

conforming surface 13a may be larger than the chip holding surface 101a. The elastic deformation part 14 is sandwiched between the plate member 13 and the base 12. The elastic deformation part 14 undergoes significant deformation with respect to the pressing force F. The rigidity of the elastic deformation part 14 is lower than the rigidity of the plate member 13. The rigidity referred to here is the degree of ease of deformation. The rigidity referred to here may also be referred to as elastic modulus or Young's modulus. The elastic deformation part 14 is a block made of rubber or resin. For example, fluorine rubber or silicone rubber may be used for the elastic deformation part 14. However, the elastic deformation part 14 is not limited thereto, and any elastic body may be used. The elastic deformation part 14 may be one or more metal springs. The thickness of the elastic deformation part 14 is greater than the thickness of the plate member 13 from the viewpoint of undergoing a significant inclination. It may also be said that the jig reference axis A1 is the neutral axis of the elastic deformation part 14. When the axis of the pressing force F overlaps the jig reference axis A1, the elastic deformation part 14 contracts in the Z direction without being inclined. It may also be said that the axis of the pressing force F is the stage reference axis A2. When the axis of the pressing force F deviates from the jig reference axis A1, the elastic deformation part 14 contracts in the Z direction. However, the amount of contraction varies from place to place. Therefore, the plate member 13 disposed on the elastic deformation part 14 is inclined.

[0026] The characteristics of the elastic deformation part 14 may be exemplified by a graph G1 of (a) of FIG. 3 and a graph G2 of (b) of FIG. 3. The horizontal axis in (a) of FIG. 3 indicates the position. The vertical axis in ~~(a)~~^(b) of FIG. 3 indicates the inclination. The position on the horizontal axis is, in other words, the position (deviation D) of the stage reference axis A2 with respect to the jig reference axis A1. A zero position means that the jig reference axis A1 overlaps the stage reference axis A2. The horizontal axis in (b) of FIG. 3 indicates the load. The vertical axis in (b) of FIG. 3 indicates the inclination. The greater the load, the greater the inclination. The graph ~~G2~~^{G3} illustrates a case where the relationship between the load and the inclination is

proportional.

[0027] Though described later as a first modified example, the elastic deformation part 14 is not limited to a configuration in which the rigidity thereof is constant. The rigidity of the elastic deformation part 14 may be variable as shown in the graph G3 of (c) of FIG. 3. In this case, it is also possible to cause any inclination by controlling the rigidity of the elastic deformation part 14 while keeping the pressing force constant.

[0028] The adjustment controller 20 provides a control signal $\phi 2$ to the main controller 104 so as to set the pressing mode to cause the desired inclination. The adjustment controller 20 holds information in which a position where the chip part 202 is to be disposed on a stage main surface 204a (placement surface, to be described later) and the inclination of the stage main surface 204a at that position are associated with each other. The adjustment controller 20 receives the position information of the chip part 202 to be placed later from the main controller 104. The adjustment controller 20 retrieves the inclination information corresponding to the received position information. Subsequently, the adjustment controller 20 sets the target inclination of the chip holding part 101 based on the inclination information that has been retrieved. The adjustment controller 20 calculates the deviation D of the stage reference axis A2 from the jig reference axis A1 based on the characteristics of the elastic deformation part 14 shown in (a) and (b) of FIG. 3. The deviation D is converted into the position of the chip holding part 101 in the X direction and the Y direction. The adjustment controller 20 calculates the force with which the chip holding part 101 presses the conforming jig 10. The force with which the chip holding part 101 presses the conforming jig 10 is converted into the position of the chip holding part 101 in the Z direction. The adjustment controller 20 outputs the control signal $\phi 1$ to the main controller 104 so as to move the chip holding part 101 to the calculated positions in the X, Y and Z directions.

[0029] <Bonding Head Adjustment Method>

A bonding method including a bonding head adjustment method will be described below with reference to FIGs. 4 to 8 as appropriate.

direction. Next, the main controller 104 causes the bonding head 200 to hold the chip part 202. Then, the main controller 104 moves the bonding head 200 holding the chip part 202 upward along the Z direction.

[0039] Next, the chip part 202 is moved to the substrate 201 (S6: (b) of FIG. 7). The main controller 104 gives the control signal $\phi 1$ to the actuator 103. As a result, the bonding head 200 moves above the region R1a of the substrate 201 where the chip part 202 is to be disposed.

[0040] Next, the chip part 202 is mounted on the substrate 201 (S7: (a) of FIG. 8). The main controller 104 gives the control signal $\phi 1$ to the actuator 103. As a result, the bonding head 200 moves downward in the Z direction toward the substrate 201. At this time, the chip holding surface 101a of the chip holding part 101 is parallel to the mounting surface 201a of the substrate 201. Assuming that the surface of the chip part 202 held by the chip holding part 101 and the opposite surface facing the substrate 201 are parallel to each other, the chip bonding surface 202a of the chip part 202 held by the chip holding surface 101a is also parallel to the mounting surface 201a of the substrate 201. The bonding head 200 performs desired processing required for bonding, such as heating for thermal curing of the adhesive.

[0041] Next, the bonding head 200 is separated from the chip part 202 (S8: (b) of FIG. 8). The main controller 104 gives the control signal $\phi 1$ to the bonding head 200. As a result, the suction operation of the bonding head 200 stops. The main controller 104 gives the control signal $\phi 1$ to the actuator 103. As a result, the bonding head 200 moves upward in the Z direction ~~toward~~ from the substrate 201. The chip part 202 is mounted on the substrate 201 by the above steps.

[0042] <Action and Effects>

In the bonding apparatus 1 and the bonding head adjustment method, even when the substrate 201 is placed on the substrate stage 204, the adjustment controller 20 has the inclination information of the stage main surface 204a. As a result, the inclination of the chip holding part 101 may be adjusted according to the inclination of the place where the chip part 202 is to be disposed. Therefore, the yield of die bonding operation may be improved.

the drive column 16, it is possible to set the inclination of the plate member 13 to a desired inclination.

[0046] According to the bonding apparatus 1B, the inclination of the chip holding part 101 may be adjusted by the steps shown in FIGs. 11 and 12. As shown in (a) of FIG. 11, the chip holding part 101 is moved above the conforming jig 10B. The chip holding part 101 may be positioned above the plate member 13. Strict alignment as shown by the deviation D between the jig reference axis A1 and the stage reference axis A2 is not required as in the embodiment. Next, as shown in (b) of FIG. 11, the adjustment controller 20 outputs the control signal $\phi 2$ to the drive column 16. The drive column 16 adjusts the length of the drive end 16a based on the control signal $\phi 2$. By adjusting the length of the drive end 16a, the plate member 13 is set to a desired inclination. Further, the main controller 104 unlocks the inclination adjustment mechanism 102. Subsequently, as shown in (a) of FIG. 12, the main controller 104 outputs the control signal $\phi 1$. The actuator 103 moves the inclination adjustment mechanism 102 and the chip holding part 101 downward in the Z direction. At this time, the lock of the movable part 102a of the inclination adjustment mechanism 102 is released. Therefore, the chip holding part 101 fixed to the movable part 102a conforms to the inclination of the plate member 13. At this time, it is sufficient that the chip holding surface 101a is in contact with the conforming surface 13a. That is, no pressing force is generated. After that, the main controller 104 locks the movable part 102a. Then, as shown in (b) of FIG. 12, the main controller 104 outputs the control signal $\phi 1$. The actuator 103 moves the inclination adjustment mechanism 102 and the chip holding part 101 upward in the Z direction. Adjustment of the inclination of the chip holding part 101 is completed by the above steps.

Reference Signs List

[0047]

1, 1A, 1B: Bonding apparatus; 10, 10A, 10B: Conforming jig; 11, 11A: Passive inclination part; 12: Base; 13: Plate member; 13a: Conforming surface; 14, 14A: Elastic deformation part; 14s: