CLAIMS

1. An apparatus for lifting a substrate, the apparatus comprising:

a first piece;

a second piece;

a set of first contact points in a first plane, wherein at least one first contact point is on the first piece and at least one first contact point is on the second piece;

a set of second contact points, wherein at least one second contact point is on the first piece and at least one second contact point is on the second piece; and

an actuator that translates the first piece, substantially parallel to the first plane, between a first position and a second position relative to the second piece,

the first position arranging the set of first contact points so that all of the contact points of the set of first contact points are able to engage the substrate, and further arranging the set of second contact points so that none of the contact points of the set of second contact points are able to engage the substrate, and wherein the first position also arranges that all of the contact points of the set of first contact points are included in an area that is defined by the substrate, and further wherein the first position also arranges that all of the contact points of the set of second contact points are outside the area that is defined by the substrate, and

the second position arranging the set of second contact points so that all of the contact points of the set of second contact points are able to engage the substrate, and further arranging the set of first contact points so that none of the contact points of the set of first contact points are able to engage the substrate, and wherein the second position also arranges that all of the contact points of the set of second contact points are included in the area that is defined by the substrate, and further wherein the second position also arranges that all of the contact points of the set of first contact points are outside the area that is defined by the substrate,

wherein at least one first contact point or at least one second contact point is a flat area of a pad on which the substrate is configured to rest.

2. The apparatus of claim 1, wherein each contact point of the set of second contact points is in the first plane.

3. The apparatus of claim 1, wherein the substrate is a wafer.

4. The apparatus of claim 1, wherein at least two contact points selected from the set of first contact points or set of second contact points are two flat regions of a shared pad on which the substrate is configured to rest.

5. The apparatus of claim 4, wherein at least one contact point of the set of first contact points shares the pad with at least one contact point of the set of second contact points.

6. The apparatus of claim 1, wherein the first piece and the second piece are fork shaped.

7. A method of using an apparatus to transport a substrate, the method comprising:

translating a first piece of the apparatus along a first plane with respect to a second piece of the apparatus to a first position, the first position arranging a set of first contact points so that all of the contact points of the set of first contact points are able to engage the substrate, and the first position further arranging a set of second contact points so that none of the contact points of the set of second contact points are able to engage the substrate, wherein the first position also arranges that all of the contact points of the set of first contact points are included in an area that is defined by the substrate, and further wherein the first position also arranges that all of the contact points of the set of second contact points are outside the area that is defined by the substrate, wherein the first plane is defined as including each of the set of first contact points wherein at least one first contact point or at least one second contact point is a flat area of a pad on which the substrate is configured to rest;

placing the substrate to engage the set of first contact points;

transporting the substrate, substantially parallel to the first plane, to a first destination;

discharging the substrate from the set of first contact points;

translating the first piece of the apparatus substantially parallel to the first plane with respect to the second piece of the apparatus to a second position, the second position arranging the set of second contact points so that all of the contact points of the set of second contact points are able to engage the substrate, and the second position further arranging the set of first contact points so that none of the contact points of the set of first contact points are able to engage the substrate, wherein the second position also arranges that all of the contact points of the set of second contact points are included in the area that is defined by the substrate, and further wherein the second position also arranges that all of the contact points of the set of first contact points are outside the area that is defined by the substrate;

processing the substrate to become a modified substrate;

placing the modified substrate to engage the set of second contact points;

transporting the modified substrate, substantially parallel to the first plane, to a second destination; and

discharging the modified substrate from the set of second contact points.

8. The method of claim 7, wherein each contact point of the set of second contact points is in the first plane.

9. The method of claim 7, wherein at least two contact points selected from the set of first contact points or set of second contact points are two flat regions of a shared pad on which the substrate is configured to rest.

10. The method of claim 9, wherein at least one contact point of the set of first contact points shares the pad with at least one contact point of the set of second contact points.

11. The method of claim 7, wherein the first piece and the second piece are fork shaped.

CLAIMS

What is claimed is:

1. An apparatus for lifting a substrate, the apparatus comprising:

a first piece;

a second piece;

a set of first contact points in a plane, wherein at least one first contact point is on the first piece and at least one first contact point is on the second piece;

a set of second contact points, wherein at least one second contact point is on the first piece and at least one second contact point is on the second piece; and

an actuator that translates the first piece, substantially parallel to the plane, between a first position and a second position relative to the second piece,

the first position arranging the set of first contact points so that all of the contact points of the set of first contact points are able to engage the substrate, and further arranging the set of second contact points so that none of the contact points of the set of second contact points are able to engage the substrate, and

the second position arranging the set of second contact points so that all of the contact points of the set of second contact points are able to engage the substrate, and further arranging the set of first contact points so that none of the contact points of the set of first contact points are able to engage the substrate.

2. The apparatus of claim 1, wherein the first position also arranges that all of the contact points of the set of first contact points are included in an area that is defined by the substrate, and further wherein the first position also arranges that all of the contact points of the set of second contact points are outside the area that is defined by the substrate.

3. The apparatus of claim 2, wherein the second position also arranges that all of the contact points of the set of second contact points are included in the area that is defined by the substrate, and further wherein the second position also arranges that all of the contact points of the set of first contact points are outside the area that is defined by the substrate.

4. The apparatus of claim 1, wherein the first position also arranges that all of the contact points of the set of first contact points are circumscribed within a circle having a diameter that is equal to the substrate diameter, and further wherein the first position

also arranges that all of the contact points of the set of second contact points are outside the circle having a diameter that is equal to the substrate diameter.

5. The apparatus of claim 4, wherein the second position also arranges that all of the contact points of the set of second contact points are circumscribed within the circle having a diameter that is equal to the substrate diameter, and further wherein the second position also arranges that all of the contact points of the set of first contact points are outside the circle having a diameter that is equal to the substrate diameter.

6. The apparatus of any of claims 1-5, wherein each contact point of the set of second contact points is in the plane.

7. The apparatus of any of claims 1-6, wherein the substrate is a wafer.

8. The apparatus of any of claims 1-7, further comprising a pad, a portion of which comprises at least one contact point.

9. The apparatus of claim 8, wherein at least two contact points share a pad.

10. The apparatus of claim 9, wherein at least one contact point of the set of first contact points shares the pad with at least one contact point of the set of second contact points.

11. A method of using an apparatus to transport a substrate, the method comprising:

translating a first piece of the apparatus along a plane with respect to a second piece of the apparatus to a first position, the first position arranging a set of first contact points so that all of the contact points of the set of first contact points are able to engage the substrate, and the first position further arranging a set of second contact points so that none of the contact points of the set of second contact points are able to engage the substrate, wherein the plane is defined as including each of the set of first contact points;

placing the substrate to engage the set of first contact points;

transporting the substrate, substantially parallel to the plane, to a first destination;

discharging the substrate from the set of first contact points;

translating the first piece of the apparatus substantially parallel to the plane with respect to the second piece of the apparatus to a second position, the second position arranging the set of second contact points so that all of the contact points of the set of second contact points are able to engage the substrate, and the second

position further arranging the set of second contact points so that none of the contact points of the set of second contact points are able to engage the substrate;

processing the substrate to become a modified substrate;

placing the modified substrate to engage the set of second contact points;

transporting the modified substrate, substantially parallel to the plane, to a second destination; and

discharging the modified substrate from the set of second contact points.

12. The method of claim 11, wherein the first position also arranges that all of the contact points of the set of first contact points are included in an area that is defined by the substrate, and further wherein the first position also arranges that all of the contact points of the set of second contact points are outside the area that is defined by the substrate.

13. The method of claim 12, wherein the second position also arranges that all of the contact points of the set of second contact points are included in the area that is defined by the substrate, and further wherein the second position also arranges that all of the contact points of the set of first contact points are outside the area that is defined by the substrate.

14. The method of claim 11, wherein the first position also arranges that all of the contact points of the set of first contact points are circumscribed within a circle having a diameter that is equal to the substrate diameter, and further wherein the first position also arranges that all of the contact points of the set of second contact points are outside a circle having a diameter that is equal to the substrate diameter.

15. The method of claim 14, wherein the second position also arranges that all of the contact points of the set of second contact points are circumscribed within a circle having a diameter that is equal to the substrate diameter, and further wherein the second position also arranges that all of the contact points of the set of first contact points are outside a circle having a diameter that is equal to the substrate diameter.

16. The method of any of claims 11-15, wherein each contact point of the set of second contact points is in the plane.

17. The method of any of claims 11-16, further comprising a pad, a portion of which comprises at least one contact point.

18. The method of claim 17, wherein at least two contact points share a pad.

19. The method of claim 18, wherein at least one contact point of the set of first contact points shares the pad with at least one contact point of the set of second contact points.