WHAT IS CLAIMED IS:

1. A flexible membrane, comprising:

a main portion with a lower surface to provide a substrate-mounting surface;

an outer annular portion extending from an outer edge of the main portion, wherein a juncture between the main portion and the outer annular portion comprises a peripheral edge hinge and an annular recess above the hinge along the outer wall of the outer annular portion, the peripheral edge hinge having rounded inner and outer surfaces and configured to be compliant; and

two annular flaps connected to the outer annular portion to divide a volume above the main portion into a plurality of chambers when the flexible membrane is secured to a carrier head;

wherein the two annular flaps connected to the outer annular portion comprise a horizontal portion extending inwardly and a thick rim, the rim configured to be secured to a base assembly, wherein the two annular flaps include an upper annular flap and a lower annular flap and the upper annular flap has a narrower horizontal portion than the lower annular flap.

2. A flexible membrane, comprising:

a main portion with a lower surface to provide a substrate-mounting surface;

an outer annular portion extending from an outer edge of the main portion, wherein a juncture between the main portion and the outer annular portion comprises a peripheral edge hinge and an annular recess above the hinge along the outer wall of the outer annular portion, the peripheral edge hinge having rounded inner and outer surfaces and configured to be compliant; and

a plurality of concentric annular flaps connected to the main portion to divide a volume above the main portion into a plurality of chambers when the flexible membrane is secured to a carrier head;

wherein a first of the plurality of concentric annular flaps includes a laterally extending section and a vertically extending section connecting the laterally extending section to the main portion and a second of the plurality of concentric annular flaps

includes a laterally extending section and a diagonally extending section connecting the laterally extending section to the main portion.

3. The flexible membrane of claim 6, wherein the first of the plurality of concentric annular flaps is an outermost flap.

4. The flexible membrane of claim 6, wherein the second of the plurality of concentric annular flaps is an innermost flap.

5. The flexible membrane of claim 5, wherein an innermost concentric annular flap of the plurality of concentric flaps comprises a horizontal portion extending outwardly, a thick rim along the outer edge of the horizontal portion, the thick rim configured to be secured to a base assembly, and an annular angled portion joined between the main portion and the horizontal portion, wherein the annular angled portion has a larger radius at its juncture with the main portion than at its juncture with the horizontal portion.

6. The flexible membrane of claim 5, wherein an outermost concentric annular flap of the plurality of concentric flaps comprises a vertical portion extending from the main portion, a horizontal portion extending from the vertical portion, and a thick rim along the outer edge of the horizontal portion, the thick rim configured to be secured to a base assembly.

7. A flexible membrane, comprising:

a main portion with a lower surface to provide a substrate-mounting surface;

an outer annular portion extending from an outer edge of the main portion, wherein a juncture between the main portion and the outer annular portion comprises a peripheral edge hinge and an annular recess above the hinge along the outer wall of the outer annular portion, the peripheral edge hinge having rounded inner and outer surfaces and configured to be compliant; and

a plurality of concentric annular flaps connected to the main portion to divide a volume above the main portion into a plurality of chambers when the flexible membrane is secured to a carrier head,

wherein an outermost concentric annular flap of the plurality of concentric flaps comprises a vertical portion extending from the main portion, a horizontal portion extending from the vertical portion, and a thick rim along the outer edge of the horizontal portion, the thick rim configured to be secured to a base assembly and wherein the horizontal portion has a smaller thickness than the vertical portion.

8. The flexible membrane of claim 10, wherein a ratio of length of the horizontal portion to length of the vertical portion is between about 1.5 and 2.0.

9. The flexible membrane of claim 6, wherein the second of the plurality of concentric annular flaps includes a notch at the juncture between the laterally extending section and the vertically extending lateral section.

10. A flexible membrane, comprising:

a main portion with a lower surface to provide a substrate-mounting surface;

an outer annular portion extending from an outer edge of the main portion, wherein a juncture between the main portion and the outer annular portion comprises a peripheral edge hinge and an annular recess above the hinge along the outer wall of the outer annular portion, the peripheral edge hinge having rounded inner and outer surfaces and configured to be compliant; and

a plurality of concentric annular flaps connected to the main portion to divide a volume above the main portion into a plurality of chambers when the flexible membrane is secured to a carrier head,

wherein at least one of the concentric annular flaps includes a notch at the juncture with the main portion.

CLAIMS

1. Flexible membrane,
comprising a main portion with a lower surface for providing a substrate mounting surface, and
an outer annular portion extending from the outer edge of the main portion;
the junction between the main portion and outer annular portion comprising a peripheral edge hinge and an annular recess on the hinge along the outer wall of the outer annular portion; the peripheral edge hinge having a rounded inner surface and outer surface, and being configured to comprise compliant [sic, adaptability].

2. Flexible membrane of Claim 1,
the outer annular portion comprising an annular recess along an outer wall, and an inwardly projecting annular step along an inner wall; the annular recess allowing bending of the annular portion, and the annular step having a non-horizontal upper part and lower surface.

3. Flexible membrane of Claim 1,
further comprising two annular flaps connected to the outer annular portion to separate the volume above the main portion into a plurality of chambers when the flexible membrane is fixed to the carrier head.

4. Flexible membrane of Claim 3,
the two annular flaps connected to the outer annular portion comprising an upper annular flap and lower annular flap; the upper annular flap and the lower annular flap comprising respective inwardly extending horizontal portions and a rim thicker than the horizontal portions; the rim configured to be fixated to the base assembly; and the upper annular flap having a horizontal portion narrower than the lower annular flap.

5. Flexible membrane of Claim 1,
further comprising a plurality of concentric annular flaps connected to the main portion to separate the volume above the main portion into chambers when the flexible membrane is fixated to the carrier head.

6. Flexible membrane of Claim 5,
The first concentric annular flap from among the plurality of concentric annular flaps comprising a laterally extending section, and vertically extending section connecting the laterally extending section to the main portion; the second concentric annular flap from among the plurality of concentric annular flaps comprising a laterally extending section, and diagonally extending section connecting the laterally extending section to the main portion.

7. Flexible membrane of Claim 6,
the first concentric annular flap being the outermost flap.

8. Flexible membrane of Claim 6,
the second concentric annular flap being the innermost flap.

9. Flexible membrane of Claim 5,
the innermost concentric annular flap of the plurality of concentric annular flaps comprising an outwardly extending horizontal portion, rim thicker than the horizontal portion along the outer edge of the horizontal portion, and annular angled portion connected between the main portion and the horizontal portion;

the rim configured so as to be fixated to the base assembly, and the annular angled portion having a larger radius at the junction with the main portion than at the junction with the horizontal portion.

10. Flexible membrane of Claim 5,
the outermost concentric annular flap of the plurality of concentric annular flaps comprising a vertical portion extending from the main portion, a horizontal portion extending from the vertical portion, and a rim thicker than the horizontal portion along the outer edge of the horizontal portion; and the rim configured by being fixated to the base assembly.

11. Flexible membrane of Claim 10,
the horizontal portion having a thinner thickness than the vertical portion.

12. Flexible membrane of Claim 10,
the ratio of the length of the horizontal portion relative to the length of the vertical portion being 1.5 to 2.0.

13. Flexible membrane of Claim 6,
the first concentric annular flap comprising a notch on the junction between the laterally extending section and the vertically extending section.

14. Flexible membrane of Claim 5,
wherein one or more of the concentric annular flaps comprises a notch on the junction with the main portion.

15. Flexible membrane,
comprising a main portion having a lower surface to provide a substrate mounting surface, outer annular portion extending from the outer edge of the main portion, and
plurality of concentric annular flaps connected with the main portion so that the volume on the main portion is separated into a plurality of chambers when the flexible membrane is fixated to the carrier head;
the first concentric annular flap from among the plurality of concentric annular flaps comprising a laterally extending section, and vertically extending section connecting the laterally extending section with the main portion; and the second concentric annular flap from among the plurality of concentric annular flaps comprising a laterally extending section and diagonally extending section connecting the laterally extending section with the main portion.

16. Flexible membrane of Claim 15,
the first concentric annular flap being the outermost flap.

17. Flexible membrane of Claim 15,
the second concentric annular flap being the innermost flap.

18. Flexible membrane of Claim 15,
the laterally extending section of the first concentric annular flap having a thickness thinner than the vertically extending section of the first concentric annular flap.

19. Flexible membrane of Claim 15,
the ratio of the length of the laterally extending section relative to the length of the vertically extending section of the first concentric annular flap being 1.5 to 2.0.