A supporting plate which makes it possible to easily strip the supporting plate from a substrate in a short period of time after thinning the substrate. In the supporting plate to which a circuit-formed surface of a substrate is bonded with an adhesive, a first penetrating hole is formed in a substantially central portion of the supporting plate in the thickness direction, grooves connecting with the first penetrating hole are formed on a surface of the supporting plate to be contacted with an adhesive, and a second penetrating hole connecting with the grooves is formed in a peripheral portion of the supporting plate in the thickness direction.
FIG. 2

1. Application of dry film

2. Exposure (groove pattern)

3. Development

4. Protection of end surface

5. Blasting

6. Application of dry film

7. Exposure (hole pattern)

8. Development

9. Protection of end surface

10. Blasting

11. Cleaning
FIG. 7

Solvent

1  4  7
2  3  W
6  1  5

Solvent

6  12  13  15
SUPPORTING PLATE, APPARATUS, AND METHOD FOR STRIPPING SUPPORTING PLATE

BACKGROUND OF THE INVENTION

[0001] 1. Field of the Invention

[0002] The present invention relates to a supporting plate which is used when a substrate such as a semiconductor wafer is thinned, and also relates to an apparatus and a method for stripping the supporting plate from the semiconductor wafer.

[0003] 2. Description of the Prior Art

[0004] There is a continuing need to make IC cards and cell phones thinner, smaller, and lighter. In order to satisfy this need, semiconductor chips to be incorporated therein must be thin. Although at present the thickness of a wafer which forms a semiconductor chip is 125-150 µm, it is expected that the thickness of a semiconductor wafer must be 25-50 µm for a next generation of chips.

[0005] An example of a conventional method for thinning a semiconductor wafer is shown in FIG. 8. Specifically, a protecting tape is attached to a surface (A-surface) of a semiconductor wafer on which a circuit (element) has been formed. The wafer is turned over, and the rear surface (B-surface) of the semiconductor wafer is ground by a grinder to make the wafer thinner. The B surface of the semiconductor wafer which has been thinned is fixed onto a dicing tape retained by a dicing frame, and the protecting tape covering the surface (A-surface) of the semiconductor wafer on which a circuit (element) has been formed is stripped in this state. Next, the wafer is cut into each chip by a dicing device.

[0006] The above-mentioned method has been disclosed in Document 1. According to Document 1, the heat-resistant protecting tape is stripped from the thinned semiconductor wafer by using a strong adhesive tape bonded to one end of the protecting tape.

[0007] Document 2 has disclosed that a protecting base obtained by immersing a ladder-type silicone oligomer in an aluminum nitride—boron nitride porous sintered material is used instead of a protecting tape, and the protecting base and a semiconductor wafer are bonded by using a thermoplastic film. Document 2 also mentions that they are immersed in pure water at 80°C for 3 hours before stripping.

[0008] Document 3 has disclosed that a protecting base is made of a material having the same thermal expansion coefficient as a semiconductor wafer such as alumina, aluminum nitride, boron nitride, or silicon carbide.

[0009] Also, Document 3 has proposed a method in which the protecting base and the semiconductor wafer are bonded by using a thermoplastic resin such as polyimide, the semiconductor wafer is thinned by a grinder, and thereafter stripping is performed by immersing in water, amine, or a mixed solution of water and amine, or by using steam.


[0013] In the above-mentioned techniques, since it is difficult for a solvent to enter between the supporting plate (protecting tape) and the semiconductor wafer when the supporting plate (protecting tape) is stripped from the semiconductor wafer, it takes too much time to strip the supporting plate from the semiconductor wafer.

[0014] Also, the thermoplastic film bonding the support plate (protecting tape) and the semiconductor wafer often fails to completely dissolve, and tends to be left in a state of sticking to either the support plate or the semiconductor wafer.

[0015] If an adhesive is left as described above, cracking or chipping of the semiconductor wafer easily occurs at the time of stripping.

[0016] In order to solve the above problem, the present applicant has proposed a supporting plate in which a plurality of penetrating holes are provided in the thickness direction of the supporting plate. FIG. 9 explains a method for stripping this supporting plate.

[0017] According to this method, a solvent supplying plate 102 is laid onto the upper surface of a supporting plate 100 via an O-ring 101. Next, a solvent is supplied from a solvent supplying pipe 103 to a space S surrounded by the supporting plate 100, the O-ring 101 and the solvent supplying plate 102. The solvent passes through penetrating holes 104 formed in the supporting plate 100, dissolves and removes an adhesive layer 105.

[0018] With the method of using a supporting plate in which a plurality of penetrating holes are provided, it is possible to securely remove an adhesive in a short period of time. However, another problem arises.

[0019] As shown in FIG. 10, the solvent leaks from the periphery of the supporting plate to the outside, and the solvent drops onto the dicing tape, which results in a deterioration of the dicing tape in a short period of time.

[0020] Further, efficiency of stripping is bad because part of a new solvent supplied to the space S is withdrawn without being utilized.

[0021] Furthermore, even if the adhesive is completely dissolved, if a finger or the like is used as a device for stripping the semiconductor wafer from the supporting plate, there is a strong likelihood that the circuit-formed surface of the semiconductor wafer will be damaged.

[0022] In order to solve the above-mentioned problems, the object of the present invention is to provide a supporting plate which makes it possible to easily strip the supporting plate from a substrate in a short period of time after thinning the substrate, and an apparatus and a method for stripping the supporting plate.

SUMMARY OF THE INVENTION

[0023] In order to solve the above-mentioned problems, according to the present invention, there is provided a supporting plate to which a circuit-formed surface of a substrate is bonded with an adhesive, wherein a first penetrating hole is formed in a substantially central portion of the supporting plate in the thickness direction, grooves
connecting with the first penetrating hole are formed on a surface of the supporting plate to be contacted with an adhesive, and a second penetrating hole connecting with the grooves is formed in a peripheral portion of the supporting plate in the thickness direction.

0024 Since the supporting plate of the present invention has a first penetrating hole formed in a substantially central portion of the supporting plate in the thickness direction, grooves formed on a surface of the supporting plate to be contacted with an adhesive so as to connect with the first penetrating hole, and a second penetrating hole formed in a peripheral portion of the supporting plate in the thickness direction so as to connect with the grooves, it is possible to use the first penetrating hole as a hole for supplying a solvent and the second penetrating hole as a hole for draining the solvent. With this, when the supporting plate is stripped from the substrate after the substrate is thinned, it is possible to supply the solvent quickly to the whole surface of the adhesive which bonds the substrate and the supporting plate so as to strip the supporting plate in a short period of time.

0025 Also, if the second penetrating hole is used as a hole for supplying a solvent and the first penetrating hole is used as a hole for draining the solvent, the same effect can be achieved.

0026 There is also provided an apparatus for stripping a supporting plate bonded to a circuit-formed surface of a substrate with an adhesive, comprising a plate which has a first penetrating hole formed in a substantially central portion of the plate in the thickness direction, a second penetrating hole formed in a peripheral portion of the plate in the thickness direction, and a hole for attracting a supporting plate formed between the first penetrating hole and the second penetrating hole in the radial direction.

0027 Since the stripping apparatus of the present invention comprises a plate which has a first penetrating hole formed in a substantially central portion of the plate in the thickness direction, a second penetrating hole formed in a peripheral portion of the plate in the thickness direction, and a hole for attracting a supporting plate formed between the first penetrating hole and the second penetrating hole in the radial direction, it is possible to use the first penetrating hole as a hole for supplying a solvent and the second penetrating hole as a hole for draining the solvent. With this, when the supporting plate is stripped from the substrate after the substrate is thinned, it is possible to supply the solvent quickly to the whole surface of the adhesive which bonds the substrate and the supporting plate so as to strip the supporting plate in a short period of time.

0028 Also, if the second penetrating hole is used as a hole for supplying a solvent and the first penetrating hole is used as a hole for draining the solvent, the same effect can be achieved.

0029 There is also provided a method for stripping a supporting plate bonded to a circuit-formed surface of a substrate with an adhesive, comprising the steps of supplying a solvent from outside to a first penetrating hole of a plate, distributing the solvent from a first penetrating hole of a supporting plate to grooves connecting with the first penetrating hole of the supporting plate, dissolving the adhesive on a surface contacted with the substrate by the solvent, and draining the solvent used for dissolving the adhesive from the second penetrating hole of the supporting plate and a second penetrating hole of the plate.

0030 Since the stripping method of the present invention comprises the steps of supplying a solvent from outside to a first penetrating hole of a plate, distributing the solvent from a first penetrating hole of a supporting plate to grooves connecting with the first penetrating hole of the supporting plate, dissolving the adhesive on a surface contacted with the substrate by the solvent, and draining the solvent used for dissolving the adhesive from a second penetrating hole of the supporting plate and a second penetrating hole of the plate, it is possible to supply the solvent quickly to the whole surface of the adhesive which bonds the substrate and the supporting plate so as to strip the supporting plate in a short period of time.

0031 There is also provided a method for stripping a supporting plate bonded to a circuit-formed surface of a substrate with an adhesive, comprising the steps of supplying a solvent from outside to a second penetrating hole of a plate, distributing the solvent from a second penetrating hole of a supporting plate to grooves connecting with the second penetrating hole of the supporting plate, dissolving the adhesive on a surface contacted with the substrate by the solvent, and draining the solvent used for dissolving the adhesive from a first penetrating hole of the supporting plate and a first penetrating hole of the plate.

0032 Since the stripping method of the present invention comprises the steps of supplying a solvent from outside to a second penetrating hole of a plate, distributing the solvent from a second penetrating hole of a supporting plate to grooves connecting with the second penetrating hole of the supporting plate, dissolving the adhesive on a surface contacted with the substrate by the solvent, and draining the solvent used for dissolving the adhesive from a first penetrating hole of the supporting plate and a first penetrating hole of the plate, it is possible to supply the solvent quickly to the whole surface of the adhesive which bonds the substrate and the supporting plate so as to strip the supporting plate in a short period of time.

BRIEF DESCRIPTION OF THE DRAWINGS

0033 FIG. 1 is a schematic view showing an embodiment of a supporting plate according to the present invention;

0034 FIG. 2 shows the process for forming a supporting plate;

0035 FIG. 3 is an enlarged view explaining staggered grooves;

0036 FIG. 4 is an enlarged view explaining honeycomb-shaped grooves;

0037 FIG. 5 is a schematic view showing an embodiment of an apparatus for stripping a supporting plate;

0038 FIG. 6 is a perspective view of FIG. 5;

0039 FIG. 7 is a view showing another embodiment of the apparatus for stripping a supporting plate;

0040 FIG. 8 is a view explaining a conventional method for stripping a supporting plate;
FIG. 9 is a view explaining the conventional method for stripping a supporting plate, and FIG. 10 is a view explaining a drawback of the conventional art for stripping a supporting plate.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Embodiments of the present invention will be described below with reference to the attached drawings. FIG. 1 is a schematic view showing an embodiment of a supporting plate according to the present invention, and FIG. 2 shows the process for forming a supporting plate.

A supporting plate 1 according to the present invention shown in FIG. 1 is made of a glass plate, a ceramic plate or a metal plate.

A circuit-formed surface of a semiconductor wafer W is bonded to one of the surfaces of the supporting plate 1 by using an adhesive, which is not shown in the drawing.

According to the present invention, the supporting plate 1 has a unique structure as described below.

A first penetrating hole 2 is formed in a substantially central portion (center) of the supporting plate 1 so as to penetrate in the thickness direction. A plurality of first penetrating holes 2 may be formed, and for example, four penetrating holes 2 are formed in FIG. 1. However, the number of the penetrating holes 2 is not limited to this.

Also, grooves 3 connecting with the first penetrating hole 2 are formed on the surface of the supporting plate to which a semiconductor wafer W is bonded. The grooves 3 are formed so as to cover almost all the surface up to the outer periphery. As an example, the grooves 3 have a depth of 0.5 mm in a case where the supporting plate 1 has a thickness of 0.7 mm. The depth of the grooves 3 needs to be sufficient so as not to be filled with an adhesive layer interposed between the supporting plate 1 and the semiconductor wafer W for bonding. With this, a small gap is defined between the adhesive layer and the grooves 3, so that a solvent can quickly flow along the gap when the solvent is supplied as described below.

A second penetrating hole 4 is formed in a peripheral portion of the supporting plate 1. The second penetrating hole 4 penetrates in the thickness direction and connects with the grooves 3 so as to drain a solvent to outside (for withdrawal). It is possible to provide a plurality of penetrating holes 4 in a peripheral portion of the supporting plate 1.

With the above-mentioned structure, the first penetrating hole 2 to supply a solvent from outside and the second penetrating hole 4 to discharge a solvent to outside are connected to each other via the grooves 3.

The grooves 3 are formed in a grid pattern, part of which is shown in the enlarged view of FIG. 1. The grooves 3 serve to connect the first penetrating hole 2 and the second penetrating hole 4 as mentioned above. Therefore, if a solvent is supplied from outside to the first penetrating hole 2, the solvent flows from the central portion to the periphery (outer periphery) portion along the grooves 3, and reaches the second penetrating hole 4.

The process for forming the supporting plate 1 provided with the grooves 3 will be described below with reference to FIG. 2.

First, a glass plate is prepared, and a dry film resist is applied to a surface of the plate where the grooves 3 are to be formed (Step 1).

An exposure step and a development step are performed to the dry film resist by using a grid-patterned photo mask (See Steps 2 and 3).

With these steps, the grid-patterned dry film resist (a resist mask for forming the grooves 3) is formed on the surface of the glass plate.

Next, a protection step is performed to the periphery, and thereafter, cutting of the glass plate is performed by a sandblasting method with the grid-patterned dry film resist as a mask (See Steps 4 and 5).

With these steps, the grid-patterned grooves 3 are formed on the surface of the glass plate, which have a predetermined depth from the surface.

Next, a dry film resist is applied to the other surface of the glass plate (See Step 6).

An exposure step and a development step are performed to the dry film resist by using a photo mask for forming the first penetrating hole 2 and the second penetrating hole 4 (See Steps 7 and 8).

With these steps, the dry film resist corresponding to the first penetrating hole 2 and the second penetrating hole 4 (a resist mask for forming the first penetrating hole 2 and the second penetrating hole 4) is formed on the other surface of the glass plate.

Next, a protection step is performed to the periphery (Step 9), and thereafter, cutting of the glass plate is performed by a sandblasting method with the resist mask for forming the first penetrating hole 2 and the second penetrating hole 4 (Step 10).

Next, cleaning is performed to the glass plate (Step 11). With these steps, the first penetrating hole 2 is formed in the central portion of the glass plate, which penetrates in the thickness direction. The second penetrating hole 4 is formed in the periphery portion, which penetrates in the thickness direction.

In the process shown in FIG. 2, the grooves 3 are formed first, and the first penetrating hole 2 and the second penetrating hole 4 are formed next. However, this order may be reversed.

A dry etching method or a wet etching method may be used to form grid-patterned grooves instead of a sandblasting method. However, when these etching methods are used, it is difficult to form uniform grooves compared to a sandblasting method although it depends on the width or the depth of the grooves. A sandblasting method is preferred to form the grooves 3.

In the supporting plate 1 of the present embodiment, the penetrating hole 2 for supplying a solvent from outside is formed in the central portion of the supporting plate 1 in the thickness direction, the grid-patterned grooves connecting with the first penetrating hole 2 are formed on a surface of the supporting plate to be contacted with an adhesive, and the second penetrating hole 4 for draining a solvent to outside connecting with the grooves 3 is formed in the peripheral portion of the supporting plate 1 in the
thickness direction. Therefore, when the supporting plate 1 is stripped from the semiconductor wafer W by using the stripping apparatus and a stripping method described below, it is possible to supply a solvent quickly to the whole surface of the adhesive which bonds the wafer W and the supporting plate 1 so as to strip the supporting plate 1 in a short period of time compared to the case of using a conventional supporting plate.

[0066] More specifically, since a conventional supporting plate has a structure in which a number of penetrating holes are formed in the thickness direction, dissolution of the adhesive starts in the area where the adhesive contacts with the penetrating holes. Therefore, it takes time to distribute the solvent over the adhesive uniformly.

[0067] In contrast, the supporting plate 1 according to the present embodiment has a structure in which the grid-patterned grooves 3 are formed on almost the whole surface to be contacted with the adhesive. Therefore, the solvent supplied from the first penetrating hole 2 flows toward the periphery portion via the grid-patterned grooves 3 connecting with the first penetrating hole 2, so that the solvent can be distributed quickly over the adhesive.

[0068] Consequently, it is possible to strip the supporting plate 1 in a short period of time compared to a conventional supporting plate.

[0069] Further, since a number of penetrating holes are not formed in the supporting plate 1 according to the present invention, unlike a conventional supporting plate, when the supporting plate 1 is stripped from the semiconductor wafer W by using the stripping apparatus and method described below, it is possible to retain the area where no hole is formed by vacuum attraction. With this, it is possible to simplify the process for stripping the supporting plate 1 from the semiconductor wafer W.

[0070] Furthermore, since a number of penetrating holes are not formed in the supporting plate 1 according to the present invention, unlike a conventional supporting plate, it is possible to improve the strength of the supporting plate 1, and increase the reuse rate.

[0071] Also, according to the present invention, since an excessive amount of force is not exerted on the semiconductor wafer W when the supporting plate 1 is stripped from the wafer W, there is little likelihood that cracking or chipping will occur in the wafer W.

[0072] Consequently, in the semiconductor wafer W to which the supporting plate 1 is attached, it is possible to utilize the surface ground by a grinder after thinning the wafer W as a second circuit-formed surface, for example.

[0073] Next, another embodiment of the supporting plate 1 will be described below.

[0074] The shape of the grooves 3 is a grid in the above-mentioned embodiment of the supporting plate 1. However, the shape of the grooves 3 may be staggered (see the enlarged view of the grooves shown in FIG. 3(a) and the enlarged view of the periphery shown in FIG. 3(b)).

[0075] More specifically, the shape of the grooves 3 according to this embodiment is formed by staggering grid-patterned grooves 3 as shown in FIG. 1 in columns at a predetermined interval.

[0076] The staggered grooves 3 make it possible to supply the solvent quickly to the whole surface of the adhesive which bonds the wafer W and the supporting plate 1 in the same manner as the case of the grid-patterned grooves 3. Consequently, it is possible to strip the supporting plate 1 from the substrate in a short period of time compared to the case of using a conventional supporting plate.

[0077] Incidentally, the staggered grooves 3 can be formed in the same process shown in FIG. 2.

[0078] Next, another embodiment of the supporting plate will be described below.

[0079] The shape of the grooves 3 is honeycombed according to this embodiment. More specifically, the shape of the grooves 3 is hexagonal (see the enlarged view of the grooves shown in FIG. 4(a) and the enlarged view of the periphery shown in FIG. 4(b)).

[0080] In the case where the shape of the grooves 3 is hexagonal, it is possible to supply the solvent more quickly to the whole surface of the adhesive which bonds the wafer W and the supporting plate 1 compared to the cases of the grid-patterned grooves 3 and the staggered grooves 3. Consequently, it is possible to strip the supporting plate 1 from the substrate in a shorter period of time compared to the case of using a conventional supporting plate.

[0081] One of the reasons is that the solvent supplied from the central portion can more easily reach the peripheral portion compared to the cases of the grid-patterned grooves 3 and the staggered grooves 3, by arranging each of the adjacent hexagonal grooves 3 to be directed from the central portion to the peripheral portion.

[0082] The hexagonal grooves 3 can be formed in the same processes shown in FIG. 2.

[0083] As for the shape of the grooves 3, it is also possible to employ a coil shape in which the grooves are directed from the hole for supplying a solvent in the center toward the hole for draining the solvent in the periphery.

[0084] Also, the supporting plate may be comprised of frosted glass as follows:

[0085] Specifically, the surface of the glass substrate to which the semiconductor wafer W is attached is roughened by 0.05 mm-0.1 mm, although this is not shown in the drawings. Since the other features are the same as described above, they are not explained again.

[0086] In this supporting plate, a solvent supplied from the first penetrating hole 2 can permeate the whole surface by capillary action. With this, it is possible to achieve the same function as the case of the supporting plate provided with the grooves 3 described above.

[0087] Next, an embodiment of the apparatus and the method of stripping the supporting plate having the above-mentioned structure from the semiconductor wafer W will be described with reference to FIGS. 5 and 6.

[0088] In this embodiment, the supporting plate 1 is provided with the hexagonal grooves 3 shown in FIG. 4, for example.

[0089] The stripping apparatus 20 according to the present embodiment comprises a plate 10. The plate 1 is supported
by an elevator mechanism so as to be elevated or lowered in the vertical direction by a predetermined stroke.

A first penetrating hole 12 (for supplying a solvent from outside) is formed in the central portion of the plate 10, and a second penetrating hole 14 (for draining a solvent to outside) is formed in the periphery portion of the plate 10. Also, a hole 13 is formed between the first penetrating hole 12 and the second penetrating hole 14 in the radial direction. The hole 13 is used for vacuuming, and a recessed portion 15 is formed at the end of the hole 13 which is in contact with the supporting plate 1. The first penetrating hole 12 is connected to a solvent supplying means, for example, by a tube which is not shown in the drawings.

When the supporting plate 1 and the semiconductor wafer W bonded to the supporting plate 1 are attracted to the plate 10 having the above-mentioned structure by vacuum attraction using the hole 13, the hole for supplying a solvent 12 is coupled to the first penetrating hole 2 of the supporting plate 1 and the hole for draining a solvent 14 is coupled to the second penetrating hole 4 of the supporting plate 1. Also, the hole 13 is positioned in an area of the supporting plate 1 where the first penetrating hole 2 and the second penetrating hole 4 are not formed.

Next, stripping the supporting plate 1 from the semiconductor wafer W by using the stripping apparatus 20 will be described.

The plate 10 is pushed onto the upper surface of the supporting plate 1, so that the hole for supplying a solvent 12 of the plate 10 is aligned (coupled) to the first penetrating hole 2 of the supporting plate 1, and the hole for draining a solvent 14 is aligned (coupled) to the second penetrating hole 4 of the supporting plate 1 (see FIG. 5).

A solvent is supplied to the hole for supplying a solvent 12 of the plate 10 by a solvent supplying means (not shown in the drawing) in this state.

The solvent flows toward the first penetrating hole 2 of the supporting plate 1, and reaches the hexagonal grooves 3 which connect with the penetrating hole 2.

In this instance, as described above, since the grooves 3 are formed so as to cover almost all surface of the supporting plate 1 up to the outer periphery, the solvent can be distributed quickly over an adhesive layer 5 so as to dissolve the adhesive layer 5.

The solvent used for dissolving the adhesive layer 5 flows to the second penetrating hole 4 formed in the periphery of the supporting plate 1 and connecting with the grooves 3, reaches the hole for draining a solvent 14 of the plate 10, and is drained to outside (and withdrawn).

Next (after a predetermined period of time passes), the supporting plate 1 is stripped from the semiconductor wafer W.

In this instance, the pressure inside the recessed portion 15 is reduced by the hole 13 for vacuuming, and the plate 10 is lifted up in the state where the supporting plate 1 is attracted to the plate 10 by vacuuming. In this way, the supporting plate 1 is stripped and the semiconductor wafer W is left to a dicing tape 7. Incidentally, the dicing tape 7 has adhesiveness and is retained by a frame 6.

According to the present embodiment of the stripping apparatus and the stripping method, the solvent supplied to the hole for supplying a solvent 12 of the plate 10 flows toward the first penetrating hole 2 of the supporting plate 1, and reaches the periphery of the supporting plate 1 via the hexagonal grooves 3 which connect with the penetrating hole 2 of the supporting plate 1. The solvent flows to the hole for draining a solvent 14 of the plate 10 via the second penetrating hole 4 formed in the periphery of the supporting plate 1 to be drained to outside.

As described above, the grooves 3 make it possible to supply the solvent quickly to the whole surface of the adhesive layer 5. Consequently, it is possible to strip the supporting plate 1 in a shorter period of time compared to the case of using the conventional supporting plate.

Incidentally, when the supporting plate 1 is stripped from the semiconductor wafer W, there are cases where the supporting plate 1 is still attached to the semiconductor wafer W due to surface tension of the solvent used for dissolving the adhesive layer 5, which makes it difficult to strip the supporting plate 1.

In these cases, it is possible to make the supporting plate 1 easier to strip by canceling (breaking) the surface tension with air supplied from the solvent supplying hole of the plate 10 to the first penetrating hole 2 of the supporting plate 1.

In order to achieve this method, an air supplying means may be provided in a stripping apparatus having the above-mentioned structure, and a tube of the air supplying means may be connected to a tube of the solvent supplying means which leads to the solvent supplying hole of the plate 10.

In the above-mentioned embodiments, a solvent is supplied to the central portion and drained from the periphery portion. However, it is also possible to supply a solvent to the periphery portion and drain from the central portion.

In this instance, the second penetrating hole 4 formed in the periphery portion of the supporting plate 1 is used for supplying a solvent from outside, and the first penetrating hole 2 formed in the central portion of the supporting plate 1 is used for draining the solvent to the outside.

Also, in the plate 10 of the stripping apparatus 20, the hole 14 formed in the periphery portion is used for supplying a solvent from outside, and the hole 12 formed in the central portion is used for draining the solvent to the outside.

Since the other features are the same as mentioned above, they are not explained again.

It should be noted that the same function can be achieved in the above-mentioned case as in the case where a solvent is supplied to the central portion and drained from the periphery portion.

In the stripping apparatus 20 according to the present embodiment, the plate 10 is provided in the upper surface of the supporting plate 1 as shown in FIG. 5. However, the plate 10 may be provided in the lower surface of the supporting plate 1 as shown in FIG. 7.
In this instance, it is not necessary to form the solvent draining hole 14 although the solvent supplying hole 12 is formed in the plate 10.

The present invention is not limited to the above-mentioned embodiments, and other various structures are possible within the scope of the present invention.

Effect of the Invention

According to the present invention, a solvent can be supplied to the whole surface of the adhesive which bonds the substrate and the supporting plate so as to strip the supporting plate in a short period of time and reduce the treatment time.

Accordingly, it is possible to achieve a supporting plate, an apparatus and a method for stripping a supporting plate suitable for reducing the treatment time with high reliability.

1. A supporting plate to which a circuit-formed surface of a substrate is bonded with an adhesive, wherein a first penetrating hole is formed in a substantially central portion of the supporting plate in the thickness direction, grooves connecting with the first penetrating hole are formed on a surface of the supporting plate to be contacted with an adhesive, and a second penetrating hole connecting with the grooves is formed in a peripheral portion of the supporting plate in the thickness direction.

2. The supporting plate according to claim 1, wherein the grooves are in a grid, staggered, or form a honeycomb pattern.

3. The supporting plate according to claim 1, wherein the first penetrating hole is a hole for supplying a solvent, and the second penetrating hole is a hole for draining the solvent.

4. The supporting plate according to claim 1, wherein the second penetrating hole is a hole for supplying a solvent, and the first penetrating hole is a hole for draining the solvent.

5. An apparatus for stripping a supporting plate bonded to a circuit-formed surface of a substrate with an adhesive, comprising a plate which has a first penetrating hole formed in a substantially central portion of the plate in the thickness direction, a second penetrating hole formed in a peripheral portion of the plate in the thickness direction, and a hole for attracting a supporting plate formed between the first penetrating hole and the second penetrating hole in the radial direction.

6. The apparatus according to claim 5, wherein the first penetrating hole is a hole for supplying a solvent, and the second penetrating hole is a hole for draining the solvent.

7. The apparatus according to claim 5, wherein the second penetrating hole is a hole for supplying a solvent, and the first penetrating hole is a hole for draining the solvent.

8. The apparatus according to claim 6, wherein the first penetrating hole is also a hole for supplying air from an air supplying means.

9. A method for stripping a supporting plate bonded to a circuit-formed surface of a substrate with an adhesive by using a plate which has a first penetrating hole formed in a substantially central portion thereof in the thickness direction a second penetrating hole formed in a peripheral portion thereof in the thickness direction, and a hole for attracting the supporting plate formed between the first penetrating hole and the second penetrating hole in the radial direction of the plate, comprising the steps of:

supplying a solvent from outside to the first penetrating hole of the plate and to an associated first penetrating hole formed in a substantially central portion of the supporting plate in the thickness direction thereof;

distributing the solvent from the first penetrating hole of the supporting plate through grooves formed on a surface of the supporting plate in contact with the adhesive and connecting with the first penetrating hole of the supporting plate;

dissolving the adhesive on the surface contacted with the substrate by the solvent; and

draining the solvent used for dissolving the adhesive from a second penetrating hole connecting with the grooves and formed in a peripheral portion of the supporting plate in the thickness direction and a second penetrating hole formed in a peripheral portion of the plate.

10. The method according to claim 9, further comprising the step of supplying air from outside to the first penetrating hole of the plate so as to distribute the air from the first penetrating hole of the supporting plate to the grooves which connect with the first penetrating hole of the supporting plate after the step of dissolving the adhesive.

11. A method for stripping a supporting plate bonded to a circuit-formed surface of a substrate with an adhesive by using a plate which has a first penetrating hole formed in one of a substantially central portion and a peripheral portion thereof in the thickness direction, a second penetrating hole formed in the other of the substantially central portion and the peripheral portion thereof and a hole for attracting the supporting plate formed between the first penetrating hole and the second penetrating hole in the radial direction of the plate, comprising the steps of:

supplying a solvent from outside to the first penetrating hole of the plate and to an associated first penetrating hole formed in one of a substantially central portion and a peripheral portion of the supporting plate in the thickness direction thereof;

distributing the solvent from the first penetrating hole of the supporting plate to grooves formed on a surface of the supporting plate in contact with the adhesive and connecting with the first penetrating hole of the supporting plate;

dissolving the adhesive on the surface contacted with the substrate by the solvent; and

draining the solvent used for dissolving the adhesive from a second penetrating hole formed in the other of the substantially central portion and the peripheral portion of the supporting plate of the supporting plate and the second penetrating hole of the plate.

12. The method according to claim 11, further comprising the step of supplying air from outside to the second penetrating hole of the plate so as to distribute the air from the second penetrating hole of the supporting plate to the grooves which connect with the second penetrating hole of the supporting plate after the step of dissolving the adhesive.
13. The supporting plate according to claim 2, wherein the first penetrating hole is a hole for supplying a solvent, and the second penetrating hole is a hole for draining the solvent.

14. The supporting plate according to claim 2, wherein the second penetrating hole is a hole for supplying a solvent, and the first penetrating hole is a hole for draining the solvent.

15. The apparatus according to claim 7, wherein the first penetrating hole is also a hole for supplying air from an air supplying means.

16. The supporting plate according to claim 1, including more than one said first penetrating formed in the substantially central portion of the supporting plate and more than one said second penetrating formed in the peripheral portion of the supporting plate.

17. The supporting plate according to claim 16, wherein said more than one said second penetrating are formed in spaced relation around the peripheral portion of the supporting plate.

18. The apparatus according to claim 5, including more than one said first penetrating formed in the substantially central portion of the plate and more than one said second penetrating formed in the peripheral portion of the plate.

19. The apparatus according to claim 18, wherein said more than one said second penetrating are formed in spaced relation around the peripheral portion of the plate.

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