intersection of the two centerlines 41x and 41y. Then, the position detection unit 55 stores the calculated XY coordinates (x0, y0) in the position database 56 as shown in FIG. 5.

[0039] In this case, since the position shift amount is calculated, the position correction unit 57 outputs the XY coordinates (x0, y0) of the center position 45 of the island 41 stored in the position database 56 as the corrected bonding position of the semiconductor chip 21 of the first stage to the bonding control unit 58.

[0040] In step S102 of FIG. 6, the bonding control unit 58 moves the bonding head 11 in the Y direction by the offset A so that the Z-direction centerline 12z of the bonding nozzle 12 comes to the XY coordinates (x0, y0). The semiconductor chip 20 is sucked and fixed to the tip of the bonding nozzle 12 so that the center coordinates XY become the position of the Z-direction centerline 12z. Accordingly, when the Z-direction centerline 12z of the bonding nozzle 12 is aligned with the XY coordinates (x0, y0), the center position 215 of the semiconductor chip 21 becomes the same XY position as the center position 45 of the island 41. Then, the bonding control unit 58 lowers the bonding nozzle 12 to bond the semiconductor chip 21 of the first stage onto the island 41.

[0041] In step S103 of FIG. 6, the bonding control unit 58 moves the bonding head 11 to the Y-direction minus side by the offset A so that the center of the visual field 60 of the camera 13 matches the center of the semiconductor chip 21. The position detection unit 55 receives the image in which the semiconductor chip 21 of the first stage bonded enters the visual field 60 as shown in FIG. 9 from the camera 13. Then, the position detection unit 55 analyzes the image to detect the positions of the marks 212 and 213 of the semiconductor chip 21 of the first stage, and detects the centerline 21x in the X direction and the centerline 21y in the Y direction from the positions of the two marks 212 and 213 to calculate the XY coordinates (x1, y1) of the center position 215 of the semiconductor chip 21 as the intersection of the two centerlines 21x and 21y. Then, the position detection unit 55 stores the calculated XY coordinates (x1, y1) in the position database 56 as shown in FIG. 5.

of the semiconductor chip 20(N-1) of the N-1th stage and the XY coordinates (xN, yN) of the center position 205(N) of the semiconductor chip 20(N) of the Nth stage stored in the position database 56. Then, in step S112 of FIG. 6, the position correction unit 57 stores the calculated position shift amount (ΔxN, ΔyN) of the semiconductor chip 20(N) of the Nth stage in the position database 56 as shown in FIG. 5. Here, (ΔxN, ΔyN) is ΔxN=xN-(xN-1), and ΔyN=yN-(yN-1).

[0048] In step S113 of FIG. 7, the position correction unit 57 adds the calculated position shift amount of the semiconductor chip 20(N) of the Nth stage to the accumulated position shift amount of the N-1th stage to calculate the accumulated position shift amount of the Nth stage, and stores it in the position database 56 as shown in FIG. 5. Here, the accumulated position shift amount of the Nth stage is

[Numerical formula 3]

$$\left(\sum_{K=1}^{N}\Delta x_K,\sum_{K=1}^{N}\Delta y_K\right).$$

[0049] In step S114 of FIG. 7, the position correction unit 57 determines whether the accumulated position shift amount of the Nth stage is greater than or equal to a predetermined threshold value. When the accumulated position shift amount of the Nth stage is less than the predetermined threshold value and it is determined as NO in step S114 of FIG. 7, the process proceeds to step S119 of FIG. 7 and the position correction unit 57 corrects the XY coordinates (xN, yN) of the center position 205 of the semiconductor chip 20(N) of the Nth stage by the position shift amount (ΔxN, ΔyN) of the semiconductor chip 20(N) of the Nth stage to output (xN+1)=xN+ΔxN, and (yN+1)=yN+ΔyN as the corrected bonding position of the semiconductor chip 20(N+1) of the N+1th stage to the bonding control unit 58, and the process proceeds to step S117 of FIG. 7.

[0050] In step S117 of FIG. 7, the control device 50 increases the counter N by 1, and determines whether N exceeds a total lamination number Nend in step S118 of FIG. 7. Then, when it is determined as NO in step S118 of FIG. 7, the process returns to step S109 of FIG. 7,

nozzle 12 so that the center coordinates XY become the position of the Z-direction centerline 12z. Accordingly, when the Z-direction centerline 12z of the bonding nozzle 12 is aligned with the XY coordinates

[Numerical formula 6]

$$\left(xN + \sum_{K=1}^{N} \Delta x_K \right), \left(yN + \sum_{K=1}^{N} \Delta y_K \right),$$

the center position 205(N+1) of the semiconductor chip 20(N+1) becomes the same position as the center position 45 of the island 41 of the substrate 40. Then, the bonding control unit 58 lowers the bonding nozzle 12 to bond the semiconductor chip 20(N+1) of the $N+1^{th}$ stage onto the semiconductor chip 20(N). Thus, as shown in FIG. 11, the center position 205(N+1) of the semiconductor chip 20(N+1) of the $N+1^{th}$ stage can be aligned with the center position 45 of the island 41 to be bonded.

[0054] By laminating and bonding the semiconductor chips 20 as described above, even if the semiconductor chip 20 of each stage continuously shifts laterally in one direction and is laminated, as shown in FIG. 11, the semiconductor chips 20 can be prevented from exceeding the predetermined threshold value and continuously shifting laterally in one direction during lamination and bonding.

[0055] Then, in step S117 of FIG. 7, the control device 50 increases the counter N by 1, and determines whether N exceeds the total lamination number Nend in step S118 of FIG. 7. Then, when it is determined as NO in step S118 of FIG. 7, the process returns to step S109 of FIG. 7, and the semiconductor chip 20(N+1) of the $N+1^{th}$ stage is bonded.

[0056] Further, when it is determined as YES in step S118 of FIG. 7, the control device 50 ends the bonding operation.

[0057] In addition, when it is determined as YES in step S115 of FIG. 7, the process proceeds to step S120 of FIG. 7 and the position correction unit 57 outputs a bonding stop command to the bonding control unit 58. The bonding control unit 58 stops the bonding operation when the