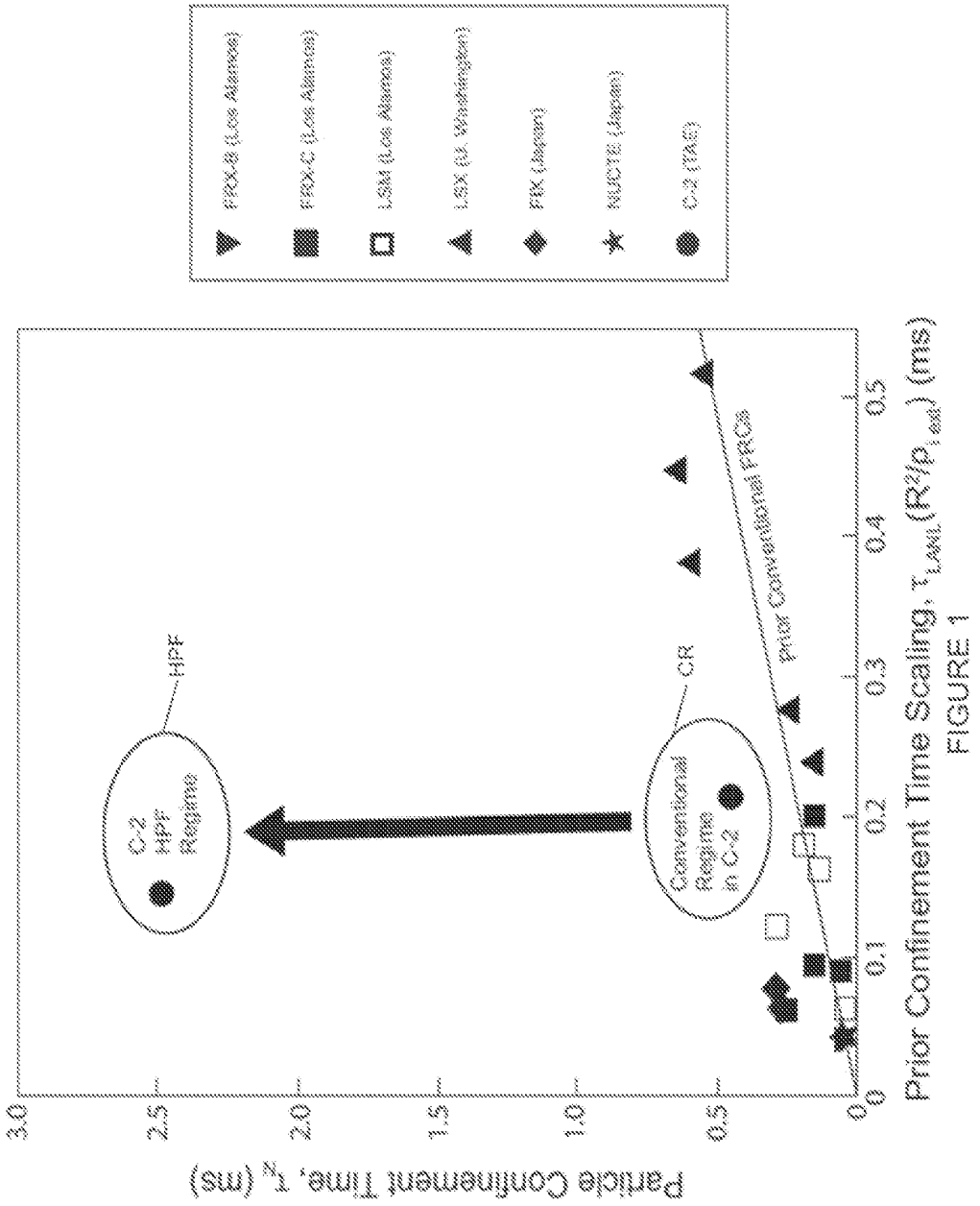

FRX-B (Los Alamos)
FRX-C (Los Alamos)
LSM (Los Alamos)
LSX (U. Washington)
FIX (Japan)
NUCTE (Japan)
C-2 (TAE)
Particle Confinement Time, τ_p (ms)
Prior Confinement Time Scaling, $\tau_{LAWL}(R^2/\rho_{i,eff})$ (ms)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
0.1
0.2
0.3
0.4
0.5
Prior Conventional FRCs
CR
Conventional Regime in C-2
HPF
C-2 HPF Regime

FIGURE 1

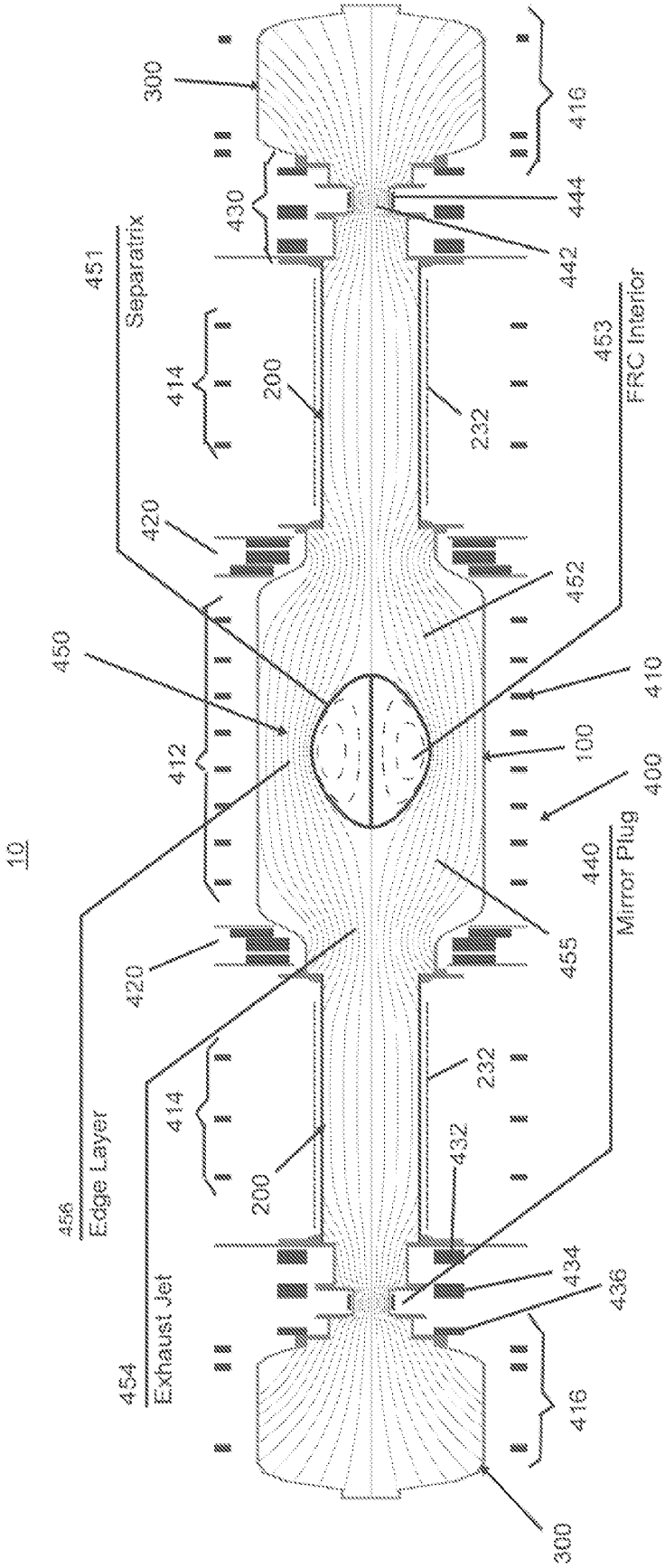

10
300
416
444
430
442
451
Separatrix
453
FRC Interior
414
200
232
420
452
450
410
412
100
400
440
Mirror Plug
455
420
232
414
200
432
456
Edge Layer
454
Exhaust Jet
434
436
416
300

FIGURE 2

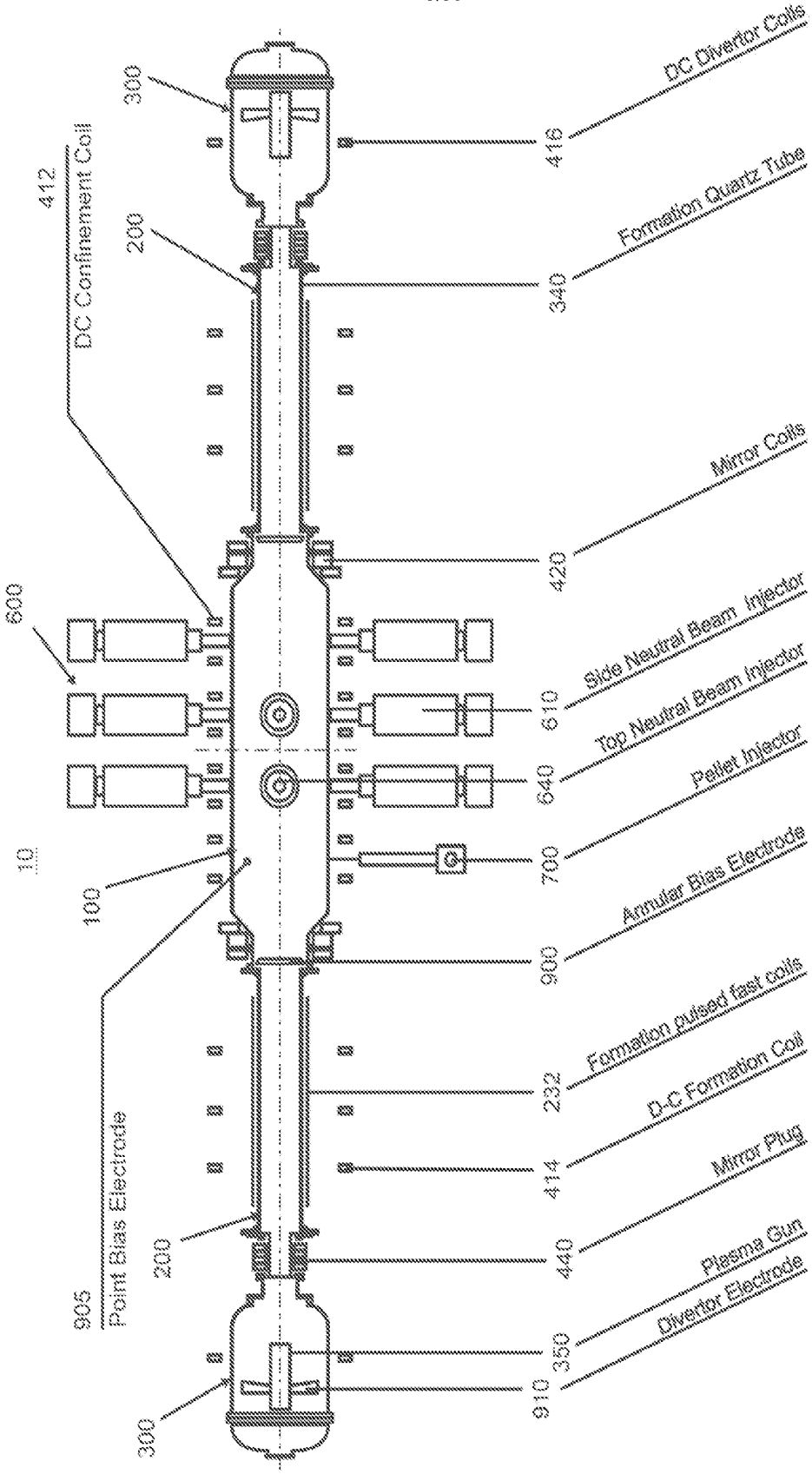

10
100
200
200
300
300
412
DC Confinement Coil
600
905
Point Bias Electrode
416
DC Divertor Coils
340
Formation Quartz Tube
420
Mirror Coils
610
Side Neutral Beam Injector
640
Top Neutral Beam Injector
700
Pellet Injector
900
Annular Bias Electrode
232
Formation pulsed fast coils
414
D-C Formation Coil
440
Mirror Plug
350
Plasma Gun
910
Divertor Electrode

FIGURE 3A

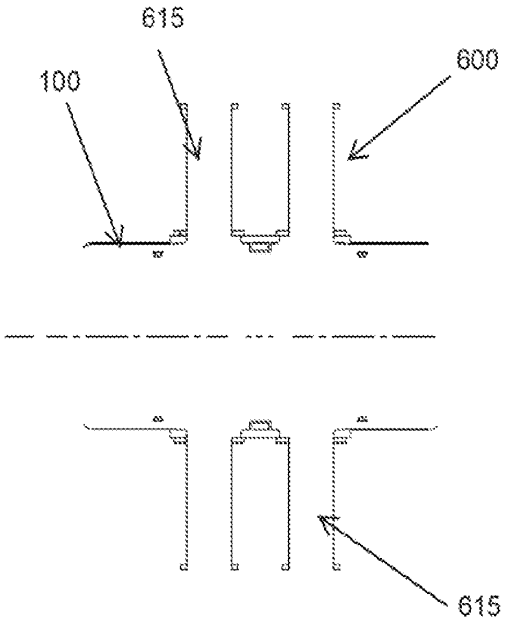


FIGURE 3B

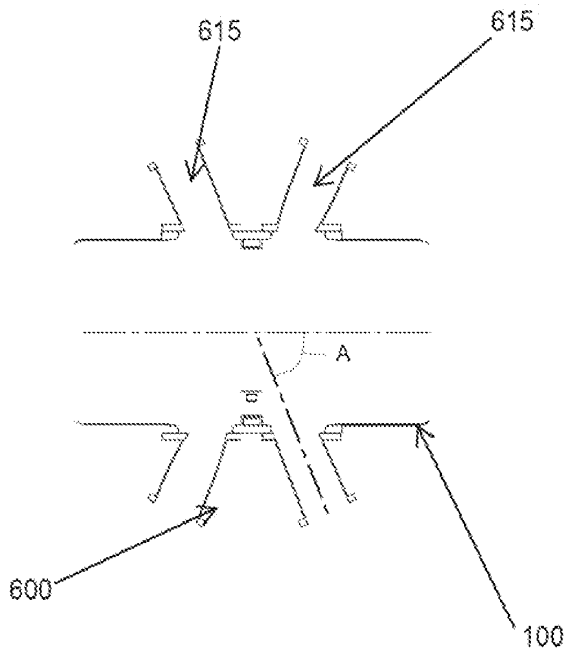


FIGURE 3C

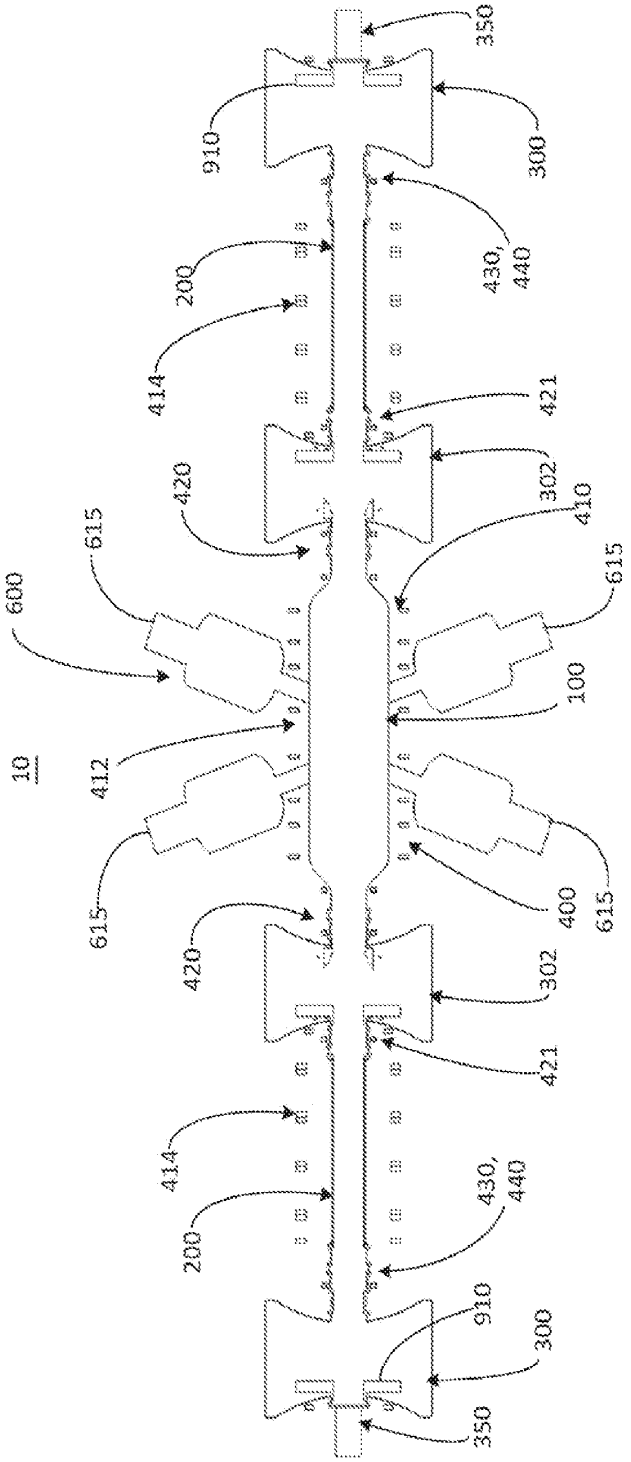

10
600
615
412
615
420
414
200
910
350
300
430,
440
421
302
410
100
400

FIGURE 3D

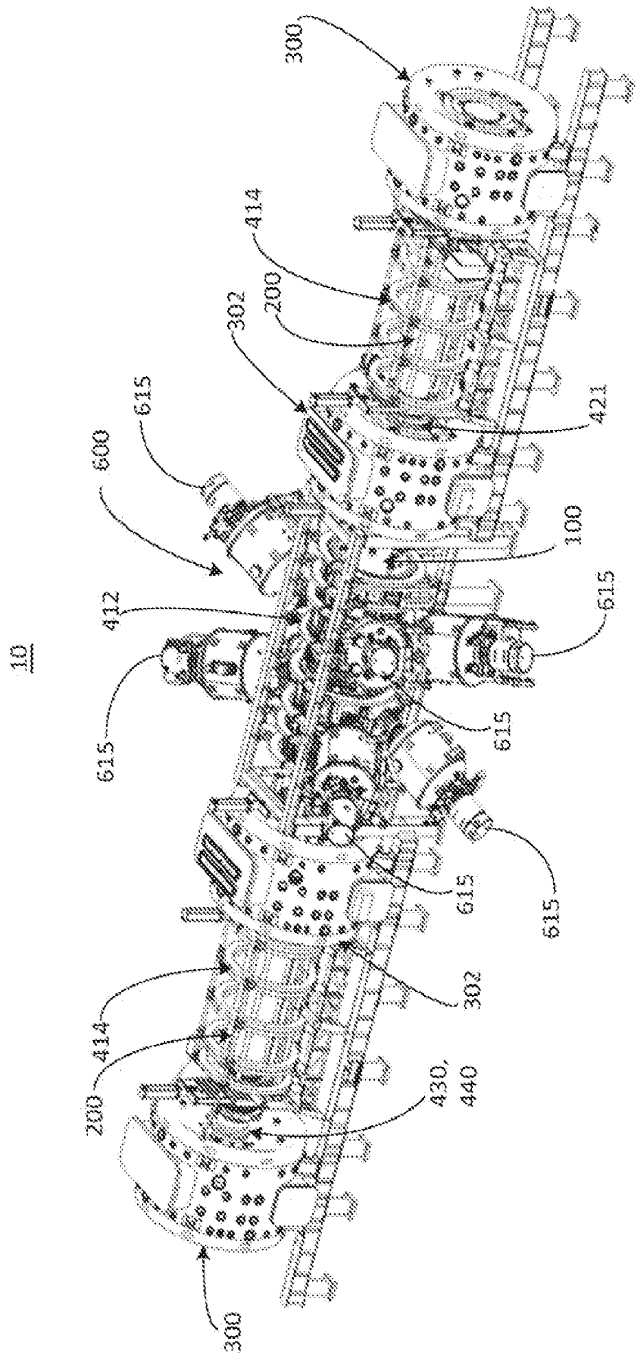

10
300
414
302
200
615
600
421
100
412
615
615
615
615
615
302
414
200
430,
440
300

FIGURE 3E

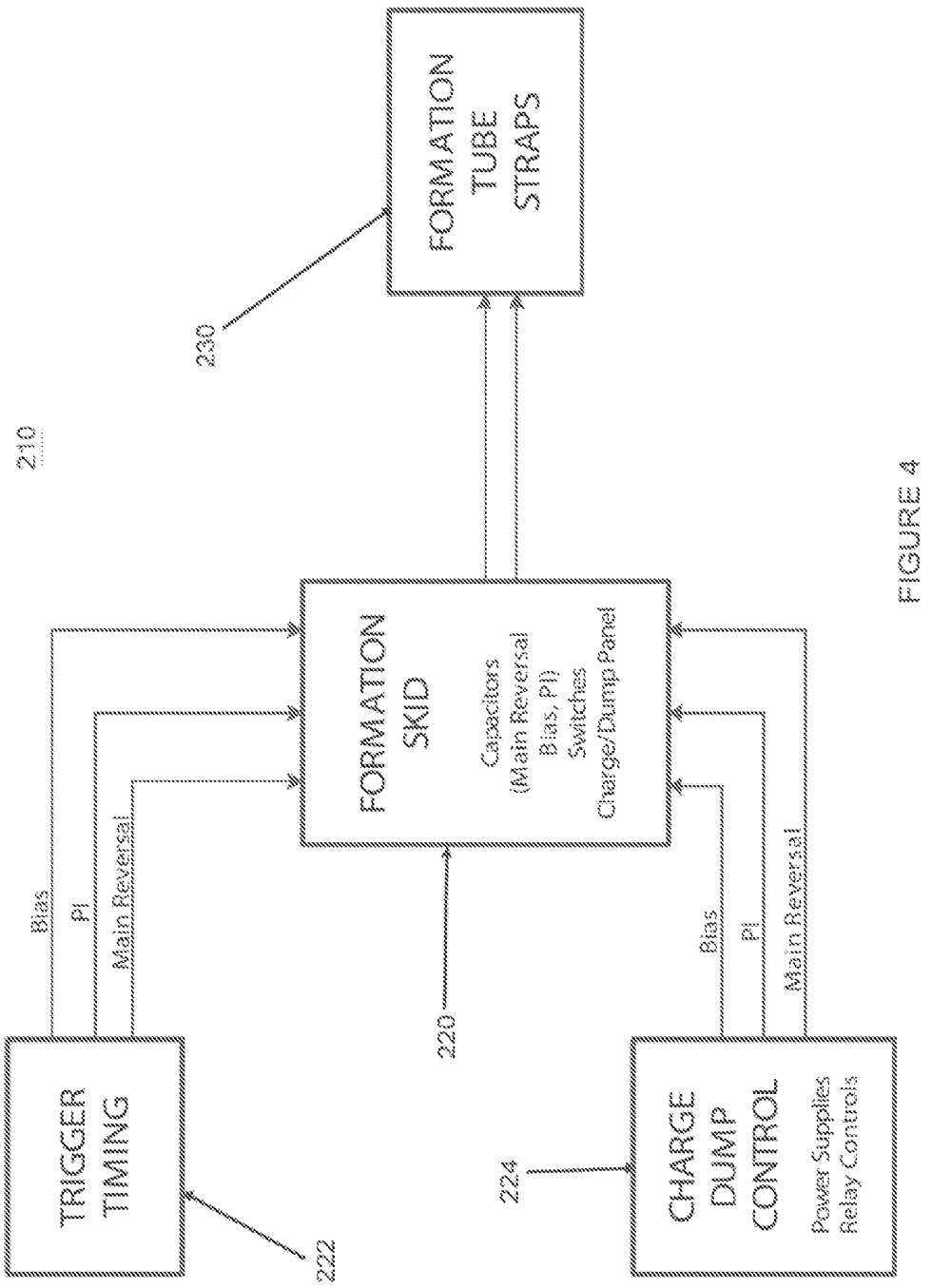

FORMATION TUBE STRAPS
230
210
FORMATION SKID
Capacitors
(Main Reversal
Bias, PI)
Switches
Charge/Dump Panel
220
Bias
PI
Main Reversal
TRIGGER TIMING
222
224
CHARGE DUMP CONTROL
Power Supplies
Relay Controls

FIGURE 4

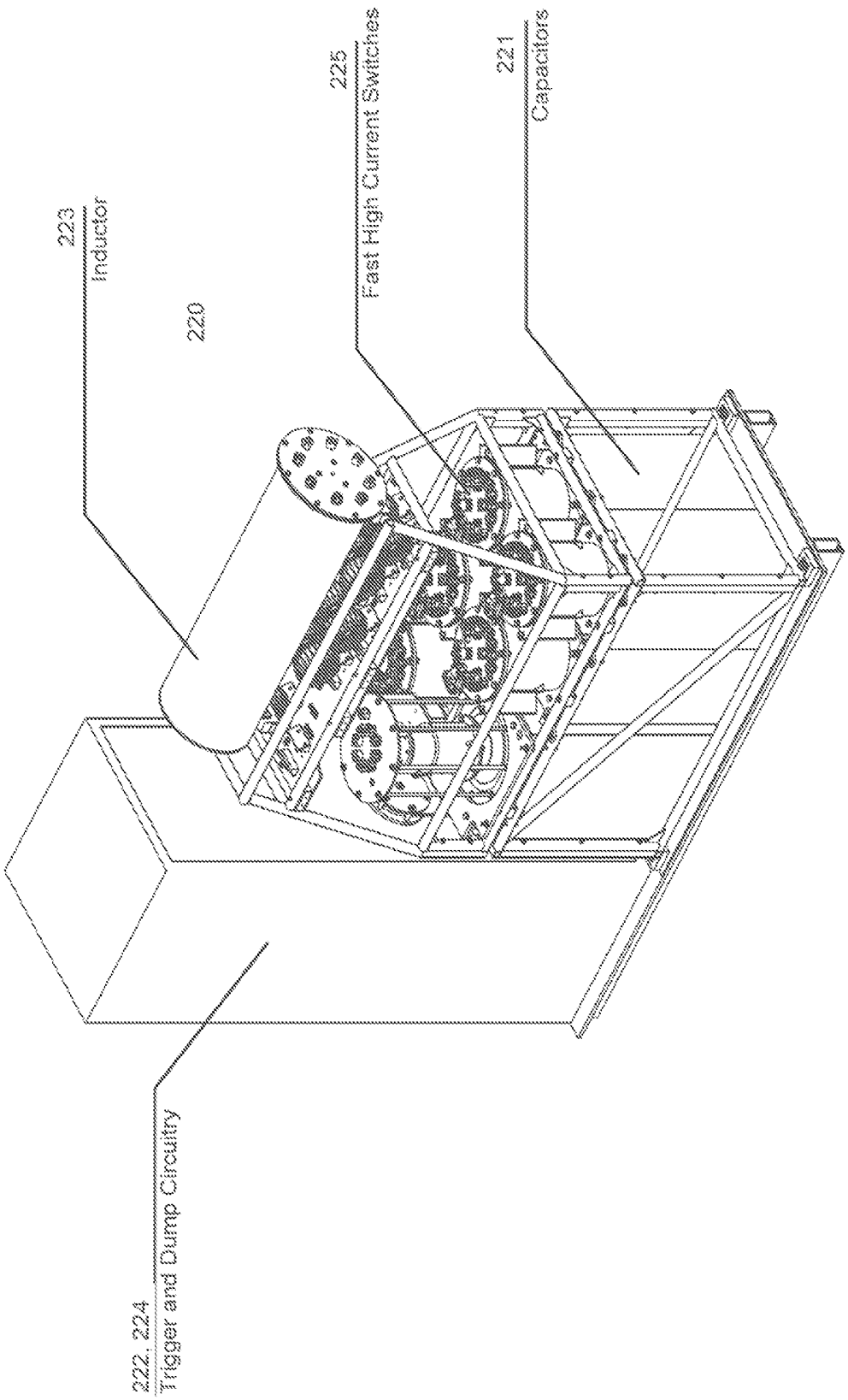

223
Inductor
220
225
Fast High Current Switches
221
Capacitors
222, 224
Trigger and Dump Circuitry

FIGURE 5

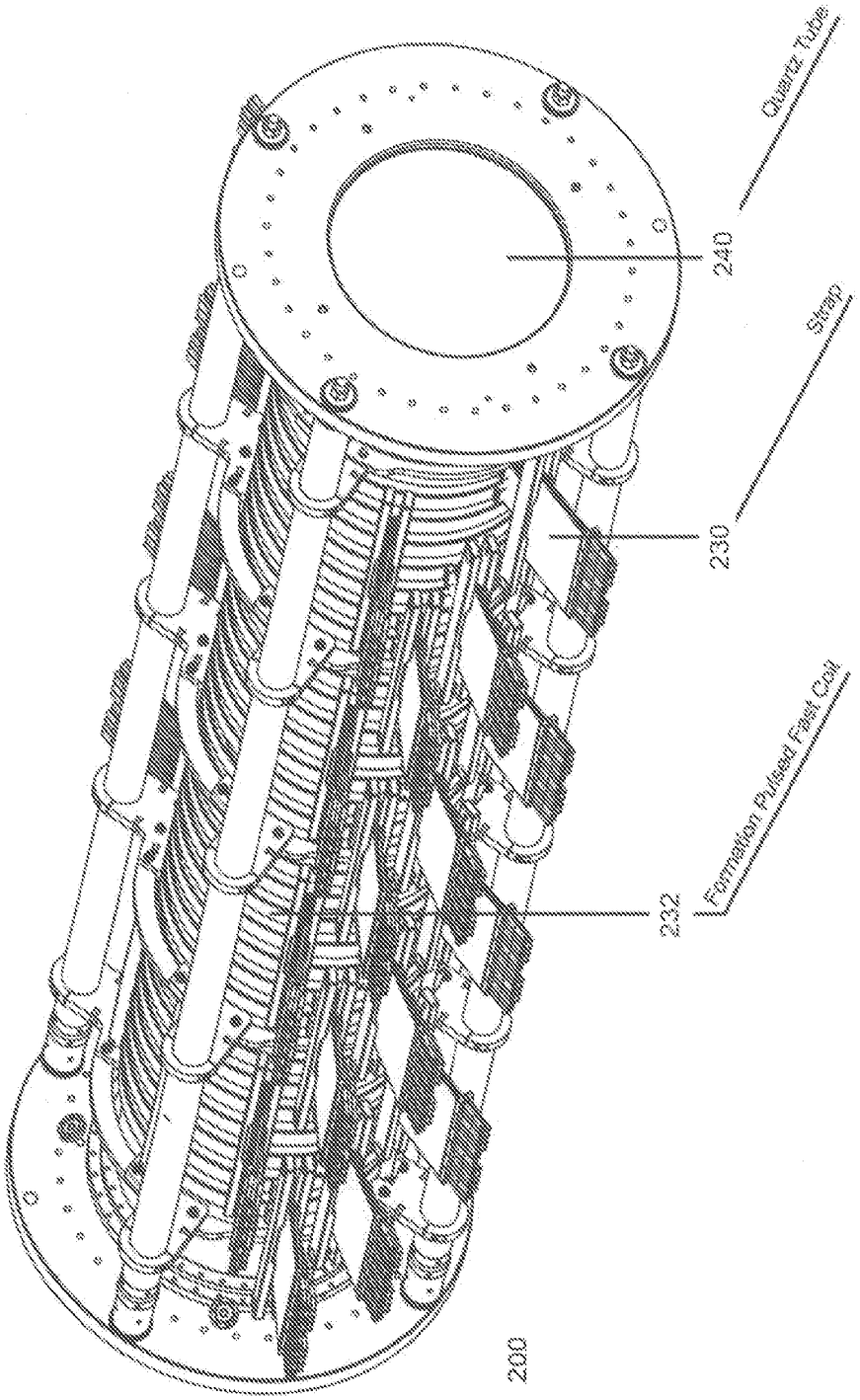

Quartz Tube
240
Strap
230
Formation Pulsed Field Coil
232
200

FIGURE 6

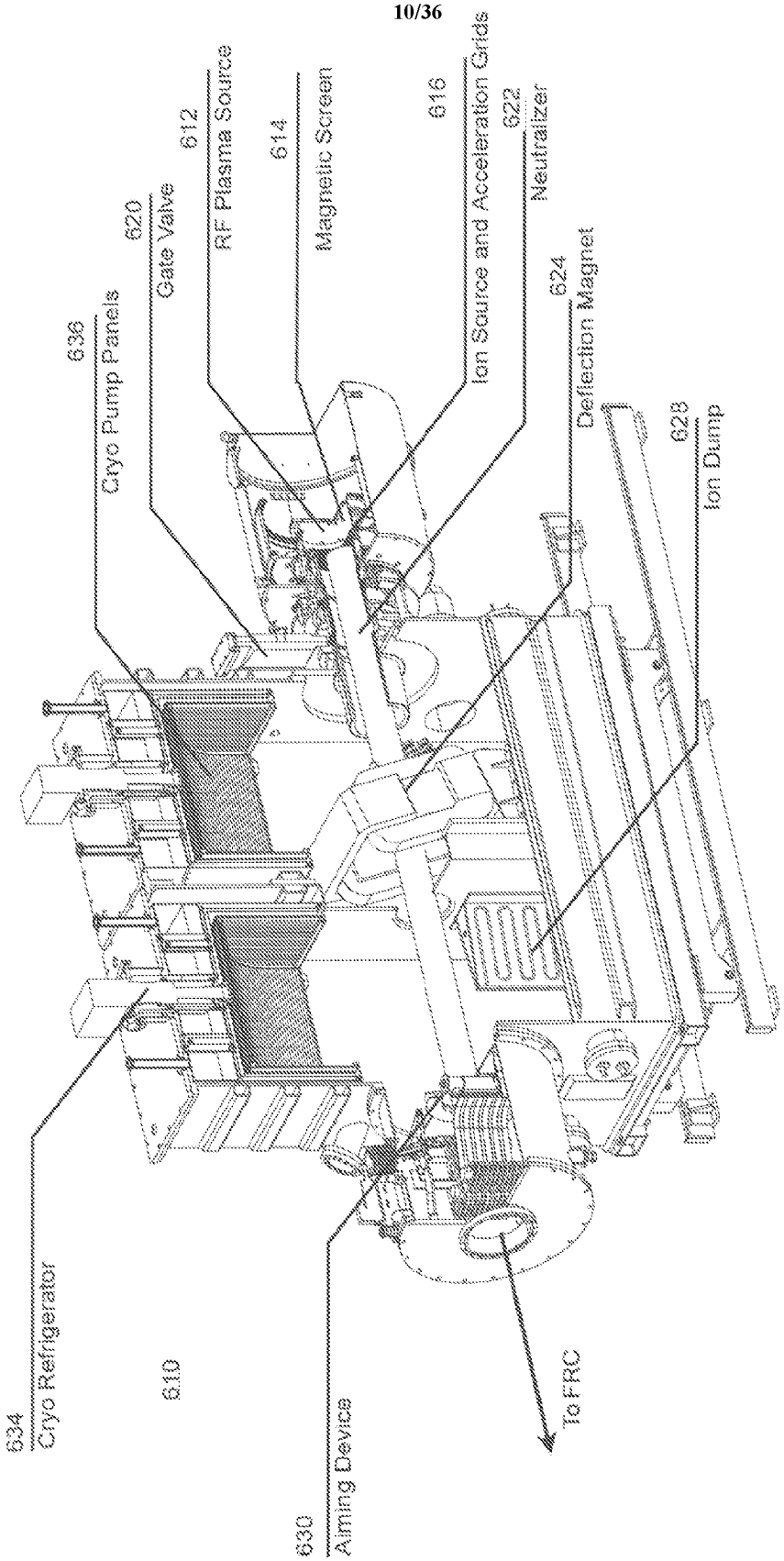

634
Cryo Refrigerator
636
Cryo Pump Panels
620
Gate Valve
612
RF Plasma Source
614
Magnetic Screen
616
Ion Source and Acceleration Grids
622
Neutralizer
624
Deflection Magnet
628
Ion Dump
610
630
Aiming Device
To FRC

FIGURE 7

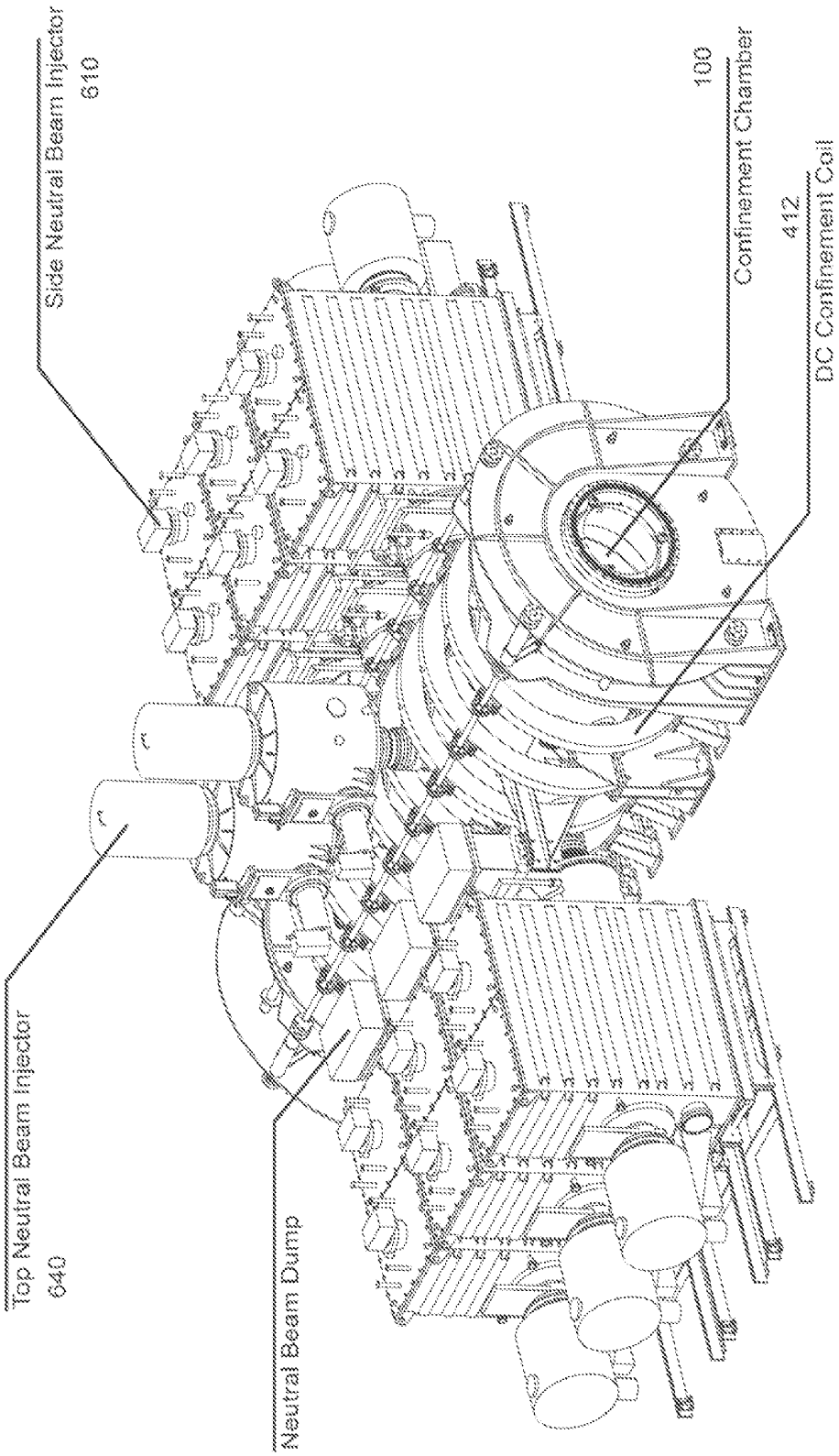

Side Neutral Beam Injector
610
100
Confinement Chamber
412
DC Confinement Coil
Top Neutral Beam Injector
640
Neutral Beam Dump

FIGURE 8

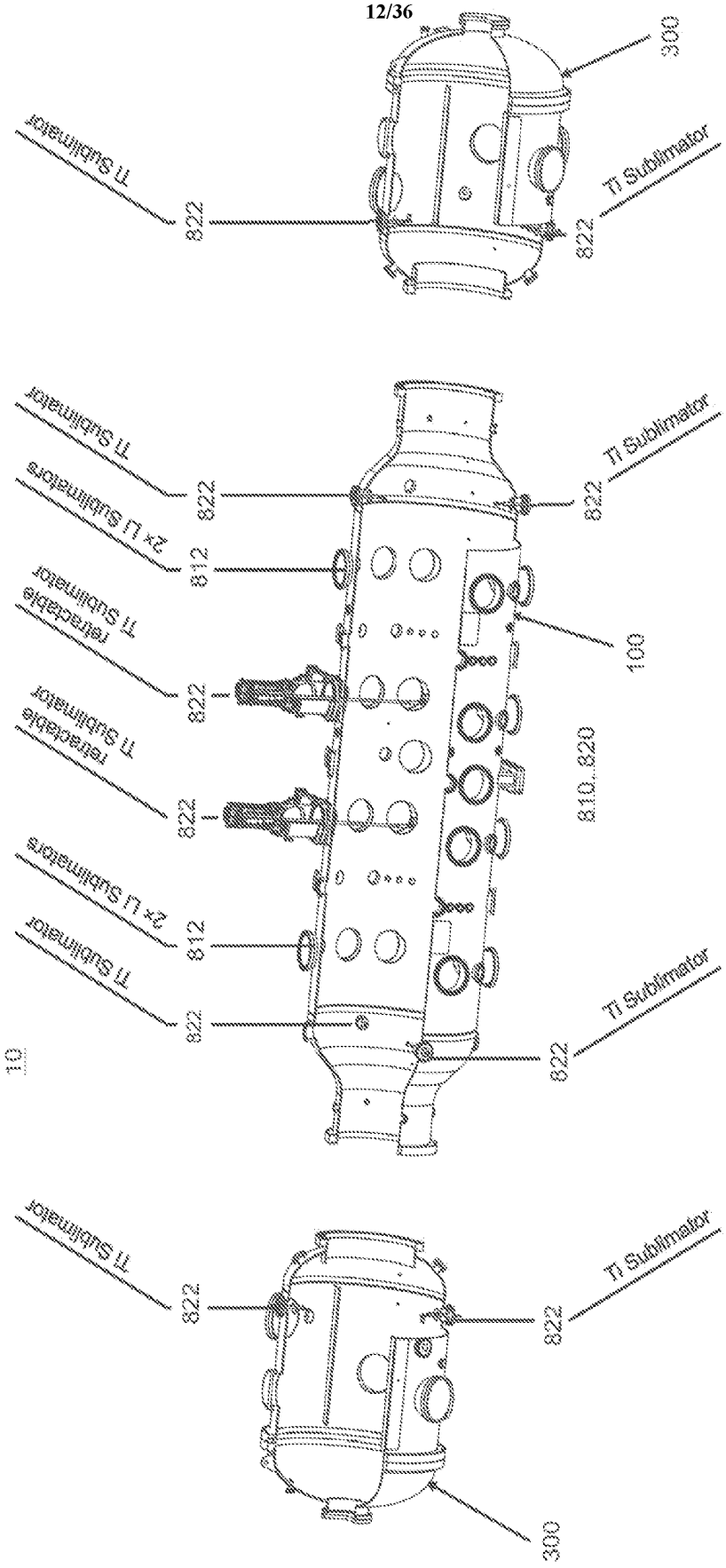

Ti Sublimator
822
Ti Sublimator
822
300
Ti Sublimator
822
2x Li Sublimators
812
Retractable Ti Sublimator
822
Retractable Ti Sublimator
822
2x Li Sublimators
812
Ti Sublimator
822
Ti Sublimator
822
100
810, 820
10
Ti Sublimator
822
Ti Sublimator
822
300

FIGURE 9

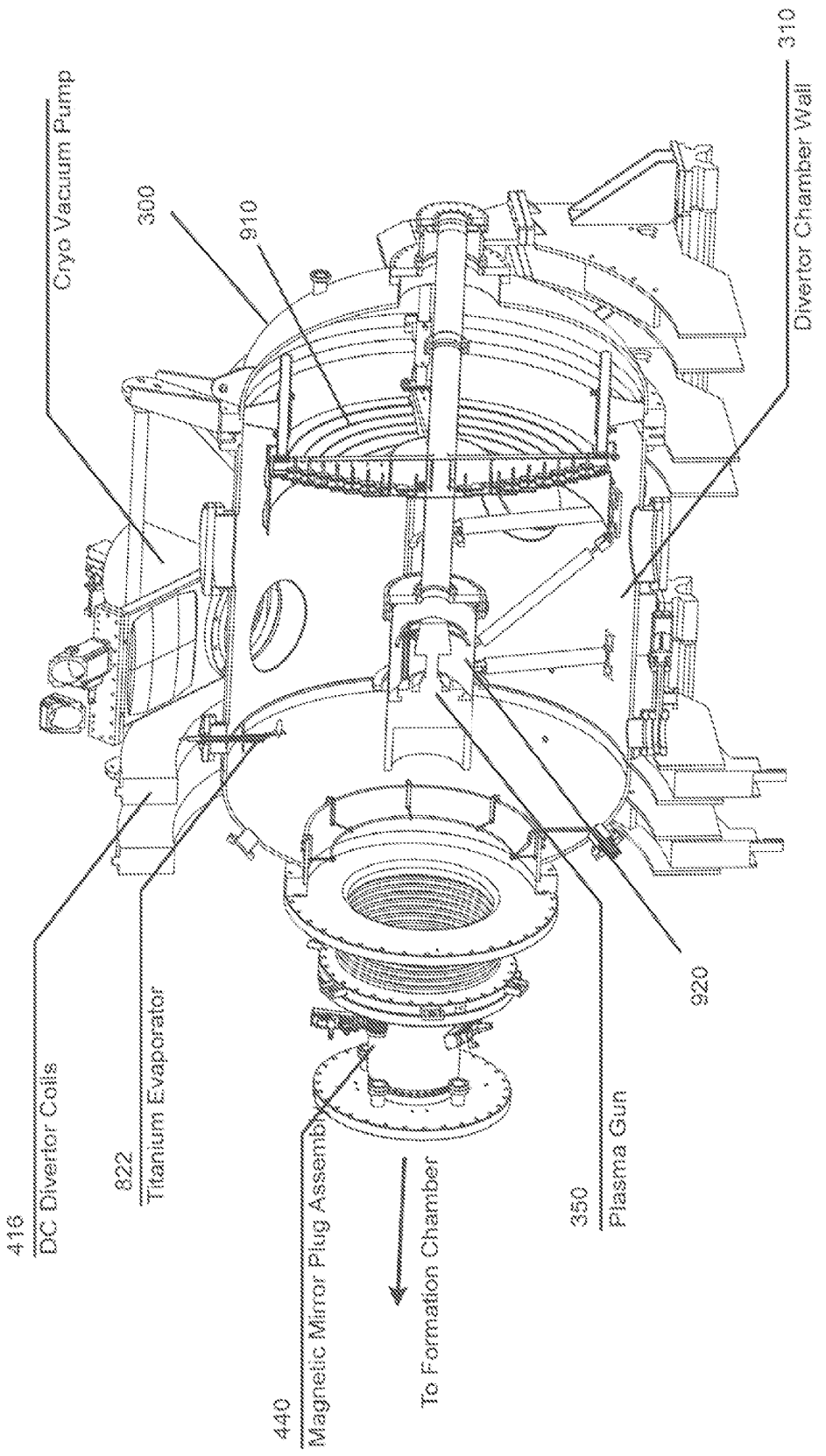

Cryo Vacuum Pump
300
910
310
Divertor Chamber Wall
920
416
DC Divertor Coils
822
Titanium Evaporator
440
Magnetic Mirror Plug Assembly
To Formation Chamber
350
Plasma Gun

FIGURE 10

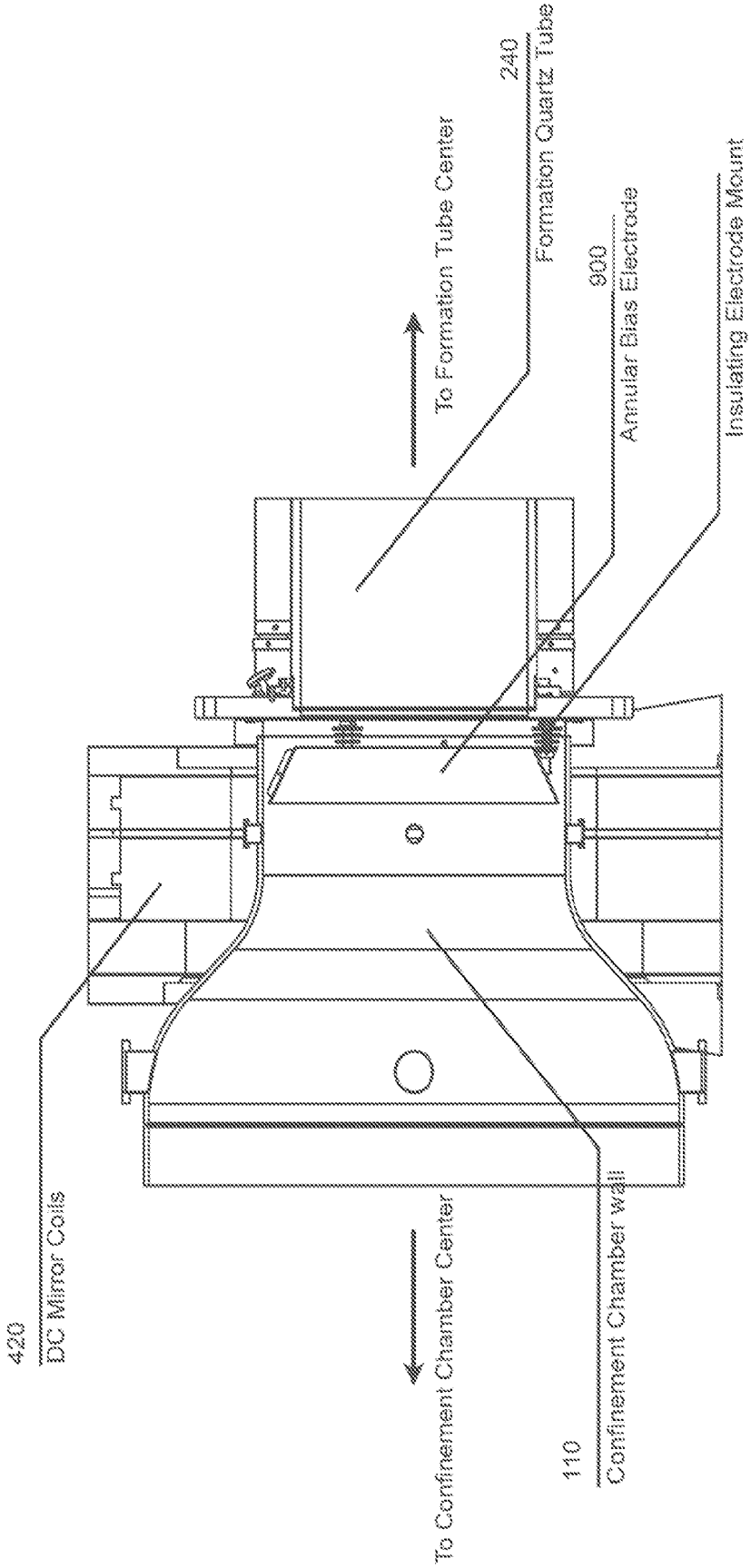

240
Formation Quartz Tube
To Formation Tube Center
900
Annular Bias Electrode
Insulating Electrode Mount
420
DC Mirror Coils
To Confinement Chamber Center
110
Confinement Chamber wall

FIGURE 11

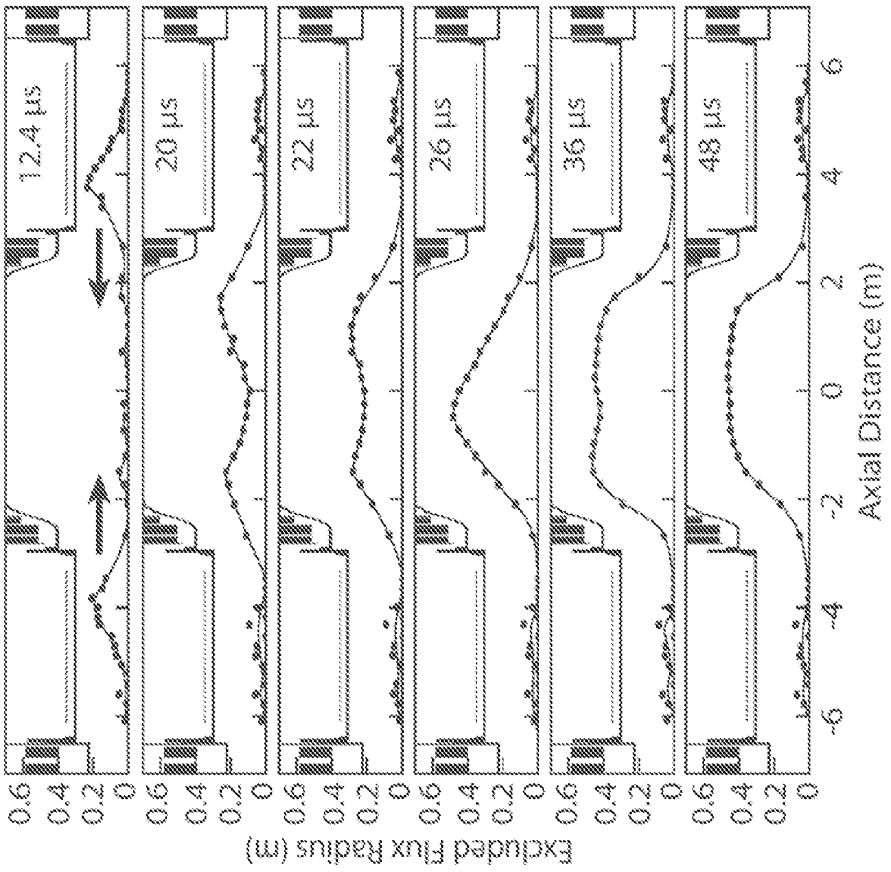

12.4 µs
20 µs
22 µs
26 µs
36 µs
48 µs
Excluded Flux Radius (m)
0.6
0.4
0.2
0
-6
-4
-2
0
2
4
6
Axial Distance (m)

FIGURE 12

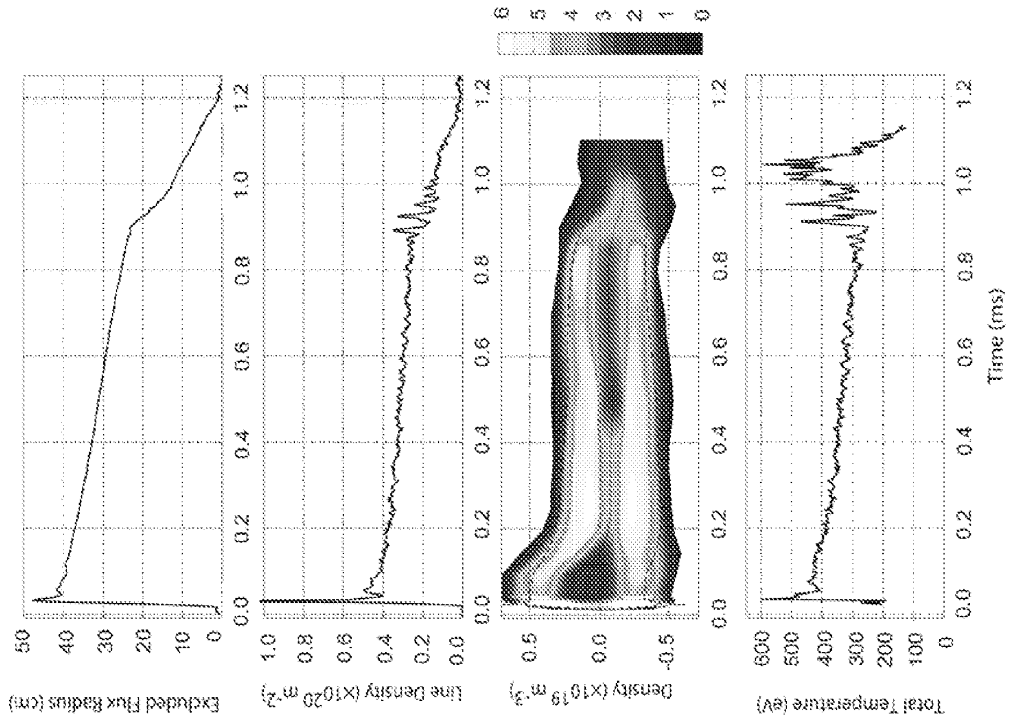


FIGURE 13A

FIGURE 13B

FIGURE 13C

FIGURE 13D

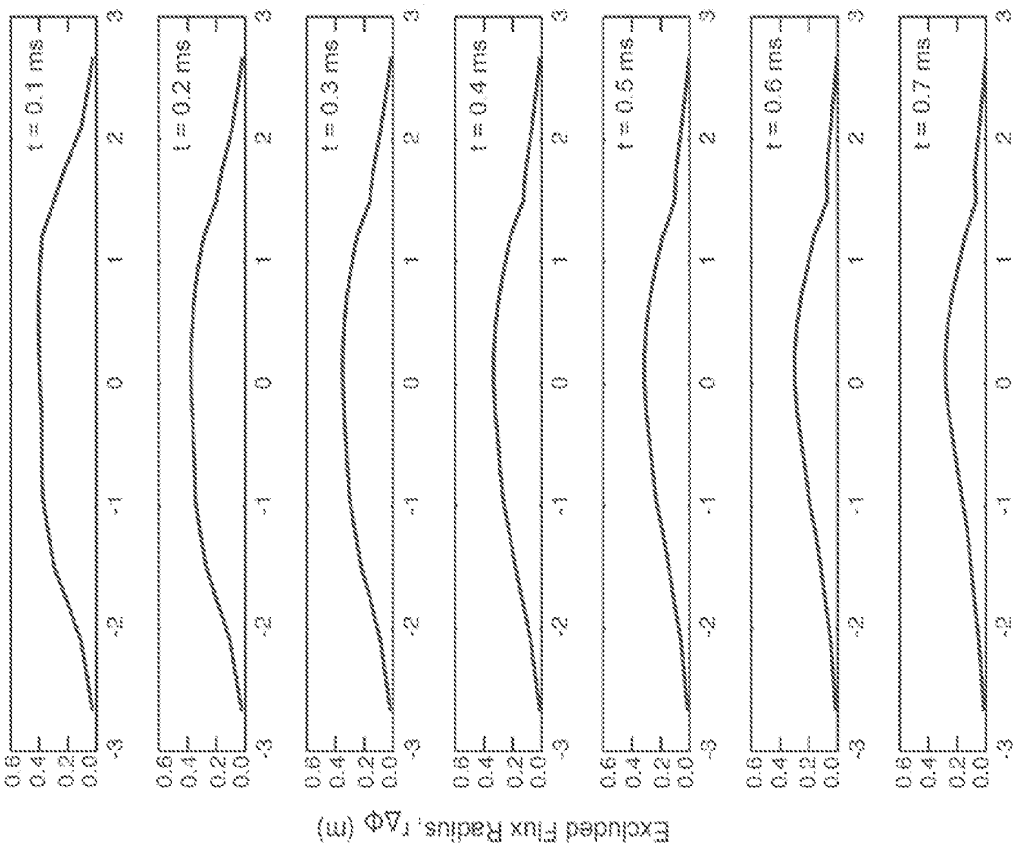

t = 0.1 ms
t = 0.2 ms
t = 0.3 ms
t = 0.4 ms
t = 0.5 ms
t = 0.6 ms
t = 0.7 ms
Excluded Flux Radius, $r_{\Delta\Phi}$ (m)
Axial Position, z (m)

FIGURE 14

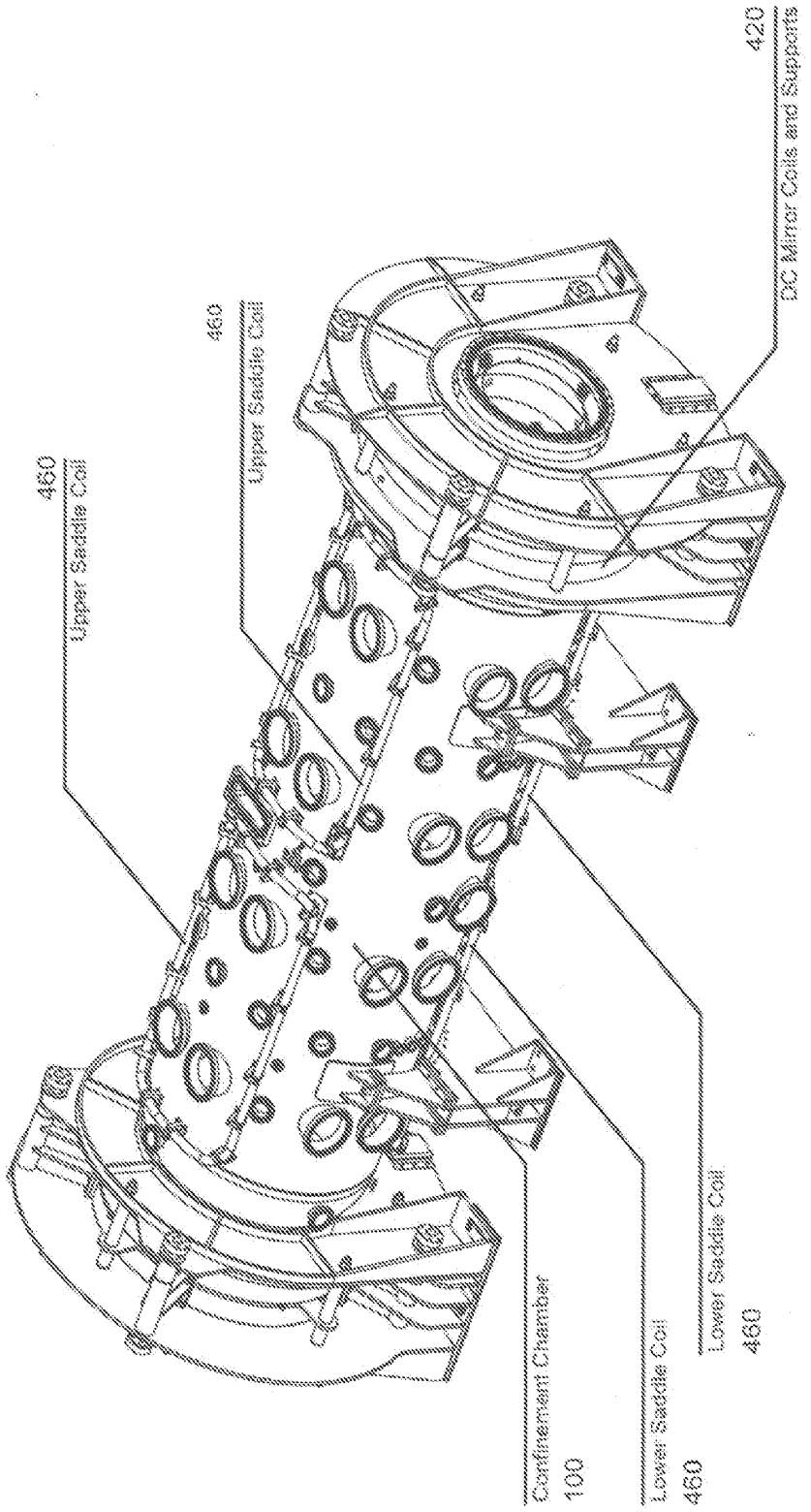

460
Upper Saddle Coil
460
Upper Saddle Coil
420
DC Mirror Coils and Supports
Confinement Chamber
100
Lower Saddle Coil
460
Lower Saddle Coil
460

FIGURE 15

FIGURE 16A

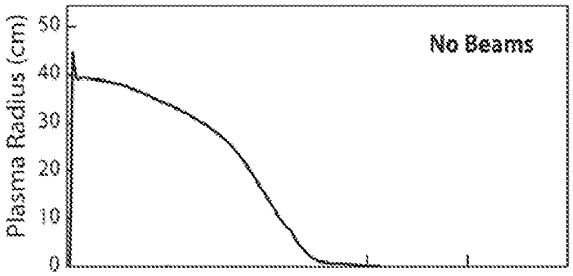


FIGURE 16B

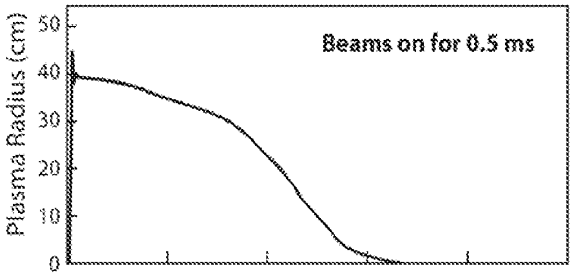


FIGURE 16C

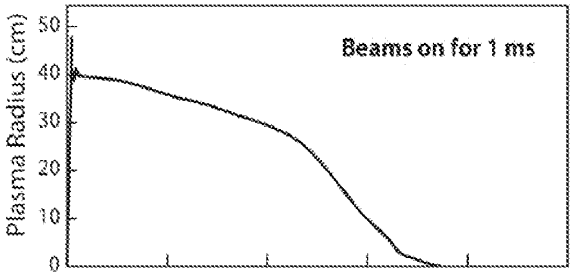


FIGURE 16D

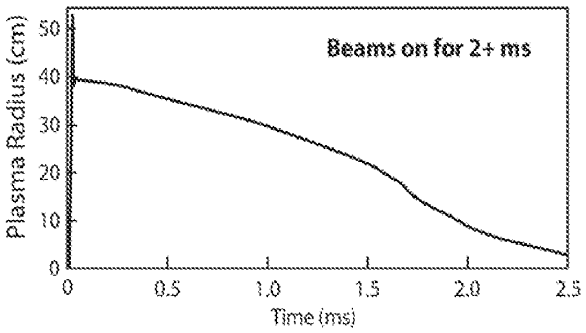


FIGURE 17A

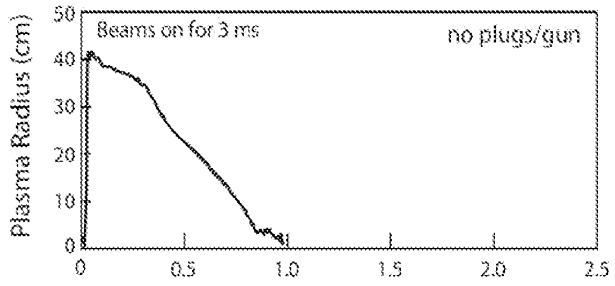


FIGURE 17B

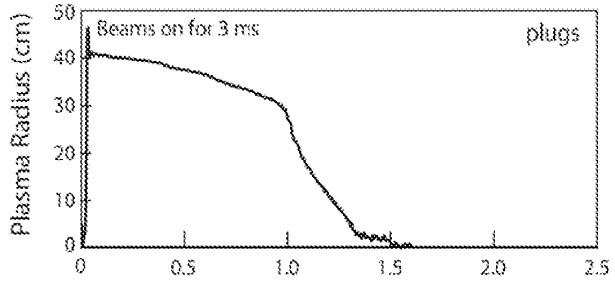


FIGURE 17C

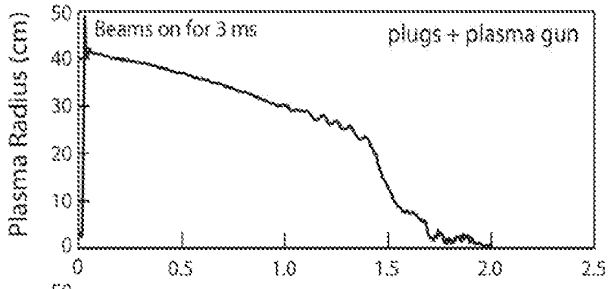


FIGURE 17D

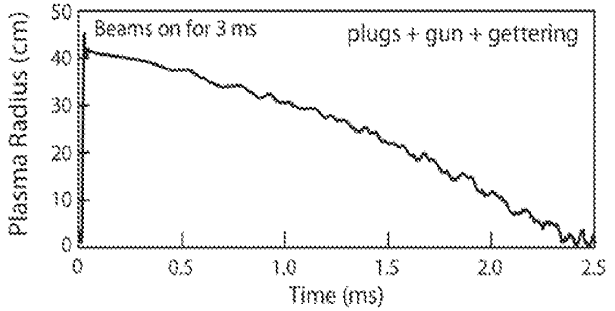
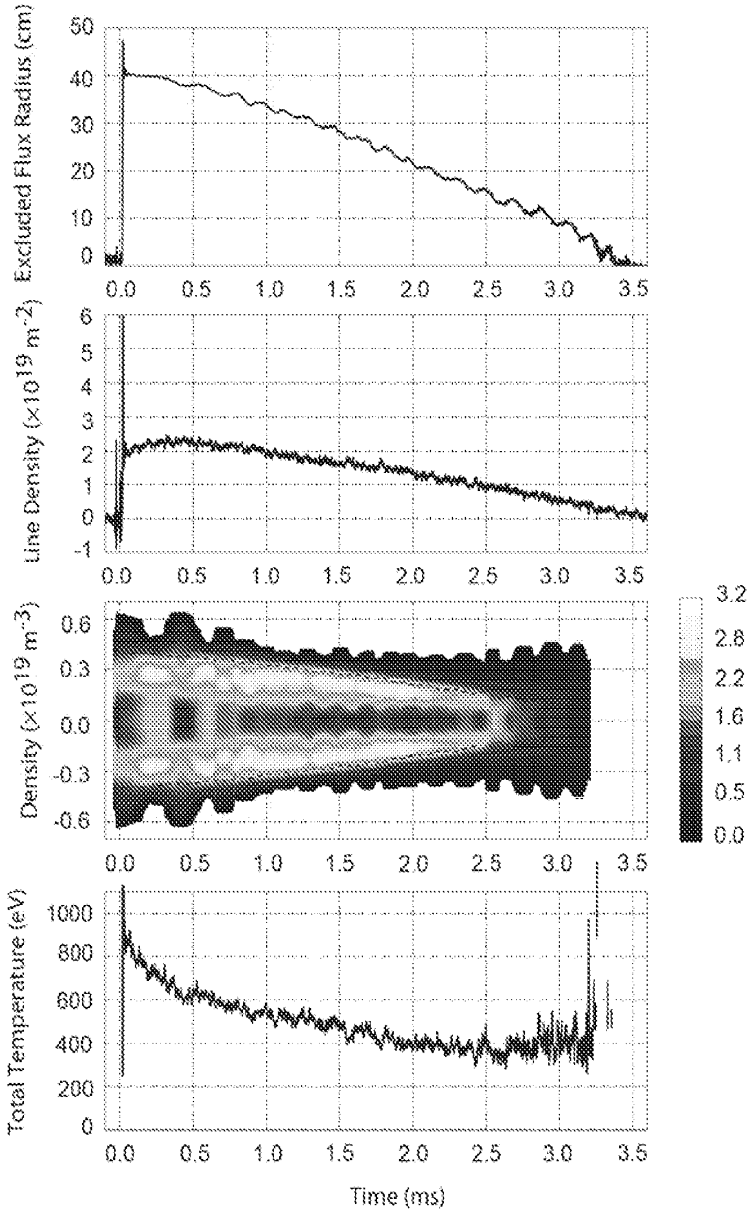


FIGURE 18A

FIGURE 18B

FIGURE 18C

FIGURE 18D



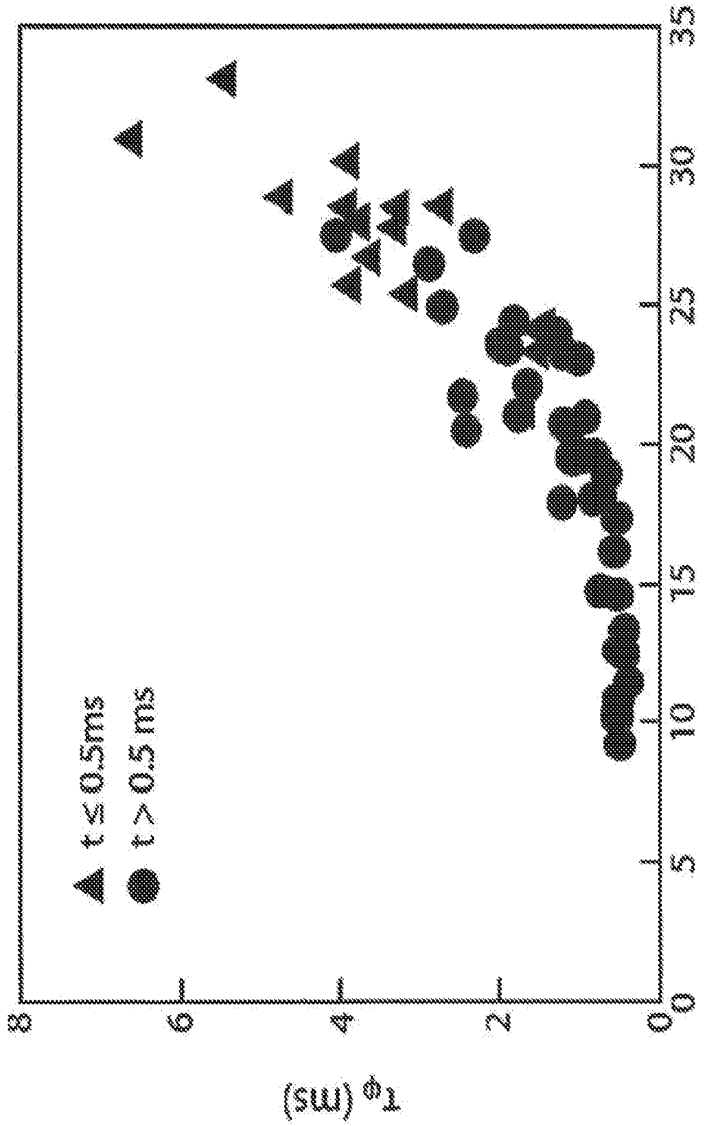


FIGURE 19

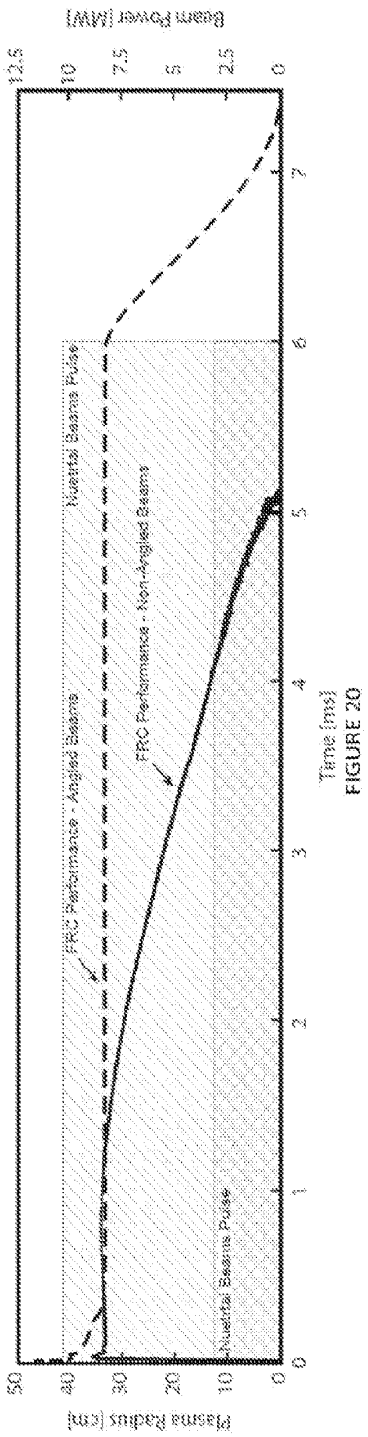


FIGURE 20

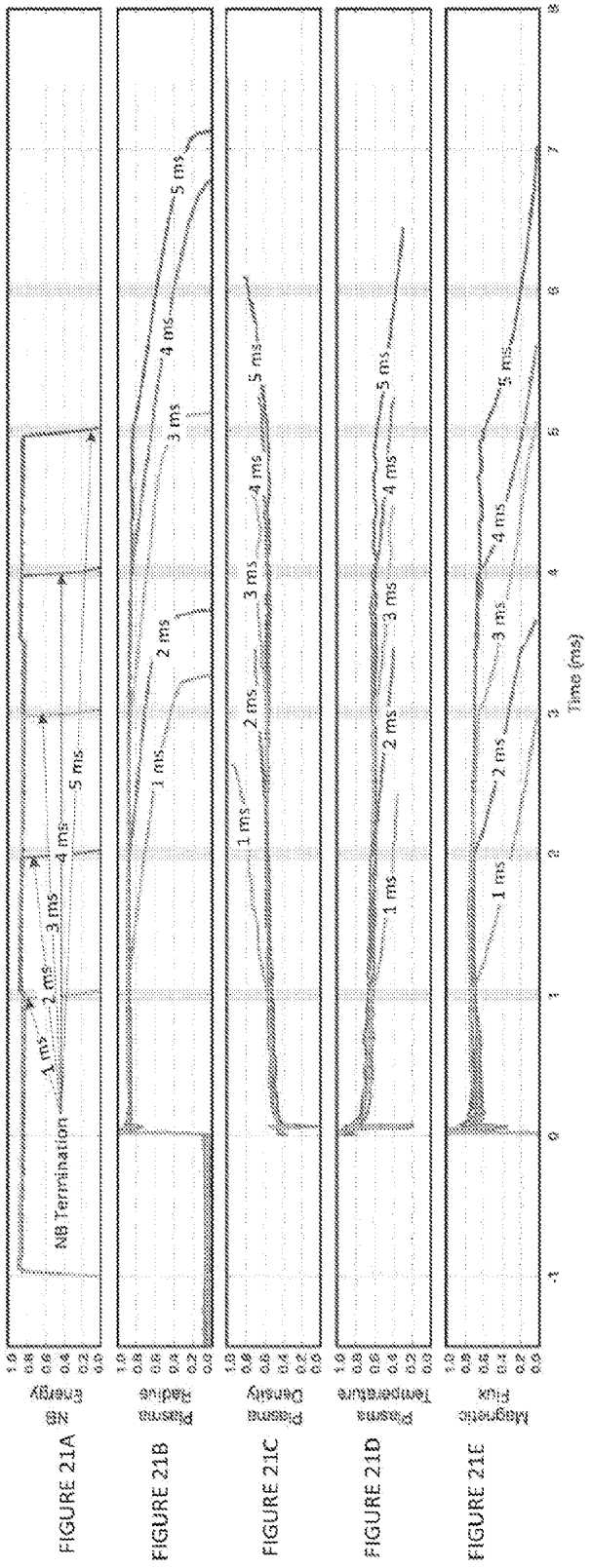


FIGURE 21A

FIGURE 21B

FIGURE 21C

FIGURE 21D

FIGURE 21E

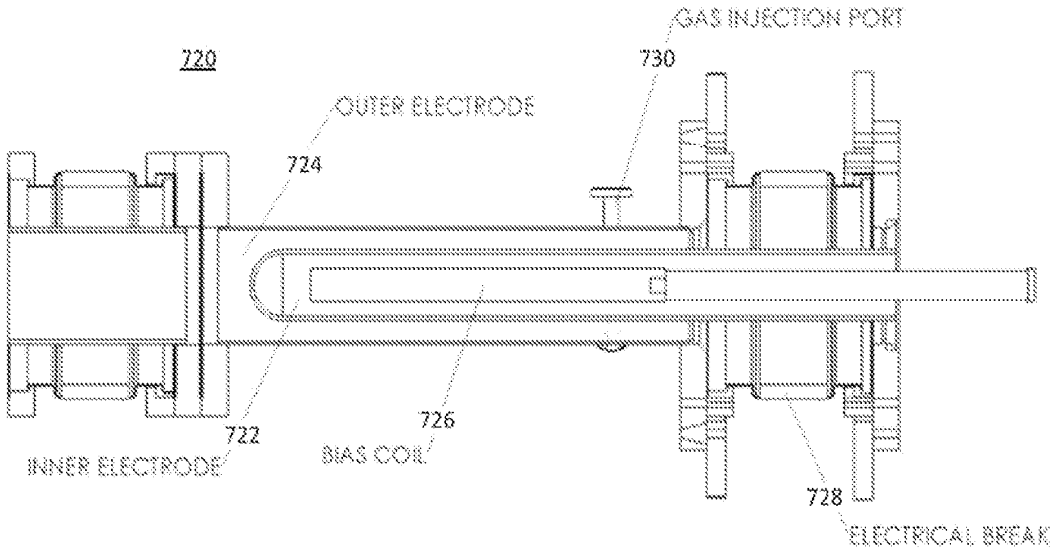


FIGURE 22A

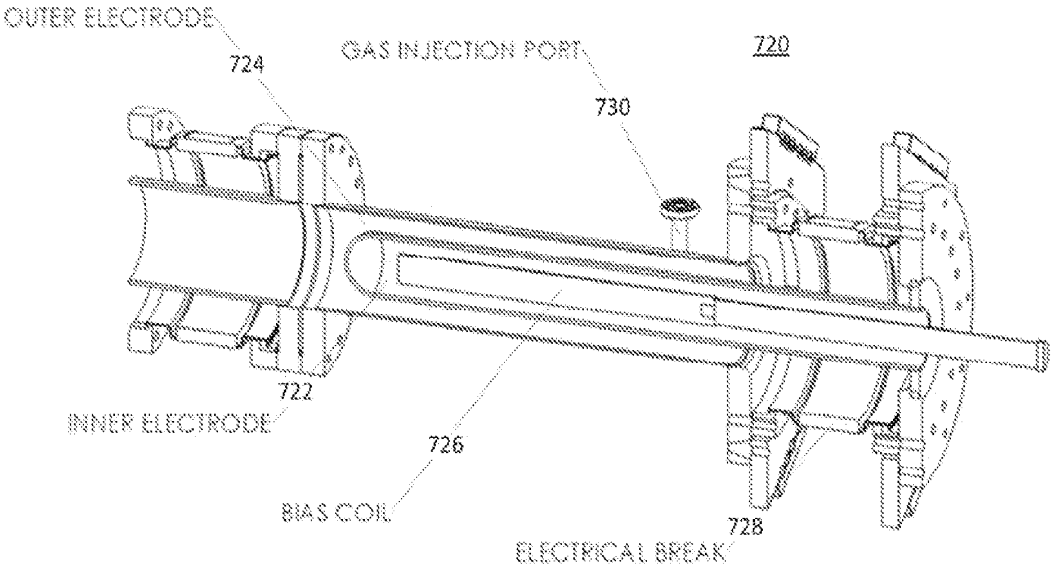


FIGURE 22B

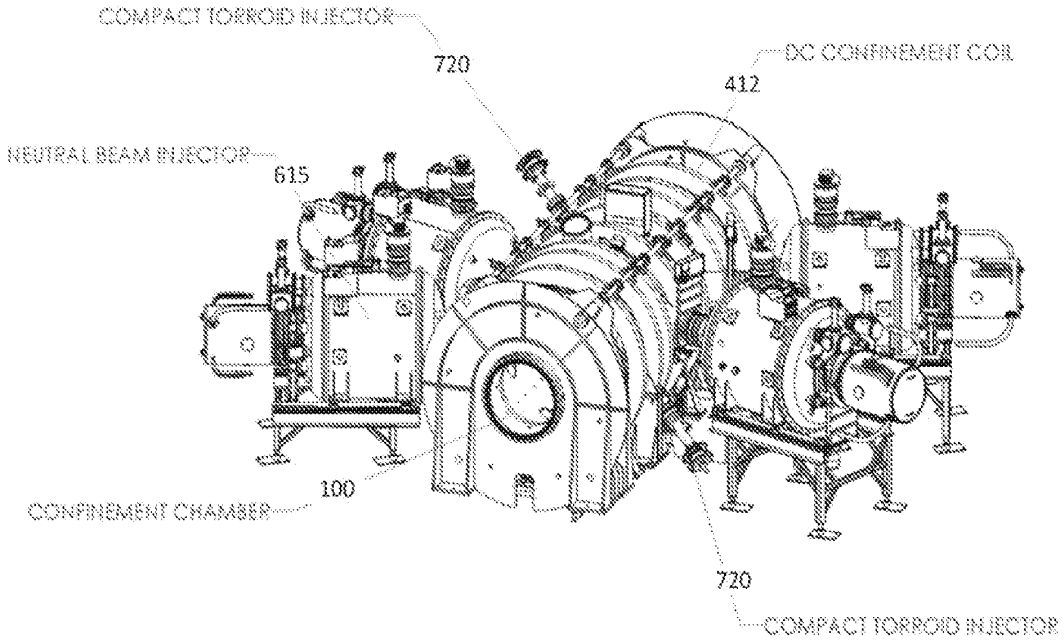


FIGURE 23A

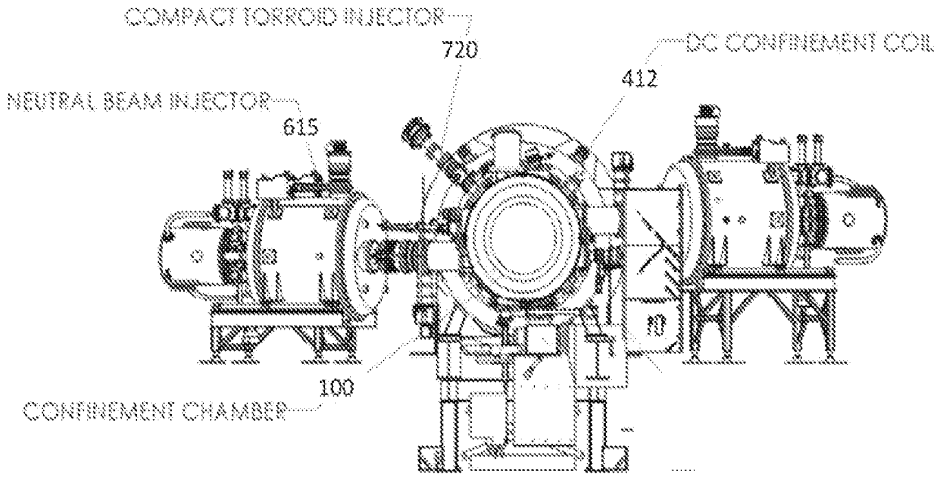


FIGURE 23B

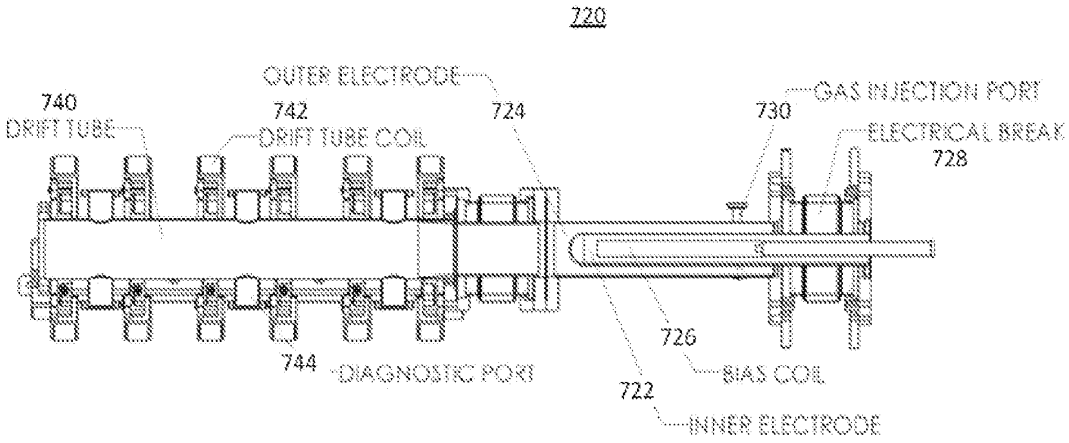


FIGURE 24A

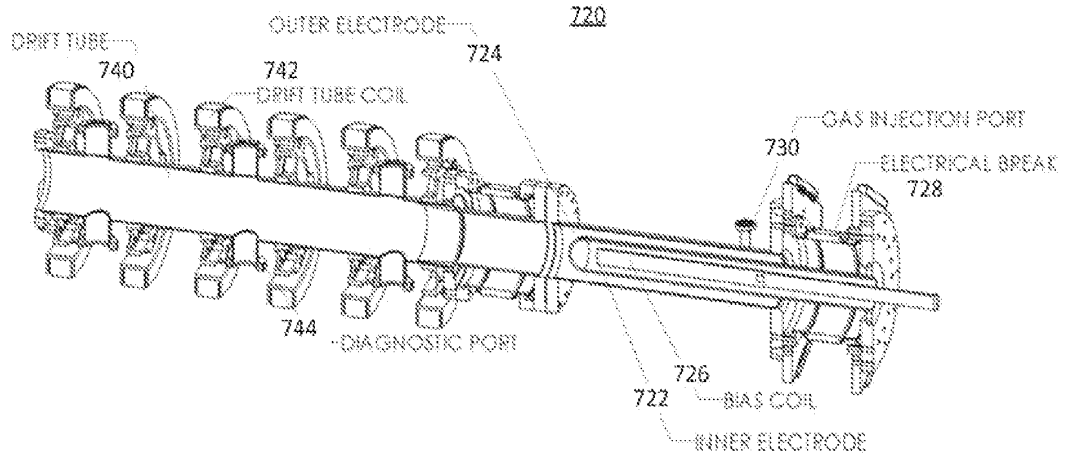


FIGURE 24B

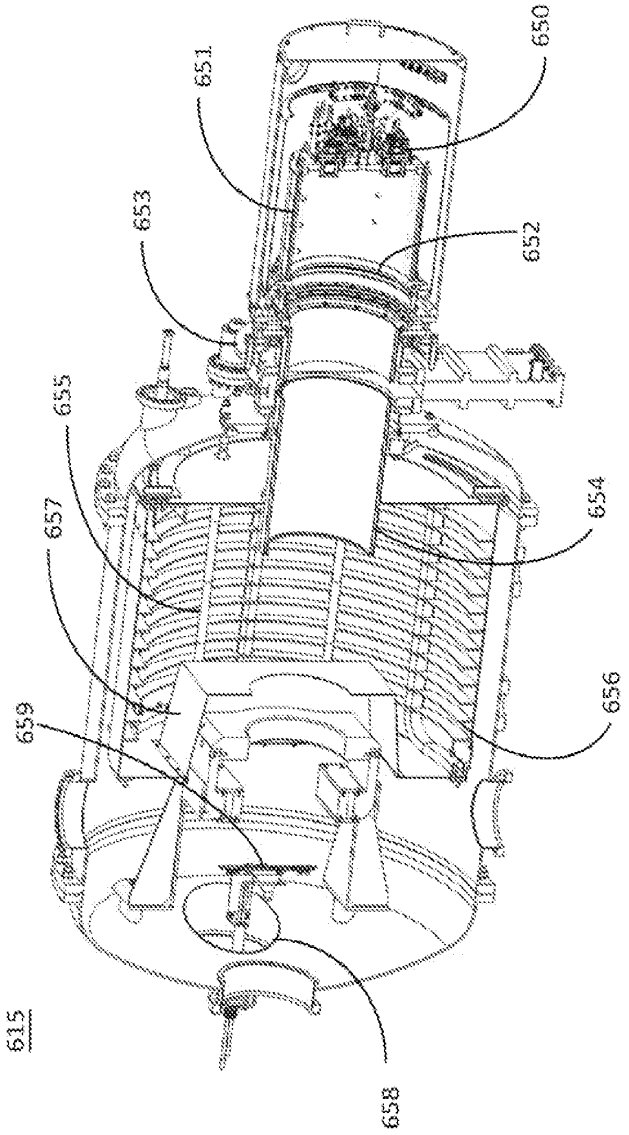


FIGURE 25

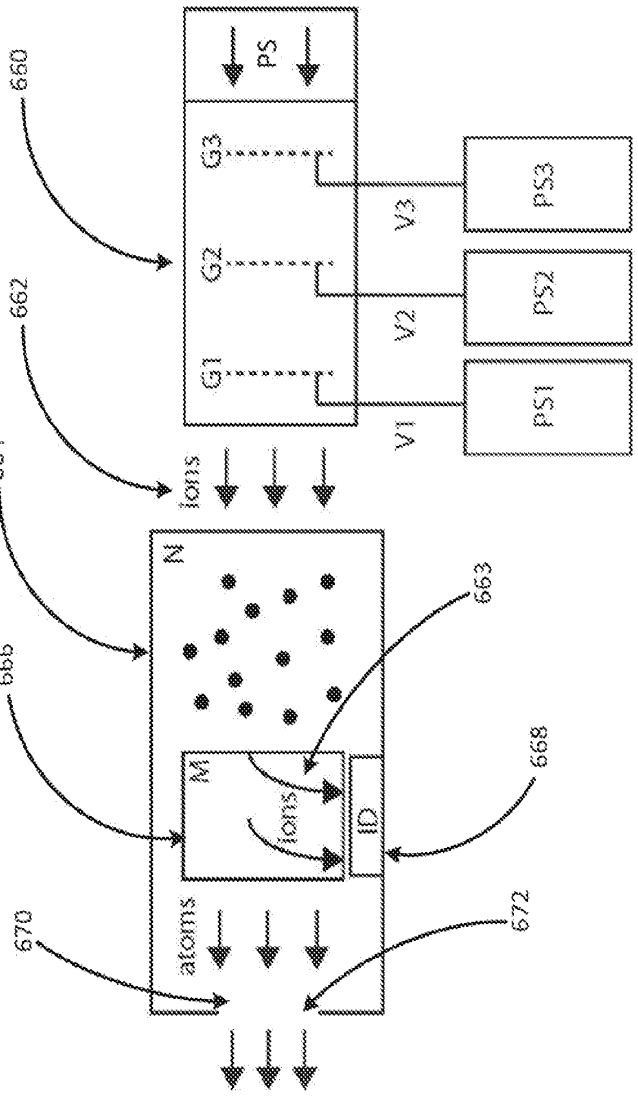

660
662
664
666
668
670
672
663
PS
G3
G2
G1
V3
V2
V1
PS3
PS2
PS1
ions
N
M
ions
ID
atoms

FIGURE 26

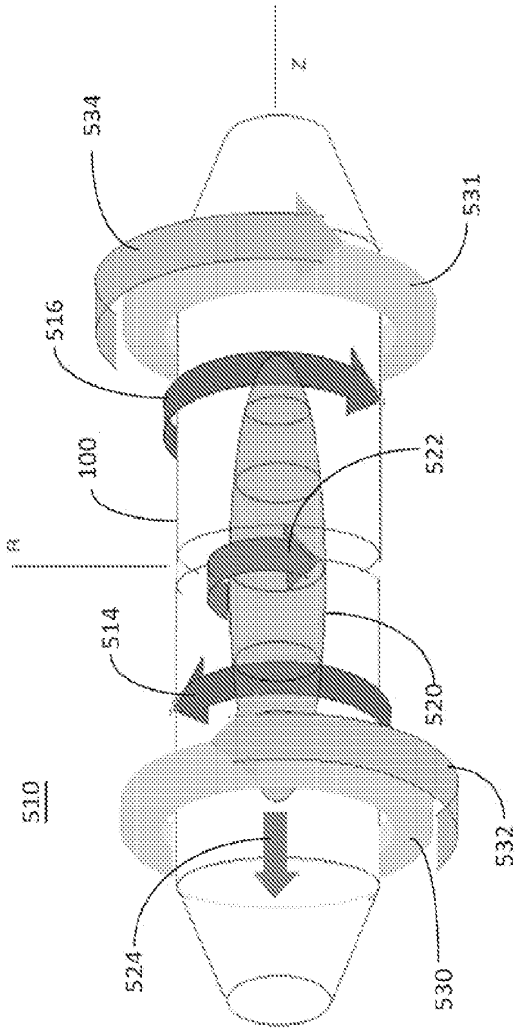


FIGURE 27

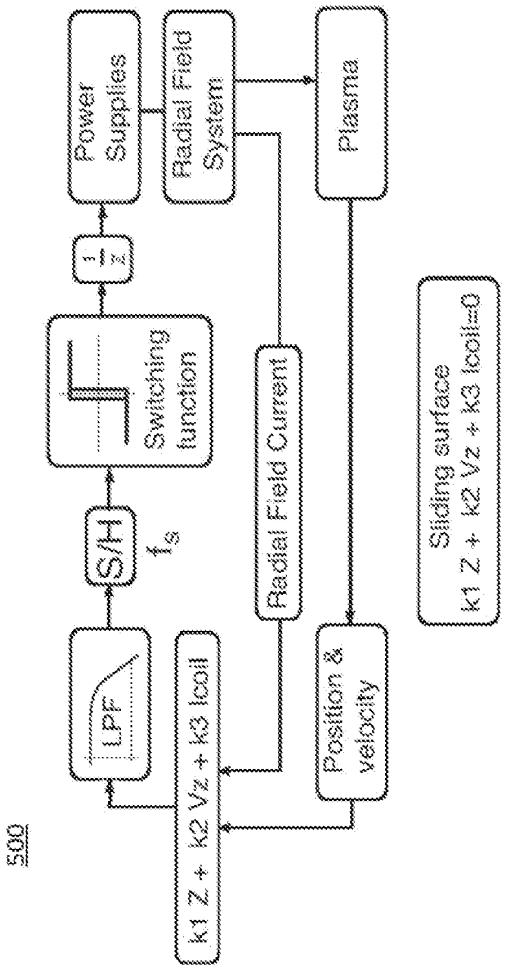

500
LPF
S/H
f_s
Switching function
$\frac{1}{z}$
Power Supplies
Radial Field System
Plasma
Radial Field Current
Position & velocity
k1 Z + k2 Vz + k3 Icoil
Sliding surface
k1 Z + k2 Vz + k3 Icoil=0

FIGURE 28

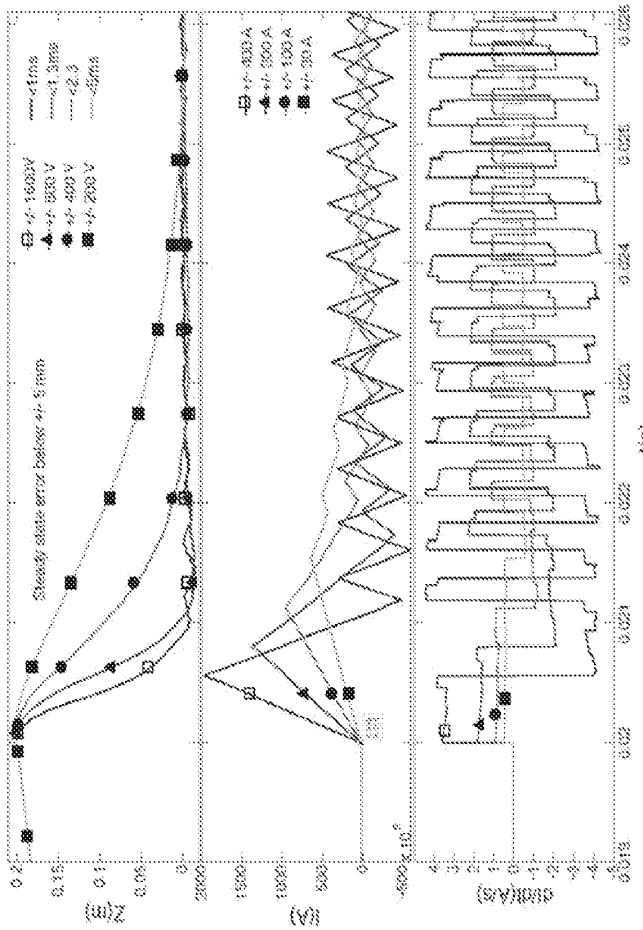


FIGURE 29

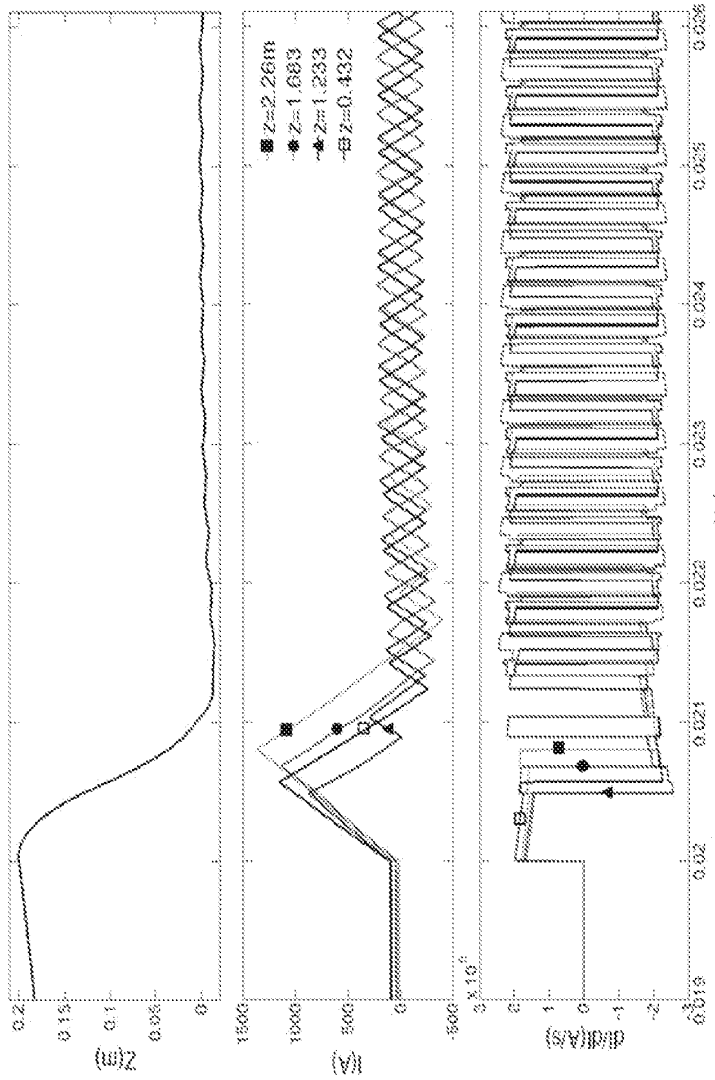


FIGURE 30

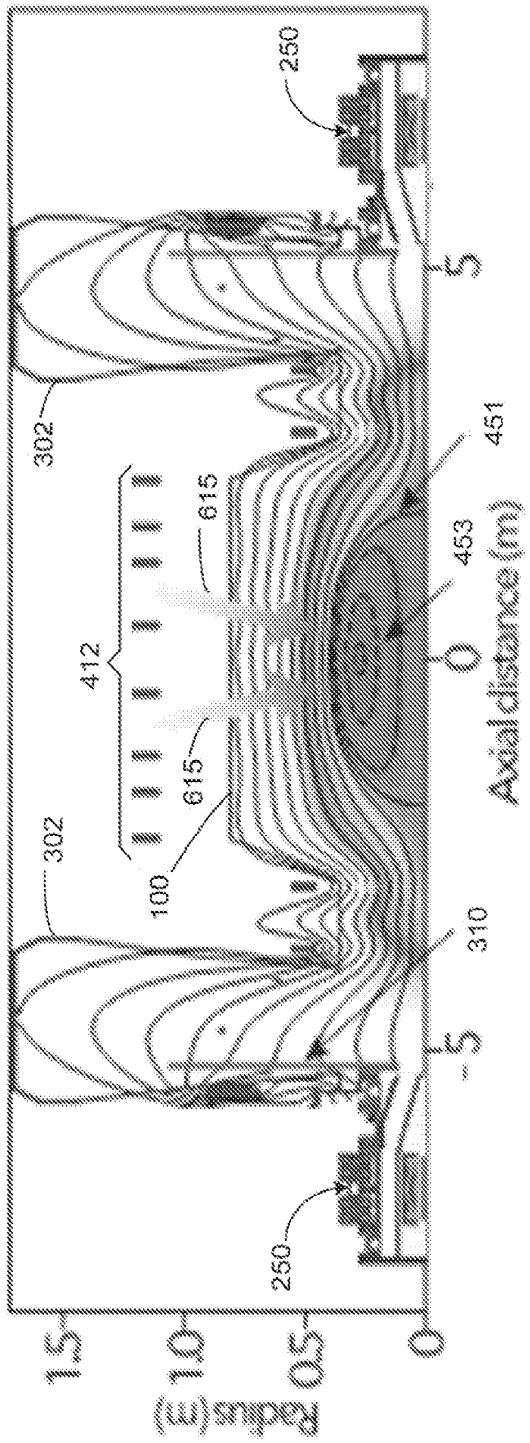

250
302
615
412
615
100
302
451
453
310
250
5
0
-5
Axial distance (m)
15
10
05
0
Radius (m)

FIGURE 31A

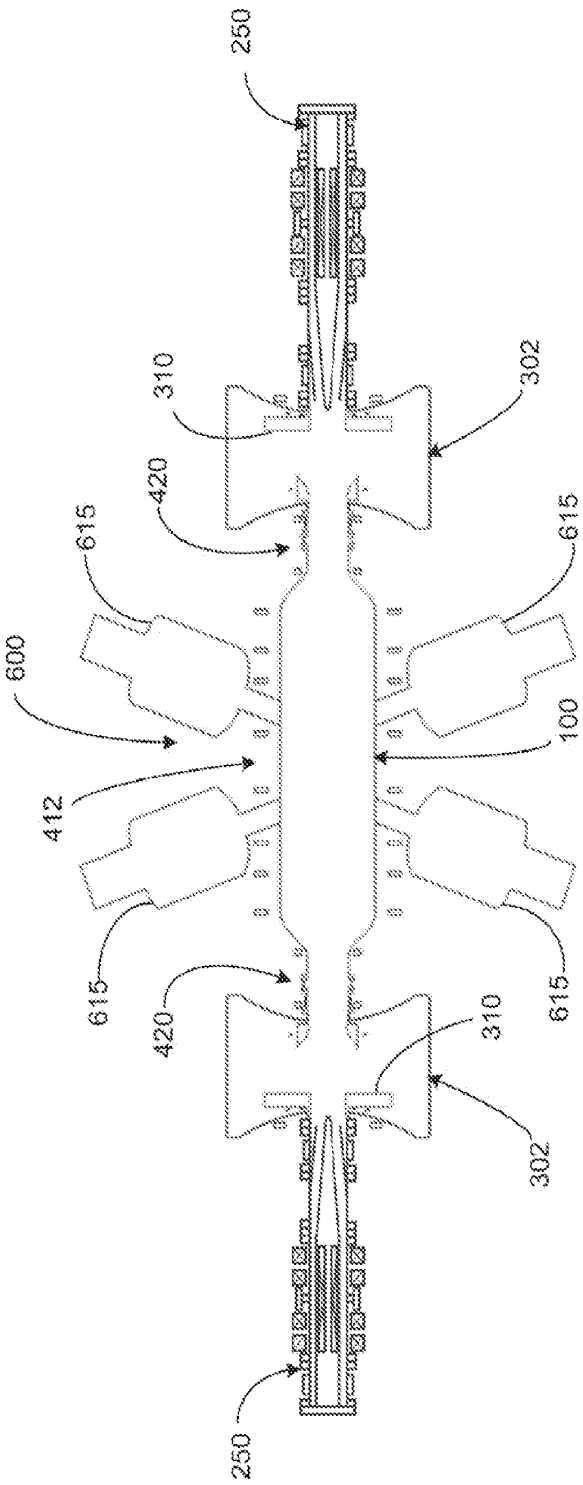


FIGURE 31B

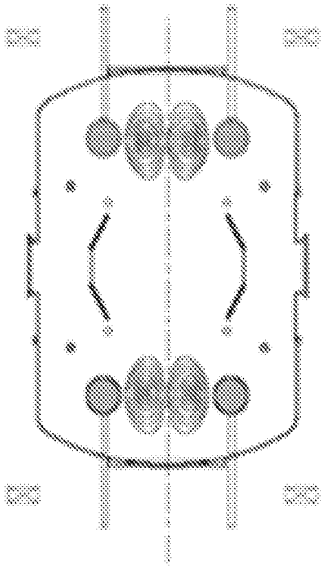


FIGURE 32B

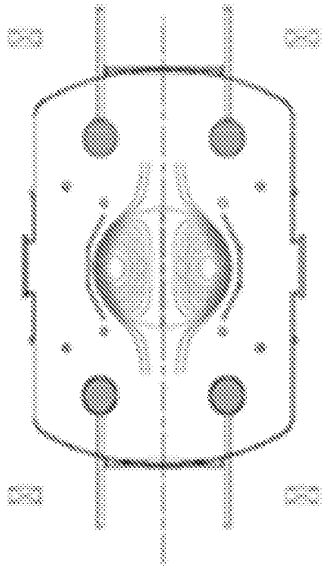


FIGURE 32D

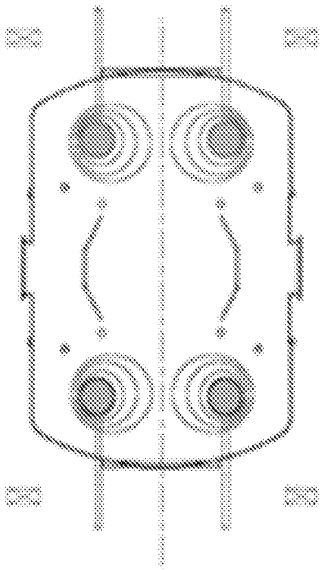


FIGURE 32A

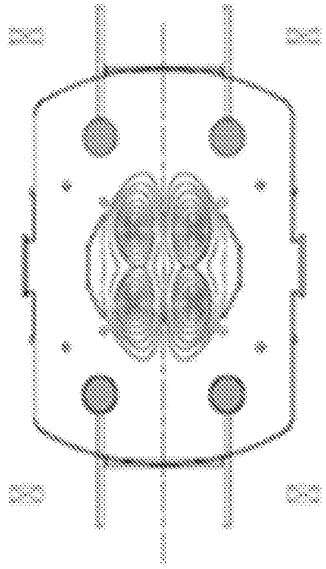


FIGURE 32C

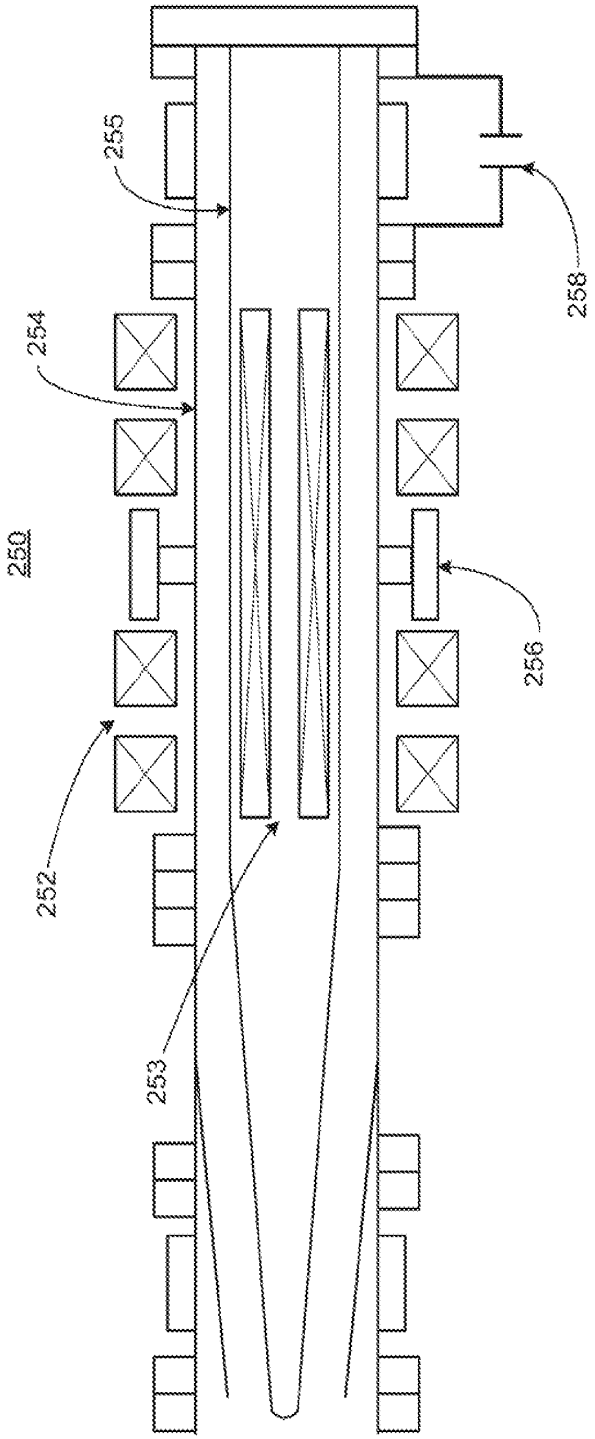


FIGURE 33