

~~WHAT IS CLAIMED IS:~~

Claims

1. A substrate carrier stack comprising:
a plurality of substrate carriers stacked in a vertical
_direction such that, for each pair of vertically adjacent
_substrate carriers, a lower substrate carrier supports an
_upper substrate carrier; wherein
each of the plurality of substrate carriers includes an
_outer carrier frame extending in a horizontal frame plane
_around an inner zone that includes an inner opening;
each of the plurality of substrate carriers includes a
_substrate seat to accommodate and carry a substrate within an
_inner accommodation space of the substrate carrier stack, the
_inner accommodation space being defined by the inner openings
_of the plurality of substrate carriers;
each of the plurality of substrate carriers includes, at
_the outer carrier frame, an upper supporting formation and a
_lower supporting formation, the upper supporting formation of
_the lower substrate carrier supporting the lower supporting
_formation of the upper substrate carrier;
the outer carrier frame of each of the plurality of
_substrate carriers includes a first frame web extending along
_a first frame web axis, a second frame web extending along a
_second frame web axis, a third frame web extending along a
_third frame web axis, and a fourth frame web extending along a
_fourth frame web axis;
the first frame web axis intersects the fourth frame web
_axis at a right angle at a first vertex of the first frame web
_and the fourth frame web, the first frame web and the fourth
_frame web are connected at a first frame vertex region of the
_outer carrier frame;
the first frame web axis intersects the second frame web
_axis at a right angle at a second vertex of the first frame
_web and the second frame web, the first frame web and the
_second frame web are connected at a second frame vertex region
_of the outer carrier frame;

the third frame web axis intersects the fourth frame web axis at a right angle at a fourth vertex of the third frame web and the fourth frame web, the third frame web and the fourth frame web are connected at a fourth frame vertex region of the outer carrier frame;
 the third frame web axis intersects the second frame web axis at a third vertex of the third frame web and the second frame web, the third frame web and the second frame web are connected at a third frame vertex region of the outer carrier frame;
 each of the plurality of substrate carriers includes a plurality of substrate holding arms that extend inwardly and upwardly from the outer carrier frame, overlap the inner zone, and define the substrate seat;
 the substrate seat is located at a distance above the outer carrier frame in the vertical direction;
 each of the plurality of substrate carriers includes a plurality of partition webs that extend from the outer carrier frame through the inner zone to define the inner opening and two auxiliary openings of the inner zone;
 a first arc-shaped portion of the plurality of partition webs extends in a first space between the fourth frame web and the inner opening to define a first of the two auxiliary openings;
 a second arc-shaped portion of the plurality of partition webs extends in a second space between the second frame web and the inner opening to define a second of the two auxiliary openings;
 the first auxiliary openings and the second auxiliary openings of the inner zones of the plurality of substrate carriers collectively define a first purging channel and a second purging channel that extend vertically parallel or substantially parallel to the inner accommodation space at opposing sides of the inner accommodation space;
 and
 the plurality of substrate carriers include purging structures that create horizontal purging flows within the substrate carrier stack through spaces between substrates held

_by the substrate seats of the plurality of substrate carriers.

2. The substrate carrier stack according to claim 1,

_further comprising:

a cover that is stacked on the plurality of substrate

_carriers and is supported by an uppermost substrate carrier of

_the plurality of substrate carriers; and

a base on which the plurality of substrate carriers are

_stacked, the base supports a lowermost substrate carrier of

_the plurality of substrate carriers.

3. The substrate carrier stack according ~~to~~ claim 2,

_wherein

_the upper supporting formation includes an upper sealing

_formation, and the lower supporting formation includes a lower

_sealing formation;

the upper sealing formation of the uppermost substrate

_carrier of the plurality of substrate carriers engages with a

_sealing formation of the cover; and

the lower sealing formation of the lowermost substrate

_carrier of the plurality of substrate carriers engages with a

_sealing formation of the base to seal the inner accommodation

_space, the first purging channel, and the second purging

_channel from an area surrounding the substrate carrier stack.

4. The substrate carrier stack according ~~to~~ claim 2 ~~or~~

~~claim 3~~, wherein

_one of the cover and the base includes a first port

_connected to the first purging channel;

one of the cover and the base includes a second port

_connected to the second purging channel; and

a purging gas is supplied into the substrate carrier

_stack via one of the first port and the second port that

_defines a supply port and is discharged from the substrate

_carrier stack via the other of the first port and the second

_port that defines a discharge port such that the purging gas

_flows through the inner accommodation space via the first

_purging channel, the second purging channel, and purging
_passages defined by the purging structures.

5. The substrate carrier stack according ~~to~~ claim 4,

_wherein

_the first port is connected to the first purging channel

_via a first laminariser included in the one of the cover and

_the base that includes the first port;

the second port is connected to the second purging

_channel via a second laminariser included in the one of the

_cover and the base that includes the second port; and

each of the first laminariser and the second

_laminariser includes a gas filtering medium and/or a gas

_distribution manifold that suppresses turbulences in the

_purging gas that passes therethrough.

6. The substrate carrier stack according ~~to~~ claim 2,

_wherein

_the cover includes purging formations connected to the

_first purging channel and the second purging channel and

_provide purging passages in which purging gas flows to the

_substrate seat of the uppermost substrate carrier or the

_substrate seats of a predetermined number of uppermost

_substrate carriers of the plurality of substrate carriers; and

the purging passages provided by the purging formations

_connect a portion of the inner accommodation space with the

_first purging channel and the second purging channel.

7. The substrate carrier stack according to ~~any of~~

~~claims~~ claim 1 ~~through 6~~, wherein

the purging structures define purging passages, and the

_each pair of vertically adjacent substrate carriers is

_provided with the purging passages which pass through the

_first arc-shaped portions and the second arc-shaped portions

_of the partition webs of the substrate carriers;

a first portion of the inner accommodation space is

_connected with the first purging channel through a first

_purging passage such that purging gas flows between the first
_purging channel and the first portion of the inner accommodation space; and
a second portion of the inner accommodation space is
_connected with the second purging channel through a second
_purging passage such that the purging gas flows between the
_second purging channel and the second portion of the inner accommodation space.

8. The substrate carrier stack according to claim 7,
_wherein the purging passages are defined by an upper surface
_of the first arc-shaped portion or the second arc-shaped
_portion of the lower substrate carrier and a lower surface of
_the first arc-shaped portion or the second arc-shaped portion
_of the upper substrate carrier.

9. The substrate carrier stack according to claim 7 ~~or~~
~~claim 8~~, wherein the purging passages are defined by elongated
_nozzle openings including an opening width in the vertical
_direction that tapers towards the inner accommodation space.

10. The substrate carrier stack according to ~~any of~~
~~claims~~claim 7 ~~through 9~~, wherein each of the purging passages
_included in the substrate carrier stack are provided within
_the substrate carrier stack at equidistant positions in the
_vertical direction.

11. The substrate carrier stack according to ~~any of~~
~~claims~~claim 1 ~~through 10~~, wherein
the upper supporting formation includes an upper sealing
_formation, and the lower supporting formation includes a lower
_sealing formation;
a first of the upper sealing formation and the lower
_sealing formation includes a continuous sealing lip that
_extends continuously around the inner zone, and a second of
_the upper sealing formation and the lower sealing formation
_includes a continuous sealing surface strip that extends
_continuously around the inner zone;
for the each pair of vertically adjacent substrate

_carriers, the lower sealing formation of the upper substrate
_carrier engages with the upper sealing formation of the lower
_substrate carrier to seal the inner accommodation space, the
_first purging channel, and the second purging channel from an
_area surrounding the substrate carrier stack.

12. The substrate carrier stack according to ~~any of~~
~~claims~~claim ~~1 through 11~~, wherein
each of the plurality of substrate carriers includes a
_first positioning formation and a second positioning formation
_such that, for the each pair of vertically adjacent substrate
_carriers, the first positioning formation of the lower
_substrate carrier engages with the second positioning
_formation of the upper substrate carrier; and
each of the plurality of substrate carriers includes a
_vertical protrusion defining a first of the first positioning
_formation and the second positioning formation, and a recess
_or opening defining a second of the first positioning
_formation and the second positioning formation.

13. The substrate carrier stack according to ~~any of~~
~~claims~~claim ~~1 through 12~~, wherein
all of the plurality of substrate carriers have a same
_structure or substantially a same structure; and
the substrate carriers of the each pair of vertically
_adjacent substrate carriers are stacked such that:
the first frame web of the lower substrate carrier
_supports the third frame web of the upper substrate carrier,
_the second frame web of the lower substrate carrier supports
_the fourth frame web of the upper substrate carrier, the third
_frame web of the lower substrate carrier supports the first
_frame web of the upper substrate carrier, and the fourth frame
_web of the lower substrate carrier supports the second frame
_web of the upper substrate carrier.

14. The substrate carrier stack according to ~~any of~~
~~claims~~claim ~~1 through 13~~, wherein each of the plurality of

_substrate carriers includes projections that project
_horizontally from an outer peripheral surface of the outer
_carrier frame.

15. The substrate carrier stack according to ~~any of~~
~~claims~~claim 1 ~~through 14~~, wherein each of the plurality of
_substrate carriers includes a first pair of projections that
_project from an outer peripheral surface of the outer carrier
_frame in a first horizontal direction and a second pair of
_projections that project from the outer peripheral surface of
_the outer carrier frame in a second horizontal direction that
_is different from the first horizontal direction.

16. A substrate carrier stack comprising:
_a plurality of substrate carriers stacked in a vertical
_direction; wherein
each of the plurality of substrate carriers includes a
_substrate seat to accommodate and carry a substrate within an
_inner accommodation space of the substrate carrier stack;
the plurality of substrate carriers include a first
_purging channel and a second purging channel that extend
_vertically parallel or substantially parallel to the inner
_accommodation space at opposing sides of the inner _accommodation space;
the plurality of substrate carriers include purging
_structures that create horizontal purging flows within the
_substrate carrier stack; and
each of the plurality of substrate carriers includes an
_outer carrier frame extending in a horizontal frame plane
_around the first purging channel, the second purging channel, _and the inner
accommodation space.

17. The substrate carrier according to claim 16, wherein
_each of the plurality of substrate carriers is integrally
_molded from a plastic material.

18. A substrate carrier comprising:
an outer carrier frame extending in a frame plane around
_an inner zone including an inner opening;

a plurality of partition webs that extend from the outer carrier frame through the inner zone to define the inner opening and two auxiliary openings of the inner zone; the two auxiliary openings define a portion of a first purging channel and a portion of a second purging channel that extend vertically parallel or substantially parallel to the inner zone when the substrate carrier is one of a plurality of substrate carriers stacked in a vertical direction.

19. The substrate carrier according to claim 18, wherein the substrate carrier is integrally molded from a plastic material.

20. The substrate carrier according to claim 18 ~~or claim 19~~, wherein the substrate carrier is integrally molded from polyether ether ketone or polycarbonate.