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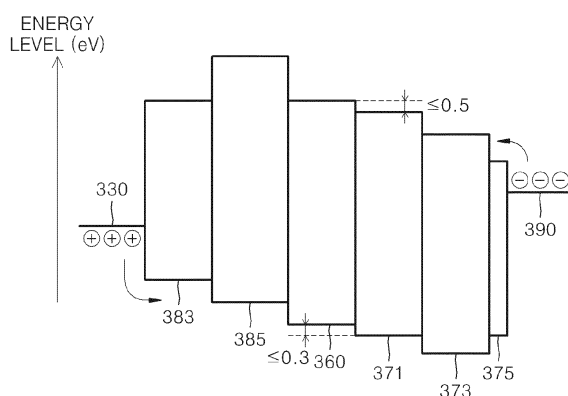
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(54) **Organic Light-Emitting Device Having Improved Efficiency Characteristics and Organic Light-Emitting Display Apparatus Including the Same**

(57) An organic light-emitting device including a first electrode, a second electrode opposite to the first electrode, a phosphorescent layer disposed between the first electrode and the second electrode, an electron transport layer disposed between the phosphorescent emission

layer and the second electrode, and an electron control layer disposed between the phosphorescent emission layer and the electron transport layer. An organic light-emitting display apparatus including the OLED is also disclosed.

FIG. 5





EUROPEAN SEARCH REPORT

Application Number
EP 12 19 7357

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 2009/191427 A1 (LIAO LIANG-SHENG [US] ET AL) 30 July 2009 (2009-07-30)	1-9,15,22	INV. H01L51/50
Y	* examples 6-13 *	20	H01L51/00
X	US 2007/252516 A1 (KONDAKOVA MARINA E [US] ET AL) 1 November 2007 (2007-11-01)	1-9,15,22	
Y	* examples 1-10 *	20	
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Y	* examples 1-4 *	20	
X	DE 10 2009 048791 A1 (MERCK PATENT GMBH [DE]) 14 April 2011 (2011-04-14)	1-3,5-9,13,15-17,22	
	* examples 10,11; table 1 *		
X	WO 2010/108579 A1 (MERCK PATENT GMBH [DE]; KAISER JOACHIM [DE]; HEIL HOLGER [DE]; STOESE) 30 September 2010 (2010-09-30)	1-3,5,6,15,21,22	
Y	* example 1 *	20	TECHNICAL FIELDS SEARCHED (IPC)
X	WO 2011/057706 A2 (MERCK PATENT GMBH [DE]; PARHAM AMIR HOSSAIN [DE]; PFLUMM CHRISTOF [DE]) 19 May 2011 (2011-05-19)	1-3,5,6,15-17,22	H01L
	* example V4 *		
Y	WO 2011/076323 A1 (MERCK PATENT GMBH [DE]; PAN JUNYOU [DE]; EBERLE THOMAS [DE]) 30 June 2011 (2011-06-30)	20	
	* example 1; compound HTM1 *		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 24 July 2013	Examiner Welter, Steve
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:

☐ 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 12 19 7357

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: 2-12(completely); 1, 22(partially)

Organic light-emitting device with a phosphorescent emission layer, an electron control layer and an electron transport layer (in this sequence) between a first and a second electrode, wherein the electron control layer comprises a compound of Formulae 1-3.

2. claims: 13, 14(completely); 1, 22(partially)

Organic light-emitting device with a phosphorescent emission layer, an electron control layer and an electron transport layer (in this sequence) between a first and a second electrode, wherein the emission layer comprises a bipolar host.

3. claims: 16-19(completely); 1, 22(partially)

Organic light-emitting device with a phosphorescent emission layer, an electron control layer and an electron transport layer (in this sequence) between a first and a second electrode, wherein the electron transporting layer comprises a compound of Formula 4.

4. claims: 20(completely); 1, 22(partially)

Organic light-emitting device with a phosphorescent emission layer, an electron control layer and an electron transport layer (in this sequence) between a first and a second electrode, further comprising a hole transporting layer comprising a compound of Formula 5.

5. claims: 21(completely); 1, 22(partially)

Organic light-emitting device with a phosphorescent emission layer, an electron control layer and an electron transport layer (in this sequence) between a first and a second electrode, further comprising a hole injection layer comprising a compound of Formula 6.

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

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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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24-07-2013

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

专利名称(译)	具有改进的效率特性的有机发光器件和包括该器件的有机发光显示器件		
公开(公告)号	EP2629346A3	公开(公告)日	2013-09-04
申请号	EP2012197357	申请日	2012-12-14
[标]申请(专利权)人(译)	三星显示有限公司		
申请(专利权)人(译)	三星DISPLAY CO. , LTD.		
当前申请(专利权)人(译)	三星DISPLAY CO. , LTD.		
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IPC分类号	H01L51/50 H01L51/00		
CPC分类号	H01L51/5016 H01L51/0058 H01L51/0059 H01L51/0061 H01L51/0067 H01L51/0072 H01L51/0073 H01L51/0085 H01L51/50 H01L51/5004 H01L51/5072 H01L51/5076 H01L51/5096 H01L2251/5384 H01L2251/552		
审查员(译)	韦尔特，史蒂夫		
优先权	1020120014825 2012-02-14 KR		
其他公开文献	EP2629346A2 EP2629346B1		
外部链接	Espacenet		

摘要(译)

一种有机发光装置，包括第一电极，与第一电极相对的第二电极，设置在第一电极和第二电极之间的磷光层，设置在磷光发光层和第二电极之间的电子传输层，以及电子控制层设置在磷光发光层和电子传输层之间。还公开了包括OLED的有机发光显示装置。

FIG. 5

