

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
9 September 2011 (09.09.2011)

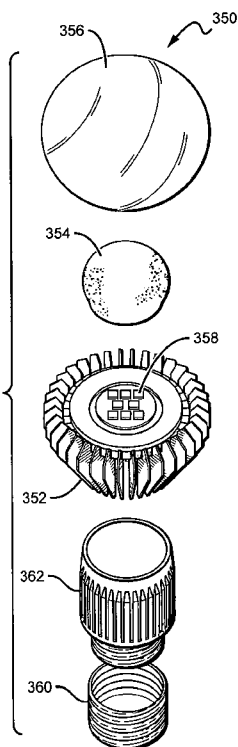
(10) International Publication Number
WO 2011/109099 A3

- (51) **International Patent Classification:**
F21K 99/00 (2010.01) *F21Y 101/02* (2006.01)
F21V 9/16 (2006.01)
- 61/435,326 23 January 2011 (23.01.2011) US
61/435,759 24 January 2011 (24.01.2011) US
13/028,913 16 February 2011 (16.02.2011) US
- (21) **International Application Number:** PCT/US2011/000406
- (22) **International Filing Date:** 2 March 2011 (02.03.2011)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
- | | | |
|------------|--------------------------------|----|
| 61/339,516 | 3 March 2010 (03.03.2010) | US |
| 61/339,515 | 3 March 2010 (03.03.2010) | US |
| 12/848,825 | 2 August 2010 (02.08.2010) | US |
| 61/386,437 | 24 September 2010 (24.09.2010) | US |
| 12/889,719 | 24 September 2010 (24.09.2010) | US |
| 61/424,665 | 19 December 2010 (19.12.2010) | US |
| 61/424,670 | 19 December 2010 (19.12.2010) | US |
| 12/975,820 | 22 December 2010 (22.12.2010) | US |
| 61/434,355 | 19 January 2011 (19.01.2011) | US |
- (71) **Applicant** (for all designated States except US): **CREE, INC.** [US/US]; 4600 Silicon Drive, Durham, NC 27703 (US).
- (72) **Inventors; and**
- (75) **Inventors/Applicants** (for US only): **YUAN, Zongjie** [CN/US]; 47 Ocean View Avenue, #41, Santa Barbara, CA 93103 (US). **TARSA, Eric** [US/US]; 105 Dearborn Place, #41, Goleta, CA 93117 (US). **TONG, Tao** [CN/US]; 3133 N. Oxnard Boulevard, Oxnard, CA 93036 (US). **LETOQUIN, Ronan** [FR/US]; 5059 Amberwood Drive, Fremont, CA 94555 (US). **KELLER, Bernd** [DE/US]; 1335 San Antonio Creek Road, Santa Barbara, CA 93111 (US). **LE, Long, Larry** [US/US]; 301 Ruthwin Drive, Morrisville, NC 27560 (US). **LAY, James, Michael** [US/US]; 535 Tranquil Sound Drive, Cary, NC 27519 (US). **DEMUYNCK, Randolph, Cary** [US/US]; 5636 Chimney Swift Drive, Wake Forest, NC 27587 (US). **NEGLEY, Gerald** [US/US]; 811 Clearview Drive,

[Continued on next page]

(54) **Title:** LED LAMP WITH REMOTE PHOSPHOR AND DIFFUSER CONFIGURATION UTILIZING RED EMITTERS

FIG. 20



(57) **Abstract:** Lamps and bulbs are disclosed generally comprising different combinations and arrangement of a light source (58), one or more wavelength conversion materials, regions or layers which are positioned separately or remotely with respect to the light source, and a separate diffusing layer. This arrangement allows for the fabrication of lamps and bulbs that are efficient, reliable and cost effective and can provide an essentially omni - directional emission pattern, even with a light source comprised of a co-planar arrangement of LEDs. Additionally, this arrangement allows aesthetic masking or concealment of the appearance of the conversion regions or layers when the lamp is not illuminated. Some embodiments of the present invention utilize LED chips (202) to provide one or more lighting components instead of providing the components through phosphor conversion. This can provide for lamps that can be operated with lower power and can be manufactured at lower cost. In one embodiment, a red lighting component can be provided by red emitting LEDs as opposed to a red conversion material.

WO 2011/109099 A3



Durham, NC 27713 (US). VAN DE VEN, Antony, P. [AU/CN]; D45 Marina Cove, 380 Hiram's Highway, Sai Kung, N.t., Hong Kong (CN).

(74) Agents: HEYBL, Jaye, G. et al.; Loppel, Patrick, Heybl & Dawson, 2815 Townsgate Road, Suite 215, Westlake Village, CA 91361 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report (Art. 21(3))
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))

(88) Date of publication of the international search report:

3 November 2011

INTERNATIONAL SEARCH REPORT

International application No PCT/US2011/000406

A. CLASSIFICATION OF SUBJECT MATTER
 INV. F21K99/00 F21V9/16
 ADD. F21Y101/02

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)
 F21K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2008/052318 A1 (TIR TECHNOLOGY LP [CA]; ASHDOWN IAN [CA]; SALSBURY MARC [CA]) 8 May 2008 (2008-05-08)	1-5, 8-13, 16-23, 25-27, 30-32, 34,35, 38-42
Y	paragraph [0022] - paragraph [0069] paragraph [0083] - paragraph [0085] claim 24 figure 6	6,7,14, 15,24, 28,29, 33,36,37
Y	----- WO 2009/128004 A1 (KONINKL PHILIPS ELECTRONICS NV [NL]; HOLTEN PETRUS A J [NL]; TORDINI G) 22 October 2009 (2009-10-22)	6,7,14, 15,24, 28,29, 33,36,37
A	page 3, line 29 - page 7, line 22 figure 1 ----- -/--	1

Further documents are listed in the continuation of Box C.

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

Date of the actual completion of the international search

9 September 2011

Date of mailing of the international search report

15/09/2011

Name and mailing address of the ISA/
 European Patent Office, P.B. 5818 Patentlaan 2
 NL - 2280 HV Rijswijk
 Tel. (+31-70) 340-2040,
 Fax: (+31-70) 340-3016

Authorized officer

 Blokland, Russell

INTERNATIONAL SEARCH REPORT

International application No PCT/US2011/000406

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/316383 A1 (SON WON-KUK [KR] ET AL) 24 December 2009 (2009-12-24) paragraph [0029] - paragraph [0124] figures 4,5,7 -----	1-6, 8-13, 16-23, 25-27, 30-32, 34,35, 38-42
X	US 2009/101930 A1 (LI YI-QUN [US]) 23 April 2009 (2009-04-23) paragraph [0033] - paragraph [0063] figures 7-9 -----	1-11, 13-42

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2011/000406

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2008052318 A1	08-05-2008	JP 2010508651 A	18-03-2010
		KR 20090082449 A	30-07-2009
		US 2008106887 A1	08-05-2008

WO 2009128004 A1	22-10-2009	CN 102007337 A	06-04-2011
		EP 2276967 A1	26-01-2011
		JP 2011518411 A	23-06-2011
		KR 20110007201 A	21-01-2011
		US 2011026246 A1	03-02-2011

US 2009316383 A1	24-12-2009	NONE	

US 2009101930 A1	23-04-2009	CA 2702436 A1	23-04-2009
		CN 101828271 A	08-09-2010
		EP 2201617 A1	30-06-2010
		JP 2011501865 A	13-01-2011
		KR 20100077199 A	07-07-2010
		WO 2009052329 A1	23-04-2009
		US 2011170277 A1	14-07-2011
