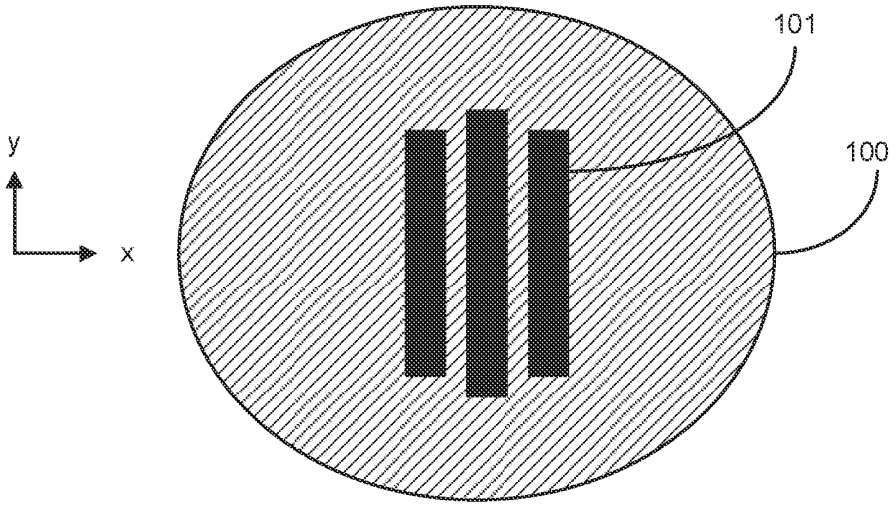


FIG. 1A

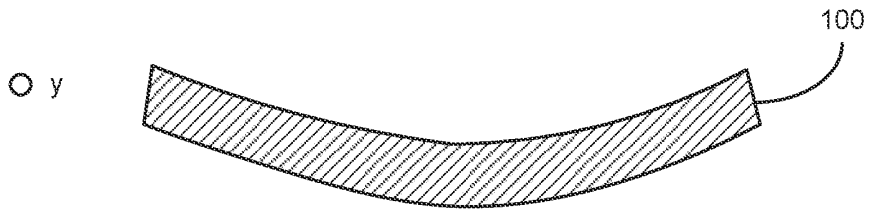


FIG. 1B

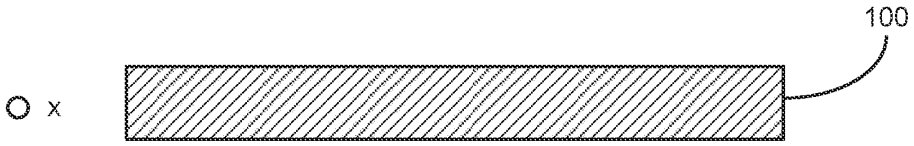


FIG. 1C

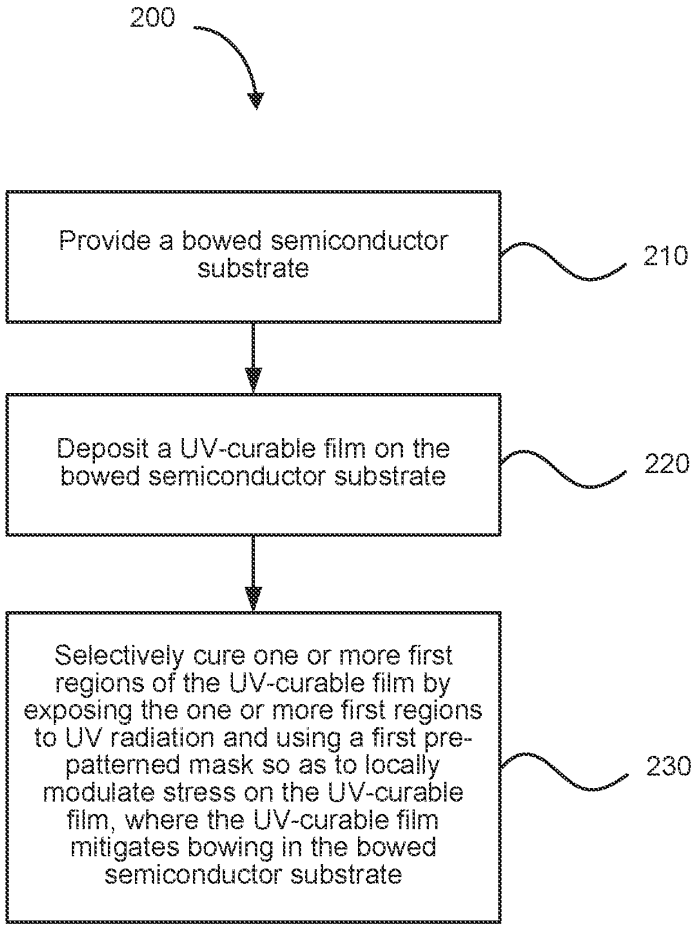

200
Provide a bowed semiconductor substrate
210
Deposit a UV-curable film on the bowed semiconductor substrate
220
Selectively cure one or more first regions of the UV-curable film by exposing the one or more first regions to UV radiation and using a first pre-patterned mask so as to locally modulate stress on the UV-curable film, where the UV-curable film mitigates bowing in the bowed semiconductor substrate
230

FIG. 2A

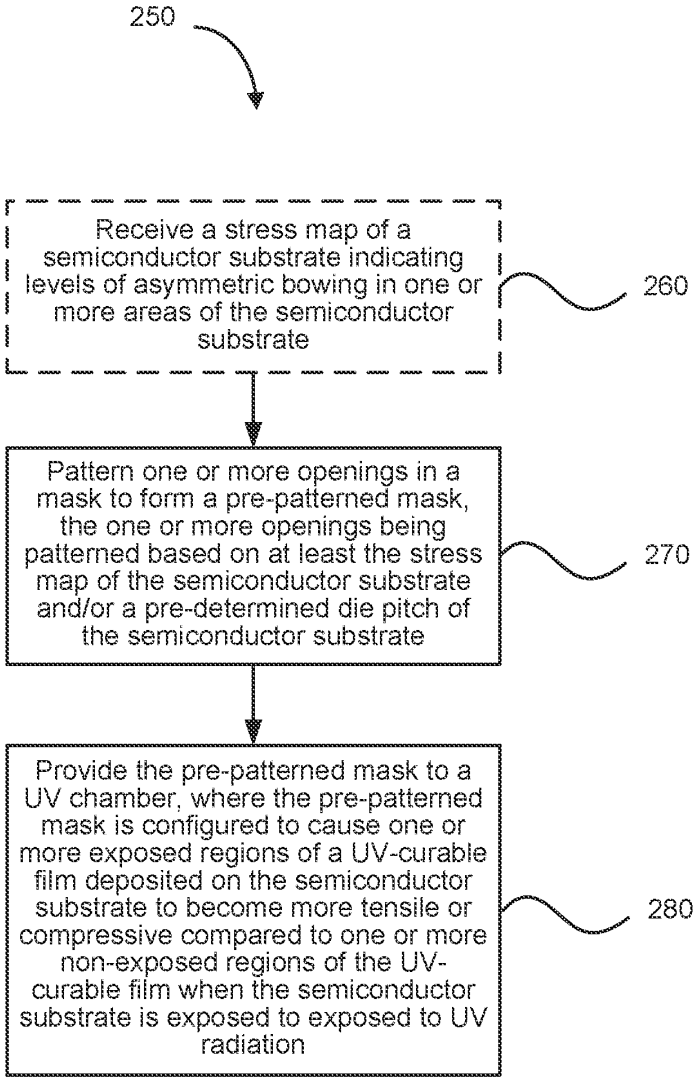

250
Receive a stress map of a semiconductor substrate indicating levels of asymmetric bowing in one or more areas of the semiconductor substrate
260
Pattern one or more openings in a mask to form a pre-patterned mask, the one or more openings being patterned based on at least the stress map of the semiconductor substrate and/or a pre-determined die pitch of the semiconductor substrate
270
Provide the pre-patterned mask to a UV chamber, where the pre-patterned mask is configured to cause one or more exposed regions of a UV-curable film deposited on the semiconductor substrate to become more tensile or compressive compared to one or more non-exposed regions of the UV-curable film when the semiconductor substrate is exposed to exposed to UV radiation
280

FIG. 2B

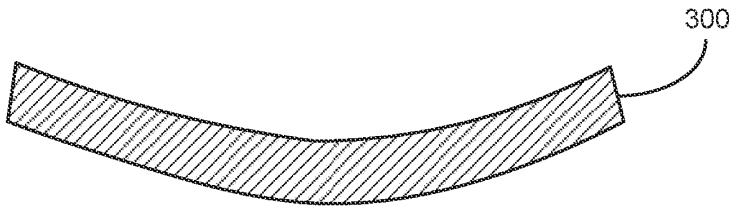


FIG. 3A

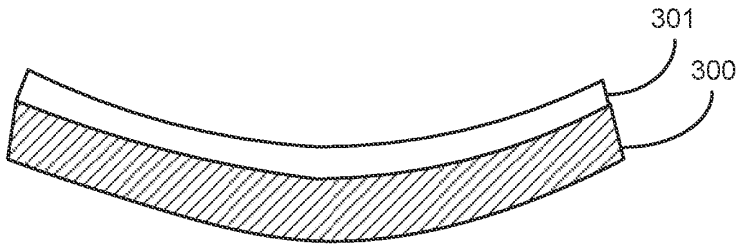


FIG. 3B

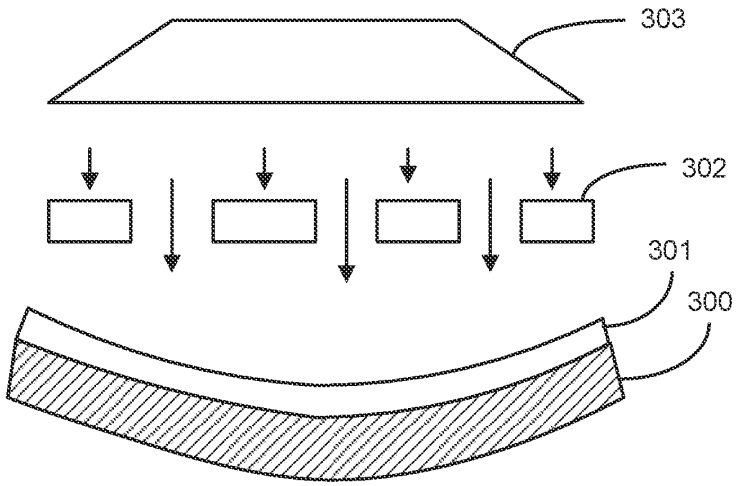


FIG. 3C

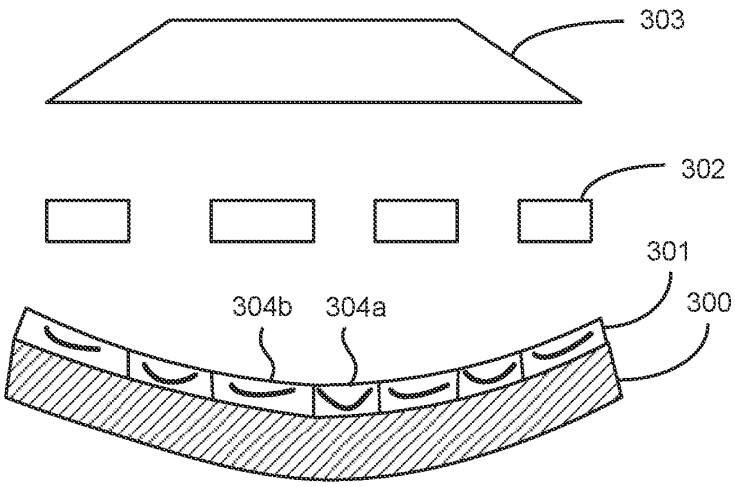


FIG. 3D

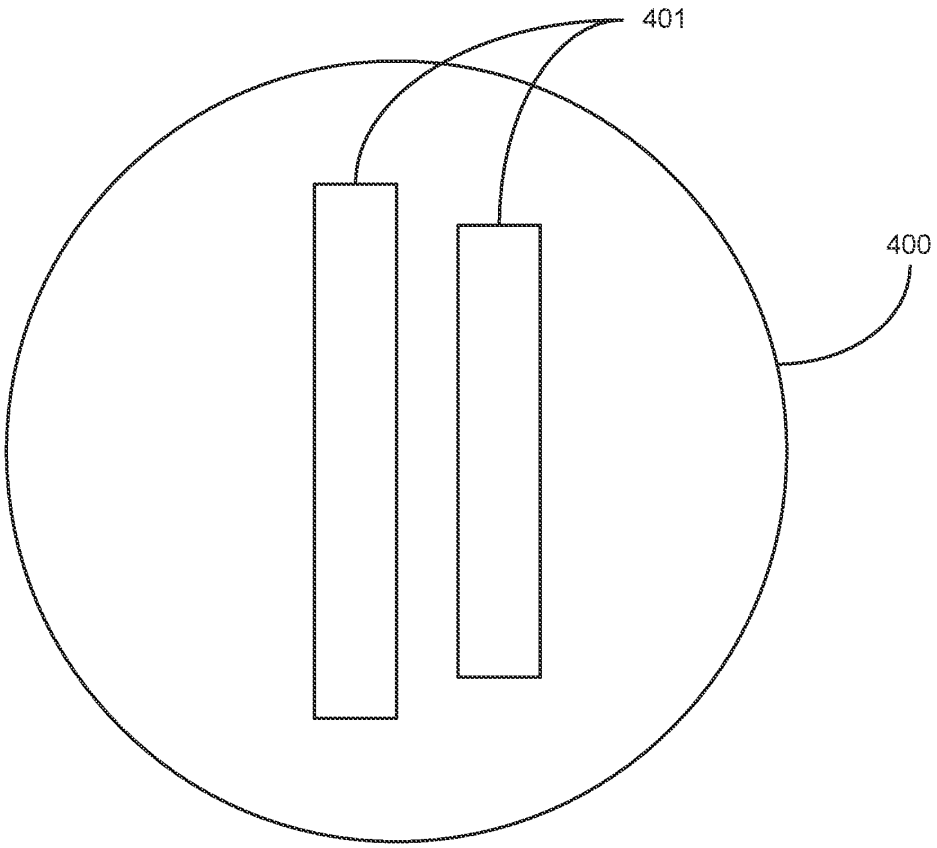


FIG. 4

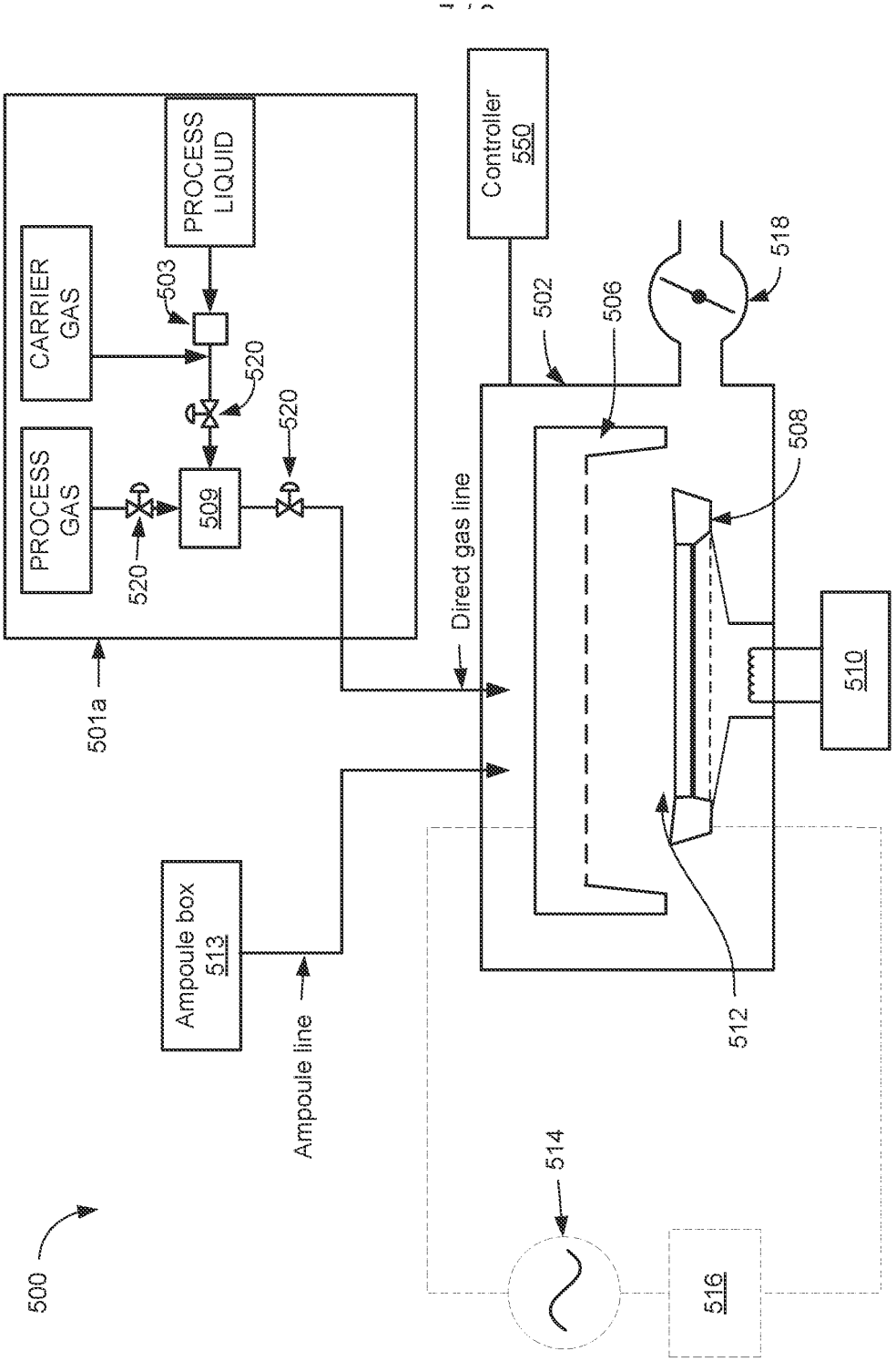

PROCESS LIQUID
CARRIER GAS
PROCESS GAS
503
520
520
520
509
501a
Direct gas line
Controller 550
502
506
518
508
510
512
Ampoule box 513
Ampoule line
514
516
500

FIG. 5

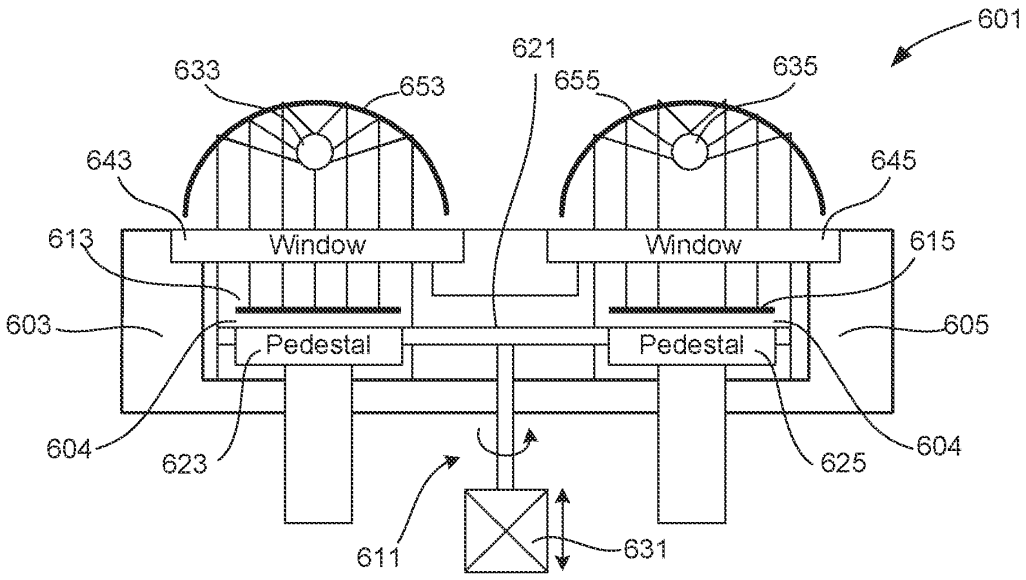

601
621
633
653
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635
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Window
Window
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Pedestal
Pedestal
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611
631

FIG. 6

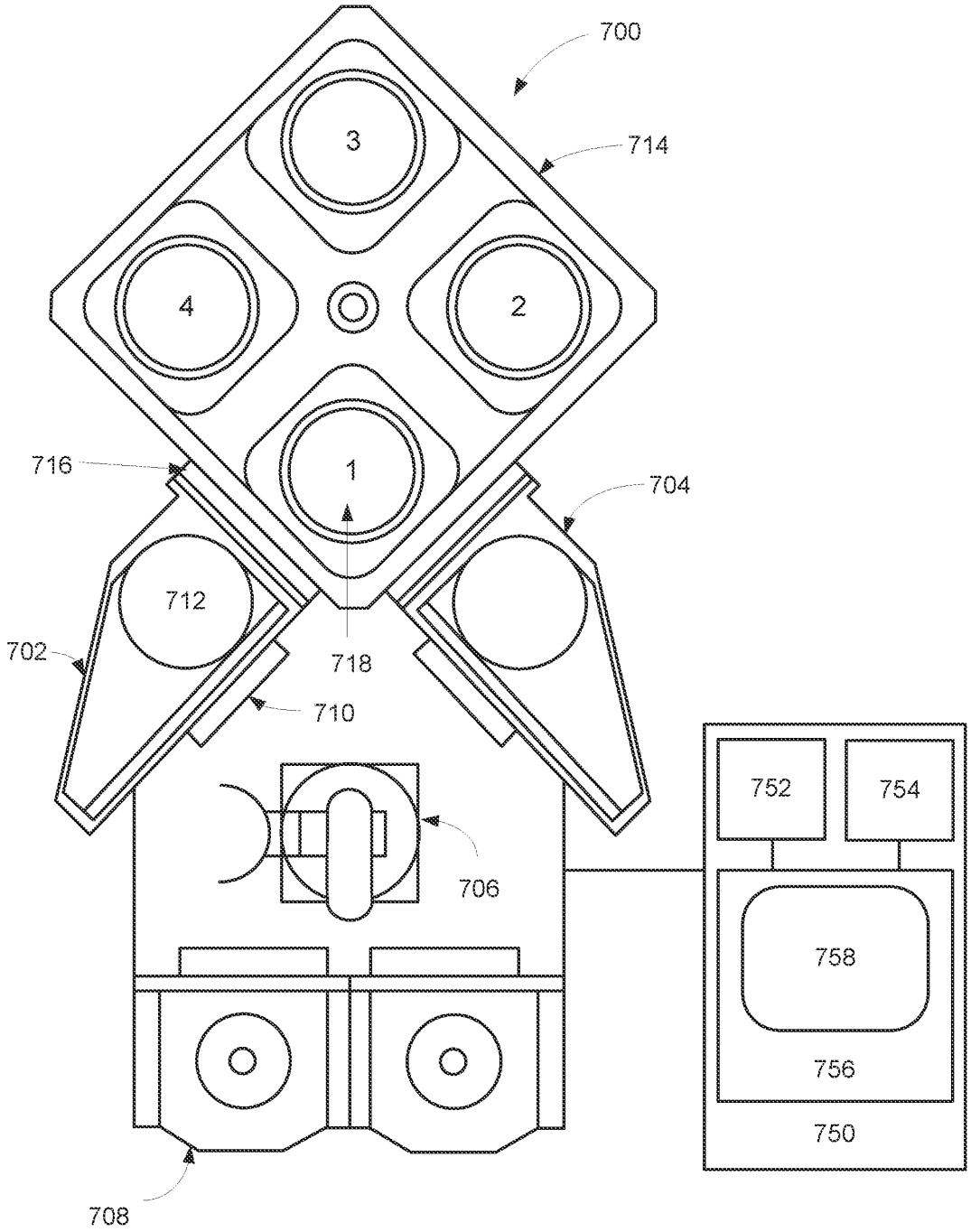


FIG. 7