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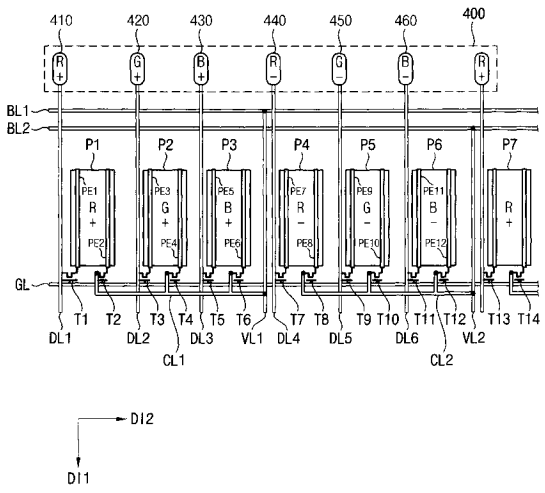
(54) Liquid crystal display device

(57) A liquid crystal display device includes a substrate, a gate line (GL), first and second data lines (DL1,DL2), a first power line (VL1), first, second, third and fourth switching elements (T1,T2,T3,T4), and first, second, third and fourth pixel electrodes (PE1,PE2,PE3,PE4). The first switching element (T1) is connected to the gate line (GL) and the first data line (DL1). The second switching element (T2) is connected to the gate line (GL) and the first power line (VL1). The third switching element (T3) is connected to the gate line (GL) and the second data line (DL2). The fourth switching element (T4) is connected to the gate line (GL) and the first power line (VL1). The first to fourth pixel electrodes (PE1,PE2,PE3,PE4) are connected to the first to fourth switching elements (T1,T2,T3,T4), respectively. Thus, a light leakage may be prevented and an aperture ratio of a display substrate may be enhanced.

FIG. 2



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EUROPEAN SEARCH REPORT

Application Number
EP 11 17 3209

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 2010/103085 A1 (LEE SUWOONG [KR] ET AL) 29 April 2010 (2010-04-29)	1,2	INV. G02F1/139 G02F1/1343 G02F1/1362 G09G3/36
A	* figures 13-20 * * paragraph [0075] - paragraph [0101] *	13-32	
A	US 2006/290863 A1 (HOESUP SOH [KR]) 28 December 2006 (2006-12-28) * paragraph [0054] - paragraph [0086]; figure 4a *	1,2, 13-32	
A	US 2009/262061 A1 (CHUNG TE-CHEN [CN] ET AL) 22 October 2009 (2009-10-22) * figures 3,4 * * paragraph [0025] - paragraph [0027] *	1,2, 13-32	

TECHNICAL FIELDS SEARCHED (IPC)

G02F
G09G

~~The present search report has been drawn up for all claims~~

Place of search	Date of completion of the search	Examiner
Munich	19 October 2011	Kentischer, Florian

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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Application Number
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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☒ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

1, 2, 13-32

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
EP 11 17 3209

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1, 2, 13-32

A liquid crystal display device, comprising: a substrate; a gate line disposed on the substrate; a first data line, a second data line and a first power line that are disposed on the substrate, insulated from the gate line and crossing the gate line; a first switching element connected to the gate line and the first data line; a second switching element connected to the gate line and the first power line; a third switching element connected to the gate line and the second data line; a fourth switching element connected to the gate line and the first power line; a first pixel electrode, a second pixel electrode, a third pixel electrode and a fourth pixel electrode that are respectively connected to the first switching element, the second switching element, the third switching element and the fourth switching element; and a first bus line disposed in parallel with the gate line and connected to the first power line.

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2. claims: 3-5, 8, 33-40, 51, 52

A liquid crystal display device, comprising: a substrate; a gate line disposed on the substrate; a first data line, a second data line and a first power line that are disposed on the substrate, insulated from the gate line and crossing the gate line; a first switching element connected to the gate line and the first data line; a second switching element connected to the gate line and the first power line; a third switching element connected to the gate line and the second data line; a fourth switching element connected to the gate line and the first power line; a first pixel electrode, a second pixel electrode, a third pixel electrode and a fourth pixel electrode that are respectively connected to the first switching element, the second switching element, the third switching element and the fourth switching element; a third data line, a fourth data line and a second power line that are insulated from the gate line and cross the gate line; a fifth switching element connected to the gate line and the third data line; a sixth switching element connected to the gate line and the second power line; a seventh switching element connected to the gate line and the fourth data line; an eighth switching element connected to the gate line and the second power line; and a fifth pixel electrode, a sixth pixel electrode, a seventh pixel electrode and an eighth pixel electrode that are connected to the fifth switching element, the sixth switching element, the seventh switching element and the eighth switching element, respectively.

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3. claims: 6, 7, 41-43, 46-50, 54, 55

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LACK OF UNITY OF INVENTION
SHEET B

Application Number
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A liquid crystal display device, comprising: a substrate; a gate line disposed on the substrate; a first data line, a second data line and a first power line that are disposed on the substrate, insulated from the gate line and crossing the gate line; a first switching element connected to the gate line and the first data line; a second switching element connected to the gate line and the first power line; a third switching element connected to the gate line and the second data line; a fourth switching element connected to the gate line and the first power line; a first pixel electrode, a second pixel electrode, a third pixel electrode and a fourth pixel electrode that are respectively connected to the first switching element, the second switching element, the third switching element and the fourth switching element; a first shield pattern connected to the first pixel electrode; and a second shield pattern connected to the second pixel electrode.

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4. claims: 9, 44

A liquid crystal display device, comprising: a substrate; a gate line disposed on the substrate; a first data line, a second data line and a first power line that are disposed on the substrate, insulated from the gate line and crossing the gate line; a first switching element connected to the gate line and the first data line; a second switching element connected to the gate line and the first power line; a third switching element connected to the gate line and the second data line; a fourth switching element connected to the gate line and the first power line; a first pixel electrode, a second pixel electrode, a third pixel electrode and a fourth pixel electrode that are respectively connected to the first switching element, the second switching element, the third switching element and the fourth switching element; a first connection line connected to the first power line, wherein the first connection line is disposed on a layer identical to the first pixel electrode, the second pixel electrode, the third pixel electrode and the fourth pixel electrode.

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5. claims: 10, 45

A liquid crystal display device, comprising: a substrate; a gate line disposed on the substrate; a first data line, a second data line and a first power line that are disposed on the substrate, insulated from the gate line and crossing the gate line; a first switching element connected to the gate line and the first data line; a second switching element connected to the gate line and the first power line; a third

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switching element connected to the gate line and the second data line; a fourth switching element connected to the gate line and the first power line; a first pixel electrode, a second pixel electrode, a third pixel electrode and a fourth pixel electrode that are respectively connected to the first switching element, the second switching element, the third switching element and the fourth switching element; a storage line positioned in parallel with the gate line to overlap with portions of the first pixel electrode, the second pixel electrode, the third pixel electrode and the fourth pixel electrode or to overlap with portions of the first, second, third and fourth switching elements to form first to fourth storage capacitors.

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6. claim: 11

A liquid crystal display device, comprising: a substrate; a gate line disposed on the substrate; a first data line, a second data line and a first power line that are disposed on the substrate, insulated from the gate line and crossing the gate line; a first switching element connected to the gate line and the first data line; a second switching element connected to the gate line and the first power line; a third switching element connected to the gate line and the second data line; a fourth switching element connected to the gate line and the first power line; a first pixel electrode, a second pixel electrode, a third pixel electrode and a fourth pixel electrode that are respectively connected to the first switching element, the second switching element, the third switching element and the fourth switching element; wherein the first pixel electrode and the second pixel electrode form a first pixel part comprising a first area and a second area, an interval between the first pixel electrode and the second pixel electrode in the first area being different from an interval between the first pixel electrode and the second pixel electrode in the second area.

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7. claim: 12

A liquid crystal display device, comprising: a substrate; a gate line disposed on the substrate; a first data line, a second data line and a first power line that are disposed on the substrate, insulated from the gate line and crossing the gate line; a first switching element connected to the gate line and the first data line; a second switching element connected to the gate line and the first power line; a third switching element connected to the gate line and the second data line; a fourth switching element connected to the gate line and the first power line; a first pixel electrode, a

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SHEET B

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

second pixel electrode, a third pixel electrode and a fourth pixel electrode that are respectively connected to the first switching element, the second switching element, the third switching element and the fourth switching element; wherein a polarity of a voltage applied to the first pixel electrode is different from a polarity of a voltage applied to the second pixel electrode with respect to a reference voltage.

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8. claim: 53

A liquid crystal display device, comprising: a substrate; a gate line disposed on the substrate; a first data line, a second data line and a first power line that are disposed on the substrate, insulated from the gate line and crossing the gate line; a first switching element connected to the gate line and the first data line; a second switching element connected to the gate line and the first power line; a third switching element connected to the gate line and the second data line; a fourth switching element connected to the gate line and the first power line; a first pixel electrode, a second pixel electrode, a third pixel electrode and a fourth pixel electrode that are respectively connected to the first switching element, the second switching element, the third switching element and the fourth switching element; wherein the first and second pixel electrodes form a first pixel part, and the third and fourth pixel electrodes form a second pixel part.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 17 3209

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19-10-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010103085 A1	29-04-2010	CN 101726893 A	09-06-2010
		KR 20100047059 A	07-05-2010
		US 2010103085 A1	29-04-2010
US 2006290863 A1	28-12-2006	CN 1885140 A	27-12-2006
		KR 20060135180 A	29-12-2006
		US 2006290863 A1	28-12-2006
US 2009262061 A1	22-10-2009	CN 101261414 A	10-09-2008
		US 2009262061 A1	22-10-2009

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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[标]申请(专利权)人(译)	三星电子株式会社		
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其他公开文献	EP2407823B1 EP2407823A2		
外部链接	Espacenet		

摘要(译)

液晶显示装置包括基板，栅极线（GL），第一和第二数据线（DL1，DL2），第一电源线（VL1），第一，第二，第三和第四开关元件（T1，T2，T3），T4），以及第一，第二，第三和第四像素电极（PE1，PE2，PE3，PE4）。第一开关元件（T1）连接到栅极线（GL）和第一数据线（DL1）。第二开关元件（T2）连接到栅极线（GL）和第一电源线（VL1）。第三开关元件（T3）连接到栅极线（GL）和第二数据线（DL2）。第四开关元件（T4）连接到栅极线（GL）和第一电源线（VL1）。第一至第四像素电极（PE1，PE2，PE3，PE4）分别连接到第一至第四开关元件（T1，T2，T3，T4）。因此，可以防止漏光并且可以增强显示基板的孔径比。

FIG. 2