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United States Patent [19] Matsumura et al.

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[45] Date of Patent: **Sep. 29, 1992**

- [54] **METHOD FOR HEAT-PROCESSING SEMICONDUCTOR DEVICE AND APPARATUS FOR THE SAME**
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- [73] Assignees: **Tokyo Electron Limited, Tokyo; Tokyo Electron Kyushu Limited, Kumamoto, both of Japan**

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[30] **Foreign Application Priority Data**

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Oct. 24, 1989 [JP]	Japan	1-276564

[51] Int. Cl.⁵ **H05B 3/68**
 [52] U.S. Cl. **364/557; 219/457; 219/464**
 [58] **Field of Search** 364/557, 505, 477; 219/405, 411, 388, 390, 457, 464, 465

[56] **References Cited**

U.S. PATENT DOCUMENTS

4,481,406	11/1984	Muka	219/405 X
4,504,730	3/1985	Shimizu	219/405 X
4,688,180	8/1987	Motomiya	364/557 X
4,690,569	9/1987	Veitch	364/557 X

4,794,217	12/1988	Quan et al.	219/10.67 X
4,881,591	11/1989	Rignall	364/557 X
4,958,061	9/1990	Wakabayashi et al.	219/411
4,982,347	1/1991	Rackerby et al.	364/557
5,001,327	3/1991	Hirasawa et al.	219/390

FOREIGN PATENT DOCUMENTS

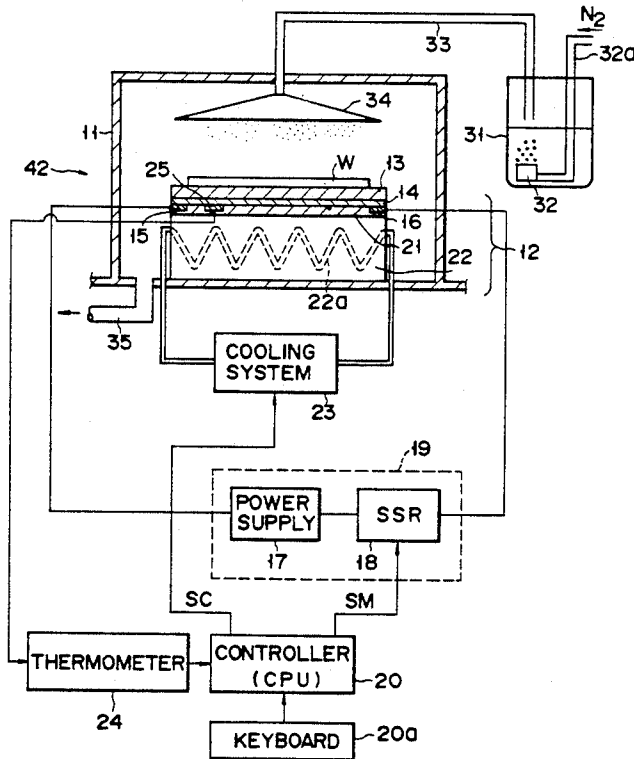
58-21332	2/1983	Japan	.
61-12030	1/1986	Japan	.
61-23321	1/1986	Japan	.
61-67224	4/1986	Japan	.
61-201426	9/1986	Japan	.
61-235835	10/1986	Japan	.
61-271834	12/1986	Japan	.

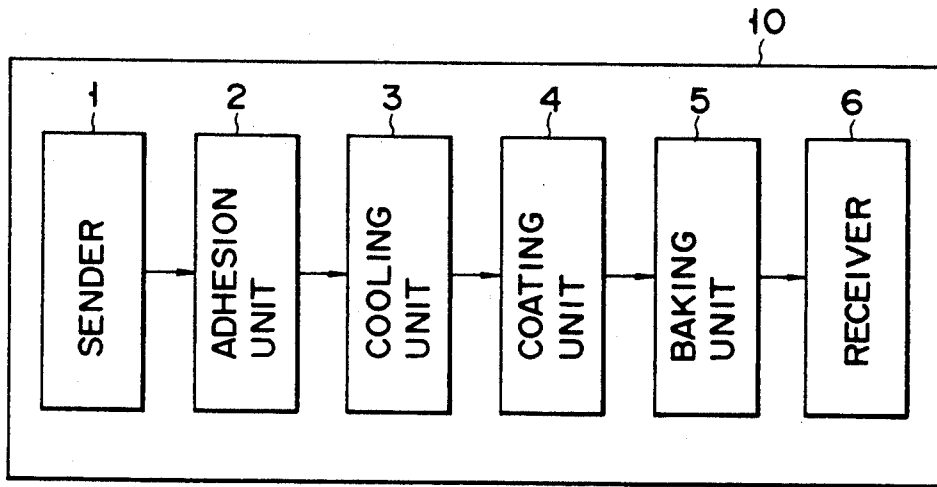
Primary Examiner—Joseph L. Dixon
Attorney, Agent, or Firm—Oblon, Spivak, McClelland, Maier & Neustadt

[57] **ABSTRACT**

CPU stores information showing a time-temperature relationship and applicable for either heating a semiconductor wafer to a hold temperature for a predetermined period of time or cooling the wafer from the hold temperature over a predetermined period of time, or for both, read the information. A conductive thin film heats the wafer in accordance with the information. A sensor detects the temperature of the wafer. A control system controls either the heating of the wafer or the cooling thereof, or both, in accordance with the detected temperature signal and the information.

12 Claims, 8 Drawing Sheets





PRIOR ART

FIG. 1

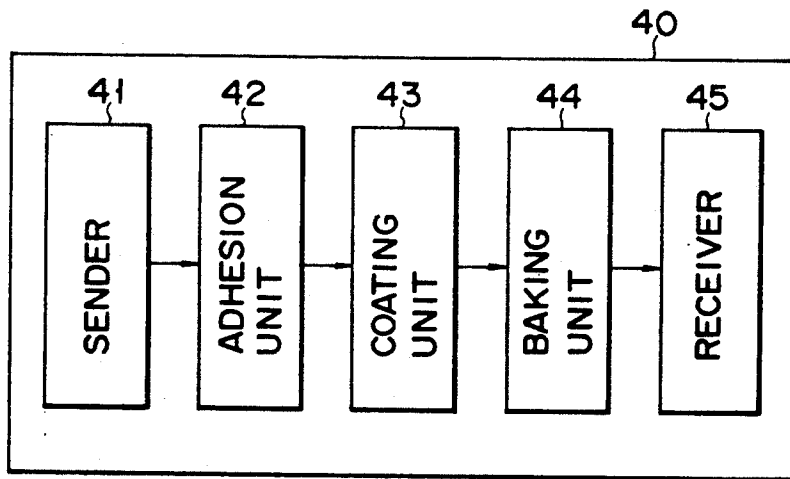
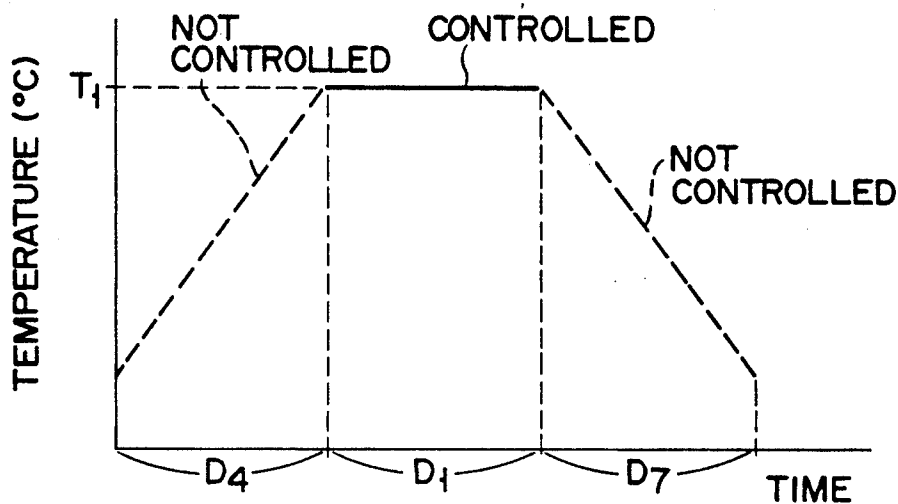
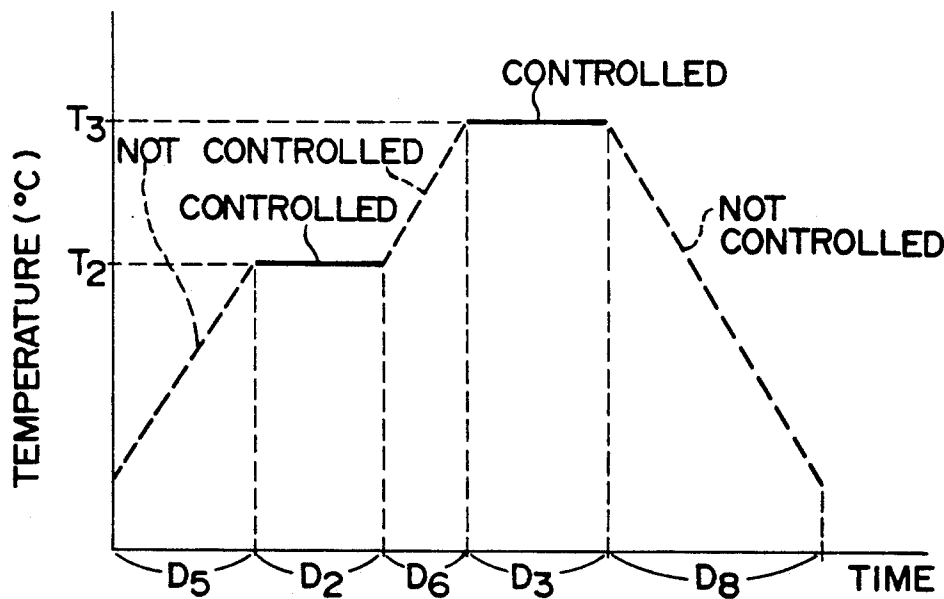


FIG. 4



PRIOR ART
FIG. 2



PRIOR ART
FIG. 3

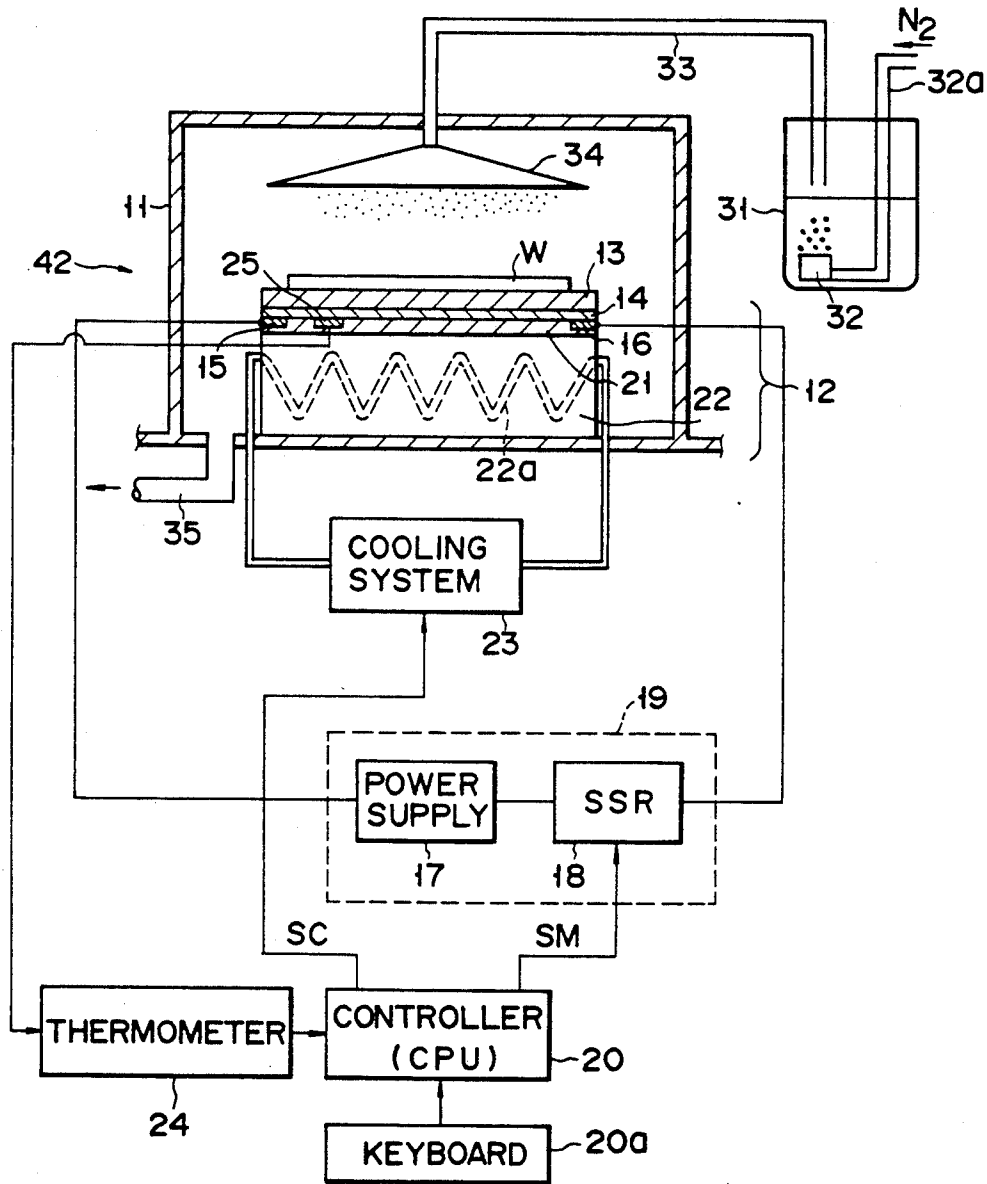


FIG. 5A

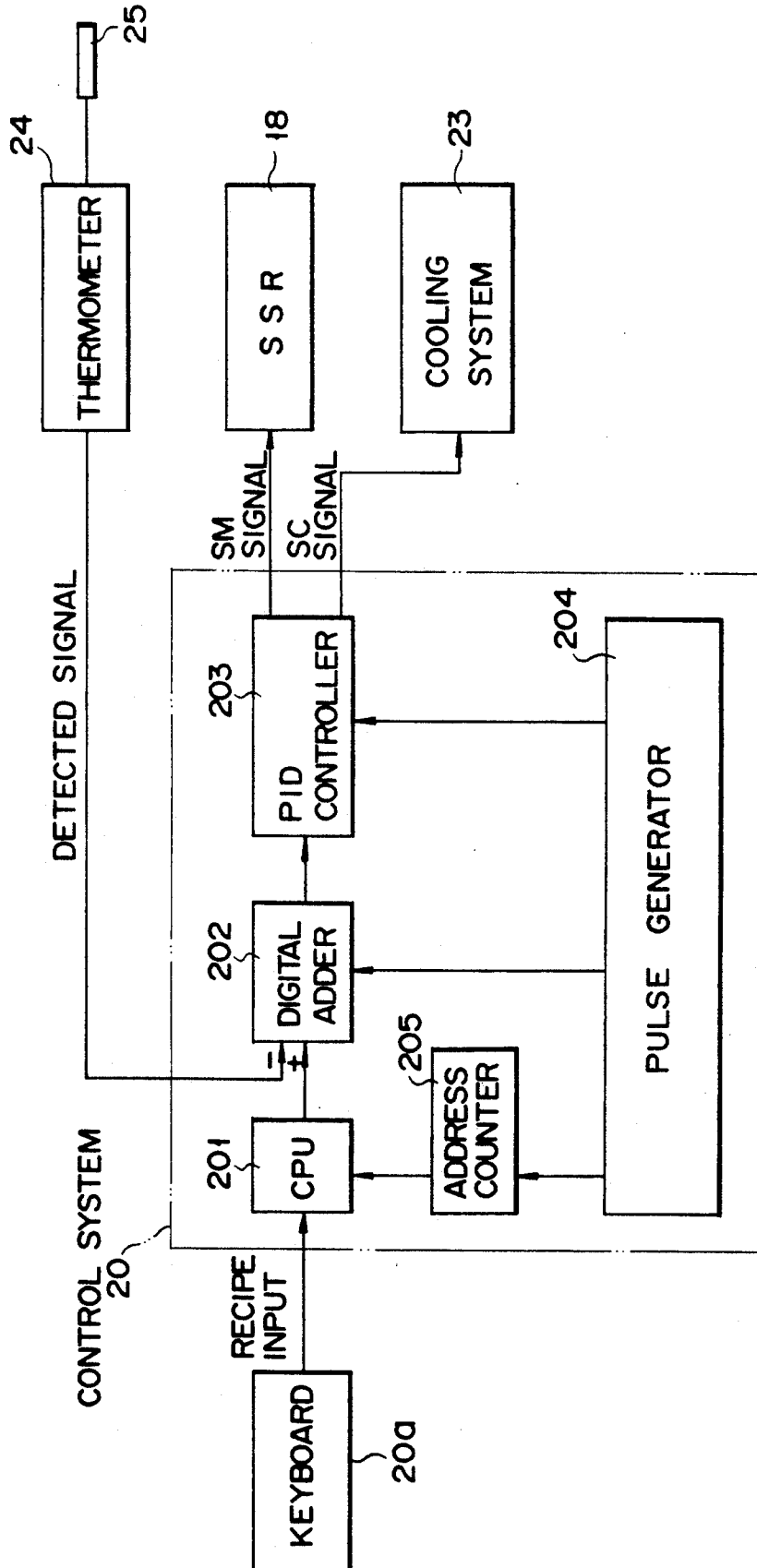


FIG. 5B

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