



US005226056A

# United States Patent [19]

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Kikuchi et al.

[45] Date of Patent: **Jul. 6, 1993**

[54] **PLASMA ASHING METHOD AND APPARATUS THEREFOR**

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[73] Assignee: **Nihon Shinku Gijutsu Kabushiki Kaisha, Chigasaki, Japan**

[21] Appl. No.: **462,380**

[22] Filed: **Jan. 9, 1990**

[30] **Foreign Application Priority Data**

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Jan. 10, 1989 [JP]	Japan	1-2043
Jan. 10, 1989 [JP]	Japan	1-2044
Jan. 10, 1989 [JP]	Japan	1-2045

[51] Int. Cl.<sup>5</sup> ..... **H04B 7/00**

[52] U.S. Cl. .... **373/18; 373/62; 156/345; 156/643; 156/646; 204/164; 204/192.1; 219/121.11; 219/121.36; 219/121.37; 219/121.4; 219/390**

[58] Field of Search ..... **156/643, 646, 668, 345; 204/192 E, 164, 298; 373/40, 18, 22, 62; 219/10.55 E, 10.55 M, 10.67, 121.43, 390, 121.11, 121.36, 121.37, 121.4, 121.41, 383**

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*Attorney, Agent, or Firm*—Armstrong & Kubovcik

[57] **ABSTRACT**

In a method for plasma ashing a resist film coated on a substrate, the temperature of the substrate is controlled initially at temperatures below that at which explosion of the resist film occurs until a surface portion of a resist film has been removed. Thereafter, the substrate temperature is increased to remove the remaining portions of the resist film. An apparatus for conducting the method includes a plurality of supports, which may be movably disposed within a vacuum treatment chamber for moving the substrate away from a source of heat and for moving the substrate into contact with the heating source.

**8 Claims, 10 Drawing Sheets**

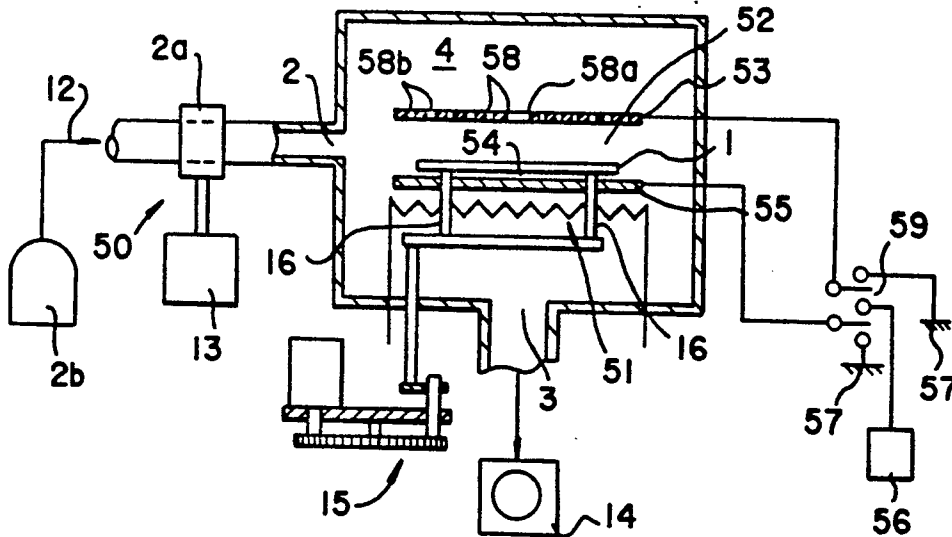


FIG.1 PRIOR ART

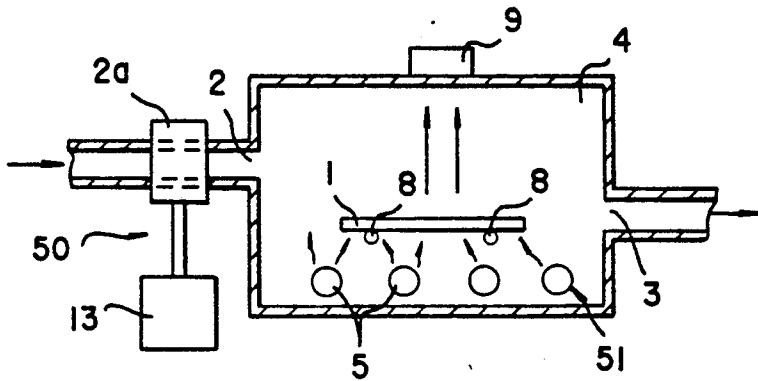


FIG.2 PRIOR ART

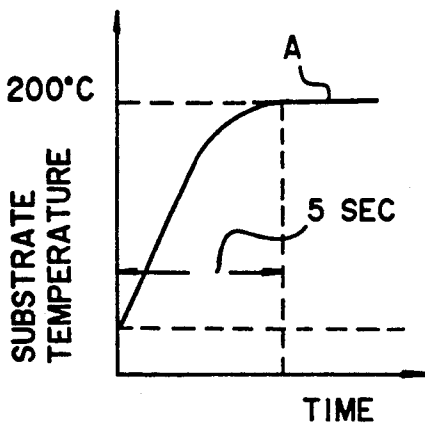
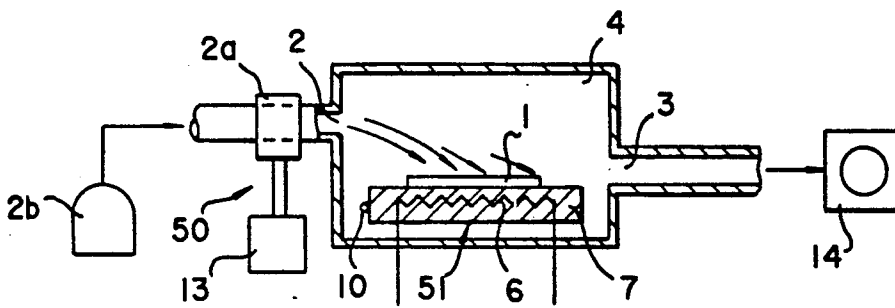


FIG.3 PRIOR ART

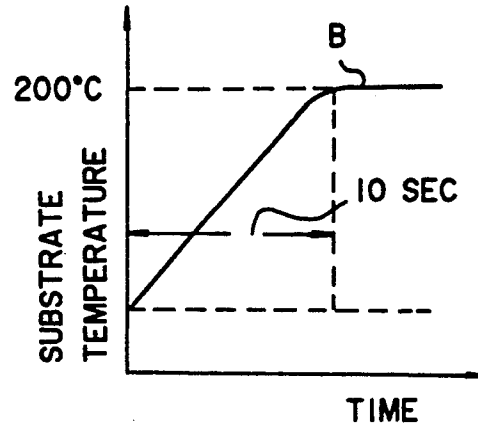


FIG.4 PRIOR ART

FIG.5  
PRIOR ART

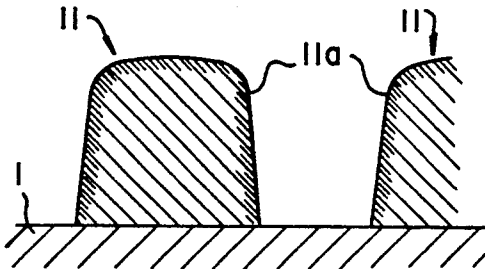


FIG.6  
PRIOR ART

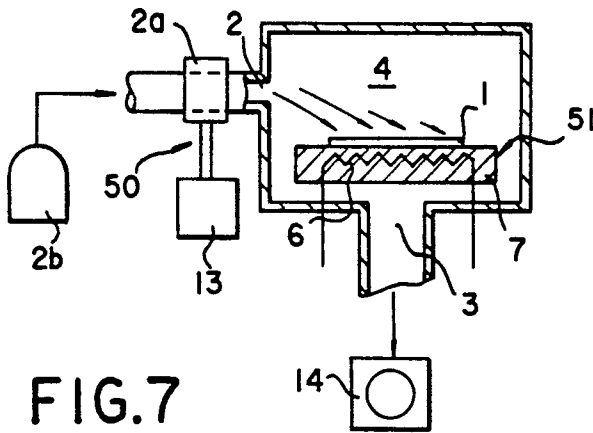
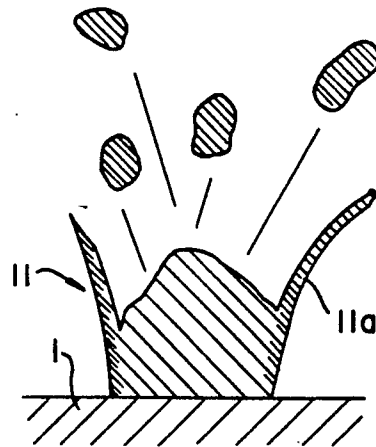


FIG.7  
PRIOR ART

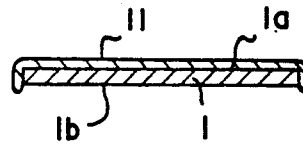


FIG.8  
PRIOR ART

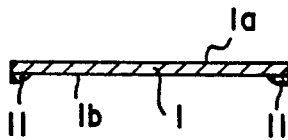


FIG.9  
PRIOR ART

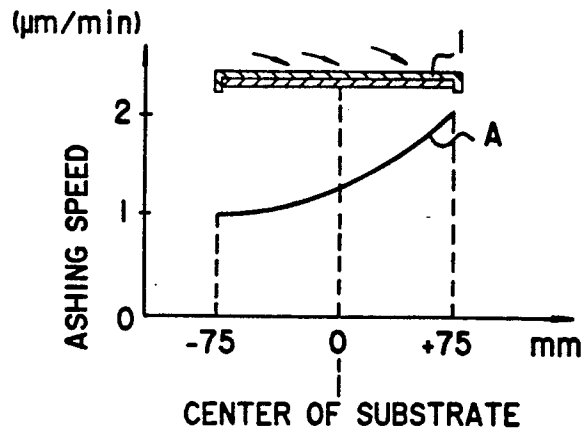


FIG.10  
PRIOR ART

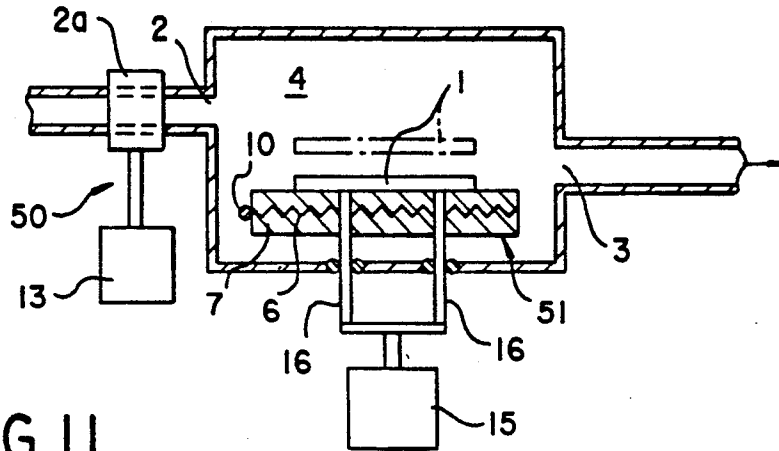


FIG. 11

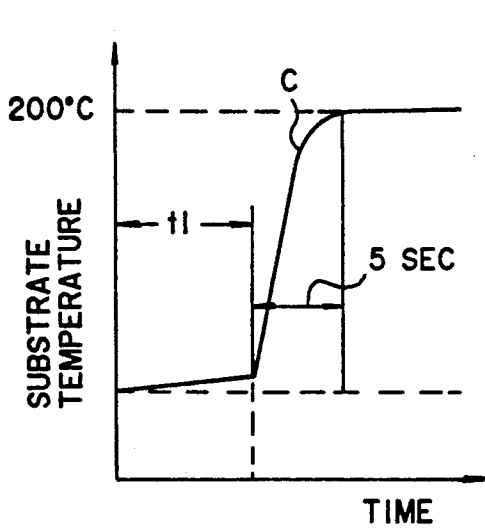


FIG. 12

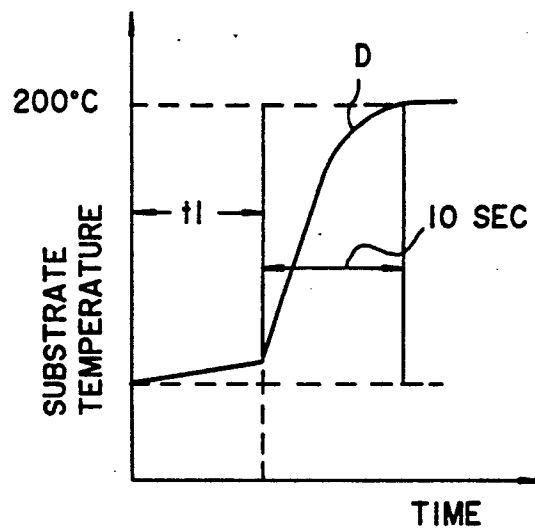


FIG. 13

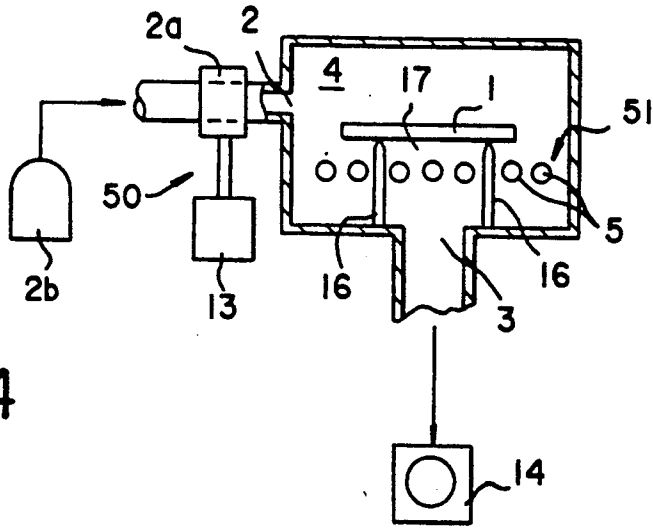


FIG. 14

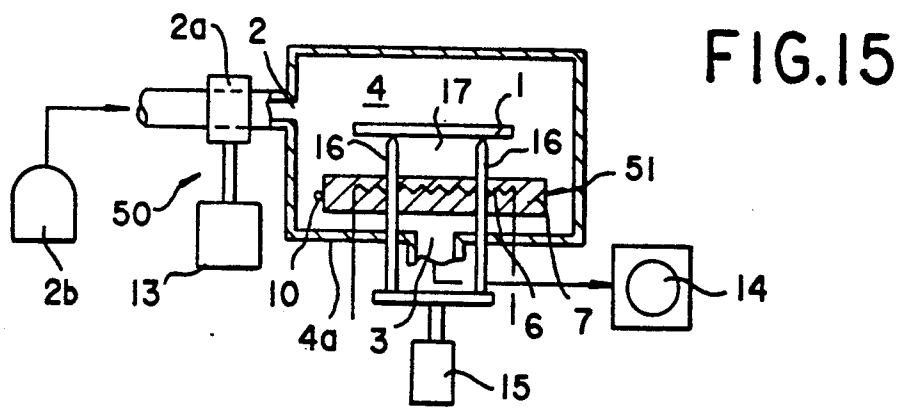


FIG. 15

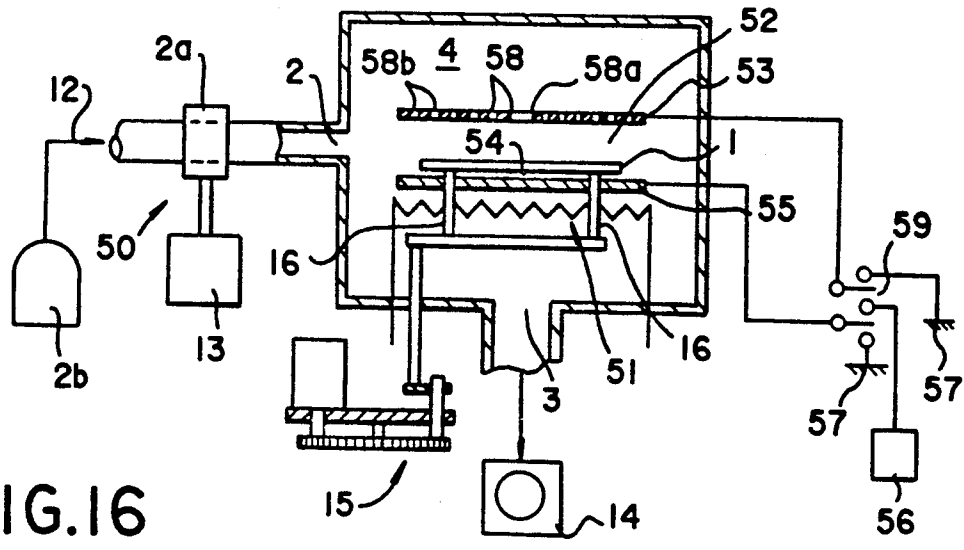


FIG. 16

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