plenum 344. Gas supplied to the first plenum 340 flows through a first plurality of holes 356 into the processing chamber. Gas supplied to the second plenum 344 flows through a second plurality of holes 360 into the processing chamber.

[0033] The lower plate 304 may be removable and replaceable to customize the configuration of the recessed region 328, the fence 336, the first plenum 340, and/or and the second plenum 344. In other words, while positions of the holes 316 and 320 of the upper plate 300 may be fixed, different configurations of the lower plate 304 may be selected and installed in accordance with desired configurations of the first plenum 340 and the corresponding first plurality of holes 356 and the second plenum 344 and the corresponding second plurality of holes 360.

[0034] For example only, as shown, the first plenum 340 has a cloverleaf pattern including four quadrants (e.g., lobes 364) surrounded by respective lobes 368 of the fence 336. Gas supplied into the first plenum 340 (e.g., at a location 370 aligned with the center hole 316) flows outward into the respective lobes 364. Conversely, the second plenum 344 includes four quadrants or lobes 372 located between respective adjacent pairs of the lobes 368 of the fence 336. The adjacent pairs of the lobes 368 of the fence 336 are connected by inwardly protruding serpentine paths (e.g., switchbacks) 376 that define respective flow channels 380 in the lobes 372 of the second plenum 344. The flow channels 380 extend radially inward from the lobes 372 of the second plenum 344 between adjacent ones of the lobes 368 of the fence 336 (or, extend radially outward from a central region of the lower plate 304). Gas supplied into the second plenum 344 (e.g., at locations 382 aligned with respective ones of the outer holes 320) flows radially outward through the flow channels 380 into the respective lobes 372.

[0035] Although as shown the first plenum 340 includes four of the lobes 364 surrounded by four of the lobes 368 of the fence 336, in other examples the lower plate ~~324~~304 may include fewer (e.g., two or three) or more (e.g., five or more) of the lobes 364 and 368. Accordingly, the lower plate ~~324~~304 may include fewer (e.g., two or three) or more (e.g., five or more) of the lobes 372, the serpentine paths 376, the flow channels 380, etc.

[0036] In this manner, the recessed region 328 defines two distinct gas distribution zones (e.g., a radially inner zone and a radially outer zone) corresponding to the first plenum 340 and the second plenum 344, respectively. Although gas is supplied

CLAIMS

~~What is claimed is:~~

1. A gas distribution device for a substrate processing system, the gas distribution device comprising:

an upper plate including a first hole and a plurality of second holes; and

a lower plate including

a recessed region formed in one of (i) an upper surface of the lower plate and (ii) a lower surface of the upper plate, wherein the recessed region defines a plenum volume between the upper plate and the lower plate, and

a raised fence located within the recessed region, wherein the fence separates the plenum volume into a first plenum and a second plenum, wherein the first plenum is in fluid communication with the first hole, and wherein the second plenum is in fluid communication with the plurality of second holes.

2. The gas distribution device of claim 1, wherein the upper plate includes a receptacle, and wherein the first hole and the plurality of second holes are located within the receptacle.

3. The gas distribution device of claim 2, wherein the receptacle is configured to receive a central injector including a first channel and a second channel.

4. The gas distribution device of claim 3, further comprising the central injector, wherein the first hole is centrally located within the receptacle and wherein the first channel is aligned with and in fluid communication with the first hole.

5. The gas distribution device of claim 4, wherein the second channel includes an annular bottom portion that is aligned with and in fluid communication with the plurality of second holes.

6. The gas distribution device of claim 1, wherein the first hole is centrally located in the upper plate and the plurality of second holes are located radially outward of the first hole.

7. The gas distribution device of claim 1, wherein an area of the first hole is substantially the same as an overall area of the plurality of second holes.

8. The gas distribution device of claim 1, wherein the first plenum and the second plenum are coplanar.

9. The gas distribution device of claim 1, wherein a height of the fence is the same as a height of an outer portion of a corresponding one of the lower plate and the upper plate surrounding the recessed region.

10. The gas distribution device of claim 1, wherein the first plenum includes a first plurality of lobes, the fence includes a second plurality of lobes, and each of the second plurality of lobes surrounds respective ones of the first plurality of lobes.

11. The gas distribution device of claim 10, wherein the first plenum has a cloverleaf shape including four lobes.

12. The gas distribution device of claim 10, wherein the second plenum includes a third plurality of lobes located between adjacent pairs of the second plurality of lobes of the fence.

13. The gas distribution device of claim 12, wherein the fence includes switchbacks that connect the adjacent pairs of the second plurality of lobes and protrude inward between adjacent pairs of the first plurality of lobes.

14. The gas distribution device of claim 13, wherein the switchbacks define flow channels in respective ones of the third plurality of lobes.

15. The gas distribution device of claim 14, wherein the flow channels extend radially outward into the respective ones of the third plurality of lobes between the adjacent pairs of the first plurality of lobes and the adjacent pairs of the second plurality of lobes.

16. The gas distribution device of claim 14, wherein radially inward ends of the flow channels are aligned with the ~~second~~ plurality of second holes.

17. The gas distribution device of claim 1, wherein the lower plate includes a first plurality of holes extending from the first plenum to lower surface of the lower plate and a second plurality of holes extended from the second plenum to the lower surface of the lower plate.

18. The gas distribution device of claim 17, wherein the second plurality of holes is located radially outward of the first plurality of holes.

19. A gas distribution device for a substrate processing system, the gas distribution device comprising:

an upper plate including a first hole and a plurality of second holes; and

a lower plate including

a recessed region formed in one of (i) an upper surface of the lower plate and (ii) a lower surface of the upper plate, wherein the recessed region defines a plenum volume between the upper plate and the lower plate, and

a plurality of grooves located within the recessed region, and

a plurality of sealing members located in respective ones of the plurality of grooves, wherein the plurality of sealing members separates the plenum volume into a first plenum and a plurality of second plenums, wherein the first plenum is in fluid communication with the first hole, and wherein the plurality of second plenums is in fluid communication with the plurality of second holes.

20. The gas distribution device of claim 19, wherein the sealing members are O-rings.