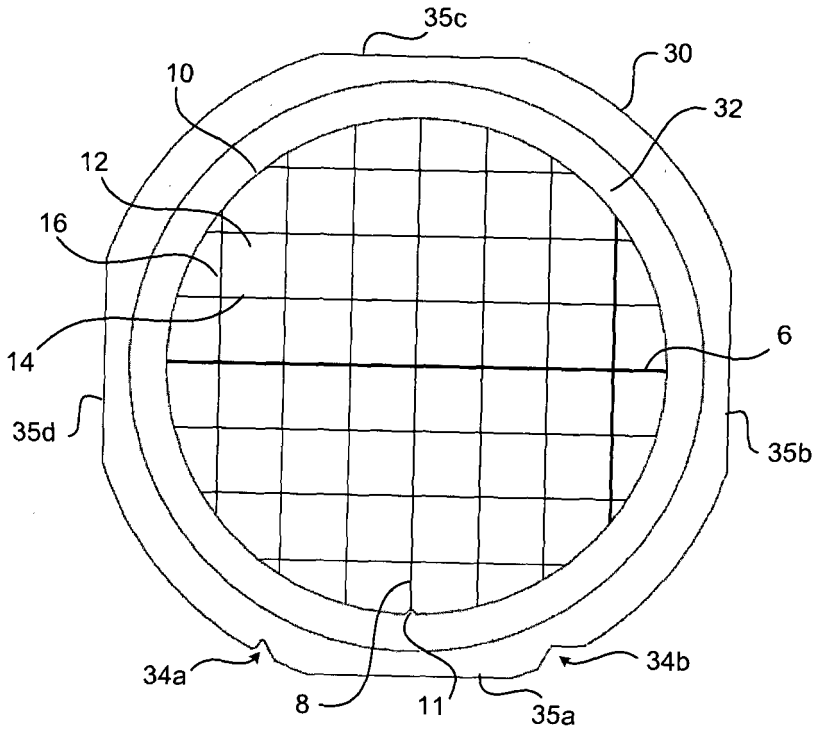

35c
30
10
32
12
16
14
6
35d
35b
34a
34b
8
11
35a

FIG. 1A

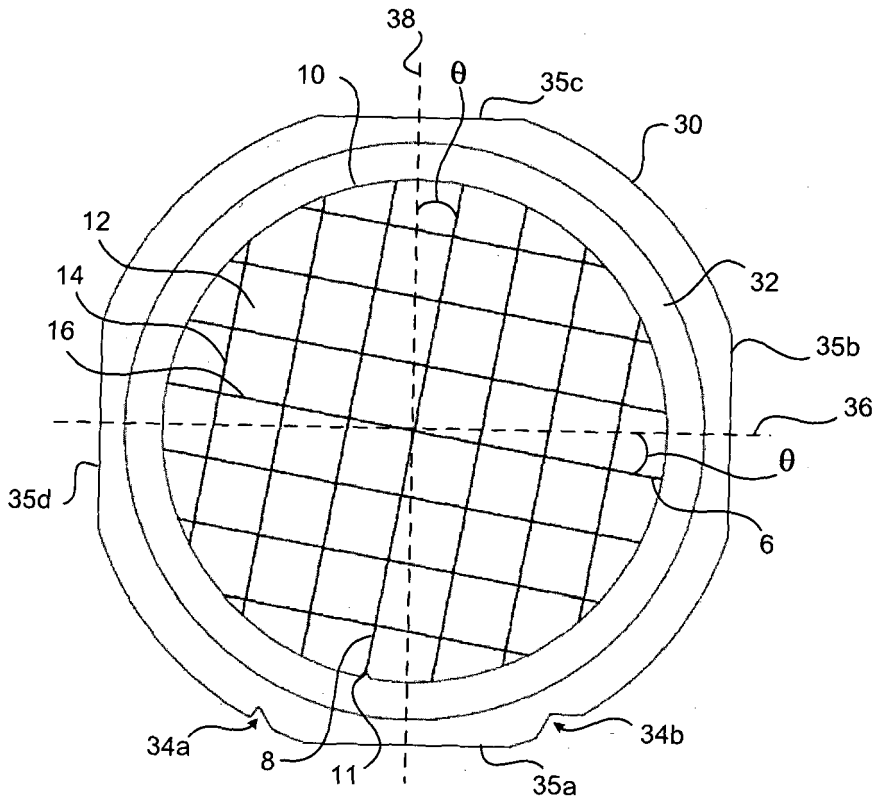
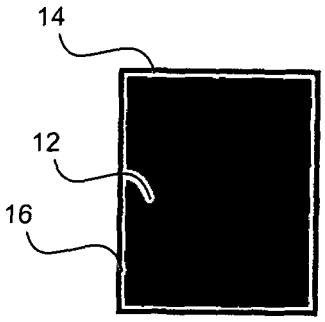

38
θ
10
35c
30
12
14
32
16
35b
36
θ
35d
6
34a
34b
8
11
35a

FIG. 1B



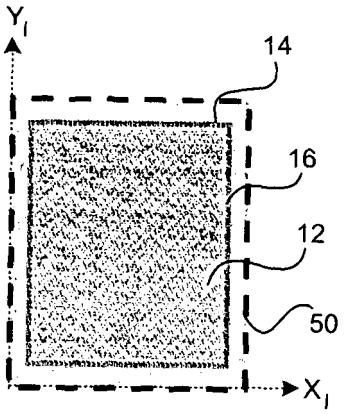
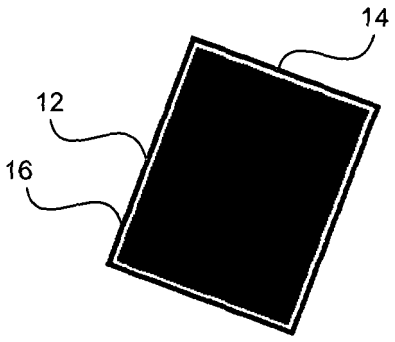


FIG. 2A



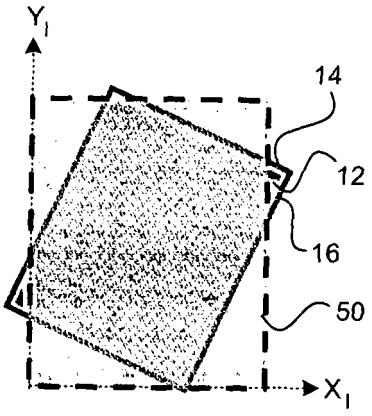


FIG. 2B

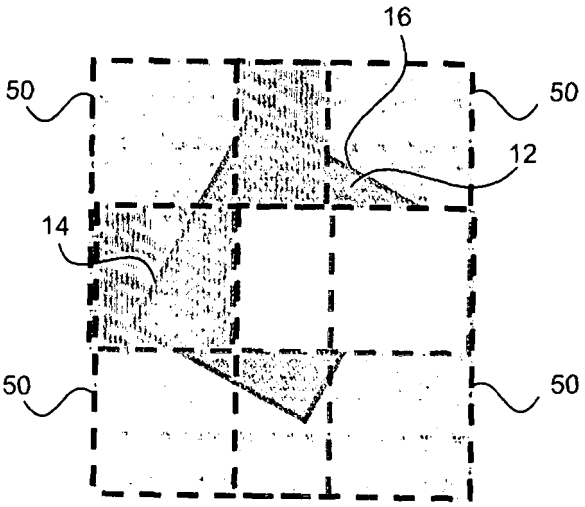


FIG. 2C

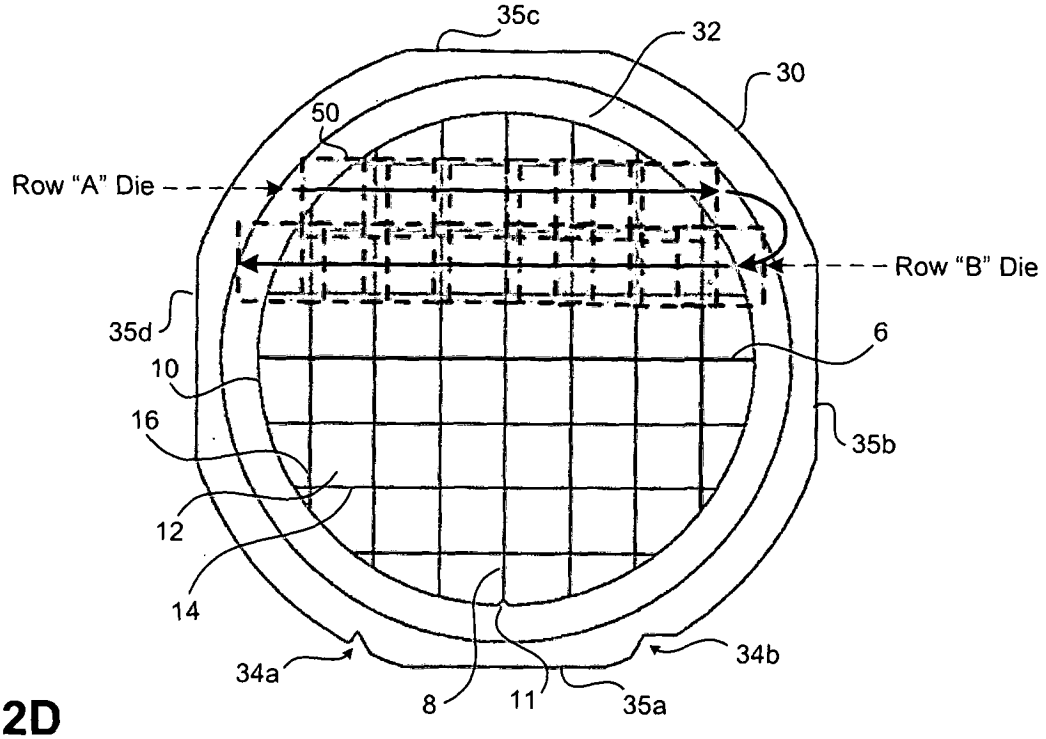

35c
32
30
50
Row "A" Die
Row "B" Die
35d
6
10
16
35b
12
14
34a
34b
8
11
35a

FIG. 2D

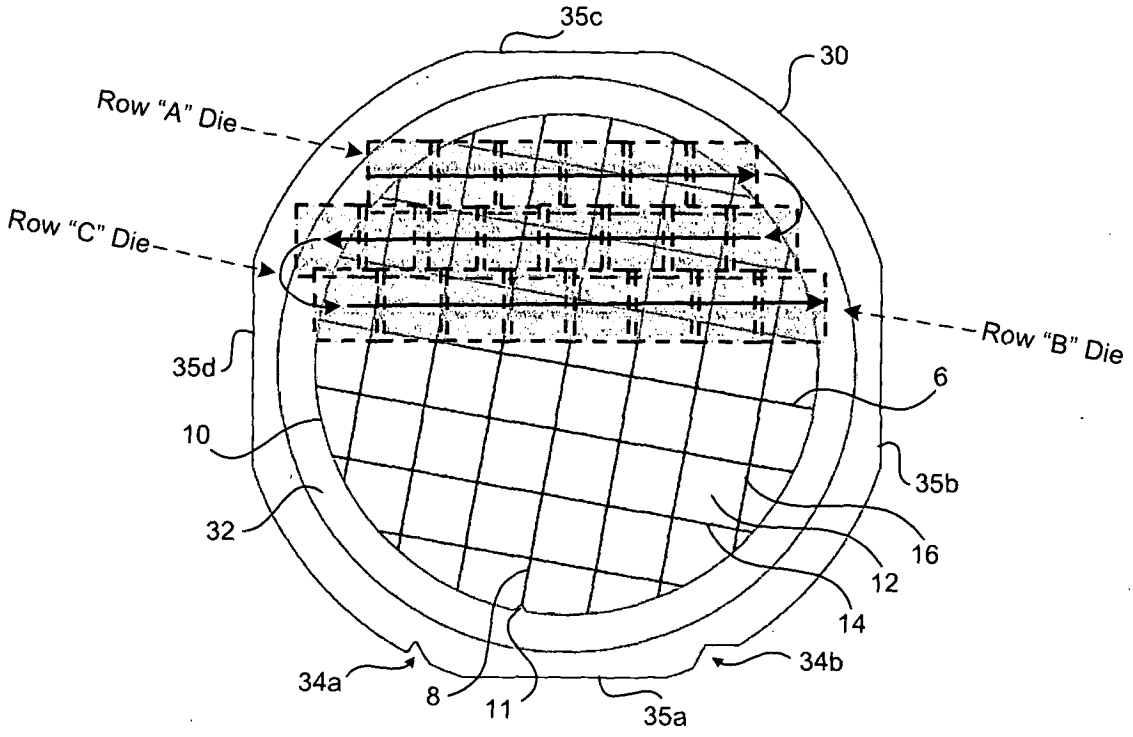

35c
30
Row "A" Die
Row "C" Die
Row "B" Die
35d
6
10
35b
32
16
12
14
34a
34b
8
11
35a

FIG. 2E

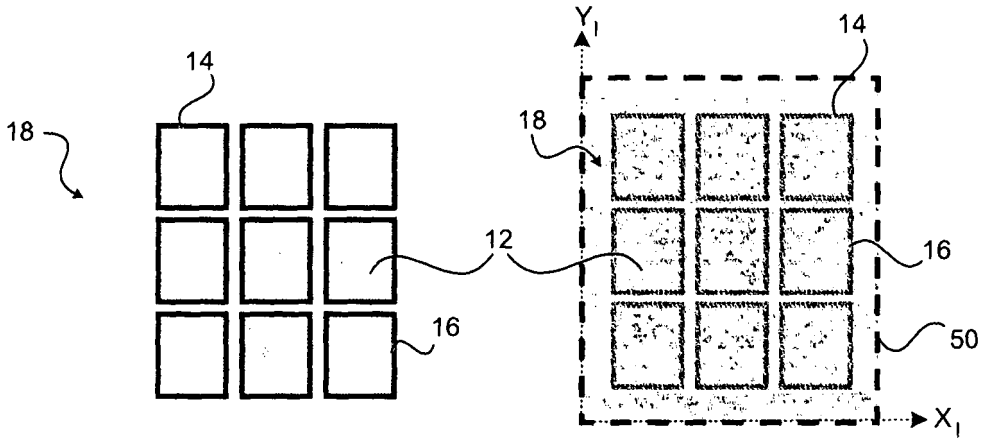


FIG. 2F

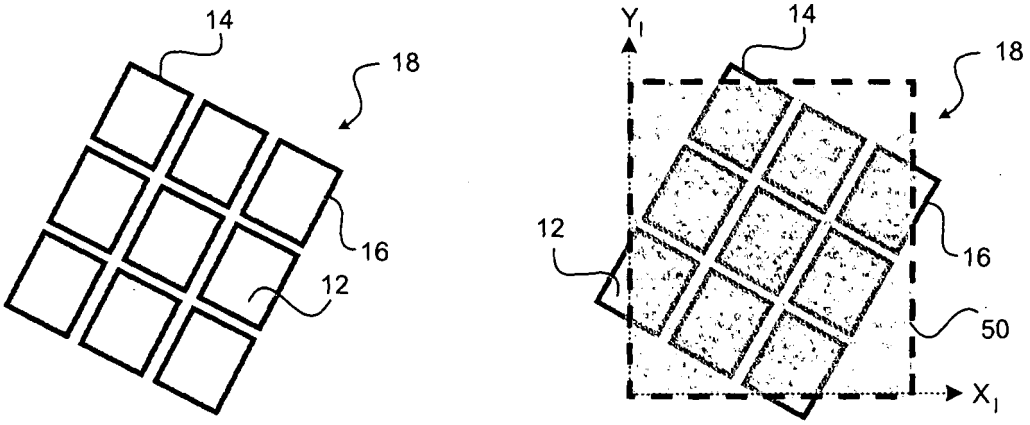


FIG. 2G

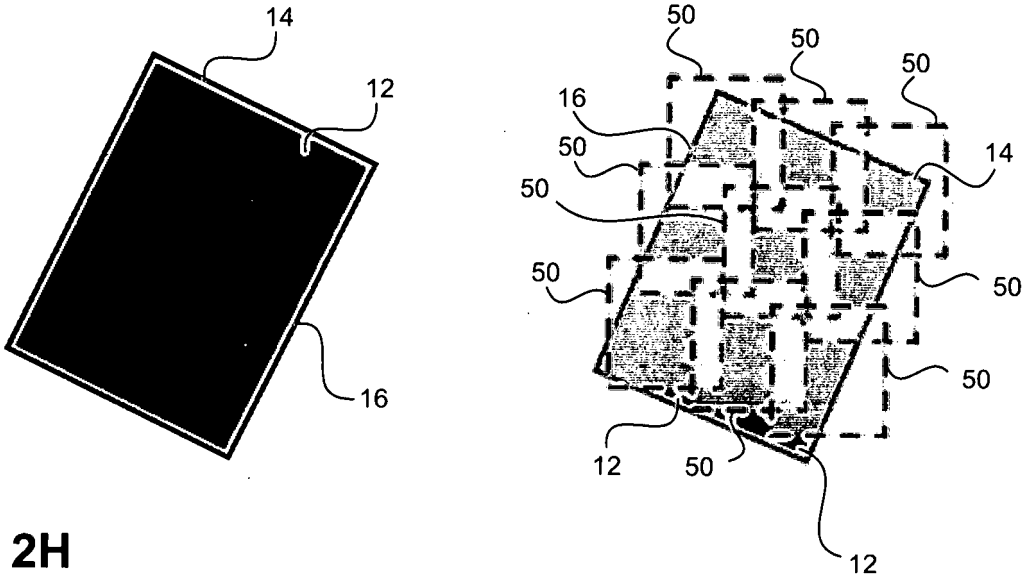

14
12
16
50
50
50
16
50
14
50
50
50
50
12
50
12

FIG. 2H

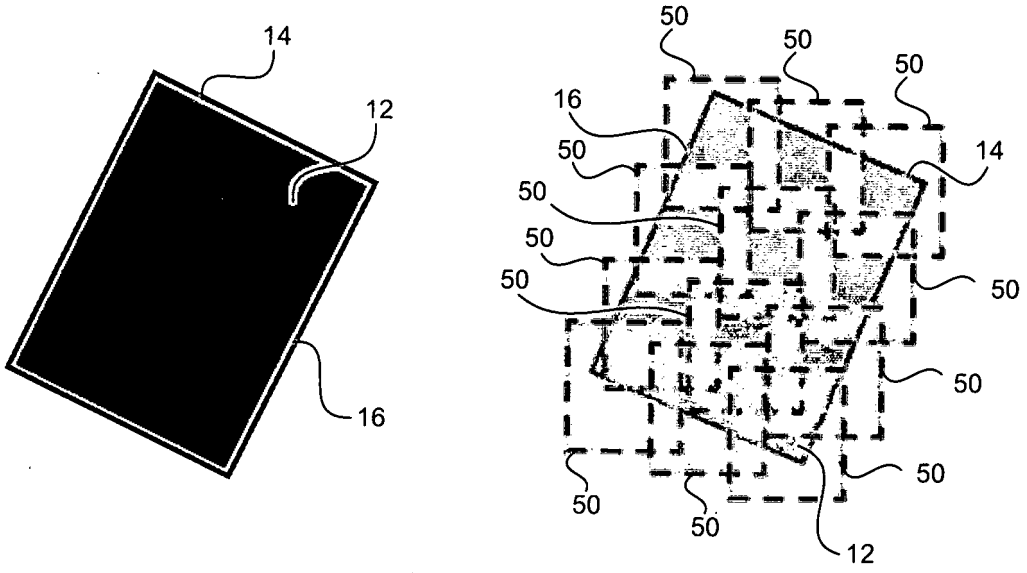

14
12
16
50
50
50
16
50
14
50
50
50
50
50
50
12

FIG. 2I

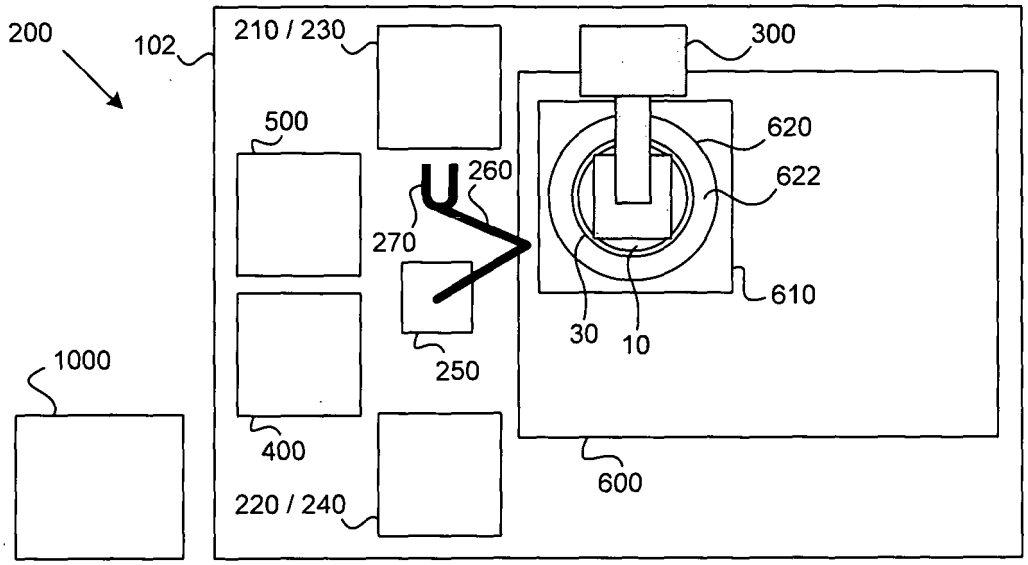

200
102
210 / 230
300
500
620
622
260
270
610
30
10
250
1000
400
600
220 / 240

FIG. 3A

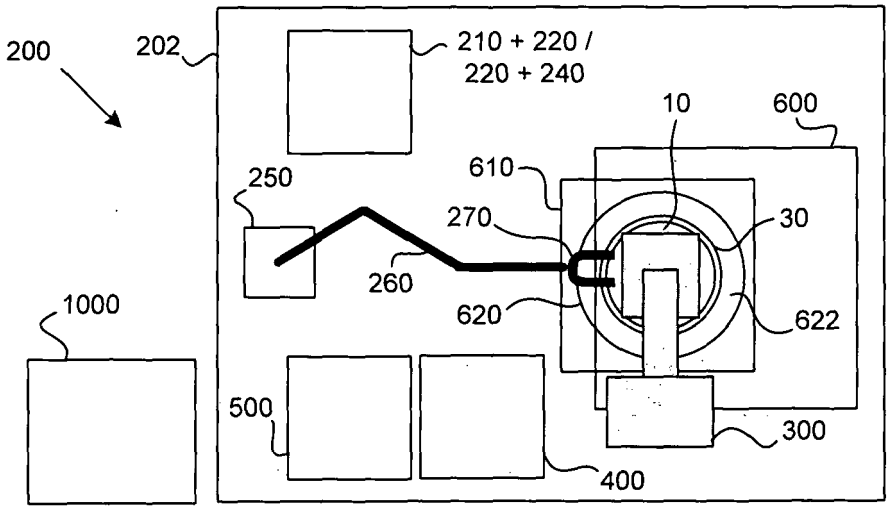

200
202
210 + 220 /
220 + 240
10
600
610
250
270
30
260
620
622
1000
500
300
400

FIG. 3B

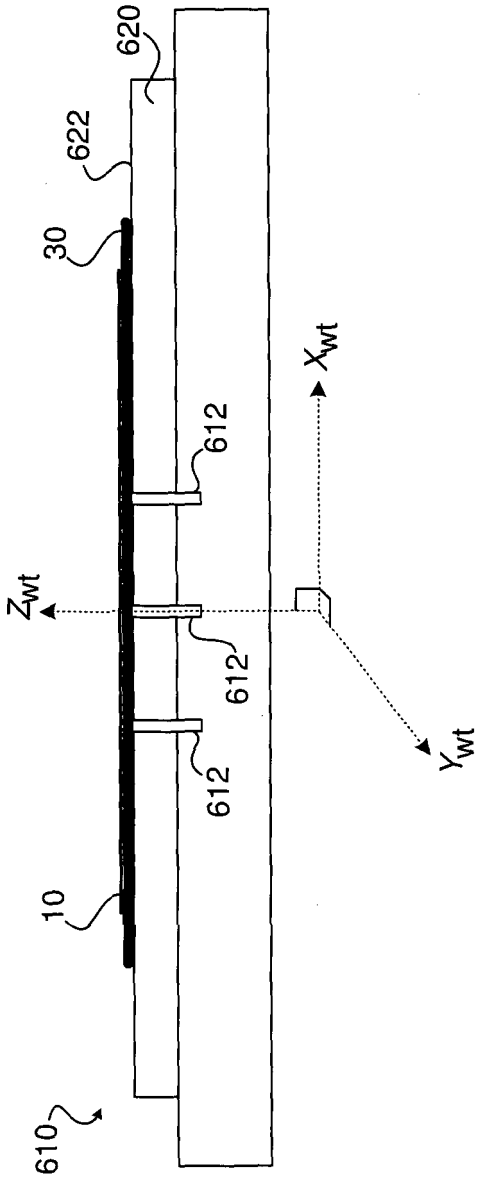


FIG. 3C

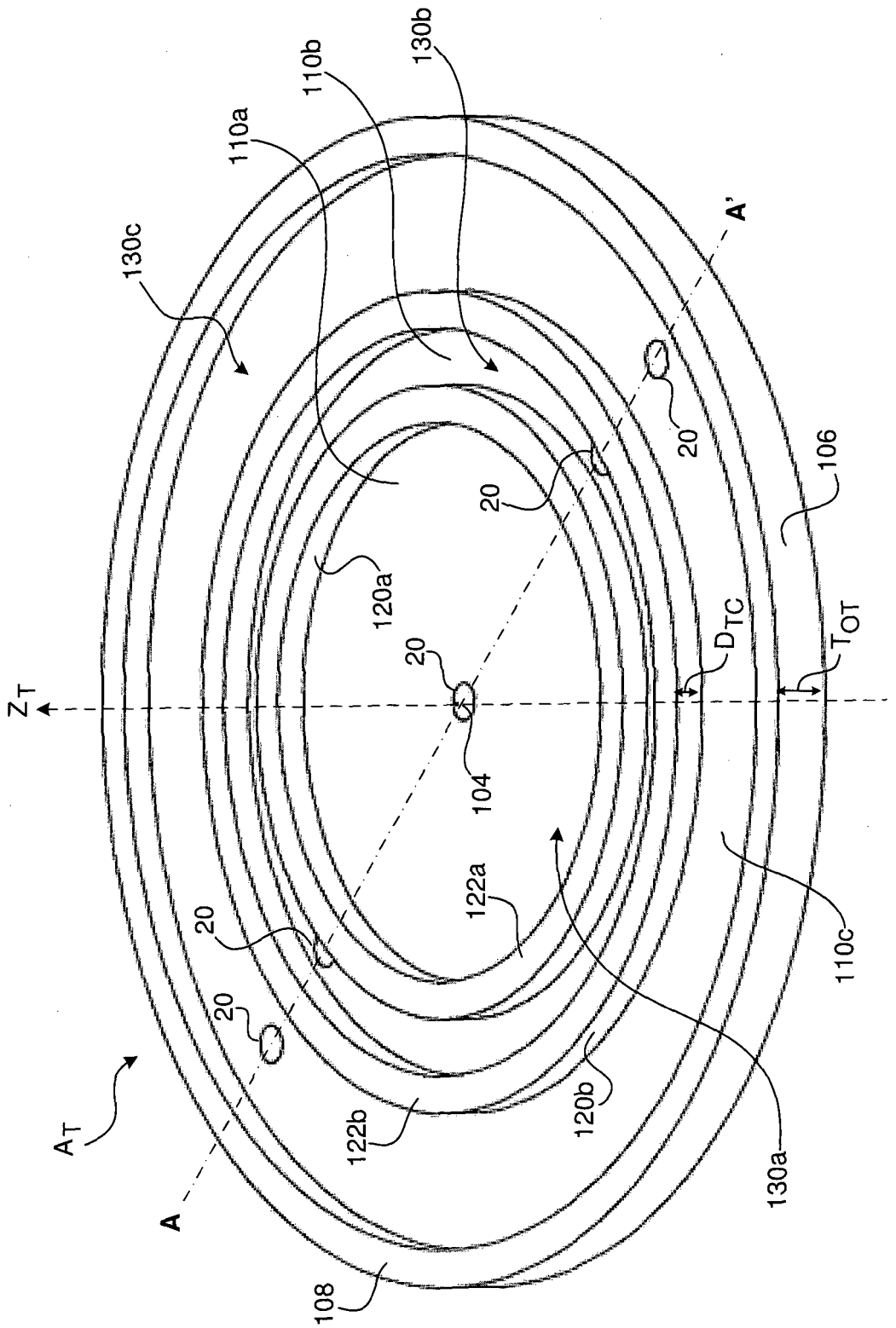
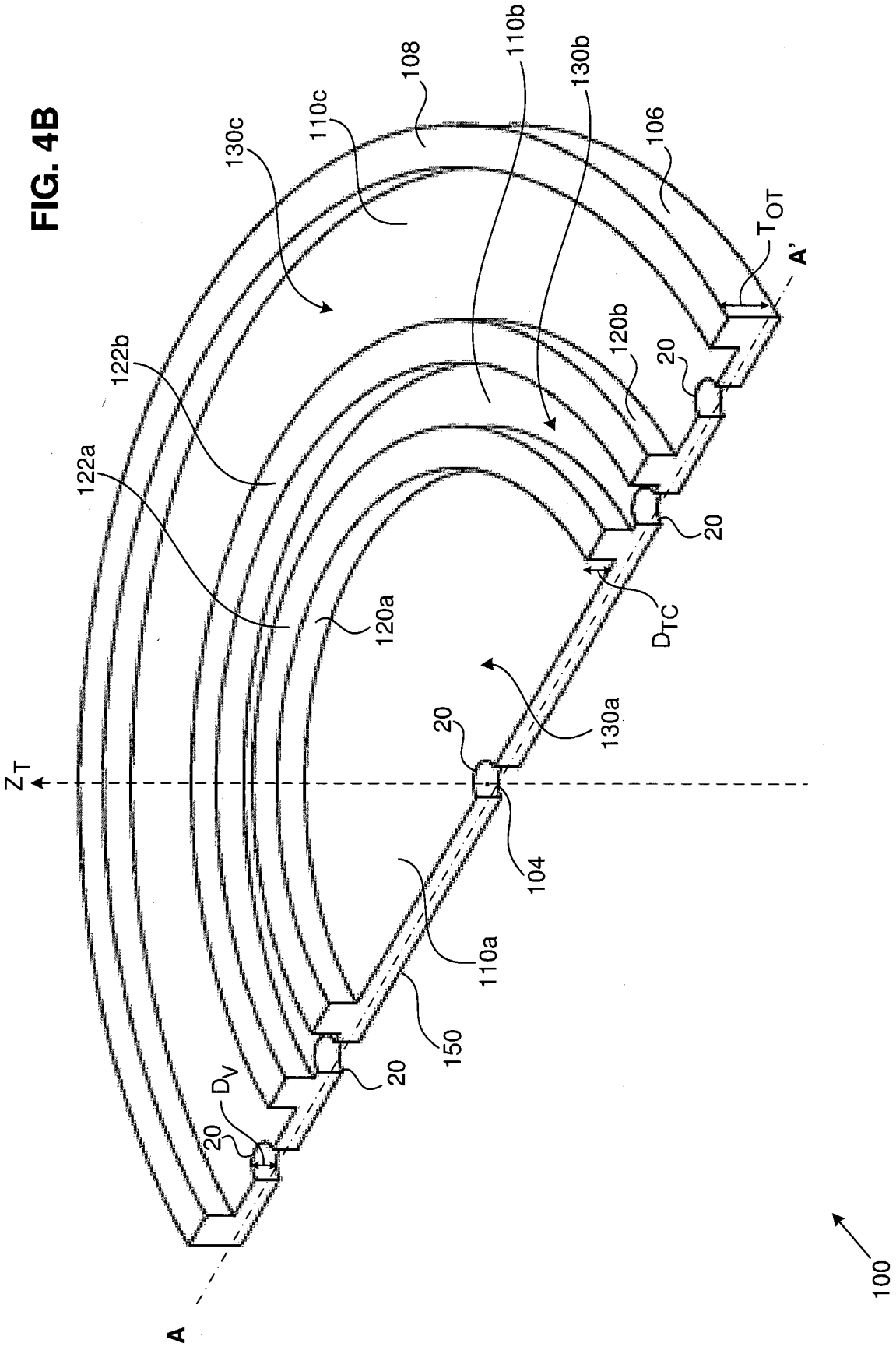

130b
110b
110a
130c
A'
20
106
120a
D_{TC}
T_{OT}
Z_T
104
122a
110c
A_T
122b
120b
130a
A
108
100

FIG. 4A

FIG. 4B


108
110b
130b
106
110c
130c
T_{OT}
A'
122b
120b
20
122a
20
120a
D_{TC}
20
130a
Z_T
104
110a
150
20
D_V
20
A
100

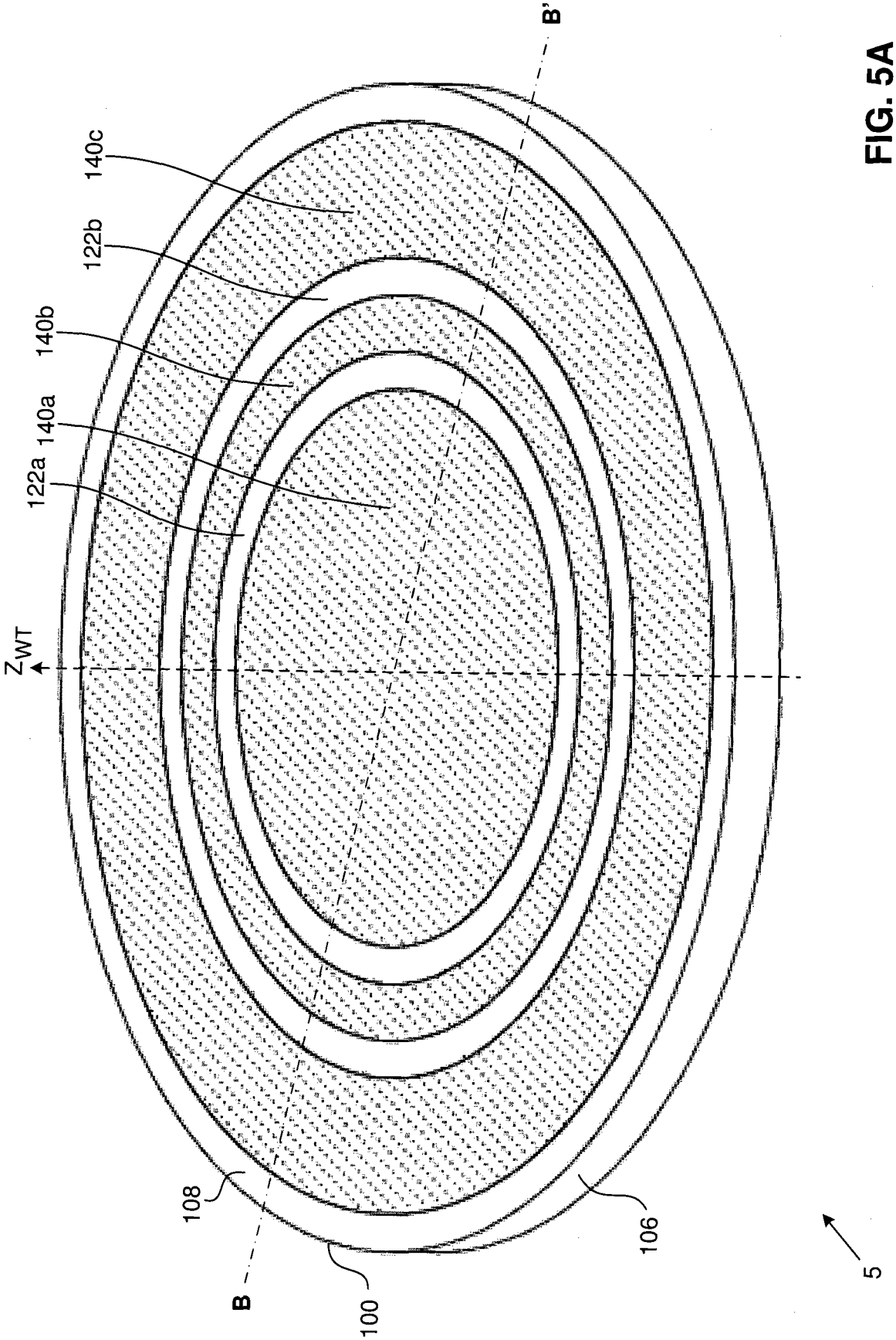


FIG. 5A

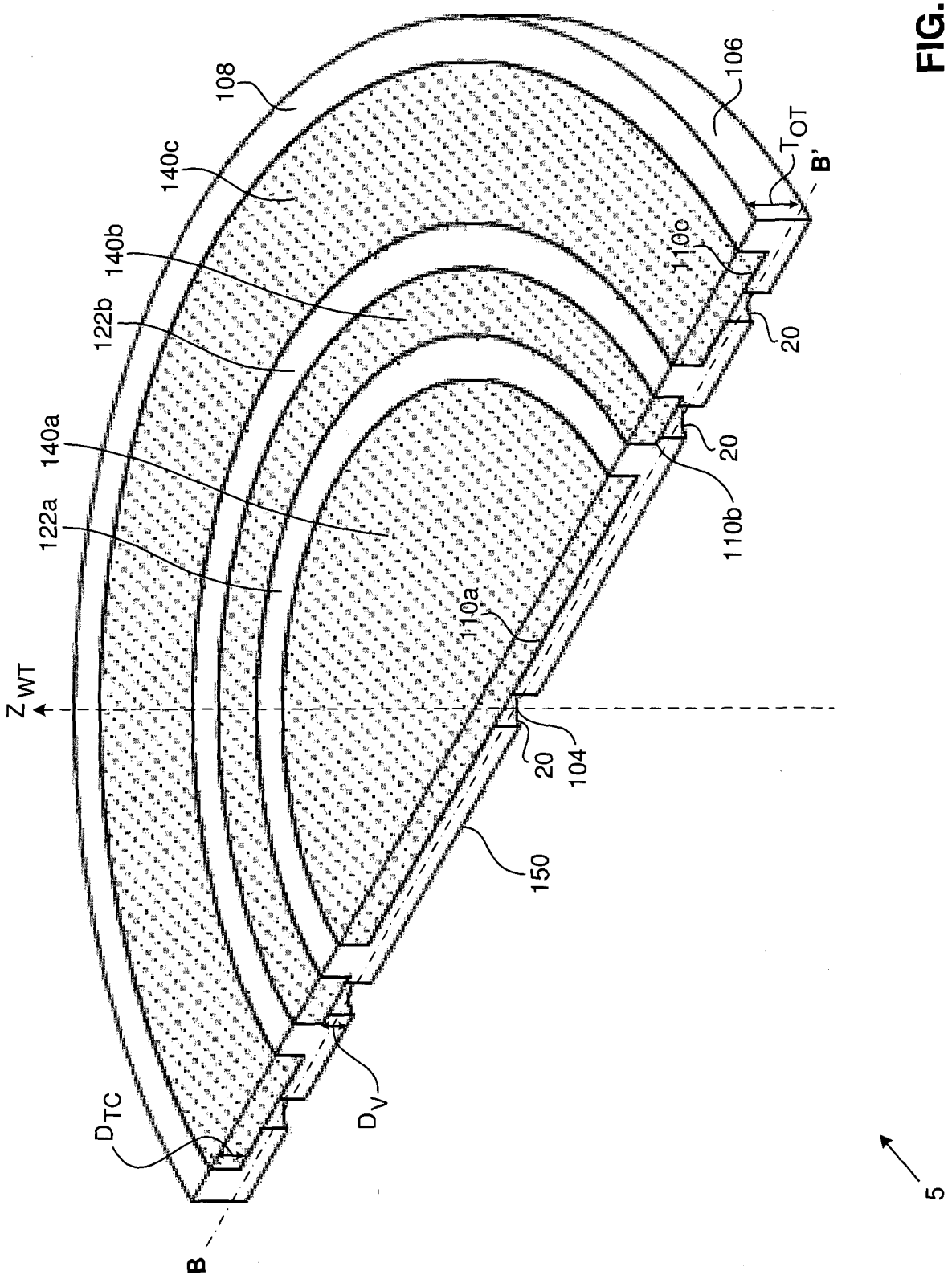

108
106
140c
T_{OT}
B'
140b
110c
122b
20
140a
20
110b
122a
110a
Z_{WT}
20
104
150
D_{TC}
D_V
B
5

FIG. 5B

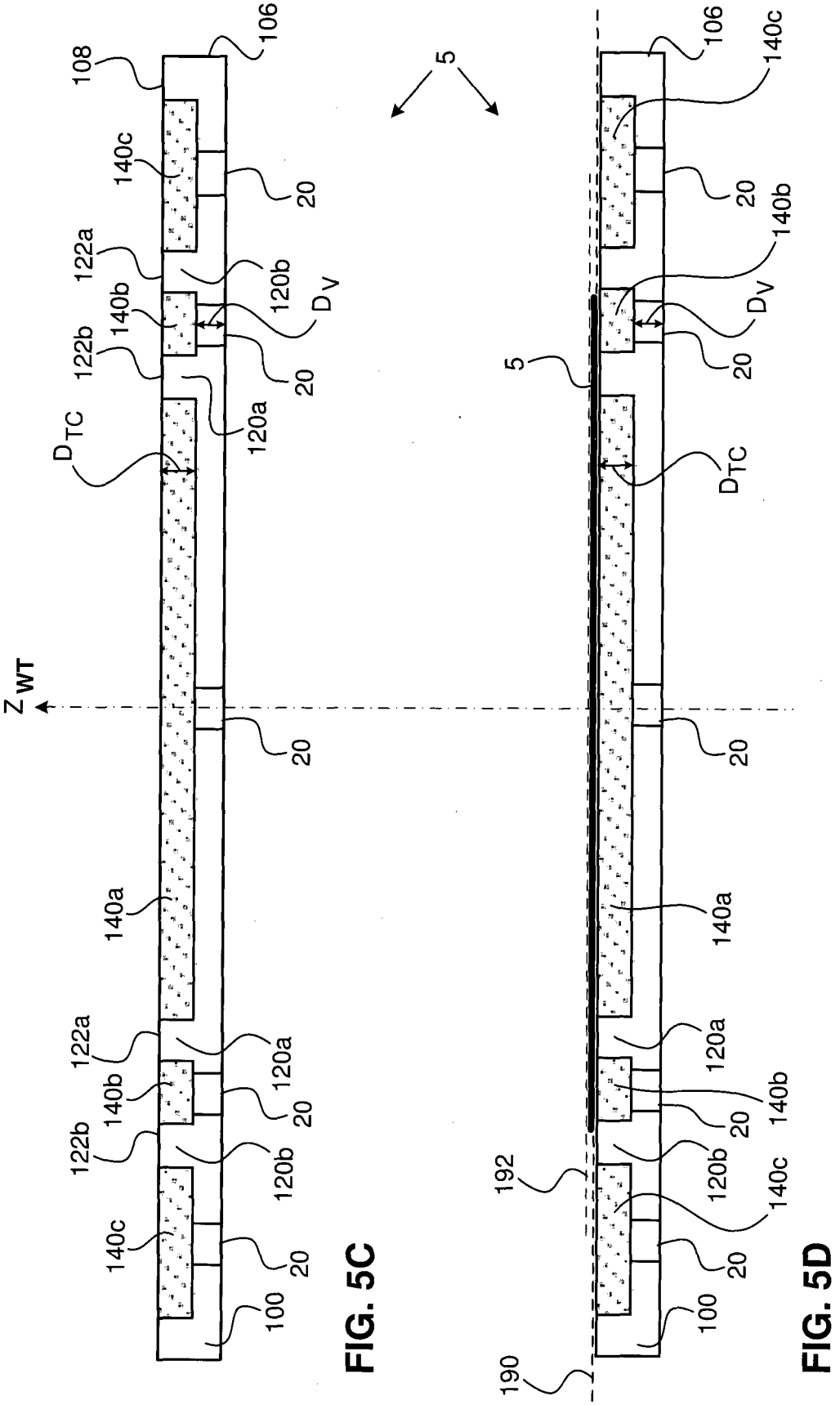

108
106
140c
20
122a
120b
140b
D_V
122b
20
120a
D_{TC}
Z_{WT}
140a
122a
120a
140b
20
122b
120b
140c
20
100
5
106
140c
20
140b
D_V
20
5
D_{TC}
140a
120a
140b
20
192
120b
140c
20
100
190

FIG. 5C

FIG. 5D

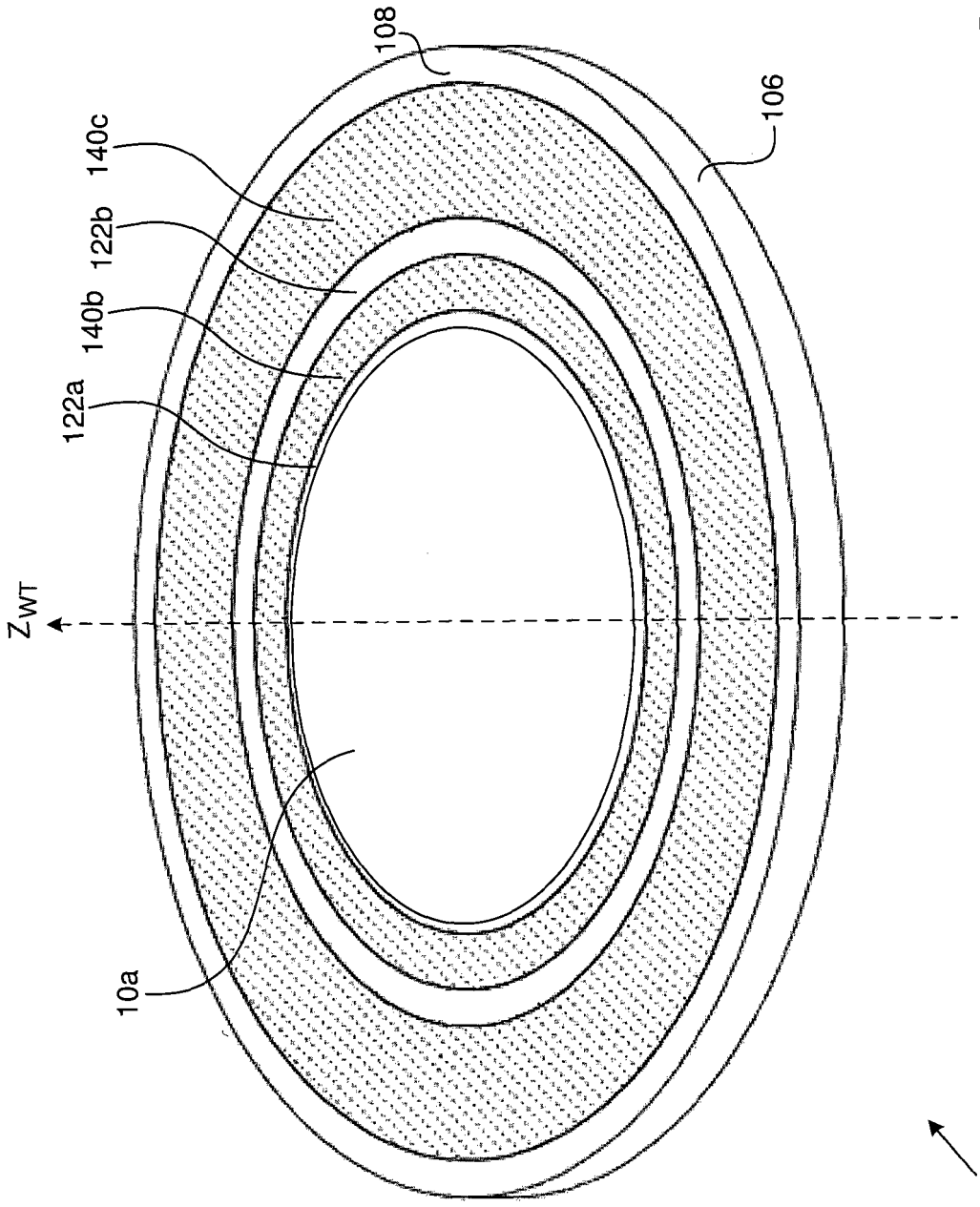


FIG. 5E

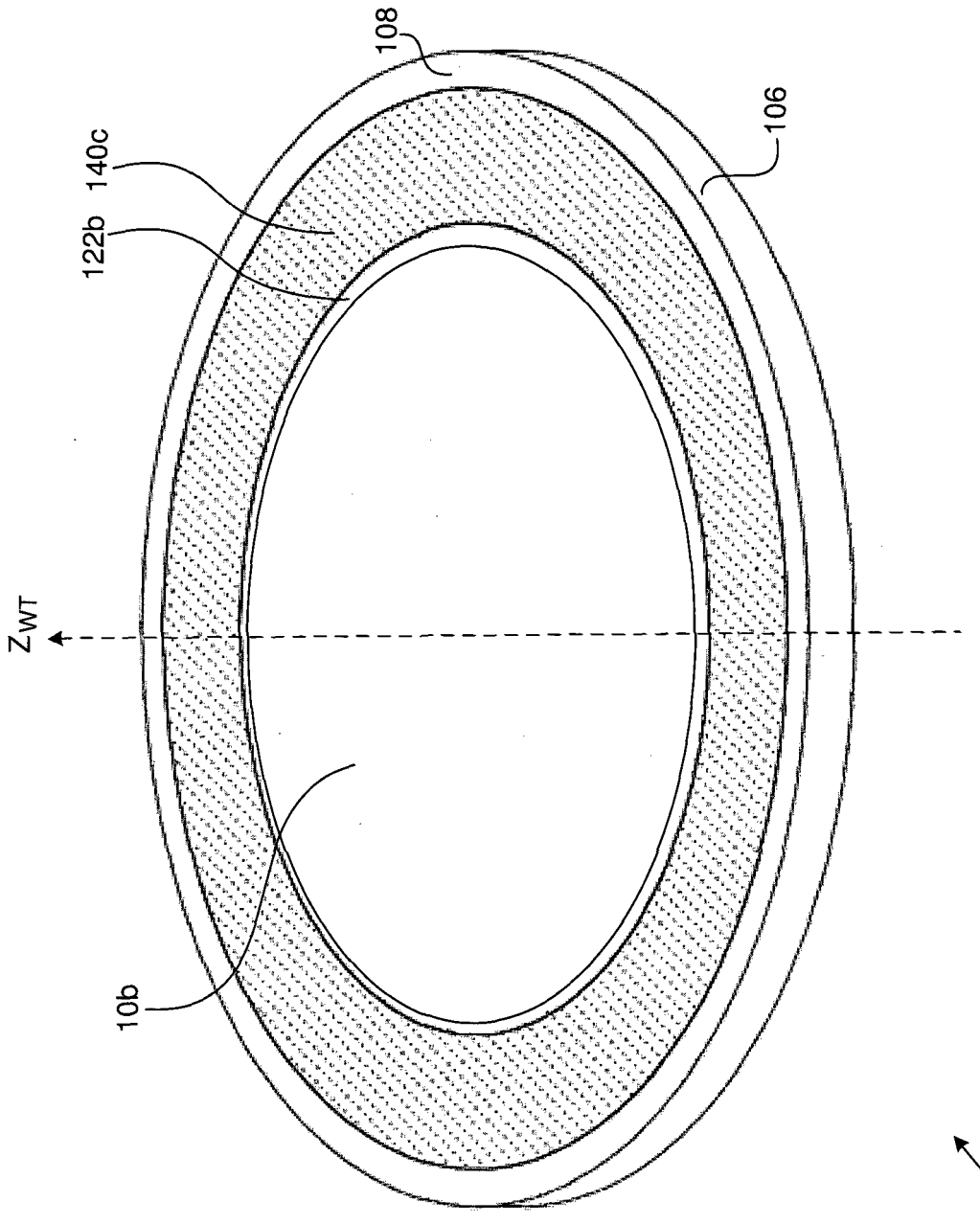


FIG. 5F

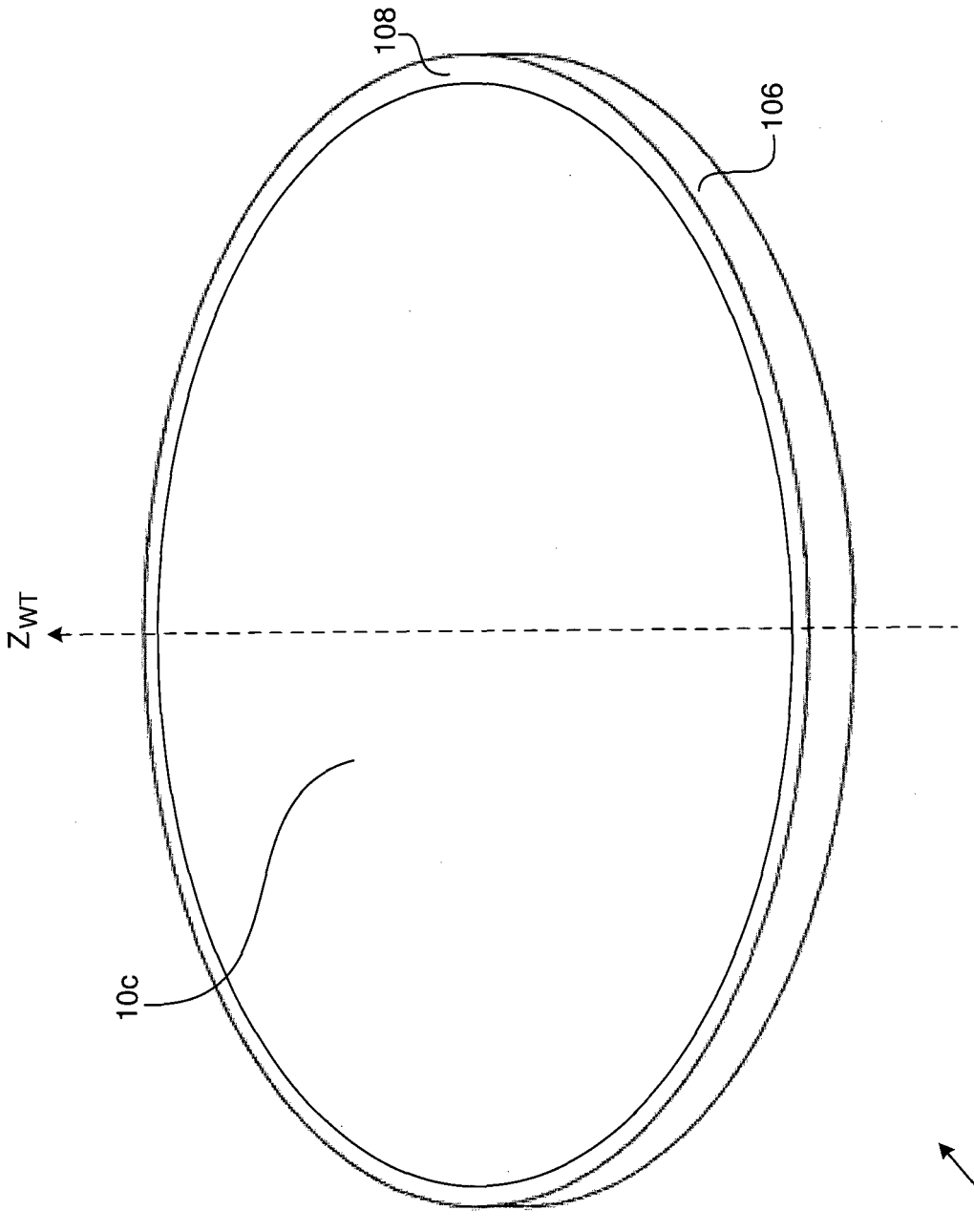


FIG. 5G

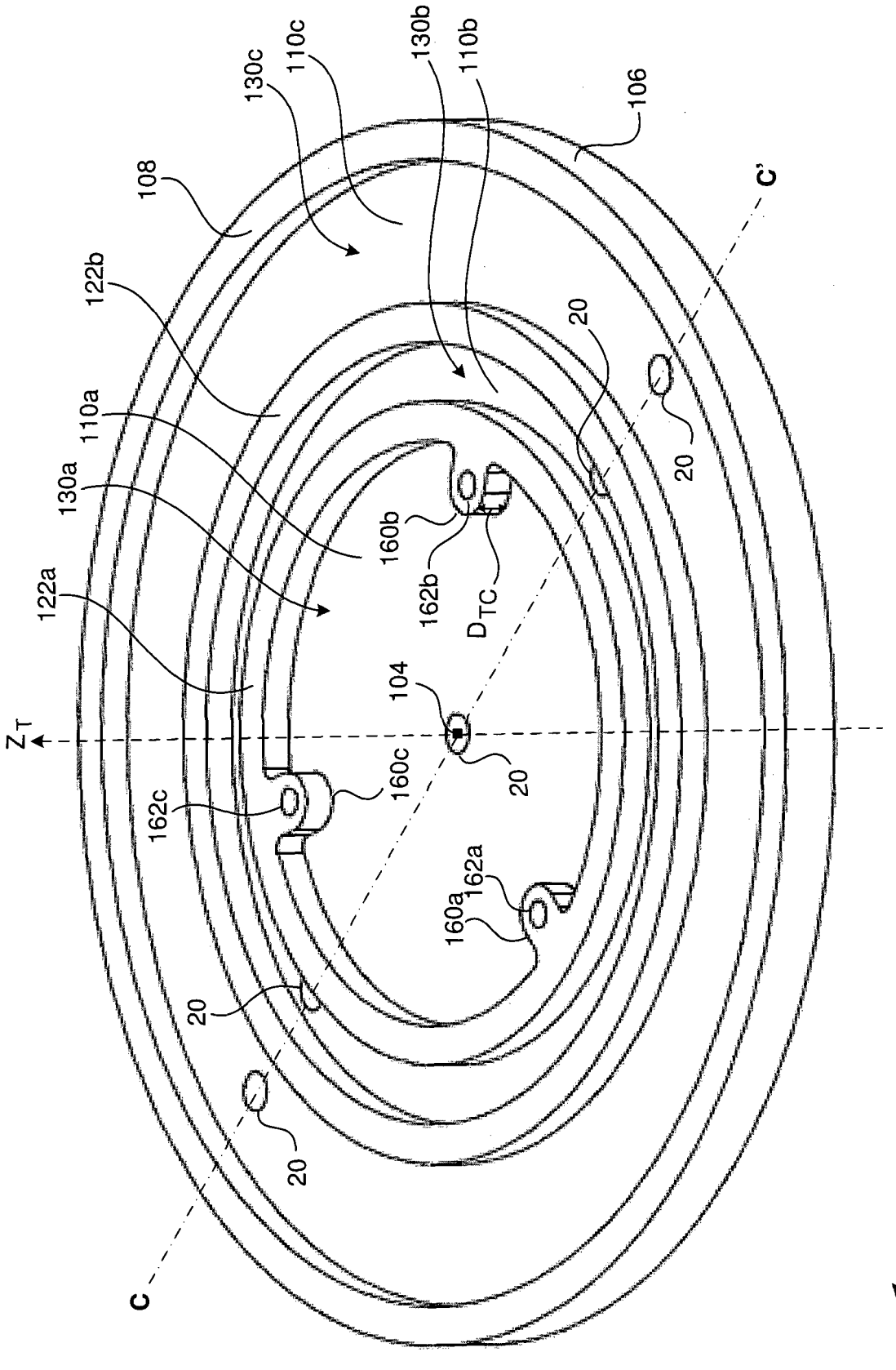

130c
110c
130b
110b
106
108
C'
122b
20
110a
130a
160b
162b
D_{TC}
122a
Z_T
104
160c
20
162c
162a
160a
20
20
C
100

FIG. 6A

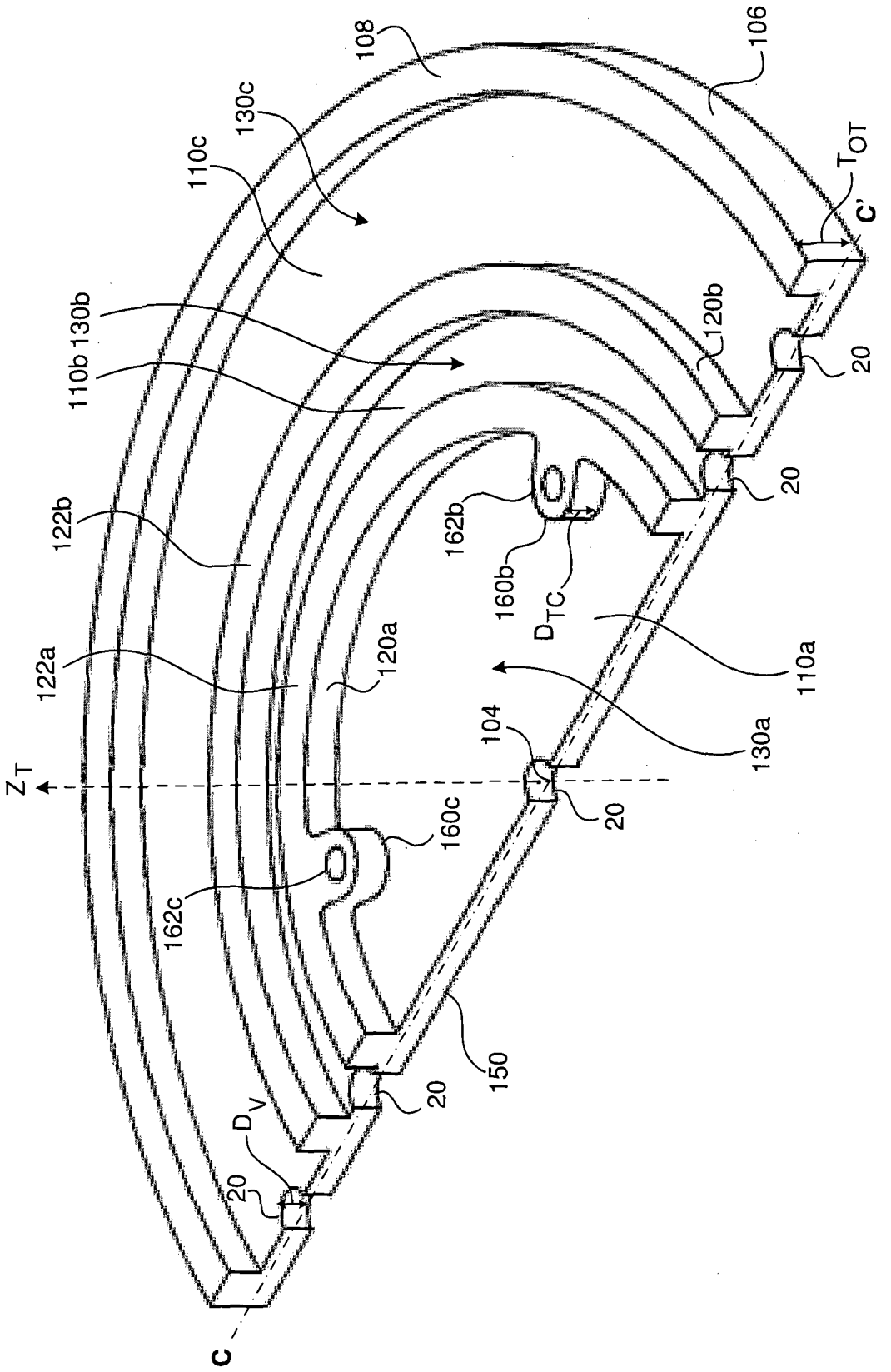

108
106
130c
110c
T_{OT}
C'
110b 130b
120b
20
122b
162b
160b
D_{TC}
122a
120a
110a
104
130a
Z_T
160c
162c
20
150
D_V
20
C
100

FIG. 6B

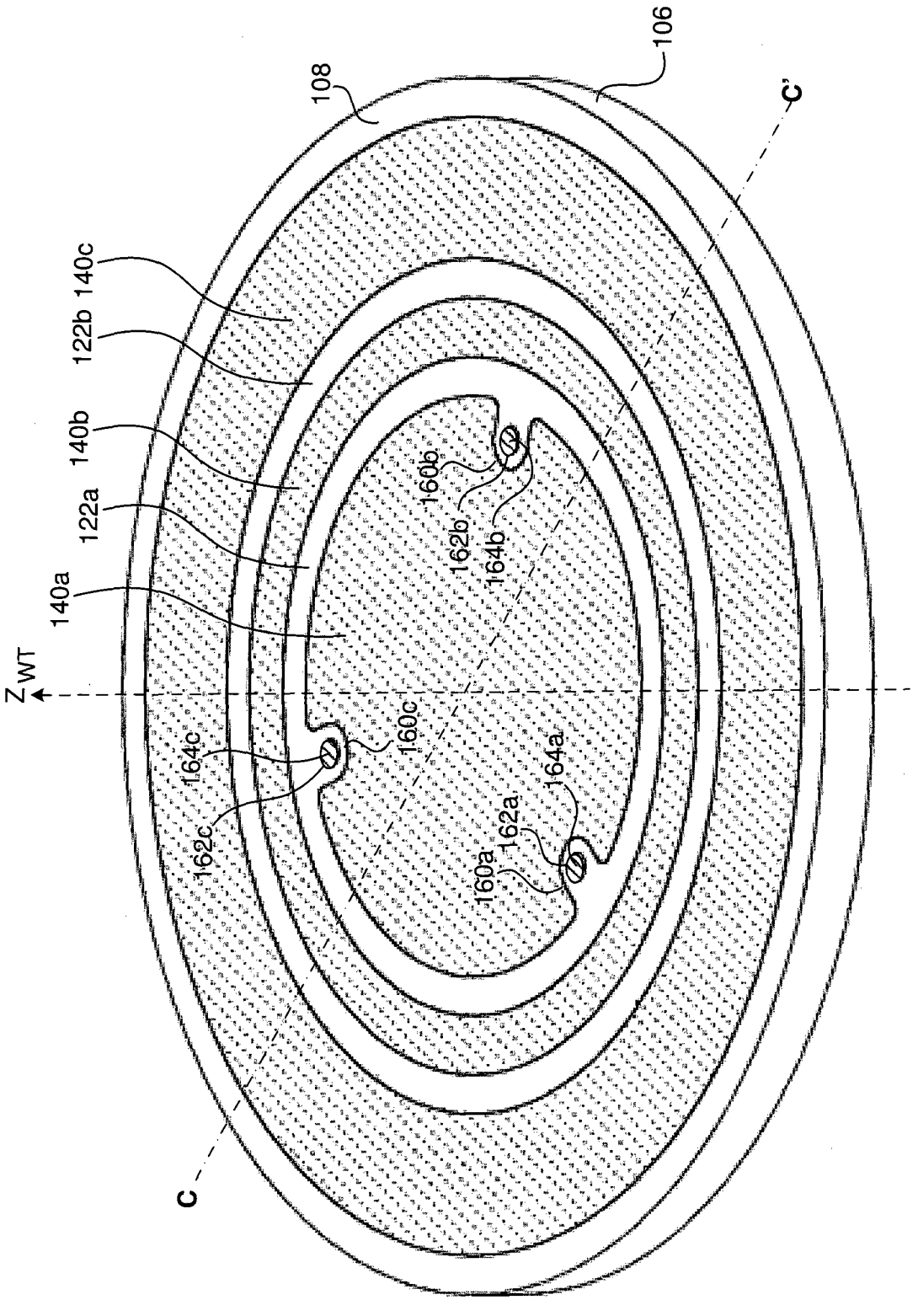

106
108
C'
140c
122b
140b
122a
140a
160b
162b
164b
Z_{WT}
160c
164c
162c
164a
162a
160a
C
5

FIG. 7A

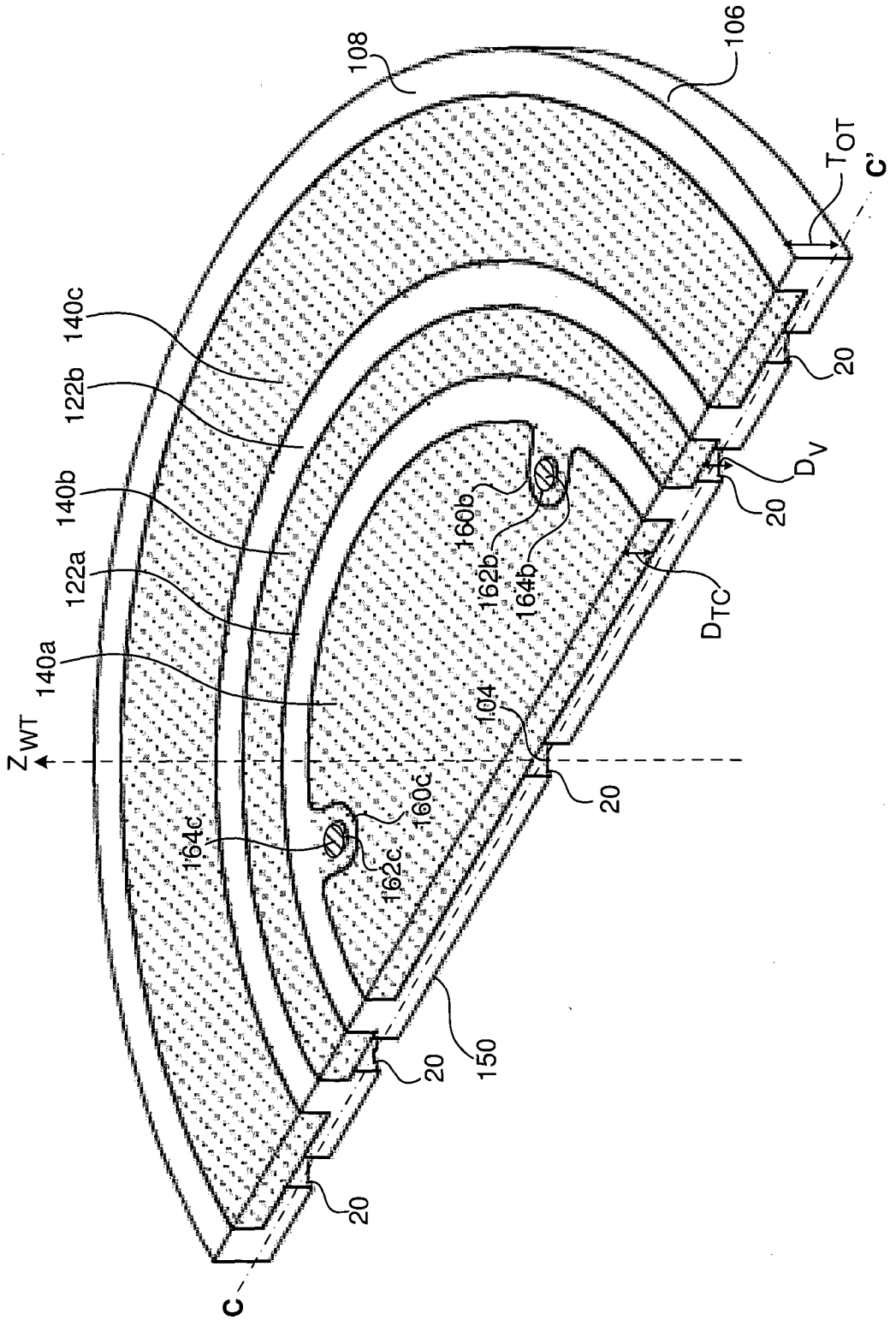

108
106
T_{OT}
C'
140c
122b
140b
122a
140a
Z_{WT}
160b
162b
164b
D_V
D_{TC}
104
160c
162c
164c
20
150
C
5

FIG. 7B

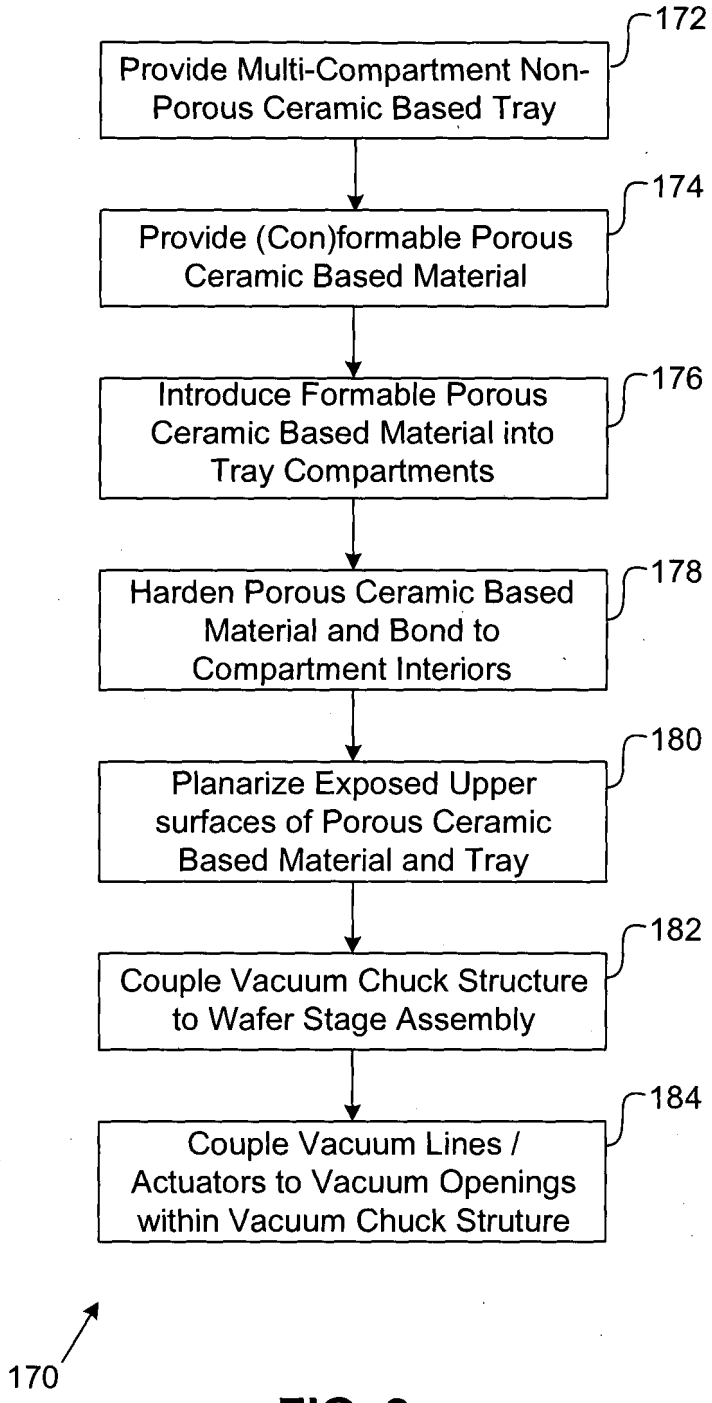

Provide Multi-Compartment Non-Porous Ceramic Based Tray
172
Provide (Con)formable Porous Ceramic Based Material
174
Introduce Formable Porous Ceramic Based Material into Tray Compartments
176
Harden Porous Ceramic Based Material and Bond to Compartment Interiors
178
Planarize Exposed Upper surfaces of Porous Ceramic Based Material and Tray
180
Couple Vacuum Chuck Structure to Wafer Stage Assembly
182
Couple Vacuum Lines / Actuators to Vacuum Openings within Vacuum Chuck Struture
184
170

FIG. 8

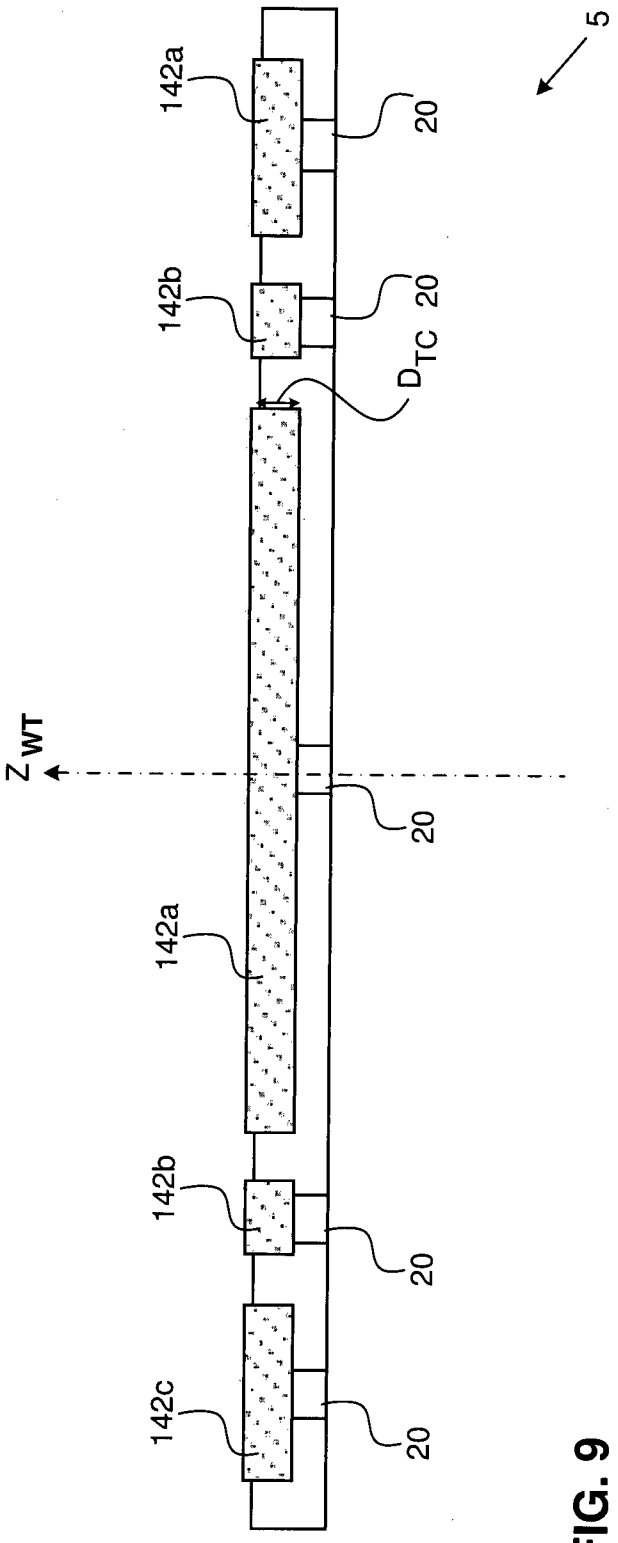


FIG. 9

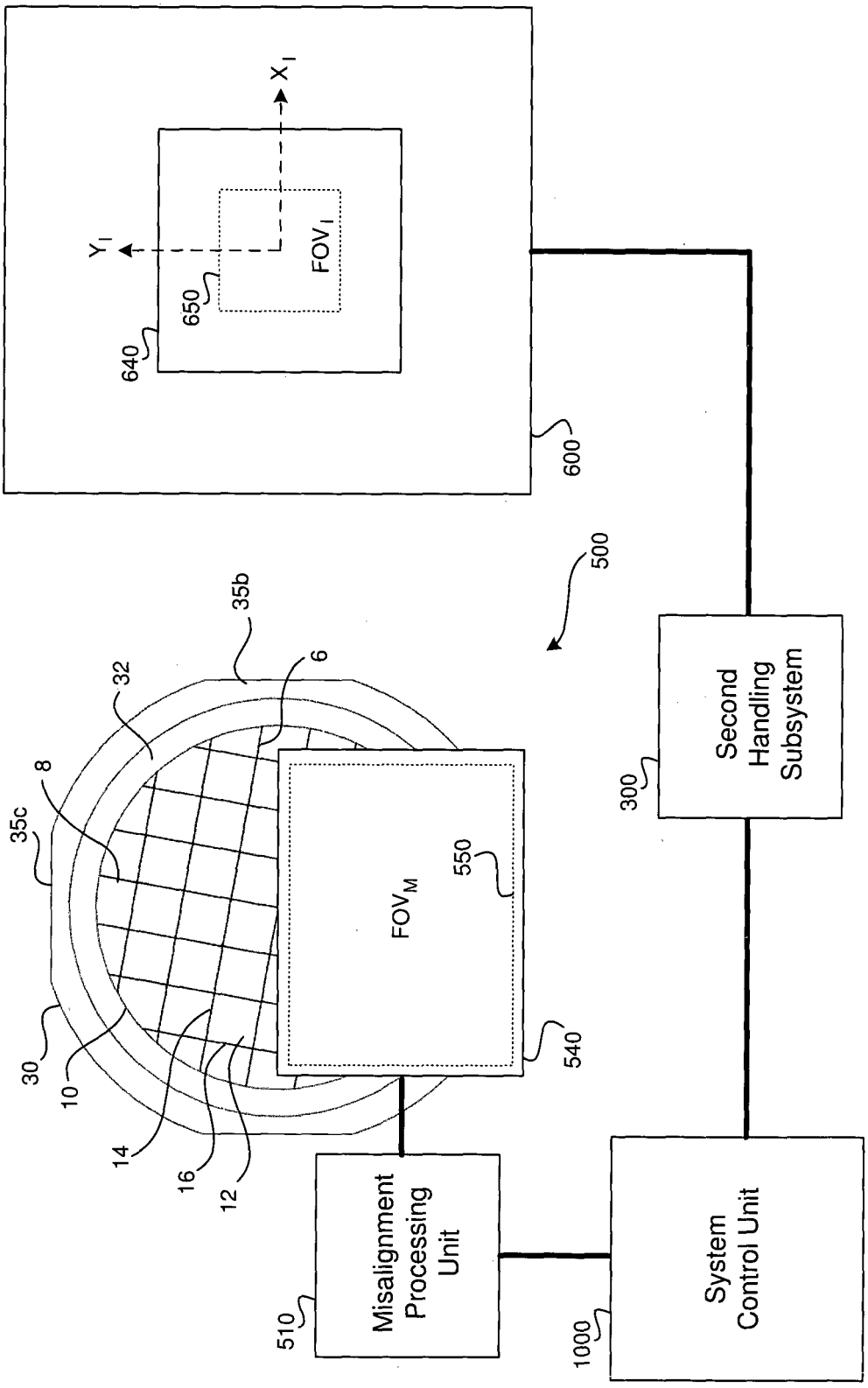

X_I
Y_I
FOV_I
650
640
600
500
35b
6
32
8
35c
30
10
14
16
12
FOV_M
550
540
300
Second Handling Subsystem
510
Misalignment Processing Unit
1000
System Control Unit

FIG. 10A

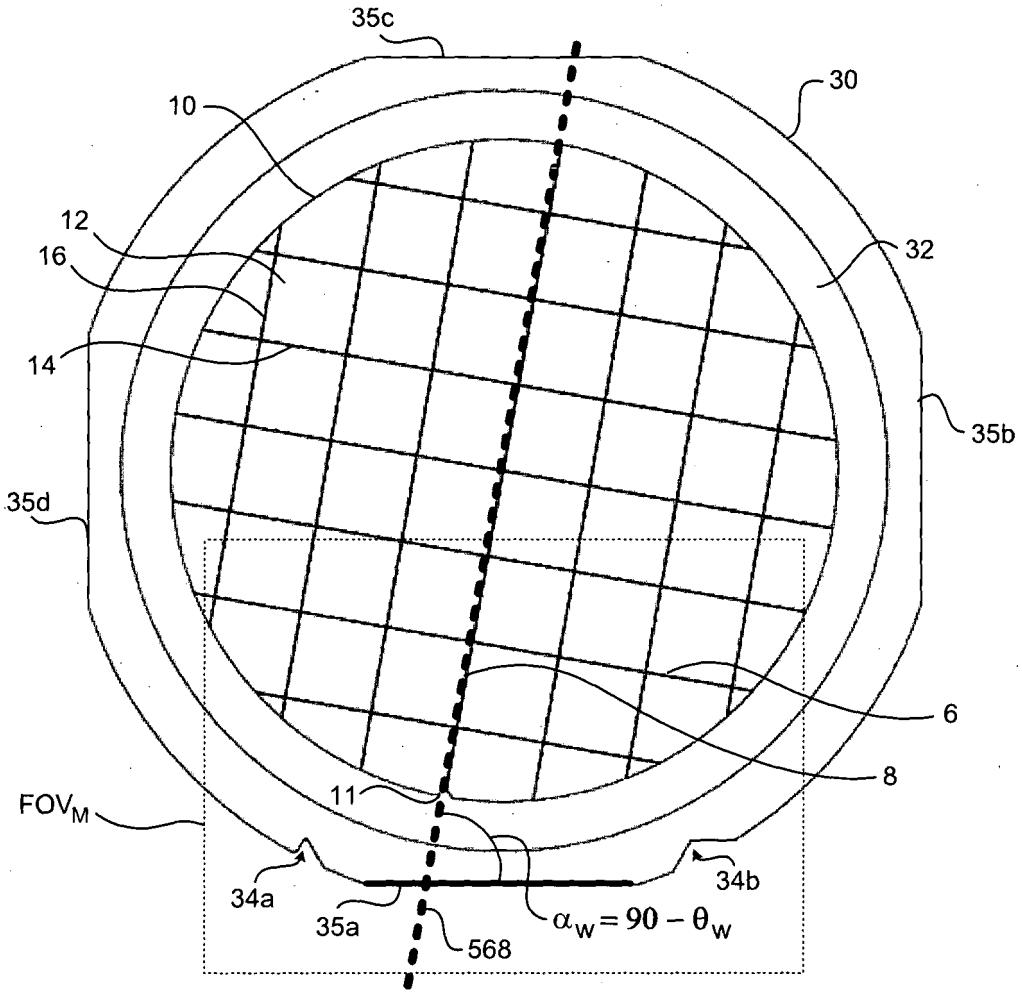

35c
10
30
12
16
32
14
35b
35d
6
8
11
FOV$_M$
34a
34b
35a
568
$\alpha_w = 90 - \theta_w$

FIG. 10B

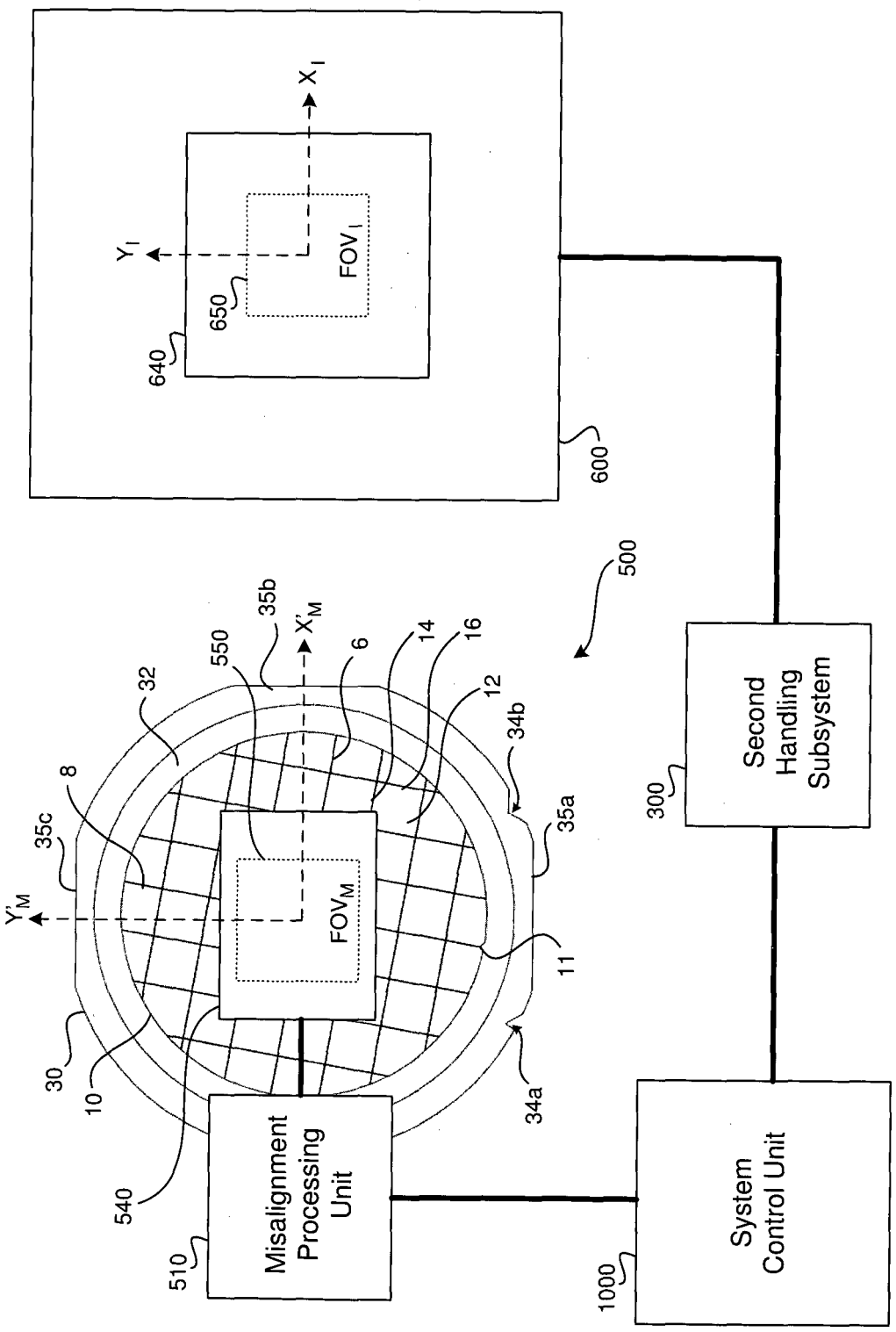

X_I
Y_I
FOV_I
650
640
600
500
X'_M
Y'_M
FOV_M
35b
550
32
6
14
16
12
34b
8
35c
35a
11
30
10
34a
540
Misalignment Processing Unit
510
Second Handling Subsystem
300
System Control Unit
1000

FIG. 10C

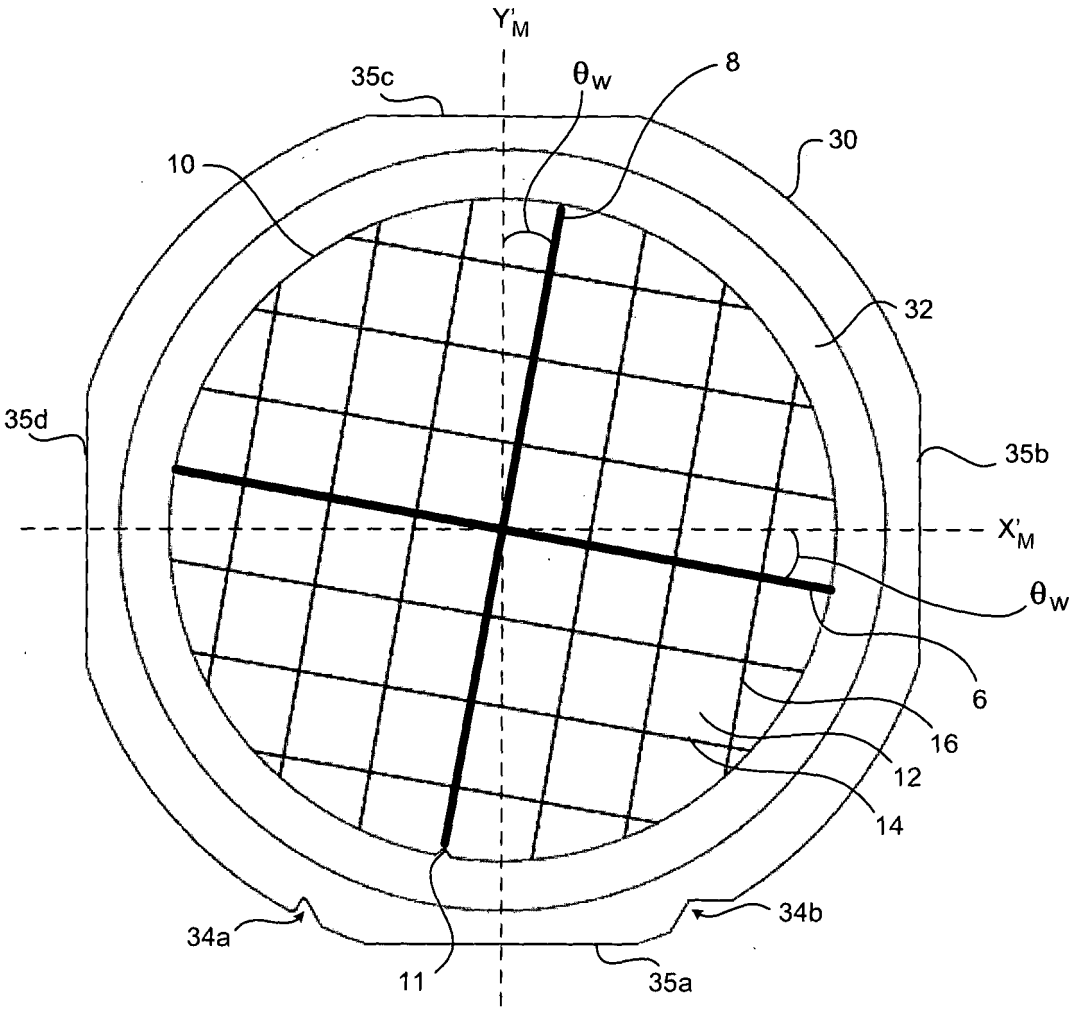


FIG. 10D

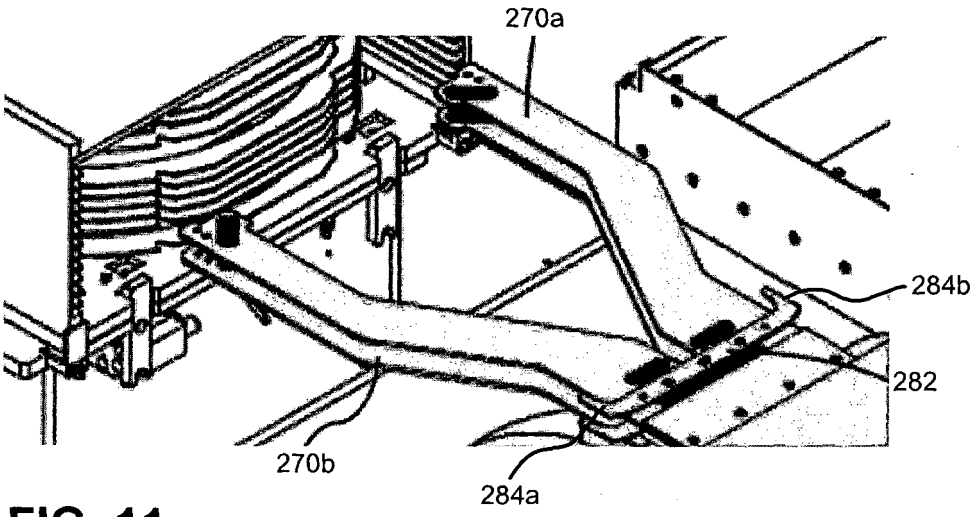


FIG. 11

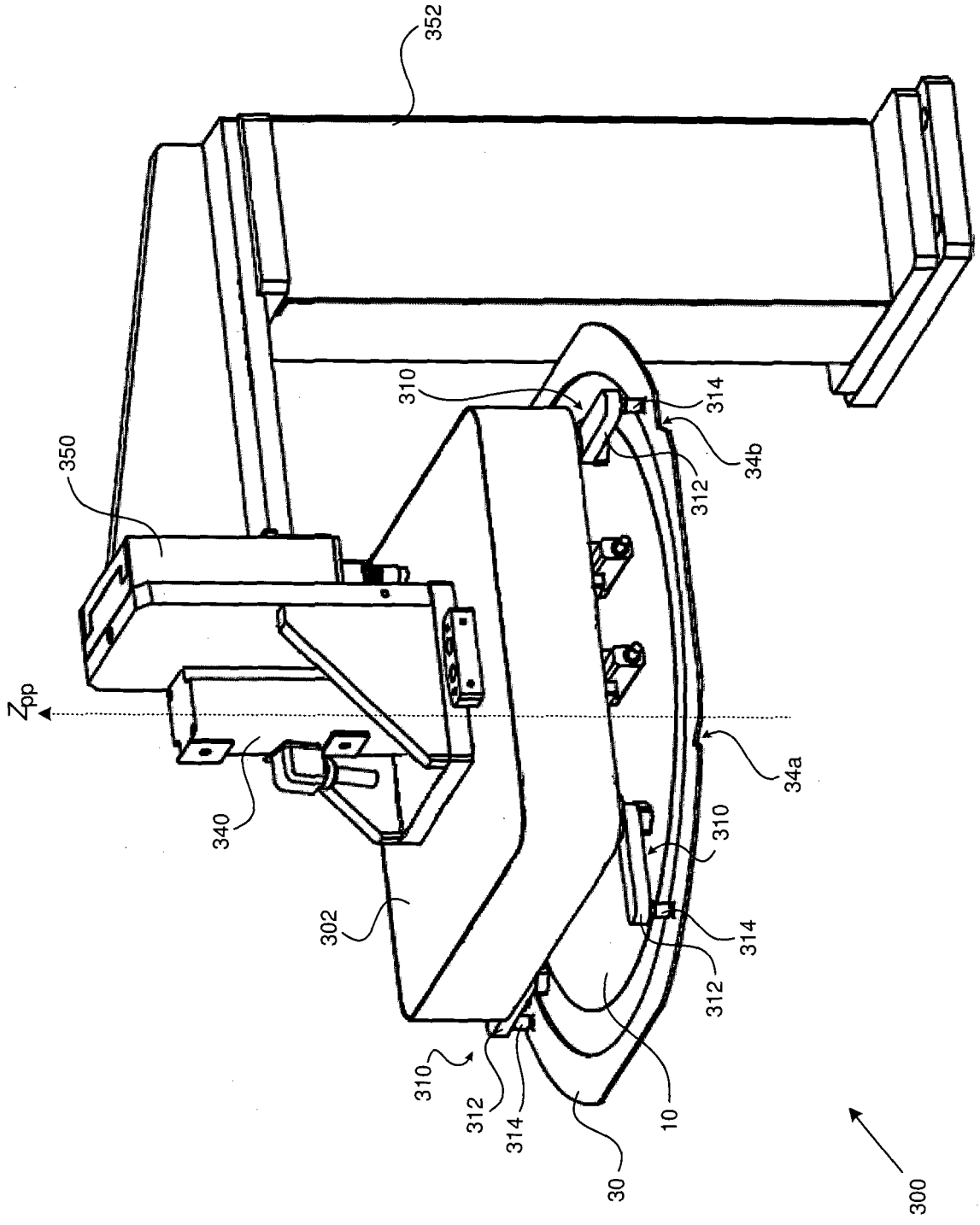

352
310
314
34b
312
350
Z_{pp}
340
34a
310
302
314
312
310
312
314
10
30
300

FIG. 12A

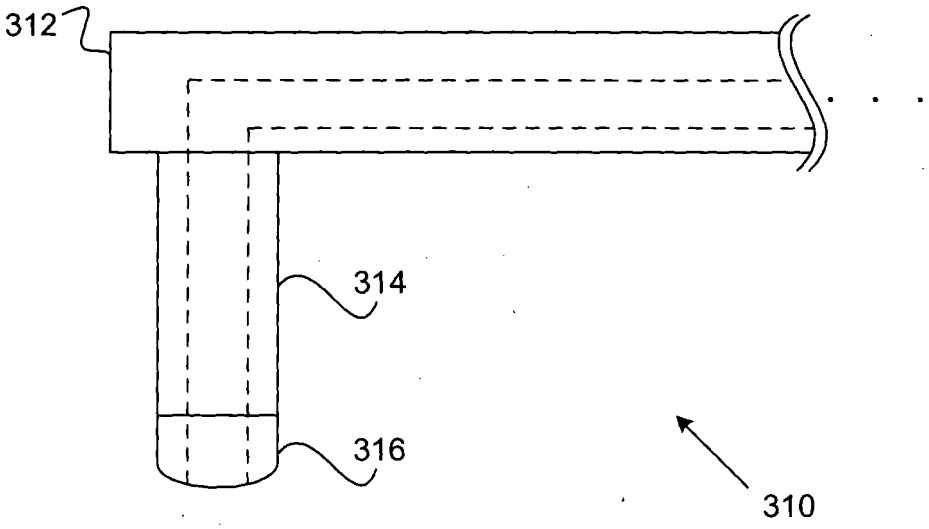


FIG. 12B

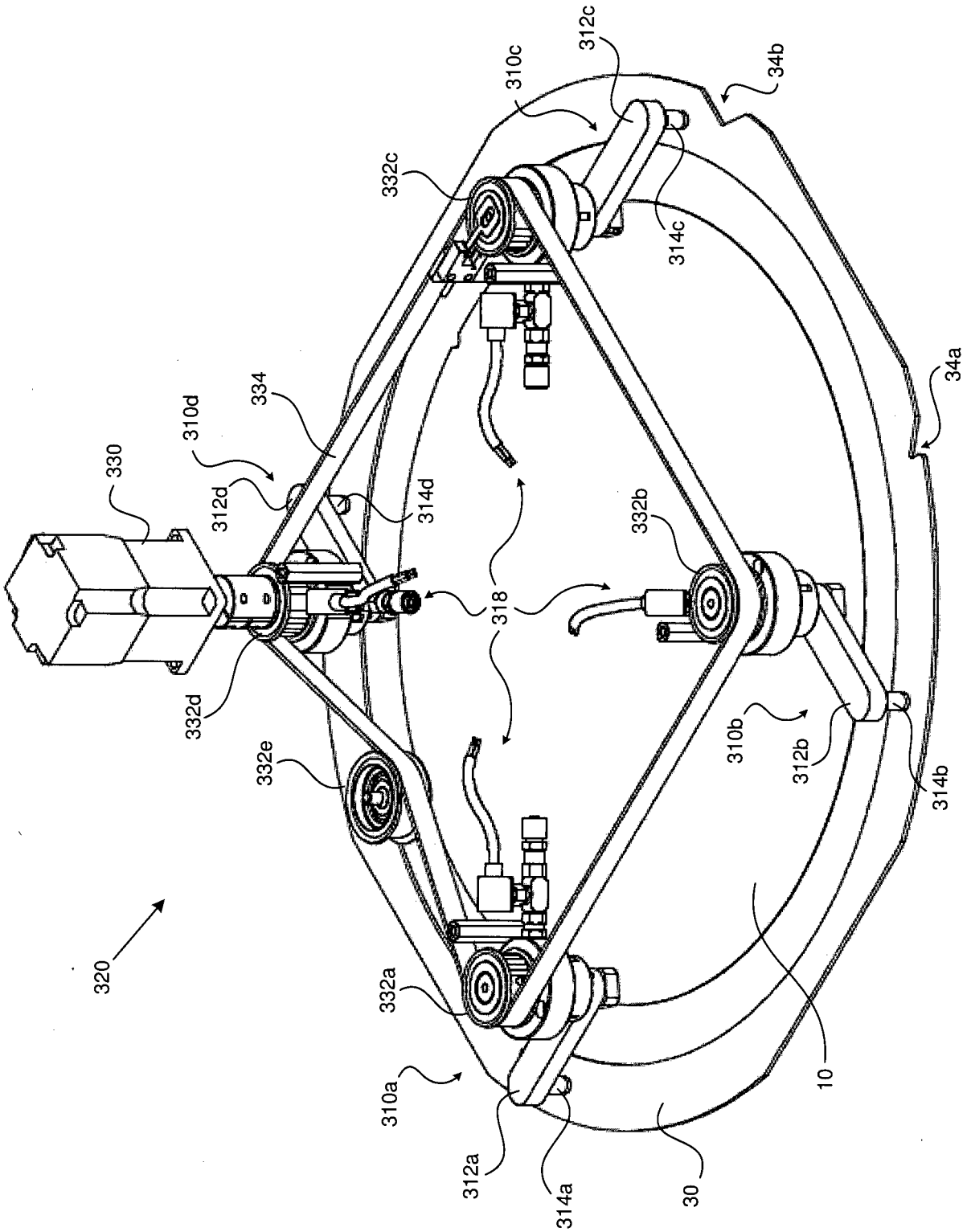

320
330
310d
312d
334
314d
332d
332e
332c
310c
312c
34b
314c
34a
332b
318
310b
312b
314b
332a
310a
312a
314a
30
10

FIG. 12C

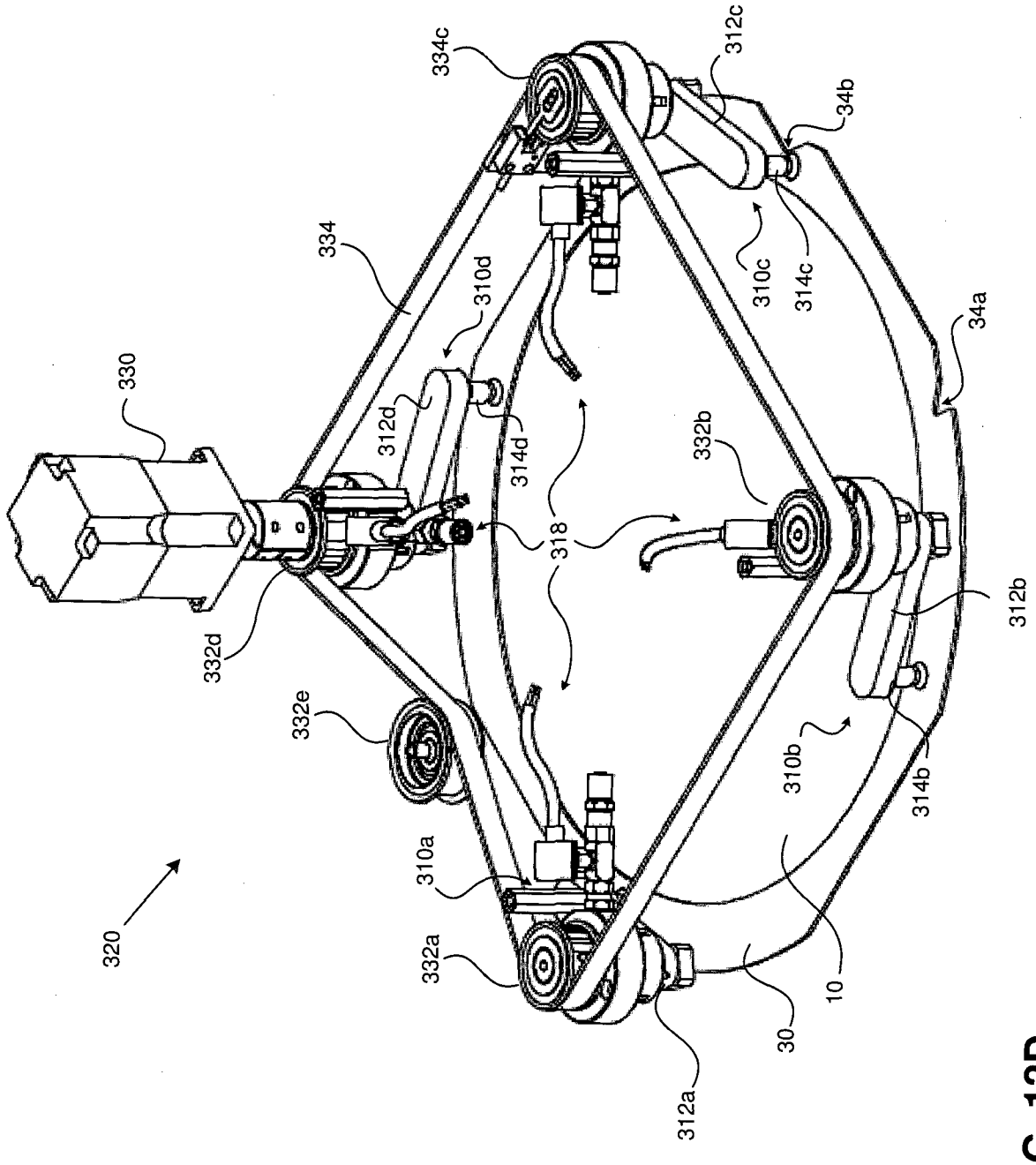

334c
312c
34b
334
310d
310c
314c
34a
330
312d
314d
332b
318
332d
312b
332e
310b
314b
310a
320
332a
10
30
312a

FIG. 12D

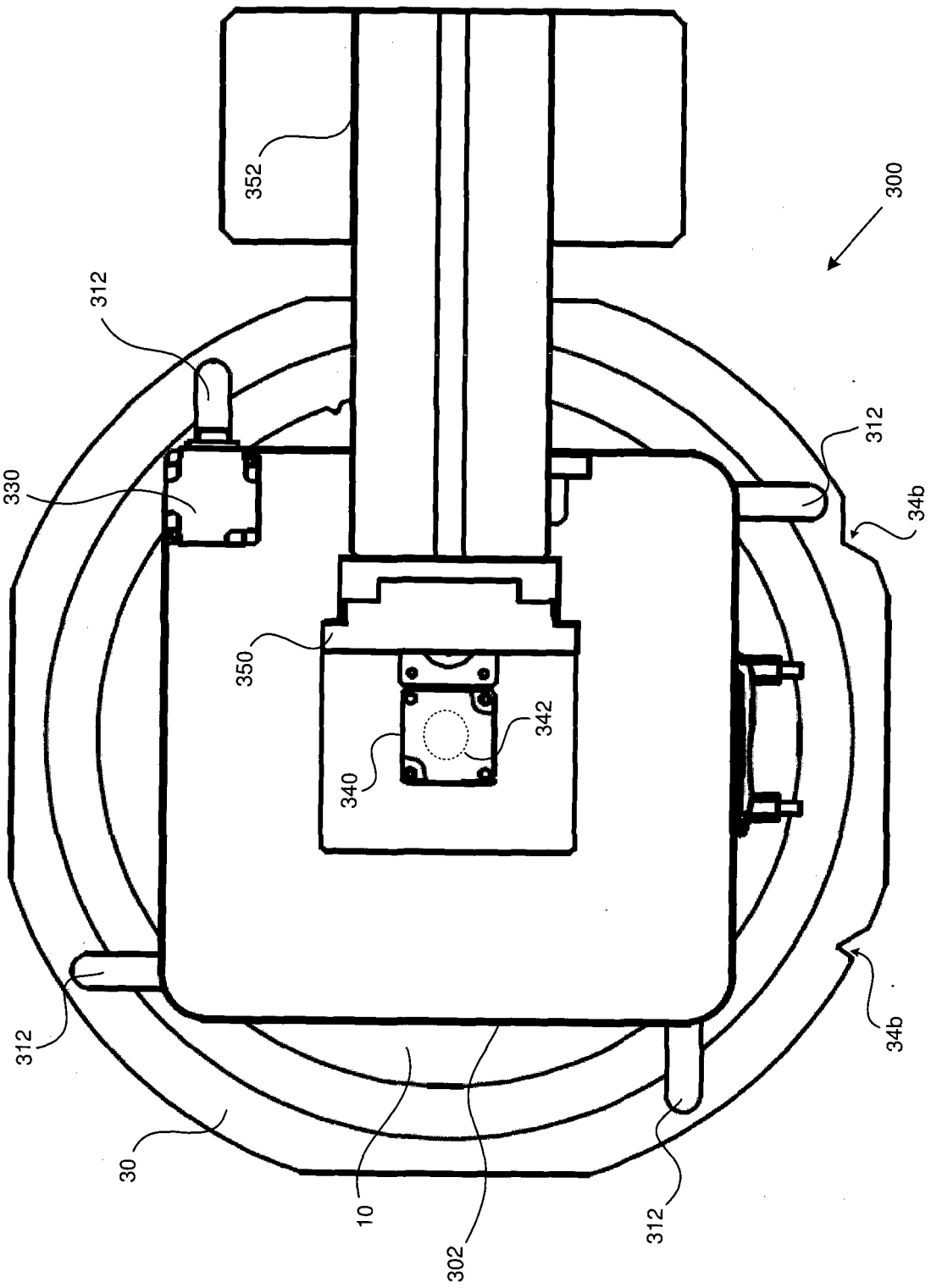


FIG. 13A

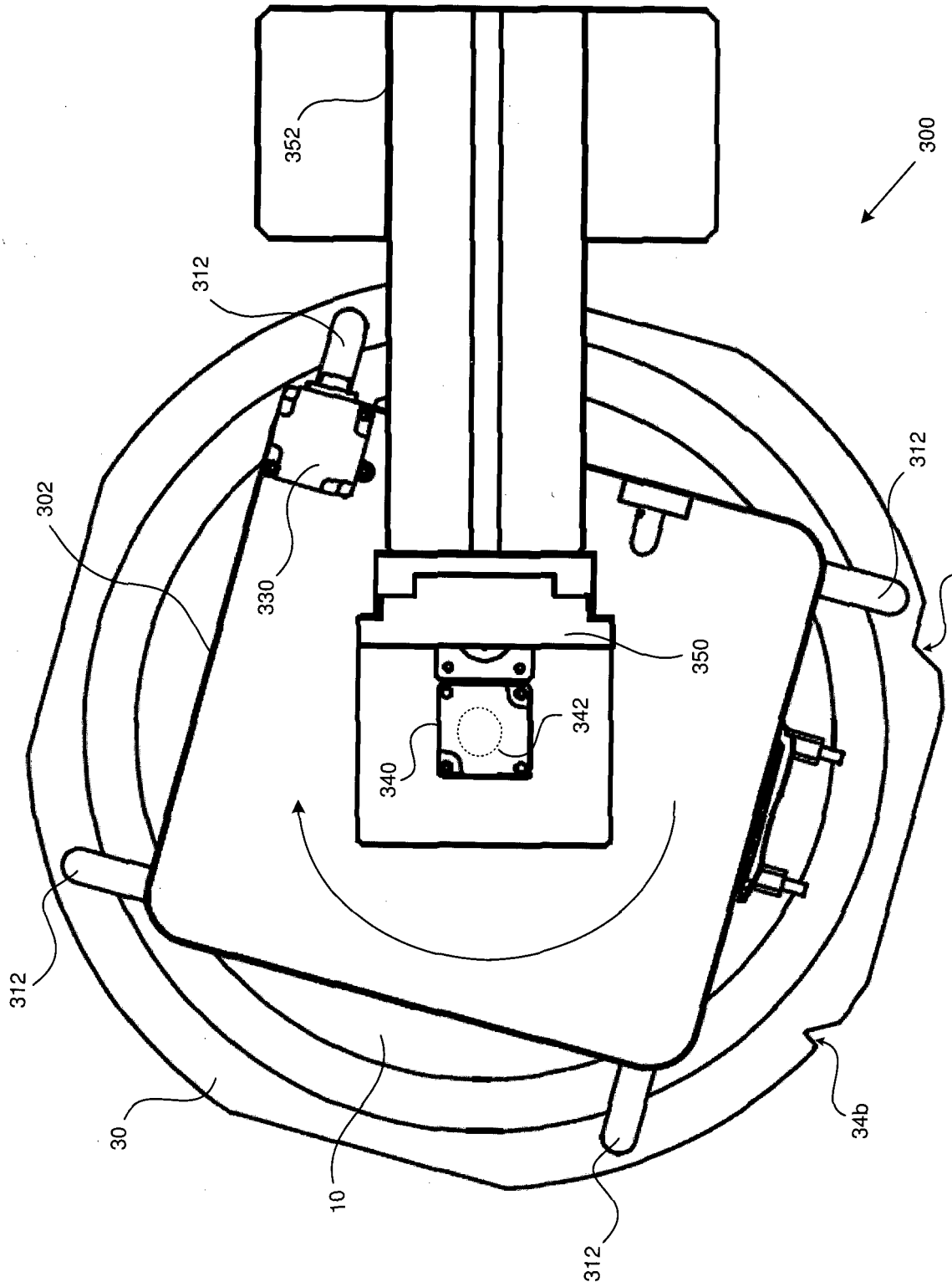


FIG. 13B

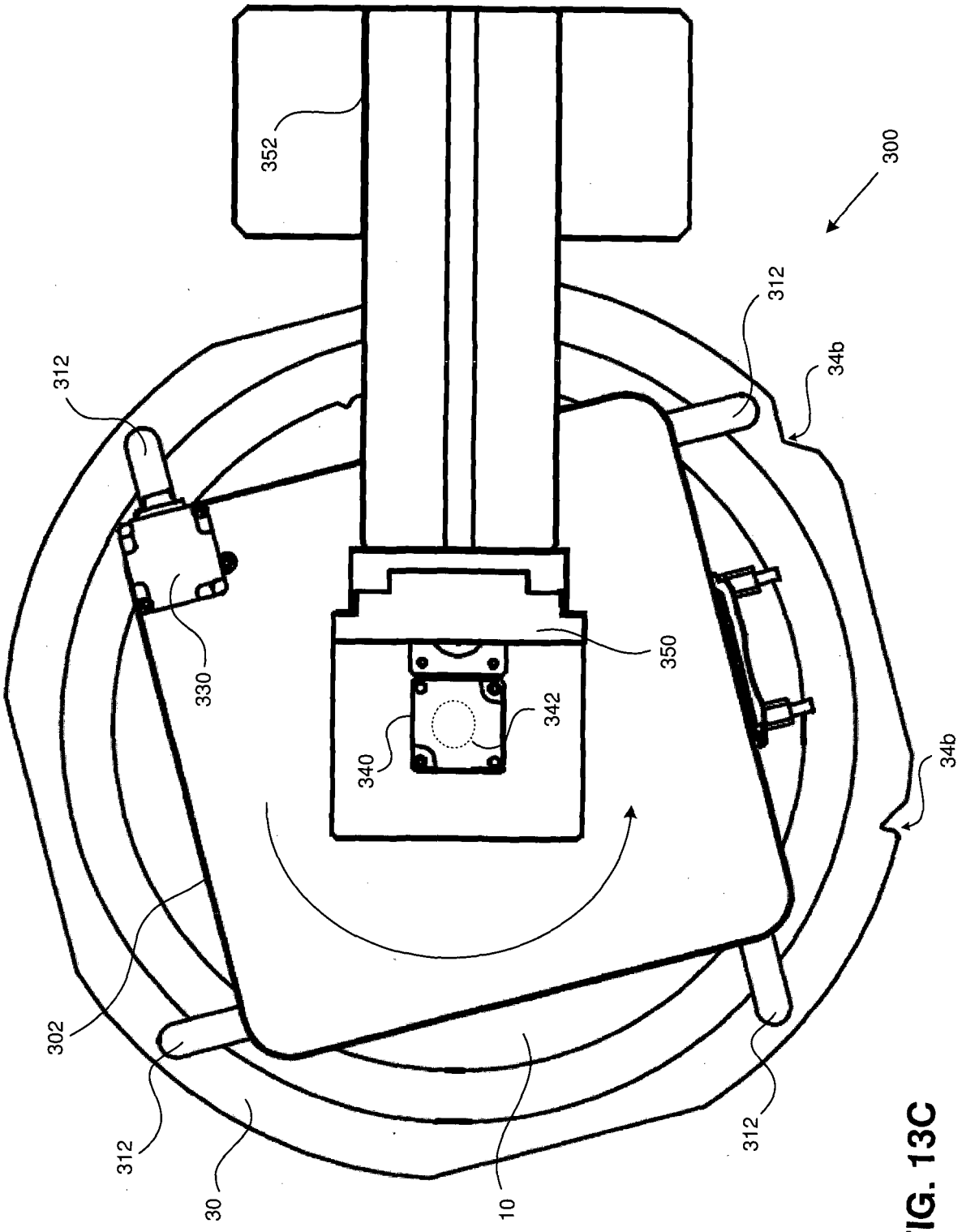
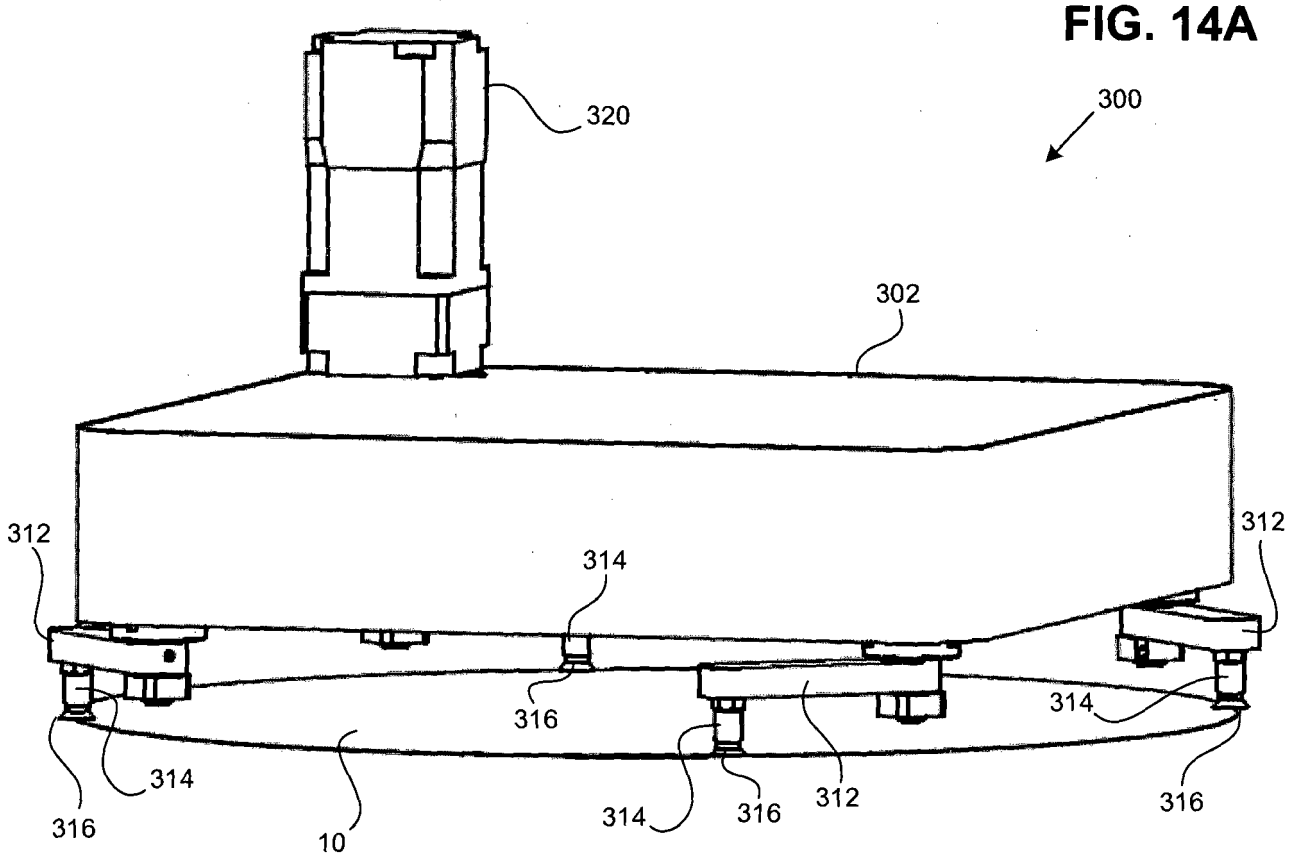


FIG. 13C

FIG. 14A



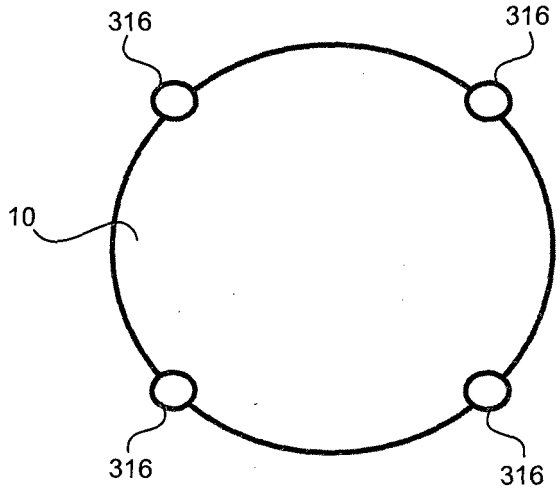


FIG. 14B

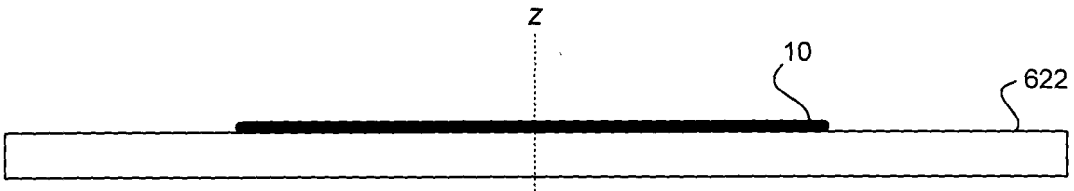


FIG. 15A

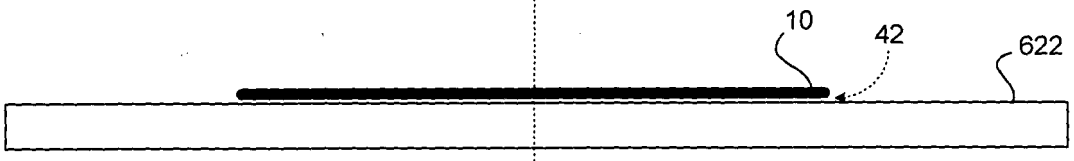


FIG. 15B

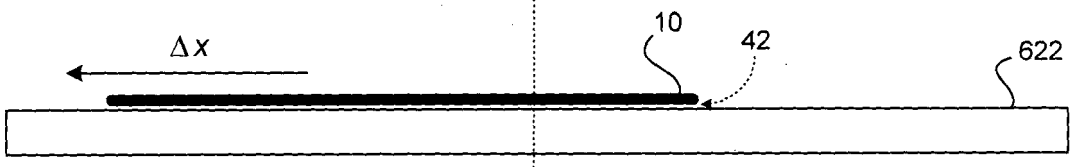
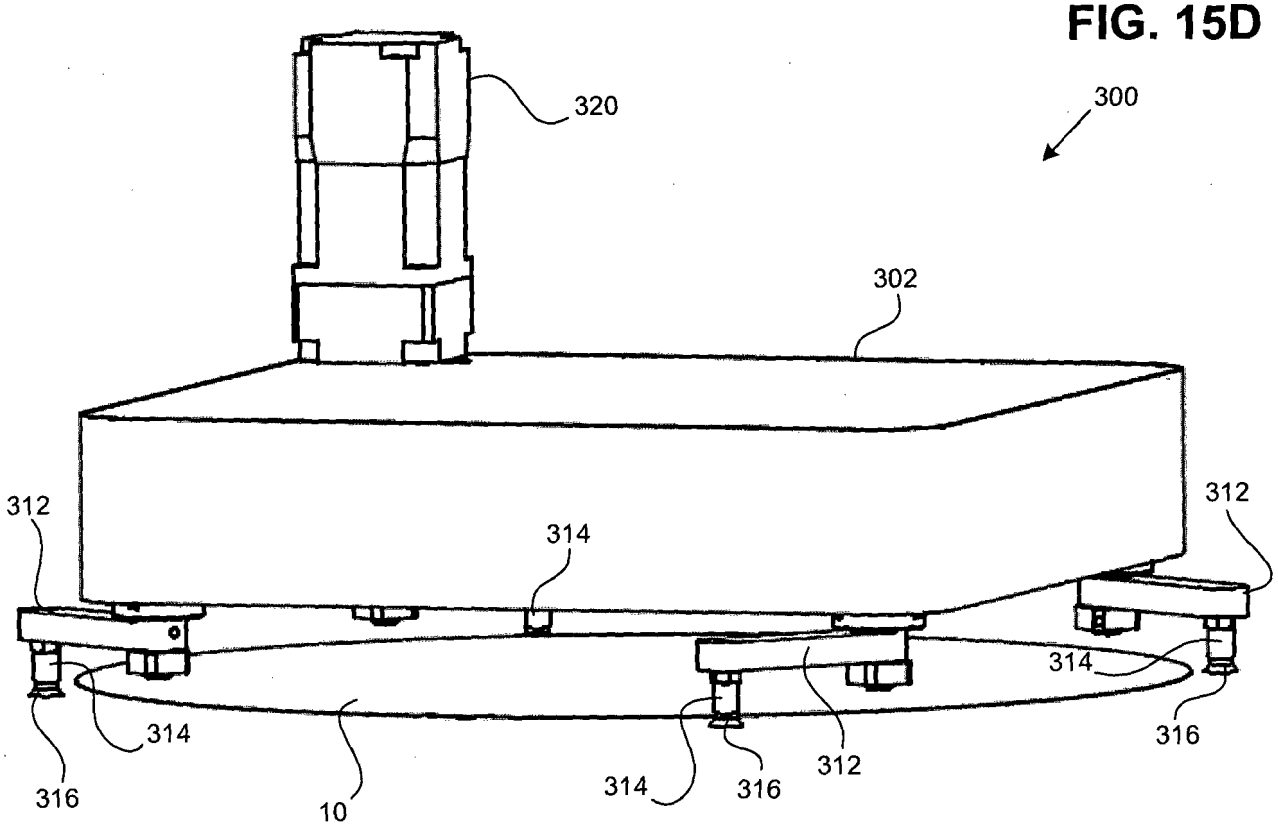


FIG. 15C

FIG. 15D



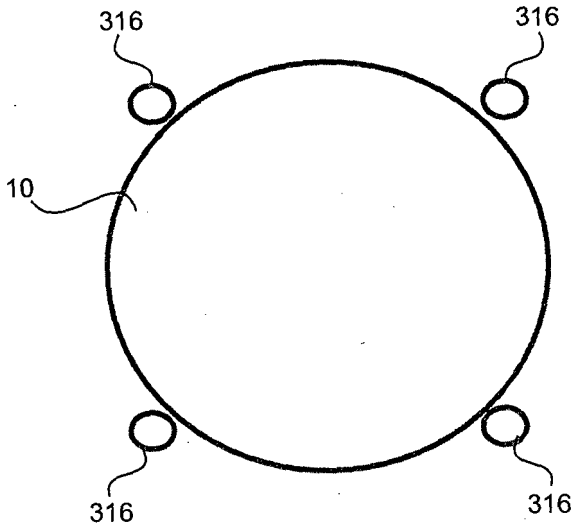


FIG. 15E

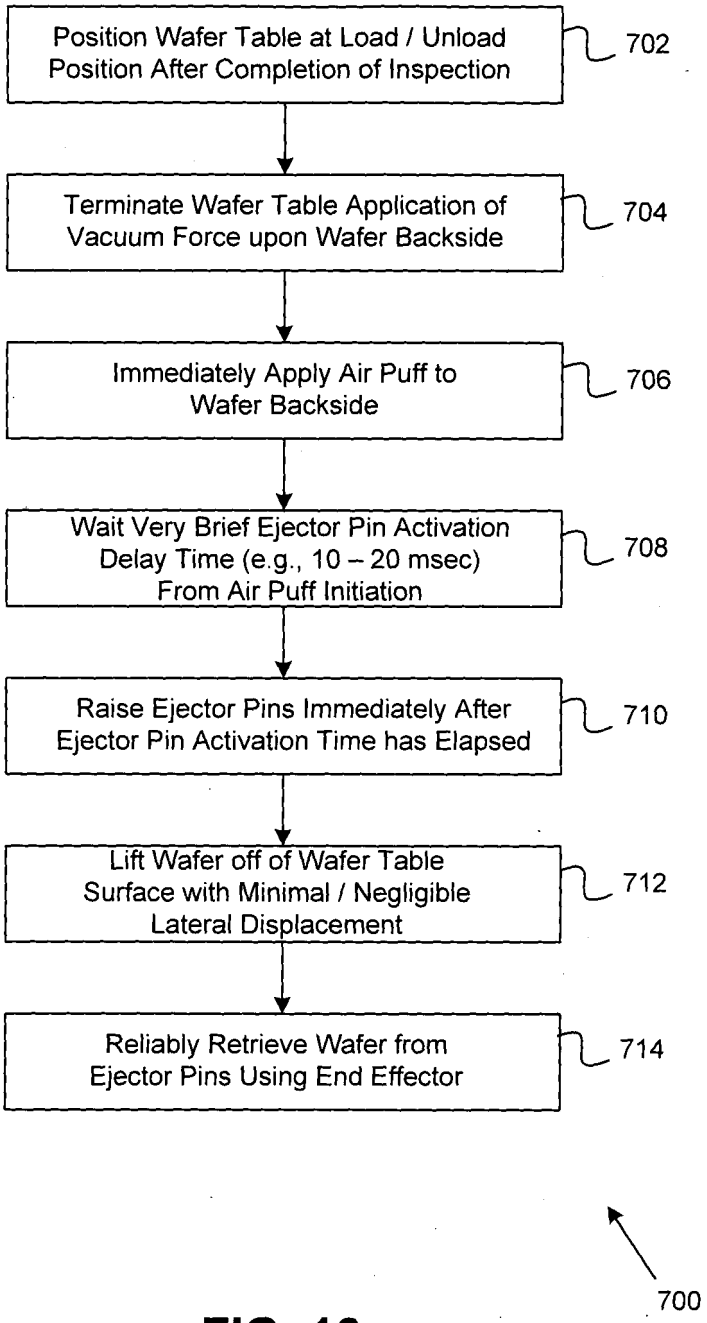
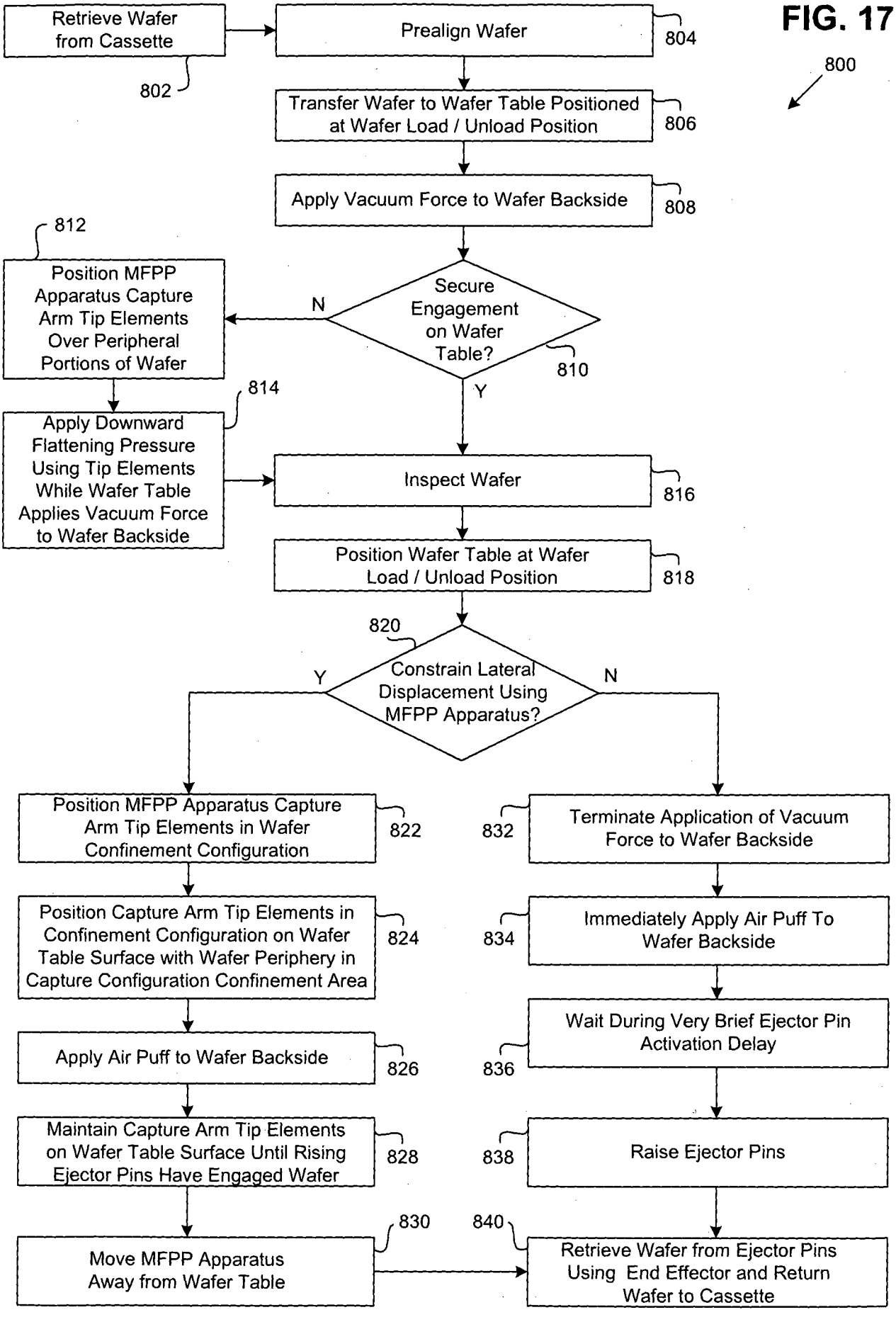

Position Wafer Table at Load / Unload Position After Completion of Inspection
702
Terminate Wafer Table Application of Vacuum Force upon Wafer Backside
704
Immediately Apply Air Puff to Wafer Backside
706
Wait Very Brief Ejector Pin Activation Delay Time (e.g., 10 – 20 msec) From Air Puff Initiation
708
Raise Ejector Pins Immediately After Ejector Pin Activation Time has Elapsed
710
Lift Wafer off of Wafer Table Surface with Minimal / Negligible Lateral Displacement
712
Reliably Retrieve Wafer from Ejector Pins Using End Effector
714
700

FIG. 16

FIG. 17


800
Retrieve Wafer from Cassette
802
Prealign Wafer
804
Transfer Wafer to Wafer Table Positioned at Wafer Load / Unload Position
806
Apply Vacuum Force to Wafer Backside
808
Secure Engagement on Wafer Table?
810
N
Y
812
Position MFPP Apparatus Capture Arm Tip Elements Over Peripheral Portions of Wafer
814
Apply Downward Flattening Pressure Using Tip Elements While Wafer Table Applies Vacuum Force to Wafer Backside
Inspect Wafer
816
Position Wafer Table at Wafer Load / Unload Position
818
820
Constrain Lateral Displacement Using MFPP Apparatus?
Y
N
Position MFPP Apparatus Capture Arm Tip Elements in Wafer Confinement Configuration
822
Position Capture Arm Tip Elements in Confinement Configuration on Wafer Table Surface with Wafer Periphery in Capture Configuration Confinement Area
824
Apply Air Puff to Wafer Backside
826
Maintain Capture Arm Tip Elements on Wafer Table Surface Until Rising Ejector Pins Have Engaged Wafer
828
Move MFPP Apparatus Away from Wafer Table
830
832
Terminate Application of Vacuum Force to Wafer Backside
834
Immediately Apply Air Puff To Wafer Backside
836
Wait During Very Brief Ejector Pin Activation Delay
838
Raise Ejector Pins
840
Retrieve Wafer from Ejector Pins Using End Effector and Return Wafer to Cassette

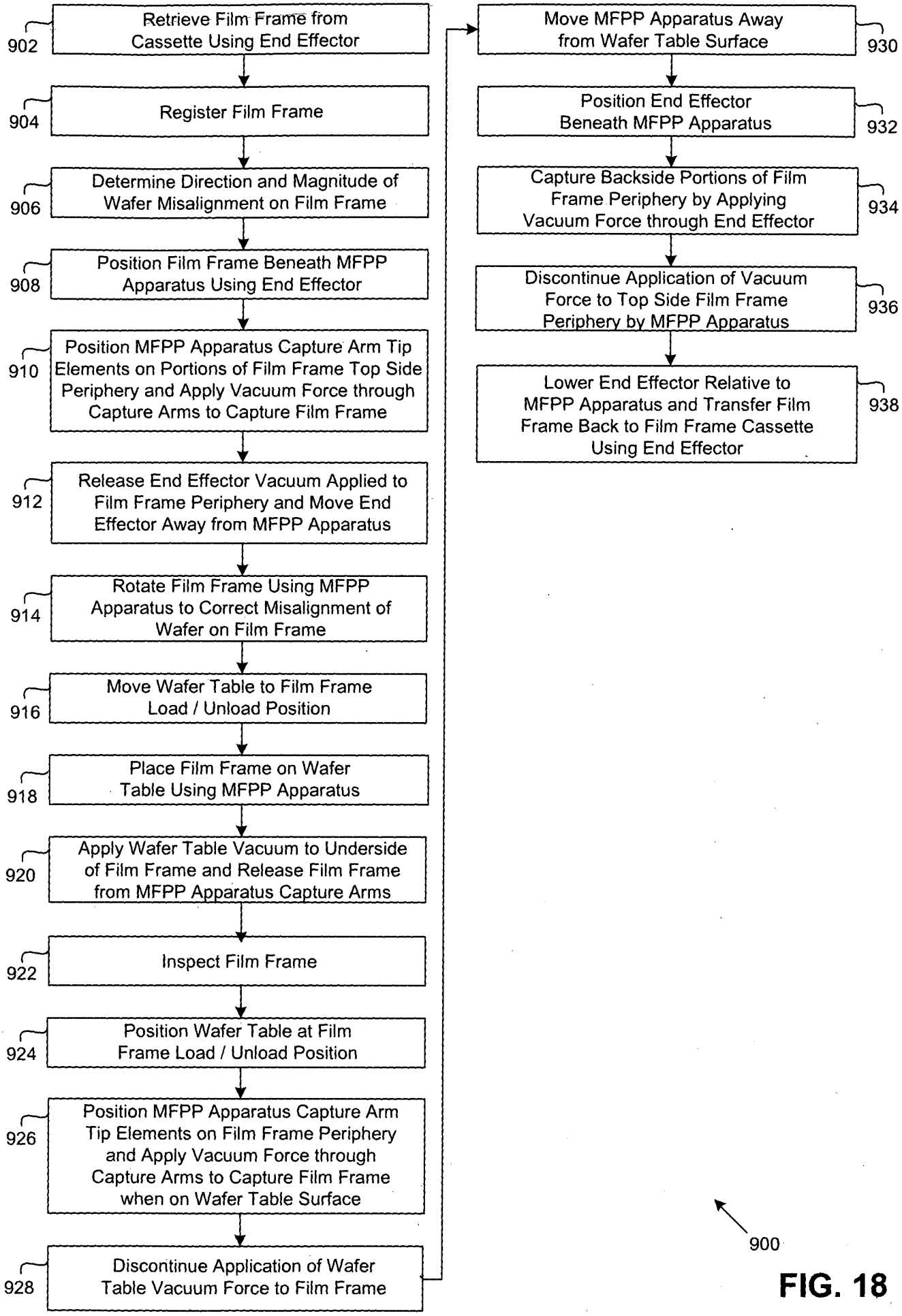

902
Retrieve Film Frame from Cassette Using End Effector
904
Register Film Frame
906
Determine Direction and Magnitude of Wafer Misalignment on Film Frame
908
Position Film Frame Beneath MFPP Apparatus Using End Effector
910
Position MFPP Apparatus Capture Arm Tip Elements on Portions of Film Frame Top Side Periphery and Apply Vacuum Force through Capture Arms to Capture Film Frame
912
Release End Effector Vacuum Applied to Film Frame Periphery and Move End Effector Away from MFPP Apparatus
914
Rotate Film Frame Using MFPP Apparatus to Correct Misalignment of Wafer on Film Frame
916
Move Wafer Table to Film Frame Load / Unload Position
918
Place Film Frame on Wafer Table Using MFPP Apparatus
920
Apply Wafer Table Vacuum to Underside of Film Frame and Release Film Frame from MFPP Apparatus Capture Arms
922
Inspect Film Frame
924
Position Wafer Table at Film Frame Load / Unload Position
926
Position MFPP Apparatus Capture Arm Tip Elements on Film Frame Periphery and Apply Vacuum Force through Capture Arms to Capture Film Frame when on Wafer Table Surface
928
Discontinue Application of Wafer Table Vacuum Force to Film Frame
930
Move MFPP Apparatus Away from Wafer Table Surface
932
Position End Effector Beneath MFPP Apparatus
934
Capture Backside Portions of Film Frame Periphery by Applying Vacuum Force through End Effector
936
Discontinue Application of Vacuum Force to Top Side Film Frame Periphery by MFPP Apparatus
938
Lower End Effector Relative to MFPP Apparatus and Transfer Film Frame Back to Film Frame Cassette Using End Effector
900

FIG. 18