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PATENT AND TRADEMARK OFFICE**

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Patent Public Advisory Committee  
Quarterly Meeting

**A Day in the Life of a Patent  
Examiner: Searching**

Jessica Manno

Supervisory Patent Examiner AU 2828

May 3, 2018

UNITED STATES  
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# How does an application get to an Examiner?

- Patent applications are given a classification based on the subject matter of the application and assigned to the proper Technology Center based on this classification.
- Each Technology Center is an organization with various art units within a broad area of mechanical, electrical, chemical or design. Each is managed by one or more directors.

**1600 – Biotechnology and Organic Chemistry**

**1700 – Chemical and Materials Engineering**

**2100 – Computer Architecture and Software**

**2400 – Network, Multiplexing, Cable, Security**

**2600 – Communications**

**2800 – Semiconductors/Memory, Optics/Photocopying, Electrical Circuits & Systems and Printing/Measuring & Testing**

**2900 – Design**

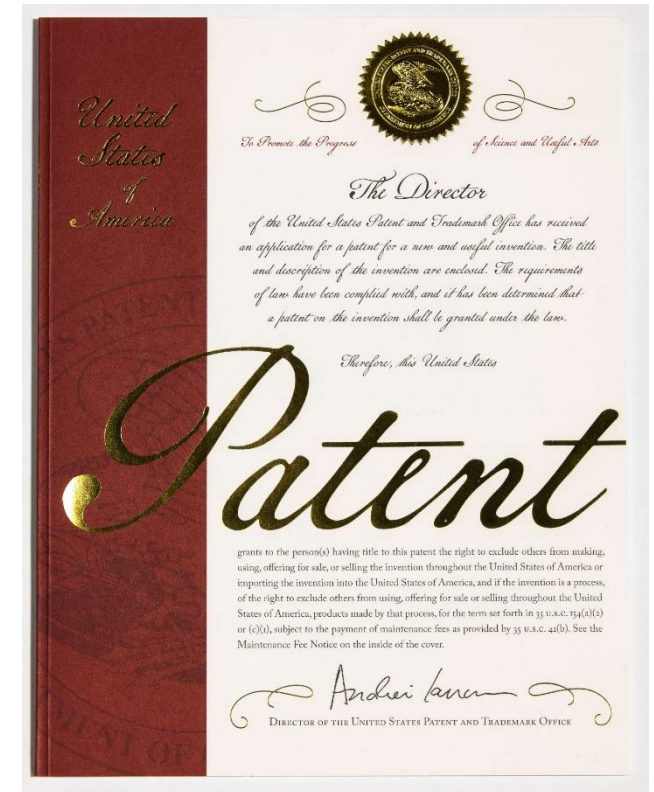
**3600 – Transportation, Construction, Agriculture, Electronic Commerce and National Security**

**3700 – Mechanical Engineering, Manufacturing and Medical Devices/Processes**

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# What does an Examiner do with the application?

- Reads and understands the invention
- Determines whether the application is adequate to define the boundaries of the claimed invention
- Determines the scope of the claims
- Searches existing technology for claimed invention
- Determines patentability of claimed invention
- Provides a response, called an Office Action, that notifies applicant of the examiner's patentability determination



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# What electronic tools does an examiner use?

- **Docket and Application Viewer (DAV)**
  - View docket and applications
- **Search Tools (EAST/WEST, other electronic databases)**
  - Search for relevant prior art
- **Office Action Correspondence Subsystem (OACS)/Official Correspondence (OC)**
  - Write up outgoing correspondence to be sent to applicants/applicant's representatives

# How are search strategies developed?

- **Claim interpretation**
  - Read and understand the claimed invention
  - Determine the scope of the claimed invention
- **Consultation with other examiners**
- **Review of the cited prior art**
  - Information disclosure statements, 3<sup>rd</sup> party submissions
- **Review of patent family documents (foreign or domestic)**

# Why do Examiners search?

- Facilitate claim interpretation
- Determine the state of the art
- Identify relevant prior art
- Determine patentability

# Where do Examiners search?

- US and International Patent Literature databases
- Electronic Searching (e.g., publications, web sites)
- Anywhere they might find the information they need with evidence of the date of publication or availability



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# Demonstration: USPTO Search Tools

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Primary Patent Examiner AU 2819

May 3, 2018

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# Docket and Application Viewer (DAV)

The screenshot displays two panels of the Docket and Application Viewer (DAV) interface. The top panel shows a summary of application counts: Active (107), Amended (9), Special New (0), Special Amended (0), Returned (1), and Expedited (2). Below this, a table lists three applications:

Thumbnail	#	Title	App. #	AIA(FITF)
	1	Immunoglobulin aggregate removal	13/651,188	No
	2	OVERLOAD AND ELUTE CHROMATOGRAPHY	14/355,818	No
	3	ANTIBODY PRODUCTION METHODS	14/380,128	No

The bottom panel shows a summary of application counts: New (107), Amended (9), Special New (0), Special Amended (0), Returned (1), Expedited (2), and Paused (1). Below this, a table lists ten applications:

#	Title	APP. #	AIA(FITF)	Filing Date
1	PRI TO	14/		
2	HIGH-AFFINITY ANTIBODY AND METHOD FOR MANUFACTURING THE SAME	14/408,458	Yes	12/16/2014
3	Diagnostics and Therapeutics for Macular Degeneration-Related Disorders	12/889,311	No	09/23/2010
4	METHOD OF PURIFICATION OF ANTI-C-MET ANTIBODY	14/595,027	Yes	01/12/2015
5	Methods of Purifying Antibodies	13/655,955	No	10/19/2011
6	METHOD OF TREATING CANCER	14/605,729	No	01/26/2015
7	METHOD FOR PREPARING A CONCENTRATE OF POLYVALENT IMMUNOGLOBULIN	14/131,944	No	01/10/2014
8	METHODS FOR PURIFICATION OF ANTIBODIES USING ALIPHATIC ALCOHOLS	14/423,802	No	02/25/2015
9	PURIFICATION OF HETERO-DIMERIC IMMUNOGLOBULINS	14/431,207	No	03/25/2015
10	CATION EXCHANGE CHROMATOGRAPHY CARRIER FOR REFINING OF ANTIBODIES, AND METHOD FOR SEPARATION OF ANTIBODY MONOMERS FROM POLYMERS THEREOF PRODUCED IN ANTIBODY DRUG MANUFACTURING PROCESS	14/435,456	No	04/14/2015

oto

# Docket and Application Viewer (DAV)

Application 14/017,201

The screenshot displays the Docket and Application Viewer (DAV) interface. On the left, there is a 'Table of Contents' pane with a list of documents. The main area shows a document viewer for 'Specification - 09/03/2013' with 'Application Number: 14/017,201'. The document content includes the title 'INTEGRATED LED BASED ILLUMINATION DEVICE', a section for 'CROSS REFERENCE TO RELATED APPLICATIONS' with paragraph [0001], and a 'TECHNICAL FIELD' section with paragraph [0002].

Receipt Date	Document Type	Page
10/27/2016	Abandonment	
11/10/2015	Fee Worksheet (SB06)	
11/10/2015	Extension of Time	
11/10/2015	EFS Acknowledgment Receipt	
05/14/2015	Examiner's search strategy and results	
05/14/2015	Index of Claims	
05/14/2015	Final Rejection	
05/14/2015	Search information including classification, datab...	
04/22/2015	EFS Acknowledgment Receipt	
04/22/2015	Amendment/Req. Reconsideration-After Non-Fina...	
04/22/2015	Claims	✓
04/22/2015	Applicant Arguments/Remarks Made in an Amen...	REM
04/22/2015	Fee Worksheet (SB06)	WFEE

**INTEGRATED LED BASED ILLUMINATION DEVICE**

**CROSS REFERENCE TO RELATED APPLICATIONS**

**[0001]** This application claims priority under 35 USC §119 to U.S. Provisional Application No. 61/697,712, filed September 6, 2012, and U.S. Provisional Application No. 61/790,887, filed March 15, 2013, both of which are incorporated by reference herein in their entireties.

**TECHNICAL FIELD**

**[0002]** The described embodiments relate to illumination modules that include Light Emitting Diodes (LEDs).

# What did the applicant disclose in the drawings?

Retrofitted lamp device (Fig. 3) having LED-based illumination device 100 (Figs. 6 or 9) therein

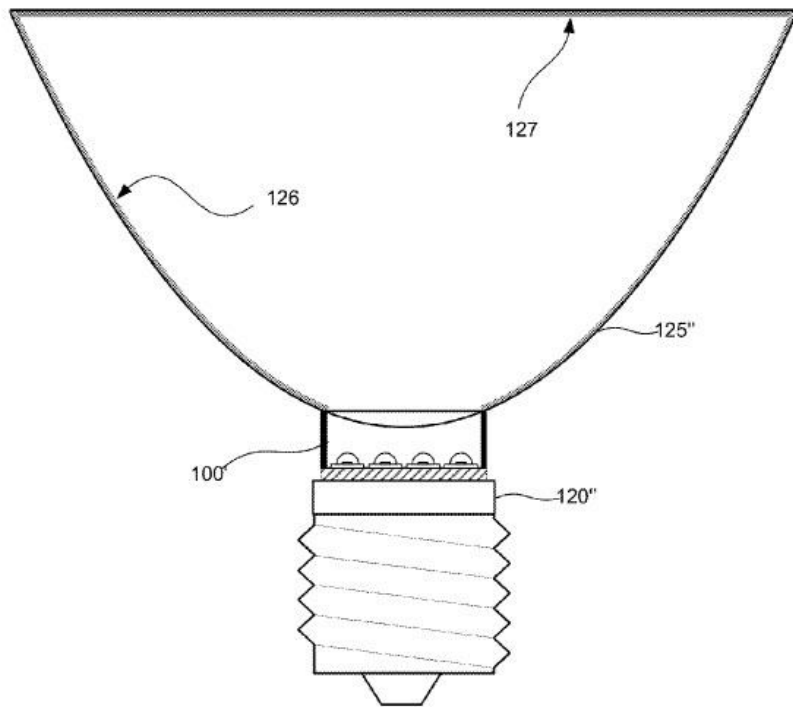


Fig. 3

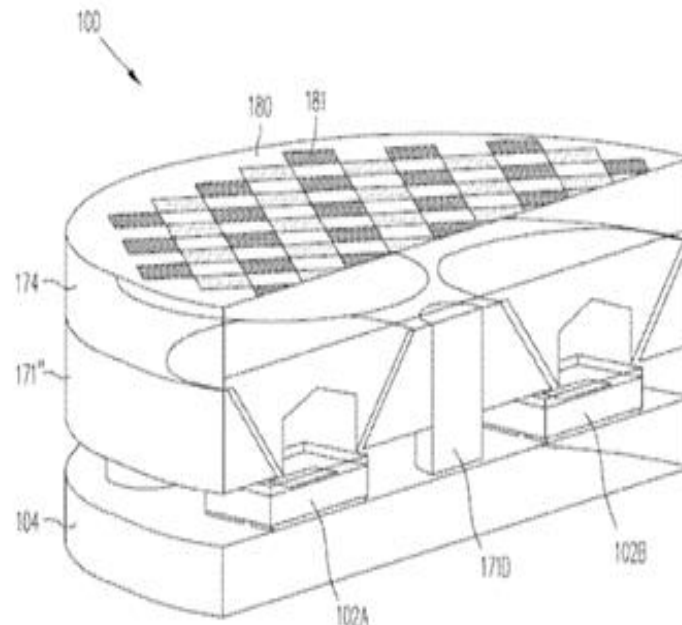


FIG. 6

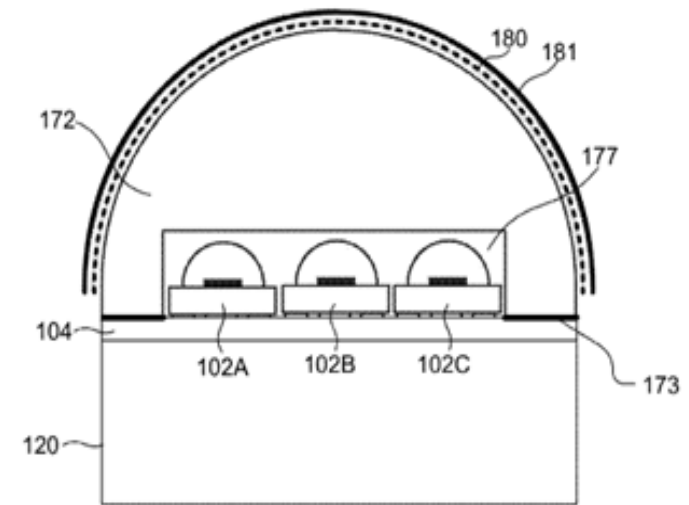


FIG. 9

# What did the applicant claim?

Claim 1. An LED based illumination device comprising: **a plurality of LEDs** mounted to an LED mounting board; **a first transmissive plate** disposed above the plurality of LEDs, the first transmissive plate includes a first amount of **a first wavelength converting material** configured to change a wavelength of an amount of light emitted by the plurality of LEDs; and a **base reflector structure** coupled to the LED mounting board between at least two of the plurality of LEDs and extending to the first transmissive plate over a contact area.

- A plurality of LEDs
- A first transmissive plate
- A first wavelength converting material
- A base reflector structure

# What are some of the tools used for Search?

- Applicant submitted prior art
- Review of International Search reports (ISR) and Written Opinions for PCT 371 applications
- Review of patent family documents (e.g., domestic, IP5, Cooperative Patent Classification (CPC) patent family)
- Review of related US patent applications
- Patents and patent-related literature (EAST/WEST)
- Non-Patent Literature (NPL) searches
- Chemical structure searches

# Search Tool: Live EAST Demo

The screenshot displays the EAST search tool interface. On the left, a tree view shows the search process, with 'Active' results expanded. The main pane lists search results, including L2 through L25, with details such as counts and descriptions. On the right, a search control panel is visible, showing the search criteria 'US-PPUB; USPAT', the default operator 'OR', and various search options like 'Prior Art Search' and 'Interference Search'. The search results pane shows the result '14/017201'.

**Search Results:**

- L2: (4) 14/017201
- L3: (124) Xicato.as.
- L4: (375) ((gerard near2 harbers) (tyler near2 kakuda) (serge near2 bierhuizen)).in.
- L7: (82) (L3 or L4) and ((plural\$5 or multiple) near8 (LED or "L.E.D." or ((light\$1emit\$4 or (li
- L8: (19) ("20070081336" "5959316" "6351069" "6504301" "6586882" "6600175" "6680569" "6812500" "
- L10: (4) (plurality near5 LEDs) and (LED near5 mounting near5 board) and (transmissive near5 pla
- L11: (496) (plurality near5 LEDs) and (LED near5 board) and (transmissive) and (wavelength near5
- L13: (99,629) (((multiple or plural\$5) near5 (LED or "L.E.D." or ((light\$1emit\$4 or (light adj
- L14: (33,913) ((glass or transparent or transparenc\$3 or transluce\$3 or transmissiv\$5) near10
- L15: (35,629) ((reflect\$3 or mirror\$3) near10 (between or adjacent or amid\$2 or medial\$2 or amor
- L16: (325) L13 and L14 and L15
- L17: (50) ("2004/0257797").URPN.
- L18: (8,143) H01L33/504.cpc. CPC: LED w/ plural wavelength conversion materials
- L19: (7,634) F21K9/64.cpc. CPC: Light source w/ space between LED and wavelength conversion mate
- L20: (21,620) H01L33/60.cpc. CPC: LED w/ reflector
- L21: (2,117) F21K9/68.cpc. CPC: Light source w/ LED and reflector
- L22: (3,579) H01L33/508.cpc. CPC: LED w/ nonuniform wavelength conversion material
- L23: (661) L18 and L19
- L24: (116) L18 and L19 and L20
- L25: (836) L18 and L22

**Search Control Panel:**

- Search: Classification List Browse Output Clear
- DBs: US-PPUB; USPAT
- Default operator: OR
- Plurals
- Highlight all hit terms initially
- Show errors
- Prior Art Search
- Order by Date
- Interference Search
- Order by No. of Hit Terms

**Search Results:**

14/017201

# Inventor and Assignee Searches

The screenshot shows the USPTO EAST interface. On the left is a navigation tree with categories like Drafts, BRS, Prior Art, Pending, Active, Failed, Saved, Favorites, Queue, Interference, Tagged (4), UDC, and Trash. The 'Active' category is expanded, showing 'L1: (4) 14/017201' and 'L2: (124) Xicato.as.'. On the right is a search control panel with fields for 'Classification' (US-PGPE; USPAT), 'Default operator' (OR), and search options like 'Prior Art Search' and 'Interference Search'. Below the search panel is a text input field containing 'Xicato.as.'. At the bottom is a table of search results.

[FLT]	+	X	U	1	Document ID	Publicati	Family I	Lang.	Pages	Title	Current OR	Current XRe	Retrieval	Inventor	S	C	P	2	3	4	5	Imag	
1	+2	☑	☑	☑	US 20140192539	20140710	51031681		23	LED-BASED LIGHT SOURCE REFLECTOR WITH SHELL ELEM	362/308	362/296.01; 362/341		YRIBERRI; JOHN S. et al.	☑	☑	☑	☑	☑	☑	☑	☑	US 2014
2	+3	☑	☑	☑	US 20140111985	20140424	50485153		33	COLOR TUNING OF A MULTI-COLOR LED BASED ILL	362/231	29/592.1		Harbers; Gerard	☑	☑	☑	☑	☑	☑	☑	☑	US 2014
3	+2	☑	☑	☑	US 20140106639	20140417	50475731			AUTOMATED COLOR TUNING OF AN LED BASED ILLUMINATION	445/3			Harbers; Gerard	☑	☑	☑	☑	☑	☑	☑	☑	
4	+1	☑	☑	☑	US 20140003044	20140102	49777948		18	INTEGRATED LED BASED ILLUMINATION DEVICE	362/230			Harbers; Gerard et al.	☑	☑	☑	☑	☑	☑	☑	☑	US 2014
5	+5	☑	☑	☑	US 20110216522	20110908	43841005			Efficient LED-Based Illumination Module With	362/84			Harbers; Gerard et al.	☑	☑	☑	☑	☑	☑	☑	☑	
6	-	-	-	-	US 20111020	20111020	44509587			LED-BASED ILLUMINATION	324/414	702/57		Harbers; Gerard	-	-	-	-	-	-	-	-	



# Inventor and Assignee Searches

Documents 1 through 375 of 375 - Filtered by Family ID (167 Families)

[FLT]	+	X	U	1	Document ID	Publicati	Family I	Lang.	Pages	Title	Current OR	Current XRe	Retrieval	Inventor	S	C	P	2	3	4	5	Imag ^
1					US 20170336539	20171123	10000019 59706			OPTICAL FIELD CURVATURE CONTROL USING MULTI-LAYER	1/1			Perreault; John D. et al.								
2					US 20170227777	20170810	10000017 27020			COMPACT NEAR-EYE DISPLAY OPTICS	1/1			CAROLLO; Jerome et al.								
3					US 20170227770	20170810	10000017 30883			COMPACT NEAR-EYE DISPLAY OPTICS FOR HIGHER OPTICAL	1/1			CAROLLO; Jerome et al.								
4					US 20170164453	20170608	10000024 54771			LED-BASED LIGHTING CONTROL NETWORK COMMUNICA	1/1			Harbers; Gerard et al.								
5					US 20170150583	20170525	10000024 38443			MULTI-PORT LED-BASED LIGHTING COMMUNICATIONS G	1/1			Harbers; Gerard								
6					US 20170427	20170427	58562096			COMMISSIONING OF DEVICES	1/1			Mueller; Martin								



# Browser Window

EAST Browser - L4: (82) (L2 or L3) a... | US 20120257386 | +1 | Tag: S | Doc: 14/40 (FILTERED) | "Full" 12/35 (Total images 35) | Drawings

File Edit View Tools Window Help

100% PGPubs Full Image Courier New 12

L4: (82) (L2 or L3) a... | US 20120257386 | +1 | Tag: S | Doc: 14/40 (FILTERED) | "Full" 12/35 (Total images 35) | Drawings

Patent Application Publication Oct. 11, 2012 Sheet 11 of 20 US 2012/0257386 A1

FIG. 19

FIG. 20

Documents 1 through 82 of 82 - Filtered by Family ID (40 Families)

[FLT]	+	U	1	Document ID	Publicatio	Family ID	Lang.	Pages	
1				US 20170097126	20170406	100002357258		25	LED-B MODUL
2	+3			US 20140003044	20140102	49777948		18	INTEG ILLUM
3	+1			US 20150008466	20150108	48048079		8	WAVEL EMITT
4	+3			US 20120250304	20121004	46927037		28	GRID TRANS
5				US 20150085521	20150326	52689510		24	INTEG
6				US 20150078004	20150319	52667827		18	LED B DEVIC
7	+1			US 20140374786	20141225	47891794		8	MOULD SCALE
8	+1			US 20130285082	20131031	45560941		9	LED P ENCAP
9	+3			US 20120087124	20120412	45924996		28	LED-B MODUL
10	+3			US 20120287624	20121115	47141753		25	LED-B MODUL
11	+1			US 20130135860	20130530	40587926		19	MODUL LIGHT
12	+2			US 20100127282	20100527	42195413		17	Light with
13	+3			US 20090103293	20090423	40563293		20	Illum Light
14	+1			US 20120257386	20121011	46965995		35	LED B MODUL
15	+3			US 20120002396	20120105	44773147		20	LED-B MODUL
16	+1			US 20110260178	20111027	44626775		10	LIGHT COLLI
17	+1			US 20110233565	20110929	44655336		12	HYBRI SUBST
18	+1			US 20110211344	20110901	41652766		17	Color
19	+1			US 20110182068	20110728	44308825		19	Led-B Illum
20	+2			US 20080142816	20080619	39190282		8	Tunab Sourc
21	+1			US 20110018017	20110127	42735391		9	LED W SIDEW
22	+1			US 20100073597	20100325	41445624		12	THIN LEDS
23	+1			US 20100065864	20100318	41227166		13	WHITE LEDS
24	+1			US 20090103296	20090423	40134797		31	Illum Light
25				US 20090402	20090402	40456318		15	Thin

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CONNECTED as "iparendo" [19:12] IDLE [00:43/03:00:00]



# Browser Window

EAST Browser - L4: (82) (L2 or L3) a... | US 20120257386 A1 | +1 | Tag: S | Doc: 14/40 (FILTERED) | Format: KWIC

File Edit View Tools Window Help

100% PGPub Full Image Courier New 12

L4: (82) (L2 or L3) a... | US 20120257386 | +1 | Tag: S | Doc: 14/40 (FILTERED) | \*Full\* 12/35 (Total images 35) | Drawings

Patent Application Publication Oct. 11, 2012 Sheet 11 of 20 US 2012/0257386 A1

FIG. 19

FIG. 20

3. The LED based illumination device of claim 2, further comprising: a second [wavelength converting](#) material disposed on the reflective mask cover plate above the active die area of a second LED.

Claims Text - CLTX (5):

5. The LED based illumination device of claim 4, wherein the color conversion cavity (CCC) includes a first surface area, wherein the first surface area is coated with a first [wavelength converting](#) material, and the output window includes a second surface area, wherein the second surface area is coated with a second [wavelength converting](#) material.

Claims Text - CLTX (6):

6. The LED based illumination device of claim 1, further comprising: a first color conversion cavity (CCC) comprising a first surface area coated with a first [wavelength converting](#) material, a second color conversion cavity (CCC) comprising a second surface area coated with a second [wavelength converting](#) material, wherein light emitted from the at least one LED directly enters the first CCC and does not directly enter the second CCC; and a second LED, wherein light emitted from the second LED directly enters the second CCC and does not directly enter the first CCC.

Claims Text - CLTX (8):

8. The LED based illumination device of claim 7, wherein the transmissive layer is coated with a third [wavelength converting](#) material.

Claims Text - CLTX (22):

22. An [LED based illumination device, comprising: a plurality of light emitting diodes](#) (LEDs); a lens element disposed above the [plurality of LEDs](#); and a patterned reflective layer disposed between the [plurality of LEDs](#) and the lens element, wherein a void in the patterned reflective layer is filled with a material that mechanically and optically couples the [plurality of LEDs](#) and the lens element.

Claims Text - CLTX (26):

L4: (82) (L2 or L3) a... | US 20120257386 A1 | +1 | Tag: S | Doc: 14/40 (FILTERED) | Format: KWIC

Documents 1 through 82 of 82 - Filtered by Family ID (40 Families)

[FLT]	U	1	Document ID	Publicatio	Family ID	Lang.	Pages	
14	+1	<input type="checkbox"/>	US 20120257386	20121011	46965995		35	LED B MODUL
15	+3	<input checked="" type="checkbox"/>	US 20120002396	20120105	44773147		20	LED-B MODUL
16		<input type="checkbox"/>	US 20111027	20111027	44696225		10	LED-B MODUL

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CONNECTED as "tparendo" [42:17] IDLE [00:39/03:00:00] 3:21 PM 4/26/2018

# Browser Window

EAST Browser - L4: (82) (L2 or L3) a... | US 20120257386 | +1 | Tag: S | Doc: 14/40 (FILTERED) | "Full" 12/35 (Total images 35) | Drawings

File Edit View Tools Window Help

100% PGPub Full Image Courier New 12

L4: (82) (L2 or L3) a... | US 20120257386 | +1 | Tag: S | Doc: 14/40 (FILTERED) | "Full" 12/35 (Total images 35) | Drawings

Patent Application Publication Oct. 11, 2012 Sheet 11 of 20 US 2012/0257386 A1

FIG. 19

FIG. 20

L4: (82) (L2 or L3) a... | US 20120257386 A1 | +1 | Tag: S | Doc: 14/40 (FILTERED) | Format: FULL

translucent material 161 is located on the surface of transmissive layer 174 in the voids of patterned reflective layer 175 aligned with LEDs 102. However, as illustrated in FIG. 10A an amount of optically translucent material 162 separates patterned reflective layer 175 from transmissive layer 174. By way of non-limiting example, optically translucent material 162 may be constructed of silicone, glass, a polycarbonate material, sapphire, alumina, plastic, or other suitable material. In some embodiments, optically translucent material 162 is the same material as flexible, optically translucent material 161. It is desirable to select an optically translucent material 162 with an index of refraction that matches the index of refraction of transmissive layer 174 to promote light extraction. Separating patterned reflective layer 175 from transmissive layer 174 with optically translucent material 162 locates patterned reflective layer 175 below the top surface of LEDs 102 when transmissive layer 174 is bonded directly to LEDs 102. This allows large angle light emission from LEDs 102 to escape through optically translucent material 162 without being blocked by patterned reflective layer 175.

[0068] In some embodiments, patterned reflective layer 175 is constructed from a polymer based material that expands when cured. As illustrated in FIG. 10A, patterned reflective layer 175 is applied in an uncured or partially cured state. After locating reflective mask cover plate 173 onto LED mounting board 104, patterned reflective layer 175 is fully cured and expands to span between the LEDs 102. In this manner, space can be allowed between patterned reflective layer 175 and LEDs 102 during assembly to accommodate manufacturing tolerances. But these spaces are closed after assembly by expansion of the polymer based material. This effectively eliminates light traps that may be created by spaces between LEDs 102 and patterned reflective layer 175 after assembly.

[0069] FIG. 11 is illustrative of a cross-section of LED based illumination module 100 similar to that depicted in FIGS. 6 and 7. In some embodiments, portions of reflective mask cover plate 173 include one or more wavelength converting materials. In the depicted embodiment, reflective mask cover plate 173 includes patterned reflective layer 175 disposed on the side of transmissive layer 174 closest to LEDs 102. Wavelength converting materials 180-182 are disposed on the side of transmissive layer 174 that is furthest from LEDs 102. By way of example, wavelength converting material 180 is disposed over a portion of transmissive layer 174 that lies above the window in patterned reflective layer 175 that allows light emitted from LED 102A to enter color conversion cavity 160. In this manner, light emitted from LED 102A passes through the window in patterned

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L4: (82) (L2 or L3) a... | US 20120257386 A1 | +1 | Tag: S | Doc: 14/40 (FILTERED)

Documents 1 through 82 of 82 - Filtered by Family ID (40 Families)

EAST Advanced Find

Find what: 180 Find Next

Area:  All  Sel/Cur Direction:  Up  Down Match word:  Whole  Part Look in:  Grid  Documents  Pagemark Comments

Match case Close Help

Pages	
35	LED-B MODUL
20	LED-B MODUL
10	

3:23 PM 4/26/2018

CONNECTED as 'lgarendo' (4345) IDLE (82.07.03.00.00)

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# Reviewing IDS Documents

EAST - [PPAC demo.wsp:1]

File View Edit Tools Window Help

Drafts

- BRS:
- Prior Art
- Pending
- Active
  - L1: (4) 14/017201
  - L2: (124) Xicato.as.
  - L3: (375) ((gerard near2 harbers) (tyler near2 kakuda) (serge near2 bierhuizen)).in.
  - L4: (82) (L2 or L3) and ((plural\$5 or multiple) near8 (LED or "L.E.D." or ((light\$1emit\$4 or (lig
  - L5: (19) ("20070081336" "5959316" "6351069" "6504301" "6586882" "6600175" "6680569" "6812500" "71
- Failed
- Saved
- Favorites
- Queue
- Interference
- Tagged (4)
- UDC
- Trash

Search Classification List Browse Queue Clear

DBs US-PGPR; USPAT

Default operator: OR

Prior Art Search  
 Interference Search

Order by Date  
 Order by No. of Hit Terms

Plurals  
 Highlight all hit terms initially  
 Show errors

```
(
"20070081336" "5959316" "6351069" "6504301" "6586882" "6600175"
"6680569" "6812500" "7126162" "7250715" "7479663" "7564180"
"7614759" "7629621" "20100163898" "20120002396" "20090322197"
"20100140655" "20110227108").pn.]
```

Documents 1 through 19 of 19 - Filtered by Family ID (17 Families)

[FLT]	+	X	U	1	Document ID	Publicati	Family I	Lang.	Pages	Title	Current OR	Current XRe	Retrieval	Inventor	S	C	P	2	3	4	5	Imag	
1		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 20120002396	20120105	44773147		20	LED-BASED ILLUMINATION MODULES WITH PTFE COLOR C	362/84			Tseng; Peter K. et al.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	US 2012
2		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 20110227108	20110922	44646541			LIGHT EMITTING DIODES WITH ENHANCED THERMAL SIN	257/98	257/E33.061		Tetz; Kevin et al.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 20100163898	20100701	42283758			LIGHT EMITTING DIODE APPARATUS	257/98	257/E33.056		HUNG; CHUN CHANG et al.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 20100140655	20100610	42230084			TRANSPARENT HEAT SPREADER FOR LEDS	257/99	165/185; 438/26		Shi; Wei	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5		<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	US 20090322197	20091231	41446521			LIGHT EMITTING DEVICE HAVING A TRANSPARENT THER	313/46	445/58		Helbing; Rene	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	US 20070412	20070412	37910922			Illumination system with	362/293	348/E9.027		Bierhuizen; Serge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	



# Text Searching Claim Language

The screenshot shows the EAST software interface. On the left is a tree view with folders like Drafts, Prior Art, Pending, Active, Failed, Saved, Favorites, Queue, Interference, Tagged (4), UDC, and Trash. The 'Active' folder is expanded, showing search results L1 through L6. L6 is selected and highlighted.

The main search area on the right contains a search bar with the query: `{(plurality near5 LEDs) and (LED near5 mounting near5 board) and (transmissive near5 plate) and (wavelength near5 converting) and ((base near5 reflector) with (contact near5 area))}`. Below the search bar are options for 'Prior Art Search' and 'Interference Search', and checkboxes for 'Plurals', 'Highlight all hit terms initially', and 'Show errors'.

At the bottom, a table displays search results. The table has columns: [FLT], +, X, U, 1, Document ID, Publicati, Family I, Lang., Pages, Title, Current OR, Current XRe, Retrieval, Inventor, S, C, P, 2, 3, 4, 5, Image. The first row shows a result for 'INTEGRATED LED BASED ILLUMINATION DEVICE' with Document ID 20140003044 and Inventor Harbers; Gerard et al.

[FLT]	+	X	U	1	Document ID	Publicati	Family I	Lang.	Pages	Title	Current OR	Current XRe	Retrieval	Inventor	S	C	P	2	3	4	5	Image	
1	+3	Γ	Γ	Γ	US 20140003044	20140102	49777948		18	INTEGRATED LED BASED ILLUMINATION DEVICE	362/230			Harbers; Gerard et al.	Γ	Γ	Γ	Γ	Γ	Γ	Γ	Γ	US 20140





# Text Search – Concept 1

## Plural mounted LEDs

The screenshot displays the EAST software interface. On the left, a tree view shows folders like Drafts, BRS, Prior Art, Pending, Active, Failed, Saved, Favorites, Queue, Interference, Tagged (4), UDC, and Trash. The Active folder is expanded, showing search results L1 through L8. L8 is selected and highlighted.

The main search results pane shows the following text for L8:

```
L8: (99,629) (((multiple or plural$5) near5 (LED or "L.E.D." or ((light$1emit$4 or (light adj emit$4)) adj (diode or device)))) near10 (mount$3 or substrate or base or board))
```

On the right, the search configuration pane is visible. It includes a search bar, a dropdown for 'Dbs' (set to LIS-PG/LIS; LIS/PAT; FRIS; EPO; JPO; DER/VENT), a 'Default operator' dropdown (set to OR), and several checkboxes:  Plurals,  Highlight all hit terms initially, and  Show errors. There are also radio buttons for search types:  Prior Art Search,  Interference Search,  Order by Date, and  Order by No. of Hit Terms.

At the bottom, a table header is visible with columns: [FLT] +, X, U, 1, Document ID, Publicati, Family I, Lang., Pages, Title, Current OR, Current XRe, Retrieval, Inventor, S, C, P, 2, 3, 4, 5, Image.

# Text Search – Concept 2

## Wavelength conversion material on Transmissive Plate

The screenshot displays the EAST search interface. On the left, a tree view shows the search structure under 'Active' with levels L1 through L9. The main search area on the right contains a search query and various search options.

**Search Query:**

```
((glass or transparent or transparenc$3 or translucen$3 or transmissiv$5) near10 (plate or lens or substrate or refract$3) near10 ((wavelength near5 (convert$3 or convers$4 or chang$3)) or phosphor$7 or fluoresc$3))
```

**Search Options:**

- Search: Classification List Browse Queue Clear
- Dbs: US-PGPub; USPAT; FFRS; EPO; JPO; DERWENT
- Default operator: OR
- Prior Art Search
- Interference Search
- Order by Date
- Order by No. of Hit Terms
- Plurals
- Highlight all hit terms initially
- Show errors

**Search Results (Left Panel):**

- L1: (4) 14/017201
- L2: (124) Xicato.as.
- L3: (375) ((gerard near2 harbers) (tyler near2 kakuda) (serge near2 bierhuizen)).in.
- L4: (82) (L2 or L3) and ((plural\$5 or multiple) near8 (LED or "L.E.D." or ((light\$1emit\$4 or (lig
- L5: (19) ("20070081336" "5959316" "6351069" "6504301" "6586882" "6600175" "6680569" "6812500" "71
- L6: (4) (plurality near5 LEDs) and (LED near5 mounting near5 board) and (transmissive near5 plate
- L7: (496) (plurality near5 LEDs) and (LED near5 board) and (transmissive) and (wavelength near5 c
- L8: (99,629) (((multiple or plural\$5) near5 (LED or "L.E.D." or ((light\$1emit\$4 or (light adj em
- L9: (33,913) ((glass or transparent or transparenc\$3 or translucen\$3 or transmissiv\$5) near10 (pl

**Search Results (Right Panel):**

Pos 216

Navigation icons: BRS form, IS&R form, Image, Text, HTML

# Text Search – Concept 3

## Reflector between LEDs

The screenshot displays the EAST search interface. On the left, a sidebar shows a tree view of folders: Drafts, BRS, Prior Art, Pending, Active, Failed, Saved, Favorites, Queue, Interference, Tagged (4), UDC, and Trash. The 'Active' folder is expanded, showing a list of search results (L1-L10) with their respective counts and search terms. The main search area on the right contains a search bar with the query: `((reflect$3 or mirror$3) near10 (between or adjacent or amid$2 or medial$2 or among$2) near10 ("L.E.D.s" or LEDs or diodes or devices))`. Below the search bar, there are options for 'Default operator' (set to OR), 'Prior Art Search' (selected), 'Interference Search', 'Order by Date' (selected), and 'Order by No. of Hit Terms'. There are also checkboxes for 'Plurals', 'Highlight all hit terms initially', and 'Show errors'. The search results are displayed in a list view, with the first result being L10: (35,629) ((reflect\$3 or mirror\$3) near10 (between or adjacent or amid\$2 or medial\$2 or among\$2) near10 ("L.E.D.s" or LEDs or diodes or devices)).

Search Classification List Browse Query Clear

Dbs US-PG/PUB; USPAT; FPRS; EPO; JPO; DERIVENT

Default operator: OR

Prior Art Search  Order by Date

Interference Search  Order by No. of Hit Terms

Plurals

Highlight all hit terms initially

Show errors

((reflect\$3 or mirror\$3) near10 (between or adjacent or amid\$2 or medial\$2 or among\$2) near10 ("L.E.D.s" or LEDs or diodes or devices))

Pos 136

BRS form ISAR form Image Text HTML



# First Reference

EAST Browser - Tagged | US 20120153313 A1 | Tag: S,T1 | Doc: 1/4 (FILTERED) | Format: KWIC

100% PGPubs Full Image Courier New 12

Tagged | US 20120153313 | Tag: S,T1 | Doc: 1/4 (FILTERED) | \*Full\*: 1/22 (Total images 22) | Front Page

Tagged | US 20120153313 A1 | Tag: S,T1 | Doc: 1/4 (FILTERED) | Format: KWIC

(19) **United States**  
 (12) **Patent Application Publication** (10) **Pub. No.: US 2012/0153313 A1**  
 YOKOTANI et al. (43) **Pub. Date: Jun. 21, 2012**

---

(54) **LIGHT EMITTING DEVICE AND ILLUMINATION APPARATUS USING SAME** (51) **Publication Classification**

(75) **Inventors:** Ryoji YOKOTANI, Hirakata-shi (JP); Yoji Urano, Ikeda-shi (JP); Ikko Kuzuhara, Toyonaka-shi (JP); Kenichiro Tanaka, Neyagawa-shi (JP)

(73) **Assignee:** Panasonic Electric Works Co., Ltd., Osaka (JP)

(21) **Appl. No.:** 13/331,028

(22) **Filed:** Dec. 20, 2011

(30) **Foreign Application Priority Data**  
 Dec. 21, 2010 (JP) ..... 2010-284765

(51) **Int. Cl.**  
*H01L 33/62* (2010.01)  
*H01L 33/08* (2010.01)

(52) **U.S. Cl.** ..... 257/88; 257/98; 257/E33.056; 257/E33.066

(57) **ABSTRACT**  
 A light emitting device includes a solid light-emitting element; a mounting substrate mounting the solid light-emitting element thereon; an encapsulating member encapsulating the solid light-emitting element; and a lead frame electrically connected to the solid light-emitting element through a wire. The lead frame is arranged on a rear surface of the mounting substrate, and the mounting substrate includes a front mounting surface on which the solid light-emitting element is mounted. The front mounting surface having a smooth surface region covered with the encapsulating member. The mounting substrate further includes a wire hole through which the wire extends from the front mounting surface of the mounting substrate to the rear surface thereof.

[0048] The [wavelength converting member 8 is produced by dispersedly mixing a transparent heat-resistant resin having a refractive index of, e.g., 1.2 to 1.5, \(e.g., a silicon resin\) and a granular yellow phosphor](#) radiating yellow light when excited by blue light emitted from the LED 2, and forming the mixture into a specified shape. The phosphor dispersed in the transparent material is not limited to the yellow one. A mixture of a plurality of phosphors may be used to adjust the color temperature or the color rendering property. For example, white light having an enhanced color rendering property can be obtained by appropriately mixing a red phosphor and a green phosphor. The wavelength converting member 8 is formed into a hemispherical shape to have an inner diameter greater than the diameter of the encapsulating member 4. Preferably, the wavelength converting member 8 has a thickness of 0.5 to 1 mm.

Description of Disclosure - DETX (32):

[0053] In a modified example shown in FIG. 3, an illuminating device 10 is configured by arranging a [plurality of light emitting devices 1 on a wiring board](#) 3a provided in addition to the substrate 3 to which the LED 2 is mounted. A wiring pattern 6a is formed on the front surface of the wiring board 3a through an insulating layer 7a. The wiring pattern 6a is bonded to the lead frames 6 of each of the light emitting devices 1 via solder layers 52a. Lead lines (not shown) for supplying electric power to the light emitting devices extend from the wiring pattern 6a. With this configuration, it is possible to [mount the plurality of light emitting devices 1 on the wiring board](#) 3a and to enhance the manufacturing efficiency of the illuminating device 10.

Description of Disclosure - DETX (45):

[0066] Next, a light emitting device in accordance with a sixth embodiment of the present invention will be described with reference to FIG. 9. The [light emitting device 1 of the present embodiment includes a plurality of LEDs 2 arranged along a line on an elongated substrate](#) 3. The LEDs 2 are encapsulated by a plurality of encapsulating members 4. A wavelength converting member 8 having a hollow semi-cylindrical shape is mounted on the substrate 3 so as to cover the encapsulating members 4. The cross section of the light emitting device 1 orthogonal to the arrangement direction of the LEDs 2 is the same as that of the first embodiment (see FIG. 10).

(10) 12 13 70 11 70 70 70 R

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Tagged | US 20120153313 A1 | Tag: S,T1 | Doc: 1/4 (FILTERED)

[FLT]	+	X	U	1	Document ID	Publicatio	Family ID	Lang.	Pages
1					US 20120153313	20120621	45418316		22
2					US 20040257797	20041223	33518581		33
3					US 20111208	20111208	45052947		12

Details Text Image HTML

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# Second Reference

EAST Browser - Tagged | US 20040257797 | Tag: S,T1 | Doc: 2/4 (FILTERED) | "Full" 1/33 (Total images 33) | Front Page

File Edit View Tools Window Help

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Tagged | US 20040257797 | Tag: S,T1 | Doc: 2/4 (FILTERED) | "Full" 1/33 (Total images 33) | Front Page

US 20040257797A1

(19) **United States**  
 (12) **Patent Application Publication** (10) Pub. No.: **US 2004/0257797 A1**  
 Suhiro et al. (43) Pub. Date: **Dec. 23, 2004**

(54) **LIGHT EMITTING DEVICE** Publication Classification  
 (76) Inventors: Yoshinobu Suhiro, Nishikasugai-gun (JP); Ryoichi Tohmon, Nishikasugai-gun (JP); Hideaki Kato, Nishikasugai-gun (JP); Satoshi Wada, Nishikasugai-gun (JP)  
 (51) Int. CL<sup>7</sup> F21K 2/00  
 (52) U.S. CL. 362/34

(57) **ABSTRACT**  
 A light emitting device has a light emitting element portion that radiates light with a predetermined wavelength, and a wavelength conversion portion that surrounds a phosphor to be excited by the light with the predetermined wavelength with a transparent and non-moisture permeability material in the form of laminae. Further, a light emitting device has a plurality of LED elements disposed on a same plane, and a wavelength conversion portion that comprises a flat transparent base member that is disposed opposite to the plurality of LED elements and a phosphor layer that is of a phosphor to be excited by light emitted from the LED element and is formed like a film on the base member. The phosphor layer includes part with no phosphor in plane.

Correspondence Address:  
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 RESTON, VA 20190 (US)

(21) Appl. No.: 10/869,036  
 (22) Filed: Jun. 17, 2004  
 (30) Foreign Application Priority Data  
 Jun. 18, 2003 (JP) 2003-173650  
 Sep. 17, 2003 (JP) 2003-324570

(0015) The light emitting device 50 is composed of: a base 51; a reflection frame 52; recesses 53 provided in the reflection frame 52; a lead 54; LED elements 55; a wavelength conversion sheet 56 that includes a transparent sheet board 56A and a wavelength conversion material layer 56B; and a diffusion plate 57. The interior of recess 53 is filled with mold resin 58. The base 51, reflection frame 52, wavelength conversion sheet 56 and diffusion plate 57 are integrally sealed with the mold resin 58.

**Summary of Invention Paragraph - BSTX (17):**

(0016) The multiple LED elements 55 arrayed in plane are mounted on the base 51, and electric power is supplied to the LED elements 55 through the lead 54 from a power source (not shown). The reflection frame 52 attached to the base 51 allows light emitted from the LED elements 55 to be reflected in the recess 53 and to be radiated upward.

**Summary of Invention Paragraph - BSTX (39):**

(0037) a wavelength conversion portion that comprises a flat transparent base member that is disposed opposite to the plurality of LED elements and a phosphor layer that is of a phosphor to be excited by light emitted from the LED element and is formed like a film on the base member;

**Detail Description Paragraph - DETX (4):**

(0070) The wavelength conversion portion 2 is composed such that a thin-film phosphor layer 2A is laid between two layers of transparent low-melting glass with a refractive index of 1.5 and the two glass layers are thermally fused to be integrated with the phosphor layer 2A. Further, the wavelength conversion portion 2 is formed into a dome-like optical shape according to a desired light distribution characteristic by hot pressing, and it seals the LED element 3 while being thermally fused and bonded onto the lead frame 5. The phosphor layer 2A is shaped like a convex polygon to cover the emission observation surface of LED element 3 in accordance with the formation of wavelength conversion portion 2.

**Detail Description Paragraph - DETX (48):**

(0114) (4) Since the wavelength conversion portion 2 is

Details Text Image HTML KWIC

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[FLT]	+	X	U	1	Document ID	Publicatio	Family ID	Lang.	Pages
1		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	US 20120153313	20120621	45418316		22
2		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	US 20040257797	20041223	33518581		33
3		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	US 20111208	20111208	45052947		12

Details Text Image HTML Full

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3:47 PM 4/26/2018

uspto

# Second Reference

EAST Browser - Tagged | US 20040257797 A1 | Tag: S,T1 | Doc: 2/4 (FILTERED) | Format: KWIC

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Tagged | US 20040257797 | Tag: S,T1 | Doc: 2/4 (FILTERED) | \*Full\* 16/33 (Total images 33) | Drawings

Tagged | US 20040257797 A1 | Tag: S,T1 | Doc: 2/4 (FILTERED) | Format: KWIC

**FIG. 15A**

**FIG. 15B**

**Abstract Paragraph - ABTX (1):**

A light emitting device has a light emitting element portion that radiates light with a predetermined wavelength, and a wavelength conversion portion that surrounds a phosphor to be excited by the light with the predetermined wavelength with a transparent and non-moisture permeability material in the form of laminae. Further, a **light emitting device has a plurality of LED elements disposed on a same plane, and a wavelength conversion portion that comprises a flat transparent base member that is disposed opposite to the plurality of LED elements and a phosphor layer that is of a phosphor to be excited by light emitted from the LED element and is formed like a film on the base member. The phosphor layer includes part with no phosphor in plane.**

**Summary of Invention Paragraph - BSTX (16):**

[0015] The light emitting device 50 is composed of: a base 51; a reflection frame 52; recesses 53 provided in the reflection frame 52; a lead 54; LED elements 55; a **wavelength conversion sheet 56 that includes a transparent sheet board 56A and a wavelength conversion material layer 56B; and a diffusion plate 57.** The interior of recess 53 is filled with mold resin 58. The base 51, reflection frame 52, wavelength conversion sheet 56 and diffusion plate 57 are integrally sealed with the mold resin 58.

**Summary of Invention Paragraph - BSTX (17):**

[0016] The **multiple LED elements 55 arrayed in plane are mounted on the base 51, and electric power is supplied to the LED elements 55 through the lead 54 from a power source (not shown).** The reflection frame 52 attached to the base 51 allows light emitted from the LED elements 55 to be reflected in the recess 53 and to be radiated upward.

**Summary of Invention Paragraph - BSTX (39):**

[0037] a wavelength conversion portion that comprises a flat transparent **base member that is disposed opposite to the plurality of LED elements and a phosphor layer that is of a phosphor to be excited by light emitted from the LED element and is formed like a film on the base member;**

Details Text Image HTML KWIC

Tagged | US 20040257797 A1 | Tag: S,T1 | Doc: 2/4 (FILTERED)

[FLT]	+	X	U	1	Document ID	Publicatio	Family ID	Lang.	Pages
1		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	US 20120153313	20120621	45418316		22
2		<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	US 20040257797	20041223	33518581		33
3		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	US 20111208	20111208	45052947		12

Details Text Image HTML Full

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# "Forward Searching"

The screenshot shows the EAST (Patent Analysis Tool) interface. The search bar contains the query: ("2004/0257797").URPN. The search results are displayed in a table below.

[FLT]	+	X	U	1	Document ID	Publicati	Family I	Lang.	Pages	Title	Current OR	Current XRe	Retrieval	Inventor	S	C	P	2	3	4	5	Ima
1					US 9951938 B2	20180424	10000032 56264			LED lamp	1/1			Dudik; David C. et al.								
2					US 9915769 B2	20180313	10000031 69921			Light emitting unit, display, and lighting app	1/1			Ohkawa; Shingo et al.								
3					US 9847465 B2	20171219	10000030 17280			Light emitting device with molded wavelength co	1/1			Basin; Grigoriy et al.								
4					US 9841175 B2	20171212	10000030 07957			Optics system for solid state lighting apparatus	1/1			Kuenzler; Glenn Howard et al.								
5					US 9818922 B2	20171114	10000029 48740			Light emitting diode package having frame with	1/1			Kim; Wan Ho								
6					US 9658520	20170523	49780109			Wavelength converting	1/1			Diiken; Durandus								





# Classification – Collecting Subgroups (Concepts)

The screenshot displays the EAST software interface, which is used for patent classification. The window title is "EAST - [PPAC demo.asp:1]". The interface is divided into several sections:

- Left Panel (Navigation):** Contains a tree view with categories: Drafts, Prior Art, Pending, Active, Failed, Saved, Favorites, Queue, Interference, Tagged (4), UDC, and Trash.
- Main List (Active):** Displays a list of search results (L1-L17) with their respective counts and descriptions. For example, L13: (8,143) H01L33/504.cpc. CPC: LED w/ plural wavelength conversion elements.
- Right Panel (Search and Classification):** Contains search controls and options. The search bar is empty. Below it, there are buttons for "Search", "Classification", "List", "Browse", "Query", and "Clear". The "DEs" field contains "LS;PGFUS;USPAT;PPRS;EPC;JPO;DERIVNT". The "Default operator" is set to "OR". There are radio buttons for "Prior Art Search" (selected) and "Interference Search". There are also radio buttons for "Order by Date" (selected) and "Order by No. of Hit Terms". On the far right, there are checkboxes for "Plurals", "Highlight all list terms initially", and "Show errors".
- Search Results Preview:** A large text area on the right shows the selected result: "H01L33/508.cpc.".
- Bottom Panel:** Shows "Pos 16" and a status bar with icons for "BRS form", "ISR form", "Image", "Text", and "HTML".

# Classification – Search Combinations of Concepts

The screenshot displays the EAST software interface, which is used for patent classification. The main window is titled "EAST - [PFRAC demo.wip:1]". The left sidebar shows a navigation tree with categories: Drafts, BRS, Prior Art, Pending, and Active. The Active category is expanded, showing a list of search results (L1 through L25) with their respective counts and descriptions. The right panel contains a search and classification interface. It includes a search bar with the text "L13 and L17", a "Classification" tab, and various search options like "Prior Art Search" and "Interference Search". The bottom status bar shows "Pos 12" and "BRS form".

**Search Results (Active):**

- L1: (4) 14/017201
- L2: (124) Xicato.as.
- L3: (375) ((gerard near2 harbers) (tyler near2 kakuda) (serge near2 bierhuizen)).in.
- L4: (82) (L2 or L3) and ((plural\$5 or multiple) near8 (LED or "L.E.D." or ((light\$1emit\$4 or (11
- L5: (19) ("20070081336" "5959316" "6351069" "6504301" "6586882" "6600175" "6680569" "6812500" "
- L6: (4) (plurality near5 LEDs) and (LED near5 mounting near5 board) and (transmissive near5 plat
- L7: (496) (plurality near5 LEDs) and (LED near5 board) and (transmissive) and (wavelength near5
- L8: (99,629) (((multiple or plural\$5) near5 (LED or "L.E.D." or ((light\$1emit\$4 or (light adj e
- L9: (33,913) ((glass or transparent or transparenc\$3 or translucent\$3 or transmissiv\$5) near10 (p
- L10: (35,629) ((reflect\$3 or mirror\$3) near10 (between or adjacent or amid\$2 or medial\$2 or amor
- L11: (325) L8 and L9 and L10
- L12: (50) ("2004/0257797").URPN.
- L13: (8,143) H01L33/504.cpc. CPC: LED w/ plural wavelength conversion elements
- L14: (7,634) F21K9/64.cpc. CPC: Light source w/ space between LED and wavelength conversion ele
- L15: (21,620) H01L33/60.cpc. CPC: LED w/ reflector
- L16: (2,117) F21K9/68.cpc. CPC: Light source w/ LED and reflector
- L17: (3,579) H01L33/508.cpc. CPC: LED w/ nonuniform wavelength conversion element
- L22: (661) L13 and L14
- L23: (116) L13 and L14 and L15
- L25: (836) L13 and L17

**Classification Panel:**

- Search: L13 and L17
- Classification: [Tab]
- Default operator: OR
- Options:  Plurals,  Highlight all hit terms initially,  Show errors
- Search Type:  Prior Art Search,  Interference Search
- Ordering:  Order by Date,  Order by No. of Hit Terms

# Third Reference

EAST Browser - Tagged | US 2010090231 A1 | Tag: S,T1 | Doc: 4/4 (FILTERED) | Format: FULL

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Tagged | US 2010090231 | Tag: S,T1 | Doc: 4/4 (FILTERED) | "Full" 1/6 (Total images: 6) | Front Page

US 2010090231A1

(19) **United States**  
 (12) **Patent Application Publication** (10) **Pub. No.: US 2010/0090231 A1**  
**JUNG et al.** (43) **Pub. Date: Apr. 15, 2010**

(54) **LED PACKAGE MODULE** **Publication Classification**

(75) **Inventors:** Suk Ho JUNG, Gyeonggi-do (KR);  
 Hyung Kun Kim, Gyeonggi-do (KR); Hak Hwan Kim,  
 Gyeonggi-do (KR); Young Jin Lee,  
 Seoul (KR); Ho Sun Paek,  
 Gyeonggi-do (KR)

(51) **Int. Cl.**  
*H01L 33/00* (2006.01)

(52) **U.S. CL** ..... 257/89; 257/E33.001

(57) **ABSTRACT**  
 An LED package module according to an aspect of the invention may include: a substrate having predetermined electrodes thereon; a plurality of LED chips mounted onto the substrate, separated from each other at predetermined intervals, and electrically connected to the electrodes; a first color resin portion molded around at least one of the plurality of LED chips; a second color resin portion molded around all of the LED chips except for the LED chip around which the first color resin portion is molded, and having a different color from the first color resin portion; and a third color resin portion encompassing both the first color resin portion and the second color resin portion and having a different color from the first color resin portion and the second color resin portion. Accordingly, a reduction in luminous efficiency of an LED caused by yellowing is prevented to thereby increase luminous efficiency and achieve a reduction in size.

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US 20110297981A1

(19) **United States**  
(12) **Patent Application Publication** (10) Pub. No.: **US 2011/0297981 A1**  
LIAO et al. (43) Pub. Date: **Dec. 8, 2011**

(54) **FLUORESCENT STRUCTURE AND METHOD FOR FORMING THE FLUORESCENT STRUCTURE AND LED PACKAGE USING THE SAME**

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(73) Assignee: **ADVANCED OPTOELECTRONIC TECHNOLOGY, INC.**, Hsinchu Hsien (TW)

(21) Appl. No.: **12987,143**

(22) Filed: **Jan. 9, 2011**

(30) **Foreign Application Priority Data**  
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*B32B 3/10* (2006.01)  
*B32B 3/02* (2006.01)

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(57) **ABSTRACT**  
A fluorescent structure for a light-emitting package includes a first fluorescent layer and a second fluorescent layer covering the first fluorescent layer. The first fluorescent layer includes first fluorescent strips, and defines first transparent regions between the first fluorescent strips. The second fluorescent layer includes second fluorescent strips, and defines second transparent regions between the second fluorescent strips. A method for forming the fluorescent structure and a light-emitting diode package using the fluorescent structure are also provided.

(310)

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FLUORESCENT STRUCTURE ACCORDING TO A FIFTH EMBODIMENT.

**DETAILED DESCRIPTION**

[0013] As shown in FIG. 1 and FIG. 2, an LED package 10 includes a cup base 100, an LED chip 200 located on the cup base 100 and a fluorescent structure 300 covering the LED chip 200.

[0014] The cup base 100 defines a recess 110, and the recess 110 has a bottom surface 111 and a top opening 112. The LED chip 200 is located on the bottom surface 111 of the recess 110, and emits light toward the top opening 112 of the recess 110. In this embodiment, the LED chip 200 may be a blue LED chip, but is not limited thereto.

[0015] The fluorescent structure 300 is located on the top opening 112 of the cup base 100. The fluorescent structure 300 is a flat plate including a first fluorescent layer 310 and a second fluorescent layer 320 covering the first fluorescent layer 310. The first fluorescent layer 310 includes first fluorescent strips 311, and defines first transparent regions 312 between the first fluorescent strips 311. Each first fluorescent strip 311 bends to form a ring around a center point, so the first fluorescent strips 311 are concentric rings spaced apart from each other. The distance between the adjacent first fluorescent strips 311 is substantially less than one millimeter.

[0016] The second fluorescent layer 320 includes second fluorescent strips 321, and defines second transparent regions 322 between the second fluorescent strips 321. Each second fluorescent strip 321 bends to form a ring around a center point, so the second fluorescent strips 321 are concentric rings spaced apart from each other. The distance between the adjacent second fluorescent strips 321 is substantially less than one millimeter.

[0017] In a top view of the stacked first fluorescent layer 310 and second fluorescent layer 320, the first fluorescent strips 311 and the second fluorescent strips 321 are

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Patent Application Publication Dec. 8, 2011 Sheet 5 of 8 US 2011/0297981 A1

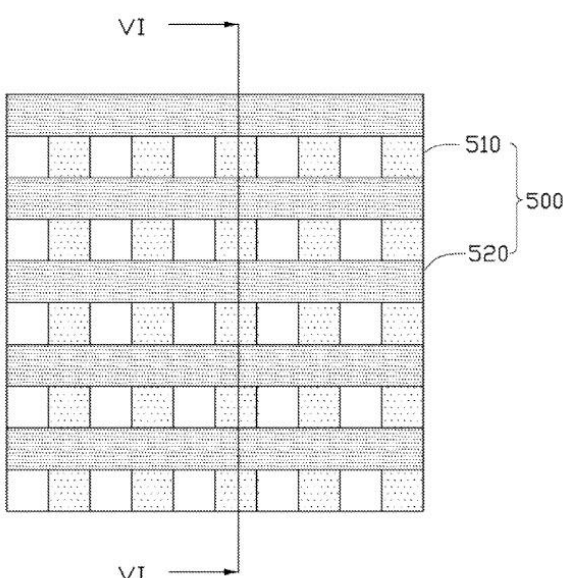


FIG. 5

[0021] As shown in FIG. 5 and FIG. 6, a third embodiment differs from the first embodiment only in the pattern of the fluorescent structure. The fluorescent structure 500 is a flat plate including a first fluorescent layer 510 and a second fluorescent layer 520 covering the first fluorescent layer 510 in the LED package 30. Each first fluorescent strip 511 and each second fluorescent strip 521 are both rectangular. The first fluorescent strips 511 are parallel to each other, and separated from each other. The second fluorescent strips 521 are parallel and separated from each other.

[0022] In a top view of the stacked first fluorescent layer 510 and second fluorescent layer 520, the first fluorescent strips 511 crisscross the second fluorescent strips 521 to form a mesh pattern. The distance between two adjacent first fluorescent strips 511, and the distance between two second fluorescent strips 521 are less than one millimeter to avoid the checker light effect.

[0023] As shown in FIG. 7, a method of forming the fluorescent structure of the present disclosure includes the following steps. A first mixture, which comprises a first sealant and a first fluorescent material mixed therein, is injected to form first fluorescent strips. The first fluorescent strips may be injected into a mold designed in the required shape, such as the concentric rings of FIG. 1, the crescents and the middle biconvex middle one of FIG. 3 or the rectangular strips of FIG. 5. In other embodiments, the first fluorescent strips may be formed by injection molding into a fluorescent film, and then can be cut into the required shape. The formed first fluorescent strips are arranged into a design pattern, such as the concentric rings of FIG. 1, the symmetrical crescents about the middle biconvex one of FIG. 3 or the parallel lines of FIG. 5, and are fixed into a portion of a transparent sealant to form the first fluorescent layer. A maximum distance between the adjacent first fluorescent strips is less than one millimeter.

[0024] Similar as above, a second mixture, which comprises a

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Patent Application Publication Dec. 8, 2011 Sheet 6 of 8 US 2011/0297981 A1

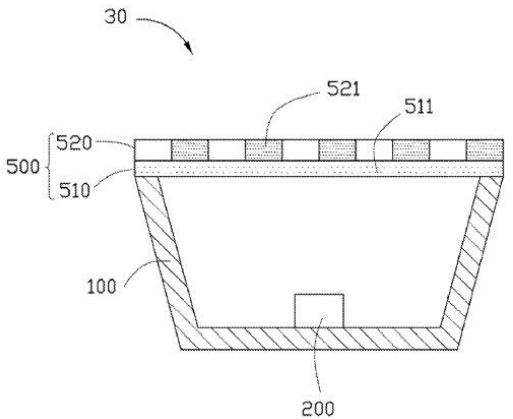


FIG. 6

[0021] As shown in FIG. 5 and FIG. 6, a third embodiment differs from the first embodiment only in the pattern of the fluorescent structure. The fluorescent structure 500 is a flat plate including a first fluorescent layer 510 and a second fluorescent layer 520 covering the first fluorescent layer 510 in the LED package 30. Each first fluorescent strip 511 and each second fluorescent strip 521 are both rectangular. The first fluorescent strips 511 are parallel to each other, and separated from each other. The second fluorescent strips 521 are parallel and separated from each other.

[0022] In a top view of the stacked first fluorescent layer 510 and second fluorescent layer 520, the first fluorescent strips 511 crisscross the second fluorescent strips 521 to form a mesh pattern. The distance between two adjacent first fluorescent strips 511, and the distance between two second fluorescent strips 521 are less than one millimeter to avoid the checker light effect.

[0023] As shown in FIG. 7, a method of forming the fluorescent structure of the present disclosure includes the following steps. A first mixture, which comprises a first sealant and a first fluorescent material mixed therein, is injected to form first fluorescent strips. The first fluorescent strips may be injected into a mold designed in the required shape, such as the concentric rings of FIG. 1, the crescents and the middle biconvex middle one of FIG. 3 or the rectangular strips of FIG. 5. In other embodiments, the first fluorescent strips may be formed by injection molding into a fluorescent film, and then can be cut into the required shape. The formed first fluorescent strips are arranged into a design pattern, such as the concentric rings of FIG. 1, the symmetrical crescents about the middle biconvex one of FIG. 3 or the parallel lines of FIG. 5, and are fixed into a portion of a transparent sealant to form the first fluorescent layer. A maximum distance between the adjacent first fluorescent strips is less than one millimeter.

[0024] Similar as above, a second mixture, which comprises a

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# Additional Search Tools

- **Online databases (e.g., IP.com, IEEE)**
- **Internet search engines (e.g., Google, Bing)**
- **Foreign databases (e.g., Espacenet, WIPO)**
- **Scientific and Technical Information Center (STIC)**
  - Electronic Information Centers which support Technology Centers
  - Technology specific search assistance
- **Search Strategy Experts (SSE)**
  - Search training and assistance

# What did the applicant claim?

Claim 2\*. A method of testing an LED based illumination device comprising the steps of: measuring the color temperature of a plurality of LEDs in an LED illumination device.

- Measurement of color temperature of LED devices

Claim 3\*. The LED based illumination device of Claim 1, wherein the first wavelength converting material is YAG.

- Wavelength converting material: YAG



*\*Note: These are hypothetical claims, they were not actual claims from the previously mentioned application.*



# NPL search: Standard method of testing

Search string for internet search engine: *"ASTM or ANSI or SEMI standards for LED color temperature measurements"*

[PDF] LED Color Characteristics

<https://www.energy.gov/sites/prod/files/2016/.../led-color-characteristics-factsheet.pdf> ▾

U.S. DEPARTMENT OF  
**ENERGY**

Energy Efficiency &  
Renewable Energy

## Solid-State Lighting Technology Fact Sheet

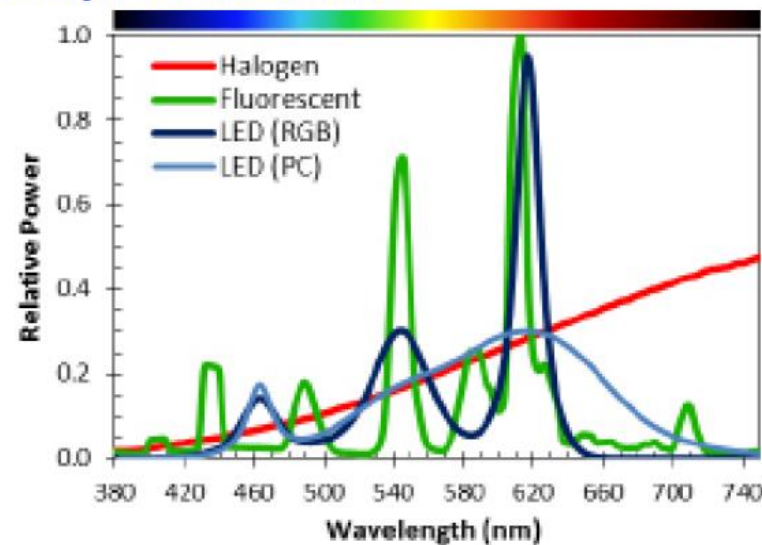
Google: ASTM or ANSI or SEMI standards for LED color temperature measurements

### LED Color Characteristics

Color quality is an important consideration when evaluating lighting products. This fact sheet reviews the fundamentals regarding light and color, summarizing the most important color issues related to white-light LED systems, including color consistency, stability, tuning, and rendering, as well as chromaticity.

#### LED Emission Attributes

Individual LED dies, often referred to as chips, emit light in



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# Chemical structure search: Search strategy formulation

- Concept to be searched: *“Wavelength converting material is YAG”*
- Claim does not define “YAG”; consult specification to identify its meaning:

[0043] By way of example, phosphors may be chosen from the set denoted by the following chemical formulas:  $\text{Y}_3\text{Al}_5\text{O}_{12}:\text{Ce}$ , (also known as YAG:Ce, or simply YAG)

- Information provided by specification: “phosphor” and “wavelength converting material” are synonyms
- Internet search determines YAG stands for Yttrium Aluminum Garnet

# Chemical structure search: Example of search query and results

Search query for  
chemical name:

*"LED devices containing Yttrium Aluminum Garnet"*

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Search Results:

Candidates Selected (ID 2)

2338 references were found containing the two concepts "LED devices" and "yttrium aluminum garnet" closely associated with one another.

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Reference  
excerpt:

Ce-doped  $\text{Al}_2\text{O}_3$ -YAG ( $\text{Y}_3\text{Al}_5\text{O}_{12}$ , **yttrium aluminum garnet**) eutectic, a resin-free phosphor for white **light emitting diodes** (WLEDs), was successfully grown by the Czochralski method. X-ray diffraction and scanning electron microscopy show that this material has a typical eutectic structure of interpenetrating sapphire and **garnet** phases, as well as lamellar spacing in the order of tens of microns. The eutectic has a higher  $\text{Ce}^{3+}$  segregation coefficient than YAG single crystal. The photoluminescence properties of this eutectic were also investigated. Results show that it is characterized by a wide excitation band, and that the...

# Questions and Comments

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