

to be measured in a state that the heating by the second heater is stopped.

[0011] In this case, the measurement head may be a bonding head which bonds the mounting body to the mounted body.

[0012] In addition, the control unit may determine the temperature of the object to be measured or whether the temperature of the object to be measured is appropriate based on a change over time in the temperature detection value of the measurement element obtained when the contact surface is brought into contact with the object to be measured.

[0013] In addition, the control unit may correct a control parameter of the first heater based on a measurement result of the temperature of the object to be measured. In this case, a plurality of measurement points may be set on the object to be measured, and the control unit may perform the temperature measurement for the plurality of measurement points and correct the control parameter so that the measurement results are equal among the plurality of measurement points.

[0014] In addition, the measurement head may further include a main body, and a measurement block having a smaller heat capacity than the main body and attached to the measurement head via a heat insulating material; the contact surface is an end face of the measurement block; and the measurement element is arranged in the measurement block.

[0015] A temperature measurement method disclosed in the specification is a method for measuring the temperature of an object to be measured which is a mounted body placed on a placing surface of a stage of a mounting apparatus or the placing surface of the stage by means of a measurement head, the method including: a step for heating the placing surface and a contact surface of the measurement head in contact

[0030] FIG. 4 is an image diagram showing a state in which the bonding head 12 is in contact with the stage 14. As shown in FIG. 4, the entire contact surface of the bonding head 12 is in contact with the placing surface of the stage 14. In addition, at this time, the second heater HH is in the OFF state, and the first heater HS is in the ON state.

[0031] After that, the control unit 16 stands by for a prescribed standby time t_s in that state, that is, in the state that the contact surface of the bonding head 12 is in contact with the placing surface of the stage 14, the first heater HS is turned on, and the second heater HH is turned off (S26). Besides, during this standby, the control unit 16 controls the energization amount of the first heater HS so as to maintain the first detection temperature $T_1 = T_S$.

[0032] If the prescribed standby time t_s has elapsed (Yes in S26), the control unit 16 stores the second detection temperature T_2 detected by the second temperature sensor 20 as an end temperature T_e (S28). If the end temperature T_e is obtained, the control unit 16 calculates a temperature change amount $\Delta T = T_e - T_f$ (S30). Besides, usually, the initial temperature T_f is substantially the same as the head-side target temperature T_H . Accordingly, instead of the initial temperature T_f , the head-side target temperature T_H may be used to calculate the temperature change amount ΔT , and step S24 may be omitted in this case.

[0033] The temperature change amount ΔT is a value representing the amount of heat flowing into and out of the bonding head 12 after the second heater HH is turned off, and can be considered as a value indicating a temperature difference between the contact surface of the bonding head 12 and the placing surface of the stage 14 (the object to be measured). The control unit 16 determines whether the temperature of the

the first heaters HS_i ($i = 1, 2, \dots, 9$) in a state that the bonding head 12 is separated from the stage 14 (S52, S54). In this state, the control unit 16 monitors whether the second detection temperature T_2 detected by the second temperature sensor 20 reaches the head-side target temperature T_H and whether a first detection temperature T_{1i} detected by each first temperature sensor 22i reaches a corresponding stage-side target temperature TS_i (S56).

[0054] If $T_2 = T_H$ and $T_{1i} = TS_i$, the controller 16 lowers the bonding head 12 (S58).

If the contact surface of the bonding head 12 comes into contact with the placing surface of the stage 14 as a result of the lowering (Yes in S60), the control unit 16 turns off the second heater HH (S62). Then, the control unit 16 stores the second detected temperature T_2 detected by the second temperature sensor 20 immediately after the contact as the initial temperature T_f (S64).

[0055] After that, if the prescribed standby time t_s has elapsed (Yes in S66), the control unit 16 stores the second detected temperature T_2 at that time as the end temperature T_e (S68). Then, a value obtained by subtracting the initial temperature T_f from the end temperature T_e is calculated as the temperature change amount ΔT_n (S70).

[0056] FIG. 7 is again referred to for description. If the temperature change amount ΔT_n is obtained, the control unit 16 subsequently determines whether the absolute value of the temperature change amount ΔT_n is equal to or less than the specified reference change amount Δ_{def} (S44). When the result of the determination is $|\Delta T_n| > \Delta_{def}$ (No in S44), the control unit 16 changes the control parameter of the first heater HS_n corresponding to the obtained temperature change amount ΔT_n (S46). Then, steps S42, S44 are executed again, and determination is made on whether to change the control parameter. On the other hand, when $|\Delta T_n| \leq \Delta_{def}$ (Yes in S44), the

$\Sigma(\Delta T_n)/9$ that is the average value of the temperature change amounts ΔT_n (S80).

Subsequently, the control unit 16 determines whether the difference between the maximum value MAX (ΔT_i) and the minimum value MIN (ΔT_i) within the obtained plurality of temperature change amounts ΔT_i is equal to or less than a prescribed reference

5 value Ddef (S82). Here, the reference value Ddef is a value at which the plurality of measurement points Pn can be regarded as substantially the same temperature, and is a value obtained in advance by experiment or the like.

[0061] If MAX (ΔT_i) – MIN (ΔT_i) $\leq$ Ddef (Yes in S82), the control unit 16 determines that the temperatures of the plurality of measurement points Pn are
10 substantially equal, and ends the processing. On the other hand, if it is not that MAX (ΔT_i) – MIN (ΔT_i) $\leq$ Ddef (No in S82), the control unit 16 compares the absolute value of the difference value between the average change amount ΔT_{ave} and the temperature change amount ΔT_n with the reference change amount Δdef for each measurement point Pn (S86). When the absolute value of the difference value is larger than the reference
15 change amount Δdef (No in S86), the control parameter of the corresponding first heater HSn is adjusted so that the absolute value of the difference value is reduced (S88). If the above processing is performed for all the measurement points Pn (n = 1-9 (S84, S90) in the shown example) (Yes in S90), step S72 is performed again and the same processing is repeated until the condition in step S82 is satisfied.

20 **[0062]** As is clear from the above description, in the temperature adjustment processing of FIG. 10, the control parameter of each first heater HSn is adjusted so that the temperature change amount ΔT is close to the average change amount ΔT_{ave} . The variations in the temperature among the measurement points Pn are more effectively eliminated by adjusting the parameters on the basis of the average change amount

ΔT_{ave} .

[0063] Besides, in the above description, and the parameters are adjusted using the average change amount ΔT_{ave} as a reference value so that the temperature change amount ΔT_n is close to the average change amount ΔT_{ave} , but the parameter serving as the reference value may also be a parameter other than the average change amount ΔT_{ave} . For example, a thermocouple is attached in advance to one measurement point P^* within the plurality of measurement points P_n , and the control parameter of the corresponding first heater HS_n is adjusted so that the measurement value obtained by the thermocouple becomes a desired value. Besides, the parameter may be adjusted so that the temperature change amounts ΔT_n of the other measurement points are close to a temperature change amount ΔT^* obtained at the measurement point P^* .

[0064] In addition, the configurations described above are all examples, and other configurations may be appropriately changed, as long as the measurement head and the stage 14 have the heaters HH, HS and when the heater HH of the measurement head is turned off after being heated to approximately the same temperature as the surface of the object to be measured, the surface temperature of the object to be measured is measured based on the detection temperature obtained by the temperature sensor arranged on the measurement head. For example, in the above description, the temperature sensor for measuring the surface temperature of the object to be measured is arranged inside the bonding head 12, but the temperature sensor may also be arranged in a member which has a heat capacity sufficiently smaller than the bonding head 12.

[0065] For example, as shown in FIG. 11, a measurement block 32 having a small heat capacity may be attached to the lower end of the main body of the bonding head 12 via a heat insulating material 34, and a temperature sensor 30 consisting of a

measured.

4. The mounting apparatus according to any one of claims 1 to 3,
wherein the control unit corrects a control parameter of the first heater based
on a measurement result of the temperature of the object to be measured.

5 5. The mounting apparatus according to claim 4,
wherein a plurality of measurement points is set on the object to be measured,
and

the control unit performs the temperature measurement for the plurality of
measurement points, and corrects the control parameter so that the measurement results
10 are equal among the plurality of measurement points.

6. The mounting apparatus according to any one of claims 1 to 5,
wherein the measurement head further comprises a main body, and a
measurement block having a smaller heat capacity than the main body and attached to the
measurement head via a heat insulating material;

15 the contact surface is an end surface of the measurement block; and
the measurement element is arranged inside the measurement block.

7. A temperature measurement method, for measuring the temperature of an
object to be measured which is a mounted body placed on a placing surface of a stage of
a mounting apparatus or the placing surface of the stage by means of a measurement head,
20 the method comprising:

a step for heating the placing surface and a contact surface of the measurement
head in contact with the object to be measured to specified target temperatures by means
of a first heater arranged inside the stage and a second heater arranged on the
measurement head;