

14 with a vacuum. A vacuum hole 16 for sucking the semiconductor die 70 with a vacuum is provided at the center of the bonding tool 10 to penetrate the base 11 and the island 13. As illustrated in FIG. 2C, a plurality of continuous vacuum suction holes 15 are provided at positions on the base 11 adjacent to an outer peripheral surface of the island 13. In this embodiment, a diameter d1 of each continuous vacuum suction hole 15 is set to be equal to a protruding height H1 of the island 13 from the bottom surface 12 of the base 11. As illustrated in FIG. 2A, the continuous vacuum suction holes 15 communicate with an annular groove 17 which is provided on the top surface 18 of the base 11 in contact with the bottom surface 26 of the heater body 21 of the heater 20. The number of continuous vacuum suction holes 15 is set such that a ratio of a total area of a plurality of continuous vacuum suction holes 15 provided on a short side of the island 13 to a total area of a plurality of continuous vacuum suction holes 15 provided on a long side of the island 13 is substantially the same as a length ratio of the short side to the long side of the island 13. Accordingly, air can be sucked from the surroundings of the island 13 with a good balance.

[0020]

The heater 20 has, for example, a rectangular plate shape in which a heating resistor element formed of platinum, tungsten, or the like is embedded in a ceramic such as aluminum nitride and has a size substantially equal to that of the bonding tool 10. As illustrated in FIG. 3A to FIG. 3C, a vacuum hole 22 that communicates with the vacuum hole 16 of the bonding tool 10 is provided at the center thereof. As illustrated in FIG. 3C, a C-shaped groove 24 is provided in a region corresponding to the inside of the annular groove 17 of the top surface 18 of the bonding tool 10, and a vacuum hole 23 penetrating the heater 20 in a thickness direction thereof is provided at one end of the groove 24. As illustrated in FIG. 3C, a vacuum hole 25 is provided at a position corresponding to a corner of the annular groove 17 of the top surface 18 of

but the shape of each continuous vacuum suction hole 115 is not limited thereto and may be, for example, rectangular or oval. When such shapes are employed, the short side width W1 may be set to be equal to the protruding height H1 of the island 13 from the bottom surface 12 of the base 11.

5 [0037]

As described above, with the flip-chip bonding apparatus 100 according to this embodiment, it is possible to prevent the bonding tool 10 from being damaged when the semiconductor die 70 of the second stage having protruding electrodes 72 and 73 disposed on both surfaces thereof is bonded to the semiconductor die 80 of the first stage and a gap between
10 the semiconductor die 70 of the second stage and the semiconductor die 80 of the first stage is sealed with the nonconductive film (NCF) 75.

[0038]

In the above description, the nonconductive film (NCF) 75 is used to seal the gap between the semiconductor die 70 of the second stage and the semiconductor die 80 of the first
15 stage, but the present invention is not limited thereto and can be applied to a case in which another type of sealing resin is employed.

[Reference Signs List]

[0039]

10, 110 Bonding tool
20 11 Base
12, 26, 35 Bottom surface
13 Island
14 Surface
15, 115 Continuous vacuum suction hole