



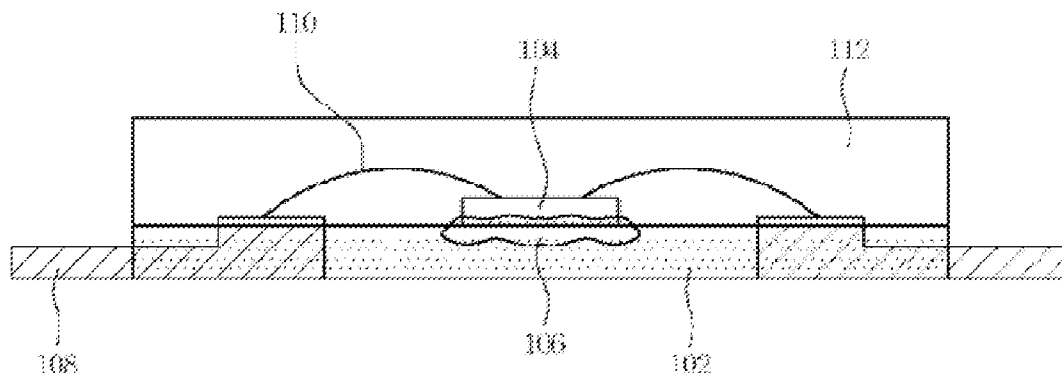
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**Tsai et al.**(10) **Pub. No.: US 2011/0266589 A1**(43) **Pub. Date: Nov. 3, 2011**(54) **LIGHT EMITTING DIODE PACKAGE  
STRUCTURE AND MANUFACTURING  
METHOD THEREFOR**(30) **Foreign Application Priority Data**

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LTD.**, Shanghai (CN)(57) **ABSTRACT**

A light emitting diode (LED) package and a manufacturing method therefor are disclosed. In one aspect, a manufacturing method of a light emitting diode package may: heat a first light transmission insulation material to cause the first light transmission insulation material to become a sticky member; connect a lead frame to the sticky member; perform a chip-bonding step that bonds at least one light-emitting diode chip on the sticky member using a light transmission glue; encapsulate the at least one light-emitting diode chip with a second light transmission insulation material; and perform a drying step that forms the sticky member and the second light transmission insulation material into shape.

(21) Appl. No.: **13/183,439**(22) Filed: **Jul. 15, 2011****Related U.S. Application Data**(63) Continuation of application No. 12/398,174, filed on  
Mar. 4, 2009, now Pat. No. 8,008,100.

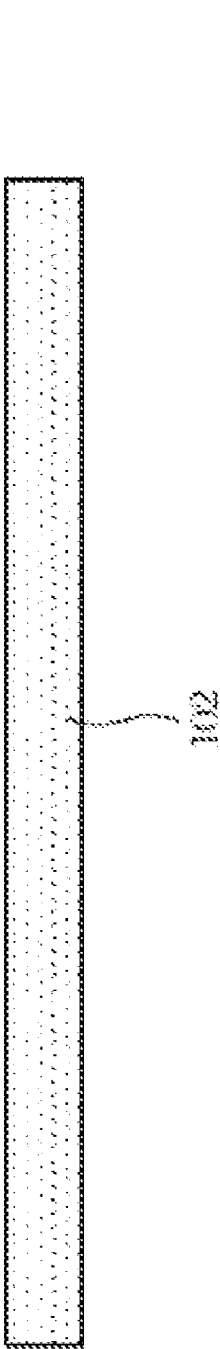


Fig. 1A

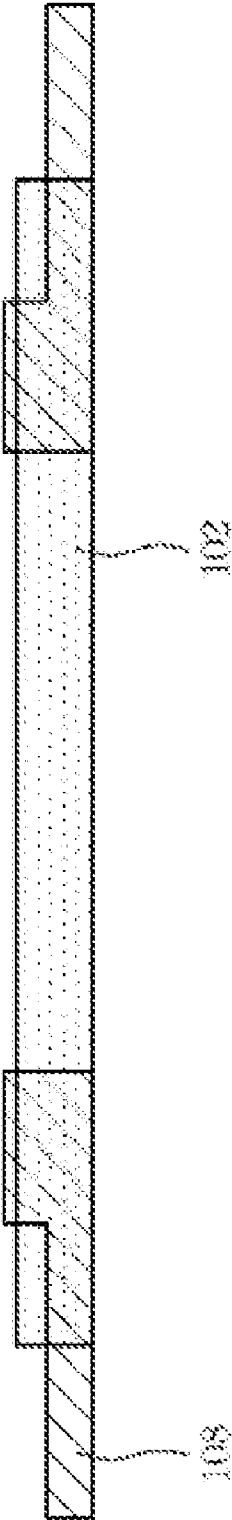


Fig. 1B

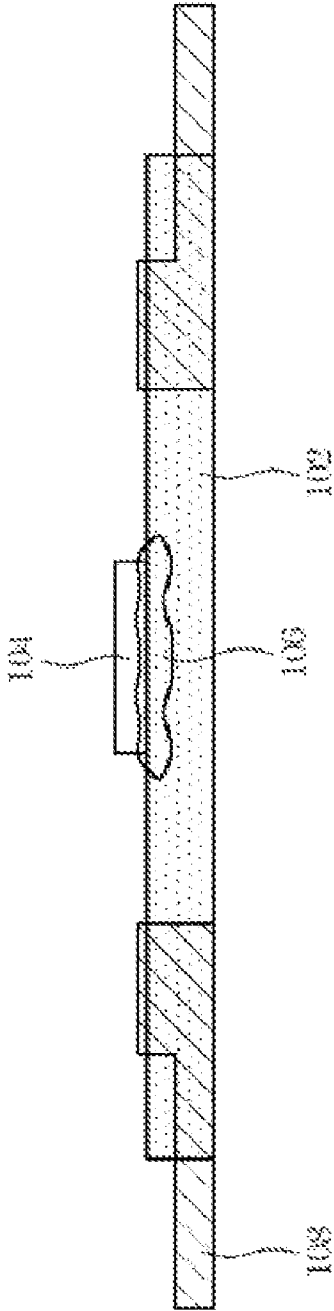


Fig. 1C

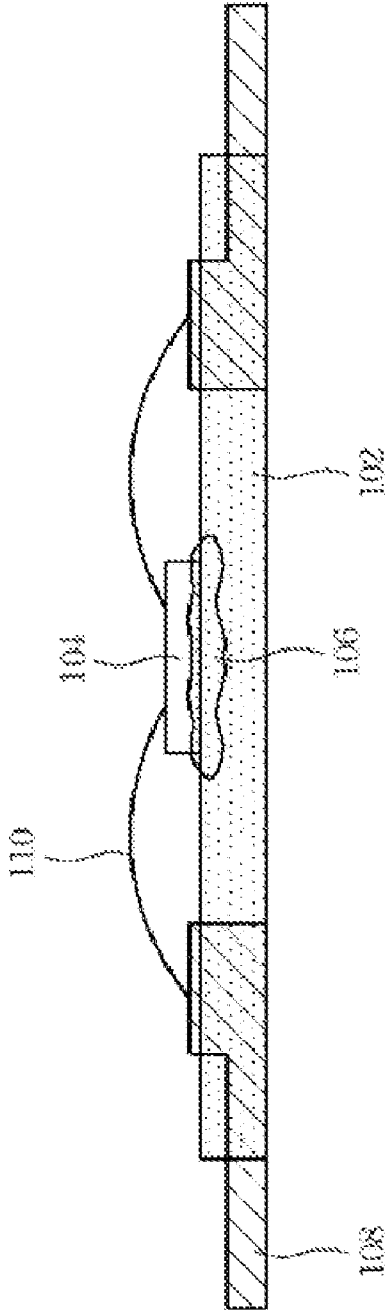


Fig. 1D

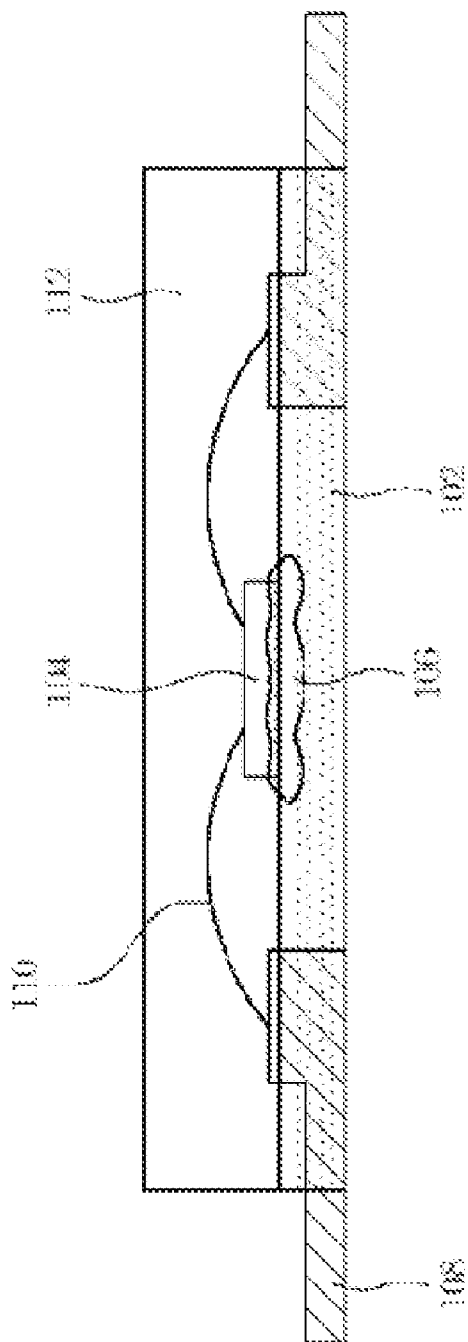


Fig. 1E

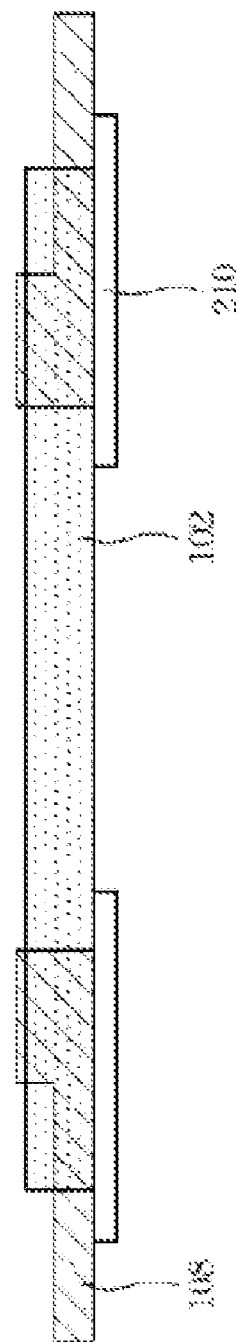


Fig. 1F

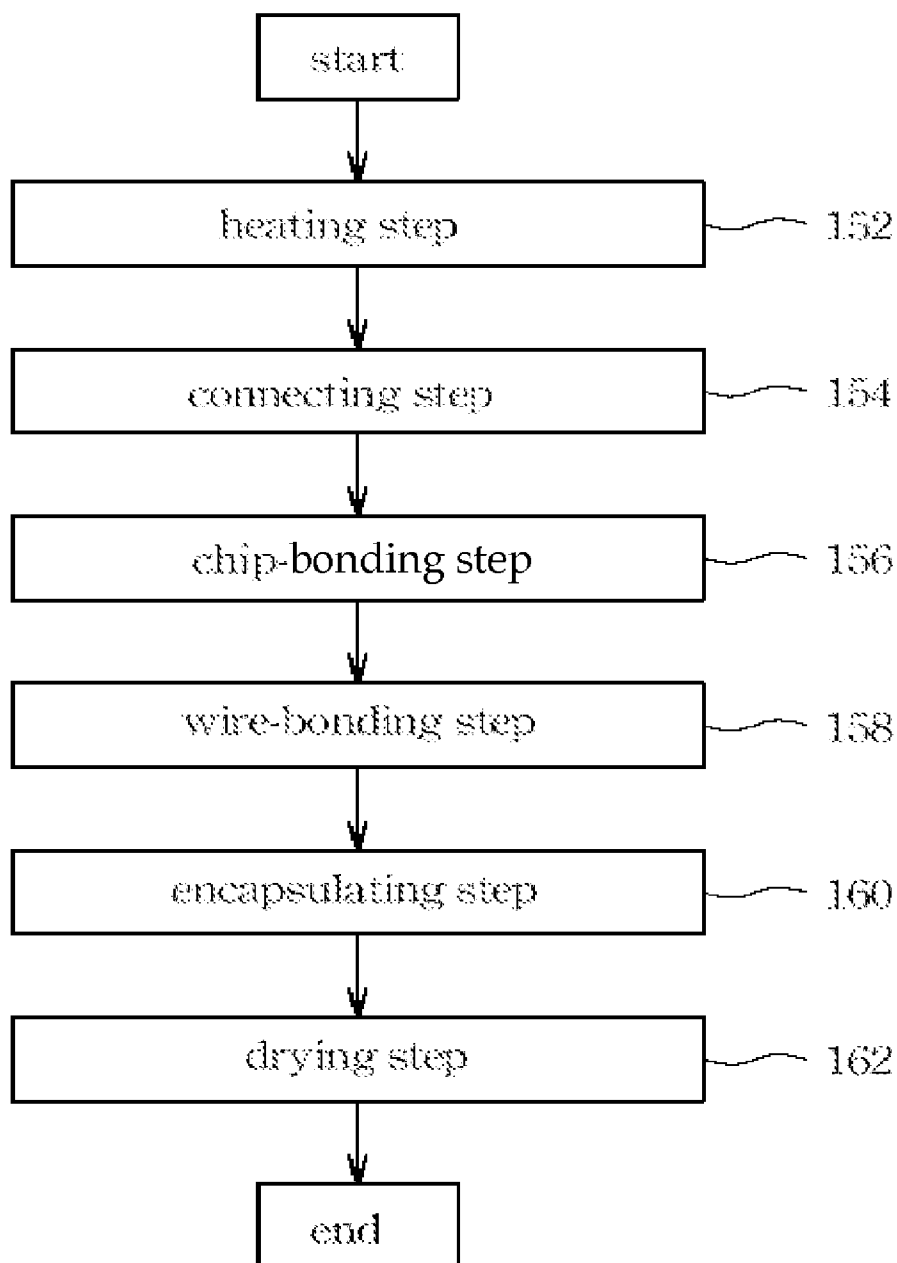
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Fig. 2

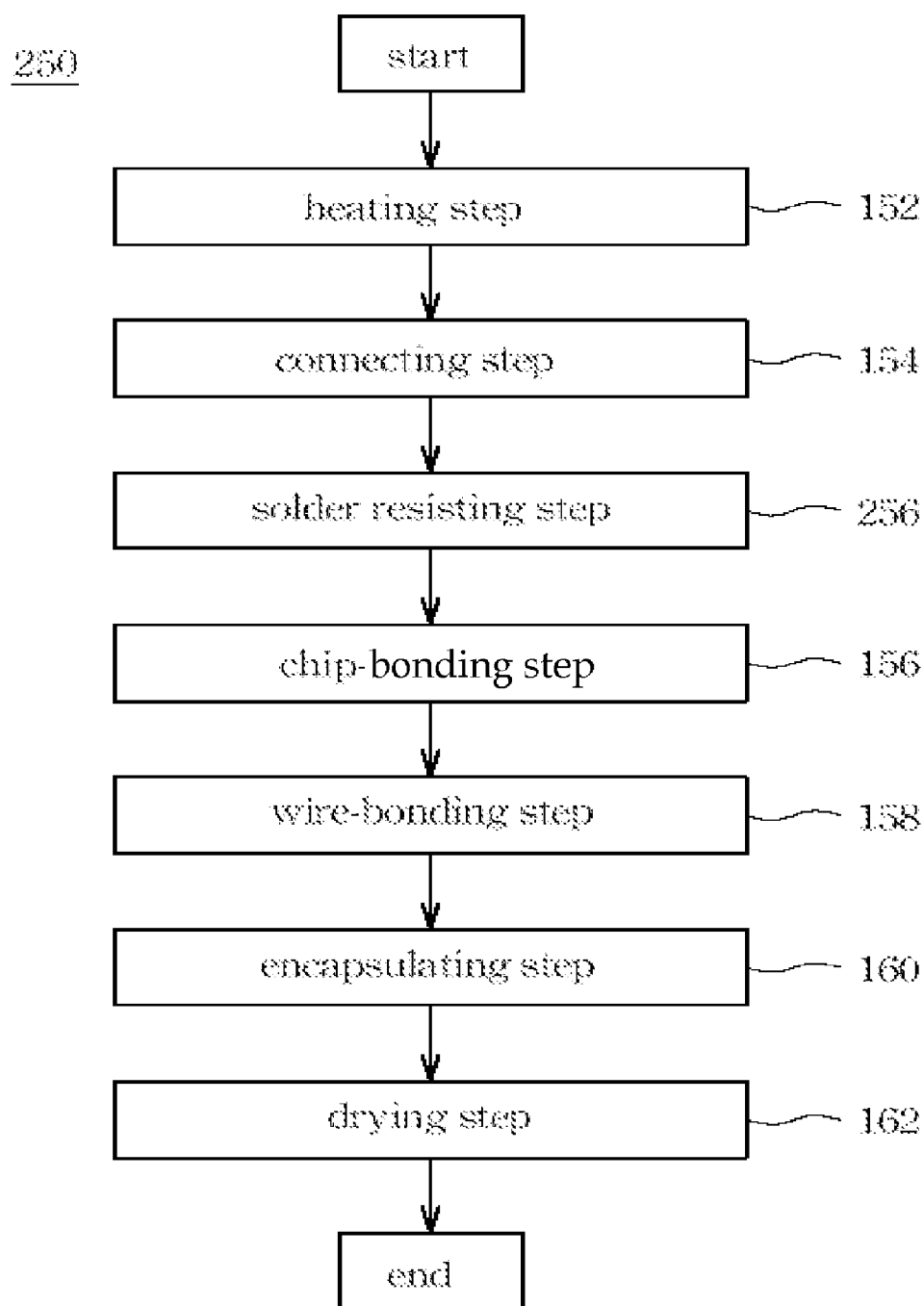


Fig. 3

# **LIGHT EMITTING DIODE PACKAGE STRUCTURE AND MANUFACTURING METHOD THEREFOR**

## **CROSS-REFERENCE TO RELATED PATENT APPLICATIONS**

**[0001]** This application claims priority to U.S. patent application Ser. No. 12/398,174, filed on Mar. 4, 2009, which claims priority to Taiwan Patent Application Number 097107548, filed on Mar. 4, 2008. These patent applications are herein incorporated in their entirety by reference.

## **BACKGROUND**

**[0002]** 1. Technical Field

**[0003]** The present disclosure relates to a light emitting diode (LED) package structure and a manufacturing method therefor, and more particularly, to a transparent LED package structure and a manufacturing method therefor.

**[0004]** 2. Description of Related Art

**[0005]** With the advance of science and technologies, various types of advertising signboards are developed, and LED advertising signboards are one type of the most popular advertising signboards. In general, advertising signboards are mounted on elevated and noticeable areas or people-crowded areas, and thus the advertising signboards are often mounted on the glass curtain walls of high-rise buildings. However, since an LED advertising signboard is generally composed of a plurality of LED units through which very little light is allowed to pass, the LED advertising signboard will block the ambient light passing through a glass curtain wall of a building when being mounted on the glass curtain wall. As a result, ambient light cannot easily enter the building from the outside.

## **SUMMARY**

**[0006]** An objective of the present disclosure is to provide a transparent LED package structure and a manufacturing method therefor, thereby overcoming the aforementioned problems.

**[0007]** In one aspect, a manufacturing method of a light emitting diode package may: heat a first light transmission insulation material to cause the first light transmission insulation material to become a sticky member; connect a lead frame to the sticky member; perform a chip-bonding step that bonds at least one light-emitting diode chip on the sticky member using a light transmission glue; encapsulate the at least one light-emitting diode chip with a second light transmission insulation material; and perform a drying step that forms the sticky member and the second light transmission insulation material into shape.

**[0008]** In one embodiment, the first light transmission insulation material may comprise transparent epoxy or silicone.

**[0009]** In another embodiment, the second light transmission insulation material may comprise transparent epoxy or silicone.

**[0010]** In yet another embodiment, the second light transmission insulation material and the first light transmission insulation material may be formed from the same transparent material.

**[0011]** In one embodiment, the manufacturing method may further perform a solder resisting step that coats a solder mask on a bottom side of the lead frame.

**[0012]** In another embodiment, the manufacturing method may further perform a wire-bonding step or a bump-bonding step that electrically connects the at least one light-emitting diode chip to the lead frame.

**[0013]** In another aspect, a manufacturing method of a light emitting diode package may: heat a first light transmission insulation material to cause the first light transmission insulation material to become a sticky member; connect a lead frame to the sticky member; perform a solder resisting step that coats a solder mask on a bottom side of the lead frame; and perform a chip-bonding step that bonds at least one light-emitting diode chip on the sticky member using a light transmission glue.

**[0014]** In one embodiment, the first light transmission insulation material may transparent epoxy or silicone.

**[0015]** In another embodiment, the manufacturing method may further encapsulate the at least one light-emitting diode chip with a second light transmission insulation material.

**[0016]** In another embodiment, the second light transmission insulation material may comprise transparent epoxy or silicone.

**[0017]** In still another embodiment, the second light transmission insulation material and the first light transmission insulation material may be formed from the same transparent material.

**[0018]** In one embodiment, the manufacturing method may further perform a wire-bonding step or a bump-bonding step that electrically connects the at least one light-emitting diode chip to the lead frame.

**[0019]** In still another embodiment, the manufacturing method may perform a drying step that forms the sticky member and the second light transmission insulation material into shape.

**[0020]** In yet another aspect, a light emitting diode package may comprise: a light transmission substrate having a central portion and a peripheral portion surrounding the central portion; at least one light-emitting diode chip disposed on the central portion of the light transmission substrate; a lead frame connecting the peripheral portion of the light transmission substrate, wherein the lead frame is electrically connected to the light-emitting diode chip; and an encapsulant disposed on the light transparent substrate, wherein the encapsulant covers the at least one light-emitting diode chip and the lead frame.

**[0021]** In one embodiment, the light transmission substrate may comprise transparent epoxy or silicone.

**[0022]** In one embodiment, the encapsulant may comprise transparent epoxy or silicone.

**[0023]** In another embodiment, the encapsulant and the light transmission substrate may be formed from the same material.

**[0024]** In one embodiment, the light emitting diode package may further comprise a light transmission glue that bonds the at least one light-emitting diode chip on the light transmission substrate.

**[0025]** In another embodiment, the light emitting diode package may further comprise a plurality of conducting wires or bumps electrically connecting the at least one light-emitting diode chip to the lead frame.

**[0026]** In yet another embodiment, the light emitting diode package may further comprise a solder mask coated on a first side of the lead frame opposite from a second side of the lead

frame that is on a same side of the light transmission substrate as the at least one light-emitting diode chip.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0027] The foregoing aspects and many of the attendant advantages of this present disclosure will become more readily appreciated as the same becomes better understood by reference to the following detailed description, when taken in conjunction with the accompanying drawings.

[0028] FIGS. 1A-1F are cross sectional schematic diagrams showing a flow process for manufacturing a transparent LED package structure according to a first embodiment of the present disclosure.

[0029] FIG. 2 is a schematic flowchart showing the manufacturing method according to the first embodiment of the present disclosure.

[0030] FIG. 3 is a schematic flow chart showing a manufacturing method according to a second embodiment of the present disclosure.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0031] In order to make the illustration of the present disclosure more explicit and complete, the following description is stated with reference to FIG. 1A through FIG. 3.

##### First Embodiment

[0032] FIG. 1A to FIG. 1E are cross sectional schematic diagrams showing a manufacturing method of an LED package structure according to a first embodiment of the present disclosure. FIG. 2 is a schematic flowchart showing the manufacturing method according to the first embodiment of the present disclosure. Referring to FIGS. 1A and 2, in the manufacturing method 150, a heating step 152 is first performed to heat a first transparent plastic material to cause it to become a sticky member 102, and the sticky member 102 is used as a substrate in the transparent LED package. In this embodiment, epoxy or silicone material is placed on a processing stage to form a board, and then the board is heated. It is noted that the sticky member 102 is transparent. A connecting step 154 is then performed in which a lead frame 108 is placed on the sticky member 102 so as to be connected with the sticky member 102, as shown in FIG. 1B and FIG. 2. Thereafter, a chip-bonding step 156 is performed in which transparent chip-bonding glue 106 is used to bond a transparent LED 104 on the sticky member 102, as shown in FIG. 1D and FIG. 2. A wire-bonding step 158 is then performed to electrically connect the lead frame 108 to the transparent LED 104 via a plurality of conducting wires 110, as shown in FIG. 1D and FIG. 2. Thereafter, an encapsulating step 160 is performed in which a second transparent plastic material 112 is used to encapsulate the transparent LED 104 to increase the brightness of the transparent LED 104, as shown in FIG. 1E and FIG. 2. A drying step 162 is then performed in which the sticky member 102 and the second transparent plastic material 112 are dried to form a transparent substrate and an encapsulant, as shown in FIG. 1E and FIG. 2.

[0033] In the structure of the transparent LED package according to the first embodiment of the present disclosure, the area occupied by the lead frame 108 is very small, so that the LED package can be a transparent structure. In addition, when the material of the second transparent plastic material 112 is the same as that of the first transparent plastic material,

the drying step 162 can be simplified, and the manufacturing method can be speeded up thereby.

##### Second Embodiment

[0034] FIG. 3 is a schematic flow chart showing a manufacturing method according to a second embodiment of the present disclosure. The manufacturing method 250 is similar to the manufacturing method 150, but the difference is that the manufacturing method 250 further comprises a solder resisting step 256. Referring to FIG. 1F, FIG. 1F is a cross section diagram showing a transparent LED package structure in the solder resisting step 256. In the solder resisting step 256, a solder mask 210 is coated on the bottom side of the lead frame 108 to prevent defects from being produced in a soldering step. The solder resisting step 256 may be performed to connect the transparent LED package to an electronic device. In addition, the solder resisting step 256 is performed between the connecting step 154 and the chip-bonding step 156 in this embodiment. However, the sequence for performing the solder resisting step 256 in the manufacturing method 250 is not limited thereto.

[0035] As is understood by a person skilled in the art, the foregoing embodiments of the present disclosure are strengths of the present disclosure rather than limiting of the present disclosure. It is intended to encapsulate various modifications and similar arrangements included within the spirit and scope of the appended claims, the scope of which should be accorded the broadest interpretation so as to encompass all such modifications and similar structures.

What is claimed is:

1. A manufacturing method of a light emitting diode package, comprising:

heating a first light transmission insulation material to cause the first light transmission insulation material to become a sticky member;

connecting a lead frame to the sticky member;

performing a chip-bonding step that bonds at least one light-emitting diode chip on the sticky member using a light transmission glue;

encapsulating the at least one light-emitting diode chip with a second light transmission insulation material; and performing a drying step that forms the sticky member and the second light transmission insulation material into shape.

2. The manufacturing method as recited in claim 1, wherein the first light transmission insulation material comprises transparent epoxy or silicone.

3. The manufacturing method as recited in claim 1, wherein the second light transmission insulation material comprises transparent epoxy or silicone.

4. The manufacturing method as recited in claim 1, wherein the second light transmission insulation material and the first light transmission insulation material are formed from the same transparent material.

5. The manufacturing method as recited in claim 1, further comprising:

performing a solder resisting step that coats a solder mask on a bottom side of the lead frame.

6. The manufacturing method as recited in claim 1, further comprising:

performing a wire-bonding step or a bump-bonding step that electrically connects the at least one light-emitting diode chip to the lead frame.



7. A manufacturing method of a light emitting diode package, comprising:

heating a first light transmission insulation material to cause the first light transmission insulation material to become a sticky member;  
connecting a lead frame to the sticky member;  
performing a solder resisting step that coats a solder mask on a bottom side of the lead frame; and  
performing a chip-bonding step that bonds at least one light-emitting diode chip on the sticky member using a light transmission glue.

8. The manufacturing method as recited in claim 7, wherein the first light transmission insulation material comprises transparent epoxy or silicone.

9. The manufacturing method as recited in claim 7, further comprising:

encapsulating the at least one light-emitting diode chip with a second light transmission insulation material.

10. The manufacturing method as recited in claim 9, wherein the second light transmission insulation material comprises transparent epoxy or silicone.

11. The manufacturing method as recited in claim 9, wherein the second light transmission insulation material and the first light transmission insulation material are formed from the same transparent material.

12. The manufacturing method as recited in claim 9, further comprising:

performing a drying step that forms the sticky member and the second light transmission insulation material into shape.

13. The manufacturing method as recited in claim 7, further comprising:

performing a wire-bonding step or a bump-bonding step that electrically connects the at least one light-emitting diode chip to the lead frame.

14. A light emitting diode package, comprising:

a light transmission substrate having a central portion and a peripheral portion surrounding the central portion;  
at least one light-emitting diode chip disposed on the central portion of the light transmission substrate;  
a lead frame connecting the peripheral portion of the light transmission substrate, wherein the lead frame is electrically connected to the light-emitting diode chip; and  
an encapsulant disposed on the light transparent substrate, wherein the encapsulant covers the at least one light-emitting diode chip and the lead frame.

15. The light emitting diode package as recited in claim 14, wherein the light transmission substrate comprises transparent epoxy or silicone.

16. The light emitting diode package as recited in claim 14, wherein the encapsulant comprises transparent epoxy or silicone.

17. The light emitting diode package as recited in claim 14, wherein the encapsulant and the light transmission substrate are formed from the same material.

18. The light emitting diode package as recited in claim 14, further comprising:

a light transmission glue that bonds the at least one light-emitting diode chip on the light transmission substrate.

19. The light emitting diode package as recited in claim 14, further comprising:

a plurality of conducting wires or bumps electrically connecting the at least one light-emitting diode chip to the lead frame.

20. The light emitting diode package as recited in claim 14, further comprising:

a solder mask coated on a first side of the lead frame opposite from a second side of the lead frame that is on a same side of the light transmission substrate as the at least one light-emitting diode chip.

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