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- (71) Applicant (for all designated States except US): EASTMAN KODAK COMPANY [US/US]; 343 State Street, Rochester, New York 14650-2201 (US).
- (72) Inventor; and
- (75) Inventor/Applicant (for US only): COK, Ronald, Steven [US/US]; 36 Westfield Commons, Rochester, New York 14625 (US).
- (74) Common Representative: EASTMAN KODAK COMPANY; 343 State Street, Rochester, New York 14650-2201 (US).

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(54) Title: LED DEVICE HAVING IMPROVED LIGHT OUTPUT

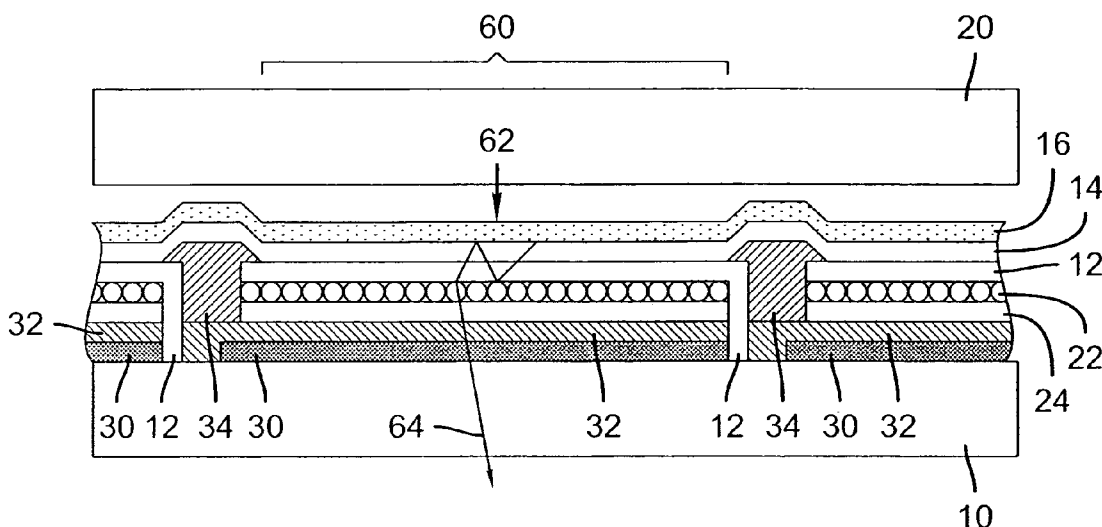


FIG. 1

(57) Abstract: An light-emitting diode (LED) device, comprising: a transparent substrate; a transparent thin-film transistor located over the substrate; a light-emitting element formed over the transparent thin-film transistor, wherein the light-emitting element comprises a first transparent extensive electrode formed at least partially over a portion of the transparent thin-film transistor, a layer of light-emitting material, and a second reflective electrode formed over the layer of light-emitting material; a low-index layer formed between the first transparent extensive electrode and the thin-film transistor; and a light-scattering layer formed between the low-index layer and the second reflective electrode, or formed as part of the second reflective electrode.

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A. CLASSIFICATION OF SUBJECT MATTER INV. H01L27/32 ADD. H01L51/52 H01L51/50 H01L21/77		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) H01L H05B		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2004/155846 A1 (HOFFMAN RANDY [US] ET AL) 12 August 2004 (2004-08-12) paragraphs [0028], [0044]; figures 1,2	1-3, 5-15, 19, 20
Y	US 2006/186802 A1 (COK RONALD S [US] ET AL) 24 August 2006 (2006-08-24) paragraphs [0038], [0039], [0057]; figure 5	1-3, 5-15, 19, 20
Y	WO 2004/081141 A (PHILIPS INTELLECTUAL PROPERTY [DE]; KONINKL PHILIPS ELECTRONICS NV [NL]) 23 September 2004 (2004-09-23) page 3, line 1 - page 4, line 34 page 5, line 29 - page 6, line 3 claims ----- -/--	8-11, 20
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents:		
A document defining the general state of the art which is not considered to be of particular relevance *E* earlier document but published on or after the international filing date *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) *O* document referring to an oral disclosure, use, exhibition or other means *P* document published prior to the international filing date but later than the priority date claimed		*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. *&* document member of the same patent family
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016		Authorized officer De Laere, Ann

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2006/098540 A (SAMSUNG ELECTRONICS CO LTD [KR]; CHO KYUNG SANG [KR]; CHOI BYOUNG LYON) 21 September 2006 (2006-09-21) paragraphs [0001] - [0029] -----	8, 9, 20
P, L, X P, L, Y	US 2008/012471 A1 (COK RONALD S [US]) 17 January 2008 (2008-01-17) the whole document -----	1-7, 12-17, 19 8-11, 20

INTERNATIONAL SEARCH REPORT

International application No.
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Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers allsearchable claims.
2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-17, 19-20

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-17,19-20

A LED device comprising at least one transparent TFT on a transparent substrate, and at least one light-emitting element formed over the transparent TFT; the LED device further comprising a low-index layer and a scattering layer; and a method of making such a LED device.

2. claim: 18

A LED device comprising at least one transparent TFT on a transparent substrate, and at least one light-emitting element formed over the transparent TFT; the light-emitting element comprising at least one light-emitting layer comprising randomly-located quantum dots.

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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