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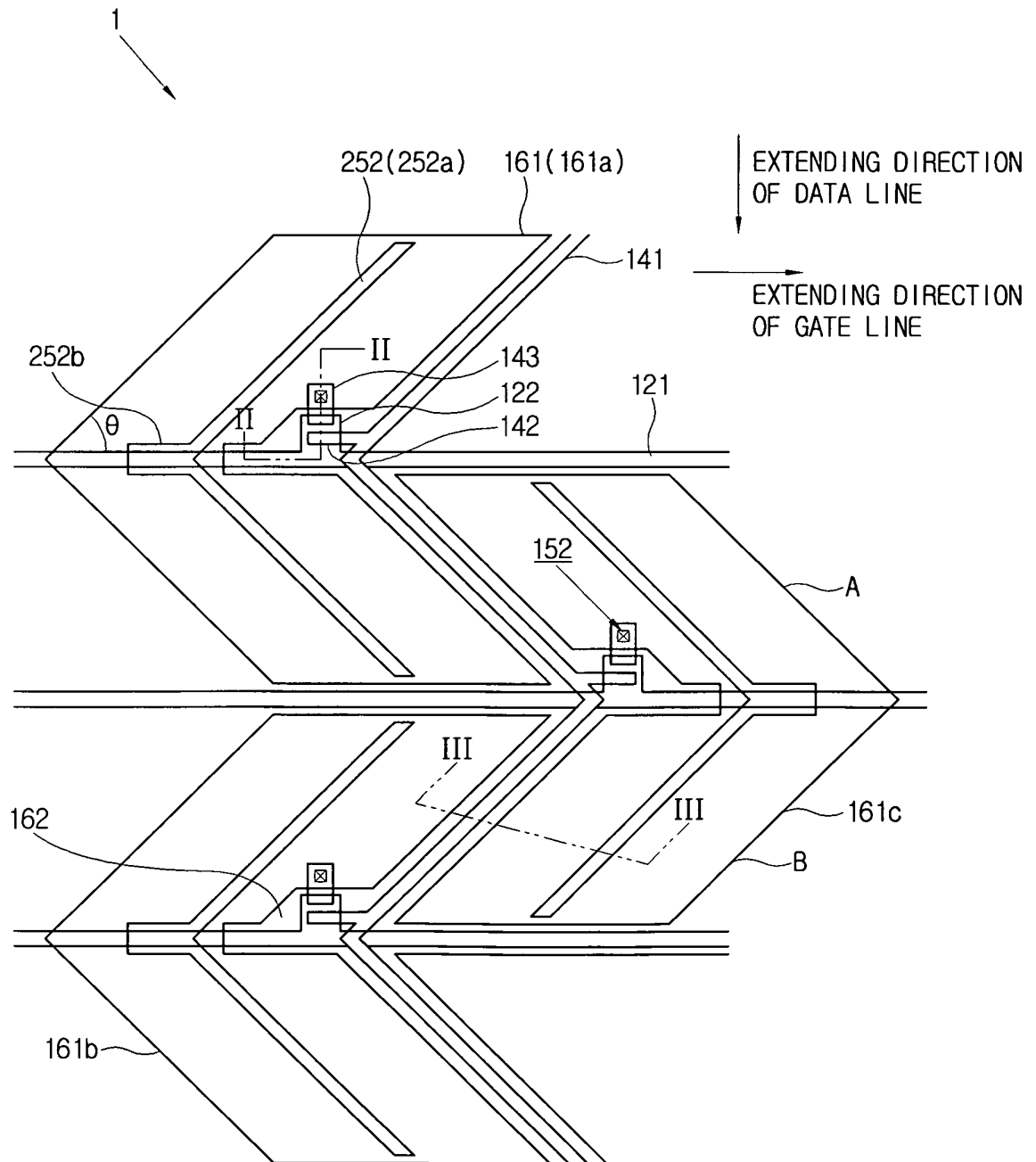
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(54) **Triangular arrangement of subpixels on both sides of a common data line in an active matrix LCD**

(57) A unit pixel (161) of a colour active matrix liquid crystal display (vertically aligned (VAL) type) consists of three individually switched subpixels (161a, 161b, 161c). The subpixels are arranged in a vertically staggered fashion on an insulating substrate at positions corresponding to the vertices of a triangle (delta arrangement): the first (161a) and second (161b) subpixels are arranged next to each other on one side of a data line (141) and form the base of the triangle. The base runs essentially parallel to the general course of the data line. The third subpixel (161c) lies on the other side of the data line at the apex of the triangle, the apex lying substantially over the midpoint of the base (i.e. over the gap between the first and second pixels). With this staggered arrangement the third subpixel is adjacent to portions of both the first and second subpixels. The first and second subpixels are respectively connected by a first and a second source electrode (142) to one side of the data line, while the third subpixel (161c) is connected to the other side of the same data line at a position substantially midway between the first and the second source electrodes. The subpixels are addressed by three individual gate lines (121) arranged parallel to each other and substantially orthogo-

nal to the general course of the data line. The gate line for the third subpixel runs in the gap between the first and second subpixels, while the common data line (141) runs in the gap between the third and the first and second subpixels. The resulting subpixel lay-out represents a kind of column multiplexing scheme. The subpixels may have a chevron shape, in which case the dataline has a zigzag form within the unit pixel to match the slanted edges of the subpixels. However, the general course of the data line is in a direction essentially orthogonal to that of the gate lines. Shift registers (123) are connected at one end of the gate lines (121) and allow the sequential driving of the subpixels in the unit pixel (driving order: first, third and second). In general, each subpixel corresponds to a region of a primary colour (RGB) in a colour filter arranged on the opposite substrate. The arrangement provides a liquid crystal display having a high aperture ratio and high light transmittance.
Keywords: staggered pixel, chevron pixel, sequential driving, column multiplexing, common data line, multiple scan line / gate line addressing, cutout.

FIG. 1





European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 07 01 1310

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 4 745 406 A (HAYASHI YUJI [JP] ET AL) 17 May 1988 (1988-05-17) * column 1, line 5 - line 7 *	1	INV. G09G3/36 G02F1/1343
Y	* figures 5,6,8 *	2-17	
Y	US 6 552 707 B1 (FUJIIYOSHI TATSUMI [JP]) 22 April 2003 (2003-04-22) * column 1, line 14 - line 21 *	2-6	ADD. G02F1/1333 G02F1/139 G02F1/1362
Y	US 2004/233343 A1 (BAEK SEUNG-SOO [KR]) 25 November 2004 (2004-11-25) * figures 1-4 * * paragraphs [0005], [0006], [0067] * * paragraphs [0080], [0081], [0088] * * paragraphs [0089], [0106], [0108] *	7-17	
X	US 6 172 729 B1 (IKEDA MUNEHIRO [JP]) 9 January 2001 (2001-01-09) * figure 1 * *Abstract*	1 14-17	
Y	EP 1 174 849 A (SONY CORP [JP]) 23 January 2002 (2002-01-23) * figures 1,3 *	13,16	TECHNICAL FIELDS SEARCHED (IPC) G09G G02F
Y	US 5 151 689 A (KABUTO NOBUAKI [JP] ET AL) 29 September 1992 (1992-09-29) * column 8, line 65 - column 9, line 37 * * column 11, line 57 - line 58 * * figure 11 *	2-17	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 February 2008	Examiner Thomas, Kenneth
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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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims 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 the first ten claims.

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:
- ☐ 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).



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: 1-13

An AMLCD having staggered subpixel electrodes in the data-line direction.

2. claims: 14-17

Chevron-shaped pixel electrodes in an LCD having staggered subpixel electrodes.

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

EP 07 01 1310

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
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21-02-2008

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 4745406	A	17-05-1988	DE 3582492 D1 EP 0194315 A1 WO 8601624 A1	16-05-1991 17-09-1986 13-03-1986
US 6552707	B1	22-04-2003	JP 3504496 B2 JP 11326869 A TW 512298 B	08-03-2004 26-11-1999 01-12-2002
US 2004233343	A1	25-11-2004	CN 1591152 A JP 2004348130 A	09-03-2005 09-12-2004
US 6172729	B1	09-01-2001	JP 3036512 B2 JP 11337971 A	24-04-2000 10-12-1999
EP 1174849	A	23-01-2002	CN 1338719 A JP 2002032051 A KR 20020014679 A US 2002033809 A1	06-03-2002 31-01-2002 25-02-2002 21-03-2002
US 5151689	A	29-09-1992	JP 2042420 A JP 2581796 B2	13-02-1990 12-02-1997

专利名称(译)	在有源矩阵LCD中的公共数据线两侧的子像素的三角排列		
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申请(专利权)人(译)	SAMSUNG ELECTRONICS CO., LTD.		
当前申请(专利权)人(译)	SAMSUNG ELECTRONICS CO., LTD.		
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IPC分类号	G09G3/36 G02F1/1343 G02F1/1333 G02F1/139 G02F1/1362		
CPC分类号	G02F1/134336 G02F1/133707 G02F1/136286 G02F1/1393 G02F2001/134318 G02F2201/52 G09G3/3648 G09G2300/0452 G09G2310/0297		
代理机构(译)	DR.威猛和合作伙伴		
优先权	1020060058293 2006-06-27 KR		
其他公开文献	EP1873748A2		
外部链接	Espacenet		

摘要(译)

彩色有源矩阵液晶显示器(垂直排列(VAL)型)的单位像素(161)由三个单独切换的子像素(161a, 161b, 161c)组成。子像素以垂直交错的方式布置在绝缘基板上与三角形的顶点对应的位置处(三角形排列):第一(161a)和第二(161b)子像素在数据的一侧彼此相邻地布置线(141)并形成三角形的底边。基本运行基本上与数据线的一般过程平行。第三子像素(161c)位于三角形顶点处的数据线的另一侧,该顶点基本上位于基座的中点上方(即,在第一和第二像素之间的间隙上)。利用这种交错排列,第三子像素与第一和第二子像素的部分相邻。第一和第二子像素分别通过第一和第二源电极(142)连接到数据线的一侧,而第三子像素(161c)连接到相同数据线的另一侧,位于基本中间的位置在第一和第二源电极之间。子像素由三个处理各个栅极线(121)彼此平行布置并且基本垂直于数据线的一般走向。第三子像素的栅极线在第一和第二子像素之间的间隙中延伸,而公共数据线(141)在第三和第一和第二子像素之间的间隙中延伸。得到的子像素布局表示一种列复用方案。子像素可以具有V形形状,在这种情况下,数据线在单位像素内具有Z字形形状以匹配子像素的倾斜边缘。然而,数据线的一般走向在与栅极线的方向基本正交的方向上。移位寄存器(123)连接在栅极线(121)的一端,并允许顺序驱动单位像素中的子像素(驱动顺序:第一,第三和第二)。通常,每个子像素对应于布置在相对基板上的滤色器中的原色(RGB)区域。该布置提供了具有高孔径比和高透光率的液晶显示器。关键词:交错像素,人字形像素,顺序驱动,列复用,公共数据线,多扫描线/栅极线寻址,切断。

FIG. 1

