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- (71) **Applicant (for all designated States except DE, US):**
KONINKLUKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).
- (71) **Applicant (for DE only):** **PHILIPS INTELLECTUAL PROPERTY & STANDARDS GMBH** [DE/DE]; Lübeckertordamm 5, 20099 Hamburg (DE).
- (72) **Inventors; and**
- (75) **Inventors/Applicants (for US only):** **SORMANI, Joseph, L., A., M.** [NL/NL]; c/o High Tech Campus Building 44, NL-5656 AE Eindhoven (NL). **LENDERINK, Egbert**

[NL/NL]; c/o High Tech Campus Building 44, NL-5656 AE Eindhoven (NL). **EPMEIER, Matthias, D.** [DE/DE]; c/o High Tech Campus Building 44, NL-5656 AE Eindhoven (NL). **WEIJERS, Aldegonda, L.** [NL/NL]; c/o High Tech Campus Building 44, NL-5656 AE Eindhoven (NL).

- (74) **Agents:** **BEKKERS, Joost, J., J.** et al.; High Tech Campus Building 44, NL-5656 AE Eindhoven (NL).
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(54) **Title:** LIGHT-EMITTING APPARATUS WITH SHAPED WAVELENGTH CONVERTER

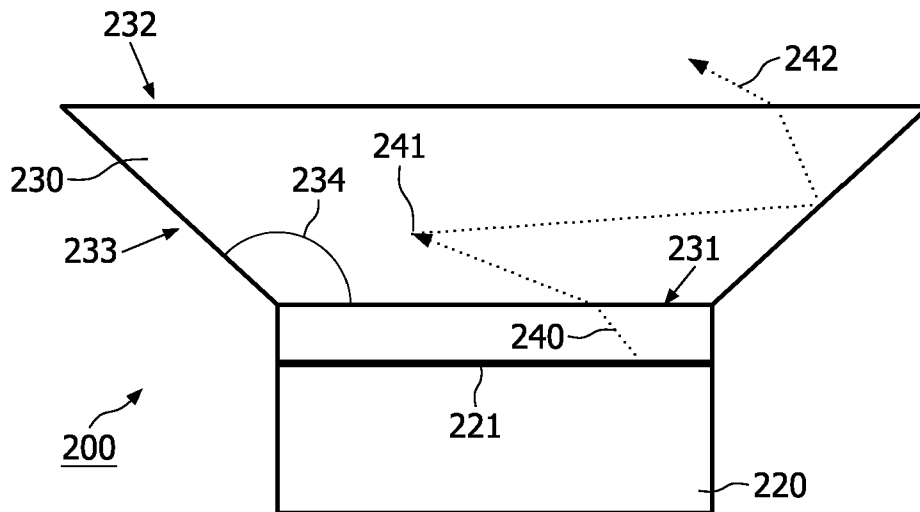


FIG. 2

(57) **Abstract:** Proposed is a light-emitting apparatus 200,300,400, comprising a semiconductor light emitting device 220,320,420 and a transparent ceramic body 230,330,430 comprising a wavelength converting material positioned in light receiving relationship to the semiconductor device. The light-emitting apparatus is characterized in that the side surfaces 233,333,433 of the ceramic body 230,330,430 are at an oblique angle 234,334,434 relative its bottom surface 231,331,431. This is especially advantageous to unlock the wave-guide modes inside the body 230,330,430. Consequently the total flux emitted from the light-emitting apparatus 200,300,400 can be enhanced considerably. Alternatively, the brightness of the top surface 232,332,432 of the ceramic body 230,330,430 can be enhanced considerably.

WO 2008/078235 A3



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B. 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
X	US 2005/269582 A1 (MUELLER GERD O [US] ET AL MUELLER GERD O [US] ET AL) 8 December 2005 (2005-12-08) cited in the application	1-3,6,7, 10
Y	paragraphs [0018], [0019], [0021], [0023], [0032], [0033]; figures 2,6	1-10
Y	WO 2006/103582 A (KONINKL PHILIPS ELECTRONICS NV [NL]; LUMILEDS LIGHTING LLC [US]) 5 October 2006 (2006-10-05) page 12, lines 12-17	4,5,8,9
Y	US 2004/227148 A1 (CAMRAS MICHAEL D [US] ET AL) 18 November 2004 (2004-11-18) paragraphs [0014], [0032], [0063] - [0067]; figures 7A-D, 7F	1-3,6,7, 10
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Further documents are listed in the continuation of B02 C

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International application No
PCT/IB2007/055109

(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication where appropriate of relevant passages	Relevant to claim No
A	EP 1 503 434 A (LUMILEDS LIGHTING LLC [US]) 2 February 2005 (2005-02-02) paragraphs [0019], [0031], [0040], [0049], [0050], [0062] - [0065]; figures 1B, 1D, 3, 12A-C -----	4, 10
A	US 2006/091411 A1 (OUDERKIRK ANDREW J [US] ET AL) 4 May 2006 (2006-05-04) paragraph [0045]; figure 7 -----	5, 9
A	US 2005/151141 A1 (GROTSCH STEFAN [DE] ET AL) 14 July 2005 (2005-07-14) paragraphs [0008], [0012], [0013], [0018], [0027], [0035], [0043], [0044]; figure 1 -----	4
A	US 2006/091784 A1 (CONNER ARLIE R [US] ET AL) 4 May 2006 (2006-05-04) paragraph [0036]; figure 2a -----	10
A	US 2004/145308 A1 (ROSSNER WOLFGANG [DE] ET AL) 29 July 2004 (2004-07-29) paragraphs [0045] - [0047], [0051]; figures 1-3, 6, 7 -----	

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/IB2007/055109
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005269582	AI	08-12-2005	CN 1977393 A 06-06-2007
			EP 175687 7 AI 28-02-2007
			WO 20051 19797 AI 15-12-2005
			JP 2006005367 A 05-01-2006
			JP 20085021 3 1 T 24-01-2008
			KR 20070042956 A 24-04-2007
			US 2007267646 AI 22-11-2007

WO 2006 103582	A	05-10-2006	CN 101160670 A 09-04-2008
			EF 1866975 AI 19-12-2007
			JP 20071 48332 A 14-06-2007
			KR 200701 17689 A 12-12-2007

US 2004227 148	AI	18-11-2004	NONE

EP 1503434	A	02-02-2005	JP 2005057266 A 03-03-2005
			US 20061 18805 AI 08-06-2006
			US 2005023545 AI 03-02-2005

US 200609 141 1	AI	04-05-2006	CN 1010881 76 A 12-12-2007
			EP 180581 0 AI 11-07-2007
			KR 2007007024 1 A 03-07-2007
			US 20080 35945 AI 14-02-2008
			WO 2006049746 AI 11-05-2006

US 2005151 141	AI	14-07-2005	DE 10351 397 AI 16-06-2005
			EP 1528603 A2 04-05-2005
			JP 20051 36427 A 26-05-2005
			KR 2005004 1990 A 04-05-2005

US 2006091784	AI	04-05-2006	CN 101095244 A 26-12-2007
			EP 180581 4 AI 11-07-2007
			KR 20070070254 A 03-07-2007
			WO 200604980 1 AI 11-05-2006

US 2004 145308	AI	29-07-2004	DE 10349038 AI 13-05-2004
			JP 2004 146835 A 20-05-2004
