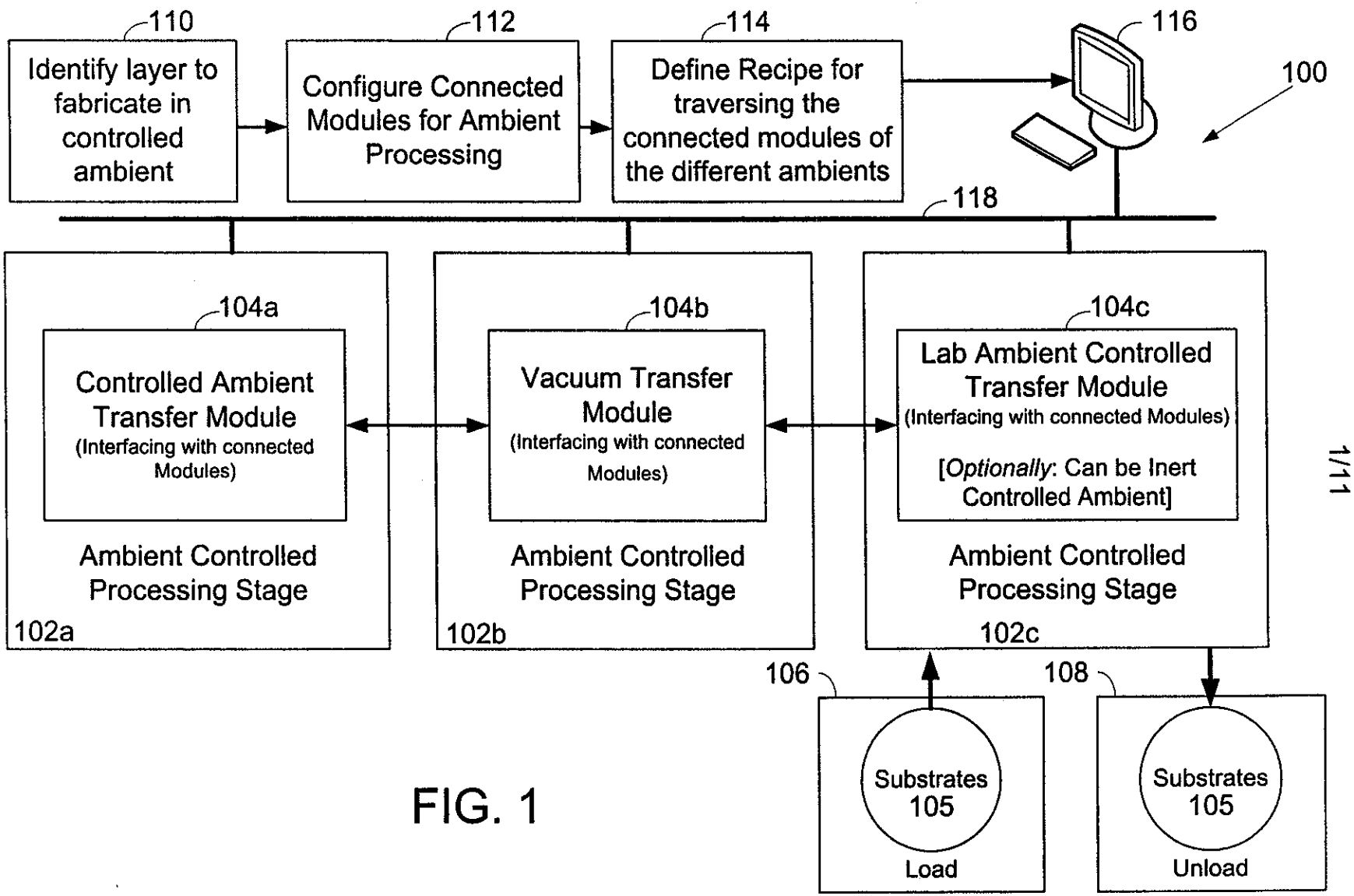

110
Identify layer to fabricate in controlled ambient
112
Configure Connected Modules for Ambient Processing
114
Define Recipe for traversing the connected modules of the different ambients
116
100
118
104a
Controlled Ambient Transfer Module
(Interfacing with connected Modules)
Ambient Controlled Processing Stage
102a
104b
Vacuum Transfer Module
(Interfacing with connected Modules)
Ambient Controlled Processing Stage
102b
104c
Lab Ambient Controlled Transfer Module
(Interfacing with connected Modules)
[Optionally: Can be Inert Controlled Ambient]
Ambient Controlled Processing Stage
102c
106
Substrates 105
Load
108
Substrates 105
Unload

FIG. 1

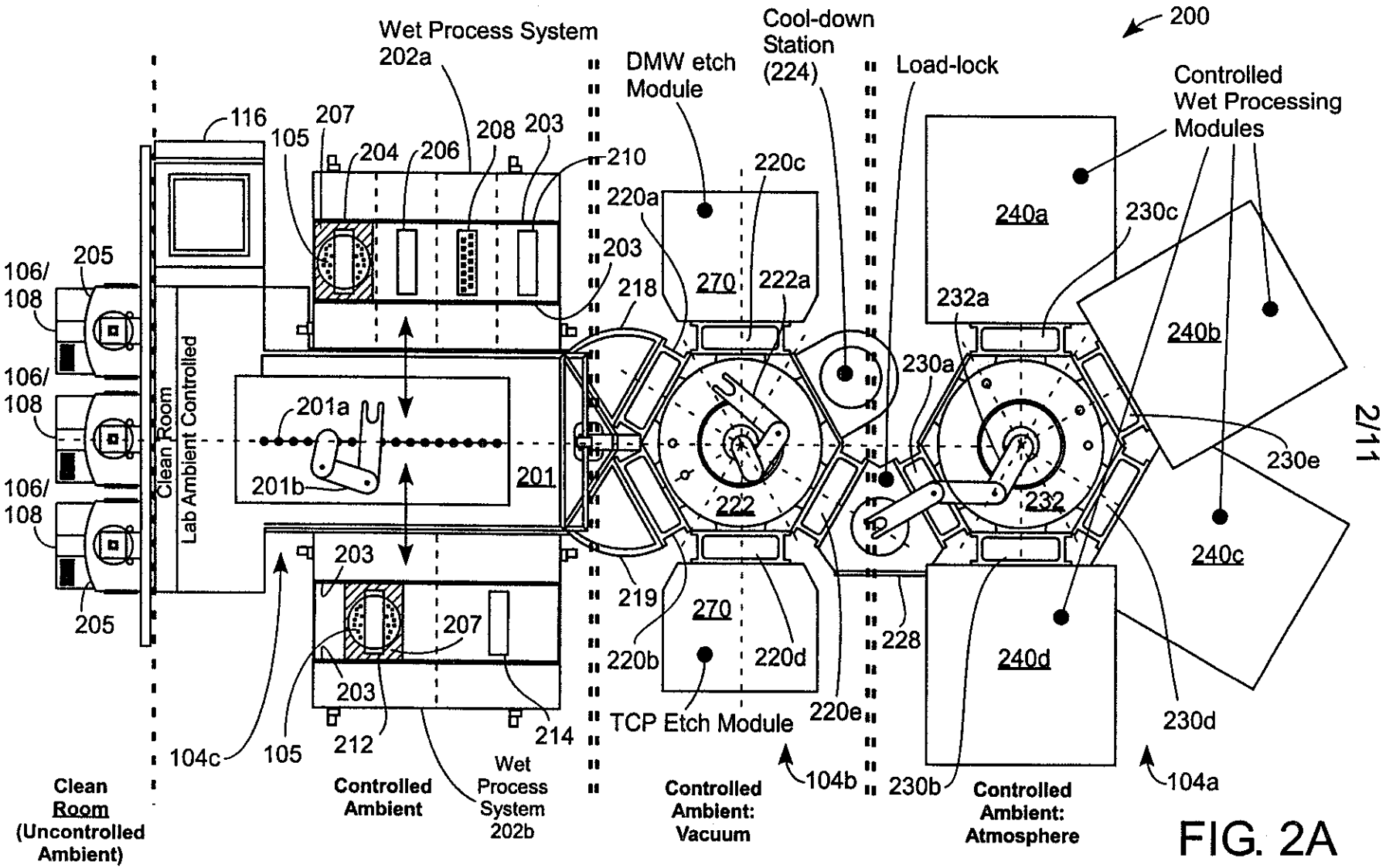

200
Wet Process System
202a
DMW etch
Module
Cool-down
Station
(224)
Load-lock
Controlled
Wet Processing
Modules
116
105
207
204
206
208
203
210
220a
220c
240a
230c
106/
108
205
203
218
270
222a
232a
240b
Clean Room
Lab Ambient Controlled
201a
201
201b
230a
230e
222
232
240c
203
207
219
270
220b
220d
228
240d
230d
TCP Etch Module
220e
104c
105
212
214
230b
104b
104a
Clean
Room
(Uncontrolled
Ambient)
Controlled
Ambient
Wet
Process
System
202b
Controlled
Ambient:
Vacuum
Controlled
Ambient:
Atmosphere

FIG. 2A

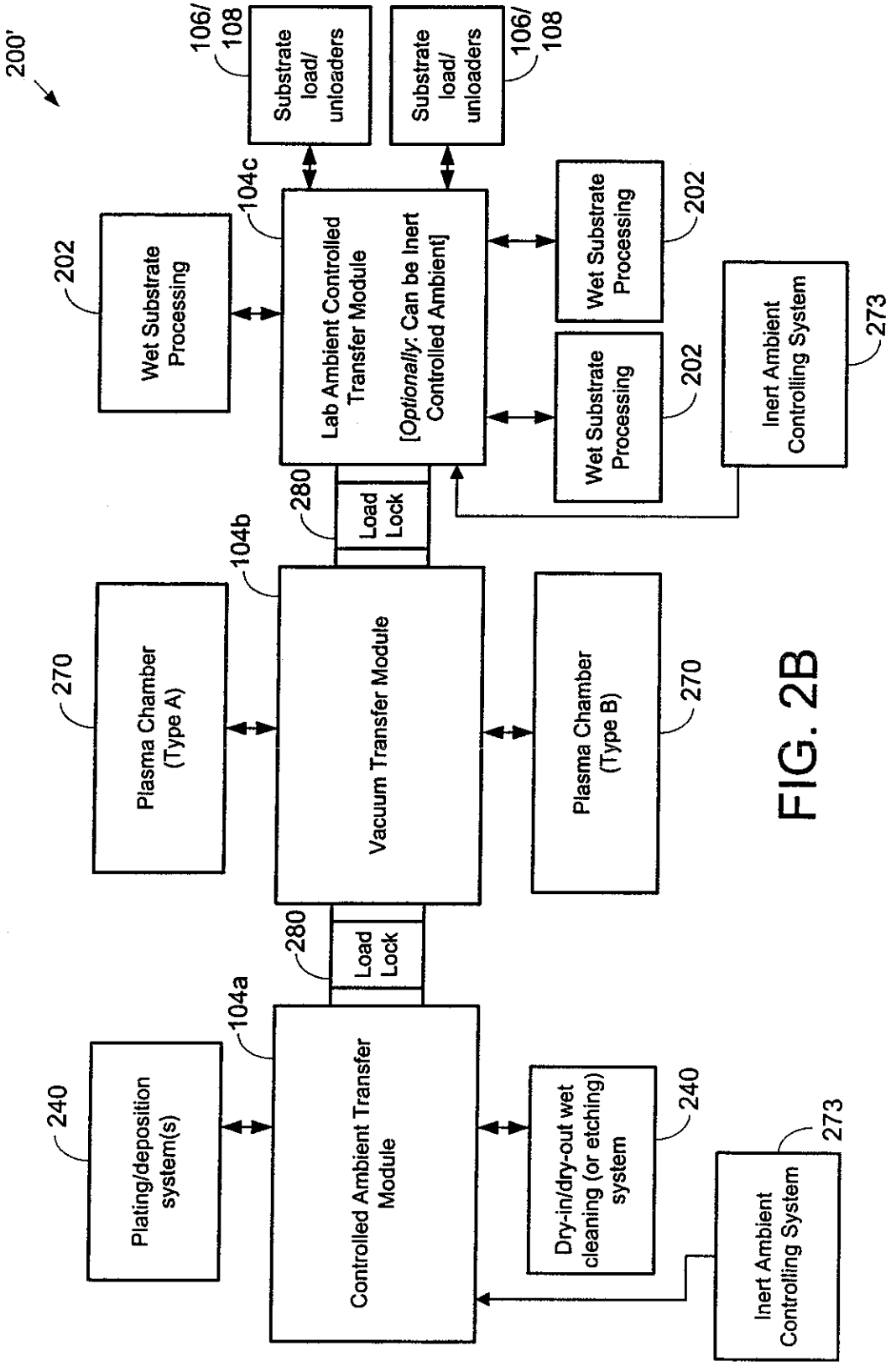

200'
106/108
Substrate load/ unloaders
Substrate load/ unloaders
106/108
104c
Lab Ambient Controlled Transfer Module
[Optionally: Can be Inert Controlled Ambient]
202
Wet Substrate Processing
Wet Substrate Processing
202
Wet Substrate Processing
202
Inert Ambient Controlling System
273
280
Load Lock
104b
Vacuum Transfer Module
270
Plasma Chamber (Type A)
Plasma Chamber (Type B)
270
280
Load Lock
104a
Controlled Ambient Transfer Module
240
Plating/deposition system(s)
Dry-in/dry-out wet cleaning (or etching) system
240
Inert Ambient Controlling System
273

FIG. 2B

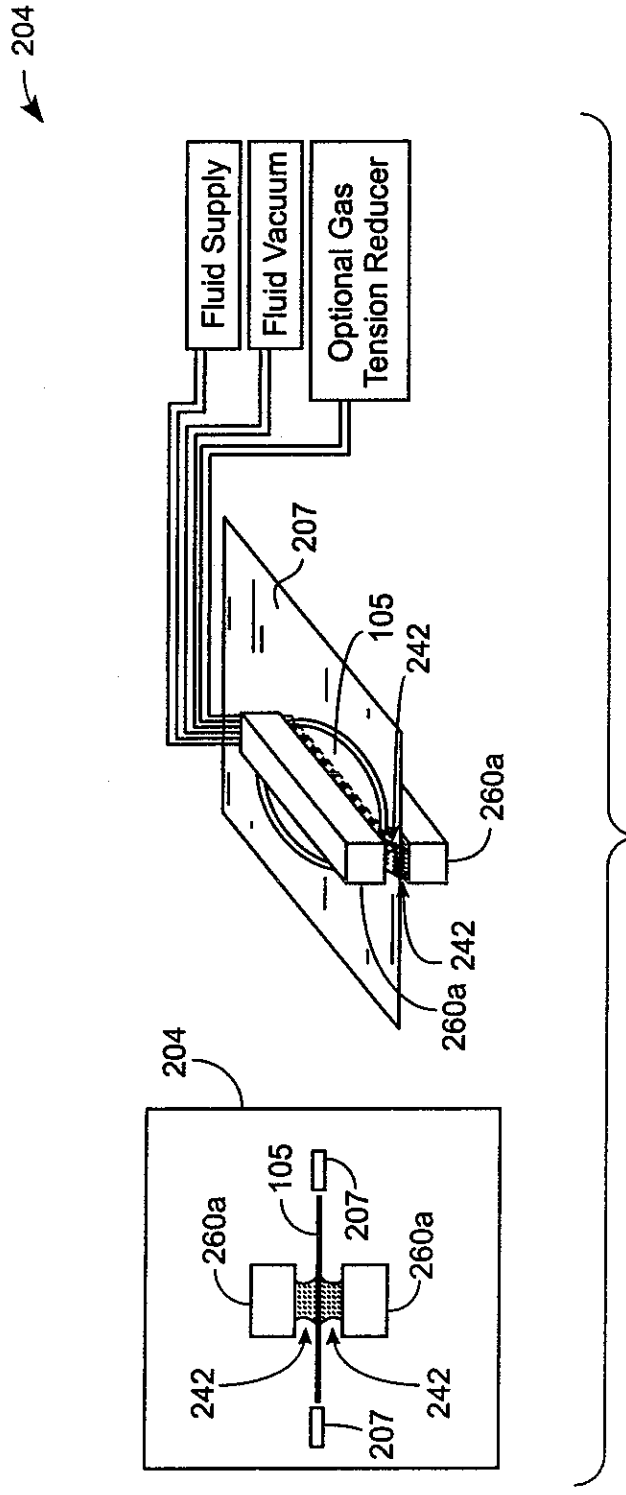

204
Fluid Supply
Fluid Vacuum
Optional Gas Tension Reducer
207
105
242
260a
260a
242
204
105
260a
207
260a
242
242
207

FIG. 2C

FIG. 2D-1

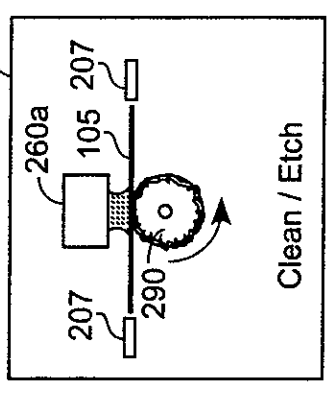


FIG. 2D-2

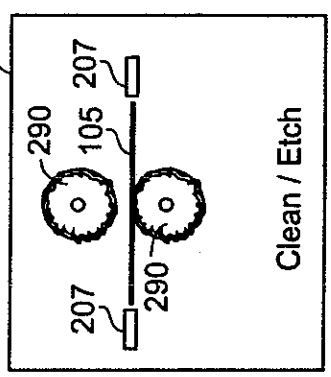


FIG. 2D-3

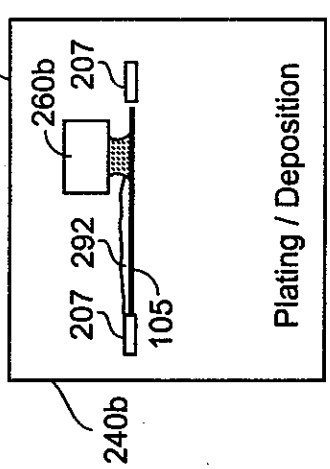


FIG. 2D-4

FIG. 2D-5

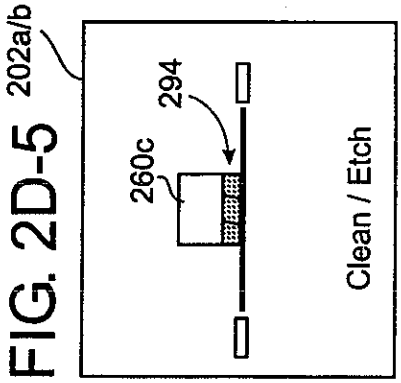
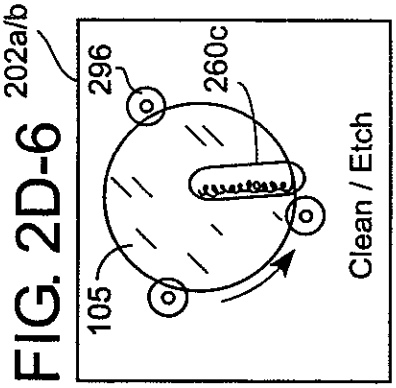


FIG. 2D-6



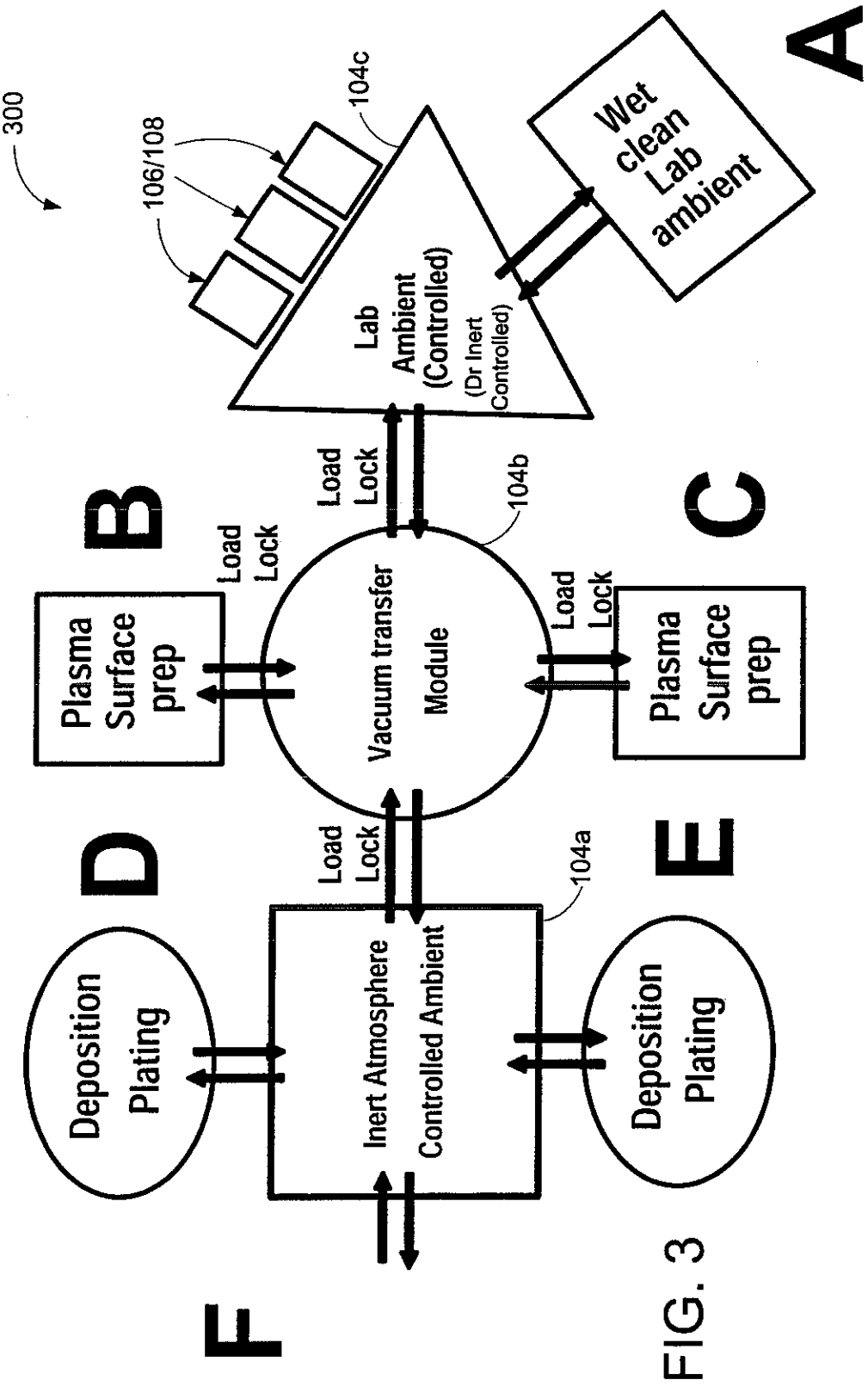

300
106/108
104c
Wet clean Lab ambient
A
Lab Ambient (Controlled)
(Dr Inert Controlled)
Load Lock
B
Load Lock
104b
Plasma Surface prep
Vacuum transfer Module
Load Lock
C
Plasma Surface prep
Load Lock
D
104a
E
Deposition Plating
Inert Atmosphere Controlled Ambient
Deposition Plating
F

FIG. 3

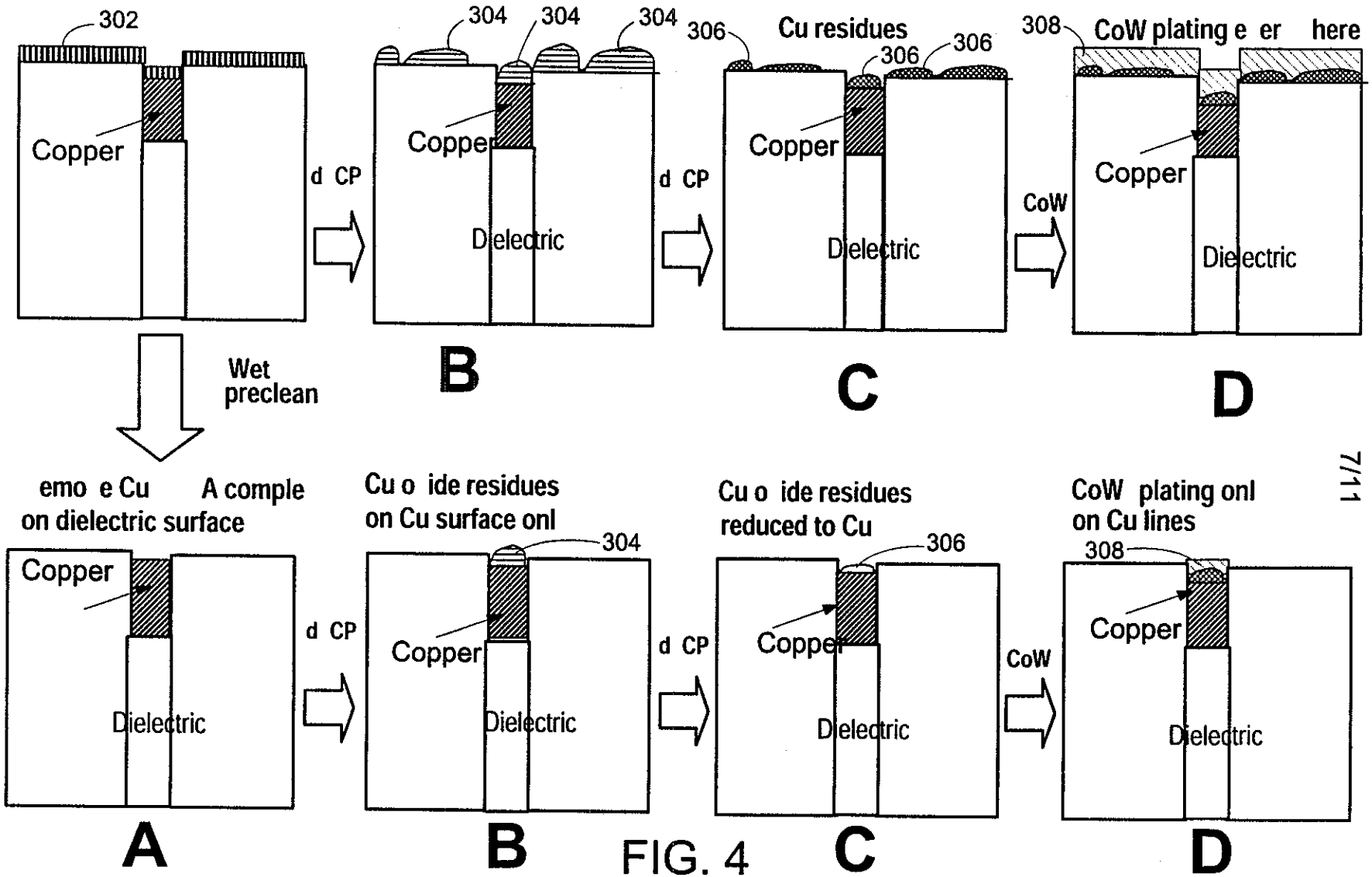

302
Copper
d CP
304
304
304
Copper
Dielectric
B
d CP
306
Cu residues
306
306
Copper
Dielectric
C
CoW
308
CoW plating e er here
Copper
Dielectric
D
Wet
preclean
emo e Cu A comple
on dielectric surface
Copper
Dielectric
A
d CP
Cu o ide residues
on Cu surface onl
304
Copper
Dielectric
B
d CP
Cu o ide residues
reduced to Cu
306
Copper
Dielectric
C
CoW
CoW plating onl
on Cu lines
308
Copper
Dielectric
D

FIG. 4

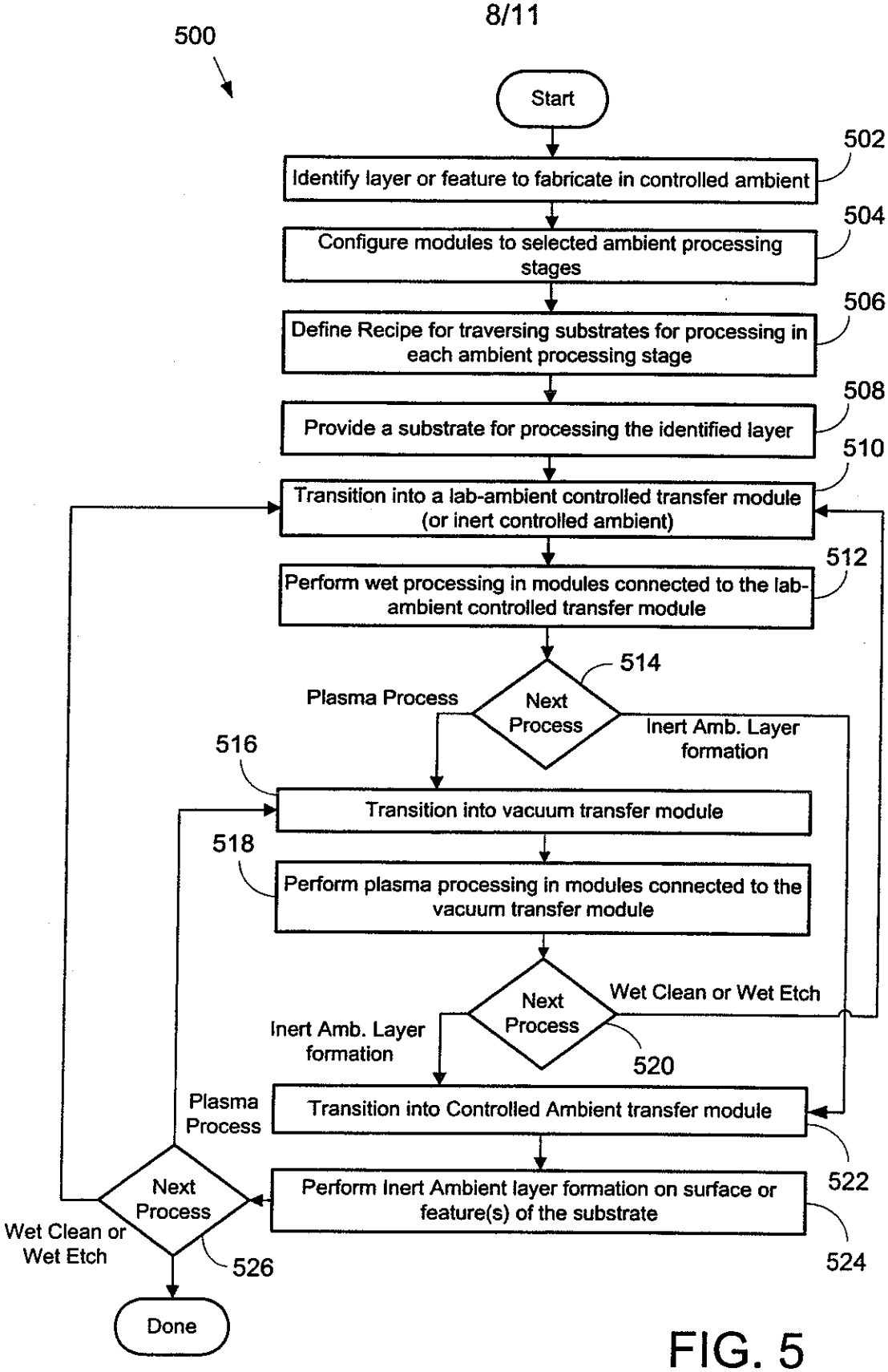

500
Start
502
Identify layer or feature to fabricate in controlled ambient
504
Configure modules to selected ambient processing stages
506
Define Recipe for traversing substrates for processing in each ambient processing stage
508
Provide a substrate for processing the identified layer
510
Transition into a lab-ambient controlled transfer module (or inert controlled ambient)
512
Perform wet processing in modules connected to the lab-ambient controlled transfer module
514
Next Process
Plasma Process
Inert Amb. Layer formation
516
Transition into vacuum transfer module
518
Perform plasma processing in modules connected to the vacuum transfer module
Next Process
Wet Clean or Wet Etch
Inert Amb. Layer formation
520
Plasma Process
Transition into Controlled Ambient transfer module
522
Next Process
Perform Inert Ambient layer formation on surface or feature(s) of the substrate
524
Wet Clean or Wet Etch
526
Done

FIG. 5

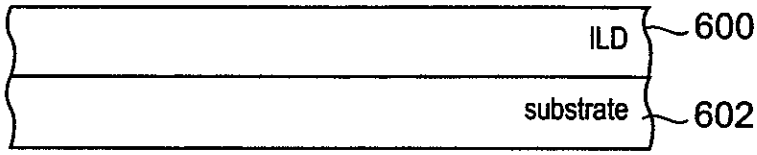


Fig. 6

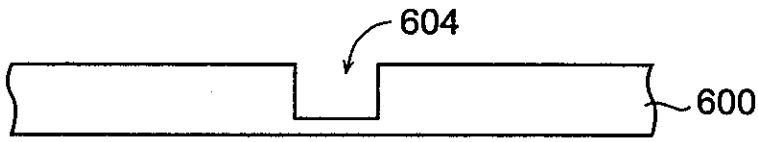


Fig. 7

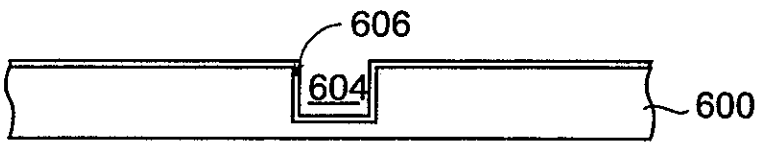


Fig. 8

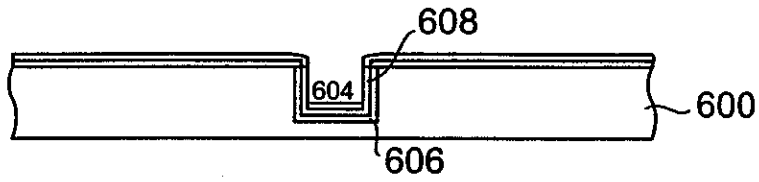


Fig. 9

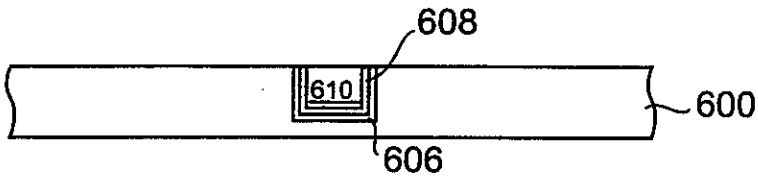


Fig. 10

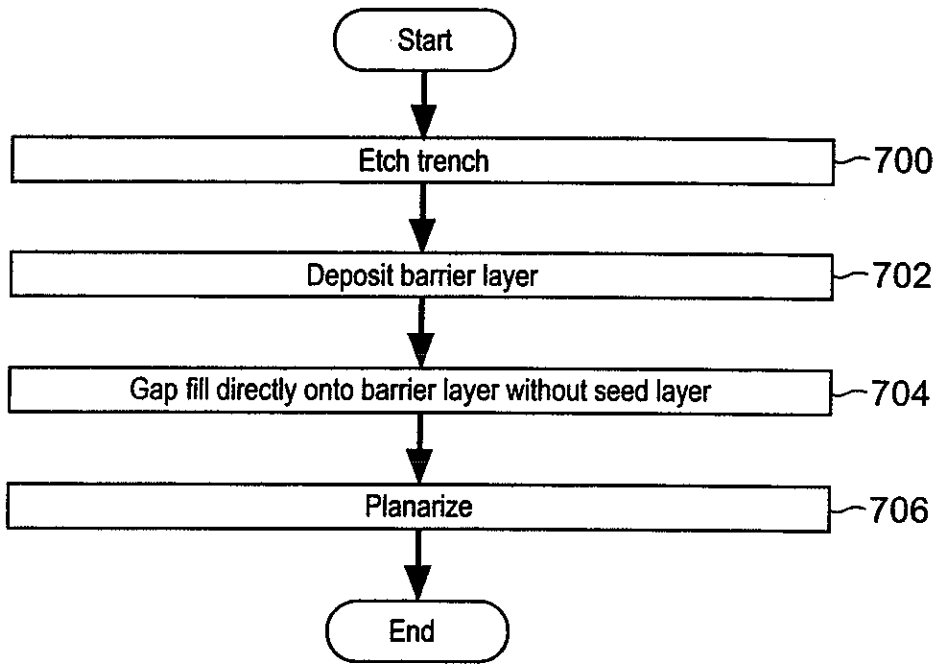

Start
Etch trench
700
Deposit barrier layer
702
Gap fill directly onto barrier layer without seed layer
704
Planarize
706
End

Fig. 11