DESCRIPTION

SHEET STICKING APPARATUS AND SHEET STICKING METHOD

FIELD OF THE INVENTION

[0001]

The present invention relates to a sheet sticking apparatus and a sticking method, more particularly to a sheet sticking apparatus and a sticking method capable of sticking a sheet to an adherend having adhered surfaces at a plurality of sections, and cutting the sheet in accordance with the size of each adhered surface.

BACKGROUND OF THE ART

[0002]

When plate-like members made of grass or the like are laminated, the members have been stuck with an adhesive sheet such as a double-sided adhesive sheet on a mating surface therebetween. Also, semiconductor wafers have been stuck with a protective sheet on the front surface side of the wafers, and stuck with an adhesive sheet such as a die bonding sheet on the rear surface side thereof.

Such an apparatus and a method for sticking the adhesive sheet are disclosed in e.g. patent document 1. The sheet sticking apparatus disclosed in such a document is arranged to substantially simultaneously stick an adhesive sheet to a plurality of semiconductor wafers, and cut the adhesive sheet in accordance with the size of each semiconductor

wafer.

PATENT DOCUMENT 1: WO2007/018041 A1

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0003]

However, in the sheet sticking apparatus disclosed in the patent document 1, there is such a disadvantage that a plurality of tables for supporting the plurality of semiconductor wafers, which are an adherend, are required, so that the arrangement of such supporting means becomes complicated, and moreover the conveying process of the adherend is increased depending on the number of the adherends supported by the supporting means.

[0004]

OBJECT OF THE INVENTION

The present invention has been proposed in view of the above disadvantages. It is an object of the present invention to provide a sheet sticking apparatus and a sheet sticking method capable of sticking an adhesive sheet to a plurality of adhered surfaces substantially simultaneously, and preventing the arrangement of supporting means for supporting an adherend from being complicated.

MEANS FOR SOLVING PROBLEMS

[0005]

In order to achieve the above object, the present

invention adopts such an arrangement that a sheet sticking apparatus for sticking an adhesive sheet having an adhesive agent layer on one surface of a base sheet to an adherend having adhered surfaces at a plurality of sections, comprises:

a supporting means for supporting the adherend; a feeding means for feeding the adhesive sheet to a position facing the each adhered surface; a sticking means for sticking the adhesive sheet to the each adhered surface; a cutting means for cutting the adhesive sheet stuck to the each adhered surface in accordance with the size of the each adhered surface; and a collecting means for collecting an unnecessary adhesive sheet occurred outside the each adhered surface due to the cutting.

[0006]

Also, the present invention may adopt such an arrangement that a sheet sticking apparatus for sticking a double-sided adhesive sheet to an adherend having adhered surfaces at a plurality of sections, comprises:

a supporting means for supporting the adherend; a feeding means for feeding the double-sided adhesive sheet temporarily stuck with a release liner on one surface thereof to a position facing the each adhered surface; a sticking means for sticking the double-sided adhesive sheet to the each adhered surface; a cutting means for cutting the double-sided adhesive sheet stuck to the each adhered surface

in accordance with the size of the each adhered surface; and a collecting means for collecting an unnecessary adhesive sheet occurred outside the each adhered surface due to the cutting; wherein the feeding means, the sticking means, and the collecting means further comprise a function for removing the release liner temporarily stuck to the double-sided adhesive sheet stuck to the each adhered surface.

[0007]

Further, the present invention adopts such a manner that a sheet sticking method for sticking an adhesive sheet having an adhesive agent layer on one surface of a base sheet to an adherend having adhered surfaces at a plurality of sections, comprises steps of:

supporting the adherend; feeding the adhesive sheet to a position facing the each adhered surface; sticking the adhesive sheet to the each adhered surface; cutting the adhesive sheet stuck to the each adhered surface in accordance with the size of the each adhered surface; and collecting an unnecessary adhesive sheet occurred outside the each adhered surface due to the cutting.

[0008]

Furthermore, the present invention may adopt such a manner that a sheet sticking method for sticking a double-sided adhesive sheet to an adherend having adhered surfaces at a plurality of sections, comprises steps of:

supporting the adherend; feeding the double-sided adhesive sheet temporarily stuck with a release liner on one surface thereof to a position facing the each adhered surface; sticking the double-sided adhesive sheet to the each adhered surface; cutting the double-sided adhesive sheet stuck to the each adhered surface in accordance with the size of the each adhered surface; collecting an unnecessary adhesive sheet occurred outside the each adhered surface due to the cutting; and removing the release liner temporarily stuck to the double-sided adhesive sheet stuck to the each adhered surface by repeating the same steps as the feeding, sticking, and collecting steps.

EFFECT OF THE INVENTION

[0009]

According to the present invention, even if the adherend has the adhered surfaces to the adhesive sheet at the plurality of sections, it is possible to stick the adhesive sheet only to a necessary part of the adherend by sticking the adhesive sheet to these adhered surfaces, and cutting it in accordance with the size of each adhered surface.

Also, a plurality of tables is not needed as a conventional manner because the adherend is made of a single member even if the adhered surfaces are dispersed in the plurality of sections.

Further, when the feeding means, the sticking means,

and the collecting means are an arrangement of further having a function for removing a release liner, it is possible to eliminate the need for a dedicated device, which is provided after the double-sided adhesive sheet is stuck to the adhered surfaces, for removing the release liner being temporarily stuck on the adhered surfaces. Further, the feeding means, the sticking means, and the collecting means can be efficiently utilized.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010]

Fig. 1 is a front view schematically showing a sheet sticking apparatus in accordance with the present embodiment.

Fig. 2 is a perspective view schematically showing the sheet sticking apparatus.

Fig. 3 is a partial cross sectional view of a table and a robot.

Fig. 4 is a perspective view schematically showing a state of peeling of a second release liner from each adhered surface.

Explanation of Reference Numerals

[0011]

10: sheet sticking apparatus

11: feeding unit (feeding means)

12: sticking unit (sticking means)

13: table (supporting means)

15: robot (cutting means)

19: collecting means

A: double-sided adhesive sheet (adhesive agent layer)

RL1: first release liner

RL2: second release liner (base sheet)

S: adhesive sheet

S1: unnecessary adhesive sheet

W: adherend

WS: adhered surface

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0012]

Hereinafter, an embodiment of the present invention will be described with reference to the drawings.

[0013]

Fig. 1 is a front view schematically showing a sheet sticking apparatus according to an embodiment of the present invention, and Fig. 2 is a perspective view schematically showing the apparatus. In these figures, a sheet sticking apparatus 10 comprises: a table 13 (a supporting means) for supporting a plate-like adherend W that has adhered surfaces WS which are dispersed at a plurality of sections in substantially the same plane; a feeding unit 11 (a feeding means) for feeding a double-sided adhesive sheet A to a position facing each adhered surface WS; a sticking unit 12 (a sticking means) for sticking the double-sided adhesive sheet A to the each adhered surface WS by imparting a press

force thereto; a multi-joint type robot 15 (a cutting means) for cutting the double-sided adhesive sheet A in accordance with the size of the each adhered surface WS after sticking the double-sided adhesive sheet A to the each adhered surface WS; and a collecting means 19 for collecting an unnecessary adhesive sheet S1 occurred outside the each adhered surface WS.

[0014]

As shown in Figs. 3 and 4, the adherend W comprises a first plate-like body W1 having a substantially square shape in plane view, and second plate-like bodies W2, each having a substantially square shape in plane view, which are disposed in recesses 101 located in four sections within a plane of the first plate-like body W1. The adhered surfaces WS in the embodiment are located at a higher position than that of the upper surface of the first plate-like body W1. The adherend W is stuck with a plate-like body or the like (not shown) via the double-sided adhesive sheet A. The adherend W being stuck therewith is, for example, used as a component of double-glazing or the like.

[0015]

As shown in Figs. 3 and 4, the table 13 comprises an outer table 51 having a substantially square shape in plane view, and an inner table 52, disposed inside the outer table 51, having a substantially square shape in plane view. The outer table 51 is arranged so as to receive the inner table

52 which is provided so as to be able to move up and down via an elevating mechanism 52A. The outer table 51 is provided so as to be able to move up and down with respect to a base plate BP via an elevating mechanism 51A. Thus, the inner table 52 can move up and down so as to adjust a level position of the adhered surfaces WS to a predetermined position with respect to the upper surface of the outer table 51 as the reference position, while the outer table 51 can move up and down in accordance with the thicknesses of the double-sided adhesive sheet A and the second release liner RL2 with respect to the press surface of a press roller 14 so as to maintain a press force of the press roller 14 per unit area substantially constant. Note that the inner table 51 may built-in a heating means (not shown) for a double-sided adhesive sheet A having heat-sensitive adhesive property.

[0016]

The feeding unit 11 comprises: a support roller 20 for supporting a raw strip sheet R in which a pressure-sensitive adhesive double-sided adhesive sheet A is temporarily stuck between a first and a second release liners RL1 and RL2; a peel plate 22 for peeling the first release liner RL1 from the raw strip sheet R while the raw strip sheet R is fed out; a winding roller 23 for winding the first release liner RL1; a plurality of guide rollers 25 to 32 disposed between the support roller 20 and the winding roller 23; a tension measuring roller 40 disposed between

the guide rollers 27 and 28 and supported by a load cell 39. The peel plate 22, the guide rollers 27, 28, 29, and the tension measuring roller 40 are integrally supported as a sticking-angle maintaining means 37, so that by synchronous movement with the sticking unit 12, the double-sided adhesive sheet A temporarily stuck with the second release liner RL2 can be stuck to the adherend W.

[0017]

The sticking unit 12 comprises the press roller 14 being supported by a portal frame 57, and provided so as to be able to move up and down by a cylinder 59.

[0018]

Note that the feeding unit 11 and the sticking unit 12 are identical to those disclosed in Japanese Patent Application No. 2005-198806 filed by the applicant, and the detailed description thereof will be omitted here.

[0019]

As shown in Fig. 3, the robot 15 comprises a robot body 62, and a cutter blade 63 supported on the free-end side of the robot body 62. The robot body 62 includes a base section 64, first to sixth arms 65A to 65F which are disposed on the upper surface side of the base section 64 so as to be rotatable in the directions indicated with arrows A to F respectively, and a tool holding chuck 69 attached to the front end side of the sixth arm 65F. The second, third and fifth arms 65B, 65C, 65E, are provided rotatably

in the directions indicated with arrows B, C, and E, respectively, within a Y-Z plane in Fig. 3; and the first, fourth and sixth arms 65A, 65D, 65F are provided rotatably about the axis thereof in the directions indicated with arrows A, D, and F respectively. This allows the double-sided adhesive sheet A temporarily stuck with the second release liner RL2 to be cut in accordance with the size of each adhered surface WS. Note that the second release liner RL2 and the double-sided adhesive sheet A which are occurred outside the adhered surfaces WS due to this cutting are called an unnecessary adhesive sheet S1.

[0020]

The collecting means 19 comprises: a peeling roller portion 18 comprising rollers 80, 81 supported by a moving frame F; a drive roller 90 rotated by driving of a motor M; and a collecting roller 93 supported on the free-end side of a rotation arm 91, and pressure-contacted to the circumferential surface of the drive roller 90 via a spring 92. The moving frame F comprises a front frame F1, and a rear frame F2 coupled therewith via a connecting member 83, and is supported by a uniaxial robot 85 and a guide rail 61 to be movable in an X axis-direction. Thus, it is arranged so that when the uniaxial robot 85 and the motor M are synchronously-driven, the moving frame F is moved in the left direction in Fig. 1; thereby the unnecessary adhesive sheet S1 is peeled from the adherend W with the peeling roller

portion 18, and is wound with the collecting roller 93 to collect the unnecessary adhesive sheet S1.

[0021]

Next, an operation of the embodiment will be described. Note that a sticking operation of the double-sided adhesive sheet A is substantially identical to that disclosed in Japanese Patent Application No. 2005-198806. Therefore, the description thereof will be simplified.

[0022]

(Supporting step)

The robot 15 supports a suction arm 100 (see Fig. 2) with the tool holding chuck 69, and transfers the adherend W onto the inner table 52. After that, the robot 15 replaces the suction arm 100 with the cutter blade 63 by using the tool holding chuck 69, and supports the cutter blade 63 to be ready for cutting.

[0023]

(Feeding step)

As shown in Fig. 1, the double-sided adhesive sheet A temporarily stuck with the second release liner RL2 is fed from the raw strip sheet R supported by the support roller 20 to the position facing each adhered surface WS of the adherend W. Note that, such feeding has already been performed in a collecting step in a series of sheet sticking operations which were previously performed (see a collecting step to be described below).

[0024]

(Sticking step)

The sticking-angle maintaining means 37 moves to the bottom left in Fig. 1, while the sticking unit 12 moves to the left side in Fig. 1 in synchronization with the movement of the sticking-angle maintaining means 37, so that the press roller 14 presses the double-sided adhesive sheet A temporarily stuck to the second release liner RL2 to stick the double-sided adhesive sheet A to the adhered surface WS.

[0025]

(Cutting step)

The double-sided adhesive sheet A, stuck to each adhered surface WS of the adherend W, is cut by the robot 15 along with the second release liner RL2, in accordance with the size of the adhered surfaces W.

[0026]

(Collecting step)

The collecting means 19 moves to the left side in Fig. 1, and the peeling roller portion 18 and the motor M are driven, so that the unnecessary adhesive sheet S1, which is occurred outside each adhered surface WS, is collected by winding the sheet S1 with the collecting roller 93. After that, the sticking-angle maintaining means 37 moves upward, while the sticking unit 12 and the collecting means 19 return to the position shown in Fig. 1 in synchronization with the

movement of the sticking-angle maintaining means 37. The motor M is locked during this return operation, so that a new double-sided adhesive sheet A is pulled out of the feeding unit 11 by a predetermined length.

[0027]

(Removing step)

After the above operation, the second release liner RL2 remains on the adhered surfaces WS with the second release liner RL2 being temporarily stuck to the double-sided adhesive sheet A. The remaining second release liner RL2 can be removed by performing the same operation again as that of (Feeding step), (Sticking step), and (Collecting step). In other words, (Feeding step): the double-sided adhesive sheet A temporarily stuck with the second release liner RL2 is newly fed to the position facing the adhered surfaces WS. (Sticking step): The double-sided adhesive sheet A is stuck to the adhered surfaces WS by driving the sticking-angle maintaining means 37 and the sticking unit 12 in synchronization with each other. (Collecting step): The collecting means 19 is moved to the left side in Fig. 1 to peel, from the adherend W, the double-sided adhesive sheet A that is newly pulled out to collect the double-sided adhesive sheet A with the collecting roller 93. As shown in Fig. 4, as a result of such operation, the second release liner RL2 that remains on the adhered surfaces WS is stuck to the double-sided adhesive sheet A, thereby being removed

from the adhered surfaces WS. After that, when the sticking-angle maintaining means 37, the sticking unit 12, and the collecting means 19 are synchronously driven to return to the position shown in Fig. 1, a new double-sided adhesive sheet A is pulled out by a predetermined length.

[0028]

In this way, the adherend W stuck with only the double-sided adhesive sheet A being stuck on the adhered surfaces WS is conveyed to the subsequent process by the robot 15 supporting the suction arm 100 to be subjected to a predetermined treatment. After that, the same operations are repeated.

[0029]

Therefore, according to this embodiment, even when a single adherend W has a plurality of adhered surfaces WS, the adherend W can be transferred or conveyed in an integrated manner, and be stuck with a double-sided adhesive sheet A substantially simultaneously.

Also, even when the adherend W has a plurality of surfaces to be stuck with the double-sided adhesive sheet A, the adherend W can be rapidly transferred or conveyed, and moreover the table for supporting the adherend W can be simply arranged because the adherend W is a single plate-like body.

[0030]

The best arrangement and method for carrying out the

present invention have been disclosed so far. However, the present invention is not limited to the above.

That is, the present invention has been illustrated and described mainly about a specific embodiment. However, it is possible for those skilled in the art to add various modifications, if necessary, to the above-described embodiment with respect to the shape, position and/or disposition without departing from the technical spirit and the range of the object of the present invention.

[0031]

For example, in the above embodiment, the sticking of the double-sided adhesive sheet A to the adhered surfaces WS has been illustrated and described. However, the present invention is not limited to the above. Therefore, the present invention may be a sheet sticking apparatus 10 for sticking an adhesive sheet S provided with an adhesive agent layer on one surface of a base sheet to adhered surfaces WS. In this case, the adhesive sheet may comprise the base sheet as the second release liner RL2, and the adhesive agent layer as the double-sided adhesive sheet A. Further, the removing step may be omitted.

[0032]

Also, in the above embodiment, it has been described that the second release liner RL2 is removed from the double-sided adhesive sheet A by performing the operation similar to that when sticking the double-sided adhesive sheet

A to the adhered surfaces WS. However, the double-sided adhesive sheet A may be conveyed from the table 13 to the subsequent process without peeling the second release liner RL2.

[0033]

Further, a raw strip sheet having no first release liner RL1 described above may be used. In this case, the guide rollers 30 and 31, the winding roller 23, and the like become unnecessary.

[0034]

Furthermore, the planar shape of the adhered surface is not limited to the illustrated arrangement example, but may be a circular shape, oval shape, polygonal shape, or the like, or may be a combination thereof.

[0035]

Still further, the sheet sticking apparatus 10 of the present invention may be adopted as a sheet sticking apparatus for sticking a protective sheet to the circuit surface of semiconductor wafers, and a mounting apparatus for integrating a semiconductor wafer with a ring frame via an adhesive sheet.

WHAT IS CLAIMED IS:

1. A sheet sticking apparatus for sticking an adhesive sheet having an adhesive agent layer on one surface of a base sheet to an adherend having adhered surfaces at a plurality of sections, comprising:

a supporting means for supporting the adherend;

a feeding means for feeding the adhesive sheet to a position facing the each adhered surface;

a sticking means for sticking the adhesive sheet to the each adhered surface;

a cutting means for cutting the adhesive sheet stuck to the each adhered surface in accordance with the size of the each adhered surface; and

a collecting means for collecting an unnecessary adhesive sheet occurred outside the each adhered surface due to the cutting.

2. A sheet sticking apparatus for sticking a double-sided adhesive sheet to an adherend having adhered surfaces at a plurality of sections, comprising:

a supporting means for supporting the adherend;

a feeding means for feeding the double-sided adhesive sheet temporarily stuck with a release liner on one surface thereof to a position facing the each adhered surface;

a sticking means for sticking the double-sided adhesive sheet to the each adhered surface;

a cutting means for cutting the double-sided adhesive sheet stuck to the each adhered surface in accordance with the size of the each adhered surface; and

a collecting means for collecting an unnecessary adhesive sheet occurred outside the each adhered surface due to the cutting;

wherein the feeding means, the sticking means, and the collecting means further comprise a function for removing the release liner temporarily stuck to the double-sided adhesive sheet stuck to the each adhered surface.

3. A sheet sticking method for sticking an adhesive sheet having an adhesive agent layer on one surface of a base sheet to an adherend having adhered surfaces at a plurality of sections, comprising steps of:

supporting the adherend;

feeding the adhesive sheet to a position facing the each adhered surface;

sticking the adhesive sheet to the each adhered surface;

cutting the adhesive sheet stuck to the each adhered surface in accordance with the size of the each adhered surface; and

collecting an unnecessary adhesive sheet occurred outside the each adhered surface due to the cutting.

4. A sheet sticking method for sticking a double-sided adhesive sheet to an adherend having adhered surfaces at a plurality of sections, comprising steps of:

supporting the adherend;

feeding the double-sided adhesive sheet temporarily stuck with a release liner on one surface thereof to a position facing the each adhered surface;

sticking the double-sided adhesive sheet to the each adhered surface;

cutting the double-sided adhesive sheet stuck to the each adhered surface in accordance with the size of the each adhered surface;

collecting an unnecessary adhesive sheet occurred outside the each adhered surface due to the cutting; and

removing the release liner temporarily stuck to the double-sided adhesive sheet stuck to the each adhered surface by repeating the same steps as the feeding, sticking, and collecting steps.