Claims

1. A substrate processing system, comprising:

a vacuum enclosure having a plurality of process windows and a continuous track positioned therein;

a plurality of processing chambers attached sidewalls of the vacuum enclosures, each processing chamber about one of the process windows;

a loadlock attached at one end of the vacuum enclosure and having a loading track positioned therein;

at least one gate valve separating the loadlock from the vacuum enclosure;

a plurality of substrate carriers configured to travel on the continuous track and the loading track;

at least one track exchanger positioned within the vacuum enclosure, the track exchangers movable between a first position, wherein substrate carriers are made to continuously move on the continuous track, and a second position wherein the substrate carriers are made to transfer between the continuous track and the loading track;

an endless belt positioned inside the vacuum enclosure;

a plurality of motorized wheels positioned inside the loadlock;

wherein the substrate carriers engage the endless belt when traveling on the continuous track and engage the motorized wheels when traveling on the loading track;

wherein the endless belt comprises a plurality of driving forks and each of the substrate carriers comprises:

a plurality of freely rotating wheels configured to engage the continuous track and the loading track;

a driving bar configured to engage the motorized wheels; and,

a driving pin configured to engage the driving forks.

2. The system of claim 1, further comprising an atmospheric section attached to the loadlock opposite to the vacuum enclosure, the atmospheric section comprising:

a return track; and,

a drive wheel having a plurality of drive forks attached thereto.

3. The system of claim 1 wherein the continuous track comprises a racetrack monorail and the loading track comprises a straight monorail.

4. The system of claim 3, wherein the track exchanger comprises a base, a curved monorail section positioned on the base, and a straight monorail section positioned on the base.

5. The system of claim 1, wherein each of the processing chambers is attached to the vacuum enclosure via a rotating hinge.

6. The system of Claim 1, wherein at least one of the plurality of processing chambers comprises a sputtering source having a shutter.

7. A substrate processing system, comprising:

a loadlock section having a first side and a second side opposite the first side;

an atmospheric section coupled to the first side of the loadlock section;

a vacuum section attached to the second side of the loadlock section and having a plurality of processing chambers attached thereto;

a carrier transport mechanism comprising:

i. a monorail formed as: a first monorail section shaped as a racetrack and positioned within the vacuum section, a second monorail section having two parallel linear monorails positioned within the loadlock section and having extensions into the atmospheric section and the vacuum section, and a third monorail section positioned in the atmospheric section and shaped as a curve having one end meeting the extension of one of the linear monorails and another end meeting the extension of another one of the linear monorails,

ii. a motive element positioned at the racetrack,

iii. a plurality of motorized wheels positioned along the second monorail section,

iv. two track exchangers positioned at one end of the first monorail section, each track exchanger comprising a movable table, a straight monorail section positioned on the table, and a curved monorail section positioned on the table,

a plurality of carriers having a plurality of wheels and configured to engage the monorail to have the carrier ride on the monorail.

8. The system of claim 7, wherein each of the plurality of carriers comprises a drive bar attached to a base, the drive bar configured to engage the plurality of motorized wheels so as to move the carrier while riding on the second monorail section.

9. The system of Claim 8, wherein each of the plurality of carriers further comprises engagement mechanism attached to the base and configured to engage the motive element so as to move the carrier while in the first monorail section.

10. The system of Claim 9, wherein when the track exchangers are in a first position the curved monorail section is aligned with the first monorail section causing the carriers to be continuously moved along the first monorail section, and when the track exchangers are in a second position the straight monorail section connects the first monorail section to the second monorail section causing carriers to be exchanged between the loadlock section and the vacuum section.

11. The system of Claim 9, wherein the atmospheric section comprises an unloading section and a loading section, and further comprising an exchanger to transfer carriers from the unloading section to the loading section.

12. The system of Claim 11, wherein the exchanger comprises a driving wheel.

13. The system of claim 7, wherein the motive element comprises an endless belt positioned at the racetrack and having a plurality of drive forks attached thereto.

14. A substrate processing system, comprising:

a loadlock section having a first side and a second side opposite the first side;

an atmospheric section attached to the first side of the loadlock section;

a vacuum section attached to the second side of the loadlock section and having a plurality of processing chambers attached thereto;

a carrier transport mechanism comprising:

i. a monorail formed as: a first monorail section shaped as a racetrack and positioned within the vacuum section, a second monorail section having two parallel linear monorails positioned within the loadlock section and having extensions into the atmospheric section and the vacuum section, and a third monorail section positioned in the atmospheric section and shaped as a curve having one end meeting the extension of one of the linear monorails and another end meeting the extension of another one of the linear monorails,

ii. an endless belt positioned at the racetrack and having a plurality of drive forks attached thereto,

iii. a driving wheel positioned in the atmospheric section and having a plurality of drive forks attached thereto,

iv. a plurality of motorized wheels positioned along the second monorail section,

v. two track exchangers positioned at one end of the first monorail section, each track exchanger comprising a movable table, a linear monorail section positioned on the table, and a curved monorail section positioned on the table,

a plurality of carriers, each carrier having a base, a plurality of wheels attached to the base and configured to engage the monorail to have the carrier ride freely on the monorail, a drive bar attached to the base, the drive bar configured to engage the plurality of motorized wheels so as to move the carrier while riding on the second monorail section, and a drive pin attached to the base and configured to engage the driving forks so as to move the carrier while in the first or third monorail section;

wherein when the track exchangers are in a first position the curved monorail section is aligned with the first monorail section causing the carriers to be continuously moved by the driving forks along the first monorail section, and when the track exchangers are in a second position the linear monorail section connects the first monorail section to the second monorail section causing carriers to be exchanged between the loadlock section and the vacuum section.

15. The system of Claim 14, wherein each of the substrate carriers further comprises a substrate holder removably attached to the base.

16. The system of Claim 14, wherein each of the plurality of processing chambers includes a shutter.

17. The system of Claim 14, wherein the loadlock section comprises a loading loadlock and an unloading loadlock having independent vacuum environment of each other.

18. The system of Claim 14, wherein at least one of the plurality of processing chambers comprises a sputtering source having a shutter.

19. The system of Claim 14, the plurality of processing chambers are connected to a common vacuum atmosphere without valve gates between them.

20. The system of Claim 14, wherein the atmospheric section comprises a loading section and an unloading section.

21. The system of claim 14, wherein the loadlock section comprises a loading loadlock and an unloading loadlock maintaining a common vacuum atmosphere and having gate valves that operate synchronously.