DESCRIPTION

TITLE OF INVENTION:

MANUFACTURING APPARATUS AND MANUFACTURING METHOD OF SEMICONDUCTOR DEVICE

Technical Field

[0001] This specification discloses a manufacturing apparatus and a manufacturing method for manufacturing a semiconductor device by bonding a chip held by a mounting tool to a substrate.

Related Art

[0002] A flip chip bonder is conventionally known as a technique for mounting a chip on a substrate. In the flip chip bonder, protruding electrodes called bumps are formed on the bottom surface of the chip. A mounting tool is used to press the chip against the substrate and heat the chip to melt the bumps to bond the bumps of the chip to the electrodes of the substrate. In recent years, several techniques have been proposed for detecting a melting timing of the bumps in such bonding processes.

[0003] For example, Patent Document 1 discloses a technique in which if a load detection value detected by a load detection means provided in a thermocompression bonding tool (corresponding to the mounting tool) decreases to a predetermined value or below, it is determined that the bumps have melted and the thermocompression bonding tool is raised. According to this technique, if melting of the bumps can be detected, the next operation, that is, raising the thermocompression bonding tool, can be performed immediately. As a result, the time required for thermocompression bonding can be shortened and productivity can be improved compared to a technique of presuming a time taken until melting occurs and continuing heating until the presumed time elapses.

30 includes a stator 30a fixed to a moving body 46 and a mover 30b movable in the Z-axis direction with respect to the stator 30a. The mover 30b is mechanically connected to the mounting tool 20 via the slide shaft 32. Further, the slide shaft 32 is attached to the moving body 46 via the leaf spring 34 which is bendable in the Z-axis direction. Further, the guide member 36 is fixed to the moving body 46. The slide shaft 32 is inserted through a through hole formed in the guide member 36 and is slidable along the through hole.

[0020] When an electric current is applied to the drive motor 30, the mover 30b moves in the Z-axis direction with respect to the moving body 46. At this time, the slide shaft 32 and the mounting tool 20 fixed to the slide shaft 32 move in the Z-axis direction together with the mover 30b while elastically deforming the leaf spring 34. A displacement amount of the slide shaft 32 with respect to the stator 30a is detected by a position sensor such as a linear scale 50 fixed to the guide member 36 and is sent to the controller 16.

[0021] The elevating mechanism 24 raises and lowers the mounting tool 20 and the pressing mechanism 22 in the Z-axis direction with respect to a base member 38. The elevating mechanism 24 includes an elevating motor 40 as a drive source. A lead screw 42 extending in the axial direction is connected to the elevating motor 40 via a coupling, and the lead screw 42 rotates along with the drive of the elevating motor 40. A moving block 44 is screwed to the lead screw 42, and the moving block 44 is fixed to an upper surface of the stator 30a of the drive motor 30. Further, the moving body 46 is fixed to a side surface of the stator 30a. The moving body 46 is slidable along a guide rail 48 fixed to the base member 38. When an electric current is applied to the elevating motor 40, the lead screw 42 rotates, and along with this, the moving block 44 rises and lowers in the Z-axis direction. Then, with the moving block 44 rising and lowering, the pressing mechanism 22 and the mounting tool 20 fixed to the moving block 44 also rise and lower. A rising and lowering amount of the pressing mechanism 22 by the elevating mechanism 24 is also detected by a sensor (e.g., an encoder attached to the elevating motor 40) and sent to the controller