

DESCRIPTION

OPTOELECTRONIC PART PRODUCING METHOD, OPTOELECTRONIC PART
PRODUCING SYSTEM, AND OPTOELECTRONIC PART

5

TECHNICAL FIELD

[0001]

The present invention relates to an optoelectronic-part producing method, an optoelectronic-part producing system, and an optoelectronic part. Specifically, it relates to
10 a method and system for producing an optoelectronic part from a pre-sealed substrate having a reflecting member, as well as to an optoelectronic part produced from such a substrate.

BACKGROUND ART

15 [0002]

The technique of producing LED packages or other types of optoelectronic parts packages by mounting LED chips or other optical elements on a substrate (e.g. a printed board or lead frame) and resin-sealing the optical elements has been conventionally known. In one method proposed for this process, after LED chips are resin-sealed, a dome-shaped
20 transparent cap is fixed on each LED chip by using an ultraviolet curable resin. (For example, refer to Patent Document 1. This method is hereinafter called the “first method.”) In another conventional method, which uses a substrate with previously formed reflecting members (reflectors), a plurality of LED chips mounted on the substrate are collectively sealed with resin to create a resin-sealed body, after which this resin-sealed body is cut (divided) into
25 individual LED packages each of which has one reflector. (For example, refer to Patent

Document 2. This method is hereinafter called the “second method.”)

BACKGROUND ART DOCUMENT

PATENT DOCUMENT

5 [0003]

Patent Document 1: JP-A 2002-232018 (page 5, Fig. 5)

Patent Document 2: JP-A 2010-125647 (pages 6-7, Figs. 1-4)

SUMMARY OF THE INVENTION

10 PROBLEM TO BE SOLVED BY THE INVENTION

[0004]

However, the first method has the problem of low productivity since this method requires the additional steps of creating a lens (the dome-shaped transparent cap) by a separate process and fixing the created lens. On the other hand, the second method has the
15 problem that the aligning, transferring and other kinds of handling of the substrate with the previously formed reflecting members and the resin-sealed body are difficult, particularly in the case where a thin substrate is used.

MEANS FOR SOLVING THE PROBLEMS

20 [0005]

In the following descriptions of “MEANS FOR SOLVING THE PROBLEMS” and “EFFECT OF THE INVENTION”, the numerals enclosed in the brackets are merely used for the purpose of easy comparison between the terms used in the descriptions and the components shown in the drawings. These numerals and the likes do not mean that “the
25 meaning of the terms used in the descriptions should be limited to the corresponding

components shown in the drawings.”

[0006]

The present invention aimed at solving the previously described problem is a method for producing an optoelectronic part from a sealed substrate (29) created by means of at least
5 an upper die (18) and a lower die (17) having a cavity (19) facing the upper die (18), the sealed substrate (29) having a substrate body (2) with a plurality of unit areas (7), a reflecting member (8) provided in each of the unit areas (7) and having a through hole or depression (10), one or more optical elements (13) mounted on the substrate body (2) inside each through hole or on the bottom surface (11) of each depression (10), and a sealing resin (28)
10 made of a cured resin (28) and sealing the optical elements (13), and the method includes the steps of:

a) preparing a temporarily fixing jig (14) having openings (15) at positions respectively corresponding to the reflecting members (8);

b) preparing a pre-sealed substrate (1) including the substrate body (2) provided with
15 the reflecting members (8) and the optical elements (13);

c) fitting the temporarily fixing jig (14) into the pre-sealed substrate (1) so that the reflecting members (8) are fitted into the openings (15);

d) fixing the temporarily fixing jig (14) with the pre-sealed substrate (1) held therein to the upper die (18) so that the openings (15) respectively overlap sub-cavities (25) included
20 in the cavity (19) in a planer view thereof, the sub-cavities (25) being located at positions respectively corresponding to the openings (15);

e) filling the cavity (19) with a resin material;

f) immersing the optical elements (13) in a fluid resin (26) made from the resin material, by closing the upper die (18) and the lower die (17);

25 g) hardening the fluid resin (26) into a cured resin (28);

h) opening the upper die (18) and the lower die (17);

i) removing the temporarily fixing jig (14) with the sealed substrate (29) held therein from the upper die (18); and

j) removing the sealed substrate (29) from the temporarily fixing jig (14),

5 wherein:

when the cured resin (28) is formed in step g), a lens portion (30) is formed in each of the sub-cavities (25), and a connecting portion (31) made of the cured resin (28) is formed by a communicating channel (27) connecting the sub-cavities (25); and

in the process of removing the sealed substrate (29) in step j), the sealed substrate
10 (29) is pushed out of the temporarily fixing jig (14), whereby the connecting portion (31) is separated from the sealed substrate (29) to obtain a first optoelectronic part having a plurality of lens portions (30).

[0007]

In one mode of the previously described method for producing an optoelectronic part
15 according to the present invention, the following step k) is provided after the step j) of removing the sealed substrate (29):

k) creating a second optoelectronic part corresponding to a subset of the entire group of the aforementioned plurality of unit areas (7) by separating the first optoelectronic part.

[0008]

20 In another mode of the previously described method for producing an optoelectronic part according to the present invention, the following step l) is provided after the step j) of removing the sealed substrate (29):

l) creating a third optoelectronic part (38) corresponding to one of the aforementioned plurality of unit areas (7) by separating the first optoelectronic part.

25 [0009]

In still another mode of the previously described method for producing an optoelectronic part according to the present invention, when the optical elements (13) are immersed in the fluid resin (26) in step f), the communicating channel (27) is formed around the entire circumference of each of the sub-cavities (25) and the fluid resin (26) is made to flow among the sub-cavities (25) through the communicating channel (27).

[0010]

In still another mode of the previously described method for producing an optoelectronic part according to the present invention, when the optical elements (13) are immersed the fluid resin (26) in step f), the communicating channel (27) is partially formed around each of the sub-cavities (25) and the fluid resin (26) is made to flow among the sub-cavities (25) through the communicating channel (27).

[0011]

In still another mode of the previously described method for producing an optoelectronic part according to the present invention, the method further includes the following steps m) and n) before the step e) of filling the cavity (19):

m) supplying a release film (40) between the upper die (18) and the lower die (17);
and

n) making the release film (40) adhere to the mold surface (22, 39) forming the cavity (19), at least within a region of the mold surface (22, 39) corresponding to the entire group of the aforementioned plurality of unit areas (7).

[0012]

In still another mode of the previously described method for producing an optoelectronic part according to the present invention, when the upper die (18) and the lower die (17) are closed to immerse the optical elements in the fluid resin (26) in step f), the lower surface of the temporarily fixing jig (14) presses the upper surface of a circumferential

member (21) forming a side portion of the cavity (19), the circumferential member (21) being elastically supported by the lower die (17) so as to allow the release film (40) to wrinkle only in a portion outside the entire group of the aforementioned plurality of unit areas (7) during the die-closing operation.

5 [0013]

In still another mode of the previously described method for producing an optoelectronic part according to the present invention, when the temporarily fixing jig (14) is fixed to the upper die (18) in step d), the reflecting members (8) are individually pressed by a plurality of individual pressing members (50) separately and elastically supported by the
10 upper die (18).

[0014]

In still another mode of the previously described method for producing an optoelectronic part according to the present invention, when the optical elements (13) are immersed in the fluid resin (26) in step f), an elastically supported movable member (53)
15 provided outside the region corresponding to the entire group of the aforementioned plurality of unit areas (7) among the mold surface (39) forming the cavity (19) is pressed by the fluid resin (26) to form a resin pool (54) into which the fluid resin (26) flows.

[0015]

A system for producing an optoelectronic part, including an upper die (18) and a
20 lower die (17) having a cavity (19) facing the upper die (18), for creating a sealed substrate (29) and for producing an optoelectronic part from the sealed substrate (29), the sealed substrate (29) having a substrate body (2) with a plurality of unit areas (7), a reflecting member (8) provided in each of the unit areas (7) and having a through hole or depression (10), one or more optical elements (13) mounted on the substrate body (2) inside each
25 through hole or on the bottom surface (11) of each depression (10), and a sealing resin (28)

made of a cured resin (28) and sealing the optical elements (13), and the system further includes:

a) a receiving unit for receiving a pre-sealed substrate (1) including the substrate body (2) provided with the reflecting members (8) and the optical elements (13);

5 b) a temporarily fixing jig (14) having openings (15) at positions respectively corresponding to the reflecting members (8) of the pre-sealed substrate (1);

c) a fixing device for fixing the temporarily fixing jig (14) to the upper die (18), with the reflecting members (8) being held in the openings (15);

d) a resin supplier for supplying a resin material into the cavity (19) having a size
10 including the entire group of the reflecting members (8) of the pre-sealed substrate (1) in a planer view thereof;

e) a die opening/closing device for opening or closing the upper die (18) and the lower die (17); and

f) a pushing device for pushing the sealed substrate (29) out of the temporarily fixing
15 jig (14),

wherein:

the cavity (19) has sub-cavities (25), which are depressions respectively corresponding to the reflecting members (8), and a communicating channel (27) connecting the sub-cavities (25); and

20 the pushing device (33) is designed to push the sealed substrate (29) out of the temporarily fixing jig (14) so as to separate the sealed substrate (29) from a connecting portion (31) made of the cured resin (28) and formed in the communicating channel (27).

[0016]

In one mode of the previously described system for producing an optoelectronic part,
25 the communicating channel (27) is formed around the entire circumference of each of the

sub-cavities (25).

[0017]

In another mode of the previously described system for producing an optoelectronic part, the communicating channel (27) is partially formed around each of the sub-cavities
5 (25).

[0018]

In still another mode of the previously described system for producing an optoelectronic part according to the present invention, the system further includes:

g) a film-supplying device for supplying a release film (40) between the upper die
10 (18) and the lower die (17); and

h) a film-adhering device for making the release film (40) adhere to the mold surface (22, 39) forming the cavity (19), at least within a region of the mold surface (22, 39) corresponding to the entire group of the aforementioned plurality of unit areas (7).

[0019]

15 In still another mode of the previously described system for producing an optoelectronic part according to the present invention:

the lower die (17) includes a circumferential member (21) elastically supported by the lower die (17) and forming a side portion of the cavity (19);

the die opening/closing device closes the upper die (18) and the lower die (17) in
20 such a manner that the lower surface of the temporarily fixing jig (14) presses the upper surface of the circumferential member (21); and

the release film (40) is allowed to wrinkle only in a portion outside the entire group of the aforementioned plurality of unit areas (7) during the die-closing operation.

[0020]

25 In still another mode of the previously described system for producing an

optoelectronic part according to the present invention, the system further includes:

- i) a plurality of individual pressing members (50) being separately and elastically supported by the upper die (18), the individual pressing members (50) being arranged corresponding to the reflecting members (8) so as to separately press each of the reflecting members (8) when the temporarily fixing jig (14) is fixed to the upper die (18).

[0021]

In still another mode of the previously described system for producing an optoelectronic part according to the present invention, the system further includes:

- j) an elastically supported movable member (53) provided outside the portion corresponding to the entire group of the aforementioned plurality of unit areas (7) among the mold surface (39) forming the cavity (19), the movable member (53) being designed to be pressed by the fluid resin (26) to form a resin pool (54) into which the fluid resin (26) flows when the upper die (18) and the lower die (17) are in the closed position.

[0022]

- 15 An optoelectronic part according to the present invention is an optoelectronic part produced from a sealed substrate (29) including a substrate body (2) with a plurality of unit areas (7), a reflecting member (8) provided in each of the unit areas (7) and having a through hole or a depression (10), one or more optical elements (13) mounted on the substrate body (2) inside each through hole or on the bottom surface (11) of each depression (10), and a
- 20 sealing resin (28) made of a cured resin (28) and sealing the optical elements (13), and the optoelectronic part includes:

- a) at least one of a plurality of lens portions (30) made of the cured resin (28), the lens portions (30) having been individually formed by fitting the reflecting members (8) into a plurality of openings (15) provided in a temporarily fixing jig (14) at positions
- 25 corresponding to the reflecting members (8), immersing the temporarily fixing jig (14) in a

fluid resin (26) so that the fluid resin (26) fills at least the through hole or the depression (10) on the side where the optical elements (13) are exposed, and curing the fluid resin (26); and

b) a sidewall portion (35) formed around each of the lens portions (30) by pressing a connecting portion (31) made of the cured resin (28) and connecting the lens portions (30), to
5 push the sealed substrate (29) out of the temporarily fixing jig (14), the sidewall portion (35) consisting of a member separated from the connecting portion (31) or the separated connecting portion (31).

[0023]

In one mode of the optoelectronic part according to the present invention, the
10 sidewall portion (35) is formed around the entire circumference of each of the lens portions (30).

[0024]

In another mode of the optoelectronic part according to the present invention, the sidewall portion (35) is partially formed around each of the lens portions (30).

15 [0025]

In still another mode of the optoelectronic part according to the present invention, the external form of the optoelectronic part corresponds to a portion of the entire group of the aforementioned plurality of unit areas (7).

[0026]

20 In still another mode of the optoelectronic part (38) according to the present invention, the external form of the optoelectronic part corresponds to one of the aforementioned unit areas (7).

EFFECT OF THE INVENTION

25 [0027]

According to the present invention, the use of the temporarily fixing jig (14) facilitates the transfer, aligning and other operations of a pre-sealed substrate (1) or sealed substrate (29) in each of the steps from the transfer of the pre-sealed substrate (1) through to the processing of the sealed substrate (29). Accordingly, the pre-sealed substrate (1) and the sealed substrate (29) can be easily handled, so that an optoelectronic part can be produced with high productivity.

BRIEF DESCRIPTION OF THE DRAWINGS

[0028]

Fig. 1(1) is a plan view of a pre-sealed substrate used in the present invention, and Fig. 1(2) is a sectional view of the pre-sealed substrate at line A-A in Fig. 1(1).

Figs. 2(1)-2(3) are sectional views illustrating the first embodiment of the present invention, the three views respectively showing the step of aligning a pre-sealed substrate and a carrier, the step of setting the carrier with the pre-sealed substrate held therein to a position above a lower die, and the state immediately before the step of immersing LED chips in a fluid resin.

Figs. 3(1)-3(3) are sectional views respectively showing a process from the step of immersing the LED chips in the fluid resin through to the step of removing a sealed substrate.

Figs. 4(1)-4(3) are sectional views respectively showing a process from the step of pushing out the sealed substrate through to the step of individuating the sealed substrate.

Figs. 5(1)-5(3) are partial plan views respectively showing a lead frame in which the reflecting members and LED chips are mounted, a sealed substrate, and individual LED packages obtained from the sealed substrate; and Fig. 5(4) is a sectional view observed from the front side of the LED packages shown in Fig. 5(3).

Figs. 6(1) and 6(2) are sectional views illustrating the second embodiment of the present invention in which a release film is used in the resin-sealing process.

Figs. 7(1) and 7(2) are sectional views illustrating the third embodiment of the present invention in which a release film and a resin pool are used in the resin-sealing
5 process.

BEST MODE FOR CARRYING OUT THE INVENTION

[0029]

Initially, as shown in Fig. 2(1), a pre-sealed substrate 1 is fitted into a carrier 14 by
10 fitting the reflecting members 8 of the pre-sealed substrate 1 into the openings 15 of the carrier 14. Next, as shown in Figs. 2(2) and 2(3), the carrier 14 with the pre-sealed substrate 1 held therein is fixed to the upper die 18, after which the lower 17 and the upper die 18 are closed. As a result, as shown in Fig. 3(1), a plurality of LED chips 13 mounted on the pre-sealed substrate 1 are dipped (immersed) in a fluid resin 26 stored in a cavity 19 (see Fig.
15 2(2)). Subsequently, the fluid resin 26 is hardened into a cured resin 28. As a result, as shown in Fig. 3(2), the LED chips 13 mounted on the pre-sealed substrate 1 are collectively sealed with the resin. Next, as shown in Figs. 3(2)-4(2), the lower die 17 and the upper die 18 are opened, the carrier 14 with the sealed substrate 29 held therein is removed from the dies, and the sealed substrate 29 is pushed out of the carrier 14. Subsequently, as shown in Figs.
20 4(2) and 4(3), the sealed substrate 29 removed from the carrier 14 are cut. Thus, the sealed substrate 29 is divided into individual LED packages 38 each of which has an LED chip 13.

FIRST EMBODIMENT

[0030]

25 The first embodiment relating to the optoelectronic-part producing method, the

optoelectronic-part producing system and the optoelectronic part according to the present invention is hereinafter described with reference to Figs. 1(1)-5(4). It should be noted that any of the drawings shown in the following description has been schematically prepared with appropriate omissions or exaggerations. In the following description, a lead frame is taken as
5 an example of the substrate body.

[0031]

The pre-sealed substrate 1 shown in Figs. 1(1) and 1(2) has a lead frame 2. The lead frame 2 includes an outer frame 3, connecting portions 4 and 5 which respectively extend in the X and Y directions, as well as a plurality of unit areas 7 partitioned into a grid pattern by
10 virtual lines 6. The pre-sealed substrate 1 also has a plurality of reflecting members 8. The reflecting members 8 are respectively provided in the aforementioned unit areas 7. The reflecting members 8, which are previously formed in the lead frame 2 by injection molding, transfer molding, compression molding or a similar process, are made of a heat-curing resin containing a filler for reflecting light and releasing heat. Each reflecting member 8 has a top
15 surface 9, a depression 10, a bottom surface 11 and an inclined surface 12. As an alternative to the depression 10, a through hole may be provided in the reflecting member 8 so that the surface of the lead frame 2 exposed inside the through hole serves as a surface corresponding to the bottom surface 11 (see Fig. 1(2)).

[0032]

20 The pre-sealed substrate 1 has a plurality of LED chips 13. One LED chip 13 is mounted on the bottom surface 11 in each of the unit areas 7. The bottom surface 11 and the inclined surface 12 of the reflecting member 8 have the function of reflecting light emitted from the LED chip 13. The electrodes (not shown) of the LED chip 13 are electrically connected to the leads (not shown) of the lead frame 2. This connection is created by a
25 commonly known method, such as wire bonding or flip-chip bonding.

[0033]

The method for producing an optoelectronic part according to the present embodiment is hereinafter described with reference to Figs. 2(1)-5(4). Initially, as shown in Fig. 2(1), the pre-sealed substrate 1 shown in Figs. 1(1) and 2(2) and a carrier (the temporarily fixing jig) 14 into which the pre-sealed substrate 1 is to be fitted are prepared.

[0034]

The carrier 14 has openings 15 into which the reflecting members 8 of the pre-sealed substrate 1 are to be fitted, with a thin pressing portion 16 projecting from the circumferential edge of each opening 15. When the reflecting member 8 is held in the opening 15, the pressing portion 16 presses the outer edge of the upper surface 9 (which is directed downward in Figs. 2(1)-2(3)) of the reflecting member 8 (see Fig. 2(2)).

[0035]

Next, the pre-sealed substrate 1 and the carrier 14 are received by the receiving unit (not shown) of the system for producing an optoelectronic part. Subsequently, as shown in Fig. 2(1), the carrier 14 and the pre-sealed substrate 1 are aligned so that the openings 15 of the carrier 14 and the reflecting members 8 of the pre-sealed substrate 1 overlap each other in their planer view.

[0036]

Next, as shown in Figs. 2(1) and 2(2), the reflecting members 8 of the pre-sealed substrate 1 are fitted into the openings 15 of the carrier 14. As a result, the pre-sealed substrate 1 is held in the carrier 14.

[0037]

Next, the carrier 14, with the reflecting members 8 of the pre-sealed substrate 1 held in the openings 15 (see Fig. 2(1)), is transferred into the space between the lower die 17 and the upper die 18 facing each other as shown in Fig. 2(2). Subsequently, with the reflecting

members 8 of the pre-sealed substrate 1 being held in the openings 15 (see Fig. 2(1)), the carrier 14 is fixed to a predetermined position on the upper die 18. To fix the carrier 14, a commonly known method can be used, such as clamping the carrier 14 with a jig or holding it by suction.

5 [0038]

The lower die 17 has a cavity block 20 with a cavity 19. The cavity 19 is the entirety of the space to be filled with a fluid resin (see the fluid resin 26 shown in Fig. 2(3)). The lower die 17 has a circumferential member 21 provided around the cavity block 20. The cavity 19 is formed by the mold surface (upper surface) 22 of the cavity block 20 and the
10 inner sidewall 23 of the circumferential member 21. The circumferential member 21 is supported by elastic members 24, such as coil springs or disc springs. The circumferential member 21 functions also as an intermediate die that forms part of the cavity 19.

[0039]

The cavity 19 has a plurality of sub-cavities 25 each of which consists of a
15 depression. The sub-cavities 25 respectively correspond to the LED chips 13 which are respectively mounted on the bottom surfaces 11 in the unit areas 7 of the pre-sealed substrate 1. In the process of fixing the carrier 14 to the upper die 18, the LED chips 13 mounted on the pre-sealed substrate 1 are aligned with the sub-cavities 25 provided in the lower die 17.

[0040]

20 Next, a resin material (not shown) is supplied into the cavity 19 including the sub-cavities 25 shown in Fig. 2(2). From the viewpoint of the form of the resin, a solid material (e.g. a powdery, fine-grained, coarse-grained, aggregated or sheet-shaped material) or a liquid material having fluidity at ordinary temperatures can be used as the aforementioned resin material. From the viewpoint of properties and kind of the resin, a
25 transparent thermosetting resin (e.g. epoxy resin or silicon resin) can be used as the

aforementioned resin material.

[0041]

Next, the resin material is heated by means of a heater (not shown) provided in the lower die 17. When a solid material is used as the resin material, the resin material in the cavity 19 is melted into a fluid resin 26, as shown in Figs. 2(2) and 2(3). When a liquid resin is used as the resin material, the liquid resin is poured into the cavity 19. In this case, the poured liquid resin directly serves as the fluid resin 26. As a result of these operations, the cavity 19 becomes filled with the fluid resin 26.

[0042]

Next, as shown in Fig. 2(3), the step of closing the lower die 17 and the upper die 18 is performed by moving the lower die 17 and the upper die 18 closer to each other. In the example of Fig. 2(3), the upper die 18 is moved downward. In the process of closing the lower die 17 and the upper die 18, the carrier 14 comes in contact with the circumferential member 21.

[0043]

Next, as shown in Figs. 2(3) and 3(1), the upper die 18 is further lowered to completely close the lower die 17 and the upper die 18. At this stage, the cavity 19 is completely formed by the lower surface of each reflecting member 8, the lower surface of the carrier 14, the mold surface (upper surface) 22 of the cavity block 20 and the inner sidewall 23 of the circumferential member 21 (see Fig. 2(2)). By completely closing the lower die 17 and the upper die 18, the LED chips 13 are dipped (immersed) in the fluid resin 26 in the cavity 19 (including the sub-cavities 25 (see Fig. 2(2)), as is also the case in the following descriptions) which is filled with the fluid resin 26.

[0044]

The structure of the mold consisting of the lower die 17 and the upper die 18 is

hereinafter described. A communicating channel 27 (see Fig. 3(1)), i.e. a space which connects the sub-cavities 25 when the lower die 17 and the upper die 18 are completely closed, is intentionally formed in at least one of the lower die 17 and the upper die 18. In the present embodiment, a communicating channel 27 leading to the neighboring sub-cavity 25 is provided in a portion of the circumference of each sub-cavity 25. The height of the communicating channel 27 should preferably be as small (or low) as possible within a range where the fluid resin 26 can flow between the neighboring sub-cavities 25.

[0045]

As shown in Fig. 3(1), in the process of immersing the LED chips 13 in the fluid resin 26, the fluid resin 26 is made to flow through the communicating channel 27. Accordingly, all the sub-cavities 25 will be evenly filled with the fluid resin 26.

[0046]

Next, in the state as shown in Fig. 3(1), the fluid resin 26 is further heated. As a result, as shown in Figs. 3(1) and 3(2), the fluid resin 26 is hardened into a cured resin 28. The cured resin 28 corresponds to the sealing resin with which the LED chip 13 is sealed. Thus, a sealed substrate (resin-sealed body) 29 having a lead frame 2, the reflecting members 8, the LED chips 13 and the cured resin 28 is completed. The completed sealed substrate 29 is still fixed to the upper die 18, with the reflecting members 8 being held in the carrier 14. Subsequently, the upper die 18 is moved upward to completely open the lower die (not shown) and the upper die 18.

[0047]

As shown in Fig. 3(2), the sealed substrate 29 has convex lens portions 30 and thin connecting portions 31, each of which is made of the cured resin 28. Each lens portion 30 consists of one of the cured resins 28 respectively formed in the sub-cavities 25 (see Fig. 2(2)). Each thin connecting portion 31 consists of one of the cured resins 28 respectively

formed in the thin connecting portions 31 (see Fig. 3(1)).

[0048]

Next, the sealed substrate 29 held in the carrier 14 fixed to the upper die 18 as shown in Fig. 3(2) is released from the fixed state. The sealed substrate 29 held in the carrier 14 can
5 be removed from the upper die 18 by an appropriate removing means (not shown). As a result, as shown in Fig. 3(3), the sealed substrate 29 held in the carrier 14 is obtained.

[0049]

Next, as shown in Fig. 4(1), the sealed substrate 29 held in the carrier 14 is placed on a fixing jig 32, after which the sealed substrate 29 is pushed out of the carrier 14 by pushing
10 the sealed substrate 29 (more specifically, the connecting portions 31 of the sealed substrate 29) by means of a pushing device 33.

[0050]

The pushing device 33 has cylindrical parts 34 respectively corresponding to the lens portions 30 of the sealed substrate 29. Each cylindrical part 34 includes one lens portion 30
15 in its planer view, and its planer size is slightly larger than that of the lens portion 30.

[0051]

In the state shown in Fig. 4(1), the cylindrical parts 34 are moved downward to push out the sealed substrate 29, whereby, as shown in Fig. 4(2), the lens portions 30 are separated from the connecting portions 31 in the sealed substrate 29 or each connecting portion 31 is
20 cut at a position near the lens portion 30. As a result, a sidewall portion 35 is formed at the position where the lens portion 30 has been separated from the connecting portion 31 or where the connecting portion 31 near the lens portion 30 has been cut.

[0052]

Next, as shown in Figs. 4(2) and 4(3), the sealed substrate 29 having the sidewall portions 35 is fixed on a stage (not shown) and (fully) cut along the predetermined cutting
25 portions 35

lines 37 by using a rotary blade 36. By this process, the sealed substrate 29 shown in Fig. 4(2) is divided into individual LED packages 38. Each of the LED packages 38 as the final products has a substrate portion (not shown) which corresponds to one individually separated piece of the lead frame 2 (see Fig. 4(1)), the reflecting member 8, the LED chip 13, the lens portion 30 and the sidewall portion 35.

[0053]

Fig. 5(1) is a planer view showing the positional relationship of the pre-sealed substrate 1, the carrier 14 and the cavity block 20. In Fig. 5(1), the alternate long and short dash lines indicate the lines forming the cavity 19 (see Fig. 2(2)), and the short dashed lines indicate the inner edge of the pressing portions 16 of the carrier 14 (see Fig. 2(1)). Fig. 5(2) shows the planer shape of a portion of the sealed substrate 29, and Figs. 5(3) and 5(4) respectively show a plan view of the individuated LED packages 38 and a sectional view of the same packages 38 observed from the front side. In the present embodiment, the communicating channels 27 in the cavity block 20 of the lower die 17 are formed so that they connect the neighboring sub-cavities 25 in the X and Y directions. Each communicating channel 27 in its planer shape is like a line segment extending along the X or Y direction.

[0054]

In the present patent application documents, a channel that extends further outward from the outermost unit areas 7 of the entire group of the aforementioned plurality of unit areas 7 (i.e. a channel with no neighboring sub-cavity 25) is also included in the communicating channels 27. For example, in Fig. 3(1), the channel 27 extending leftward from the leftmost unit area 7 is also included in the communicating channels 27.

[0055]

As described thus far, according to the present embodiment, the use of the carrier 14 facilitates the transfer, aligning and other kinds of handling of the pre-sealed substrate 1 or

the sealed substrate 29 in each of the steps from the transfer of the pre-sealed substrate 1 through to the steps after the resin sealing. Accordingly, the pre-sealed substrate 1 and the sealed substrate 29 can be easily handled, so that the LED packages 38 can be produced with high productivity.

5 [0056]

Furthermore, according to the present embodiment, the communicating channels 27, which connect the sub-cavities 25 when the lower die 17 and the upper die 18 are completely closed, are intentionally formed in at least one of the lower die 17 and the upper die 18. Therefore, in the process of immersing the LED chips 13 in the fluid resin 26, the fluid resin
10 26 is made to flow through the communicating channels 27. Accordingly, all the sub-cavities 25 will be evenly filled with the fluid resin 26. As a result, the lens portions 30 and the connecting portions 31 individually formed in the unit areas 7 (see Fig. 3(3)) will be more uniform in dimensions and shape.

[0057]

15 Furthermore, according to the present embodiment, the communicating channels 27 have the smallest possible height within a range where the fluid resin 26 can flow between the neighboring sub-cavities 25. Accordingly, a thin connecting portion 31 is obtained, which allows the sealed substrate 29 to be smoothly pushed out of the carrier 14. As a result, an LED package 38 having a high level of appearance quality at the sidewall portion 35 is
20 obtained.

[0058]

In the process of cutting the sealed substrate 29, any cutting means other than the rotary blade 36 may be used, such as a laser beam, wire saw, hand saw or water jet. Furthermore, instead of fully cutting the sealed substrate 29 as shown in Fig. 4(3), it is
25 possible to initially “half-cut” the sealed substrate 29 (by forming grooves in the thickness

direction along the cutting lines 37 of the substrate) and subsequently apply an external force on the sealed substrate 29 to divide it into individual LED packages 38.

[0059]

As one cutting mode, an example in which the unit areas 7 have a 16×16 matrix structure in the X and Y directions is hereinafter described. In the previously described embodiment, each LED package 38 consisted of one unit area 7. In the present example, if the sealed substrate is divided so as to obtain one package from each unit area 7 as already described in the present embodiment, a total of 256 ($=16 \times 16$) LED packages 38, each of which consists of one unit area 7, will be obtained.

10 [0060]

In the case where the individuation is performed in units of two or more unit areas 7 constituting a portion (subset) of the entire group of the unit areas 7, an LED package composed of two or more unit areas 7 belonging to the subset is obtained. For example, when the subset consists of sixteen unit areas 7 arranged in the 4×4 matrix pattern, a total of 16 pieces of LED packages will be obtained, with each package having a matrix-shaped surface light source consisting of sixteen unit areas 7. As another example, when the subset consists of eight unit areas 7 arranged in the 1×8 pattern, a total of 32 pieces of LED packages will be obtained, with each package having a linear light source consisting of eight unit areas 7.

20 [0061]

As still another example, it is also possible to cut the sealed substrate 29 at cutting lines extending along the outer edge of the entire group of the unit areas 7 arranged in the 16×16 matrix pattern and discard the unnecessary portions outside the cutting lines. In this case, one LED package having a matrix-shaped surface light source consisting of 256 ($=16$

×16) unit areas 7 is obtained. In the present case, a pushing device 33 shaped like a rectangular sleeve having a planer shape including the entire group of the unit areas 7 may be used to push out the sealed substrate 29 at the communicating channel 27 that extends further outward from the outermost unit areas 7 of the entire group of the aforementioned plurality of unit areas 7. By this method, one LED package having a matrix-shaped surface light source consisting of 256 unit areas 7 is obtained by separating the sealed substrate 29 from the connecting portions 31.

[0062]

In the present embodiment, the communicating channels 27 for connecting the mutually neighboring sub-cavities 25 in the cavity block 20 of the lower die 17 have a planer shape consisting of line segments extending in the X and Y directions. However, this is not the only possible design. For example, it is also possible to form communicating channels 27 which connect the obliquely neighboring sub-cavities 25. In this case, the communicating channels 27 have a planer shape resembling the letter "X." In either of the cases where the communicating channels 27 have a planer shape consisting of line segments extending in the X and Y directions or resembling the letter "X", the lens portions 30 are partially connected to each other, and therefore, can be easily separated from the connecting portions 31.

[0063]

It is also possible to make the neighboring sub-cavities 25 communicate with each other on the entire circumference of each sub-cavity 25. In this case, the lens portions 30 are connected with each other through the communicating channel 27 on the entire circumference of each lens portion 30. Also in this case, the easy separation between the lens portions 30 and the connecting portion 31 can be achieved by forming the communicating channels 27 with a small height, i.e. by forming the connecting portion 31 with a small thickness.

[0064]

In the previously described example of the present embodiment, one LED chip 13 was mounted on each unit area 7. However, the present invention can also be applied in the case where two or more LED chips 13 are mounted on each unit area 7. As a first example, each reflecting member 8 may have a single depression 10 in which two or more LED chips 13 are mounted on the bottom surface 11. As a second example, each reflecting member 8 may have two or more depressions 10, with one LED chip 13 mounted on the bottom surface 11 of each depression 10. In any of these two examples, three LED chips respectively producing red (R), green (G) and blue (B) rays of light may be used as the LED chips 13, in which case one LED package 38 emitting white light composed of the three colors of light can be obtained.

SECOND EMBODIMENT

[0065]

The second embodiment of the present invention is hereinafter described with reference to Figs. 6(1) and 6(2). In the present embodiment, as shown in Figs. 6(1) and 6(2), a release film 40 is adhered to the mold surface 39 forming the entire cavity 19. In this state, the fluid resin 26 is supplied until the cavity 19 is filled with it. The mold surface 39 is formed by the mold surface (upper surface) 22 of the cavity block 20 shown in Fig. 2(2) and the inner sidewall 23 of the circumferential member 21.

[0066]

A film-feeding system (not shown) including a film-feeding roll and film-rewinding roll is provided on the outside of the circumferential member 21 of the lower die 17. Furthermore, on the outside of the circumferential member 21 of the lower die 17, a film-pressing member 41 and a film-supporting member 42 are respectively provided on the

upper and lower sides, facing each other. The film-pressing member 41 is vertically movable. The film-supporting member 42 is supported by an elastic member 43, such as a coil spring. A frame member 44 is provided outside the film-supporting member 42.

[0067]

5 It is preferable to provide sealing members 45 and 46 between the upper surface of the frame member 44 and the lower surface of the film-supporting member 41 as well as between the upper surface of the film-supporting member 41 and the lower surface of the upper die 18. When the lower die 17 and the upper die 18 are closed, the sealing members 45 and 46 separate the cavity 19 from the outside of the lower die 17 and the upper die 18.

10 [0068]

 According to the present embodiment, the film-pressing member 41 is initially lowered to hold (clamp) the release film 40 by means of the film-pressing member 41 and the film-supporting member 42, as shown in Fig. 6(1). At this stage, the release film 40 is clamped with an appropriate amount of force so that the release film 40 can slip (slide)
15 between the film-pressing member 41 and the film-supporting member 42. Subsequently, by means of a film-suction device having suction channels (not shown) formed in the lower die 17 and other components, the release film 40 is sucked onto the mold surface 39 forming the cavity 19. In this process, the release film 40 can slip to some extent. In this manner, the release film 40 can be adhered to the mold surface 39 without no wrinkle in the release film
20 40 or no gap under the film 40 over the entire mold surface 39.

[0069]

 Next, similar to the first embodiment, a resin material (not shown) is supplied into the cavity 19 including the sub-cavities 25. In the present embodiment, the resin material is supplied into the cavity 19 while the release film 40 is held by suction on the mold surface
25 39 forming the cavity 19.

[0070]

Next, as shown in Fig. 6(2), the resin material is melted into a fluid resin 26 by heat. Concurrently with this heating process, (1) the film-pressing member 41 is lowered to completely clamp the release film 40, and (2) the upper die 18 is lowered until it comes in
5 contact with the film-pressing member 41 via the sealing member 46. By these operations, the lower die 17 and the upper die 18 are brought to a half-closed position.

[0071]

At this point, the following states are realized: (1) the cavity 19 (see Fig. 6(1)) is separated from the outside, (2) the cavity 19 is filled with the fluid resin 26, and (3) the
10 release film 40 wrinkles at a portion near the outer edge 47 of the cavity 19, or at a portion corresponding to the outside of the plurality of unit areas 7 shown in Fig. 2(2).

[0072]

Next, the upper die 18 is further lowered from the position shown in Fig. 6(2) to completely close the lower die 17 and the upper die 18. As a result, the LED chips 13 are
15 dipped (immersed) in the fluid resin 26 stored in the cavity 19. Subsequently, similar to the first embodiment (see Figs. 3(1) and 3(2)), the fluid resin 26 is cured to create a sealed substrate 29.

[0073]

According to the present embodiment, firstly, as shown in Fig. 6(2), the presence of
20 the release film 40 adhered to the mold surface 39 of the lower die 17 prevents direct contact between the cured resin 28 and the mold surface 39, so that the sealed substrate 29 held in the carrier 14 can be easily separated from the release film 40. Therefore, even if the lead frame shown in Fig. 1(2) is thin, the sealed substrate 29 can be easily removed from the lower die 17 without causing any significant stress in the sealed substrate 29 (see Figs. 3(1)
25 and 3(2)).

[0074]

Secondly, when the lower die 17 and the upper die 18 are completely closed, the release film 40 is made to wrinkle only on the outside of the plurality of unit areas 7 shown in Fig. 2(2). Thus, the wrinkle formed in the release film 40 is prevented from adversely affecting the surface shape of the LED packages 38.

[0075]

In the present embodiment, the quality of LED packages (including the appearance quality, as is also the case in the following descriptions) is improved due to the previously described two reasons. The production yield (the percentage of non-defective products) of LED packages is also improved.

[0076]

It is preferable to reduce the pressure in the cavity 19 by using suction channels (not shown) provided in the upper die 18 when the lower die 17 and the upper die 18 are half closed. One effect of this operation is that the dust, gas and other components existing in the cavity 19 are discharged from the cavity 19. Another effect is that the gas components which are contained in the fluid resin 26 and may possibly produce bubbles in the LED packages are discharged from the cavity 19. As a result, the quality of LED packages is improved, and the production yield (the percentage of non-defective products) of LED packages is also improved.

20

THIRD EMBODIMENT

[0077]

The third embodiment of the present invention is hereinafter described with reference to Figs. 7(1) and 7(2). In the present embodiment, as shown in Fig. 7(1), the following two components are added to the system of the second embodiment: The first component is the

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individual pressing member 50, which is supported by an elastic member 49, such as a coil spring, in a depression 48 formed in the upper die 18. When the pre-sealed substrate 1 is fixed on the upper die 18, the individual pressing members 50 respectively press the reflecting members 8 of the pre-sealed substrate 1. The second component is the movable member 53 supported by an elastic member 52, such as a coil spring, in a depression 51 formed near the outer edge of the cavity block 20, or at a portion corresponding to the outside of the plurality of unit areas 7 shown in Fig. 2(2). The coil spring or similar element constituting the elastic member 52 has a spring constant that allows the movable member 53 to descend when pressed by the fluid resin 26 as will be described later.

10 [0078]

As shown in Fig. 7(2), the individual pressing members 50 respectively and separately press the reflecting members 8. Therefore, even if the reflecting members 8 vary in their thickness, the top surfaces 9 of the reflecting members 8 (the lower surfaces of the reflecting members 8 in Fig. 7(2)) will be evenly pressed onto the pressing portions 16 of the carrier 14.

[0079]

As shown in Fig. 7(2), the movable member 53 descends when pressed by the fluid resin 26. Therefore, if there is an excessive amount of fluid resin 26, the movable member 53 is pressed by the fluid resin 26 and descends. As a result, a resin pool 54 for receiving the excess of the fluid resin 26 is formed.

[0080]

According to the present embodiment, even if the reflecting members 8 vary in thickness, the top surfaces 9 of the reflecting members 8 can be evenly pressed onto the pressing portions 16 of the carrier 14. Furthermore, even if the amounts of the supplied resin material vary, the excess of the fluid resin 26 can be received in the resin pool 54. Due to

these mechanisms, the lens portion 30 and the connecting portion 31 formed in each of the unit areas 7 shown in Fig. 3(3) will be approximately uniform in both dimensions and shape.

[0081]

In the previously described embodiments, a lead frame 2 was used as the substrate body. The substrate body may be a printed board in which a laminated material (e.g. glass epoxy), ceramic material or metallic material is used as the base material. A flexible printed board using a resin film as the base material may also be used. The planer shape of the substrate body is not limited to quadrilateral. For example, it may be a substantially circular shape (i.e. a shape similar to a semiconductor wafer).

10 [0082]

In the previously described embodiments, the LED chip 13 was taken as an example of the optical element mounted on the pre-sealed substrate 1, and the LED package 38 was taken as an example of the optoelectronic part to be produced. However, these are not the only possible choices. For example, the present invention may be applied to a device using a combination of a light emitter and light receiver as the optical elements mounted on the pre-sealed substrate 1. In this case, a light emitting and receiving element is obtained as the optoelectronic part. The present invention may also be applied to a device using a laser-diode chip as the optical elements mounted on the pre-sealed substrate 1. In this case, a laser-diode package is obtained as the optoelectronic part.

20 [0083]

In the previous embodiments, a plurality of unit areas 7 partitioned into a grid pattern by the virtual lines 6 was provided in the lead frame 2, as shown in Fig. 1(1). It is also possible to provide the lead frame with a plurality of unit areas arranged in a non-grid pattern. For example, a plurality of unit areas arranged in a honeycomb pattern in a planer view may be provided in the lead frame. In the case where a plurality of unit areas in a non-grid pattern

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is provided in the lead frame, a laser beam, wire saw, hand saw, water jet or other cutting device can be used in the process of cutting the sealed substrate.

[0084]

It should be noted that the present invention is not limited to the previously described
 5 embodiments. These embodiments can be arbitrarily and appropriately combined, changed or selectively adopted as needed without departing from the spirit and scope of the present invention.

EXPLANATION OF NUMERALS

10 [0085]

1... Pre-sealed Substrate

2... Lead Frame (Substrate Body)

3... Outer Frame

4 and 5... Connecting Portion

15 6... Virtual Line

7... Unit Area

8... Reflecting Member

9... Top Surface

10... Depression

20 11... Bottom Surface

12... Inclined Surface

13... LED Chip (Optical Element)

14... Carrier (Temporarily Fixing Jig)

15... Opening

25 16... Pressing Portion

- 17... Lower Die
- 18... Upper Die
- 19... Cavity
- 20... Cavity Block
- 5 21... Circumferential Member
- 22... Mold Surface
- 23... Inner Sidewall
- 24, 43, 49 and 52... Elastic Member
- 25... Sub-Cavity
- 10 26... Fluid Resin
- 27... Communicating Channel
- 28... Cured Resin (Sealing Resin)
- 29... Sealed Substrate
- 30... Lens Portion
- 15 31... Connecting Portion
- 32... Fixing Jig
- 33... Pushing Device
- 34... Cylindrical Part
- 35... Sidewall
- 20 36... Rotary Blade
- 37... Cutting Line
- 38... LED Package
- 39... Mold Surface
- 40... Release Film
- 25 41... Film-Pressing Member

- 42... Film-Supporting Member
- 44... Frame Member
- 45 and 46... Sealing Member
- 47... Outer Edge
- 5 48... Depression
- 50... Individual Pressing Member
- 51... Depression
- 53... Movable Member
- 54... Resin Pool

CLAIMS

1. A method for producing an optoelectronic part from a sealed substrate created by means of at least an upper die and a lower die having a cavity facing the upper die, the sealed substrate having a substrate body with a plurality of unit areas, a reflecting member provided in each of the unit areas and having a through hole or depression, one or more optical elements mounted on the substrate body inside each through hole or on a bottom surface of each depression, and a sealing resin made of a cured resin and sealing the optical elements, and the method comprising steps of:
- 5
- 10 a) preparing a temporarily fixing jig having openings at positions respectively corresponding to the reflecting members;
- b) preparing a pre-sealed substrate including the substrate body provided with the reflecting members and the optical elements;
- c) fitting the temporarily fixing jig into the pre-sealed substrate so that the reflecting
- 15 members are fitted into the openings;
- d) fixing the temporarily fixing jig with the pre-sealed substrate held therein to the upper die so that the openings respectively overlap sub-cavities included in the cavity in a planer view thereof, the sub-cavities being located at positions respectively corresponding to the openings;
- 20 e) filling the cavity with a resin material;
- f) immersing the optical elements in a fluid resin made from the resin material, by closing the upper die and the lower die;
- g) hardening the fluid resin into a cured resin;
- h) opening the upper die and the lower die;
- 25 i) removing the temporarily fixing jig with the sealed substrate held therein from the

upper die; and

j) removing the sealed substrate from the temporarily fixing jig,

wherein:

when the cured resin is formed in step g), a lens portion is formed in each of the
5 sub-cavities, and a connecting portion made of the cured resin is formed by a communicating
channel connecting the sub-cavities; and

in the process of removing the sealed substrate in step j), the sealed substrate is
pushed out of the temporarily fixing jig, whereby the connecting portion is separated from
the sealed substrate to obtain a first optoelectronic part having a plurality of lens portions.

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2. The method for producing an optoelectronic part according to claim 1,
wherein a following step k) is provided after the step j) of removing the sealed substrate:

k) creating a second optoelectronic part corresponding to a subset of an entire group
of the aforementioned plurality of unit areas by separating the first optoelectronic part.

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3. The method for producing an optoelectronic part according to claim 1,
wherein a following step l) is provided after the step j) of removing the sealed substrate:

l) creating a third optoelectronic part corresponding to one of the aforementioned
plurality of unit areas by separating the first optoelectronic part.

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4. The method for producing an optoelectronic part according to one of claims
1-3, wherein, when the optical elements are immersed in the fluid resin in step f), the
communicating channel is formed around an entire circumference of each of the sub-cavities
and the fluid resin is made to flow among the sub-cavities through the communicating

25 channel.

5. The method for producing an optoelectronic part according to one of claims 1-3, wherein, when the optical elements are immersed the fluid resin in step f), the communicating channel is partially formed around each of the sub-cavities and the fluid resin is made to flow among the sub-cavities through the communicating channel.

6. The method for producing an optoelectronic part according to one of claims 1-3, further comprising following steps m) and n) before the step e) of filling the cavity:

m) supplying a release film between the upper die and the lower die; and

10 n) making the release film adhere to the mold surface forming the cavity, at least within a region of the mold surface corresponding to the entire group of the aforementioned plurality of unit areas.

7. The method for producing an optoelectronic part according to claim 6, 15 wherein, when the upper die and the lower die are closed to immerse the optical elements in the fluid resin in step f), a lower surface of the temporarily fixing jig presses an upper surface of a circumferential member forming a side portion of the cavity, the circumferential member being elastically supported by the lower die so as to allow the release film to wrinkle only in a portion outside the entire group of the aforementioned plurality of unit 20 areas during a die-closing operation.

8. The method for producing an optoelectronic part according to one of claims 1-3, wherein, when the temporarily fixing jig is fixed to the upper die in step d), the reflecting members are individually pressed by a plurality of individual pressing members 25 separately and elastically supported by the upper die.

9. The method for producing an optoelectronic part according to one of claims 1-3, wherein, when the optical elements are immersed in the fluid resin in step f), an elastically supported movable member provided outside a region corresponding to the entire
5 group of the aforementioned plurality of unit areas among the mold surface forming the cavity is pressed by the fluid resin to form a resin pool into which the fluid resin flows.

10. A system for producing an optoelectronic part, including an upper die and a lower die having a cavity facing the upper die, for creating a sealed substrate and for
10 producing an optoelectronic part from the sealed substrate, the sealed substrate having a substrate body with a plurality of unit areas, a reflecting member provided in each of the unit areas and having a through hole or depression, one or more optical elements mounted on the substrate body inside each through hole or on a bottom surface of each depression, and a sealing resin made of a cured resin and sealing the optical elements, and the system further
15 comprising:

a) a receiving unit for receiving a pre-sealed substrate including the substrate body provided with the reflecting members and the optical elements;

b) a temporarily fixing jig having openings at positions respectively corresponding to the reflecting members of the pre-sealed substrate;

20 c) a fixing device for fixing the temporarily fixing jig to the upper die, with the reflecting members being held in the openings;

d) a resin supplier for supplying a resin material into the cavity having a size including an entire group of the reflecting members of the pre-sealed substrate in a planer view thereof;

25 e) a die opening/closing device for opening or closing the upper die and the lower

die; and

f) a pushing device for pushing the sealed substrate out of the temporarily fixing jig,

wherein:

the cavity has sub-cavities, which are depressions respectively corresponding to the
5 reflecting members, and a communicating channel connecting the sub-cavities; and

the pushing device is designed to push the sealed substrate out of the temporarily
fixing jig so as to separate the sealed substrate from a connecting portion made of the cured
resin and formed in the communicating channel.

10 11. The system for producing an optoelectronic part according to claim 10,
wherein the communicating channel is formed around an entire circumference of each of the
sub-cavities.

12. The system for producing an optoelectronic part according to claim 10,
15 wherein the communicating channel is partially formed around each of the sub-cavities.

13. The system for producing an optoelectronic part according to one of claims
10-12, further comprising:

g) a film-supplying device for supplying a release film between the upper die and the
20 lower die; and

h) a film-adhering device for making the release film adhere to the mold surface
forming the cavity, at least within a region of the mold surface corresponding to the entire
group of the aforementioned plurality of unit areas.

25 14. The system for producing an optoelectronic part according to claim 13,

wherein:

the lower die includes a circumferential member elastically supported by the lower die and forming a side portion of the cavity;

the die opening/closing device closes the upper die and the lower die in such a manner that a lower surface of the temporarily fixing jig presses an upper surface of the circumferential member; and

the release film is allowed to wrinkle only in a portion outside the entire group of the aforementioned plurality of unit areas during a die-closing operation.

10 15. The system for producing an optoelectronic part according to one of claims 10-12, further comprising:

i) a plurality of individual pressing members being separately and elastically supported by the upper die, the individual pressing members being arranged corresponding to the reflecting members so as to separately press each of the reflecting members when the temporarily fixing jig is fixed to the upper die.

16. The system for producing an optoelectronic part according to one of claims 10-12, further comprising:

j) an elastically supported movable member provided outside the portion corresponding to the entire group of the aforementioned plurality of unit areas among the mold surface forming the cavity, the movable member being designed to be pressed by the fluid resin to form a resin pool into which the fluid resin flows when the upper die and the lower die are in the closed position.

25 17. An optoelectronic part produced from a sealed substrate including a substrate

body with a plurality of unit areas, a reflecting member provided in each of the unit areas and having a through hole or a depression, one or more optical elements mounted on the substrate body inside each through hole or on a bottom surface of each depression, and a sealing resin made of a cured resin and sealing the optical elements, and the optoelectronic
5 part comprising:

a) at least one of a plurality of lens portions made of the cured resin, the lens portions having been individually formed by fitting the reflecting members into a plurality of openings provided in a temporarily fixing jig at positions corresponding to the reflecting members, immersing the temporarily fixing jig in a fluid resin so that the fluid resin fills at
10 least the through hole or the depression on a side where the optical elements are exposed, and curing the fluid resin; and

b) a sidewall portion formed around each of the lens portions by pressing a connecting portion made of the cured resin and connecting the lens portions, to push the sealed substrate out of the temporarily fixing jig, the sidewall portion consisting of a member
15 separated from the connecting portion or the separated connecting portion.

18. The optoelectronic part according to claim 17, wherein the sidewall portion is formed around an entire circumference of each of the lens portions.

20 19. The optoelectronic part according to claim 17, wherein the sidewall portion is partially formed around each of the lens portions.

20. The optoelectronic part according to claim 17, wherein an external form of the optoelectronic part corresponds to a portion of an entire group of the aforementioned
25 plurality of unit areas.

21. The optoelectronic part according to claim 17, wherein an external form of the optoelectronic part corresponds to one of the aforementioned unit areas.