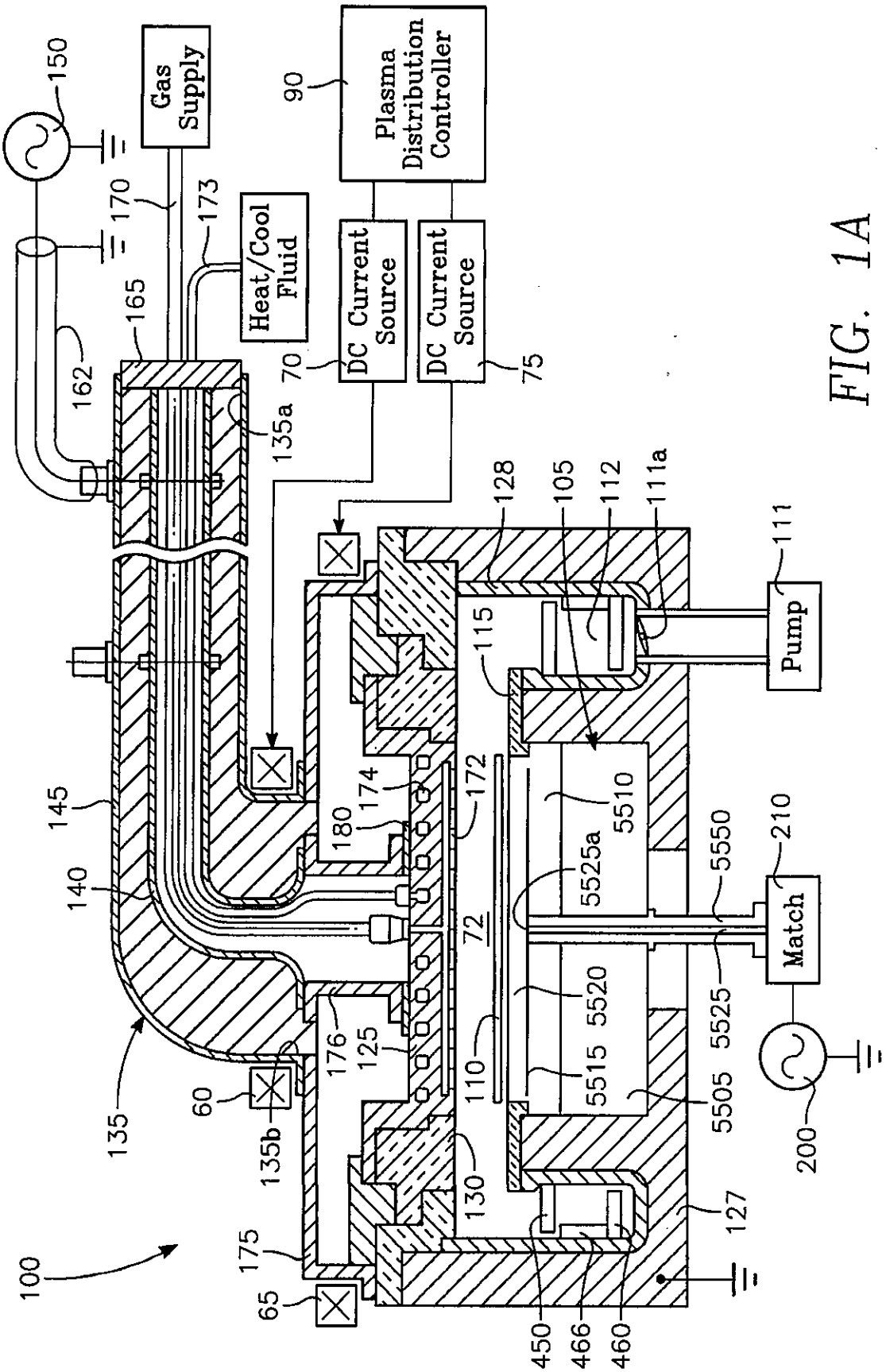

Gas Supply
Plasma Distribution Controller
Heat/Cool Fluid
DC Current Source
DC Current Source
Pump
Match
150
170
173
90
165
162
70
75
135a
128
105
112
111a
111
115
145
140
174
172
180
5510
5525a
5550
210
72
5520
5515
5505
5525
110
176
125
60
135
135b
130
127
175
65
100
200
450
466
460

FIG. 1A

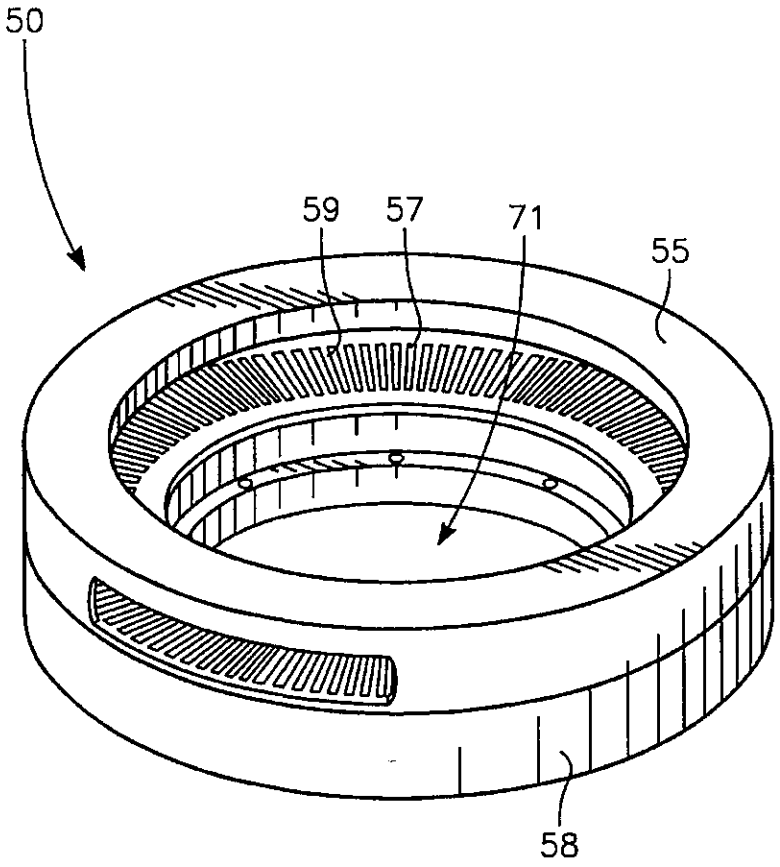


FIG. 1B

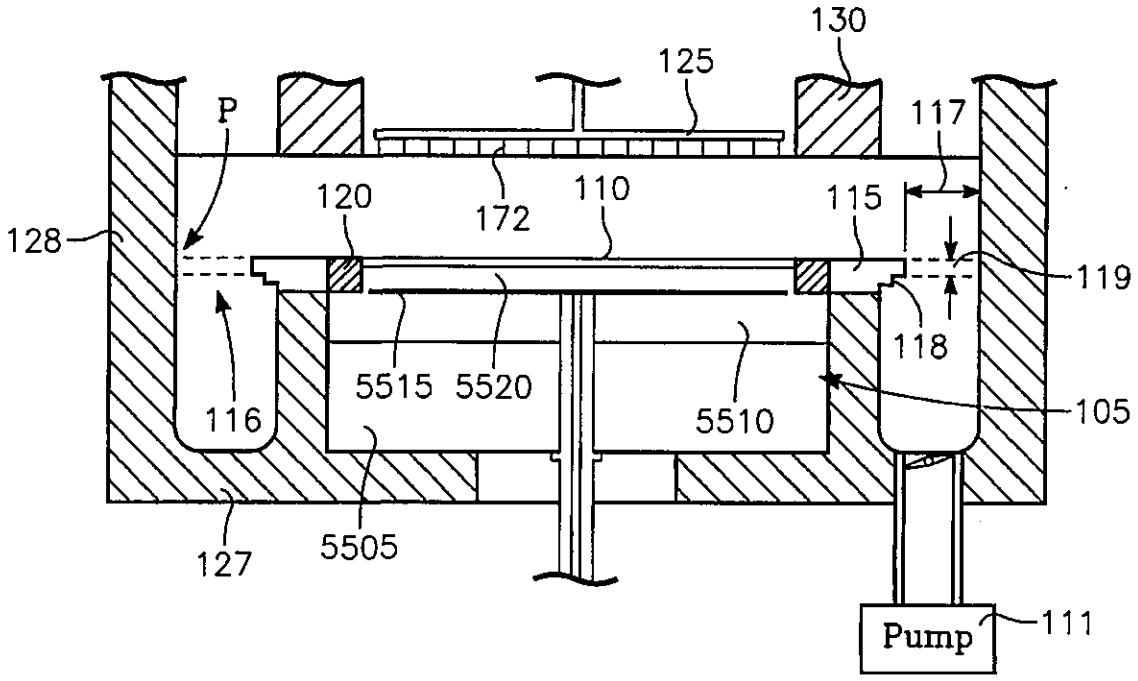

130
125
P
117
120
172
110
115
128
119
118
116
5515
5520
5510
105
127
5505
Pump
111

FIG. 2A

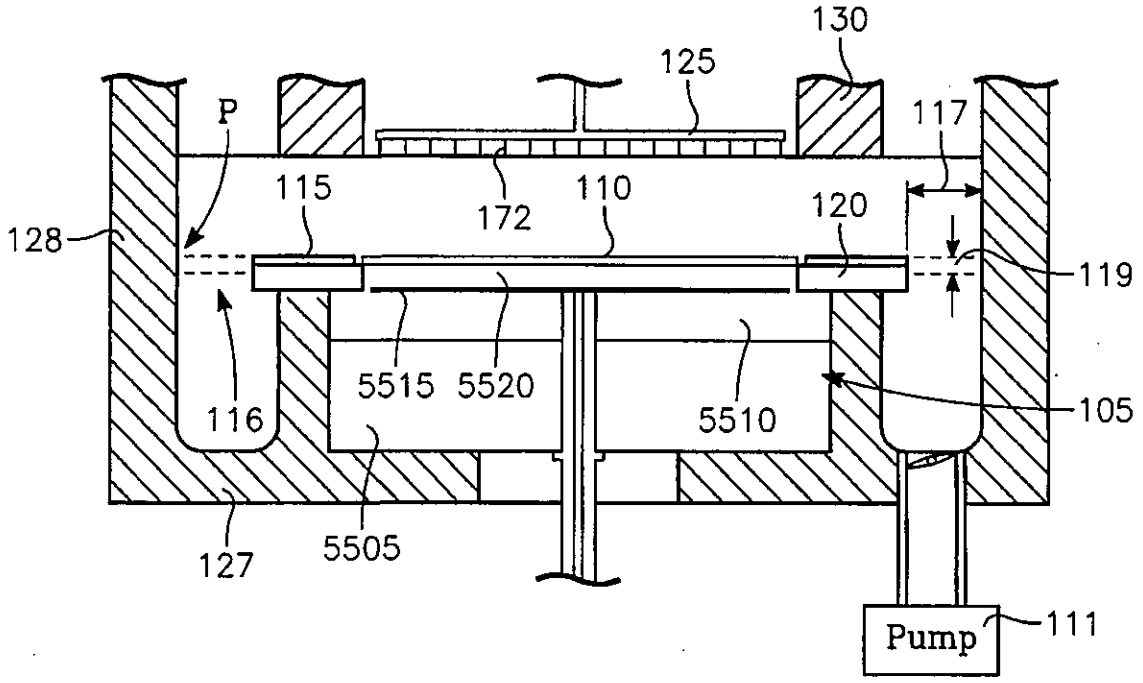

130
125
P
117
115
172
110
120
128
119
116
5515
5520
5510
105
127
5505
Pump
111

FIG. 2B

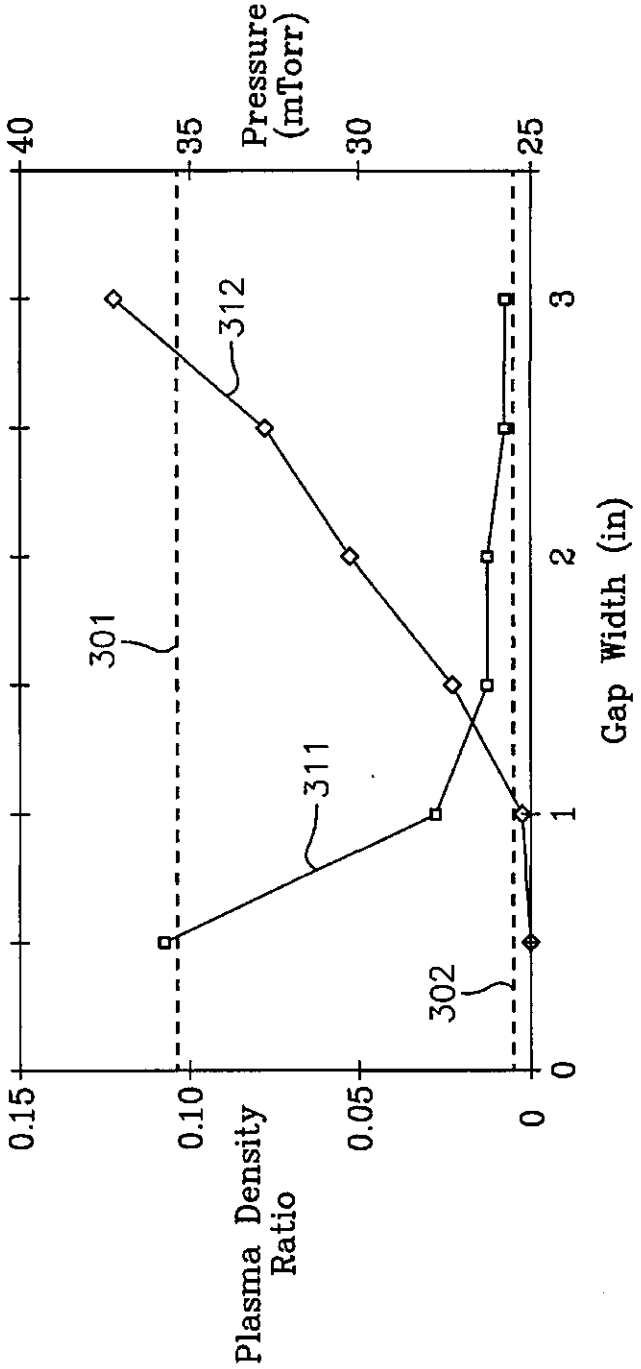

Pressure (mTorr)
40
35
30
25
0.15
0.10
0.05
0
Plasma Density Ratio
0
1
2
3
Gap Width (in)
301
302
311
312

FIG. 2C

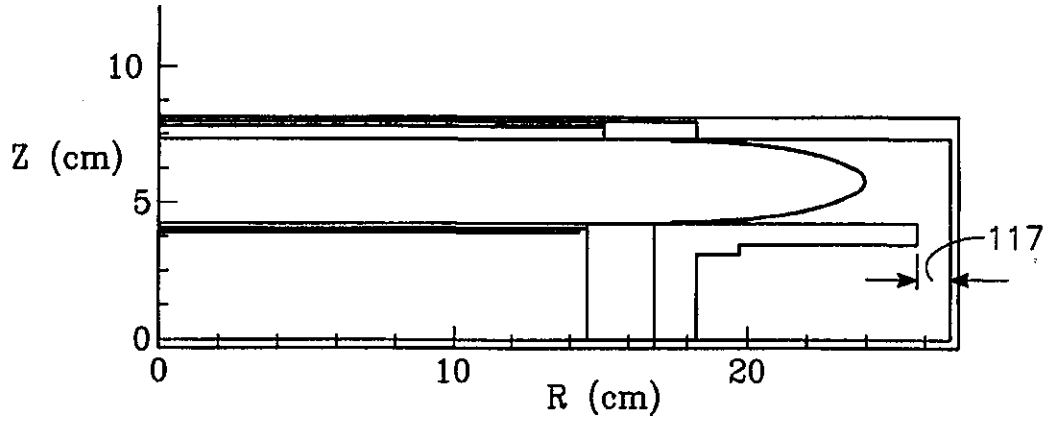


FIG. 2D

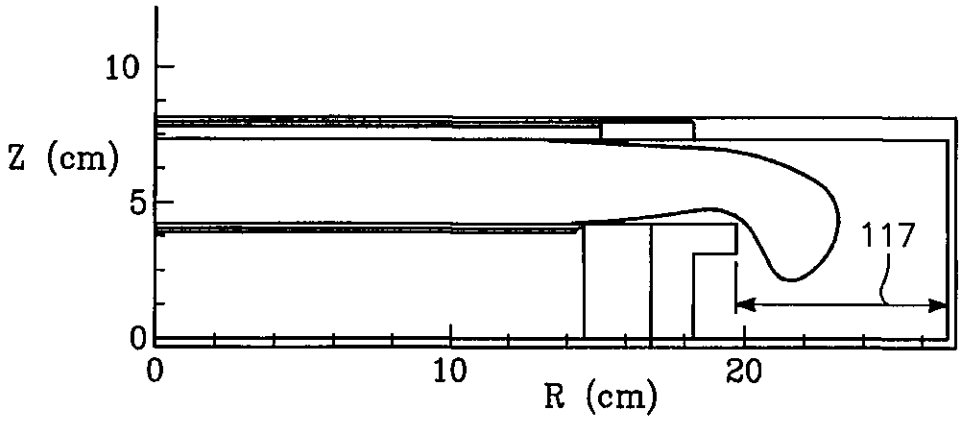


FIG. 2E

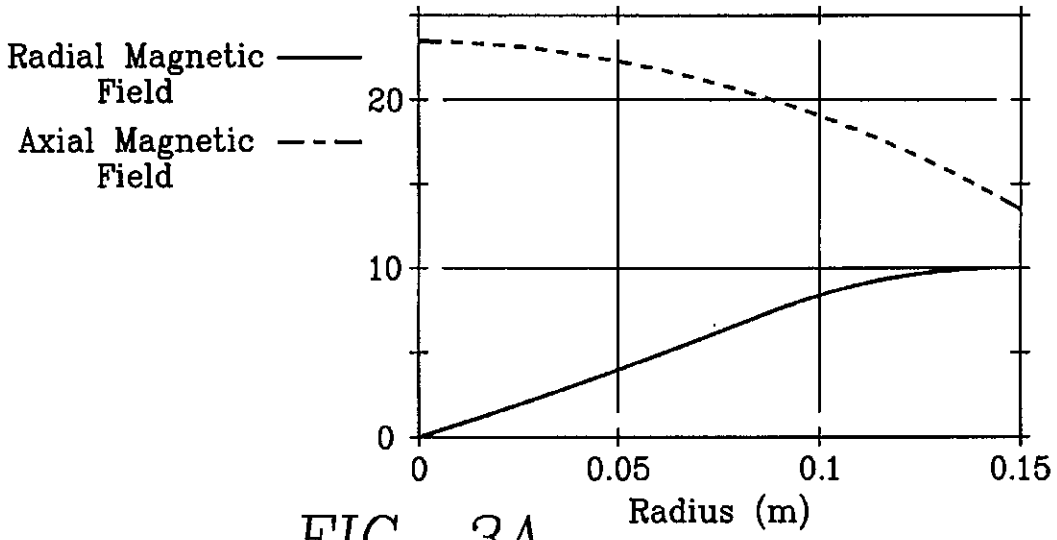


FIG. 3A

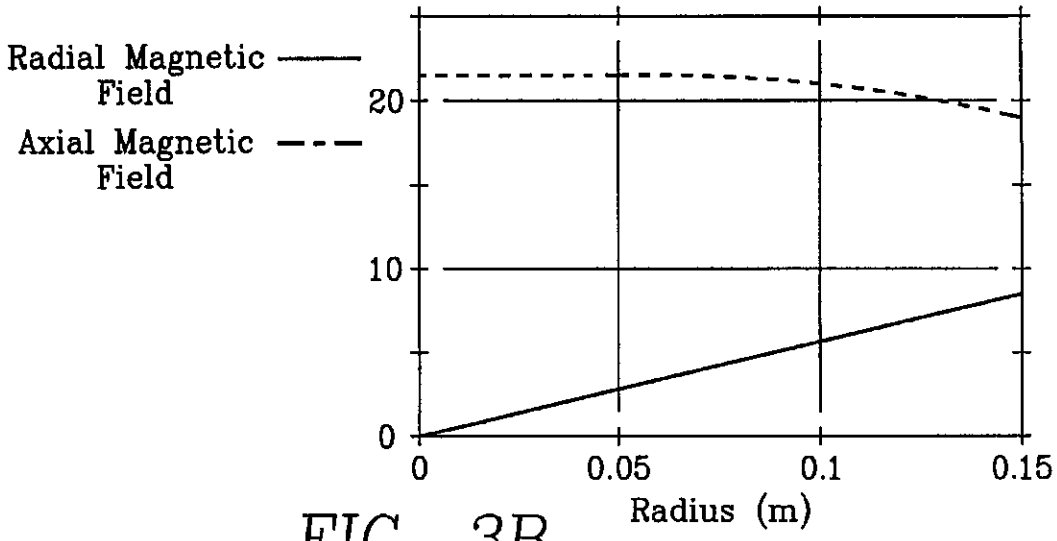


FIG. 3B

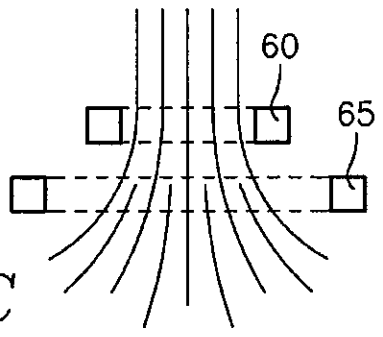


FIG. 3C

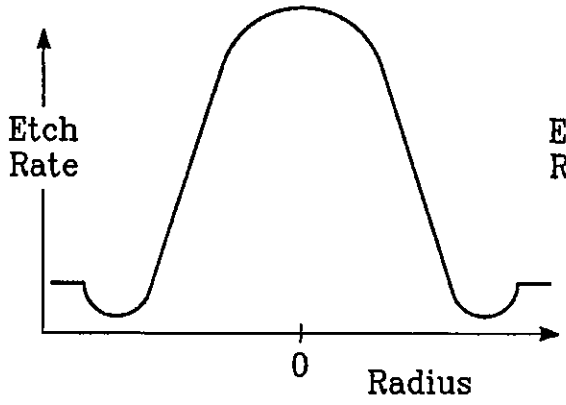


FIG. 4A

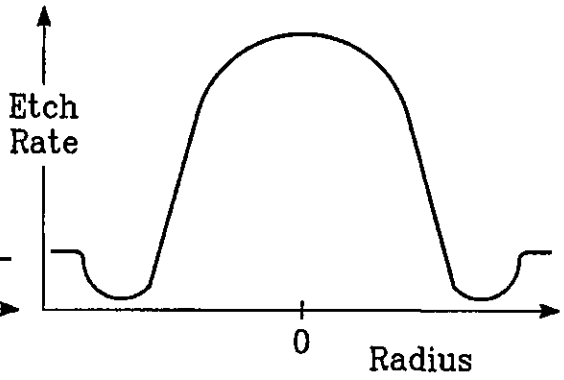


FIG. 4B

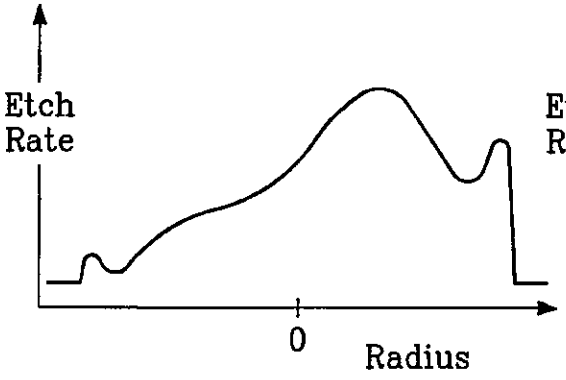


FIG. 4C

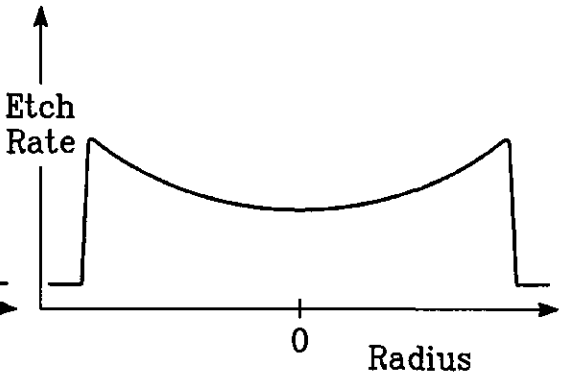


FIG. 4D

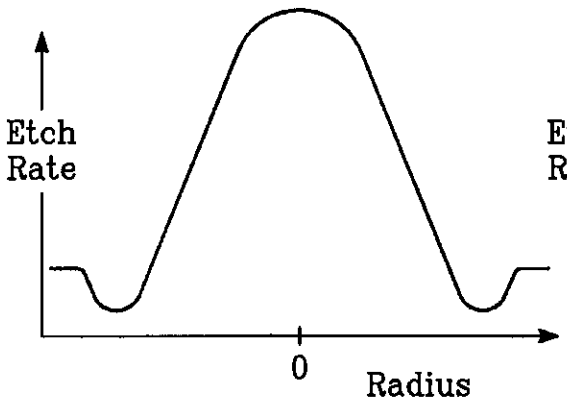


FIG. 5A

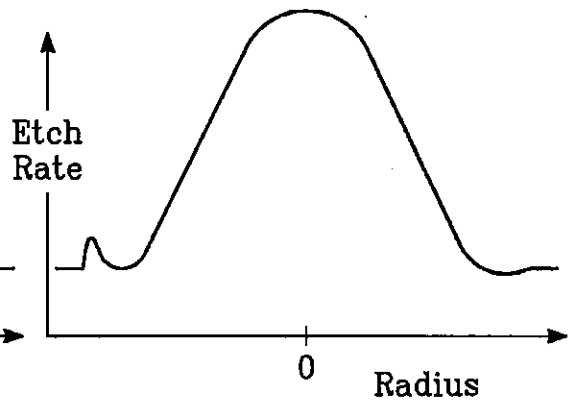


FIG. 5B

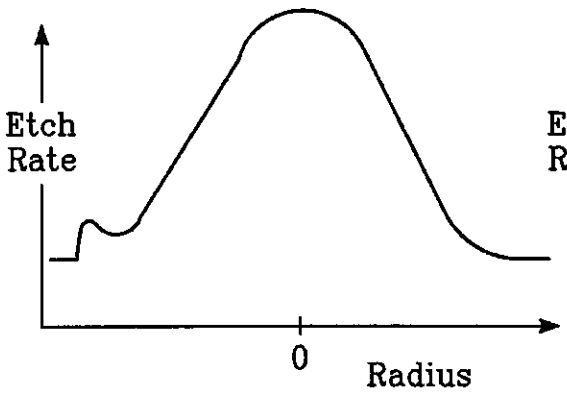


FIG. 5C

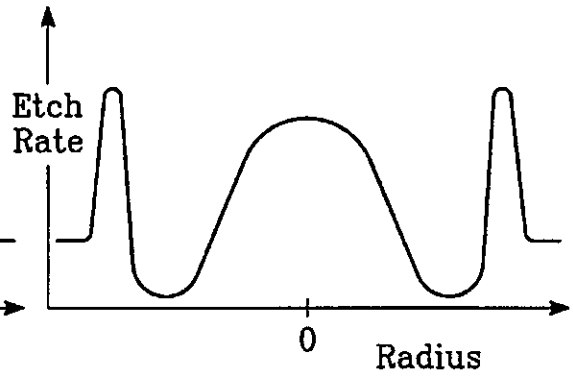


FIG. 5D

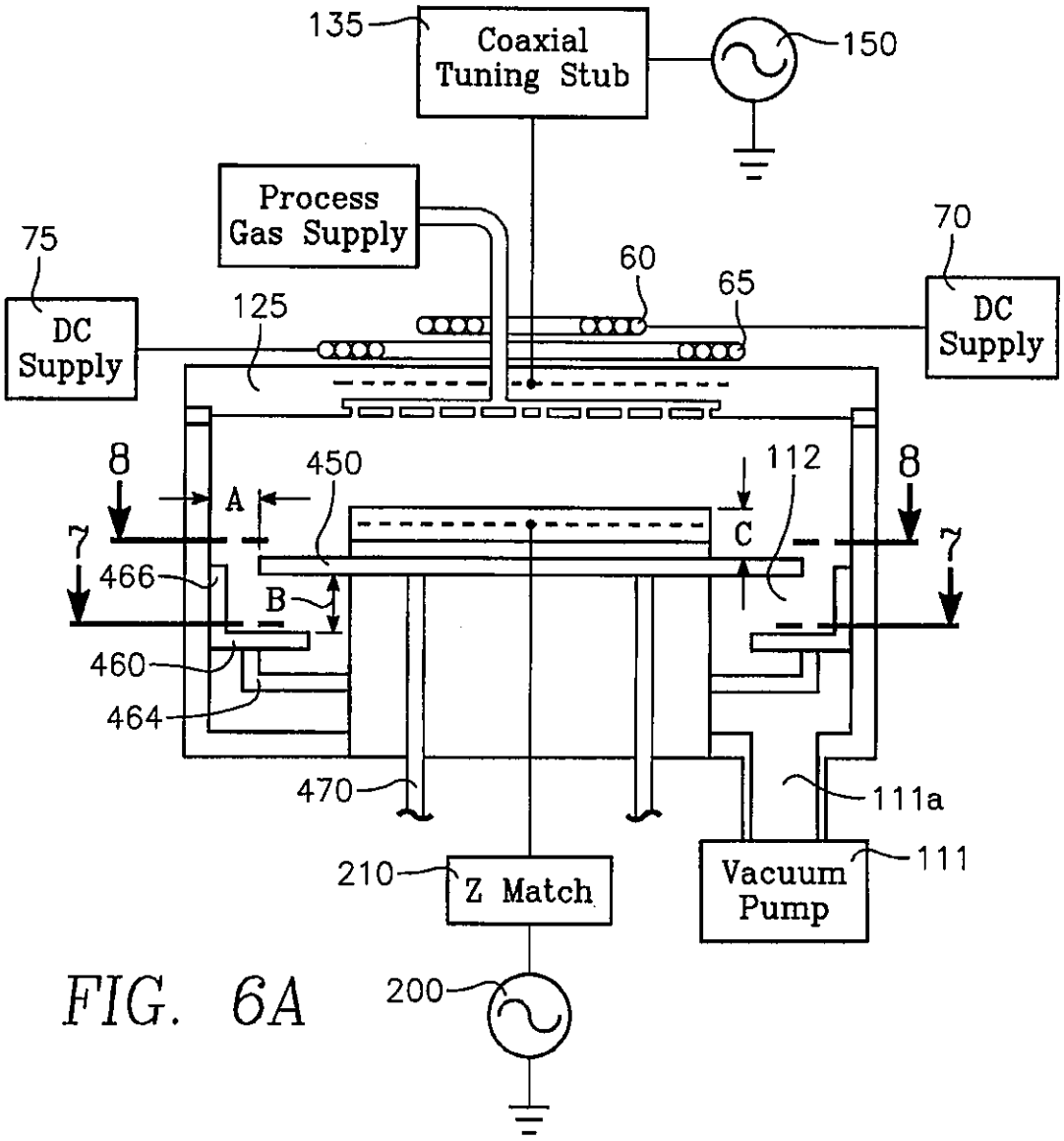


FIG. 6A

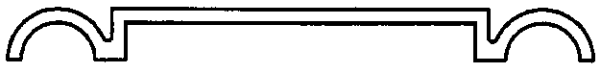


FIG. 6B

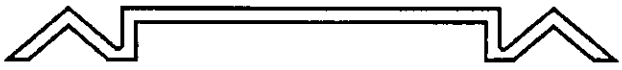


FIG. 6C

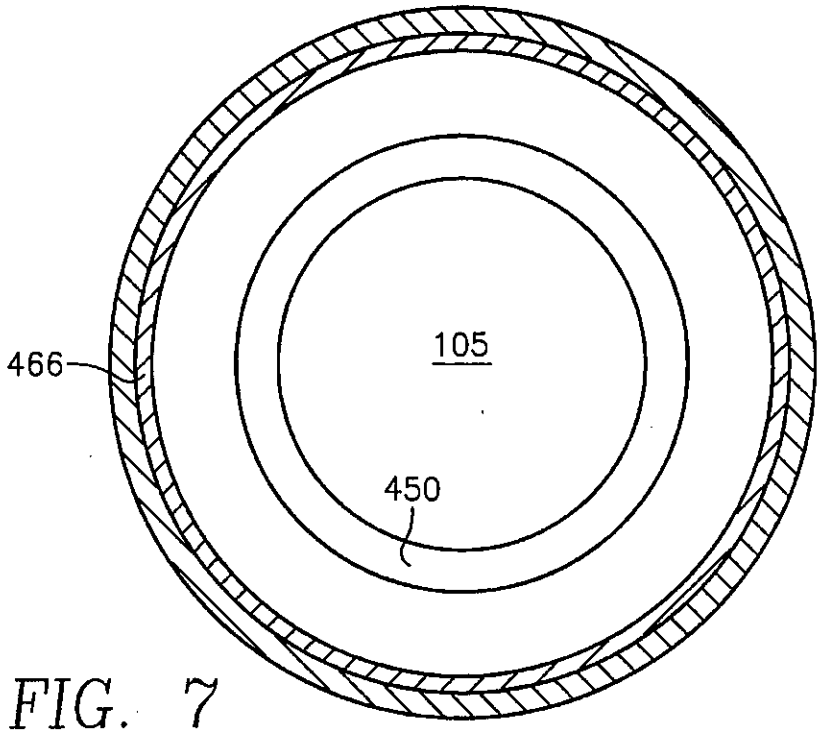


FIG. 7

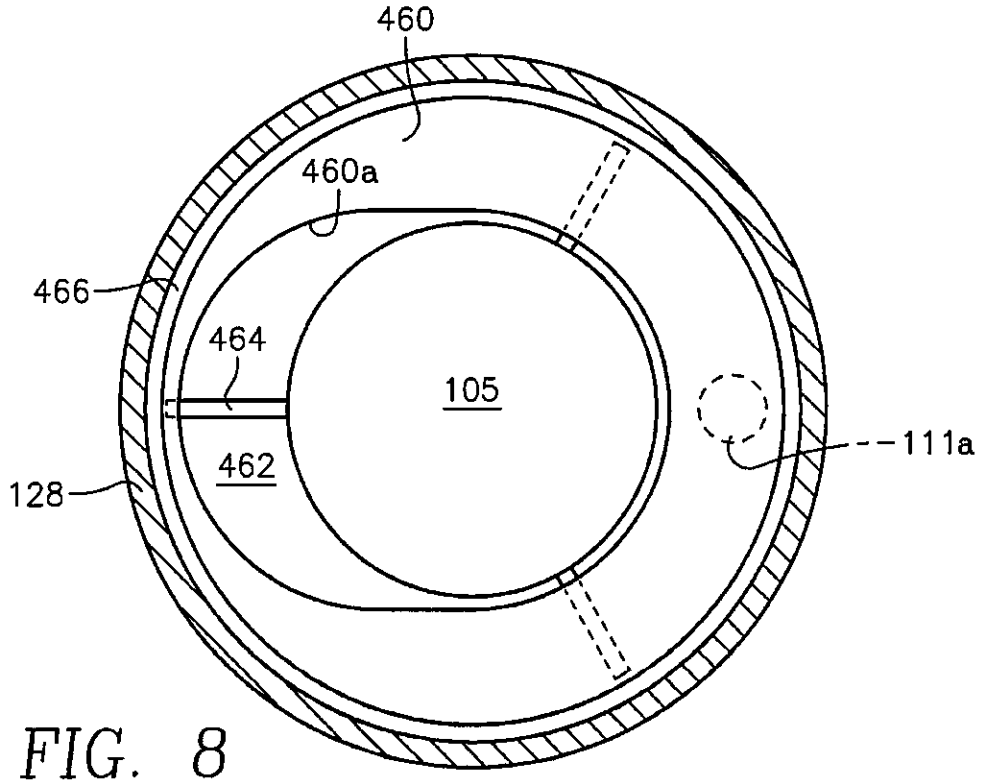


FIG. 8

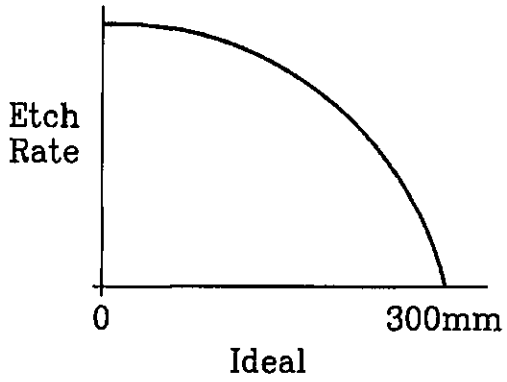


FIG. 9A

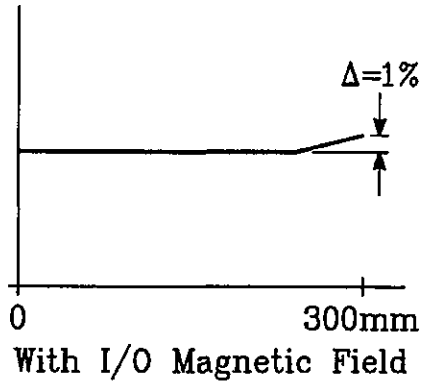


FIG. 9B

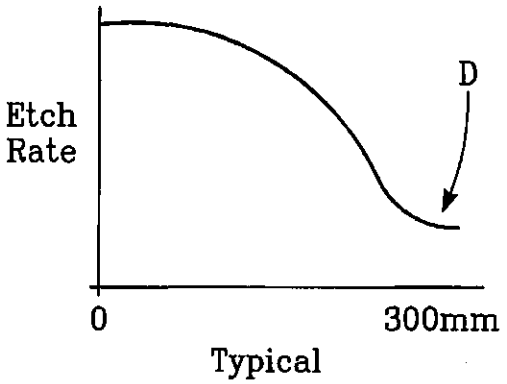


FIG. 10A

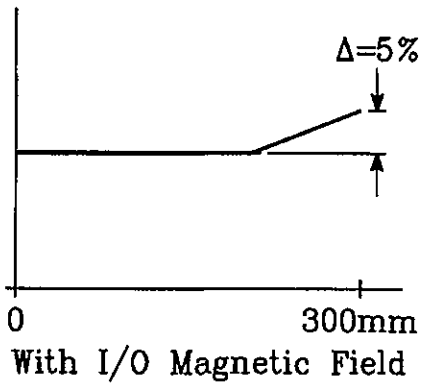


FIG. 10B

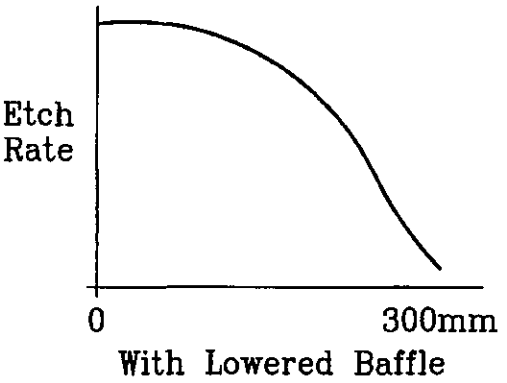


FIG. 11A

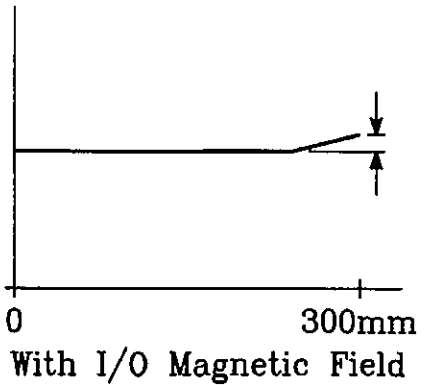


FIG. 11B

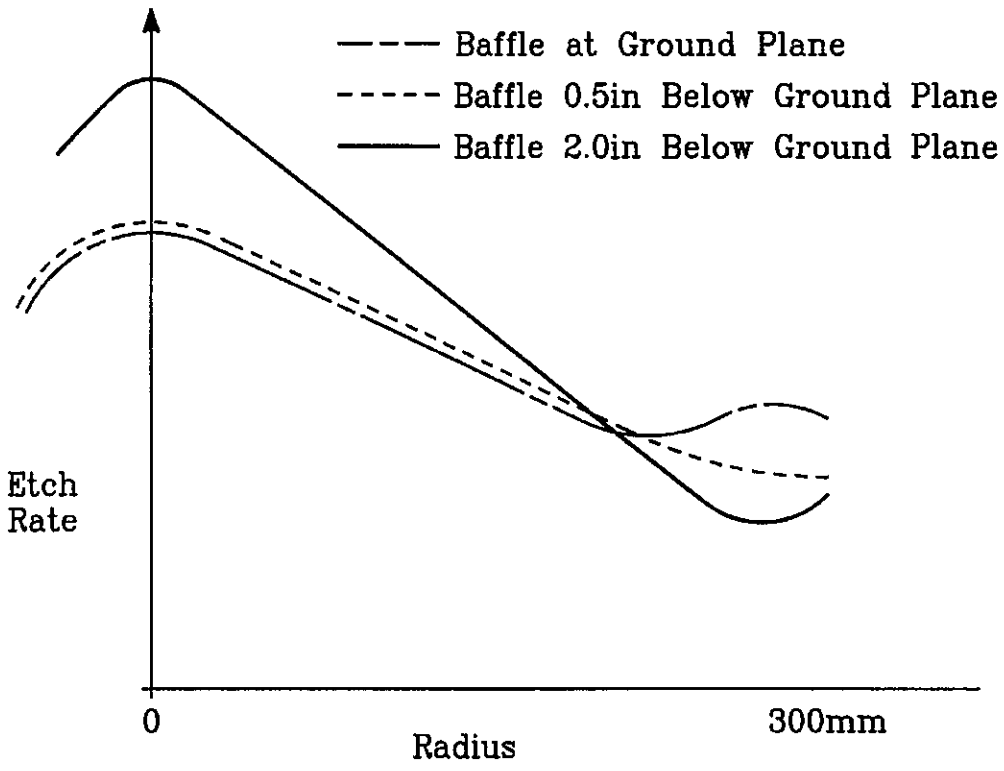

Baffle at Ground Plane
Baffle 0.5in Below Ground Plane
Baffle 2.0in Below Ground Plane
Etch Rate
0
300mm
Radius

FIG. 12

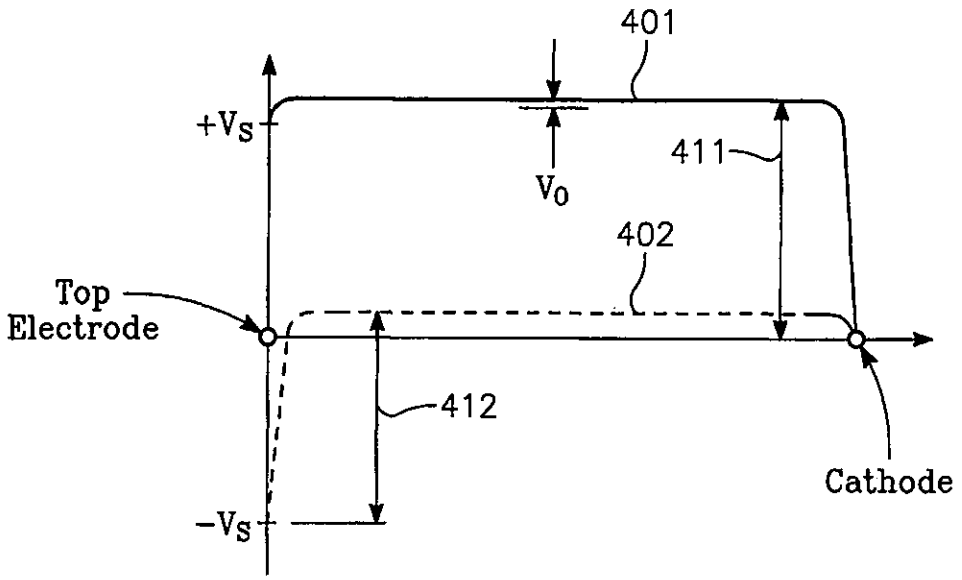


FIG. 13A

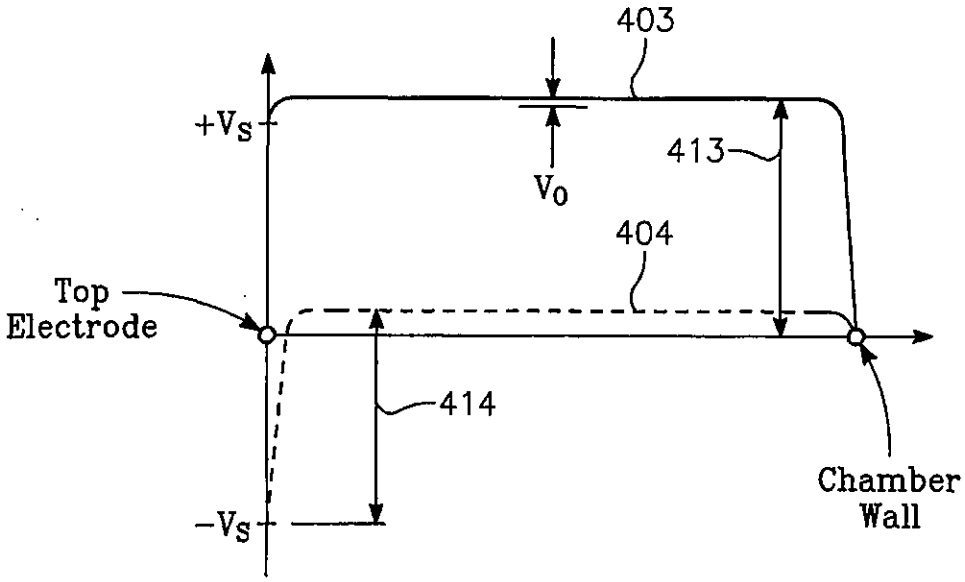


FIG. 13B

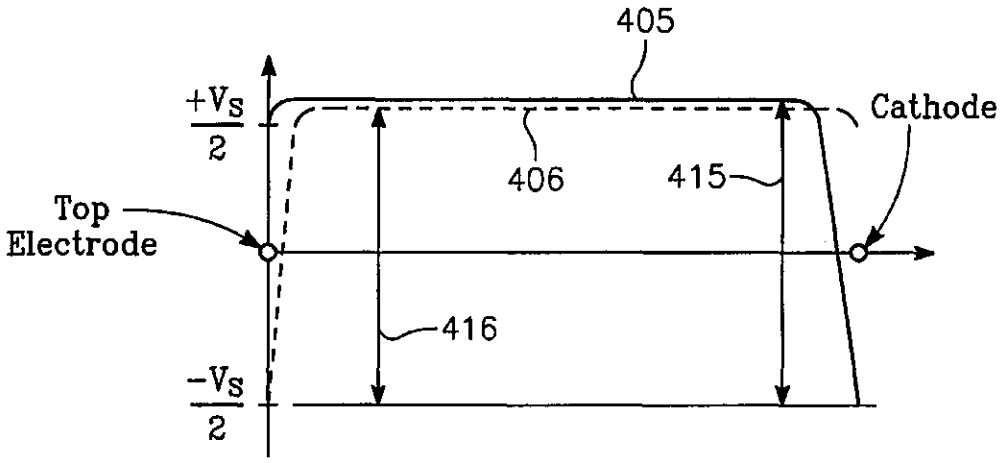


FIG. 13C

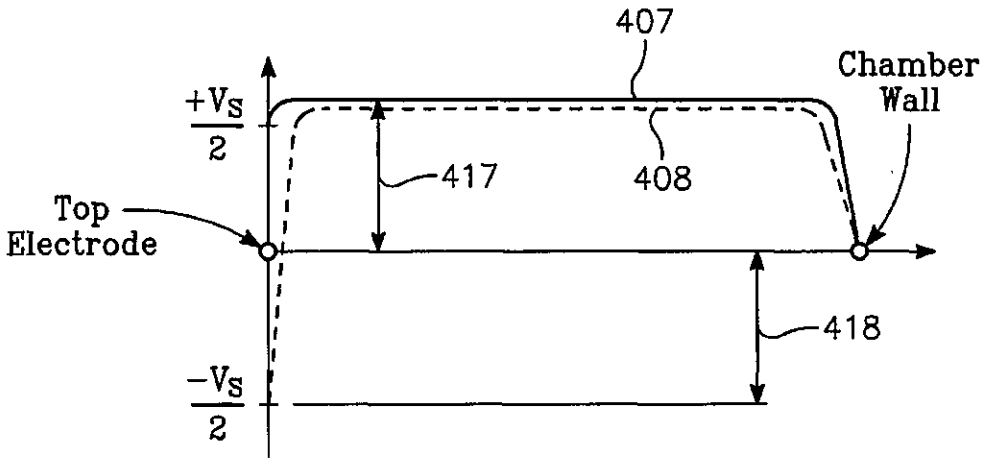


FIG. 13D

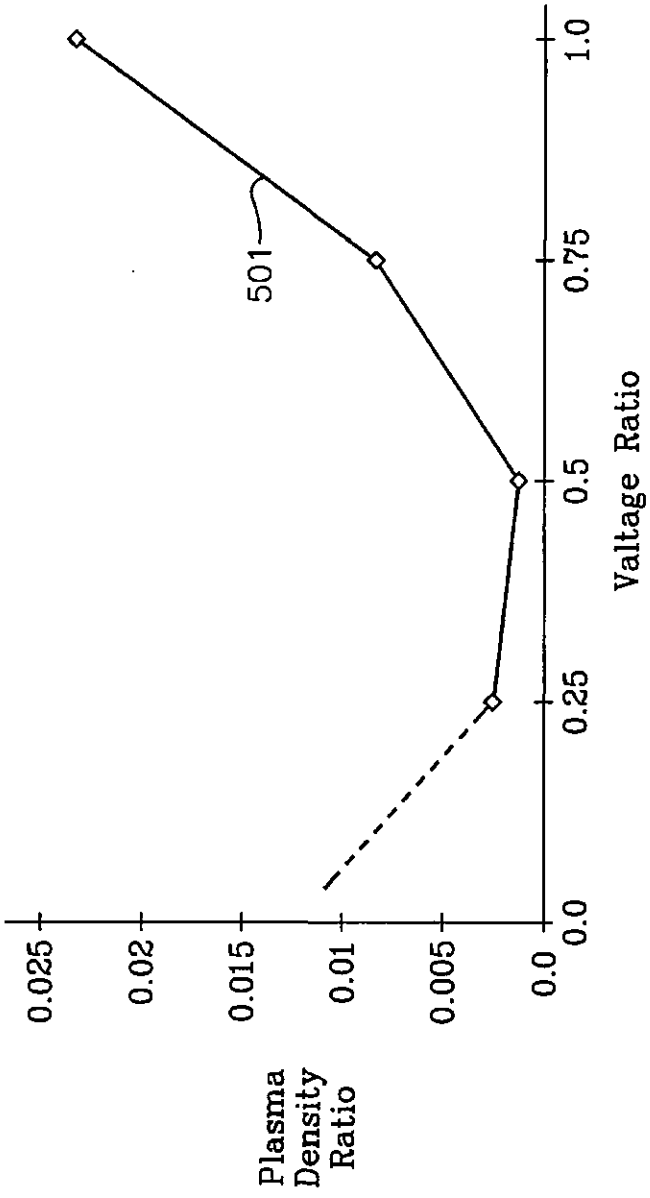

Plasma Density Ratio
0.025
0.02
0.015
0.01
0.005
0.0
0.0
0.25
0.5
0.75
1.0
Valtage Ratio
501

FIG. 14A

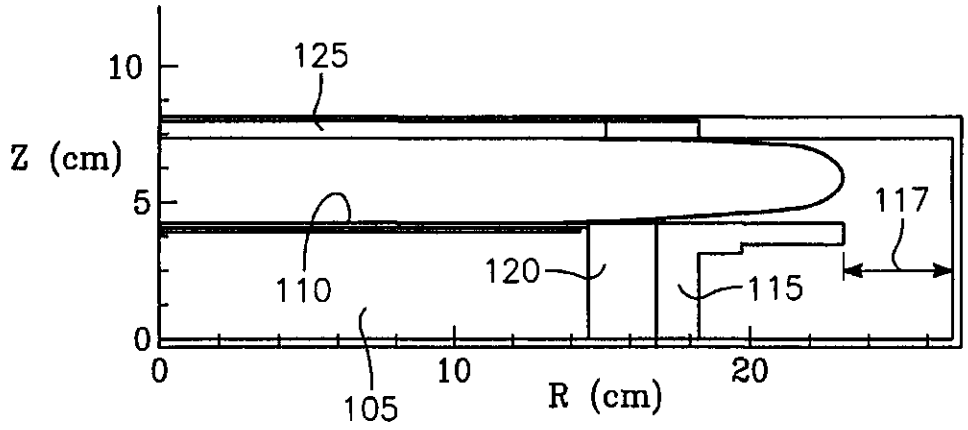


FIG. 14B

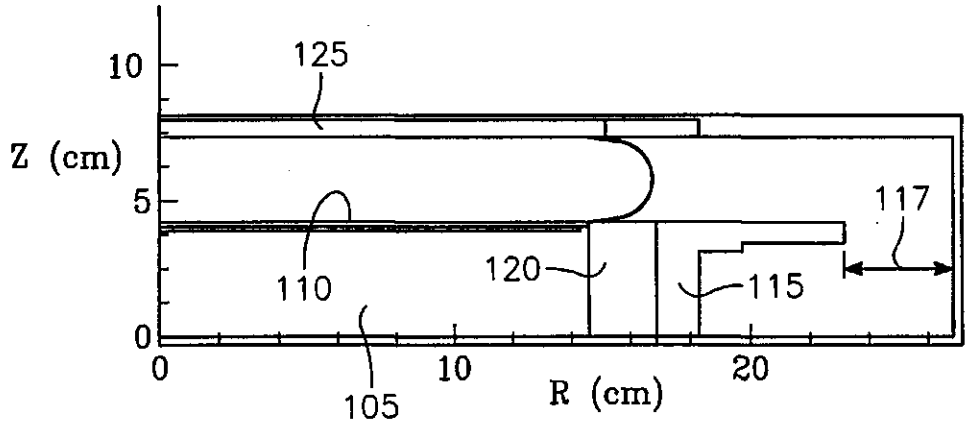


FIG. 14C

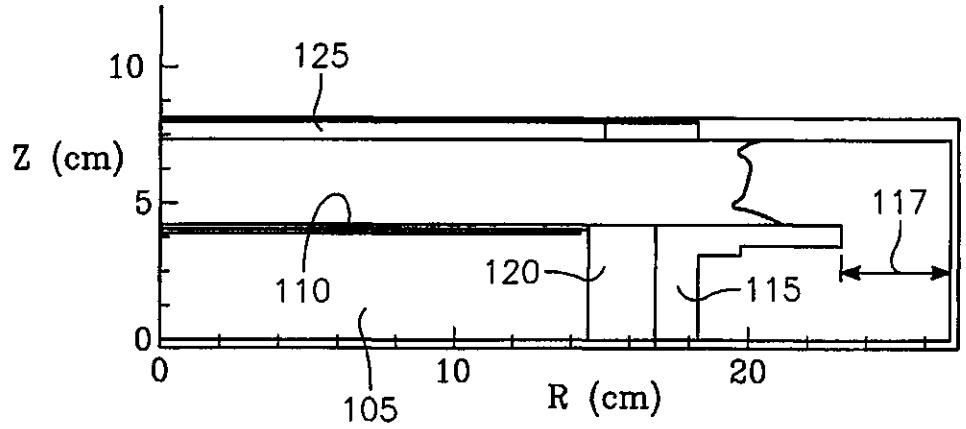


FIG. 14D

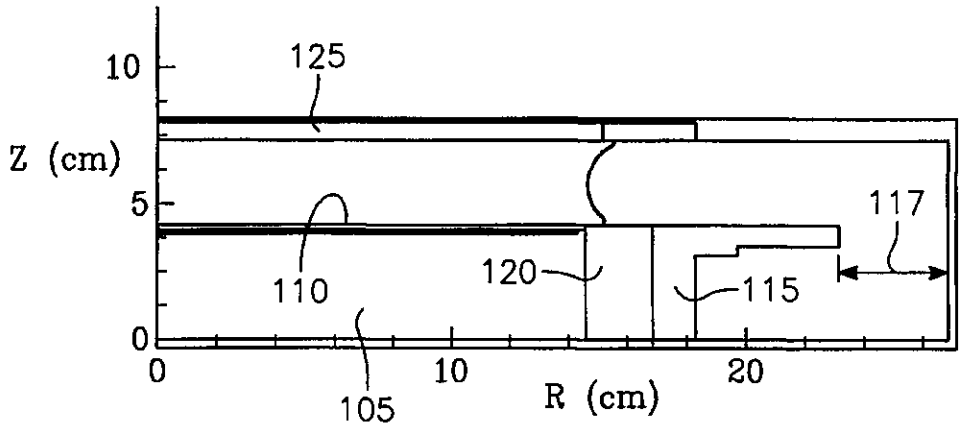


FIG. 14E

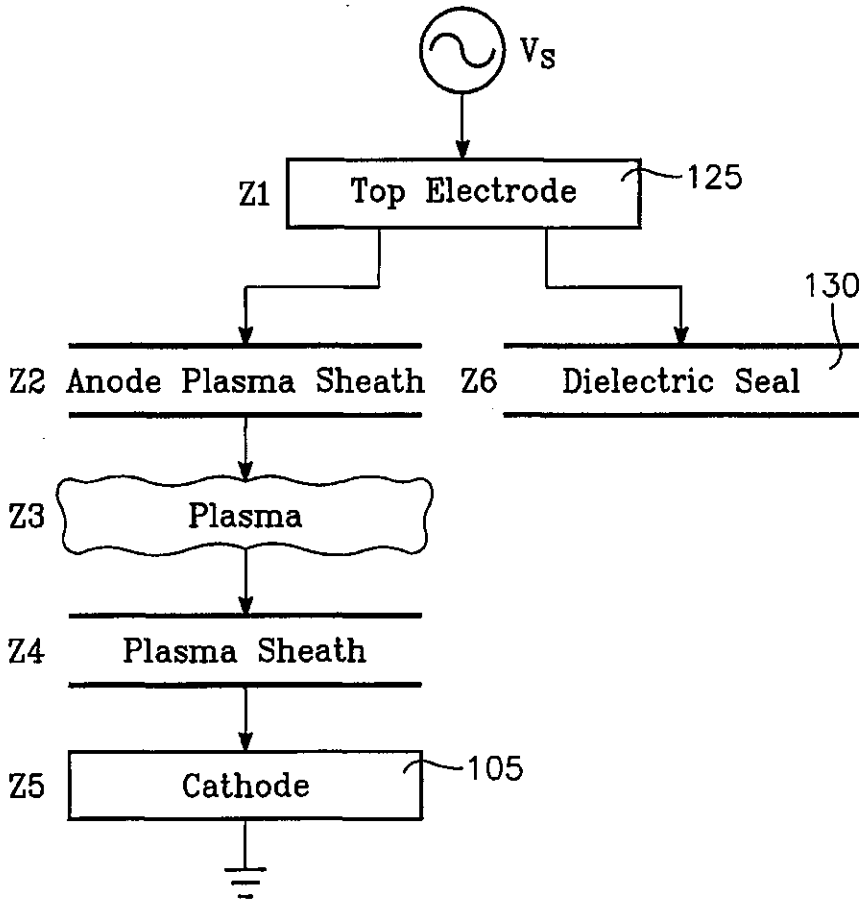

Vs
Z1
Top Electrode
125
130
Z2
Anode Plasma Sheath
Z6
Dielectric Seal
Z3
Plasma
Z4
Plasma Sheath
Z5
Cathode
105

FIG. 15

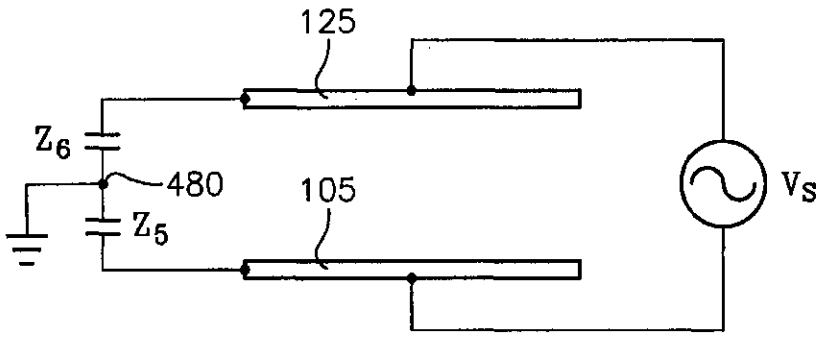

125
Z6
480
105
Z5
Vs

FIG. 16

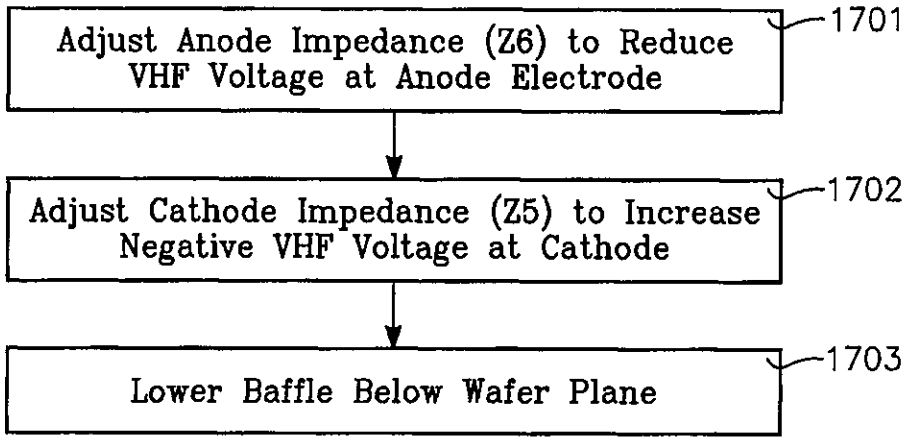

Adjust Anode Impedance (Z6) to Reduce VHF Voltage at Anode Electrode
1701
Adjust Cathode Impedance (Z5) to Increase Negative VHF Voltage at Cathode
1702
Lower Baffle Below Wafer Plane
1703

FIG. 17