

31, multiple first suction holes 32 and multiple second suction holes 33 are provided. The first suction holes 32 and the second suction holes 33 are connected with a vacuum apparatus not shown herein, and suck and fix the substrate holder 10 on the placement surface 31a by using vacuum.

[0042] As shown in FIGs. 2 and 3, the substrate holder 10 is configured by using a base 11 and a positioning member 21. The base 11 is a plate-shaped ceramic member in which the upper surface 11a and a lower surface 11b are polished. FIG. 2 illustrates a state in which the substrate holder 10 is set on a placement station 50 disposed in the vicinity of the bonding apparatus 80.

[0043] The positioning member 21 is a metal-made plate-shaped member formed with at least one opening 22 into which the individual substrate 41 is fit. As shown in FIG. 3, the positioning member 21 is superimposed onto the upper surface 11a of the base 11 by providing a pin 23 extending toward the base 11 and ~~determining~~fitting the pin 23 into a hole 14 provided in the base 11. When the positioning member 21 is superimposed on the upper surface 11a of the base 11, as shown in FIG. 2, the opening 22 forms a concave part 13 defining the position at which the individual substrate 41 is placed. The concave part 13 partitions the region in which the individual substrate 41 is placed. It is noted that the hole 14 of the base 11 is larger than the pin 23 of the positioning member 21 so as to be able to absorb a thermal expansion difference between the base 11 and the positioning member 21.

[0044] In the region of the concave part 13 of the base 11, a through hole 12 penetrating through the base 11 in the thickness direction is provided. As shown in FIG. 4, the through hole 12 is in communication with the second suction hole 33 provided on the placement surface 31a when the substrate holder 10 is placed on the placement surface 31a of the stage 31.

[0045] An upper flatness value of the upper surface 11a and a lower flatness value of the lower surface 11b of the base 11 are each equal to or less than a reference flatness value, and a thickness deviation of the base 11 is equal to or less than a reference deviation. Here, the flatness value is a value of an interval between two flat surfaces in the case where the interval between the two flat

if the thickness of the solder layer 43 is as thin as 10 μm , favorable gold solder fusion bonding can still be performed.

[0057] Moreover, the substrate holder 10 has a configuration in which the positioning member 21 made of metal is superimposed onto the base 11 as a plate-shaped ceramic ~~step~~-member in which the upper surface 11a and the lower surface 11b are polished. Therefore, the flatness values and the thickness deviation of the base 11 can be reduced, and the positioning member 21 not limited by the flatness value is made by inexpensive metal. Accordingly, the cost can be reduced.

[0058] In the following, the solid line a and the dot-chain line b of FIG. 5 are described. In ceramic materials, there are ceramic materials with low thermal conductivity as well as ceramic materials with higher thermal conductivity. As described above, the solid line a of FIG. 5 indicates the temperature change of the individual substrate 41 in the case where the base 11 is formed by using a ceramic material with low thermal conductivity, and the dot-chain line b of FIG. 5 illustrates the temperature change of the individual substrate 41 in the case where the base 11 is formed by a ceramic material with thermal conductivity higher than the case of the solid line a.

[0059] As indicated by the solid line a of FIG. 5, in the case of the ceramic material with low thermal conductivity, even if the individual substrate 41 is heated by the heater of the stage 31, the speed that the heat from the stage 31 is transmitted to the individual substrate 41 is slow, and it takes time for the temperature of the individual substrate 41 to reach the bonding start temperature T1. However, when the semiconductor chip 45 is heated by the heater built in the bonding head 31 and the heat from the semiconductor chip 45 is transmitted to the individual substrate 41, since the heat does not escape from the individual substrate 41 to the stage 31, the time during which the temperature rises from the bonding start temperature T1 to the bonding temperature T2 is reduced.

WHAT IS CLAIMED IS:

1. ~~(Currently amended)~~ A substrate holder, holding an individual substrate to which a semiconductor chip is bonded, the substrate holder comprising:

a base, having a plate shape, wherein the individual substrate is placed on an upper surface of the base, and a lower surface of the base is sucked and fixed to a placement surface of a stage of a bonding apparatus; and

a positioning member, provided on the base to define a position of the individual substrate placed on the upper surface of the base,

wherein the upper surface of the base is a flat surface,

the positioning member is a plate-shaped member formed with at least one opening with which the individual substrate is fit, and is superimposed on the upper surface of the base so that the opening forms a concave part defining a position at which the individual substrate is placed,

in the base, a through hole penetrating in a thickness direction is provided in a region in which the individual substrate is placed,

the through hole is in communication with a suction hole provided in the stage of the bonding apparatus when the lower surface is sucked and fixed to the placement surface of the stage of the bonding apparatus.

2. ~~(Cancelled)~~—

3. ~~(Currently amended)~~ A substrate holder, holding an individual substrate to which a semiconductor chip is bonded, the substrate holder comprising:

a base, having a plate shape, wherein the individual substrate is placed on an upper surface of the base, and a lower surface of the base is sucked and fixed to a placement surface of a stage of a bonding apparatus; and

a positioning member, provided on the base to define a position of the individual substrate placed on the upper surface of the base,

wherein the upper surface of the base is a flat surface,

the positioning member is a plate-shaped member formed with at least one opening with which the individual substrate is fit, and is superimposed on the upper surface of the base so that the opening forms a concave part defining a position at which the individual substrate is placed,

5 wherein in the base, a plurality of individual substrates are placed on the upper surface, and a plurality of through holes penetrating in a thickness direction are respectively provided in respective regions in which the respective individual substrates are placed,

wherein the respective through holes are in communication with at least one suction hole provided in the stage of the bonding apparatus when the lower surface is sucked and fixed to the
10 placement surface of the stage of the bonding apparatus.

34. The substrate holder as claimed in claim 32,

wherein in the base, a groove allowing the through holes to communicate with each other is provided on the lower surface.

54. ~~(Currently amended)~~ The substrate holder as claimed in any one of claims 1 ~~or 3 or 4~~ to
15 3,

wherein in the base, an upper flatness value of the upper surface and a lower flatness value of the lower surface are equal to or less than a reference flatness value, and a thickness deviation is equal to or less than a reference deviation.

6.—

20 75. ~~(Currently amended)~~ The substrate holder as claimed in any one of claims 1 ~~and 3~~ to 54,

wherein the base is a ceramic member in which the upper surface and the lower surface are polished, and

the positioning member is made of metal.

25 86. ~~(Currently amended)~~ A bonding system, comprising:

a bonding apparatus, bonding a semiconductor chip to an individual substrate; and
a substrate holder, holding the individual substrate,
wherein the bonding apparatus comprises a stage for sucking and fixing the substrate holder
on a placement surface, and

5 the substrate holder comprises:

a base, having a plate shape, wherein the individual substrate is placed on an upper surface
of the base, and a lower surface of the base is sucked and fixed to the placement surface of the
stage; and

a positioning member, provided on the base to define a position of the individual substrate
10 placed on the upper surface of the base,

wherein the upper surface of the base is a flat surface,

the positioning member is a plate-shaped member formed with at least one opening with
which the individual substrate is fit, and is superimposed on the upper surface of the base so that
the opening forms a concave part defining a position at which the individual substrate is placed,

15 wherein the stage comprises a suction hole,

wherein in the base, a through hole penetrating in a thickness direction is provided in a
region in which the individual substrate is placed,

the through hole is in communication with the suction hole provided in the stage when the
lower surface is sucked and fixed to the placement surface, and sucks and fixes the individual
20 substrate to the upper surface of the base.

~~9. (Cancelled)~~

~~107. (Currently amended)~~ A bonding system, comprising:

a bonding apparatus, bonding a semiconductor chip to an individual substrate; and

a substrate holder, holding the individual substrate,

25 wherein the bonding apparatus comprises a stage for sucking and fixing the substrate holder

on a placement surface, and

the substrate holder comprises:

a base, having a plate shape, wherein the individual substrate is placed on an upper surface of the base, and a lower surface of the base is sucked and fixed to the placement surface of the

5 stage; and

a positioning member, provided on the base to define a position of the individual substrate placed on the upper surface of the base,

wherein the upper surface of the base is a flat surface,

10 the positioning member is a plate-shaped member formed with at least one opening with which the individual substrate is fit, and is superimposed on the upper surface of the base so that the opening forms a concave part defining a position at which the individual substrate is placed,

wherein in the substrate holder, a plurality of individual substrates are placed on the upper surface,

15 the positioning member respectively defines a position of each of the individual substrates placed on the upper surface of the base,

the stage comprises at least one suction hole,

in the base, through holes penetrating in a thickness direction are respectively provided in respective regions in which the individual substrates are placed, and

20 each of the through holes is in communication with at least one suction hole when the lower surface is sucked and fixed to the placement surface, and sucks and fixes each of the individual substrates to the upper surface of the base.

118. The bonding system as claimed in claim 107,

wherein in the base, a groove allowing the through holes to communicate with each other is provided on the lower surface.

25 129. (Currently amended) The bonding system as claimed in any one of claims 8 or 10 or

~~116 to 8,~~

wherein in the base, an upper flatness value of the upper surface and a lower flatness value of the lower surface are equal to or less than a reference flatness value, and a thickness deviation is equal to or less than a reference deviation.

5 ~~13.—~~

~~1410. (Currently amended) The substrate holder~~bonding system as claimed in any one of claims ~~8 and 10 to 12~~6 to 9,

wherein the base is a ceramic member in which the upper surface and the lower surface are polished, and

10 the positioning member is made of metal.

~~1511.~~ A bonding method for bonding a semiconductor chip to an individual substrate, the bonding method comprising:

a preparation step of preparing:

a substrate holder, comprising: a base, wherein a plurality of individual substrates are
15 placed on an upper surface of the base; and a positioning member, provided on the base to define a position of each of the individual substrates placed on the upper surface of the base, wherein through holes penetrating in a thickness direction are respectively provided in respective regions in which the individual substrates are placed, the upper surface of the base is a flat surface, and the positioning member is a plate-shaped member formed with at least one opening with which
20 the individual substrate is fit, and is superimposed on the upper surface of the base so that the opening forms a concave part defining a position at which the individual substrate is placed; and a bonding apparatus, comprising a stage having at least one suction hole, and pressing the semiconductor chip to the individual substrate to perform bonding;

a placement step of placing the individual substrates on ~~the a~~ a placement surface of the
25 substrate holder, and allowing each of the through holes to communicate with at least one of the

suction hole to place the substrate holder on the placement surface of the stage;

a sucking and fixing step, making the at least one of the suction hole of the bonding apparatus vacuum to suck and fix the substrate holder to the placement surface of the stage, and respectively sucking and fixing each of the individual substrates to the upper surface of the base;

5 and

a bonding process of bonding, in order, the semiconductor chip to the individual substrates.

1612. The bonding method as claimed in claim 1511,

wherein the bonding apparatus comprises a placement station for placing the individual substrates on the placement surface of the substrate holder, and

10 in the placement step, after the individual substrates are placed on the placement surface of the substrate holder by using the placement station, the substrate holder on which the individual substrates are placed are conveyed onto the stage, and the substrate holder that is conveyed is placed on the placement surface of the stage.