[0014] The wafer holder 12 holds the wafer 70. The wafer 70 includes a plurality of semiconductor chips 72 diced in a grid pattern. The wafer holder 12 holds the plurality of semiconductor chips 72 by, for example, vacuum sucking the wafer 70. The wafer holder 12 may hold the plurality of semiconductor chips 72 by, for example, sticking the wafer 70 on a film.

[0015] The handling unit 14 includes, for example, a stepping motor 15, a rotary shaft 16, an arm 17, a base 18, and a pickup tool 19. The stepping motor 15 rotates the rotary shaft 16 to invert the base 18 and the pickup tool 19. The arm 17 has one end attached to the rotary shaft 16 and extending obliquely downward in the Z-axis direction from the rotary shaft 16, and has the other end attached to an upper surface 18a of the base 18 in the Z-axis direction. The base 18 is fixed to a tip of the arm 17 with a bolt or the like. The pickup tool 19 is attached to a lower surface 18b of the base 18 in the Z-axis direction. The pickup tool 19 is configured to be movable in the Z-axis direction.

[0016] The handling unit 14 is moved to above the wafer holder 12 with the pickup tool 19 directed downward. The handling unit 14 sucks the semiconductor chip 72 from above by the pickup tool 19. On the other hand, the stepping motor 15 rotates the rotary shaft 16 and inverts the base 18 and the pickup tool 19, thereby causing the lower surface 18b of the base 18 to face upward in the Z-axis direction and the pickup tool 19 to face upward. Accordingly, the handling unit 14 inverts the semiconductor chip 72 that has been picked up.

[0017] The bonding head 20 sucks the semiconductor chip 72 picked up from the wafer holder 12 and conveys it to a position of the substrate 80, and bonds the semiconductor chip 72 to the substrate 80.

[0018] A bonding tool 22 is attached to the bonding head 20 via a Z-axis drive mechanism 21. A camera 24 is attached to the bonding head 20. The bonding head 20 is configured to be movable in the X-axis direction and the Y-axis direction by the XY table 26. The bonding tool 22 and the camera 24 are configured to be movable in the X-axis direction and the Y-axis direction together with the bonding head 20.

measurement part 61 and the distance between the reference position of the plurality of peripheral sections and the mounting position of the semiconductor chip 72 after mounting of the semiconductor chip 72, the inspection part 62 inspects a relative position of the semiconductor chip 72 with respect to the mounting section.

[0028] Based on the relative position of the semiconductor chip 72 with respect to the mounting section that is inspected by the inspection part 62, the mounting part 63 mounts the semiconductor chip 72 with respect to the mounting section. For example, based on the amount of deviation of the relative position of the semiconductor chip 72 inspected by the inspection part 62 from a target position, the mounting part 63 corrects the mounting position of the semiconductor chip 72 with respect to the mounting section.

[0029] An inspection method executed by the bonding apparatus 100 according to the present embodiment includes: a step (first step) of measuring a reference position of a mounting section before mounting of the semiconductor chip 72; a step (second step) of measuring a reference position of a plurality of peripheral sections located around the mounting section; a step (third step) of measuring a position of the semiconductor chip 72 after mounting; and a step (fourth step) of, based on a distance between the reference position of the mounting section and the reference position of the plurality of peripheral sections and a distance between the reference position of the plurality of peripheral sections and the mounting position of the semiconductor chip 72 after mounting of the semiconductor chip 72, inspecting a relative position of the semiconductor chip 72 with respect to the mounting section.

[0030] FIG. 2 shows an example of a state before mounting of the semiconductor chip 72, and is a diagram for describing the first step and the second step mentioned above. In the example shown in FIG. 2, a plurality of substrates 80 are arranged in parallel in a vertical direction (first direction) and a horizontal direction (second direction). Among these substrates 80, the substrate 80 located in the center is set as a mounting section 80A. The substrates 80 adjacent to the mounting section 80A on both sides in the vertical direction are set as a first peripheral section

80B and a second peripheral section 80C. The substrates 80 adjacent to the mounting section 80A on both sides in the horizontal direction are set as a third peripheral section 80D and a fourth peripheral section 80E. A feature point of the substrate 80 includes, for example, an alignment mark ~~M1~~MA indicating a position of the substrate 80. The alignment mark ~~M1~~MA is provided in the vicinity of two diagonally located corners of an upper surface of the substrate 80. For example, based on position information of two feature points of the substrate 80, the measurement part 61 measures an intermediate position between the two feature points as the reference position of the substrate 80.

[0031] The inspection part 62 calculates a distance ~~L1~~ L3 between a reference position PA of the mounting section 80A and a reference position PB of the first peripheral section 80B, a distance ~~L2~~ L4 between the reference position PA of the mounting section 80A and a reference position PC of the second peripheral section 80C, a distance ~~L3~~ L1 between the reference position PA of the mounting section 80A and a reference position PD of the third peripheral section 80D, and a distance ~~L4~~ L2 between the reference position PA of the mounting section 80A and a reference position PE of the fourth peripheral section 80E.

[0032] FIG. 3 shows an example of a state after mounting of the semiconductor chip 72, and is a diagram for describing the third step and the fourth step mentioned above.

[0033] In the example shown in FIG. 3, the inspection part 62 calculates a distance ~~L1a~~ L3a between a mounting position PX of the semiconductor chip 72 and the reference position PB of the first peripheral section 80B, a distance ~~L2a~~ L4a between the mounting position PX of the semiconductor chip 72 and the reference position PC of the second peripheral section 80C, a distance ~~L3a~~ L1a between the mounting position PX of the semiconductor chip 72 and the reference position PD of the third peripheral section 80D, and a distance ~~L4a~~ L2a between the mounting position PX of the semiconductor chip 72 and the reference position PE of the fourth peripheral section 80E.

[0034] For example, based on the distances ~~L1, L2, L3, and L4~~L3, L4, L1, and L2 between

the reference position PA of the mounting section 80A and the reference positions PB to PE of the plurality of peripheral sections 80B to 80E before mounting of the semiconductor chip 72, the inspection part 62 identifies relative positions of the mounting section 80A and the peripheral sections 80B to 80E. Based on the distances ~~L1a, L2a, L3a, and L4a~~L3a, L4a, L1a, and L2a between the reference positions PB to PE of the plurality of peripheral sections 80B to 80E and the mounting position PX of the semiconductor chip 72 after mounting of the semiconductor chip 72, the inspection part 62 identifies relative positions of the semiconductor chip 72 and the peripheral sections 80B to 80E. Based on the relative positions of the mounting section 80A and the peripheral sections 80B to 80E and the relative positions of the semiconductor chip 72 and the peripheral sections 80B to 80E after mounting of the semiconductor chip 72, the inspection part 62 inspects the relative position of the semiconductor chip 72 with respect to the mounting section 80A.

[0035] Next, processing for mounting the semiconductor chip 72 that is executed by the bonding apparatus 100 according to the present embodiment is described.

[0036] As shown in FIG. 4, first, the bonding controller 60 moves the bonding head 20 and arranges the bonding tool 22 above the handling unit 14 (S10).

[0037] Next, the bonding controller 60 drives the Z-axis drive mechanism 21 to lower the bonding tool 22 and hold the semiconductor chip 72 at a tip of the bonding tool 22 (S11).

[0038] Next, the bonding controller 60 drives the Z-axis drive mechanism 21 to lift the bonding tool 22 to a preset height, and then moves the bonding head 20 to arrange the camera 24 above the bonding stage 40. Then, the bonding controller 60 executes processing for position measurement of the semiconductor chip 72 (S12).

[0039] As shown in FIG. 5, in the processing for position measurement of the semiconductor chip 72, first, the bonding controller 60 measures a reference position of the mounting section 80A based on image data of the mounting section 80A photographed by the camera 24 (S20).

[0040] Next, the bonding controller 60 measures the reference positions PB to PE of the plurality of peripheral sections 80B to 80E based on image data of the peripheral sections 80B to