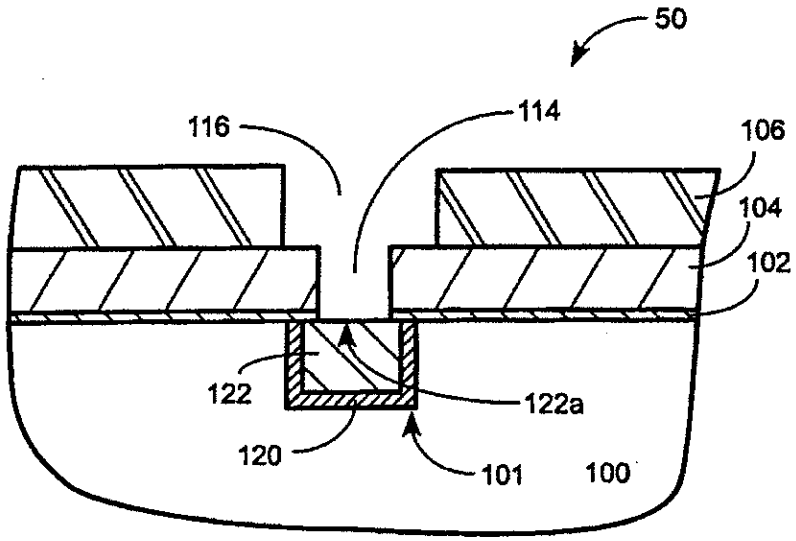

50
116
114
106
104
102
122
122a
120
101
100

FIG. 1A

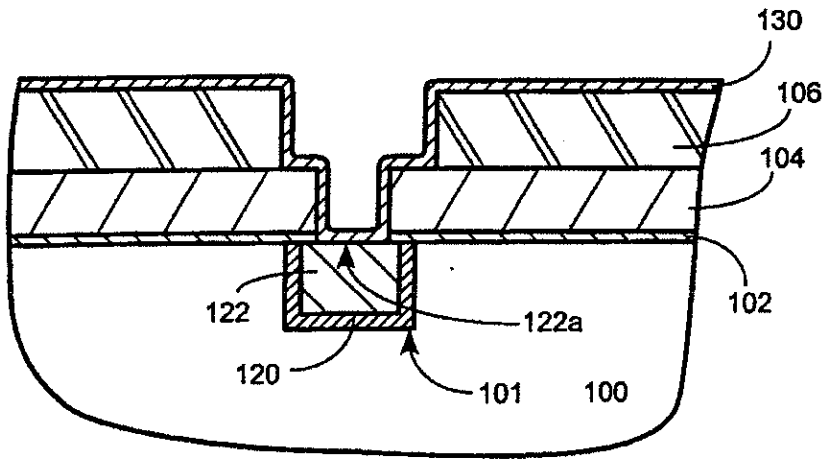

130
106
104
102
122
122a
120
101
100

FIG. 1B

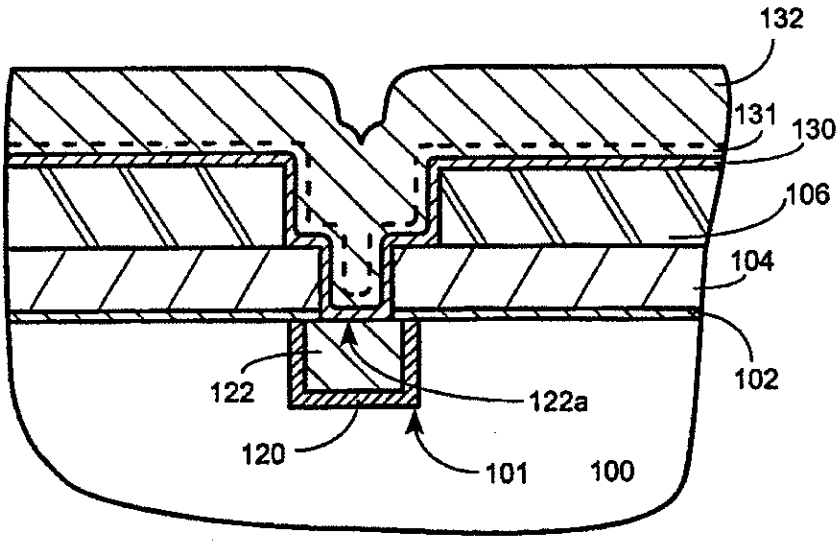

132
131
130
106
104
102
122
122a
120
101
100

FIG. 1C

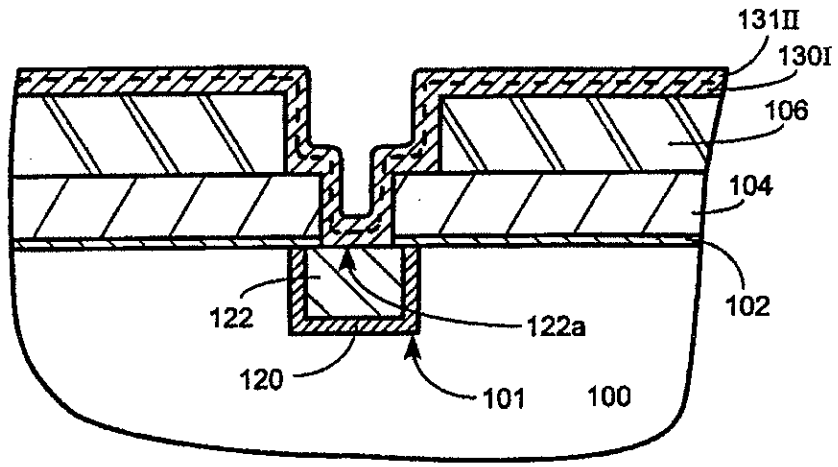

131II
130I
106
104
102
122
122a
120
101
100

FIG. 1D

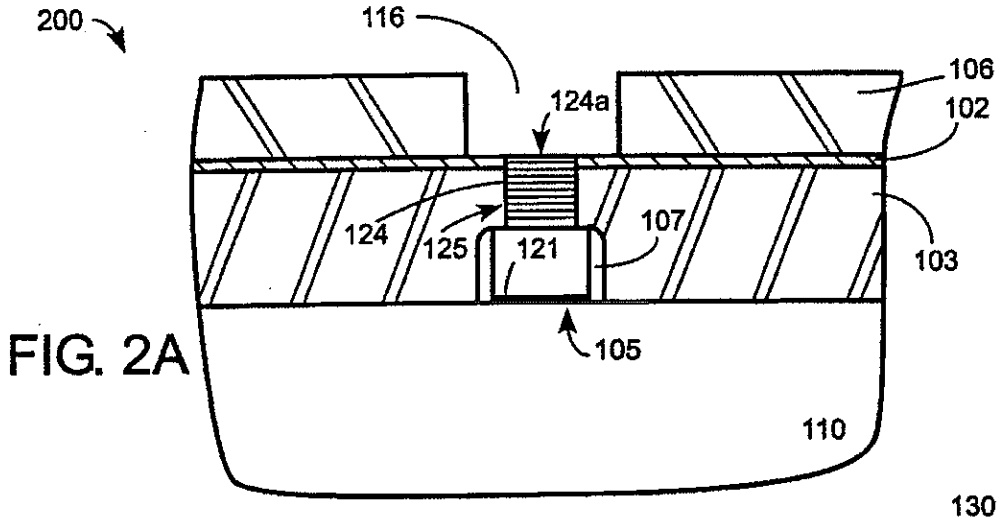


FIG. 2A

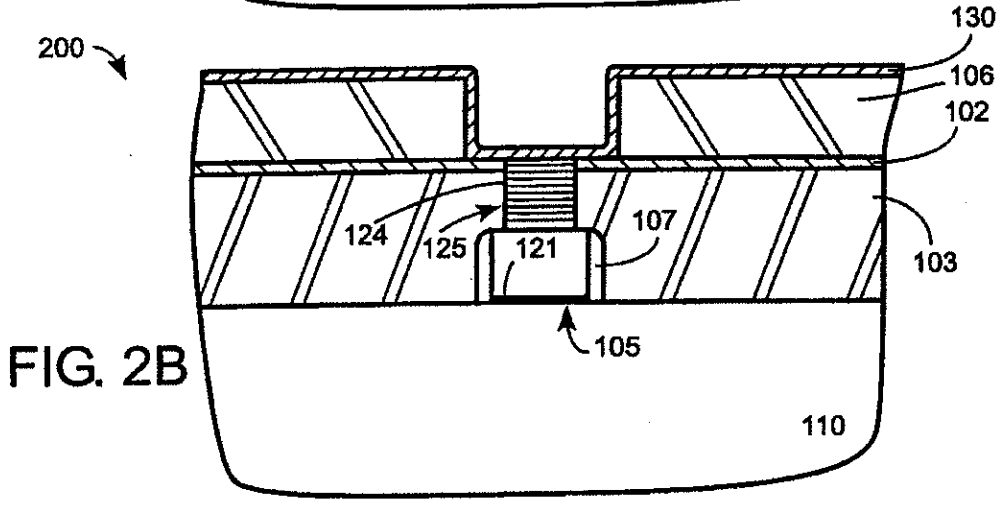


FIG. 2B

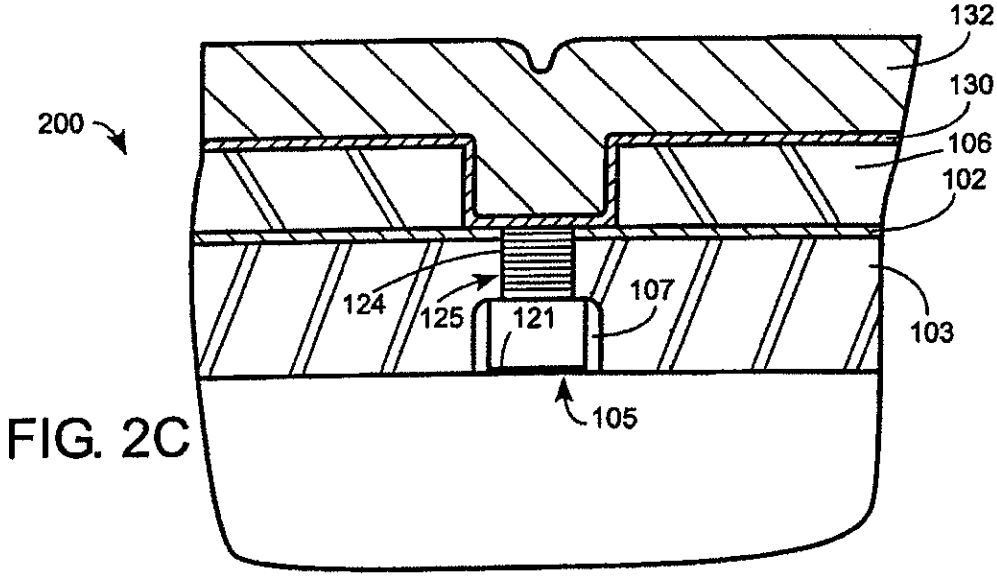


FIG. 2C

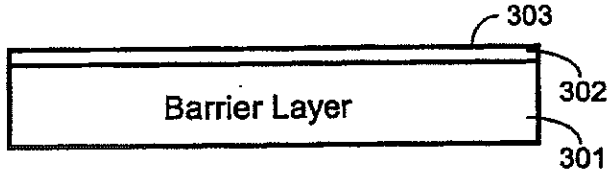


FIG. 3A

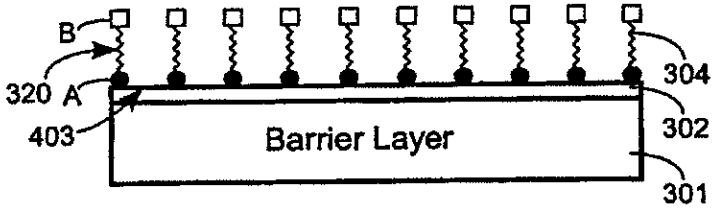


FIG. 3B

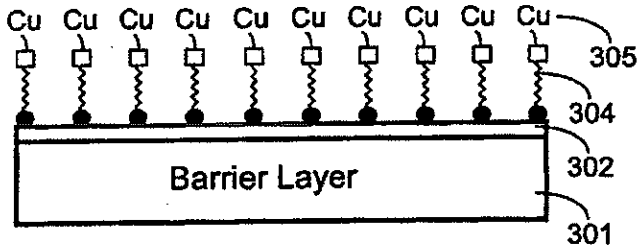


FIG. 3C

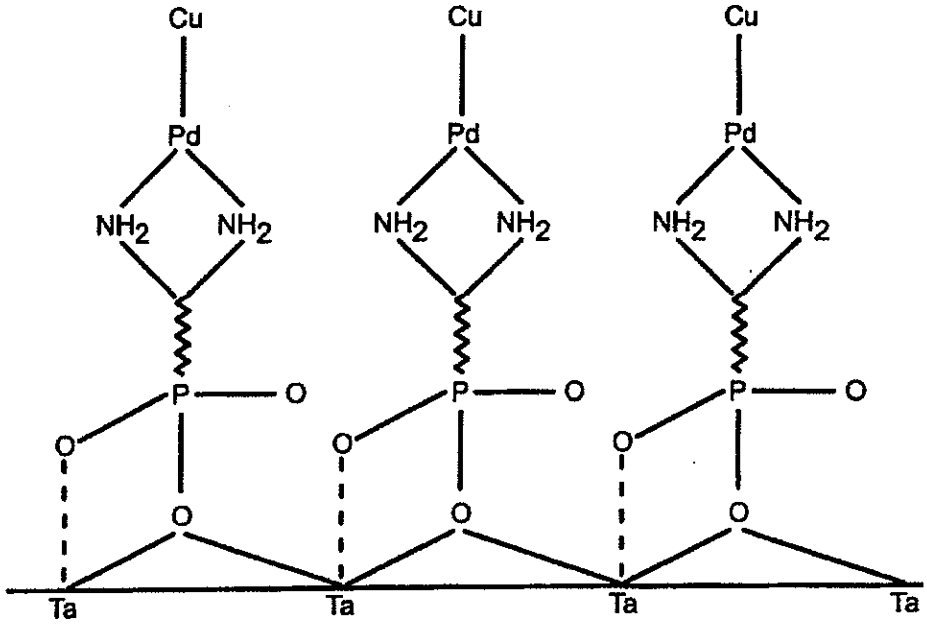


FIG. 3D

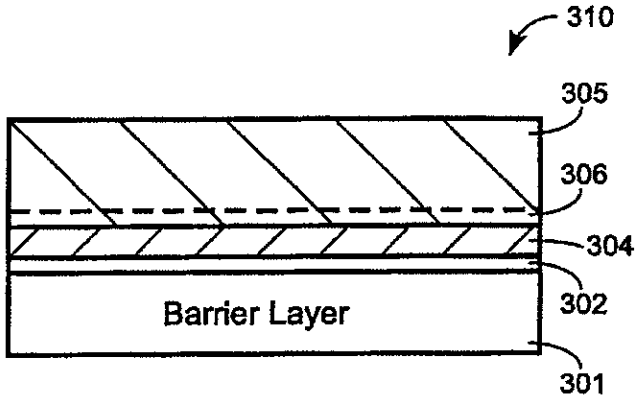

310
305
306
304
302
Barrier Layer
301

FIG. 3E

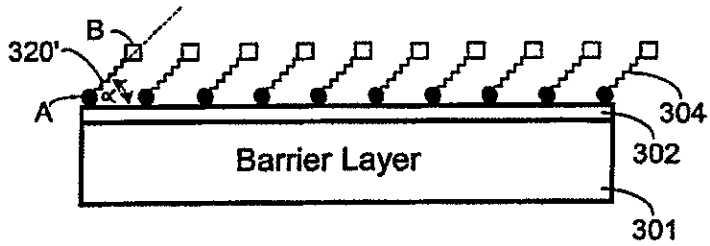

B
320'
A
α
304
302
Barrier Layer
301

FIG. 3F

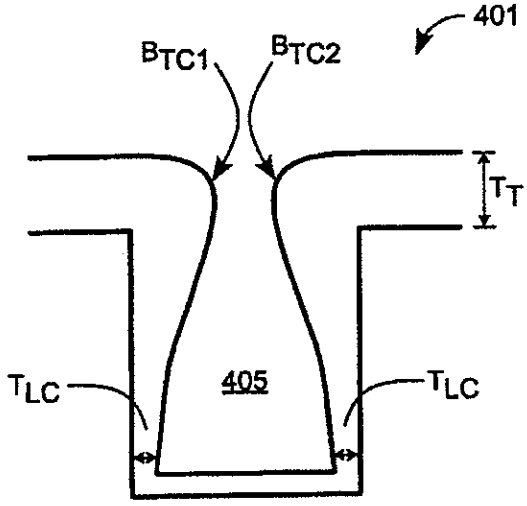


FIG. 4

FIG. 5A

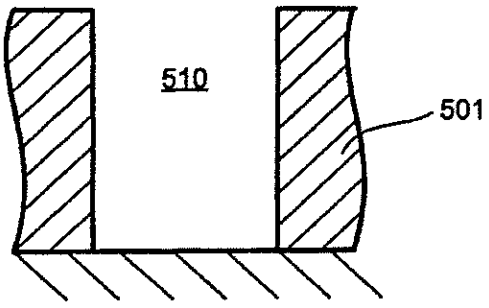


FIG. 5B

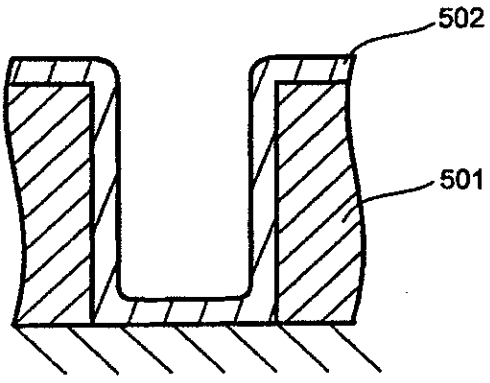


FIG. 5C

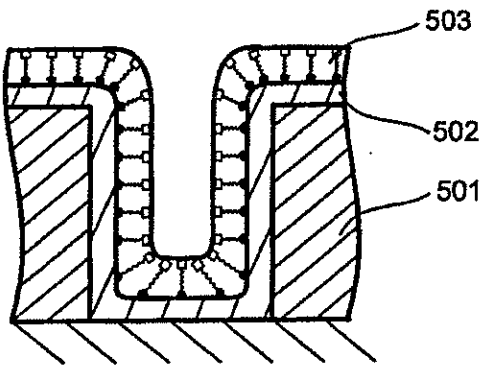


FIG. 5D

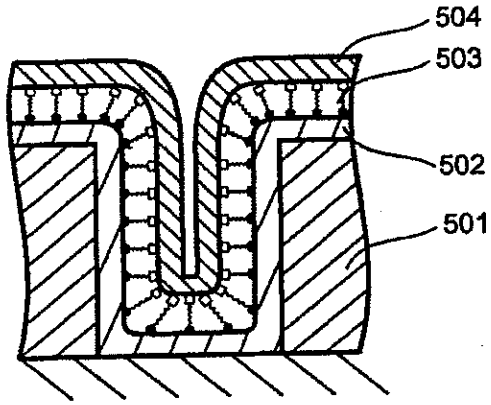
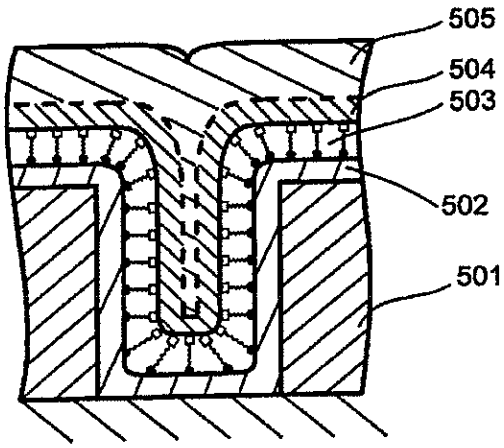


FIG. 5E



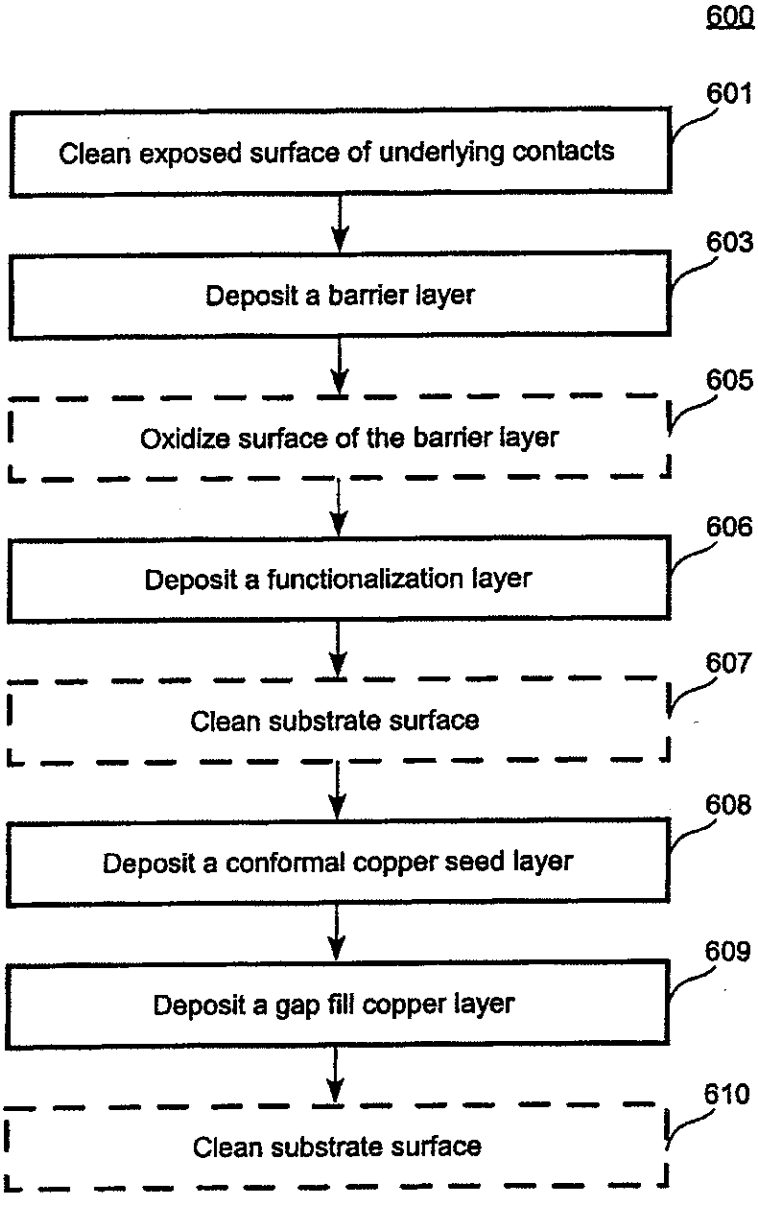

600
601
Clean exposed surface of underlying contacts
603
Deposit a barrier layer
605
Oxidize surface of the barrier layer
606
Deposit a functionalization layer
607
Clean substrate surface
608
Deposit a conformal copper seed layer
609
Deposit a gap fill copper layer
610
Clean substrate surface

FIG. 6A

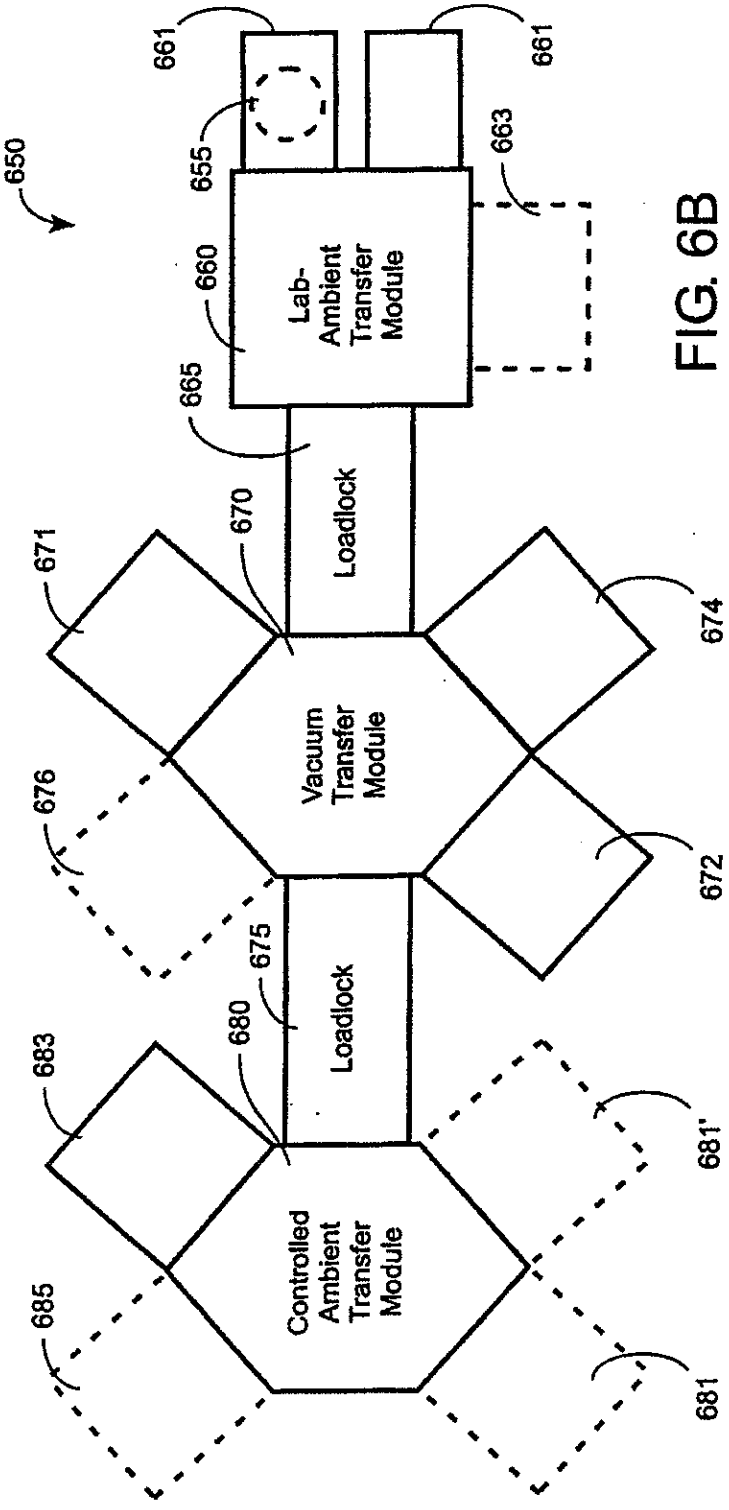

650
661
661
655
663
660
Lab-
Ambient
Transfer
Module
665
670
Loadlock
671
674
Vacuum
Transfer
Module
676
672
675
680
Loadlock
683
681'
Controlled
Ambient
Transfer
Module
685
681

FIG. 6B