



# United States Patent [19]

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Muller et al.

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[54] **ETCH PROFILE SHAPING THROUGH WAFER TEMPERATURE CONTROL**

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[21] Appl. No.: **402,378**

[22] Filed: **Mar. 13, 1995**

[51] Int. Cl.<sup>6</sup> ..... **H01L 21/302**

[52] U.S. Cl. .... **156/643.1**; 156/659.11; 156/657.1; 156/651.1; 216/67; 216/37; 216/80

[58] Field of Search ..... 156/643.1, 657.1, 156/659.11, 651.1, 662.1, 345 P; 216/2, 41, 67, 37, 80; 204/192.32, 192.37, 298.31

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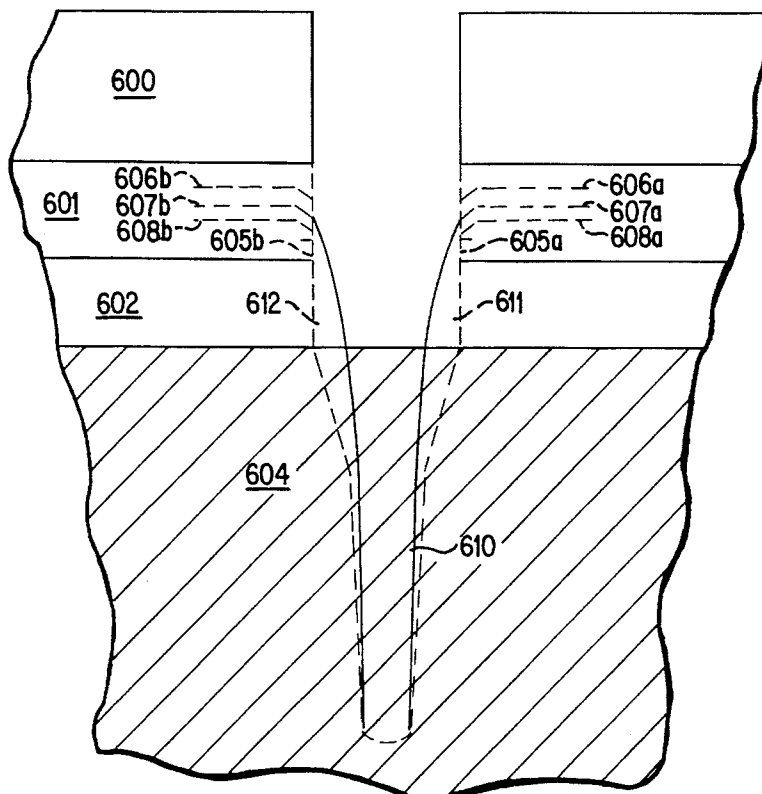
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[57] **ABSTRACT**

In a method of etch profile shaping through wafer temperature control during an etch process wherein deposition of a passivation film is temperature dependent, a gap between a semiconductor wafer to be etched and a cathode is pressurized at a first pressure, and the pressure in the gap is changed to a second pressure at a predetermined time during the etch process, thereby altering heat transfer from the semiconductor wafer to the cathode. The temperature of the wafer is adjusted one or more times during an etching process to control profile shaping of deep trenches, contact holes and shapes for mask opening shaping during the etch process.

**26 Claims, 8 Drawing Sheets**



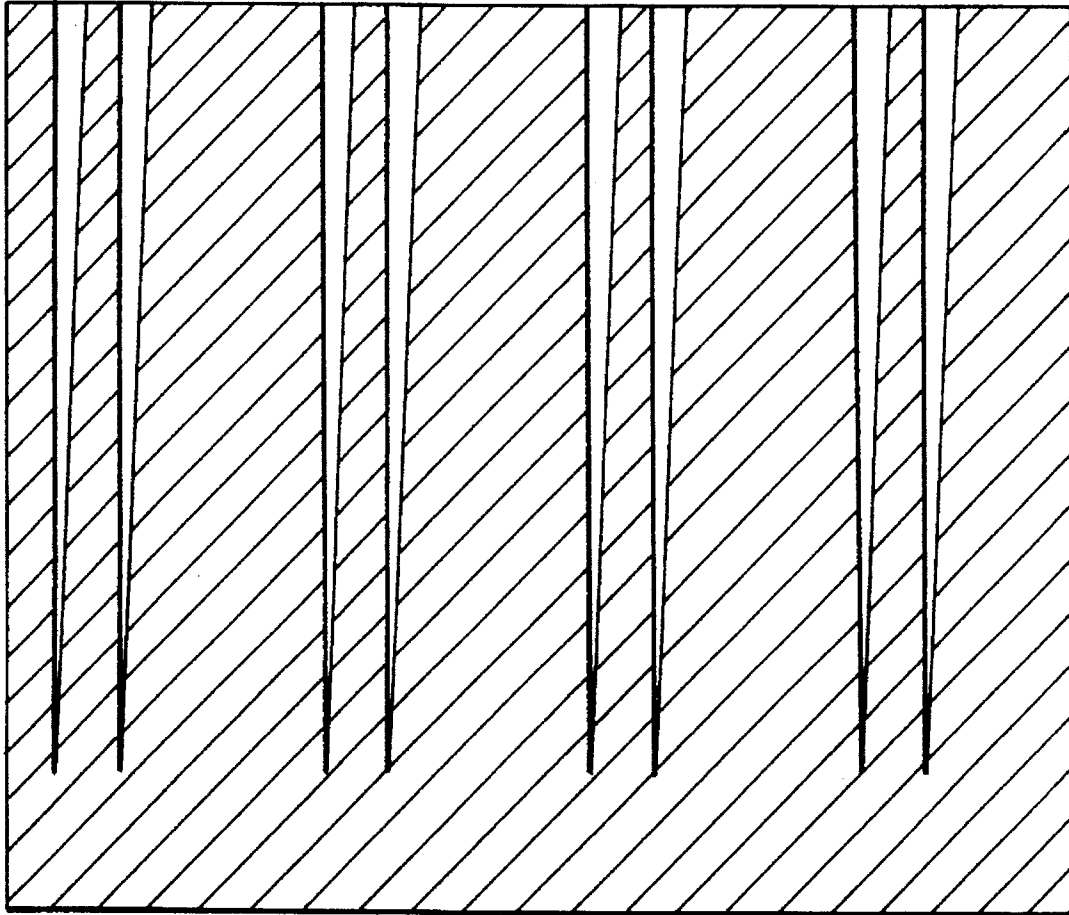


FIG. 1

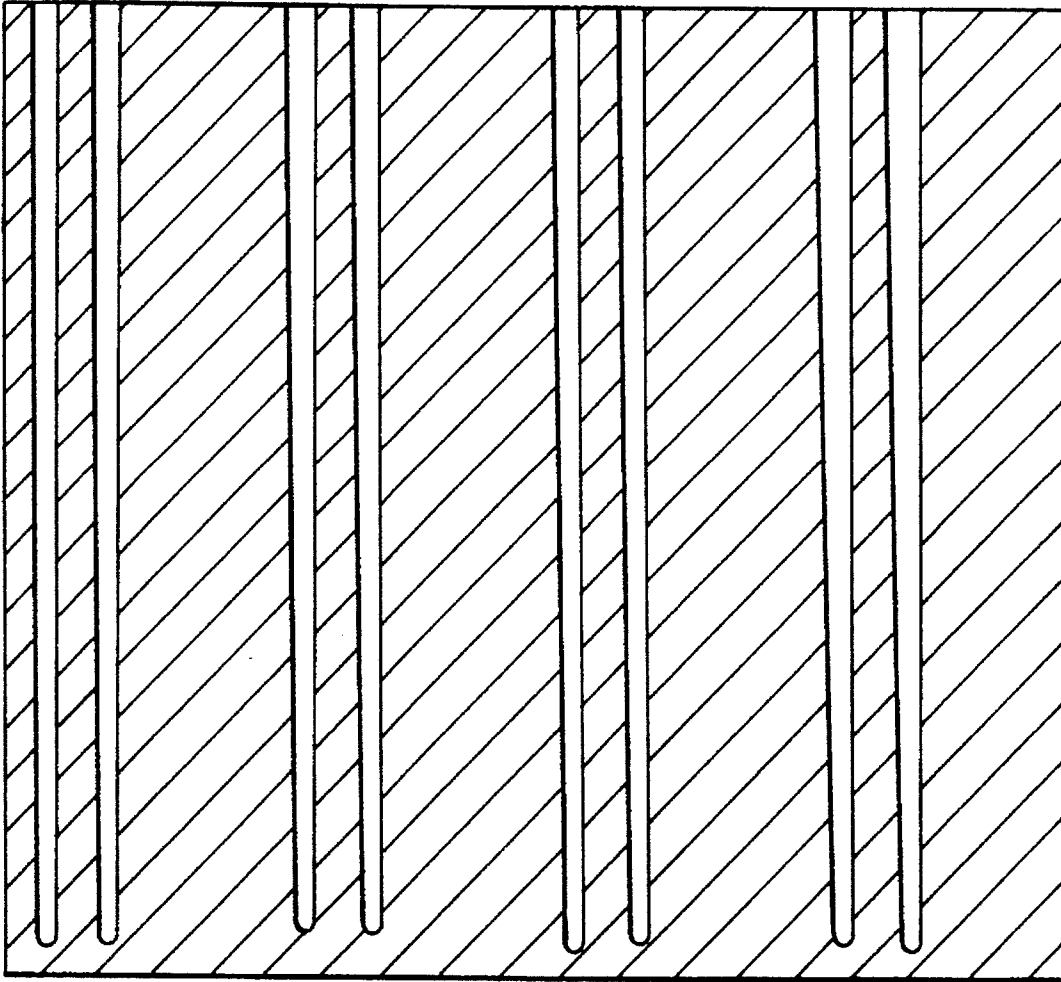


FIG. 2

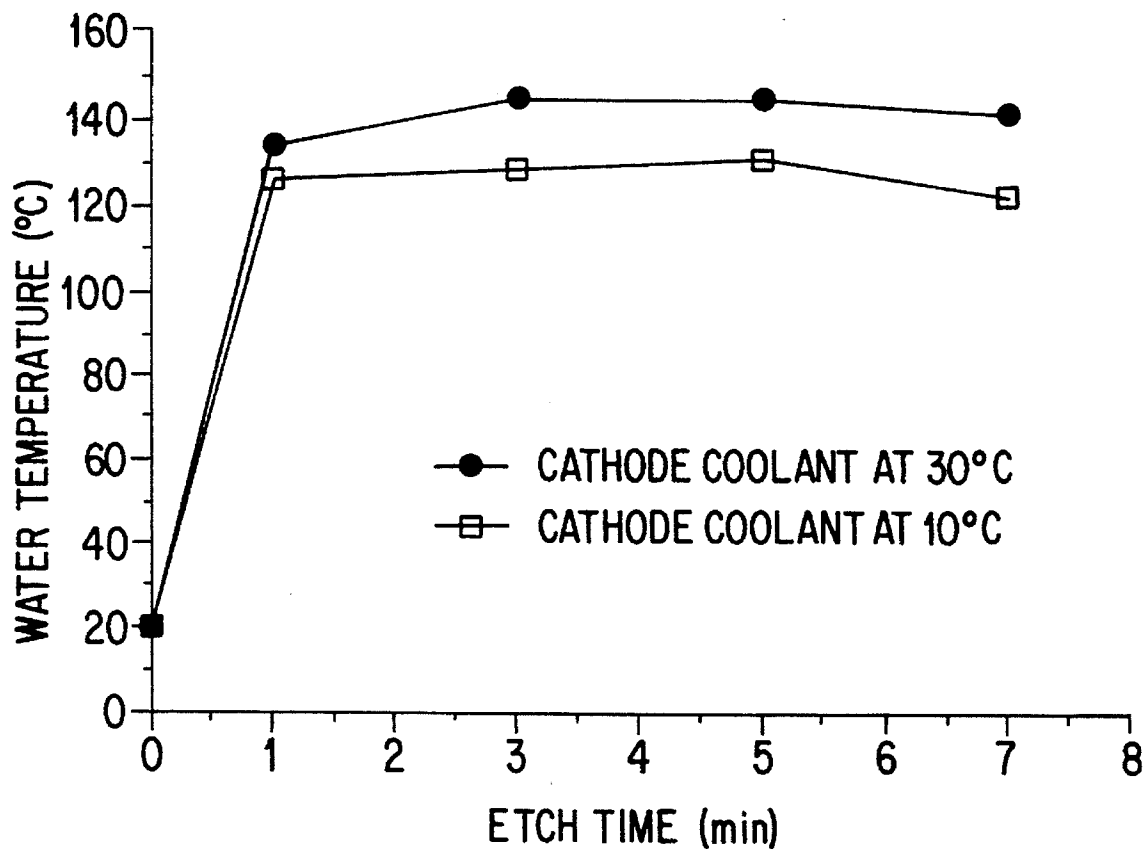


FIG. 3

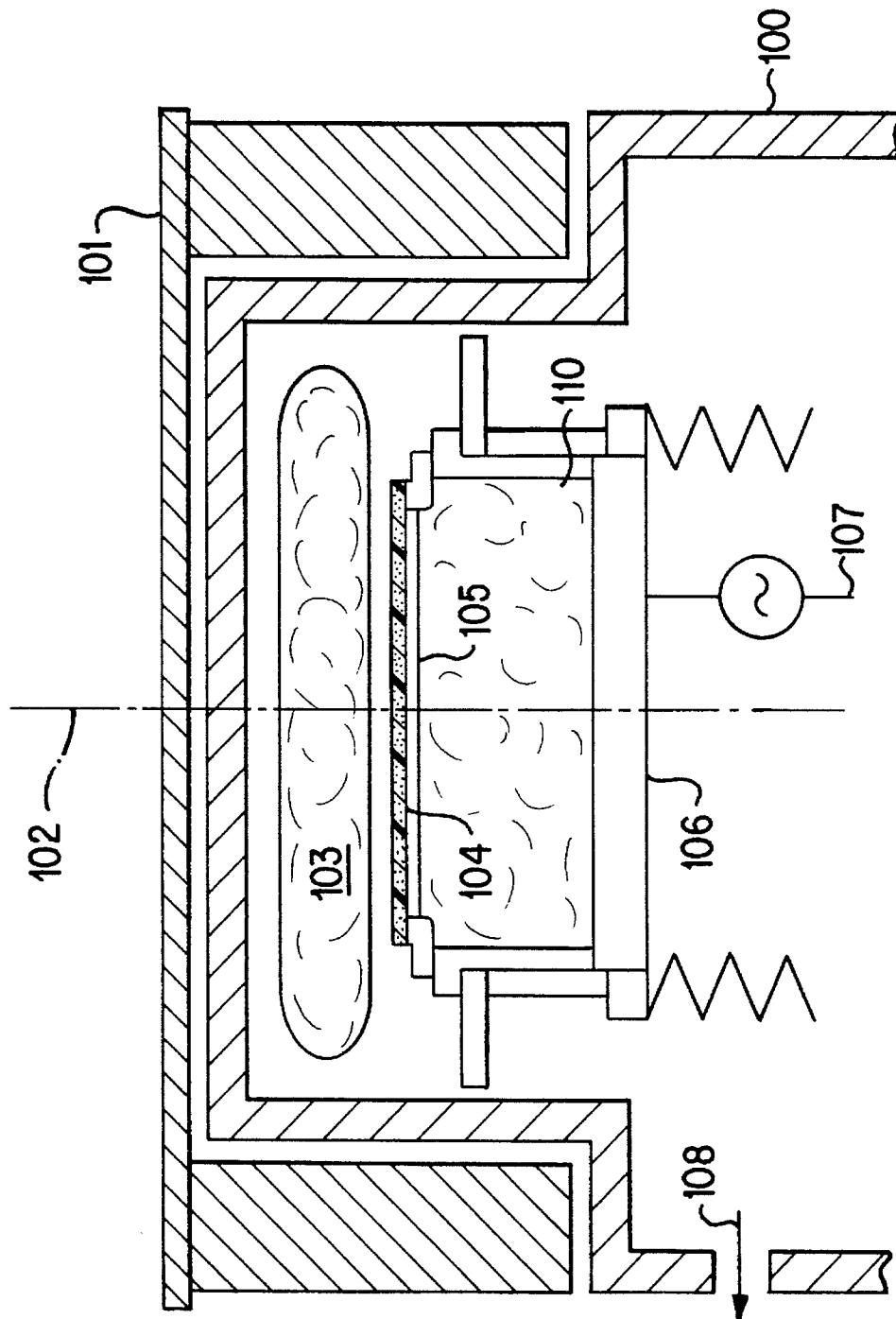


FIG. 4

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