

Patent Specification

(Do not change the format, order, and bold text of this Specification arbitrarily. Do not fill in the parts marked with ※)

※ **Application No.:**

※ **Application Date:**

※ **IPC Classification:**

I. Title of Invention: (Chinese/English)

A LIGHT SOURCE ASSEMBLY STRUCTURE OF A
BACKLIGHT MODULE AND AN LCD THEREWITH /
LIGHT SOURCE ASSEMBLY STRUCTURE OF A
BACKLIGHT MODULE

II. Applicant: (1 in total)

Name: (Chinese/English)

AUO CORPORATION /AU OPTRONICS CORP.

Representative: (Chinese/English)

LEE, KUEN-YAO/LEE, KUEN-YAO

Residence or Business Address: (Chinese/English)

No. 1 Li-Hsin Road 2, Hsinchu Science Park, Hsinchu City/ No.1, Li-Hsin
Road 2, Science-Based Industrial Park, Hsin-Chu City, Taiwan, R.O.C.

Nationality: (Chinese/English) Republic of China/TWN

III. Inventor: (1 in total)

Name: (Chinese/English)

1. LIU, PANG-HSUAN/ LIU, PANG-HSUAN

Nationality: (Chinese/English)

1. Republic of China/TWN

IV. Statement:

- ☐ The facts specified in ☐ Sub-paragraph 1 or ☐ Sub-paragraph 2 of Paragraph 2 of Article 22 of the Patent Act are claimed, and the date of occurrence of the facts is: (month) (day), (year).
- ☐ Prior to the application, patents have been applied for in the following countries (regions):
[the format should follow: accepting country (region), application date, application no., sequential notation]
 - ☐ Claiming the right of international priority under Paragraph 1 of Article 27 of the Patent Act:
 - ☐ Not claiming the right of international priority under Paragraph 1 of Article 27 of the Patent Act:
- ☐ Claiming the right of domestic priority under Paragraph 1 of Article 29 of the Patent Act:
[the format should follow: application date, application no., sequential notation]
- ☐ Claiming biological materials under Article 30 of the Patent Act:
 - ☐ Required to deposit biological materials:
Domestic biological materials [the format should follow: deposit institution, date, number, sequential notation]

Foreign biological materials [the format should follow: deposit country, institution, date, number, sequential notation]
 - ☐ Not required to deposit biological materials:
If easily available to those having ordinary skill in the art, there is no deposit requirement.

V. Summary of the Invention in Chinese:

The present invention discloses a light source assembly structure of a backlight module. The structure includes at least one light source assembly and one backboard. The light source assembly includes at least one light-emitting device and one board. The backboard has at least one protrusion part. The board is detachably installed on the backboard and is tightly held by the backboard and the protrusion part.

VI. Summary of the Invention in English:

The present invention discloses a light source assembly structure of a backlight module. The light source assembly structure includes at least one light source and a back plate. The light source module includes at least one light-emitting device and a substrate. The back plate has at least one protrusion part. The substrate is detachably installed on the back plate and is tightly held by the back plate and the protrusion part.

VII. Designated Representative Figure:

(1) The designated representative figure of this case is: FIG. (2).

(2) Brief description of the component symbols of this figure:

100	LED light source assembly structure		
102	LED light source		
104	Board	106	Backboard
108	Stamped protrusion part	112	Protrusion part
114	Side	116	Conductive material

VIII. If there are chemical formulae for this invention, please disclose the chemical formula that best demonstrates the characteristics of the invention:

None

IX. Specification:

[Technical Field of the Invention]

The present invention discloses a light source assembly structure, especially a light emitting diode (LED) light source assembly structure used in a liquid crystal display (LCD) backlight module.

[Prior Art]

In recent years, various display technologies have continued to flourish. After continuous research and development, new products, such as LCDs, plasma displays, and organic LED displays, etc., have gradually been commercialized and applied to display devices of various sizes and areas. At present, the entire display industry is moving towards high brightness and efficiency in order to make more commercially valuable display products. Among the various key components of LCDs, the backlight module used to supply light has a significant impact on the overall luminous efficacy of the LCD. When the backlight module itself has excellent luminous efficacy, it can not only improve the brightness of the LCD, but also provide flexibility in the design and manufacturing of other components in the LCD. However, when the backlight module itself has poor luminous efficacy, the light source it can provide is limited, which often limits the brightness performance of the LCD product.

While improving the luminous efficacy of the backlight module, improving the luminous efficacy of the light-emitting device is a commonly used improvement solution. However, when improving the luminous efficacy of the light-emitting device, it is inevitable

that the heat dissipation problem must be properly addressed. Otherwise, the solution to improve luminous efficacy cannot be implemented. Therefore, the industry has invested manpower and other resources in order to design and manufacture suitable products that not only meet the needs of LCD products, but also meet the requirements in terms of luminous efficacy and heat dissipation performance. In addition, it is necessary to consider whether the process is simple and whether the cost is reasonable.

Please refer to FIG. 1, which is a cross-sectional view of an LED light source assembly structure 10 in a backlight module according to the prior art. As shown in FIG. 1, the LED light source assembly structure 10 according to the prior art comprises an LED light source 12, a metal board 14 supporting the LED light source 12, and a backboard 16. The LED light source 12 is welded to the surface of the metal board 14 and the metal board 14 is fastened onto the backboard 16 by a plurality of bolts 18 and a plurality of nuts 22. When light is emitted from the LED light source 12, the heat thus generated is conducted to the backboard 16 through the metal board 14 and then to the air to achieve the purpose of heat dissipation.

However, to achieve the purpose of sufficient heat dissipation, the above heat dissipation paths must be in good contact to prevent air or other media with poor heat dissipation from affecting the overall heat dissipation rate or even causing poor heat dissipation, thereby damaging the LED light source 12 or the metal board 14 and the circuit (not shown) on the

backboard 16. Therefore, in the prior art, the metal board 14 is fastened onto the backboard 16 by bolts 18 and nuts 22. The metal board 14 and the backboard 16 are tightly held by the force when the bolts 18 are locked to the nuts 22 so that the contact surface of the metal board 14 and the backboard 16 in the above heat dissipation path is intact and good. Therefore, as long as the welding between the LED light source 12 and the metal board 14 is good, the overall heat dissipation performance of the LED light source assembly structure 10 can meet the requirements.

However, although such a design is sufficient to tightly hold the metal board 14 and the backboard 16 so that the heat dissipation performance of the LED light source assembly structure 10 reaches the expected level, it requires the use of bolts 18 and nuts 22 for assembly, which is too complicated during assembly and results in an increase in various labor and material costs. Although the number of bolts and nuts may vary according to actual needs, it is impossible to use only a few. Particularly in some large backlight modules, where dozens or hundreds of LED light sources are installed, the number of bolts and nuts used must be considerable, further highlighting this problem.

Therefore, how to develop a new LED light source assembly structure that can not only tightly hold the metal board to the backboard so that each contact surface in the heat dissipation path has good contact, thereby allowing the heat dissipation performance of the

LED light source assembly structure to reach the expected level, but is also easy to assemble without the problem of overly complicated assembly while having low cost has become a very important issue.

[Summary of the Invention]

Therefore, the purpose of the present invention is to provide an LED light source assembly structure in a backlight module to solve the above problems.

In the preferred embodiments of the present invention, a light source assembly structure of a backlight module is disclosed. The light source assembly structure comprises at least one light source assembly and one backboard. The light source assembly comprises at least one light emitting device and one board. The backboard has at least one protrusion part. Wherein the board is detachably installed on the backboard and the board is tightly held by the backboard and the protrusion part.

Due to the LED light source assembly structure in the backlight module of the present invention, the gap between the at least one protrusion part of the backboard and the backboard is less than the thickness of the board. Since the material of the backboard itself is elastic, the board can be detachably installed on the backboard. At the same time, at least one corner or at least one side of the board is tightly held by the backboard and the at least one protrusion part. By utilizing the clamping force applied to the board by the backboard and the protrusion part, the board can not only be tightly held onto the backboard, but the contact surface between the board and the backboard will also be intact and good. Thus, as long as the welding between the LED light source and the board is good, the heat thus generated when light is emitted from the

LED light source will be quickly conducted to the backboard through the board and then to the air, thereby achieving the purpose of sufficient heat dissipation. At the same time, since the LED light source assembly structure of the present invention completely eliminates or partially eliminates the use of bolts, the assembly will not be too complicated, thereby avoiding the problem of increasing costs.

[Embodiments]

Please refer to FIGS. 2 and 3. FIG. 2 is a cross-sectional view of the LED light source assembly structure 100 in the backlight module of the first embodiment of the present invention. FIG. 3 is a top view of the LED light source assembly structure 100 in the backlight module of FIG. 2. As shown in FIGS. 2 and 3, the LED light source assembly structure 100 of the present invention comprises at least one LED light source 102, one board 104 supporting the LED light source 102, and one backboard 106. The LED light source 102 is welded to the surface of the board 104. The board 104 is made of metal material so as to conduct the heat generated from the LED light source 102. The material of the board can be aluminum, copper, aluminum alloy, or copper alloy. The backboard 106 is also made of metal material, and the material of the backboard 106 can be stainless steel, aluminum, aluminum alloy, or galvanized steel plate.

The backboard 106 has at least one stamped protrusion part 108. The stamped protrusion part 108 may have different specially designed shapes. For example, the protrusion part 112 may be V-shaped, flat, arc-shaped, sawtooth-shaped, etc. Regardless of its shape, the gap

between the at least one protrusion part 112 of the stamped protrusion part 108 and the backboard 106 is less than the thickness of the board 104. Furthermore, because the metal material of the backboard 106 itself is elastic, the board 104 can be detachably installed on the backboard 106, and at least one side 114 of the board 104 is tightly held by the backboard 106 and the at least one stamped protrusion part 108. In addition, because the board 104 and the backboard 106 may not in fact be in complete contact, causing an air layer between them, and the heat conduction effect of air is very poor. Therefore, in order to reduce the chance of an air layer between the board 104 and the backboard 106, a thermally conductive material 116, such as thermally conductive glue or thermally conductive paste, is often added to reduce the air layer and thereby increase the heat conduction effect. Whether to add the conductive material 116 or to coat the entire surface depends entirely on actual needs. In FIG. 2, adding the conductive material 116 and coating the entire surface is taken as an example. In this case, not only can the board 104 be fastened onto the backboard 106, but the contact surface between the board 104 and the backboard 106 will also be intact and good due to the clamping force applied to the board 104 by the backboard 106 and the stamped protrusion part 108. Thus, as long as the welding between the LED light source 102 and the board 104 is good, the heat thus generated when light is emitted from the LED light source 102 will be quickly conducted to the backboard 106 through the board 104 and the conductive material 116 and then to the air, thereby achieving the purpose of sufficient heat dissipation. Furthermore, since the backboard 106 is processed by stamping when the stamped protrusion part 108 is made, the backboard 106 and the stamped protrusion part 108 are integrally formed. Therefore, as long as it is able

to tightly fasten the board 104, the stamped protrusion part 108 can be made on the outer edge of the backboard 106 as much as possible, without affecting the heat dissipation performance of the backboard 106 at all.

s

Please refer to FIG. 4, which is a top view of an LED light source assembly structure 200 in a backlight module according to a second embodiment of the present invention. As shown in FIG. 4, the LED light source assembly 200 of the present invention comprises at least one LED light source 202, one board 204 supporting the LED light source 202, and one backboard 206. The LED light source 202 is welded to the surface of the board 204. The board 204 and the backboard 206 are both made of metal materials so as to conduct the heat generated from the LED light source 202. The backboard 206 has at least one stamped protrusion part 208. The

stamped protrusion part 208 may have different specially designed shapes. Regardless of its shape, the gap between the at least one protrusion part 212 of the stamped protrusion part 208 and the backboard 206 is less than the thickness of the board 204. Furthermore, because the metal material of the backboard 206 itself is elastic, the board 204 can be detachably installed on the backboard 206, and at least one corner 214 of the board 204 is tightly held by the backboard 206 and the at least one stamped protrusion part 208.

In addition, because the board 204 and the backboard 206 may not in fact be in complete contact, causing an air layer between them, and the heat conduction effect of air is very poor. Therefore, in order to reduce the chance of an air layer between the board 204 and the backboard 206, a thermally conductive material 216, such as thermally conductive glue or thermally conductive paste, is often added to reduce the air layer and thereby increase the heat conduction effect. Whether to add the conductive material 216 or to coat the entire surface depends entirely on actual needs. In FIG. 4, adding the conductive material 216 and coating the entire surface is taken as an example. In this case, not only can the board 204 be fastened onto the backboard 206, but also the contact surface between the board 204 and the backboard 206 will be intact and good due to the clamping force applied to the board 204 by the backboard 206 and the stamped protrusion part 208. Thus, as long as the welding between the LED light source 202 and the board 204 is good, the heat thus generated when light is emitted from the LED light source 202 will be quickly conducted to the backboard 206 through the board 204 and the conductive material 216 and then to the air, thereby achieving the purpose of sufficient heat dissipation. In addition, other parts in this embodiment are the same as those in the first embodiment.

It is worth noting that the present invention can also concurrently use the stamped protrusion part and the backboard to tightly hold the sides and corners of the board to achieve the same purpose, and the number of boards installed on the backboard and the number of LED light sources installed on the board can be adjusted according to actual conditions without any special restrictions. In addition, the present invention can also use bolts, nuts, and stamped protrusion parts to fasten the board onto the backboard while at the same time achieving the purpose of reducing the number of bolts and nuts used. Please refer to FIG. 5, which is a cross-sectional view of an LED light source assembly structure 300 in a backlight module according to a third embodiment of the present invention. As shown in FIG. 5, the LED light source assembly structure 300 of the present invention comprises an LED light source 302, a board 304 supporting the LED light source 302, and a backboard 306. The LED light source 302 is welded to the surface of the board 304. The board 304 and the backboard 306 are both made of metal materials so as to conduct the heat generated from the LED light source 302. In order to reduce the chance of an air layer between the board 304 and the backboard 306, a thermally conductive material may be selectively added between the board 304 and the backboard 306, thereby increasing the heat conduction effect. FIG. 5 is an example in which no conductive material is added.

In addition to at least one stamped protrusion part 308, the backboard 306 also has at least one bolt hole 312. Therefore, the board 304 is not only tightly held by the backboard 306 and the stamped protrusion part 308, but is also fastened onto the backboard 306 by the bolt 314 and the nut 316. In this case, the contact surface between the board 304 and the backboard 306 will be intact and good due to the clamping force applied to the board 304 by the

backboard 306 and the stamped protrusion part 308 and the force when the bolt 314 is locked to the nut 316. Thus, as long as the welding between the LED light source 302 and the board 304 is good, the heat thus generated when light is emitted from the LED light source 302 will be quickly conducted to the backboard 306 through the board 304 and then to the air, thereby achieving the purpose of sufficient heat dissipation. Although some bolts and nuts are still used in this embodiment, since some of the bolts and nuts have been replaced by the stamped protrusion part, it effectively overcomes the problems of overly complicated assembly, increased cost, etc. due to too many bolts and nuts in the prior art. In addition, other parts in this embodiment are the same as those in the first embodiment.

Please refer to FIG. 6, which is a cross-sectional view of an LED light source assembly structure 330 in a backlight module according to a fourth embodiment of the present invention. As shown in FIG. 6, in the LED light source assembly structure 330 in the backlight module of the fourth embodiment of the present invention, the nut can also be replaced with a screw copper pillar 348 embedded in the backboard 336, which together with the clamping force applied to the board 334 by the stamped protrusion part 338, can fasten the board 334 onto the backboard 336. Please refer to FIG. 7, which is a cross-sectional view of an LED light source assembly structure 360 in a backlight module according to a fifth embodiment of the present invention. As shown in FIG. 7, the LED light source assembly structure 360 of the

present invention may also use rivets 378, which together with the clamping force applied to the board 364 by the stamped protrusion part 368, can fasten the board 364 onto the backboard 366.

Please refer to FIG. 8, which is an operational view of the LED light source assembly structure in the backlight module of the present invention when applied to an LCD 400. As shown in FIG. 8, the LCD 400 comprises a backlight module 402 and an LCD panel 404 disposed thereon. The backlight module 402 comprises not only an LED light source assembly structure 406 but also at least one light guide plate 408. The LED light source assembly structure 406 can be any LED light source assembly structure disclosed in the present invention. The light emitted from the LED light source assembly 406 is emitted into the light guide plate 408 and then through an optical mechanism (not shown) inside the light guide plate 408 to become a uniform surface light source, and then directed to the LCD panel 404 before finally producing an image after continuous refraction of the liquid crystal molecules 412 in the LCD panel 404.

Because the LED light source assembly structure of the backlight module of the present invention utilizes the clamping force applied to the board by the backboard and the protrusion part to tightly fasten the board onto the backboard, the contact surface between the board and the backboard is intact and good. Thus, as long as the welding between the LED light source and the board is good, the heat thus generated when light is emitted from the LED light source will be quickly conducted to the backboard through the board and then to the air, thereby

achieving the purpose of sufficient heat dissipation. When the LED light source assembly structure of the backlight module of the present invention is applied to an actual production line, a product that meets the heat dissipation specification, is easy to assemble, and is low in cost can be made.

Compared with the LED light source assembly structure of the backlight module in the prior art, the LED light source assembly structure of the backlight module of the present invention has a gap between at least one protrusion part of the backboard and the backboard that is less than the thickness of the board. Additionally, because the material of the backboard itself is elastic, the board can be detachably installed on the backboard, while at least one corner or at least one side of the board is tightly held by the backboard and the at least one protrusion part. By utilizing the clamping force applied to the board by the backboard and the protrusion part, the board can not only be tightly held onto the backboard, but the contact surface between the board and the backboard will also be intact and good. Thus, as long as the welding between the LED light source and the board is good, the heat thus generated when light is emitted from the LED light source will be quickly conducted to the backboard through the board and then to the air, thereby achieving the purpose of sufficient heat dissipation. At the same time, since the LED light source assembly structure of the present invention completely eliminates or partially eliminates the use of bolts, the assembly will not be too complicated, thereby avoiding the problem of increasing costs.

The above are merely preferred embodiments of the present invention. All equivalent changes and modifications made according to the claims of the present invention should fall within the patent scope of the present invention.

[Brief Description of Figures]

FIG. 1 is a cross-sectional view of an LED light source assembly structure in a backlight module according to the prior art.

FIG. 2 is a cross-sectional view of an LED light source assembly structure in a backlight module according to a first embodiment of the present invention.

FIG. 3 is a top view of the LED light source assembly structure in the backlight module of FIG. 2.

FIG. 4 is a top view of an LED light source assembly structure in a backlight module according to a second embodiment of the present invention.

FIG. 5 is a cross-sectional view of an LED light source assembly structure in a backlight module according to a third embodiment of the present invention.

FIG. 6 is a cross-sectional view of an LED light source assembly structure in a backlight module according to a fourth embodiment of the present invention.

FIG. 7 is a cross-sectional view of an LED light source assembly structure in a backlight module according to a fifth embodiment of the present invention.

FIG. 8 is an operational view of the LED light source assembly structure in the backlight module of the present invention when applied to an LCD.

[Description of the Main Component Symbols]

10, 100, 200, 300, 406, 330, 360 LED light source assembly structure

12, 102, 202, 302		LED light source	
14		Metal board	
16, 106, 206, 306, 336, 366		Backboard	
18, 314		Bolt	
22, 316		Nut	
104, 204, 304, 334, 364		Board	
108, 208, 308, 338, 368		Stamped protrusion part	
112, 212		Protrusion part	
114	Side	214	Corner
116, 216	Conductive material	312	Bolt hole
348	Screw copper pillar	378	Rivet
400	LCD	402	Backlight module
404	LCD panel	408	Light guide plate
412	Liquid crystal molecules		

X. Claims:

1. A light source assembly structure of a backlight module, comprising:
at least one light source assembly, the light source assembly having at least one light-emitting device and one board; and
a backboard having at least one first protrusion part;
wherein the board is detachably installed on the backboard and the board is tightly held by the backboard and the first protrusion part.
2. The light source assembly structure according to Claim 1, wherein the light-emitting device is an LED.
3. The light source assembly structure according to Claim 1, wherein the material of the board comprises aluminum, copper, aluminum alloy, or copper alloy.
4. The light source assembly structure according to Claim 1, wherein at least one side of the board is tightly held by the backboard and the first protrusion part.
5. The light source assembly structure according to Claim 1, wherein at least one edge of the board is tightly held by the backboard and the first protrusion part.
6. The light source assembly structure according to Claim 1, wherein the gap between the at least one second protrusion part of the first protrusion part and the board is less than the thickness of the backboard.

7. The light source assembly structure according to Claim 1, wherein the light source assembly structure further comprises at least one fastening mechanism for tightly locking the board to the backboard.
8. The light source assembly structure according to Claim 7, wherein the fastening mechanism comprises a bolt, a rivet, a nut, or a screw copper pillar.
9. The light source assembly structure according to Claim 1, wherein the material of the backboard comprises stainless steel, aluminum, aluminum alloy, or galvanized steel plate.
10. The light source assembly structure according to Claim 1, wherein the light-emitting device is welded onto the board.
11. The light source assembly structure according to Claim 1, wherein the backlight module further comprises at least one light guide plate for guiding the light emitted from the light-emitting device to an LCD panel.
12. The light source assembly structure according to Claim 1, wherein there is a thermally conductive component between the board and the backboard.
13. The light source assembly structure according to Claim 12, wherein the thermally conductive component comprises thermally conductive paste or thermally conductive glue.

14. The light source assembly structure according to Claim 1, wherein the first protrusion part is formed by a stamping process.
15. The light source assembly structure according to Claim 1, wherein the backboard and the first protrusion part are integrally formed.
16. An LCD, comprising:
- an LCD panel; and
 - a light source assembly structure disposed under the LCD panel, the light source assembly structure comprising:
 - at least one light source assembly, the light source assembly having at least one light-emitting device and one board; and
 - one backboard having at least one protrusion part;Wherein the board is detachably installed on the backboard and the board is tightly held by the backboard and the protrusion part.
17. The LCD according to Claim 16, wherein there is a thermally conductive component between the board and the backboard.
18. The LCD according to Claim 16, wherein the protrusion part is formed by a stamping process.

19. The LCD according to Claim 16, wherein the backboard and the protrusion part are integrally formed.

XI. Figures:

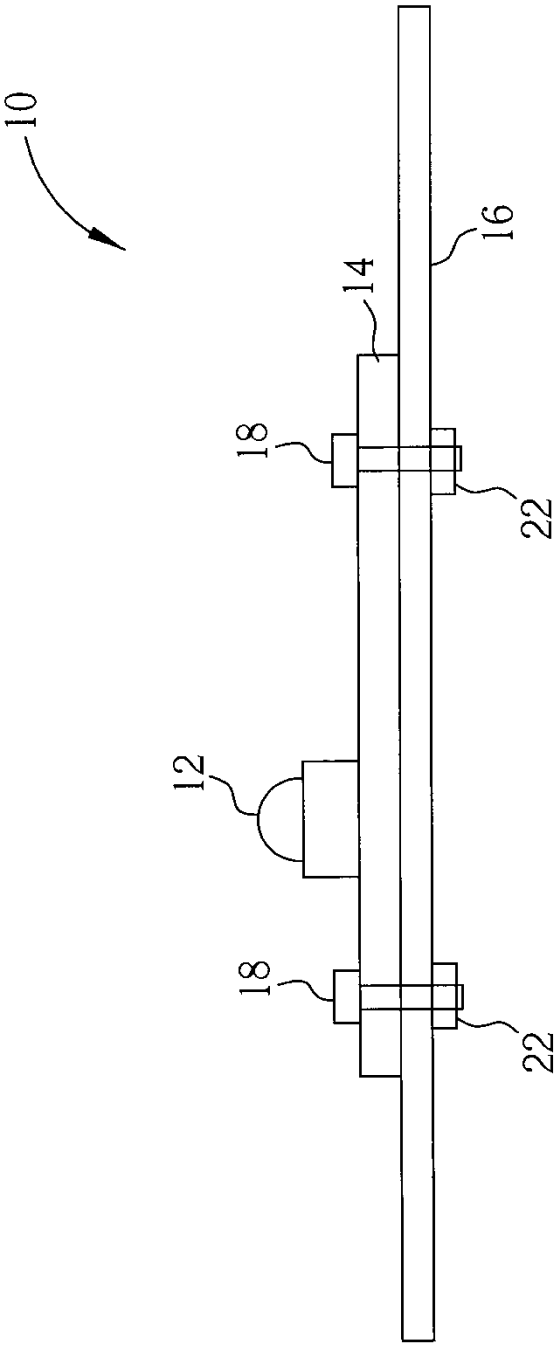


FIG. 1

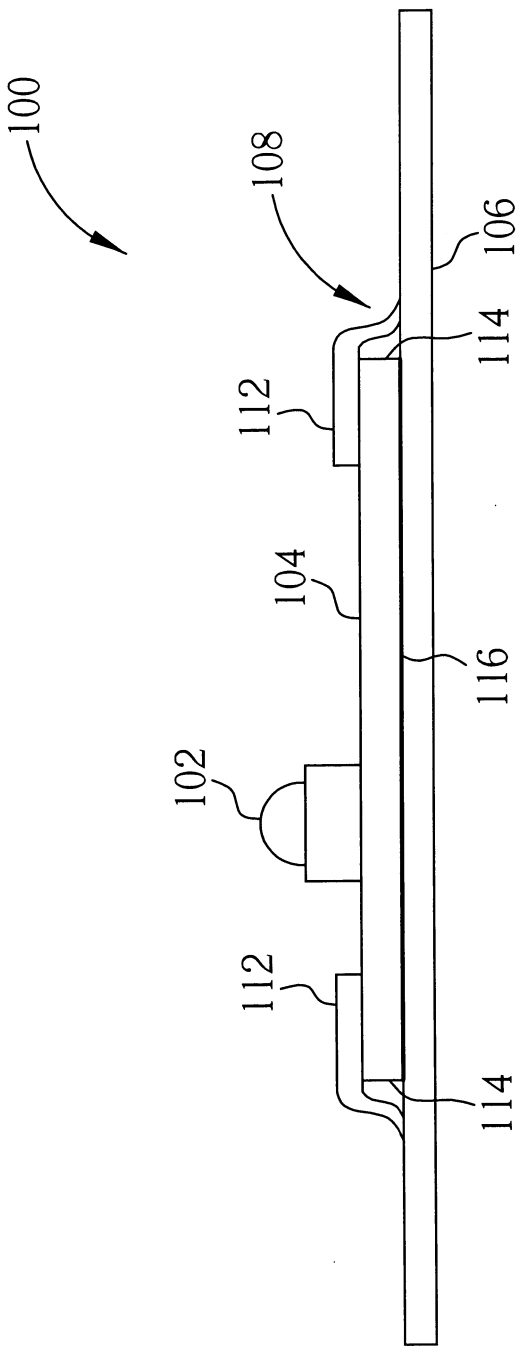


FIG. 2

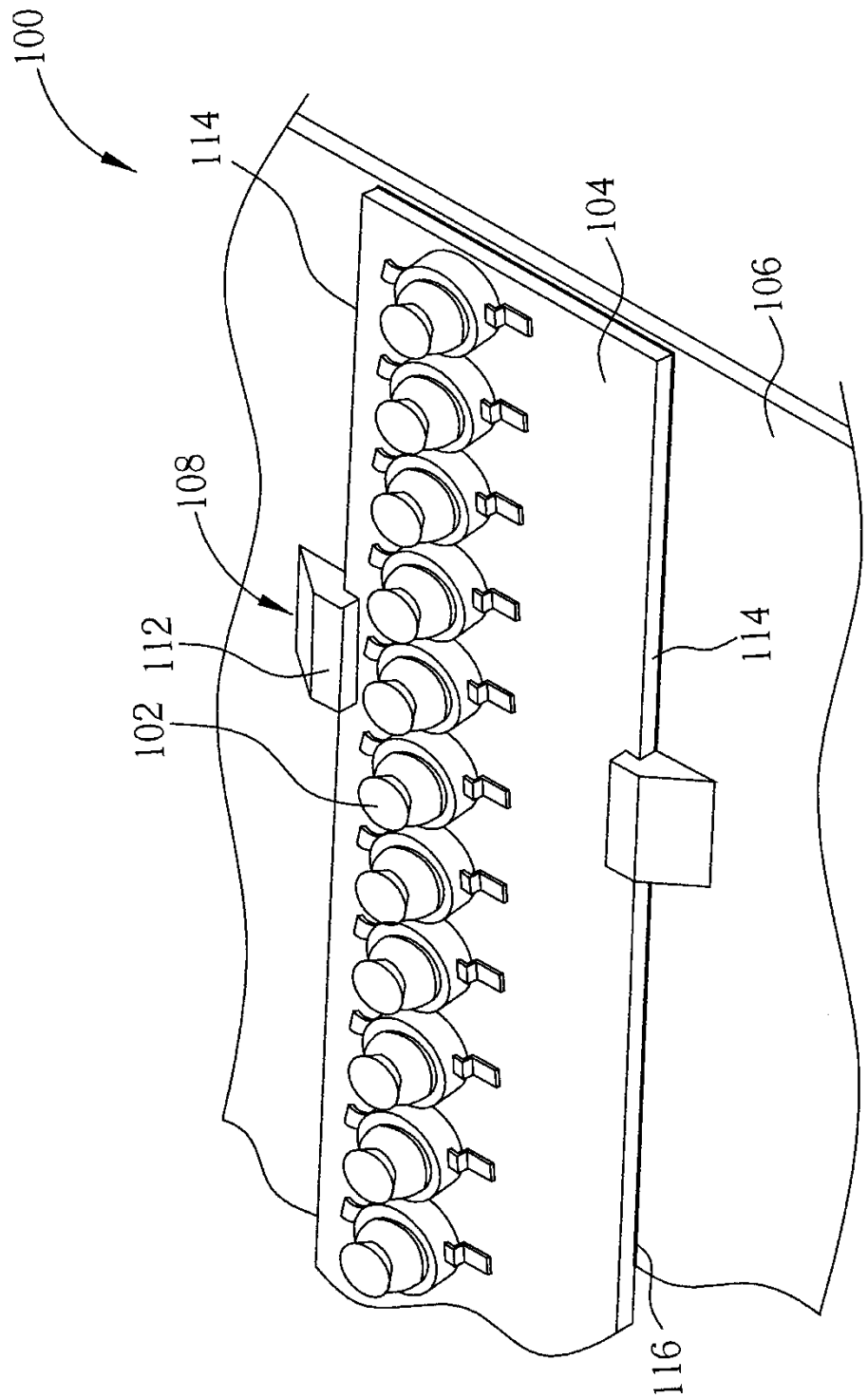


FIG. 3

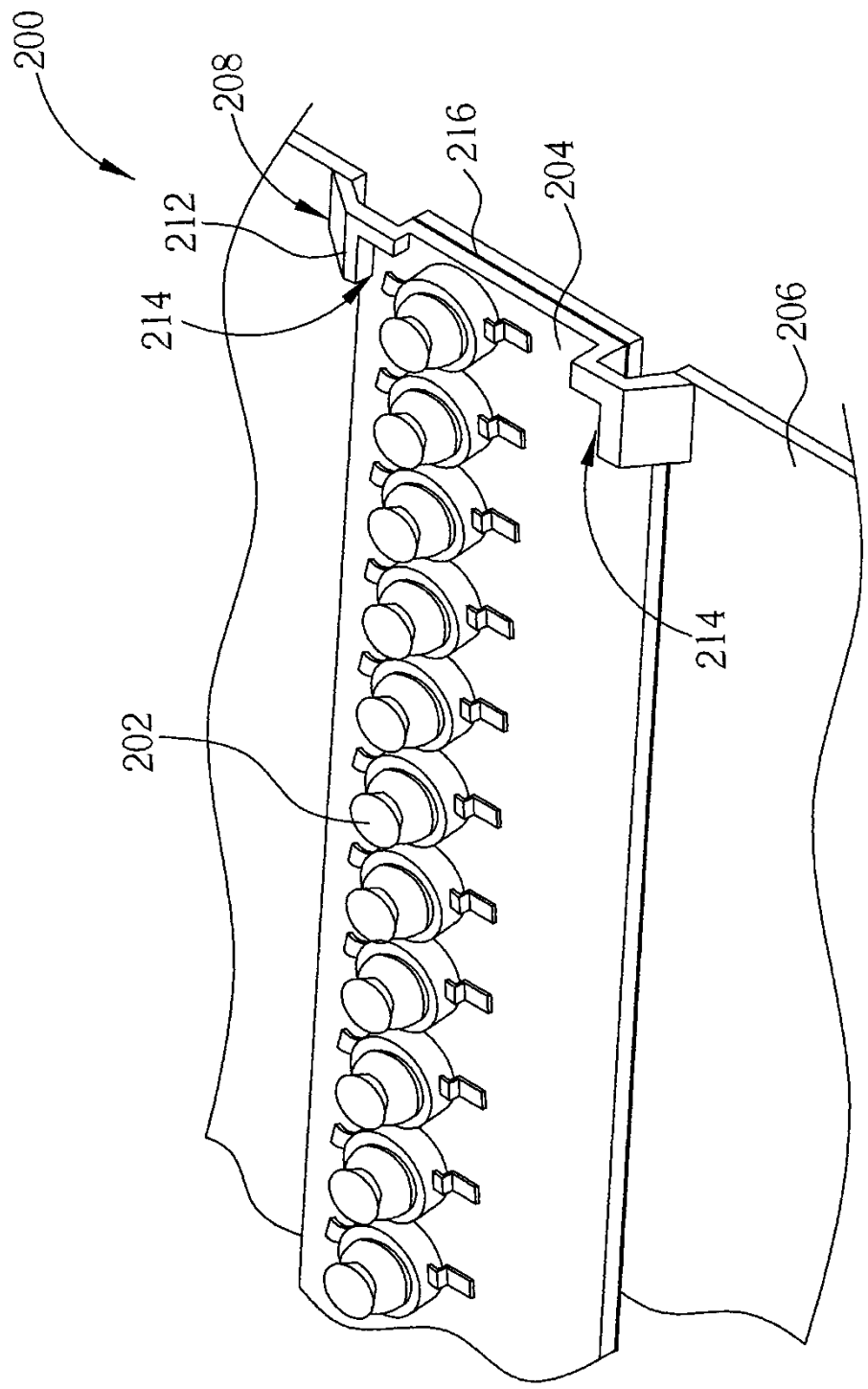


FIG. 4

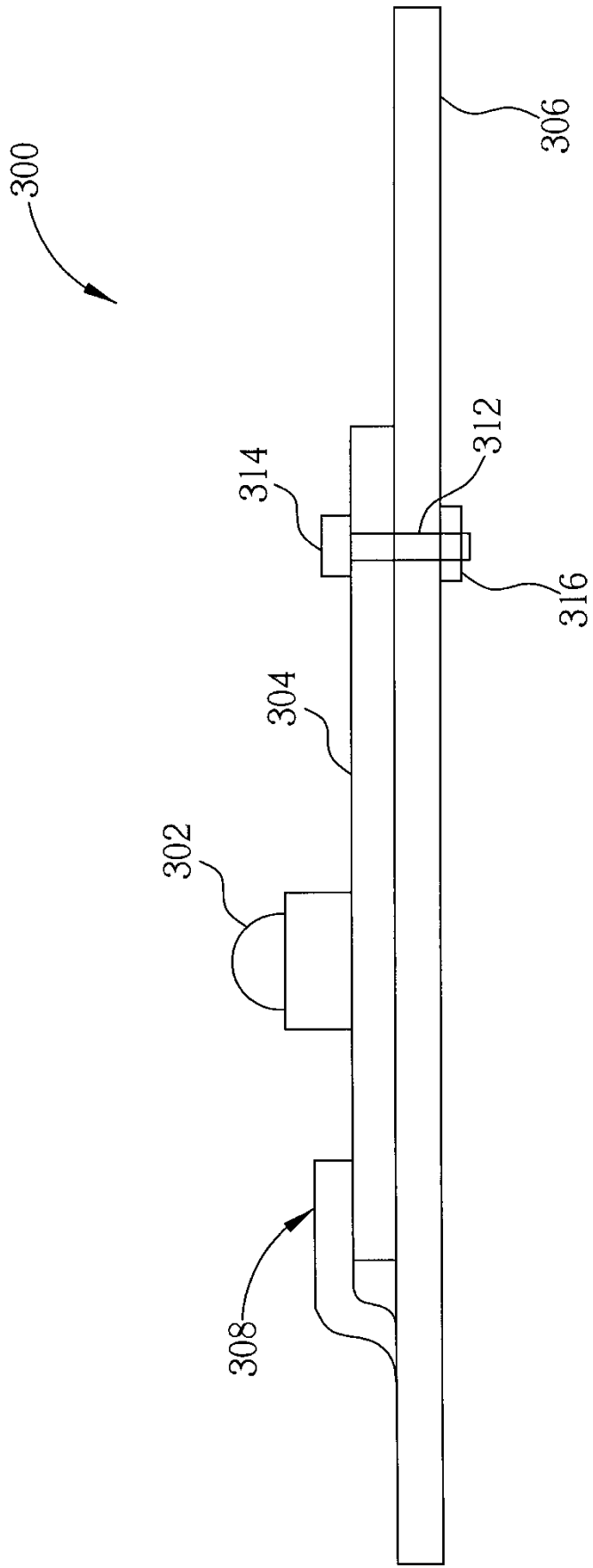


FIG. 5

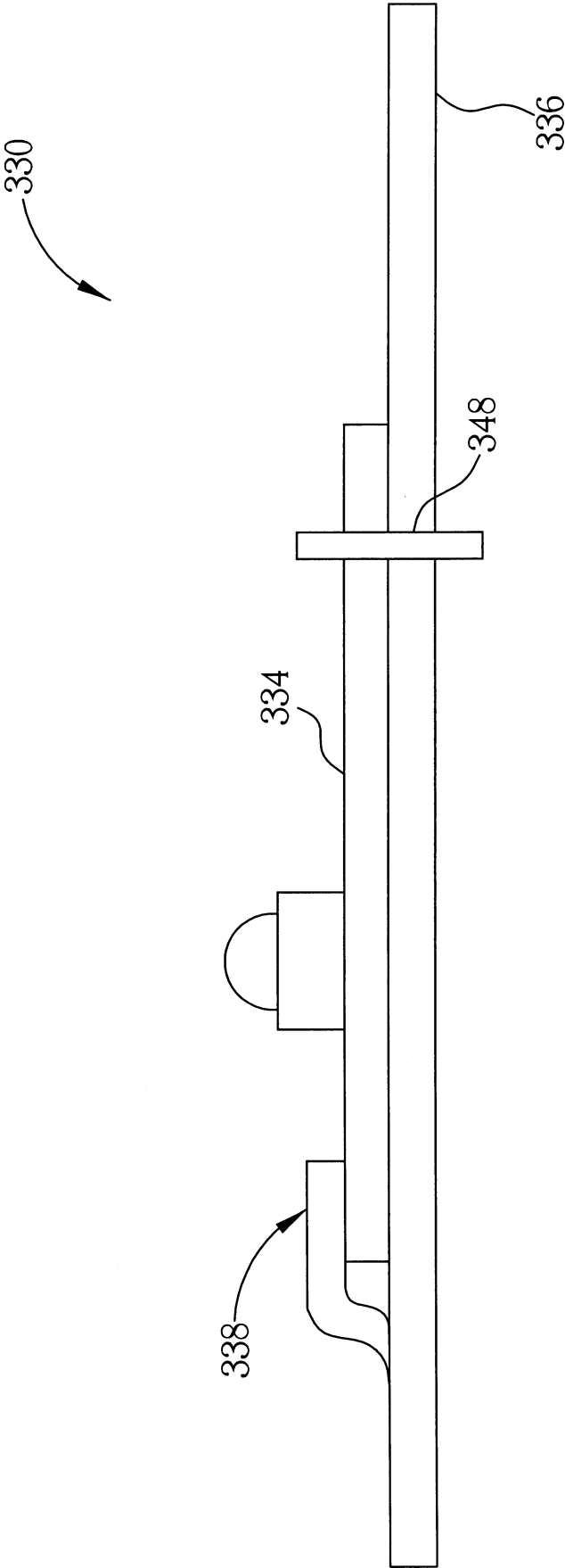


FIG. 6

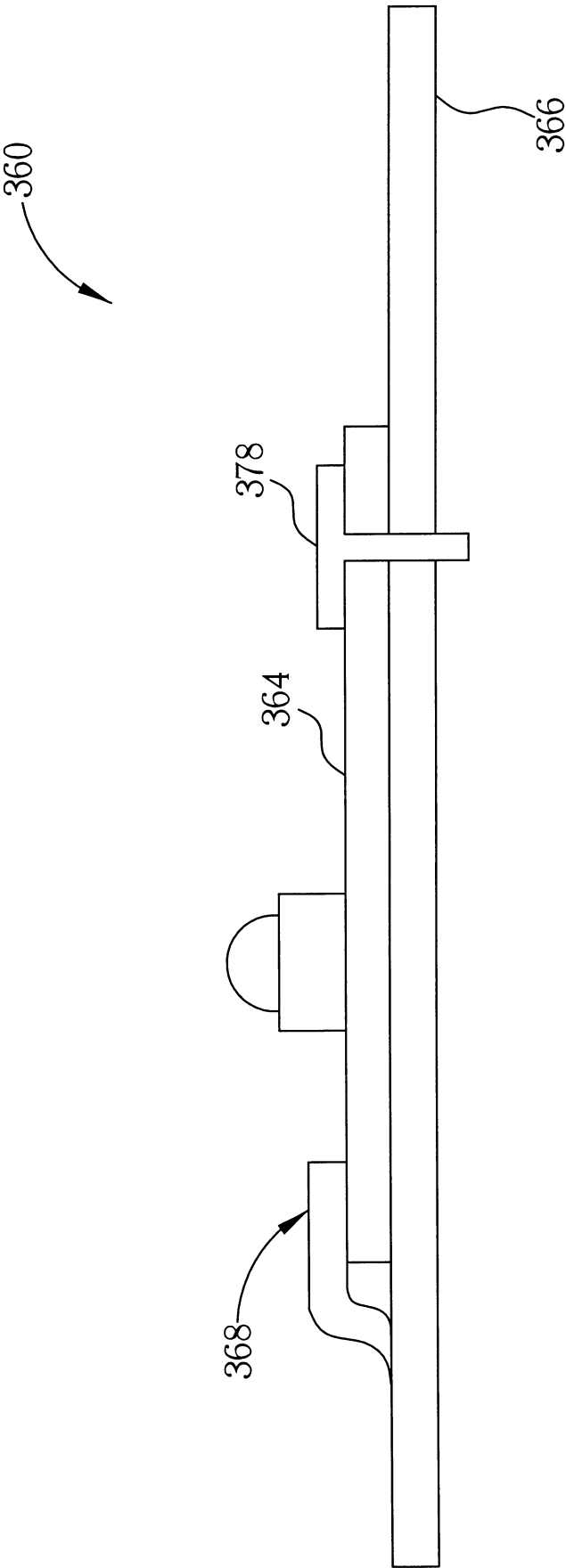


FIG. 7

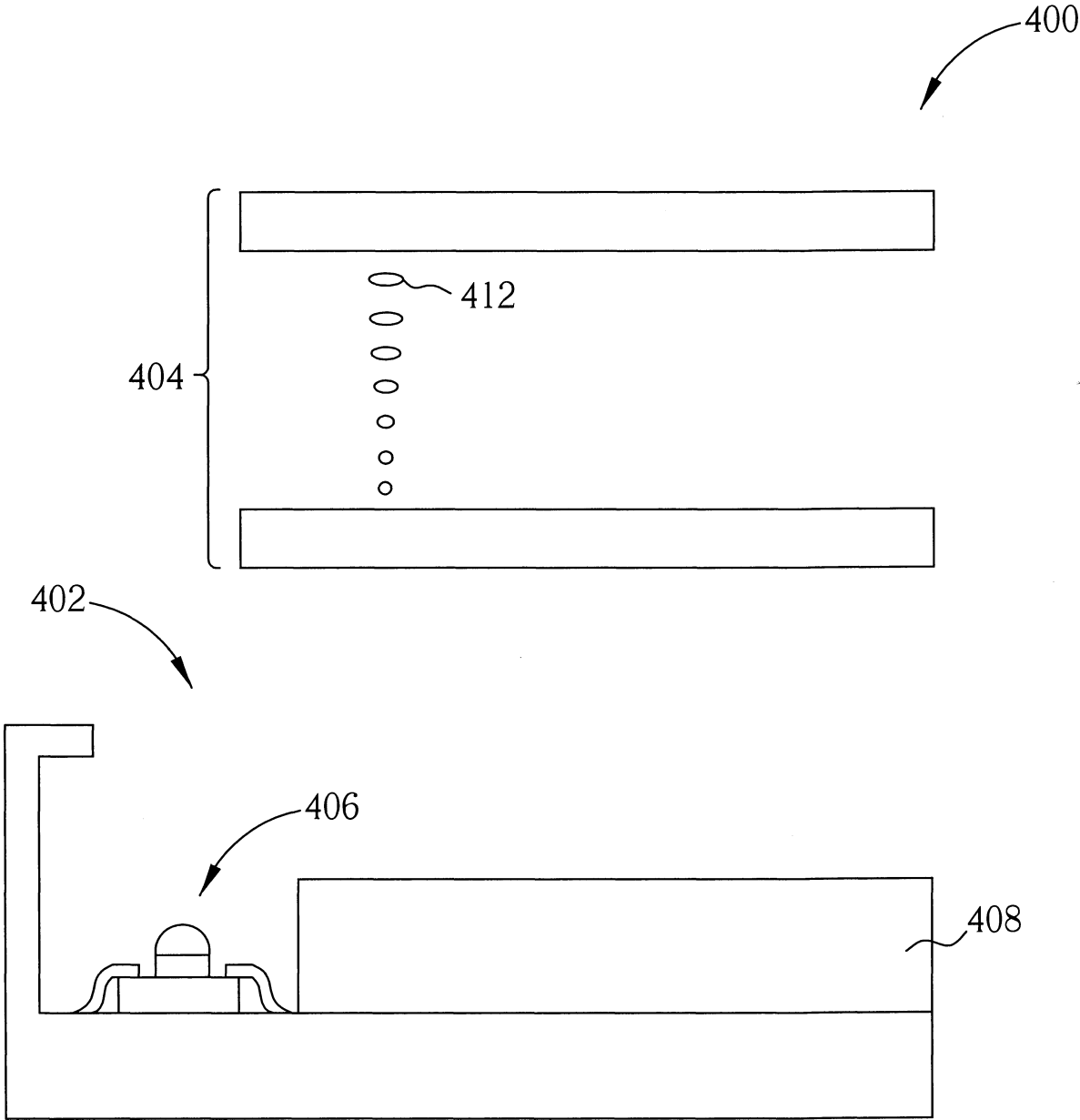


FIG. 8

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD**

Affidavit of Jason Lesowitz

I, Jason Lesowitz, hereby declare are follows:

1. I am a citizen of the United States of America and I am over 18 years of age. I have personal knowledge of the matters stated in this affidavit, all of which are true and correct.

2. I am a freelance Translator for TransPerfect Translations.

3. I submit this declaration to certify the accuracy of the translation I performed relating to D1-TWI248538B (hereinafter “D1-TWI248538B”).

4. I am qualified to translate Chinese technical documents into English, including translating Chinese patent documents into English. My qualifications include 14 years of experience as a Chinese-to-English translator of academic and technical documents including patent documents. I am a native speaker of English and I have passed the Master Level of the Test of Chinese as a Foreign Language.

5. Attached as **EX1007** is a true and accurate copy of D1-TWI248538B.

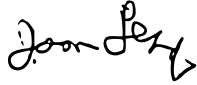
6. Attached as **EX1003** is a true and accurate copy of an English translation of D1-TWI248538B, which I prepared based on **EX1007** and my personal knowledge of the Chinese and English languages.

7. I understand that by submitting this declaration I may be called to testify about the facts contained in this affidavit and/or my translation of D1-TWI248538B, and I agree to make myself available to testify at a reasonable location and time.

8. I hereby declare that all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful

false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code.

Date: June 11, 2025

By: 

Jason Lesowitz