nov. 11, 2008, now Pat. No. 7,952,675, which is a continuation of application No. 11/542,308, filed on Oct. 2, 2006, now Pat. No. 7,486,366, which is a division of application No. 09/903,010, filed on Jul. 11, 2001, now Pat. No. 7,145,622.

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(51) Int. Cl.

G02F 1/1337 (2006.01)**G02F 1/1335** (2006.01)**G02F 1/1362** (2006.01)

(52) U.S. Cl.

CPC **G02F1/1362** (2013.01); **G02F 1/1393**
(2013.01); **G02F 1/133528** (2013.01); **G02F**
1/133707 (2013.01)

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FIG. 1A
PRIOR ART

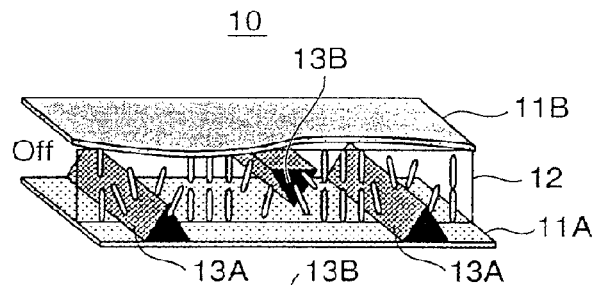


FIG. 1B
PRIOR ART

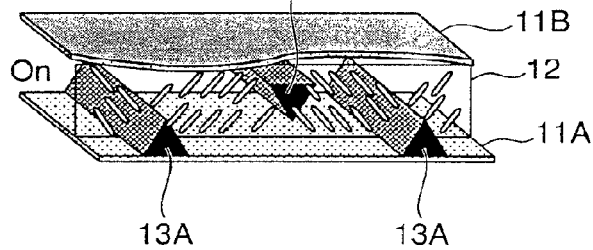
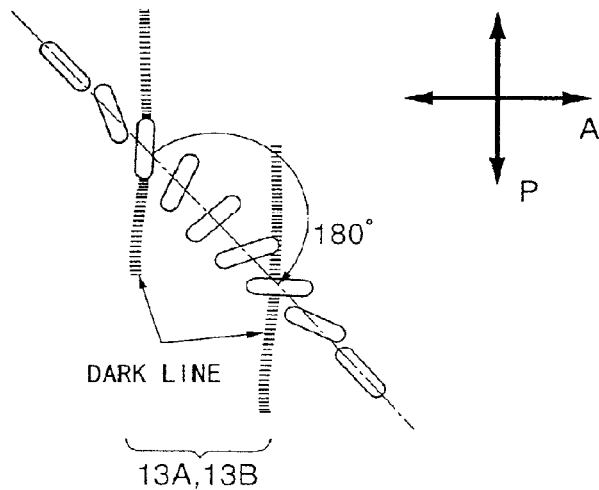
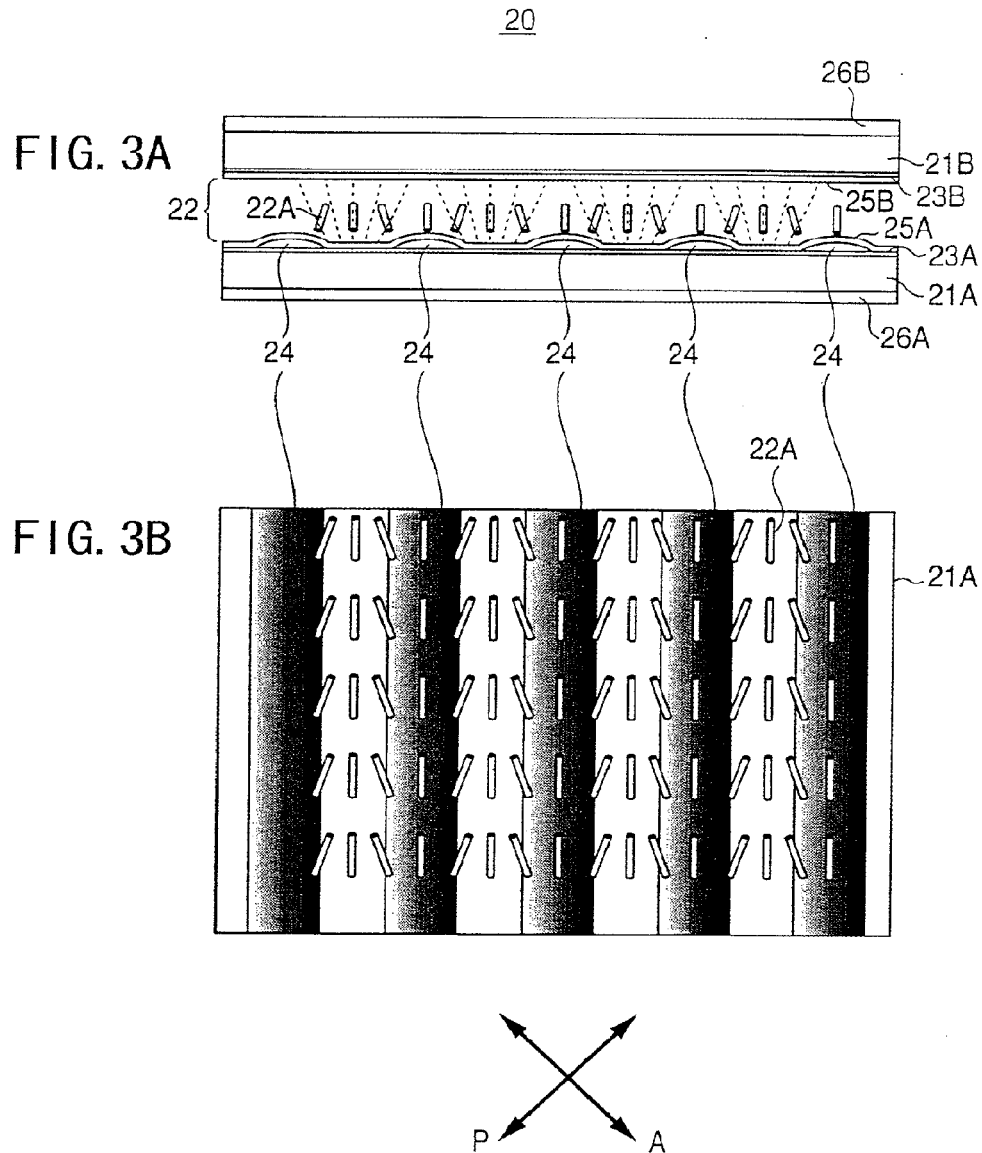


FIG. 2 PRIOR ART





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