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United States Patent [19]

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Patrick et al.

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[54] **COIL CONFIGURATIONS FOR IMPROVED UNIFORMITY IN INDUCTIVELY COUPLED PLASMA SYSTEMS**

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[21] Appl. No.: **27,995**

[22] Filed: **Mar. 8, 1993**

[51] Int. Cl.⁶ **H05H 1/00**

[52] U.S. Cl. **156/345; 156/643; 118/723 I; 204/298.06; 204/298.34**

[58] Field of Search **156/345, 643; 118/723 I, 723 IR; 204/298.34, 298.06; 315/111.41, 111.21**

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U.S. PATENT DOCUMENTS

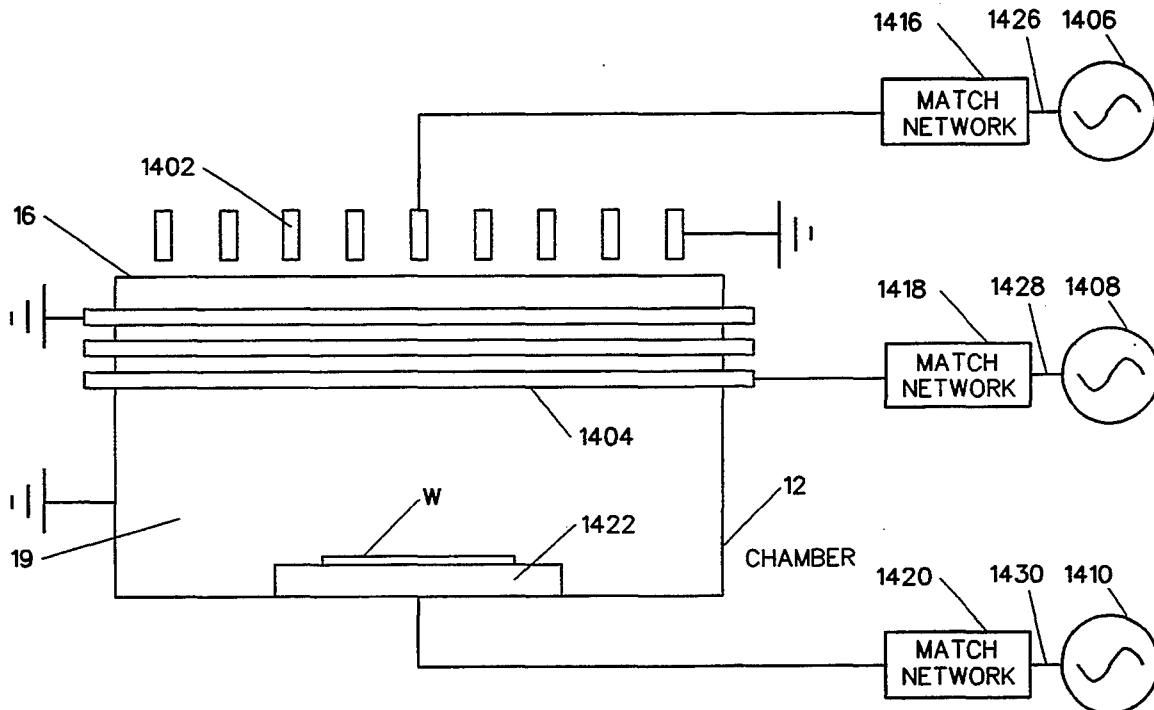
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Primary Examiner—Thi Dang

[57] **ABSTRACT**

The present invention relates to an apparatus for generating a low pressure plasma circulating in a planar direction within a process enclosure. The invention generates plasma having substantially uniform density characteristics across a planar axis. The invention achieves improved uniformity of the plasma density by delivering more radio frequency power toward the periphery of the circulating plasma than toward the center of the plasma. Increasing the periphery power to the circulating plasma compensates for increased plasma losses due to interaction with the side walls of the process containment enclosure.

8 Claims, 14 Drawing Sheets



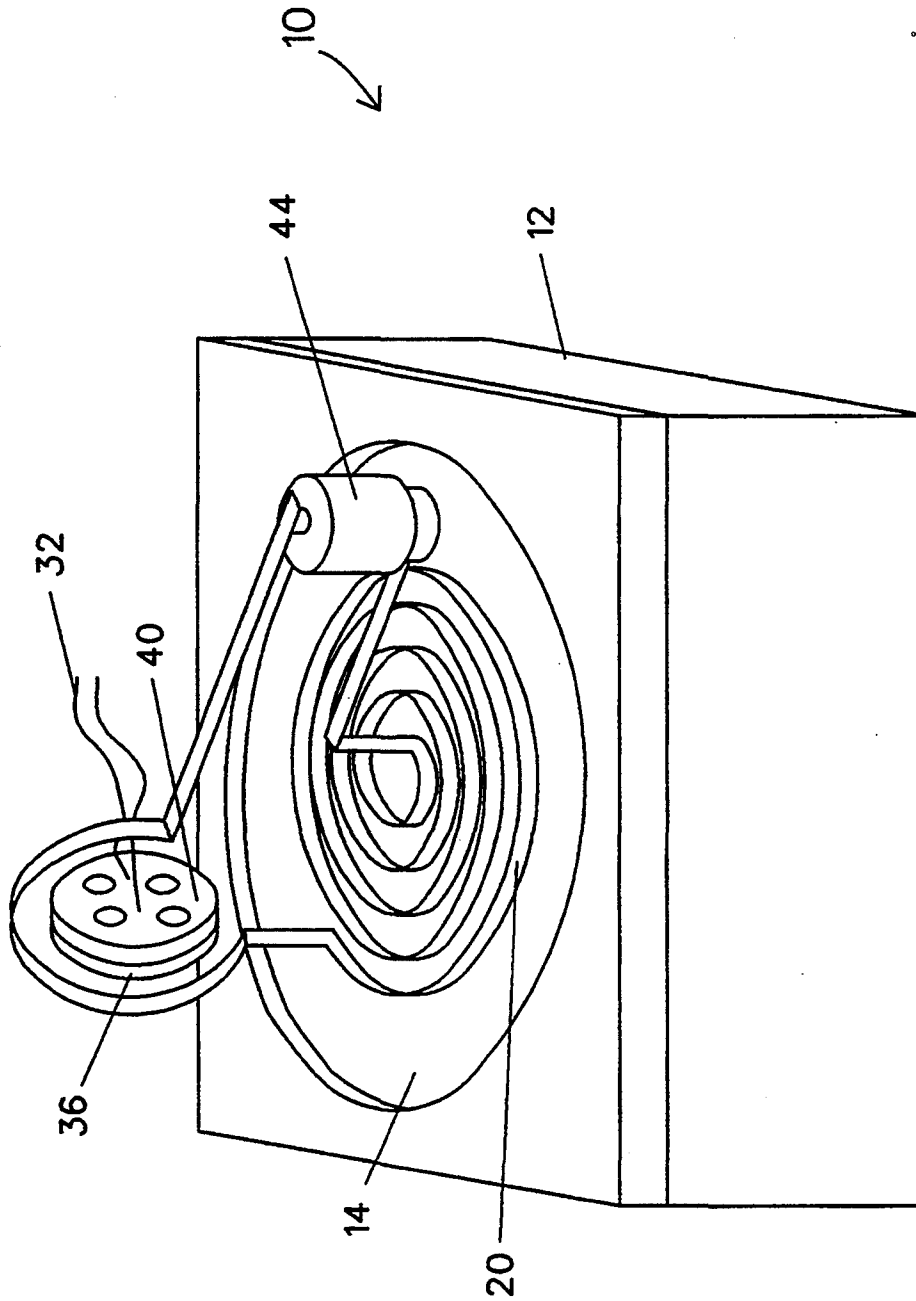


FIG. 1 (PRIOR ART)

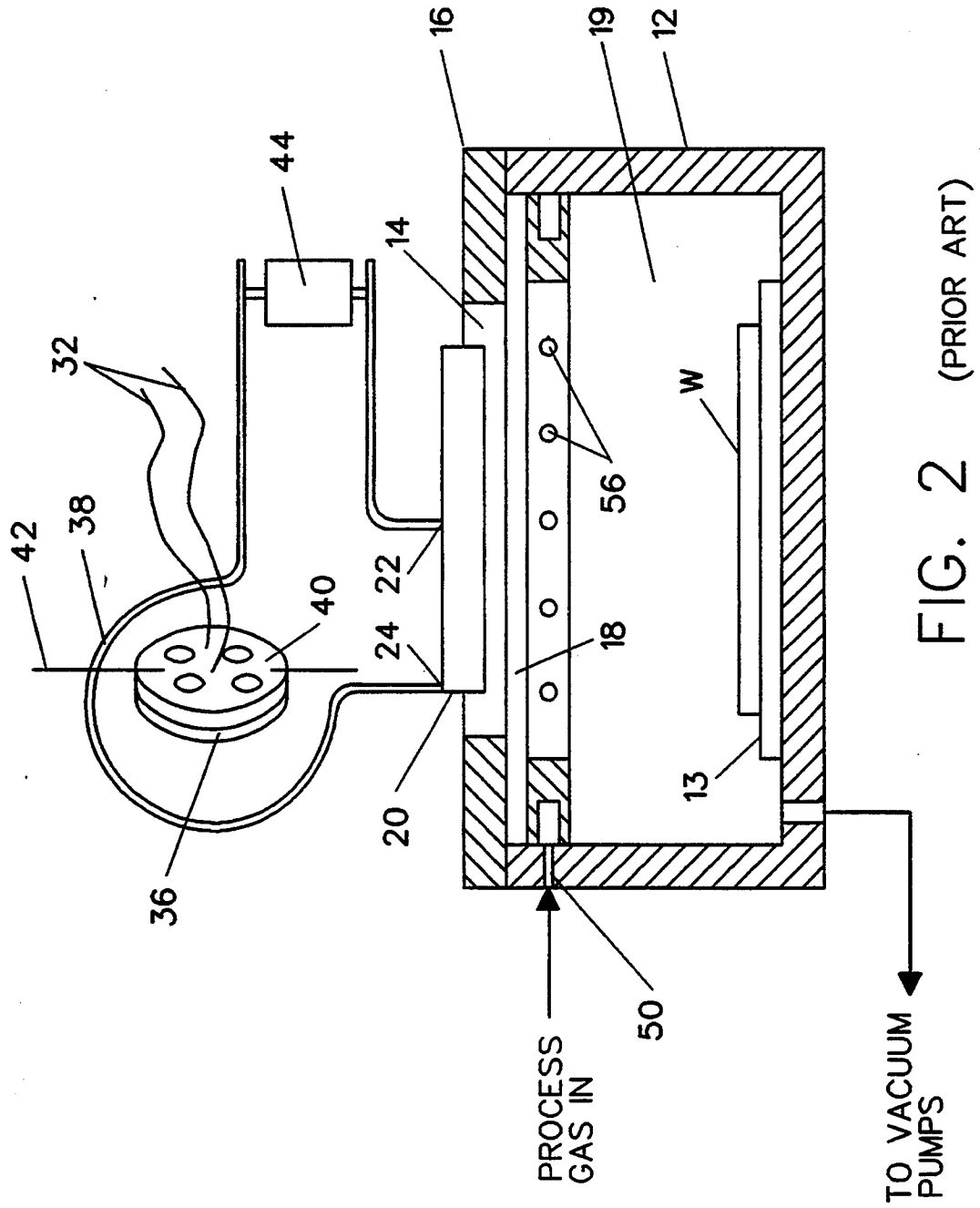


FIG. 2 (PRIOR ART)

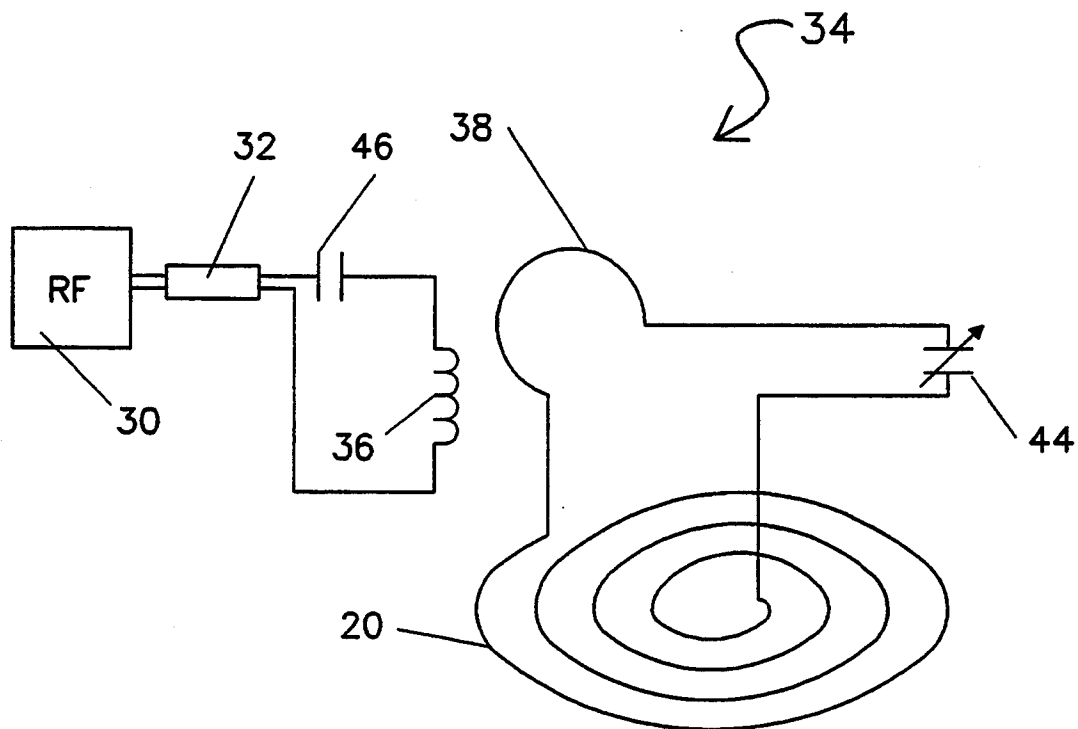


FIG. 3 (PRIOR ART)

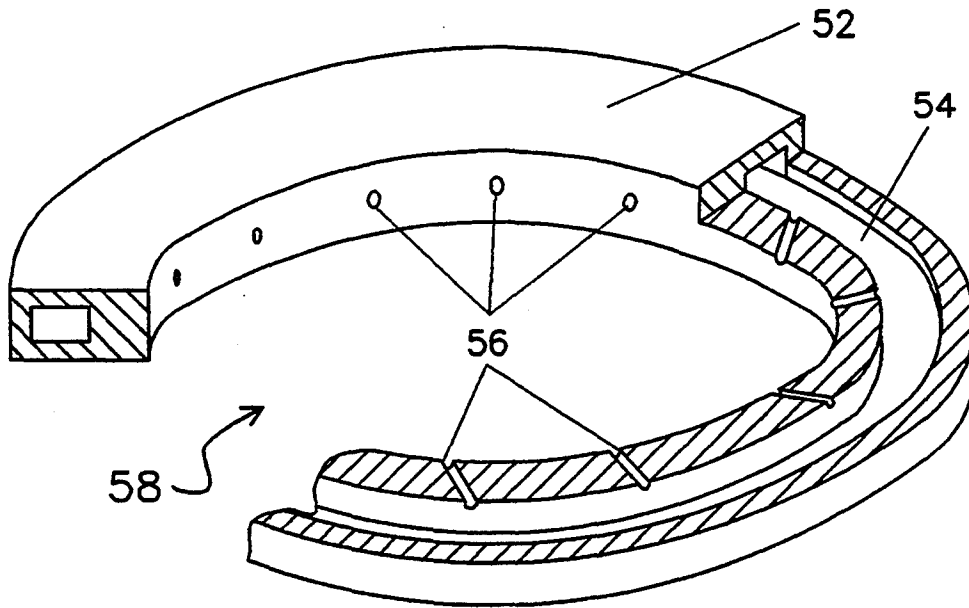


FIG. 4 (PRIOR ART)

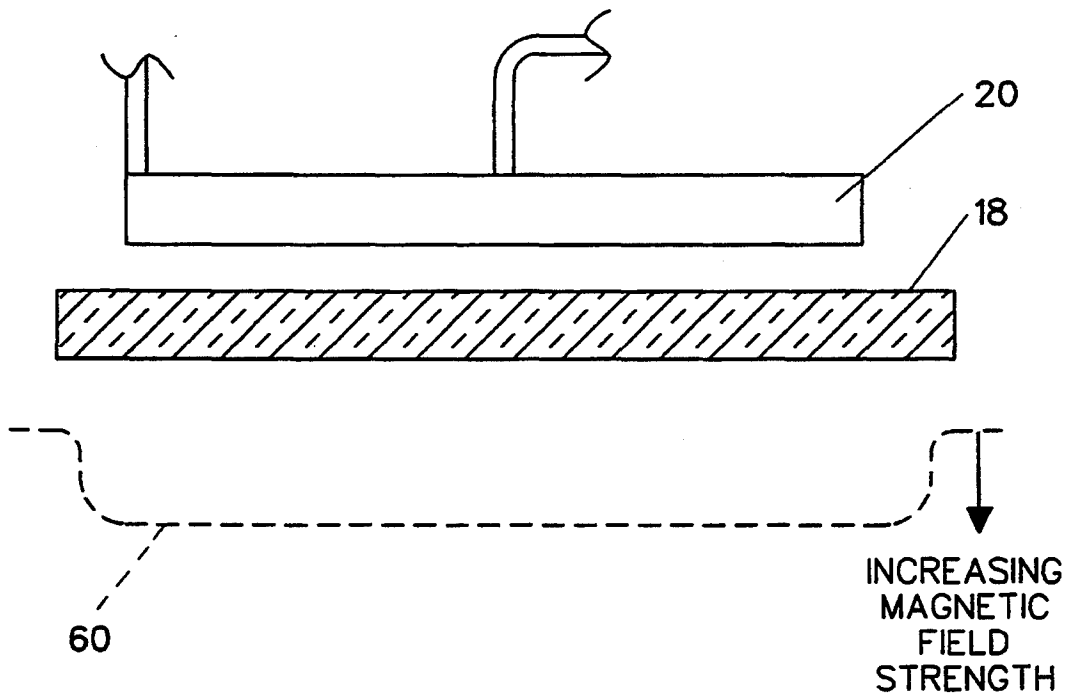


FIG. 5 (PRIOR ART)

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