

Claims:

1. A system for processing substrates in vacuum processing chambers, comprising:
  - a plurality of carriers, each carrier configured for supporting and transporting substrates throughout the system;
  - each of the carriers comprising clips for holding substrates while exposing both surfaces of each substrate;
  - each of the carriers comprising two paramagnetic common rails at each end thereof;
  - a plurality of magnetized rollers for transporting the carriers throughout the system, by engaging and magnetically holding the common rails;
  - a flip station comprising a rotatable frame coupled to rotating axis, and wherein a subset of the plurality of magnetized rollers is positioned on each end of the frame.
2. The system of claim 1, wherein each of the carriers is configured for supporting a linear array of 1xn substrates, wherein n is an integer larger than 1.
3. The system of claim 1, wherein each of the carriers further comprises two sliding rails configured for holding different substrates of different sizes.
4. The system of claim 3, wherein the sliding rails are spring-loaded in close position.
5. The system of claim 1, wherein the carriers are transported inside the vacuum processing chambers in a vertical orientation.
6. The system of claim 1, further comprising a conveyor for returning carriers to the loading station after completion of processing.
7. The system of claim 6, wherein the conveyor passes above the vacuum processing chambers in atmospheric environment.

8. The system of claim 1, wherein each of the plurality of magnetized rollers comprises a rotating shaft having a plurality of magnetic wheels attached thereto in alternating magnetic polarity.
9. The system of claim 8, wherein each of the shafts is rotated by a flexible tension element.
10. The system of claim 9, wherein the flexible tension element comprises a belt or a chain.
11. The system of claim 1, further comprising a carrier elevator coupled to a loading/unloading station.
12. The system of claim 11, wherein the carrier elevator comprises a plurality of vertically oriented conveyor belts, each conveyor belt having a plurality of pins extended to engage the common rails.
13. The system of claim 11, wherein the loading/unloading station comprises an incoming substrate conveyor, an outgoing substrate conveyor, a substrate load lifter, substrate unload lifter, and carrier actuator configured for actuating the carrier to release its substrates.
14. The system of claim 13, further comprising mask loading mechanism for loading masks onto the carriers.
15. The system of claim 13, wherein the loading/unloading station comprises an upper carrier transport and a lower carrier transport spaced vertically below the upper carrier transport, and wherein the incoming substrate conveyor and the outgoing substrate conveyor pass in a space positioned vertically between the upper carrier transport and the lower carrier transport.
16. The system of claim 11, wherein the loading/unloading station further comprises retractable substrate alignment pins configured to align substrates loaded onto the carriers.

17. A universal carrier that may be used with different sizes and different types of substrates, comprising:

- two traveling rails, one at each edge for engaging a transport mechanism;

- two elongated sidebars, each connected to the traveling rails at the edge thereof;

- a plurality of retaining clips provided on the sidebars and configured for engaging an edge of a substrate for holding the substrate without touching any surface of the substrate;

- two actuators provided on each traveling rail, each actuator configured for opening and closing a corresponding sidebar using a sliding operation;

- a locking mechanism provided on the actuator to lock the corresponding sidebar in a desired slide position;

- a plurality of support clips provided on the sidebars

wherein the actuator comprises carrier clamps made of magnetic material.

18. The universal carrier of claim 17, wherein the actuator further comprises clamp bar that has grooved surface and engages grooved surface on bottom of the carrier clamp to lock the clamp in a desired place.

19. The universal carrier of claim 18, wherein the actuator further comprises springs configured to push the carrier clamps into contact with the clamp bar.

20. The universal carrier of claim 19, wherein the actuator comprises a slide block having linear bearings for riding on linear rails.

21. The universal carrier of claim 17, wherein the actuator comprises a slide block having linear bearings for riding on linear rails.