

JP2002164583A CHIP TYPE LIGHT-EMITTING DIODE AND MANUFACTURING METHOD THEREOF

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CHIP TYPE LIGHT-EMITTING DIODE AND MANUFACTURING METHOD THEREOF

Abstract

PROBLEM TO BE SOLVED: To provide a chip type light-emitting diode which is fitted to a motherboard together with another electronic part in the same process and is very effective as a light source of a liquid-crystal back light. SOLUTION: The chip type light-emitting diode 20 comprises a base stage 21 fitted to the backside of the motherboard, a main body 22 which extends from the base stage 21 and penetrates the hole provided at the motherboard for arrangement, and a light-emitting diode element 28 which, provided to the main body part 22, emits light on the surface side of the motherboard. With the base stage 21 and the main body 22 formed into almost T-shape, the base stage 21 is provided with a pair of external-connection electrodes 24 and 25 which are electrically connected to the light-emitting diode element 28. The light-emitting diode element 28 is sealed with a resin sealing body 30.

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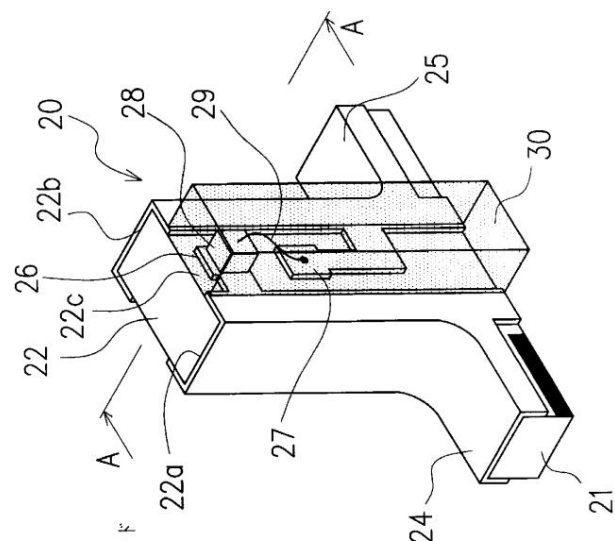
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(57) [Abstract]

[Problem] To provide a chip-type light-emitting diode that can be attached to a motherboard in the same process as other electronic components and is extremely useful as a light source for a liquid

crystal backlight. [Solution] This chip-type light-emitting diode 20 comprises a base 21 attached to the back side of the motherboard, a main body 22 extending from the base 21 and disposed passing through a hole provided in the motherboard, and a light-emitting diode element 28 provided on the main body 22 and emitting light on the front side of the motherboard. The base 21 and the main body 22 are formed in a substantially T-shape, and the base 21 is provided with a pair of external connection electrodes 24, 25 electrically connected to the light-emitting diode element 28. The light-emitting diode element 28 is sealed with a resin sealant 30.



20...チップ型発光ダイオード
21...基台
22...本体部
24, 25...外部接続用電極
26...カソード電極
27...アノード電極
28...発光ダイオード素子
29...ボンディングワイヤ
30...樹脂封止体

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[Claims] [Claim 1] A

chip-type light-emitting diode comprising a base, a main body extending from the base, a light-emitting portion provided on the main body, and a resin sealant that seals the light-emitting portion.

[Claim 2] The chip type light emitting diode according to claim 1, wherein the base and the main body are substantially T-shaped.

[Claim 3] The chip type light emitting diode according to claim 1, wherein the base is provided with a pair of external connection electrodes electrically connected to the light emitting portion.

[Claim 4] The chip-type light-emitting diode according to claim 1, wherein the base is disposed on one side of a motherboard, the main body passes through a hole formed in the motherboard, and the light-emitting portion provided on the main body is exposed on the other side of the motherboard.

[Claim 5] The chip-type light-emitting diode according to claim 1, wherein the light-emitting portion is provided on a side surface of the main body, and the light-emitting direction of the light-emitting portion is substantially the same as the light-guiding direction of a light-guiding plate of a liquid crystal

backlight arranged on a motherboard. [Claim 6] The chip-type light-emitting diode according to claim 1, wherein the resin sealing body is provided with a convex lens portion.

7. The chip-type light-emitting diode according to claim 1, further comprising a reflecting surface that is inclined outwardly so as to surround the light-emitting diode element that constitutes the light-emitting portion.

8.

The chip-type light-emitting diode according to claim 1, wherein a light-shielding surface is formed on a part of an outer surface of the resin

sealing body. [Claim 9] A process of opening a large number of rectangular holes at equal intervals in the vertical and horizontal directions in an aggregate circuit board, forming through holes on the inner peripheral surfaces of these holes, and providing, between the plurality of holes, a plurality of bases, main body portions extending vertically from each of the bases, electrodes for external connection formed on the bases, and first and second electrode portions formed on the main body portions; a process of arranging a light emitting portion on the first electrode portion and connecting the light emitting

portion and the second electrode portion by a bonding wire; a process of placing a mold having a recess for accommodating the light emitting portion and the bonding wire on the aggregate circuit board with the recess corresponding to the light emitting portion and the bonding wire, and filling the recess with resin to seal

the light emitting portion and the bonding wire; and a process of cutting the aggregate circuit board in the vertical and horizontal directions after removing the mold so that each chip-type light emitting diode is formed, the chip-type light emitting diode having a base having electrodes for external connection and a main body portion having first and second electrode portions and a light

emitting portion. [0001] A

method for manufacturing a chip-type light-emitting diode, comprising:

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The present invention relates to a chip-type light-emitting die.

The present invention relates to a chip-type light-emitting diode and a method

for manufacturing the same.

One known example of such a light emitting diode is shown in Fig. 15. This chip type light emitting diode 1 has a cathode electrode 3 and an anode electrode 4 patterned on the top surface of a glass epoxy substrate 2 (hereinafter referred to as the glass epoxy substrate), a light emitting diode element 6 fixed onto the cathode electrode 3 with a conductive adhesive (not shown), and the top electrode of the light emitting diode element 6 and the anode electrode 4 are connected with a bonding wire 7, and the bonding wire 7 and the light emitting diode element 6 are protected by a resin sealant 8. The above-mentioned chip type light emitting diode 1 is generally mounted on

the front side of a motherboard and often emits light upward. However, in recent years, many other electronic components are mounted on the back side of the motherboard, so that electrodes 15, 16 for external connection of the glass epoxy substrate 2 are fixed with solder 10 on the back side of the motherboard 9 in the same manner as other electronic components 12, and a resin sealant 8 is inserted into a hole 11 opened in the motherboard 9 to emit light upward, as shown in Figure 16. In this structure, the chip-type light-emitting diode 1 and other electronic components 12 only need to be mounted on one side of the motherboard 9, which has the advantage of simplifying the mounting process compared to the conventional mounting on both sides of the motherboard 9.

[0004]

[Problems to be Solved by the Invention] However, when the chip-type light-emitting diode 1 mounted on the back side of the motherboard 9 as described above is used as a light source for a liquid crystal backlight, since the light guide direction of the light guide plate 13 arranged on the front side of the motherboard 9 differs from the light emission direction from the light-emitting diode element 6 as shown in Fig. 16, a reflection surface 14 at an angle of about 45° must be formed at the end of the light guide plate 13, and the light emitted upward from the chip-type light-emitting diode 1 must be bent by 90° at the reflection surface 14 and guided into the light guide plate 13. As a result, of the light emitted upward from the chip-type light-emitting diode 1, only the light emitted approximately directly upward is guided into the light guide plate 13, resulting in a small amount of incident light and a loss of light also occurring at the reflection surface 14 of the light guide plate 13.

[0005] On the other hand, as a structure for effectively guiding light to the light guide plate 13, it is also possible to use side-emitting chip-type light-emitting diodes and make the light guide direction of the light guide plate 13 coincide with the light emission direction from the chip-type light-emitting diodes. However, in this case, the chip-type light-emitting diodes would be mounted on the front surface side of the motherboard 9, and the above-mentioned mounting on one surface side would not be possible. [0006] Therefore, one object of the present invention is to

[0007] Another object of the present invention is to provide a chip-type light-emitting diode which can be attached to one side of a motherboard and emits light from the other side, making it extremely useful as a light source for a

liquid crystal backlight. [0008] Another object of the present invention is to provide a chip-type light-emitting diode which can be attached to one side of a motherboard and therefore can be attached at the same time in the same process as other electronic components which are to be attached to this one

side. [0009] [Means for solving the problems] In order to solve the above problems, the chip-type light-emitting diode according to claim 1 of the present invention is characterized in that it comprises a base, a main body extending from the base, a

light-emitting part provided on the main body, and a resin sealant which seals the light-emitting part. [0010] According to this invention, a main body extends from the base of the chip-type light-emitting diode, and a light-emitting portion is provided on this main body, so that when the base is attached to the motherboard, the light-emitting portion can be made to emit light at a position away from the motherboard.

[0011] The invention of claim 2 is the chip type light emitting diode of claim 1, characterized in that the base and main body are substantially T-shaped. [0012] According to this invention, since the base and

main body are formed substantially T-shaped, when the base is attached to the motherboard, light can be emitted at a position where the main body extends in a direction perpendicular to the mounting surface of the motherboard. [0013] The invention of claim 3 is the chip type light emitting diode of claim 1, characterized in that the base is provided with a pair of external connection electrodes electrically connected to the light emitting portion.

[0014] The invention of claim 4 is characterized in that in the chip type light emitting diode of claim 1, the base is disposed on one side of the motherboard, the main body passes through a hole in the motherboard, and the light emitting part provided on the main body is exposed on the other side of the motherboard.

[0015] According to this invention, since the base is located on one side of the motherboard and the main body passes through a hole in the motherboard, for example, when the base is attached to the back side of the motherboard, the light emitting part can be exposed on the front side of the motherboard.

[0016] The invention of claim 5 is characterized in that, in the chip-type light-emitting diode of claim 1, the light-emitting part is provided on the side surface of the main body, and the light-emitting direction thereof is approximately the same as the light-guiding direction of a light-guiding plate of a liquid crystal backlight disposed on a motherboard.

[0017] According to this invention, by providing the light emitting portion of the chip type light emitting diode on the side of the main body, the light emitting direction can be made to approximately coincide with the light guide direction of the light guide plate of the liquid crystal backlight arranged on the motherboard, and a large amount of light can be incident on the light

guide plate. [0018] The invention of claim 6 is characterized in that, in the chip type light emitting diode of claim 1, a convex lens portion is provided on the resin sealing body. [0019] According to this invention, the lens portion can increase the directivity of the light emitted from the light emitting portion, thereby increasing the brightness.

[0020] The invention of claim 7 is the chip type light emitting diode of claim 1, characterized in that a reflecting surface inclined outward is provided so as to surround the periphery of the light emitting diode element constituting the light emitting portion.

[0021] According to this invention, the light emitted from the light emitting portion is reflected in the same direction by the reflective surface, thereby improving the light

concentration. [0022] The invention of claim 8 is the chip-type light emitting diode according to claim 1, characterized in that a light-shielding surface is formed on a part of the outer surface of the resin sealing body.

[0023] According to this invention, by blocking a portion of the light emitted from the light emitting portion with the light blocking surface, the light is not scattered around the resin encapsulant, and the light concentration in a desired direction can be improved. [0024]

A method for manufacturing a chip-type light emitting diode according to claim 9 is characterized in that a plurality of chip-type light emitting diodes are formed on one collective circuit board through a plurality of processes, and in the final process, the collective circuit board is divided so that individual chip-type light emitting diodes are produced. [0025] According to this invention, a large number of chip-type light emitting diodes can be obtained from one collective circuit board by simple means. [Embodiment of the Invention]

Hereinafter, an

embodiment of the chip-type light emitting diode according to the present invention will be described in detail with reference to the attached drawings. In the chip type light emitting diode according to the first embodiment shown in Figures 1 to 3, Figure 1 is a perspective view showing the external shape of the chip type light emitting diode, Figure 2 is a front view of the chip type light emitting diode when mounted on a motherboard, and Figure 3 is a cross-sectional view taken along line A-A in Figure 1 when mounted on a motherboard. [0027] Referring to Figures 1

to 3, one embodiment of the chip type light emitting diode according to the present invention is indicated by reference numeral 20, and this chip type light emitting diode 20 is constituted by a glass epoxy substrate having a base 21 fixed to one surface, for example the back surface, of a motherboard 23, and a main body 22 extending upward from the approximate center of the base 21 in an approximately T-shaped configuration. In this embodiment, the base 21 and the main body 22 are formed integrally, but they may be separate. The base

The base 21 extends horizontally on both sides of the main body 22, and a pair of external connection electrodes 24, 25 are formed on the upper surface of the base 21. The main body 22 is in the shape of a rectangular prism, and the external connection electrodes 24, 25 rise continuously from the left and right side surfaces 22a, 22b, reaching the upper ends of the left and right side surfaces 22a, 22b. A cathode electrode 26 as a first electrode portion and an anode electrode 27 as a second electrode portion are formed on the front side surface 22c of the main body 22, one above the other, and the cathode electrode 26 and the anode electrode 27 are connected to the external connection electrodes 24, 25, respectively.

A light emitting diode element 28 is placed on the upper surface of the cathode electrode 26 as a light emitting section, and its lower electrode is fixed via a conductive adhesive (not shown). The upper electrode of the light emitting diode element 28 is connected to the anode electrode 27 by a bonding wire 29. Therefore, a current is supplied to the light emitting diode element 28 from the external connection electrodes 24, 25 via the cathode electrode 26 and the anode electrode 27, and the light emitting diode element 28 emits light. Depending on the polarity of the light emitting diode element 28, it may be placed on the anode electrode 27 side. Furthermore, there is no limitation on the type or color of light emitted by the light emitting diode element 28.

[0029] The light emitting diode element 28 and the bonding wire 29 are covered by a resin sealing body 30 provided on the front side surface 22c of the main body 22. This resin sealing body 30 is formed in a block shape on the front side surface 22c of the main body 22, and covers the light emitting diode element 28, the bonding wire 29, the cathode electrode 26 and the anode electrode 27. A transparent epoxy resin is used as the material for the resin sealing body 30. [0030] Figures 2 and 3 show the chip type light emitting diode 20 when mounted on the motherboard

23. The motherboard 23 has a hole 31 through which the main body 22 of the chip type light emitting diode 20 penetrates from the back side of the motherboard 23. The base 21 of the chip-type light-emitting diode 20 abuts against the periphery of the hole 31 on the rear surface side of the motherboard 23, and external connection electrodes 24, 25 on both sides are fixed by solder 10 to circuits 32 a, 32 b printed on the motherboard 23.

At this time, the body 22 of the chip type light emitting diode 20 penetrates the hole 31 of the motherboard 23 from the back side and protrudes to the other side of the motherboard 23, i.e., the front side. The light emitting diode element 28 mounted on the front side surface 22c of the body 22 is exposed from the front surface of the motherboard 23 facing forward.

Therefore, when this is used as a light source for a light guide plate of a liquid crystal backlight, the chip type light emitting diode 20 is set so that the light emitting diode element 28 is located near the side end surface 34 of the light guide plate 33 arranged on the front side of the motherboard 23, as shown in Figure 3. The side end surface 34 of the light guide plate 33 is shaped straight in the vertical direction.

The light emitting diode elements 28 are formed in such a manner that they are not reflective surfaces as in the conventional structure. In this structure, when light is emitted from the light emitting diode elements 28 toward the side end faces 34 of the light guide plate 33, the light emission direction and the light guide direction of the light guide plate 33 are substantially the same, so that the light incident on the side end faces 34 of the light guide plate 33 is not bent but is guided straight in the horizontal direction as it is. In this manner, since the light emitting diode elements 28 are located near the side end faces 34 of the light guide plate 33, the amount of light incident on the light guide plate 33 is increased, and since there is no bending of light using a reflective surface as in the conventional structure, the loss of light is extremely reduced.

4 shows a second embodiment of the chip-type light-emitting diode according to the present invention. This chip-type light-emitting diode 20a has a semi-spherical lens portion 35 formed integrally with the resin sealing body 30 provided on the front surface of the main body 22, and the lens portion 35 enhances the directivity of light emitted from the light-emitting diode element 28, aiming at increased brightness. Therefore, the lens portion 35 is located above the light-emitting diode element 28, and is configured so that the light emitted from the light-emitting diode element 28 is easily focused on one point. Note that the configuration other than the lens portion 35 is the same as that of the light-emitting diode 20 of the first embodiment, and therefore detailed description thereof will be omitted by assigning the same reference numerals.

[0033] Fig. 5 shows a third embodiment of a chip-type light-emitting diode according to the present invention. This chip-type light-emitting diode 20b has a semi-cylindrical lens portion 36 formed integrally on the front surface of the resin sealing body 30 provided on the main body portion 22. In this embodiment, the light emitted from the light-emitting diode element 28 is easily focused toward the center by the lens portion 36 and is not easily scattered to the left and right sides, so that the directivity of the light is improved as in the second embodiment. Note that the configuration other than the lens portion 36 is the same as that of the light-emitting diode 20 of the first embodiment, so that the same reference numerals are used and detailed description is omitted. [0034] Fig. 6 shows a fourth embodiment of a

chip-type light-emitting diode according to the present invention. In this chip-type light-emitting diode 20c, a cup-shaped reflective frame 37 is disposed so as to surround the light-emitting diode element 28, and the light emitted from the light-emitting diode element 28 is reflected by the inner peripheral surface of the reflective frame 37, thereby enhancing the light-gathering ability in the forward direction. The inner peripheral surface of the reflective frame 37 is tapered, and is painted white or silver-plated to enhance the reflectivity. Since the configuration other than the reflective frame 37 is the same as that of the light-emitting diode 20 of the first embodiment, the same reference numerals are used and detailed description is omitted.

7 shows a chip-type light-emitting diode according to a fifth embodiment of the present invention. In this chip-type light-emitting diode 20d, a protrusion 39 having a recess 38 is integrally provided on the front surface of the body 22. The light-emitting diode element 28 is disposed in the recess 38, and a light-transmitting

The recess 38 is filled with resin 40 to resin-seal the light-emitting diode element 28. Therefore, even in this embodiment, the light emitted from the light-emitting diode element 28 is reflected by the inner peripheral surface of the recess 38, so that the light is more easily collected forward, leading to increased brightness. As in the previous embodiment, the inner peripheral surface of the recess 38 is inclined outward, and is painted white or silver-plated to increase the reflectance. The configuration other than the protrusion 39 having the recess 38 is the same as that of the light-emitting diode 20 of the first embodiment, so that the same reference numerals are used and detailed description is omitted.

[0036] Fig. 8 shows a sixth embodiment of the chip-type light-emitting diode according to the present invention. This chip-type light-emitting diode 20e has an outer peripheral surface of the resin sealing body 30 that is entirely light-shielded, so that the light emitted from the light-emitting diode element 28 is not scattered around the resin sealing body, and the light-collecting ability to the front is improved. That is, a light-shielding surface 46 is formed by applying a light-shielding coating film, plating, or light-shielding sheet to both sides and the top and bottom of the resin sealing body, so that the light emitted from the light-emitting diode element 28 is directed only toward the front side of the resin sealing body 30 that is not light-shielded. Note that the configuration other than the provision of the light-shielding surface 46 on the resin sealing body 30 is the same as that of the light-emitting diode 20 of the first embodiment, and the detailed description will be

omitted by assigning the same reference numerals. [0037] Fig. 9 shows a seventh embodiment of the chip-type light-emitting diode according to the present invention. In this chip-type light-emitting diode 20f, like the sixth embodiment, the resin encapsulant 30 protruding from the front side of the body 22 is shielded to improve the light-collecting ability of the light emitted from the light-emitting diode element 28. In this embodiment, except for one side 47 of the resin encapsulant 30, a light-shielding surface 48 is formed on the other side, upper and lower surfaces, and front surface, so that the light emitted from the light-emitting diode element 28 is emitted only from one side 47 of the resin encapsulant 30. Note that the configuration other than the provision of the light-shielding surface 48 on the resin encapsulant 30 is the same as that of the light-emitting diode 20 of the first embodiment, so that the same reference numerals are used

and detailed description is omitted. [0038] Next, the manufacturing process of the chip-type light-emitting diode 20 according to the first embodiment will be described. FIG. 10 shows all the steps of the manufacturing method according to the present invention, and FIGS. 11 to 14 show the individual manufacturing steps in order. First, as shown in Figures 10 and 11, a number of rectangular holes 42 are opened at equal intervals in the vertical and horizontal directions in a single collective circuit board 41, and through holes are formed on the inner peripheral surfaces of the holes 42, while the aforementioned external connection electrodes 24, 25, cathode electrodes 26, and anode electrodes 27

are patterned on the front and back surfaces of the collective circuit board 41. (First Step) Generally, a glass epoxy board is used for the collective circuit

board. It is formed by etching or deposition.

[0039] Next, as shown in Figures 10 and 12, the light emitting diode element 28 is adhered and fixed on the formed cathode electrode 26 via a conductive adhesive, and the tip of the bonding wire 29 extending from the upper surface of the light emitting diode element 28 is connected to the anode electrode 27. (Second step)

[0040] Next,

as shown in Figures 10 and 13, a mold 43 is placed on the collective circuit board 41. This mold 43 has a recess 44 formed therein corresponding to the arrangement portion of the light emitting diode element 28 and the bonding wire 29, and covers all of the external connection electrodes 24, 25 and the rectangular hole 42 when placed on the collective circuit board 41. A colorless and transparent epoxy resin is filled into the recess 44 of the mold 43 thus placed, and the light emitting diode element 28 and the bonding wire 29 are resin-sealed. The filled epoxy resin is hardened through a hardening process. (Third step) [0041] In the last step, as

shown in Figures 10 and 14, the mold 43 is first removed. At this time, the light-emitting diode elements 28 and the bonding wires 29 are completely sealed by the resin sealant 30 filled in the recesses 44 of the mold 43. Next, the collective circuit board 41 is cut along the X-axis (X1, X2, ... Xn) and Y-axis (Y1, Y2, ... Yn) directions assumed on the collective circuit board 41, and divided into individual chip-type light-emitting diodes (fourth step). [0042] Through the above-mentioned series of steps, a T-shaped chip-type light-emitting diode 20 consisting of a base 21 and a body part 22 extending from the base 21 in a direction approximately perpendicular to the base 21 as shown in Figure 1 is completed. These chip-type light-emitting diodes 20 are taped and then mounted on a motherboard 23 as shown in Figures 2 and 3. In the above embodiment, the light emitting diode element 28 is attached to the front surface 22c of the main body 22 extending straight upward from the motherboard 23, and emits light in a lateral direction parallel to the motherboard 23. However, if the angle of the side end surface 34 of the light guide plate 33 is different from that in the above embodiment, it is preferable to change the attachment angle of the light emitting diode element 28 in accordance with the angle, and to make the light emission direction from the light emitting diode element 28 and the light guide direction of the light guide plate 33 appropriate. It is.

[0044] In the above embodiment, the chip-type light-emitting diode 20 of the present invention is used as a light source for the light guide plate 33 of a liquid crystal backlight. However, it is of course possible to use it for other purposes, such as as an indicator for a mobile phone or a PDA (Personal Digital Assistance).

[0045] The present invention is not limited to the above-mentioned embodiment, and various changes and modifications can be made.

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do.

[0046] [Effects of the Invention] As explained above, according to the chip type light emitting diode of the present invention, the main body extends from the base and the light emitting part is provided on this main body, so that when the base is attached to the back side of the motherboard, the main body can penetrate the hole and the light emitting part can be exposed on the front side of the motherboard, making it extremely useful as a light source for a liquid crystal backlight. In particular, when it is formed in a T-shape, light is emitted horizontally from the main body, and the light guide direction of the light guide plate arranged on the front side of the motherboard coincides with the light emission direction from the light emitting part, so that the amount of light incident on the light guide plate is increased and light loss is small, making it extremely useful.

[0047] Furthermore, the chip type light emitting diode of the present invention can be attached to one side of the motherboard, and therefore can be attached at the same time as other electronic components to be attached to this one side, simplifying the mounting process and shortening the mounting time. [0048] In addition, according to the manufacturing method of the chip type light emitting diode of the present invention, a large number of chip type light emitting diodes can be easily manufactured from one collective circuit board, and manufacturing costs can be reduced. [Brief Description of the Drawings]

Fig. 1 is a perspective view showing a first embodiment of the chip type light emitting diode of the present invention. Fig. 2 is a front view of the chip type light emitting diode mounted on a motherboard.

3 is a cross-sectional view taken along line AA in FIG. 1 when the chip-type light-emitting diode is mounted on a motherboard.

Fig. 4 is a perspective view showing a second embodiment of the chip-type light-emitting diode according to the present invention; Fig. 5 is a perspective view showing a third embodiment of the chip-type light-emitting diode according to the present invention; FIG. 1 is a perspective view showing an embodiment.

Fig. 6 is a perspective view showing a fourth embodiment of a chip-type light-emitting diode according to the present invention Fig. 7 is a perspective view showing a fifth embodiment of a chip-type light-emitting diode according to the present invention

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Fig. 8 is a perspective view showing a sixth embodiment of a chip-type light-emitting diode according to the present invention

Fig. 9 is a perspective view showing a seventh embodiment of a chip-type light-emitting diode according to the present invention

FIG. 10 is a diagram showing a chip-type light-emitting diode according to the first embodiment.

Fig. 11 is a process diagram for forming an electrode pattern on the collective circuit board; Fig. 12 is a process diagram for mounting a light-emitting diode element on the collective circuit board; FIG.

Fig. 13 is a process diagram for resin-sealing a light-emitting diode element mounted on an aggregate circuit board; Fig. 14 is a process diagram for dividing a resin-sealed aggregate circuit board in the X- and Y-axis directions; Fig. 15 is a cross-sectional view showing an example of a conventional light-emitting diode; Fig. 16 is a process diagram for attaching the conventional light-emitting diode to a motherboard;

[Explanation of symbols] 20

Chip type light emitting diode 21 Base 22 Main body 23 Motherboard 24, 25 External connection electrode 26 Cathode electrode (first electrode portion) 27 Anode electrode (second electrode portion) 28 Light emitting diode element (light emitting portion) 29 Bonding wire 30 Resin sealing body 31 Hole 33 Light guide plate 35, 36 Lens portion 37 Reflecting frame 46, 48 Light shielding surface 41 Collective circuit board 42 Square hole 43 Mold 44 Recess

FIG. 1

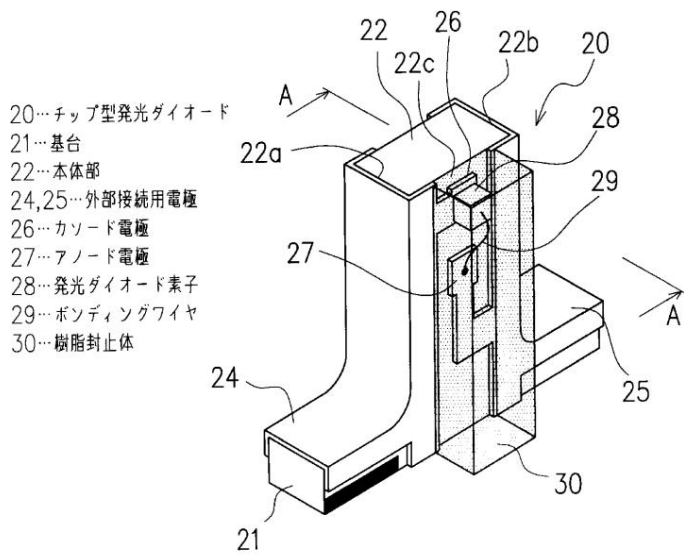


Figure 3

FIG2

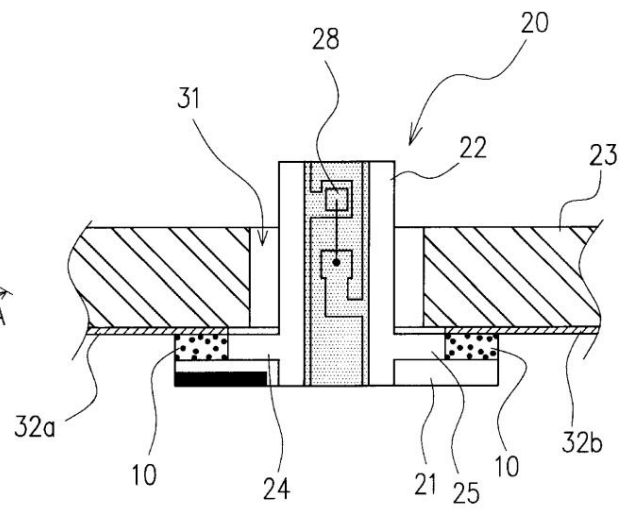


FIG4

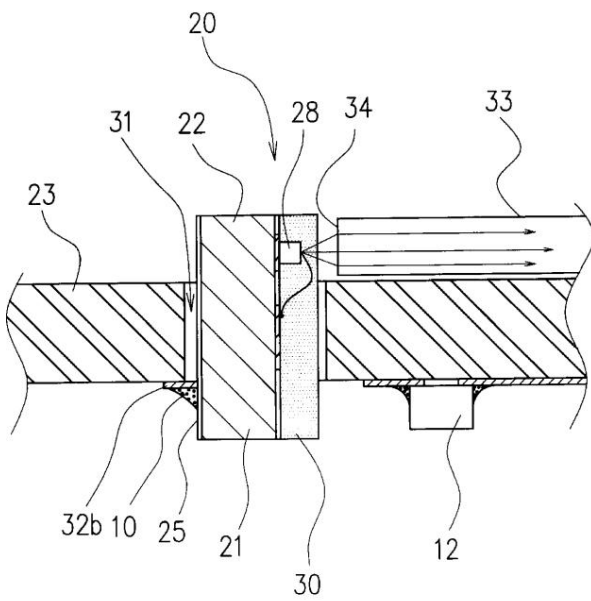
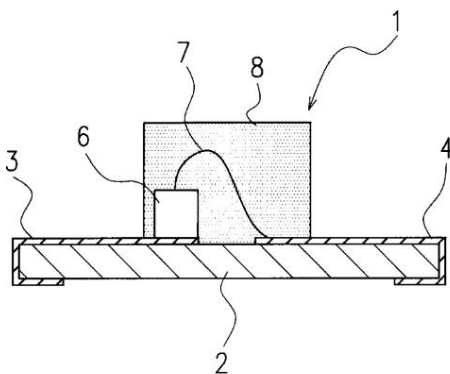
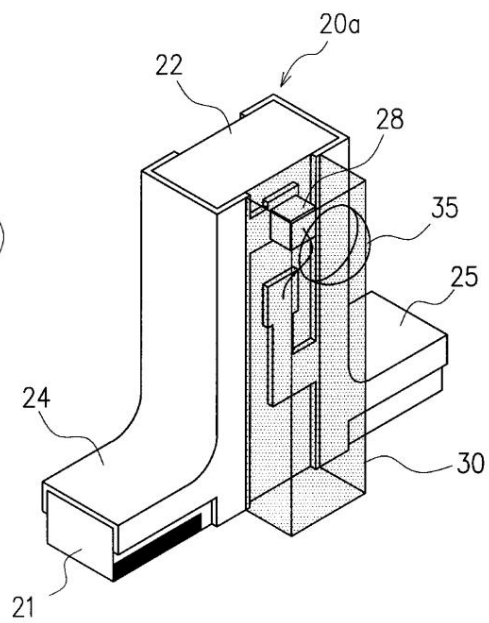


FIG. 15



(8)

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FIG. 5

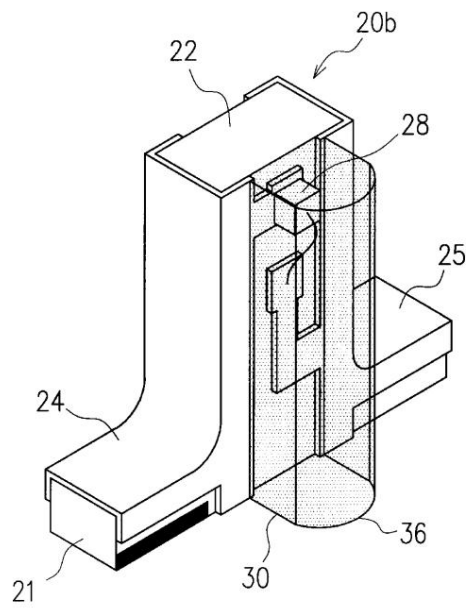


FIG. 6

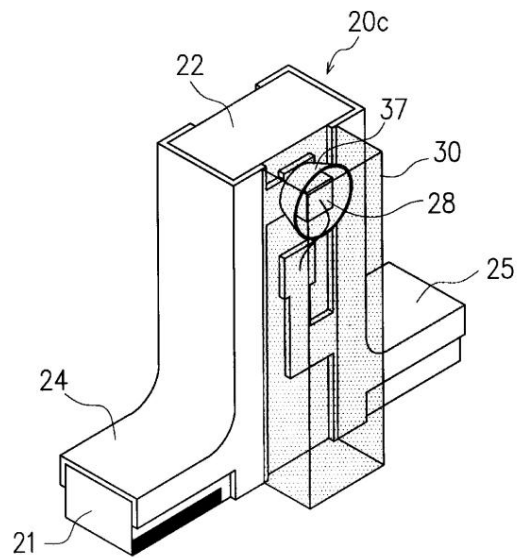


FIG. 7

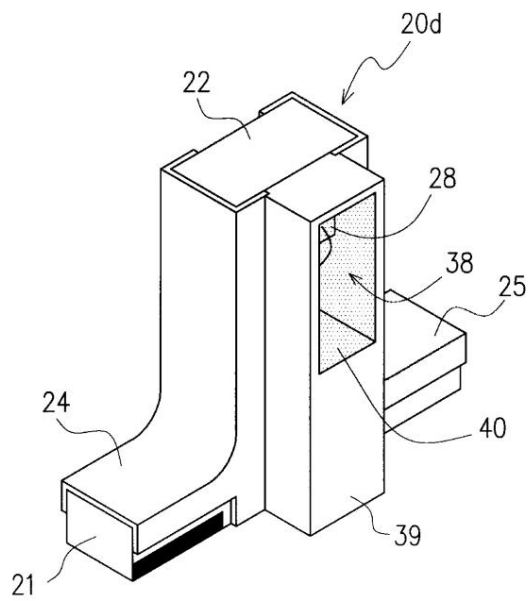
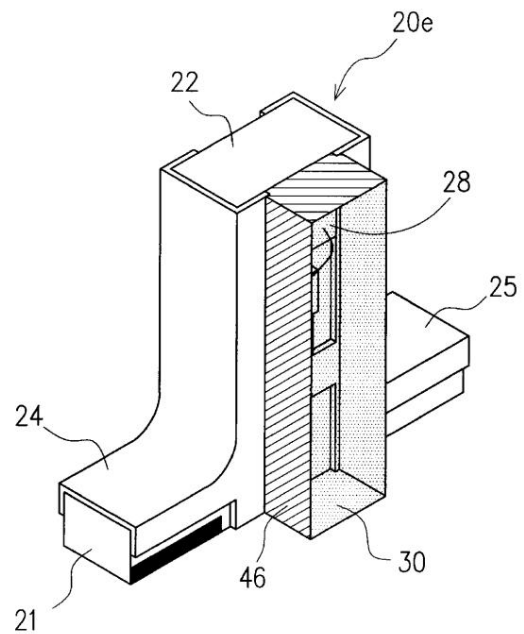


FIG. 8



(9)

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FIG. 9

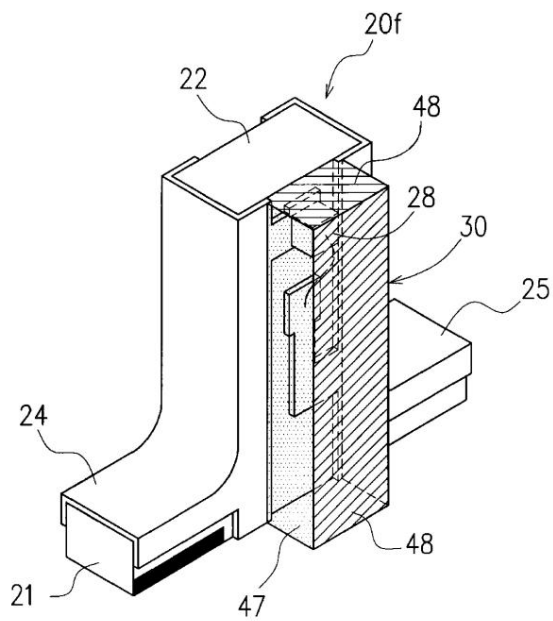


FIG. 10

チップ型発光ダイオード製造工程

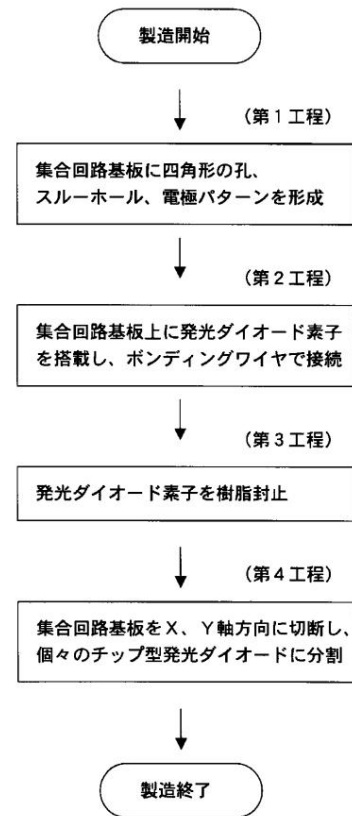
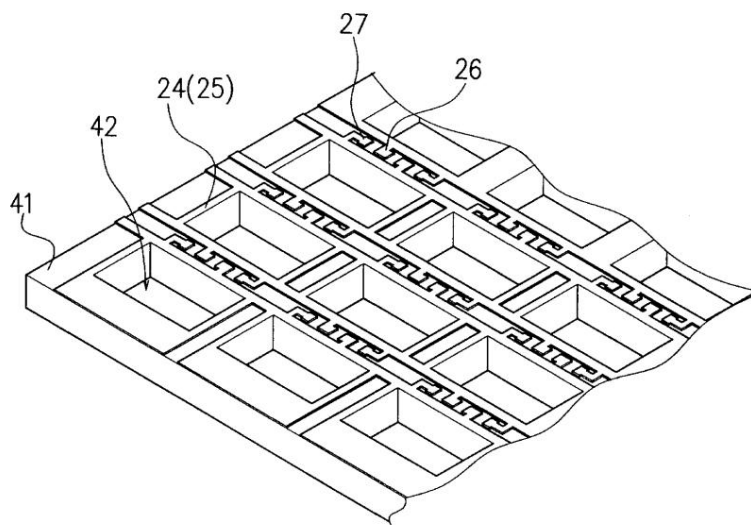


FIG. 11



(10)

JP2002-164583

FIG. 12

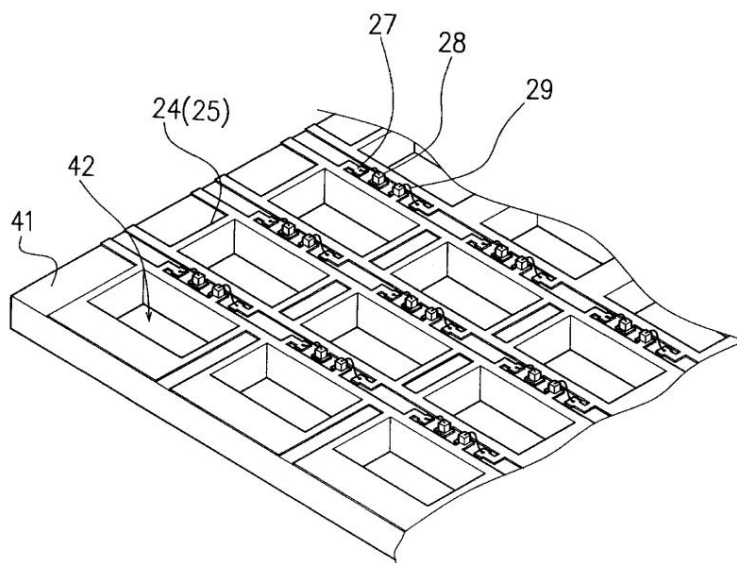


FIG. 13

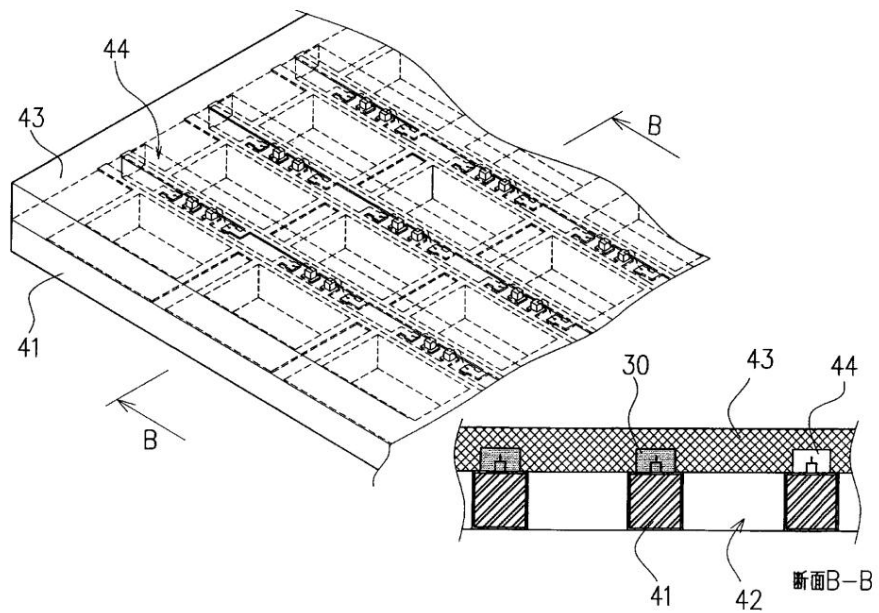


FIG. 14

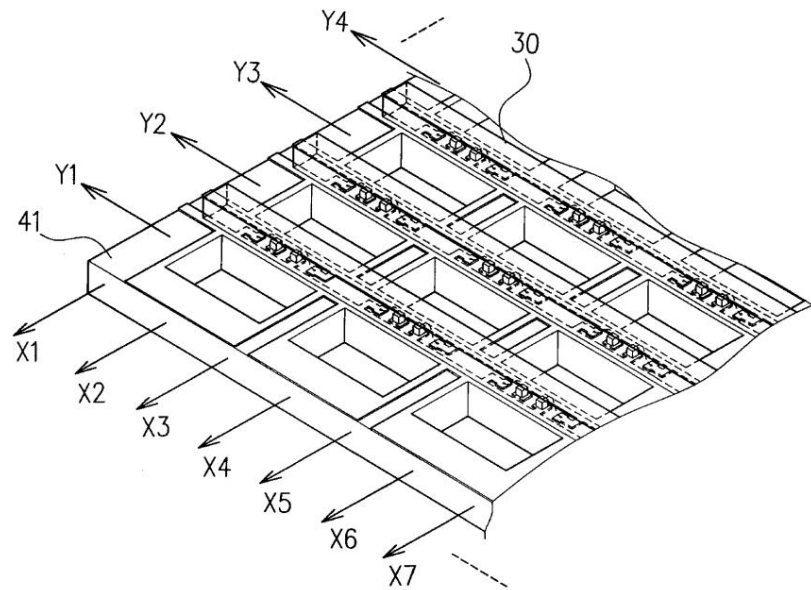


FIG. 16

