REPLACED SHEET SG
Description : paged 1 to paged 11
Claim(s) : paged 12 to paged 14
Drawing(s) : paged 1/5 to paged 5/5
Abstract : paged 15 to paged 15
DATE OF RECEIPT

TITLE OF THE INVENTION

Component Supply Method

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a component supply method for obtaining individual components by cutting a wafer of ceramic or silicon, for example, and supplying the as-obtained individual components to a subsequent step.

Description of the Background Art

In relation to a technique of obtaining a number of silicon chips from a silicon wafer, the following two methods are well known in the art:

In the first method, prepared is an adhesive sheet which is provided on its one surface with an adhesive layer whose adhesion is reduced by irradiation with ultraviolet rays. As shown in Fig. 2, a wafer 2 is stuck onto a surface of such an adhesive sheet 1 provided with an adhesive layer. Then, the as-stuck wafer 2 is diced to be subdivided into individual silicon chips 3. Then, ultraviolet rays are applied to reduce adhesion of the adhesive layer provided on the adhesive sheet 1. Thereafter the adhesive sheet 1 is mounted on an expander which is carried on an X-Y drive unit. Then, the adhesive sheet 1 is expanded by the expander so that its area is enlarged as shown in Figs. 3A and 3B, thereby separating the respective silicon chips 3 from each other. Referring to Figs. 3A and 3B, the adhesive sheet 1 is

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mounted on adhesive sheet mounting members 4 which are provided in the expander.

When the silicon chips 3 are separated from each other through clearances as described above, positional information of each silicon chip 3 is obtained through an image taken by a camera on the adhesive sheet 1, and the X-Y drive unit is driven on the basis of such positional information to locate the silicon chip 3 to be taken out on a chip discharge position.

On the other hand, a thrust pin 5 is arranged under such a chip discharge position as shown in Fig. 4, while a suction chuck 6 is arranged above the silicon chip 3. In this chip discharge position, the thrust pin 5 is upwardly driven as shown in Fig. 4 to upwardly move the silicon chip 3 to be taken out, so that this silicon chip 3 is sucked by the suction chuck 6 in this state and carried to be supplied to a next step.

The second method utilizes a foam releasable adhesive sheet, which is formed by a base material having a foam releasable adhesive layer, whose adhesion is reduced by heating, provided on one surface and another adhesive layer, whose adhesion is not reduced by heating, provided on another surface. In the second method, the adhesive layer provided on the other side of such a foam releasable adhesive sheet is stuck onto a flat plate type support member to expose the foam releasable adhesive layer, so that a silicon wafer is stuck onto the foam releasable adhesive layer and diced to be subdivided into

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individual silicon chips. Then the plate type support member is heated to reduce the adhesion of the foam releasable adhesive layer, and the respective silicon chips are separated from this layer at random to obtain a number of silicon chips.

In the first method, each silicon chip is located in the discharge position through image processing. Therefore, a high-priced image processor is required and it takes time for such processing, leading to insufficient component suppliability. Further, the thrust pin 5 is so worn upon repeated employment that the same must be replaced by a new one. In addition, the silicon chip 3 may be damaged by impact applied by the thrust pin 5.

On the other hand, the second method can be carried out at a low cost since no image processor is required. In this method, however, the adhesion of the foam releasable adhesive layer is reduced by heating to separate a number of silicon chips from this layer at random. In order to systematically supply such silicon chips to a next step, therefore, it is necessary to re-align the as-obtained number of silicon chips with a complicated operation.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a method of supplying a number of components obtained by subdividing a wafer in high suppliability with substantially no damage of the components, which can systematically supply a number of

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components to a next step at a low cost.

The present invention is directed to a component supply method of subdividing a wafer of a material such as ceramic or silicon for obtaining individual components and supplying such individual components to a subsequent step, which comprises the following steps:

According to the present invention, first prepared are a flat plate type pallet which has a reference portion for performing location for later processing, and an adhesive sheet which is formed by a base material having a foam releasable first adhesive layer, whose adhesion is reduced by heating, provided on its one surface and a second adhesive layer, whose adhesion is not reduced by heating or less reduced than the first adhesive layer by heating, provided on another surface. Then, the adhesive sheet is stuck onto one surface of the pallet. Thereafter a wafer is stuck onto the first adhesive layer of the adhesive sheet to have a prescribed positional relation to the reference portion of the pallet. Then the wafer is cut on the basis of the reference portion to obtain individual components, and the adhesion of the first adhesive layer is reduced by heating. Thereafter the individual components obtained by cutting the wafer are taken out from the pallet on the basis of the reference portion, to be supplied to a subsequent step.

According to the present invention, the reference portion provided in the pallet is used for performing location in the

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steps of sticking the wafer, cutting the wafer and taking out the individual components. Thus, it is possible to efficiently supply the components obtained by subdividing the wafer systematically to a next step at a low cost, with no requirement for a high-priced image processor.

While the conventional method shown in Fig. 4 employs the thrust pin in order to smoothly take out the components from the adhesive sheet, the adhesion of the foam releasable first adhesive layer is reduced by heating before the components are taken out according to the present invention. Thus, it is possible to easily separate and take out the components from the adhesive sheet with no employment of the thrust pin. Therefore, no damage is caused in the components by the thrust pin and it is possible to omit the complicated operation of exchanging such a thrust pin.

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 perspective view for illustrating a step of taking out components from a pallet in an embodiment of the present invention;

Fig. 2 is a perspective view showing a wafer which is stuck onto a support member and cut into chips in a conventional

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method;

Figs. 3A and 3B are sectional views for illustrating a step of separating components, which are cut on an adhesive sheet, from each other by expanding the adhesive sheet in a first conventional method of supplying components;

Fig. 4 is a typical side elevational view for illustrating a step of taking out components in a second conventional method of supplying components;

Fig. 5 is a partially fragmented sectional view showing an adhesive sheet which is employed in an embodiment of the present invention;

Fig. 6 is a perspective view showing a wafer which is stuck onto a pallet and cut into individual components in the embodiment;

Fig. 7 typically illustrates respective steps of the embodiment;

Fig. 8 is a perspective view showing an adhesive sheet and a wafer which are stuck onto a pallet provided with holes serving as reference portions; and

Fig. 9 is a perspective view showing a wafer which is arranged in a cavity of a pallet.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the present invention is now described with reference to the drawings, to clarify the inventive component supply method.

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Fig. 5 illustrates an adhesive sheet 11 which is employed in this embodiment. This adhesive sheet 11 is formed by a base material 12 of a synthetic resin film such as a PET film, a first adhesive layer 13 which is provided on one surface thereof and a second adhesive layer 14 which is provided on another surface. The first adhesive layer 13 is made of a foam releasable adhesive whose adhesion is reduced by heating. Such a foam releasable adhesive can be prepared from an acrylic adhesive and an isobutane-based foaming agent. The second adhesive layer 14 is made of an adhesive whose adhesion is not reduced by heating or less reduced than the first adhesive layer 13 by heating. The second adhesive layer 14 can be prepared from an acrylic adhesive, for example.

Then, a pallet 15 which is in the form of a rectangular plate is prepared as shown in Fig. 6, so that the second adhesive layer 14 (see Fig. 5) of the adhesive sheet 11 is stuck onto the upper surface of this pallet 15. In this case, the adhesive sheet 11 is stuck to a prescribed position on the upper surface of the pallet 15 on the basis of side surfaces 15a and 15d thereof. This prescribed position is set as that separated from the side surfaces 15a to 15d by prescribed linear dimensions.

According to this embodiment, the side surfaces 15a to 15d of the pallet 15 correspond to "reference portions" of the present invention.

The pallet 15 may be formed by a member having a cavity

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under the central region of the sheet 16 or that in the form of a rectangular frame, in place of the rectangular plate type member having the shape illustrated in the figures.

Then, a wafer 16 is stuck onto the upper surface of the adhesive sheet 11 through the adhesion of the first adhesive layer 13. The wafer 16 is so stuck as to have a prescribed positional relation to reference surfaces which are defined by the side surfaces 15a to 15d of the pallet 15. Then, the wafer 16 is cut by a dicing unit on the basis of the aforementioned positional relation, to obtain individual components 17. Fig. 6 shows a plurality of cutting lines A and B for dividing the wafer 16 into the number of components 17.

The dicing unit cuts the wafer 16 at a prescribed position on the basis of the side surfaces 15a and 15d of the pallet 15. Since the wafer 16 is thus cut on the basis of the side surfaces 15a to 15d of the pallet 15, the as-obtained components 17 are being stuck on the adhesive sheet 11 in states having prescribed positional relations with respect to the side surfaces 15a to 15d of the pallet 15. Such prescribed positional relations are also set so that the components 17 are separated by prescribed distances from the side surfaces 15a to 15d serving as reference surfaces.

Thereafter the pallet 15 is carried from the dicing unit 18 to a heating unit 19 as shown in Fig. 7, by arbitrary carrier means such as a belt conveyor. The pallet 15 is also carried to a

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locating station 20 described later by similar carrier means.

The heating unit 19 may be formed by a heater for heating the pallet 15 from a lower side, or a heating/drying furnace for receiving the pallet 15 therein. The heating unit 19 heats the pallet 15 to reduce the adhesion of the first adhesive layer 13 of the adhesive sheet 11. Consequently, the plurality of components 17 being stuck on the adhesive sheet 11 can be easily separated from the first adhesive layer 13 due to such reduction of its adhesion.

Then the pallet 15 is carried to the locating station 20.

In the locating station 20, the pallet 15 is located on a prescribed position, as shown in Fig. 1. At this time, movable guides 22 and 23 which are driven by air cylinders 22a and 23a push the side surfaces 15a and 15d of the pallet 15 to bring the side surfaces 15b and 15c into contact with fixed guides 24 and 25, thereby locating the pallet 15 on the prescribed position.

When the side surfaces 15b and 15c are brought into contact with the fixed guides 24 and 25, the pallet 15 is fixed at the position by a fixing plate 26. This fixing plate 26 has a number of through holes 27, which communicate with a tube 26b connected to suction means (not shown). The fixing plate 26 can be vertically driven by a vertical drive unit 28 which is formed by an air cylinder or the like. The pallet 15 is fixed onto an upper surface 26a of the fixing plate 26.

When the pallet 15 is located and fixed in the

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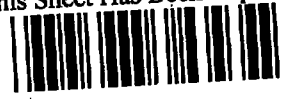
aforementioned manner, a component discharge unit such as a suction chuck is brought from the above into contact with a component 17 to be taken out, to discharge and supply the same to a next step as shown by arrow X in Fig. 1.

Since the pallet 15 is located on the prescribed position through the side surfaces 15b and 15c and the components 17 are also placed on the prescribed positions with respect to the side surfaces 15a and 15b, it is possible to reliably take out the target component 17 by downwardly moving the discharge unit such as a suction chuck while maintaining a prescribed positional relation with respect to the side surfaces 15a and 15d. Namely, it is possible to reliably discharge the target component 17 in response to distances from some of the side surfaces 15a to 15d.

Since the adhesion of the first adhesive layer 13 of the adhesive sheet 11 is reduced by the aforementioned heating, it is possible to extremely easily take out, i.e., separate the target component 17 from the adhesive sheet 11. Therefore, it is not necessary to use the thrust pin 5 which has been employed in the conventional method shown in Fig. 4. Thus, the components 17 are not damaged when the same are taken out from the pallet 15, while it is possible to omit the complicated operation of exchanging the thrust pin 5.

The components 17 can be taken out by any means in place of the suction chuck, so far as the means can temporarily fix the target component 17 and then separate the same. Further, the

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components 17 may not necessarily be taken out one by one from the pallet 15, but a plurality of such components can be simultaneously taken out.

Although the pallet 15 having a rectangular plane shape is employed in the aforementioned embodiment, this pallet may alternatively have another plane shape such as a circular one, so far as the same has reference portions for enabling location.

While the side surfaces 15a to 15d of the pallet 15 are employed as the reference portions in the aforementioned embodiment, holes 35a to 35d may alternatively be formed in corner portions of a pallet 35 as shown in Fig. 8, for carrying out the aforementioned locating step.

As shown in Fig. 9, further, a cavity 45a may be formed in an upper surface of a pallet 45 in response to the shape of an adhesive sheet 11, so that the adhesive sheet 11 is arranged in this cavity 45a. In this case, the position for sticking the adhesive sheet 11 is further accurately decided on the basis of the aforementioned cavity 45a.

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 spirit and scope of the present invention being limited only by the terms of the appended claims.

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WHAT IS CLAIMED IS:

1. A component supply method comprising the steps of:

preparing a pallet having a reference portion for performing location for later processing and an adhesive sheet being formed by a base material having a first adhesive layer, being reduced in adhesion by heating, provided on its one surface and a second adhesive layer, being not reduced in adhesion by heating or less reduced in adhesion than said first adhesive layer by heating, provided on another surface;

sticking said adhesive sheet onto one surface of said pallet;

sticking a wafer onto said first adhesive layer of said adhesive sheet to have a prescribed positional relation with respect to said reference portion of said pallet;

cutting said wafer on the basis of said reference portion thereby obtaining individual components; and

reducing adhesion of said first adhesive layer by heating for taking out said individual components obtained by said cutting of said wafer from said first adhesive layer on the basis of said reference portion.

2. A component supply method in accordance with claim 1, wherein a plurality of said reference portions are provided in said pallet.

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3. A component supply method in accordance with claim 2, wherein said reference portions are a plurality of side surfaces of said pallet.

4. A component supply method in accordance with claim 2, wherein said plurality of reference portions are a plurality of holes provided in corner portions of said pallet.

5. A component supply method in accordance with claim 1, wherein said adhesive sheet is stuck onto said one surface of said pallet to have a prescribed positional relation with respect to said reference portion.

6. A component supply method in accordance with claim 1, wherein said prescribed positional relation is set on the basis of the distance between said reference portion and said wafer.

7. A component supply method in accordance with claim 1, wherein said pallet is formed by a plate type member.

8. A component supply method in accordance with claim 7, wherein said second adhesive layer of said adhesive sheet is stuck onto said one surface of said pallet.

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