



(51) International Patent Classification:

F21V 7/00 (2006.01) F21Y 101/02 (2006.01)
F21V 8/00 (2006.01) F21Y 103/00 (2006.01)

(21) International Application Number:

PCT/US2014/047318

(22) International Filing Date:

18 July 2014 (18.07.2014)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

61/856,009	18 July 2013 (18.07.2013)	US
61/996,814	14 May 2014 (14.05.2014)	US
62/003,766	28 May 2014 (28.05.2014)	US
62/009,811	9 June 2014 (09.06.2014)	US

(71) Applicant: QUARKSTAR LLC [US/US]; 3455 Cliff Shadows Parkway, Suite 150, Las Vegas, Nevada 89129 (US).

(72) Inventors: YORK, Allan Brent; 21442-93B Avenue, Langley, British Columbia V1M 1R3 (CA). SPEIER, Ingo; 7938 Patterson Road, Saanichton, British Columbia V8M 1L5 (CA). STORMBERG, Hans Peter; Rolandstr. 15, 52223 Stolberg (DE).

(74) Agents: WEYDE, Markus et al.; Fish & Richardson P.C., P. O. Box 1022, Minneapolis, Minnesota 55440-1022 (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, BN, 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, IR, IS, JP, KE, KG, 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, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, 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, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, 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, KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

[Continued on next page]

(54) Title: MODULAR LIGHT GUIDE LUMINAIRES

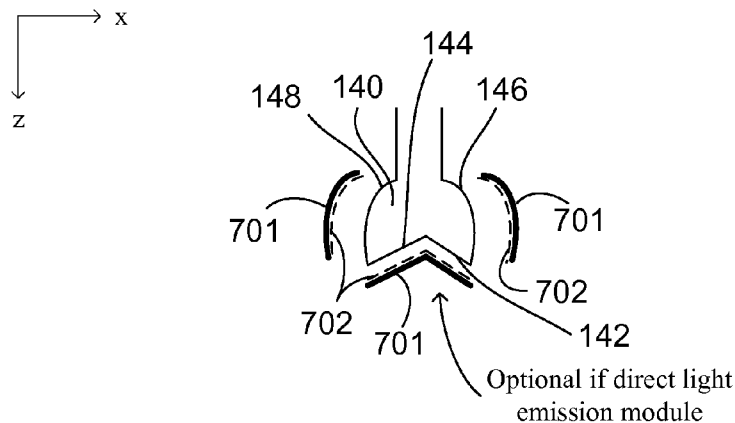


FIG. 7A

(57) Abstract: The present technology relates to achieving a low manufactured cost and high design alignment robustness for fabrication of modular light guide luminaires featuring solid state light-emitting elements.





— *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:
2 July 2015

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/047318

A. CLASSIFICATION OF SUBJECT MATTER
 INV. F21V7/00 F21V8/00
 ADD. F21Y101/02 F21Y103/00

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)
 F21V G02B F21Y

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 practicable, search terms used)
 EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2013/023008 A1 (QUARKSTAR LLC [US]; DAU WILSON [CA]; GARDNER ROBERT C [US]; LERMAN GEO) 14 February 2013 (2013-02-14)	1-16, 19-23, 44-53
Y	page 35, line 2 - line 11 page 42, line 8 - line 28 page 40, line 7 - line 12 figure 2c	17,18
X	US 2012/268966 A1 (MCCOLLUM TIMOTHY A [US] ET AL) 25 October 2012 (2012-10-25)	1,2, 6-16, 19-23, 44,45, 47,50
	paragraph [0031] paragraph [0045] figures 4A-4J	
	----- -/--	

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 application or patent 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	Date of mailing of the international search report
14 January 2015	18/05/2015

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 Prévot, Eric
--	--

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2014/047318

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 all searchable 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.:

1-23, 44-53

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.

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2014/047318

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 2012/176352 A1 (PANASONIC CORP [JP]; ONO TATSUJI [JP]; KOIZUMI HIDEKI [JP]; TANAKA TOS) 27 December 2012 (2012-12-27) figures 8,9,10 -----	17,18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/047318

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
WO 2013023008	A1	14-02-2013	CN 103858244 A	11-06-2014
			EP 2742540 A1	18-06-2014
			JP 2014527269 A	09-10-2014
			US 8602586 B1	10-12-2013
			US 2013039090 A1	14-02-2013
			US 2013201715 A1	08-08-2013
			US 2014104868 A1	17-04-2014
			US 2014126235 A1	08-05-2014
			WO 2013023008 A1	14-02-2013

US 2012268966	A1	25-10-2012	TW 201303222 A	16-01-2013
			US 2012268966 A1	25-10-2012
			WO 2012145293 A2	26-10-2012

WO 2012176352	A1	27-12-2012	JP 5547691 B2	16-07-2014
			JP 2013004463 A	07-01-2013
			WO 2012176352 A1	27-12-2012

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-23, 44-53

A luminaire module comprising one or more light-emitting elements (LEEs) disposed on one or more substrates and adapted to emit light in a forward direction; a light guide comprising an input end and an output end, and side surfaces extending from the input end to the output end, the side surfaces shaped to guide light emitted by the one or more LEEs and received at the input end of the light guide in the forward direction to the output end of the light guide and provide guided light at the output end of the light guide; and an optical extractor optically coupled with the output end of the light guide and adapted to receive the guided light, the optical extractor having a first redirecting surface and one or more output surfaces, the first redirecting surface of the optical extractor being adapted to reflect at least a portion of the light received at the optical extractor in a first direction that has a component orthogonal to the forward direction, wherein at least one of the first redirecting surface or at least one of the one or more output surfaces diffuse light.

2. claims: 24-35

A luminaire module comprising one or more light-emitting elements (LEEs) disposed on one or more substrates and adapted to emit light in a forward direction; a light guide comprising an input end and an output end, and side surfaces extending from the input end to the output end, the side surfaces shaped to guide light, emitted by the one or more LEEs and received at the input end of the light guide, in the forward direction to the output end of the light guide and provide guided light at the output end of the light guide; an optical extractor optically coupled with the output end of the light guide and adapted to receive the guided light, the optical extractor having a first redirecting surface, the first redirecting surface of the optical extractor being adapted to reflect at least a portion of the light received at the optical extractor in a first direction that has a component orthogonal to the forward direction; and an optical insert coupled with the first redirecting surface, the optical insert adapted to receive at least a portion of light from the light guide at one or more light input surfaces of the optical insert.

3. claims: 36-43

An illumination device comprising a light source configured to emit light having an anisotropic spectral power distribution; and an optical coupler having an input

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

aperture and an exit aperture, the input aperture optically coupled with the light source, the optical coupler having a diffusive side surface disposed between the input and exit apertures, the side surface configured to reflect incident light having a first divergence into reflected light having a second divergence being larger than the first divergence.

4. claims: 54-63

A luminaire module comprising one or more light-emitting elements (LEEs) disposed on one or more substrates and adapted to emit light in a forward direction; a light guide comprising an input end and an output end, and side surfaces extending from the input end to the output end, the side surfaces shaped to guide light emitted by the one or more LEEs and received at the input end of the light guide in the forward direction to the output end of the light guide and provide guided light at the output end of the light guide; a protective material disposed adjacent to at least a portion of at least one of the side surfaces of the light guide; and an optical extractor optically coupled with the output end of the light guide and adapted to receive the guided light, the optical extractor having a first redirecting surface, the first redirecting surface of the optical extractor being adapted to reflect at least a portion of the light received at the optical extractor in a first direction that has a component orthogonal to the forward direction.

5. claims: 64-71

A method for fabricating a modular luminaire, the method comprising bonding a plurality of light-emitting elements (LEEs) to one or more substrate; molding optical couplers to the bonded LEEs, wherein each optical coupler is registered to one or more corresponding LEEs of the plurality of LEEs, such that the couplers molded to the LEEs form a coupler assembly; and optically bonding the coupler assembly to an application component comprising a light guide and an optical extractor to generate the modular luminaire.
