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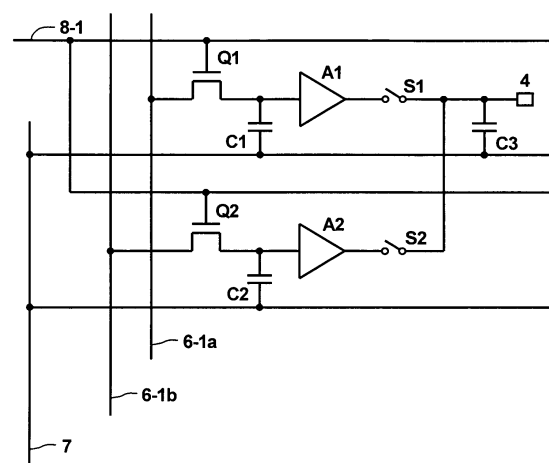
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(54) **Liquid crystal display apparatus, and driving circuit and driving method thereof**

(57) A liquid crystal display apparatus is composed of a plurality of pixels, a plurality of switches and a driver circuit for driving the plurality of switches. Each of the plurality of pixels is provided with a liquid crystal element in which a liquid crystal layer is sandwiched between a pixel driving electrode and a common electrode confronting with each other, a first sampling and holding circuit, a second sampling and holding circuit and a switching device. The switching device switches a positive image signal voltage and a negative image signal voltage, and supplies the positive and negative image signal voltages alternately to the pixel driving electrode.



**FIG. 1**

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**PARTIAL EUROPEAN SEARCH REPORT**

Application Number

under Rule 62a and/or 63 of the European Patent Convention.  
This report shall be considered, for the purposes of  
subsequent proceedings, as the European search report

EP 09 00 2045

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 6 278 426 B1 (AKIYAMA MASAHIKO [JP]) 21 August 2001 (2001-08-21)	1-3,15	INV. G09G3/36 G09G3/00
Y	* column 13, line 56 - column 14, line 13; figures 20,21,22 * * column 4, line 45 - column 14, line 54 *	4-9,16, 17	
X	US 6 456 267 B1 (SATO HIDEO [JP] ET AL) 24 September 2002 (2002-09-24)	1-3,15	
Y	* column 1 - column 13; figures 1-12,15-19 *	4-9,16, 17	
Y	US 6 331 844 B1 (OKUMURA HARUHIKO [JP] ET AL) 18 December 2001 (2001-12-18) * column 18, line 42 - line 67; figure 15 *	4,5,16	
Y	EP 1 622 259 A1 (MATSUSHITA ELECTRIC IND CO LTD [JP]) 1 February 2006 (2006-02-01) * paragraph [0052] - paragraph [0058]; figure 6 *	4,5,16	
Y	US 4 471 347 A (NAKAZAWA NOBUO [JP] ET AL) 11 September 1984 (1984-09-11) * column 1 - column 3; figures 1,2 * ----- -/--	8,9	TECHNICAL FIELDS SEARCHED (IPC)  G09G
<b>INCOMPLETE SEARCH</b>			
<p>The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.</p> <p>Claims searched completely :</p> <p>Claims searched incompletely :</p> <p>Claims not searched :</p> <p>Reason for the limitation of the search: see sheet C</p>			
Place of search <b>Munich</b>		Date of completion of the search <b>19 April 2011</b>	Examiner <b>Gartlan, Michael</b>
<b>CATEGORY OF CITED DOCUMENTS</b> 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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EPO FORM 1503 03.82 (P04E07)



## PARTIAL EUROPEAN SEARCH REPORT

Application Number  
EP 09 00 2045

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
Y	US 2006/050035 A1 (LEO HON-YUAN [TW] ET AL) 9 March 2006 (2006-03-09) * paragraph [0001] - paragraph [0029]; figures 2,4 * -----	6,7,17	
			TECHNICAL FIELDS SEARCHED (IPC)



**INCOMPLETE SEARCH  
SHEET C**

Application Number  
EP 09 00 2045

Claim(s) completely searchable:  
1-11, 15-19

Claim(s) not searched:  
12-14

Reason for the limitation of the search:

Rule 62a



Application Number

EP 09 00 2045

**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:

1-9, 15-17

☐ 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:

☐ 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).



# **LACK OF UNITY OF INVENTION** **SHEET B**

Application Number

EP 09 00 2045

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: 1-3, 15

a load element common to the first and second buffer amplifiers is connected between an output terminal of the switching means and a ground potential

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## 2. claims: 4, 5, 16

a control means for controlling a bias voltage to make a constant electric current load transistor to be intermittently active in synchronism with switching timing of the switching means at the prescribed period

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## 3. claims: 6, 7, 17

a common electrode voltage control means for changing a level of common electrode voltage applied to the common electrode to be within two different levels so as to make an absolute value of potential difference across the liquid crystal layer to be approximately the same value in synchronism with timing of switching the positive and negative image signal voltages to be applied to the pixel driving electrode.

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## 4. claims: 8, 9

a pixel inspection switching means for inspecting pixels connected between the pixel driving electrode and one data line of the pair of data lines; and a pixel inspection control means for reading out a pixel driving electrode voltage from the pixel driving electrode to the one data line through the pixel inspection switching means

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## 5. claims: 10, 11, 18, 19

timing control means for controlling a switching period of the positive and negative image signal voltages by the switching means and a level changing period of the common electrode voltage by the common electrode voltage control means to be N-times a horizontal scanning period that is a selection period of the plurality of gate lines, where N is an arbitrary natural number, and for controlling reference timing of starting vertical scanning to be operated in a prescribed phase relation at each frame

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 09 00 2045

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

19-04-2011

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专利名称(译)	液晶显示装置及其驱动电路和驱动方法		
公开(公告)号	<a href="#">EP2093751A3</a>	公开(公告)日	2011-06-01
申请号	EP2009002045	申请日	2009-02-13
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IPC分类号	G09G3/36 G09G3/00		
CPC分类号	G09G3/3677 G09G3/006 G09G3/3614 G09G3/3655 G09G3/3659 G09G3/3666 G09G3/3688 G09G2300/0814 G09G2300/0823 G09G2300/0833 G09G2300/0852 G09G2320/0233 G09G2320/0295 G09G2330/021		
代理机构(译)	MANITZ , FINSTERWALD & PARTNER GBR		
优先权	2008037180 2008-02-19 JP 2008329050 2008-12-25 JP		
其他公开文献	EP2093751A2 EP2093751B1		
外部链接	<a href="#">Espacenet</a>		

#### 摘要(译)

液晶显示装置由多个像素，多个开关和用于驱动多个开关的驱动电路组成。多个像素中的每一个都设置有液晶元件，其中液晶层夹在像素驱动电极和彼此面对的公共电极之间，第一采样和保持电路，第二采样和保持电路以及开关装置。切换装置切换正图像信号电压和负图像信号电压，并将正图像信号电压和负图像信号电压交替地提供给像素驱动电极。



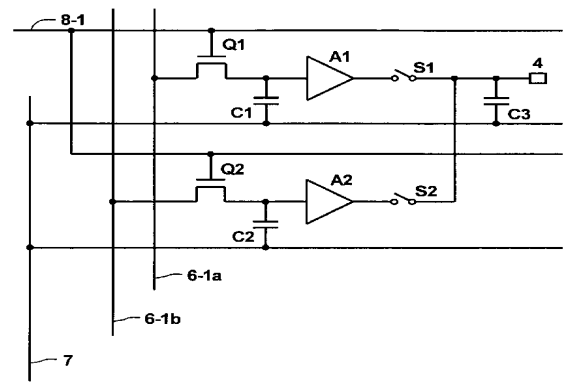


FIG. 1