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Collins et al.

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[54] METHOD FOR PLASMA PROCESSING USING MAGNETICALLY ENHANCED PLASMA CHEMICAL VAPOR DEPOSITION

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[21] Appl. No.: **618,142**

[22] Filed: **Nov. 23, 1990**

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Assistant Examiner—B. Everhart

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Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 559,947, Jul. 31, 1990, abandoned, and a continuation-in-part of Ser. No. 560,530, Jul. 31, 1990, abandoned, each is a continuation-in-part of Ser. No. 416,750, Oct. 3, 1989, abandoned.

[51] Int. Cl.⁵ **H01L 21/00**; H01L 21/02; H01L 21/302; H01L 21/463

[52] U.S. Cl. **437/225**; 437/228; 427/571

[58] Field of Search 437/225, 228, 233; 427/571

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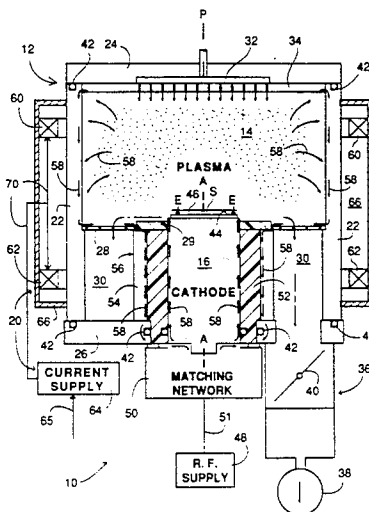
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[57] ABSTRACT

A method for plasma processing characterized by the steps of disposing a wafer proximate to a cathode within a process chamber, releasing a gas into the chamber, applying R.F. power in the VHF/UHF frequency range to the cathode to form a plasma within the chamber, developing a magnetic field within the chamber having flux lines substantially perpendicular to the surface of the wafer, and varying the strength of the magnetic field until a desired cathode sheath voltage is attained. The apparatus includes a chamber, a wafer-supporting cathode disposed within the chamber, a mechanism for introducing gas into the chamber, an R.F. power source coupled to the cathode operating in the frequency from about 50–800 megahertz, an electromagnetic coil disposed around the chamber adapted to develop a magnetic field within the chamber which is substantially perpendicular to the wafer and a variable output power supply coupled to the coil to vary the magnetic field strength and therefore the cathode sheath voltage within the chamber.

15 Claims, 5 Drawing Sheets



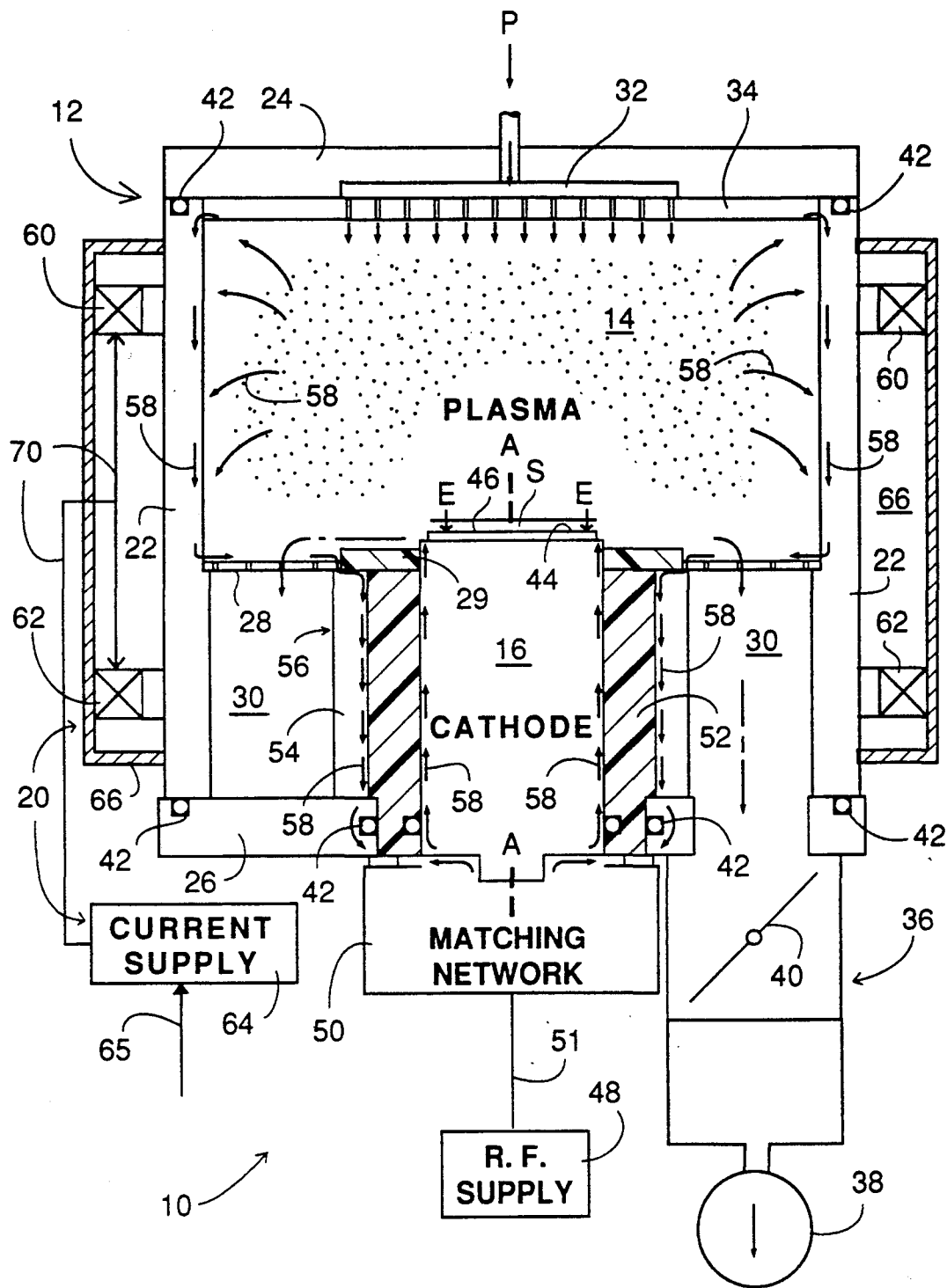


Figure 1

Figure 2a

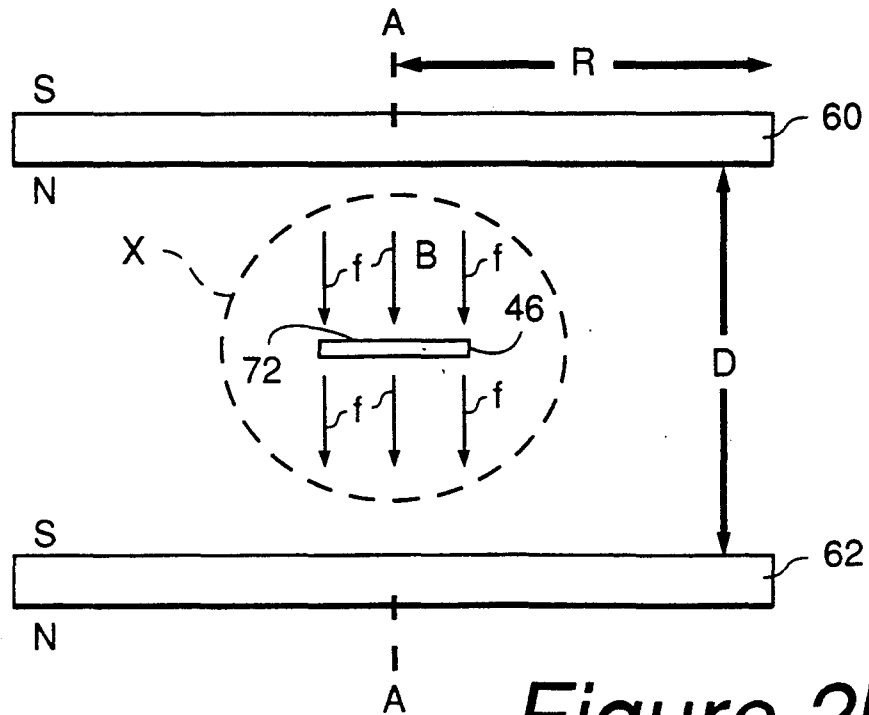
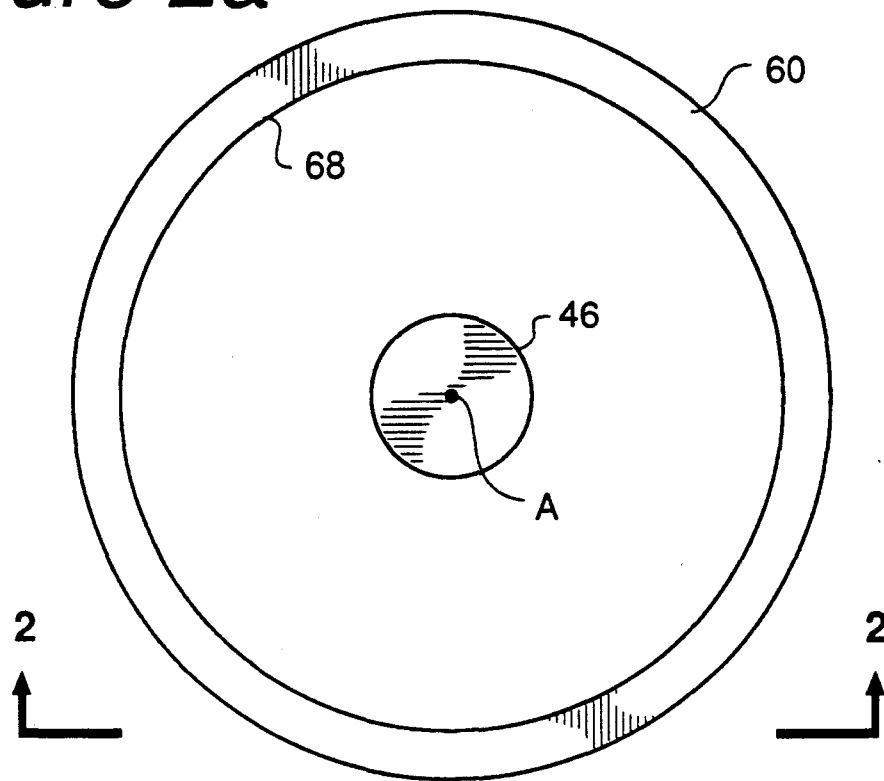


Figure 2b

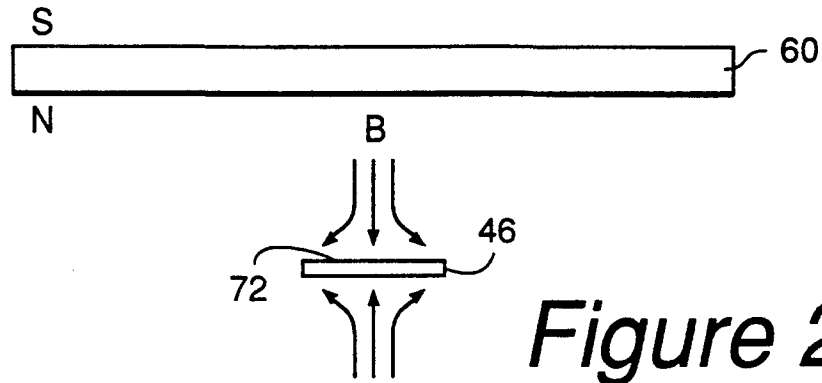


Figure 2c

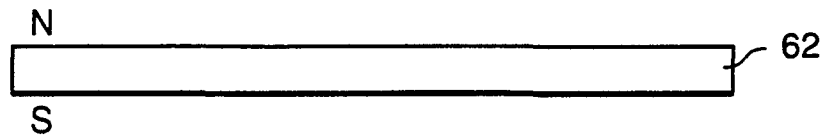


Figure 2d

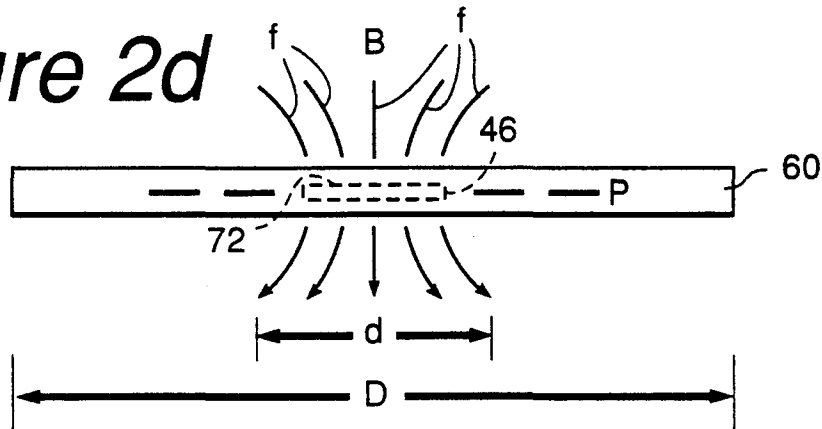
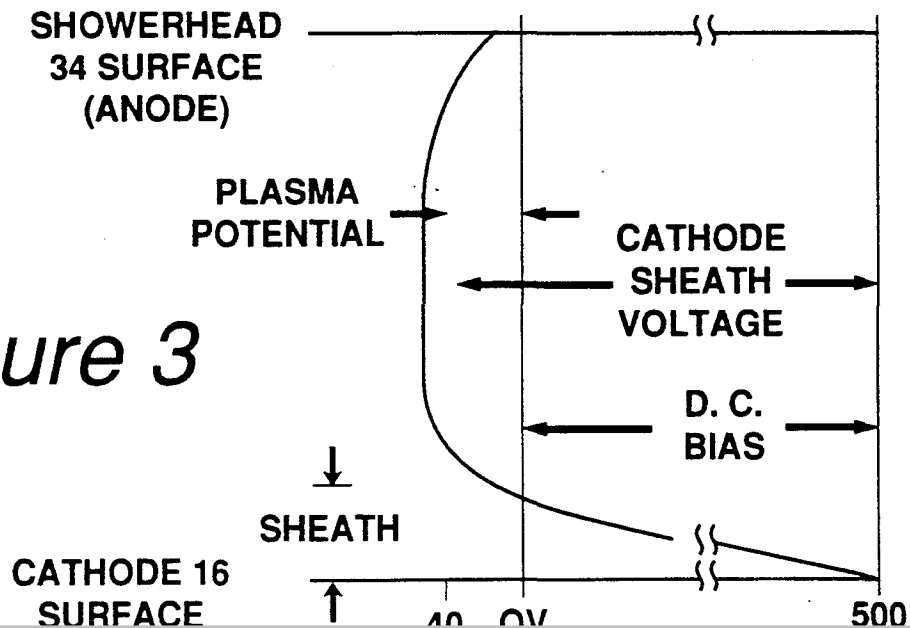


Figure 3



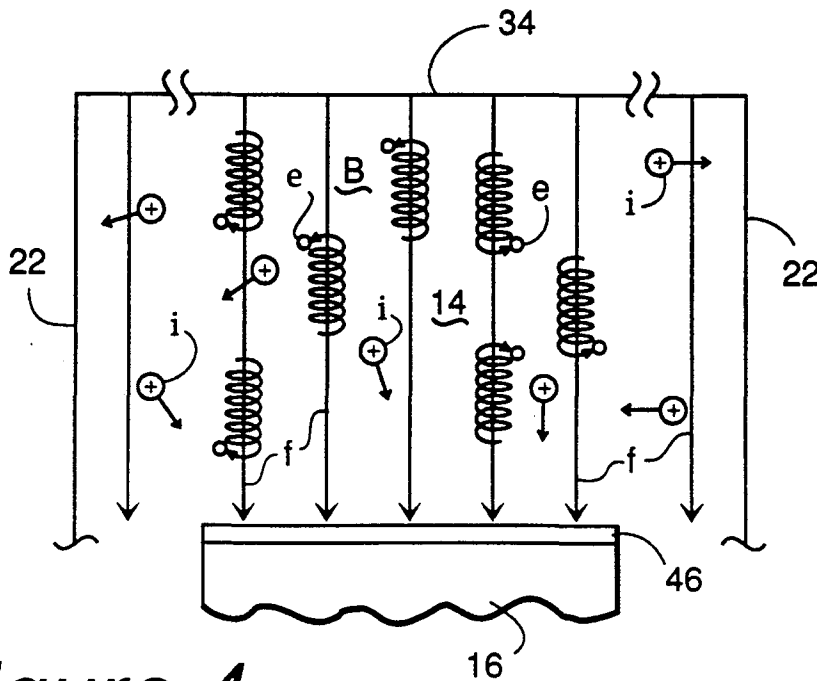


Figure 4

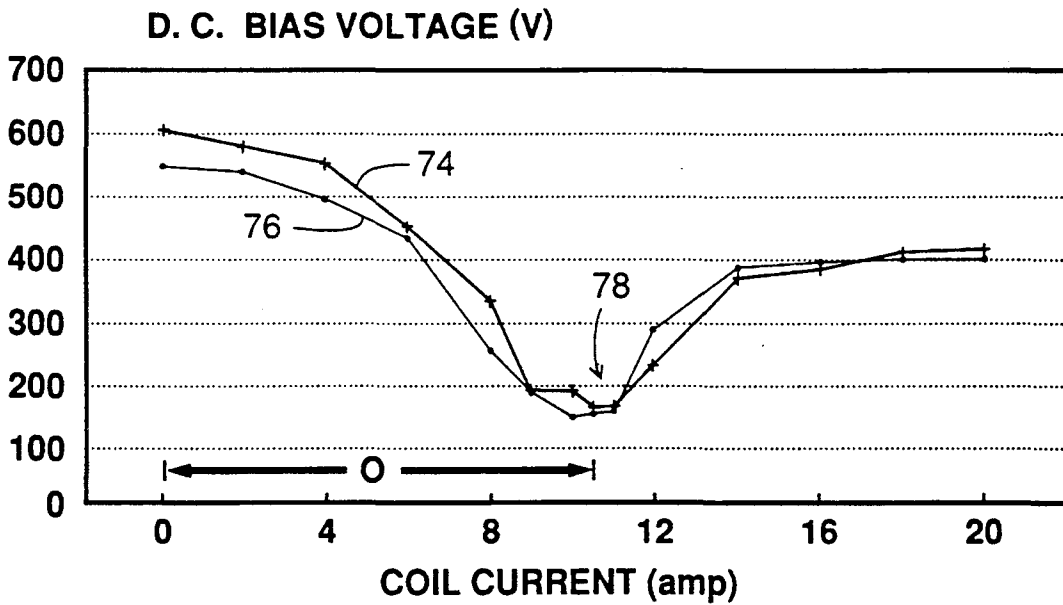


Figure 5

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