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Sale Accounting Date:07/21/2021

Sale Item Reference Number	Effective Date
15441644	07/20/2021

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
I20217KE48434188	1551	MAINTENANCE FEE DUE AT 3.5 YEARS	$2,000.00	Wire

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/441,644	02/27/2018	9905742	Q231501	6962

23373 7590 02/07/2018

SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

EVERLIGHT ELECTRONICS CO., LTD., New Taipei City, TAIWAN;
Chung-Chuan HSIEH, New Taipei City, TAIWAN;
Yung Chieh CHEN, New Taipei City, TAIWAN;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501	6962

23373 7590 01/31/2018

SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER
NARAGHI, ALI

ART UNIT	PAPER NUMBER
2896	

NOTIFICATION DATE	DELIVERY MODE
01/31/2018	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PPROCESSING@SUGHRUE.COM
sughrue@sughrue.com
USPTO@sughrue.com

FH_000003

Response to Rule 312 Communication	Application No.	Applicant(s)
	15/441,644	HSIEH ET AL.
	Examiner	Art Unit
	ALI NARAGHI	2896

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

1. ☒ The amendment filed on *16 November 2017* under 37 CFR 1.312 has been considered, and has been:

a) ☒ entered.

b) ☐ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.
Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

/ALI NARAGHI/
Primary Examiner, Art Unit 2896

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22314-1450
or Fax **(571) 273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS
(Note: Use Block 1 for any change of address)

23373

SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, NW
SUITE 800
WASHINGTON, DC 20037

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, EFS-Web transmitted, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO	CONFIRMATION NO
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501	6962

TITLE OF INVENTION: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

APPLN TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	Undiscounted	$960	$0	$0	$960	01/02/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
NARAGHI, ALI	2896	257-099000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached.
Use of a Customer Number is required.

2. For printing on the patent front page, list
(1) the names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1. Sughrue Mion, PLLC
2.
3.

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)
PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)
EVERLIGHT ELECTRONICS CO., LTD. New Taipei City, Taiwan

Please check the appropriate assignee category or categories (will not be printed on the patent): ☐ Individual ☑ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:
☑ Issue Fee
☐ Publication Fee (No small entity discount permitted)
☐ Advance Order - # of Copies

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
☐ A check is enclosed.
☑ Payment by credit card. Form PTO-2038 is attached.
☑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number 19-4880 (enclose an extra copy of this form).

5. Change of Entity Status (from status indicated above)
☐ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see form PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
☐ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
☐ Applicant changing to regular undiscounted fee status — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature /John F. Rabena/ Date January 2, 2018
Typed or Printed Name John F. Rabena Registration No. 38,584

Electronic Patent Application Fee Transmittal

Application Number:	15441644
Filing Date:	24-Feb-2017
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Filer:	John F. Rabena/Joshua Gilman
Attorney Docket Number:	Q231501

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**960**

Electronic Acknowledgement Receipt

EFS ID:	31375473
Application Number:	15441644
International Application Number:	
Confirmation Number:	6962
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Customer Number:	23373
Filer:	John F. Rabena/Joshua Gilman
Filer Authorized By:	John F. Rabena
Attorney Docket Number:	Q231501
Receipt Date:	02-JAN-2018
Filing Date:	24-FEB-2017
Time Stamp:	09:24:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$960
RAM confirmation Number	010218INTEFSW09245500
Deposit Account	194880
Authorized User	Joshua Gilman

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.20 (Post Issuance fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	Q231501IssueFeeTransmittal.pdf	33097 ffb4af18181069f0cf5932fcb523ee1d739edcab	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30587 8e086a30635b252357d39017649cf803896b327f	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	63684		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501	6962

23373 7590 12/07/2017

SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER
NARAGHI, ALI

ART UNIT	PAPER NUMBER
2896	

NOTIFICATION DATE	DELIVERY MODE
12/07/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PPROCESSING@SUGHRUE.COM
sughrue@sughrue.com
USPTO@sughrue.com

FH_000010

Response to Rule 312 Communication	Application No.	Applicant(s)
	15/441,644	HSIEH ET AL.
	Examiner	Art Unit
	ALI NARAGHI	2896

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address –

1. ☒ The amendment filed on *20 November 2017* under 37 CFR 1.312 has been considered, and has been:

a) ☒ entered.

b) ☐ entered as directed to matters of form not affecting the scope of the invention.

c) ☐ disapproved because the amendment was filed after the payment of the issue fee.
Any amendment filed after the date the issue fee is paid must be accompanied by a petition under 37 CFR 1.313(c)(1) and the required fee to withdraw the application from issue.

d) ☐ disapproved. See explanation below.

e) ☐ entered in part. See explanation below.

/ALI NARAGHI/
Primary Examiner, Art Unit 2896

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Chung-Chuan HSIEH, et al.

Appln. No.: 15/441,644

Confirmation No.: 6962

Filed: February 24, 2017

Docket No: Q231501

Group Art Unit: 2896

Examiner: NARAGHI, ALI

For: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

SUBMISSION OF CORRECTED EXECUTED DECLARATION

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In view of the application filed on February 24, 2017, Applicant submits herewith a copy of the Corrected Declaration for the above identified application properly executed by the inventors.

In the previously filed Declaration of February 24, 2017, the second inventor's execution date was inadvertently left blank. The Applicant would like the Examiner to enter this Declaration in lieu of the previously submitted Declaration.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,
/Young H. Chon/

Young H. Chon
Registration No. 67967

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: December 1, 2017

Electronic Acknowledgement Receipt

EFS ID:	31102393
Application Number:	15441644
International Application Number:	
Confirmation Number:	6962
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Customer Number:	23373
Filer:	Natalya Dvorson/margaret ahn
Filer Authorized By:	Natalya Dvorson
Attorney Docket Number:	Q231501
Receipt Date:	01-DEC-2017
Filing Date:	24-FEB-2017
Time Stamp:	12:57:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Q231501SubmissionofCorrectedExecutedDecasFiled.pdf	99225 28cf7f564b3968f4da54ab1f49650f7d91c95e2a	yes	4

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Oath or Declaration filed	2	4
	Miscellaneous Incoming Letter	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	99225	

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New Applications Under 35 U.S.C. 111

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National Stage of an International Application under 35 U.S.C. 371

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New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Docket No.: Q231501
Only After Sept 16, 2012
US Rights Only

ASSIGNMENT WITH DECLARATION FOR PATENT APPLICATION (37 CFR 1.63)

专利申请转让声明书(37 CFR 1.63)

Chinese Language Assignment with Declaration

鉴于，我 / 我们，即下面签名之发明人（以下简称“转让人”），已发明下文确认之申请中所述的若干改善之处；和

鉴于，_____（地址位于_____）（“承让人”）意欲购买申请和发明以及就此随后获取的任何美国专利中的全部权利、所有权和权益；

因此，就有值代价而言，相关收据特此确认：

我 / 我们，上文指名转让人，特此向上文指名承让人及其继承人和受让人出售、转让及出让该申请中适用于美利坚合众国的全部权利、所有权和权益，及该申请中披露的适用于美利坚合众国的发明（包括该申请的所有分案和延续申请），及可能据此颁发的所有美国专利证书及所有再颁发之专利证书（包括 35 USC 119 项下的要求优先权的权利及针对过往损害赔偿提起诉讼的权利）；我 / 我们请求美国专利及商标局局长向承让人及其继承人和受让人签发该申请中所载列之发明的任何专利证书；及我 / 我们将会应承让人的要求，无偿签立承让人申请美国专利所必需的所有文件。

（合法化审批无需记录，但须作为 35 USC 261 项下执行的表面证据）

作为下述发明人，我特此声明：

此转让声明乃有关：

☐ 随附的申请，或

☒ 于 _____ 日提交的美国专利申请或 PCT 国际申请号 _____（确认号 ）。

该申请有权：

_____

_____

_____

Whereas, I/We, the undersigned inventor(s) hereinafter called assignor(s), have invented certain improvements described in the application identified below; and

Whereas, Everlight Electronics Co., Ltd. of No.6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan, R.O.C, (assignee), desires to acquire the entire right, title, and interest in the application and invention, and to any United States patents to be obtained therefor;

Now therefore, for valuable consideration, receipt whereof is hereby acknowledged,

I/We, the above named assignor(s), hereby sell, assign and transfer to the above named assignee, its successors and assigns, the entire right, title and interest in the application and the invention disclosed therein for the United States of America, including all divisions, and continuations thereof, and all Letters Patent of the United States that may be granted thereon, and all reissues thereof, including the right to claim priority under 35 USC 119 and the right to sue for past damages, and I/we request the Director of the U.S. Patent and Trademark Office to issue any Letters Patent granted upon the invention set forth in the application to the assignee, its successors and assigns; and I/we will execute without further consideration all papers deemed necessary by the assignee in connection with the United States application when called upon to do so by the assignee.

(Legalization not required for recording but is prima facie evidence of execution under 35 USC 261)

As the below named inventor, I hereby declare that:

This assignment with declaration is directed to:

☐ The attached application, or

☒ United States Application or PCT International Application Number 15/441,644 filed on February 24, 2017 (Confirmation No. 6962).

The application is entitled:

CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

Chinese Language Assignment with Declaration

我已做出或授权他人做出上述确认的申请。

我相信我是申请中要求保护的发明的原创发明人或原创联合发明人之一。

我已读阅并理解提交该转让声明的申请内容。

根据 37 CFR 1.56 的规定，我明白我有义务向专利局披露据我所知的有关专利性的所有实质性信息。

特此确认，根据 18 USC 1001 的规定，在本转让声明书中蓄意做出任何虚假声明会被处以罚款或五(5)年以下监禁或两者并罚。

The above identified application was made or was authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

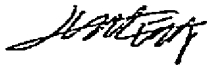
I have reviewed and understand the contents of the application for which this assignment with declaration is being submitted.

I am aware of the duty to disclose to the Office all information known to me to be material to patentability as defined in 37 CFR 1.56.

I hereby acknowledge that any willful false statement made in this assignment with declaration is punishable under 18 USC 1001 by fine or imprisonment of not more than five (5) years, or both.

STATEMENT OF ACCURATE TRANSLATION IN ACCORDANCE WITH 37 CFR 1.69(b):

The assignment with declaration is an accurate translation of the corresponding English language assignment with declaration.

Signature 

Date March 17, 2014

NAME OF SOLE OR FIRST INVENTOR: 唯一发明人或第一发明人姓名：		
Given Name (first and middle [if any]) 名（名和中名［若有］） Chung-Chuan	Family Name or Surname 姓 Hsieh	
Inventor's signature 发明人签名 Chung Chuan Hsieh		Date 日期 November 30, 2017
Residence: 住所： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan		
Mailing Address: 通讯地址： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan		

NAME OF SECOND INVENTOR: 第二发明人姓名：		
Given Name (first and middle [if any]) 名（名和中名［若有］） Yung Chieh	Family Name or Surname 姓 Chen	
Inventor's signature 发明人签名 Chen Yung Chieh		Date 日期 November 15, 2017
Residence: 住所： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan		
Mailing Address: 通讯地址： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan		

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Docket No: Q231501
Chung-Chuan HSIEH, et al.	Allowed: October 2, 2017
Appln. No.: 15/441,644	Group Art Unit: 2896
Confirmation No.: 6962	Examiner: NARAGHI, ALI
Filed: February 24, 2017	

For: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

AMENDMENT UNDER 37 C.F.R. §1.312
AND
RESPONSE TO NOTICE TO FILE CORRECTED APPLICATION PAPERS

MAIL STOP ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Pursuant to the provisions of 37 C.F.R. §1.312 **and** in response to the "Notice to File Corrected Application Papers-Notice of Allowance mailed", dated October 31, 2017, please amend the above-identified application as follows on the accompanying pages.

TABLE OF CONTENTS

AMENDMENTS TO THE DRAWINGS 2

AMENDMENTS TO THE CLAIMS 3

REMARKS 9

AMENDMENTS TO THE DRAWINGS

Submitted herewith is a replacement drawing in which FIG. 3 is amended to overcome the drawing objections. No new matter is added.

Attachment: 1 Replacement Sheet(s)

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (previously presented): A light emitting device comprising:

at least one electrode portion; and

a resin housing containing a reflecting material and covering a portion of said at least one electrode portion,

wherein said at least one electrode portion comprises a wing portion which is exposed outside the housing, the wing portion extending in a length-wise direction of the wing portion along an edge of the housing and protruding from the housing in a width-wise direction of the wing portion, the length-wise direction being substantially perpendicular to the width-wise direction,

wherein the wing portion comprises:

a central area; and

at least one edge area having a length in the length-wise direction shorter than that of the central area, and

wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area,

wherein the at least one electrode portion further comprises an electrode portion cross section,

wherein the resin housing comprises at least one housing cross section,

wherein the at least one housing cross section is located in a vicinity of four corners of the resin housing, and

wherein the at least one housing cross section is not level with the electrode portion cross section.

2. (canceled).

3. (previously presented): The light emitting device according to claim 1, wherein the electrode portion cross section comprises at least one curved surface.

4. - 7. (canceled).

8. (previously presented): The light emitting device according to claim 1, wherein the at least one electrode portion comprises an inner side surface and a connecting surface, and the inner side surface and the connecting surface connect with each other to form a step surface.

9. (previously presented): The light emitting device according to claim 1, wherein the at least one recess is located at the connecting surface to form an uneven surface.

10. (currently amended): A light emitting device comprising:

at least one electrode portion having a wing portion; and

a resin housing containing a reflecting material,

wherein the wing portion comprises:

a central area protruding from the housing in a first direction away from the housing; and

at least one edge area protruding from an edge portion of the central area, in the first direction, and

wherein the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing,

wherein the at least one electrode portion further comprises an electrode portion cross section,

wherein the resin housing comprises at least one housing cross section,

wherein the at least one housing cross section is located in a vicinity of a comer of the resin housing,

wherein the at least one housing cross section is not level with the electrode portion cross section,

wherein the at least one edge area comprises two edge areas, and

wherein the two edge areas protrude from the central area in the first direction.

11. (original): The light emitting device according to claim 10, wherein the wing portion is exposed outside the resin housing.

12. (original): The light emitting device according to claim 11, wherein the wing portion comprises two edge areas.

13. (original): The light emitting device according to claim 12, wherein the two edge areas protrude from central area.

14. (canceled).

15. (previously presented): The light emitting device according to claim 10, wherein the at least one electrode portion cross section comprises a curved surface.

16. - 17. (canceled).

18. (previously presented): The light emitting device according to claim 10, wherein the at least one electrode portion further comprises a conductive layer.

19. (previously presented): The light emitting device according to claim 18, wherein the conductive layer is not located on a surface of the at least one electrode portion cross section.

20. (previously presented): The light emitting device according to claim 19, wherein the conductive layer is located on a surface of the central area.

21. (previously presented): The light emitting device according to claim 1, wherein the central area and the at least one edge area protrude from the housing in the width-wise direction.

22. (previously presented): The light emitting device according to claim 1, wherein the at least one edge area comprises two edge areas.

23. (previously presented): The light emitting device according to claim 22, wherein the two edge areas protrude from central area in the width-wise direction.

24. (previously presented): The light emitting device according to claim 22, wherein the central area is provided between the two edge areas along the length-wise direction.

25. (previously presented): The light emitting device according to claim 10, wherein a width, in a third direction substantially perpendicular to the first and second directions, of the at least one edge area is different from that of the central area.

26. - 27. (canceled).

28. (previously presented): The light emitting device according to claim 10, wherein the central area is provided between the two edge areas along a third direction substantially perpendicular to the first and second directions.

29. (previously presented): The light emitting device according to claim 1, wherein the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion.

30. (previously presented): The light emitting device according to claim 29, wherein the electrode portion cross section extends in a thickness direction of the at least one electrode portion.

31. (previously presented): The light emitting device according to claim 10, wherein the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion.

32. (previously presented): The light emitting device according to claim 31, wherein the electrode portion cross section extends in a thickness direction of the at least one electrode portion.

33. - 38. (canceled).

REMARKS

By way of this Amendment, Applicant hereby amends claim 10 for additional clarity.

The changes being made are editorial in nature and no question of new matter or questions of further search arise.

Entry and consideration of this Amendment are respectfully requested.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/Young H. Chon/

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WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: November 16, 2017

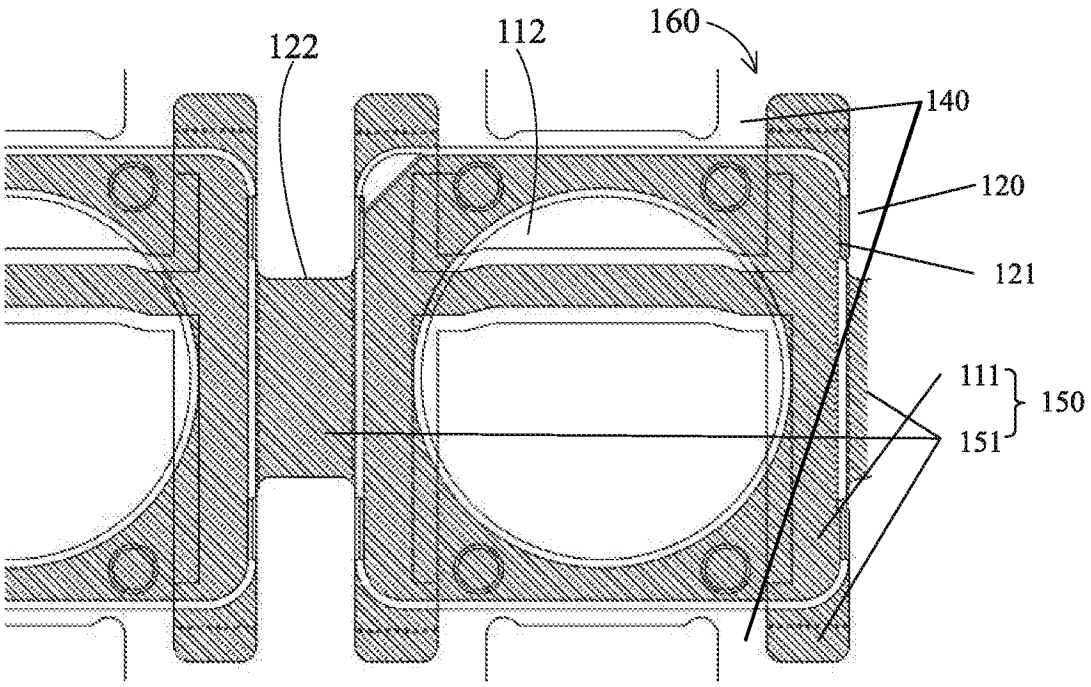


FIG. 3

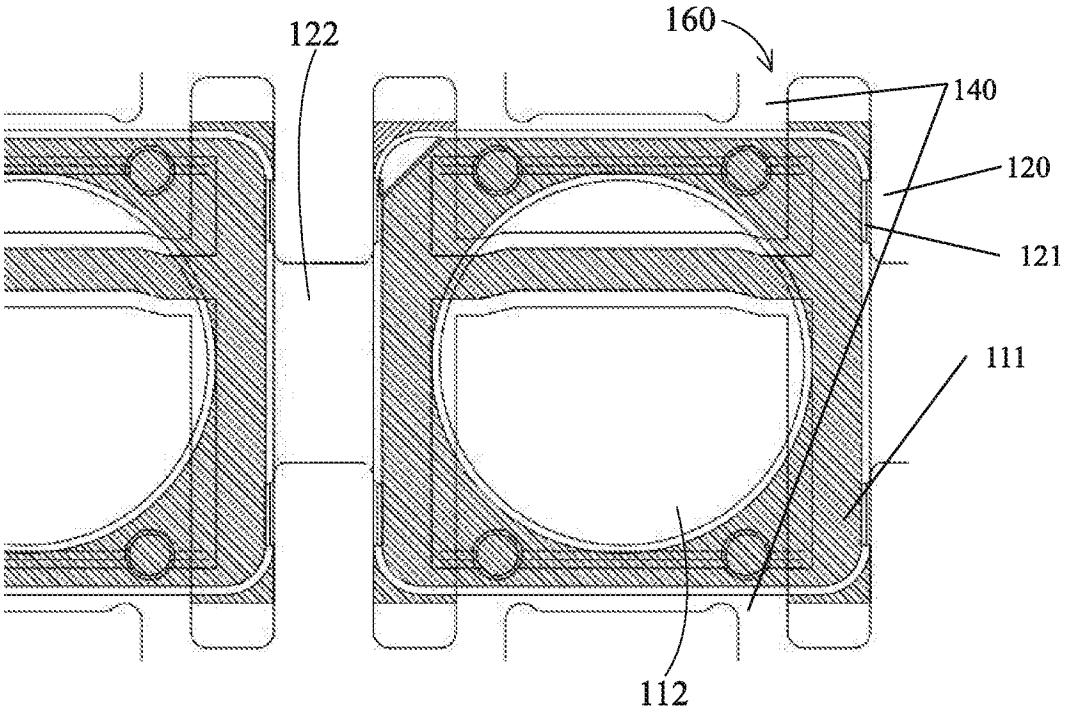


FIG. 4

Electronic Acknowledgement Receipt

EFS ID:	30973720
Application Number:	15441644
International Application Number:	
Confirmation Number:	6962
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Customer Number:	23373
Filer:	Natalya Dvorson/margaret ahn
Filer Authorized By:	Natalya Dvorson
Attorney Docket Number:	Q231501
Receipt Date:	16-NOV-2017
Filing Date:	24-FEB-2017
Time Stamp:	15:53:09
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Q231501Amendment312ResponsetoNFCAPasFiled.pdf	37371 5f5ff2be91b37ab67f67be47b8763c7b31058863	yes	9

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment after Notice of Allowance (Rule 312)	1	1
	Drawings-only black and white line drawings	2	2
	Claims	3	8
	Applicant Arguments/Remarks Made in an Amendment	9	9

Warnings:					
Information:					
2	Drawings-only black and white line drawings	Q231501ReplacementDrawingasFiled.pdf	270738 ed557969a210dafb4b4d430a3fdef376067639f4	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	308109		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15/441,644
Confirmation Number	6962
Filing Date	February 24, 2017
First Named Inventor	Chung-Chuan HSIEH
Art Unit	2896
Examiner Name	NARAGHI, ALI
Attorney Docket Number	Q231501

U.S. PATENTS

Examiner Initials*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear

U.S. PATENT APPLICATION PUBLICATIONS

Examiner Initials*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	1.	20130214298	A1	2013-08-22	Lin et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear	T[5]

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city, and/or country where published.	T[5]
	2.	Non Final Office Action issued in U.S. Application No. 15/470,009 dated August 10, 2017	

EXAMINER SIGNATURE

Examiner Signature	/ALI NARAGHI/	Date Considered	11/15/2017

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.N/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15/441,644
	Confirmation Number	6962
	Filing Date	February 24, 2017
	First Named Inventor	Chung-Chuan HSIEH
	Art Unit	2896
	Examiner Name	NARAGHI, ALI
	Attorney Docket Number	Q231501

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☑ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ That each item of information contained in the Information Disclosure Statement filed concurrently herewith: (i) was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement; or (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement. See 37 CFR 1.704(d).

☑ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☑ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

☐ None

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Loren H. Tung/	Date (YYYY-MM-DD)	2017-11-10
Name/Print	Loren H. Tung	Registration Number	64,236

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(Not for submission under 37 CFR 1.99)

Application Number	15/441,644
Confirmation Number	6962
Filing Date	February 24, 2017
First Named Inventor	Chung-Chuan HSIEH
Art Unit	2896
Examiner Name	NARAGHI, ALI
Attorney Docket Number	Q231501

U.S. PATENTS

Examiner Initials*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear

U.S. PATENT APPLICATION PUBLICATIONS

Examiner Initials*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	1.	20130214298	A1	2013-08-22	Lin et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear	T[5]

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city, and/or country where published.	T[5]
	2.	Non Final Office Action issued in U.S. Application No. 15/470,009 dated August 10, 2017	

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

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	Application Number	15/441,644
	Confirmation Number	6962
	Filing Date	February 24, 2017
	First Named Inventor	Chung-Chuan HSIEH
	Art Unit	2896
	Examiner Name	NARAGHI, ALI
	Attorney Docket Number	Q231501

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OR

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☐ That each item of information contained in the Information Disclosure Statement filed concurrently herewith: (i) was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement; or (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement. See 37 CFR 1.704(d).

☑ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☑ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

☐ None

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Loren H. Tung/	Date (YYYY-MM-DD)	2017-11-10
Name/Print	Loren H. Tung	Registration Number	64,236

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. 2 Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). 3 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 5 Applicant is to place a check mark here if English language translation is attached.

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Docket No: Q231501
Chung-Chuan HSIEH, et al.	Allowed: October 2, 2017
Appln. No.: 15/441,644	Group Art Unit: 2896
Confirmation No.: 6962	Examiner: NARAGHI, ALI
Filed: February 24, 2017	

For: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97 and 1.98

MAIL STOP ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the duty of disclosure under 37 C.F.R. § 1.56, Applicant hereby notifies the U.S. Patent and Trademark Office of the documents which are listed on the attached PTO/SB/08 (modified) form and/or listed herein and which the Examiner may deem material to patentability of the claims of the above-identified application.

One copy of each of the listed documents is submitted herewith, except for the following: U.S. patents and/or U.S. patent publications; and co-pending non-provisional U.S. applications filed after June 30, 2003.

The present Information Disclosure Statement is being filed after either a Final Office Action, Notice of Allowance, or an action that otherwise closes prosecution in the application (whichever is earlier), but on or before payment of the Issue Fee, and therefore the fee of $180.00 under 37 C.F.R. § 1.17(p) is being remitted, and a Statement Under 37 C.F.R. § 1.97(e) is being submitted.

The submission of the listed documents is not intended as an admission that any such document constitutes prior art against the claims of the present application. Applicant does not waive any right to take any action that would be appropriate to antedate or otherwise remove any listed document as a competent reference against the claims of the present application.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,
/Loren H. Tung/
Loren H. Tung
Registration No. 64,236

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: November 10, 2017

Electronic Patent Application Fee Transmittal

Application Number:	15441644
Filing Date:	24-Feb-2017
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Filer:	Loren H. Tung
Attorney Docket Number:	Q231501

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt

EFS ID:	30921427
Application Number:	15441644
International Application Number:	
Confirmation Number:	6962
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Customer Number:	23373
Filer:	Loren H. Tung
Filer Authorized By:	
Attorney Docket Number:	Q231501
Receipt Date:	10-NOV-2017
Filing Date:	24-FEB-2017
Time Stamp:	18:36:53
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$180
RAM confirmation Number	111317INTEFSW00015453194880
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Q231501IDSasfiled.pdf	49235 754b64c371b2f76e7c139d45dccd0f5bc5c14320	yes	4
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Information Disclosure Statement (IDS) Form (SB08)		3	4	
	Transmittal Letter		1	2	
Warnings:					
Information:					
2	Non Patent Literature	Q231501NFOANPLasFiled.pdf	832320 5456b550b5cefefab7d98f301cc0e79a215a0b90	no	17
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30354 e797fc92e3c4a4236d34691e0f5670ce4d987e9c	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	911909		

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

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New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501	6962

23373 7590 10/31/2017

SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER	
NARAGHI, ALI	

ART UNIT	PAPER NUMBER
2896	

NOTIFICATION DATE	DELIVERY MODE
10/31/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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sughrue@sughrue.com
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UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Application No. : 15441644
Applicant : Hsieh
Filing Date : 02/24/2017
Date Mailed : 10/31/2017

NOTICE TO FILE CORRECTED APPLICATION PAPERS

Notice of Allowance Mailed

This application has been accorded an Allowance Date and is being prepared for issuance. The application, however, is incomplete for the reasons below.

Applicant is given two (2) months from the mail date of this Notice within which to respond. This time period for reply is extendable under 37 CFR 1.136(a) for only TWO additional MONTHS.

The informalities requiring correction are indicated in the attachment(s). If the informality pertains to the abstract, specification (including claims) or drawings, the informality must be corrected with an amendment in compliance with 37 CFR 1.121 (or, if the application is a reissue application, 37 CFR 1.173). Such an amendment may be filed after payment of the issue fee if limited to correction of informalities noted herein. See Waiver of 37 CFR 1.312 for Documents Required by the Office of Patent Publication, 1280 Off. Gaz. Patent Office 918 (March 23, 2004). In addition, if the informality is not corrected until after payment of the issue fee, for purposes of 35 U.S.C. 154(b)(1)(iv), "all outstanding requirements" will be considered to have been satisfied when the informality has been corrected. A failure to respond within the above-identified time period will result in the application being ABANDONED.

See attachment(s).

A copy of this notice MUST be returned with the reply. Please address response to "Mail Stop Issue Fee, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450".

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Publication Branch
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(571) 272-4200

IDENTIFICATION OF DRAWING DEFICIENCIES

- [ ] There is a hole or the image thereof within the illustration. FIG(s)
- [ ] The illustration is penetrated or traversed by a solid or broken line that is not intended to be part of the drawing, such as a dark line caused by a flaw in the copying process. FIG(s)
- [ ] An ink stamp or the image thereof obscures part of the illustration. FIG(s)
- [ ] The drawing is marred by black smudges, obliterations, or fax/copier marks (for example, speckles or dots in a substantial portion of the drawing). FIG(s)
- [ ] Figure numbers are duplicated or missing. FIG(s)
- [ ] Drawing sheet or figure is missing. FIG(s)
- [ ] Numbers, letters, or reference characters in the drawing have been crossed out or are illegibly handwritten. FIG(s)
- [ ] The character of the lines, numbers, and letters is poor. FIG(s)
- [ ] The drawing's background shows that the original drawing was made on graph paper or other paper with a pattern or decoration. FIG(s)
- [ ] The FIG. number label is placed in a location that causes the drawing to be read upside down. FIG(s)
- [X] Data, a reference number, or part of the drawing is truncated or missing, or a lead line has no reference number. FIG(s) 3
- [ ] The drawing and/or the FIG. label contain(s) foreign language. FIG(s)
- [ ] This utility application contains a photograph of a view that is capable of being illustrated as a line drawing. FIG(s)
- [ ] A petition under 37 CFR 1.84(a)(2) to accept color drawings has been granted, but the brief description of the drawings in the specification does not contain (or has not been amended to contain) the paragraph required by 37 CFR 1.84(a)(2)(iii).
- [ ] This reissue application contains added and/or amended drawings that are not labeled as “New” or “Amended” or “Canceled” as required by 37 CFR 1.173(b)(3). FIG(s)
- [ ] This Design reissue application contains a drawing that is labeled as “Canceled” but is not surrounded by brackets, or a drawing that is surrounded by brackets but is not labeled as “Canceled.” See 37 CFR 1.173(b)(3). FIG(s)
- [ ] OTHER:
- [ ] COMMENTS:

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501	6962

23373 7590 10/25/2017

SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER
NARAGHI, ALI

ART UNIT	PAPER NUMBER
2896	

NOTIFICATION DATE	DELIVERY MODE
10/25/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PPROCESSING@SUGHRUE.COM
sughrue@sughrue.com
USPTO@sughrue.com

FH_000044

corrected **Notice of Allowability**	**Application No.** 15/441,644	**Applicant(s)** HSIEH ET AL.	
	Examiner ALI NARAGHI	**Art Unit** 2896	**AIA (First Inventor to File) Status** Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *09/22/2017*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1,3,8-13,15,18-25,28-32*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☒ All b) ☐ Some *c) ☐ None of the:
   1. ☒ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/ALI NARAGHI/
Primary Examiner, Art Unit 2896

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Young H Chon on 22/September/2017.

Please cancel claims 33-38, 26-27.

Please amend claim 10 as following: A light emitting device comprising:

at least one electrode portion having a wing portion: and a resin housing containing a reflecting material, wherein the wing portion comprises: a central area protruding from the housing in a first direction away from the housing; and at least one edge area protruding from an edge portion of the central area, in the first direction, and wherein the central area is recessed from the at least one edge area in a second direction wherein the at least one electrode portion further comprises an electrode portion cross section, wherein the resin housing comprises at least one housing cross section, wherein the at least one housing cross section is located in a vicinity of a comer

of the resin housing, ~~and~~ wherein the at least one housing cross section is not level with the electrode portion cross section~~.~~ , wherein the at least one edge area comprises two edge areas, and wherein the two edge areas protrude from central area in the first direction.

Please amend claim 28 as following: The light emitting device according to claim ~~26~~ 10 , wherein the central area is provided between the two edge area along a third direction substantially perpendicular to the first and second direction.

Allowable Subject Matter

Claims 1,3,8-13,15,18-25,28-32 are allowed.

The following is the reason for allowance of claim 1, wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area.

The following is the reason for allowance of claim 10: wherein the at least one edge area comprises two edge areas, wherein the two edge areas protrude from central are in the first direction.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hussell et al (US Pub No. 20120127720), Bando (US Pub No. 20070262328).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALI NARAGHI whose telephone number is (571)270-5720. The examiner can normally be reached on 9AM-6PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Such can be reached on 571-272-8895. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ALI NARAGHI/
Primary Examiner, Art Unit 2896

Notice of References Cited	Application/Control No. 15/441,644	Applicant(s)/Patent Under Reexamination HSIEH ET AL.	
	Examiner ALI NARAGHI	Art Unit 2896	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2007/0262328 A1	11-2007	Bando; Yoshitaka	H01L33/486	257/79
*	B	US-2012/0127720 A1	05-2012	Hussell; Christopher P.	H01L25/0753	362/249.02
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15441644	HSIEH ET AL.
	Examiner	**Art Unit**
	ALI NARAGHI	2896

CPC								
Symbol							**Type**	**Version**
H01L		33	/	62			F	2013-01-01
H01L		33	/	60			I	2013-01-01
H01L		33	/	56			I	2013-01-01
H01L		2933	/	0066			A	2013-01-01
H01L		2933	/	005			A	2013-01-01
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CPC Combination Sets								
Symbol						**Type**	**Set**	**Ranking**	**Version**
			/						
			/						

FH_000050

IKEA Supply AG
Exhibit 1002 Page 50 of 329

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	22	
/ALI NARAGHI/ Primary Examiner.Art Unit 2896	09/26/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15441644	HSIEH ET AL.
	Examiner	**Art Unit**
	ALI NARAGHI	2896

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
		H	0	1	R	43 / 00 (2006.01.01)						
CROSS REFERENCE(S)												
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)											

FH_000051

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	22	
/ALI NARAGHI/ Primary Examiner.Art Unit 2896	09/26/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15441644	HSIEH ET AL.
	Examiner	**Art Unit**
	ALI NARAGHI	2896

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1		17												
	2	16	18												
2	3	17	19												
	4	18	20												
	5	5	21												
	6	6	22												
	7	7	23												
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4	9	19	25												
11	10		26												
12	11		27												
13	12	20	28												
14	13	9	29												
	14	10	30												
15	15	21	31												
	16	22	32												

IKEA Supply AG
Exhibit 1002 Page 52 of 329

FH_000052

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 22	
/ALI NARAGHI/ Primary Examiner.Art Unit 2896 (Primary Examiner)	09/26/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

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NOTICE OF ALLOWANCE AND FEE(S) DUE

23373 7590 10/02/2017

SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

EXAMINER
NARAGHI, ALI

ART UNIT	PAPER NUMBER
2896	

DATE MAILED: 10/02/2017

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501	6962

TITLE OF INVENTION: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	01/02/2018

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

FH_000053

IKEA Supply AG
Exhibit 1002 Page 53 of 329

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: Mail **Mail Stop ISSUE FEE**
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
or Fax (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

23373 7590 10/02/2017
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission
I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501	6962

TITLE OF INVENTION: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$960	$0	$0	$960	01/02/2018

EXAMINER	ART UNIT	CLASS-SUBCLASS
NARAGHI, ALI	2896	257-099000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).
- ❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.
1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. The following fee(s) are submitted:
- ❑ Issue Fee
- ❑ Publication Fee (No small entity discount permitted)
- ❑ Advance Order - # of Copies _____

4b. Payment of Fee(s): **(Please first reapply any previously paid issue fee shown above)**
- ❑ A check is enclosed.
- ❑ Payment by credit card. Form PTO-2038 is attached.
- ❑ The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. **Change in Entity Status** (from status indicated above)
- ❑ Applicant certifying micro entity status. See 37 CFR 1.29 — NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
- ❑ Applicant changing to regular undiscounted fee status. — NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501	6962

23373 7590 10/02/2017

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SUITE 800
WASHINGTON, DC 20037

EXAMINER	
NARAGHI, ALI	
ART UNIT	**PAPER NUMBER**
2896	

DATE MAILED: 10/02/2017

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 15/441,644	Applicant(s) HSIEH ET AL.	
	Examiner ALI NARAGHI	Art Unit 2896	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *09/22/2017*.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on_____.
2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. ☒ The allowed claim(s) is/are *1,3,8-13,15,18-25,28-32*. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☒ All b) ☐ Some *c) ☐ None of the:
   1. ☒ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 09/22/2017,07/06/2017
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☒ Interview Summary (PTO-413), Paper No./Mail Date *20170926* .
5. ☒ Examiner's Amendment/Comment
6. ☒ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/ALI NARAGHI/
Primary Examiner, Art Unit 2896

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

DETAILED ACTION

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in an interview with Young H Chon on 22/September/2017.

Please cancel claims 33-38, 26-27.

Please amend claim 10 as following: A light emitting device comprising:

at least one electrode portion having a wing portion: and a resin housing containing a reflecting material, wherein the wing portion comprises: a central area protruding from the housing in a first direction away from the housing; and at least one edge area protruding from an edge portion of the central area, in the first direction, and wherein the central area is recessed from the at least one edge area in a second direction wherein the at least one electrode portion further comprises an electrode portion cross section, wherein the resin housing comprises at least one housing cross section, wherein the at least one housing cross section is located in a vicinity of a comer

of the resin housing, and wherein the at least one housing cross section is not level with the electrode portion cross section~~.~~ ; wherein the at least one edge area comprises two edge areas, wherein the two edge areas protrude from central are in the first direction.

Please amend claim 28 as following: The light emitting device according to claim ~~26~~ 10 , wherein the central area is provided between the two edge area along a third direction substantially perpendicular to the first and second direction.

Allowable Subject Matter

Claims 1,3,8-13,15,18-25,28-32 are allowed.

The following is the reason for allowance of claim 1, wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area.

The following is the reason for allowance of claim 10: wherein the at least one edge area comprises two edge areas, wherein the two edge areas protrude from central are in the first direction.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Hussell et al (US Pub No. 20120127720), Bando (US Pub No. 20070262328).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALI NARAGHI whose telephone number is (571)270-5720. The examiner can normally be reached on 9AM-6PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Such can be reached on 571-272-8895. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ALI NARAGHI/
Primary Examiner, Art Unit 2896

Examiner-Initiated Interview Summary	Application No.	Applicant(s)	
	15/441,644	HSIEH ET AL.	
	Examiner	Art Unit	
	ALI NARAGHI	2896	

All participants (applicant, applicant's representative, PTO personnel):

(1) *ALI NARAGHI*.

(3) *Young H Chon*.

(2) _____.

(4) _____.

Date of Interview: *22/September/2017*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☐ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1 and 10*.

Identification of prior art discussed: _____.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Please refer to examiner amendment.

Applicant recordation instructions: It is not necessary for applicant to provide a separate record of the substance of interview.

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☐ Attachment

/ALI NARAGHI/ Primary Examiner, Art Unit 2896	

Notice of References Cited	Application/Control No. 15/441,644	Applicant(s)/Patent Under Reexamination HSIEH ET AL.	
	Examiner ALI NARAGHI	Art Unit 2896	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2007/0262328 A1	11-2007	Bando; Yoshitaka	H01L33/486	257/79
*	B	US-2012/0127720 A1	05-2012	Hussell; Christopher P.	H01L25/0753	362/249.02
	C	US-				
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15441644	HSIEH ET AL.
	Examiner	Art Unit
	ALI NARAGHI	2896

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

SEARCH NOTES		
Search Notes	Date	Examiner
Searched East	6/4/2017	AN
Searched East	9/26/2017	AN

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
	Please refer to east search report	9/26/2017	AN

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15441644	HSIEH ET AL.
	Examiner	**Art Unit**
	ALI NARAGHI	2896

CPC								
Symbol							**Type**	**Version**
H01L		33	/	62			F	2013-01-01
H01L		33	/	60			I	2013-01-01
H01L		33	/	56			I	2013-01-01
H01L		2933	/	0066			A	2013-01-01
H01L		2933	/	005			A	2013-01-01
			/					
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CPC Combination Sets									
Symbol							**Type**	**Set**	**Ranking**	**Version**
			/							
			/							

IKEA Supply AG
Exhibit 1002 Page 64 of 329

FH_000064

NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	20	
/ALI NARAGHI/ Primary Examiner.Art Unit 2896	09/26/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15441644	HSIEH ET AL.
	Examiner	**Art Unit**
	ALI NARAGHI	2896

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
		H	0	1	R	43 / 00 (2006.01.01)						

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				

IKEA Supply AG
Exhibit 1002 Page 65 of 329

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	20	
/ALI NARAGHI/ Primary Examiner.Art Unit 2896	09/26/2017	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	1

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15441644	HSIEH ET AL.
	Examiner	**Art Unit**
	ALI NARAGHI	2896

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	1		17												
	2	15	18												
2	3	16	19												
	4	17	20												
	5	5	21												
	6	6	22												
	7	7	23												
3	8	8	24												
4	9	17	25												
11	10		26												
12	11		27												
13	12	18	28												
14	13	9	29												
	14	10	30												
	15	19	31												
	16	20	32												

FH_000066

IKEA Supply AG
Exhibit 1002 Page 66 of 329

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 20	
/ALI NARAGHI/ Primary Examiner.Art Unit 2896 (Primary Examiner)	09/26/2017 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 1

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15/441,644
Confirmation Number	6962
Filing Date	February 24, 2017
First Named Inventor	Chung-Chuan HSIEH
Art Unit	2896
Examiner Name	NARAGHI, ALI
Attorney Docket Number	Q231501

U.S. PATENTS

Examiner Initials*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	1.	9030096	B2	2015-05-12	KOBAYASHI	
	2.	7462870	B2	2008-12-09	NAKASHIMA	
	3.	8686464	B2	2014-04-01	INOUE et al.	
	4.	8487328	B2	2013-07-16	NAKABAYASHI	
	5.	9035343	B2	2015-05-19	ZHANG	

U.S. PATENT APPLICATION PUBLICATIONS

Examiner Initials*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	6.	20160365495	A1	2016-12-15	IKENAGA et al	
	7.	20060175716	A1	2006-08-10	NAKASHIMA	
	8.	20140197438	A1	2014-07-17	OH et al	
	9.	20120104427	A1	2012-05-03	CHAN et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear	T[5]
	10.	2014060343	JP	A	2014-04-03	SANKEN ELECTRIC Co., Ltd.		Abstract
	11.	2014017460	JP	A	2014-01-30	FUSHENG Ind., Co., Ltd.		Abstract
	12.	201340410	TW	A	2013-10-01	ADVANCED SEMICONDUCTOR Eng.		Abstract
	13.	20100083907	KR	A	2010-07-23	SUL MYUNG SOON		Abstract

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city, and/or country where published.	T[5]
	14.	U.S. Notice of Allowance issued in U.S. Application No.: 15/441,582, dated 04/06/2017	
	15.	TW Office Action issued in TW 105127459 dated 04/21/2017	

EXAMINER SIGNATURE

Examiner Signature	/ALI NARAGHI/	Date Considered	09/26/2017

FH_000067

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. 2 Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). 3 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 5 Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.N/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15/441,644
	Confirmation Number	6962
	Filing Date	February 24, 2017
	First Named Inventor	Chung-Chuan HSIEH
	Art Unit	2896
	Examiner Name	NARAGHI, ALI
	Attorney Docket Number	Q231501

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☑ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ That each item of information contained in the Information Disclosure Statement filed concurrently herewith: (i) was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement; or (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement. See 37 CFR 1.704(d).

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☑ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

☐ None

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Young H. Chon/	Date (YYYY-MM-DD)	2017-07-06
Name/Print	Young H. Chon	Registration Number	67967

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. 2 Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). 3 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 5 Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.N/

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BIB DATA SHEET

CONFIRMATION NO. 6962

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
15/441,644	02/24/2017	257	2896	Q231501

APPLICANTS

EVERLIGHT ELECTRONICS CO., LTD., New Taipei City, TAIWAN;

INVENTORS

Chung-Chuan HSIEH, New Taipei City, TAIWAN;
Yung Chieh CHEN, New Taipei City, TAIWAN;

**** CONTINUING DATA ***************************

This application is a DIV of 14/720,230 05/22/2015 PAT 9640733

**** FOREIGN APPLICATIONS ***************************

TAIWAN 103118060 05/23/2014
TAIWAN 104103527 02/03/2015

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

03/02/2017

Foreign Priority claimed ☑ Yes ☐ No 35 USC 119(a-d) conditions met ☑ Yes ☐ No Verified and Acknowledged /ALI NARAGHI/ Examiner's Signature	☐ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		TAIWAN	28	20	2

ADDRESS

SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037
UNITED STATES

TITLE

CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

FILING FEE RECEIVED	FEES: Authority has been given in Paper	☐ All Fees
2820	No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	☐ 1.16 Fees (Filing) ☐ 1.17 Fees (Processing Ext. of time) ☐ 1.18 Fees (Issue) ☐ Other _____ ☐ Credit

BIB (Rev. 05/07).

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	1	("20120127720").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/09/26 20:17
S1	104	elbow near2 gate	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/08/29 14:23
S2	128	elbow near2 electrode	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/08/29 14:24
S3	1618	h01l27/14614.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/08/29 14:55
S4	1513	S3 and @ad<"20160624"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/08/29 15:01
S5	20	("20030085415" | "20040092054" | "20040094784" | "20050133825" | "20050184291" | "20060186504" | "20060220069" | "20070045763" | "20070194213" | "20080121952" | "20080233695" | "20090084847" | "20090115017" | "20090173976" | "20090303371" | "20100090304" | "20110079832" | "20110180689" | "20110242388" | "7518172").PN. OR ("9420209").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/08/29 18:51
S6	2	("20060007338" | "6586807").PN. OR ("9245921").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/08/29 19:35
S7	0	JP02011159757	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2017/08/29 20:12

			DERWENT; IBM_TDB			
S8	1	JP2010019598	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/08/29 20:12
S9	8269	h01l27/1463.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/08/30 12:52
S10	601	S9 and (photo adj2 diode)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/08/30 12:53
S11	579	S10 and @ad<"20160624"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/08/30 12:53
S12	1	("9245921").PN.	USPAT; USOCR	OR	OFF	2017/08/30 14:52
S13	1	("20110181749").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/08/30 15:30
S14	1	("9245921").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2017/08/30 15:37
S15	2	("20160218138").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/08/31 19:38
S16	2	("20110181749").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/08/31 19:43

9/ 26/ 2017 8:47:26 PM
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15/441,644
Confirmation Number	6962
Filing Date	February 24, 2017
First Named Inventor	Chung-Chuan HSIEH
Art Unit	2896
Examiner Name	NARAGHI, ALI
Attorney Docket Number	Q231501

U.S. PATENTS

Examiner Initials*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	1.	9640733	B2	2017-05-02	Hsieh et al.	

U.S. PATENT APPLICATION PUBLICATIONS

Examiner Initials*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	2.	20120162998	A1	2012-06-28	Takahashi et al.	
	3.	20030011048	A1	2003-01-16	Abbott et al.	
	4.	20070262328	A1	2007-11-15	Yoshitaka Bando	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear	T[5]

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city, and/or country where published.	T[5]
	5.	European Search Report issued in European Patent Application No. 17169634.7 dated June 22, 2017	

EXAMINER SIGNATURE

Examiner Signature	/ALI NARAGHI/	Date Considered	09/26/2017

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. 2 Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). 3 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 5 Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.N/

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	Art Unit	2896
	Examiner Name	NARAGHI, ALI
	Attorney Docket Number	Q231501

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☐ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ That each item of information contained in the Information Disclosure Statement filed concurrently herewith: (i) was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement; or (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement. See 37 CFR 1.704(d).

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☑ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

☐ None

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Young H. Chon/	Date (YYYY-MM-DD)	2017-09-22
Name/Print	Young H. Chon	Registration Number	67967

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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Application Number	15/441,644
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NON-PATENT LITERATURE DOCUMENTS

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	5.	European Search Report issued in European Patent Application No. 17169634.7 dated June 22, 2017	

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

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CERTIFICATION STATEMENT

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OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ That each item of information contained in the Information Disclosure Statement filed concurrently herewith: (i) was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement; or (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement. See 37 CFR 1.704(d).

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☑ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

☐ None

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23373
CUSTOMER NUMBER

SIGNATURE

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Signature	/Young H. Chon/	Date (YYYY-MM-DD)	2017-09-22
Name/Print	Young H. Chon	Registration Number	67967

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Electronic Acknowledgement Receipt

EFS ID:	30446795
Application Number:	15441644
International Application Number:	
Confirmation Number:	6962
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Customer Number:	23373
Filer:	Natalya Dvorson/margaret ahn
Filer Authorized By:	Natalya Dvorson
Attorney Docket Number:	Q231501
Receipt Date:	22-SEP-2017
Filing Date:	24-FEB-2017
Time Stamp:	13:39:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Q231501IDSasFiled.pdf	49506 f521a9bc22ec8e28a6e7a59a37be50b35513d1f1	yes	4

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Transmittal Letter	1	2
	Information Disclosure Statement (IDS) Form (SB08)	3	4

Warnings:					
Information:					
2	Non Patent Literature	Q231501ESSRasFiled.pdf	1761320 cf79a41c570372cc38b630e8b365203b988d785d	no	10
Warnings:					
Information:					
		Total Files Size (in bytes):	1810826		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Docket No: Q231501
Chung-Chuan HSIEH, et al.	
Appln. No.: 15/441,644	Group Art Unit: 2896
Confirmation No.: 6962	Examiner: NARAGHI, ALI
Filed: February 24, 2017	

For: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97 and 1.98

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the duty of disclosure under 37 C.F.R. § 1.56, Applicant hereby notifies the U.S. Patent and Trademark Office of the documents which are listed on the attached PTO/SB/08 (modified) form and/or listed herein and which the Examiner may deem material to patentability of the claims of the above-identified application.

One copy of each of the listed documents is submitted herewith, except for the following: U.S. patents and/or U.S. patent publications; and co-pending non-provisional U.S. applications filed after June 30, 2003.

The present Information Disclosure Statement is being filed: (1) No later than three months from the application's filing date; (2) Before the mailing date of the first Office Action on the merits (whichever is later); or (3) Before the mailing date of the first Office Action after filing a request for continued examination (RCE) under §1.114, and therefore, no Statement under 37 C.F.R. § 1.97(e) or fee under 37 C.F.R. § 1.17(p) is required.

The submission of the listed documents is not intended as an admission that any such document constitutes prior art against the claims of the present application. Applicant does not waive any right to take any action that would be appropriate to antedate or otherwise remove any listed document as a competent reference against the claims of the present application.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/Young H. Chon/

Young H. Chon
Registration No. 67967

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: September 22, 2017

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Chung-Chuan HSIEH, et al.

Appln. No.: 15/441,644

Confirmation No.: 6962

Filed: February 24, 2017

Docket No: Q231501

Group Art Unit: 2896

Examiner: NARAGHI, ALI

For: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

AMENDMENT UNDER 37 C.F.R. § 1.111
AND
STATEMENT OF SUBSTANCE OF INTERVIEW

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Office Action dated June 8, 2017, please amend the above-identified application as follows on the accompanying pages.

TABLE OF CONTENTS

AMENDMENTS TO THE CLAIMS 2

REMARKS 11

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): A light emitting device comprising:

at least one electrode portion; and

a resin housing containing a reflecting material and covering a portion of said at least one electrode portion,

~~wherein said at least one electrode portion is partially covered by the resin housing;~~

wherein said at least one electrode portion ~~further~~ comprises a wing portion which is exposed outside the housing, the wing portion extending in a length-wise direction of the wing portion along an edge of the housing and protruding from the housing in a width-wise direction of the wing portion, the length-wise direction being substantially perpendicular to the width-wise direction.

wherein the wing portion ~~further~~ comprises:

a central area; and

at least one edge area having a length in the length-wise direction shorter than that of the central area, and

wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area,

wherein the at least one electrode portion further comprises an electrode portion cross section,

wherein the resin housing comprises at least one housing cross section,

wherein the at least one housing cross section is located in a vicinity of four corners of the resin housing, and

wherein the at least one housing cross section is not level with the electrode portion cross section.

2. (canceled).

3. (currently amended): The light emitting device according to ~~claim 2~~claim 1, wherein the electrode portion cross section comprises at least one curved surface.

4. - 7. (canceled).

8. (currently amended): The light emitting device according to ~~claim 7~~claim 1, wherein the at least one electrode portion comprises an inner side surface and a connecting surface, and the inner side surface and the connecting surface connect with each other to form a step surface.

9. (currently amended): The light emitting device according to ~~claim 7~~claim 1, wherein the at least one recess is located at the connecting surface to form an uneven surface.

10. (currently amended): A light emitting device comprising:

at least one electrode portion having a wing portion; and

a resin housing containing a reflecting material,

~~wherein the at least one electrode portion comprises a wing portion, and~~

wherein the wing portion ~~further~~ comprises:

a central area protruding from the housing in a first direction away from the housing; and

at least one edge area protruding from an edge portion of the central area in the first direction, and

wherein the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing,

wherein the at least one electrode portion further comprises an electrode portion cross section,

wherein the resin housing comprises at least one housing cross section,

wherein the at least one housing cross section is located in a vicinity of a corner of the resin housing, and

wherein the at least one housing cross section is not level with the electrode portion cross section.

11. (original): The light emitting device according to claim 10, wherein the wing portion is exposed outside the resin housing.

12. (original): The light emitting device according to claim 11, wherein the wing portion comprises two edge areas.

13. (original): The light emitting device according to claim 12, wherein the two edge areas protrude from central area.

14. (canceled).

15. (currently amended): The light emitting device according to ~~claim 14~~claim 10, wherein the at least one electrode portion cross section comprises a curved surface.

16. - 17. (canceled).

18. (currently amended): The light emitting device according to ~~claim 17~~claim 10, wherein the at least one electrode portion further comprises a conductive layer.

19. (currently amended): The light emitting device according to claim 18, wherein the conductive layer is not located on ~~the~~ a surface of the at least one electrode portion cross section.

20. (currently amended): The light emitting device according to claim 19, wherein the conductive layer is located on ~~the~~ a surface of the central area.

21. (new): The light emitting device according to claim 1, wherein the central area and the at least one edge area protrude from the housing in the width-wise direction.

22. (new): The light emitting device according to claim 1, wherein the at least one edge area comprises two edge areas.

23. (new): The light emitting device according to claim 22, wherein the two edge areas protrude from central area in the width-wise direction.

24. (new): The light emitting device according to claim 22, wherein the central area is provided between the two edge areas along the length-wise direction.

25. (new): The light emitting device according to claim 10, wherein a width, in a third direction substantially perpendicular to the first and second directions, of the at least one edge area is different from that of the central area.

26. (new): The light emitting device according to claim 10, wherein the at least one edge area comprises two edge areas.

27. (new): The light emitting device according to claim 26, wherein the two edge areas protrude from central area in the first direction.

28. (new): The light emitting device according to claim 26, wherein the central area is provided between the two edge areas along a third direction substantially perpendicular to the first and second directions.

29. (new): The light emitting device according to claim 1, wherein the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion.

30. (new): The light emitting device according to claim 29, wherein the electrode portion cross section extends in a thickness direction of the at least one electrode portion.

31. (new): The light emitting device according to claim 10, wherein the electrode portion cross section corresponds to at least a portion of an outer surface of the wing portion.

32. (new): The light emitting device according to claim 31, wherein the electrode portion cross section extends in a thickness direction of the at least one electrode portion.

33. (new): A light emitting device comprising:

at least one electrode including an electrode cross section; and

a resin housing covering a portion of said at least one electrode and including at least one housing cross section,

wherein said at least one electrode comprises a wing portion which is exposed outside the housing, the wing portion extending in a first direction along an edge of the housing and protruding from the housing in a second direction, the first direction being substantially perpendicular to the second direction,

wherein the wing portion comprises:

a central area; and

two edge areas, each edge area having a length in the first direction different from that of the central area,

wherein the two edge areas protrude in the second direction from opposite end portions of the central area along the first direction, the central area being recessed in a third direction opposite to the second direction,

wherein the at least one housing cross section is located in a vicinity of a corner of the resin housing, and

wherein the at least one housing cross section is not level with the electrode cross section.

34. (new): The light emitting device according to claim 33, wherein the electrode cross section corresponds to at least a portion of an outer surface of the wing portion.

35. (new): The light emitting device according to claim 34, wherein the electrode cross section extends in a thickness direction of the at least one electrode.

36. (new): A light emitting device comprising:

an electrode including an electrode cross section; and

a resin housing covering at least a portion of the electrode and including at least one housing cross section,

wherein the electrode comprises a wing portion which is exposed outside the housing, the wing portion having a width in a first direction and having a length in a second direction substantially perpendicular to the first direction, the wing portion extending in the second direction along an edge of the housing and protruding from the housing in the first direction away from the housing,

wherein the wing portion comprises:

a central portion; and

two edge portions, each edge portion protruding from the central portion in the first direction away from the housing and the central portion,

wherein the central portion is recessed in a third direction opposite to the first direction toward the housing,

wherein the at least one housing cross section is located in a vicinity of a corner of the resin housing, and

wherein the at least one housing cross section is not level with the electrode cross section.

37. (new): The light emitting device according to claim 36, wherein the electrode cross section corresponds to at least a portion of an outer surface of the wing portion.

38. (new): The light emitting device according to claim 37, wherein the electrode cross section extends in a thickness direction of the at least one electrode.

REMARKS

Status of the Application

Claims 1-20 stand rejected. Of the claims, claims 1 and 10 are independent claims.

By way of this Amendment, Applicant amends independent claims 1 and 10 along with dependent claims 3, 5, 8, 9, 15, 16 and 18-20. Applicant cancels dependent claims 2, 4- 7, 14, 16 and 17 and adds new claims 21-38. Therefore, claims 1, 3, 8, 9-13, 15 and 18-38 are all the claims pending in the application.

Support for Amendments

Applicant submits that the support for amended claims 1 and 10 can be found in, for example, paragraphs [0041], [0060] and [0069] along with FIG. 17D of the originally-filed Specification. No new matter has been added. Reconsideration and allowance of the subject application are respectfully requested.

Statement of Substance of Interview

Applicant thanks the Examiner for the courtesies extended during the interview conducted between the Examiner and the Applicant's undersigned representative on August 16, 2017. During the interview, Applicant's representative and the Examiner discussed Applicant's proposed amendments. In response, the Examiner has provided additional references related to the proposed amendments.

It is respectfully submitted that the instant STATEMENT OF SUBSTANCE OF INTERVIEW complies with the requirements of 37 C.F.R. §§1.2 and 1.133 and M.P.E.P. §713.04.

Claim Rejections - 35 U.S.C. § 103

Claims 1-17 is/are rejected under 35 U.S.C. 103 as allegedly being unpatentable over SEO et al (US Pub No. 20110193111; hereinafter "Seo"), in view of Kida et al (US Pub No. 20040016873; hereinafter "Kida"). Applicant submits the following arguments in traversal of this rejection.

Claim 1

Applicant respectfully submits that claim 1 is patentable because Seo fails to disclose or reasonably suggest each and every element of the claim.

For example, Seo fails to disclose or reasonably suggest a light emitting device where:

i) the wing portion (112A) extends in a length-wise direction of the wing portion along an edge of the housing (111);

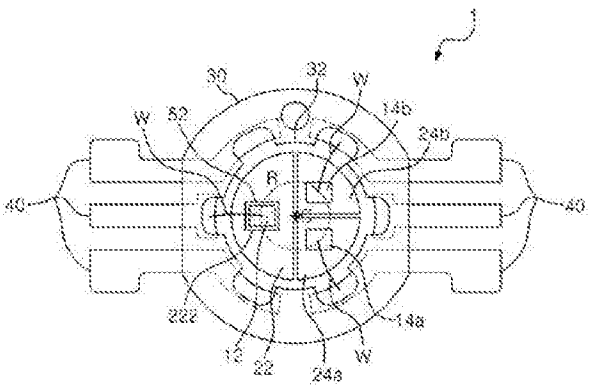
ii) the wing portion (112A) protrudes from the housing (111) in a width-wise direction of the wing portion;

iii) at least one edge (112A2) area has a length in the length-wise direction shorter than that of the central area (112A1); and

iv) the at least one edge area (112A2) protrudes in the width-wise direction from an end portion of the central area (112A1).

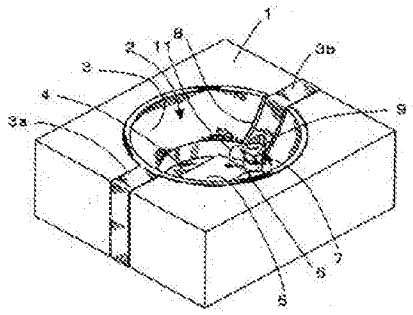
To the contrary, even under the broadest reasonable interpretation afforded to the Examiner, the lead frame 40 of Seo does not meet the claimed features described in iii) and iv) of above.

Fig. 2



Seo

FIG. 1



Kida

In addition, Kida fails to cure the deficiency of Seo. Therefore, Applicant submits that independent claim 1 and corresponding dependent claims are patentable over the cited references.

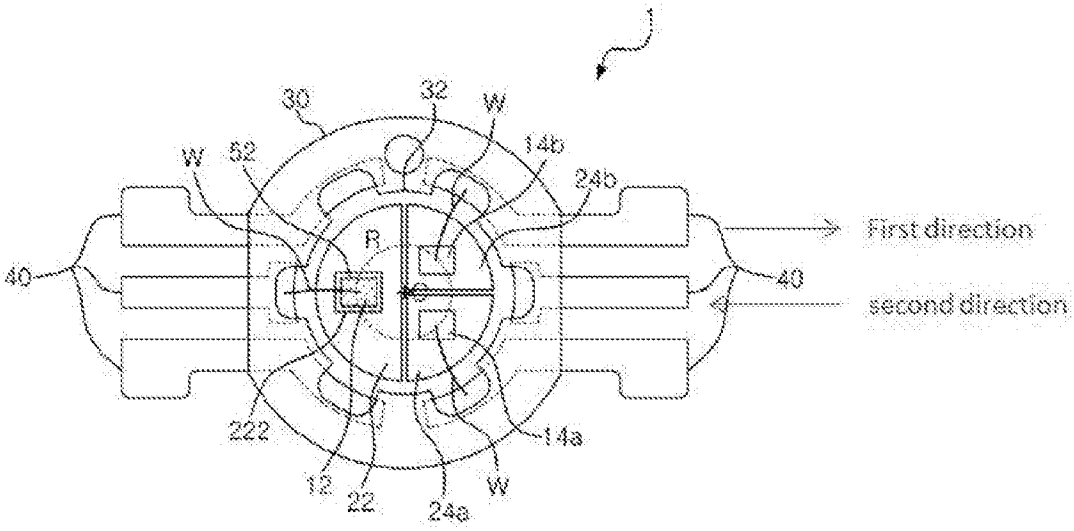
Claim 10

Applicant respectfully submits that claim 10 is patentable because Seo fails to disclose or reasonably suggest each and every element of the claim.

For example, Seo fails to disclose or reasonably suggest a light emitting device where " the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing," as claimed.

Referring to the annotated FIG. 2 of Seo reproduced below, Seo does not disclose or reasonably suggest a light emitting device where "the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing."

Fig. 2



In addition, Kida fails to cure the deficiency of Seo. Therefore, Applicant submits that independent claim 10 and corresponding dependent claims are patentable over the cited references.

New Claims

Applicant adds new dependent claims 21-28. Applicant also adds new claims 29 and 30.

Applicant submits that claims 21-28 are patentable at least for the virtue of their dependencies. Applicant submits that claims 29 and 30 are patentable at least for the reasons submitted for independent claims 1 and 10.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the

Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/Young H. Chon/

Young H. Chon
Registration No. 67967

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: September 6, 2017

Electronic Patent Application Fee Transmittal

Application Number:	15441644
Filing Date:	24-Feb-2017
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Filer:	Natalya Dvorson/margaret ahn
Attorney Docket Number:	Q231501

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	10	80	800
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	1	420	420
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1220**

Electronic Acknowledgement Receipt

EFS ID:	30283324
Application Number:	15441644
International Application Number:	
Confirmation Number:	6962
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Customer Number:	23373
Filer:	Natalya Dvorson/margaret ahn
Filer Authorized By:	Natalya Dvorson
Attorney Docket Number:	Q231501
Receipt Date:	06-SEP-2017
Filing Date:	24-FEB-2017
Time Stamp:	14:36:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1220
RAM confirmation Number	090717INTEFSW14363100
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Q231501Amendment111SSIasFiled.pdf	152723 92d50090c3c7f6ec6887ce179d67c917578e5950	yes	15

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Claims	2	10
	Applicant Arguments/Remarks Made in an Amendment	11	15

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	31918 b5ea33bb2f061f666dc0e642adb61aa1fdc6f257	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	184641	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/441,644	Filing Date 02/24/2017	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).			
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	09/06/2017	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 30	Minus	** 20	= 10	X $80 =	800
	Independent (37 CFR 1.16(h))	* 4	Minus	***3	= 1	X $420 =	420
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	1220

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

LIE
TERRANCE LAWRENCE

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**
If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

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FAX

Date	August , 2017		
To:	Examiner NARAGHI, ALI		
Of:	PTO Group Art Unit 2896		
Fax	571-270-6720		
From:	Young H. Chon, #67,967 (telephone no. 202-663-7397)		
Subject	Agenda for Interview- TBD		
Our Ref	Q231501	Appln No	15/441,644
Conf No	6962	Inventors	Chung-Chuan HSIEH
Pages			

Please call attention to problems with this transmission by return fax or telephone. Thank you.

THE INFORMATION CONTAINED IN THIS COMMUNICATION IS CONFIDENTIAL, MAY BE ATTORNEY-CLIENT PRIVILEGED, AND IS INTENDED ONLY FOR THE USE OF THE ADDRESSEE. UNAUTHORIZED USE, DISCLOSURE OR COPYING IS STRICTLY PROHIBITED AND MAY BE UNLAWFUL. IF YOU HAVE RECEIVED THIS COMMUNICATION IN ERROR, PLEASE IMMEDIATELY NOTIFY US.

Please see attached Agenda for the interview to be scheduled.

Sughrue
SUGHRUE MION, PLLC

AGENDA

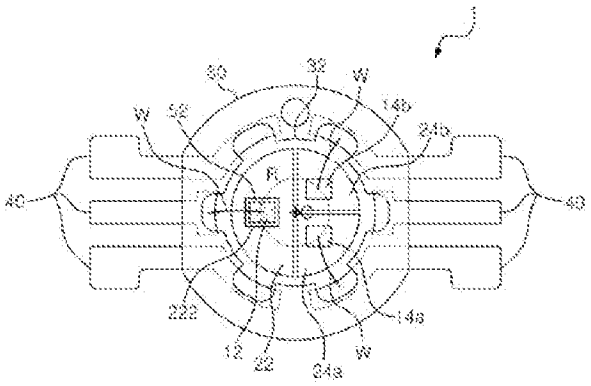
Examiner: NARAGHI, ALI

Please review the attached proposed claim amendments of below. We would like to discuss the proposed amendments with you.

Claim Rejections - 35 U.S.C. § 103

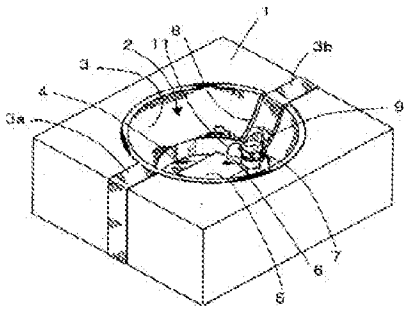
Claims 1-17 is/are rejected under 35 U.S.C. 103 as allegedly being unpatentable over SEO et al (US Pub No. 20110193111; hereinafter "Seo"), in view of Kida et al (US Pub No. 20040016873; hereinafter "Kida").

Fig. 2



Seo

FIG. 1



Kida

Claim 1

Referring to the Office Action, the Examiner alleges that a lead frame 40 of Seo, protruding from a housing 30, corresponds to the recited wing portion.

To advance the prosecution of the instant Application, Applicant amends independent claim 1 to highlight the following features:

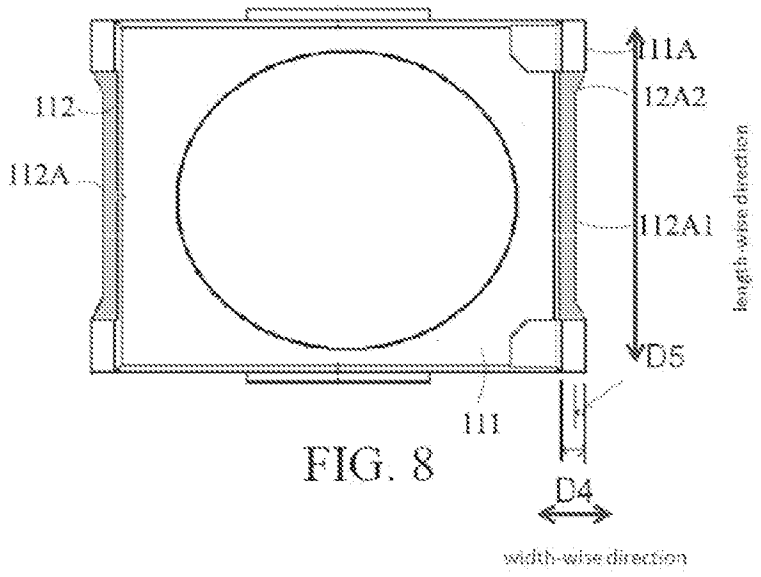


FIG. 8

i) the wing portion (112A) extends in a length-wise direction of the wing portion along an edge of the housing (111);

ii) the wing portion (112A) protrudes from the housing (111) in a width-wise direction of the wing portion;

iii) at least one edge (112A2) area has a length in the length-wise direction shorter than that of the central area (112A1); and

iv) the at least one edge area (112A2) protrudes in the width-wise direction from an end portion of the central area (112A1).

To the contrary, even under the broadest reasonable interpretation afforded to the Examiner, the lead frame 40 of Seo does not meet the claimed features described in iii) and iv) of above.

Claim 10

For independent claim 10, Applicant amends independent claim 10 to recite that "the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing."

Please refer to the annotated FIG. 22 of the instant Application reproduced below.

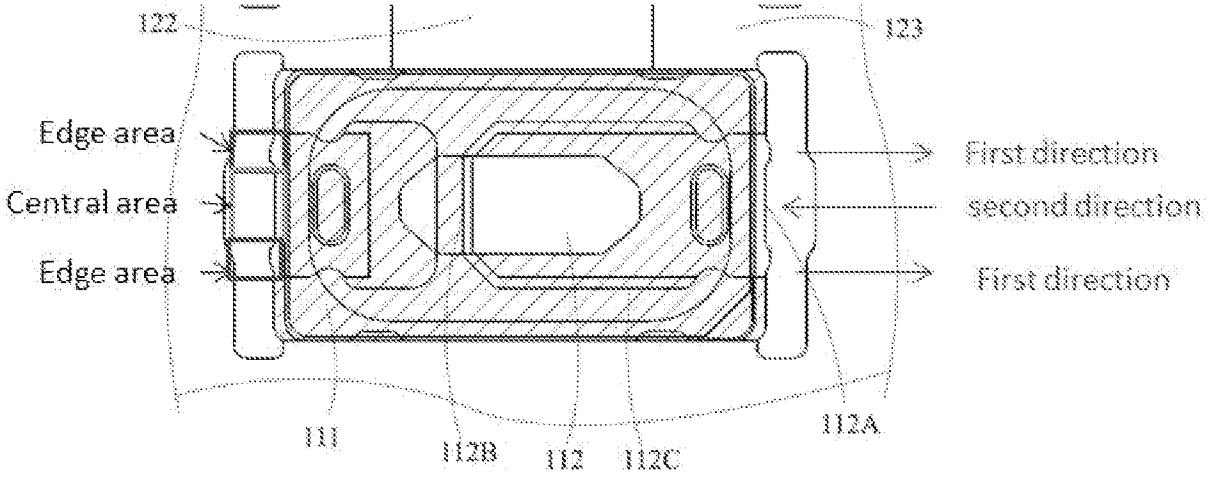
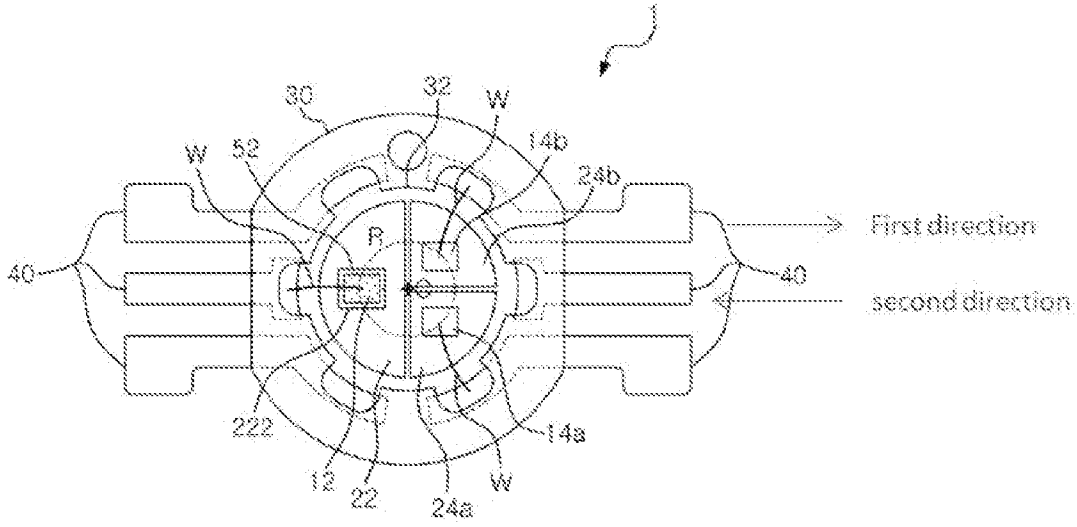


FIG. 22

With respect to overcoming the outstanding rejections, referring to the annotated FIG. 2 of Seo reproduced below, Seo does not disclose or reasonably suggest a light emitting device where "the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing."

Fig. 2



Independent Claims 29 and 30

Independent claims 29 and 30 recite similar features as independent claims 1 and 10.

Thank you,

Young H. Chon

CLAIMS FOR DISCUSSION ONLY; NOT TO BE ENTERED

LISTING OF CLAIMS:

1. (currently amended): A light emitting device comprising:

at least one electrode portion; and

a resin housing containing a reflecting material and covering a portion of said at least one electrode portion,

~~wherein said at least one electrode portion is partially covered by the resin housing,~~

wherein said at least one electrode portion ~~further~~ comprises a wing portion which is exposed outside the housing, the wing portion extending in a length-wise direction of the wing portion along an edge of the housing and protruding from the housing in a width-wise direction of the wing portion, the length-wise direction being substantially perpendicular to the width-wise direction,

wherein the wing portion ~~further~~ comprises:

a central area; and

at least one edge area having a length in the length-wise direction shorter than that of the central area, and

wherein the at least one edge area protrudes in the width-wise direction from an end portion of the central area.

2. (currently amended): The light emitting device according to claim 1, wherein the at least one electrode portion further comprises an electrode portion cross section.

3. (original): The light emitting device according to claim 2, wherein the electrode portion cross section comprises at least one curved surface.

4. (original): The light emitting device according to claim 3, wherein the resin housing further comprises at least one housing cross section.

5. (currently amended): The light emitting device according to claim 4, wherein the at least one housing cross section is located in ~~the~~ a vicinity of ~~the~~ four corners of the resin housing.

6. (currently amended): The light emitting device according to claim 5, wherein the at least one housing cross section is not level with the electrode portion cross section.

7. (original): The light emitting device according to claim 1, wherein the at least one electrode portion comprises at least one recess.

8. (original): The light emitting device according to claim 7, wherein the at least one electrode portion comprises an inner side surface and a connecting surface, and the inner side surface and the connecting surface connect with each other to form a step surface.

9. (currently amended): The light emitting device according to claim 7, wherein the at least one recess is located at the connecting surface to form an uneven surface.

10. (currently amended): A light emitting device comprising:

at least one electrode portion having a wing portion; and

a resin housing containing a reflecting material,

~~wherein the at least one electrode portion comprises a wing portion, and~~

wherein the wing portion ~~further~~ comprises:

a central area protruding from the housing in a first direction away from the housing; and

at least one edge area protruding from an edge portion of the central area in the first direction, and

wherein the central area is recessed from the at least one edge area in a second direction opposite from the first direction toward the housing.

11. (original): The light emitting device according to claim 10, wherein the wing portion is exposed outside the resin housing.

12. (original): The light emitting device according to claim 11, wherein the wing portion comprises two edge areas.

13. (original): The light emitting device according to claim 12, wherein the two edge areas protrude from central area.

14. (original): The light emitting device according to claim 13, wherein the resin housing further comprises at least one housing cross section and at least one electrode portion cross section.

15. (original): The light emitting device according to claim 14, wherein the at least one electrode portion cross section comprises a curved surface.

16. (currently amended): The light emitting device according to claim 15, wherein the at least one housing cross section is located in ~~the~~ a vicinity of ~~the~~ a corner of the resin housing.

17. (currently amended): The light emitting device according to claim 16, wherein the at least one housing cross section is not level with the at least one electrode portion cross section.

18. (currently amended): The light emitting device according to claim 17, wherein the at least one electrode portion further comprises a conductive layer.

19. (currently amended): The light emitting device according to claim 18, wherein the conductive layer is not located on ~~the~~ a surface of the at least one electrode portion cross section.

20. (currently amended): The light emitting device according to claim 19, wherein the conductive layer is located on ~~the~~ a surface of the central area.

21. (new): The light emitting device according to claim 1, wherein the central area and the at least one edge area protrude from the housing in the width-wise direction.

22. (new): The light emitting device according to claim 1, wherein the at least one edge area comprises two edge areas.

23. (new): The light emitting device according to claim 22, wherein the two edge areas protrude from central area in the width-wise direction.

24. (new): The light emitting device according to claim 22, wherein the central area is provided between the two edge areas along the length-wise direction.

25. (new): The light emitting device according to claim 10, wherein a width, in a third direction substantially perpendicular to the first and second directions, of the at least one edge area is different from that of the central area.

26. (new): The light emitting device according to claim 10, wherein the at least one edge area comprises two edge areas.

27. (new): The light emitting device according to claim 26, wherein the two edge areas protrude from central area in the first direction.

28. (new): The light emitting device according to claim 26, wherein the central area is provided between the two edge areas along a third direction substantially perpendicular to the first and second directions.

29. (new): A light emitting device comprising:

at least one electrode; and

a resin housing covering a portion of said at least one electrode,

wherein said at least one electrode comprises a wing portion which is exposed outside the housing, the wing portion extending in a first direction along an edge of the housing and protruding from the housing in a second direction, the first direction being substantially perpendicular to the second direction,

wherein the wing portion comprises:

a central area; and

two edge areas, each edge area having a length in the first direction different from that of the central area, and

wherein the two edge areas protrude in the second direction from opposite end portions of the central area along the first direction, the central area being recessed in a third direction opposite to the second direction.

30. (new): A light emitting device comprising:

an electrode; and

a resin housing covering at least a portion of the electrode,

wherein the electrode comprises a wing portion which is exposed outside the housing, the wing portion having a width in a first direction and having a length in a second direction substantially perpendicular to the first direction, the wing portion extending in the second direction along an edge of the housing and protruding from the housing in the first direction away from the housing,

wherein the wing portion comprises:

a central portion; and

two edge portions, each edge portion protruding from the central portion in the first direction away from the housing and the central portion, and

wherein the central portion is recessed in a third direction opposite to the first direction toward the housing.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501	6962

23373 7590 08/29/2017

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WASHINGTON, DC 20037

EXAMINER
NARAGHI, ALI

ART UNIT	PAPER NUMBER
2896	

NOTIFICATION DATE	DELIVERY MODE
08/29/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PPROCESSING@SUGHRUE.COM
sughrue@sughrue.com
USPTO@sughrue.com

Applicant-Initiated Interview Summary	Application No.	Applicant(s)	
	15/441,644	HSIEH ET AL.	
	Examiner	Art Unit	
	ALI NARAGHI	2896	

All participants (applicant, applicant's representative, PTO personnel):

(1) *ALI NARAGHI*.

(3) *Young Chon*.

(2) _____.

(4) _____.

Date of Interview: *16 August 2017*.

Type: ☒ Telephonic ☐ Video Conference
☐ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☐ Yes ☒ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☐103 ☒Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1*.

Identification of prior art discussed: _____.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

Applicant discussed their proposed amendments with examiner. Examiner showed the applicant some prior arts such as Hussell et al (US Pub No. 20120127720), and Bando (US Pub No. 20070262328) that would read on the proposed amendments.

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☒ Attachment

/ALI NARAGHI/ Primary Examiner, Art Unit 2896	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	15/441,644
Confirmation Number	6962
Filing Date	February 24, 2017
First Named Inventor	Chung-Chuan HSIEH
Art Unit	2896
Examiner Name	NARAGHI, ALI
Attorney Docket Number	Q231501

U.S. PATENTS

Examiner Initials*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	1.	9030096	B2	2015-05-12	KOBAYASHI	
	2.	7462870	B2	2008-12-09	NAKASHIMA	
	3.	8686464	B2	2014-04-01	INOUE et al.	
	4.	8487328	B2	2013-07-16	NAKABAYASHI	
	5.	9035343	B2	2015-05-19	ZHANG	

U.S. PATENT APPLICATION PUBLICATIONS

Examiner Initials*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	6.	20160365495	A1	2016-12-15	IKENAGA et al	
	7.	20060175716	A1	2006-08-10	NAKASHIMA	
	8.	20140197438	A1	2014-07-17	OH et al	
	9.	20120104427	A1	2012-05-03	CHAN et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear	T[5]
	10.	2014060343	JP	A	2014-04-03	SANKEN ELECTRIC Co., Ltd.		Abstract
	11.	2014017460	JP	A	2014-01-30	FUSHENG Ind., Co., Ltd.		Abstract
	12.	201340410	TW	A	2013-10-01	ADVANCED SEMICONDUCTOR Eng.		Abstract
	13.	20100083907	KR	A	2010-07-23	SUL MYUNG SOON		Abstract

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city, and/or country where published.	T[5]
	14.	U.S. Notice of Allowance issued in U.S. Application No.: 15/441,582, dated 04/06/2017	
	15.	TW Office Action issued in TW 105127459 dated 04/21/2017	

EXAMINER SIGNATURE

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. 2 Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). 3 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 5 Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	15/441,644
	Confirmation Number	6962
	Filing Date	February 24, 2017
	First Named Inventor	Chung-Chuan HSIEH
	Art Unit	2896
	Examiner Name	NARAGHI, ALI
	Attorney Docket Number	Q231501

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

☑ That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

☐ That each item of information contained in the Information Disclosure Statement filed concurrently herewith: (i) was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement; or (ii) is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the Information Disclosure Statement. See 37 CFR 1.704(d).

☐ The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☑ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

☐ None

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Young H. Chon/	Date (YYYY-MM-DD)	2017-07-06
Name/Print	Young H. Chon	Registration Number	67967

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. 2 Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). 3 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 5 Applicant is to place a check mark here if English language translation is attached.

Electronic Acknowledgement Receipt

EFS ID:	29705170
Application Number:	15441644
International Application Number:	
Confirmation Number:	6962
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Customer Number:	23373
Filer:	Natalya Dvorson/margaret ahn
Filer Authorized By:	Natalya Dvorson
Attorney Docket Number:	Q231501
Receipt Date:	06-JUL-2017
Filing Date:	24-FEB-2017
Time Stamp:	15:24:07
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Non Patent Literature	Q231501NPLNoticeofAllowanceissuedinUSApplication15441582Dated040617.pdf	790239 28095dad867b4b86956865077cdb2179ca3b7de1	no	12

Warnings:

Information:					
2	Foreign Reference	Q231501REFJP2014060343withAbstract.pdf	1356362 f2cf040c8b4eeb599559b6d98755c867bbc079b9	no	19
Warnings:					
Information:					
3	Foreign Reference	Q231501REFJP2014017460withAbstract.pdf	1411494 659c06967128189e6a775ab75caf860a05cc0500	no	23
Warnings:					
Information:					
4	Foreign Reference	Q231501REFTW201340410withAbstract.pdf	1745976 909a72cfd87def82df4a39e186c6eedaedfa0f8f	no	31
Warnings:					
Information:					
5	Foreign Reference	Q231501REFKR1020100083907withAbstract.pdf	1441238 3389980249cf2c3d5dbbc3cb2f5d16c1a82c636d	no	14
Warnings:					
Information:					
6		Q231501IDSasFiledd.pdf	52021 292284bcd156fbc52471ae6f9ab6a9106db08ff0	yes	4

Multipart Description/PDF files in .zip description

Document Description	Start	End
Transmittal Letter	1	2
Information Disclosure Statement (IDS) Form (SB08)	3	4

Warnings:					
Information:					
7	Non Patent Literature	Q231501TWOAasFiled.pdf	583289 ca489ca9e3dbd6424fc1a1eef707f1e52084b239	no	6
Warnings:					
Information:					

Total Files Size (in bytes):	7380619

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Espacenet

Bibliographic data: JP2014060343 (A) — 2014-04-03

METHOD OF MANUFACTURING LIGHT-EMITTING DIODE, LIGHT-EMITTING DIODE

Inventor(s): KATO TAKASHI ± (KATO TAKASHI)

Applicant(s): SANKEN ELECTRIC CO LTD ± (SANKEN ELECTRIC CO LTD)

Classification: - international: ***H01L23/29; H01L23/31; H01L33/60; H01L33/62***
- cooperative: **H01L24/97**; H01L2224/48091; H01L2224/48247; H01L2224/48464; H01L2924/12041; H01L2924/181 more

Application number: JP20120205789 20120919 Global Dossier

Priority number(s): JP20120205789 20120919

Abstract of JP2014060343 (A)

PROBLEM TO BE SOLVED: To facilitate manufacture of a light-emitting diode configured so that a lead terminal is projecting from a reflective layer.SOLUTION: A reflective layer 13 is formed on the entire lead frame. The reflective layer 13 is formed uniformly over a wide range on the entire lead frame, but it is open in a window 131 and a lead opening 132. As shown in Fig. 4(c), a light-emitting diode chip 14 is mounted on a second lead frame 112 exposed in the window 131. As shown in Fig. 4(d), the window 131 is filled with a fluorescent material, and a fluorescent layer 16 is formed. A plurality of light-emitting diodes 10 can be obtained while being divided, by cutting between regions corresponding to adjoining light-emitting diodes by using a dicing saw. A lead frame opening 101 is divided into two, thereby forming lead frame notches 114, 113 of a light-emitting diode formed on both sides thereof. Similarly, a lead opening 132 is also divided into two, thereby two reflective layer notches 133.

(19)日本国特許庁(JP)　(12)公開特許公報(A)　(11)特許出願公開番号
特開2014-60343
(P2014-60343A)
(43)公開日　平成26年4月3日(2014.4.3)

(51)Int.Cl.		F I			テーマコード（参考）
H01L 33/62	(2010.01)	H01L	33/00	440	4M109
H01L 33/60	(2010.01)	H01L	33/00	432	5F142
H01L 23/29	(2006.01)	H01L	23/30	F	
H01L 23/31	(2006.01)				

審査請求 未請求　請求項の数 6　ＯＬ　（全 18 頁）

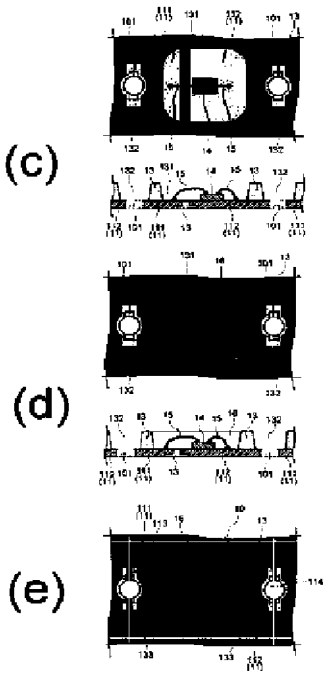
(21)出願番号　特願2012-205789 (P2012-205789)
(22)出願日　平成24年9月19日 (2012.9.19)

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Ｆターム(参考)　4M109 AA01 BA01 GA01
5F142 AA51 BA02 BA24 CA02 CC02
CC14 CC16 CC26 CE02 CE16
CE32 DA02 DA12 DA73 EA02
EA18 FA01 FA44 FA48

(54)【発明の名称】発光ダイオードの製造方法、発光ダイオード

(57)【要約】
【課題】反射層からリード端子が突出した構成の発光ダイオードを容易に製造する。
【解決手段】反射層１３を全体リードフレーム上に形成する。反射層１３は、全体リードフレーム上の広い範囲にわたり一様に形成されるが、窓部１３１とリード開口部１３２では開口した形態とされる。図４（ｃ）に示されるように、窓部１３１内部で露出した第２リードフレーム１１２上に発光ダイオードチップ１４を搭載する。図４（ｄ）に示されるように、窓部１３１内部に蛍光材料を充填し、蛍光層１６を形成する。隣接する発光ダイオードに対応した領域間をダイシングソーを用いて切断することによって、複数の発光ダイオード１０を分断して得る。リードフレーム開口部１０１が２つに分断され、その両側において形成される発光ダイオードのリードフレーム切り欠き部１１４、１１３となる。また、リード開口部１３２も同様に２つに分断されて２つの反射層切り欠き部１３３となる。
【選択図】図４



【特許請求の範囲】
【請求項１】
リードフレーム上に発光ダイオードチップを搭載し、当該発光ダイオードチップの周囲に蛍光層を介して反射層が形成された構成を具備する発光ダイオードを２次元配列させた状態で製造する、発光ダイオードの製造方法であって、
一つの発光ダイオードに対応する領域において、前記リードフレームは空隙を介して配置された第１リードフレームと第２リードフレームとを具備し、一方向で隣接する２つの発光ダイオードに対応した領域間においては、一方の発光ダイオードに対応した領域における前記第１リードフレームと他方の発光ダイオードに対応した領域における前記第２リードフレームとが連結して構成されるように、前記リードフレームが多数配列された構成を具備する全体リードフレームが用いられ、
前記全体リードフレーム上において、一つの発光ダイオードに対応する領域において前記第１リードフレームの一部と前記第２リードフレームの一部とを露出させる窓部と、前記一方向で隣接する２つの発光ダイオードに対応する領域の境界部分において前記全体リードフレームを露出させるリード開口部と、を具備した形態で前記全体リードフレームを覆う前記反射層を、トランスファーモールドによって形成する反射層形成工程と、
前記窓部の中における前記第１リードフレーム又は前記第２リードフレーム上に前記発光ダイオードチップを搭載し、前記発光ダイオードチップ中の両極をそれぞれ前記第１リードフレーム、前記第２リードフレームに接続するチップ搭載工程と、
前記窓部内に前記蛍光層を形成する蛍光層形成工程と、
前記一方向で隣接する２つの発光ダイオードに対応した領域の境界部分を前記一方向と垂直な他方向に沿って前記反射層及び前記全体リードフレームを切断し、かつ前記他方向において隣接する発光ダイオードに対応する領域間を前記一方向に沿って切断する切断工程と、
を具備することを特徴とする発光ダイオードの製造方法。
【請求項２】
前記全体リードフレームにおいて、前記リード開口部に対応した箇所に、前記リード開口部よりも小さなリードフレーム開口部が形成されたことを特徴とする請求項１に記載の発光ダイオードの製造方法。
【請求項３】
前記リードフレーム開口部は円形状とされたことを特徴とする請求項２に記載の発光ダイオードの製造方法。
【請求項４】
下面において前記リードフレーム開口部に隣接した箇所が局所的に薄肉加工された前記全体リードフレームが用いられ、
前記反射層形成工程において、
前記全体リードフレームの下面側において、前記リードフレーム開口部に隣接し局所的に薄肉加工された箇所に前記反射層を形成しないことを特徴とする請求項２又は３に記載の発光ダイオードの製造方法。
【請求項５】
下面において前記第１リードフレーム又は前記第２リードフレームの外周が局所的に薄肉加工された前記全体リードフレームが用いられ、
前記反射層形成工程において、
前記全体リードフレームの下面側において、前記外周が局所的に薄肉加工された箇所に前記反射層を形成することを特徴とする請求項１から請求項４までのいずれか１項に記載の発光ダイオードの製造方法。
【請求項６】
請求項１から請求項５までのいずれか１項に記載の発光ダイオードの製造方法によって製造されたことを特徴とする発光ダイオード。
【発明の詳細な説明】

【技術分野】
【０００１】
本発明は、ＬＥＤ（発光ダイオード）チップをリードフレーム上に搭載した構成を具備する発光ダイオード、その製造方法に関する。
【背景技術】
【０００２】
ＬＥＤ（発光ダイオード）が使用される際には、リードフレーム上に発光ダイオードチップが搭載され、この発光ダイオードに通電がされ、その発光が外部に取り出される形態とされる。高い発光効率を得るために、発光ダイオードチップの周囲には、その内面で光を反射させる反射層が形成される。また、白色発光ダイオードの場合には、白色を発光させるために必要となる蛍光層が反射層で囲まれた内部において発光ダイオードチップの周辺に形成される。反射層は樹脂材料で構成することができ、発光ダイオードチップの電極となるリード端子はこの反射層の両側から突出した形態とされる。
【０００３】
こうした構成の発光ダイオードの構造、製造方法は、例えば特許文献１に記載されている。ここでは、単一の全体リードフレームを用いて、多数の発光ダイオードが多数配列して同時に製造される。最後に全体リードフレーム等が縦横の２方向で切断されて、個々の発光ダイオードが分離されて得られる。
【０００４】
図８（ａ）～（ｆ）は、特許文献１の製造方法における各工程を全体リードフレーム９００に対応して上面から見た図である。
【０００５】
図８（ａ）は、この場合に用いられる全体リードフレーム９００の平面図である。図８（ａ）において破線で囲まれた領域が単一の発光ダイオードに対応したリードフレーム９１となる。リードフレーム９１は、発光ダイオードにおける両極に対応して左右２つの領域（第１リードフレーム９１１、第２リードフレーム９１２）に分割されている。図示されるように、この全体リードフレーム９００においては、リードフレーム９１が２次元配列して一体化した構成とされる。このため、全体リードフレーム９００においては、外枠部９０１が設けられており、外枠部９０１によって各リードフレーム９１（第１リードフレーム９１１、第２リードフレーム９１２）が一体化されている。また、この２次元配列における縦方向においては、隣接するリードフレーム９１間あるいはリードフレーム９１と外枠部９０１とは連結部９０２によって接続される。これによって、複数のリードフレーム９１が全体リードフレーム９００として一体化される。
【０００６】
この全体リードフレーム９００に対して、まず、図８（ｂ）に示されるように、反射層９２がトランスファーモールドによって所望の形状で形成される。反射層９２は、各リードフレーム９１上において搭載された発光ダイオードを取り囲むパターンで形成される。このため、反射層９２には窓部９２１が形成され、この窓部９２１中で各第１リードフレーム９１１、第２リードフレーム９１２の表面が露出する形態とされる。
【０００７】
その後、この各窓部９２１中において露出した第２リードフレーム９１２に発光ダイオードを搭載し、第１リードフレーム９１１、第２リードフレーム９１２に対して発光ダイオードにおける両極からそれぞれボンディングワイヤを接続した後に、図８（ｃ）に示されるように、各窓部９２１を埋め込むように蛍光層９３を形成する。窓部９２１の内面は、発光ダイオードが発した光を図８中の紙面上方に反射させるために、全体リードフレーム９００に対して傾斜角をもって形成されている。
【０００８】
その後、図８（ｄ）に示されるように図中上下方向に延伸するブレード（切断刃）２００を用いて上下における外枠部９０１が切断され、図８（ｅ）に示されるように左右方向に延伸するブレード２００を用いて左右における外枠部９０１及び連結部９０２（図示せ

ず）が切断される。これによって、図８（ｆ）に示されるように、個々の発光ダイオード９０が分割されて得られる。

【０００９】

図９は、この製造方法によって製造される発光ダイオード９０の上面図（ａ）、そのＤ－Ｄ方向の断面図（ｂ）、底面図（ｃ）である。この発光ダイオード９０においては、右側の第２リードフレーム９１２上に発光ダイオードチップ９４が搭載され、その両極が、それぞれ左側の第１リードフレーム９１１、右側の第２リードフレーム９１２にボンディングワイヤ９５で接続される。この構成によって、蛍光層９３中（リードフレーム９１上）の発光ダイオードチップ９４が発した光を蛍光層９３が吸収し、異なる波長の光が放出される。発光ダイオードが発した光と蛍光層９３が発した光は混合されて白色となり、共に蛍光層９３を取り囲む反射層９２の内面で反射され、図８（ｃ）における紙面の上方向に発せられる。これによって、この発光ダイオード９０は、高効率で白色の発光をすることができる。

【００１０】

また、第１リードフレーム９１１の左側端部、第２リードフレーム９１２の右側端部は反射層９２からそれぞれ左側、右側に突出している。この発光ダイオード９０を実装して使用する際には、この第１リードフレーム９１１、第２リードフレーム９１２におけるこの突出した部分をリード端子として用いることができ、これに対してはんだ付けを行い、発光ダイオード９０を基板上に固定し、配線を接続することができる。

【００１１】

上記の製造方法を用いて、この構造を具備する発光ダイオード９０を容易に製造することができる。

【先行技術文献】

【特許文献】

【００１２】

【特許文献１】特開２０１２－０６９８８５号公報

【発明の概要】

【発明が解決しようとする課題】

【００１３】

上記の製造方法において、反射層９２は、図８（ｂ）に示されるように、図中上下方向に延びる列では一体化されているが、左右方向に隣接する列の間では分離されて形成される。これは、前記の通り、反射層９２から左右方向に第１リードフレーム９１１、第２リードフレーム９１２が突出した部分をリード端子として用いるためである。このため、少なくとも図８における左右方向に隣接した２つの発光ダイオードに対応する領域の境界付近においては反射層９２は形成されない。

【００１４】

こうした反射層９２のパターンはトランスファーモールドによって形成することができるものの、そのパターンは図８（ｂ）中の上下方向において細長く、左右方向において隣接する発光ダイオードに対応する領域間で分離された形態となる。トランスファーモールドにおいては、反射層９２となる樹脂材料が液状の状態とされて金型中に流し込まれ、その後にこれを硬化させることによって、反射層９２とされる。この際、このパターニングを精密に行うためには、金型中がこの樹脂材料で空隙なく充填されることが必要であるが、このように独立した細長いパターンが多く存在する場合には、このパターンの金型を樹脂材料で空隙無く充填することが困難となる。このため、上記の形状をもつ反射層９２の精密なパターニングを行うことは実際には困難であった。

【００１５】

従って、反射層からリード端子が突出した構成の発光ダイオードを容易に製造することは困難であった。

【００１６】

本発明は、かかる問題点に鑑みてなされたものであり、上記問題点を解決する発明を提

供することを目的とする。

【課題を解決するための手段】

【００１７】

本発明は、上記課題を解決すべく、以下に掲げる構成とした。

本発明の半導体モジュールの製造方法は、リードフレーム上に発光ダイオードチップを搭載し、当該発光ダイオードチップの周囲に蛍光層を介して反射層が形成された構成を具備する発光ダイオードを２次元配列させた状態で製造する、発光ダイオードの製造方法であって、一つの発光ダイオードに対応する領域において、前記リードフレームは空隙を介して配置された第１リードフレームと第２リードフレームとを具備し、一方向で隣接する２つの発光ダイオードに対応した領域間においては、一方の発光ダイオードに対応した領域における前記第１リードフレームと他方の発光ダイオードに対応した領域における前記第２リードフレームとが連結して構成されるように、前記リードフレームが多数配列された構成を具備する全体リードフレームが用いられ、前記全体リードフレーム上において、一つの発光ダイオードに対応する領域において前記第１リードフレームの一部と前記第２リードフレームの一部とを露出させる窓部と、前記一方向で隣接する２つの発光ダイオードに対応する領域の境界部分において前記全体リードフレームを露出させるリード開口部と、を具備した形態で前記全体リードフレームを覆う前記反射層を、トランスファーモールドによって形成する反射層形成工程と、前記窓部の中における前記第１リードフレーム又は前記第２リードフレーム上に前記発光ダイオードチップを搭載し、前記発光ダイオードチップ中の両極をそれぞれ前記第１リードフレーム、前記第２リードフレームに接続するチップ搭載工程と、前記窓部内に前記蛍光層を形成する蛍光層形成工程と、前記一方向で隣接する２つの発光ダイオードに対応した領域の境界部分を前記一方向と垂直な他方向に沿って前記反射層及び前記全体リードフレームを切断し、かつ前記他方向において隣接する発光ダイオードに対応する領域間を前記一方向に沿って切断する切断工程と、を具備することを特徴とする。

本発明の半導体モジュールの製造方法は、前記全体リードフレームにおいて、前記リード開口部に対応した箇所に、前記リード開口部よりも小さなリードフレーム開口部が形成されたことを特徴とする。

本発明の半導体モジュールの製造方法において、前記リードフレーム開口部は円形状とされたことを特徴とする。

本発明の半導体モジュールの製造方法は、下面において前記リードフレーム開口部に隣接した箇所が局所的に薄肉加工された前記全体リードフレームが用いられ、前記反射層形成工程において、前記全体リードフレームの下面側において、前記リードフレーム開口部に隣接し局所的に薄肉加工された箇所に前記反射層を形成しないことを特徴とする。

本発明の半導体モジュールの製造方法は、下面において前記第１リードフレーム又は前記第２リードフレームの外周が局所的に薄肉加工された前記全体リードフレームが用いられ、前記反射層形成工程において、前記全体リードフレームの下面側において、前記外周が局所的に薄肉加工された箇所に前記反射層を形成することを特徴とする。

本発明の半導体モジュールは、前記発光ダイオードの製造方法によって製造されたことを特徴とする。

【発明の効果】

【００１８】

本発明は以上のように構成されているので、反射層からリード端子が突出した構成の発光ダイオードを容易に製造することができる。

【図面の簡単な説明】

【００１９】

【図１】本発明の実施の形態に係る発光ダイオードの製造方法において用いられるリードフレームの形態を示す上面図（ａ）、その断面図（ｂ）である。

【図２】本発明の実施の形態に係る発光ダイオードの製造方法において用いられる全体リードフレームの形態を示す上面図である。

【図３】本発明の実施の形態に係る発光ダイオードの製造方法の各工程における形態を示す図（その１）である。
【図４】本発明の実施の形態に係る発光ダイオードの製造方法の各工程における形態を示す図（その２）である。
【図５】本発明の実施の形態に係る発光ダイオードの製造方法の各工程における全体リードフレーム上における形態を示す図である。
【図６】本発明の実施の形態に係る発光ダイオードの上面図（ａ）、断面図（ｂ）、底面図（ｃ）である。
【図７】本発明の実施の形態に係る発光ダイオードの端面の斜視図である。
【図８】従来の発光ダイオードの製造方法の一例の各工程における形態を示す図である。
【図９】従来の発光ダイオードの一例の上面図（ａ）、断面図（ｂ）、底面図（ｃ）である。
【発明を実施するための形態】
【００２０】
以下、本発明の実施の形態となる発光ダイオードの製造方法、及びこの発光ダイオードについて説明する。この発光ダイオードにおいては、リードフレーム上に発光ダイオードチップが搭載され、その周囲に反射層が形成されている。発光ダイオードチップは、この反射層に設けられた窓部中に設置され、その周囲には蛍光層が設けられている。蛍光層は、発光ダイオードチップが発した単色の光を吸収してこれと異なる波長の光を発する。このため、この発光ダイオードにおいては、発光ダイオードチップが発する光と、蛍光層が発した光の、異なる２種類の波長の光が同時に発せられる。これらの光のうち、窓部の内面に達した光はそこで反射される。これにより、例えば白色光を発することができる。これらの点については特許文献１に記載の発光ダイオードと同様である。ただし、特許文献１に記載の発光ダイオードとは、反射層の両端部におけるリード端子の形態が大きく異なる。これに応じて、リードフレーム、反射層の形態が大きく異なる。
【００２１】
図１は、この製造方法において用いられるリードフレーム１１の上面図（ａ）及びそのＡ－Ａ方向の断面図（ｂ）である。ここで示されたリードフレーム１１は、発光ダイオード１個分に相当する。実際には複数の発光ダイオードを同時に製造するために、図１のパターンのリードフレーム１１が多数配列されて固定された形態の全体リードフレーム１００が用いられる。図２は、この全体リードフレーム１００の形態を示す上面図であり、この破線で囲まれた領域が図１に示されたリードフレーム１１に相当する。
【００２２】
このリードフレーム１１は、図１において図示された範囲（単一の発光ダイオードに対応する領域）内では第１リードフレーム１１１と第２リードフレーム１１２に分離されている。このため、第１リードフレーム１１１と第２リードフレーム１１２とは空隙を介して左右に配されている。第１リードフレーム１１１の左側端部、第２リードフレーム１１２の右側端部、すなわち、これらにおける空隙と反対側の端面側にはそれぞれリードフレーム切り欠き部１１３、１１４が形成されている。リードフレーム切り欠き部１１３、１１４はリード端子とされる部分に対応して形成される。
【００２３】
第１リードフレーム１１１においては、その上下に連結部１１５、１１６がそれぞれ接続され、第２リードフレーム１１２においては、その上側に連結部１１７、１１８が、その下側に連結部１１９、１２０が接続されている。第１リードフレーム１１１、第２リードフレーム１１２共に、図示されるように下面側（発光ダイオードチップが搭載される側と反対側）の外周が局所的に薄肉加工されており、このために段差が形成されている。また、リードフレーム切り欠き部１１３、１１４と隣接した領域においても、第１リードフレーム１１１、第２リードフレーム１１２は局所的に薄肉加工されており、同様に段差が形成されている。図１（ａ）における点線は、これらの段差を示している。また、連結部１１５～１２０も第１リードフレーム１１１、第２リードフレーム１１２の周囲と同様に

薄肉加工されている。

【００２４】

全体リードフレーム１００においては、図２に示されるように、図１の構成が２次元配列されて一体化されている。ここでは、図中左右方向（一方向）で隣接する２つの発光ダイオードに対応した領域間においては、一方の発光ダイオードに対応した領域における第１リードフレーム１１１と他方の発光ダイオードに対応した領域における第２リードフレーム１１２とは連結している。このため、図１における第１リードフレーム１１１はその左側の発光ダイオードに対応した第２リードフレーム１１２と、第２リードフレーム１１２はその右側の発光ダイオードに対応した第１リードフレーム１１１と連結して一体化されている。

【００２５】

また、図１の構成におけるリードフレーム１１は、その上下方向（他方向）において隣接する発光ダイオードに対応したリードフレーム１１と、連結部１１５～１２０によって接続される。なお、実際には図８（ａ）と同様の外枠部も使用されるが、ここではその記載を省略している。以上の構成によって、全体リードフレーム１００は一体化して構成されている。

【００２６】

ここで、左右方向で隣接する発光ダイオードに対応した領域間で一体化された第１リードフレーム１１１と第２リードフレーム１１２の間の境界部分（単一の発光ダイオードに対応する領域の左右両端の部分）において、円形状のリードフレーム開口部１０１が形成されている。後述するように、図１におけるリードフレーム切り欠き部１１３、１１４は、このリードフレーム開口部１０１が左右に分断されることによって形成される。図２で示されるように、リードフレーム開口部１０１は、全体リードフレーム１００中において周期的に２次元配列されて形成される。

【００２７】

この構成の全体リードフレーム１００は、例えば銅板を板金加工することによって製造することができる。この際、第１リードフレーム１１１と第２リードフレーム１１２における前記の薄肉加工も、プレス加工やエッチングによって行うことができる。

【００２８】

図３（ａ）（ｂ）、図４（ｃ）～（ｅ）は、この全体リードフレーム１００を用いた発光ダイオードの製造方法の工程における形態を単一の発光ダイオードに対応した領域において示す図である。ここで、図３（ａ）（ｂ）、図４（ｃ）（ｄ）中の上側は各工程において上面から見た形態を示し、下側はその断面図を示す。ここでは、左右に隣接した発光ダイオードに対応する領域との境界部分も同時に示されている。図４（ｅ）においては、上面から見た形態のみが示され、断面図は省略されている。

【００２９】

また、図５（ａ）～（ｆ）は、複数の発光ダイオードが配列された広い領域において、各工程における上面から見た形態を示している。ここで、図５（ａ）、（ｂ）、（ｃ）、（ｆ）は、それぞれ図３（ａ）、図３（ｂ）、図４（ｄ）、図４（ｅ）に対応した工程における広い領域を示す上面図となっている。

【００３０】

図３（ａ）は、ここで示される箇所における前記の全体リードフレーム１００の形態が示されている。以降で示される断面図は、このＢ－Ｂ方向の断面に対応する。上面図（上側）においては、下面において形成された段差は点線で示されている。図５（ａ）は、これに対応した全体リードフレーム１００の上面図である。

【００３１】

この全体リードフレーム１００に対して、図３（ｂ）、図５（ｂ）に示される形状で、反射層１３を全体リードフレーム１００（リードフレーム１１）上に形成する（反射層形成工程）。反射層１３の材料としては例えばエポキシ樹脂等の熱硬化性樹脂を用い、その成型はトランスファーモールドによる。この形状で反射層１３を形成するためには、例え

ば、下金型に全体リードフレーム１００をセットし、この上に、内部の形状がこの反射層１３の形状とされた空洞部をもつ上金型をセットし、この空洞部に反射層１３となる樹脂材料を液状の状態として加圧供給する。空洞部がこの材料で充填された後で硬化させることによって、反射層１３とされる。図３（ｂ）上、図５（ｂ）に示されるように、反射層１３は、全体リードフレーム１００（リードフレーム１１）上の広い範囲にわたり一様に形成されるが、窓部１３１とリード開口部１３２では開口した形態とされる。

【００３２】

窓部１３１の中には後で発光ダイオードチップが搭載され、これを取り囲む反射層１３の内面は発光ダイオードチップが発する光を上方に向けて反射させる。このため、窓部１３１中における反射層１３の内面は、この中に収容される発光ダイオードチップが発する発光を反射するように、リードフレーム１１の表面に対して傾斜角をもつように設定される。

【００３３】

リード開口部１３２は、前記のリードフレーム開口部１０１に対応して形成される。このため、リード開口部１３２も、左右方向において隣接する２つの発光ダイオードに対応する領域の境界部分に形成される。ただし、リード開口部１３２はリードフレーム開口部１０１よりもその周囲のリードフレーム１１上面が露出するように設定される。また、リード開口部１３２もリードフレーム開口部１０１と同様に、全体リードフレーム１００上で周期的に２次元配列されて形成される。

【００３４】

ここで、トランスファーモールドの際に、下金型に全体リードフレーム１００の下面側の薄肉加工されない部分が当接するようにして全体リードフレーム１００を固定した場合、反射層１３は、全体リードフレーム１００の上面側だけでなく、第１リードフレーム１１１、第２リードフレーム１１２間の空隙や第１リードフレーム１１１、第２リードフレーム１１２の下面側外周の薄肉加工された箇所にも形成される。このため、反射層１３の下面側においては、全体リードフレーム１００（リードフレーム１１）の薄肉加工されなかった領域が露出し、その周囲に反射層１３が形成される。一方、リードフレーム開口部１０１が形成された箇所の上面側においては、リードフレーム開口部１０１よりも広いリード開口部１３２が形成されているため、リードフレーム開口部１０１に樹脂は入り込まず、リードフレーム開口部１０１内には反射層１３は形成されない。このため、全体リードフレーム１００におけるリードフレーム開口部１０１に隣接して薄肉加工された箇所にも反射層１３は形成されない。このため、この箇所は薄肉加工されているものの、反射層１３の下面において露出する。

【００３５】

また、図５（ｂ）に示されるように、反射層１３は、全体リードフレーム１００の上面側において、図中の上下方向、左右方向共に隣接する発光ダイオードに対応する領域間で一体化して形成される。すなわち、左右方向に隣接する発光ダイオードに対応する領域間では反射層９２が分離された図８（ｂ）の場合（特許文献１）と異なり、反射層１３は、全体リードフレーム１００の上の広い範囲で一体化されて形成されている。

【００３６】

次に、図４（ｃ）に示されるように、窓部１３１内部で露出した第２リードフレーム１１２上に発光ダイオードチップ１４を搭載する（チップ搭載工程）。発光ダイオードチップ１４中に形成された発光ダイオードの一方の極、他方の極は、ボンディングワイヤ１５によって第１リードフレーム１１１、第２リードフレーム１１２にそれぞれ接続される。

【００３７】

次に、図４（ｄ）、図５（ｃ）に示されるように、この状態で、窓部１３１内部に蛍光材料を充填し、蛍光層１６を形成する（蛍光層形成工程）。例えば青色発光ダイオードが用いられる場合には、ＹＡＧ（イットリウム・アルミニウム・ガーネット）系の蛍光材料を用いれば、この蛍光材料が発する光と青色とが混合された疑似白色の発光を得ることが可能である。

【００３８】
その後、図４（ｅ）に示されるように、隣接する発光ダイオードに対応した領域間をダイシングソーを用いて切断することによって、複数の発光ダイオード１０を分断して得る（切断工程）。切断工程は、図５における上下方向に沿った切断を行う第１切断工程と、左右方向に沿った切断を行う第２切断工程とからなる。
【００３９】
まず、図５（ｄ）に示されるように、ダイシングソーのブレード２００を用いて、左右方向において隣接する発光ダイオードに対応する領域間を上下方向に沿って切断する（第１切断工程）。図においてはブレード２００を複数同時に記載しているが、実際には切断は各箇所毎に行われる。この切断の際には、ブレード２００は、図中上下方向に並んだリードフレーム開口部１０１の中心を結ぶ線上を切断する。これによって、全体リードフレーム１００において一体化されていた第２リードフレーム１１２（左側）と第１リードフレーム１１１（右側）とが分断される。この際、リードフレーム開口部１０１が２つに分断され、その両側において形成される発光ダイオードのリードフレーム切り欠き部１１４、１１３となる。また、リード開口部１３２も同様に２つに分断されて２つの反射層切り欠き部１３３となる。
【００４０】
次に、図５（ｅ）に示されるように、同様にブレード２００を用いて、図中上下方向において隣接する発光ダイオード１０間を左右方向に沿って切断する（第２切断工程）。この際にブレード２００が切断するのは、肉厚が薄くかつ細い連結部１１５～１２０と、樹脂材料で構成された反射層１３と、図示しない外枠部である。なお、第１切断工程と第２切断工程の順序を逆転させることも可能である。
【００４１】
これにより、図４（ｅ）、図５（ｆ）に示されるように、個々の発光ダイオード１０が分断されて得られる。この製造方法においては、反射層形成工程（図３（ｂ）、図５（ｂ））において、反射層１３が全体リードフレーム１００の上の広い範囲で、特に図４、５における左右方向において一体化されているため、トランスファーモールドを行う際に、金型に樹脂材料を空隙無く充填することが容易である。すなわち、この発光ダイオード１０を高い歩留まりで容易に製造することができる。
【００４２】
また、第１リードフレーム１１１、第２リードフレーム１１２の下面側において、その外周が薄肉加工された部分にも反射層１３が形成されることによって、反射層１３は、第１リードフレーム１１１、第２リードフレーム１１２の端部において上面側から下面側までこれらを取り囲んで形成される。このため、第１リードフレーム１１１、第２リードフレーム１１２の外周端部が反射層１３に対するくさびとなり、反射層１３は全体リードフレーム１００（リードフレーム１１）に強固に固定される。すなわち、この段差を設けることによって、反射層１３のリードフレーム１１に対する固定の機械的強度を高めることができる。一方、リード開口部１３２に隣接して薄肉化された領域には反射層１３は形成されないため、こうした効果はこの箇所では得られないが、これによる他の効果については後述する。
【００４３】
この発光ダイオード１０の上面図、そのＣ－Ｃ方向の断面図、底面図を図６（ａ）、（ｂ）、（ｃ）にそれぞれ示す。また、その端部の斜視図を図７に示す。上面側（図６（ａ））においては、左右両端の反射層切り欠き部１３３から、第１リードフレーム１１１のリードフレーム切り欠き部１１３周囲、第２リードフレーム１１２のリードフレーム切り欠き部１１４周囲の部分がそれぞれ露出する。一方、下面側（図６（ｃ））においては、反射層１３の中で、第１リードフレーム１１１と第２リードフレーム１１２の薄肉加工されなかった領域が露出する。また、リードフレーム開口部１０１（リードフレーム切り欠き部１１３、１１４）に隣接して薄肉加工された領域には反射層１３は形成されていない。

【００４４】
この発光ダイオード１０においては、第１リードフレーム１１１と第２リードフレーム１１２とが発光ダイオードの両極に接続された電極となり、これらに通電することにより、発光させることが可能である。これらの電極に対する電気的接続は、例えばプリント基板上でこの発光ダイオード１０の裏面においてはんだを介した接続を行うことにより得ることができる。この際、図６、７に示されるように、反射層１３端部の反射層切り欠き部１３３から第１リードフレーム１１１と第２リードフレーム１１２の端部が突出しており、この突出した部分がリード端子とされる。このため、反射層切り欠き部１３３から露出した第１リードフレーム１１１と第２リードフレーム１１２の端部にはんだ付けを行うことによって、この発光ダイオード１０を固定あるいはこれに対して電気的接続をとることができる。

【００４５】
この際、特許文献１に記載の技術（図９の構成）においては、反射層９２の端面からリード端子（第１リードフレーム９１１、第２リードフレーム９１２）が突出したのに対し、この発光ダイオード１０においては、反射層１３の端面に形成された反射層切り欠き部１３３から第１リードフレーム１１１と第２リードフレーム１１２の端部が露出している。この構成により、リード端子は反射層１３の端面から突出しない状態で形成され、取り扱い時におけるリード端子の損傷が抑制され、かつ発光ダイオード１０全体を小型化することもできる。あるいは、単一の全体リードフレーム１００を用いてより多くの発光ダイオード１０を製造することができる。

【００４６】
また、リード端子となる第１リードフレーム１１１と第２リードフレーム１１２の端部にはんだ付けを行なう際には、リードフレーム切り欠き部１１３、１１４が形成されているため、図６（ａ）に示される上面側からはんだを目視で確認することが容易となる。また、リードフレーム切り欠き部１１３、１１４の箇所の裏面側で第１リードフレーム１１１、第２リードフレーム１１２の端部は図７に示されたように薄肉加工され、かつこの箇所には反射層１３も形成されないため、溶けたはんだは、この薄肉加工された部分に溜まりやすくなる。その後、この溶けたはんだは、リードフレーム切り欠き部１１３、１１４の端面を上側に向かって濡れ広がるため、はんだの存在を上側から目視で特に容易に確認することができる。すなわち、この構成の発光ダイオード１０においては、はんだ付けを高い信頼性で容易に行うことができる。

【００４７】
なお、上記の構成において、リードフレーム開口部１０１は円形状であるとしたが、２つに分断されて２つのリードフレーム切り欠き部とすることができる限りにおいて、その形状は任意である。また、上下左右対称の形状である必要もない。例えば、三角形、四角形等、金属板に形成することのできる開口形状であれば任意である。

【００４８】
更に、図７の形状より、第１リードフレーム、第２リードフレームにリードフレーム切り欠き部が存在せず、反射層切り欠き部のみが形成された場合においても、反射層切り欠き部で突出した第１リードフレーム、第２リードフレームをリード端子として使用することができることは明らかである。この場合、反射層において反射層切り欠き部（リード開口部）を形成すれば、反射層切り欠き部で露出した第１リードフレーム、第２リードフレームをリード端子とすることができる。

【００４９】
また、第１リードフレーム、第２リードフレームの下面外周における段差あるいは局所的に薄肉加工された部分、リードフレーム開口部（切り欠き部）に隣接した段差あるいは局所的に薄肉加工された部分、をそれぞれ形成しない場合でも、同様に第１リードフレーム、第２リードフレームをリード端子とすることができることも明らかである。

【００５０】
更に、リードフレーム、全体リードフレームの構成も、上記の製造方法が適用できる限

りにおいて、任意である。例えば、連結部の数、太さ等は、リードフレームを全体として一体化できる限りにおいて任意である。連結部を太くして発光ダイオードの下面で露出する金属面積を広くすれば、高い放熱特性が得られる。

【００５１】

また、リードフレームの上面は平坦である必要はない。例えば、発光ダイオードチップを搭載するリードフレーム（第２リードフレーム）における発光ダイオードに対応する領域を掘り下げた形状に加工すれば、発光ダイオードチップの固定がより確実に行われ、かつこの固定に用いられた接着剤やはんだが他の領域、例えばボンディングワイヤが接続される領域にまで広がることが抑制される。こうした加工も、全体リードフレームにおいて前記の下面側の段差と同様に行うことができる。

【００５２】

また、上記の例では同一構成の発光ダイオードが多数同時に配列して形成されるものとしたが、寸法が同一であれば、各発光ダイオードの構成が同一である必要はない。更に、上記の切断工程によって分断できる構成であれば、寸法も全ての発光ダイオードで同一である必要はない。

【００５３】

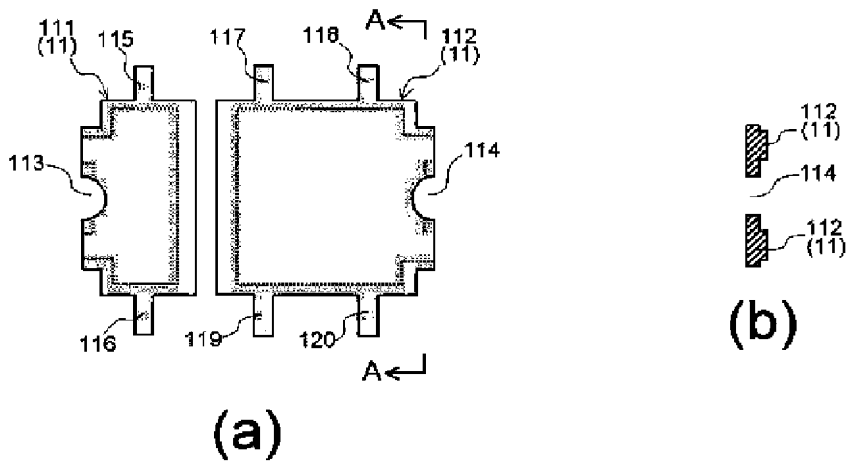
また、リードフレームの形状は、２つの電極として反射層の外部に取り出せ、かつ上記の製造方法が適用できる限りにおいて、任意である。例えば、単一の発光ダイオードに対応する領域内において、第１リードフレーム、第２リードフレーム以外の他の部分を適宜設けることもできる。これらの部分のうちのどれに発光ダイオードチップを搭載するかは適宜設定することができる。反射層やその窓部の形状も、内部に発光ダイオードチップや蛍光層を設けることができる限りにおいて、任意である。また、窓部内における発光ダイオードチップとリードフレームとの電気的接続はボンディングワイヤによって行うものとしたが、２つの電極が上記と同様に外部に取り出せる限りにおいて、任意である。

【符号の説明】

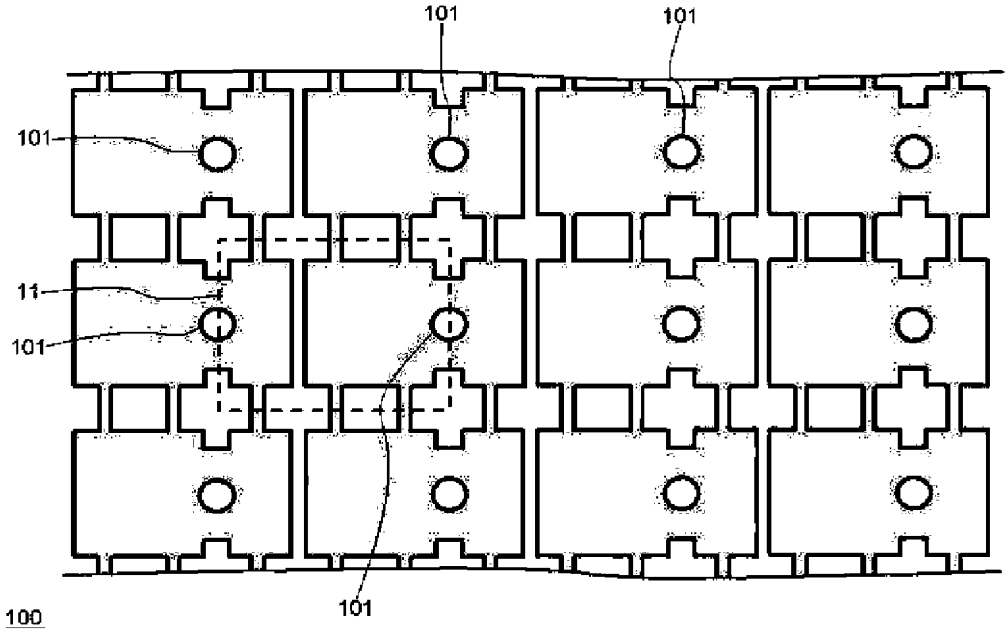
【００５４】

１０、９０　発光ダイオード
１１、９１　リードフレーム
１３、９２　反射層
１４、９４　発光ダイオードチップ
１５、９５　ボンディングワイヤ
１６、９３　蛍光層
１００、９００　全体リードフレーム
１０１　リードフレーム開口部
１１１、９１１　第１リードフレーム
１１２、９１２　第２リードフレーム
１１３、１１４　リードフレーム切り欠き部
１１５～１２０、９０２　連結部
１３１、９２１　窓部
１３２　リード開口部
１３３　反射層切り欠き部
２００　ブレード
９０１　外枠部

【図１】

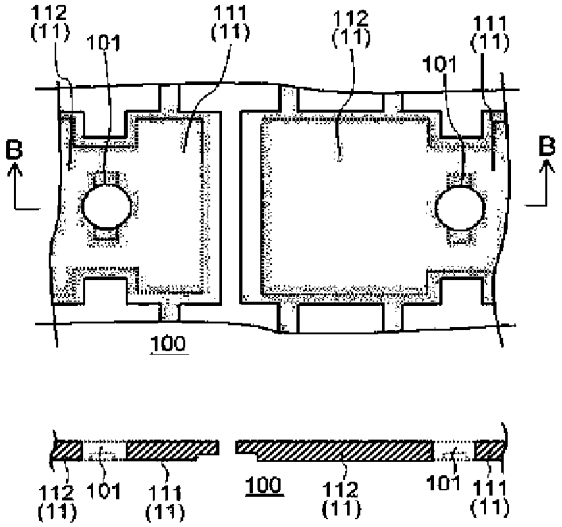

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【図２】

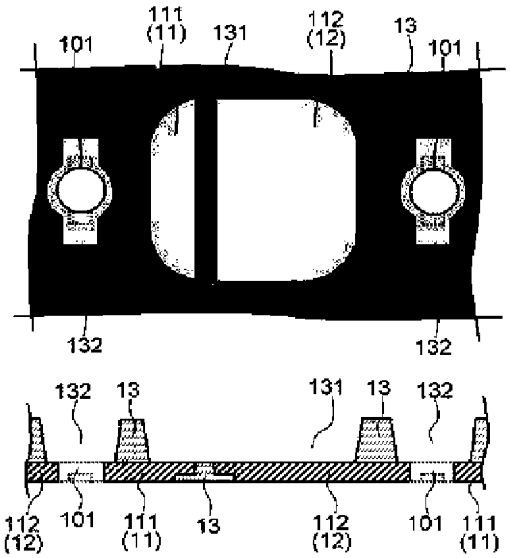

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【図３】

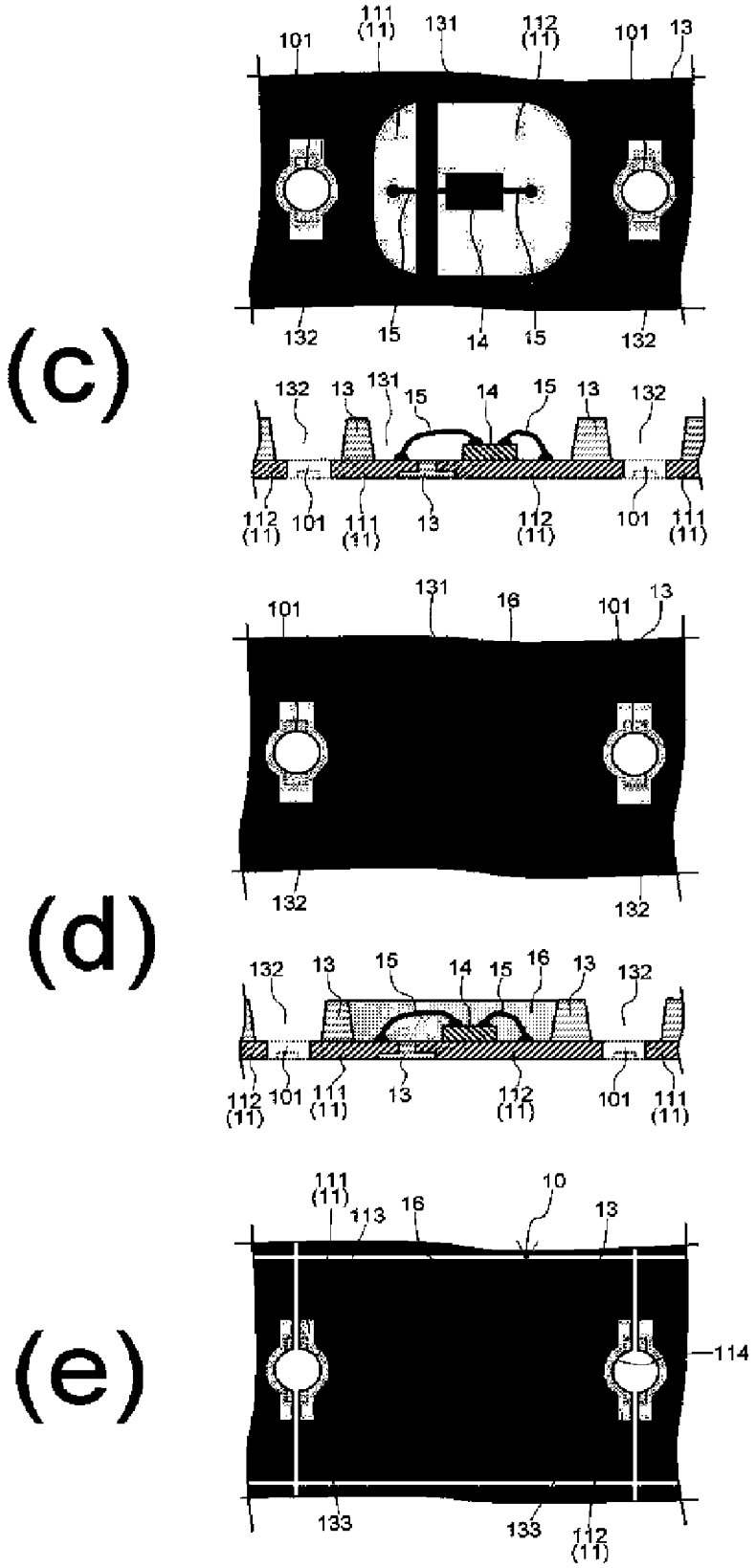
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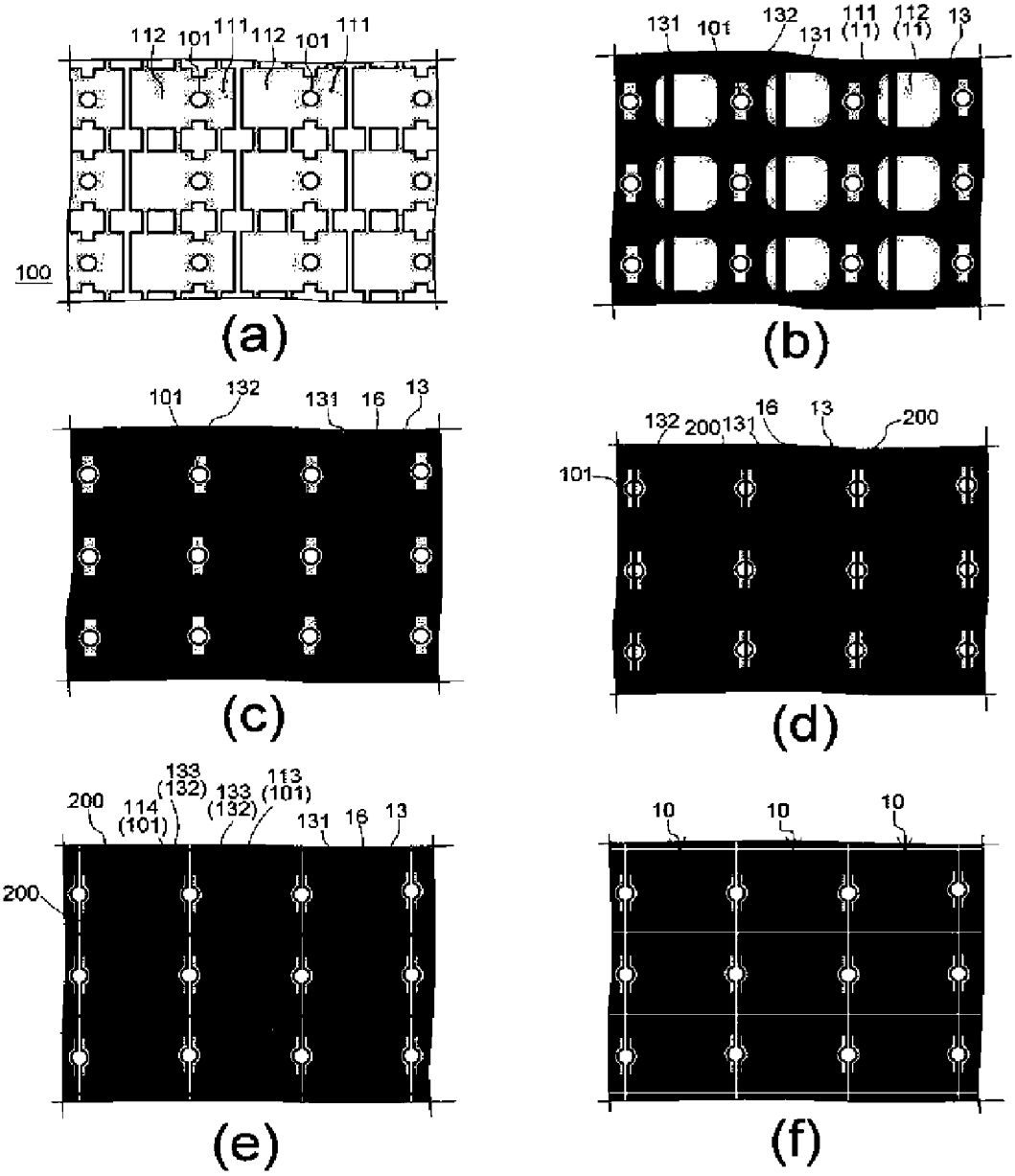

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【図４】

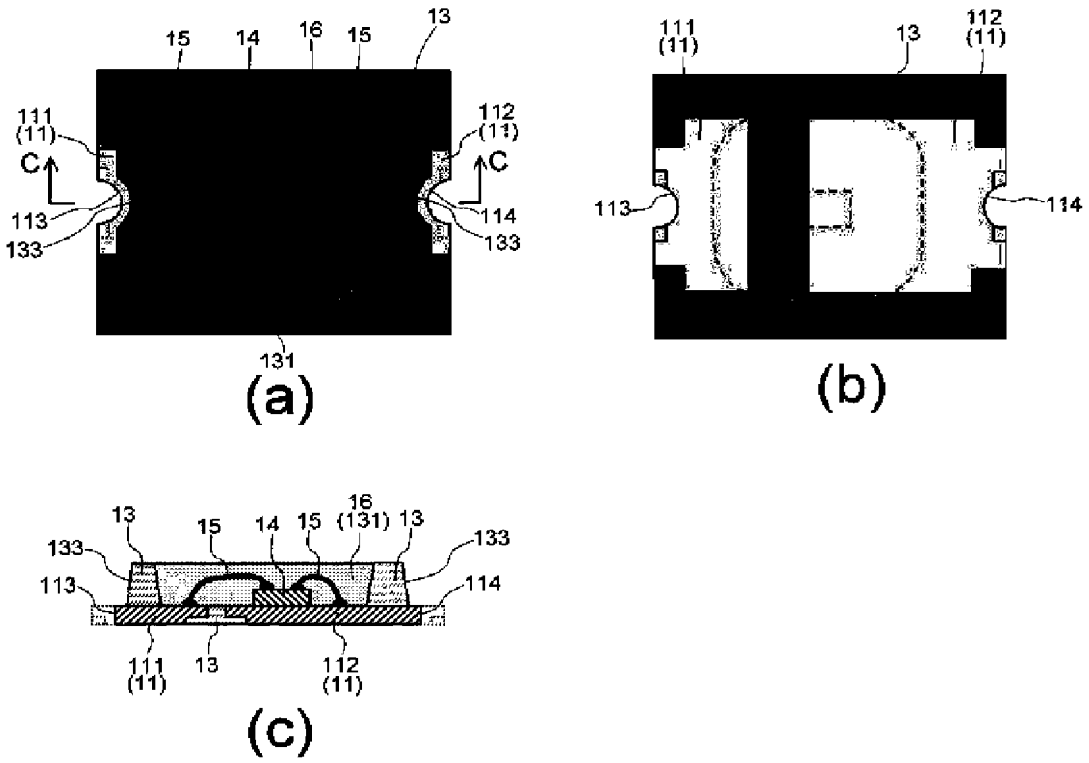


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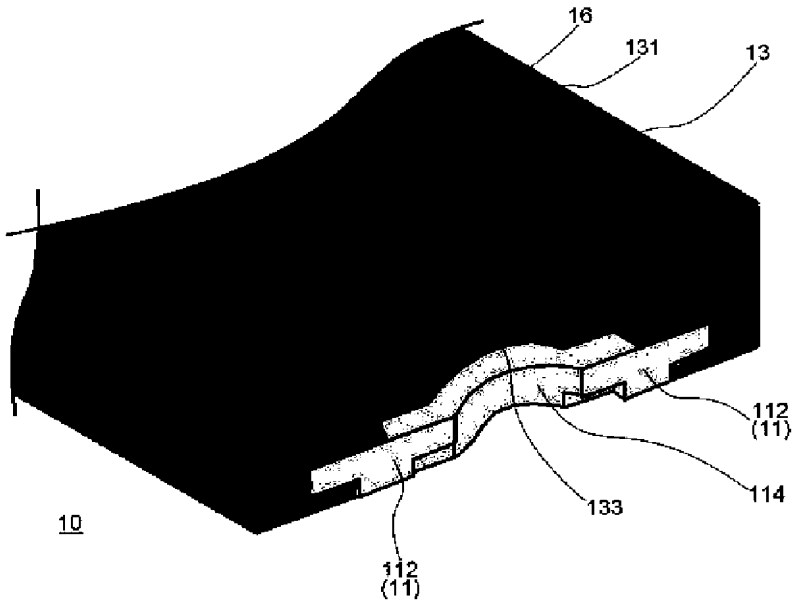
【図５】


112 101 111 112 101 111
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131 101 132 131 111 (11) 112 (11) 13
(b)
101 132 131 16 13
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132 200 131 16 13 200
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(e)
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(f)

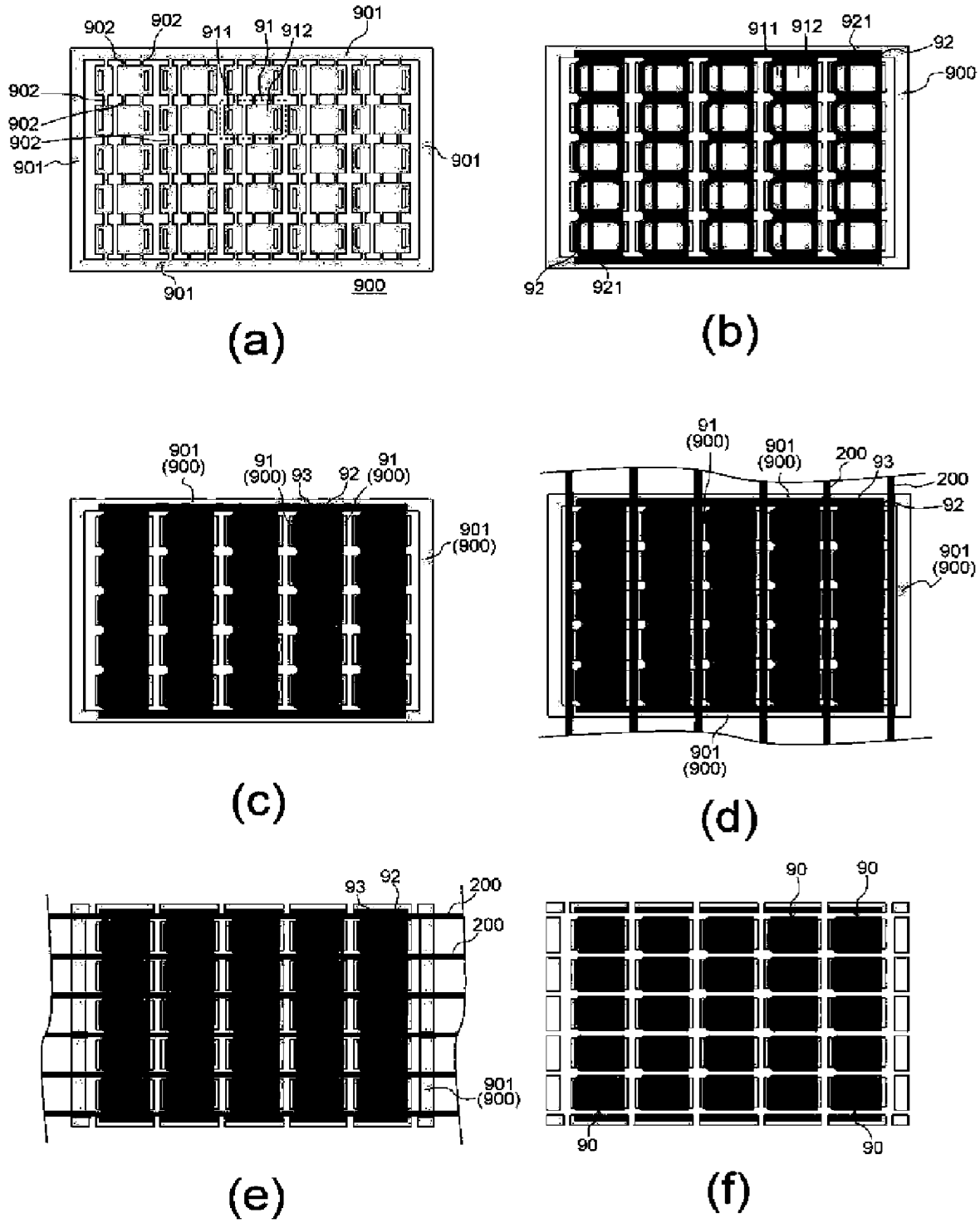
【図６】


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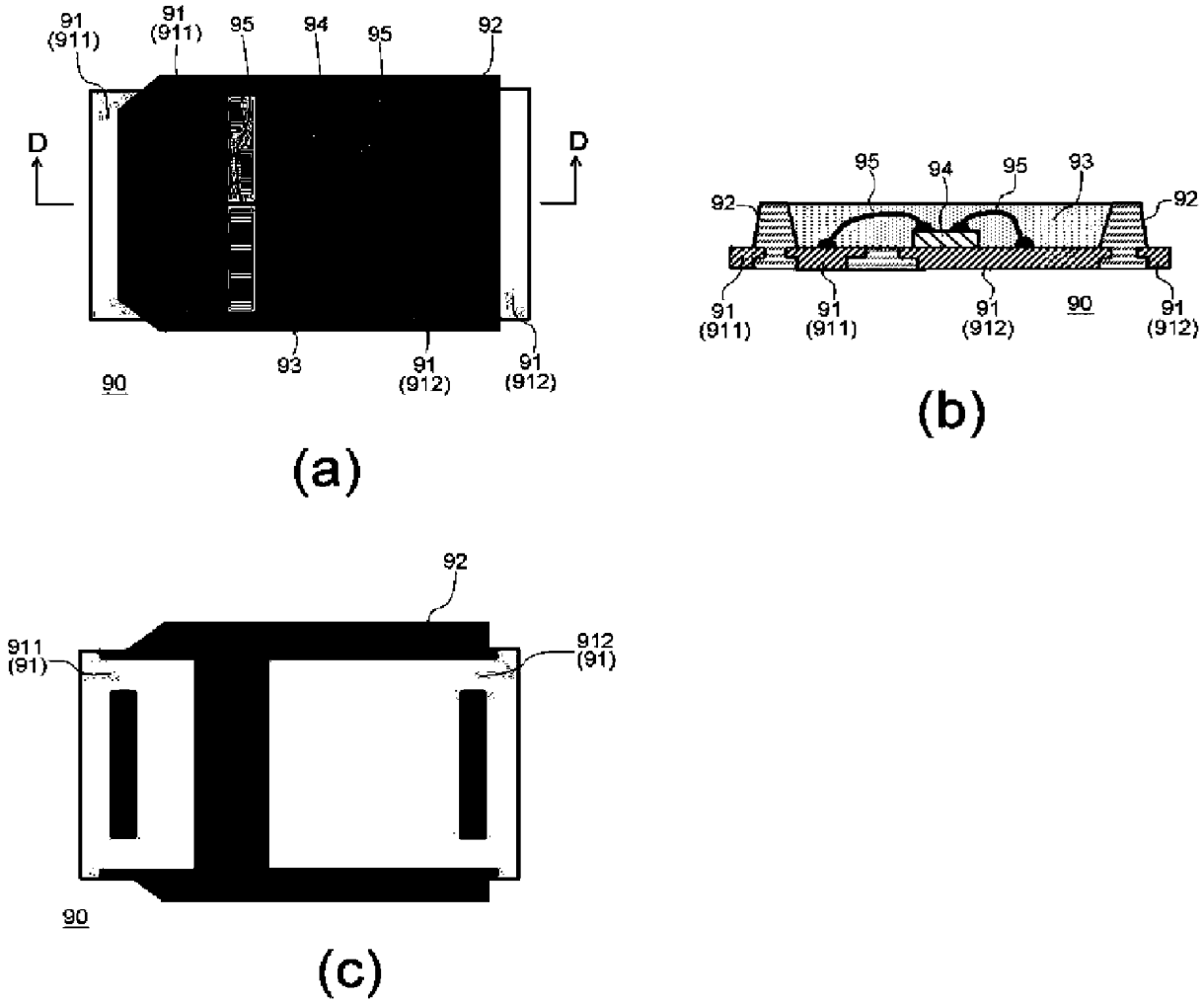
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【図８】


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METHOD FOR MANUFACTURING LEAD FRAME ASSEMBLY OF LIGHT-EMITTING DIODE

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Classification: **- international:** ***H01L33/62***
- cooperative:

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Abstract of JP2014017460 (A)

PROBLEM TO BE SOLVED: To improve a nondefective manufactured product rate of light-emitting diodes.SOLUTION: A method for manufacturing a lead frame assembly comprises a step of preparing a metal plate material. On the metal plate material, a metal outer frame and a plurality of metal lead frames are formed, and the metal outer frame and the metal lead frames are coupled with each other by a plurality of coupling parts. After the metal lead frames are electrically plated, rubber seats are formed on the metal lead frames and at a position adjacent to a hollow function area of the rubber seats, a plurality of reserved spaces leading the coupling parts to the outside are formed and the portions of the coupling parts exposed outside are cut off. Then, in the rubber seats, die bonding, wire bonding, and adhesive injection steps are performed. Finally, before adhesive is cured, power is applied to the cut-off coupling parts of the metal lead frames to light a light-emitting chip, and it is tested whether brightness and a blending ratio of chromaticity are accurate or not.

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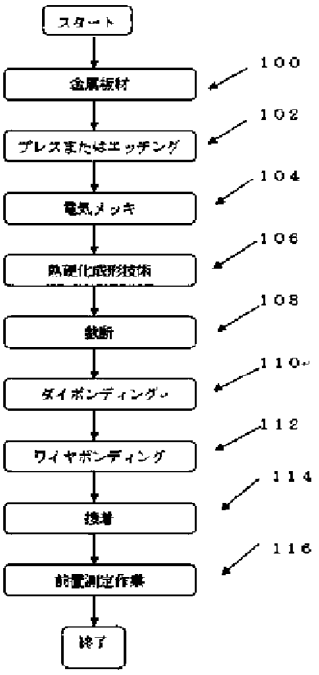
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(54)【発明の名称】発光ダイオードのリードフレームアセンブリーの製造方法

(57)【要約】　（修正有）
【課題】発光ダイオードの製造良品率を向上する。
【解決手段】リードフレームアセンブリーの製造方法であって、金属板材を用意するステップを備えており、金属板材には金属外枠および複数の金属リードフレームが形成されており、金属外枠および金属リードフレームは複数の連結部により連結されており、金属リードフレームは電気メッキを施した後に、金属リードフレームにゴム台座が形成されて、およびゴム台座の中空機能エリアと隣り合う位置には連結部を外部に漏出せしめる複数の保留空間が形成されることにより、外部に露出した連結部を裁断する。それからゴムの台座の中にてダイボンディング、ワイヤボンディングおよび接着剤注入工程を行う。最後に、接着剤が硬化する前に、切断された金属リードフレームの連結部に電源を印加して発光チップを点灯せしめて、輝度および色度の配合比が正確か否かをテストする。
【選択図】図１



【特許請求の範囲】
【請求項１】
発光ダイオードのリードフレームアセンブリーの製造方法であって、
ａ）、金属板材を用意するステップと、
ｂ）、該金属板材に金属外枠および複数の金属リードフレームのリードフレームアセンブリーを成形するステップであって、該金属リードフレームには第一電極片および第二電極片を有して、該第一電極片と該第二電極片には連結部を有しており、該連結部は複数の金属リードフレームおよび該金属外枠とを連結するステップと、
ｃ）、該金属リードフレームにゴム台座を成形するステップであって、成形後の該ゴム台座の正面には該第一電極片および該第二電極片を外部に露出せしめるための中空機能エリアを有して、該ゴム台座と隣り合う横方向および縦方向の位置には複数の保留空間が形成されて、該保留空間該は連結部を外部に露出せしめるステップと、
ｄ）、外部に露出した該連結部を裁断するステップと、
ｅ）、該ゴム台座の中空機能エリア中の第二電極片に発光チップを固接するステップと、
ｆ）、金属ワイヤを用いて該発光チップと該第一電極片とを電気的に接続するステップと、
ｇ）、該中空機能エリアに接着剤を注入するステップと、
ｈ）、切断された金属リードフレーム上の連結部に電源を印加し、該第一電極片および該第二電極片を通電して該発光チップを点灯せしめ、輝度および色度の配合比のテストを行なうステップと、
を備える前記方法。
【請求項２】
ステップｂの金属外枠には離隔態様で配列された複数の長孔および短孔を有しており、二つの該短孔のあいだには貫通孔を有する請求項１に記載のリードフレームアセンブリーの製造方法。
【請求項３】
該ステップｂの該第一電極片は、該第二電極片と隣り合わないかまたは対応しない側辺にいずれも該連結部を有する請求項２に記載のリードフレームアセンブリーの製造方法。
【請求項４】
該連結部が、縦方向および横方向にて各々の金属リードフレームを連結している請求項３に記載のリードフレームアセンブリーの製造方法。
【請求項５】
該第一電極片が長方形であり、かつ該第一電極片は、該第二電極片と隣り合うかまたは対応する側辺には、対応する二つの切り欠きを有する請求項４に記載のリードフレームアセンブリーの製造方法。
【請求項６】
該第二電極片の二つの側辺には対応する二つの凹槽を有しており、該第二電極片の他方の側辺には凹口を有する請求項５に記載のリードフレームアセンブリーの製造方法。
【請求項７】
ステップｂとｃとのあいだに電気メッキのステップをさらに備えており、リードフレームアセンブリーをプレスまたはエッチングした後に、該リードフレームアセンブリーの金属リードフレームに電気メッキにより一層の金属膜を施す請求項６に記載のリードフレームアセンブリーの製造方法。
【請求項８】
該ゴム台座の裏面に二つの通孔を有しており、該二つの通孔は該第一電極片および該第二電極片を外部に露出するのに用いられる請求項７に記載のリードフレームアセンブリーの製造方法。
【請求項９】
該ステップｃにおける保留空間は、該連結部にて熱硬化性プラスチックを有しない請求

項８に記載のリードフレームアセンブリーの製造方法。
【請求項１０】
該ステップｅの発光チップが単色または多色のチップである請求項９に記載のリードフレームアセンブリーの製造方法。
【請求項１１】
該ステップｆの金属ワイヤが金ワイヤである請求項１０に記載のリードフレームアセンブリーの製造方法。
【請求項１２】
該ステップｇの接着剤がシリコン接着剤である請求項１１に記載のリードフレームアセンブリーの製造方法。
【請求項１３】
該接着剤に蛍光パウダーが添加されている請求項１２に記載のリードフレームアセンブリーの製造方法。
【請求項１４】
発光ダイオードのリードフレームアセンブリーの製造方法であって、
ａ）、金属板材を用意するステップと、
ｂ）、該金属板材に金属外枠および複数の金属リードフレームのリードフレームアセンブリーを成形するステップであって、該金属リードフレームには第一電極片および第二電極片を有して、該第一電極片と該第二電極片には連結部を有しており、該連結部は複数の金属リードフレームおよび該金属外枠とを連結するステップと、
ｃ）、該金属リードフレームにゴム台座を成形するステップであって、該ゴム台座の正面には該第一電極片および該第二電極片を外部に露出せしめるための中空機能エリアを有するステップと、
ｄ）、ドリルを用いて該中空機能エリアに隣り合う位置を掘って該連結部を破断するステップと、
ｅ）、該ゴム台座の中空機能エリア中の第二電極片に発光チップを固接するステップと、
ｆ）、金属ワイヤを用いて該発光チップと該第一電極片とを電気的に接続するステップと、
ｇ）、該中空機能エリアに接着剤を注入するステップと、
ｈ）、切断された金属リードフレーム上の連結部に電源を印加し、該第一電極片および該第二電極片を通電して該発光チップを点灯せしめ、輝度および色度の配合比のテストを行なうステップと、
を備える前記方法。
【請求項１５】
ステップｂの金属外枠には離隔態様で配列された複数の長孔および短孔を有しており、二つの該短孔のあいだには貫通孔を有する請求項１４に記載のリードフレームアセンブリーの製造方法。
【請求項１６】
該ステップｂの該第一電極片は、該第二電極片と隣り合わないかまたは対応しない側辺にいずれも該連結部を有する請求項１５に記載のリードフレームアセンブリーの製造方法。
【請求項１７】
該連結部が、縦方向または横方向にて各々の金属リードフレームを連結している請求項１６に記載のリードフレームアセンブリーの製造方法。
【請求項１８】
該第一電極片が長方形であり、かつ該第一電極片は、該第二電極片と隣り合うかまたは対応する側辺には、対応する二つの切り欠きを有する請求項１７に記載のリードフレームアセンブリーの製造方法。
【請求項１９】

該第二電極片の二つの側辺には対応する二つの凹槽を有しており、該第二電極片の他方の側辺には凹口を有する請求項１８に記載のリードフレームアセンブリーの製造方法。
【請求項２０】
該ゴム台座の裏面に二つの通孔を有しており、該二つの通孔は該第一電極片および該第二電極片を外部に露出するのに用いられる請求項２１に記載のリードフレームアセンブリーの製造方法。
【請求項２１】
ステップｂとｃとのあいだに電気メッキのステップをさらに備えており、リードフレームアセンブリーをプレスまたはエッチングした後に、該リードフレームアセンブリーの金属リードフレームに電気メッキにより一層の金属膜を施す請求項２０に記載のリードフレームアセンブリーの製造方法。
【請求項２２】
ステップｄにてドリルを用いてゴム台座を掘って、該連結部を破断するがしかし該ゴム台座は穿通しないか、または該ゴム台座をも穿通して該連結部が破断して通孔を形成する請求項２１に記載のリードフレームアセンブリーの製造方法。
【請求項２３】
該ステップｅの発光チップが単色または多色のチップである請求項２２に記載のリードフレームアセンブリーの製造方法。
【請求項２４】
該ステップｆの金属ワイヤが金ワイヤである請求項２３に記載のリードフレームアセンブリーの製造方法。
【請求項２５】
該ステップｇの接着剤がシリコン接着剤である請求項２４に記載のリードフレームアセンブリーの製造方法。
【請求項２６】
該接着剤に蛍光パウダーが添加されている請求項２５に記載のリードフレームアセンブリーの製造方法。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は発光ダイオードに係わり、特に発光ダイオードのリードフレームアセンブリーの製造方法に係わる。
【背景技術】
【０００２】
昨今において発光ダイオードはさまざまな電子装置、電器製品または照明器具等の製品に広く用いられており、かつ発光ダイオードの製造は高輝度、多色光および優れた放熱効果を有する技術の開発および改善へシフトするため、発光ダイオードの製造原価が高くなりつつある。発光ダイオード製造原価は前記要素により向上されるほか、発光ダイオードの製造良品率の直接影響を受ける。
【０００３】
従来、発光ダイオードを製造の時にまず金属板材を用意し、プレスまたはエッチングにより金属板材をリードフレームアセンブリーに加工すると金属外枠が形成され、該金属外枠は連結部を介して複数の金属リードフレームに連結されており、該金属リードフレームは正極片および負極片を備えており、また複数の該金属リードフレームには熱硬化性プラスチックを用いてゴム台座が成形されており、該ゴム台座が製造完成後に、該ゴム台座の中空機能エリアの中で外部に露出した正、負極片にて発光チップのダイボンディングおよび金ワイヤボンディング工程を行ない、ダイボンディングおよびワイヤボンディング工程後には該中空機能エリアの中に蛍光パウダーが混入されたシリコン接着剤を注入し、接着工程後に金属リードフレームを裁断およびテストする。
【０００４】

従来の発光ダイオードは製造完成後に輝度および色度配合比のテストを行うので、発光ダイオードの輝度および色度の配合比が要求を満たさず、よって発光ダイオードの製造良品率は５０％前後に止まっていた。その主な原因は、該金属リードフレームにゴム台座を成形した後に金属リードフレームの正極片および負極片の連結部を裁断せず、該金属リードフレームの正極片および負極片はいずれも接続された状態にあり、ゴム台座の中空機能エリアに接着剤を注入した後にすぐ発光ダイオードの輝度および色度の配合比が正確か否かをテストできなく、全工程が完成後にはじめて品質確認が可能なため、不良の発光ダイオードを適時に検出できないことにある。

【発明の概要】

【発明が解決しようとする課題】

【０００５】

よって、本発明の主な目的は従来の問題点を解決することにあり、本発明では発光ダイオードのリードフレームアセンブリーの金属リードフレームにてゴム台座を成形した後にまず所定の金属リードフレームの連結部を裁断または切断し、その後のダイボンディング、ワイヤボンディングおよび接着工程においては、接着剤が硬化する前に前置測定作業を行って発光ダイオードの輝度および色度の配合比が正確か否かをテスト可能なため、発光ダイオードの製造良品率が９０％を上回り、さらに製造原価を大幅に下げることも可能になる。

【課題を解決するための手段】

【０００６】

上記目的を実現すべく、本発明は、発光ダイオードのリードフレームアセンブリーの製造方法であって、該製造方法は、

金属板材を用意するステップと、

該金属板材に金属外枠および複数の金属リードフレームのリードフレームアセンブリーを成形するステップであって、該金属リードフレームには第一電極片および第二電極片を有して、該第一電極片と該第二電極片には連結部を有しており、該連結部は複数の金属リードフレームおよび該金属外枠とを連結するステップと、

該金属リードフレームにゴム台座を成形するステップであって、成形後の該ゴム台座の正面には該第一電極片および該第二電極片を外部に露出せしめるための中空機能エリアを有して、該中空機能エリアの隣り合う横方向の位置には複数の保留空間が形成されて、該連結部を外部に露出せしめるステップと、

該外部に露出した該連結部を裁断するステップと、

該ゴム台座の中空機能エリア中の第二電極片に発光チップを固接するステップと、

金属ワイヤを用いて該発光チップと該第一電極片とを電気的に接続するステップと、

該中空機能エリアに接着剤を注入するステップと、

切断された金属リードフレーム上の連結部に電源を印加し、該第一電極片および該第二電極片を通電して該発光チップを点灯せしめ、輝度および色度の配合比のテストを行なうステップとを備える。

【０００７】

該金属外枠には離隔態様で配列された複数の長孔および短孔を有しており、二つの該短孔のあいだには貫通孔を有する。

【０００８】

該第一電極片は、該第二電極片と隣り合わないかまたは対応しない側辺にいずれも該連結部を有する。

【０００９】

該連結部は各々の金属リードフレームを縦方向および横方向に連結する。

【００１０】

該第一電極片が長方形であり、かつ該第一電極片は、該第二電極片と隣り合うかまたは対応する側辺に、対応する二つの切り欠きを有する。

【００１１】

該第二電極片の二つの側辺には対応する二つの凹槽を有しており、該第二電極片の他方の側辺には凹口を有する。

【００１２】

該ゴム台座の裏面に二つの通孔を有しており、該二つの通孔は該第一電極片および該第二電極片を外部に露出するのに用いられる。

【００１３】

リードフレームアセンブリーをプレスまたはエッチングした後に、該リードフレームアセンブリーの金属リードフレームに電気メッキにより一層の金属膜を施す。

【００１４】

該保留空間は該連結部に熱硬化性プラスチックを有しない。

【００１５】

該発光チップが単色または多色のチップである。

【００１６】

該金属ワイヤが金ワイヤである。

【００１７】

該接着剤がシリコン接着剤である。

【００１８】

該接着剤に蛍光パウダーが添加されている。

【００１９】

上記目的を実現すべく、本発明は、別の発光ダイオードのリードフレームアセンブリーの製造方法を提案しており、該製造方法は、

金属板材を用意するステップと、

該金属板材に金属外枠および複数の金属リードフレームのリードフレームアセンブリーを成形するステップであって、該金属リードフレームには第一電極片および第二電極片を有して、該第一電極片と該第二電極片には連結部を有しており、該連結部は複数の金属リードフレームおよび該金属外枠とを連結するステップと、

該金属リードフレームにゴム台座を成形するステップであって、該ゴム台座の正面には該第一電極片および該第二電極片を外部に露出せしめるための中空機能エリアを有するステップと、

ドリルを用いて該中空機能エリアに隣り合う位置の中を掘って該連結部を破断するステップと、

該ゴム台座の中空機能エリア中の第二電極片に発光チップを固接するステップと、

金属ワイヤを用いて該発光チップと該第一電極片とを電気的に接続するステップと、

該中空機能エリアに接着剤を注入するステップと、

切断された金属リードフレーム上の連結部に電源を印加し、該第一電極片および該第二電極片を通電して該発光チップを点灯せしめ、輝度および色度の配合比のテストを行なうステップとを備える。

【００２０】

該金属外枠には離隔態様で配列された複数の長孔および短孔を有しており、二つの該短孔のあいだには貫通孔を有する。

【００２１】

該第一電極片は、該第二電極片と隣り合わないかまたは対応しない側辺にいずれも該連結部を有する。

【００２２】

該連結部は各々の金属リードフレームを縦方向および横方向に連結する。

【００２３】

該第一電極片が長方形であり、かつ該第一電極片は、該第二電極片と隣り合うかまたは対応する側辺に、対応する二つの切り欠きを有する。

【００２４】

該第二電極片の二つの側辺には対応する二つの凹槽を有しており、該第二電極片の他方

の側辺には凹口を有する。
【００２５】
リードフレームアセンブリーをプレスまたはエッチングした後に、該リードフレームアセンブリーの金属リードフレームに電気メッキにより一層の金属膜を施す。
【００２６】
該ゴム台座の裏面に二つの通孔を有しており、該二つの通孔は該第一電極片および該第二電極片を外部に露出するのに用いられる。
【００２７】
該ドリルがゴム台座を掘って該連結部を破断すした後に該ゴム台座は穿通しないか、または該ゴム台座をも穿通して該連結部が破断して通孔を形成する。
【００２８】
該発光チップが単色または多色のチップである。
【００２９】
該金属ワイヤが金ワイヤである。
【００３０】
該接着剤がシリコン接着剤である。
【００３１】
該接着剤に蛍光パウダーが添加されている。
【図面の簡単な説明】
【００３２】
【図１】本発明の製造流れの見取り図である。
【図２】本発明の発光ダイオードのリードフレームアセンブリーの見取り図である。
【図３】図１の局所拡大見取り図である。
【図４】本発明の発光ダイオードのリードフレームアセンブリーにゴム台座が成形された正面図の見取り図である。
【図５】本発明の発光ダイオードのリードフレームアセンブリーにゴム台座が成形された裏面の見取り図である。
【図６】図４の連結部が切断された際の見取り図である。
【図７】本発明の発光ダイオードのリードフレームアセンブリーの上面視見取り図である。
【図８】本発明の発光ダイオードのリードフレームアセンブリーの側面図の見取り図である。
【図９】本発明の別の実施例製造フローチャートの見取り図である。
【図１０】本発明のリードフレームアセンブリー正面図の見取り図である。
【図１１】本発明のゴム台座の中間位置に孔を開けた際の見取り図である。
【発明を実施するための形態】
【００３３】
以下、図面に結合して本発明の技術内容および詳細な説明について説明を行っており、すなわち
図１、図２、および図３に示すは、本発明の製造フローチャートと、発光ダイオードのリードフレームアセンブリーと、および図２の局所拡大見取り図である。図に示すように、本発明の発光ダイオードのリードフレームアセンブリーはまず、ステップ１００において金属板材を用意する。
【００３４】
ステップ１０２において、プレスまたはエッチングにより該金属板材をリードフレームアセンブリー１０に加工しており、該リードフレームアセンブリー１０は金属外枠１および複数の金属リードフレーム２を備える。該金属外枠１には離隔態様で配列された複数の長孔１１および短孔１２を有しており、二つの該短孔１２のあいだには貫通孔１３を有する。該金属リードフレーム２には第一電極片２１および第二電極片２２を有しており、該第一電極片２１は長方形であり、かつ該第一電極片２１は、該第二電極片２２と隣り合う

かまたは対応する側辺には対応する二つの切り欠き２１１を有しており、該第二電極片２２の二つの側辺には対応する二つの凹槽２２１を有して、該第二電極片２２の他方の側辺には凹口２２２を有しており、該側辺の二つの凹槽２２１および該凹口２２２により該第二電極片２２は上着如き形状をなす。該第一電極片２１は、該第二電極片２２と隣り合うかまたは対応する側辺に連結部（ｂａｒ）２３を有せず、それ以外の三つの側辺にはいずれも連結部２３を有しており、該連結部２３は、該縦方向および横方向の複数の金属リードフレーム２および該金属外枠１を連結する。

【００３５】

ステップ１０４において、リードフレームアセンブリー１０をプレスまたはエッチングした後に、該リードフレームアセンブリー１０の金属リードフレーム２に電気メッキを施して、該金属リードフレーム２に一層の金属膜を電気メッキする。

【００３６】

ステップ１０６において、上記発光ダイオードのリードフレームアセンブリー１０を電気メッキを施した後に、熱硬化性プラスチックを用いて、熱硬化成形技術により該金属リードフレーム２にゴム台座３を成形しており、該ゴム台座３は成形後に該第一電極片２１、第二電極片２２および該連結部２３を包覆する。該ゴム台座３は正面に中空機能エリア３１を有しており、該中空機能エリア３１は図４に示すように、該第一電極片２１および該第二電極片２２を外部に露出する。同様に、該ゴム台座３は裏面に二つの通孔３２、３３を有しており、該二つの通孔３２、３３は第一電極片２１および第二電極片２２を外部に露出するのに用いられて、該第一電極片２１および該第二電極片２２が導通して発光チップ（図示せず）を点灯した際に、該二つの通孔３２、３３は図５に示すように、該第一電極片２１および第二電極片２２を放熱させるのに用いられる。ゴム台座３が熱硬化した後に、該ゴム台座３の中空機能エリア３１と隣り合う縦方向および横方向位置に複数の保留空間（熱硬化性プラスチックを有しない）３４が形成されており、図５に示すように、該保留空間３４にて連結部２３は外部に露出している。

【００３７】

ステップ１０８において、該金属リードフレーム２のゴム台座３が熱硬化した後に、図６に示すように、該ゴム台座３の横方向両側の保留空間３４の中にで外部に露出した該連結部２３を裁断し、該連結部２３が切断された後に、該ゴム台座３は他のゴム台座３に連結されている。

【００３８】

ステップ１１０において、該連結部２３を切断した後に、図６、図７に示すように、該ゴム台座３の中空機能エリア３１にて外部に露出した第二電極片２２に発光チップ４を固接する。本図において、該発光チップ４は単色または多色のチップである。

【００３９】

ステップ１１２において、該発光チップ４と該中空機能エリア３１の外部に露出した第一電極片２１とのあいだは金属ワイヤ５により電気的に接続されている。本図面において、該金属ワイヤ５は、図６、図７に示すように金ワイヤである。

【００４０】

ステップ１１４において、ダイボンディングとワイヤボンディング工程が完成後に、図８に示すように、該ゴム台座３の中空機能エリア３１内にて接着工程を行い、該中空機能エリア３１内に接着剤６を注入する。本図面において該接着剤６はシリコン接着剤である。

【００４１】

ステップ１１６において、接着工程後に発光ダイオードに対して前置測定作業を行なうことが可能であるが、いわゆる前置測定作業とは、接着完成後および該接着剤６が硬化する前に、テスト作業者が連結部２３が切断された一つの金属リードフレーム２の該第一電極片２１および該第二電極片２２に電圧を印加して該発光チップ４を点灯せしめ、発生する光は該接着剤６に混入された蛍光パウダーと混色され、形成された色度および輝度が事前に設計された色度および輝度配合比の要求を満たすか否かを確認する作業のことを指す

。

【００４２】

例えば、白色光の一つの発光ダイオードを製造する際に、該発光チップが青色光である場合、中空機能エリア３１に注入された接着剤６には黄色の蛍光パウダーが混入されており、接着剤６を注入後まだ硬化していないうちに、テスト作業者は連結部２３が切断された金属リードフレーム２の該第一電極片２１および該第二電極片２２に電源を印加して、発光チップ４と黄色の蛍光パウダーが混入された接着剤６の輝度および色度の配合比が正確か否かを確認可能である。

【００４３】

上記の金属リードフレーム２が、ゴム台座３の製造完成後、金属リードフレーム２の連結部２３の裁断を行なうことにより、発光ダイオードが接着工程後前置測定作業を行なうことが可能になり、これにより発光ダイオードの製造良品率が９０％を上回ることができる。

【００４４】

図９、図１０、図１１は、本発明の別の実施例の製造フローチャートと、リードフレームアセンブリー正面図と、およびゴム台座の中間位置にて孔を開けた見取り図である。図に示すように、本実施例の製造フローチャートは図１と同様であり、異なるのは連結部２３を切断する方法だけである。ゴム台座３が熱硬化した後に、該ゴム台座３に保留空間が形成されず、ドリルを用いて（図示せず）中空機能エリア３１と隣り合う位置にてかつ該横方向の連結部２３に対応するゴム台座３を掘って該連結部２３を破断する（がしかしゴム台座３は貫通しない）か、またはゴム台座３をも穿通して、該連結部２３が破断して通孔３５を形成せしめて、該連結部２３が破断した後に、該ゴム台座３は依然として他のゴム台座３に連結されている。

【００４５】

該連結部２３が破断した後に、該ゴム台座３の中空機能エリア３１の中にて外部に露出した第二電極片２２に発光チップ４を固接し、該発光チップ４と該中空機能エリア３１の外部に露出した第一電極片２１とのあいだは金属ワイヤ５により電気的に接続されている。ダイボンディングとワイヤボンディング工程が完成後に、該ゴム台座３の中空機能エリア３１内にて接着工程を行い、該中空機能エリア３１内に接着剤６を注入してから、発光ダイオードに対して前置測定作業を行なうことが可能であるが、いわゆる前置測定作業とは、接着完成後および該接着剤６が硬化する前に、テスト作業者が連結部２３が切断された一つの金属リードフレーム２の該第一電極片２１および該第二電極片２２に電圧を印加して該発光チップ４を点灯せしめ、発生する光は該接着剤６に混入された蛍光パウダーと混色され、形成された色度および輝度が事前に設計された色度および輝度配合比の要求を満たすか否かを確認する作業のことを指す。

【００４６】

上記は本発明の好適な実施例であり、本発明の実施範囲を限定するためのものではない。およそ本発明の特許請求の範囲に従って行った均等な変化ならびに修飾は、いずれも本発明の特許範囲に含まれると見なすべきである。

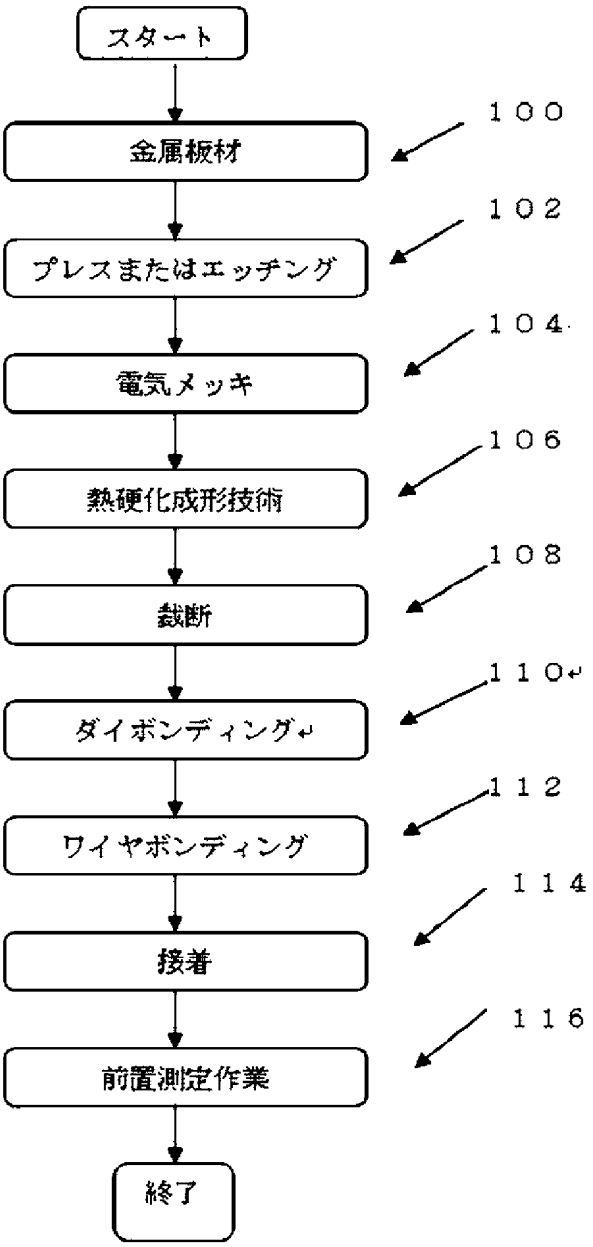
【符号の説明】

【００４７】

１００～１１６	ステップ
１０	リードフレームアセンブリー
１	金属外枠
１１	長孔
１２	短孔
１３	貫穿孔
２	金属リードフレーム
２１	第一電極片ム
２１１	切り欠き

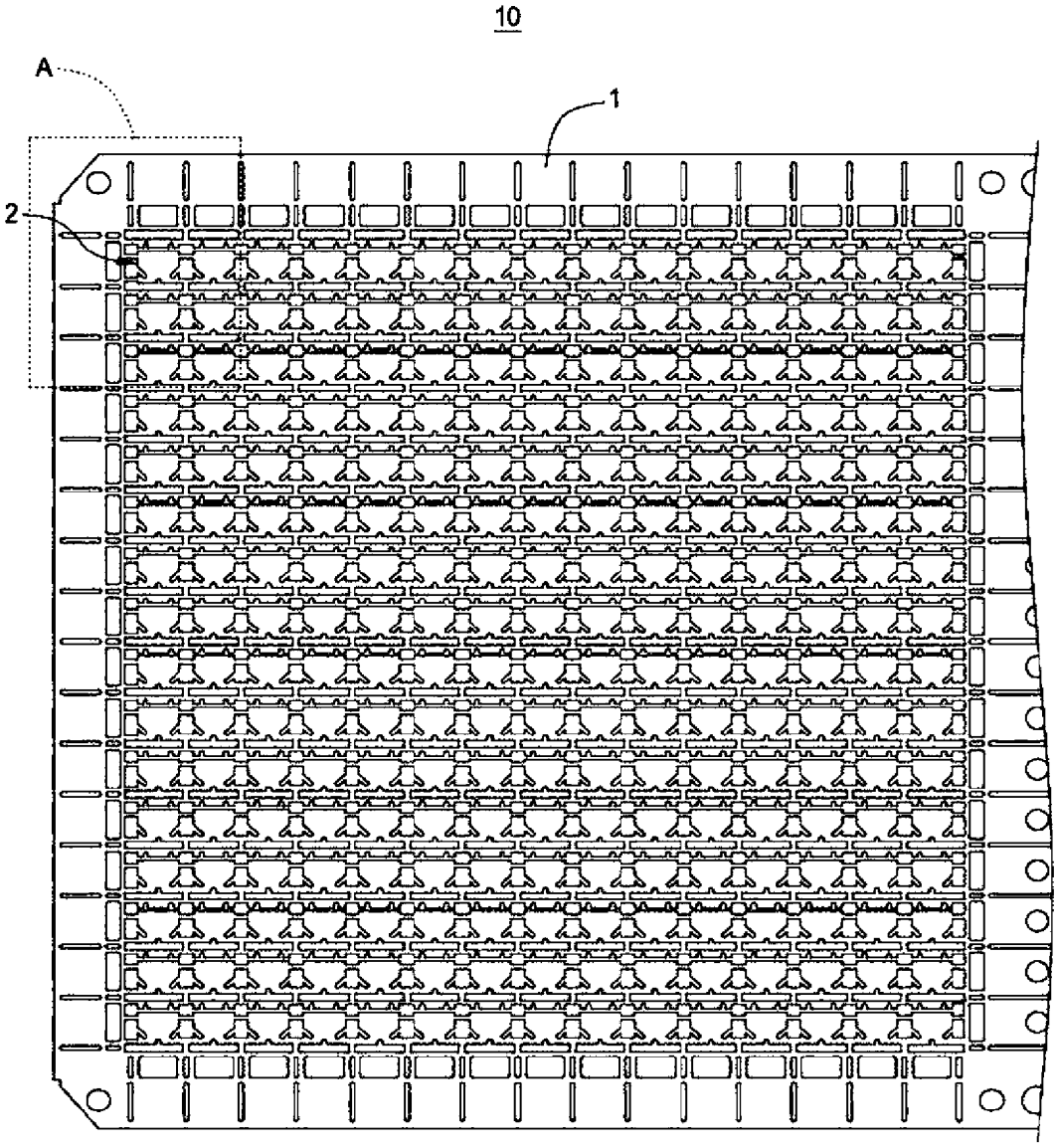
２２　第二電極片
２２１　凹槽
２２２　凹口
２３　連結部
３　ゴム台座
３１　中空機能エリア
３２、３３　通孔
３４　中間保留空間
３５　通孔
４　発光チップ
５　金ワイヤ
６　接着剤

【図１】

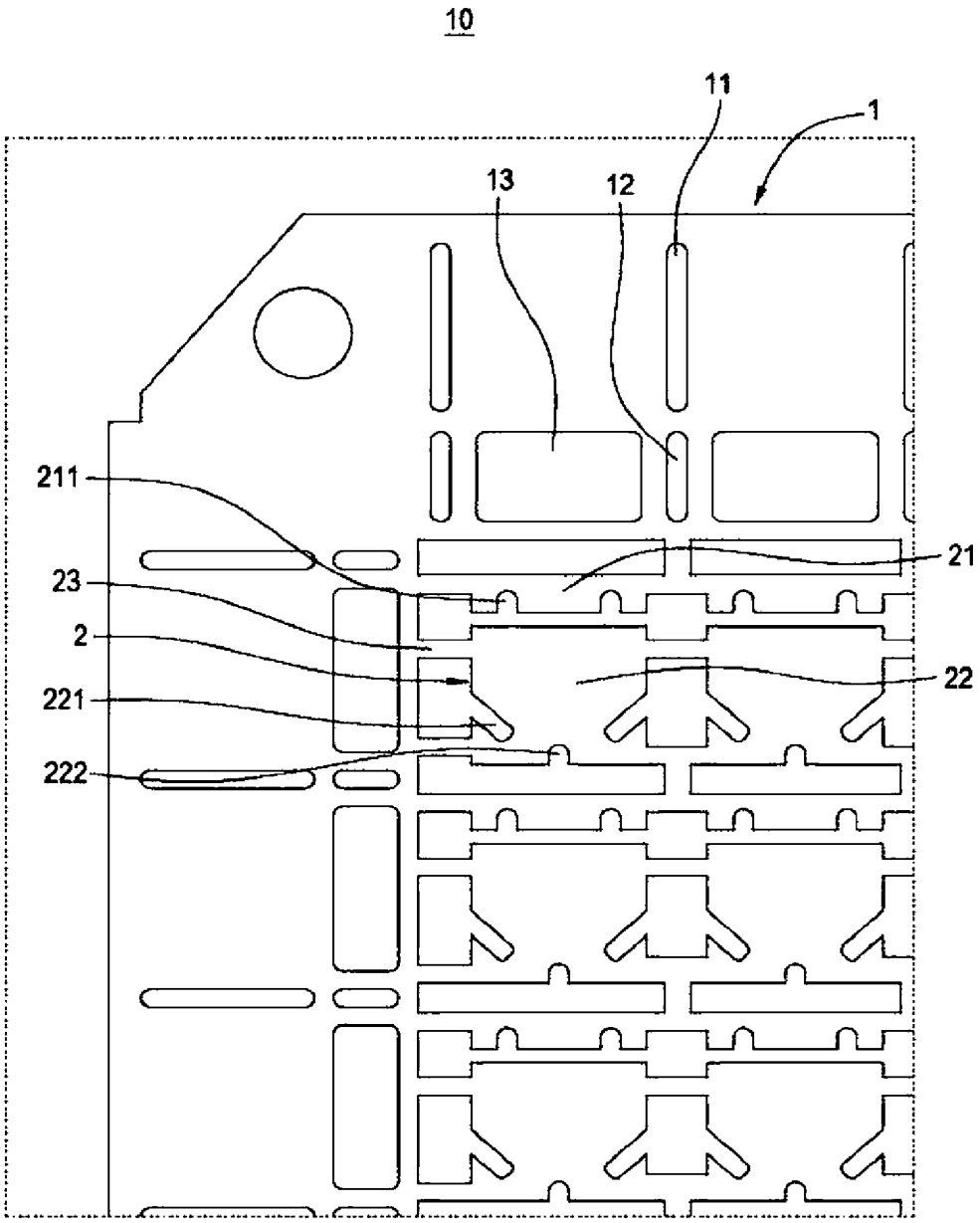


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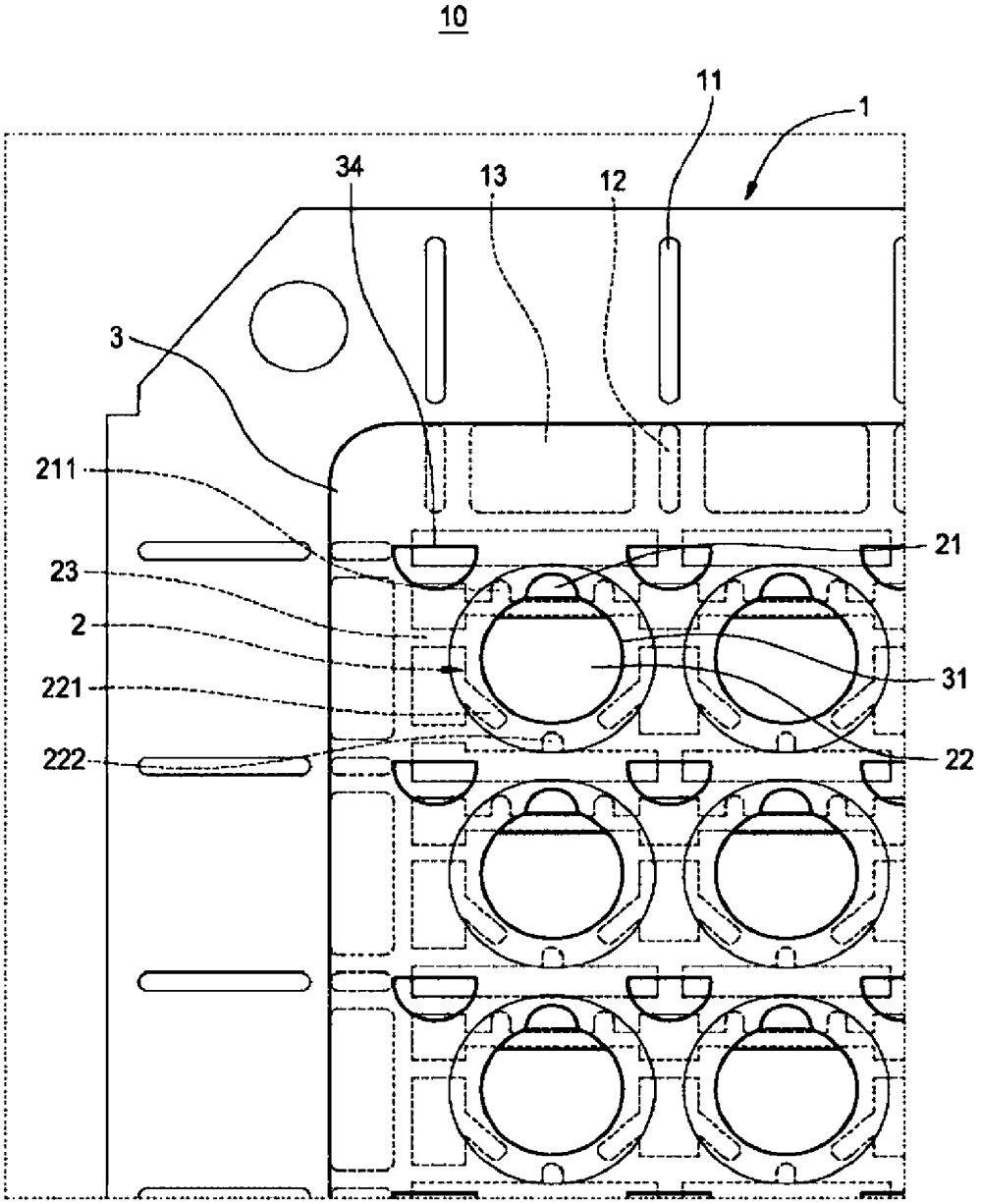
【図２】



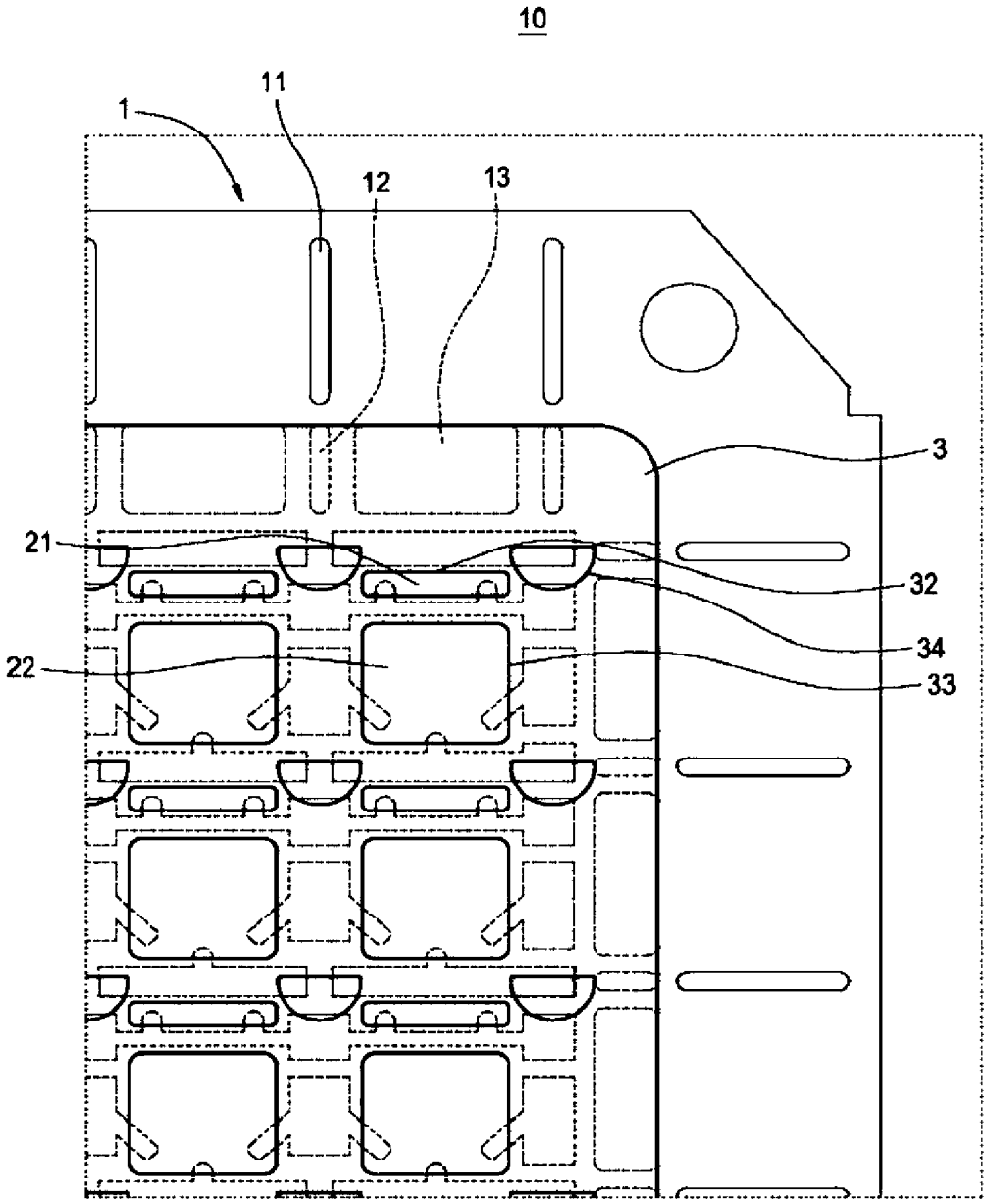
【図３】



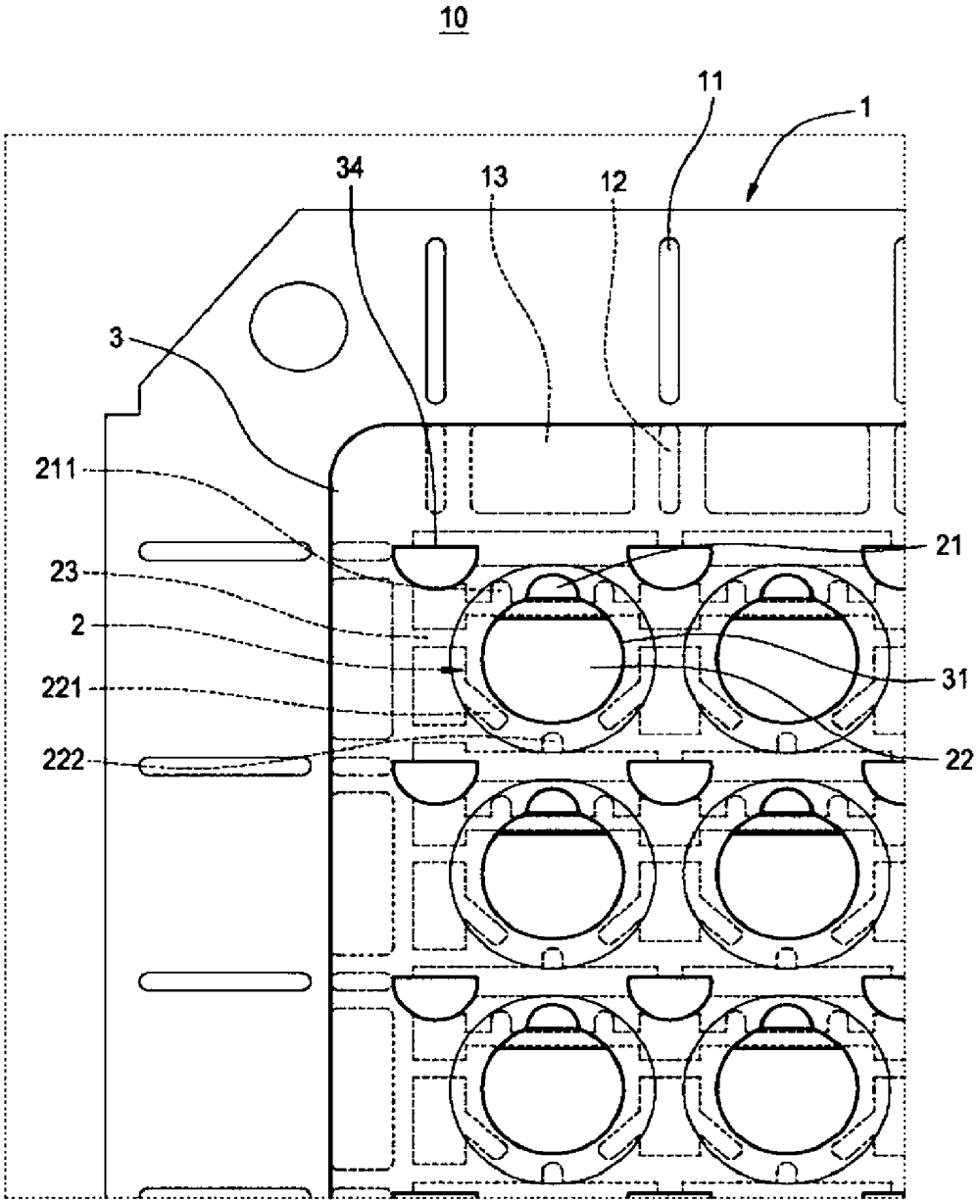
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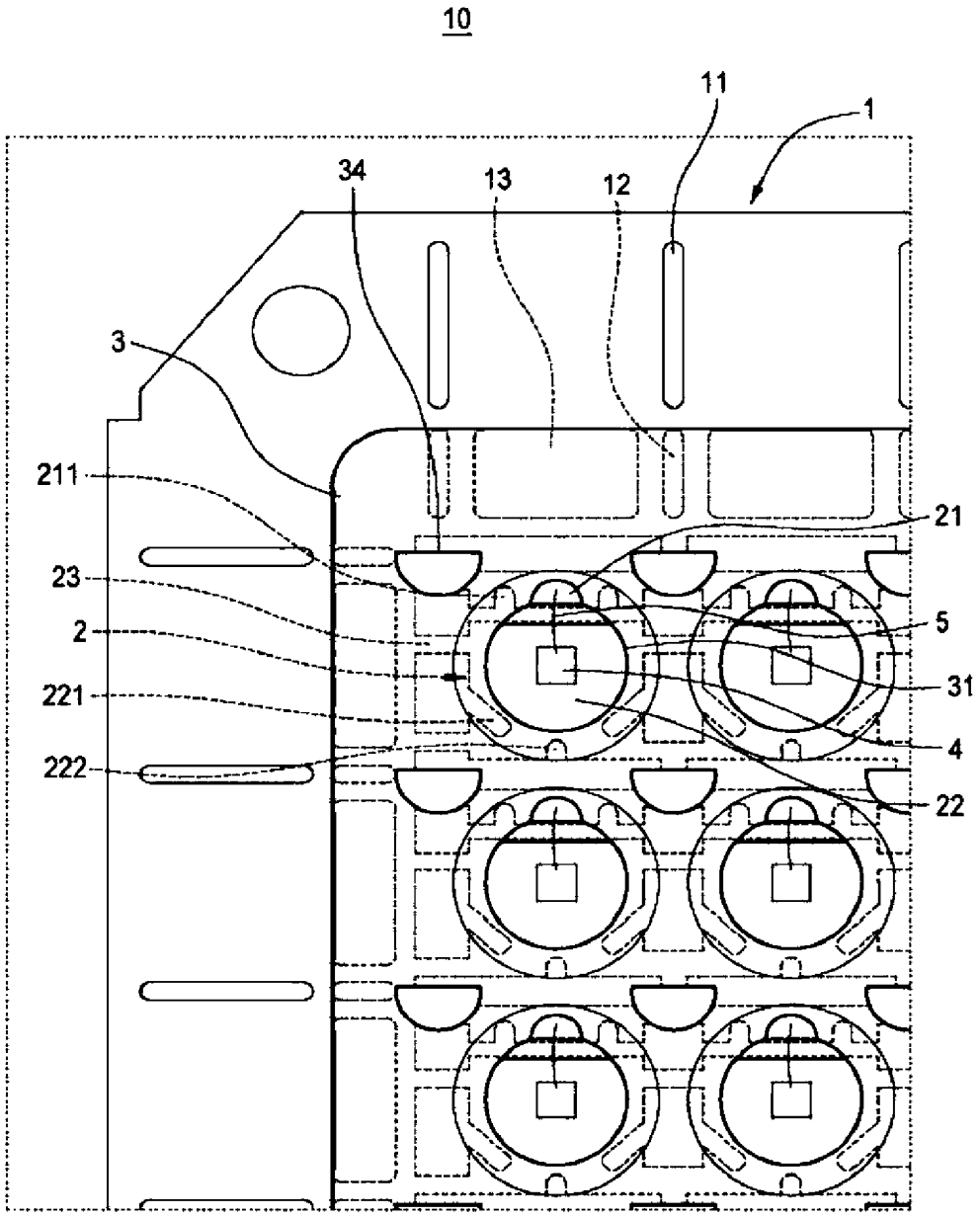
【図５】



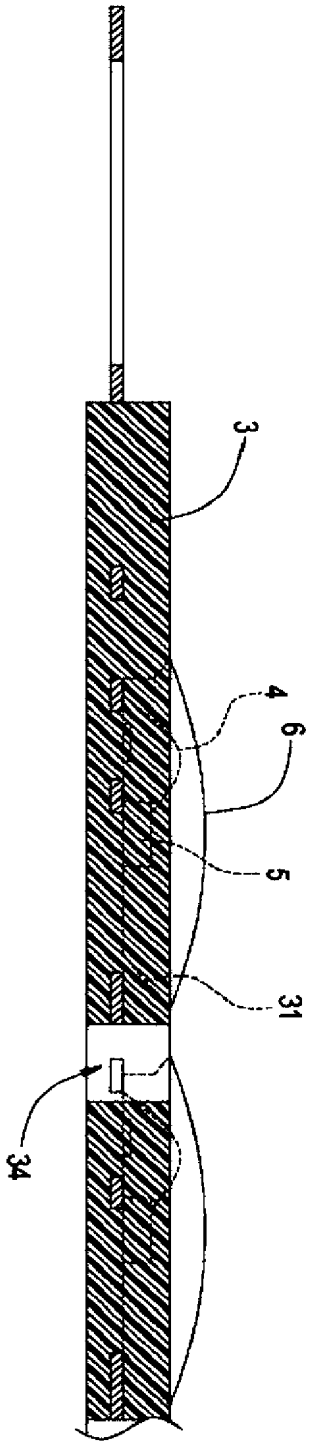
【図６】



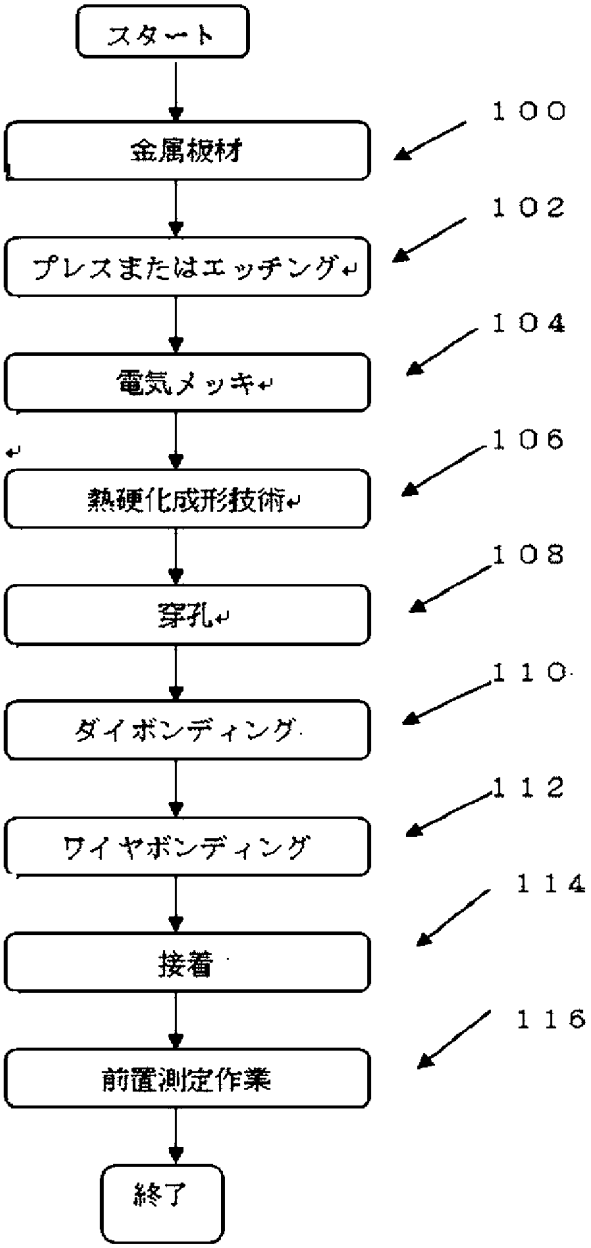
【図７】



【図８】

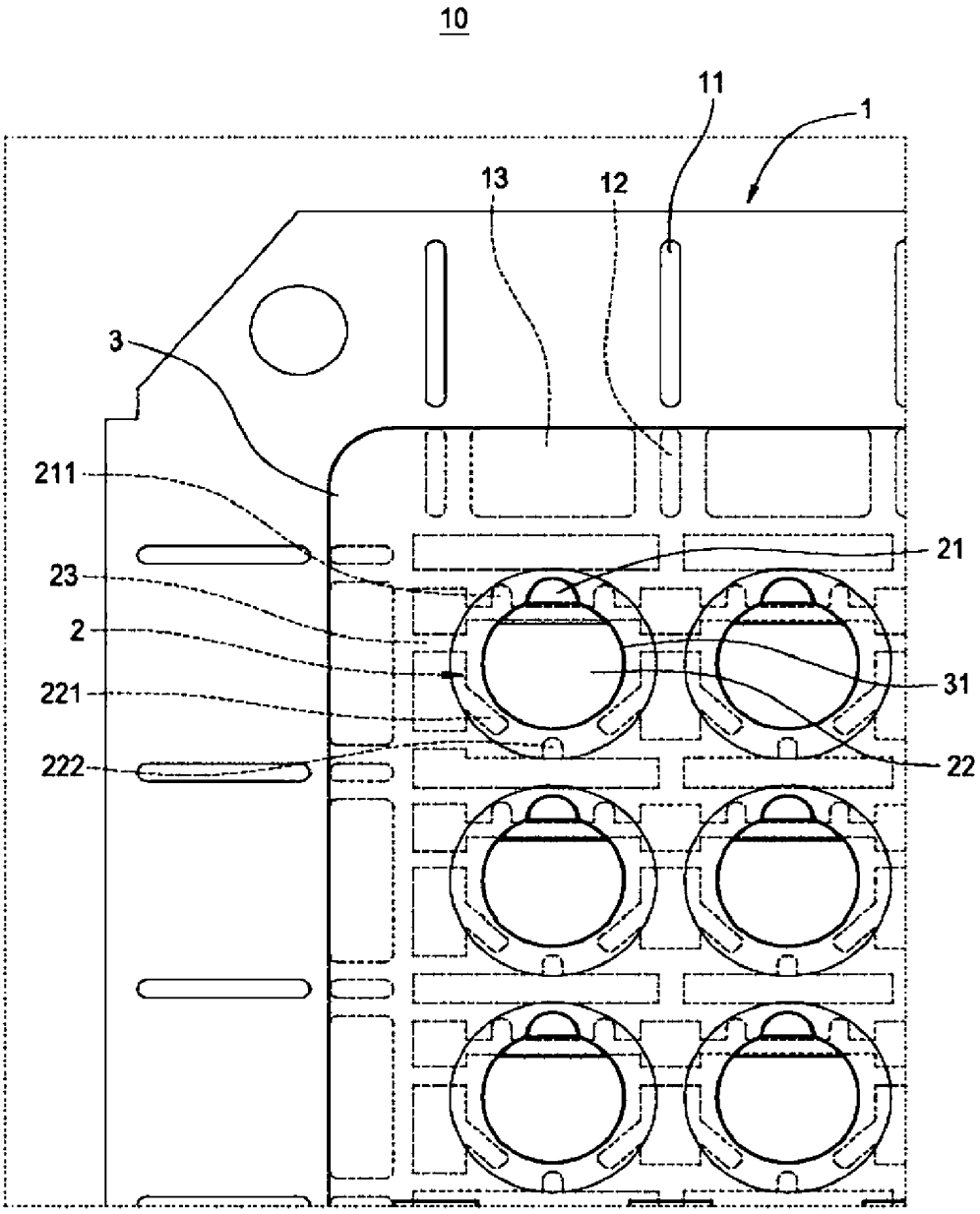


【図９】

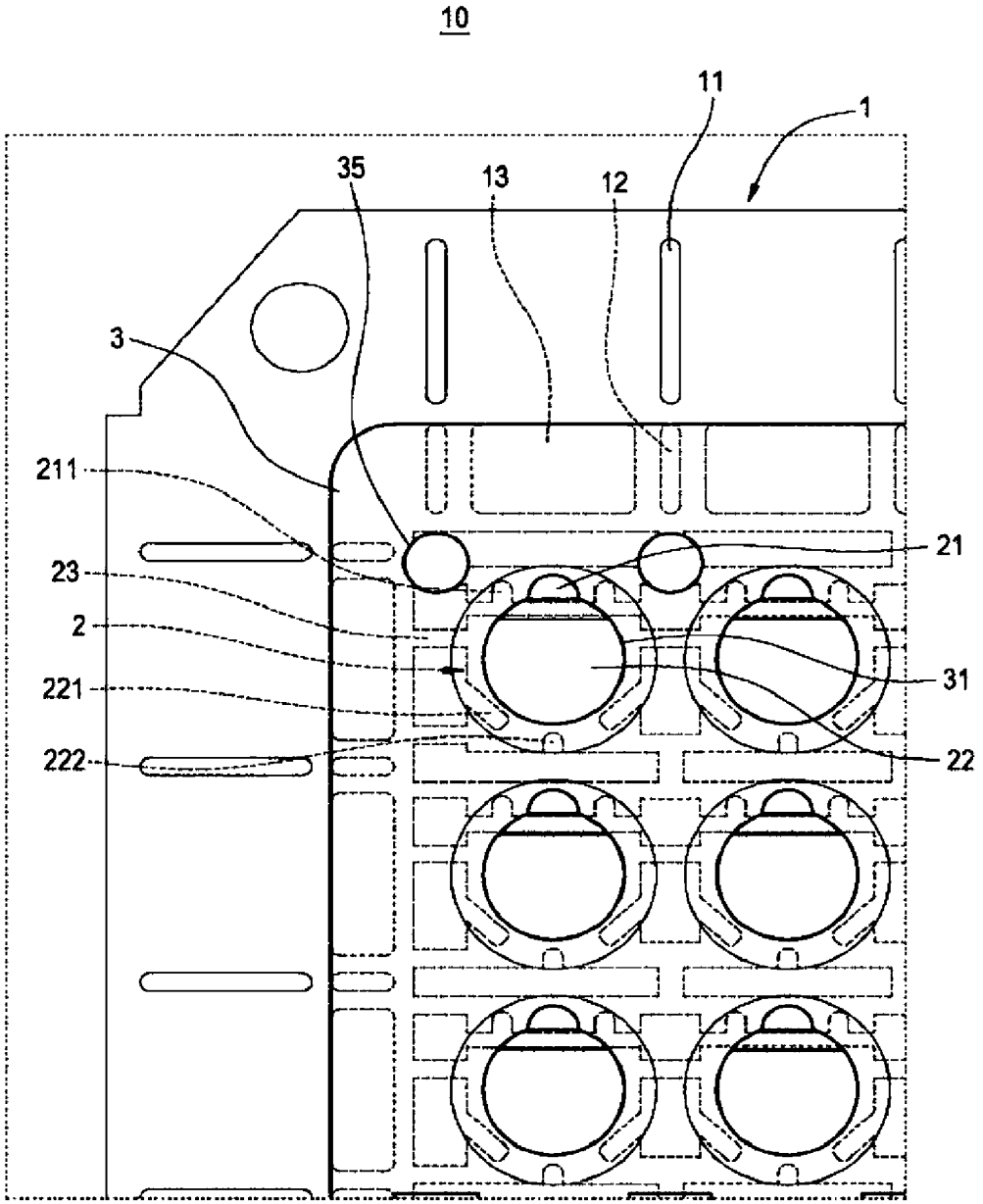


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【図１０】



【図１１】



フロントページの続き

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Light emitting diode package and carrier

Inventor(s): CHAN HSUN-WEI [TW] ± (CHAN, HSUN-WEI, ; CHAN, HSUN WEI)

Applicant(s): ADVANCED SEMICONDUCTOR ENG [TW] ± (ADVANCED SEMICONDUCTOR ENGINEERING, INC)

Classification: - international: ***H01L33/48***
- cooperative: **H01L33/486**; H01L2224/48091; H01L2224/48247; H01L2224/49113; H01L33/50; H01L33/62 more

Application number: TW20120124054 20120704

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Abstract of TW201340410 (A)

An LED package with trenches traversing a die pad to provide a mechanical interlock mechanism to strengthen bonding between the die pad and an insulator such that de-lamination is less likely to occur between the die pad and the insulator. A chip carrying region is defined by a barrier portion formed by the insulator in the trenches and in gaps between electrodes and the die pad, such that a light converting layer is confined within the barrier portion.

(19)中華民國智慧財產局
(12)發明說明書公開本 (11)公開編號：TW 201340410 A
(43)公開日： 中華民國 102 (2013) 年 10 月 01 日

(21)申請案號：101124054 (22)申請日： 中華民國 101 (2012) 年 07 月 04 日
(51)Int. Cl.： *H01L33/48 (2010.01)*
(30)優先權：2012/03/16 美國 13/422,213
(71)申請人：日月光半導體製造股份有限公司 (中華民國) ADVANCED SEMICONDUCTOR ENGINEERING, INC. (TW)
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申請實體審查：有 申請專利範圍項數：20 項 圖式數：16 共 29 頁

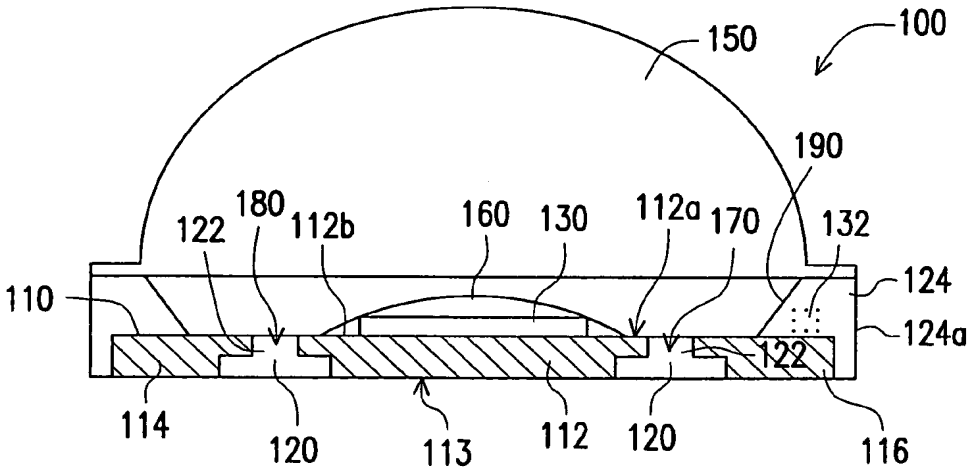
(54)名稱

發光二極體封裝以及承載板

LIGHT EMITTING DIODE PACKAGE AND CARRIER

(57)摘要

一種發光二極體封裝具有橫貫晶片座之多個溝槽，用以提供一機械連結，以強化晶片座與絕緣材間之結合，並降低可能發生於晶片座及絕緣層間之脫層的可能性。位於溝槽內及電極與晶片座間之間隙內的絕緣層共同形成一阻隔部，而阻隔部定義出一晶片承載區，以使光轉變層限位於阻隔部內。



100：發光二極體封裝
110：導線架
112：晶片座
112a：晶片座上表面
112b：晶片承載區
113：晶片座下表面
114：第一電極
116：第二電極
120：第一絕緣材
122：阻隔部
124：周緣部
130：發光二極體晶片
132：保護元件
150：第二絕緣材
160：光轉變層
170：第一間隙
180：第二間隙

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190：側壁

(19)中華民國智慧財產局
(12)發明說明書公開本 (11)公開編號：TW 201340410 A
(43)公開日： 中華民國 102 (2013) 年 10 月 01 日

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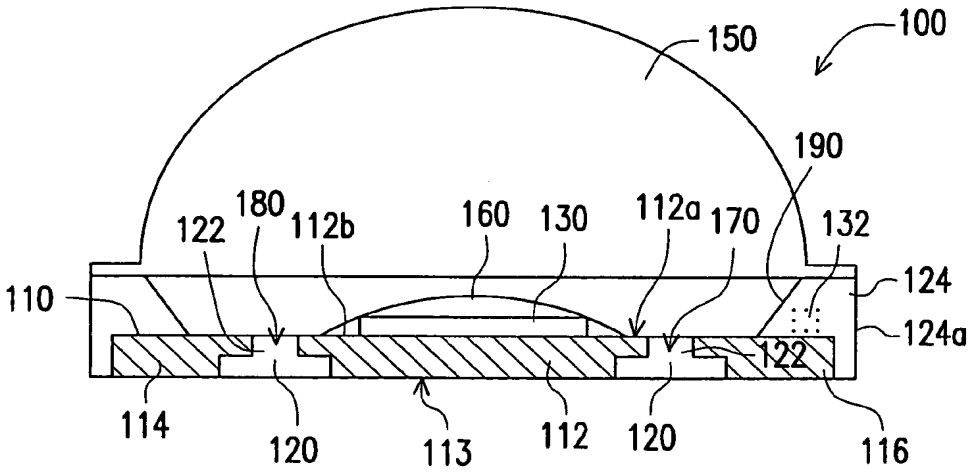
(54)名稱

發光二極體封裝以及承載板

LIGHT EMITTING DIODE PACKAGE AND CARRIER

(57)摘要

一種發光二極體封裝具有橫貫晶片座之多個溝槽，用以提供一機械連結，以強化晶片座與絕緣材間之結合，並降低可能發生於晶片座及絕緣層間之脫層的可能性。位於溝槽內及電極與晶片座間之間隙內的絕緣層共同形成一阻隔部，而阻隔部定義出一晶片承載區，以使光轉變層限位於阻隔部內。



100：發光二極體封裝
110：導線架
112：晶片座
112a：晶片座上表面
112b：晶片承載區
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114：第一電極
116：第二電極
120：第一絕緣材
122：阻隔部
124：周緣部
130：發光二極體晶片
132：保護元件
150：第二絕緣材
160：光轉變層
170：第一間隙
180：第二間隙

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發明專利說明書

（本說明書格式、順序，請勿任意更動，※記號部分請勿填寫）

※ 申請案號：101124054

※ 申請日：101.7.04 ※IPC 分類：H01L 33/48 (2010.01)

一、發明名稱：

發光二極體封裝以及承載板 / LIGHT EMITTING DIODE PACKAGE AND CARRIER

二、中文發明摘要：

一種發光二極體封裝具有橫貫晶片座之多個溝槽，用以提供一機械連結，以強化晶片座與絕緣材間之結合，並降低可能發生於晶片座及絕緣層間之脫層的可能性。位於溝槽內及電極與晶片座間之間隙內的絕緣層共同形成一阻隔部，而阻隔部定義出一晶片承載區，以使光轉變層限位於阻隔部內。

三、英文發明摘要：

An LED package with trenches traversing a die pad to provide a mechanical interlock mechanism to strengthen bonding between the die pad and an insulator such that de-lamination is less likely to occur between the die pad and the insulator. A chip carrying region is defined by a barrier portion formed by the insulator in the trenches and in gaps between electrodes and the die pad, such that a light converting layer is confined within the barrier portion.

四、指定代表圖：

（一）本案之指定代表圖：圖 2

（二）本代表圖之元件符號簡單說明：

100：發光二極體封裝

110：導線架

112：晶片座

112a：晶片座上表面

112b：晶片承載區

113：晶片座下表面

114：第一電極

116：第二電極

120：第一絕緣材

122：阻隔部

124：周緣部

130：發光二極體晶片

132：保護元件

150：第二絕緣材

160：光轉變層

170：第一間隙

180：第二間隙

190：側壁

五、本案若有化學式時，請揭示最能顯示發明特徵的化學式：無

六、發明說明：

【發明所屬之技術領域】

本發明是有關於一種封裝結構，且特別是有關於一種發光二極體的封裝結構。

【先前技術】

發光二極體裝置已有許多不同的應用，例如掃描器燈源、投影裝置的燈源、液晶顯示器的背光源或前光源，汽車儀表板上的照明燈源，交通號誌的燈源以及一般照明裝置的燈源等等。相較於傳統燈管，例如白熾燈，發光二極體裝置具有例如體積較小、使用壽命較長、驅動電壓/電流較低、結構強度較高、不含汞（減少廢棄時造成的污染）以及高發光效率以節省能源等顯著優勢。

發光二極體裝置通常包括至少一表面黏著型之發光二極體封裝，其內具有一發光二極體晶片。近年來，具有預封型導線架以承載發光二極體晶片的發光二極體封裝已被提出，取代傳統的陶製基板。預封型導線架包括一絕緣封裝膠材包覆一導線架且封裝膠材暴露出導線架之正電極與負電極。

然而，導線架與封裝膠材間的結合力通常較弱，且導線架與封裝膠材的熱膨脹係數也有極大的差異。由於導線架與封裝膠材的熱膨脹係數不同，當傳統的封裝結構經歷溫度循環時，其導線架與封裝膠材的界面即會誘發應力的產生。例如當發光二極體封裝是以表面黏著方式至一印刷

線路板時，其於回流焊接製程期間應力會造成導線架與封裝膠材之間的脫層現象。更可能使發光二極體封裝經脫層處暴露於空氣或溼氣中，進而造成發光二極體封裝的損壞。

【發明內容】

本發明提供一種發光二極體封裝，其可減少材料上的浪費及簡化發光二極體封裝的製程。

本發明之一實施例提出一種發光二極體封裝，包括一殼體。殼體具有一開口，開口具有一開放式頂部、一封閉式底部及多個側壁，側壁連接封閉式底部及開放式頂部，殼體包括一導線架。導線架具有一晶片座及至少一電極。至少一電極經由至少一間隙而與晶片座隔離。晶片座包括一第一溝槽與一第二溝槽，第一溝槽及第二溝槽位於殼體之開口內，各溝槽之一端連接至少一間隙。殼體更包括一第一絕緣材。第一絕緣材部份地包覆導線架，且暴露一部份晶片座之一上表面及一部份至少一電極，部份第一絕緣材填入至少一間隙及第一及第二溝槽。發光二極體封裝更包括一發光二極體晶片。發光二極體晶片配置於暴露之晶片座之上表面上，且位於第一溝槽及第二溝槽之間。發光二極體封裝更包括一導線，導線連接發光二極體晶片至電極之暴露部分。發光二極體封裝更包括一第二絕緣材。第二絕緣材包覆發光二極體晶片及導線。

本發明之另一實施例提出一種承載板，用於一發光二極體封裝，承載板包括一導線架。導線架包括一晶片座。

晶片座具有一上表面、一下表面、一第一溝槽及一第二溝槽。第一溝槽及第二溝槽完全地橫貫上表面。導線架更包括一第一電極以及一第二電極。第一電極以及第二電極分別位於晶片座的相對兩側，第一電極以及第二電極與晶片座隔離。晶片座與第一電極藉由一第一間隙分離，且第一間隙連通第一溝槽的一第一端以及第二溝槽的一第二端，而晶片座與第二電極藉由一第二間隙分離，且第二間隙連通第一溝槽的一第二端以及第二溝槽的一第二端。晶片座的上表面具有以第一間隙、第二間隙、第一溝槽以及第二溝槽為邊界的一晶片承載區。導線架更包括一絕緣材。絕緣材包覆部分的導線架。絕緣材至少暴露出晶片座的晶片承載區、一部分的第一電極以及一部份的第二電極，且一部分的絕緣材填入第一間隙、第二間隙、第一溝槽以及第二溝槽。

本發明之另一實施例提出一種發光二極體封裝，發光二極體封裝包括一導線架。導線架包括一晶片座。晶片座具有一第一溝槽與一第二溝槽，第一溝槽與第二溝槽橫跨晶片座之一上表面。導線架更包括一第一電極以及一第二電極。第一電極以及第二電極分別位於晶片座的相對兩側，第一電極及第二電極藉由連通第一溝槽及第二溝槽之第一間隙及第二間隙與晶片座間隔。第一間隙、第二間隙、第一溝槽及第二溝槽於晶片座上定義出的一晶片承載區。發光二極體封裝更包括一第一絕緣材。第一絕緣材至少部分地填入第一間隙、第二間隙、第一溝槽以及第二溝槽且

形成圍繞晶片承載區之一阻隔部。發光二極體封裝更包括一發光二極體晶片。發光二極體晶片位於晶片承載區內。發光二極體封裝更包括多條導線。導線連接發光二極體晶片至第一電極與第二電極。發光二極體封裝更包括一第二絕緣材，第二絕緣材包覆發光二極體晶片及導線。

為讓本發明之上述特徵和優點能更明顯易懂，下文特舉實施例，並配合所附圖式作詳細說明如下。

【實施方式】

請參考圖 1，本發明一實施例之發光二極體封裝 100 包括一殼體 102、一發光二極體晶片 130 以及一第二絕緣材或透鏡 150。殼體 102 包括一包覆於第一絕緣材 120 內之導線架 110。發光二極體晶片 130 設置於殼體 102 所定義之一開口內。

圖 2 為圖 1 之發光二極體封裝沿 2-2 線的剖面示意圖。請參考圖 2，導線架 110 包括一晶片座 112、一第一電極 114 及一第二電極 116。導線架 110 的材質通常為金屬，例如：銅、鋁等，亦可在導線架 110 表面鍍上一金屬鍍層（metal coating）例如鍍銀或鍍金，以增加導電性。

第一電極 114 及第二電極 116 分別位於晶片座 112 的相對兩側。晶片座 112、第一電極 114 及第二電極 116 相互分離，其中晶片座 112 與第一電極 114 之間相隔一第一間隙 170，晶片座 112 與第二電極 116 之間相隔一第二間隙 180。圖 3 為導線架 110 之立體示意圖。請參考圖 3，晶

片座 112 包括兩個溝槽 117a、117b，且溝槽 117a、117b 橫貫晶片座 112 之一上表面 112a。在另一實施例中，兩溝槽可如圖 6 中之溝槽 118a、118b 所示，僅部份橫跨上表面 112a，而不橫貫上表面 112a。此部分將於之後做詳述。

請參考圖 2 及圖 3，第一間隙 170 分離晶片座 112 與第二電極 116，而第二間隙 180 分離晶片座 112 與第一電極 114。因此，於晶片座 112 的上表面 112a 上，以第一間隙 170、第二間隙 180、第一溝槽 117a 及第二溝槽 117b 為邊界共同定義出一晶片承載區 112b。部分的第一絕緣材 120 填入溝槽 117a、117b 中。由於溝槽 117a、117b 位於殼體 102 之開口內，第一絕緣材 120 填入溝槽 117a、117b 提供額外的機械互鎖，以加強晶片座 112 與第一絕緣材 120 之間的接合，使晶片座 112 與第一絕緣材 120 之間不容易有脫層的現象發生。圖 4 為導線架 110 的仰視示意圖。請參考圖 4，導線架 110 可具有至少一凹部 115 於第一電極 114 或第二電極 116 上。

請參考圖 2，第一絕緣材 120 包覆部份導線架 110，以將晶片座 112 電性絕緣於第一電極 114 及第二電極 116。第一絕緣材 120 更可形成一周緣部 124，以定義發光二極體封裝 100 之區域，周緣部 124 係由一垂直外壁 124a 所定義。周緣部 124 及導線架 110 共同定義出一殼體，殼體具有一開口，開口具有一開放式頂部、一封閉式底部及多個側壁 190，側壁 190 連接開放式頂部及封閉式底部。該開口環狀設置以容置半球狀之第二絕緣材 150。在另一

實施例中，第一絕緣材 120 為一封裝膠體，其材質可以是透明聚合物或是半透明聚合物，例如軟膠、彈性物質或是樹脂，其中樹脂可為環氧樹脂、矽膠或是環氧-矽膠混合樹脂。

請參考圖 5，第一絕緣材 120 於殼體之封閉式底部暴露出至少一部份之晶片座 112、一部份之第一電極 114 及一部份之第二電極 116（暴露的部份以剖面線繪示）。此外，第一絕緣材 120 填入第一間隙 170 及第二間隙 180，以使晶片座 112 該晶片座 112 電性絕緣於該第一電極 114 及第二電極 116。

請繼續參照圖 5，發光二極體晶片 130 配置於晶片座 112 之上表面 112a 上，以使發光二極體晶片 130 及晶片座 112 之間具有良好之導熱性。舉例而言，發光二極體晶片 130 可經由金屬銲接固定於上表面 112a。導線 140 分別連接第一電極 114 或第二電極 116 之暴露部分至發光二極體晶片 130 之電性接墊上（例如，正極與負極接墊）。在另一實施例中，負極接墊並非如前述實施例所示設置於發光二極體晶片 130 之頂面，而是設置於發光二極體晶片 130 之底面。負極接墊可以一導電材料電性連接至晶片座 112，而可不設置電極 114、116 的其中之一。

承上述，請繼續參照圖 5，周緣部 124 之內側壁上可設有一第一缺口 192 以及一第二缺口 194，分別對應於該第一電極 114 的一第一打線接合區 114a 以及第二電極 116 的一第二打線接合區 116a。在另一實施例中，若打線接合

區 114a、116a 足以提供打線接合空間需求而無需缺口 192、194 提供額外的暴露區域時，則可不設置缺口 192、194。

請回頭參照圖 1 及圖 2，第二絕緣材 150 包覆發光二極體晶片 130 及導線 140。在本實施例中，第二絕緣材 150 可為一封裝膠體，其材質可以是透明聚合物或是半透明聚合物，例如軟膠、彈性物質或是樹脂，其中樹脂可為環氧樹脂、矽膠或是環氧-矽膠混合樹脂。為了增加上述之發光二極體封裝所發射出之光線的均勻度，可散射其光線，使光線猶如從各種發射點射出。例如：添加散射粒子（未繪示）於第二絕緣材 150 中以散射光線。

請參考圖 2，光轉變層 160 設置於第二絕緣材 150 與發光二極體晶片 130 之間，且覆蓋發光二極體晶片 130 及部分導線 140（未繪示於圖 2）。光轉變層 160 包含光轉變物質顆粒，例如為螢光顆粒。發光二極體晶片 130 射出的光線，例如：藍光，可以被光轉變物質顆粒轉換為不同顏色的光線，例如：綠光、黃光或紅光，其不同顏色的光線再混合以產生白光。光轉變層 160 可選擇性設置，例如在只發單色光之發光二極體封裝中則不需設置光轉變層 160。在本發明的其他實施例中，亦可將第二絕緣材 150 摻入光轉變物質顆粒來取代光轉變層 160。

請繼續參照圖 2，發光二極體封裝 100 更包括一保護元件 132，用以保護晶片 130 不承受過量電流。保護元件 132 設置於第二電極 116 上且藉由一導線（未示於圖中）

電性連接至第一電極 114。第一絕緣材 120 覆蓋保護元件 132。保護元件 132。例如為一稽納二極體（Zener Diode）。可調整工作電壓並具有穩定電路之功能。

圖 7 為圖 2 之發光二極體封裝之部分剖面示意圖。請參照圖 7，其中，周緣部 124 及第二絕緣材 150 未繪示於圖中以更清楚呈現內部構造。第一絕緣材 120 位於第一間隙 170、第二間隙 180、第一溝槽 117a 及第二溝槽 117b 的部分形成圍繞晶片承載區 112b 的一阻隔部 122。阻隔部 122 具有一頂部 122a，其實質上與晶片座 112 之上表面 112a 共平面。在一實施例中，光轉變層 160 係由一光轉變合成物形成，此光轉變合成物包括散佈於一透明矽聚合物之磷光粒子及二氧化矽粒子，其中透明矽聚合物可被熱或光硬化。光轉變合成物於液態時，可被塗佈於晶片 130 及緊鄰晶片 130 之晶片座 112 的上表面 112a 上，再將其硬化至固態，而形成光轉變層 160。藉由光轉變合成物之材料性質，使其比黏附於有機的阻隔部 122 更能穩固地黏附於具金屬特性之晶片座。光轉變合成物可被限制在阻隔部 122 之內，且一旦硬化至固態，其形成之光轉變層 160 即會被限制在阻隔部 122 之內。

圖 8A 為圖 8 之發光二極體封裝的立體示意圖。圖 8 及圖 8A 繪示了本發明之另一實施例，其中發光二極體晶片 130 及光轉變層 160 未繪示於圖中以更清楚呈現內部構造。阻隔部 622 具有一上表面 622a，其高於晶片座 112 之上表面 112a。阻隔部 622 將光轉變層 160 局限於阻隔部 122

所圈圍之區域內。在另一實施例中，如圖 9 所示，阻隔部 722 具有一上表面 722a，其高於晶片座 112 之上表面 112a，且阻隔部 722 之上表面 722a 在面向發光二極體晶片 130 的一側具有一斜面 122b。如此配置，阻隔部 722 將光轉變層 160 局限在阻隔部 722 所圈圍之區域內，並增加其出光效率。在另一實施例中，如圖 10 所示，阻隔部 822 具有一上表面 822a，其低於晶片座 112 之上表面 112a 而呈現出一凹陷部。如此配置，利用上表面 822a 之凹陷外型，將光轉變層 160 局限於阻隔部 822 所圈圍之區域內。光轉變層 160 局限於圖 8 至圖 10 之實施例的阻隔部 622、722、822 內，以便於對光轉變層 160 加以硬化以固著於晶片座 112 之上表面 112a 上。

請參照圖 11，導線架 110a 可具有一或多個凹部 113a 於晶片座 112 的上表面 112a，用以供第一絕緣材 120 填入，以增加晶片座 112 與第一絕緣材 120 之間的接合強度，使晶片座 112 與第一絕緣材 120 之間不容易有脫層的現象發生。同理，導線架 110a 具有至少一凹部 115 於第一電極 114 及/或第二電極 116 的表面，用以供第一絕緣材填入，以增加第一電極 114 及/或第二電極 116 與第一絕緣材 120 之間的接合強度，使第一電極 114 或第二電極 116 與第一絕緣材 120 之間不容易有脫層（de-lamination）的現象發生。

請參考圖 12 及 13，在本實施例中，第一絕緣材 120 覆蓋除了第一打線接合區 114a、第二打線接合區 116a 以

及晶片承載區 112b 以外的導線架 110 上表面之所有區域，意即，第一絕緣材 120 只暴露導線架 110 之第一打線接合區 114a、第二打線接合區 116a 以及晶片承載區 112b。

圖 14 至圖 16 為數個發光二極體封裝的側視示意圖，其第二絕緣材 150 有不同的配置。第二絕緣材 150 包覆發光二極體晶片 130 及導線 140，且填充凹杯結構。在本發明之一實施例中，如圖 14 所示，第二絕緣材 150 的一頂面與周緣部 124 的頂面共平面。在本發明之其他實施例中，如圖 15 所示，第二絕緣材 150 更可包括一圓頂形透鏡部，以增強發光二極體封裝結構 100 的光萃取效率，如圖 16 所示，第二絕緣材 150 包括一類橢球狀透鏡部，該透鏡部之頂部被截去而形成一實質平坦表面。

雖然本發明已以實施例揭露如上，然其並非用以限定本發明，任何所屬技術領域中具有通常知識者，在不脫離本發明之精神和範圍內，當可作些許之更動與潤飾，故本發明之保護範圍當視後附之申請專利範圍所界定者為準。

【圖式簡單說明】

圖 1 為根據本發明一實施例之發光二極體封裝的立體示意圖。

圖 2 為圖 1 之發光二極體封裝沿 2-2 線的剖面示意圖。

圖 3 為圖 1 之發光二極體封裝之導線架的立體示意圖。

圖 4 為圖 3 之導線架的仰視示意圖。

圖 5 為圖 1 之發光二極體封裝之俯視示意圖。

圖 6 為本發明另一實施例之發光二極體封裝之俯視示意圖。

圖 7 為圖 2 之發光二極體封裝之部分剖面示意圖。

圖 8 為本發明另一實施例之發光二極體封裝之部分剖面示意圖。

圖 8A 為圖 8 之發光二極體封裝的立體示意圖。

圖 9 為本發明另一實施例之發光二極體封裝之部分剖面示意圖。

圖 10 為本發明另一實施例之發光二極體封裝之部分剖面示意圖。

圖 11 為本發明另一實施例之用於發光二極體封裝之導線架的立體示意圖。

圖 12 為本發明另一實施例之發光二極體封裝之俯視示意圖。

圖 13 為圖 12 之發光二極體封裝之立體示意圖。

圖 14 至圖 16 為本發明之三個不同實施例之發光二極體封裝的側視示意圖。

【主要元件符號說明】

100：發光二極體封裝

102：殼體

110、110a：導線架

112：晶片座

112a：上表面

112b：晶片承載區
113：下表面
113a、115：凹部
114：第一電極
114a：第一打線接合區
116：第二電極
116a：第二打線接合區
117a：第一溝槽
117b：第二溝槽
120：第一絕緣材
122、622、722、822：阻隔部
122a、622a、722a、822a：阻隔部上表面
122b：斜面
124：周緣部
124a：垂直外壁
130：發光二極體晶片
132：保護元件
140：導線
142：第二導線
150：第二絕緣材
160：光轉變層
170：第一間隙
180：第二間隙
190：側壁
192：第一讓位缺口
194：第二讓位缺口

七、申請專利範圍：

1. 一種發光二極體封裝，包括：

一殼體，具有一開口，該開口具有一開放式頂部、一封閉式底部及多個側壁，該些側壁連接該封閉式底部及該開放式頂部，該殼體包括：

一導線架，具有一晶片座及至少一電極，該至少一電極經由至少一間隙而與該晶片座隔離，該晶片座包括一第一溝槽與一第二溝槽，該第一溝槽及該第二溝槽位於該殼體之該開口內，各溝槽之一端連接該至少一間隙； 以及

一第一絕緣材，部份地包覆該導線架以暴露一部份該晶片座之一上表面及一部份該至少一電極，且該第一絕緣材部份地填入該至少一間隙及該第一及第二溝槽；

一發光二極體晶片，配置於暴露之該晶片座之該上表面上，且位於該第一溝槽及該第二溝槽之間；

至少一導線，連接該發光二極體晶片至該至少一電極之暴露部分；以及

一第二絕緣材，包覆該發光二極體晶片及該導線。

2. 如申請專利範圍第 1 項所述之發光二極體封裝，其另包含一光轉變層設於該第二絕緣材與該發光二極體晶片之間，該光轉變層覆蓋該發光二極體晶片。

3. 如申請專利範圍第 2 項所述之發光二極體封裝，其中填入該間隙、該第一溝槽及該第二溝槽之部分該第一絕

緣材形成圍繞該光轉變層的一阻隔部。

4. 如申請專利範圍第 3 項所述之發光二極體封裝，其中該阻隔部的一上表面高於該晶片座之該上表面，且該阻隔部的該上表面在面向該發光二極體晶片的一側為一斜面。

5. 如申請專利範圍第 3 項所述之發光二極體封裝，其中該阻隔部的一上表面實質上與該晶片座之該上表面共平面。

6. 如申請專利範圍第 3 項所述之發光二極體封裝，其中該阻隔部的一上表面低於該晶片座之該上表面。

7. 如申請專利範圍第 1 項所述之發光二極體封裝，其中該至少一電極包括至少一凹部，且該第一絕緣材填入至少部份之該凹部。

8. 如申請專利範圍第 1 項所述之發光二極體封裝，其中該晶片座的該上表面包括至少一凹部，且該第一絕緣材填入至少部份之該凹部。

9. 如申請專利範圍第 1 項所述之發光二極體封裝，其中該第一絕緣材包括位於該圍繞該發光二極體晶片的一壁體，該壁體與該導線架共同形成一凹陷杯狀結構，且該暴露部份之該晶片座之該上表面及該暴露部份之該電極位於該凹陷杯狀結構的一底部。

10. 如申請專利範圍第 9 項所述之發光二極體封裝，其中該凹陷杯狀結構的該壁體之一側壁上具有一缺口，以暴露出該電極的一打線接合區。

11. 如申請專利範圍第 10 項所述之發光二極體封裝，其中該第一絕緣材覆蓋與該上表面同側的除了該第一打線接合區、該第二打線接合區及一晶片承載區以外的該導線架的所有區域，該晶片承載區由該至少一間隙、該第一溝槽與該第二溝槽所定義。

12. 一種承載板，用於一發光二極體封裝，該承載板包括：

一導線架，包括：

一晶片座，具有一上表面、一下表面、一第一溝槽及一第二溝槽，該第一溝槽及該第二溝槽完全地橫貫該上表面；以及

一第一電極以及一第二電極，分別位於該晶片座的相對兩側，該第一電極及該第二電極與該晶片座隔離，該晶片座與該第一電極藉由一第一間隙分離，該第一間隙連通該第一溝槽的一第一端以及該第二溝槽的一第一端，該晶片座與該第二電極藉由一第二間隙分離，該第二間隙連通該第一溝槽的一第二端以及該第二溝槽的一第二端，該晶片座的該上表面具有以該第一間隙、該第二間隙、該第一溝槽以及該第二溝槽為邊界的一晶片承載區；以及

一絕緣材，包覆部分的該導線架，其中該絕緣材至少暴露出該晶片座的該晶片承載區、一部分的該第一電極以及一部份的該第二電極，且一部分的該絕緣材填入該第一間隙、該第二間隙、該第一溝槽以及該第二溝槽。

13. 如申請專利範圍第 12 項所述之承載板，其中填入該第一間隙、該第二間隙、該第一溝槽以及該第二溝槽之部分該絕緣材形成圍繞該晶片承載區的一阻隔部，該阻隔部的一上表面高於該晶片座之該上表面。

14. 如申請專利範圍第 13 項所述之承載板，其中該阻隔部的該上表面的一側為一斜面。

15. 如申請專利範圍第 12 項所述之承載板，其中填入該第一間隙、該第二間隙、該第一溝槽以及該第二溝槽之部分該絕緣材形成圍繞該晶片承載區的一阻隔部，該阻隔部的一上表面實質上與該晶片座之該上表面共平面。

16. 如申請專利範圍第 12 項所述之承載板，其中位於該第一間隙、該第二間隙、該第一溝槽以及該第二溝槽之部分該絕緣材形成圍繞該晶片承載區的一阻隔部，該阻隔部的一上表面低於該晶片座之該上表面。

17. 如申請專利範圍第 12 項所述之承載板，其中該絕緣材包括位於該導線架之一周圍且環繞該晶片承載區的一壁體，該壁體與該導線架共同形成一凹陷杯狀結構，且該晶片承載區位於該凹陷杯狀結構的一底部。

18. 如申請專利範圍第 17 項所述之承載板，其中該凹陷杯狀結構的該壁體之一側壁上具有一第一缺口以及一第二缺口，以分別暴露出該第一電極的一第一打線接合區以及該第二電極的一第二打線接合區。

19. 一種發光二極體封裝，包括：

一導線架，包括：

一晶片座，具有一第一溝槽與一第二溝槽，該第一溝槽與該第二溝槽橫跨該晶片座之一上表面；以及

一第一電極以及一第二電極，分別位於該晶片座的相對兩側，該第一電極及該第二電極藉由連通該第一溝槽及該第二溝槽之一第一間隙及一第二間隙與該晶片座間隔，該第一間隙、該第二間隙、該第一溝槽及該第二溝槽於晶片座上定義出一晶片承載區；

一第一絕緣材，該第一絕緣材至少部分地填入該第一間隙、該第二間隙、該第一溝槽以及該第二溝槽且形成圍繞該晶片承載區之一阻隔部；

一發光二極體晶片，位於該晶片承載區內；

多條導線，連接該發光二極體晶片至該第一電極與該第二電極；以及

一第二絕緣材，包覆該發光二極體晶片及該些導線。

20. 如申請專利範圍第 19 項所述之發光二極體封裝，更包括一光轉變層設於該第二絕緣材與該發光二極體晶片之間，該光轉變層覆蓋該發光二極體晶片，其中該阻隔部之一上表面高於、實質上共平面於或低於該晶片座之該上表面，且該阻隔部圍繞該光轉變層。

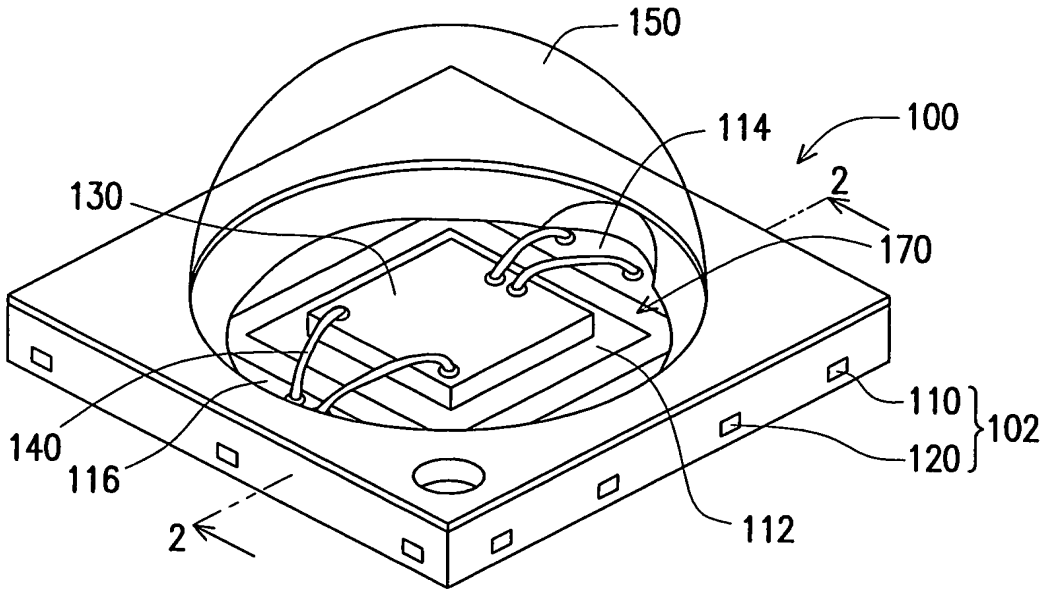

150
114
100
130
2
170
110
102
120
140
116
112
2

圖 1

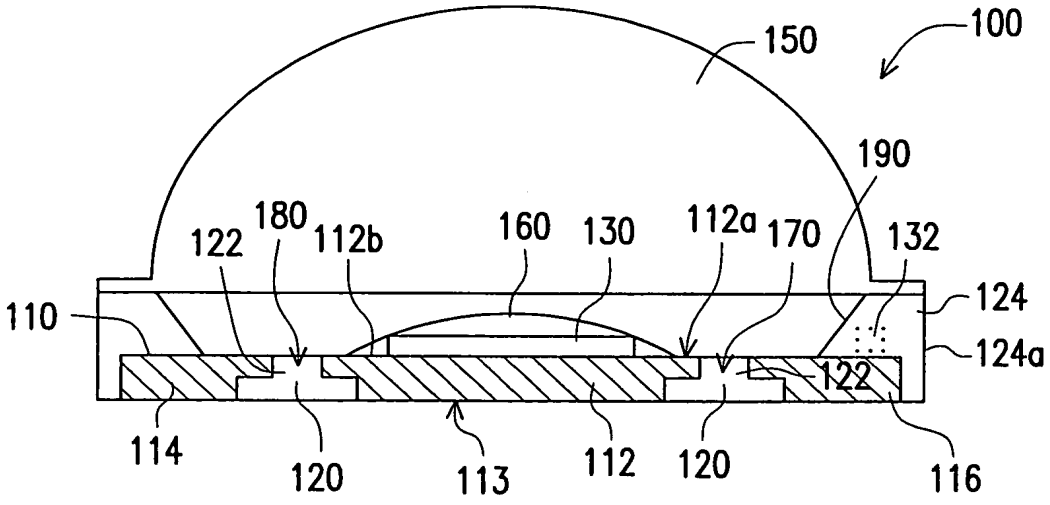

150
100
190
122
180
112b
160
130
112a
170
132
110
124
124a
122
114
120
113
112
120
116

圖 2

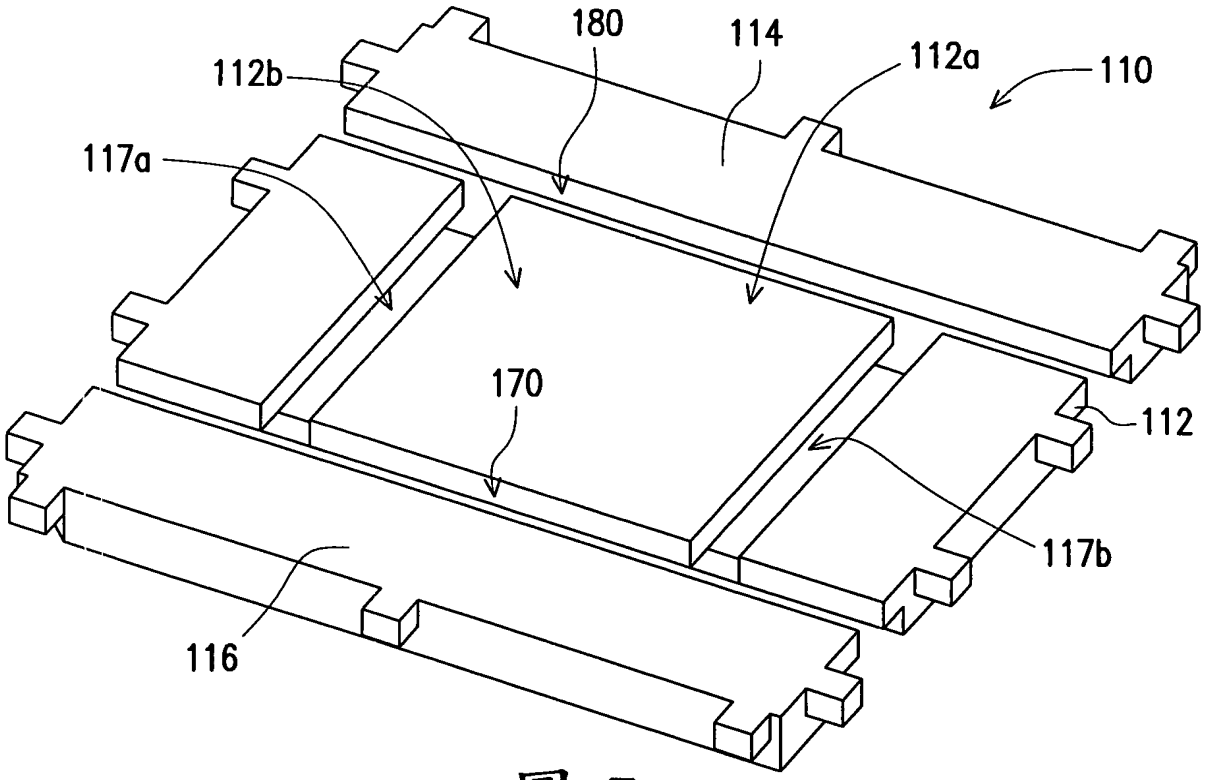

180
114
112a
110
112b
117a
170
112
117b
116

圖 3

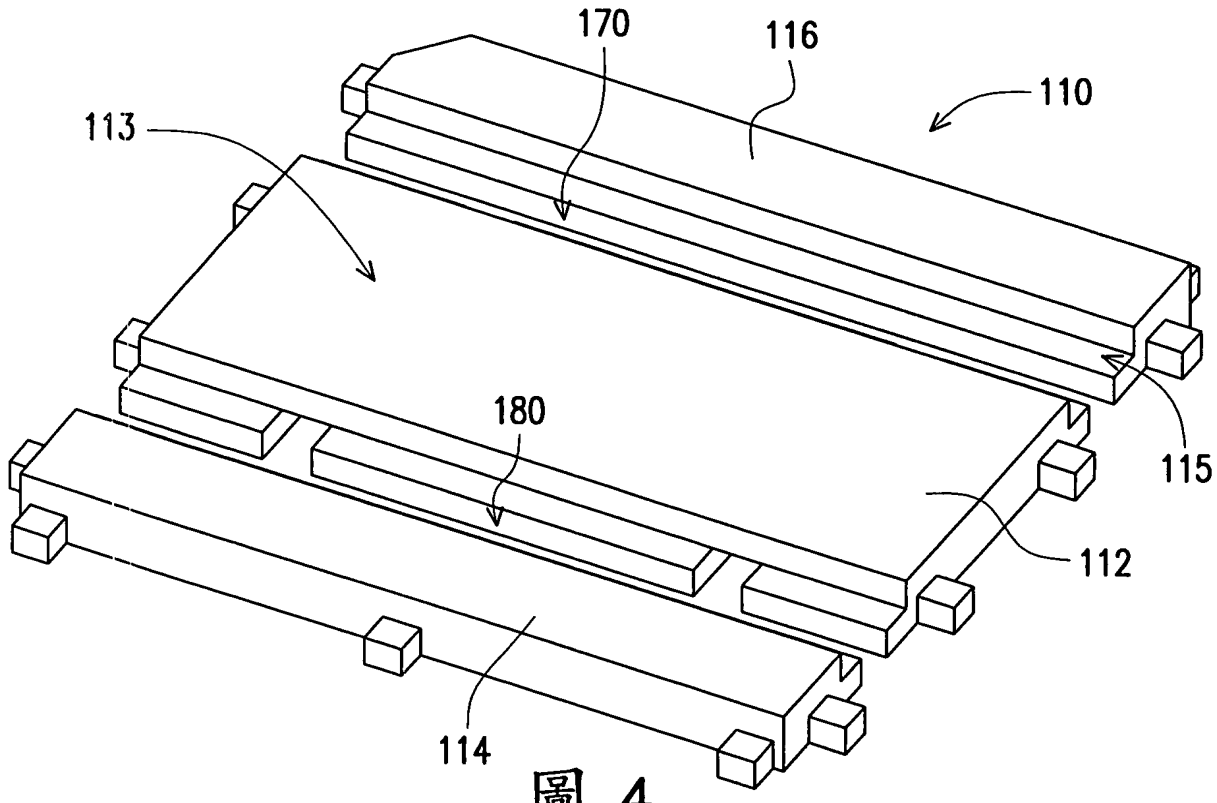

170
116
110
113
180
115
112
114

圖 4

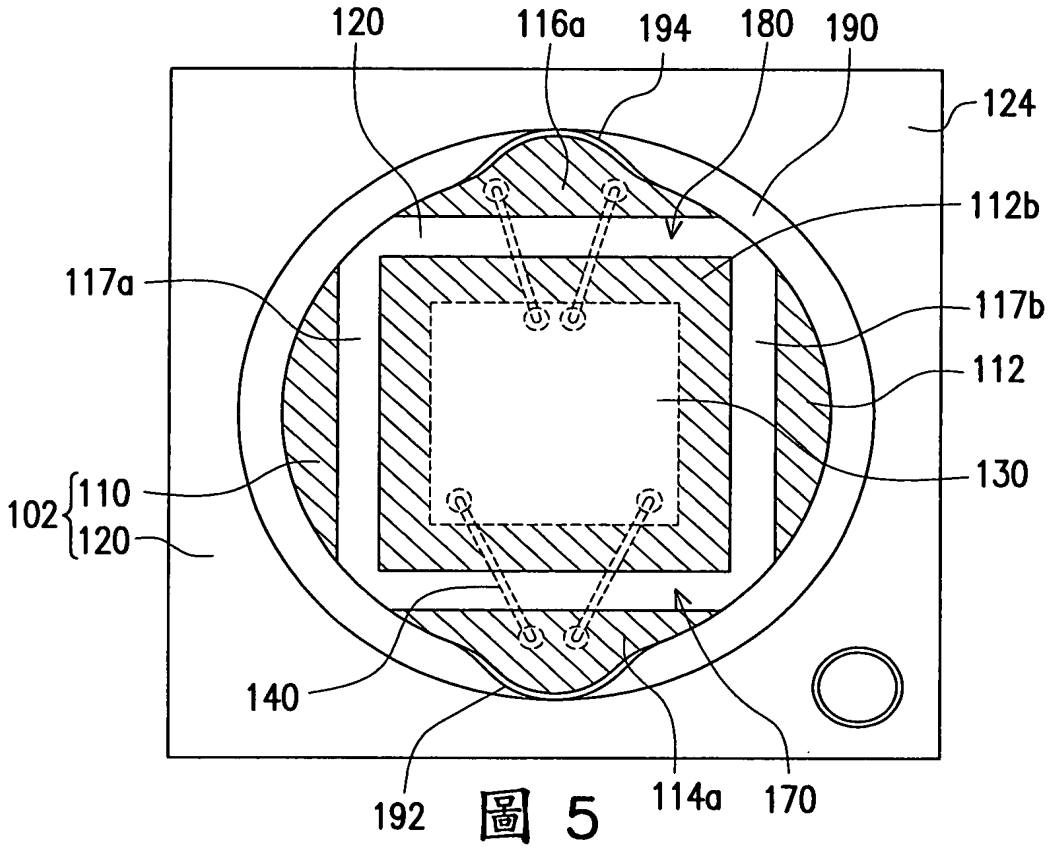

120
116a
194
180
190
124
112b
117a
117b
112
130
102
110
120
140
192
114a
170

圖 5

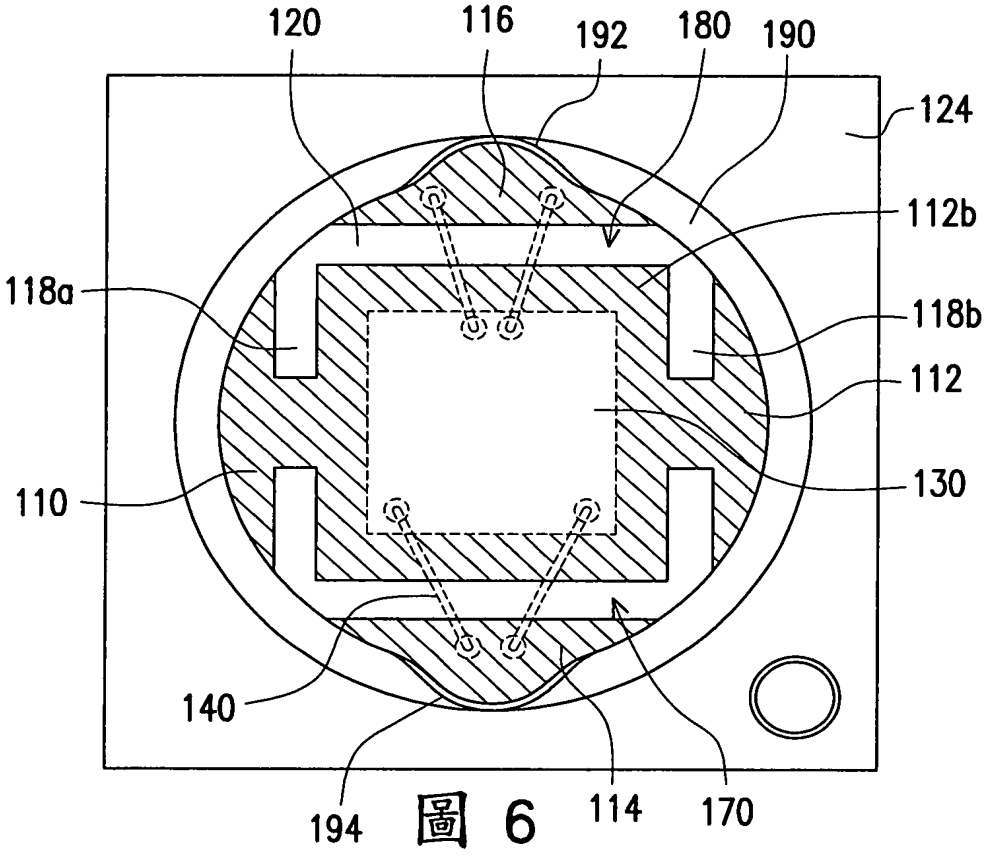

120
116
192
180
190
124
112b
118a
118b
112
130
110
140
194
114
170

圖 6

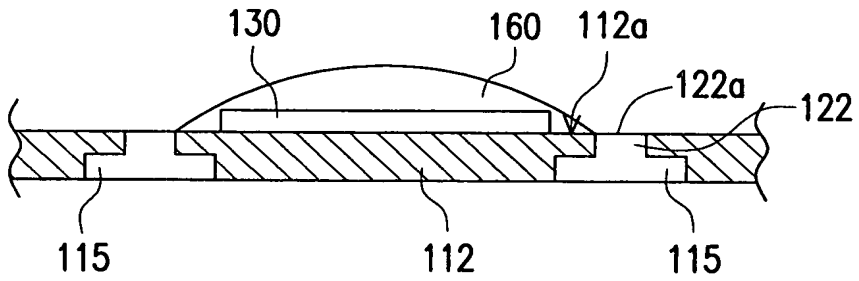

130
160
112a
122a
122
115
112
115

圖 7

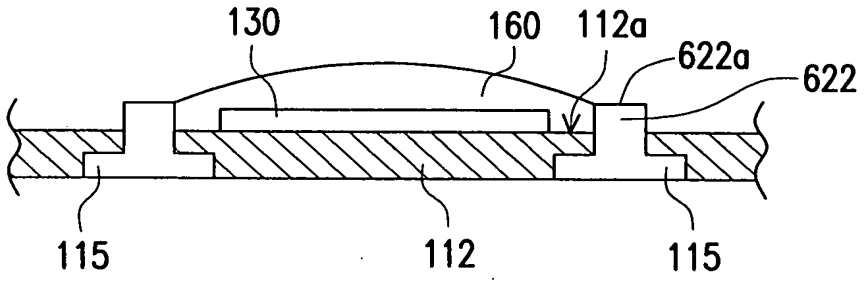

130
160
112a
622a
622
115
112
115

圖 8

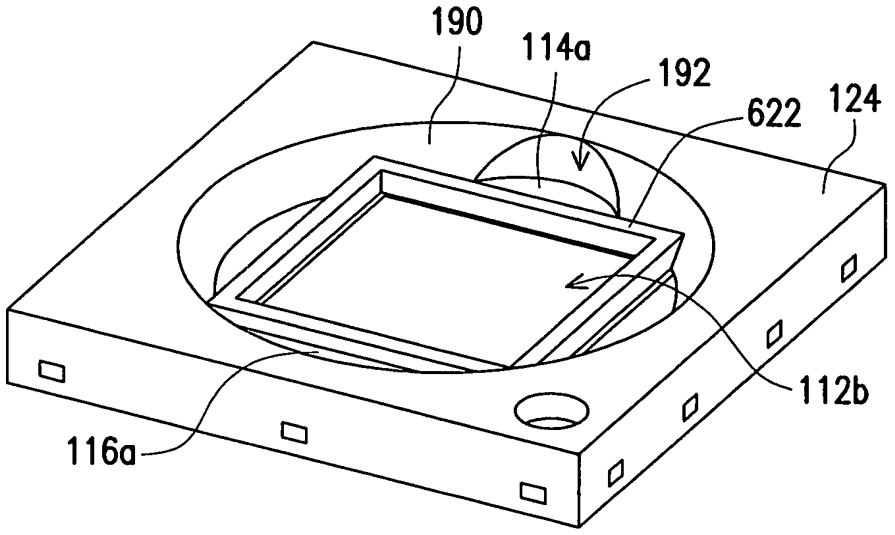

190
114a
192
622
124
112b
116a

圖 8A

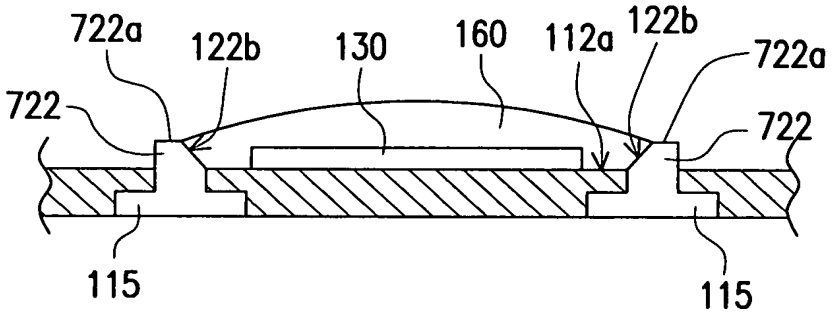

722a
122b
130
160
112a
122b
722a
722
722
115
115

圖 9

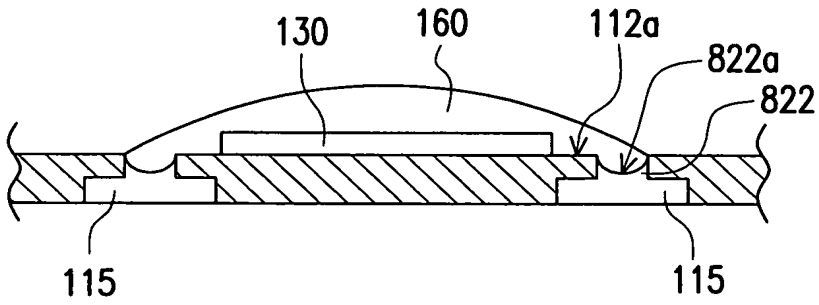

130
160
112a
822a
822
115
115

圖 10

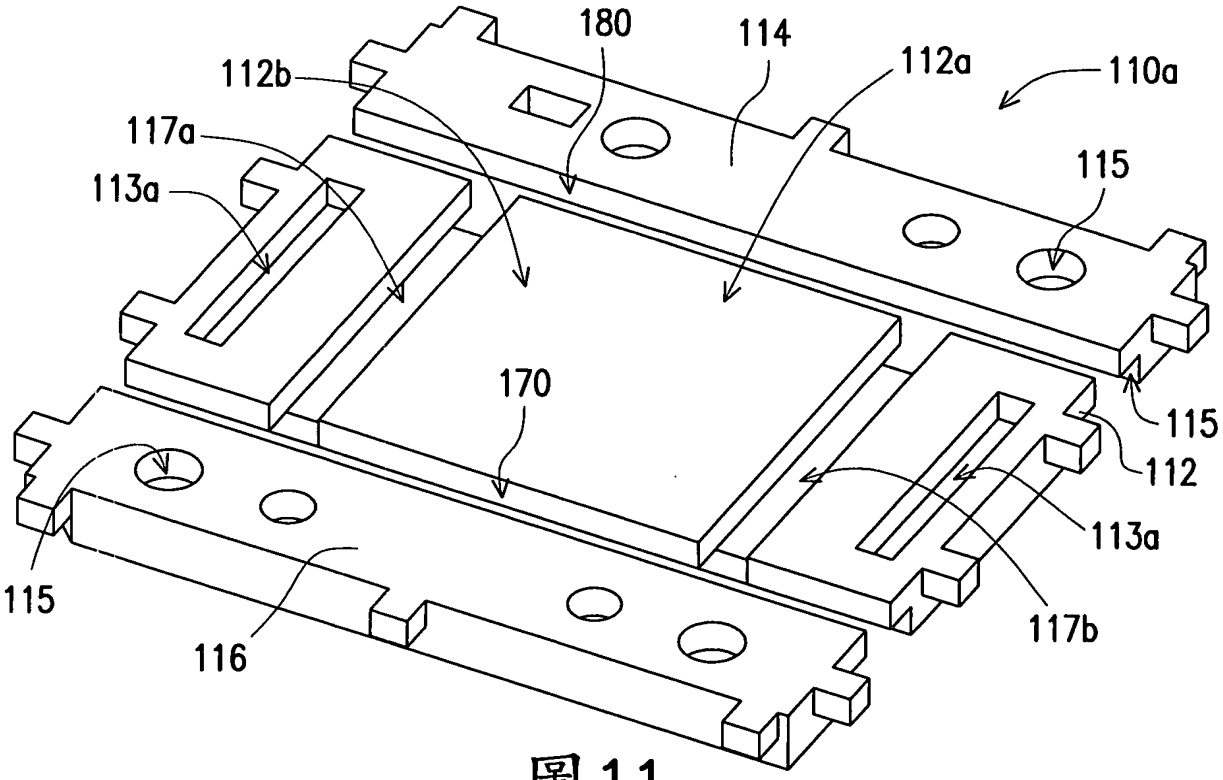

180
114
112a
110a
112b
117a
113a
115
170
115
112
113a
115
116
117b

圖 11

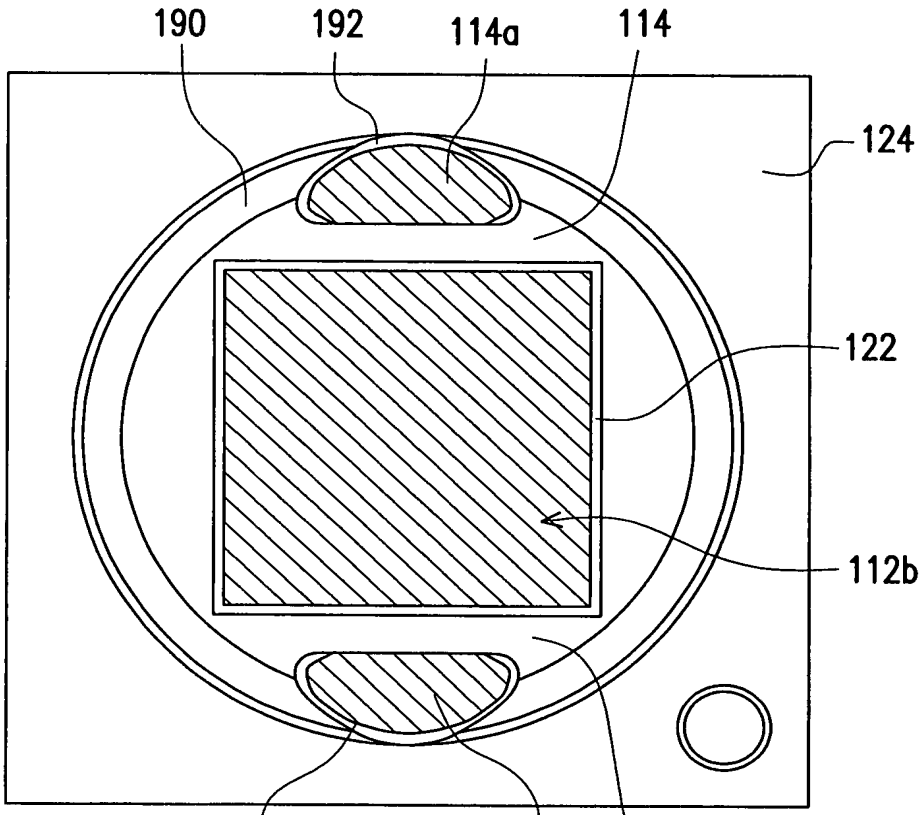

190
192
114a
114
124
122
112b
194
116a
116

圖 12

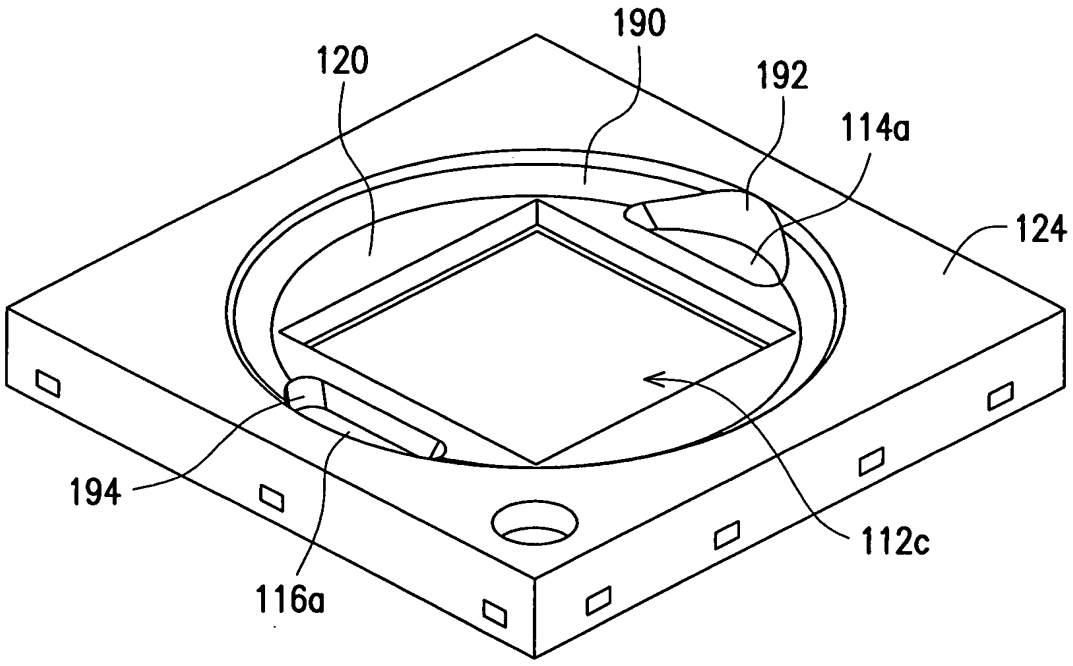


圖 13

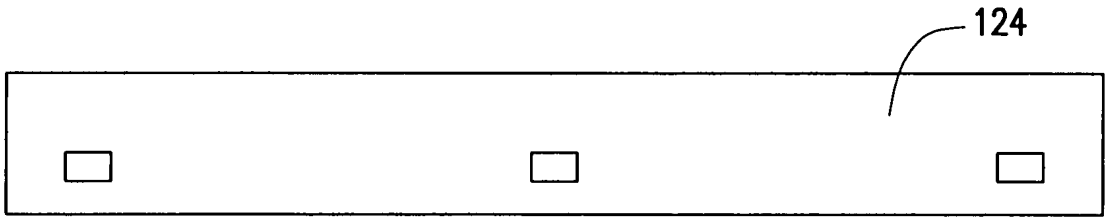


圖 14

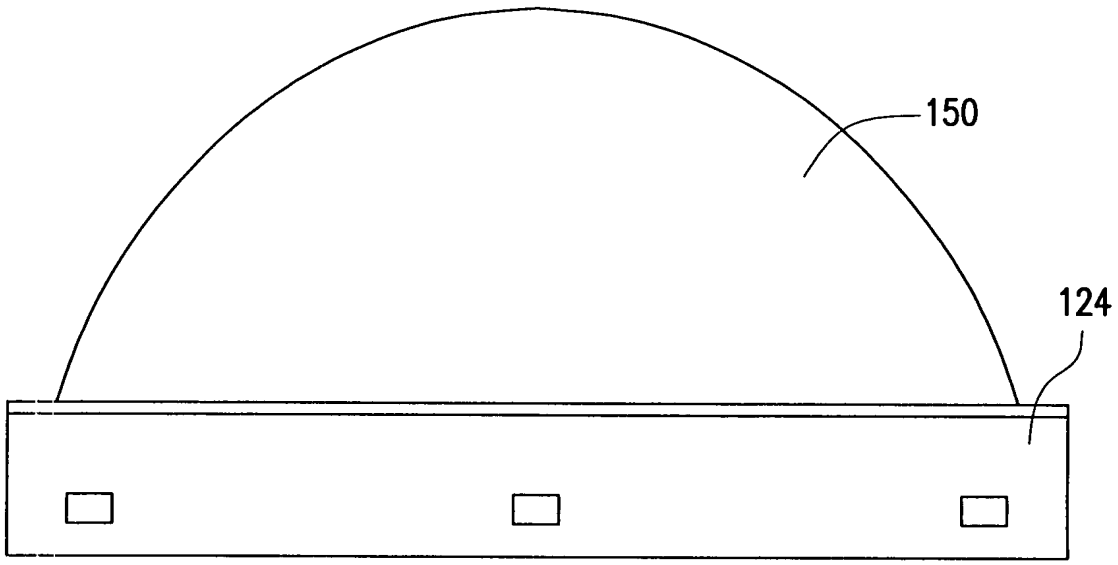


圖 15

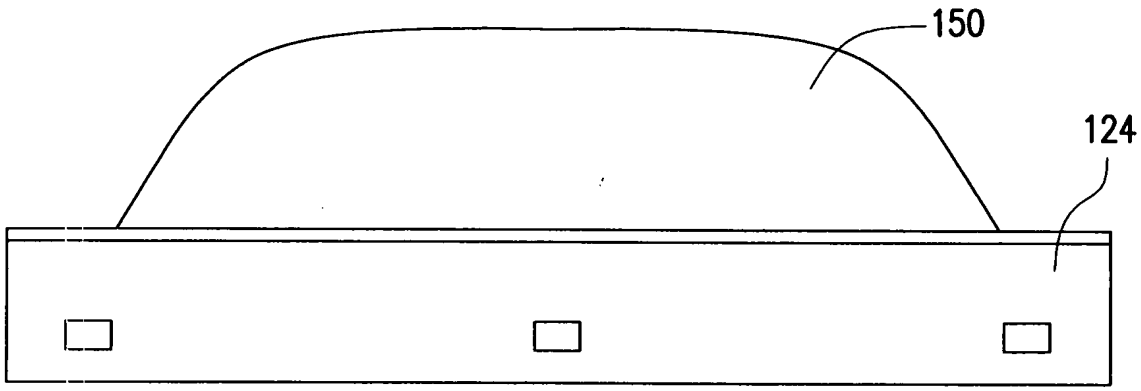


圖 16

Espacenet

Bibliographic data: KR20100083907 (A) — 2010-07-23

LED PACKAGE AND METHOD FOR MANUFACTURING THE SAME

Inventor(s): SUL MYUNG SOON [KR]; SUNG KI JOO [KR] ± (SUL, MYUNG SOON, ; SUNG, KI JOO)

Applicant(s): SUL MYUNG SOON [KR] ± (SUL, MYUNG SOON)

Classification: - international: ***H01L33/62; H01L33/64***
- cooperative: **H01L24/97**; H01L2224/48091; H01L2224/48247 more

Application number: KR20090003237 20090115 Global Dossier

Priority number(s): KR20090003237 20090115

Abstract of KR20100083907 (A)

PURPOSE: A light emitting diode(LED) package and a method for manufacturing the same are provided to improve thermal conductivity and thermal radiation capacity by forming asymmetrically two metals which forms the LED package. CONSTITUTION: A reflective surface(130) and a lead frame(110) are respectively integrated into a cathode(111) and an anode(112). One end of the cathode and one end of the anode are expanded from the lead frame. The other ends of the cathode and the anode are opposite to each other. A reflective surface is formed by deforming at least part of the cathode and the anode. The reflective surface has an angle more than 90 degrees with respect to the cathode or the anode.

(19) 대한민국특허청(KR)
(12) 공개특허공보(A)

(11) 공개번호 10-2010-0083907
(43) 공개일자 2010년07월23일

(51) Int. Cl.
H01L 33/62 (2010.01) *H01L 33/64* (2010.01)
(21) 출원번호 10-2009-0003237
(22) 출원일자 2009년01월15일
심사청구일자 2009년01월15일

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성기주
경기도 용인시 수지구 성복동 LG빌리지 605동 503호
(74) 대리인
김한

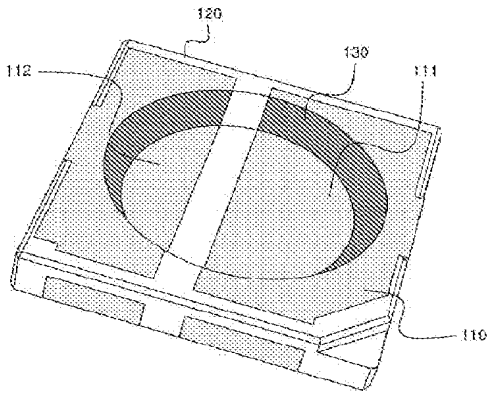
전체 청구항 수 : 총 15 항

(54) LED 패키지 및 이의 제조 방법

(57) 요 약

LED 패키지 및 이의 제조 방법이 개시된다. 본 발명에 의하면, 리드 프레임(110), 각각의 일단은 리드 프레임(110)으로부터 연장되며 타단은 소정 거리 이격된 상태로 서로 대향하는 캐소드(111)와 애노드(112), 및 캐소드(111)와 애노드(112)의 적어도 일부가 변형되어 형성된 반사면(130)을 포함하는 LED 패키지가 제공된다. 본 발명에 의하면, LED 패키지가 간단한 구조로 구성됨과 동시에 높은 열전도율과 열방사율을 가지며, 완성품의 신뢰성과 내구성 또한 향상될 수 있게 된다.

대 표 도 - 도2



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IKEA Supply AG
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특허청구의 범위

청구항 1

캐소드, 애노드, 상기 캐소드 및 상기 애노드와 각각 일체를 이루면서 연속적으로 형성되는 반사면 및 리드 프레임을 포함하는 것을 특징으로 하는 LED 패키지.

청구항 2

리드 프레임;

각각의 일단은 상기 리드 프레임으로부터 연장되며 타단은 소정 거리 이격된 상태로 서로 대향하는 캐소드(cathode)와 애노드(anode); 및

상기 캐소드와 상기 애노드의 적어도 일부가 변형되어 형성된 반사면

을 포함하는 것을 특징으로 하는 LED 패키지.

청구항 3

제2항에 있어서,

상기 캐소드와 상기 애노드는 비대칭적으로 형성되어 상기 캐소드와 상기 애노드 중 어느 하나가 더 넓게 형성되는 것을 특징으로 하는 LED 패키지.

청구항 4

제2항에 있어서,

상기 반사면은 상기 캐소드 또는 상기 애노드를 기준으로 90도 이상의 경사도를 갖는 것을 특징으로 하는 LED 패키지.

청구항 5

제2항에 있어서,

상기 캐소드 및 상기 애노드와 상기 반사면이 서로 접하는 부분은 에칭된 상태인 것을 특징으로 하는 LED 패키지.

청구항 6

제2항에 있어서,

상기 캐소드와 상기 애노드의 LED 칩이 안착되는 부분은 에칭된 상태인 것을 특징으로 하는 LED 패키지.

청구항 7

제2항에 있어서,

상기 캐소드와 상기 애노드 사이에 절연체를 더 포함하는 것을 특징으로 하는 LED 패키지.

청구항 8

제2항에 있어서,

상기 리드 프레임, 상기 캐소드와 상기 애노드 및 상기 반사면의 재질은 금속 또는 금속 합금을 포함하는 것을 특징으로 하는 LED 패키지.

청구항 9

(a) 리드 프레임을 가공하되, 각각의 일단은 상기 리드 프레임으로부터 연장되며 타단은 소정 거리 이격된 상태로 서로 대향하는 캐소드(cathode)와 애노드(anode)가 함께 형성되도록 가공하는 단계; 및

(b) 상기 캐소드와 애노드의 전면 중 적어도 일부에 프레싱(pressing)을 가하여 반사면을 형성하는 단계

를 포함하는 것을 특징으로 하는 LED 패키지의 제조방법.

청구항 10

제9항에 있어서,

상기 (a) 단계에서 상기 캐소드와 애노드를 비대칭적으로 형성하여 상기 캐소드와 애노드 중 어느 하나가 더 넓게 형성되도록 하는 것을 특징으로 하는 LED 패키지의 제조방법.

청구항 11

제9항에 있어서,

상기 (b) 단계에서 상기 반사면은 상기 캐소드 또는 상기 애노드를 기준으로 90도 이상의 경사도를 갖는 것을 특징으로 하는 LED 패키지의 제조방법.

청구항 12

제9항에 있어서,

상기 (a) 단계 이후에 상기 캐소드 및 상기 애노드와 상기 반사면이 서로 접하는 부분을 에칭하는 단계를 더 포함하는 것을 특징으로 하는 LED 패키지의 제조방법.

청구항 13

제9항에 있어서,

상기 (a) 단계 이후에 상기 캐소드와 상기 애노드의 LED 칩이 안착되는 부분을 에칭하는 단계를 더 포함하는 것을 특징으로 하는 LED 패키지의 제조방법.

청구항 14

제9항에 있어서,

상기 (b) 단계 이후에 상기 캐소드와 상기 애노드 사이에 절연체를 형성하는 단계를 더 포함하는 것을 특징으로 하는 LED 패키지의 제조방법.

청구항 15

제14항에 있어서,

상기 절연체는 사출물 주입 방식을 이용하여 형성하는 것을 특징으로 하는 LED 패키지의 제조방법.

명 세 서

발명의 상세한 설명

기 술 분 야

[0001] 본 발명은 LED 패키지 및 이의 제조 방법에 관한 것이다. 보다 상세하게는, LED 칩이 반사면과 직접적으로 연결되어 높은 열전도율을 보이고, LED 칩과의 높은 부착력을 보이며, 캐소드와 애노드의 일부를 반사면으로 이용함에 따라 높은 반사율을 보임과 동시에 반사면을 위한 별도의 구성요소의 필요가 없게 되는 LED 패키지 및 이의 제조 방법에 관한 것이다.

배 경 기 술

[0002] LED(light-emitting diode)는 반도체의 p-n접합 다이오드의 일종으로서 화합물인 반도체 단자에 전기 신호를 보내면 이를 빛으로 변환하여 발광하는 발광 다이오드를 일컫는다.

[0003] 이러한 LED에 있어서는 모듈화를 위한 패키지가 중요한 요소인데, 이렇게 패키지된 LED는 가전기기, 자동차, 건축, 의료 기기, 디스플레이, 환경 등 거의 모든 산업에 적용되고 있으며, 최근에는 일반 조명 시장에서도 기존

조명을 대체하고 있는 추세이다.

[0004] 특히, LED를 이용한 조명이 부각되고 있는 이유는 고휘도 백색 LED의 성능지수가 100l m/W로 이미 백열전구 및 할로겐 램프의 수준을 완전히 넘었고, 일반 형광등 수준에 비해 높은 성능을 보이고 있기 때문이다. 또한, 전력소비, 수명, 내구성, 견고성, 집적화 등의 측면에서도 여러가지 형태로 장점을 보이고 있기 때문이다.

[0005] 이러한 우수한 특성의 LED를 얻기 위해서는 그 패키지 과정이 매우 중요하다.

[0006] 도 1은 통상적인 고전력용 LED 모듈의 기본 구조를 나타내는 도면이다. LED 모듈에는 LED 패키지가 포함되어 있다.

[0007] 도 1에 도시되는 바와 같이, 통상적인 LED 모듈은 LED 칩(10), 리드 프레임(20), 열 싱크(heat sink; 30), 형광체(40) 및 렌즈(50) 등을 포함하여 구성될 수 있다.

[0008] LED 칩(10)은 LED 소자를 포함하여 전기적 신호를 광 신호로 변환하는 구성요소이고, 리드 프레임(20)은 LED 칩(10)에 전기적 신호를 전달하는 기능을 수행한다. 이러한 프레임(20)의 재질로서는 가격이 저렴한 고분자 재료가 널리 이용되고 있다.

[0009] 한편, 열 싱크(30)는 LED 모듈이 동작할 시에 방출되는 열을 흡수하는 기능을 수행하며, 형광체(40)는 LED 칩(10)으로부터 방출되는 빛을 원하는 색과 온도를 갖는 빛으로 변환하는 기능을 수행한다. 또한, 렌즈(50)는 반사 특성을 원하는 형태로 제어하기 위한 구성요소이다.

[0010] 이러한 통상적인 LED 모듈에 있어서는 LED 칩(10)으로부터 방출되는 광이 반사되는 반사면(A)이 플라스틱 등으로 이루어지는 것이 일반적이었다. 이 경우 반사율이 떨어지는 플라스틱 부위에서 반사가 이루어지므로 반사율의 저하를 감수하였어야 했다.

[0011] 또한, 캐소드와 애노드를 분리하여 형성하는 2단 구조의 리드 프레임에 있어서는 절연체로서 기능하는 몰딩 재료가 중앙에 존재하게 되어서 LED 칩이 상기 몰딩 재료 상에 실장될 수 밖에 없었다. 이에 따라 열방산 능력이 떨어지는 문제가 있었다.

[0012] 한편, 열 싱크(30)와 같은 재료를 이용하는 구조에 있어서는 열 싱크(30)와 다른 구성요소 또는 LED 칩(10)과 다른 구성요소 간의 접착면에서 계면 잔류응력 등에 의하여 신뢰성이 저하되는 문제가 있었다.

[0013] 따라서, 계면이 최소화되는 간단한 구조로 구성할 수 있으면서도 높은 열방산 능력과 신뢰성을 갖는 LED 모듈을 위한 패키지 방법에 대한 개발이 시급한 실정이다.

발명의 내용

해결 하고자하는 과제

[0014] 본 발명은 상술한 종래 기술의 문제점을 해결하기 위하여 안출된 것이다.

[0015] 본 발명의 다른 목적은 LED 패키지를 간단한 2개의 금속물로 구성하되, 상기 2개의 금속물을 비대칭적으로 형성하여 LED 칩이 금속물 상에 실장되게 함으로써 높은 열방산 능력과 열전도율을 갖는 LED 모듈을 얻을 수 있도록 하는 것이다.

[0016] 본 발명의 또 다른 목적은 LED 패키지를 구성하는 금속물 자체를 반사면으로 이용함으로써 높은 반사 효율을 보이고 반사면을 위한 별도의 구성요소를 필요로 하지 않아 제조 원가를 절감하고, 완성품의 무게를 경감시킬 수 있도록 하는 것이다.

[0017] 본 발명의 또 다른 목적은 LED 패키지에 있어서 절연을 위한 플라스틱 몰딩부가 차지하는 공간을 최소화함으로써 LED 칩이 금속물 위의 넓은 부분에 실장될 수 있도록 하고 이에 따라 우수한 열방산 능력을 가질 수 있도록 하는 것이다.

[0018] 본 발명의 또 다른 목적은 LED 패키지에 있어서 캐소드 및 애노드와 반사면이 접하는 부분을 하프 에칭하여 반사면의 형성을 용이하게 하고 LED 칩과 캐소드 및 애노드의 접촉 면적을 극대화시킴으로써 완성품의 열방산 능력이 향상될 수 있도록 하는 것이다.

[0019] 본 발명의 또 다른 목적은 LED 패키지에 있어서 LED 칩이 실장되는 부분을 하프 에칭하여 LED 칩과 다른 구성요소간의 접촉력을 극대화시킴으로써 완성품의 내구성 및 신뢰성이 향상될 수 있도록 하는 것이다.

과제 해결수단

[0020] 상술한 목적을 달성하기 위하여, 본 발명의 일 실시예에 따르면, 캐소드, 애노드, 상기 캐소드 및 상기 애노드와 각각 일체를 이루면서 연속적으로 형성되는 반사면 및 리드 프레임을 포함하는 LED 패키지가 제공된다.

[0021] 그리고, 상술한 목적을 달성하기 위하여, 본 발명의 다른 실시예에 따르면, 리드 프레임; 각각의 일단은 상기 리드 프레임으로부터 연장되며 타단은 소정 거리 이격된 상태로 서로 대향하는 캐소드(cathode)와 애노드(anode); 및 상기 캐소드와 상기 애노드의 적어도 일부가 변형되어 형성된 반사면을 포함하는 LED 패키지가 제공된다.

[0022] 상기 캐소드와 상기 애노드는 비대칭적으로 형성되어 상기 캐소드와 상기 애노드 중 어느 하나가 더 넓게 형성될 수 있다.

[0023] 상기 반사면은 상기 캐소드 또는 상기 애노드를 기준으로 90도 이상의 경사도를 가질 수 있다.

[0024] 상기 캐소드 및 상기 애노드와 상기 반사면이 서로 접하는 부분은 에칭된 상태일 수 있다.

[0025] 상기 캐소드와 상기 애노드의 LED 칩이 안착되는 부분은 에칭된 상태일 수 있다.

[0026] 상기 캐소드와 상기 애노드 사이에 절연체를 더 포함할 수 있다.

[0027] 상기 리드 프레임, 상기 캐소드와 상기 애노드 및 상기 반사면의 재질은 금속 또는 금속 합금을 포함할 수 있다.

[0028] 그리고, 상술한 목적을 달성하기 위하여, 본 발명의 또 다른 실시예에 따르면, (a) 리드 프레임을 가공하되, 각각의 일단은 상기 리드 프레임으로부터 연장되며 타단은 소정 거리 이격된 상태로 서로 대향하는 캐소드(cathode)와 애노드(anode)가 함께 형성되도록 가공하는 단계; 및 (b) 상기 캐소드와 애노드의 전면 중 적어도 일부에 프레싱(pressing)을 가하여 반사면을 형성하는 단계를 포함하는 LED 패키지의 제조방법이 제공된다.

[0029] 상기 (a) 단계에서 상기 캐소드와 애노드를 비대칭적으로 형성하여 상기 캐소드와 애노드 중 어느 하나가 더 넓게 형성될 수 있다.

[0030] 상기 (b) 단계에서 상기 반사면은 상기 캐소드 또는 상기 애노드를 기준으로 90도 이상의 경사도를 가질 수 있다.

[0031] 상기 (a) 단계 이후에 상기 캐소드 및 상기 애노드와 상기 반사면이 서로 접하는 부분을 에칭하는 단계를 더 포함할 수 있다.

[0032] 상기 (a) 단계 이후에 상기 캐소드와 상기 애노드의 LED 칩이 안착되는 부분을 에칭하는 단계를 더 포함할 수 있다.

[0033] 상기 (b) 단계 이후에 상기 캐소드와 상기 애노드 사이에 절연체를 형성하는 단계를 더 포함할 수 있다.

[0034] 상기 절연체는 사출물 주입 방식을 이용하여 형성할 수 있다.

효 과

[0035] 본 발명에 의하면, LED 패키지를 간단한 2개의 금속물로 구성할 수 있으며, 이렇게 하더라도 상기 2개의 금속물을 비대칭적으로 형성함으로써, LED 칩이 금속물(반사면) 상에 직접적으로 실장될 수 있어 높은 열방산 능력과 열전도율을 갖는 LED 모듈이 얻어질 수 있게 된다.

[0036] 또한, 본 발명에 의하면, LED 패키지를 구성하는 금속물이 반사면으로서의 기능도 수행하기 때문에, 높은 반사효율이 얻어질 수 있고, 반사면을 위한 별도의 구성요소가 필요 없게 되어 제조 원가 절감과 완성품의 무게 경감을 꾀할 수 있게 된다.

[0037] 또한, 본 발명에 의하면, LED 패키지에 있어서 절연을 위한 플라스틱 몰딩부가 차지하는 공간이 최소화되어, LED 칩이 금속물 위의 넓은 부분에 실장될 수 있으며, 이에 따라 우수한 열방산 능력이 달성될 수 있게 된다.

[0038] 또한, 본 발명에 의하면, LED 패키지에 있어서 캐소드 및 애노드와 반사면이 접하는 부분의 두께를 하프 에칭에 의하여 감소시킬 수 있으며, 이에 따라 반사면 형성을 위한 캐소드 및 애노드의 변형을 용이하게 하고 반사면 형성 후에 캐소드 및 애노드의 휨 현상 등이 나타나지 않아서 LED 칩과 캐소드 및 애노드의 접촉 면적을 극대화

시킴으로써 완성품의 열방산 능력이 향상되게 된다.

[0039] 또한, 본 발명에 의하면, LED 패키지에 있어서 LED 칩이 실장되는 부분이 하프 에칭에 의해 적절한 거칠기를 가질 수 있으며, 이에 따라 LED 칩과 다른 구성요소간의 접촉력이 극대화될 수 있게 된다.

발명의 실시를 위한 구체적인 내용

[0040] 후술하는 본 발명에 대한 상세한 설명은, 본 발명이 실시될 수 있는 특정 실시예를 예시로서 도시하는 첨부 도면을 참조한다. 이들 실시예는 당업자가 본 발명을 실시할 수 있기에 충분하도록 상세히 설명된다. 본 발명의 다양한 실시예는 서로 다르지만 상호 배타적일 필요는 없음이 이해되어야 한다. 예를 들어, 여기에 기재되어 있는 특정 형상, 구조 및 특성은 일 실시예에 관련하여 본 발명의 정신 및 범위를 벗어나지 않으면서 다른 실시예로 구현될 수 있다. 또한, 각각의 개시된 실시예 내의 개별 구성요소의 위치 또는 배치는 본 발명의 정신 및 범위를 벗어나지 않으면서 변경될 수 있음이 이해되어야 한다. 따라서, 후술하는 상세한 설명은 한정적인 의미로서 취하려는 것이 아니며, 본 발명의 범위는, 적절하게 설명된다면, 그 청구항들이 주장하는 것과 균등한 모든 범위와 더불어 첨부된 청구항에 의해서만 한정된다. 도면에서 유사한 참조부호는 여러 측면에 걸쳐서 동일하거나 유사한 기능을 지칭한다.

[0041] 이하에서는, 본 발명이 속하는 기술분야에서 통상의 지식을 가진 자가 본 발명을 용이하게 실시할 수 있도록 하기 위하여, 본 발명의 바람직한 실시예들에 관하여 첨부된 도면을 참조하여 상세히 설명하기로 한다.

[0042] [본 발명의 바람직한 실시예]

[0043] LED 패키지의 전체 구성

[0044] 도 2는 본 발명의 일 실시예에 따른 LED 패키지의 전체적인 구성을 나타내는 사시도이다.

[0045] 도 3은 도 2에 도시되는 LED 패키지의 분해 사시도이다.

[0046] 도 4는 본 발명의 일 실시예에 따른 LED 패키지를 일 이상 포함하는 구조의 전면 사시도이다.

[0047] 도 5 및 도 6은 도 4의 후면 사시도를 나타낸다.

[0048] 도 2 내지 도 6에 도시되는 바와 같이, 본 발명의 일 실시예에 따른 LED 패키지는 캐소드(cathode: 111) 및 애노드(anode: 112)를 포함하는 리드 프레임(lead frame: 110), 캐소드(111)와 애노드(112) 사이의 절연체로서 기능하는 플라스틱 사출물(120), LED 칩으로부터 방사되는 광을 반사시키는 반사면(130)을 포함하여 구성될 수 있다.

[0049] 리드 프레임(110)은 LED 패키지에 실장되는 LED 칩에 전기를 공급하고 이를 지지해주는 기능을 수행한다. 리드 프레임(110)은 캐소드(111)와 애노드(112)를 포함하는 형태로 가공되며, 이에 따라 캐소드(111)와 애노드(112)의 형태는 리드 프레임(110)의 형태에 의존적이게 된다.

[0050] 캐소드(111)와 애노드(112)는 모두 리드 프레임(110)으로부터 연장된다. 즉, 캐소드(111)와 애노드(112)의 일단은 리드 프레임(110)에 연결되어 있으며, 캐소드(111)와 애노드(112)의 타단은 서로 이격되어 있게 된다.

[0051] 캐소드(111)와 애노드(112)는 서로 대향하는 형태일 수 있으나, 대칭적이지는 않도록 형성되는 것이 바람직하다. 즉, 캐소드(111)와 애노드(112) 중 어느 하나의 면적이 더 넓도록 형성되는 것이 바람직하다. 도면에는 더 넓은 면적을 차지하고 있는 것이 캐소드(111), 그렇지 않은 것이 애노드(112)인 것으로 도시되었으나, 그 반대일 수도 있다.

[0052] 한편, 캐소드(111)와 애노드(112)에 있어서, 추후 반사면(130)을 형성하기 위하여 캐소드(111)와 애노드(112)가 변형되는 부분, 즉 캐소드(111) 및 애노드(112)와 반사면(130)이 접하는 부분은 하프 에칭(half etching)이 수행된 상태일 수 있다. 여기서 하프 에칭이라는 것은 에칭 대상물에 대하여 그 두께의 반 정도를 부식시켜 제거하는 것을 의미한다. 즉, 하프 에칭을 통해 캐소드(111) 및 애노드(112)와 반사면(130)이 접하는 부분의 두께가 리드 프레임(110)의 두께보다 얇도록 한다.

[0053] 이러한 하프 에칭은 캐소드(111) 및 애노드(112)와 반사면(130)이 접하는 부분의 두께를 감소시킬 수 있으며, 이에 따라 반사면(130) 형성을 위한 캐소드(111) 및 애노드(112)의 변형을 용이하게 하고 반사면(130) 형성 후에 캐소드(111) 및 애노드(112)의 휨 현상 등이 나타나지 않아서 LED 칩과 캐소드 및 애노드의 접촉 면적을 극대화시킴으로써 완성품의 열방산 능력이 향상되게 된다.

[0054] 또한, 캐소드(111)와 애노드(112)에 있어서, 추후 LED 칩이 실장되는 면, 즉 리드 프레임(110)의 전면은 하프 에칭(half etching)이 수행된 상태일 수 있다. 즉, 리드 프레임(110) 두께의 반만큼을 부식시키는 하프 에칭을 통해 LED 칩이 실장되는 공간을 캐소드(111)와 애노드(112) 상에 형성시킨다. 이때, 하프 에칭이 의해 부식되는 면적이 실장될 LED 칩의 크기보다 약간 크게 하는 것이 바람직하다.

[0055] 이러한 하프 에칭은 LED 칩이 캐소드(111)와 애노드(112) 상에 안착되게 하며, 동시에 LED 칩이 실장되는 부분에 적당한 거칠기(roughness)를 가져다 주므로 LED 칩 실장시 접착력을 강화시켜 주고 그 결과 LED 패키지의 내구성 및 신뢰성을 향상시켜 준다.

[0056] 그리고, 본 발명의 일 실시예에 따른 LED 패키지의 반사면(130)은 캐소드(111)와 애노드(112)의 일부가 변형된 형태로 형성된다. 추후 설명되는 바와 같이, 캐소드(111)와 애노드(112)가 프레싱(pressing) 됨에 따라, 외곽부가 소정 각도의 경사면으로 이루어지는 오목부가 형성되게 되고, 상기 오목부의 외곽부, 즉 경사면이 반사면(130)으로서 기능하게 된다. 이러한 오목부는 도면에 도시되는 바와 같이 LED 패키지의 정 중앙을 중심으로 하는 원형일 수 있으나 이에 제한되는 것은 아니다. 또한, 반사면(130)의 경사도는 LED 패키지에서 요구되는 반사 효율에 따라 다양하게 변경될 수 있다. 일례로서 반사면(130)은 캐소드(111) 또는 애노드(112)를 기준으로 90도 이상의 경사도를 가질 수 있다.

[0057] 이와 같이 캐소드(111)와 애노드(112)의 일부가 반사면(130)으로서의 기능을 수행함에 따라 반사면(130)을 위한 별도의 구성요소가 필요 없게 되고, 반사면(130)의 재질이 금속 물질로 이루어짐에 따라 LED 패키지의 반사 효율이 향상되게 되고, 캐소드(111)와 애노드(112) 상에 실장되는 LED 칩이 반사면과 직접적으로 연결됨에 따라 LED 패키지의 방열(열전달) 효율이 향상되게 된다.

[0058] LED 패키지의 제조 방법

[0059] 이하에서는, 도 2 내지 도 6을 참조하여 본 발명의 일 실시예에 따른 LED 패키지의 제조 과정에 대해 상세히 설명하기로 한다.

[0060] 먼저, 리드 프레임(110)의 형태를 소정의 원하는 형태로 가공한다. 리드 프레임(110)은 임의의 도전체, 즉 금속 또는 금속 합금을 포함하여 형성할 수 있으나 리드 프레임(110)의 재질은 구리인 것이 바람직하다.

[0061] 상기 가공 과정에서 캐소드(111) 및 애노드(112)도 함께 형성시킨다. 전술한 바와 같이, 캐소드(111)와 애노드(112)는 리드 프레임(110)에서 각각 연장되어 서로 대향하되 일단이 서로 이격되는 형태로 형성될 수 있다.

[0062] 이 때 캐소드(111)와 애노드(112)는 비대칭적인 형태로 가공하여, 즉 캐소드(111)와 애노드(112) 중 어느 하나의 면적이 더 크도록 가공하는 것이 바람직하다. 이로써 캐소드(111)와 애노드(112)가 비대칭적인 형태로 형성됨에 따라 캐소드(111)와 애노드(112) 사이에 노출되는 플라스틱 사출물(120)의 면적이 줄어들어, 즉 LED 칩과 접촉되는 캐소드(111)와 애노드(112)의 면적이 커져서 LED 패키지의 방열 효과가 향상될 수 있다.

[0063] 다음으로 리드 프레임(110)의 두께의 반 정도를 부식시키는 하프 에칭을 수행한다. 하프 에칭은 캐소드(111) 및 애노드(112)와 반사면(130)이 접하는 부분 및/또는 캐소드(111)와 애노드(112) 상에LED 칩이 실장될 부분에 대해 행해진다. 이러한 하프 에칭을 통해 추후 반사면(130) 형성 후에 캐소드(111) 및 애노드(112)의 휨 현상 등이 나타나지 않게 된다. 또한 추후 완성될 LED 패키지에 LED 칩이 안착될 공간이 확보될 수 있음과 동시에 LED 칩이 안착되는 리드 프레임(110), 더 정확하게는 캐소드(111)와 애노드(112)의 거칠기(roughness)가 증가하게 된다. 하프 에칭은 마스크를 이용하는 통상의 포토 리소그래피 및 습식 에칭 방식을 이용하여 수행될 수 있으나, 반드시 이에 한정되는 것은 아니다.

[0064] 이러한 캐소드(111) 및 애노드(112)의 휨 현상의 방지, 즉 캐소드(111) 및 애노드(112)의 평탄도의 향상에 따라 LED 칩과 캐소드(111) 및 애노드(112)의 접촉 면적이 커져서 LED 패키지의 열방산 능력이 더욱 향상될 수 있다. 구체적으로 설명하면, 하프 에칭에 의해 캐소드(111) 및 애노드(112)와 반사면(130)이 접하는 부분의 두께가 얇아지면[즉, 리드 프레임(110)의 두께보다 얇아지면] 향후 반사면(130) 형성을 위한 프레싱 작업시 발생할 수 있는 캐소드(111)와 애노드(112) 상의 원하지 않는 변형(예를 들면, 휨 또는 국부적인 굴곡 등)을 줄일 수 있어서 캐소드(111)와 애노드(112)가 보다 편평한 상태로 형성되고 그 결과 LED 칩과 캐소드(111) 및 애노드(112)간의 접촉 면적이 커져서 LED 패키지의 열방산 능력이 향상된다.

[0065] 또한, 이러한 거칠기의 증가에 따라 캐소드(111)와 애노드(112) 상의 LED 칩의 접착력은 더욱 향상될 수 있다. 구체적으로 설명하면, 하프 에칭에 의해 LED 칩이 실장될 부분에 일정 깊이(300 um 내외)의 공동(cavity)이 형성되고, 이 부분이 에칭에 따라 거칠기가 증가하여 LED 칩의 안정적인 실장이 가능하고 안착된 LED 칩의 접착

력이 향상되어 LED 패키지의 내구성 및 신뢰성이 더욱 향상될 수 있다.

[0066] 다음으로 프레싱을 통해 반사면(130)을 형성한다. 도 2 내지 도 4에 도시되는 바와 같이, 일단이 리드 프레임(110)에 연결되어 있고 타단은 서로 이격되어 있는 캐소드(111)와 애노드(112)의 전면, 즉 추후 LED 칩이 실장되는 부분의 주변에 프레싱을 수행하여 오목부가 형성될 수 있도록 한다. 다시 말하여, LED 칩이 실장될 지점 주위에 소정의 경사각을 갖는 반사면(130)을 형성한다.

[0067] 본 발명의 LED 패키지에 있어서 반사면(130)의 특징은 캐소드(111)와 애노드(112)의 적어도 일부가 반사면(130)으로서의 기능을 수행한다는 것이다. 구체적으로 설명하면, 본 발명에서는 반사면(130)이 캐소드(111)와 애노드(112)와는 별개의 구성요소로 형성되는 것이 아니라, 프레싱 과정을 통해 캐소드(111)와 애노드(112)의 적어도 일부가 변형되어 반사면(130)이 형성된다는 것이다. 즉, 본 발명의 LED 패키지는 반사면(130)이 캐소드(111)와 애노드(112)와 각각 일체를 이루면서 연속적으로 형성되는 것을 특징적 구성으로 한다.

[0068] 본 발명에서는 캐소드(111)와 애노드(112)가 금속 재질이므로 종래의 LED 패키지에서 채용하는 플라스틱 재질의 반사면에 비하여 표면 상태가 우수하여 상대적으로 LED패키지의 반사율이 향상될 수 있다. 특히, 종래의 플라스틱 재질의 반사면은 광원 중에 포함되는 자외선 등에 의하여 그 성질이 서서히 변질되어 LED 패키지의 신뢰성이 저하될 수 있으나, 본 발명의 금속 재질의 반사면(130)은 이러한 현상을 방지할 수 있다.

[0069] 한편, 캐소드(111)와 애노드(112)에 대한 프레싱 작업만으로 반사면(130)이 형성되게 됨에 따라, 반사면(130) 설치를 위하여 금속 부재 등과 같은 별도의 구성요소를 사용할 필요가 없어서 LED 패키지의 무게가 경감되고 LED 패키지의 제조 비용이 절감될 수 있게 된다.

[0070] 끝으로 반사면(130)을 형성시킨 후에는 몰딩 작업을 통해 절연체 기능을 하는 플라스틱 사출물(120)을 주입함으로써 LED 패키지의 제조를 완료한다. 이때 절연체의 재질은 플라스틱에 한정되지는 않으며, 플라스틱 사출물의 주입 과정은 공지의 기술이므로 본 명세서에서는 상세한 설명은 생략한다.

[0071] LED 모듈 제조

[0072] 이하에서는 본 발명의 일 실시예에 따른 LED 패키지를 이용하여 LED 모듈을 제조하는 과정에 대해 간단히 설명하기로 한다.

[0073] 먼저, 상술한 과정으로 제조된 LED 패키지의 중앙 부분에 LED 칩을 실장시킨다. 전술한 바와 같이, 캐소드(111)와 애노드(112)가 서로 대향하되 비대칭적인 형태를 띄기 때문에, LED 패키지의 중심에 LED 칩이 실장된다면, 이러한 LED 칩은 캐소드(111) 및 애노드(112) 상에 실장될 수 있게 된다. LED 칩의 실장 방법은 솔더링(soldering) 방식 또는 Ag 에폭시(epoxy) 수지 등의 물질을 이용하여 접합하는 방식 등이 이용될 수 있으나, 이에 한정되지 않음은 물론이다

[0074] LED 칩 실장 후에는 와이어 본딩(wire bonding)을 수행한다. 와이어 본딩이란 LED 패키지에서 리드 프레임(또는 캐소드와 애노드)과 LED 칩의 두 전극을 와이어로 연결하는 과정이다. 이러한 와이어 본딩은 캐소드(111)와 애노드(112)에 대해 각각 수행하게 되는데, 본 발명에 따른 LED 패키지에 포함되는 캐소드(111)와 애노드(112)는 서로 비대칭적인 형태를 띠고 있으므로, 캐소드(111)와 애노드(112)의 구분을 위한 별도의 표시가 필요 없게 된다. 즉, 와이어 본딩시 캐소드(111)와 애노드(112)가 대칭적인 형태가 아니므로 양자간의 구별이 용이하여 캐소드(111)와 애노드(112)의 구별을 위한 특별한 방향 표시 등이 필요 없게 된다.

[0075] 와이어 본딩 작업이 완료된 후에는 LED 칩의 응용 분야에 따라 형광체 도포, 렌즈 부착 과정 등을 추가로 수행하여 최종적인 LED 모듈을 완성시킬 수 있다.

[0076] 한편, LED 모듈의 생산성 제고 측면에서 도 4 내지 도 6에 도시한 바와 같이 본 발명에서는 복수개의 LED 패키지를 일괄 공정으로 제조할 수 있음은 물론이다.

[0077] 이상에서 본 발명이 구체적인 구성요소 등과 같은 특정 사항들과 한정된 실시예 및 도면에 의해 설명되었으나, 이는 본 발명의 보다 전반적인 이해를 돕기 위해서 제공된 것일 뿐, 본 발명이 상기 실시예들에 한정되는 것은 아니며, 본 발명이 속하는 기술분야에서 통상적인 지식을 가진 자라면 이러한 기재로부터 다양한 수정 및 변형을 꾀할 수 있다.

[0078] 따라서, 본 발명의 사상은 상기 설명된 실시예에 국한되어 정해져서는 아니되며, 후술하는 특허청구범위뿐만 아니라 이 특허청구범위와 균등하게 또는 등가적으로 변형된 모든 것들은 본 발명의 사상의 범주에 속한다고 할 것이다.

도면의 간단한 설명

[0079] 도 1은 종래 LED 모듈의 구성을 나타내는 도면이다.

[0080] 도 2는 본 발명의 일 실시예에 따른 LED 패키지의 전체적인 구성을 나타내는 사시도이다.

[0081] 도 3은 도 2에 도시되는 LED 패키지의 분해 사시도이다.

[0082] 도 4는 본 발명의 일 실시예에 따른 LED 패키지를 일 이상 포함하는 구조의 전면 사시도이다.

[0083] 도 5 및 도 6은 도 4의 후면 사시도이다.

[0084] <주요 도면부호에 관한 간단한 설명>

[0085] 110: 리드 프레임

[0086] 111: 캐소드

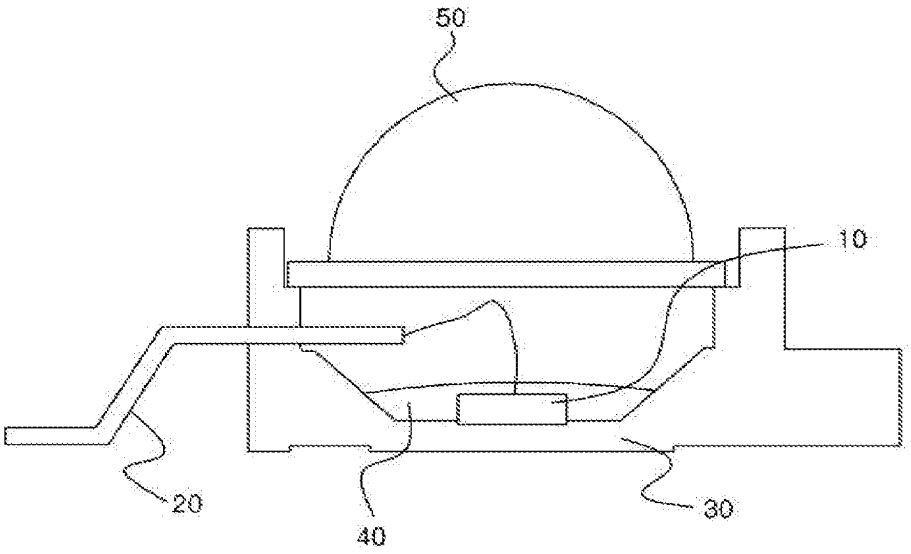
[0087] 112: 애노드

[0088] 120: 플라스틱 사출물

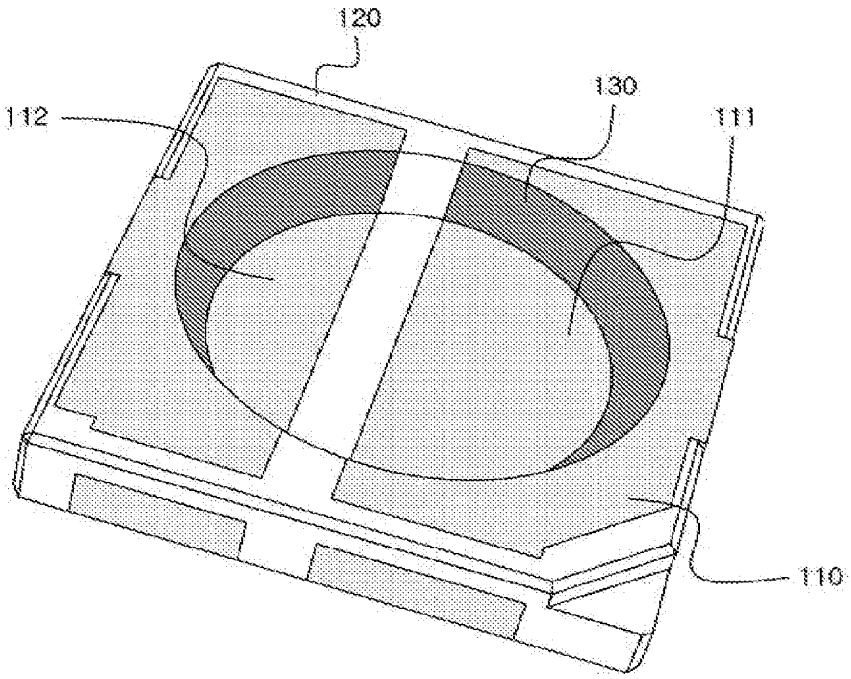
[0089] 130: 반사면

도면

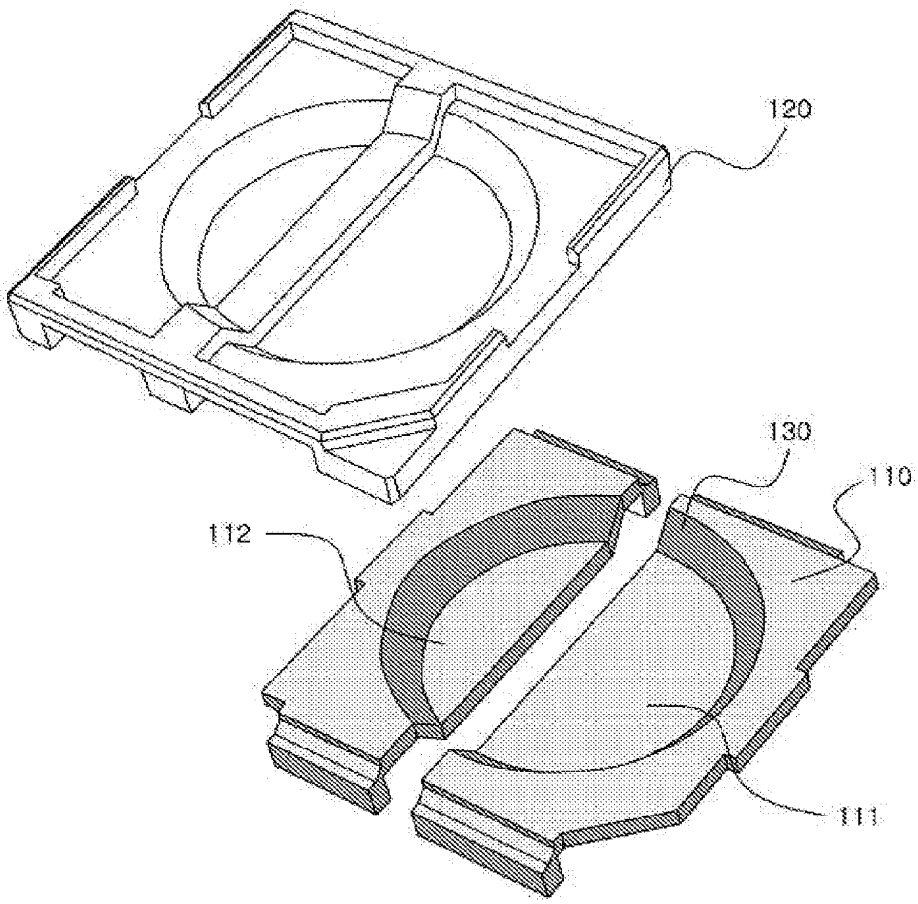
도면1



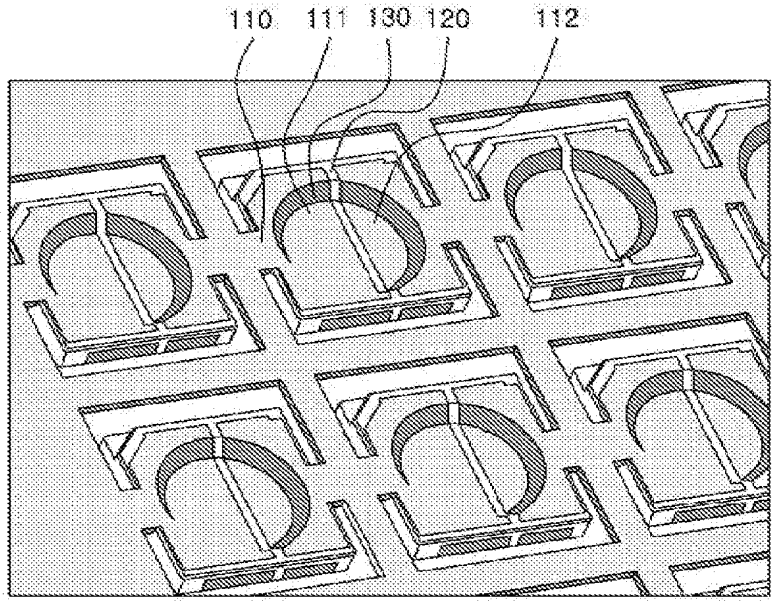
도면2



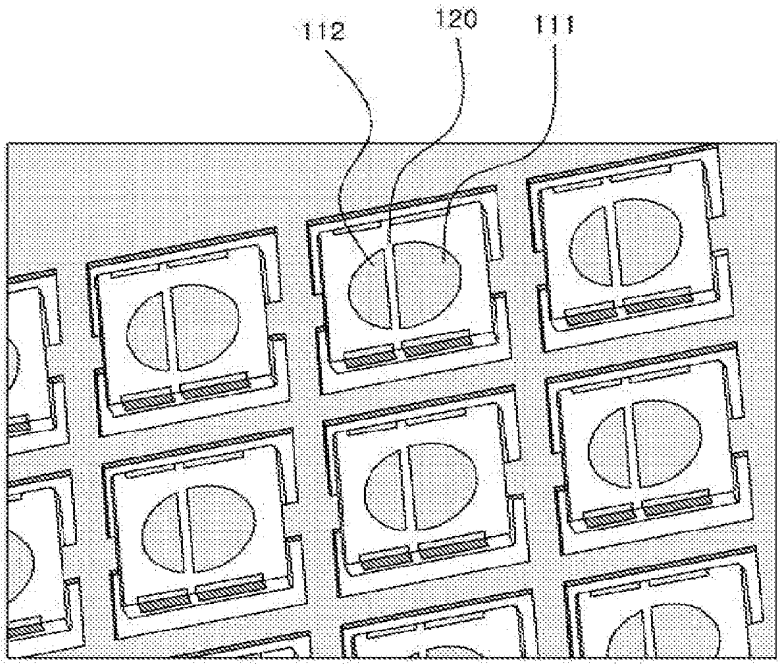
도면3



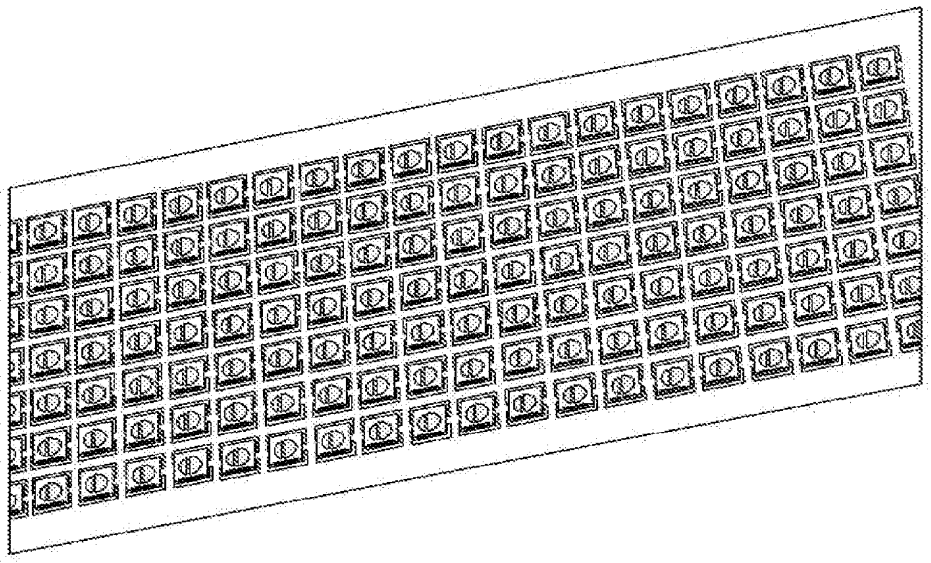
도면4



도면5



도면6



IKEA Supply AG
Exhibit 1002 Page 206 of 329

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of	Docket No: Q231501
Chung-Chuan HSIEH, et al.	
Appln. No.: 15/441,644	Group Art Unit: 2896
Confirmation No.: 6962	Examiner: NARAGHI, ALI
Filed: February 24, 2017	

For: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

INFORMATION DISCLOSURE STATEMENT
UNDER 37 C.F.R. §§ 1.97 and 1.98

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the duty of disclosure under 37 C.F.R. § 1.56, Applicant hereby notifies the U.S. Patent and Trademark Office of the documents which are listed on the attached PTO/SB/08 (modified) form and/or listed herein and which the Examiner may deem material to patentability of the claims of the above-identified application.

One copy of each of the listed documents is submitted herewith, except for the following: U.S. patents and/or U.S. patent publications; and co-pending non-provisional U.S. applications filed after June 30, 2003.

The present Information Disclosure Statement is being filed after the later of three months from the application's filing date and the mailing date of the first Office Action on the merits, but before a Final Office Action, Notice of Allowance, or an action that otherwise closes prosecution in the application (whichever is earlier), and therefore Applicant is filing

concurrently herewith a Statement Under 37 C.F.R. § 1.97(e). No fee under 37 C.F.R. § 1.17(p) is required.

For foreign language documents, please see column "T" in the "Foreign Patent Documents" section of the attached PTO/SB/08 form.

The submission of the listed documents is not intended as an admission that any such document constitutes prior art against the claims of the present application. Applicant does not waive any right to take any action that would be appropriate to antedate or otherwise remove any listed document as a competent reference against the claims of the present application.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/Young H. Chon/

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WASHINGTON OFFICE
23373
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Date: July 6, 2017

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501	6962

23373 7590 06/08/2017

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WASHINGTON, DC 20037

EXAMINER
NARAGHI, ALI

ART UNIT	PAPER NUMBER
2896	

NOTIFICATION DATE	DELIVERY MODE
06/08/2017	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

PPROCESSING@SUGHRUE.COM
sughrue@sughrue.com
USPTO@sughrue.com

Office Action Summary	Application No. 15/441,644	Applicant(s) HSIEH ET AL.	
	Examiner ALI NARAGHI	Art Unit 2896	AIA (First Inventor to File) Status Yes

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *02/24/2017*.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5)☒ Claim(s) *1-20* is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6)☐ Claim(s) _____ is/are allowed.

7)☒ Claim(s) *1-20* is/are rejected.

8)☐ Claim(s) _____ is/are objected to.

9)☐ Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

10)☐ The specification is objected to by the Examiner.

11)☒ The drawing(s) filed on *02/24/2017* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☒ All b)☐ Some** c)☐ None of the:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☒ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date *02/24/2017*.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

4) ☐ Other: _____.

The present application, filed on or after March 16, 2013, is being examined under the first inventor to file provisions of the AIA.

What is claimed is:

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent for a claimed invention may not be obtained, notwithstanding that the claimed invention is not identically disclosed as set forth in section 102, if the differences between the claimed invention and the prior art are such that the claimed invention as a whole would have been obvious before the effective filing date of the claimed invention to a person having ordinary skill in the art to which the claimed invention pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-17 is/are rejected under 35 U.S.C. 103 as being unpatentable over SEO et al (US Pub No. 20110193111), in view of Kida et al (US Pub No. 20040016873).

With respect to claim 1, SEO et al discloses at least one electrode portion (any 40,Fig.1); and a housing (30,Fig.1) , wherein said at least one electrode portion is partially covered by the housing (Fig.1), wherein said at least one electrode portion further comprises a wing portion which is exposed outside the housing (40 outside of housing,Fig.1), wherein the wing portion further comprises a central area (the last portion of bottom portion of 40 right next to protrusion,Fig.1) and at least one edge area (after protrusion before 30,Fig.1) , and the edge area protrudes from the central area (Fig.1). However, SEO et al does not explicitly disclose where the housing is made out

of resin and has reflecting material. On the other hand, Kida et al discloses that the housing is made of resin (1,Fig.1) and has reflecting material (3,Fig.1). On the other hand, it would have been obvious to one of ordinary skill in the art at the time of invention to modify SEO et al according to the teachings of Kida et al such that the housing is made of resin and has reflecting material, in order to increase luminosity and heat dissipation of the device.

With respect to claim 2, SEO et al discloses wherein at least one electrode portion (40 left or right,Fig.1) further comprises an electrode portion cross section (the dotted section, Fig.1).

With respect to claim 3, SEO et al discloses wherein the electrode portion cross section comprises at least one curved surface (Fig.1).

With respect to claim 4, SEO et al discloses wherein the resin housing further comprises at least one housing cross section (top portion of 30,Fig.1).

With respect to claim 5, SEO et al discloses wherein the housing cross section is located in the vicinity of the four corners of the resin housing (Fig.1).

With respect to claim 6, SEO et al discloses wherein the housing cross section is not level with the electrode portion cross section (Fig.2).

With respect to claim 7, SEO et al discloses wherein the at least one electrode portion comprises at least one recess (edge of 40 inside 30,Fig.2).

With respect to claim 8, SEO et al discloses wherein the at least one electrode portion comprises an inner side surface (first vertical dotted line,Fig.2) and a connecting surface (edge and dotted vertical line next to the edge,Fig.2), and the inner side surface and the connecting surface connect with each other to form a step surface (Fig.2).

With respect to claim 9, SEO et al discloses wherein the recess is located at the connecting surface to form an uneven surface (Fig.2).

With respect to claim 10, SEO et al discloses at least one electrode portion (Any 40,Fig.1); and a housing (30,Fig.1) , wherein the at least one electrode portion comprises a wing portion (lower portion of 40,Fig.1), and wherein the wing portion further comprises a central area (edge of lower portion of 40 towards 30,Fig.1) and at least one edge area (upper portion of 40 just outside 30,Fig.1), and the central area is recessed from the at least one edge area (Fig.1). However, SEO et al does not explicitly disclose where the housing is made out of resin and has reflecting material. On the other hand, Kida et al discloses that the housing is made of resin (1,Fig.1) and has reflecting material (3,Fig.1). On the other hand, it would have been obvious to one of

ordinary skill in the art at the time of invention to modify SEO et al according to the teachings of Kida et al such that the housing is made of resin and has reflecting material, in order to increase luminosity and heat dissipation of the device.

With respect to claim 11, SEO et al discloses wherein the wing portion is exposed outside the resin housing (Fig.1).

With respect to claim 12, SEO et al discloses wherein the wing portion comprises two edge areas (two outer corners of 40 away from 30,Fig.1).

With respect to claim 13, SEO et al discloses wherein the two edge areas protrude from central area (they protrude in x direction, Fig.1).

With respect to claim 14, SEO et al discloses wherein the resin housing further comprises at least one housing cross section (upper portion of 30,Fig.1) and at least one electrode portion cross section (dotted section of 40,Fig.2).

With respect to claim 15, SEO et al discloses wherein the at least one electrode portion cross section comprises a curved surface (upper and lower electrodes,Fig.2).

With respect to claim 16, SEO et al discloses wherein the at least one housing cross section is located in the vicinity of the corner of the resin housing (Fig.2).

With respect to claim 17, SEO et al discloses wherein the housing cross section is not level with the electrode portion cross section (Fig.2).

Claims 18-20 is/are rejected under 35 U.S.C. 103 as being unpatentable over SEO et al (US Pub No. 20110193111), in view of Kida et al (US Pub No. 20040016873), in view of Chen (US Pub No. 20140159098).

With respect to claim 18, arts cited above do not explicitly disclose wherein the electrode portion further comprises a conductive layer. On the other hand, Chen discloses wherein the electrode portion further comprises a conductive layer (50,Fig.2). It would have been obvious to one of ordinary skill in the art at the time of invention to modify arts cited above so they would include fastner in order to tighten the electrode in to the substrate.

With respect to claim 19, Chen discloses wherein the conductive layer is not located on the surface of the at least one electrode portion cross section (Fig.2).

With respect to claim 20, Chen discloses wherein the conductive layer is located on the surface of the central area (because it is not located inside the housing).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALI NARAGHI whose telephone number is (571)270-5720. The examiner can normally be reached on 9AM-6PM.

Examiner interviews are available via telephone, in-person, and video conferencing using a USPTO supplied web-based collaboration tool. To schedule an interview, applicant is encouraged to use the USPTO Automated Interview Request (AIR) at http://www.uspto.gov/interviewpractice.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Such can be reached on 571-272-8895. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/ALI NARAGHI/
Primary Examiner, Art Unit 2896

Notice of References Cited	Application/Control No. 15/441,644	Applicant(s)/Patent Under Reexamination HSIEH ET AL.	
	Examiner ALI NARAGHI	Art Unit 2896	Page 1 of 1

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2014/0159098 A1	06-2014	Chen; Ying-Zhong	H01L33/62	257/99
*	B	US-2011/0193111 A1	08-2011	SEO; Jung Hoo	H01L25/0753	257/89
*	C	US-2004/0016873 A1	01-2004	Kida, Shinobu	H01L31/0203	250/214R
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
	S					
	T					

NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
	U	
	V	
	W	
	X	

*A copy of this reference is not being furnished with this Office action. (See MPEP § 707.05(a).)
Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	15441644	HSIEH ET AL.
	Examiner	Art Unit
	ALI NARAGHI	2896

CPC- SEARCHED		
Symbol	Date	Examiner

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
Searched East	6/4/2017	AN

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	1	("20150340568").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2016/11/10 01:49
S2	4456	h01l33/483.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/11/10 01:51
S3	4029	S2 and @ad<"20140523"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/11/10 01:52
S4	73	S3 and lead$1frame and housing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/11/10 01:56
S5	23867	h01l33/62.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/11/10 02:03
S6	259	S5 and lead$1frame and housing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/11/10 02:04
S7	233	S6 and @ad<"20140523"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/11/10 02:04
S8	1130	led and lead$1frame and housing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2016/11/10 02:34

			DERWENT; IBM_TDB			
S9	1059	S8 and @ad<"20140523"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/11/10 02:34
S10	28	led and (lead$1frame with protrusion)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/11/10 03:26
S11	25	S10 and @ad<"20140523"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/11/10 03:26
S12	1	"14720230"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/12/06 15:11
S13	144735	(h01l33/$$$$$).cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/12/06 15:25
S14	9848	S13 and (electrode with cover$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/12/06 15:25
S15	765	S13 and (electrode with cover$3) and housing	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/12/06 15:25
S16	578	S15 and @ad<"20140523"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/12/06 15:26
S17	5	("20020011601" | "20040240773" | "20090090926").PN. OR ("8026533").URPN.	US-PGPUB; USPAT; USOCR	OR	OFF	2016/12/06 17:08

S18	1	("20130270588").PN.	US-PGPUB; USPAT; USOCR	OR	OFF	2016/12/06 18:49
S20	22	(US-20070246841-$ | US-20070261374-$ | US-20090261374-$ | US-20100083907-$ | US-20120132949-$ | US-20130270588-$ | US-8137999-$ | US-9024514-$ | US-D149221-$ | US-D154430-$ | US-D154432-$).DID.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/05/25 21:09
S21	1	"14720230"	USPAT	OR	OFF	2017/05/31 18:59
S22	28646	h01l33/62.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/05/31 19:09
S23	2954	S22 and hous$3	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/05/31 19:09
S24	2379	S23 and @ad<"20140523"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/05/31 19:09
S25	100	("20010045640" | "20040075100" | "20040079957" | "20040087057" | "20050269587" | "20060043401" | "20060118808" | "20060157726" | "20060186418" | "20070052074" | "20070057364" | "20070114514" | "20070262328" | "20080023722" | "20080048201" | "20080185605" | "20080258130" | "20080278941" | "20080283849" | "20090008662" | "20090101921" | "20090121249" | "20090122533" | "20090159905" | "20090267085" | "20090321779" | "20100059783" | "20100102345" | "20100155748" | "20100163887" | "20100181582" | "20100210048" | "20100237360" | "20100270577" | "20110006658" | "20110090711" | "20110180827" | "20110186873" | "20110316022" | "20120069560" | "20120127720" | "20120307481" | "20130003375" | "20130011946" | "20140027801" | "20140159088" | "20140217434" | "4946547" | "5200022" | "5210051" | "5393993" | "5506446" | "5523589" | "6274924" | "6498355" | "6806583" | "6828170" | "6921927" | "6936855" | "6949771" | "7098483" | "7253448" | "7361940" | "7566159" |	US-PGPUB; USPAT; USOCR	OR	OFF	2017/06/02 13:01

		"7592638" | "7659551" | "7692206" | "7791061" | "7852015" | "7858993" | "8269244" | "8354992" | "8497522" | "8598602" | "8610140" | "8648359" | "8686445" | "D597968" | "D622680" | "D626095" | "D627310" | "D628541" | "D632267" | "D632659" | "D634284" | "D634285" | "D634286" | "D634716" | "D641719" | "D643819" | "D648686" | "D648687" | "D658599" | "D659657" | "D661264" | "D667801" | "D679842" | "D704358" | "D708156" | "RE34861").PN. OR ("9111778").URPN.				
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S28	20	S27 and @ad<"20140523"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/02 19:01
S29	349	LED same (resin adj2 hous$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/02 19:10
S30	310	S29 and @ad<"20140523"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/02 19:10
S31	349	LED same (resin adj2 hous$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/03 14:53
S32	28710	h01l33/62.cpc.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/03 14:54

S33	27	S32 and (hous$3 with resin with reflect$3)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2017/06/03 14:54

6/4/2017 3:26:57 PM
C:\Users\anaraghi\Documents\EAST\Workspaces\15441644.wsp

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Divisional of Appl No.	14/720,230
Confirmation Number	Not Yet Assigned
Filing Date	February 24, 2017
First Named Inventor	Chung-Chuan HSIEH
Art Unit	Not Yet Assigned2896
Examiner Name	~~Not Yet Assigned~~
Attorney Docket Number	Q231501

U.S. PATENTS

Examiner Initials*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	1.	9024514	B2	2015-05-05	KATO Hideaki	
	2.	8137999	B2	2012-03-20	WANG Billy	

U.S. PATENT APPLICATION PUBLICATIONS

Examiner Initials*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	3.	20130270588		2013-10-17	Wang Chiou-Yueh	
	4.	20120132949	A1	2012-05-31	WATARI Gen	
	5.	20090261374	A1	2009-10-22	HAYASHI Masaki	
	6.	20070261374	A1	2007-11-15	NELSON Benny Kevin	
	7.	20070246841	A1	2007-10-25	YAMAMOTO Saiki	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear	T[5]
	8.	201340410	TW	A	2013-10-01	Advanced Semiconductor Eng.		
	9.	101346584	CN	A	2009-01-14	Matsushita Electric Works Ltd		
	10.	3020070049380	KR		2007-11-28	Lumens Co Ltd		
	11.	D149221	TW		2012-09-11			
	12.	D154430	TW		2013-07-01			
	13.	D154432	TW		2013-07-01			
	14.	20100083907	KR		2010-07-23	Sul Myung Soon		
	15.	2014017460	JP		2014-01-30	Fusheng Ind Co LTD		
	16.	2014060343	JP		2014-04-03	Sanken Electric Co LTD		

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city, and/or country where published.	T[5]

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. 2 Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). 3 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 5 Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.N/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Divisional of Appl No.	14/720,230
	Confirmation Number	Not Yet Assigned
	Filing Date	February 24, 2017
	First Named Inventor	Chung-Chuan HSIEH
	Art Unit	~~Not Yet Assigned~~ 2896
	Examiner Name	Not Yet Assigned Ali Naraghi
	Attorney Docket Number	Q231501

EXAMINER SIGNATURE			
Examiner Signature	/ALI NARAGHI/	Date Considered	06/04/2017

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. 2 Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). 3 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 5 Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /A.N/

UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501

CONFIRMATION NO. 6962

23373
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

PUBLICATION NOTICE



Title:CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

Publication No.US-2017-0162771-A1
Publication Date:06/08/2017

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501

CONFIRMATION NO. 6962

POA ACCEPTANCE LETTER

23373
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

OC000000090248213

Date Mailed: 04/13/2017

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 03/27/2017.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/kgebremichael/

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Chung-Chuan HSIEH, et al.

Appln. No.: 15/441,644

Confirmation No.: 6962

Filed: February 24, 2017

Docket No: Q231501

Group Art Unit: 2811

Examiner: Not Yet Assigned

For: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

RESPONSE TO NOTICE REGARDING POWER OF ATTORNEY

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In response to the Notice Regarding Power of Attorney dated March 3, 2017, Applicant respectfully request the Examiner to accept the updated Power of Attorney executed by a representative of Everlight Electronics Co., Ltd.

Respectfully submitted,

/John F. Rabena/
John F. Rabena
Registration No. 38,584

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: March 27, 2017

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter.

I hereby appoint:

Patent Practitioner(s) associated with the following Customer Number:

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (Form PTO/AIA/82A).

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

The address associated with the above-mentioned Customer Number.

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

EVERLIGHT ELECTRONICS CO., LTD

- ☐ Inventor or Joint Inventor (title not required below)
- ☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
- ☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
- ☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a Petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document)(provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	Hsien Chia Lin	Date (Optional)	
Name	Hsien Chia LIN		
Title	Manager		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of 1 forms are submitted.

Electronic Acknowledgement Receipt

EFS ID:	28744451
Application Number:	15441644
International Application Number:	
Confirmation Number:	6962
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Customer Number:	23373
Filer:	John F. Rabena/Shannon Shenton
Filer Authorized By:	John F. Rabena
Attorney Docket Number:	Q231501
Receipt Date:	27-MAR-2017
Filing Date:	24-FEB-2017
Time Stamp:	14:15:05
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Q231501ResponsetoNoticeRegardingPowerofAttorneyandExecutedEverlightPowerofAttorney.pdf	84984 306afc27da74dfc49bec5e5c2d8bb9ffe8bd0d19	yes	2

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Response to Pre-Exam Formalities Notice	1	1
	Power of Attorney	2	2
Warnings:			
Information:			
	Total Files Size (in bytes):	84984	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

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MAILED
MAR 07 2017
OFFICE OF PETITIONS

SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON DC 20037

Doc Code: TRACK1.GRANT

Decision Granting Request for Prioritized Examination (Track I or After RCE)	Application No.: 15/441,644

The Petition under 37 C.F.R. § 1.182 for Expedited Processing of Request for Prioritized Examination under 37 C.F.R. § 1.102(e), filed February 24, 2017, is **GRANTED**.

1. THE REQUEST FILED February 24, 2017 IS **GRANTED.**

The above-identified application has met the requirements for prioritized examination

A. ☒ for an original nonprovisional application (Track I).
B. ☐ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination.** The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

A. filing a **petition for extension of time** to extend the time period for filing a reply;
B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims**, or a multiple dependent claim;
C. filing a **request for continued examination**;
D. filing a notice of appeal;
E. filing a request for suspension of action;
F. mailing of a notice of allowance;
G. mailing of a final Office action;
H. completion of examination as defined in 37 CFR 41.102; or
I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to Brian W. Brown at 571-272-5338.

/Brian W. Brown/
[*Signature*]

Petitions Examiner, Office of Petitions
(Title)

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 15/441,644

APPLICATION AS FILED - PART I

	(Column 1)	(Column 2)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE($)	FEE($)		RATE($)	FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	20 minus 20 =	*			OR	x 80 =	0.00
INDEPENDENT CLAIMS (37 CFR 1.16(h))	2 minus 3 =	*				x 420 =	0.00
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	1600

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1)		(Column 2)	(Column 3)					
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE($)	ADDITIONAL FEE($)		RATE($)	ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
15/441,644	02/24/2017	2811	1600	Q231501	20	2

CONFIRMATION NO. 6962

FILING RECEIPT

23373
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

OC000000089809353

Date Mailed: 03/03/2017

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. **If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections**

Inventor(s)

Chung-Chuan HSIEH, New Taipei City, TAIWAN;
Yung Chieh CHEN, New Taipei City, TAIWAN;

Applicant(s)

EVERLIGHT ELECTRONICS CO., LTD., New Taipei City, TAIWAN;

Assignment For Published Patent Application

EVERLIGHT ELECTRONICS CO., LTD., New Taipei City, TAIWAN

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a DIV of 14/720,230 05/22/2015

Foreign Applications (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.)
TAIWAN 103118060 05/23/2014
TAIWAN 104103527 02/03/2015

Permission to Access Application via Priority Document Exchange: No

Permission to Access Search Results: No

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 03/02/2017

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 15/441,644**

Projected Publication Date: 06/08/2017

Non-Publication Request: No

Early Publication Request: No

Title

CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

Preliminary Class

257

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

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Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

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LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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NOT GRANTED

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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
15/441,644	02/24/2017	Chung-Chuan HSIEH	Q231501

CONFIRMATION NO. 6962

IMPROPER CPOA LETTER

23373
SUGHRUE MION, PLLC
2100 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20037

OC000000089609639

Date Mailed: 03/03/2017

NOTICE REGARDING POWER OF ATTORNEY

This is in response to the power of attorney filed 02/24/2017. The power of attorney in this application is not accepted for the reason(s) listed below:

- The power of attorney has not been accepted because the party who is giving power has not been identified. Power of attorney may only be signed by the applicant for patent (37 CFR 1.42) or the patent owner. A party who is not the applicant must become the applicant in accordance with 37 CFR 1.46(c) and appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. For a reissue application, reexamination proceeding, or supplemental examination proceeding, a patent owner who was not the applicant under 37 CFR 1.46 must appoint any power of attorney in compliance with 37 CFR 3.71 and 3.73. See 37 CFR 1.32(b)(4).

/bzewdie/

Office of Data Management, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

FEE TRANSMITTAL

Complete if Known	
Divisional of App	14/720,230
Filing Date	February 24, 2017
First Named Inventor	Chung-Chuan HSIEH
Examiner Name	Not Yet Assigned
Art Unit	Not Yet Assigned
Docket No.	Q231501

☐ Applicant asserts small entity status. See 37 CFR 1.27.

☐ Applicant certifies micro entity status. See 37 CFR 1.29. Form PTO/SB/15A or B or equivalent must either be attached or have been submitted previously.

TOTAL AMOUNT OF PAYMENT **($)6,140.00**

METHOD OF PAYMENT (check all that apply)

☐ Check ☑ **Credit Card** ☐ Money Order ☐ None ☐ Other (please identify): _____

☐ Deposit Account Deposit Account Number: 19-4880 Deposit Account Name: Sughrue Mion, PLLC

For the above-identified deposit account, the Director is hereby authorized to: (check all that apply)

☐ Charge fee(s) indicated below ☐ Charge fee(s) indicated below, **except for the Issue Fee and the Publication Fee**

☐ Charge fee(s) indicated below, **except for the filing fee, the Issue Fee and the Publication Fee**

☑ Charge any additional fee(s), except for the Issue Fee and the Publication Fee, or underpayments of fee(s) under 37 CFR 1.16 and 1.17 ☑ Credit any overpayment of fees(s)

FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES (U = undiscounted fee; S = small entity fee; M = micro entity fee)

	FILING FEES			SEARCH FEES			EXAMINATION FEES			
Application Type	**U($)**	**S($)**	**M($)**	**U($)**	**S($)**	**M($)**	**U($)**	**S($)**	**M(&)**	**Fees Paid ($)**
Utility	280	140*	70	600	300	150	720	360	180	**1,600**
Design	180	90	45	120	60	30	460	230	115	
Plant	180	90	45	380	190	95	580	290	145	
Reissue	280	140	70	600	300	150	2160	1080	540	
Provisional	260	130	65	0	0		0	0	0	

* The $140 small entity status filing fee for a utility application is further reduced to $70 for a small entity status applicant who filed the application via EFS-Web.

2. EXCESS CLAIM FEES

Fee Description	**Undiscounted Fee ($)**	**Small Entity Fee ($)**	**Micro Entity Fee ($)**
Each claim over 20 (including Reissues)	80	40	20
Each independent claim over 3 (including Reissues)	420	210	105
Multiple dependent claims	780	390	195

Total Claims		**Extra Claims**		**Fee ($)**		**Fee Paid ($)**
20	- 20 or HP =	0	X	80	=	0

HP = highest number of total claims paid for, if greater than 20.

Multiple Dependent Claims	
Fee($)	**Fee Paid ($)**
780	**0**

Indep. Claims		**Extra Claims**		**Fee ($)**		**Fee Paid ($)**
2	- 3 or HP =	0	X	420	=	0

HP = highest number of independent claims paid for, if greater than 3.

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper (excluding electronically filed sequence or computer listings under 37 CFR 1.52(e)), the application size fee due is $400 ($200 for small entity or $ 100 for micro entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets		**Extra Sheets**		**Number of each additional 50 or fraction thereof**		**Fee($)**	**Fee Paid ($)**
61	- 100 =	0	/ 50	0	(round up to a whole number) x	400	**0**
61 *.75	46 - 100 =	0	/ 50	0	EFS Fee Discount	400	**0**

4. OTHER FEE(S) Fees Paid ($)

Non-English Specification, $140 fee ($ 70 for small entity or $35 for micro entity) _____

Non-electronic filing fee under 37 CFR 1.16(t) for a utility application, $400 fee ($200 small or micro entity) _____

Other (e.g., late filing surcharge): **Track One Prioritized Examination Fee $4,000.00; Processing Fee $140.00; Publication Fee $0.00; and Petition Fee Expedited Processing $400.00** **$4,540.00**

SUBMITTED BY

Signature	/John F. Rabena/	Registration No. (Attorney/Agent) 38,584	Telephone: 202.293.7060
Name (Print/Type)	John F. Rabena		Date: February 24, 2017

UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	Q231501
First Named Inventor	Chung-Chuan HSIEH
Title	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
Express Mail Label No.	

APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents.

ADDRESS TO: **Commissioner for Patents**
P.O. Box 1450
Alexandria VA 22313-1450

1. ☑ **Fee Transmittal Form** (PTO/SB/17 or equivalent)
2. ☐ **Applicant asserts small entity status.** See 37 CFR 1.27.
3. ☐ **Applicant certifies micro entity status.** See 37 CFR 1.29. Applicant must attach form PTO/SB/15A or B or equivalent.
4. ☑ **Specification** [Total Pages 31]
   Both the claims and abstract must start on a new page.
   (See MPEP § 608.01(a) for information on the preferred arrangement)
5. ☑ Drawing(s) (35 U.S.C. 113) [Total Sheets 28]
6. **Inventor's Oath or Declaration** [Total Sheets 3]
   (including substitute statements under 37 CFR 1.64 and assignments serving as an oath or declaration under 37 CFR 1.63(e))
   a. ☑ Newly executed (original or copy)
   b. ☐ A copy from a prior application (37 CFR 1.63(d))
7. ☑ **Application Data Sheet.** **See note below.* See 37 CFR 1.76 (PTO/AIA/14 or equivalent)
8. ☐ **CD-ROM or CD-R** in duplicate, large table or Computer Program (*Appendix*)
   ☐ Landscape Table on CD
9. ☐ **Nucleotide and/or Amino Acid Sequence Submission**
   (if applications, items a. – c. are required)
   a. ☐ Computer Readable Form (CRF)
   b. Specification Sequence Listing on:
      i. ☐ CD-ROM or CD-R (2 copies); or
      ii. ☐ Paper
   c. ☐ Statements verifying identity of above copies

ACCOMPANYING APPLICATION PAPERS

10. ☐ **Assignment Papers** (cover sheet & document(s))
    Name of Assignee EVERLIGHT ELECTRONICS CO., LTD.
11. ☐ **37 CFR 3.73(c) Statement** ☐ **Power of Attorney**
    (when there is an assignee)
12. ☐ **English Translation Document** *(if applicable)*
13. ☑ **Information Disclosure Statement**
    (PTO/SB/08 or PTO-1449)
    ☐ Copies of citations attached
14. ☐ **Preliminary Amendment**
15. ☐ **Return Receipt PostCard**
    (MPEP § 503)(Should be specifically itemized)
16. ☐ **Certified Copy of Priority Document(s)**
    (if foreign priority is claimed)
17. ☐ **Nonpublication Request**
    Under 35 U.S.C. 122(b)(2)(B)(i). Applicant must attach form PTO/SB/35 or equivalent.
18. ☑ **Priority is claimed from:**
    SEE ATTACHED
19. ☐ **Other**:

Note: (1) Benefit claims under 37 CFR 1.78 and foreign priority claims under 1.55 must be included in an Application Data Sheet (ADS).
(2) For applications filed under 35 U.S.C. 111, the application must contain an ADS specifying the applicant if the applicant is an assignee, person to whom the inventor is under an obligation to assign, or person who otherwise shows sufficient proprietary interest in the matter. See 37 CFR 1.46(b).

☑ The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

20. **If a CONTINUING APPLICATION**, *check appropriate box, and supply the requisite information below and in the first sentence of the specification following the title, or in an Application Data Sheet under 37 CFR 1.76*:

☐ Continuation ☑ **Divisional** ☐ Continuation-in-part (CIP) of prior application No: **14/720,230**

Prior application information: *Examiner: Ali NARAGHI* *Art Unit: 2896*

21. CORRESPONDENCE ADDRESS

☑ The address associated with Customer Number: WASHINGTON OFFICE 23373 CUSTOMER NUMBER

OR ☐ Correspondence address below

Signature	/John F. Rabena/	Date	February 24, 2017
Name	John F. Rabena	Registration No.	38,584

UTILITY PATENT APPLICATION TRANSMITTAL
ADDITIONAL PAGE

Priority is claimed from:

Country	Application No	Filing Date
TW	103118060	2014-05-23
TW	104103527	2015-02-03

The priority documents are attached herewith.

Attorney Docket No.			Q231501
CORRESPONDENCE ADDRESS			
☑ The address associated with Customer Number:	WASHINGTON OFFICE 23373 CUSTOMER NUMBER	OR	☐ Correspondence address below

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Chung-Chuan HSIEH, et al.

Docket No: Q231501

Divisional of Appln. No.: 14/720,230

Group Art Unit: Not Yet Assigned

Confirmation No.: Not Yet Assigned

Examiner: Not Yet Assigned

Filed: February 24, 2017

For: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

PETITION UNDER 37 C.F.R. § 1.182 FOR EXPEDITED PROCESSING OF REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 C.F.R. § 1.102(e)

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

The above referenced application was filed on February 24, 2017, along with a Certification and Request for Prioritized Examination under 37 C.F.R. § 1.102(e) in the USPTO.

Applicant has been advised by the Office of Petitions that consideration of the Request for Prioritized Examination under 37 C.F.R. § 1.102(e) in the USPTO may be expedited through submission of the present Petition under 37 C.F.R. § 1.182.

It is respectfully requested that this Petition be granted for expedited processing of the Request for Prioritized Examination under 37 C.F.R. § 1.102(e) in the USPTO.

The statutory fee of $400.00 is being charged to Deposit Account No. 19-4880 via EFS Payment Screen. The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

/John F. Rabena/
John F. Rabena
Registration No. 38,584

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: February 24, 2017

ABSTRACT

A carrier leadframe, including a frame body and a carrier, is provided. The frame body includes at least one supporting portion, and the carrier includes a shell and at least one electrode portion and is mechanically engaged with the frame body via the supporting portion. A method for manufacturing the carrier leadframe as described above, as well as a light emitting device made from the carrier leadframe and a method for manufacturing the device, are also provided. The carrier leadframe has carriers that are separate in advance and mechanically engaged with the frame body, thereby facilitating the quick release of material after encapsulation. Besides, in the carrier leadframe as provided, each carrier is electrically isolated from another carrier, so the electric measurement can be performed before the release of material. Therefore, the speed and yield of production of the light emitting device made from the carrier leadframe is improved.

CLAIMS

What is claimed is:

1. A light emitting device comprising:

at least one electrode portion; and

a resin housing containing a reflecting material,

wherein said at least one electrode portion is partially covered by the resin housing,

wherein said at least one electrode portion further comprises a wing portion which is exposed outside the housing,

wherein the wing portion further comprises a central area and at least one edge area, and the edge area protrudes from the central area.

2. The light emitting device according to claim 1, wherein at least one electrode portion further comprises an electrode portion cross section.
3. The light emitting device according to claim 2, wherein the electrode portion cross section comprises at least one curved surface.
4. The light emitting device according to claim 3, wherein the resin housing further comprises at least one housing cross section.
5. The light emitting device according to claim 4, wherein the housing cross section is located in the vicinity of the four corners of the resin housing.
6. The light emitting device according to claim 5, wherein the housing cross section is not level with the electrode portion cross section.
7. The light emitting device according to claim 1, wherein the at least one electrode portion comprises at least one recess.
8. The light emitting device according to claim 7, wherein the at least one electrode portion comprises an inner side surface and a connecting

surface, and the inner side surface and the connecting surface connect with each other to form a step surface.

9. The light emitting device according to claim 7, wherein the recess is located at the connecting surface to form an uneven surface.

10. A light emitting device comprising:

at least one electrode portion; and

a resin housing containing a reflecting material,

wherein the at least one electrode portion comprises a wing portion, and

wherein the wing portion further comprises a central area and at least one edge area, and the central area is recessed from the at least one edge area.

11. The light emitting device according to claim 10, wherein the wing portion is exposed outside the resin housing.

12. The light emitting device according to claim 11, wherein the wing portion comprises two edge areas.

13. The light emitting device according to claim 12, wherein the two edge areas protrude from central area.

14. The light emitting device according to claim 13, wherein the resin housing further comprises at least one housing cross section and at least one electrode portion cross section.

15. The light emitting device according to claim 14, wherein the at least one electrode portion cross section comprises a curved surface.

16. The light emitting device according to claim 15, wherein the at least one housing cross section is located in the vicinity of the corner of the resin housing.

17. The light emitting device according to claim 16, wherein the housing cross section is not level with the electrode portion cross section.
18. The light emitting device according to claim 17, wherein the electrode portion further comprises a conductive layer.
19. The light emitting device according to claim 18, wherein the conductive layer is not located on the surface of the at least one electrode portion cross section.
20. The light emitting device according to claim 19, wherein the conductive layer is located on the surface of the central area.

CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present disclosure is part of a divisional application of U.S. Patent Application No. 14/720,230, which was filed on May 22, 2015 claiming the priority benefit of Taiwan Patent Application No. 103118060, filed on May 23, 2014, and Taiwan Patent Application No. 104103527, filed on February 03, 2015. The aforementioned applications are incorporated herein by reference in their entirety.

TECHNICAL FIELD

[0002] The present disclosure relates to a carrier leadframe and a light emitting device made from the carrier leadframe. More particularly, the present disclosure relates to a carrier leadframe for receiving a light emitting diode (LED) chip and a light emitting device made from the leadframe.

BACKGROUND

[0003] Unless otherwise indicated herein, approaches described in this section are not prior art to the claims listed below and are not admitted to be prior art by inclusion in this section.

[0004] Light emitting diodes (LEDs) have such advantages as a long service life, a small volume, high resistance to shock, low heat generation and low power consumption, so they have been widely used as indicators or light sources in household appliances and various other appliances. In recent years, LEDs have developed towards multicolor and high brightness, so applications thereof have been extended to large-sized outdoor signboards,

traffic signal lamps and related fields. In the future, it is even possible that the LEDs become mainstream illumination light sources having both power-saving and environmental protection functions. To impart the LEDs with good reliability, most of the LEDs are subjected to a packaging process to form durable light emitting devices.

[0005] In recent years, a dicing-type carrier leadframe has been developed by manufacturers in the art to which the present disclosure belongs. Specifically, a plastic body is molded on a metal sheet material, then a die bonding process, a wire bonding process and an encapsulation process are performed, and then the metal sheet material and the plastic body are diced away simultaneously to form individual light emitting devices that are separate from each other. However, a large amount of plastic and metal dusts tend to be produced during the dicing process, which seriously pollute the surfaces of the final products and thus degrade the reliability of the products. Additionally, this process does not allow for a light-on test prior to the encapsulation process, and measurements can only be made after the products are singulated. However, the final products that have been singulated are piled randomly, and machine measurements on them can only be made after surface orientation and direction adjustment. This requires use of additional instruments and is time consuming.

SUMMARY

[0006] The following summary is for illustrative purpose only and is not intended to be limiting in any way. That is, the following summary is provided to introduce concepts, highlights, benefits and advantages of the novel and non-obvious techniques described herein. Select implementations are further

described below in the detailed description. Thus, the following summary is not intended to identify essential features of the claimed subject matter, nor is it intended for use in determining the scope of the claimed subject matter.

[0007] In view of the aforesaid problems, the present invention provides a carrier and a carrier leadframe, which has at least one carrier that is separated in advance and mechanically engaged with the leadframe, thereby facilitating quick release of material after die bonding, wire bonding and encapsulation. Besides, in the carrier leadframe of the present invention, each carrier is electrically isolated from other carriers, so after LEDs are die bonded and wire bonded to the carriers, the electric measurement can be performed before the release of material. Furthermore, a light emitting device made from the carrier leadframe is also provided in the present invention, and with the advantages of the aforesaid carrier leadframe, the production speed and yield of the light emitting device can be greatly improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0008] The accompanying drawings are included to provide a further understanding of the disclosure, and are incorporated in and constitute a part of the present disclosure. The drawings illustrate implementations of the disclosure and, together with the description, serve to explain the principles of the disclosure. It is appreciable that the drawings are not necessarily in scale as some components may be shown to be out of proportion than the size in actual implementation in order to clearly illustrate the concept of the present disclosure.

[0009] FIG. 1 is a partial schematic view of an embodiment of a carrier leadframe according to the present disclosure.

[0010] FIG. 2 is a partial schematic view of a conductive sheet used in the carrier leadframe of FIG. 1.

[0011] FIG. 3 is a partial schematic view of the carrier leadframe of FIG. 1 after a plastic body is formed.

[0012] FIG. 4 and FIG. 4A are partial schematic views of the carrier leadframe of FIG. 1 after the residual material is removed.

[0013] FIG. 5 is a partial schematic view of another embodiment of the carrier leadframe according to the present disclosure.

[0014] FIG. 6 is a top view of a light emitting device according to an embodiment of the present disclosure.

[0015] FIG. 7 is a top view of a light emitting device according to another embodiment of the present disclosure.

[0016] FIG. 8 is a top view of a light emitting device according to a further embodiment of the present disclosure.

[0017] FIG. 9 is a top view of a light emitting device according to yet another embodiment of the present disclosure.

[0018] FIG. 10 is a top view of a light emitting device according to yet a further embodiment of the present disclosure.

[0019] FIG. 11 is a top view of a light emitting device according to still another embodiment of the present disclosure.

[0020] FIG. 12A to FIG. 12D are respectively a top view, a cross-sectional view taken along the front-to-back direction, a cross-sectional view taken along the left-to-right direction, and a partially enlarged view of a carrier leadframe according to an embodiment of the present disclosure.

[0021] FIG. 13A to FIG. 16 are schematic views illustrating steps of a method for manufacturing a carrier leadframe according to an embodiment of the present disclosure.

[0022] FIG. 17A to FIG. 17D are respectively a top view, a cross-sectional view taken along the front-to-back direction, a cross-sectional view taken along the left-to-right direction, and a partially enlarged view of a carrier leadframe according to an embodiment of the present disclosure.

[0023] FIG. 18A to FIG. 22 are schematic views illustrating steps of a method for manufacturing a carrier leadframe according to an embodiment of the present disclosure.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0024] A carrier leadframe of the present invention comprises a frame body and a carrier, and the carrier includes a housing and at least one electrode portion. In the present invention, the frame body includes at least one supporting portion and is mechanically engaged with the carrier so that the carrier is supported on the frame body. In a specific embodiment of the present invention, the housing may have a concave portion mating with the supporting portion, and the carrier is supported on the frame body through the engagement between the supporting portion and the concave portion. The position of the concave portion is not particularly limited in the present invention, and the concave portion may be located at a side surface or at the border between a bottom surface and the side surface of the carrier. The supporting portion goes deep into the carrier or is only positioned on the bottom surface of the carrier with a half thereof being exposed outside.

[0025] FIG. 1 is a partial schematic view of an embodiment of a carrier leadframe according to the present disclosure. As shown in FIG. 1, a carrier leadframe 100 comprises a carrier 110 and a frame body 120, and the carrier 110 comprises a housing 111 and two electrode portions 112. The frame body 120 comprises a plurality of supporting portions 121. As shown in FIG. 1, the frame body 120 beneath the carrier leadframe 100 comprises four supporting portions 121, and four concave portions are formed at the border between the side surfaces and the bottom surface of the housing 111 (corresponding to positions of the supporting portions 121) so that each of the four supporting portions 121 is positioned on the bottom surface of the carrier 110 with a half thereof being exposed outside. In an embodiment, the carrier 110 further comprises a reflection concave cup to expose a part of each of the electrode portions 112. The electrode portion 112 extends outwardly from the reflection concave cup through the housing 111 to the outside.

[0026] The frame body 120 may also have a runner area 122 and a side portion 123, and the runner area 122 is disposed on the side portion 123. The runner area 122 is a through area that allows a plastic body 150 (as shown in FIG. 3) to be described later to flow therethrough, and the supporting portion 121 is disposed also on the side portion 123.

[0027] Additionally, each of the electrode portions 112 may also be formed with pinholes, grooves (linear slits on the surface of the electrode portion) and steps in the present disclosure. The mechanical binding force between the housing and the electrode portion of the carrier can be increased due to the pinholes, the grooves and the steps. As shown in FIG. 1, each of the two electrode portions 112 in the carrier 110 comprises two pinholes 141 and three

grooves 143, and steps 142 are provided on edges of the two electrode portions 112 that are surrounded by the housing 111, thereby increasing the binding strength between the housing 111 and the electrode portions 112.

[0028] Each carrier in the carrier leadframe of the present disclosure is supported on the frame body via the mechanical engagement between the concave portion and the supporting portion, and the electrode portions of different carriers are electrically isolated from each other. Thus, after the die bonding process, the wire bonding process and the encapsulation process subsequently performed on the light emitting devices, the electric measurement can be made on the light emitting devices that have not been singulated (i.e., the light emitting devices that are still supported on the frame body in a regular way). Since the light emitting devices are arranged regularly, equipment and time required for surface orientation and direction adjustment are eliminated and the production speed of the light emitting devices can be greatly improved.

[0029] The carrier leadframe of the present disclosure may be manufactured in the following way. First, a conductive sheet is provided. The conductive sheet comprises a frame body, at least one void area and at least one extending portion, and the frame body comprises at least one supporting portion. Then, a plastic body is formed on the conductive sheet to cover at least a part of the extending portion and at least a part of the supporting portion and to fill at least a part of the void area. Subsequently, the part of the extending portion exposed outside the housing and a part of the plastic body filled within the void area are respectively removed so as to form the carrier. In particular, after the two removing steps, the housing of the carrier is formed

by the remaining plastic body, and the electrode portion of the carrier is formed by the extending portion remaining on the plastic body.

[0030] Hereinafter, the manufacturing process of the carrier leadframe 100 of FIG. 1 will be detailed with reference to FIG. 2 to FIG. 4. First, a conductive sheet 160 as shown in FIG. 2 is provided. The conductive sheet 160 comprises a frame body 120, a plurality of void areas 130 and a plurality of extending portions 140. The frame body 120 also comprises a plurality of supporting portions 121, and each of the extending portions 140 comprises a plurality of pinholes 141, grooves 143 and steps 142. Finally, the part of each of the extending portions 140 exposed outside the housing is removed to form the carrier leadframe 100 of FIG. 1.

[0031] In the present disclosure, the conductive sheet may be made of a metal sheet, including a pure metal sheet, an alloy sheet, and a metal composite sheet, and the composite sheet is preferably a metal sheet cladded with a conductive layer having a relatively high resistance to oxidation or a relatively high solder binding force (e.g., a silver-plated copper sheet, or the like). The frame body, the extending portion and the void portion are formed in an appropriate way. When the conductive sheet is made of a metal sheet, the frame body, the extending portion and the void portion may be preferably formed through a stamping process; however, they may also be formed through a dicing process or a mold casting process. Moreover, if the conductive sheet has insufficient conductivity, a conductive layer (not shown) may be formed on the conductive sheet after the conductive sheet is provided (the conductivity of the conductive layer is higher than that of the conductive sheet) so as to increase the reliability of the subsequent test. The material of

the conductive layer may include materials having high conductivity (e.g., silver, or the like).

[0032] After the conductive sheet is provided, a plastic body is then formed on the conductive sheet. The way in which the plastic body is formed is not limited. For Example, the plastic body may be formed through transfer molding, injection molding, etc. The material of the plastic body is not limited. For example, it may be selected from plastic materials commonly used in this industry, e.g., epoxy compositions, silicon compositions, polyphthalamide compositions, or polyethylene terephthalate compositions. In a specific embodiment of the present disclosure, the plastic body is made of an epoxy composition through transfer molding. In another embodiment, the plastic body may be a thermosetting material and may further comprise a reflective material, e.g., titanium dioxide (TiO2), zinc oxide (ZnO) or boron nitride (BN).

[0033] Next, a plastic body 150 is formed on the conductive sheet 160 as shown in FIG. 3. The plastic body 150 covers a part of each of the extending portions 140 and completely covers all of the pinholes 141 and grooves 143. The plastic body 150 also fills a part of the void area 130 (the part of the void area 130 above and below the extending portion 140 is not filled) and completely covers all of the supporting portions 121. The plastic body 150 also fills the runner area 122 and is formed integrally with another adjacent plastic body 150.

[0034] Further speaking, during the formation of the plastic body 150 in the present disclosure, the material of the plastic body 150 will fill the mold cavity of the mold and the void area. In this step, the housing 111 and the residual material 151 are still held together. The scope of the residual material 151 is

defined depending on the subsequent application of the product. As shown in FIG. 3, what denoted by dotted lines is the residual material 151 defined in this embodiment. Thereafter, the defined residual material 151 is removed as shown in FIG. 4, thereby forming the housing 111 of the carrier 110.

[0035] If the runner area 122 is filled with the plastic body 150, the residual material 151 may be removed in at least two steps, e.g., by firstly removing the residual material 151 filled in the runner area 122 and then removing the residual material 151 filled in the void area 130 or vice versa. This can simplify the arrangement of knives for removing the residual material 151 in each step so that the knives have sufficient distances therebetween and desirable strength.

[0036] Finally, the part of each of the extending portions 140 exposed outside the housing 111 is removed to form the carrier leadframe 100 as shown in FIG. 1. Before the part of each of the extending portions 140 is removed, the part of the frame body 120 at two sides of the runner area 122 may be removed optionally with a knife of a length larger than that of the runner area 122 so as to thoroughly remove the residual material 151 possibly left in the runner area 122; thus, the damage to the electrode portions 112 or the light emitting diode (LED) chips can be avoided by preventing the residual material 151 from falling off onto the electrode portions 112 or the LED chips. After the part of the frame body 120 at the two sides of the runner area 122 is removed, the length of the runner area 122 is increased as shown in FIG. 4B.

[0037] Therefore, the manufacturing method of this embodiment may optionally perform two or more removing steps on the conductive sheet 160

and may also perform two or more removing steps on the plastic body 150 (the residual material 151).

[0038] In the present disclosure, the residual material 151 and parts of the extending portions 140 are removed separately. In particular, the order in which the residual material 151 and the parts of the extending portions 140 are removed is not particularly limited as long as they are separately removed. For example, it may be that all the parts of the extending portions 140 are simultaneously removed after all the residual material 151 is simultaneously removed, or all the residual material 151 is removed after all the parts of the extending portions 140 are simultaneously removed, or part of the residual material 151 and parts of the extending portions 140 are removed alternately in different stages. The way in which the removing steps are performed is not limited, and the removing steps may be accomplished for example through a dicing process or a stamping process but preferably be accomplished through the stamping process. The stamping process is taken as an example in the embodiments of the present disclosure.

[0039] The tools and the working strength can be adjusted depending on the mechanical properties of the parts to be removed in the present disclosure. In particular, the respective removing steps can avoid drawbacks resulting from removing different materials simultaneously, e.g., plane defects or damage to the removing tools (knives) due to non-uniform stresses. Additionally, dusts of the plastic body tend to be produced during the removal of the plastic body as compared to the removal of the extending portion. The dusts can only be removed by a strong external force, e.g., through strong air blowing, shaking, or ultrasonic waves. If the cleaning step is to be performed

after the residual material and the extending portion are simultaneously removed, it is possible that the bonding force between the carrier and the frame body is insufficient to avoid falling off of the material. Thus, in the present disclosure, the cleaning step (i.e., the cleaning of the plastic body) is preferably performed after the residual material is removed and before the extending portion is removed. This can enhance the connection strength between the carrier and the leadframe by means of the extending portion so as to avoid falling off of the material during the cleaning step, and finally the extending portion is removed.

[0040] After the removing steps, at least one electrode portion cross section will be formed on the electrode portion of the carrier, and a housing cross section will be formed by the residual material on the housing of the carrier. In the present disclosure, the electrode portion cross section and the housing cross section may be located on a same surface or different surfaces of the carrier depending on the safety specification of the final product or depending on the customer requirements. Further speaking, when the electrode portion cross section and the housing cross section are located on the same surface of the carrier, the electrode portion cross section and the housing cross section may be level with each other (i.e., form a flat surface) or may not be level with each other (i.e., do not form a flat surface).

[0041] As shown in FIG. 1, the electrode portion 112 has a wing portion 112A exposed outside the housing, and the wing portion 112A comprises a central protruding area (or called central area) 112A1 and two outer edge areas (or called edge areas) 112A2. In the embodiment of FIG. 1, each of the edge areas 112A2 comprises an electrode portion cross section, and the electrode

portion cross sections are level with a part of the housing cross section 111A of the housing 111; and in this case, the carrier has a relatively flat appearance. However, as shown in FIG. 5, the wing portion 112A of the electrode portion 112 comprises a central protruding area 112A1 and two outer edge areas 112A2, and the electrode portion cross section of the electrode portion 112 is not level with the housing cross section 111A of the housing 111; and in this case, the electrode portion 112 has an additional lateral area that can increase the binding force with the solder so as to increase the component bonding strength of the light emitting devices after the subsequent component bonding process.

[0042] Moreover, in case where the conductive sheet is a metal composite sheet with an antioxidant layer, a cross section uncovered with the antioxidant layer will be formed on the electrode portion cross section. In the present disclosure, the cross section uncovered with the antioxidant layer is preferably formed integrally with the central area of the electrode portion. During the subsequent component bonding process, the solder may climb along the side surface of the wing portion and cover the side surface, and in this case, at least a part of the cross section uncovered with the antioxidant layer can be covered by the solder to reduce the probability that the cross section portion is oxidized. Additionally, the cross section uncovered with the antioxidant layer and the surface of the adjacent central area are at the same side, and preferably form a continuous surface so as to reduce sharp points or rough edges of the electrode portion. Otherwise, the sharp points or rough edges would cause wear of the subsequent processing machine, and what is worse, a charge

accumulation effect might occur at the sharp points or the rough edges to influence the reliability of the finally product.

[0043] The present disclosure also provides a light emitting device made from the carrier leadframe of the present disclosure, and the light emitting device comprises a carrier, an LED chip and an encapsulant. The LED chip is carried within the carrier and covered by the encapsulant. The material of the encapsulant in the present disclosure may be a plastic composite of epoxy resins or silicone. Moreover, the light emitting device of the present disclosure may optionally have fluorescent materials added into the encapsulant, and examples of the fluorescent materials include: aluminate fluorescent materials (e.g., doped yttrium aluminum oxide compounds, doped lutetium aluminum oxide compounds, doped terbium aluminum oxide compounds, or combinations thereof), silicate fluorescent materials, sulfide fluorescent materials, oxynitride fluorescent materials, nitride fluorescent materials, fluoride fluorescent materials, or combinations thereof.

[0044] The light emitting device of the present disclosure may be manufactured in the following way. First, a carrier leadframe as described above is provided. Then, an LED chip is provided and die bonded and wire bonded into the reflection concave cup of the carrier. Thereafter, the reflection concave cup is filled with an encapsulant so as to encapsulate the LED chip to form a light emitting device on the frame body. Finally, the light emitting device is separated from the frame body (i.e., the carrier is separated from the frame body for example through extrusion) to form a separate light emitting device.

[0045] A plurality of LED chips may also be provided within the carrier in the present disclosure, and these LED chips can emit lights of the same or different spectrums. After the LED chips are fixed, the wire bonding process may be performed to electrically connect the LED chips with the electrode portion. Other electronic elements, e.g., a Zener diode or a thermistor, may also be provided depending on requirements of the final product.

[0046] Referring to FIG. 6, a top view of a light emitting device according to an embodiment of the present disclosure is shown therein. The wing portion 112A of the electrode portion 112 has a central area 112A1 and two edge areas 112A2, and the central area 112A1 protrudes from the two edge areas 112A2. The wing portion 112A protrudes out of the housing cross section 111A of the housing 111 so that the central area 1112A1 of the wing portion 112A of the electrode portion 112 is not coplanar with the housing cross section 111A of the housing 111. An interval D1 is the distance between the central area of the wing portion 112A of the electrode portion 112 and the inner side of the housing cross section 111A of the housing 111, and the interval D1 is about 0.1 mm. An interval D2 is the distance between the central area 112A1 of the wing portion 112A of the electrode portion 112 and the outer side of the wing portion 112A of the housing 111 (i.e., the central area 112A1 of the wing portion 112A of the electrode portion 112 and the wing portion 112A of the housing 111), and the interval D2 is about 0.05 mm.

[0047] Referring to FIG. 7, a top view of a light emitting device according to another embodiment of the present disclosure is shown therein. The wing portion 112A of the electrode portion 112 has a central area 112A1 and two edge areas 112A2, and the wing portion 112A protrudes out of the housing

cross section 111A of the housing 111 so that the wing portion 112A of the electrode portion 112 is not coplanar with the housing cross section 111A of the housing 111. The interval D1 is the distance between the central area of the wing portion 112A of the electrode portion 112 and the inner side of the housing cross section 111A of the housing 111, and the interval D1 is about 0.1 mm. An interval D3 is the distance between the central area 112A1 of the wing portion 112A of the electrode portion 112 and the outer side of the cross section 111A of the housing 111, and the interval D3 is about 0.075 mm.

[0048] Referring to FIG. 8, a top view of a light emitting device according to a further embodiment of the present disclosure is shown therein. The wing portion 112A of the electrode portion 112 has a central area 112A1 and two edge areas 112A2, the central area 112A1 is recessed from the two edge areas 112A2, and the electrode portion cross sections of the two edge areas 112A2 are sloping surfaces. The wing portion 112A is recessed into the cross section 111A of the housing 111 so that the wing portion 112A of the electrode portion 112 is not coplanar with the cross section 111A of the housing 111. An interval D4 is the distance between the outer side and the inner side of the cross section 111A of the housing 111, and the interval D4 is about 0.05 mm. An interval D5 is the distance between the central area of the wing portion 112A of the electrode portion 112 and the outer side of the cross section 111A of the housing 111, and the interval D5 is about 0.025 mm.

[0049] Referring to FIG. 9, a top view of a light emitting device according to yet another embodiment of the present disclosure is shown therein. The wing portion 112A of the electrode portion 112 has a central area 112A1 and two edge areas 112A2, the central area 112A1 protrudes out of the two edge areas

112A2, and the electrode portion cross sections of the two edge areas 112A2 are sloping surfaces. The wing portion 112A protrudes out of the cross section 111A of the housing 111 so that the wing portion 112A of the electrode portion 112 is not coplanar with the cross section 111A of the housing 111.

[0050] Referring to FIG. 10, a top view of a light emitting device according to yet a further embodiment of the present disclosure is shown therein. The wing portion 112A of the electrode portion 112 is a convex curved surface, i.e., the external surface of the central area and the outline (the electrode portion cross sections) of the edge areas together form a continuous convex curved surface. The wing portion 112A protrudes out of the cross section 111A of the housing 111 so that the wing portion 112A of the electrode portion 112 is not coplanar with the cross section 111A of the housing 111.

[0051] Referring to FIG. 11, a top view of a light emitting device according to still another embodiment of the present disclosure is shown therein. The wing portion 112A of the electrode portion 112 is a concave curved surface, i.e., the external surface of the central area and the outline (the electrode portion cross sections) of the edge areas together form a continuous concave curved surface. The wing portion 112A is recessed into the cross section 111A of the housing 111 so that the wing portion 112A of the electrode portion 112 is not coplanar with the cross section 111A of the housing 111.

[0052] Referring to FIG. 12A to FIG. 12D, schematic views (i.e., a top view, a cross-sectional view taken along the front-to-back direction, a cross-sectional view taken along the left-to-right direction, and a partially enlarged view) of a carrier leadframe 100' according to an embodiment of the present disclosure are shown therein. The carrier leadframe 100' is similar to the aforesaid

carrier leadframe 100. That is, the carrier leadframe 100' also comprises a frame body 120 and a carrier 110, the frame body 120 comprises at least one supporting portion 121, the carrier 110 comprises a housing 111 and at least one electrode portion 112, and the housing 111 is mechanically engaged with the frame body 120 via the supporting portion 121. Thus, for the technical contents of the aforesaid elements, reference may be made to the counterparts of the carrier leadframe 100.

[0053] Preferably, the at least one electrode 112 may be two electrode portions 112 spaced apart from each other to respectively serve as an anode terminal and a cathode terminal of the carrier 110. The two electrode portions 112 are surrounded by the frame body 120, i.e., the two electrode portions 112 are located within a space surrounded by the frame body 120 itself. The two electrode portions 112 may be separated from the frame body 120 by at least one void area 130 so that the two electrode portions 112 will not make contact with the frame body 120 and thus be electrically isolated from the frame body 120.

[0054] The supporting portion 121 of the frame body 120 extends towards one of the two electrode portions 112, but will not make contact with the electrode portion 112. In this embodiment, there are four supporting portions 121 that are distributed at two sides of the electrode portions 112. The housing 111 may at least cover the supporting portions 121 and at least a part of the two electrode portions 112, and is at least disposed within a part of the void area 130. Thereby, the housing 111 is mechanically engaged with the frame body 120 via the supporting portions 121, and the housing 111 is also mechanically engaged with the two electrode portions 112 so that the housing 111 and the

two electrode portions 112 can be held within the frame body 120 without falling off from the frame body 120.

[0055] The shape features of the electrode portions 112 will be further described. Referring to FIG. 13A, each of the two electrode portions 112 has a wing portion 112A and an inner side surface 112B that are disposed opposite to each other (i.e., disposed oppositely), the wing portion 112A may be exposed outside the housing cross section 111A of the housing 111 (reference may be made to the aforesaid relevant descriptions of FIG. 6 to FIG. 11) and does not face the wing portion 112A of another electrode portion 112. The inner side surfaces 112B of the two electrode portions 112 may face each other, and at least a part of the two electrode portions 112 may be covered by the housing 111.

[0056] Each of the two electrode portions 112 further comprises two connecting surfaces 112C disposed opposite to each other, and each of the connecting surfaces 112C connects the wing portion 112A with the inner side surface 112B. That is, an edge (e.g., a front edge) of the connecting surface 112C connects with an edge (i.e., a left edge) of the wing portion 112A, while another edge (e.g., a back edge) of the connecting surface 112C connects with an edge (i.e., a left edge) of the inner side surface 112B. The wing portion 112A, the inner side surface 112B and the two connecting surfaces 112C may not be flat surfaces. That is, the wing portion 112A, the inner side surface 112B and the two connecting surfaces 112C may be uneven or stepped surfaces.

[0057] Each of the two electrode portions 112 may further comprise at least one recess 1121, and the recess 1121 may be disposed on the connecting

surface 112C so that the connecting surface 112C becomes an uneven surface. The recess 1121 can increase the contact area between the electrode portion 112 and the housing 111 (the plastic body 150) and strengthen the fastening effect between the electrode portion 112 and the housing 111 by virtue of the corresponding geometric relationships so that the binding force between the electrode portion 112 and the housing 111 is relatively strong. If there are a plurality of recesses 1121, the recesses 1121 may be sized differently according to different binding forces required at different positions between the electrode portion 112 and the housing 111.

[0058] The wing portion 112A, the inner side surface 112B and the two connecting surfaces 112C of the two electrode portions 112 may have the at least one void area 130 divided into a plurality of void areas 130, namely a gap 131, two first through grooves 132 and two second through grooves 133 in communication with each other. The gap 131 is disposed between the inner side surfaces 112B of the two electrode portions 112, and the two first through grooves 132 are disposed along the two connecting surfaces 112C of the two electrode portions 112. That is, one of the first through grooves 132 extends from an edge of one connecting surface 112C of one electrode portion 112 to an edge of one connecting surface 112C, which faces the same direction, of the other electrode portion 112. The two first through grooves 132 are spaced apart from each other.

[0059] The two second through grooves 133 are disposed along the wing portions 112A of the two electrode portions 112. That is, each of the second through grooves 133 extends only along the wing portion 112A of one of the

electrode portions 112. The two second through grooves 133 are also spaced apart from each other.

[0060] The supporting portion 121 of the frame body 120 may extend towards one of the two connecting surfaces 112C of the two electrode portions 112 into one of the two first through grooves 132. The housing 111 may be optionally disposed within the two first through grooves 132 and/or the gap 131. Additionally, the housing cross section 111A of the housing 111 may at least comprise a curved surface, e.g., may have a rounded corner 111R as shown in FIG. 12D. The housing cross section of the housing 111 has the rounded corner that is connected to the electrode portion cross section 112A2 of the electrode portion 112. The rounded corner 111R can disperse the impact force so that the rounded corner 111R is unlikely to be broken or cracked by the impact force during a vibration test of the singulated carrier 110. Moreover, in the embodiment as shown in FIG. 12D, the housing cross section and the electrode portion cross section do not form a flat surface, i.e., the housing cross section is not level with the electrode portion cross section.

[0061] According to the above descriptions, the carrier leadframe 100' can also allow the electrode portions 112 of the carriers 110 to be electrically isolated from each other. Thus, after the die bonding process, the wire bonding process and the encapsulation process are subsequently performed on the light emitting devices, the electric measurement can be directly performed on the light emitting devices that are not singulated, and this greatly improves the production speed of the light emitting devices. It shall be further appreciated that, the technical contents of the carrier leadframe 100' may also be used as a reference for the carrier leadframe 100.

[0062] An embodiment of the present disclosure further provides a method for manufacturing a carrier leadframe, which can at least manufacture the aforesaid carrier leadframe 100'. The method for manufacturing the carrier leadframe 100' is similar to the method for manufacturing the aforesaid carrier leadframe 100 and comprises the following steps.

[0063] Referring to FIG. 13A to FIG. 13C, first a conductive sheet 160 is provided. The conductive sheet 160 comprises a frame body 120, and the frame body 120 comprises at least one supporting portion 121, at least one void area 130 and at least one extending portion 140. The at least one void area 130 may correspond to a gap 131, two first through grooves 132 and two second through grooves 133 of the carrier leadframe 100', but at this point, the two first through grooves 132 are not in communication with the two second through grooves 133 yet. The at least one extending portion 140 may correspond to the two electrode portions 112 of the carrier leadframe 100', but at this point, the two electrode portions 112 have not been separated from the frame body 120 yet.

[0064] Referring to FIG. 14, then a plastic body 150 is formed in a second step. The plastic body 150 covers at least a part of the extending portion 140 and at least a part of the supporting portion 121, and the plastic body 150 fills at least a part of the void area 130. For example, the plastic body 150 covers a part of the two electrode portions 112 of the extending portion 140 and completely covers the supporting portion 121, and the plastic body 150 fills the gap 131 and the two first through grooves 132 of the void area 130 but does not fill the second through grooves 133 of the void area 130. Furthermore, the plastic body 150 may make contact with the recess 1121 (as shown in FIG. 13A) of

the extending portion 140 so as to increase the contact area between the plastic body 150 and the extending portion 140.

[0065] Referring to FIG. 15, part of the plastic body 150 filled in the void area 130 is removed in a third step. That is, part of the plastic body 150 filled in the two first through grooves 132 is removed. The plastic body 150 to be removed is called the residual material 151 (as shown in FIG. 14), and the scope of the residual material 151 is defined depending on the specific shape of the product. In this embodiment, the plastic body 150 filled in two end areas of the two first through grooves 132 is removed so that convex corners at four corners of the plastic body 150 are removed. The remaining plastic body 150 forms the housing 111 of the carrier leadframe 100'.

[0066] Referring to FIG. 16, the part of the extending portion 140 exposed outside the plastic body 150 is removed in a fourth step so that the remaining extending portion 140 is separated from the frame body 120. In other words, the part of the extending portion 140 at two sides of the second through groove 133 (as shown in FIG. 15) will be removed in this step so that the second through groove 133 is in communication with the first through groove 132. The remaining extending portion 140 forms the electrode portions 112 of the carrier leadframe 100'.

[0067] After the aforesaid steps, the carrier leadframe 100' is formed. For detailed technical contents of the aforesaid steps, reference may be made to the method for manufacturing the carrier leadframe 100. For example, a conductive layer may be firstly formed on the conductive sheet 160, the third step and the fourth step may be swapped with each other, and the plastic body 150 may be cleaned before the fourth step.

[0068] Referring to FIG. 17A to FIG. 17D, schematic views (i.e., a top view, a cross-sectional view taken along the front-to-back direction, a cross-sectional view taken along the left-to-right direction, and a partially enlarged view) of a carrier leadframe 100'' according to an embodiment of the present disclosure are shown therein, where more than one carrier leadframe 100'' are shown.

[0069] The carrier leadframe 100'' is similar to the aforesaid carrier leadframes 100 and 100', so reference may be made to each other for the technical contents of the carrier leadframes 100'', 100, and 100'. However, it shall be appreciated that, the frame body 120 of the carrier leadframe 100'' has a side portion 123 and a runner area 122, and the side portion 123 may be commonly owned by the leadframes 120 of two carrier leadframes 100''. In other words, the frame body 120 of the two carrier leadframes 100'' may be formed integrally via the commonly owned side portion 123. Moreover, the carriers 110 of the two carrier leadframes 100'' are separated from each other by the side portion 123. The runner area 122 is disposed in the side portion 123 and is in communication with one of the two first through grooves 132 of each carrier leadframe 100''. It shall be further appreciated that, the housing cross section 111A of the housing 111 may at least comprise a curved surface, e.g., may have a rounded corner 111R, and the rounded corner 111R is connected to the side portion 123 of the frame body 120. Additionally, the electrode portion cross section of the electrode portion 112 may also at least comprise a curved surface, and the aforesaid curved surfaces are not limited to a single curvature. That is, the outline of the edge areas of the electrode portion 112 is a curved line. The electrode portion cross section is not adjacent to the rounded corner 111R. The impact force can be dispersed due to the curved

cross section. Meanwhile, in the embodiment as shown in FIG. 17D, the housing cross section and the electrode portion cross section do not form a flat surface, i.e., the housing cross section is not level with the electrode portion cross section.

[0070] In terms of the effect, the carrier leadframe 100'' can also allow the electrode portions 112 of the carriers 110 to be electrically isolated from each other. Thus, after the die bonding process, the wire bonding process and the encapsulation process are subsequently performed on the light emitting devices, the electric measurement can be directly performed on the light emitting devices that are not singulated, and this greatly improves the production speed of the light emitting devices.

[0071] An embodiment of the present disclosure further provides a method for manufacturing a carrier leadframe, which can at least manufacture the aforesaid carrier leadframe 100''. The method for manufacturing the carrier leadframe 100'' is similar to the method for manufacturing the carrier leadframe 100', so identical descriptions will be omitted or simplified. The method for manufacturing the carrier leadframe 100'' may comprise the following steps.

[0072] Referring to FIG. 18A to FIG. 18C, first a conductive sheet 160 is provided. Two conductive sheets 160 are provided in this embodiment as an example. Each of the conductive sheets 160 comprises at least one frame body 120, and the frame body 120 comprises at least one supporting portion 121, at least one side portion 123, at least one runner area 122, at least one void area 130 and at least one extending portion 140. The runner area 122 is

disposed on the side portion 123 and is in communication with the void area 130.

[0073] Referring to FIG. 19, then a plastic body 150 is formed in a second step. The plastic body 150 covers at least a part of the extending portion 140 and at least a part of the supporting portion 121 of each conductive sheet 160, and the plastic body 150 fills at least a part of the void area 130. The plastic body 150 also fills the runner area 122; that is, the plastic body 150 passes through the runner area 122 to cover another conductive sheet 160. Moreover, the plastic body 150 makes contact with the recess 1121 (as shown in FIG. 18A) of the extending portion 140 to increase the contact area between the plastic body 150 and the extending portion 140.

[0074] Referring to FIG. 20, the plastic body 150 within the runner area 122 is removed in a third step. The plastic body 150 can be removed in one step or in several steps. Specifically, if the plastic body 150 is to be removed in one step, then a knife of a length larger than that of the runner area 122 will be used to remove the part of the frame body 120 at the two sides of the runner area 122 as well as the plastic body 150 within the runner area 122 together. Thus, after the plastic body 150 within the runner area 122 is removed, the runner area 122 will be slightly elongated.

[0075] If the plastic body 150 is to be removed in several steps, then first a knife of a length slightly smaller than that of the runner area 122 will be used to remove part of the plastic body 150 within the runner area 122, and then another knife is used to scrape off the remaining plastic body 150 within the runner area 122.

[0076] Referring to FIG. 21, part of the plastic body 150 filled within the void area 130 is removed in a fourth step. That is, part of the plastic body 150 filled within the two first through grooves 132 (e.g., the residual material 151 at the four corners as shown in FIG. 20) is removed. After the third and the fourth steps, the remaining plastic body 150 that is not removed forms the housing 111 of the carrier leadframe 100".

[0077] Referring to FIG. 22, the part of the extending portion 140 exposed outside the plastic body 150 (as shown in FIG. 21) is removed in a fifth step so that the remaining extending portion 140 is separated from the frame body 120. In other words, the part of the extending portion 140 at the two sides of the second through groove 133 will be removed in this step so that the second through groove 133 is in communication with the first through groove 132. The remaining extending portion 140 forms the electrode portions 112 of the carrier leadframe 100".

[0078] After the aforesaid steps, the carrier leadframe 100" is formed. It shall be noted that, the order in which the third step to the fifth step are executed is not limited, but can be swapped with each other.

[0079] The above description is related to the detailed technical contents and inventive features thereof. People skilled in this field may proceed with a variety of modifications and replacements based on the description and suggestions of the present disclosure as described without departing from the characteristics thereof. Nevertheless, although such modifications and replacements are not fully disclosed in the above descriptions, they have substantially been covered in the following claims as appended.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Filer:	John F. Rabena/Shannon Shenton
Attorney Docket Number:	Q231501

Filed as Large Entity

Filing Fees for Track I Prioritized Examination - Nonprovisional Application under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	280	280
UTILITY SEARCH FEE	1111	1	600	600
UTILITY EXAMINATION FEE	1311	1	720	720
REQUEST FOR PRIORITIZED EXAMINATION	1817	1	4000	4000
Pages:				
Claims:				
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
PETITION FEE- 37 CFR 1.17(F) (GROUP I)	1462	1	400	400
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
		Total in USD ($)		**6140**

Electronic Acknowledgement Receipt

EFS ID:	28454211
Application Number:	15441644
International Application Number:	
Confirmation Number:	6962
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Customer Number:	23373
Filer:	John F. Rabena/Shannon Shenton
Filer Authorized By:	John F. Rabena
Attorney Docket Number:	Q231501
Receipt Date:	24-FEB-2017
Filing Date:	
Time Stamp:	13:48:41
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$6140
RAM confirmation Number	022717INTEFSW13492600
Deposit Account	194880
Authorized User	Shannon Shenton

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

37 CFR 1.16 (National application filing, search, and examination fees)

37 CFR 1.17 (Patent application and reexamination processing fees)

37 CFR 1.19 (Document supply fees)

37 CFR 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	TrackOne Request	Q231501CertificateandRequestforPrioritizedExaminationTrackOne.pdf	39945 8ac5eb4a61e21afdfe48ec5b74f5357b3fb3e45e	no	1
Warnings:					
Information:					
2	Application Data Sheet	Q231501ADS.pdf	1561002 f2d64825eda003a3e0afb3033d90775840142695	no	7
Warnings:					
Information:					
3	Oath or Declaration filed	Q231501ExecutedAssignmentwithDeclaration.pdf	185753 b3aee3415298c907496986c306579451f9a25aa8	no	3
Warnings:					
Information:					
4	Drawings-only black and white line drawings	Q231501Drawings.pdf	1058345 475cb55416c353089b8edd774c197257260ee44a	no	28
Warnings:					
Information:					
5		Q231501DivisionalFeeTransmittalDivisionalTransmittalandIDS.pdf	80877 dda8ae258e8a1ebb90e67598f177b553da67cec0	yes	6

Multipart Description/PDF files in .zip description

Document Description	Start	End
Information Disclosure Statement (IDS) Form (SB08)	5	6
Transmittal Letter	4	4
Transmittal of New Application	1	3

Warnings:					
Information:					
6	Petition for review by the Office of Petitions	Q231501PetitionforExpeditedProcessing.pdf	18347 7000959509af582d0bfa2cf63a9715619cfaa565	no	1
Warnings:					
Information:					
7		Q231501SpecificationASFILED.pdf	124471 9b03726a4619e7309c7a3b37cce73b6edaaa4493	yes	31
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Abstract		31	31	
	Claims		28	30	
	Specification		1	27	
Warnings:					
Information:					
8	Fee Worksheet (SB06)	fee-info.pdf	41697 5f93a30685db49cef75a19baf20bf3dc0870e52b	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	3110437		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Chung-Chuan HSIEH	Nonprovisional Application Number:		Not Yet Assigned	
Filing Date:	February 24, 2017	Confirmation Number:	Not Yet Assigned	Docket Number:	Q231501
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE				

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1) and the prioritized examination fee set forth in 37 CFR 1.17(c) have been filed with the request. The publication fee requirement is met because that fee, set forth in 37 CFR 1.18(d), is currently $0. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.

2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims, and that any request for an extension of time will cause an outstanding Track I request to be dismissed.

3. The applicable box is checked below:

I. ☑ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

--OR--

(b) The application is an original nonprovisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, **or** the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☐ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original nonprovisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature	/John F. Rabena/	Date	February 24, 2017
Name (Print/Typed)	John F. Rabena	Practitioner Registration Number	38,584

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

☑ *Total of __1__ forms are submitted.

PTO/AIA/14 (12-13)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	Q231501
	Application Number	
Title of Invention	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Chung-Chuan		HSIEH	

Residence Information (Select One) US Residency ● Non US Residency Active US Military Service

City	New Taipei City	Country of Residence i	TW

Mailing Address of Inventor:

Address 1	No. 6-8, Zhonghua Rd., Shulin Dist.
Address 2	
City	New Taipei City
State/Province	
Postal Code	23860
Country i	TW

Inventor 2 Remove

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Yung Chieh		CHEN	

Residence Information (Select One) US Residency ◉ Non US Residency Active US Military Service

City	New Taipei City	Country of Residence i	TW

Mailing Address of Inventor:

Address 1	No. 6-8, Zhonghua Rd., Shulin Dist.,
Address 2	
City	New Taipei City
State/Province	
Postal Code	23860
Country i	TW

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

FH_000280

IKEA Supply AG
Exhibit 1002 Page 280 of 329

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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	Q231501
	Application Number	
Title of Invention	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE	

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	23373		
Email Address	sughrue@sughrue.com	Add Email	Remove Email

Application Information:

Title of the Invention	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE		
Attorney Docket Number	Q231501	**Small Entity Status Claimed**	☐
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	28	**Suggested Figure for Publication (if any)**	

Filing By Reference :

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	● Customer Number	US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	23373		

PTO/AIA/14 (12-13)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	Q231501
	Application Number	
Title of Invention	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the application number blank.

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Division of	14720230	2015-05-22

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button. Add

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)[i] the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
103118060	TW	2014-05-23	

Remove

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)
104103527	TW	2015-02-03	

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button. Add

PTO/AIA/14 (12-13)
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	Q231501
	Application Number	
Title of Invention	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Authorization to Permit Access:

☐ Authorization to Permit Access to the Instant Application by the Participating Offices

If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.

In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.

In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date o f filing this Authorization.

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

PTO/AIA/14 (12-13)
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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	Q231501
	Application Number	
Title of Invention	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE	

Applicant 1 Remove

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

● Assignee	Legal Representative under 35 U.S.C. 117	Joint Inventor
Person to whom the inventor is obligated to assign.	Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor :

If the Applicant is an Organization check here. ☒

Organization Name	EVERLIGHT ELECTRONICS CO., LTD.		
Mailing Address Information For Applicant:			
Address 1	No. 6-8, Zhonghua Rd., Shulin Dist.		
Address 2			
City	New Taipei City	**State/Province**	
Country	TW	Postal Code	23860
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button. Add

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not subsitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication . An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

Remove

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

PTO/AIA/14 (12-13)
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U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	Q231501
	Application Number	
Title of Invention	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE	

Organization Name	EVERLIGHT ELECTRONICS CO., LTD.		
Mailing Address Information For Assignee including Non-Applicant Assignee:			
Address 1	No. 6-8, Zhonghua Rd., Shulin Dist.		
Address 2			
City	New Taipei City	**State/Province**	
Country i	TW	Postal Code	23860
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button. Add

Signature:

Remove

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Signature	/John F. Rabena/			Date (YYYY-MM-DD)	2017-02-24
First Name	John F.	Last Name	Rabena	Registration Number	38584

Additional Signature may be generated within this form by selecting the Add button. Add

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent C o o p eration Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Docket No.: Q231501
Only After Sept 16, 2012
US Rights Only

ASSIGNMENT WITH DECLARATION FOR PATENT APPLICATION (37 CFR 1.63)

专利申请转让声明书(37 CFR 1.63)

Chinese Language Assignment with Declaration

鉴于，我 / 我们，即下面签名之发明人（以下简称“转让人”），已发明下文确认之申请中所述的若干改善之处；和

鉴于，_____（地址位于_____）（“承让人”）意欲购买申请和发明以及就此随后获取的任何美国专利中的全部权利、所有权和权益；

因此，就有值代价而言，相关收据特此确认：

我 / 我们，上文指名转让人，特此向上文指名承让人及其继承人和受让人出售、转让及出让该申请中适用于美利坚合众国的全部权利、所有权和权益，及该申请中披露的适用于美利坚合众国的发明（包括该申请的所有分案和延续申请），及可能据此颁发的所有美国专利证书及所有再颁发之专利证书（包括 35 USC 119 项下的要求优先权的权利及针对过往损害赔偿提起诉讼的权利）；我 / 我们请求美国专利及商标局局长向承让人及其继承人和受让人签发该申请中所载列之发明的任何专利证书；及我 / 我们将会应承让人的要求，无偿签立承让人申请美国专利所必需的所有文件。

（合法化审批无需记录，但须作为 35 USC 261 项下执行的表面证据）

作为下述发明人，我特此声明：

此转让声明乃有关：

☐ 随附的申请，或

☐ 于 _____ 日提交的美国专利申请或 PCT 国际申请号 _____（确认号 ）。

该申请有权：

_____

_____

_____

Whereas, I/We, the undersigned inventor(s) hereinafter called assignor(s), have invented certain improvements described in the application identified below; and

Whereas, Everlight Electronics Co., Ltd. of No.6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan, R.O.C, (assignee), desires to acquire the entire right, title, and interest in the application and invention, and to any United States patents to be obtained therefor;

Now therefore, for valuable consideration, receipt whereof is hereby acknowledged,

I/We, the above named assignor(s), hereby sell, assign and transfer to the above named assignee, its successors and assigns, the entire right, title and interest in the application and the invention disclosed therein for the United States of America, including all divisions, and continuations thereof, and all Letters Patent of the United States that may be granted thereon, and all reissues thereof, including the right to claim priority under 35 USC 119 and the right to sue for past damages, and I/we request the Director of the U.S. Patent and Trademark Office to issue any Letters Patent granted upon the invention set forth in the application to the assignee, its successors and assigns; and I/we will execute without further consideration all papers deemed necessary by the assignee in connection with the United States application when called upon to do so by the assignee.

(Legalization not required for recording but is prima facie evidence of execution under 35 USC 261)

As the below named inventor, I hereby declare that:

This assignment with declaration is directed to:

☒ The attached application, or

☐ United States Application or PCT International Application Number _____ filed on _____ (Confirmation No. _____).

The application is entitled:

CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

Chinese Language Assignment with Declaration

我已做出或授权他人做出上述确认的申请。

我相信我是申请中要求保护的发明的原创发明人或原创联合发明人之一。

我已读阅并理解提交该转让声明的申请内容。

根据 37 CFR 1.56 的规定，我明白我有义务向专利局披露据我所知的有关专利性的所有实质性信息。

特此确认，根据 18 USC 1001 的规定，在本转让声明书中蓄意做出任何虚假声明会被处以罚款或五(5)年以下监禁或两者并罚。

The above identified application was made or was authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

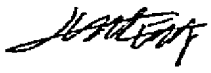
I have reviewed and understand the contents of the application for which this assignment with declaration is being submitted.

I am aware of the duty to disclose to the Office all information known to me to be material to patentability as defined in 37 CFR 1.56.

I hereby acknowledge that any willful false statement made in this assignment with declaration is punishable under 18 USC 1001 by fine or imprisonment of not more than five (5) years, or both.

STATEMENT OF ACCURATE TRANSLATION IN ACCORDANCE WITH 37 CFR 1.69(b):

The assignment with declaration is an accurate translation of the corresponding English language assignment with declaration.

Signature 

Date March 17, 2014

NAME OF SOLE OR FIRST INVENTOR: 唯一发明人或第一发明人姓名：			
Given Name (first and middle [if any]) 名（名和中名［若有］） Chung-Chuan		Family Name or Surname 姓 Hsieh	
Inventor's signature 发明人签名 Chung Chuan Hsieh			Date 日期 2017/02/21
Residence: 住所： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan			
Mailing Address: 通讯地址： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan			
NAME OF SECOND INVENTOR: 第二发明人姓名：			
Given Name (first and middle [if any]) 名（名和中名［若有］） Yung Chieh		Family Name or Surname 姓 Chen	
Inventor's signature 发明人签名 CHEN YUNG CHIEH			Date 日期
Residence: 住所： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan			
Mailing Address: 通讯地址： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan			

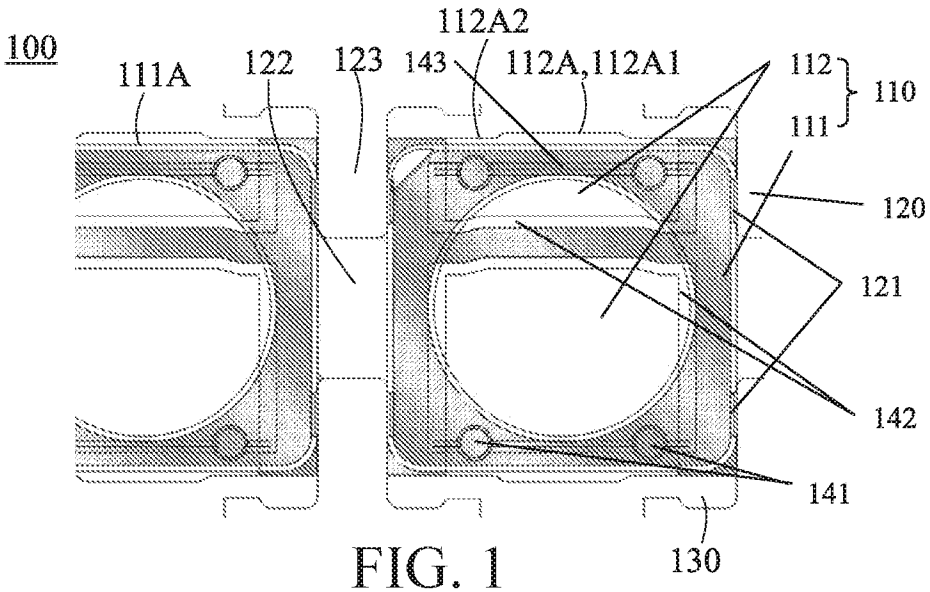

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FIG. 1

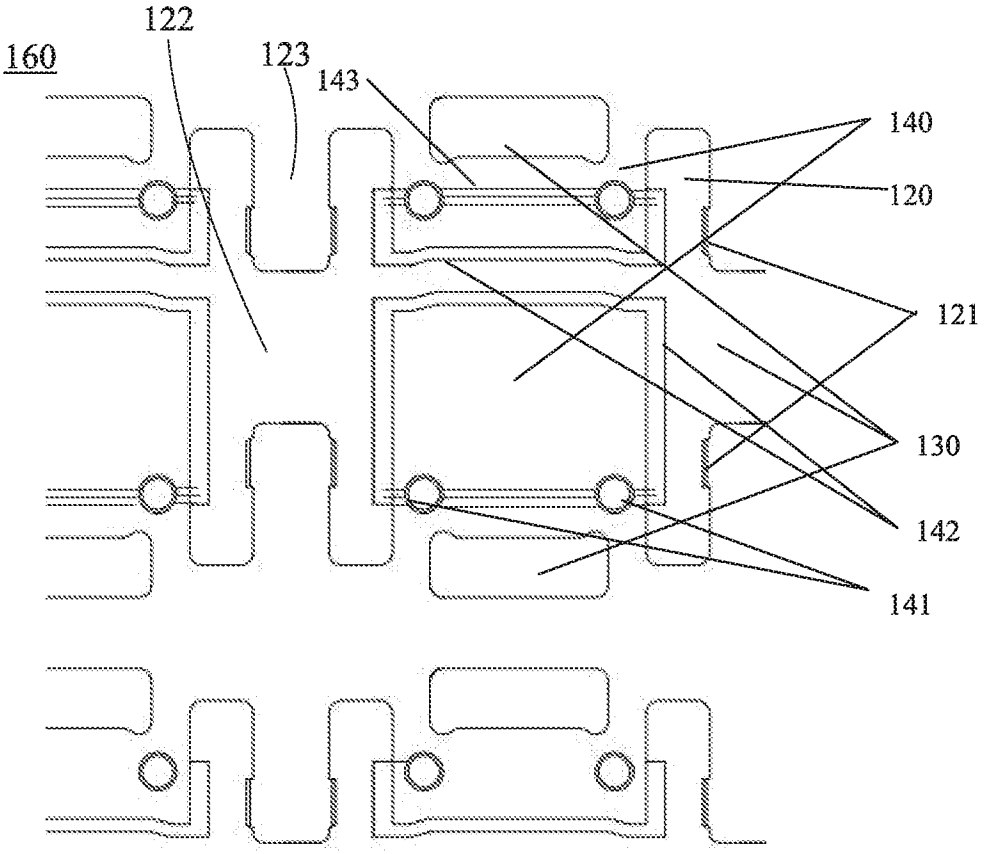

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FIG. 2

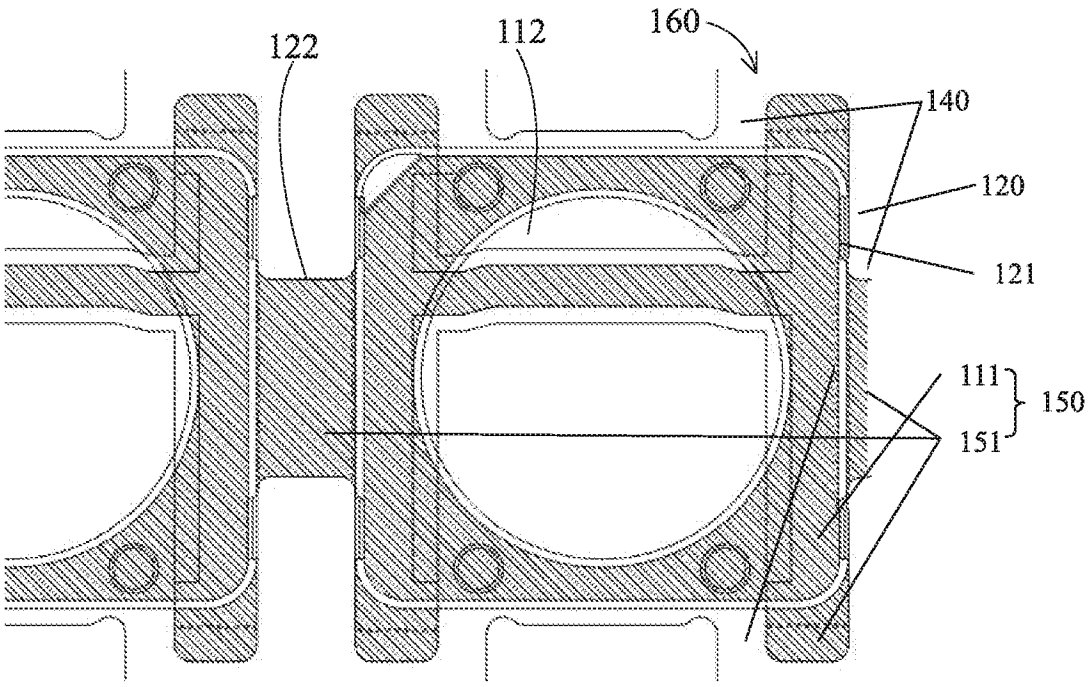


FIG. 3

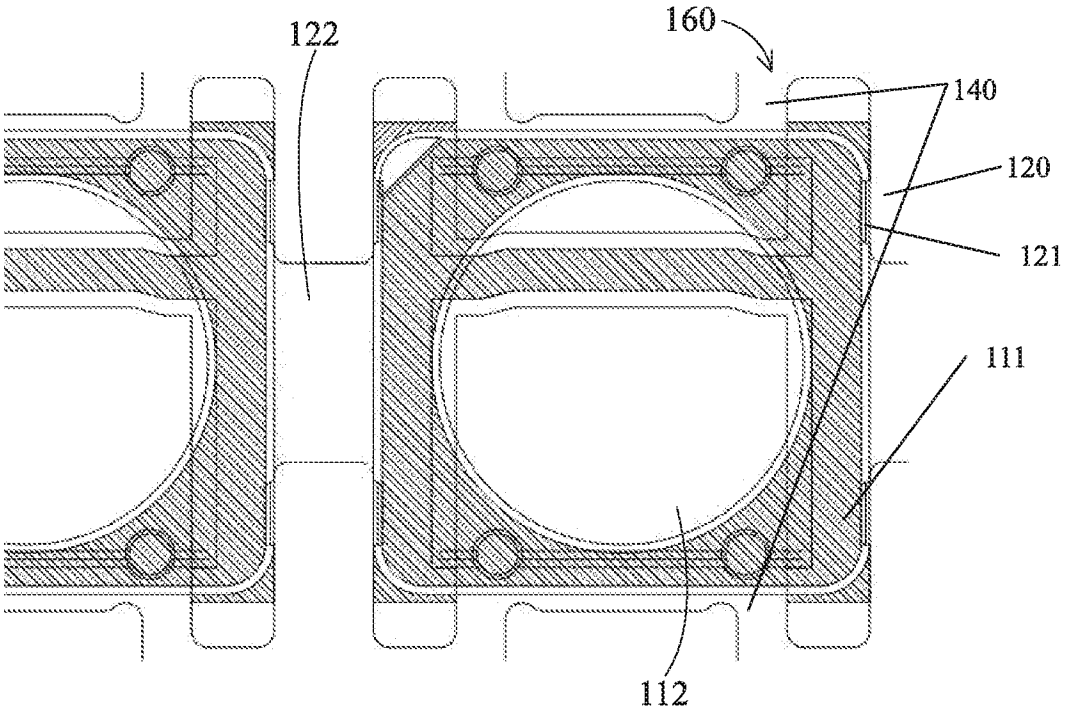


FIG. 4

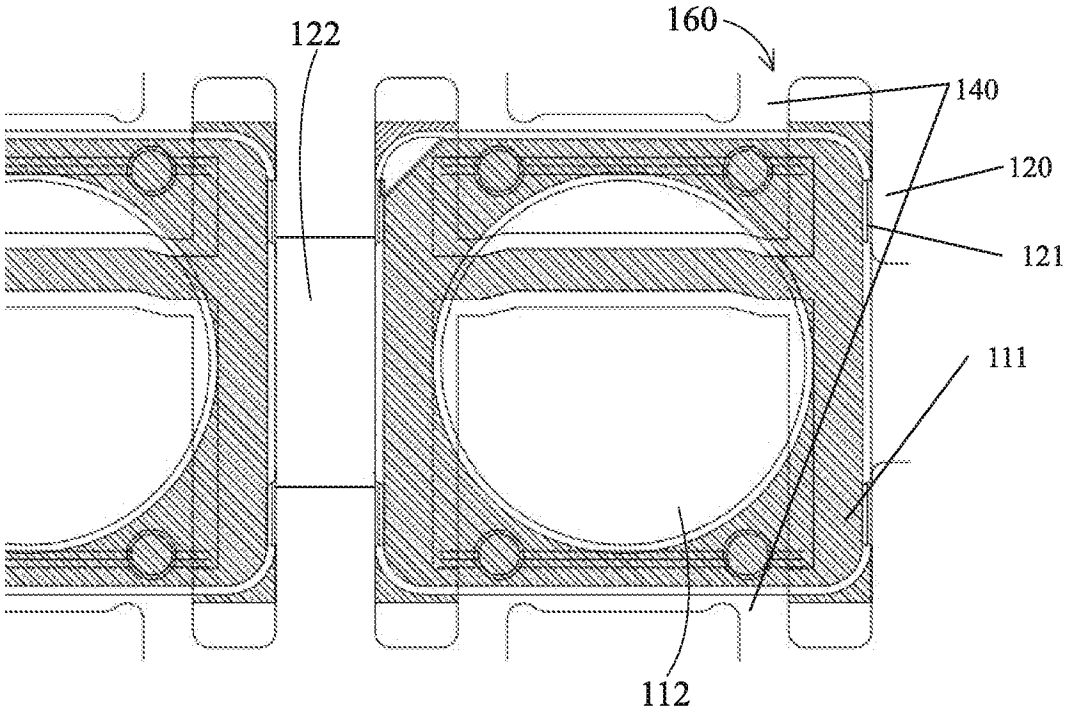


FIG. 4A

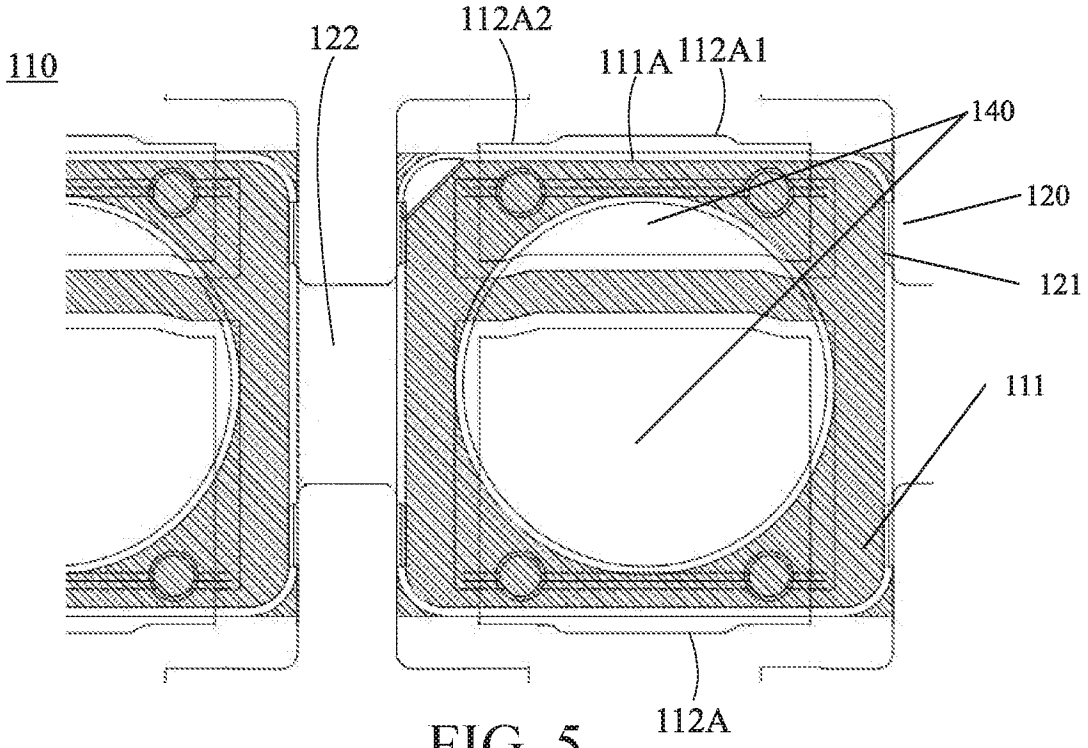

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FIG. 5

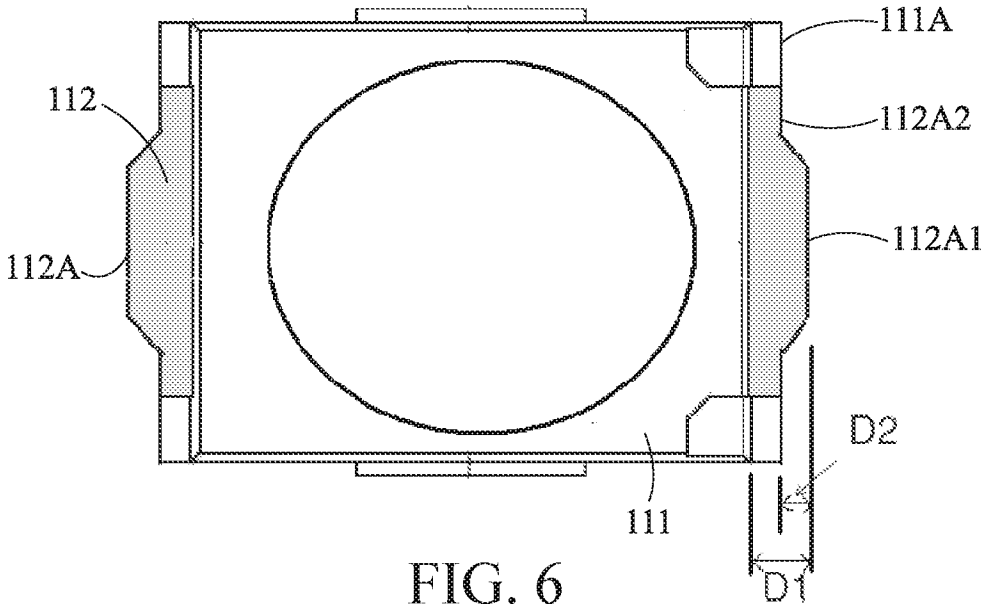

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FIG. 6

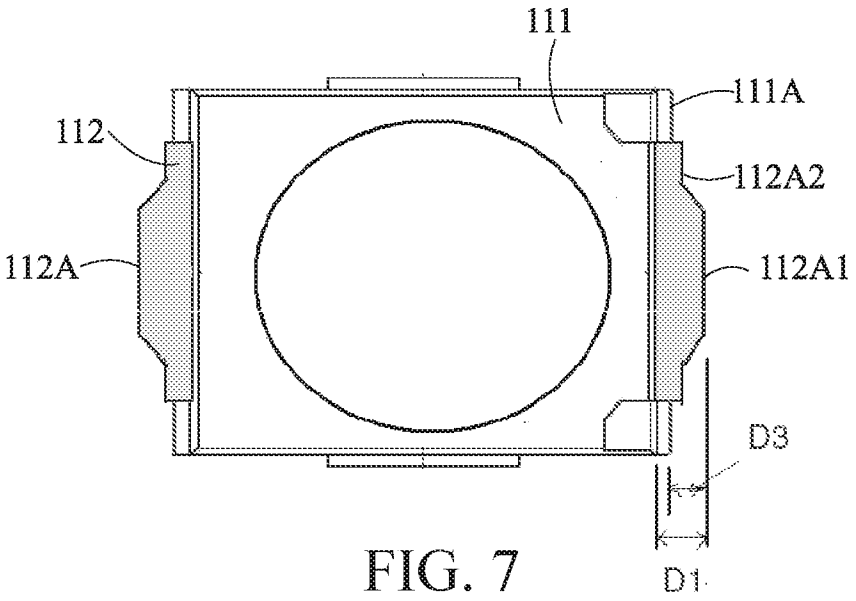

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FIG. 7

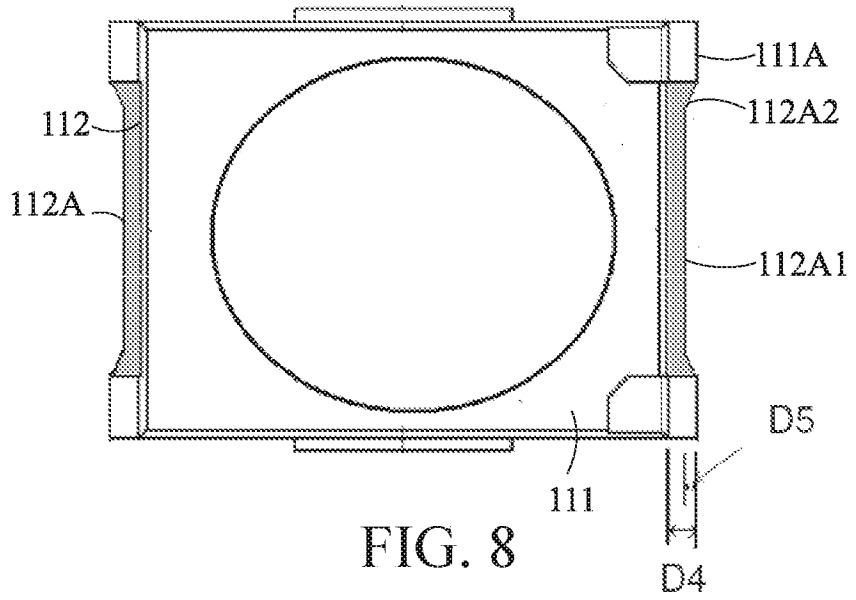

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FIG. 8

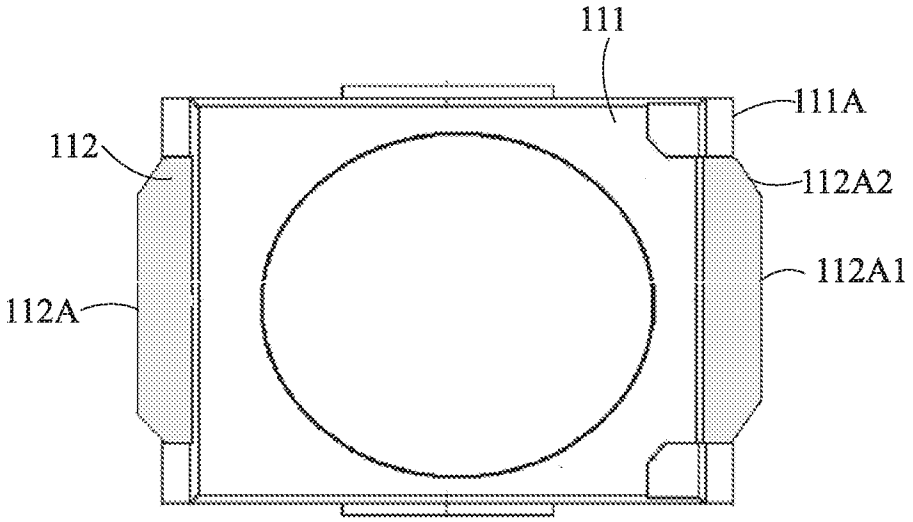


FIG. 9

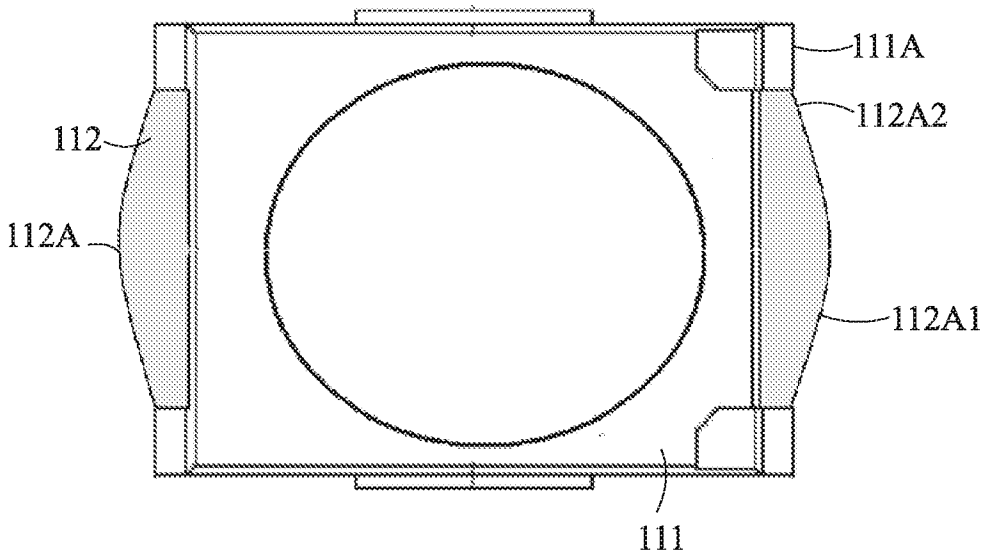


FIG. 10

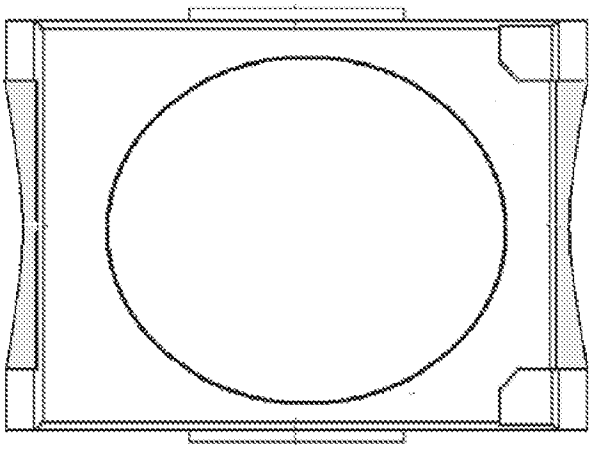


FIG. 11

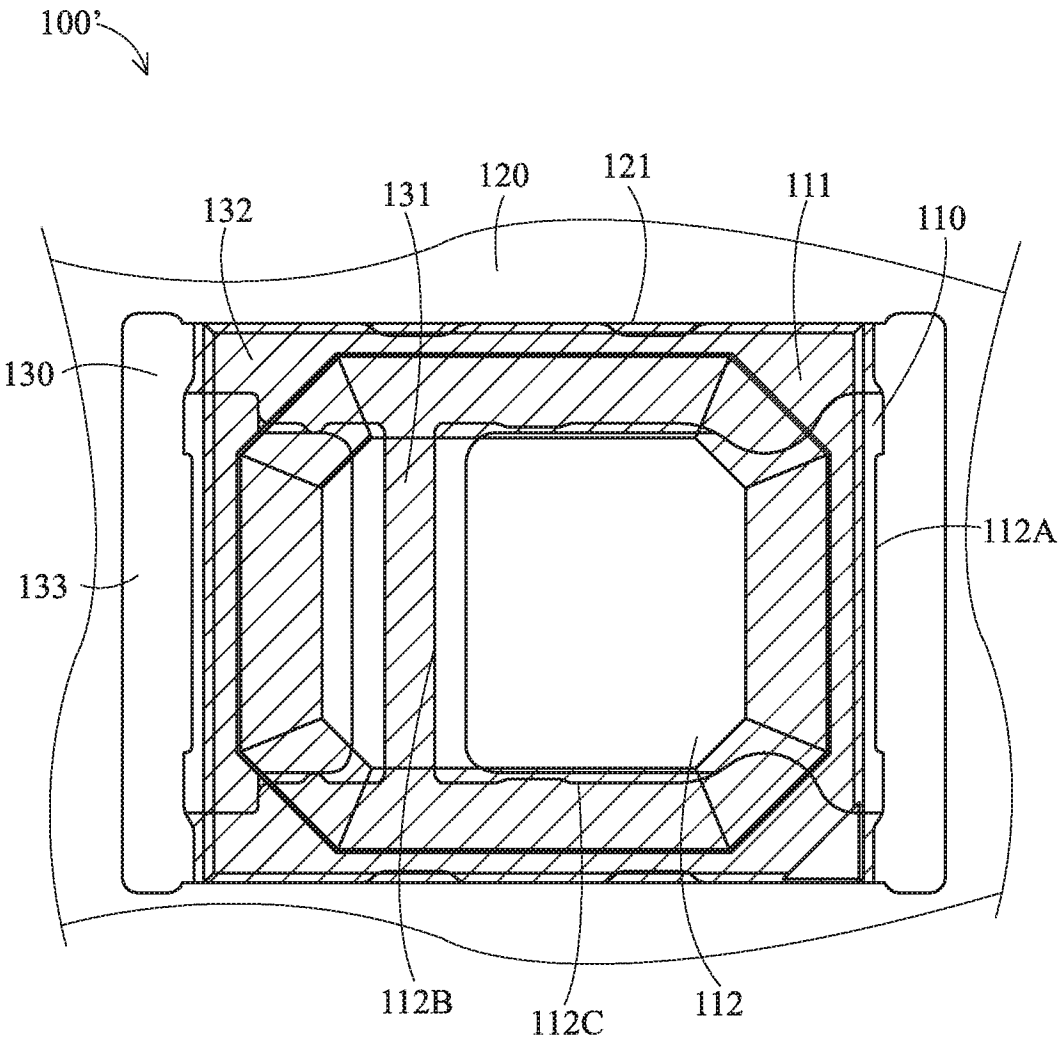


FIG. 12A

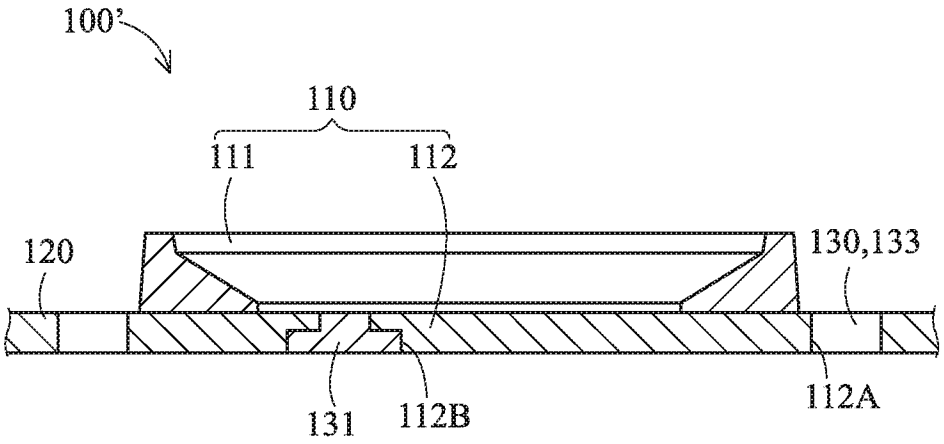


FIG. 12B

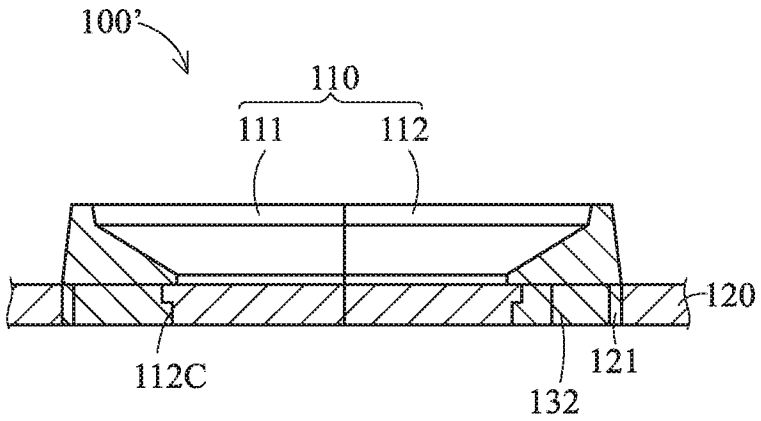


FIG. 12C

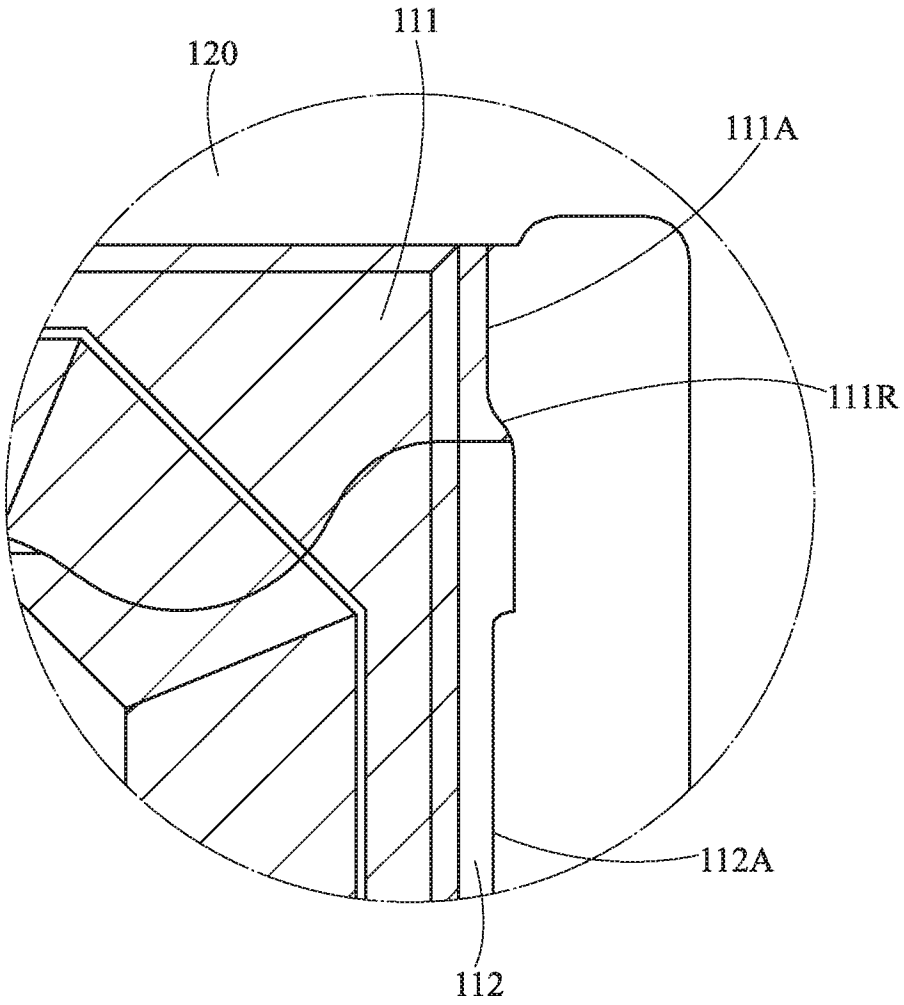


FIG. 12D

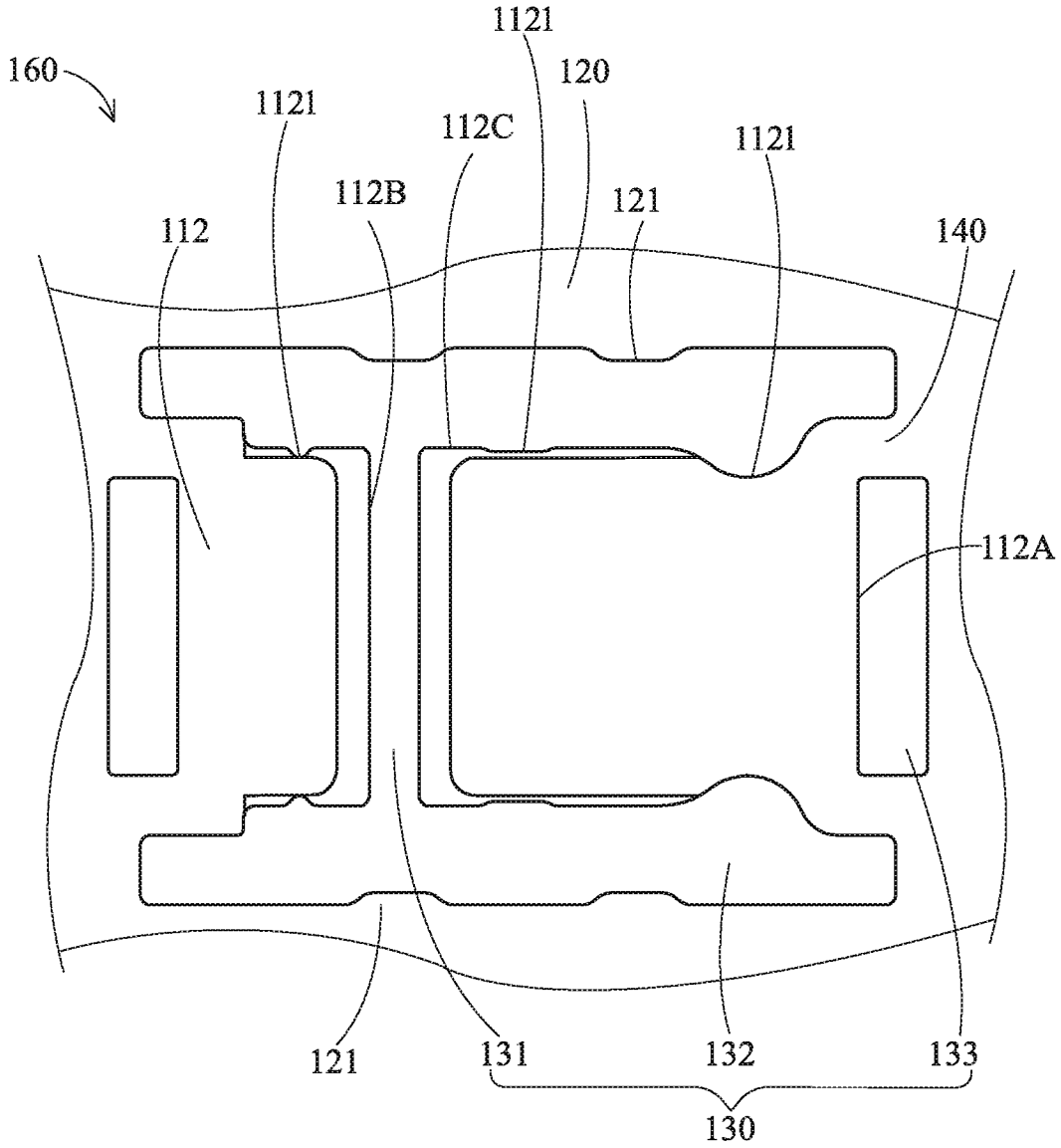

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FIG. 13A

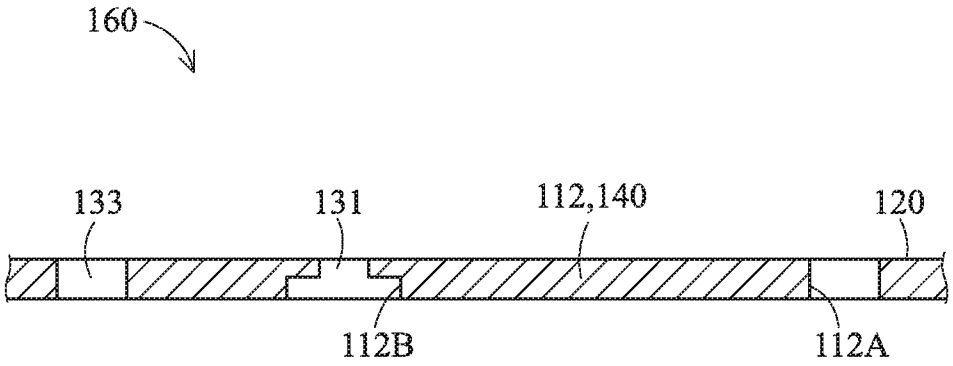


FIG. 13B

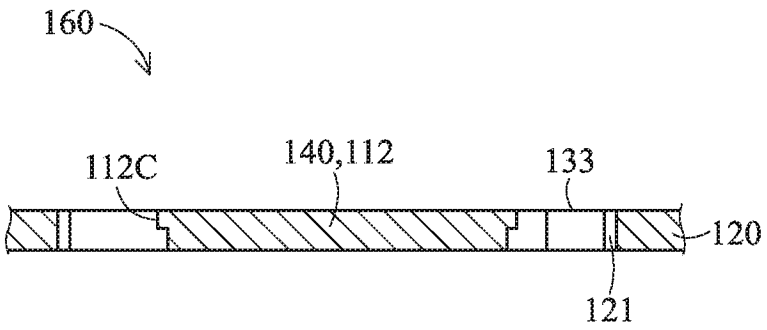


FIG. 13C

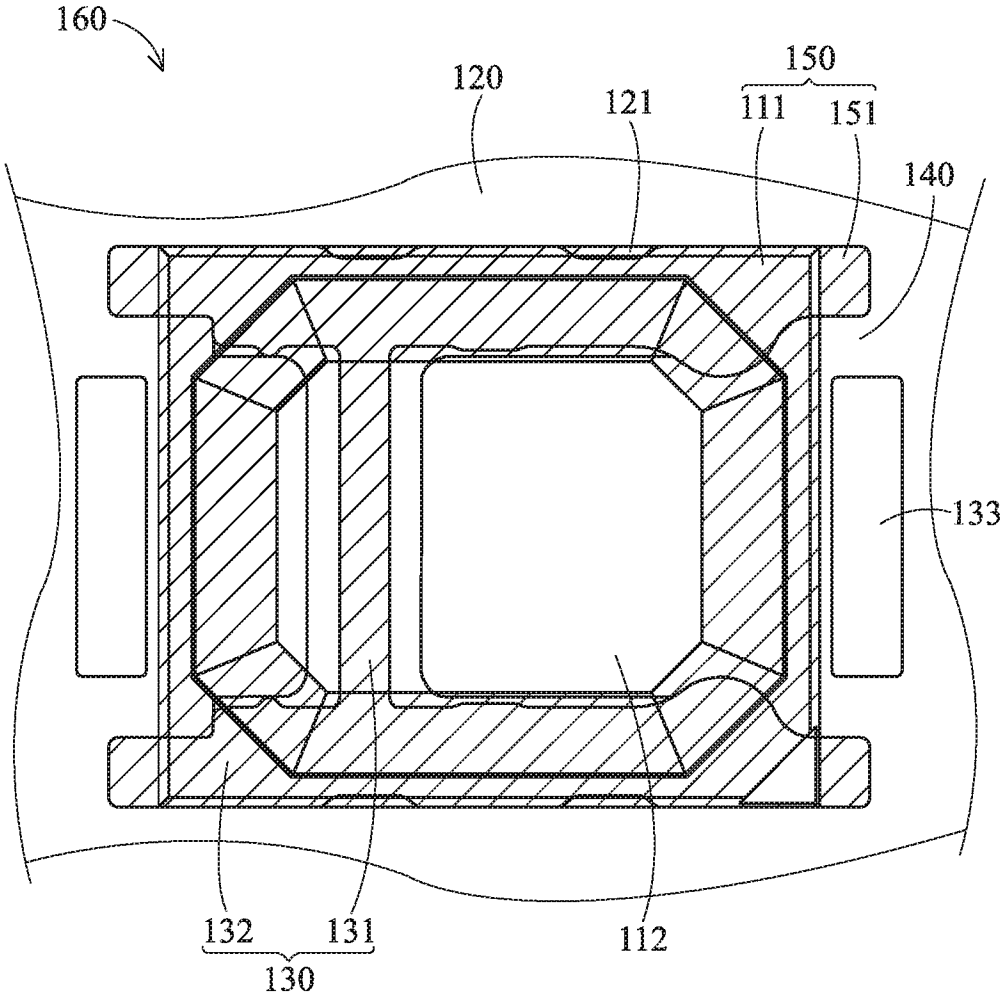


FIG. 14

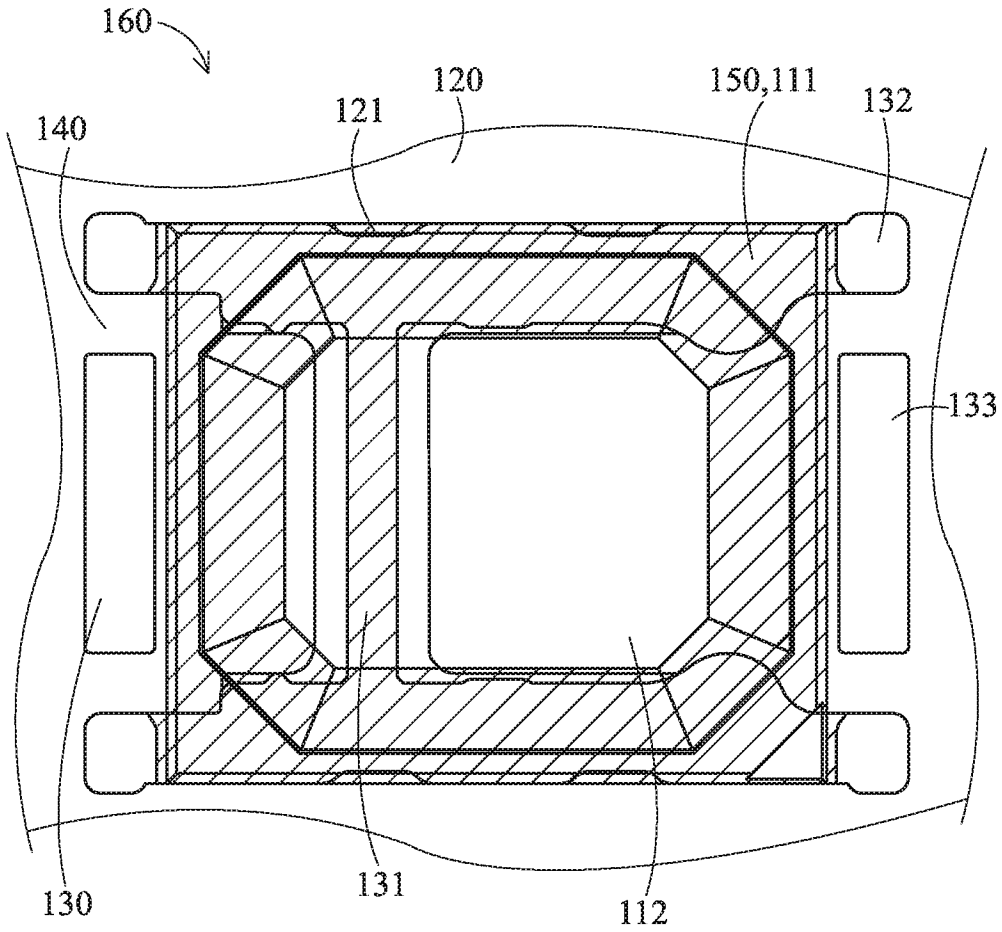


FIG. 15

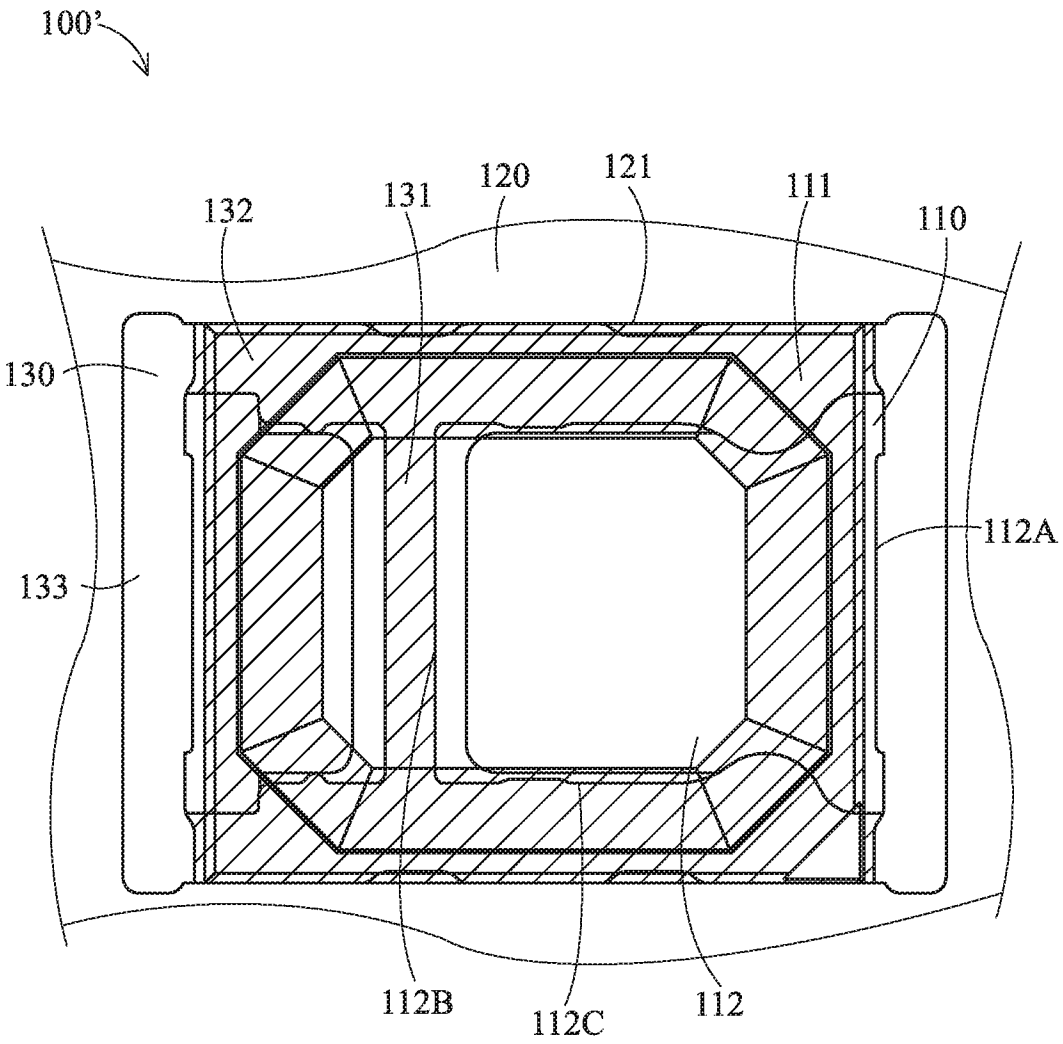


FIG. 16

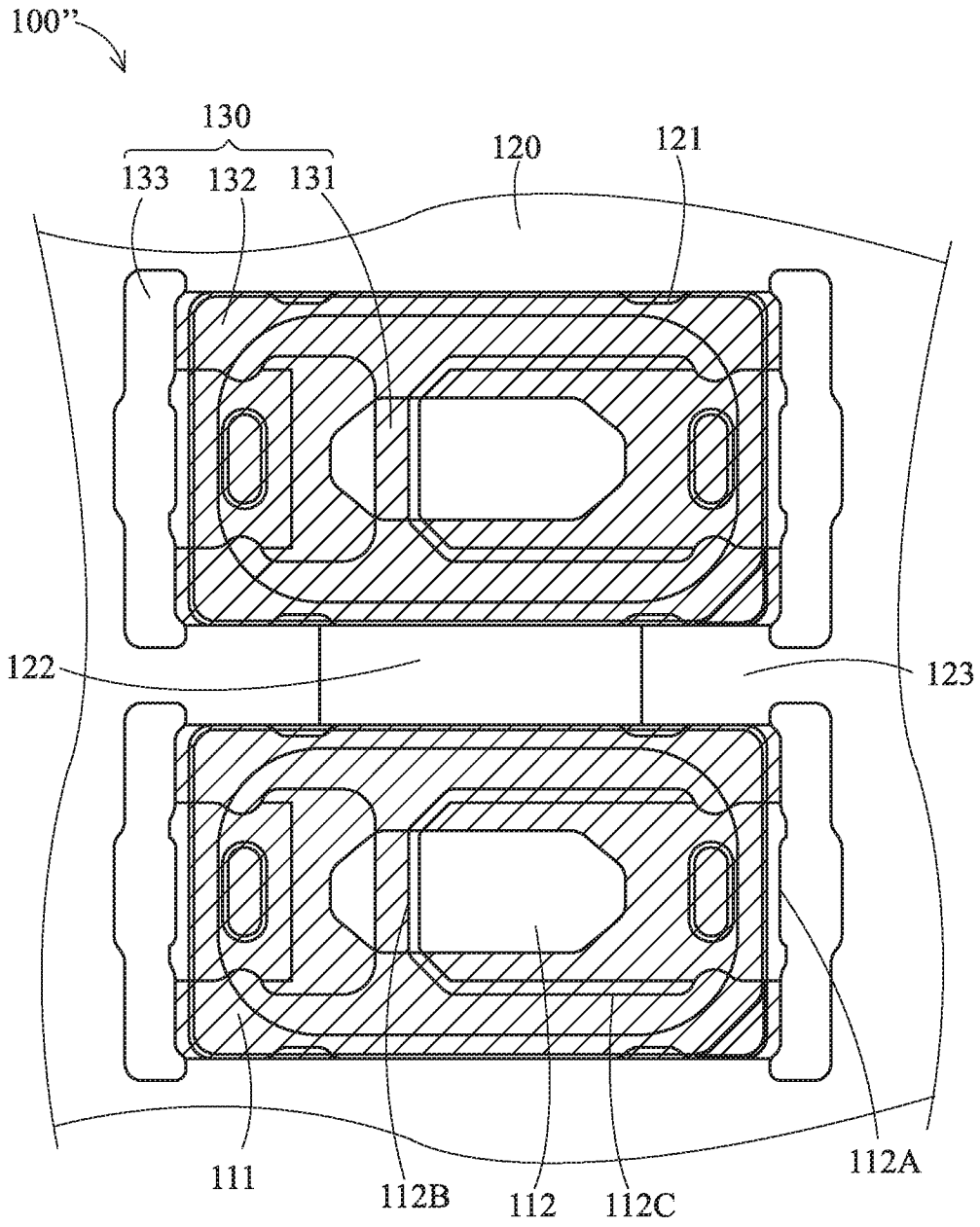


FIG. 17A

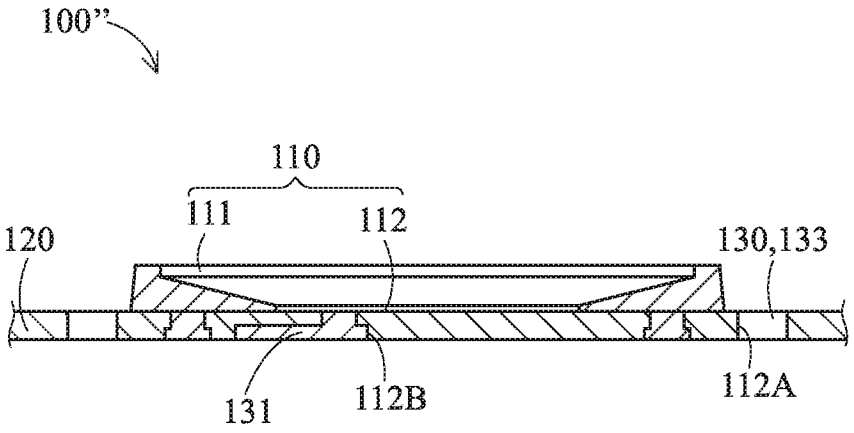


FIG. 17B

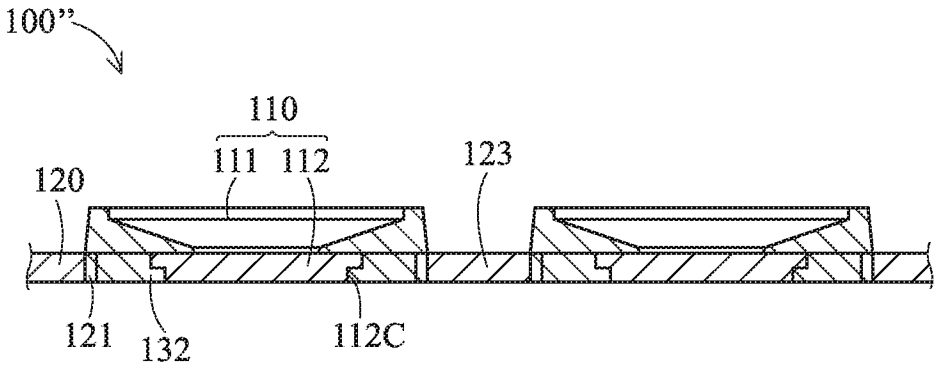


FIG. 17C

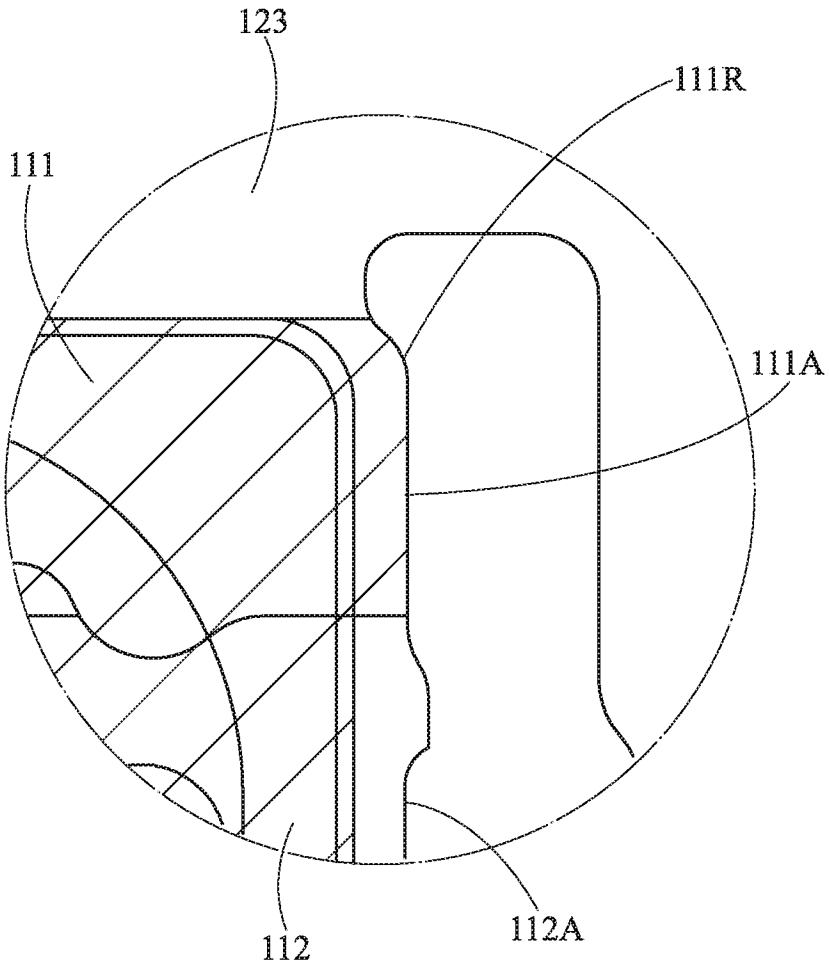


FIG. 17D

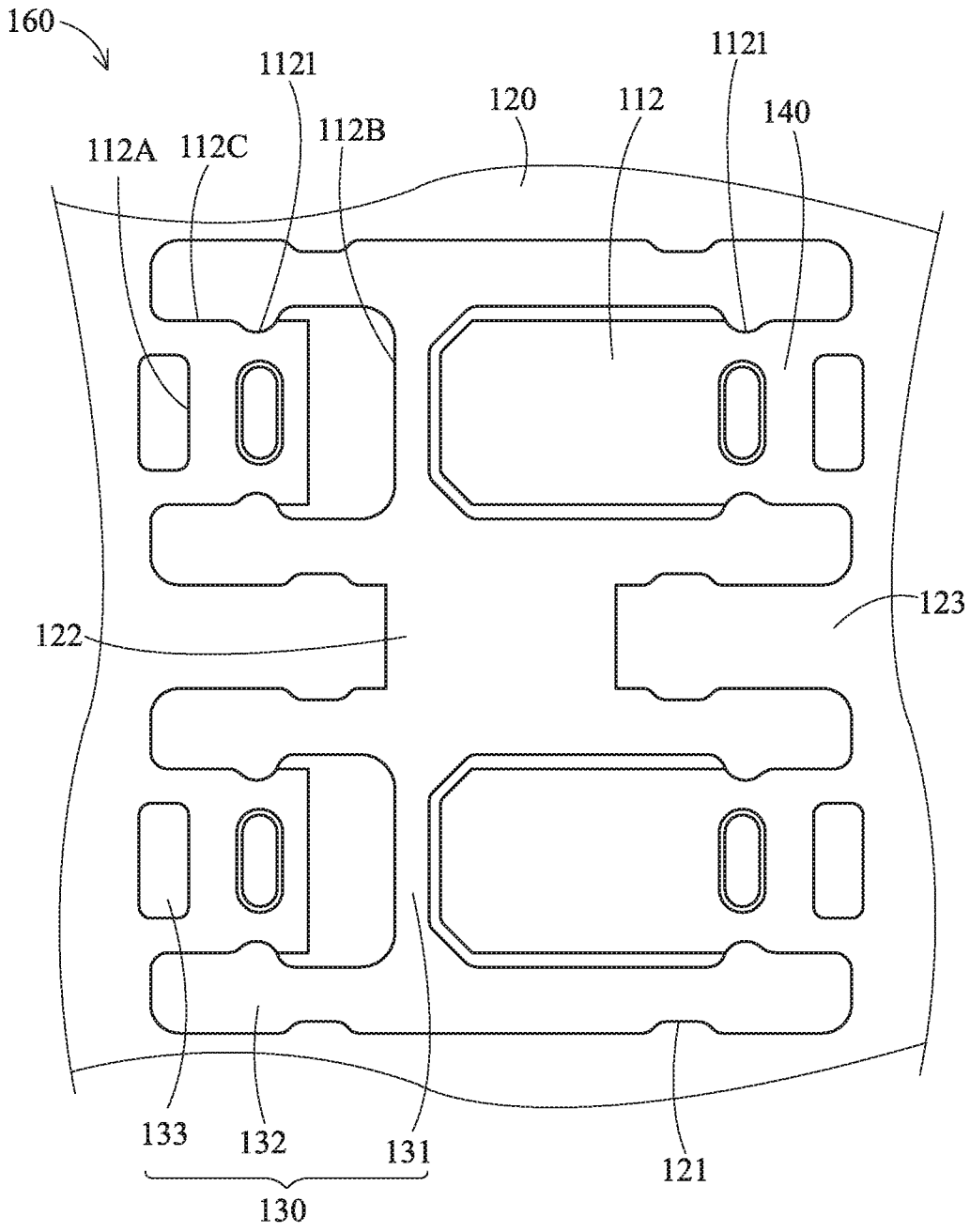

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FIG. 18A

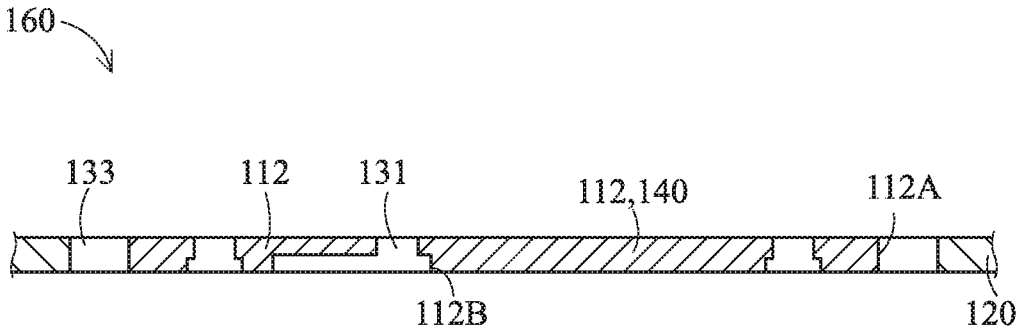


FIG. 18B

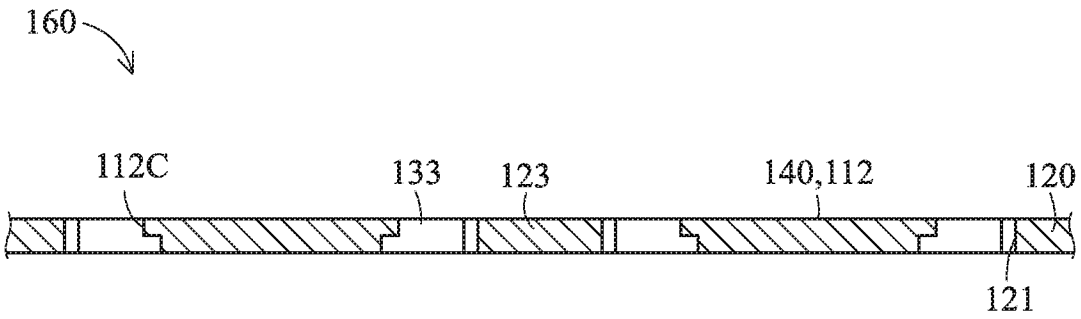


FIG. 18C

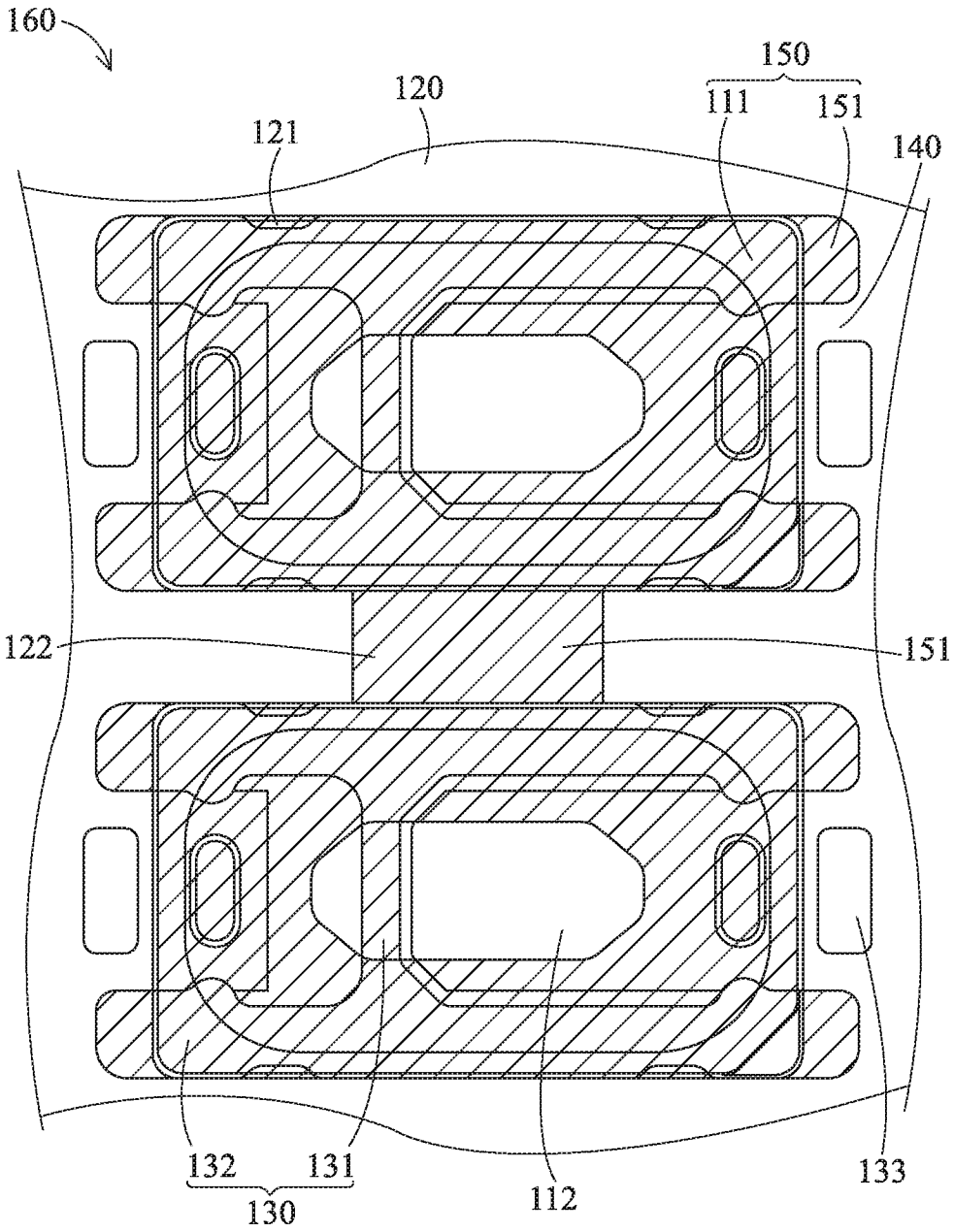


FIG. 19

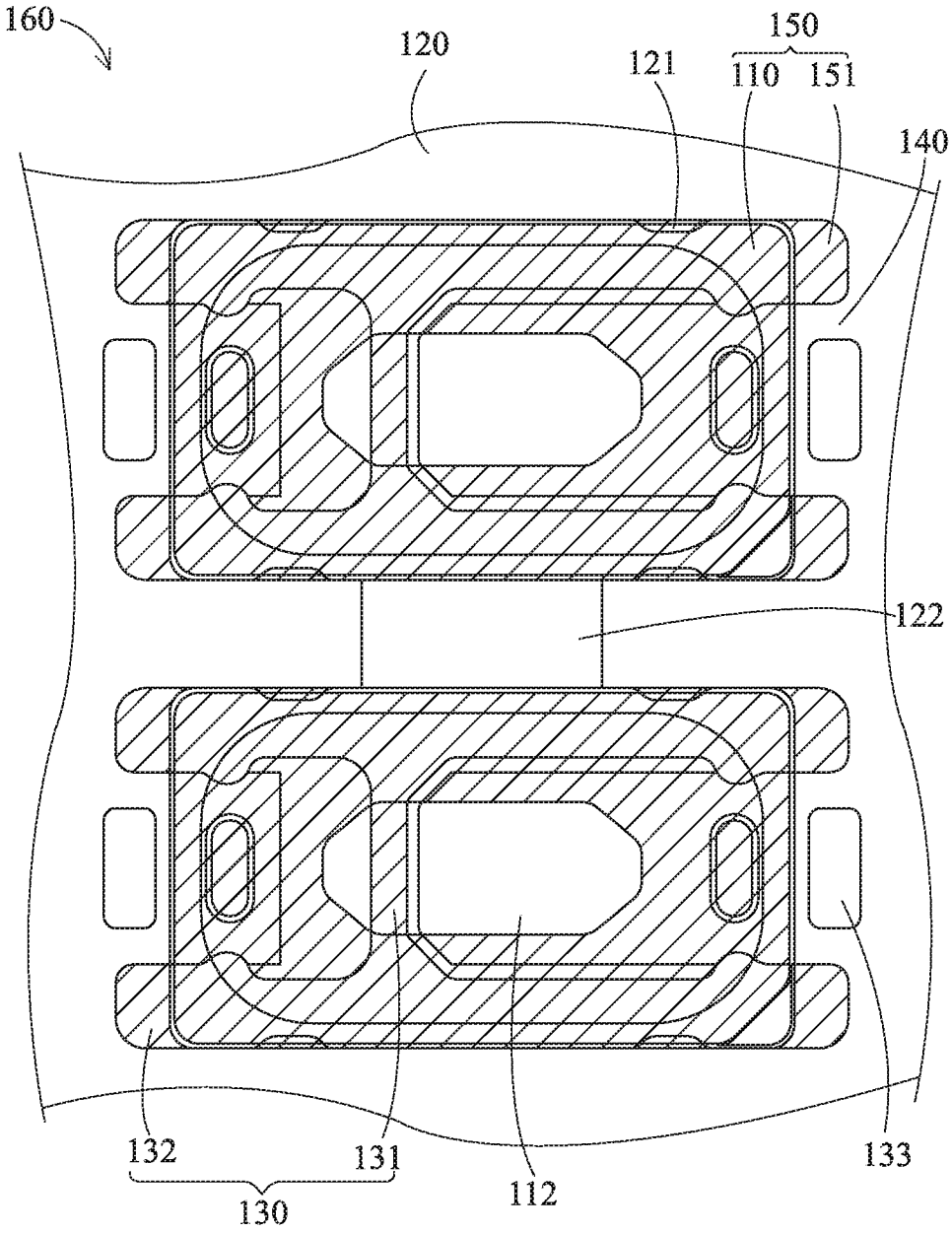


FIG. 20

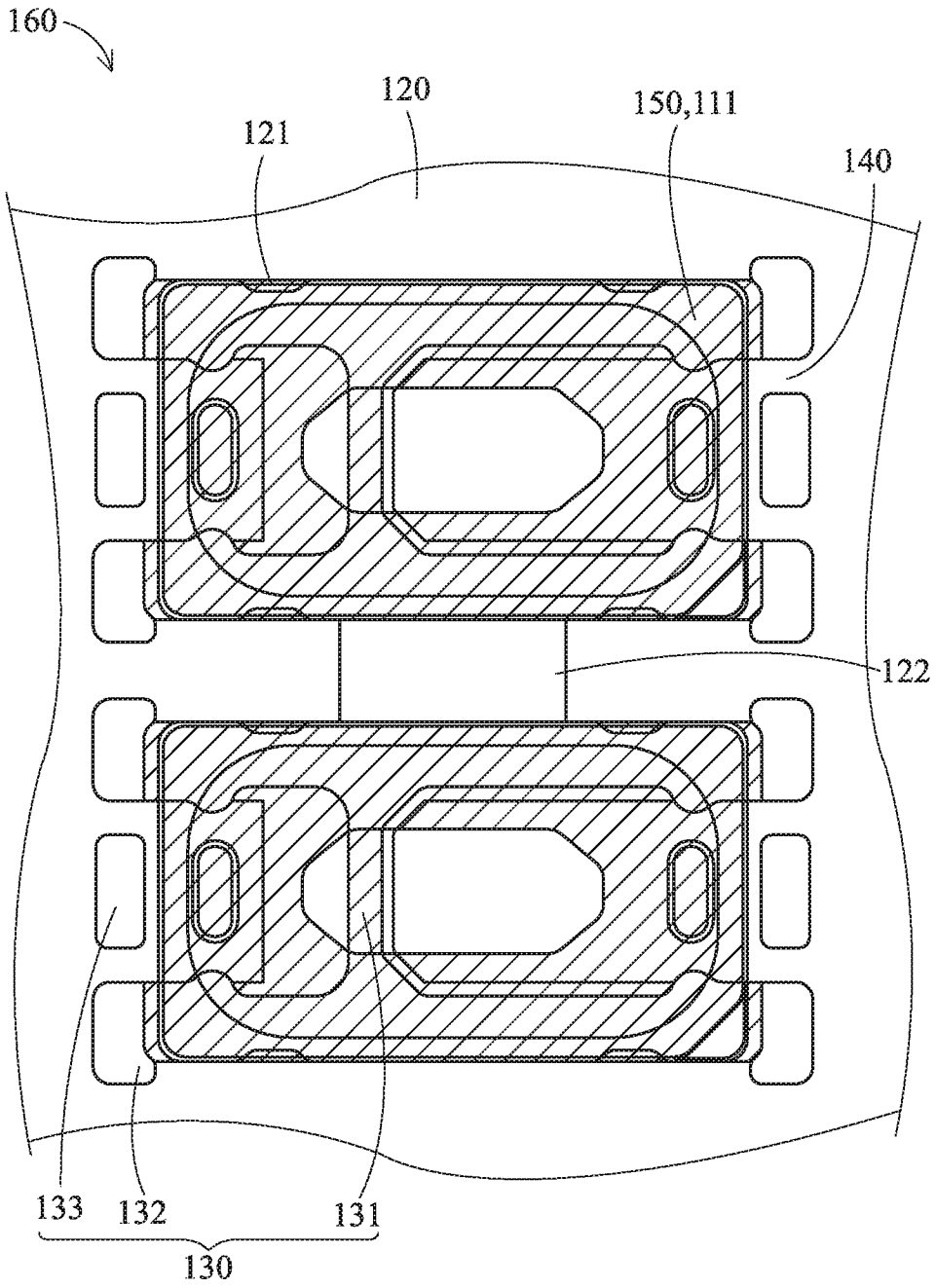


FIG. 21

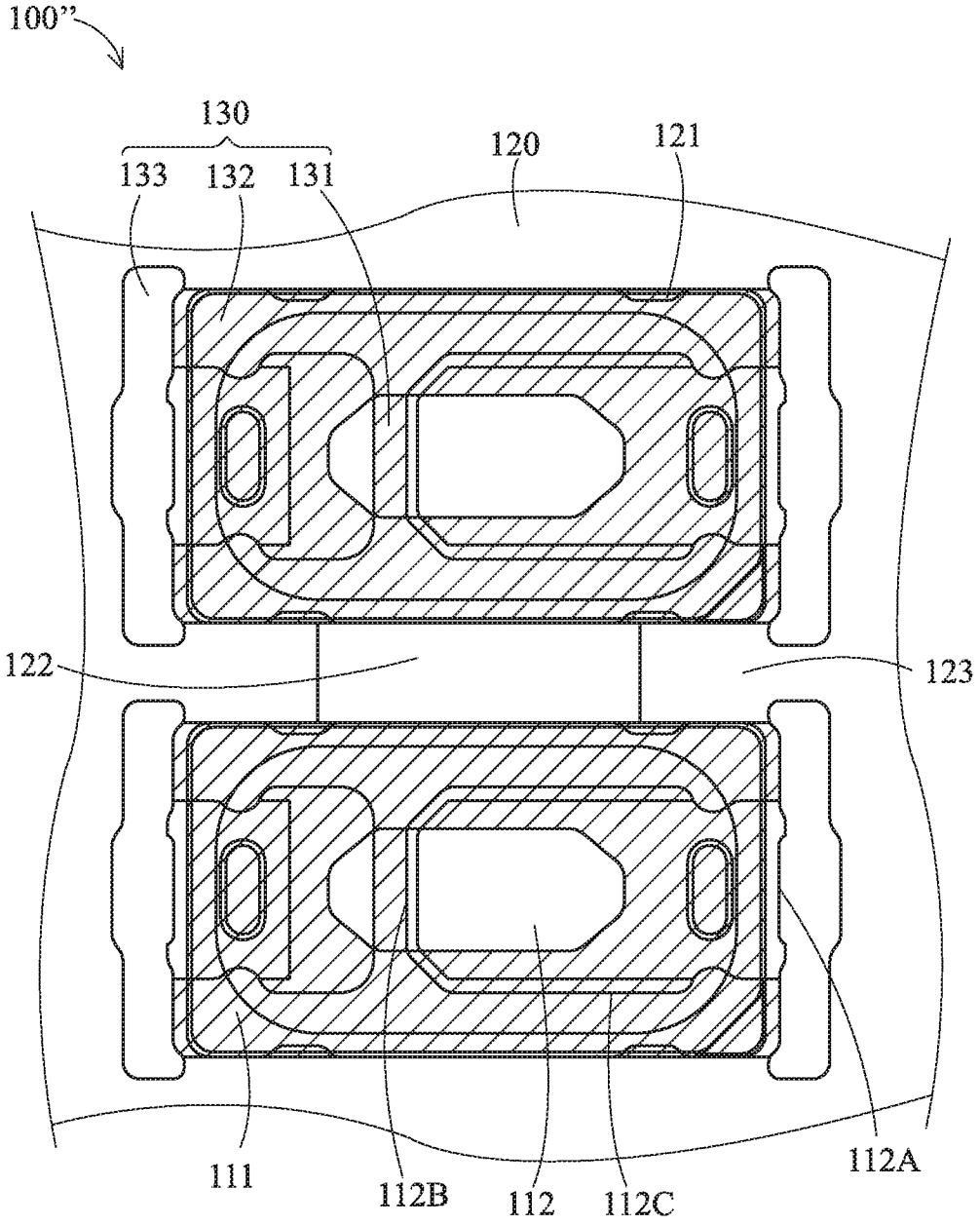


FIG. 22

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Divisional of Appl No.	14/720,230
Confirmation Number	Not Yet Assigned
Filing Date	February 24, 2017
First Named Inventor	Chung-Chuan HSIEH
Art Unit	Not Yet Assigned
Examiner Name	Not Yet Assigned
Attorney Docket Number	Q231501

U.S. PATENTS

Examiner Initials*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	1.	9024514	B2	2015-05-05	KATO Hideaki	
	2.	8137999	B2	2012-03-20	WANG Billy	

U.S. PATENT APPLICATION PUBLICATIONS

Examiner Initials*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear
	3.	20130270588		2013-10-17	Wang Chiou-Yueh	
	4.	20120132949	A1	2012-05-31	WATARI Gen	
	5.	20090261374	A1	2009-10-22	HAYASHI Masaki	
	6.	20070261374	A1	2007-11-15	NELSON Benny Kevin	
	7.	20070246841	A1	2007-10-25	YAMAMOTO Saiki	

FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines, where Relevant Passages or Relevant Figures Appear	T[5]
	8.	201340410	TW	A	2013-10-01	Advanced Semiconductor Eng.		
	9.	101346584	CN	A	2009-01-14	Matsushita Electric Works Ltd		
	10.	3020070049380	KR		2007-11-28	Lumens Co Ltd		
	11.	D149221	TW		2012-09-11			
	12.	D154430	TW		2013-07-01			
	13.	D154432	TW		2013-07-01			
	14.	20100083907	KR		2010-07-23	Sul Myung Soon		
	15.	2014017460	JP		2014-01-30	Fusheng Ind Co LTD		
	16.	2014060343	JP		2014-04-03	Sanken Electric Co LTD		

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city, and/or country where published.	T[5]

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. 2 Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). 3 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 5 Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Divisional of Appl No.	14/720,230
	Confirmation Number	Not Yet Assigned
	Filing Date	February 24, 2017
	First Named Inventor	Chung-Chuan HSIEH
	Art Unit	Not Yet Assigned
	Examiner Name	Not Yet Assigned
	Attorney Docket Number	Q231501

EXAMINER SIGNATURE			
Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

1 See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. 2 Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). 3 For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4 Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. 5 Applicant is to place a check mark here if English language translation is attached.

PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Chung-Chuan HSIEH, et al.

Docket No: Q231501

Divisional of Appln. No.: 14/720,230

Group Art Unit: Not Yet Assigned

Confirmation No.: Not Yet Assigned

Examiner: Not Yet Assigned

Filed: February 24, 2017

For: CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

INFORMATION DISCLOSURE STATEMENT
UNDER 37 CFR §§ 1.97 and 1.98

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In accordance with the duty of disclosure under 37 CFR §1.56, Applicant hereby notifies the U.S. Patent and Trademark Office of the documents which are listed on the attached PTO/SB/08 A & B (modified) form which are all the references of record in parent application No. **14/720,230**. Applicant is not submitting duplicate copies of these references but requests that they be listed on the face of any patent granted on the above application. (See 37 CFR §1.98(d)). Copies of any cited copending applications, if not previously submitted, are being submitted herewith.

The submission of the listed documents is not intended as an admission that any such document constitutes prior art against the claims of the present application. Applicant does not waive any right to take any action that would be appropriate to antedate or otherwise remove any listed document as a competent reference against the claims of the present application.

Respectfully submitted,

/John F. Rabena/
John F. Rabena
Registration No. 38,584

SUGHRUE MION, PLLC
Telephone: 202.293.7060
Facsimile: 202.293.7860

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

Date: February 24, 2017

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in the attached transmittal letter.

I hereby appoint:

Patent Practitioner(s) associated with the following Customer Number:

WASHINGTON OFFICE
23373
CUSTOMER NUMBER

as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (Form PTO/AIA/82A).

Please recognize or change the correspondence address for the application identified in the attached transmittal letter to:

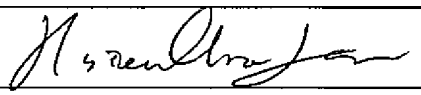
The address associated with the above-mentioned Customer Number.

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

☐ Inventor or Joint Inventor (title not required below)
☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)
☐ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)
☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a Petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document)(provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature		Date (Optional)	2017/2/21
Name	Hsien Chia Lin		
Title	Manager		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of 1 forms are submitted.

Electronic Acknowledgement Receipt

EFS ID:	28454340
Application Number:	15441644
International Application Number:	
Confirmation Number:	6962
Title of Invention:	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE
First Named Inventor/Applicant Name:	Chung-Chuan HSIEH
Correspondence Address:	SUGHRUE MION, PLLC - 2100 PENNSYLVANIA AVENUE, N.W. SUITE 800 WASHINGTON DC 20037 US 202-293-7060 PPROCESSING@SUGHRUE.COM
Filer:	John F. Rabena/Shannon Shenton
Filer Authorized By:	John F. Rabena
Attorney Docket Number:	Q231501
Receipt Date:	24-FEB-2017
Filing Date:	
Time Stamp:	13:54:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	Q231501TransmittalforPowerof Attorney.pdf	16964 021b2e70373b7178c0e647c39077bf690ae16815	no	1
Warnings:					
Information:					
2	Power of Attorney	Q231501ExecutedPowerofAttorney.pdf	85441 18375cdbd9caf200defe1ee11621bab1226e63c0	no	1
Warnings:					
Information:					
		Total Files Size (in bytes):	102405		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS			
NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.			
Application Number	15/441,644		
Filing Date	February 24, 2017		
First Named Inventor	Chung-Chuan HSIEH		
Title	CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE		
Art Unit	Not Yet Assigned		
Examiner Name	Not Yet Assigned		
Attorney Docket Number	Q231501		
SIGNATURE of Applicant or Patent Practitioner			
Signature	/John F. Rabena/	Date (Optional)	02/24/2017
Name	John F. Rabena	Registration Number	38,584
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			
NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. If more than one applicant, use multiple forms.			
☑ *Total of 1 forms are submitted.			

PATENT ASSIGNMENT COVER SHEET

Electronic Version v1.1
Stylesheet Version v1.2

EPAS ID: PAT4290563

SUBMISSION TYPE:	NEW ASSIGNMENT
NATURE OF CONVEYANCE:	ASSIGNMENT

CONVEYING PARTY DATA

Name	Execution Date
CHUNG-CHUAN HSIEH	02/21/2017
YUNG CHIEH CHEN	02/21/2017

RECEIVING PARTY DATA

Name:	EVERLIGHT ELECTRONICS LTD
Street Address:	NO. 6-8, ZHONGHUA RD., SHULIN DIST.
City:	NEW TAIPEI CITY
State/Country:	TAIWAN
Postal Code:	23860

PROPERTY NUMBERS Total: 1

Property Type	Number
Application Number:	15441644

CORRESPONDENCE DATA

Fax Number: (202)293-7860

Correspondence will be sent to the e-mail address first; if that is unsuccessful, it will be sent using a fax number, if provided; if that is unsuccessful, it will be sent via US Mail.

Phone: 202-293-7060
Email: sshenton@sughrue.com
Correspondent Name: SUGHRUE MION, PLLC
Address Line 1: 2100 PENNSYLVANIA AVENUE, N.W.
Address Line 2: SUITE 800
Address Line 4: WASHINGTON, D.C. 20037

ATTORNEY DOCKET NUMBER:	Q231501
NAME OF SUBMITTER:	SHANNON SHENTON
SIGNATURE:	/Shannon Shenton/
DATE SIGNED:	02/24/2017
	This document serves as an Oath/Declaration (37 CFR 1.63).

Total Attachments: 3
source=Q231501ExecutedAssignmentwithDeclaration#page1.tif
source=Q231501ExecutedAssignmentwithDeclaration#page2.tif
source=Q231501ExecutedAssignmentwithDeclaration#page3.tif

Docket No.: Q231501
Only After Sept 16, 2012
US Rights Only

ASSIGNMENT WITH DECLARATION FOR PATENT APPLICATION (37 CFR 1.63)

专利申请转让声明书(37 CFR 1.63)

Chinese Language Assignment with Declaration

鉴于，我 / 我们，即下面签名之发明人（以下简称“转让人”），已发明下文确认之申请中所述的若干改善之处；和

鉴于，_____（地址位于_____）（“承让人”）意欲购买申请和发明以及就此随后获取的任何美国专利中的全部权利、所有权和权益；

因此，就有值代价而言，相关收据特此确认：

我 / 我们，上文指名转让人，特此向上文指名承让人及其继承人和受让人出售、转让及出让该申请中适用于美利坚合众国的全部权利、所有权和权益，及该申请中披露的适用于美利坚合众国的发明（包括该申请的所有分案和延续申请），及可能据此颁发的所有美国专利证书及所有再颁发之专利证书（包括 35 USC 119 项下的要求优先权的权利及针对过往损害赔偿提起诉讼的权利）；我 / 我们请求美国专利及商标局局长向承让人及其继承人和受让人签发该申请中所载列之发明的任何专利证书；及我 / 我们将会应承让人的要求，无偿签立承让人申请美国专利所必需的所有文件。

（合法化审批无需记录，但须作为 35 USC 261 项下执行的表面证据）

作为下述发明人，我特此声明：

此转让声明乃有关：

☐ 随附的申请，或

☐ 于 _____ 日提交的美国专利申请或 PCT 国际申请号 _____（确认号 ）。

该申请有权：

_____

_____

_____

Whereas, I/We, the undersigned inventor(s) hereinafter called assignor(s), have invented certain improvements described in the application identified below; and

Whereas, Everlight Electronics Co., Ltd. of No.6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan, R.O.C, (assignee), desires to acquire the entire right, title, and interest in the application and invention, and to any United States patents to be obtained therefor;

Now therefore, for valuable consideration, receipt whereof is hereby acknowledged,

I/We, the above named assignor(s), hereby sell, assign and transfer to the above named assignee, its successors and assigns, the entire right, title and interest in the application and the invention disclosed therein for the United States of America, including all divisions, and continuations thereof, and all Letters Patent of the United States that may be granted thereon, and all reissues thereof, including the right to claim priority under 35 USC 119 and the right to sue for past damages, and I/we request the Director of the U.S. Patent and Trademark Office to issue any Letters Patent granted upon the invention set forth in the application to the assignee, its successors and assigns; and I/we will execute without further consideration all papers deemed necessary by the assignee in connection with the United States application when called upon to do so by the assignee.

(Legalization not required for recording but is prima facie evidence of execution under 35 USC 261)

As the below named inventor, I hereby declare that:

This assignment with declaration is directed to:

☒ The attached application, or

☐ United States Application or PCT International Application Number _____ filed on _____ (Confirmation No. _____).

The application is entitled:

CARRIER, CARRIER LEADFRAME, AND LIGHT EMITTING DEVICE

Chinese Language Assignment with Declaration

我已做出或授权他人做出上述确认的申请。

我相信我是申请中要求保护的发明的原创发明人或原创联合发明人之一。

我已读阅并理解提交该转让声明的申请内容。

根据 37 CFR 1.56 的规定，我明白我有义务向专利局披露据我所知的有关专利性的所有实质性信息。

特此确认，根据 18 USC 1001 的规定，在本转让声明书中蓄意做出任何虚假声明会被处以罚款或五(5)年以下监禁或两者并罚。

The above identified application was made or was authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

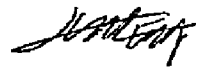
I have reviewed and understand the contents of the application for which this assignment with declaration is being submitted.

I am aware of the duty to disclose to the Office all information known to me to be material to patentability as defined in 37 CFR 1.56.

I hereby acknowledge that any willful false statement made in this assignment with declaration is punishable under 18 USC 1001 by fine or imprisonment of not more than five (5) years, or both.

STATEMENT OF ACCURATE TRANSLATION IN ACCORDANCE WITH 37 CFR 1.69(b):

The assignment with declaration is an accurate translation of the corresponding English language assignment with declaration.

Signature 

Date March 17, 2014

NAME OF SOLE OR FIRST INVENTOR: 唯一发明人或第一发明人姓名：			
Given Name (first and middle [if any]) 名（名和中名［若有］） Chung-Chuan		Family Name or Surname 姓 Hsieh	
Inventor's signature 发明人签名 Chung Chuan Hsieh			Date 日期 2017/02/21
Residence: 住所： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan			
Mailing Address: 通讯地址： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan			
NAME OF SECOND INVENTOR: 第二发明人姓名：			
Given Name (first and middle [if any]) 名（名和中名［若有］） Yung Chieh		Family Name or Surname 姓 Chen	
Inventor's signature 发明人签名 CHEN YUNG CHIEH			Date 日期
Residence: 住所： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan			
Mailing Address: 通讯地址： No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City 23860, Taiwan			

SCORE Placeholder Sheet for IFW Content

Application Number: 15441644 Document Date: 02/24/2017

The presence of this form in the IFW record indicates that the following document type was received in electronic format on the date identified above. This content is stored in the SCORE database.

- Drawings – Other than Black and White Line Drawings

Since this was an electronic submission, there is no physical artifact folder, no artifact folder is recorded in PALM, and no paper documents or physical media exist. The TIFF images in the IFW record were created from the original documents that are stored in SCORE.

To access the documents in the SCORE database, refer to instructions below.

At the time of document entry (noted above):

- Examiners may access SCORE content via the eDAN interface.
- Other USPTO employees can bookmark the current SCORE URL (http://Score.uspto.gov/ScoreAccessWeb/).
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Form Revision Date: September 30, 2013