

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

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

(Continued)

(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.

(56) **References Cited**

U.S. PATENT DOCUMENTS

4,834,509 A 5/1989 Gunjima et al.
 5,566,008 A 10/1996 Yoshida et al.

(Continued)

FOREIGN PATENT DOCUMENTS

EP 272585 6/1988
 EP 0 884 626 12/1998

(Continued)

OTHER PUBLICATIONS

Golden View Display Inc., webpage, http://www.goldenviewdisplay.com/lcd_explained.html, pp. 1-3, downloaded Mar. 7, 2013.

(Continued)

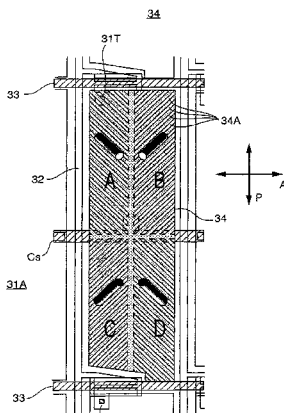
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(57) **ABSTRACT**

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



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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.

8,471,994	B2	6/2013	Kataoka et al.
8,570,477	B2	10/2013	Kataoka et al.
8,797,490	B2	8/2014	Kataoka et al.
2002/0159018	A1	10/2002	Kataoka et al.
2003/0071952	A1	4/2003	Yoshida et al.
2003/0202146	A1	10/2003	Takeda et al.
2004/0075798	A1	4/2004	Inoue et al.
2004/0080697	A1	4/2004	Song et al.
2004/0095538	A1	5/2004	Kim et al.
2005/0128397	A1	6/2005	Sasaki et al.
2005/0259209	A1	11/2005	Takeda et al.
2008/0192198	A1	8/2008	Na et al.
2009/0290111	A1	11/2009	Sasaki et al.
2013/0038828	A1	2/2013	Koma
2013/0162921	A1	6/2013	Kataoka et al.

(51) **Int. Cl.**

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

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

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(56)

References Cited

U.S. PATENT DOCUMENTS

5,691,791	A	11/1997	Nakamura et al.
5,959,763	A	9/1999	Bozler et al.
6,339,462	B1	1/2002	Kishimoto et al.
6,452,653	B1	9/2002	Yamanaka et al.
6,507,383	B1	1/2003	Abe et al.
6,671,019	B1	12/2003	Petschek et al.
6,690,441	B2	2/2004	Moriya
6,710,837	B1	3/2004	Song et al.
6,724,452	B1*	4/2004	Takeda et al. 349/139
7,130,012	B2	10/2006	Doi et al.
7,145,622	B2	12/2006	Kataoka et al.
7,486,366	B2	2/2009	Kataoka et al.
7,952,675	B2	5/2011	Kataoka et al.

FOREIGN PATENT DOCUMENTS

JP	61-011725	1/1986
JP	10-239669	9/1998
JP	11-109355	4/1999
JP	11-242225	9/1999
JP	11-352489	12/1999
JP	11-352491	12/1999
JP	11352490	12/1999
JP	2000-155317	6/2000
JP	2000-193976	7/2000

OTHER PUBLICATIONS

Liquid crystal display, Wikipedia, the free encyclopedia, webpage, http://en.wikipedia.org/wiki/Liquid_crystal_display, pp. 1-19, downloaded Mar. 7, 2013.

U.S. Appl. No. 09/903,010, filed Jul. 11, 2001.
 U.S. Appl. No. 10/665,177, filed Sep. 18, 2003.
 U.S. Appl. No. 11/542,308, filed Oct. 2, 2006.
 U.S. Appl. No. 12/268,722, filed Nov. 11, 2008.
 U.S. Appl. No. 13/051,386, filed Mar. 18, 2011.
 U.S. Appl. No. 13/613,836, filed Sep. 13, 2012.
 U.S. Appl. No. 14/030,881, filed Sep. 18, 2013.
 U.S. Appl. No. 14/171,470, filed Feb. 3, 2014.

* cited by examiner

FIG. 1A
PRIOR ART

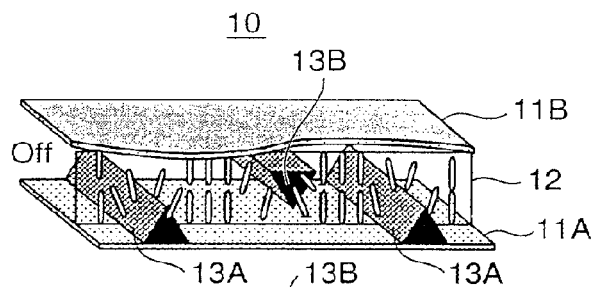


FIG. 1B
PRIOR ART

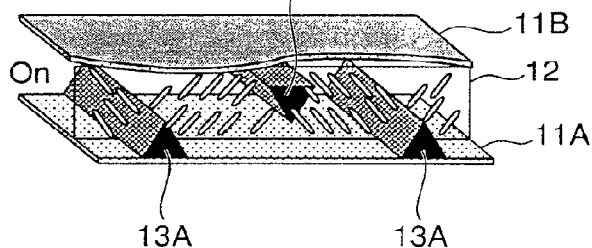
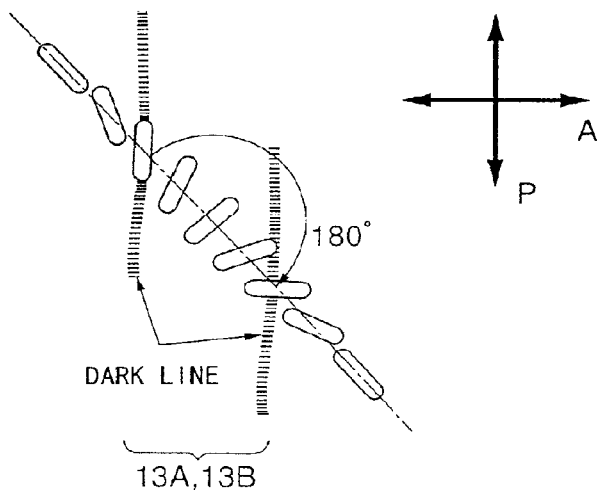
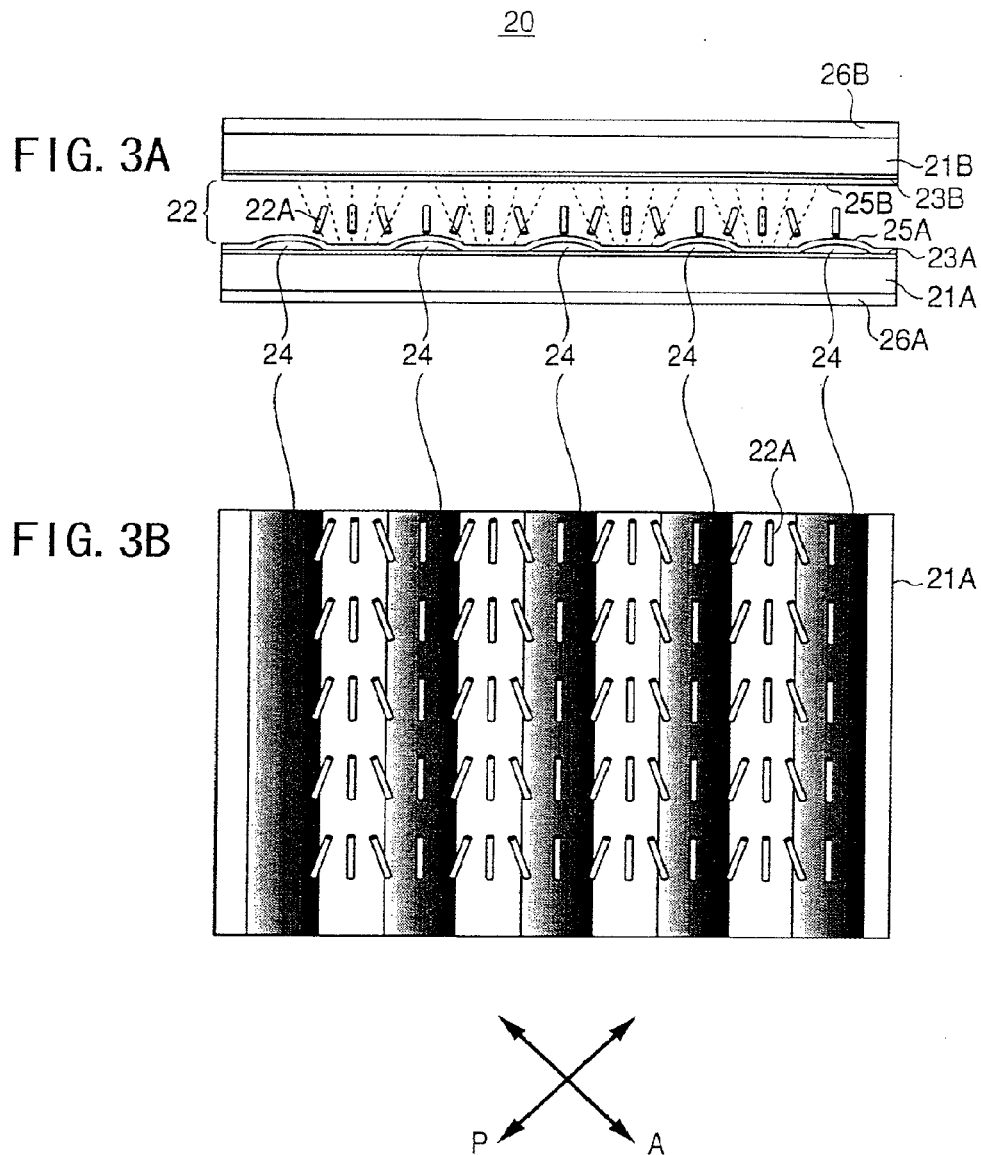


FIG. 2 PRIOR ART





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