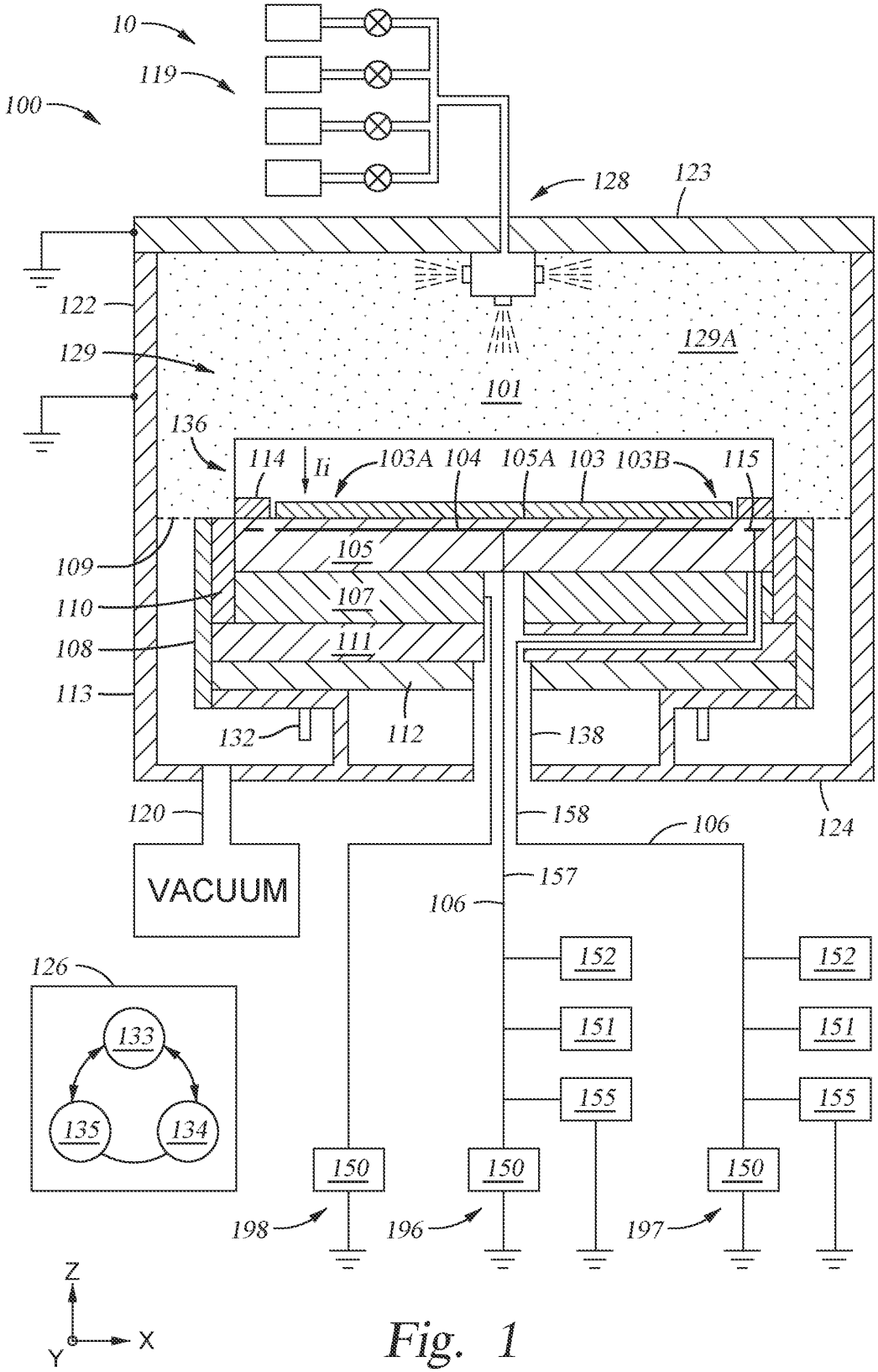

10
119
100
128
123
122
129
129A
101
136
114
Ii
103A
104
105A
103
103B
115
109
105
110
107
108
111
113
132
112
138
120
158
106
124
VACUUM
157
106
126
152
151
155
133
135
134
150
198
196
197
Z
X
Y

Fig. 1

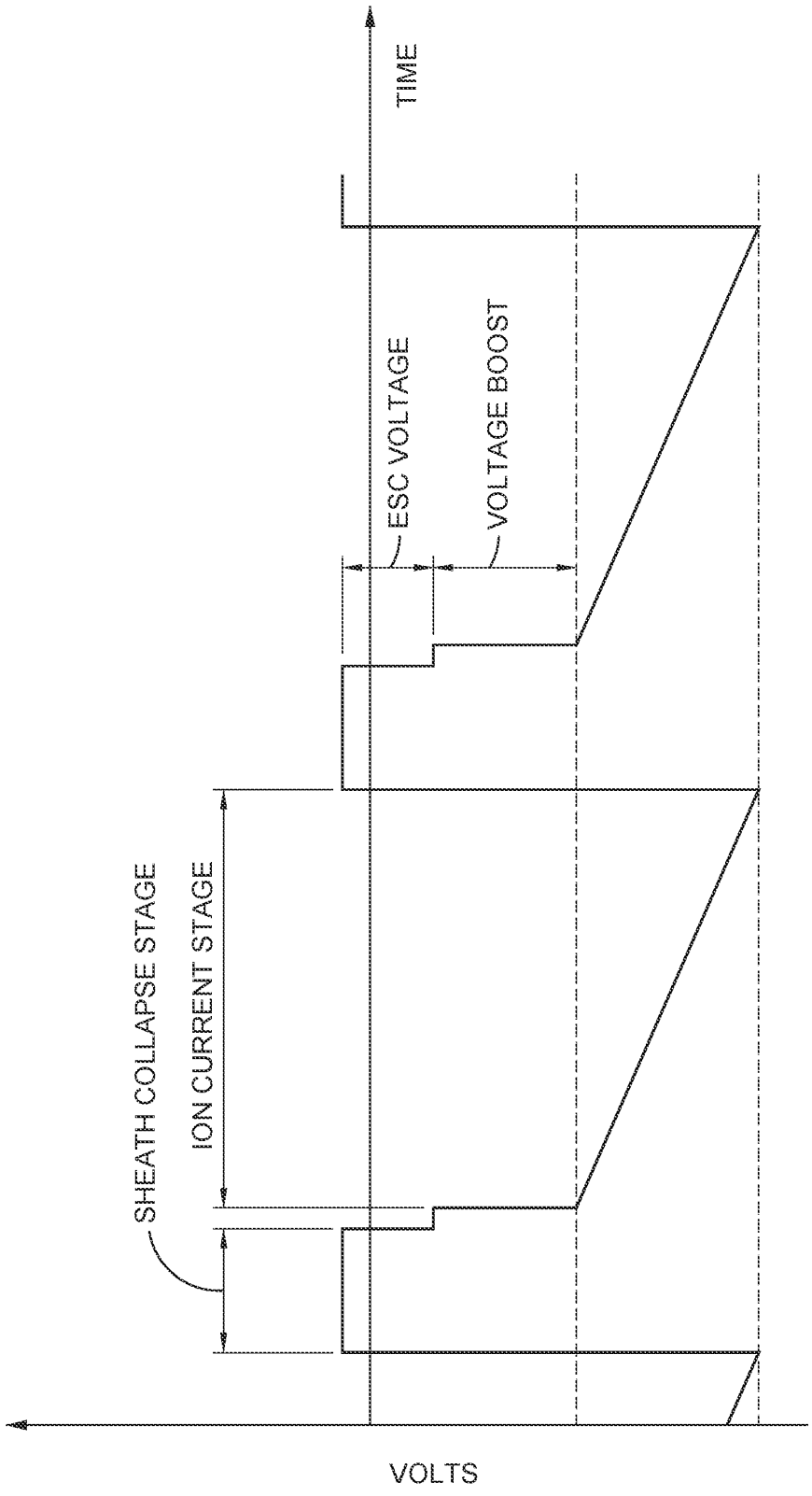

TIME
ESC VOLTAGE
VOLTAGE BOOST
SHEATH COLLAPSE STAGE
ION CURRENT STAGE
VOLTS

Fig. 2A

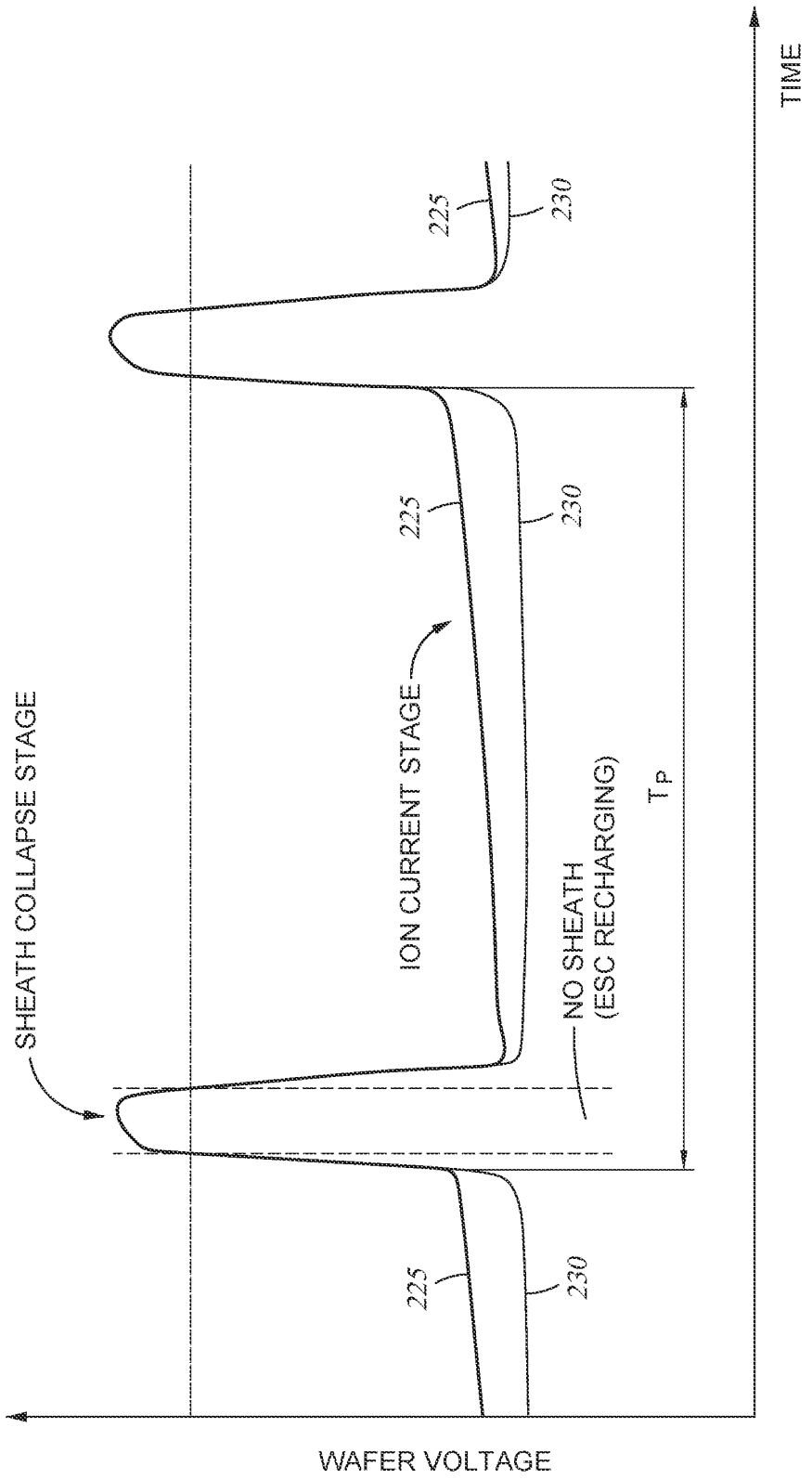

TIME
WAFER VOLTAGE
SHEATH COLLAPSE STAGE
ION CURRENT STAGE
NO SHEATH
(ESC RECHARGING)
T_P
225
230
225
230
225
230

Fig. 2B

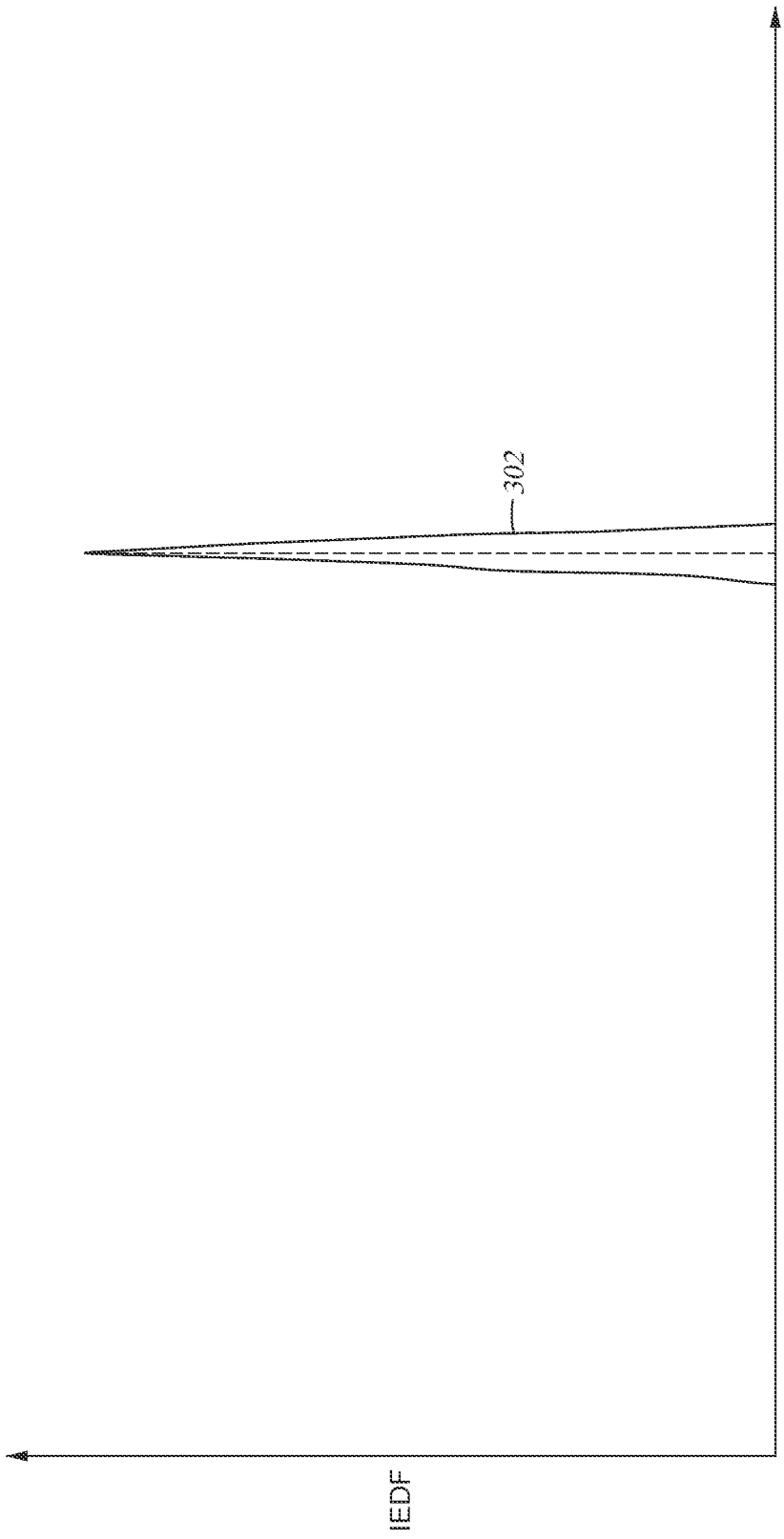


Fig. 3

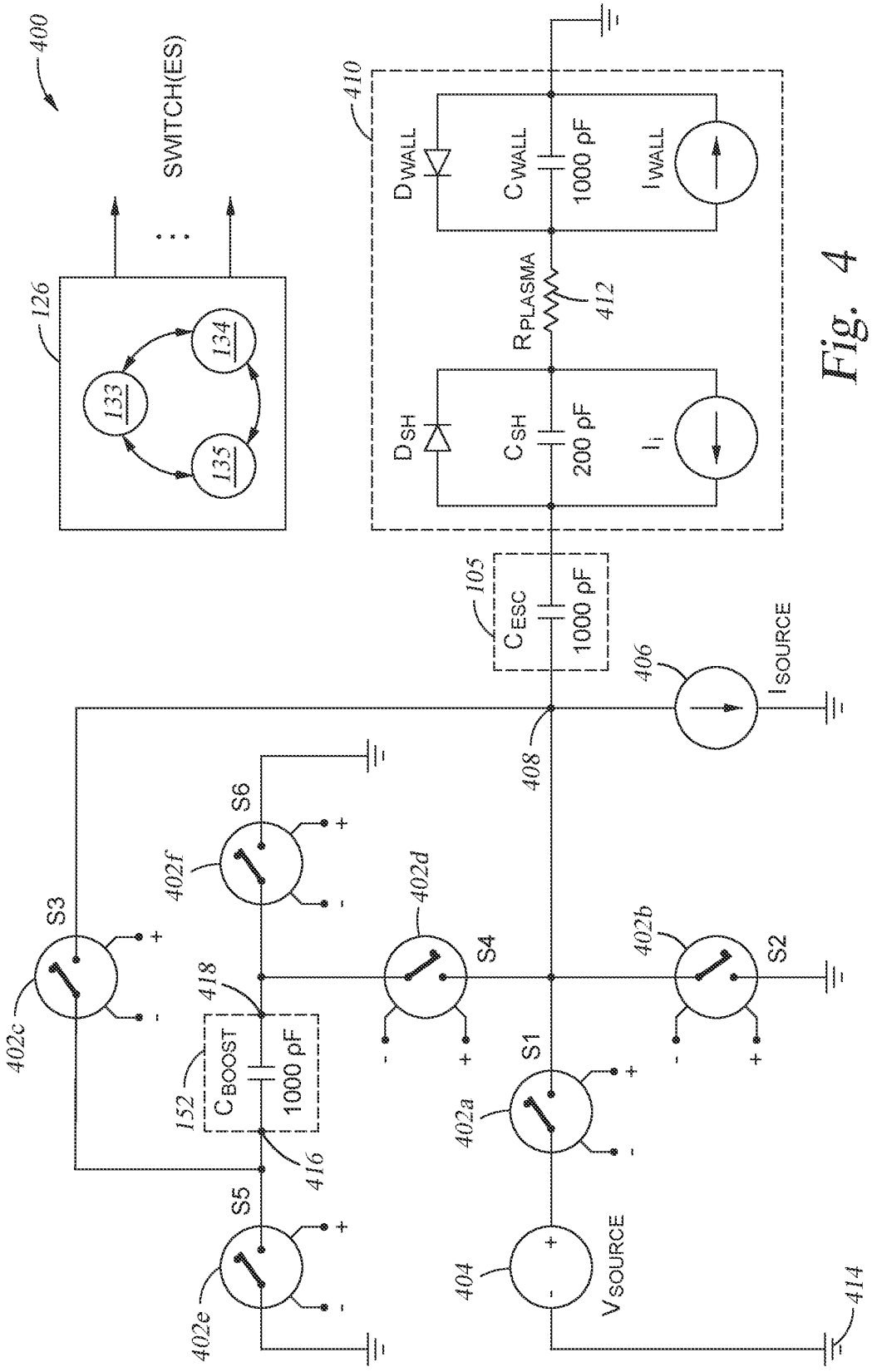

400
SWITCH(ES)
126
133
134
135
410
DWALL
CWALL
1000 pF
IWALL
RPLASMA
412
DSH
CSH
200 pF
Ii
105
CESC
1000 pF
406
ISOURCE
408
S6
402f
S3
402c
S4
402d
S2
402b
418
152
CBOOST
1000 pF
416
S1
402a
S5
402e
404
VSOURCE
414

Fig. 4

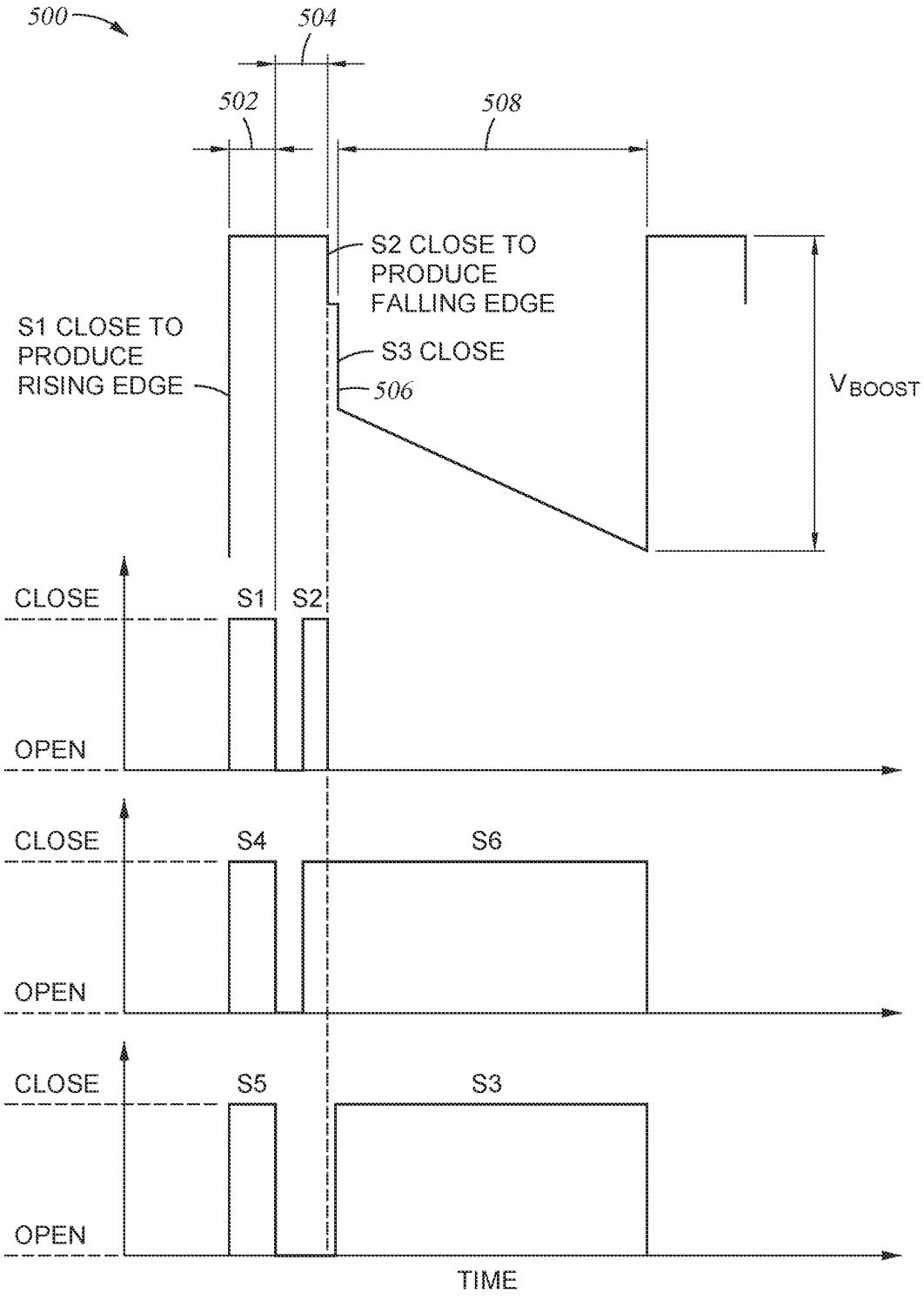

500
504
502
508
S2 CLOSE TO PRODUCE FALLING EDGE
S1 CLOSE TO PRODUCE RISING EDGE
S3 CLOSE
506
V_{BOOST}
CLOSE
S1
S2
OPEN
CLOSE
S4
S6
OPEN
CLOSE
S5
S3
OPEN
TIME

Fig. 5

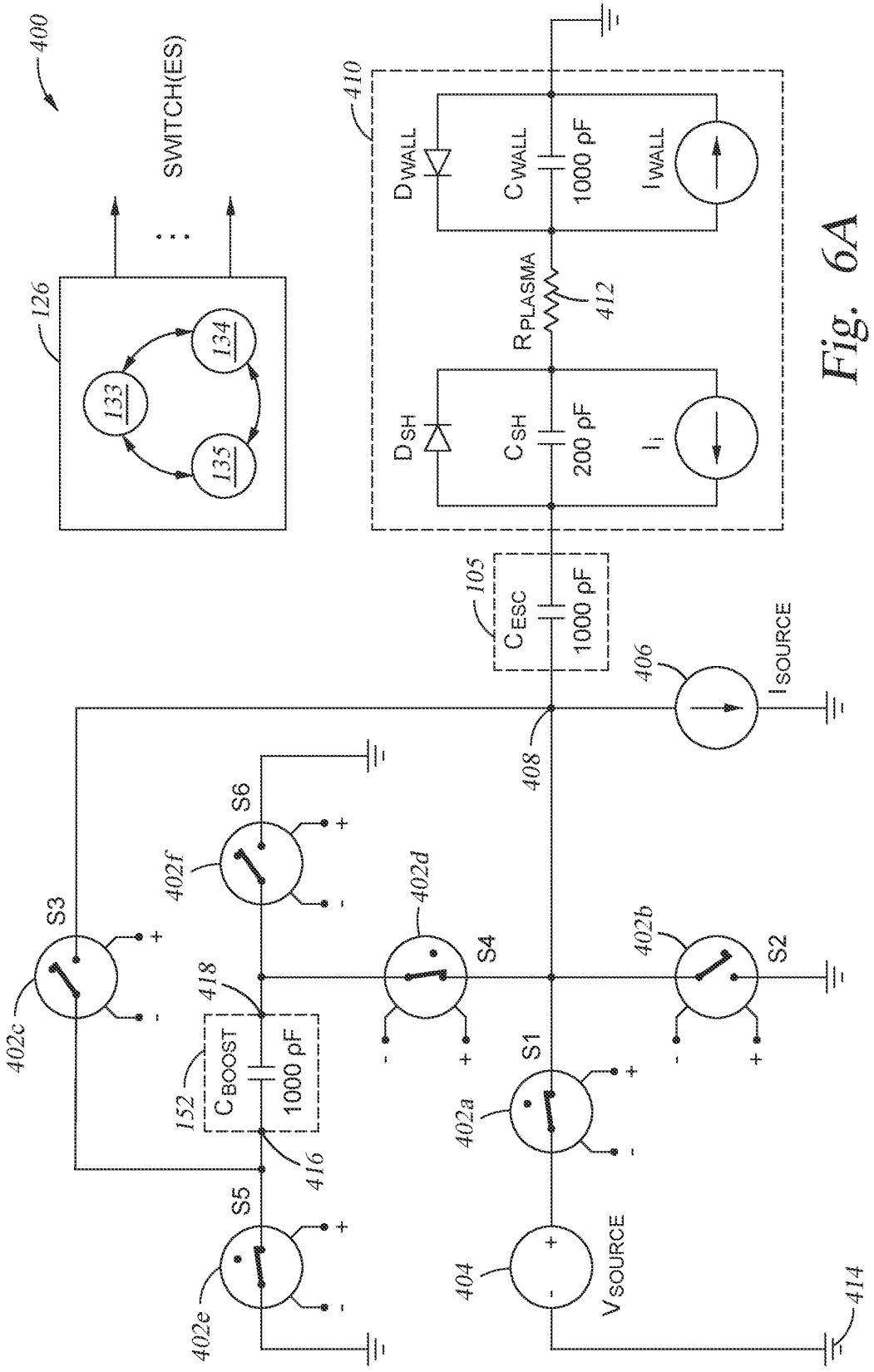

400
SWITCH(ES)
126
133
134
135
410
DWALL
CWALL
1000 pF
IWALL
RPLASMA
412
DSH
CSH
200 pF
Ii
105
CESC
1000 pF
406
ISOURCE
408
S6
402f
S3
402c
402d
S4
402b
S2
418
152
CBOOST
1000 pF
416
S1
402a
S5
402e
404
VSOURCE
414

Fig. 6A

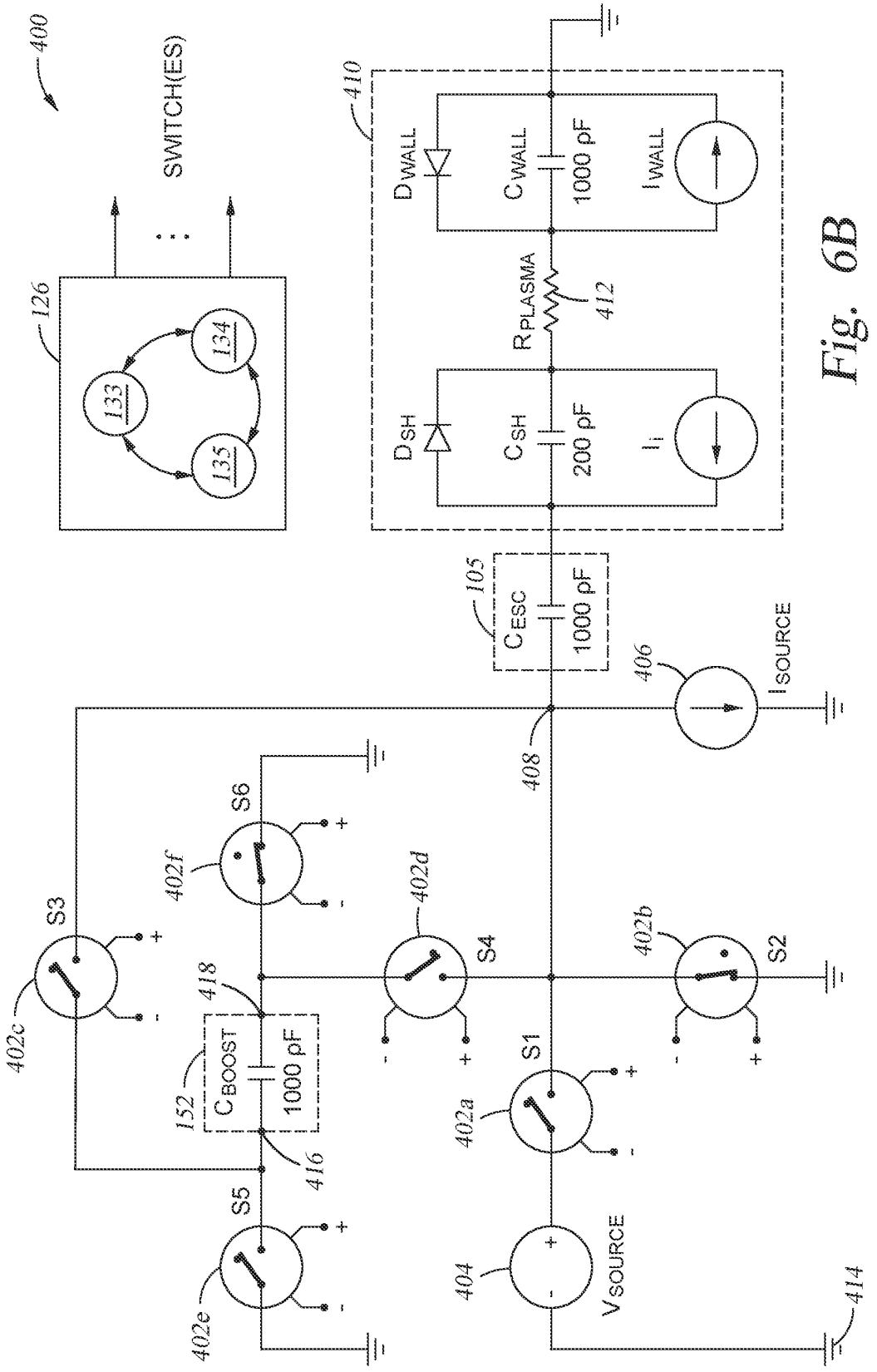

400
SWITCH(ES)
126
133
134
135
410
DWALL
CWALL
1000 pF
IWALL
RPLASMA
412
DSH
CSH
200 pF
Ii
105
CESC
1000 pF
406
ISOURCE
408
S6
402f
S3
402c
S4
402d
S2
402b
418
152
CBOOST
1000 pF
416
S1
402a
S5
402e
404
VSOURCE
414

Fig. 6B

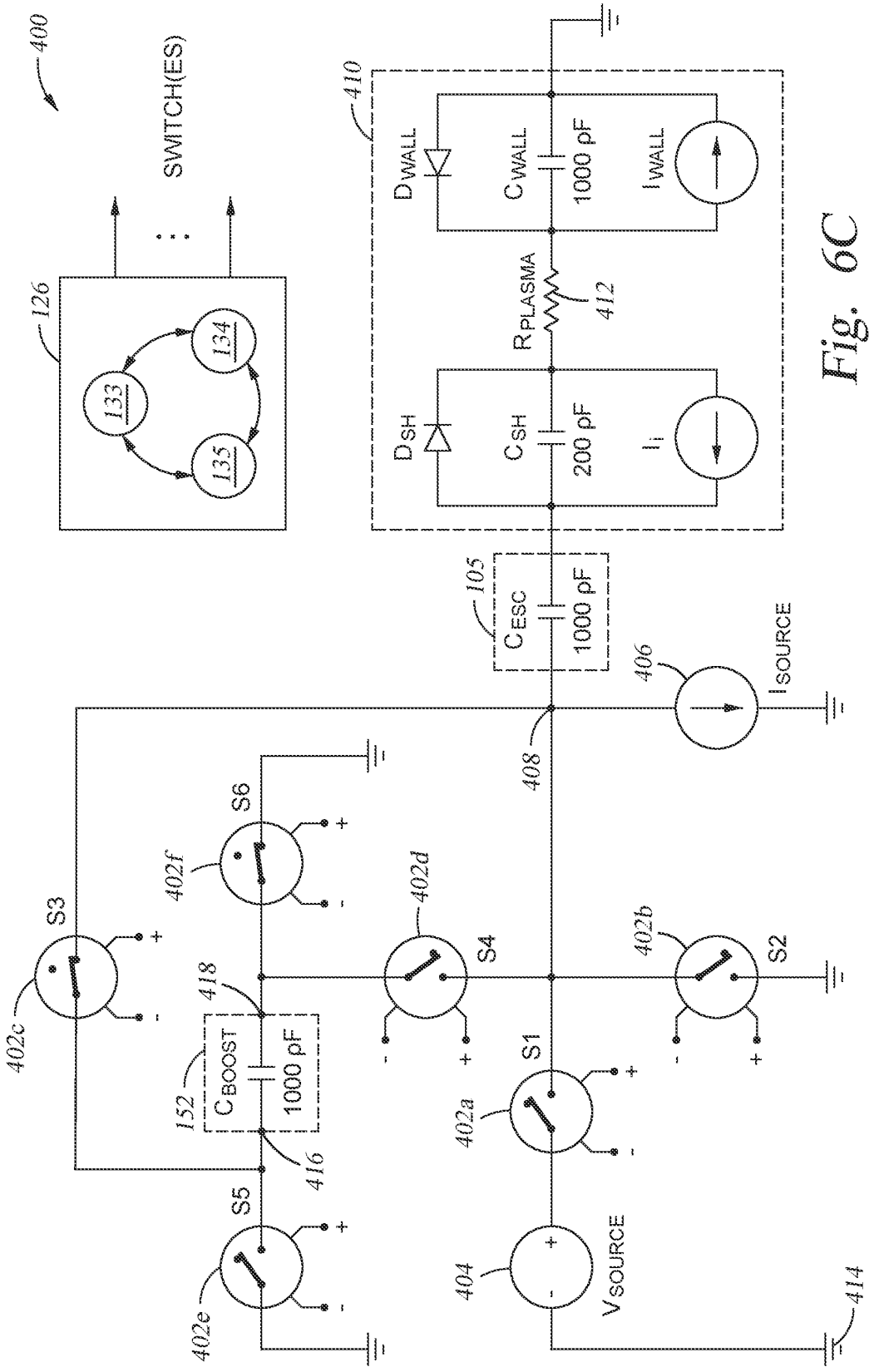

400
SWITCH(ES)
126
133
134
135
410
DWALL
CWALL
1000 pF
IWALL
RPLASMA
412
DSH
CSH
200 pF
Ii
105
CESC
1000 pF
406
ISOURCE
408
S3
S6
S4
S2
S1
S5
402c
402f
402d
402b
402a
402e
418
152
CBOOST
1000 pF
416
404
VSOURCE
414

Fig. 6C

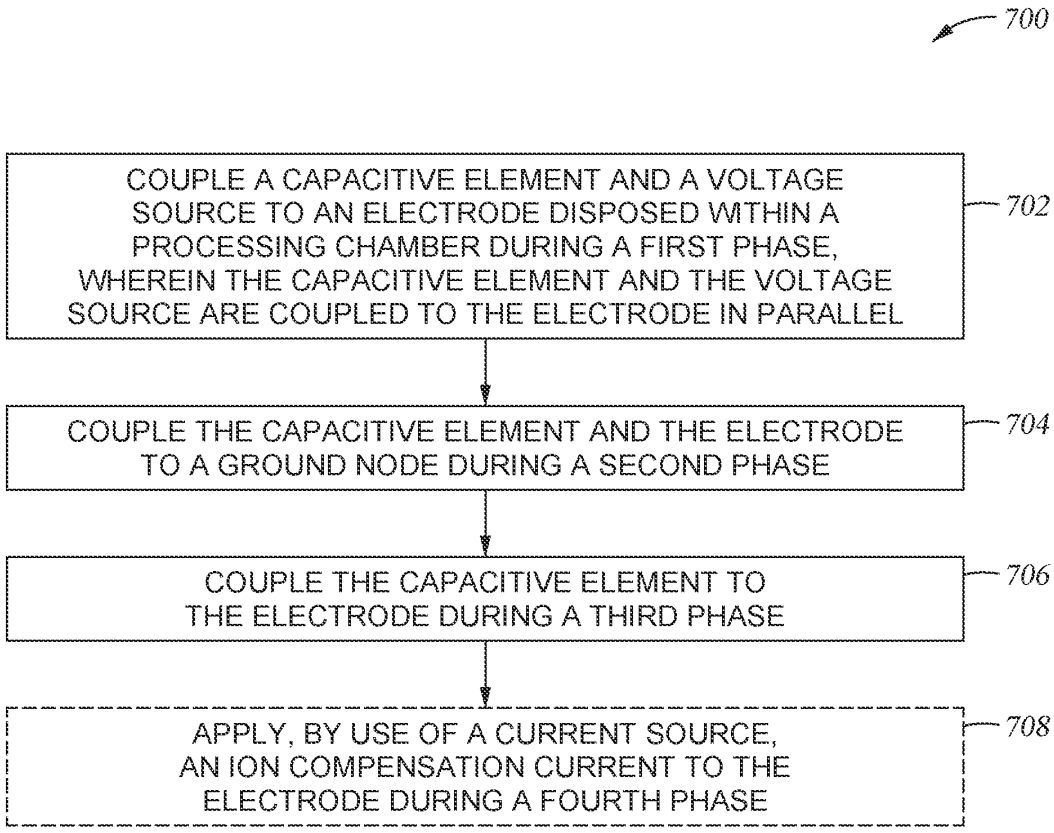

700
COUPLE A CAPACITIVE ELEMENT AND A VOLTAGE SOURCE TO AN ELECTRODE DISPOSED WITHIN A PROCESSING CHAMBER DURING A FIRST PHASE, WHEREIN THE CAPACITIVE ELEMENT AND THE VOLTAGE SOURCE ARE COUPLED TO THE ELECTRODE IN PARALLEL
702
COUPLE THE CAPACITIVE ELEMENT AND THE ELECTRODE TO A GROUND NODE DURING A SECOND PHASE
704
COUPLE THE CAPACITIVE ELEMENT TO THE ELECTRODE DURING A THIRD PHASE
706
APPLY, BY USE OF A CURRENT SOURCE, AN ION COMPENSATION CURRENT TO THE ELECTRODE DURING A FOURTH PHASE
708

Fig. 7

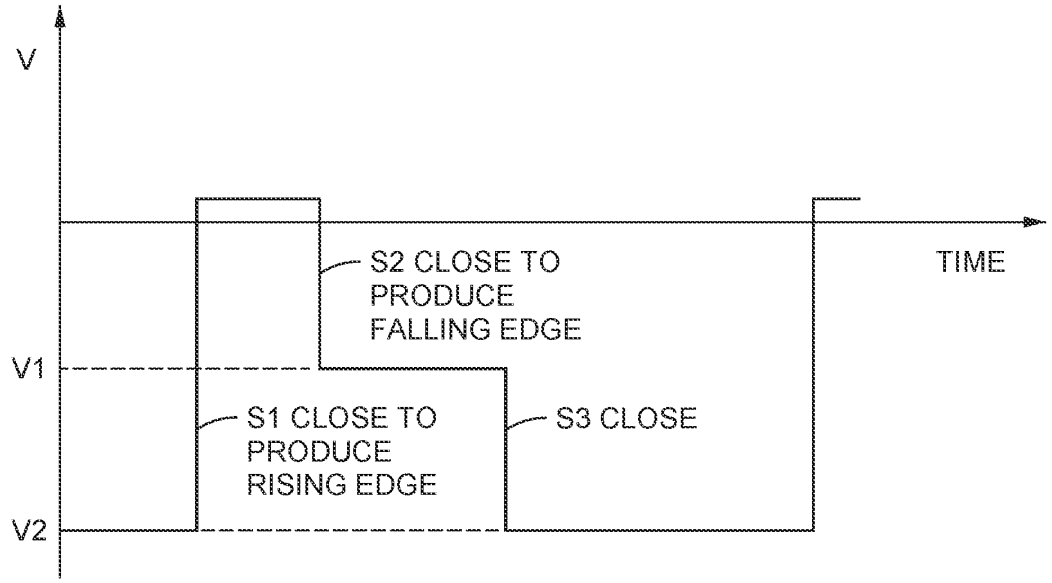

V
TIME
S2 CLOSE TO
PRODUCE
FALLING EDGE
V1
S1 CLOSE TO
PRODUCE
RISING EDGE
S3 CLOSE
V2

Fig. 8A

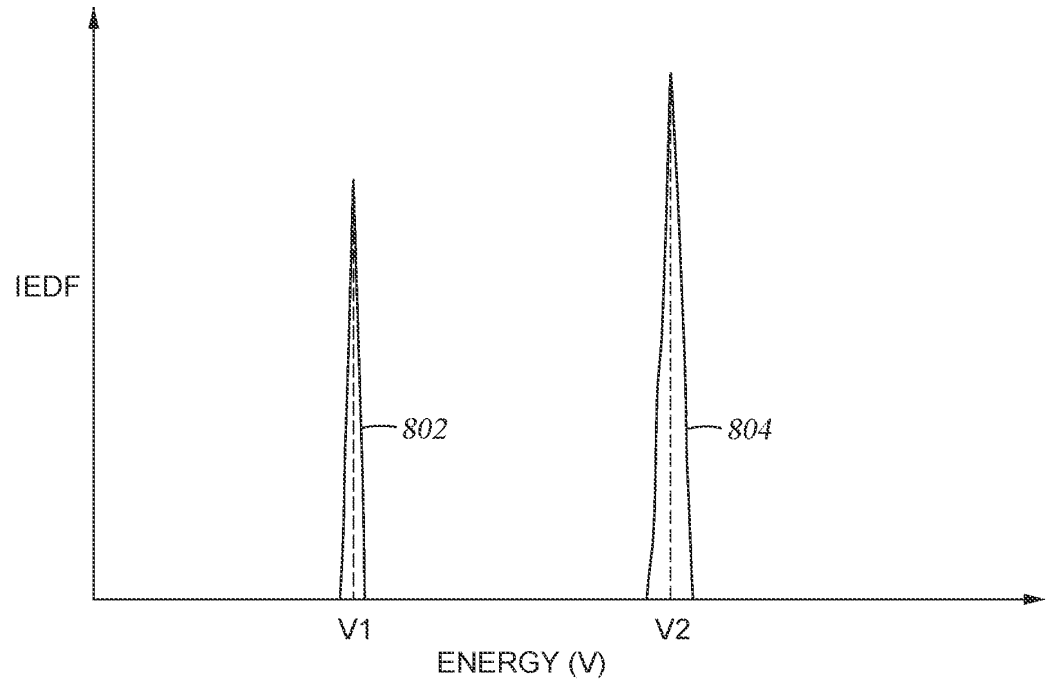

IEDF
802
804
V1
V2
ENERGY (V)

Fig. 8B

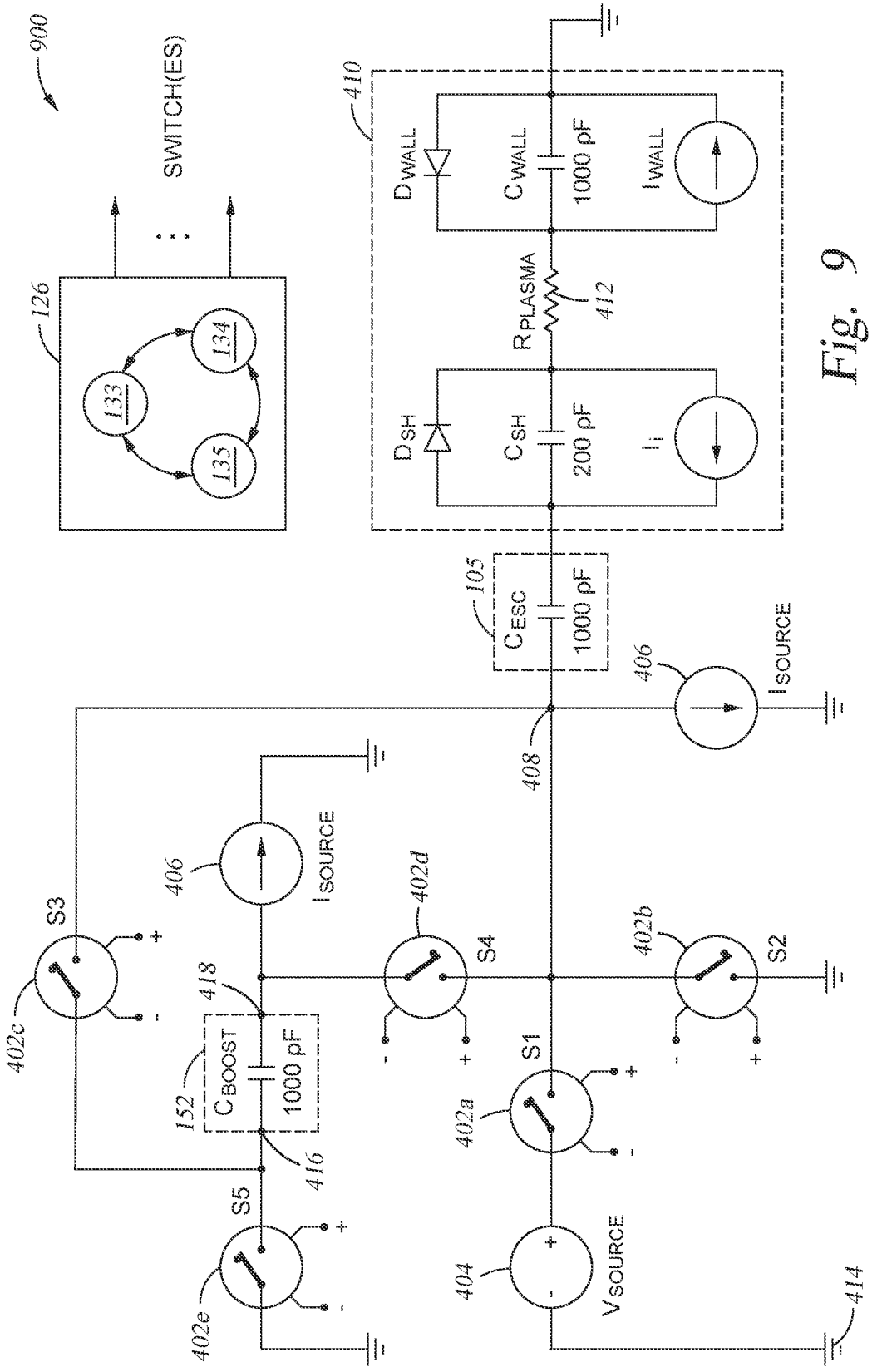

900
SWITCH(ES)
126
133
134
135
410
DWALL
CWALL
1000 pF
IWALL
RPLASMA
412
DSH
CSH
200 pF
Ii
105
CESC
1000 pF
406
ISOURCE
408
S3
402c
418
152
CBOOST
1000 pF
416
S5
402e
S4
402d
S1
402a
S2
402b
404
VSOURCE
414

Fig. 9

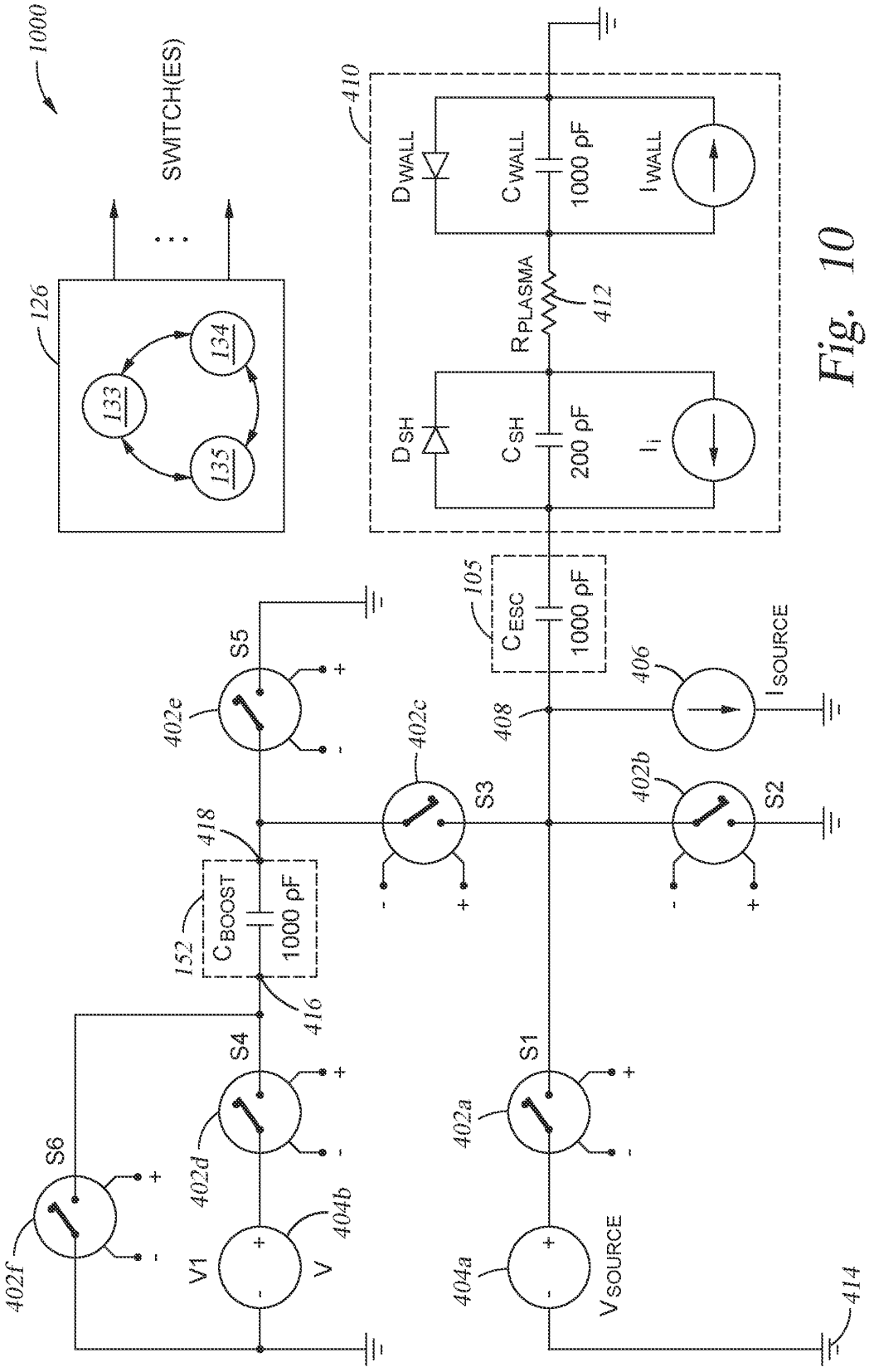

1000
SWITCH(ES)
126
133
134
135
410
DWALL
CWALL
1000 pF
IWALL
RPLASMA
412
DSH
CSH
200 pF
Ii
105
CESC
1000 pF
ISOURCE
406
408
S5
402e
S3
402c
S2
402b
418
152
CBOOST
1000 pF
416
S4
402d
S6
402f
V1
404b
V
S1
402a
404a
VSOURCE
414

Fig. 10