

## TITLE OF THE INVENTION

Compression Molding Method and Compression Mold for Semiconductor Chip

## BACKGROUND OF THE INVENTION

### 5 Field of the Invention

The present invention relates to compression molding methods and compression molds for semiconductor chips, for sealing semiconductor chips mounted on a substrate into a resin molded body to form a molded substrate.

### Description of the Background Art

10 Conventionally, a compression mold for semiconductor chips is used to compress and mold all of a predetermined plurality of semiconductor chips arranged in a matrix and mounted on a substrate into a resin molded body at a time. This is done by the following method.

First, a predetermined amount of a granular resin material (granular resin) is  
15 supplied to a shutter-type supply unit of a resin material supply mechanism, and then flattened to have a predetermined uniform thickness. Next, a shutter of the shutter-type supply unit is opened to drop the flattened granular resin into a lower mold cavity (large cavity) for compression molding covered with a long mold release film, while maintaining a flattened profile of the resin.

20 Next, the flattened granular resin is melted by heating in the lower mold cavity. The mold is then clamped to immerse semiconductor chips mounted on a substrate in the molten resin in the lower mold cavity. Consequently, the molten resin in the lower mold cavity is pressurized by a cavity bottom surface member.

As a result of this process, all of the predetermined plurality of semiconductor  
25 chips arranged in a matrix and mounted on one substrate can be sealed into one resin molded body at a time. This method employs a compression molding technique of sealing the semiconductor chips mounted on the substrate into the resin molded body having a shape corresponding to the shape of the lower mold cavity in the lower mold

cavity, to form a molded substrate. The mold is opened after a lapse of a predetermined time required for curing the molten resin, and the molded substrate (resin molded body) is removed from the lower mold cavity.

5 A conventional method is as follows (see Japanese Patent Laying-Open No. 2002-36270). Flattened granular resin on a short mold release film which has been precut outside a mold is carried into the mold. Then, the granular resin is placed on an opening of a lower mold cavity via the mold release film. After that, the air is discharged from the lower mold cavity by forcible suction to cover the lower mold cavity with the mold release film. As a result, the lower mold cavity is supplied with  
10 the granular resin simultaneously with being covered with the mold release film.

Again in this case, as described above, a compression molding technique of sealing a predetermined plurality of semiconductor chips arranged in a matrix and mounted on one substrate into one resin molded body in the lower mold cavity is employed, to form a molded substrate.

15 The compression molding technique described above is disadvantageous in that a large difference in thermal expansion coefficient between the substrate and the resin (difference in shrinkage ratio during cooling) causes distortion to occur easily, which causes warp to occur easily in the molded substrate. In particular, the larger the substrate, the more pronounced the warp. It is thus desired to efficiently prevent the  
20 occurrence of warp of a molded substrate when compressing and molding semiconductor chips arranged in a matrix and mounted on a substrate.

In order to reduce such occurrence of warp of a substrate, it has been considered, for example, to form three grooves (concave portions) to prevent substrate warp in one resin molded body formed on one substrate. According to this approach, this one resin  
25 molded body is divided into four divided resin molded bodies (referred to as islands). Put another way, in a molded substrate, the grooves are utilized to reduce the occurrence of distortion resulting from the difference in thermal expansion coefficient between the substrate and the resin.

In this method, first, measured and flattened granular resin is supplied into each of four divided cavities covered with a mold release film. Then, the granular resin in each of the divided cavities is melted by heating. Next, semiconductor chips mounted on a substrate are immersed in the molten resin in each of the divided cavities.

5 Consequently, the molten resin in each of the divided cavities is pressurized by a divided cavity bottom surface member. As a result, the semiconductor chips mounted on the substrate are sealed into each of divided resin molded bodies, to form a molded substrate.

10 When granular resin is used, a lower mold cavity needs to have a considerable depth since a predetermined amount of granular resin has a low bulk density and a high volume, and in order to supply the granular resin in such a manner that the granular resin does not adhere to a mold surface of the lower mold. For example, the depth needs to be three times (or more) the thickness of a resin molded body which is compressed and molded in the lower mold cavity. Likewise, when a structure having  
15 divided cavities (structure having grooves) is used in order to prevent the occurrence of warp of a substrate, the depth needs to be three times (or more) the thickness of divided resin molded bodies. Further, conventionally, granular resin is individually supplied into divided cavities, usually in such a manner that the granular resin does not adhere to a mold surface of a lower mold or partition surfaces of partition units forming the  
20 divided cavities (lower mold surface). Thus, the cavity needs to have a great depth. This increases an upward moving distance of a cavity bottom surface member, causing a mold release film covering the divided cavities to be easily loosened at a sliding portion of the cavity bottom surface member. This results in a disadvantage in that "wrinkles" occur easily in the mold release film. It is thus desired to efficiently  
25 prevent the occurrence of wrinkles in the mold release film covering the divided cavities by, for example, minimizing the moving distance of the cavity bottom surface member.

When a structure having divided cavities as described above is used, a cavity

block provided on a mold, i.e., a cavity block including the divided cavities and partition members is manufactured as one piece, usually resulting in an increased manufacturing cost. Further, if the thickness of divided resin molded bodies is changed, a mold (cavity block) needs to be manufactured from the beginning, resulting in a further increased manufacturing cost. The resultant increased cost of manufacturing the cavity block increases the manufacturing cost of the compression molding device, resulting in inability to efficiently improve the productivity of the product (molded substrate).

It is thus desired to efficiently reduce the manufacturing cost of the compression molding device by, for example, providing partition members to be attachable to and detachable from a cavity bottom surface member, thereby efficiently improving the productivity of the product (molded substrate).

Moreover, when a structure having divided cavities as described above is used, measured and flattened granular resin is individually supplied into the divided cavities, resulting in a resin material supply mechanism having a complex structure. As a result, the manufacturing cost increases, and a time for supplying the resin material (granular resin) is extended, resulting in inability to efficiently improve the productivity of the product (molded substrate). It is thus desired to efficiently reduce the manufacturing cost of the compression molding device and efficiently reduce the time for supplying the resin material (granular resin) by, for example, supplying the entire flattened granular resin into a lower mold cavity (onto the entire bottom surface of a large cavity) at a time, with a mold release film covering the lower mold cavity, thereby efficiently improving the productivity of the product (molded substrate).

#### SUMMARY OF THE INVENTION

The present invention was made in view of the above problems, and an object of the present invention is to efficiently prevent the occurrence of warp of a product (molded substrate). Another object of the present invention is to efficiently prevent the occurrence of wrinkles in a mold release film covering divided cavities. Still

another object of the present invention is to efficiently improve the productivity of the product (molded substrate).

Partition members are provided in predetermined positions on a tip surface of a cavity bottom surface member, to form a predetermined plurality of divided cavities in a lower mold cavity. A height of the partition members is set to be equal to a thickness of divided resin molded bodies. When sealing semiconductor chips mounted on a substrate into the divided resin molded bodies each having a shape corresponding to a shape of each divided cavity, the cavity bottom surface member is moved upward for a minimum necessary moving distance. Here, resin in the divided cavities is pressurized, to form the divided resin molded bodies. Here, grooves to prevent substrate warp each having a shape corresponding to a shape of each partition member are formed between adjacent ones of the divided resin molded bodies.

The foregoing and other objects, features, aspects and advantages of the present invention will become more apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic vertical sectional view schematically showing a compression mold for semiconductor chips in the present invention, which illustrates a cross section in a long side direction of a substrate, in a state where the mold is opened before molding with the mold (first embodiment).

Fig. 2 is a vertical sectional view schematically showing the compression mold for semiconductor chips corresponding to the mold shown in Fig. 1, which illustrates a state where a resin material has been supplied into a lower mold cavity formed in the mold and covered with a mold release film (first embodiment).

Fig. 3 is a vertical sectional view schematically showing the compression mold for semiconductor chips corresponding to the mold shown in Fig. 1, which illustrates a state where the mold has been clamped (first embodiment).

Fig. 4A is a vertical sectional view schematically showing the compression

mold for semiconductor chips corresponding to the mold shown in Fig. 1, which illustrates a state where the mold has been opened after molding with the mold (first embodiment).

5 Fig. 4B is an enlarged front view schematically showing a molded substrate in an enlarged manner which has been molded with the mold shown in Fig. 4A (first embodiment).

10 Fig. 5 is a plan view schematically showing a lower mold surface of the mold shown in Fig. 2, which illustrates a state where the resin material (granular resin) has been supplied into the lower mold cavity formed in the mold and covered with the mold release film (first embodiment).

Fig. 6 is a schematic perspective view schematically showing a cavity bottom surface member forming a cavity bottom surface of the mold shown in Fig. 1, which illustrates a state where partition members have been provided to be attachable to and detachable from the cavity bottom surface member (first embodiment).

15 Fig. 7 is a vertical sectional view schematically showing the compression mold for semiconductor chips corresponding to the mold shown in Fig. 2, which illustrates a cross section in a short side direction of the substrate, in a state where the resin material (granular resin) has been supplied into the lower mold cavity formed in the mold and covered with the mold release film (first embodiment).

20 Fig. 8 is a vertical sectional view schematically showing the compression mold for semiconductor chips corresponding to the mold shown in Fig. 3, which illustrates a cross section in the short side direction of the substrate, in a state where the mold has been clamped (first embodiment).

25 Fig. 9 is an enlarged vertical sectional view schematically showing a substantial part of the mold shown in Fig. 1 in an enlarged manner, which illustrates the partition member provided on the cavity bottom surface member of the mold (first embodiment).

Fig. 10 is a vertical sectional view schematically showing another compression mold for semiconductor chips in the present invention, which illustrates a cross section

in a short side direction of a substrate, in a state where the mold is opened (second embodiment).

Fig. 11A is a plan view schematically showing a mold surface of a lower mold in the mold shown in Fig. 10 (second embodiment).

5 Fig. 11B is a bottom view schematically showing an upper cavity bottom surface member of a cavity bottom surface member and a partition member in the mold shown in Fig. 10, which illustrates a state before the partition member is mounted in the upper cavity bottom surface member (second embodiment).

10 Fig. 11C is a bottom view schematically showing the upper cavity bottom surface member of the cavity bottom surface member and the partition member in the mold shown in Fig. 10, which illustrates a state where the partition member has been mounted in the upper cavity bottom surface member (second embodiment).

15 Fig. 12A is a vertical sectional view schematically showing a partition member used in another embodiment of the present invention, which illustrates a state before the partition member is mounted in an upper cavity bottom surface member (third embodiment).

20 Fig. 12B is a vertical sectional view schematically showing the partition member used in the another embodiment of the present invention, which illustrates a state where the partition member has been mounted in the upper cavity bottom surface member (third embodiment).

Fig. 13A is a perspective view schematically showing a molded substrate which has been compressed and molded with the mold shown in Fig. 1 (first embodiment).

25 Fig. 13B is a perspective view schematically showing a molded substrate which has been compressed and molded with the mold shown in Fig. 10 (second embodiment).

Fig. 14 is an enlarged vertical sectional view schematically showing a substantial part of another compression mold for semiconductor chips in the present invention in an enlarged manner, which illustrates a cross section in a short side

direction of a substrate, in a state where the mold is opened (fourth embodiment).

Fig. 15 is an enlarged vertical sectional view schematically showing a substantial part of the mold shown in Fig. 14 in an enlarged manner, which illustrates a state where the mold has been clamped (fourth embodiment).

5            Fig. 16 is a vertical sectional view schematically showing the mold shown in Fig. 14, which illustrates a cross section in the short side direction of the substrate, in a state where the mold is opened (fourth embodiment).

            Fig. 17A is a perspective view schematically showing an example of a molded substrate in an enlarged manner, which has been molded with the mold shown in Fig.  
10          10 (fifth embodiment).

            Fig. 17B is a perspective view schematically showing an example of a molded substrate in an enlarged manner, which has been molded with the mold shown in Fig.  
10 (fifth embodiment).

            Fig. 17C is a perspective view schematically showing an example of a molded  
15          substrate in an enlarged manner, which has been molded with the mold shown in Fig.  
10 (fifth embodiment).

            Fig. 17D is a perspective view schematically showing an example of a molded substrate in an enlarged manner, which has been molded with the mold shown in Fig.  
10 (fifth embodiment).

20           Fig. 18A is a perspective view schematically showing an example of a molded substrate in an enlarged manner, which has been molded with the mold shown in Fig.  
10 (fifth embodiment).

            Fig. 18B is a perspective view schematically showing an example of a molded substrate in an enlarged manner, which has been molded with the mold shown in Fig.  
25          10 (fifth embodiment).

            Fig. 18C is a perspective view schematically showing an example of a molded substrate in an enlarged manner, which has been molded with the mold shown in Fig.  
10 (fifth embodiment).

Fig. 18D is a perspective view schematically showing an example of a molded substrate in an enlarged manner, which has been molded with the mold shown in Fig. 10 (fifth embodiment).

5 Fig. 19A is a perspective view schematically showing a partition member in an enlarged manner, which is used in a compression mold for semiconductor chips in the present invention (sixth embodiment).

Fig. 19B is a perspective view schematically showing a partition member in an enlarged manner, which is used in a compression mold for semiconductor chips in the present invention (sixth embodiment).

10 Fig. 20A is a perspective view schematically showing an example of a molded substrate which has been compressed and molded with another compression mold for semiconductor chips in the present invention (seventh embodiment).

Fig. 20B is a perspective view schematically showing an example of a molded substrate which has been compressed and molded with another compression mold for semiconductor chips in the present invention (seventh embodiment).

15 Fig. 20C is a perspective view schematically showing an example of a molded substrate which has been compressed and molded with another mold in the present invention (eighth embodiment).

20 Fig. 21A is a schematic perspective view schematically showing an example of a molded substrate which has been compressed and molded with another compression mold for semiconductor chips in the present invention (eighth embodiment).

Fig. 21B is a schematic perspective view schematically showing an example of a molded substrate which has been compressed and molded with another compression mold for semiconductor chips in the present invention (eighth embodiment).

25 Fig. 21C is a schematic perspective view schematically showing an example of a molded substrate which has been compressed and molded with another compression mold for semiconductor chips in the present invention (eighth embodiment).

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Compression molding methods and compression molds for semiconductor chips of the present invention will be described hereinafter in first to eighth embodiments.

#### First Embodiment

A first embodiment will be described in detail with reference to Figs. 1 to 9 and 13A. Figs. 1, 2, 3, 4, 5, 7 and 8 show a compression mold for semiconductor chips of the first embodiment. Fig. 6 shows a cavity bottom surface member provided on the mold of the first embodiment, and partition members provided on the cavity bottom surface member in an attachable and detachable manner. Fig. 9 shows the partition member provided on the cavity bottom surface member provided on the mold of the first embodiment. Fig. 13A shows a molded substrate of the first embodiment.

#### (Substrate Used in First Embodiment)

A substrate 1 used in this embodiment has a predetermined plurality of semiconductor chips 2 such as ICs (integrated circuits) arranged in a matrix mounted thereon. In this embodiment, semiconductor chips 2 arranged in a matrix and mounted on substrate 1 can be sealed into divided resin molded bodies 3 (resin molded body 33), to form a molded substrate 4.

#### (Structure of Compression Mold for Semiconductor Chips in First Embodiment)

A compression mold 5 for semiconductor chips shown in Figs. 1 to 9 includes an upper mold 6 and a lower mold 7 arranged opposite to upper mold 6. A (long) mold release film 8 is provided in a tensioned state between upper mold 6 and lower mold 7. A mold surface of upper mold 6 includes a substrate setting portion 9. A mold surface of lower mold 7 includes a lower mold cavity (large cavity) 10 for compression molding having a predetermined depth. Mold 5 includes means 11 for supplying a resin material into large cavity 10 (hereinafter also referred to as "resin material supply means 11").

Although not shown, mold 5 (upper mold 6 and lower mold 7) includes heating means for heating the resin material in lower mold cavity 10, and a clamping mechanism for clamping mold 5 (upper mold 6 and lower mold 7). In compression

mold 5, substrate 1 having semiconductor chips 2 mounted thereon can be set on substrate setting portion 9 of upper mold 6, with a semiconductor chip mounted surface 1a being directed downward. Lower mold cavity 10 and the mold surface of lower mold 7 can be covered with mold release film 8 along their shapes by adsorption. A resin material, e.g., a granular resin material 12 (hereinafter also referred to as "granular resin 12") can be supplied by resin material supply means 11 into lower mold cavity 10 covered with mold release film 8. Granular resin 12 can be melted by the heating means in lower mold cavity 10. By clamping mold 5 (upper mold 6 and lower mold 7) by the clamping mechanism, semiconductor chip mounted surface 1a of substrate 1 that has been set on substrate setting portion 9 of upper mold 6 can be pressed by the mold surface of lower mold 7.

Further, by pressurizing a resin 13 in lower mold cavity 10, semiconductor chips 2 mounted on substrate 1 can be immersed in molten resin (hereinafter also referred to as "fluid resin") 13 that has been heated in the lower mold cavity. As a result, semiconductor chips 2 mounted on substrate 1 can be sealed into a predetermined number of divided resin molded bodies 3 (hereinafter also referred to as "divided packages 3") to be described later in lower mold cavity 10. With this compression molding, molded substrate 4 can be formed.

#### (Structure of Resin Material Supply Means in First Embodiment)

As shown in Fig. 1, for example, resin material supply means 11 includes a frame 15 having a through hole 14, an open/close shutter plate 16 provided on the side of a lower opening 14a of through hole 14 in frame 15, and an opening/closing mechanism of the shutter plate (not shown) for horizontally opening and closing shutter plate 16. By opening lower opening 14a of through hole 14 with shutter plate 16, through hole 14 can be formed in a resin supply unit 17.

More specifically, first, a predetermined amount of granular resin 12 is supplied to resin supply unit 17 through an upper opening 14b of through hole 14, and flattened to have a predetermined uniform thickness. Then, resin material supply means 11 is

inserted into mold 5 (upper mold 6 and lower mold 7). Then, by opening shutter 16, flattened and uniform granular resin 12 can be supplied into lower mold cavity 10 having mold release film 8 covering the entire cavity bottom surface 10b of the lower mold. Here, as shown in Fig. 5, granular resin 12 is uniformly dispersed in lower mold cavity 10 when viewed two-dimensionally.

According to this structure, it is unnecessary to measure and flatten a predetermined amount of granular resin, and individually supply the resin into divided cavities, as described in the conventional example. Thus, the time for supplying the resin material can be efficiently reduced, thereby efficiently reducing the time for supplying the resin material by resin material supply means 11. As a result, the productivity of molded substrate 4 can be efficiently improved.

#### (Structure of Lower Mold Cavity in First Embodiment)

Lower mold cavity (large cavity) 10 includes a cavity opening 10a, cavity bottom surface 10b, and a cavity side surface 10c on the mold surface of lower mold 7.

Lower mold cavity 10 also includes a cavity bottom surface member 18 with cavity bottom surface 10b as a tip surface, and a cavity side surface member 7 including cavity side surface 10c (hereinafter also referred to as "lower mold body 7"). Lower mold cavity 10 further includes pressurizing means 19 for pressurizing molten resin 13 in cavity 10 by moving cavity bottom surface member 18 upward in cavity 10, and a compression spring 34 provided between cavity side surface member 7 and pressurizing means 19.

One cavity bottom surface member 18 is capable of vertically sliding by means of pressurizing means 19 within a slide hole 20 (slide portion) formed to be connected to cavity side surface 10c of lower mold cavity 10.

Further, as will be described later, cavity bottom surface member 18 including partition members 21 is moved upward for a minimum necessary moving distance 24 by pressurizing means 19. As a result, semiconductor chip mounted surface 1a (hereinafter also referred to as "substrate surface 1a") can be pressed by tip surfaces 21a

of partition members 21.

By clamping mold 5 (upper mold 6 and lower mold 7), resin 12 in lower mold cavity 10 can be pressurized with a predetermined pressure from cavity bottom surface member 18 via mold release film 8. Consequently, as will be described later, the predetermined plurality of semiconductor chips 2 mounted on substrate 1 can be immersed in resin 13 (hereinafter also referred to as "fluid resin 13") that has been melted by heating in lower mold cavity 10. Further, the plurality of semiconductor chips 2 mounted on substrate 1 can be sealed into resin molded body 33 having a shape corresponding to the shape of lower mold cavity 10, i.e., into each of the plurality of divided resin molded bodies 3.

(Structure of Partition Member in First Embodiment)

As shown in Fig. 1, in large cavity 10 of lower mold 7, the predetermined number of partition members (convex portions) 21 protrude from cavity bottom surface 10b. A height 23 of partition member 21, i.e., a distance from cavity bottom surface 10b to tip surface 21a of partition member 21 corresponds to a thickness of resin molded body 33 molded in lower mold cavity 10. That is, height 23 of partition member 21 has the same distance (length) as the thickness of resin molded body 33.

Note that height 23 is equal to depth 23 of cavity 10 when substrate surface 1a is pressed by tip surfaces 21a of partition members 21 when the resin in lower mold cavity 10 is pressurized by upward-moving cavity bottom surface member 18.

Resin molded body 33 molded to have the shape corresponding to the shape of lower mold large cavity 10 is provided with grooves (concave portions) 28 each having a shape corresponding to the shape of each partition member (convex portion) 21. As a result, divided resin molded bodies 3 corresponding to divided cavities 22 to be described later can be formed on opposite sides of each groove (concave portion) 28, thereby forming molded substrate 4. Such formation of grooves (concave portions) 28 in the conventional resin molded body (cured resin 33) can reduce the occurrence of warp of resin molded body 33 as described in the conventional example. Therefore,

the occurrence of warp of molded substrate 4 resulting from the difference in thermal expansion coefficient between substrate 1 and resin molded body 33 can be efficiently prevented.

Moreover, as will be described later, the predetermined number of partition members 21 are arranged to be attachable to and detachable from cavity bottom surface member 18. That is, partition members 21 having height 23 corresponding to the thickness of resin molded body 33 can be replaced with other partition members in cavity bottom surface member 18. Conventionally, a cavity block having divided cavities is manufactured as one piece in accordance with various types of molded substrates (divided resin molded bodies having different thicknesses), which usually results in an increased manufacturing cost. In contrast, the first embodiment employs the structure in which partition members 21 are provided to be attachable to and detachable from cavity bottom surface member 18, thereby efficiently reducing the manufacturing cost of the compression molding device to efficiently improve the productivity of the product (molded substrate).

Further, partition members 21 can be utilized to form divided cavities 22 in large cavity 10. Partition member 21 is provided on cavity bottom surface 10b (the tip surface of cavity bottom surface member 18) to extend in a short side direction of cavity 10 (substrate 1). Thus, tip surface 21a of partition member 21 corresponds to the entire one side of its adjacent divided cavity 22.

In the illustrated example, three partition members 21 are arranged on cavity bottom surface 10b along a long side of cavity 10 (substrate 1), to form four divided cavities 22. Accordingly, as shown in Fig. 13A, by forming three straight grooves (concave portions) 28 corresponding to partition members 21 in resin molded body 33 corresponding to large cavity 10 in molded substrate 4, four divided resin molded bodies 3 corresponding to divided cavities 22 can be formed.

Note that partition members 21 of the first embodiment are means for forming concave portions to prevent substrate warp in resin molded body 33 corresponding to

large cavity 10.

Furthermore, as described above, the entire predetermined amount of granular resin 12 can be supplied at a time by resin material supply means 11 into cavity 10 (bottom surfaces 22a of divided cavities 22 and tip surfaces 21a of partition members 21) covered with resin mold film 8. Here, as described above, granular resin 12 can be  
5 supplied onto the entire cavity bottom surface 10b.

Thus, the predetermined plurality of semiconductor chips 2 mounted on substrate 1 can be sealed into divided resin molded bodies 3 each having a shape corresponding to the shape of each divided cavity 22. As a result, molded substrate 4  
10 shown in Fig. 13A can be obtained. Here, in cavity 10 having partition members 21, the predetermined plurality of semiconductor chips 2 mounted on substrate 1 can also be sealed into resin molded body 33 having the shape corresponding to the shape of cavity 10. Moreover, grooves (concave portions) 28 each having the shape corresponding to the shape of each partition member 21 to prevent substrate warp are  
15 formed between adjacent ones of divided resin molded bodies 3. Accordingly, the occurrence of distortion of molded substrate 4 can be efficiently prevented by grooves 28, thereby efficiently preventing the occurrence of warp of molded substrate 4.

A shape of a bottom surface 28a of groove 28 is a transcription of the shape of the tip (e.g., tip surface 21a) of partition member 21. Cavity bottom surface 10b  
20 between partition members 21 in cavity 10 is divided cavity bottom surface 22a. Tip surface 21a of partition member 21 is a shallow cavity bottom surface, and the tip surface of cavity bottom surface member 18 is a deep cavity bottom surface (large cavity bottom surface 10b and divided cavity bottom surface 22a).

(Resin Connection Path of Partition Member in First Embodiment)

25 Tip surface 21a of partition member 21 of the first embodiment includes resin connection paths (through gates) 35 each having a semicircular bottom. Thus, when the resin in divided cavities 22 is pressurized by cavity bottom surface member 18, tip surfaces 21a of partition members 21 can be pressed onto substrate surface 1a. In

addition, the resin (molten resin 13) in divided cavities 22 can be moved between divided cavities 22 through resin connection paths 35 provided on tip surfaces 21a of partition members 21, to adjust the amounts of resin in divided cavities 22. The resin cured in resin connection path 35 becomes a connected resin portion 36, and is formed  
5 on bottom surface 28a of groove 28 between divided resin molded bodies 3.

(Minimum Necessary Moving Distance of Cavity Bottom Surface Member Including Partition Members in First Embodiment)

As shown in Fig. 1, tip surface (partition surface) 21a of partition member 21 has predetermined distance (predetermined height) 23 from cavity bottom surface 10b,  
10 the predetermined distance being the same as the thickness of divided resin molded bodies 3 (resin molded body 33). Predetermined distance 24 between an upper surface (P. L surface) of lower mold 7 and tip surface 21a of the partition member is minimum necessary moving distance 24 for which substrate surface 1a can be pressed upward (in a direction of the mold surface) by the mold surface of lower mold body 7 (compression  
15 spring 34), when cavity bottom surface member 18 is moved in the direction of the mold surface by means of pressurizing means 19 to pressurize the resin in cavities 10 and 22.

Further, by moving cavity bottom surface member 18 upward in lower mold cavity 10, substrate surface 1a can be pressed upward by tip surfaces 21a of partition  
20 members 21. The predetermined number of partition members 21 are capable of vertically sliding together with cavity bottom surface member 18 within cavity 10 (slide hole 20).

Substrate 1 is sandwiched between the mold surface of upper mold 6 and the mold surface of lower mold 7 (which includes tip surfaces 21a of partition members 21)  
25 by means of elastic pressure from compression spring 34 for minimum necessary moving distance 24 of cavity bottom surface member 18. Note that the distance between the upper surface (P. L surface) of the lower mold and tip surface 21a of partition member 21 may be predetermined distance 24 before the resin is pressurized

by cavity bottom surface member 18.

(Mold Release Film and Minimum Necessary Moving Distance of Cavity Bottom Surface Member in First Embodiment)

5 In the first embodiment, cavity bottom surface member 18 is moved upward for minimum necessary moving distance 24, to pressurize molten resin 13 in divided cavities 22 covered with mold release film 8. In this process, first, semiconductor chip mounted surface 1a of substrate 1 that has been supplied to and set on substrate setting portion 9 of upper mold 6 is pressed by the mold surface of lower mold body 7 by means of the elastic pressure from compression spring 34. Then, tip surfaces 21a of  
10 partition members 21 are pressed onto substrate surface 1a. As a result, molten resin 13 in divided cavities 22 can be pressurized. Here, cavity bottom surface member 18 only moves for minimum necessary moving distance 24. Further, cavity bottom surface member 18 and partition members 21 do not move relative to each other. Therefore, loosening of mold release film 8 covering divided cavities 22 between cavity  
15 bottom surfaces 22a (10b) and partition members 21 can be efficiently prevented, thereby efficiently preventing the occurrence of wrinkles in mold release film 8 covering divided cavities 22.

Conventionally, the depth of a lower mold cavity needs to have a distance at least three times the thickness of a resin molded body, and the moving distance of a  
20 cavity bottom surface member is at least twice or more the thickness of the resin molded body.

(Resin Material Supply Portion in Lower Mold Cavity in First Embodiment)

According to the first embodiment, as described above, flattened granular resin 12 can be supplied by resin material supply means 11 into lower mold cavity 10  
25 covered with mold release film 8, to be dispersed in the entire cavity bottom surface. Conventionally, granular resin is individually supplied to divided cavities, resulting in inability to supply the granular resin to mold surfaces of partition members forming the divided cavities (which correspond to the tip surfaces of the partition members of the

first embodiment). In contrast, according to the first embodiment, the partition members forming the divided cavities are provided to be attachable to and detachable from the cavity bottom surface member which slides vertically, and the entire flattened granular resin is supplied at a time onto the entire cavity bottom surface of the lower mold, with mold release film 8 covering lower mold cavity 10. Accordingly, space above the position of the tip surfaces of the partition members in the lower mold cavity can be used as a granular resin supply portion, and space above the entire cavity bottom surface of the lower mold including the tip surfaces of the partition members can be used as a granular resin supply portion.

According to the first embodiment, therefore, the lower mold cavity does not need to have a depth three times the thickness of the divided resin molded bodies as in the conventional example, so the depth of lower mold cavity 10 can be extremely reduced as compared to that of the conventional example.

The granular resin supplied onto tip surfaces 21a of partition members 21 is melted by heating, and the molten resin (fluid resin) flows into divided cavities 22. As a result, the molten resin is housed in each of divided cavities 22 of lower mold cavity 10.

(Structure of Attachable and detachable Partition Member in First Embodiment)

As described above, according to the first embodiment, partition members 21 can be attached to and detached from cavity bottom surface member 18. As shown in the illustrated example, cavity bottom surface member 18 includes an upper cavity bottom surface member (cavity block) 29 and a lower cavity bottom surface member (base member) 30.

Cavity bottom surface member 18 includes a predetermined number of groove-like fit portions (grooves in the illustrated example) 31 for the partition members, which extend along a short side direction of cavity 10, and in which partition members 21 fit in an attachable and detachable manner. Thus, a base portion 21b of partition member 21 can be horizontally (laterally) pushed to fit in fit portion 31 of

cavity bottom surface member 18 (upper cavity bottom surface member 29 and lower cavity bottom surface member 30). Here, a tip portion 21c of partition member 21 protrudes from cavity bottom surface member 18.

5 Lower cavity bottom surface member 30 includes catch members 32 such as bolts for catching partition members 21 that have fit in fit portions 31. Catch members 32 can catch partition members 21 that have fit in fit portions 31 from the side of lower cavity bottom surface member 30.

10 First, base portions 21b of partition members 21 horizontally fit in fit portions 31 of cavity bottom surface member 18 (29 and 30) in an attachable and detachable manner. Then, the predetermined number of catch members 32 catch partition members 21 from the side of lower cavity bottom surface member 30. According to the first embodiment, partition members 21 can be readily mounted to be attachable to and detachable from cavity bottom surface member 18 in order to accommodate a change in thickness of divided resin molded bodies 3.

15 For example, when divided resin molded bodies having a predetermined thickness (divided resin molded bodies having a different thickness) are newly compressed and molded, first, partition members 21 are detached from cavity bottom surface member 18. Then, partition members 21 having a height corresponding to the thickness of the new divided resin molded bodies are attached to cavity bottom surface member 18.

20 According to the first embodiment, therefore, partition members 21 can be replaced with other partition members, thereby efficiently forming molded substrate 4 with mold 5 in the first embodiment, to efficiently improve the productivity of the product (molded substrate).

25 (Compression Molding Method for Semiconductor Chips in First Embodiment)

First, as shown in Fig. 1, compression mold 5 for semiconductor chips is used to set substrate 1 having the predetermined plurality of semiconductor chips 2 arranged in a matrix mounted thereon (substrate before molding) onto substrate setting portion 9 of

upper mold 6, with semiconductor chip mounted surface 1a being directed downward. Then, the mold surface of lower mold 7 and the surface of lower mold cavity 10 (divided cavities 22 and partition members 21) are covered with mold release film 8 by adsorption. Then, flattened granular resin 12 is supplied by resin material supply means 11 into cavity 10 (divided cavities 22) covered with mold release film 8. Here, flattened granular resin 12 is dropped via mold release film 8 onto the entire bottom surface 10b of cavity 10, i.e., bottom surfaces 22a of the divided cavities and tip surfaces 21a of partition members 21, while maintaining a flattened profile of the resin. Thus, the entire flattened granular resin 12 can be supplied into cavity 10 at a time. Therefore, granular resin 12 can be supplied to be dispersed in the entire cavity bottom surface 11b (bottom surfaces 22a of divided cavities 22 and tip surfaces 21a of partition members 21).

Next, resin 12 in lower mold cavity 10 (bottom surface 22a of the divided cavities and tip surfaces 21a of the partition members) is melted by heating. Upper and lower molds 6 and 7 are then clamped to each other. Here, the mold surface of lower mold body 7 is pressed onto semiconductor chip mounted surface 1a of substrate 1 of upper mold 6. Then, cavity bottom surface member 18 is moved upward for minimum necessary moving distance 24, thus pressurizing resin 13 in large cavity 10 (divided cavities 22). Here, substrate surface 1a can be pressed by the mold surface of lower mold 7 by means of the elastic pressure from compression spring 34, and substrate surface 1a can be pressed by tip surfaces 21a of partition members 21. Accordingly, all of the predetermined plurality of semiconductor chips 2 can be sealed at a time into divided resin molded bodies (divided packages) 3 each having the shape corresponding to the shape of each divided cavity 22. As a result, grooves (concave portions) 28 each having the shape corresponding to the shape of each tip portion (which includes tip surface 21a) of partition member 21 are formed between adjacent ones of divided resin molded bodies 3. Here, connected resin portion (cured resin) 36 is formed in resin connection path 35. The lower and upper molds are then opened,

and molded substrate 4 (divided resin molded bodies 3) is removed from lower mold cavity 10 (22).

#### Second Embodiment

5 A second embodiment will now be described in detail with reference to Figs. 10, 11A to 11C, and 13B.

Figs. 10 and 11A to 11C show a compression mold for semiconductor chips of the second embodiment. Fig. 13B shows a molded substrate which has been molded with the mold of the second embodiment. The mold of the second embodiment has the same basic structure as that of the mold of the first embodiment, and thus detailed description thereof will not be repeated. The substrate used in the first embodiment is used in the second embodiment as well. The mold of the second embodiment includes a through gate on opposite sides of partition members in a lower mold cavity.

#### (Structure of Compression Mold for Semiconductor Chips in Second Embodiment)

15 As in the first embodiment, a mold 41 shown in Figs. 10 and 11A to 11C includes an upper mold 42 and a lower mold 43. Mold 41 also includes a large cavity 44 (a cavity opening 44a, a cavity bottom surface 44b, and a cavity side surface 44c) of the lower mold, a cavity bottom surface member 45, and pressurizing means 19. Mold 41 further includes substrate setting portion 9 of the upper mold, mold release film 8  
20 covering lower mold cavity 44, and a compression spring (not shown) provided between lower mold 43 and pressurizing means 19. As in the first embodiment, mold 41 includes heating means and a clamping mechanism.

As in the first embodiment, a predetermined number of partition members 46 protrude from cavity bottom surface 44b. Partition members 46 are provided to be  
25 attachable to and detachable from cavity bottom surface member 45. Large cavity 44 is divided into a predetermined number of divided cavities 47 by the predetermined number of partition members 46. In the example shown in Fig. 11A, four divided cavities 47 are arranged along a long side direction of large cavity 44. Accordingly, as

in the first embodiment, semiconductor chips 2 arranged in a matrix and mounted on substrate 1 can be compressed and molded into a resin molded body 56 having a shape corresponding to the shape of large cavity 44.

Further, as in the first embodiment, semiconductor chips 2 arranged in a matrix and mounted on substrate 1 can be sealed into each of divided resin molded bodies 48 each having a shape corresponding to the shape of each divided cavity 47.

Furthermore, as in the first embodiment, straight grooves (concave portions) 57 each having a shape corresponding to the shape of each partition member 46 are formed in resin molded body 56 having the shape corresponding to the shape of large cavity 44, to form divided resin molded bodies 48. As a result, molded substrate 49 is formed (see Fig. 13B).

Note that partition members 46 of the second embodiment serve as means for forming grooves (concave portions) 57 in resin molded body 56 of molded substrate 49. Grooves (concave portions) 57 can efficiently prevent the occurrence of warp of molded substrate 49.

#### (Structure of Partition Member in Second Embodiment)

As in the first embodiment, partition member 46 includes a tip surface 46a, a base portion 46b, and a tip portion 46c. A distance between cavity bottom surface 44b (divided cavity bottom surface 47a) and tip surface 46a of partition member 46, i.e., a height 50 of partition member 46 corresponds to a thickness of divided resin molded bodies 48 (resin molded body 56). Further, as in the first embodiment, cavity bottom surface member 45 moves upward for a minimum necessary moving distance 51.

One side of each of adjacent divided cavities 47 (at tip surface 46a of the partition member) extends along a short side direction of large cavity 44, as in the first embodiment. In the second embodiment, unlike the first embodiment, a resin connection path (bottom surface through gate) 52 of cavity bottom surface 44b is provided on opposite sides of partition member 46. Resin connection path 52 connects adjacent divided cavities 47 to each other. Resin connection path 52 is

provided on cavity bottom surface 44b on opposite sides of partition member 46. Accordingly, excess and deficiency of the amounts of resin (granular resin 12) supplied into divided cavities 47 in the second embodiment can be adjusted in resin connection path 52. The resin cured in resin connection path 52 becomes a connected resin portion (cured resin) 54.

Further, as in the first embodiment, when a predetermined amount of flattened granular resin 12 is supplied into large cavity 44 by resin material supply means 11, granular resin 12 is dispersed in the entire bottom surface 44b of large cavity 44.

Cavity bottom surface member 45 including the predetermined number of partition members 46 vertically slides as a unit within a slide hole 53 including cavity side surface 44c. As shown in Fig. 13B, grooves 57 each having a long hole shape are formed in resin molded body 56 formed on substrate 1 and molded in large cavity 44, to correspond to partition members 46 in the second embodiment.

The shape of a bottom surface 57a of groove 57 having a long hole shape of resin molded body 56 is a transcription of the shape of tip surface 46a (tip portion 46c) of the partition member. The resin cures in resin connection path 52 on opposite sides of grooves 57 each having a long hole shape of resin molded body 56, and becomes connected resin portion 54.

(Structure of Attachable and detachable Partition Member in Second Embodiment)

As shown in Figs. 10, 11B and 11C, cavity bottom surface member 45 includes an upper cavity bottom surface member 58 and a lower cavity bottom surface member 59. Upper cavity bottom surface member 58 includes fit portions 60 each having a long hole shape, in which partition members 46 are fit in an attachable and detachable manner. Partition members 46 are caught in upper cavity bottom surface member 58 by catch members 61 such as bolts.

As shown in Fig. 11B, first, the partition member is moved perpendicularly (upward) from the side of tip portion 46c toward fit portion 60 of upper cavity bottom

surface member 58, to fit base portion 46b in fit portion 60. Then, as shown in Fig. 11C, partition member 46 is caught by catch members 61 from the side of base portion 46b, to integrate partition member 46 with lower cavity bottom surface member 59. As a result, cavity bottom surface member 45 is formed.

5           Note that tip surface 46a of partition member 46 of the second embodiment can be formed with a plane shape.

(Compression Molding Method for Semiconductor Chips in Second Embodiment)

10           As in the first embodiment, mold 41 (upper mold 42 and lower mold 43) of the second embodiment is used to supply flattened granular resin 12 into cavity 44 covered with mold release film 8. Here, flattened granular resin 12 is dropped onto the entire bottom surface 44b of cavity 44, i.e., bottom surfaces 47a of divided cavities 47 and tip surfaces 46a of partition members 46, while maintaining a flattened profile of the resin. Thus, granular resin 12 can be supplied to be dispersed in the entire cavity bottom surface 44b (bottom surfaces 47a of divided cavities 47 and tip surfaces 46a of partition members 46) via mold release film 8.

15           Next, resin 12 in lower mold cavity 44 (bottom surfaces 47a of the divided cavities and tip surfaces 46a of the partition members) is melted by heating, and mold 41 (upper mold 42 and lower mold 43) is clamped. Then, cavity bottom surface member 45 is moved upward for minimum necessary moving distance 51, to pressurize the resin in large cavity 44 (divided cavities 47) with a predetermined pressure. Here, substrate surface 1a is pressed by tip surfaces 46a of partition members 46. Accordingly, all of the predetermined plurality of semiconductor chips 2 can be sealed at a time into divided resin molded bodies (divided packages) 48 each having the shape corresponding to the shape of each divided cavity 47 in divided cavities 47.

20           Here, grooves (concave portions) 57 each having the shape corresponding to the shape of the tip portion (which includes the tip surface) of the partition member are formed between adjacent ones of divided resin molded bodies 48. Thus, the amounts

of resin in divided cavities 47 can be adjusted in resin connection path 52 of cavity bottom surface 44b. Further, the resin is cured in resin connection path 52 on opposite sides of partition members 46 (grooves 57), thereby forming connected resin portion (cured resin) 54. Mold 41 (upper mold 42 and lower mold 43) is then opened, to  
5 remove molded substrate 49 (divided resin molded bodies 48 and resin molded body 56) from lower mold cavity 44. Note that groove 57 has bottom surface 57a.

The same function and effect as that of the first embodiment can be obtained in the second embodiment.

#### Third Embodiment

10 A third embodiment will now be described in detail with reference to Figs. 12A to 12B. Figs. 12A to 12B show a substantial part of another compression mold for semiconductor chips, in which a partition member is provided to be attachable to and detachable from a cavity bottom surface member. The mold of the third embodiment has the same basic structure as that of the mold of the first embodiment, and thus  
15 detailed description thereof will not be repeated. The substrate used in the first embodiment is used in the third embodiment as well.

#### (Structure of Compression Mold for Semiconductor Chips in Third Embodiment)

The mold of the third embodiment has the same basic structure as that of the  
20 mold of the first embodiment. The mold shown in Figs. 12A to 12B includes a cavity bottom surface member 141 and a partition member 142, as in the first embodiment. Partition member 142 is provided to be attachable to and detachable from cavity bottom surface member 141. Thus, in the mold of the third embodiment, semiconductor chips  
2 mounted on substrate 1 can be sealed into divided resin molded bodies each having a  
25 shape corresponding to the shape of each divided cavity (lower mold cavity). With such compression molding, a molded substrate can be formed. Here, a groove to prevent substrate warp having a shape corresponding to the shape of partition member 142 is formed in a resin molded body compressed and molded in the lower mold cavity,

or between the divided resin molded bodies.

According to the third embodiment, if the thickness of the resin molded body compressed and molded in the lower mold cavity is changed, for example, the partition member can be easily and efficiently replaced from above a mold surface of the lower mold (cavity bottom surface). As a result, the productivity of the molded substrate (resin molded body) can be efficiently improved. The same function and effect as that obtained with the molds of the first and second embodiments can be obtained with the mold of the third embodiment.

(Structure of Attachable and detachable Partition Member in Third Embodiment)

Partition member 142 includes a tip surface 142a, a base portion 142b, a tip portion 142c, and a cavity-bottom-surface-corresponding portion 142d. Cavity bottom surface member 141 includes an upper cavity bottom surface member 143 and a lower cavity bottom surface member 144. Thus, when partition member 142 is provided on cavity bottom surface member 141 (upper cavity bottom surface member 143), a cavity bottom surface 145 and cavity-bottom-surface-corresponding portion 142d of partition member 142 are positioned in the same plane. Further, cavity bottom surface 145 which is an upper surface of upper cavity bottom surface member 143 includes a fit hole (fit portion) 146 in which base portion 142b of partition member 142 is inserted in an attachable and detachable manner from the side of cavity bottom surface 145, and a catch portion 146a of fit hole 146 for catching partition member 142 (base portion 142b).

A lower surface of upper cavity bottom surface member 143 includes an insertion hole 148 in which a bolt member 147 for catching partition member 142 in upper cavity bottom surface member 143 (cavity bottom surface member 141) is inserted. Insertion hole 148 includes a catch portion 148a for catching bolt member 147. Fit hole 146 and insertion hole 148 are connected to each other in upper cavity bottom surface member 143.

Lower cavity bottom surface member 144 includes a through insertion hole 149. When upper cavity bottom surface member 143 and lower cavity bottom surface member 144 are joined to each other, fit hole 146 and insertion hole 148 of upper cavity bottom surface member 143 are connected to insertion hole 149 of lower cavity bottom surface member 144.

As shown in Fig. 12A, first, partition member 142 is inserted downward, from the side of base portion 142b, in an opening 146b of fit hole 146 of the upper surface (cavity bottom surface 145) of upper cavity bottom surface member 143. Here, partition member 142 (base portion 142b) is caught by catch portion 146a of fit hole 146. Further, bolt member 147 is inserted in an opening 148b of insertion hole 148 of the lower surface of upper cavity bottom surface member 143, to fix partition member 142 in fit hole 146 of upper cavity bottom surface member 143 by bolt member 147. Here, a tip portion 147a of bolt member 147 is screwed into partition member 142 (base portion 142b). A bolt head 147b of bolt member 147 is caught by catch portion 148a of insertion hole 148.

Next, as shown in Fig. 12B, lower cavity bottom surface member 144 is integrated with upper cavity bottom surface member 143, to form cavity bottom surface member 141 including partition member 142. Here, fit hole 146 and insertion hole 148 of upper cavity bottom surface member 143 are connected to insertion hole 149 of lower cavity bottom surface member 144. When partition member 142 is detached from fit hole 146 of upper cavity bottom surface member 143, the above procedure is carried out in reverse order.

After partition member 142 is inserted in fit hole 146 of cavity bottom surface member 141, bolt member 147 is passed through insertion hole 149 of lower cavity bottom surface member 144, to fix partition member 142 in fit hole 146.

According to the third embodiment, partition member 142 can be mounted on cavity bottom surface member 141 in the lower mold cavity from above cavity bottom surface 145. Thus, partition member 142 can be mounted efficiently and quickly.

Accordingly, if the thickness of the resin molded body is changed, the partition member can be replaced easily and quickly. As a result, the productivity of the molded substrate (product) can be efficiently improved.

#### Fourth Embodiment

5 A fourth embodiment will now be described in detail with reference to Figs. 14, 15 and 16. Figs. 14, 15 and 16 show a compression mold for semiconductor chips in the fourth embodiment. The mold of the fourth embodiment has the same basic structure as that of the mold of the first to third embodiments, and thus detailed description thereof will not be repeated.

10 Substrate 1 used in the first to third embodiments is used in the fourth embodiment as well. In the fourth embodiment, molded substrate 4 shown in Fig. 13A is formed. Further, in the fourth embodiment, a partition member is elastically biased in a direction of a cavity (in a direction perpendicular to a mold surface) in a cavity bottom surface member. Thus, a tip portion of the partition member protrudes  
15 from a cavity bottom surface. Accordingly, in the fourth embodiment, elastic force can be utilized to move the partition member (tip portion) in accordance with a thickness of divided resin molded bodies compressed and molded in divided cavities.

#### (Structure of Compression Mold for Semiconductor Chips in Fourth Embodiment)

20 A compression mold 71 for semiconductor chips shown in Figs. 14, 15 and 16 includes an upper mold 72 and a lower mold 73, as in the first to third embodiments. Compression mold 71 includes a large cavity 74 (a cavity opening 74a, a cavity bottom surface 74b, and a cavity side surface 74c) having a predetermined depth and provided in a mold surface of lower mold 73, a cavity bottom surface member 75, and  
25 pressurizing means 19. Compression mold 71 includes substrate setting portion 9 of the upper mold, mold release film 8 to cover lower mold cavity 74, and a compression spring (not shown) provided between lower mold body 73 and pressurizing means 19. Thus, the resin can be pressurized by moving cavity bottom surface member 75 upward

by means of pressurizing means 19 within slide hole 20 which is connected to large cavity 74 (side surface 74c) of lower mold 73. Although not shown, as in the first to third embodiments, heating means and a clamping mechanism are provided in the fourth embodiment.

5 In the fourth embodiment, as in the first to third embodiments, a predetermined number of partition members (elastic partition members) 76 are provided on lower mold cavity 74 (cavity bottom surface member 75). The predetermined number of partition members 76 divide lower mold cavity 74 into a predetermined number of divided cavities 77.

10 Although not shown, in the fourth embodiment, as in the first to third embodiments, the entire flattened granular resin 12 is supplied at a time into lower mold cavity 74 (which includes divided cavities 77) by resin material supply means 11. Here, in the fourth embodiment, as in the first to third embodiments, space above tip surfaces 76a of partition members 76 can be used as a resin material supply portion.

15 Further, in the fourth embodiment, as in the first to third embodiments, cavity bottom surface member 75 in which partition members 76 have been inserted are moved upward for a minimum necessary moving distance 89.

#### (Structure of Partition Member in Fourth Embodiment)

In the fourth embodiment, as in the first to third embodiments, partition member

20 76 includes tip surface 76a, a base portion 76b, and a tip portion 76c. Partition member 76 of the fourth embodiment is inserted through cavity bottom surface 74b, as in the first to third embodiments. Tip portion 76c (which includes tip surface 76a) of partition member 76 protrudes from cavity bottom surface 74b. Thus, the predetermined plurality of divided cavities 77 can be formed by partitioning lower mold

25 cavity 74 by partition members 76. Tip surface 76a of partition member 76 includes a resin connection path 91. In the fourth embodiment, tip surface 76a and tip portion 76c of partition member 76 can be formed with the same shapes as those in the first to third embodiments, for example. Note that partition members 76 of the fourth

embodiment serve as means for forming concave portions, which forms grooves 28 to prevent substrate warp in resin molded body 33 of molded substrate 4.

Partition members 76 of the fourth embodiment are provided to be attachable to and detachable from cavity bottom surface member 75 having cavity bottom surface 74b as a tip surface. Further, (the entire) partition members 76 elastically slide vertically with respect to cavity bottom surface member 75 (cavity bottom surface 74b). That is, in lower mold cavity 74, tip portion 76c and tip surface 76a of partition member 76 elastically slide vertically. In the fourth embodiment, as in the first to third embodiments, semiconductor chips 2 arranged in a matrix and mounted on substrate 1 can be immersed in the resin in lower mold cavity 74 (divided cavities 77) covered with mold release film 8. Here, the resin in lower mold cavity 74 can be pressurized by moving cavity bottom surface member 75 (pressurizing means 19) upward. Thus, semiconductor chips 2 arranged in a matrix and mounted on substrate 1 can be sealed into divided resin molded bodies 3 each having the shape corresponding to the shape of each divided cavity 77. As a result, molded substrate 4 is formed. Here, semiconductor chips 2 mounted on substrate 1 can be sealed into resin molded body 33 having the shape corresponding to the shape of lower mold cavity 74, and grooves (concave portions) 28 each having a shape corresponding to the shape of each elastic partition member 76 can be formed in resin molded body 33.

According to the fourth embodiment, grooves (concave portions) 28 formed in resin molded body 33 of molded substrate 4 can reduce the occurrence of distortion resulting from the difference in thermal expansion coefficient between substrate 1 and resin molded body (cured resin) 33. According to the fourth embodiment, therefore, the occurrence of warp of the product (molded substrate) can be efficiently prevented.

#### (Structure of Cavity Bottom Surface Member in Fourth Embodiment)

Cavity bottom surface member 75 having cavity bottom surface 74b as a tip surface includes an upper cavity bottom surface member (cavity block) 80 and a lower cavity bottom surface member (base member) 81. Upper cavity bottom surface

member 80 includes an elastic slide hole (a groove in the illustrated example) 82 in which partition member 76 has been fit to be able to elastically move (vertically). Further, as shown in the illustrate example, elastic slide hole 82 of upper cavity bottom surface member 80 includes an upper opening 82a and a lower opening 82b. Elastic slide hole 82 includes a catch portion 82c in a central position of hole 82 for catching an elastic slide portion of the partition member.

Lower cavity bottom surface member 81 includes a predetermined number of elastic mechanisms (elastically biasing mechanisms) 83 each for elastically biasing partition member 76 in elastic slide hole 82 in a mold surface direction (upward). Tip portion 76c of partition member 76 is fit through upper opening 82a. Elastic mechanism 83 of lower cavity bottom surface member 81 can be fit through lower opening 82b. Base portion 76b of partition member 76 is provided, with an engagement concave portion (a groove in the illustrated example) 76d opening downward.

As will be described later, elastic mechanism 83 includes a protruding engagement convex portion (a bolt head in the illustrated example) 87b in an upper portion of mechanism 83. Thus, in elastic slide hole 82 of the upper cavity bottom surface member, engagement concave portion 76d of partition member 76 can be brought into engagement with engagement convex portion 87b of elastic mechanism 83.

#### (Structure of Attachable and detachable Partition Member in Fourth Embodiment)

In the fourth embodiment, as in the first to third embodiments, partition member (elastic partition member) 76 can be provided to be attachable to and detachable from elastic slide hole 82 of cavity bottom surface member 75. For example, partition member 76 can be horizontally moved (slid) to fit in elastic slide hole (groove) 82, to bring engagement convex portion 87b of elastic mechanism 83 fixed in lower cavity bottom surface member 81 in elastic slide hole 82 into engagement with engagement

concave portion 76d of partition member 76. Partition member 76 can be horizontally moved from (take out of) elastic slide hole 82, to be detached from elastic slide hole 82.

That is, in the fourth embodiment, as in the first to third embodiments, partition member 76 is provided to be attachable to and detachable from cavity bottom surface member 75 (elastic slide hole 82), so that partition member 76 can be efficiently replaced. This leads to efficient compression molding, thus efficiently forming the molded substrate (resin molded body) with mold 71 of the fourth embodiment.

#### (Structure of Elastic Mechanism in Fourth Embodiment)

The structure of elastic mechanism (elastically biasing mechanism) 83 of the fourth embodiment is described. Elastic mechanism 83 includes, for example, an upper plate 84 and a lower plate 85 positioned below upper plate 84, as shown in the illustrated example. An elastic member 86 such as a compression spring or a Belleville spring is provided between upper plate 84 and lower plate 85. A bolt member 87 is provided through upper plate 84, lower plate 85, and elastic member 86.

By screwing a lower tip 87a of bolt member 87 into lower cavity bottom surface member 81, elastic mechanism 83 can be fixed to lower cavity bottom surface member 81. Upper plate 84 (and elastic member 86) is provided to be able to move vertically with respect to bolt member 87. Engagement convex portion (bolt head) 87b which is an upper base of bolt member 87 can be brought into engagement with engagement concave portion 76d of partition member 76 provided to be attachable to and detachable from elastic slide hole 82 of upper cavity bottom surface member 80.

Partition member 76, which is placed on upper plate 84, can be elastically biased upward by elastic member 86, and partition member 76 is caught by catch portion 82c of elastic slide hole 82. Thus, in the fourth embodiment, partition member 76 is fit in cavity bottom surface member 75 to be able to elastically move (vertically) by elastic mechanism 83. In this case, when the downward pressure on partition member (elastic partition member) 76 is released, partition member 76 moves upward by the upward elastically biasing force from elastic mechanism 83, and is caught by

catch portion 82c, so that tip surface 76a of partition member 76 stops at the original position.

(Height of Partition Member in Fourth Embodiment)

5 In the fourth embodiment, as in the first to third embodiments, a height 78 of partition member (elastic partition member) 76 can be made to correspond to a thickness in a particular range (or to a thickness equal to or smaller than a particular numerical value) of divided resin molded bodies 3. That is, when the resin in divided cavities 77 (74) is pressurized by cavity bottom surface member 75, tip surface 76a of elastic partition member 76 can be elastically pressed by substrate surface 1a, thereby  
10 setting the height of elastic partition member 76 to a thickness (maximum value 90) of the divided resin molded bodies.

For example, in the fourth embodiment, height 78 of partition member 76, i.e., the distance between cavity bottom surface 74b and tip surface 76a of partition member 76 can be set to a distance (length) 78 which is obtained by adding a minimum  
15 necessary elastically moving distance 88 of cavity bottom surface member 75 to maximum value 90 of a thickness in a particular range of divided resin molded bodies 3 (resin molded body 33).

In the fourth embodiment, if the thickness of the divided resin molded bodies is changed in a particular range due to change of design or molding, for example, it is  
20 unnecessary to replace partition member 76. Accordingly, although in a particular range, elastic partition member 76 of the fourth embodiment can accommodate a change in thickness of divided resin molded bodies 3.

For example, if the thickness of divided resin molded bodies 3 is maximum value 90 in a particular range, upper mold 72 and lower mold 73 are clamped to each  
25 other. Further, cavity bottom surface member 75 is moved upward for a predetermined moving distance (which includes minimum necessary moving distance 89 and minimum necessary elastically moving distance 88). As a result, a mold surface of lower mold 73 can be pressed onto substrate surface 1a, to press tip surface

76a of partition member 76 onto substrate surface 1a. Here, tip surface 76a of elastic partition member 76 pressed by substrate surface 1a moves downward in lower mold cavity 74. If the thickness of divided resin molded bodies 3 is a minimum value in a particular range, for example, tip surface 76a of elastic partition member 76 is again  
5 pressed by substrate surface 1a.

(Compression Molding Method for Semiconductor Chips in Fourth Embodiment)

According to a compression molding method using mold 71 (upper mold 72 and lower mold 73) of the fourth embodiment, first, as in the first to third embodiments,  
10 flattened granular resin 12 is supplied into lower mold large cavity 74 (divided cavities 77) covered with mold release film 8. Here, flattened granular resin 12 is dropped onto the entire bottom surface 74b of lower mold cavity 74, i.e., bottom surfaces 77a of divided cavities 77 and tip surfaces 76a of partition members 76, while maintaining a flattened profile of the resin. That is, the entire granular resin 12 can be supplied into  
15 lower mold cavity 74 at a time. Therefore, granular resin 12 can be supplied onto the entire cavity bottom surface 74b (bottom surfaces 77a of the divided cavities and tip surfaces 76a of partition members 76) with mold release film 8 interposed therebetween.

Next, the resin in lower mold cavity 74 (which includes bottom surfaces 77a of  
20 the divided cavities) is melted by heating, and then mold 71 (upper mold 72 and lower mold 73) is closed. Here, the mold surface of lower mold 73 can be pressed onto substrate surface 1a. Next, cavity bottom surface member 75 is moved upward for minimum necessary moving distance 89, and further moved for minimum necessary elastically moving distance 88. As a result, the resin in large cavity 74 (divided  
25 cavities 77) is pressurized with a predetermined pressure. Accordingly, all of the predetermined plurality of semiconductor chips 2 can be compressed and sealed (sealed and molded with resin) at a time into divided resin molded bodies 3 each having the shape corresponding to the shape of each divided cavity 77 in divided cavities 77, to

form molded substrate 4. Here, groove (concave portion) 28 having the shape corresponding to the shape of tip portion 76c (which includes tip surface 76a) of partition member 76 is formed in resin molded body 33 compressed and molded in lower mold cavity 74, and positioned between adjacent divided resin molded bodies 3. Thus, by opening mold 71 (upper mold 72 and lower mold 73), the predetermined number of divided resin molded bodies 3 of molded substrate 4 can be removed from lower mold cavity 74.

(Function and Effect in Fourth Embodiment)

The same function and effect as that obtained in the first to third embodiments can be obtained in the fourth embodiment.

According to the fourth embodiment, as in the first to third embodiments, semiconductor chips 2 mounted on substrate 1 can be sealed into divided resin molded bodies 3, and groove 28 corresponding to partition member 76 can be formed between adjacent divided resin molded bodies 3. Therefore, the occurrence of warp of molded substrate 4 can be efficiently prevented.

Further, according to the fourth embodiment, as in the first to third embodiments, excess and deficiency of the amounts of resin in adjacent divided cavities 77 can be adjusted by utilizing the function of resin connection path 91. Furthermore, according to the fourth embodiment, as in the first to third embodiments, the entire bottom surface 74b of lower mold cavity 74 can be covered with flattened granular resin 12 by resin material supply means 11. Thus in the fourth embodiment, as in the first to third embodiments, it is unnecessary to individually supply the granular resin into the divided cavities, as described in the conventional example. Accordingly, the manufacturing cost of the device including the resin material supply means can be efficiently reduced, to efficiently reduce the time for supplying the resin material. As a result of the reduction in manufacturing cost of the device and the reduction in time for supplying the resin material, the productivity of molded substrate 4 can be efficiently improved.

In the fourth embodiment, cavity bottom surface member 75 is moved upward for the predetermined moving distance (minimum necessary moving distance 89 and minimum necessary elastically moving distance 88). Thus in the fourth embodiment, elastic partition member 76 only slides for minimum necessary moving distance 88 with respect to cavity bottom surface member 75. Therefore, loosening of mold release film 8 covering divided cavities 77 can be efficiently prevented.

Moreover, in the fourth embodiment, partition member 76 provided on cavity bottom surface member 75 is elastically biased upward by the elastic mechanism (a compression spring or a Belleville spring), thereby elastically sliding elastic partition member 76 vertically with respect to cavity bottom surface member 75. For example, when tip surface 76a of partition member 76 elastically biased upward is pressed downward, the partition member (tip surface) can be elastically moved downward against the elastically biasing force from partition member 76.

Further, when semiconductor chips 2 mounted on substrate 1 are compressed and molded to form molded substrate 4 (product) while accommodating the thicknesses of various types of divided resin molded bodies 3, although in a particular range, the different thicknesses of divided resin molded bodies 3 can be accommodated without replacing partition members 76 which elastically slide vertically. For example, height 78 of elastic partition member 76 can be set to distance (length) 78 which is obtained by adding minimum necessary elastically moving distance 88 to maximum value 90 in a particular range of a thickness of divided resin molded bodies 3.

When divided resin molded bodies 3 having the thickness of maximum value 90 (minimum necessary value) in a particular range are compressed and molded, resin 12 is pressurized by cavity bottom surface member 75 by moving cavity bottom surface member 75 by predetermined moving distances 89 and 88, thereby elastically pressing tip surfaces 76a of partition members 76 onto substrate surface 1a. According to the fourth embodiment, therefore, the different thicknesses of divided resin molded bodies 3 can be efficiently accommodated without replacing (elastic) partition members 76.

Conventionally, when a mold is disassembled in order to replace partition members 76 (which include cavity bottom surface member 75 or the cavity block described in the conventional example), a mold temperature needs to be lowered to replace the mold, and then raised again, with the need to stabilize the mold temperature, resulting in an extended time required for the process. In contrast, the fourth embodiment employs the cavity bottom surface member including the elastically moving partition members, eliminating the need to disassemble the mold, thus also eliminating the time for stabilizing the mold temperature. Therefore, the productivity of the molded substrate compressed and molded with the mold can be efficiently improved.

In addition, when molded substrates 4 (divided resin molded bodies 3) having different thicknesses as described above are compressed and molded, for example, it is unnecessary to manufacture a large number of cavity bottom surface members 75 including partition members 76 to accommodate divided resin molded bodies 3 having the different thicknesses as described above. Therefore, the productivity of molded substrates 4 (divided resin molded bodies) can be efficiently improved.

In the fourth embodiment, minimum necessary moving distance 89 of cavity bottom surface member 75 does not need to be employed. In this case, when mold 71 (upper mold 72 and lower mold 73) is clamped, i.e., when substrate 1 of upper mold 72 is pressed by the mold surface of lower mold 73, tip surfaces 76a of elastic partition members 76 abut (or are pressed onto) substrate surface 1a.

Further, since the resin in divided cavities 77 is pressurized by moving cavity bottom surface member 75 upward, with tip surfaces 76a of elastic partition members 76 being pressed onto substrate surface 1a, the height of elastic partition members 76 can be set to be equal to the thickness of the divided resin molded bodies.

In this case, granular resin 12 can be supplied into lower mold cavity 74, with the mold release film covering the entire bottom surface 74b of the lower mold cavity, or a predetermined amount of granular resin 12 can be individually supplied into each

of divided cavities 77.

#### Fifth Embodiment

A fifth embodiment will now be described in detail with reference to Figs. 17A to 17D and 18A to 18D. Figs. 17A to 17D and 18A to 18D show examples of a shape of a groove having a long hole shape when viewed two-dimensionally, which is formed in resin molded body 56 (divided resin molded bodies 48) compressed and molded with mold 41 (partition members 46) of the second embodiment.

Mold 41 of the second embodiment is used to form molded substrate 49 shown in Fig. 13B, and the shape of groove 57 (which includes bottom surface 57a) is a transcription of the shape of tip portion 46c (tip surface 46a) of partition member 46, as in the second embodiment. The same function and effect as that of the above embodiments can be obtained in the fifth embodiment.

In Fig. 17A, a groove 101 of resin molded body 56 (divided resin molded bodies 48) formed on substrate 1 has a trapezoidal shape. In Fig. 17B, a groove 102 has a trapezoidal shape having a semi-elliptical shape of an end surface. In Fig. 17C, a groove 103 has a trapezoidal shape having a tapered shape of an end surface. In Fig. 17D, a groove 104 has a trapezoidal shape having a wedge shape of an end surface.

In Fig. 18A, a groove 105 has a V-shape. In Fig. 18B, a groove 106 has a round-bottom shape (cylindrical vault). In Fig. 18C, a groove 107 having a narrow width is formed in resin molded body 56 (divided resin molded bodies 48). In Fig. 18D, two grooves 108 each having the same trapezoidal shape as that of Fig. 17A are formed in a row.

Connected resin portion 54 that has been cured in resin connection path 52 is formed on outer opposite sides of each of grooves 101, 102, 103, 104, 105, 106, 107 and 108 described above. In the fifth embodiment, as in the second embodiment, grooves (concave portions) 101, 102, 103, 104, 105, 106, 107 and 108 formed in resin molded body 56 (48) of molded substrate 49 can efficiently prevent the occurrence of warp of molded substrate 49.

### Sixth Embodiment

A sixth embodiment will now be described in detail with reference to Figs. 19A to 19B. The sixth embodiment provides examples of a shape of the tip portion (tip surface) of partition member 21, 46 and 76 described in the first to fourth embodiments, with a resin connection path being provided at the tip surface of the partition member. The same function and effect as that obtained in the above embodiments can be obtained in the sixth embodiment.

Fig. 19A shows a partition member 111 including a resin connection path (fin gate) 112 having a slit shape (thin film-like shape) at a tip surface 111a of partition member 111. Fig. 19B shows a partition member 113 including rectangular resin connection paths (through gates) 114 (two paths in the illustrated example) at a tip surface 113a of partition member 113. In the sixth embodiment, as in the above embodiments, resin cured in resin connection paths 112 and 114 becomes a connected resin portion. Further, in the sixth embodiment, as in the above embodiments, the grooves (concave portions) formed in partition members 111 and 113 can be utilized to efficiently prevent the occurrence of warp of molded substrates 4 and 49. Note that resin connection path (fin gate) 112 having a slit shape (thin film-like shape) shown in Fig. 19A may have a thickness of 100  $\mu$ m or less.

### Seventh Embodiment

A seventh embodiment will now be described in detail with reference to Figs. 20A to 20B. The seventh embodiment provides examples of forming concave portions to prevent warp in a resin molded body in order to efficiently prevent the occurrence of warp of a molded substrate. In the seventh embodiment, the concave portions formed in the resin molded body can reduce the occurrence of warp of the molded substrate, thus efficiently preventing the occurrence of warp of the molded substrate.

In Fig. 20A, V-shaped grooves 117 are formed as concave portions to prevent warp in a resin molded body 115 on a molded substrate 116, resin molded body 115

including compressed and molded semiconductor chips 2 mounted on substrate 1. In the example shown in Fig. 20A, V-shaped grooves (concave portions) 17 to prevent warp are formed along both a long side direction and a short side direction of substrate 1. Thus, a predetermined number of individual resin molded bodies 118 are arranged in a matrix on substrate 1 by V-shaped grooves 117. Therefore, in the example shown in Fig. 20A (by V-shaped grooves 17 to prevent warp), the occurrence of warp of molded substrate 116 can be efficiently prevented.

In Fig. 20B, a predetermined number of (dimple-like) small concave portions 121 are formed as concave portions to prevent warp in a resin molded body 119 on a molded substrate 120, resin molded body 119 including compressed and molded semiconductor chips 2 mounted on substrate 1. In the example shown in Fig. 20B, (dimple-like) small concave portions 121 to prevent warp are arranged in appropriate positions of the resin molded body. Therefore, in the example shown in Fig. 20B (by small concave portions 121 to prevent warp), the occurrence of warp of molded substrate 120 can be efficiently prevented.

#### Eighth Embodiment

An eighth embodiment will now be described in detail with reference to Figs. 20C, and 21A to 21C. The eighth embodiment provides examples of forming convex portions to prevent warp on a resin molded body in order to efficiently prevent the occurrence of warp of a molded substrate. In the eighth embodiment, the convex portions to prevent warp formed on the resin molded body can reinforce a force against a force that causes warp of the molded substrate. Accordingly, these reinforcing convex portions can efficiently prevent the occurrence of warp of the molded substrate.

In Fig. 20C, a predetermined number of (dimple-like) small convex portions 124 are formed as convex portions to prevent warp on a resin molded body 122 on a molded substrate 123, resin molded body 122 including compressed and molded semiconductor chips 2 mounted on substrate 1. In the example shown in Fig. 20C, (dimple-like) small convex portions 124 to prevent warp are arranged in appropriate

positions of resin molded body 122. Therefore, in the example shown in Fig. 20C (by small convex portions 124 to prevent warp), the occurrence of warp of molded substrate 123 can be efficiently prevented.

5 In Fig. 21A, ribs are formed as convex portions to prevent warp on a resin molded body 125 on a molded substrate 126, resin molded body 125 including compressed and molded semiconductor chips 2 mounted on substrate 1. In the example shown in Fig. 21A, long-side rim ribs 127 are provided along rims in a long side direction of substrate 1 on an upper surface of resin molded body 125. Therefore, in the example shown in Fig. 21A (by long-side rim ribs 127 to prevent warp), the occurrence of warp of molded substrate 126 can be efficiently prevented.

10 In Fig. 21B, a rib is formed as a convex portion to prevent warp on a resin molded body 128 on a molded substrate 129, resin molded body 128 including compressed and molded semiconductor chips 2 mounted on substrate 1. In the example shown in Fig. 21B, an outer rim rib 130 is provided along an outer rim including the long side direction and short side direction of substrate 1 on an upper surface of resin molded body 128. Therefore, in the example shown in Fig. 21B (by outer rim rib 130 to prevent warp), the occurrence of warp of molded substrate 129 can be efficiently prevented.

15 In Fig. 21C, ribs are formed as convex portions to prevent warp on a resin molded body 131 on a molded substrate 132, resin molded body 131 including compressed and molded semiconductor chips 2 mounted on substrate 1. In the example shown in Fig. 21C, a predetermined number of small ribs 133 are provided on side surfaces of resin molded body 131. Therefore, in the example shown in Fig. 21C (by small ribs 133 to prevent warp), the occurrence of warp of molded substrate 132 can be efficiently prevented.

20 Note that a large substrate can be used in each of the above embodiments. For example, a substrate having a short side of 70 mm or more and a long side of 250 mm or more can be used.

While the above embodiments have been described as using a thermosetting resin material, a thermoplastic resin material can be used.

5 In each of the above embodiments, various forms of resin materials such as a resin material in granular form (granular resin), a resin material in liquid form (liquid resin), a resin material in the form of powder having predetermined particle diameter distribution (powder resin), a resin material in particle form (particle resin), a resin material in paste form (paste resin), or a resin material in tablet form (tablet resin) can be employed.

10 In each of the above embodiments, for example, a silicone-based resin material (silicone resin) or an epoxy-based resin material (epoxy resin) can be used.

In each of the above embodiments, various types of resin materials such as a transparent resin material, a translucent resin material, or a resin material including a phosphor substance or a fluorescent substance can be used.

15 While the above embodiments have been described as using granular resin, liquid resin (fluid resin) such as silicone resin can be used. In this case, first, the liquid resin (fluid resin) such as silicone resin is heated in a lower mold cavity. At the same time, semiconductor chips mounted on a substrate are immersed in the fluid resin (molten resin) heated in the lower mold cavity, to pressurize the resin in the lower mold cavity by a cavity bottom surface member. Thus, by curing the resin in the lower mold  
20 cavity thereafter, a molded substrate can be obtained in which the semiconductor chips on the substrate have been sealed into a resin molded body (cured resin) having a shape corresponding to the shape of the lower mold cavity.

In each of the above embodiments, the so-called vacuum molding can be employed in which the air within the lower mold cavity (divided cavities) cut off from  
25 outside air is forcibly discharged by forcible discharge means such as a vacuum pump, to set a predetermined degree of vacuum in the lower mold cavity (divided cavities).

In each of the above embodiments, a precut mold release film (one precut mold release film) can be used as mold release film 8. In this case, first, a frame having a

through hole is placed on the precut mold release film (one precut mold release film), and a resin material such as granular resin is supplied to a resin supply concave portion (through hole) of the frame and flattened. Then, in this state, the flattened granular resin (which includes the precut mold release film and the frame) is inserted between upper and lower molds. Then, the resin supply concave portion of the frame is placed on a lower mold cavity (cavity opening) with the mold release film interposed therebetween. Then, the flattened granular resin is dropped together with the mold release film. As a result, the lower mold cavity (divided cavities) is covered with the mold release film. Thus, the entire flattened granular resin can be supplied at a time into the lower mold cavity (divided cavities) covered with the mold release film, with the mold release film covering the lower mold cavity. Accordingly, as in the above embodiments, the semiconductor chips mounted on the substrate can be sealed with resin in the lower mold cavity (divided cavities) covered with the precut mold release film.

In each of the above embodiments, the resin material (such as granular resin) can be supplied into each of the divided cavities formed by the partition members provided on the cavity bottom surface member. In this case, the molten resin (fluid resin) heated in the divided cavities generally flows slightly in the divided cavities. Thus, the occurrence of damage or break to wire (which electrically connects the substrate to the semiconductor chips) immersed in the molten resin, or the occurrence of wire sweep can be efficiently prevented. As a result, the electric characteristics of pieces that are formed by cutting predetermined positions of the molded substrate can be efficiently improved.

In each of the above embodiments, divided resin molded bodies 3 (resin molded body 33) can have a thickness (the height of the partition member) of 1.0 mm or less, for example. Minimum necessary moving distances 24 and 88, or minimum necessary elastically moving distance 88 can be any value, and can be set to 0.2 mm or less, for example. In each of the above embodiments, for example, the divided resin molded

bodies can have a thickness of 0.7 mm, and minimum necessary moving distances 24 and 89 can be set to 0.1 mm. Alternatively, the height of the partition member that moves elastically can be set to a height which is obtained by adding the minimum necessary elastically moving distance of 0.1 mm to the maximum value of 1.0 mm of the thickness of the divided resin molded bodies (resin molded body) described above. For example, a length three times the thickness 24 of 0.7 mm of divided resin molded bodies 3 (resin molded body 33) is 2.1 mm.

Although the present invention has been described and illustrated in detail, it is clearly understood that the same is by way of illustration and example only and is not to be taken by way of limitation, the scope of the present invention being interpreted by the terms of the appended claims.

WHAT IS CLAIMED IS:

1. A compression molding method for a semiconductor chip, comprising the steps of:

preparing a compression mold for semiconductor chips;

coating a cavity provided in the compression mold with a mold release film;

5 providing a resin material in the cavity coated with said mold release film and heating said resin material;

immersing a semiconductor chip disposed on a substrate in said resin material in the cavity by clamping said compression mold; and

10 compressing said resin material in the cavity by a cavity bottom member, and molding said semiconductor chip in a resin compact having a shape corresponding to said cavity shape and a predetermined thickness;

the compression molding method further comprising the steps of:

preparing a partition member for partitioning a cavity to form a plurality of divided cavities;

15 providing said partition member on a member on the cavity bottom member while elastically biasing said partition member;

setting a height of said partition member from the bottom surface of said cavity such that a tip surface of said partition member presses a substrate when pressurizing resin in said cavity by the member forming the bottom surface of said cavity;

20 providing said cavity with a resin connection path connecting said plurality of divided cavities for adjusting the amount of the resin material in each of said divided cavities:

providing the whole area of said bottom surface of said cavity with said resin material evenly;

25 pressing, when pressurizing said resin in said cavity by the member forming the bottom surface of said cavity, the tip surface of said partition member onto said substrate;

adjusting, when pressing the tip surface of said partition member onto said

substrate, the amounts of resin in said divided cavities by utilizing function of said resin  
30 connection path; and

forming, when pressing the tip surface of said partition member onto said  
substrate, a groove having a shape corresponding to a shape of said partition member;

molding said semiconductor chip in divided resin molded bodies having a shape  
corresponding to said divided cavities.

35

2. The compression molding method for a semiconductor chip according to  
claim 1, wherein

in said step of supplying resin into said cavity, said resin is supplied into all of  
said plurality of divided cavities at a time.

3. The compression molding method for a semiconductor chip according to  
claim 1, wherein

in said step of supplying said resin into said cavity, said resin is individually  
supplied into each of said plurality of divided cavities.

4. A compression mold for a semiconductor chip, comprising:

a cavity for compression molding being provided in a compression mold for  
semiconductor chips and having an upward opening;

5 a setting portion provided above said opening, on which a substrate can be set  
with a semiconductor chip mounted on said substrate being directed downward;

a mold release film coating said cavity;

a resin material to be supplied into said cavity coated with said mold release  
film;

heating means which heats said resin material in said cavity;

10 a mechanism for closing said substrate and said cavity to each other, to immerse  
said semiconductor chip mounted on said substrate in said resin in said cavity;

a cavity bottom surface member for pressurizing said resin in said cavity from a bottom surface side of said cavity;

15 a partition member provided in a predetermined position on the bottom surface of said cavity, for partitioning said cavity to form a plurality of divided cavities;

a resin connection path for adjusting amounts of said resin in said plurality of divided cavities; and

a mechanism for elastically biasing said partition member with respect to said cavity bottom surface member,

20 a height of said partition member from the bottom surface of said cavity being set such that a tip surface of said partition member presses a surface of said substrate when pressurizing said resin by said cavity bottom surface member.

5. The compression mold for a semiconductor chip according to claim 4, wherein

said resin connection path has a slit shape.