



(12) **United States Patent**  
**Masuda et al.**

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(54) **PLASMA PROCESSING APPARATUS AND PLASMA PROCESSING METHOD**

(75) Inventors: **Toshio Masuda**, Toride (JP); **Kazue Takahashi**, Kudamatsu (JP); **Ryoji Fukuyama**, Kudamatsu (JP); **Tomoyuki Tamura**, Kudamatsu (JP)

(73) Assignee: **Hitachi, Ltd.**, Tokyo (JP)

(\* ) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 13 days.

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(30) **Foreign Application Priority Data**

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(51) **Int. Cl.<sup>7</sup>** ..... **H01L 21/00**

(52) **U.S. Cl.** ..... **438/715**; 156/345.44; 156/345.46; 156/345.48; 156/345.49; 216/68; 216/70; 438/729

(58) **Field of Search** ..... 156/345 P, 345 C, 156/345 ME, 345 MG, 345 PH; 438/710, 715, 728, 729, 732; 216/67, 70, 71, 68

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*Primary Examiner*—William A. Powell

(74) *Attorney, Agent, or Firm*—Antonelli, Terry, Stout & Kraus, LLP

(57) **ABSTRACT**

In a plasma processing apparatus that has a vacuum chamber, a process gas supply means of supply gas to a processing chamber, an electrode to hold a sample inside said vacuum chamber, a plasma generator installed in said vacuum chamber opposite to said sample, and a vacuum exhaust system to decrease pressure of said vacuum chamber, a bias voltage of  $V_{dc} = -300$  to  $-50$  V is applied and the surface temperature of said plate ranges from 100 to 200° C. In addition, the surface temperature fluctuation of the silicon-made plate in said plasma processing apparatus is kept within  $\pm 25^\circ$  C.

**10 Claims, 7 Drawing Sheets**

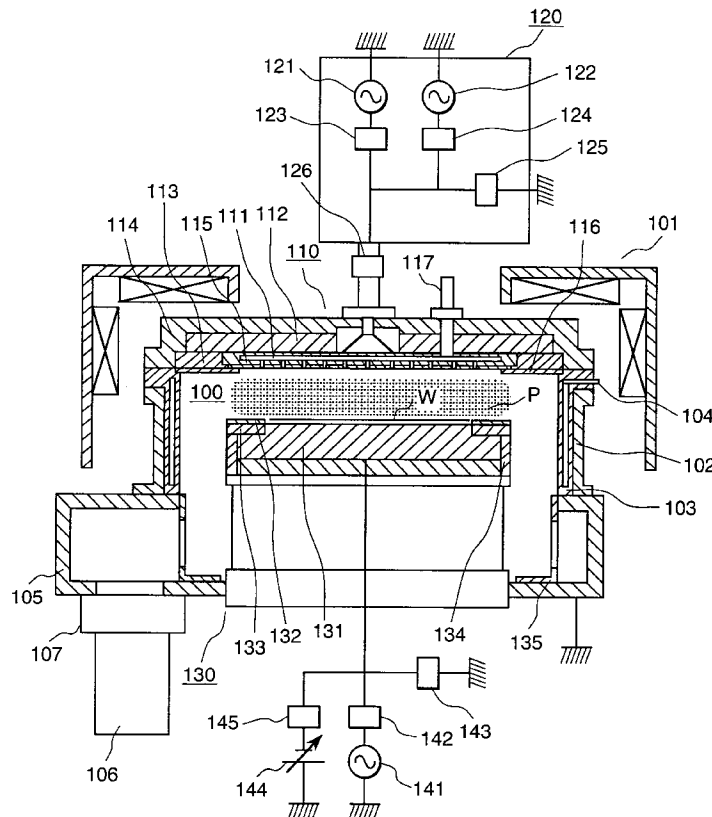


FIG. 1

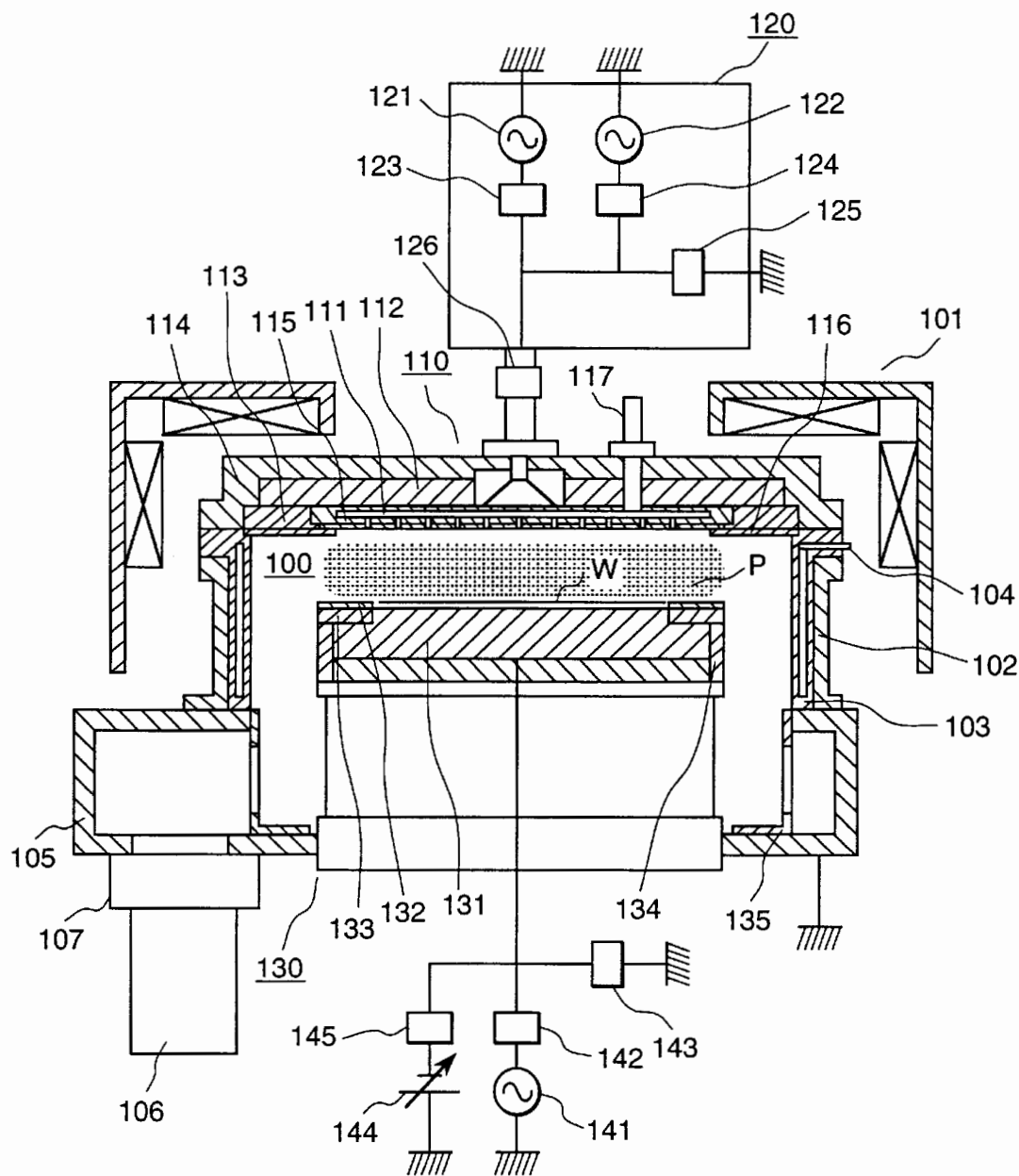


FIG. 2

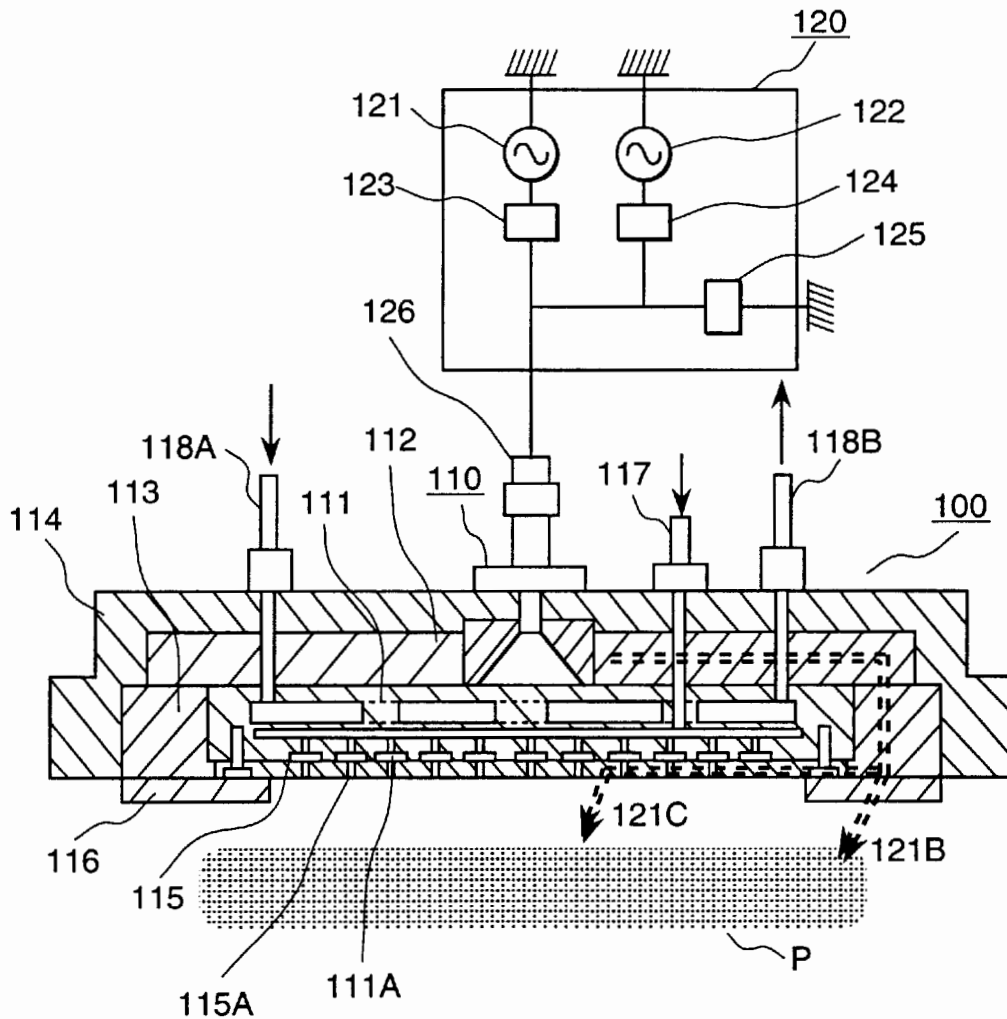


FIG. 3

Si ETCHING RATE ( $\mu\text{m/h}$ )

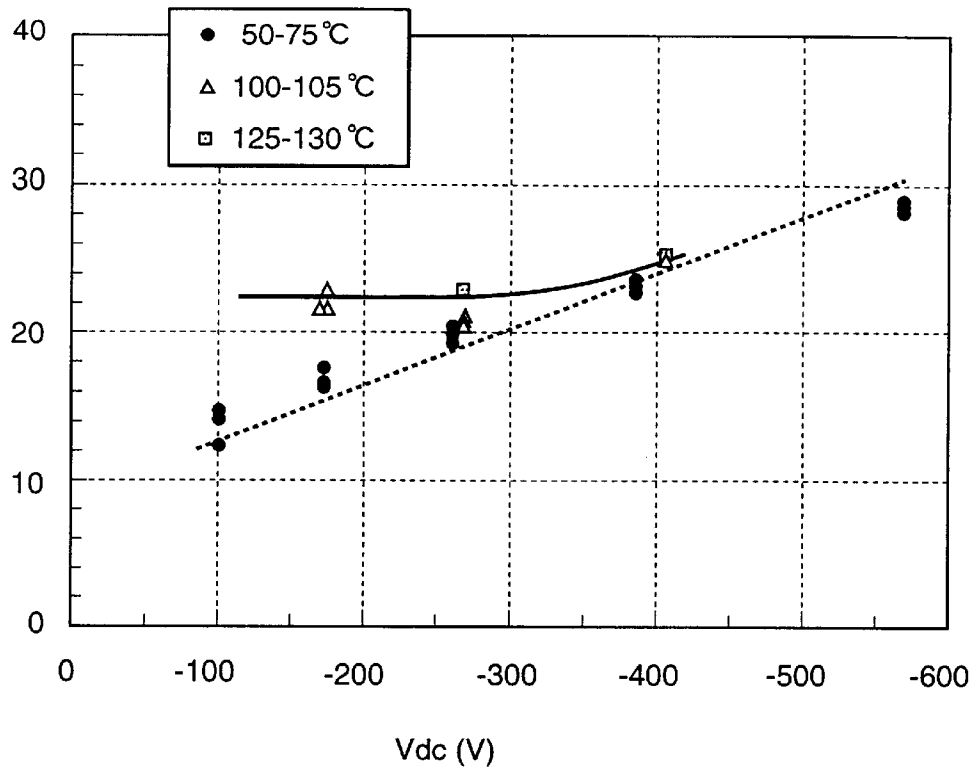


FIG. 4

TEMPERATURE (deg)

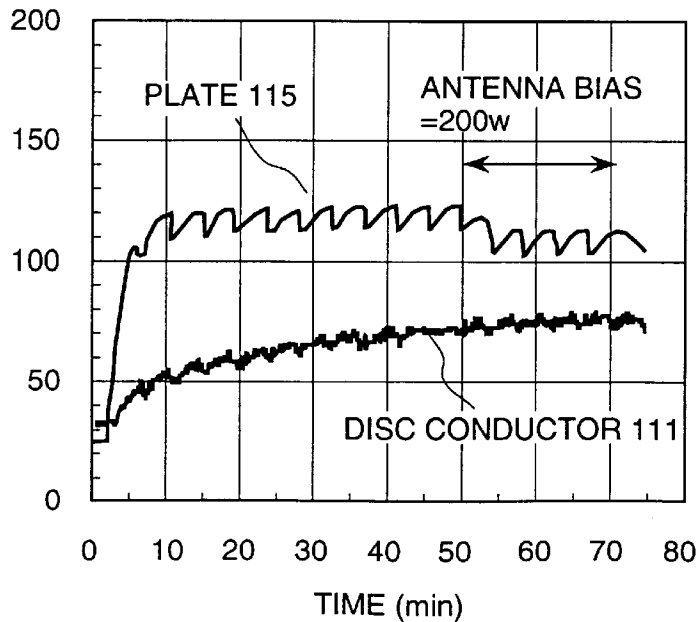


FIG. 5

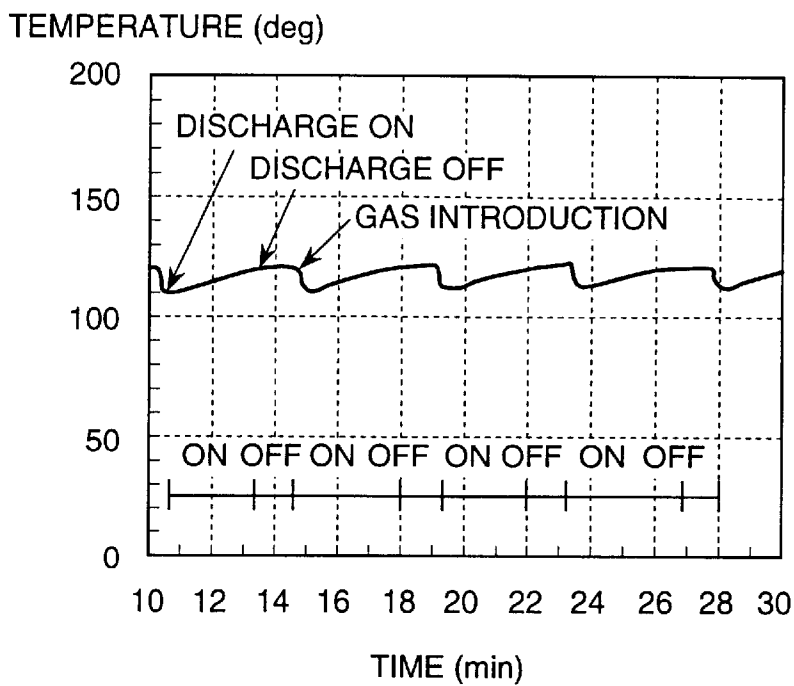
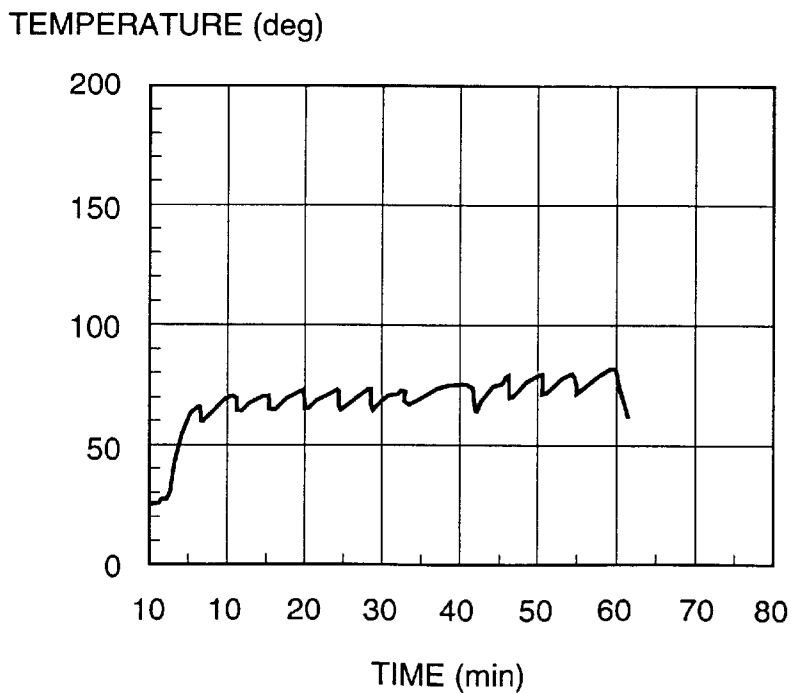


FIG. 6



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