

CLAIMS

What is claimed is:

1. An apparatus comprising:
a showerhead faceplate, wherein:
 - 5 the showerhead faceplate is configured to removably mate with a showerhead backplate,
 - the showerhead faceplate has a plate region having a plurality of gas distribution ports located therein,
 - each gas distribution port extends through the showerhead faceplate,
 - 10 the showerhead faceplate includes one or more first planar thermal contact surfaces, each first planar thermal contact surface configured to contact a corresponding second planar thermal contact surface on the showerhead backplate when the showerhead faceplate is mated to the showerhead backplate,
 - 15 the one or more first planar thermal contact surfaces include an annular planar thermal contact surface that has an outer diameter of between 12" and 18" and that encircles the plate region when viewed along a first axis that is perpendicular to the annular planar thermal contact surface, and
 - 20 the annular planar thermal contact surface has a flatness less than or equal to a value between 800 μin and 1200 μin and a surface roughness Ra less than or equal to a value between 24 μin to 40 μin .
 2. The apparatus of claim 1, further including a plurality of posts located within the plate region and extending away from the plate region, wherein the one or more first planar thermal contact surfaces includes, for each of the posts, an endpost thermal contact surface that is
 - 25 parallel to the annular planar thermal contact surface.
 3. The apparatus of claim 2, wherein the first planar thermal contact surfaces have flatness values less than or equal to 1000 μin and average surface roughness Ra greater than or equal to 24 μin .
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 4. The apparatus of claim 2, wherein the first planar thermal contact surfaces have flatness values less than or equal to 1000 μin and average surface roughness Ra greater than or equal to 30 μin .

5. The apparatus of claim 2, wherein the first planar thermal contact surfaces have flatness values less than or equal to 1000 μ m and average surface roughness Ra greater than or equal to 40 μ m.
- 5 6. The apparatus of claim 1, wherein the showerhead faceplate is made of an aluminum alloy.
7. The apparatus of claim **Error! Reference source not found.**1, wherein:
- the showerhead faceplate includes a plurality of first threaded holes distributed around
10 the plate region and located in the annular planar thermal contact surface.
8. The apparatus of claim 7, wherein:
- the first threaded holes are arranged in a circular array with an angular spacing of at most 20° in between adjacent first threaded holes.
- 15 9. The apparatus of claim 7, wherein:
- the showerhead faceplate further includes a first thermal interference fit feature that is configured to interface with a second thermal interference fit feature on the showerhead backplate when the showerhead faceplate is mated to the showerhead backplate,
- 20 the first thermal interference fit feature includes a first axially symmetric surface that faces radially outwards and is located in between the plate region and the first threaded holes, and
- the first axially symmetric surface has a first cross-sectional profile that is dimensioned so as to be within 0.01" to 0.014" of a corresponding second cross-sectional profile of the
25 second thermal interference fit feature on the showerhead backplate when the showerhead faceplate is mated to the showerhead backplate such that the showerhead faceplate is centered with respect to the showerhead backplate and the showerhead faceplate and the showerhead backplate are both at 20°C.
- 30 10. The apparatus of claim 9, wherein:
- the first thermal interference fit feature is a first cylindrical surface having a first diameter,
- the second thermal interference fit feature on the showerhead backplate with which the first thermal interference fit feature is configured to interface when the showerhead

faceplate is mounted to the showerhead backplate is a second cylindrical surface having a second diameter, and

the first diameter is smaller than the second diameter and within 0.02" of the second diameter when the showerhead faceplate and the showerhead backplate are both at 20°C.

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11. The apparatus of claim 10, wherein:

the showerhead faceplate includes an inner wall that extends around the plate region and is interposed between the first threaded holes and the plate region,

the inner wall extends away from the annular planar thermal contact surface, and

10 the first thermal interference fit feature is provided by an outward-facing surface of the inner wall.

12. The apparatus of claim 9, further comprising:

15 a plurality of first threaded fasteners equal in number to the number of first threaded holes;

a plurality of washers at least equal in number to the number of first threaded holes; and

20 a plurality of conical spring washers at least equal in number to the number of first threaded holes, wherein the apparatus is a kit configured to facilitate replacement of an expired showerhead faceplate attached to the showerhead backplate of a semiconductor processing tool.

13. The apparatus of claim 12, wherein:

the showerhead faceplate is made of a first material,

25 the first threaded fasteners are made of a second material,

the conical spring washers are made of a first alloy,

the washers are made of a second alloy,

the first material and the second material are each selected from the group consisting of: an aluminum alloy, 6061-T6 aluminum alloy, and alumina,

30 the first alloy and the second alloy are each selected from the group consisting of: a nickel alloy, an aluminum alloy, and 6061-T6 aluminum alloy,

the second material is selected from the group consisting of the first material and a material other than the first material, and

the second alloy is selected from the group consisting of the first alloy and an alloy other than the first alloy.

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14. The apparatus of claim 9, further comprising:

the showerhead backplate having a plurality of through-holes equal in number to the number of first threaded holes;

10 a plurality of first threaded fasteners equal in number to the number of first threaded holes;

a plurality of washers at least equal in number to the number of first threaded holes; and

a plurality of conical spring washers at least equal in number to the number of first threaded holes, wherein:

15 each first threaded fastener of the plurality of first threaded fasteners is inserted through at least one of the washers, one of the conical spring washers, one of the through-holes, and screwed into a corresponding one of the first threaded holes, and

20 at least one washer is interposed between each of the conical spring washers and the showerhead backplate.

15. The apparatus of claim 14, wherein:

one or more of the through-holes in the showerhead backplate are threaded holes having an inner thread diameter large enough that the first threaded fastener inserted therethrough is able to be inserted therethrough without engagement of the threads of the first threaded fastener with the threads of the threaded hole.

16. The apparatus of claim 14, wherein:

the showerhead faceplate is made of a first material,
30 the showerhead backplate is made of a second material,
the threaded fasteners are made of a third material,
the conical spring washers are made of a first alloy,
the washers are made of a second alloy,

the first material, the second material, and the third material are each selected from the group consisting of: an aluminum alloy, 6061-T6 aluminum alloy, and alumina,

the first alloy and the second alloy are each selected from the group consisting of: a nickel alloy, an aluminum alloy, and 6061-T6 aluminum alloy,

5 the second material is selected from the group consisting of the first material, the third material, and a material other than the first material and the third material,

the third material is selected from the group consisting of the first material, the second material, and a material other than the first material and the second material, and

10 the second alloy is selected from the group consisting of the first alloy and an alloy other than the first alloy.

17. The apparatus of claim 14, wherein each first fastener is torqued to between 6 inch-pounds and 8 inch-pounds.

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