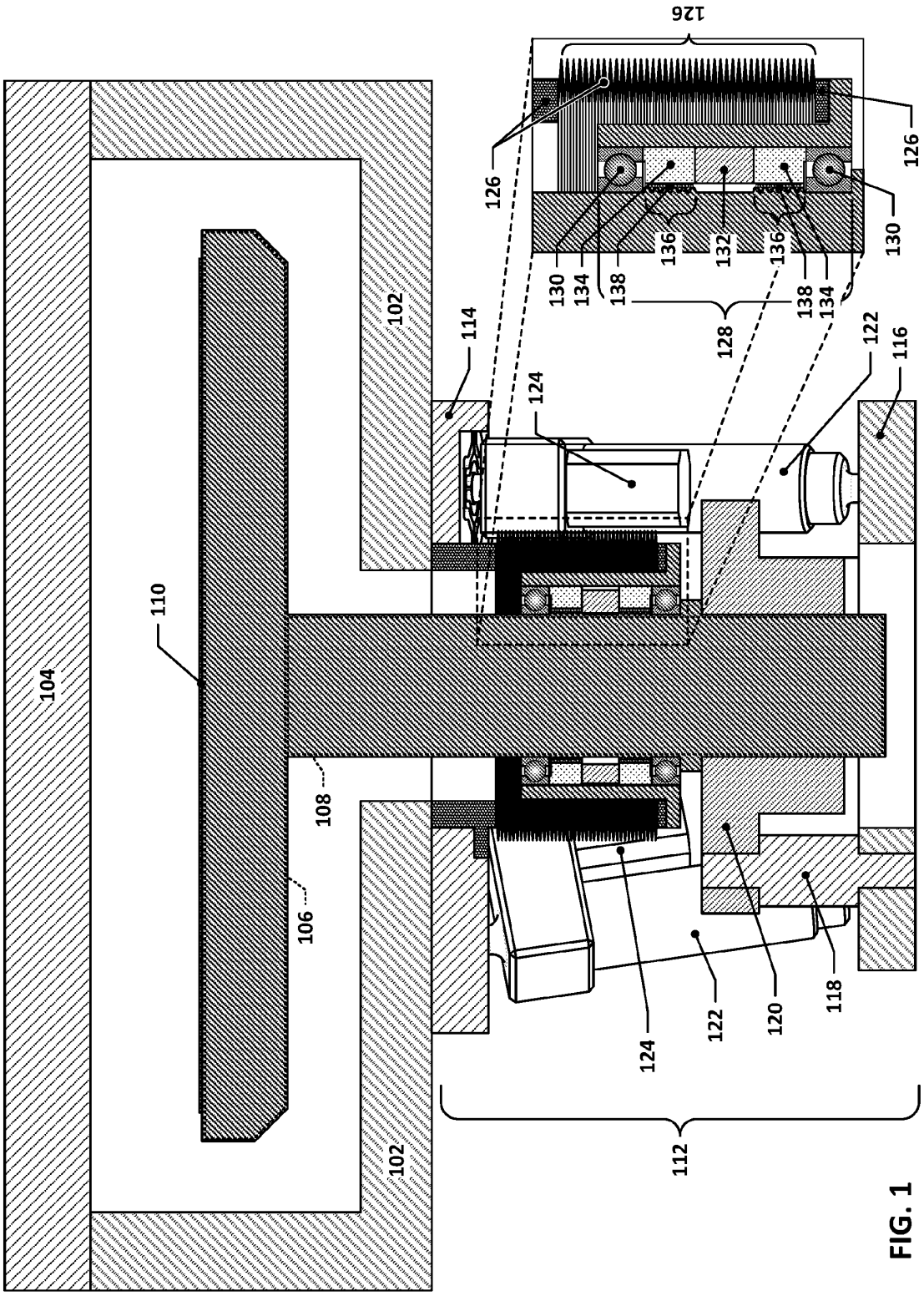

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118
112

FIG. 1

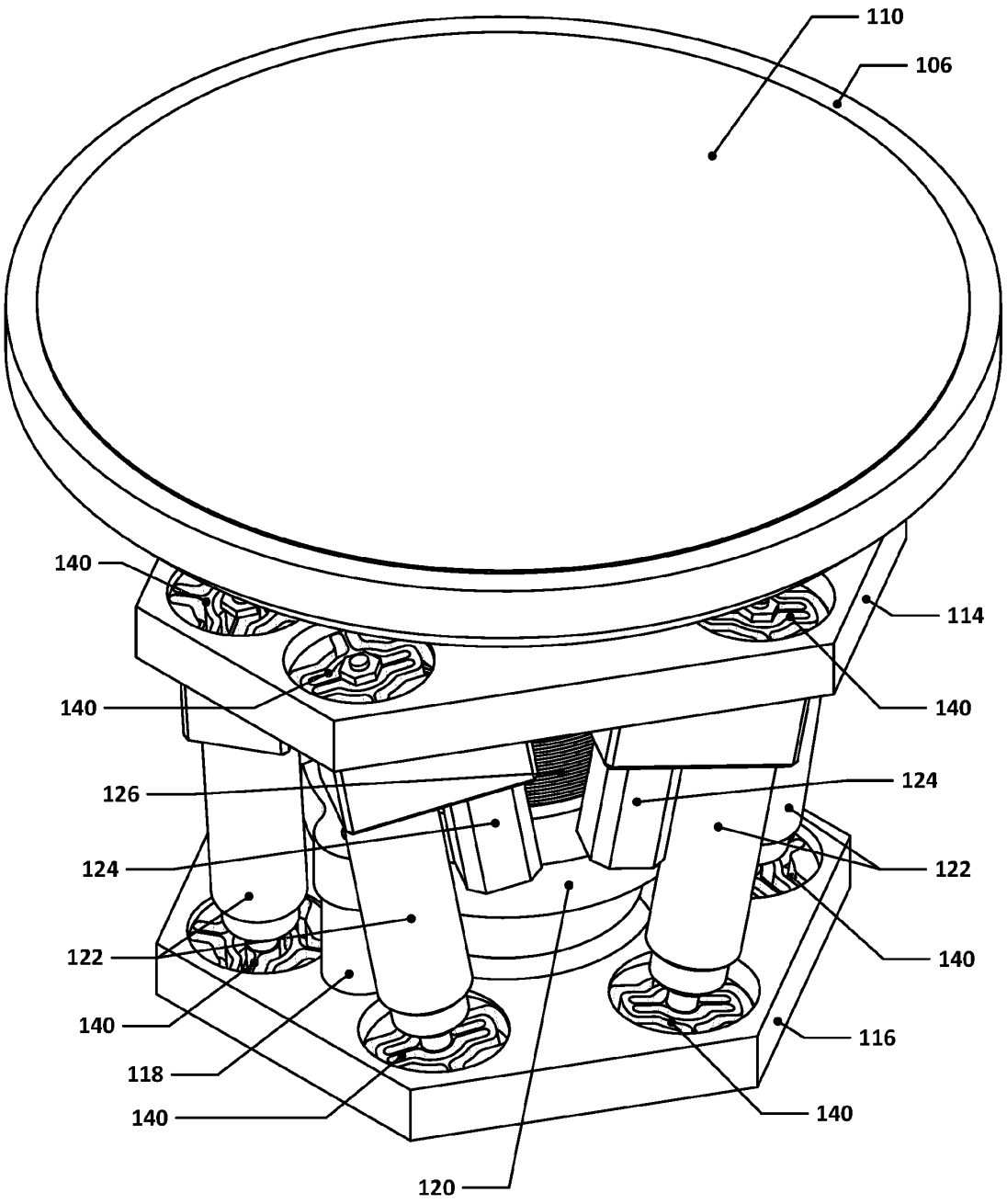

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114
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126
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122
122
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140
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140
140
120

FIG. 2

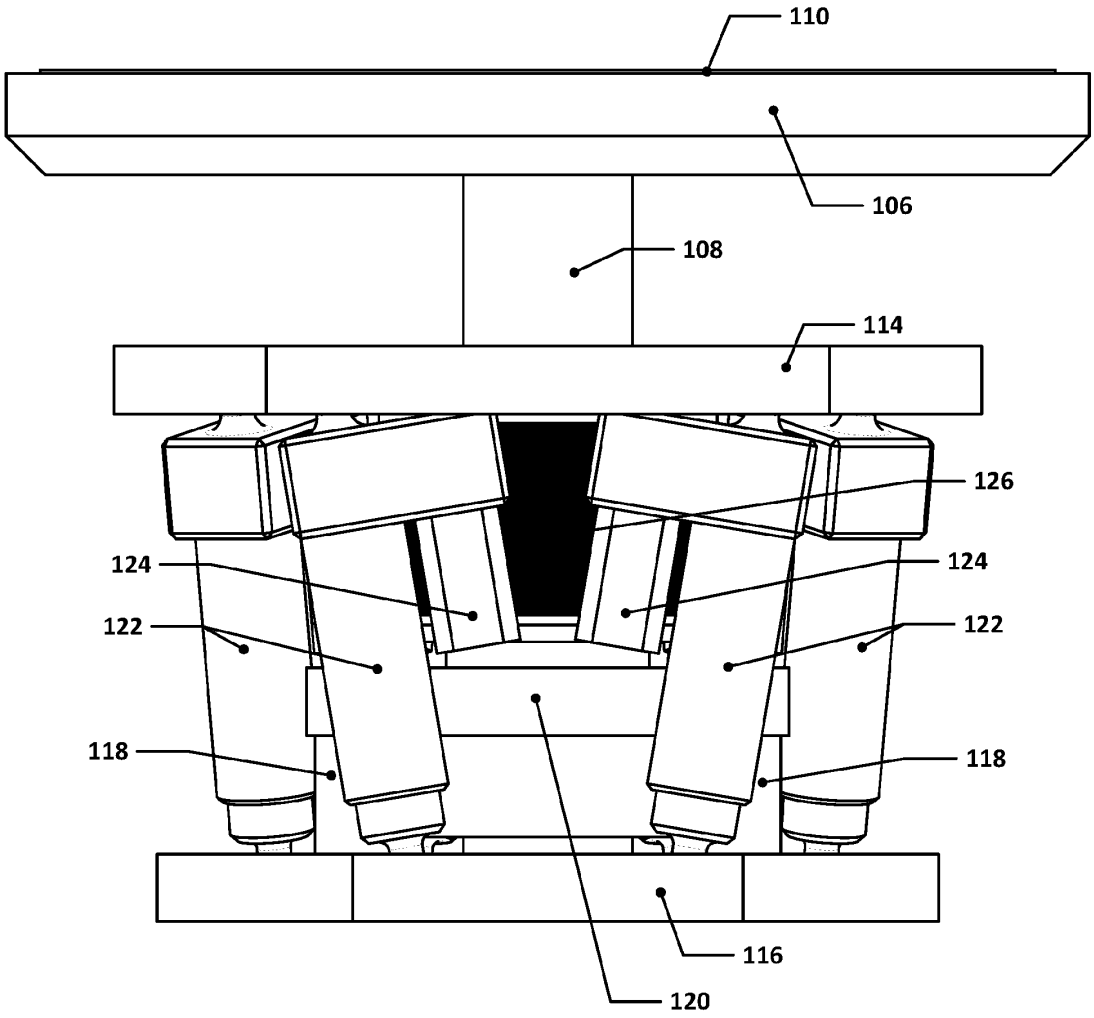


FIG. 3

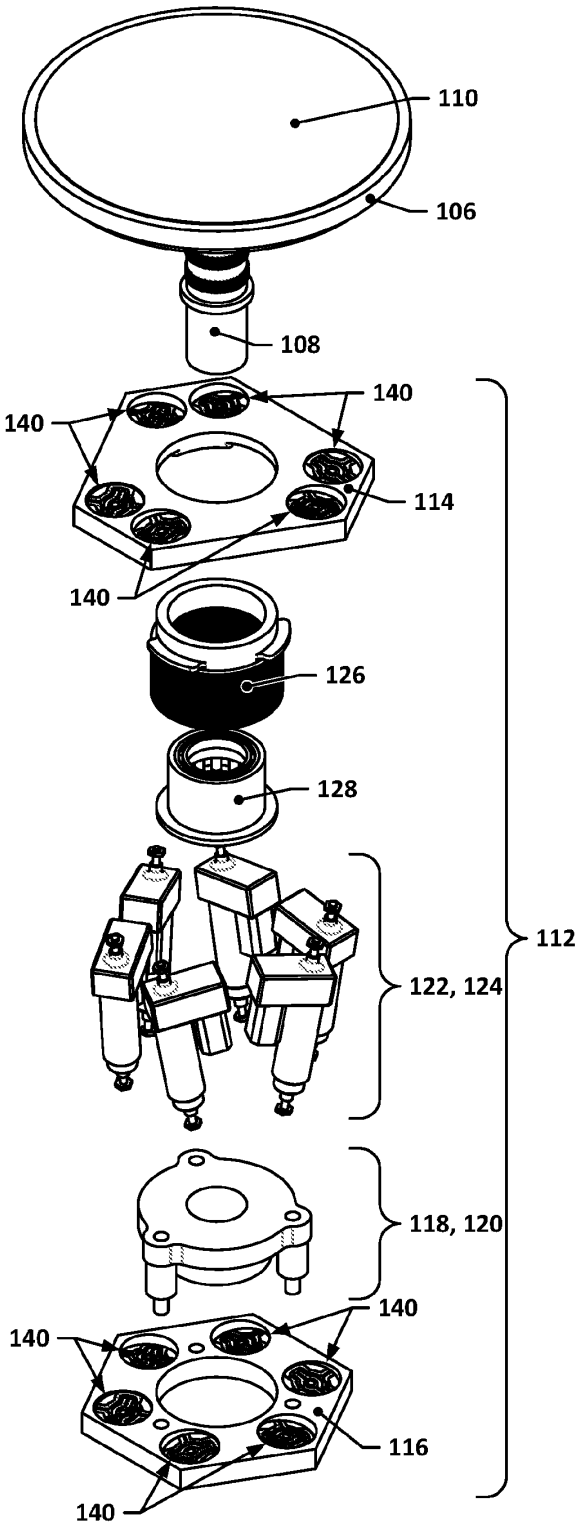

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114
140
126
128
112
122, 124
118, 120
140
140
116
140

FIG. 4

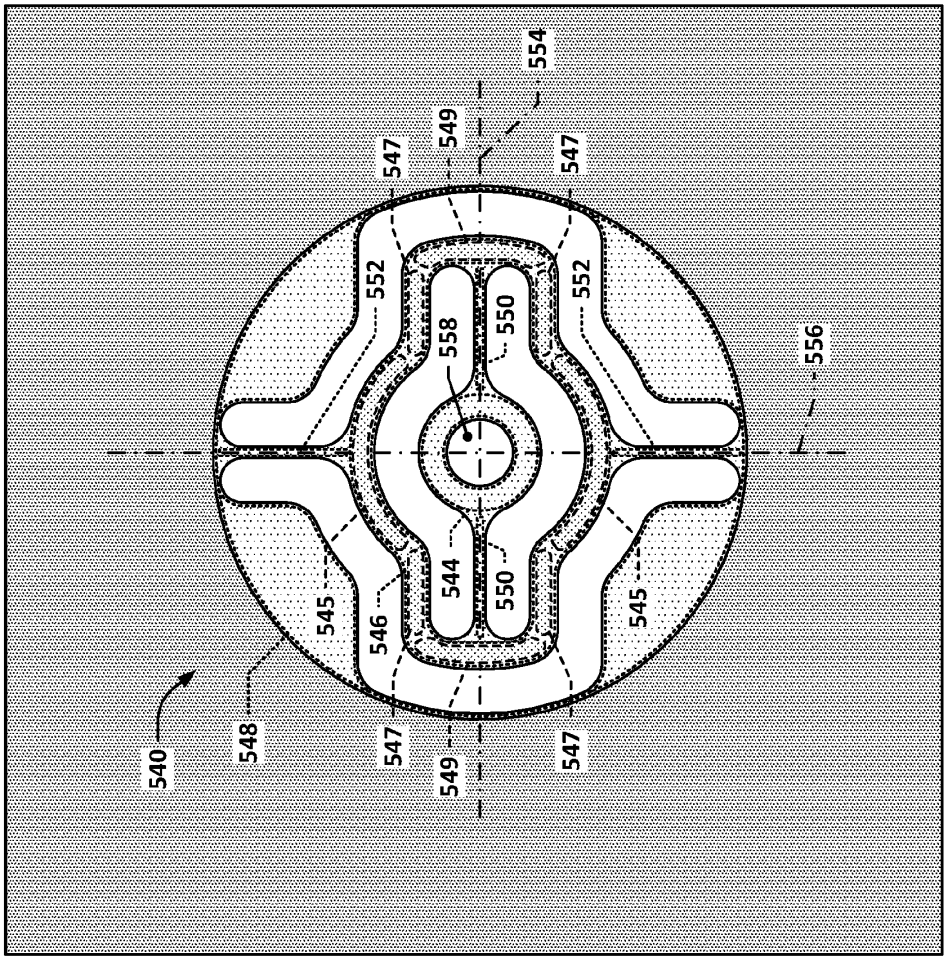

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FIG. 5

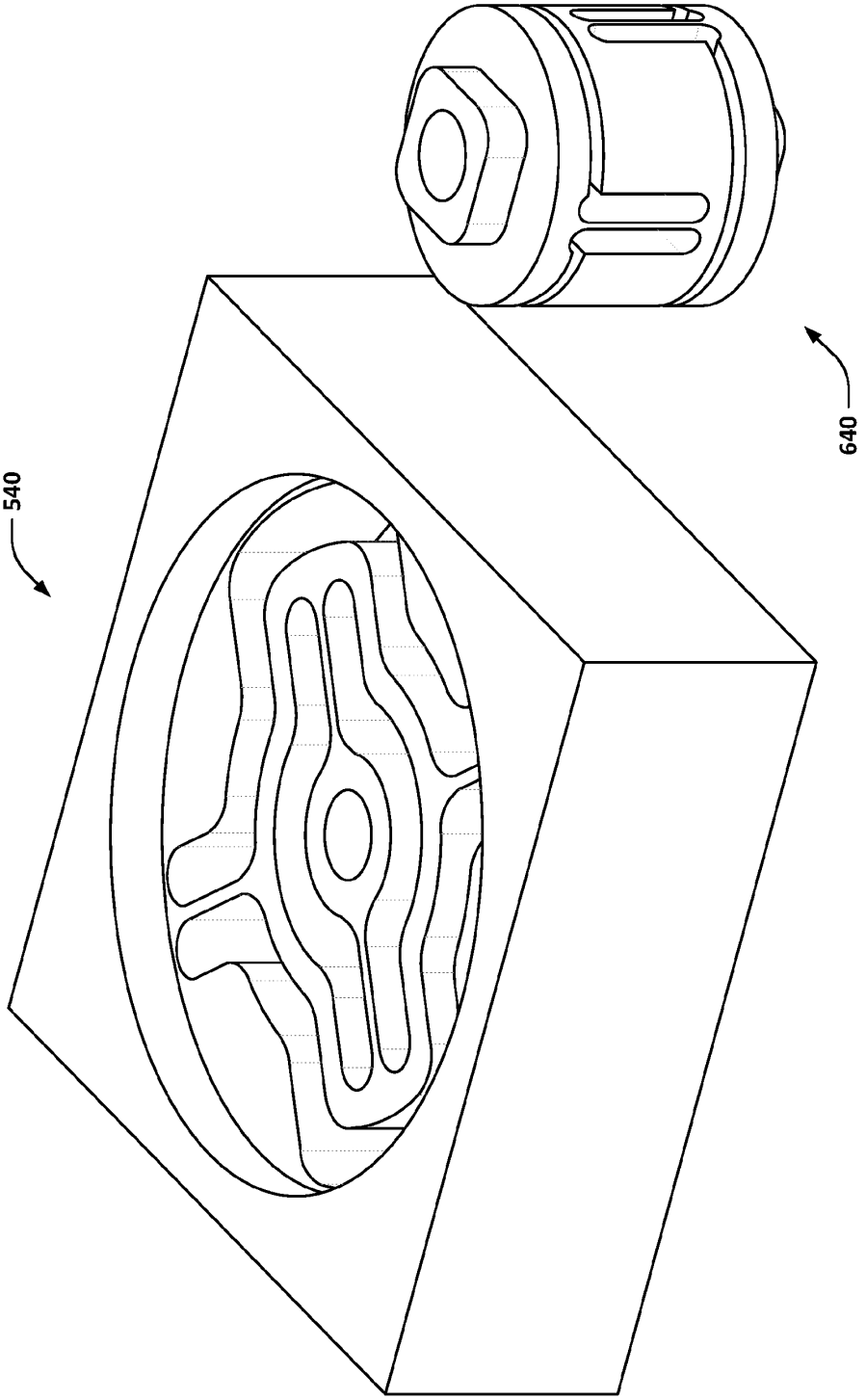


FIG. 6

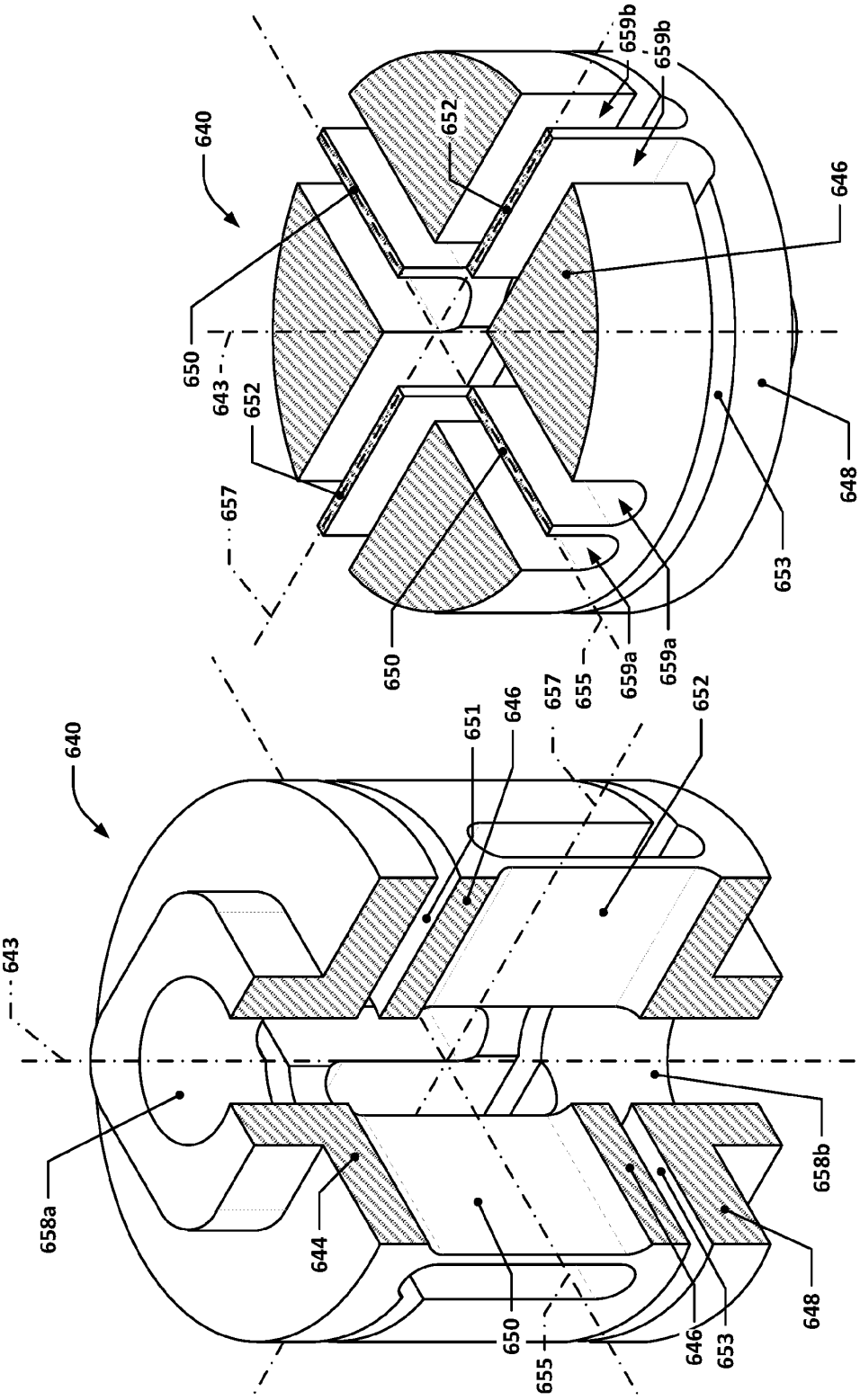

640
643
658a
644
650
655
646
653
648
658b
651
657
652
659a
659b

FIG. 7

640
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659a
659b
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FIG. 8

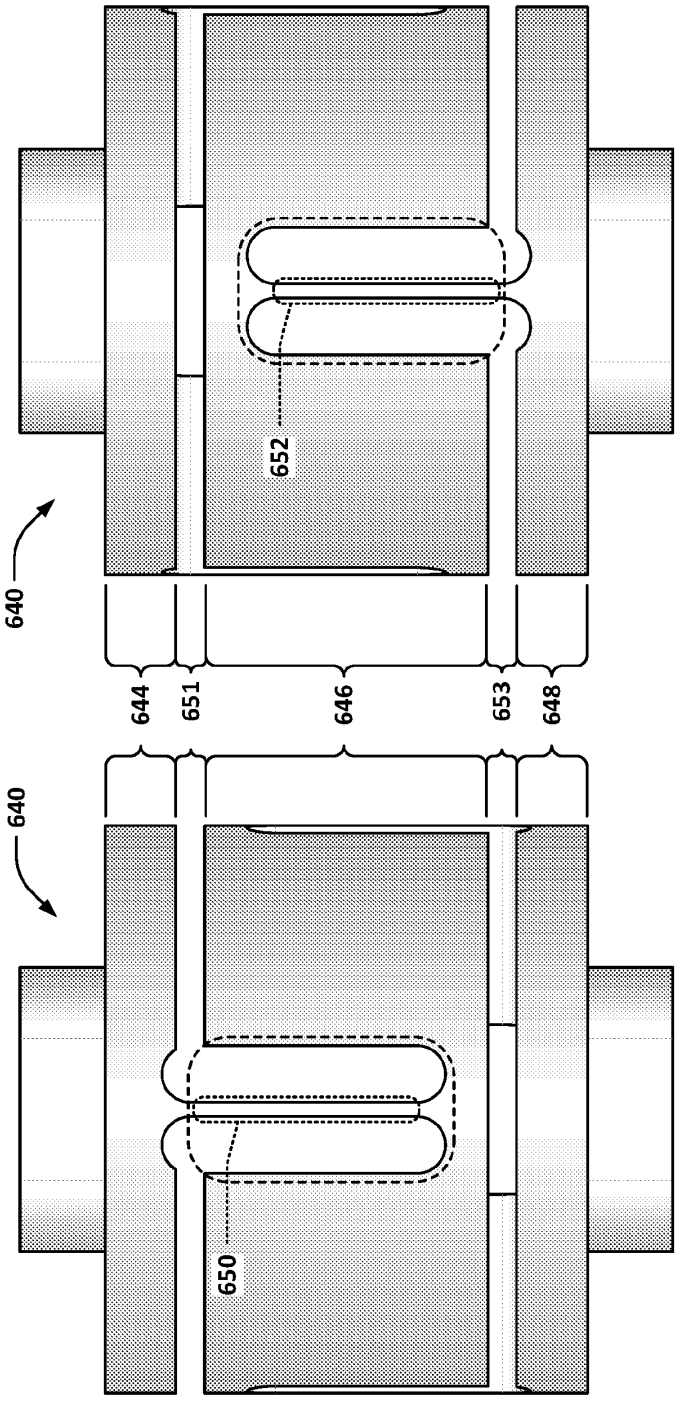


FIG. 10

FIG. 9

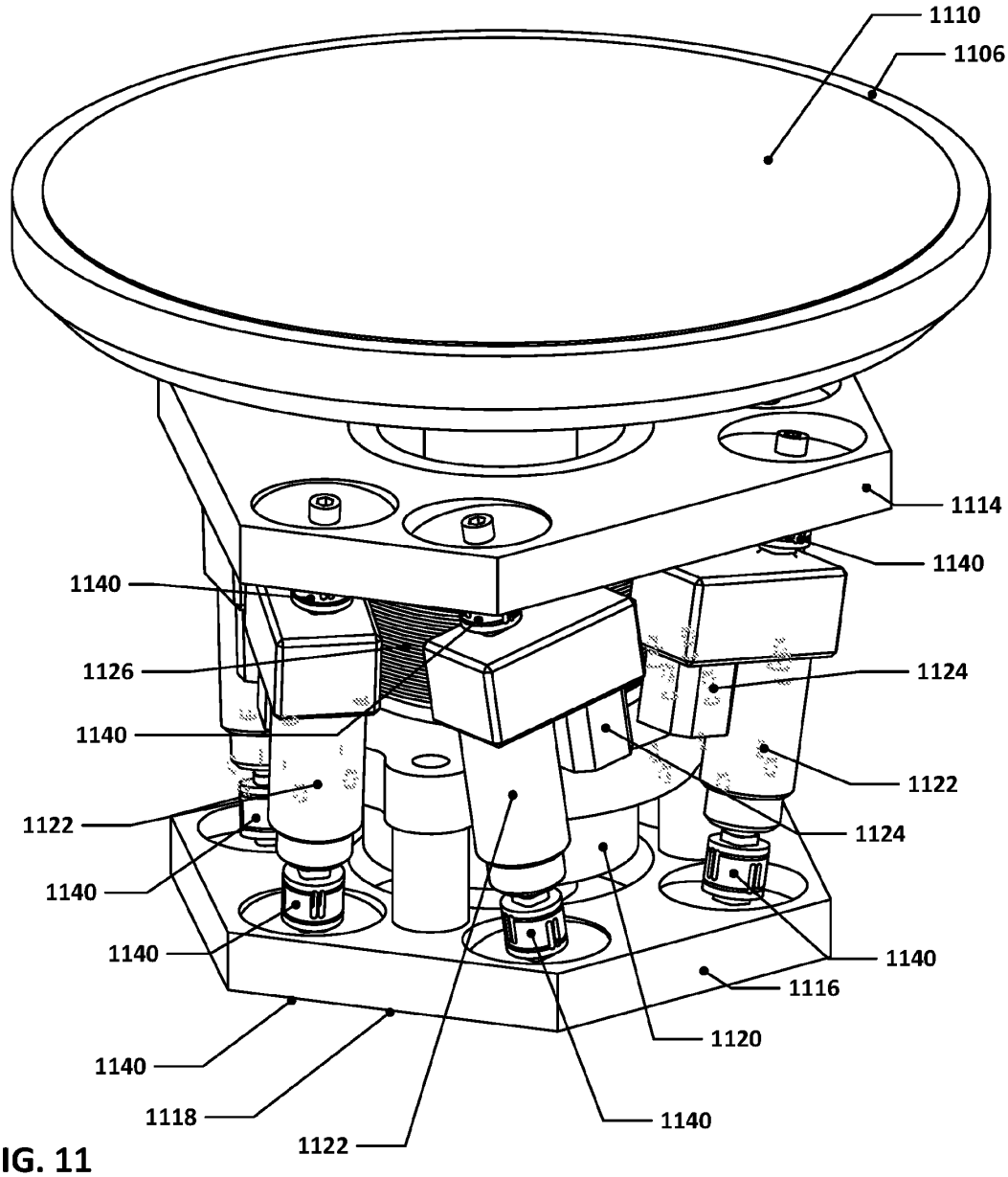

1110
1106
1114
1140
1140
1126
1124
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1122
1122
1124
1140
1140
1140
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1120
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1118
1122
1140

FIG. 11

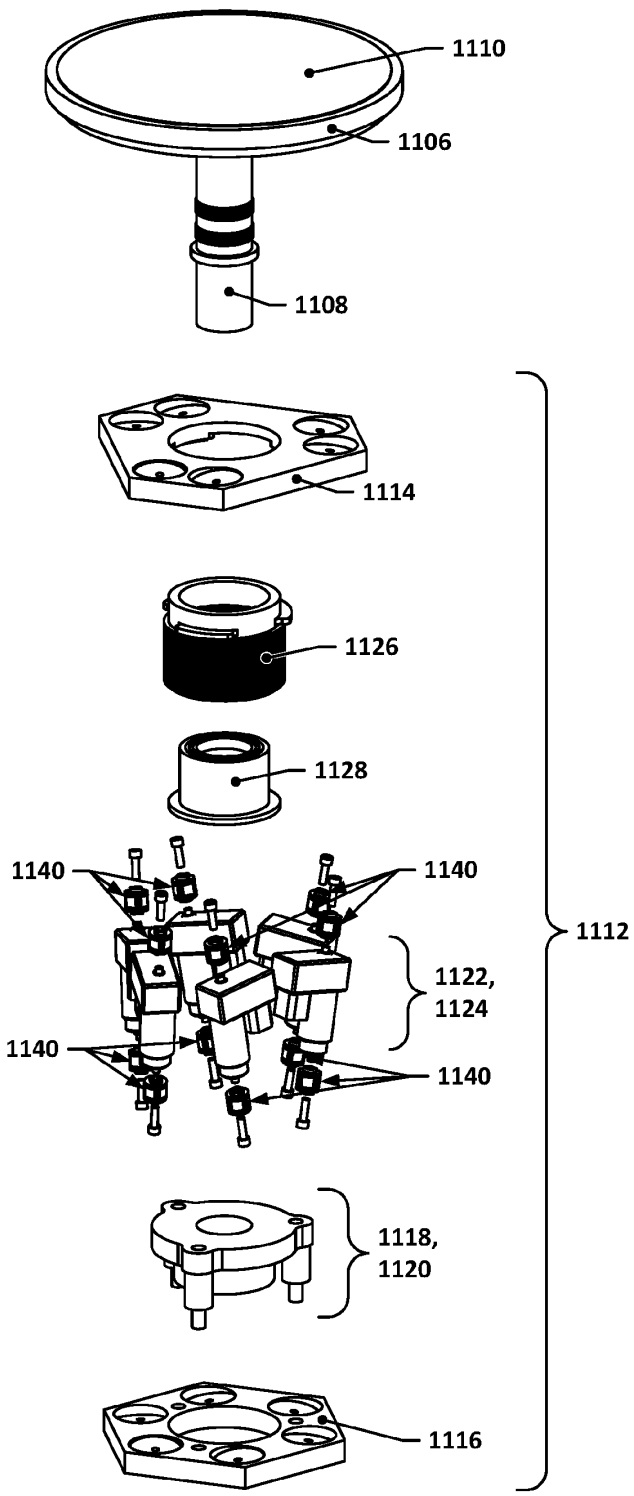
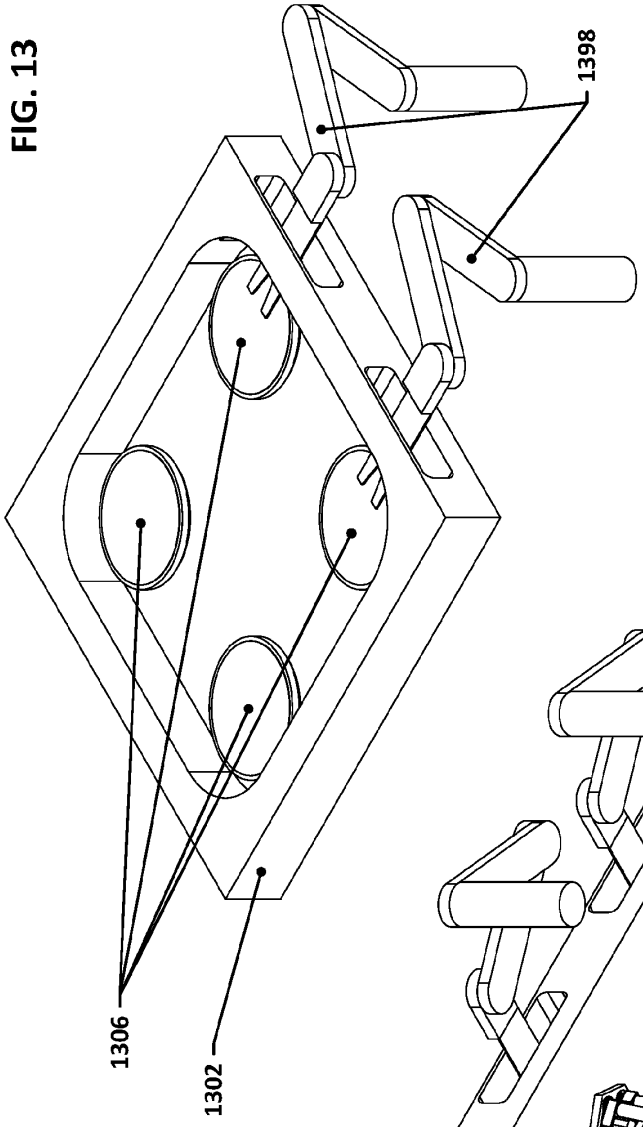

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1106
1108
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1126
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1122,
1124
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1116

FIG. 12

FIG. 13



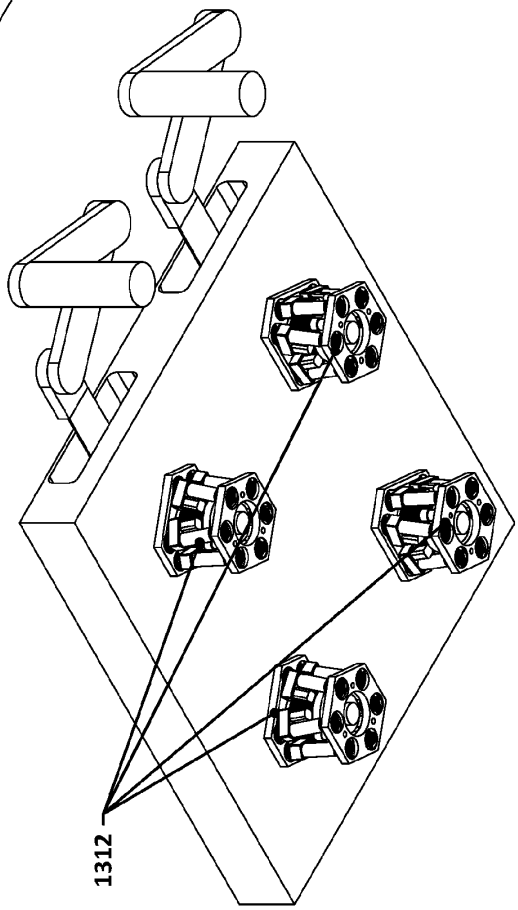


FIG. 14

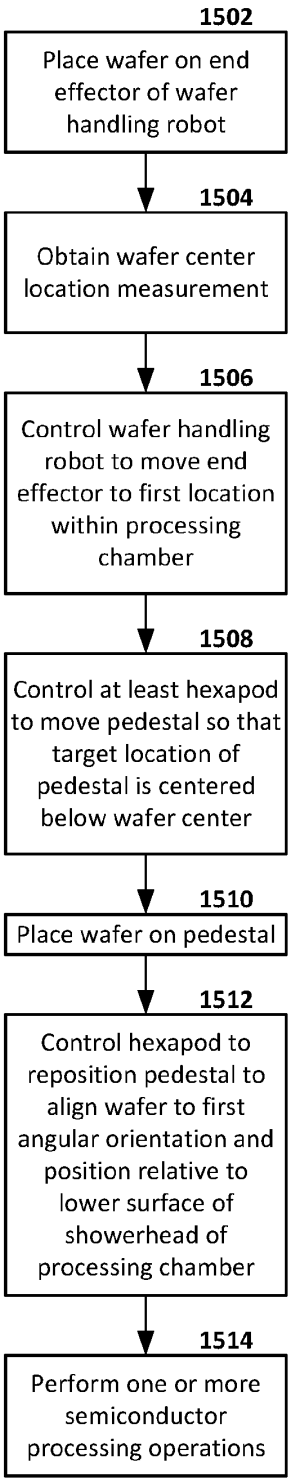

1502
Place wafer on end effector of wafer handling robot
1504
Obtain wafer center location measurement
1506
Control wafer handling robot to move end effector to first location within processing chamber
1508
Control at least hexapod to move pedestal so that target location of pedestal is centered below wafer center
1510
Place wafer on pedestal
1512
Control hexapod to reposition pedestal to align wafer to first angular orientation and position relative to lower surface of showerhead of processing chamber
1514
Perform one or more semiconductor processing operations

FIG. 15

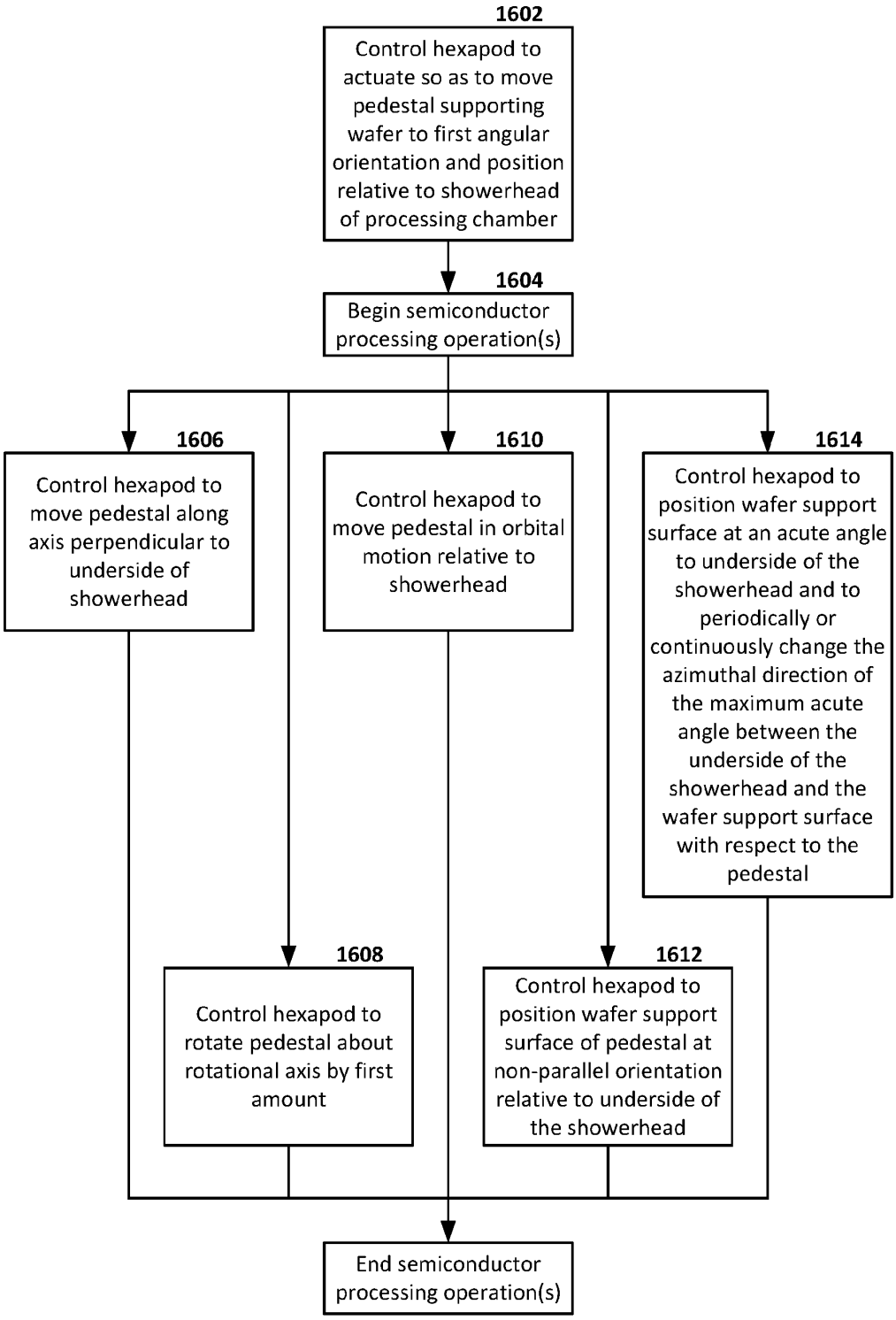

1602
Control hexapod to actuate so as to move pedestal supporting wafer to first angular orientation and position relative to showerhead of processing chamber
1604
Begin semiconductor processing operation(s)
1606
Control hexapod to move pedestal along axis perpendicular to underside of showerhead
1610
Control hexapod to move pedestal in orbital motion relative to showerhead
1614
Control hexapod to position wafer support surface at an acute angle to underside of the showerhead and to periodically or continuously change the azimuthal direction of the maximum acute angle between the underside of the showerhead and the wafer support surface with respect to the pedestal
1608
Control hexapod to rotate pedestal about rotational axis by first amount
1612
Control hexapod to position wafer support surface of pedestal at non-parallel orientation relative to underside of the showerhead
End semiconductor processing operation(s)

FIG. 16

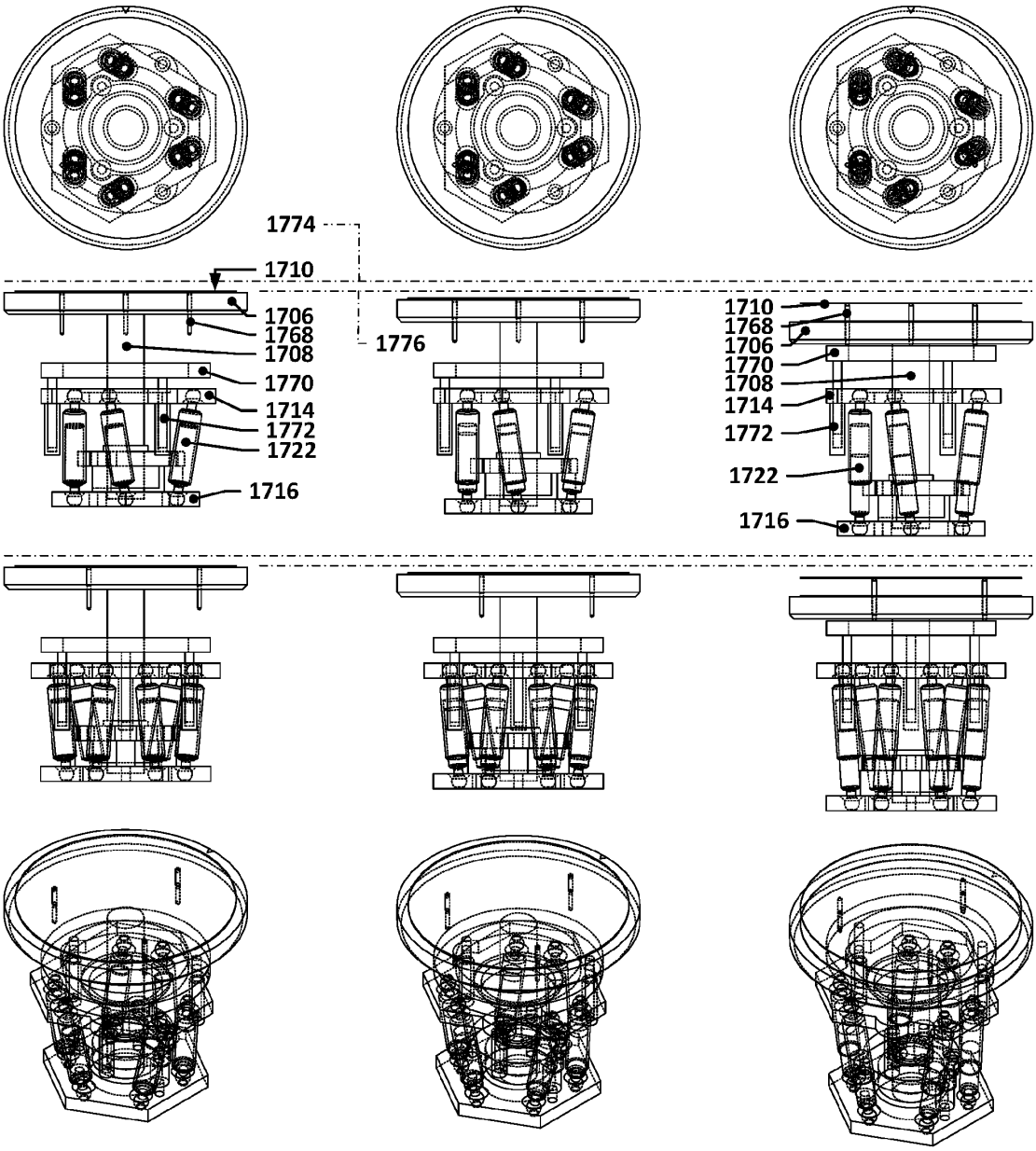


FIG. 17 FIG. 18 FIG. 19

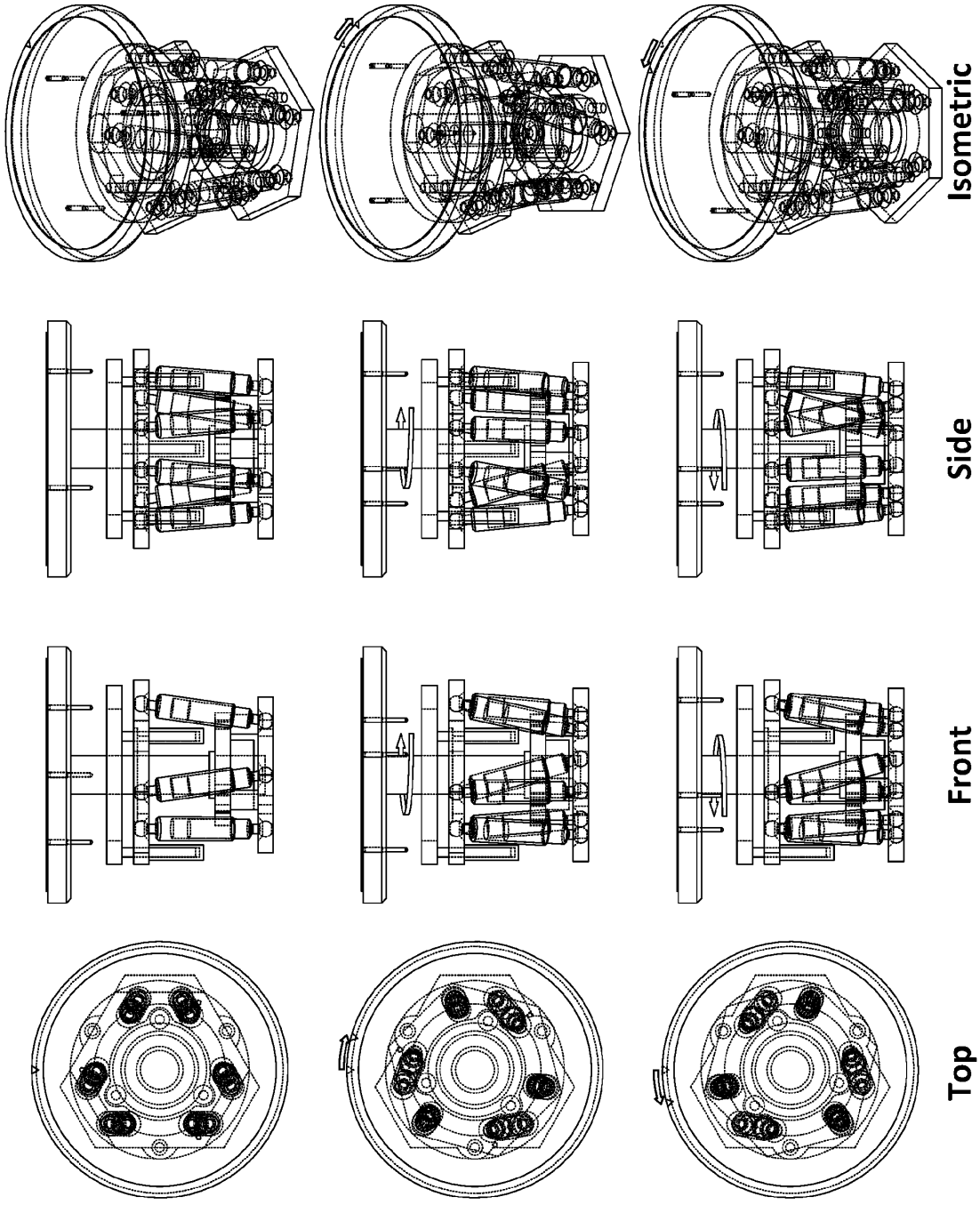


FIG. 20

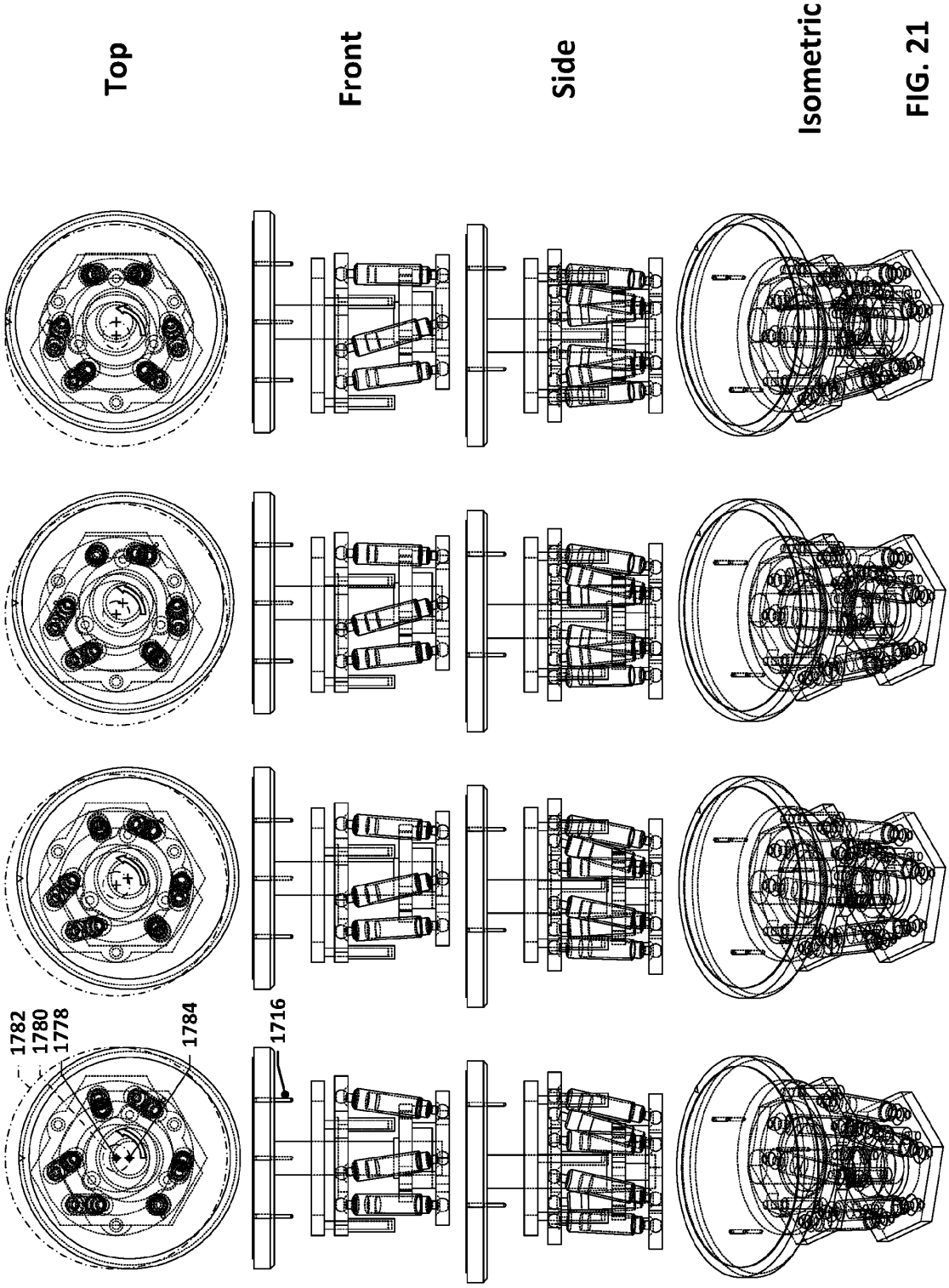


FIG. 21

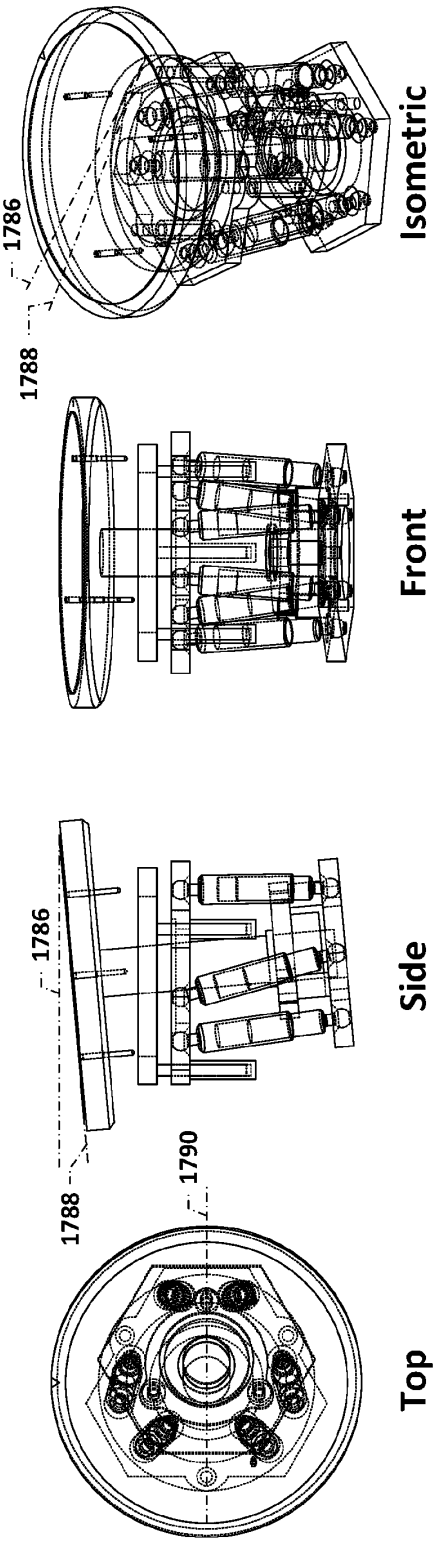

Isometric
1786
1788
Front
Side
1786
1788
1790
Top

FIG. 22

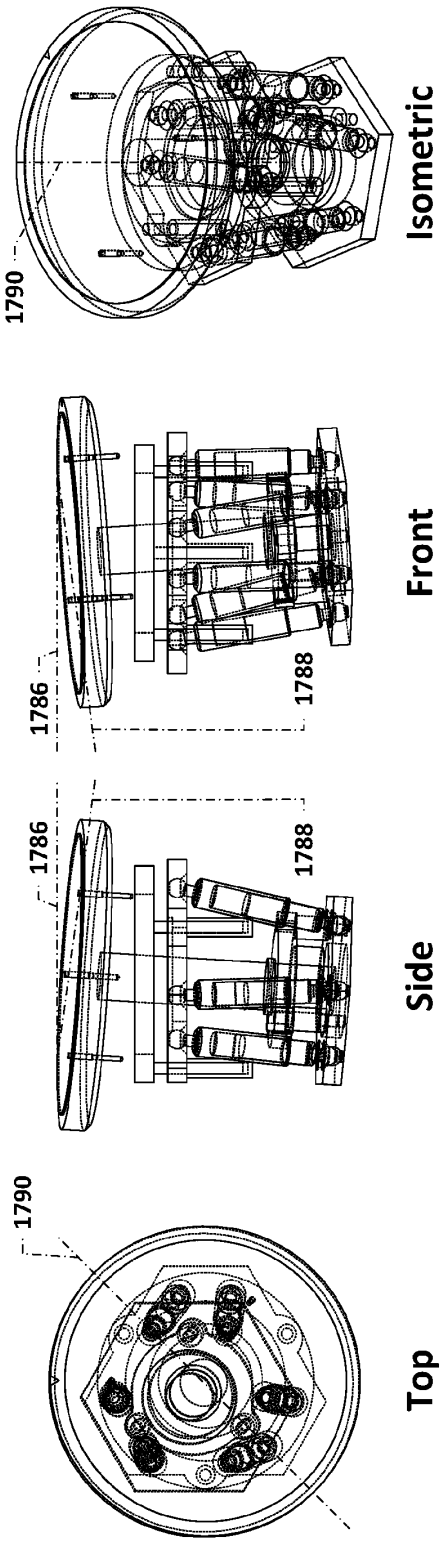

Isometric
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Front
1786
1788
Side
1786
1788
1790
Top

FIG. 23

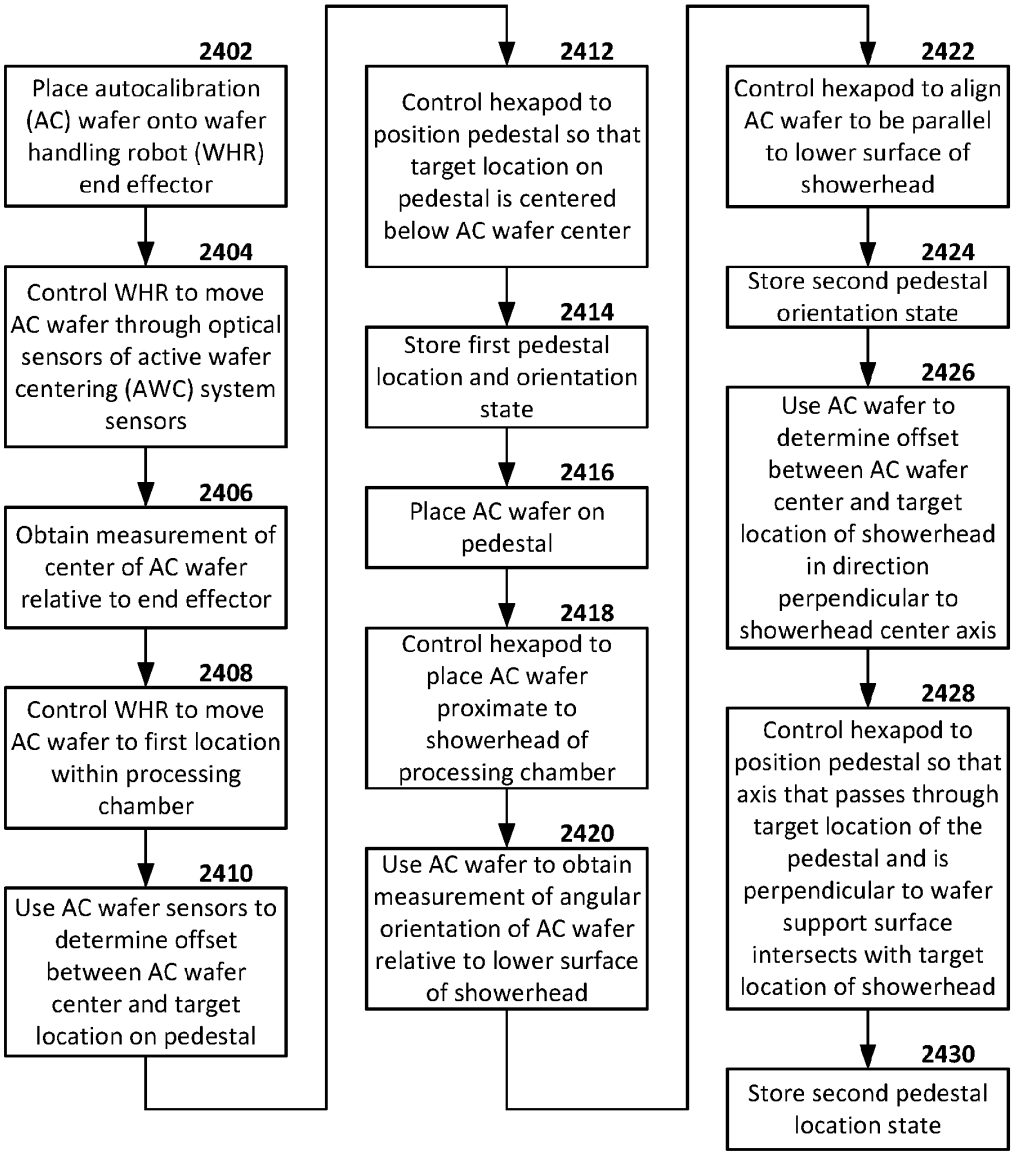

2402
Place autocalibration (AC) wafer onto wafer handling robot (WHR) end effector
2404
Control WHR to move AC wafer through optical sensors of active wafer centering (AWC) system sensors
2406
Obtain measurement of center of AC wafer relative to end effector
2408
Control WHR to move AC wafer to first location within processing chamber
2410
Use AC wafer sensors to determine offset between AC wafer center and target location on pedestal
2412
Control hexapod to position pedestal so that target location on pedestal is centered below AC wafer center
2414
Store first pedestal location and orientation state
2416
Place AC wafer on pedestal
2418
Control hexapod to place AC wafer proximate to showerhead of processing chamber
2420
Use AC wafer to obtain measurement of angular orientation of AC wafer relative to lower surface of showerhead
2422
Control hexapod to align AC wafer to be parallel to lower surface of showerhead
2424
Store second pedestal orientation state
2426
Use AC wafer to determine offset between AC wafer center and target location of showerhead in direction perpendicular to showerhead center axis
2428
Control hexapod to position pedestal so that axis that passes through target location of the pedestal and is perpendicular to wafer support surface intersects with target location of showerhead
2430
Store second pedestal location state

FIG. 24

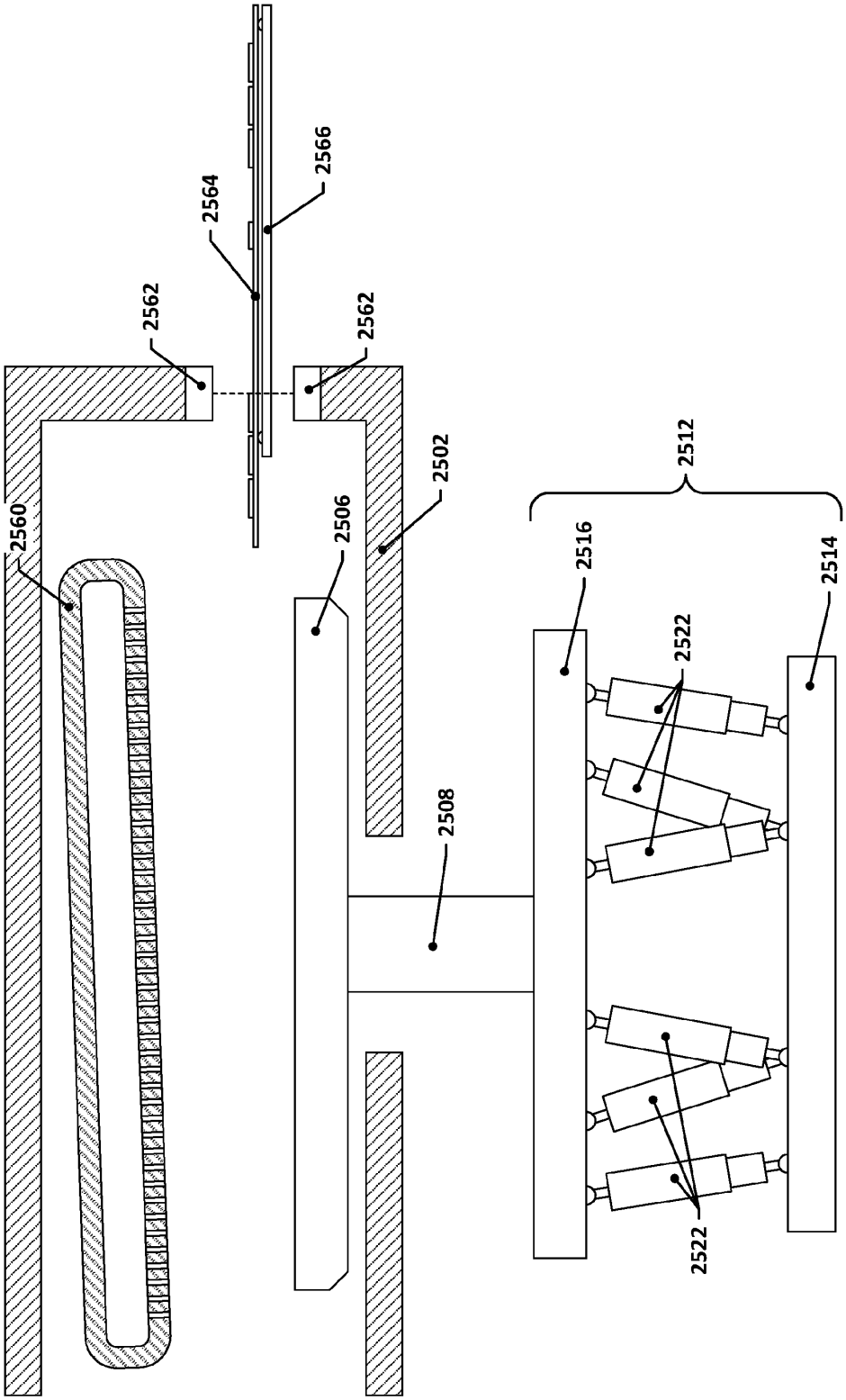

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FIG. 25

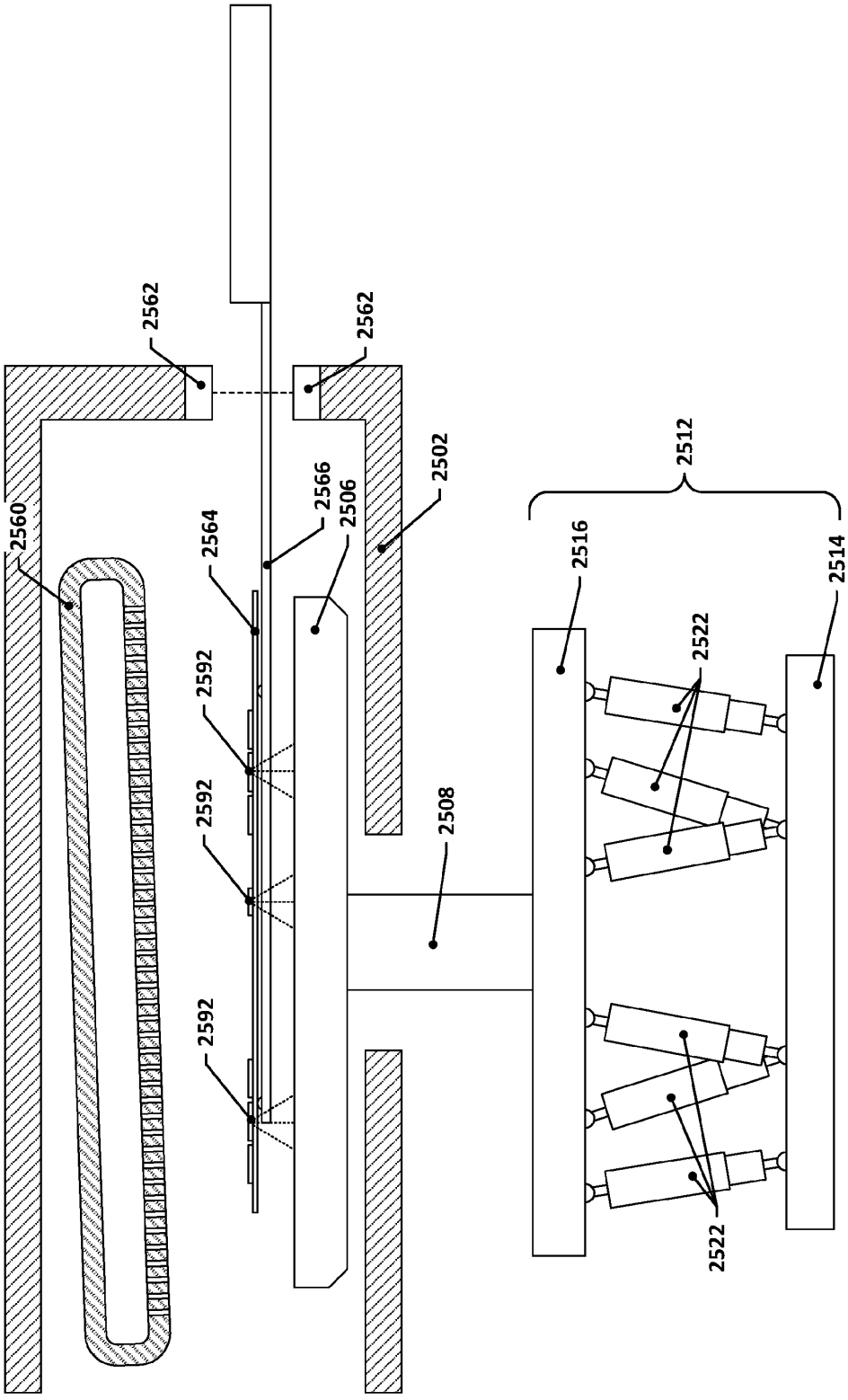

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2592
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FIG. 26

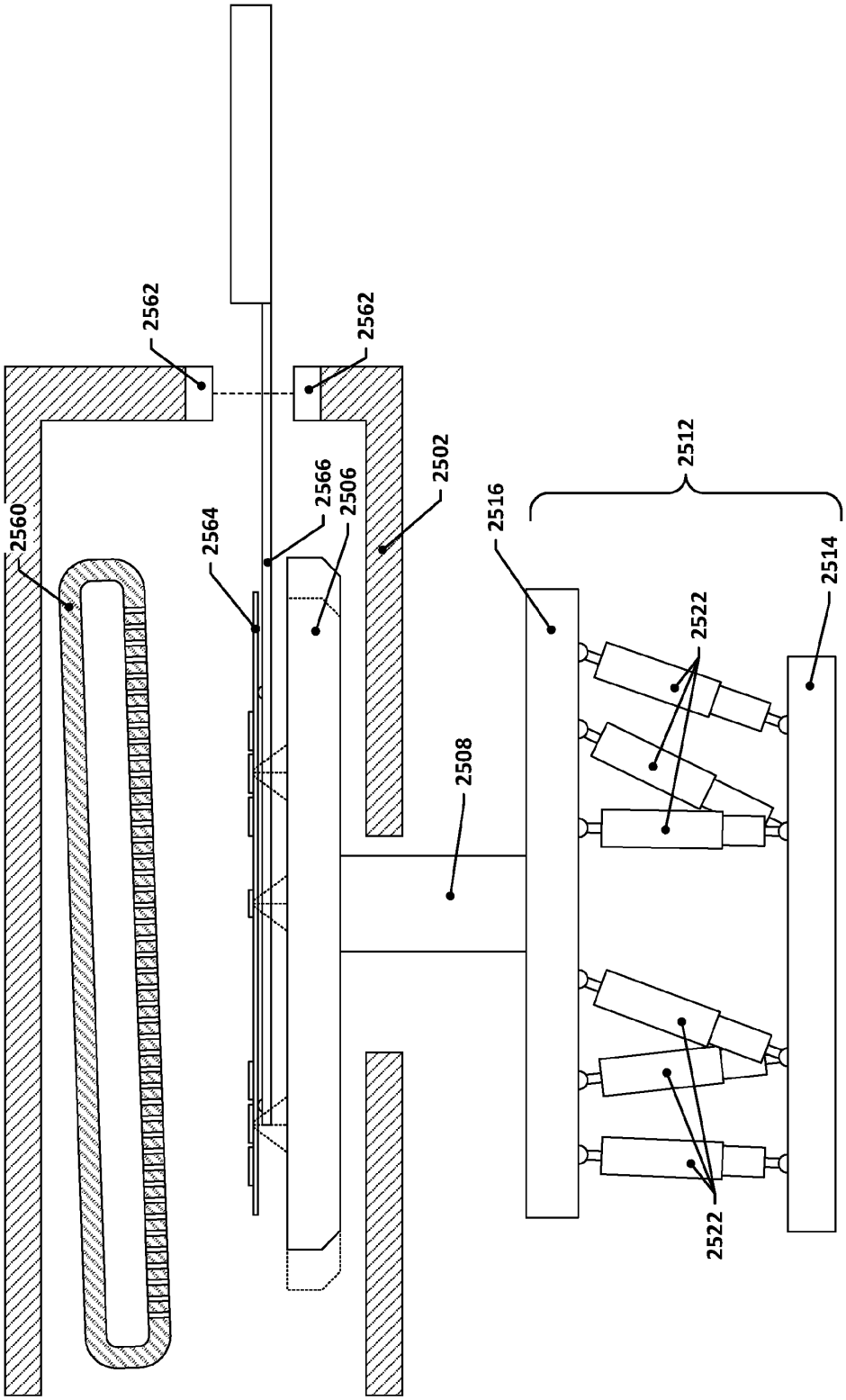

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FIG. 27

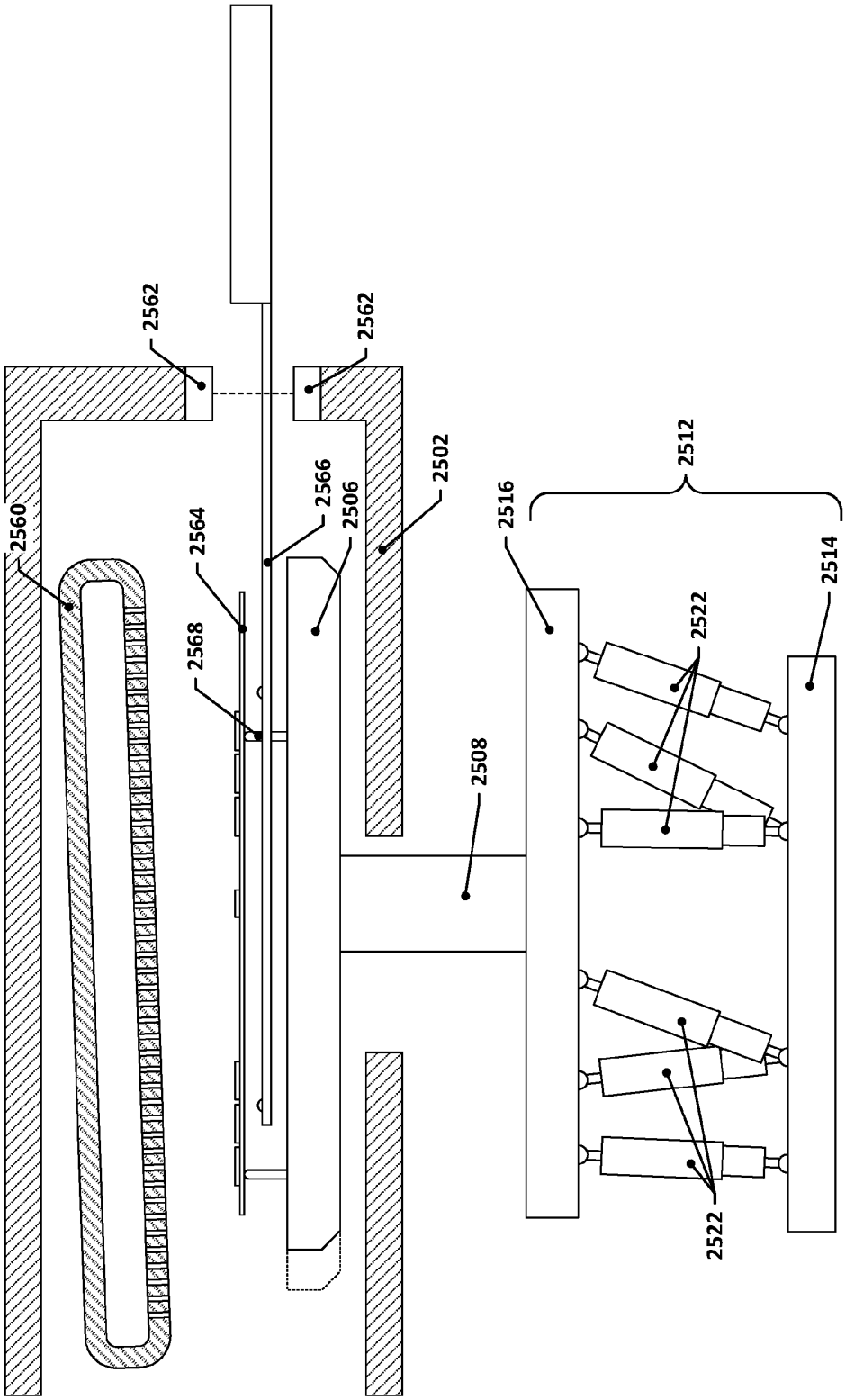

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FIG. 28

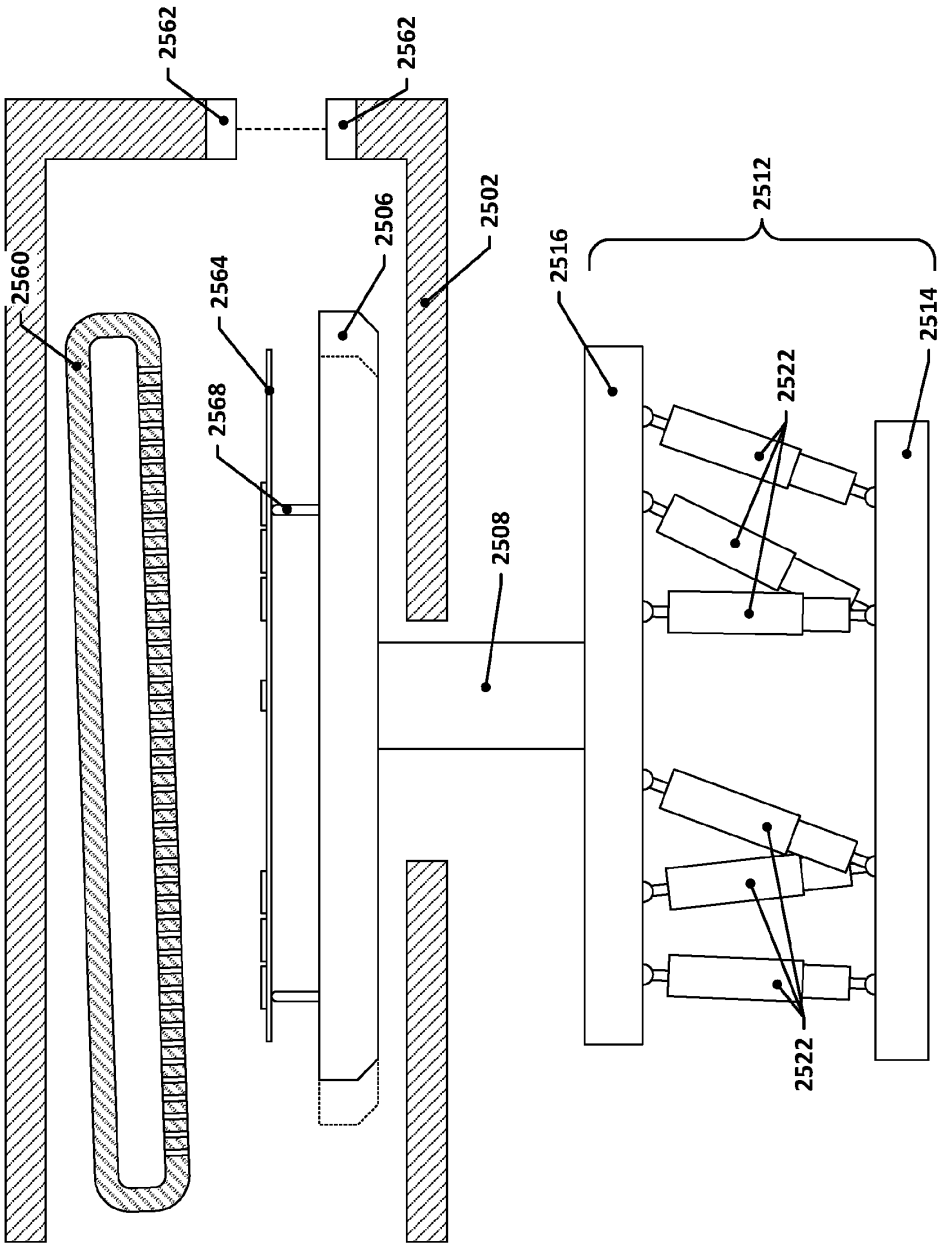

2562
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FIG. 29

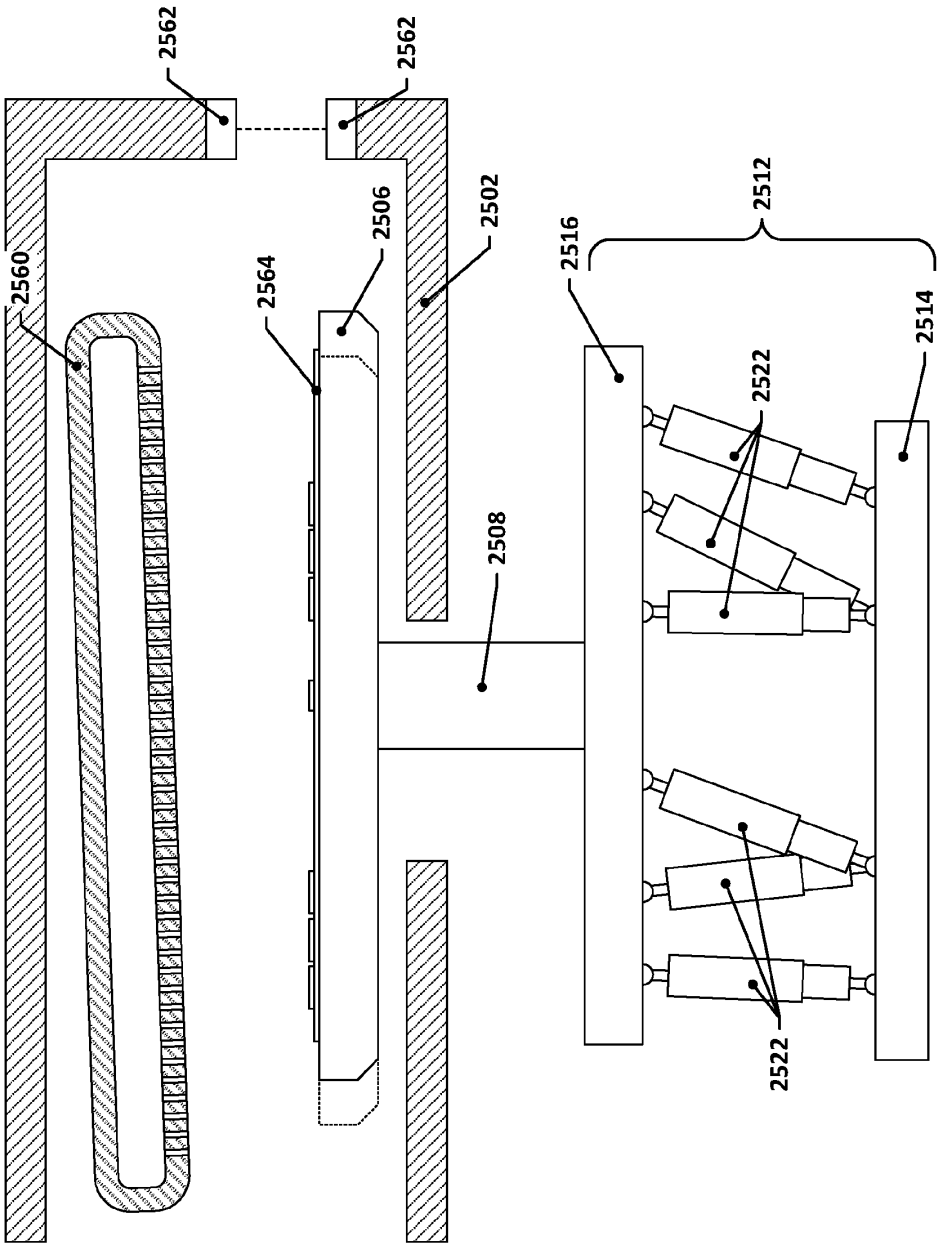


FIG. 30

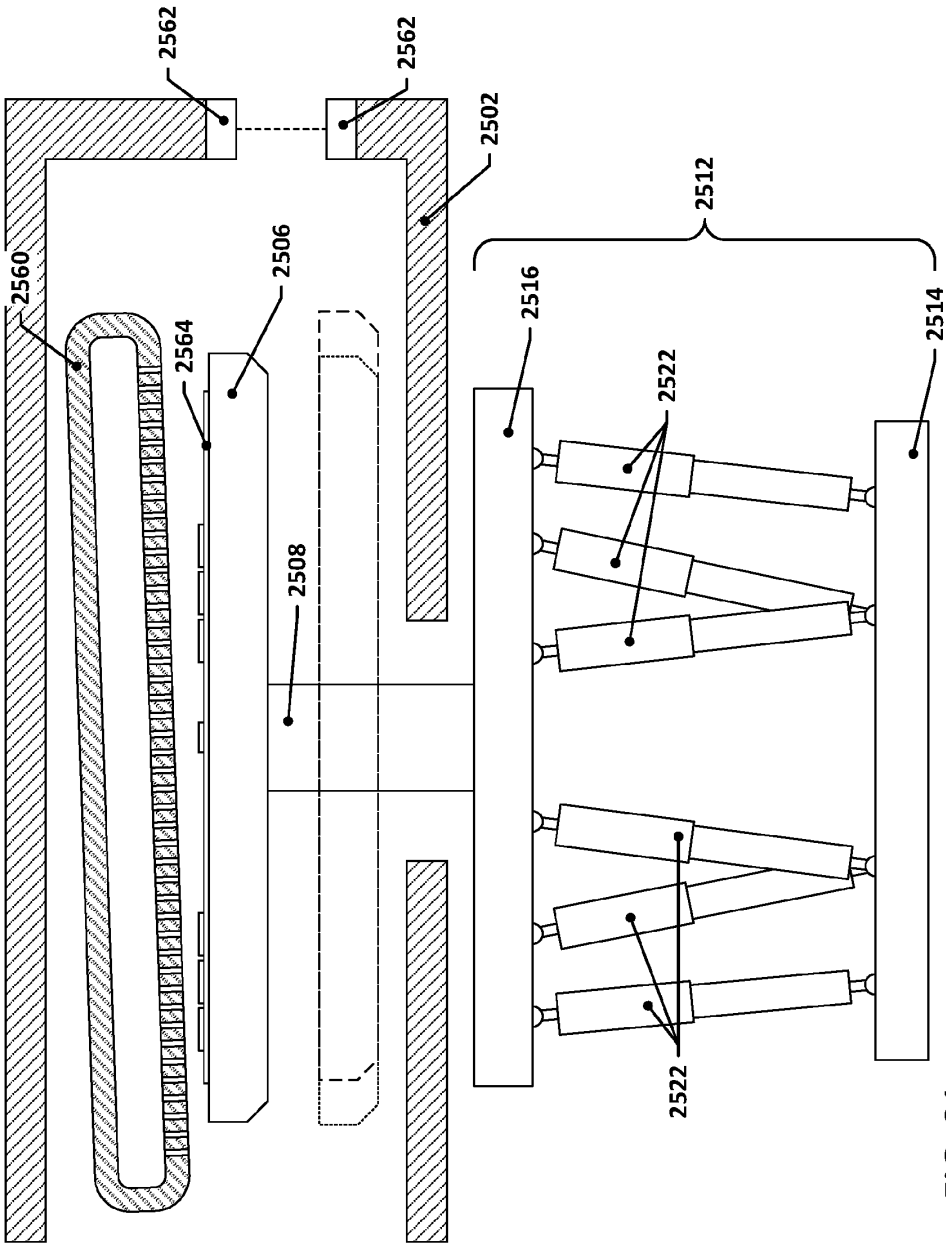


FIG. 31

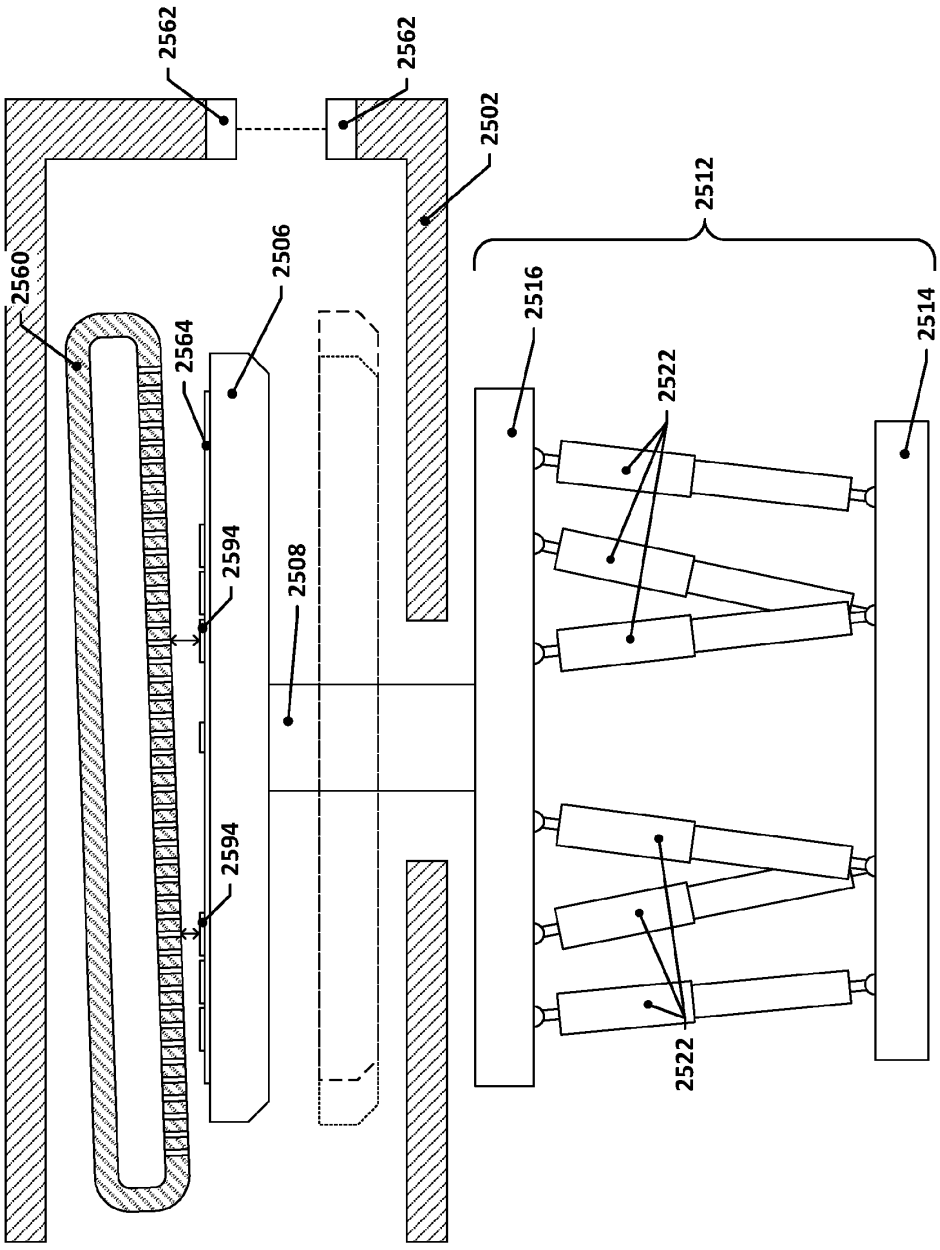

2562
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2512
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2506
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2564
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2594
2508
2594
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FIG. 32

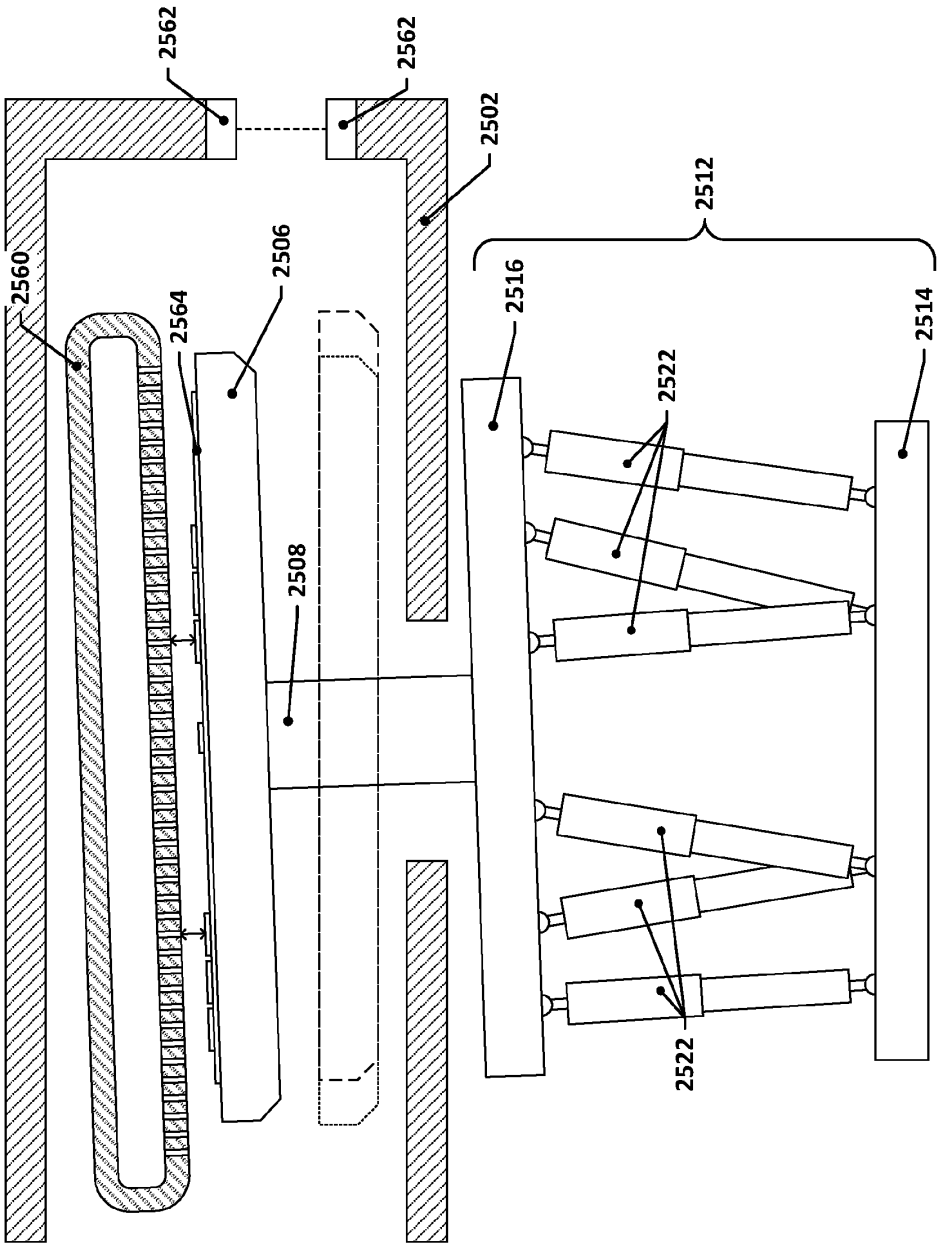


FIG. 33

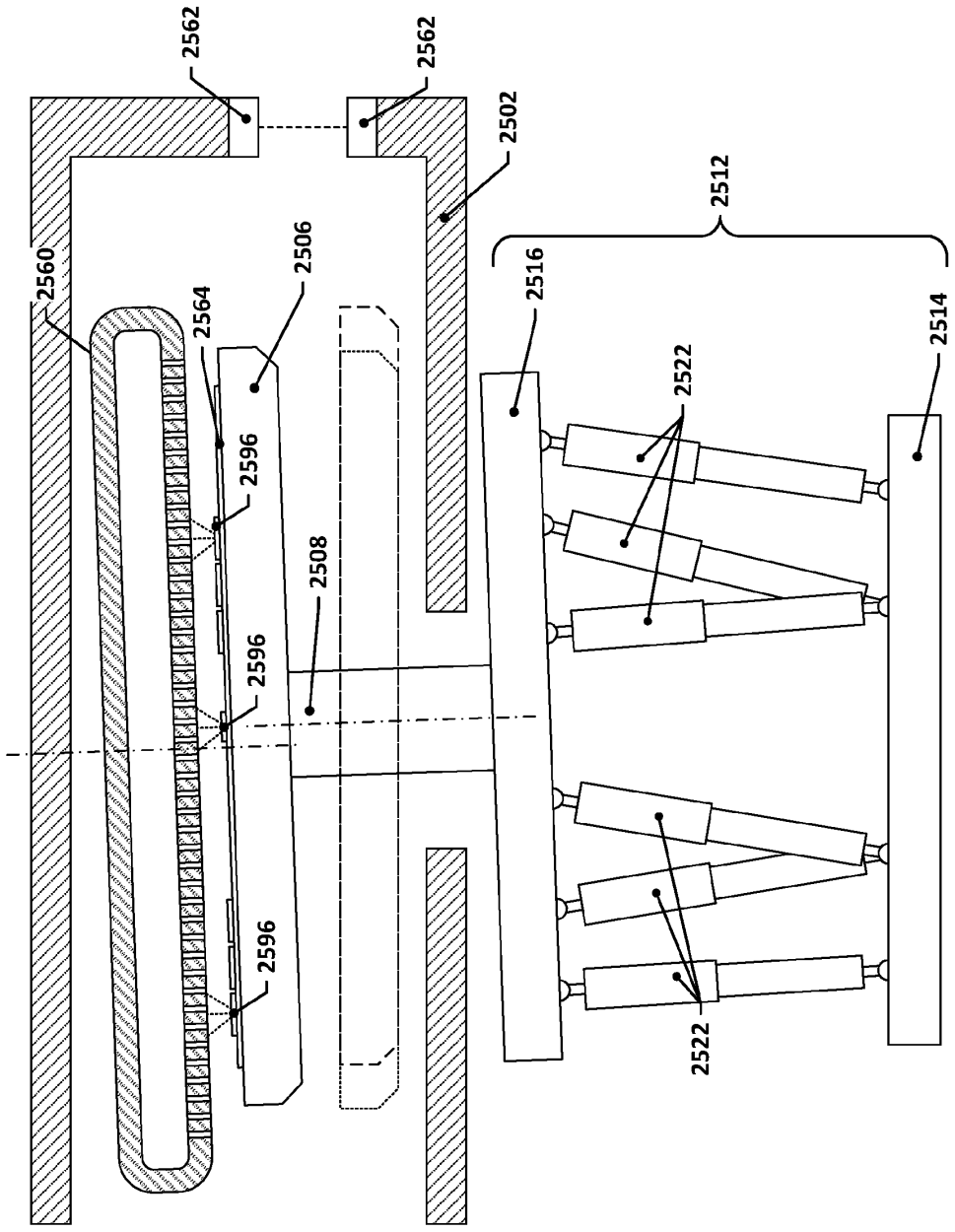

2562
2562
2502
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2564
2506
2516
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2596
2508
2596
2596
2522

FIG. 34

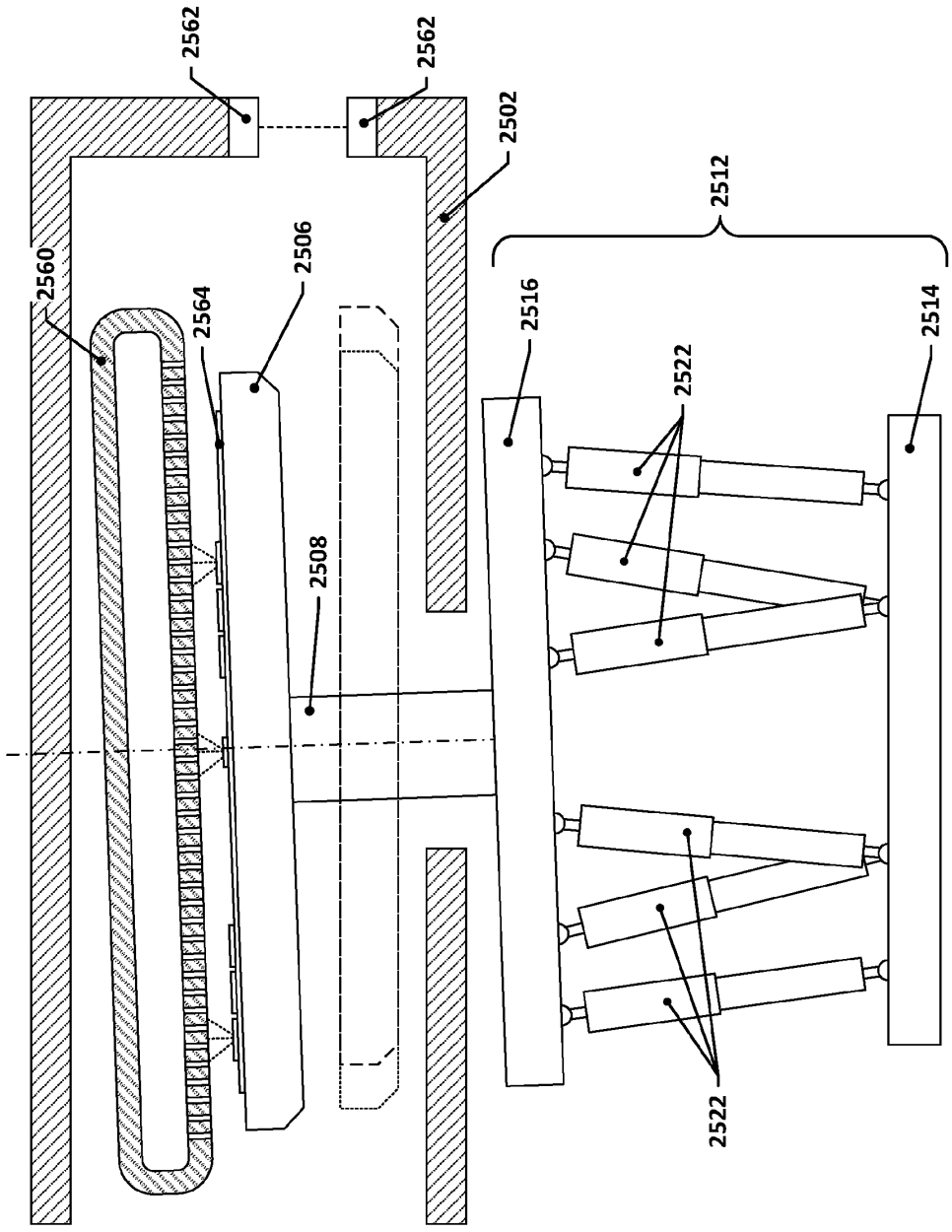


FIG. 35

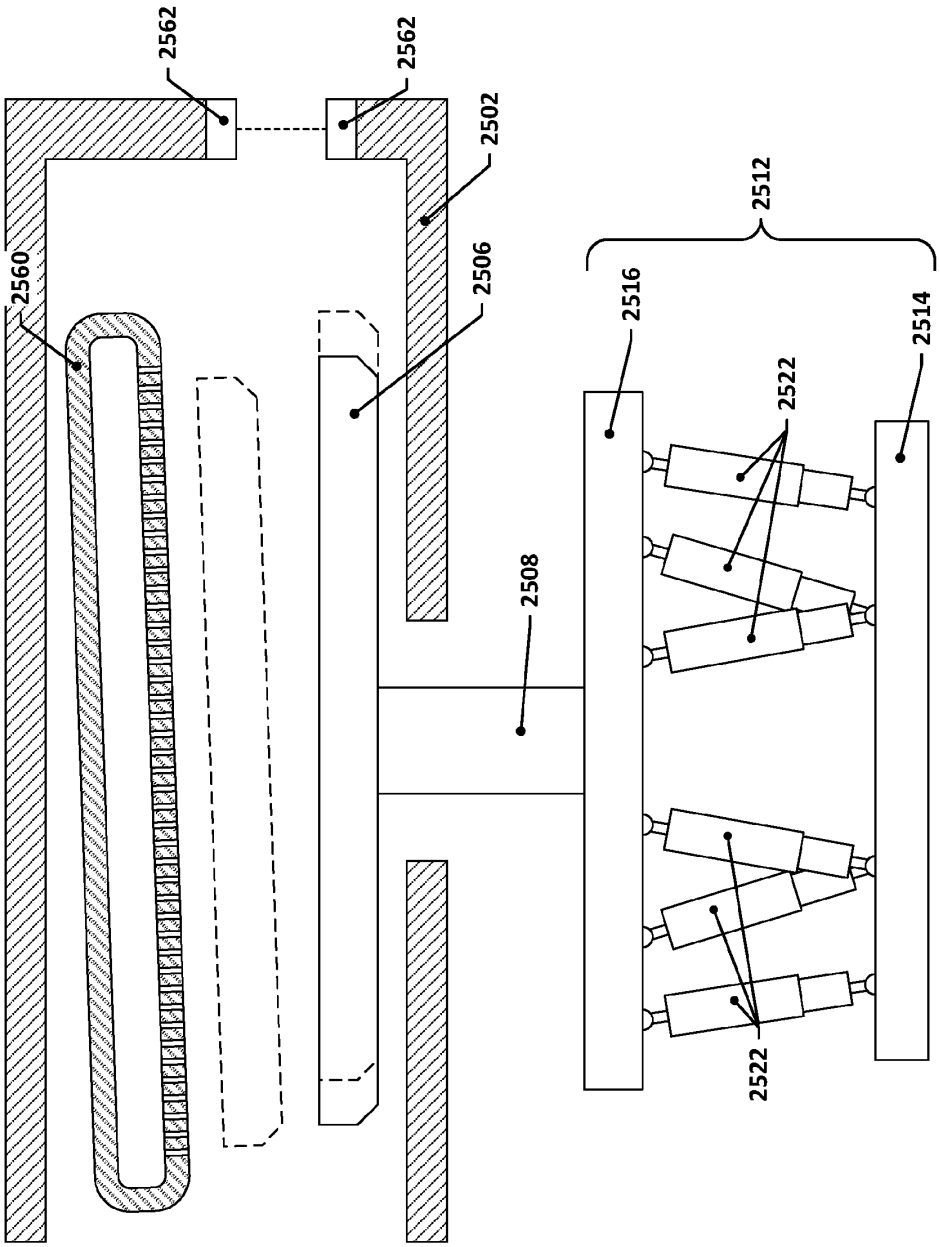


FIG. 36