

CLAIMS:

1. A substrate processing system comprising:  
a transfer region housing defining a transfer region fluidly coupled with a plurality of processing regions, wherein a sidewall of the transfer region housing defines a sealable access for providing and receiving substrates;  
a plurality of substrate supports disposed within the transfer region; and  
a transfer apparatus comprising:  
a central hub including a shaft extending at a distal end through the transfer region housing into the transfer region,  
a lateral translation apparatus coupled with an exterior surface of the transfer region housing, the lateral translation apparatus configured to provide at least one direction of lateral movement of the shaft, and  
an end effector coupled with the shaft at the distal end of the shaft within the transfer region, the end effector comprising a plurality of arms having a number of arms equal to a number of substrate supports of the plurality of substrate supports.
2. The substrate processing system of claim 1, further comprising a first drive coupled with the shaft and configured to rotate the shaft about a central axis through the shaft, wherein the first drive comprises a frameless motor extending about the shaft.
3. The substrate processing system of claim 2, further comprising a second drive coupled with the shaft and configured to provide vertical translation of the shaft, wherein the first drive is contained within a housing coupled with guides along which the second drive directs the housing, and which vertically translates the first drive and the shaft.
4. The substrate processing system of claim 1, wherein the lateral translation apparatus comprises a first stage translatable in a first lateral direction, and wherein the central hub is coupled with the first stage.
5. The substrate processing system of claim 4, wherein the lateral translation apparatus comprises a second stage translatable in a second lateral direction, wherein the second

stage is vertically aligned and coupled with the first stage, and wherein the second lateral direction is orthogonal to the first lateral direction.

6. The substrate processing system of claim 1, further comprising a bellows through which the shaft extends, wherein the bellows is fixedly coupled with a baseplate of the transfer apparatus at a first end, and wherein the bellows is sized to afford lateral translation of the shaft within a volume of the bellows.

7. A transfer apparatus comprising:  
a baseplate defining a central aperture;  
a shaft, a distal end of which at least partially extends through the central aperture  
of the baseplate;  
a lateral translation apparatus coupled with the baseplate, the lateral translation apparatus configured to provide at least one direction of lateral movement of the shaft within the central aperture of the baseplate;  
a bellows coupled with the baseplate and axially aligned with the central aperture  
of the baseplate, wherein the shaft at least partially extends through the bellows; and  
a first drive coupled with the shaft and configured to rotate the shaft about a central axis of the shaft.

8. The transfer apparatus of claim 7, further comprising a support coupled with the lateral translation apparatus, wherein the support comprises one or more guides extending vertically along a surface of the support facing the shaft.

9. The transfer apparatus of claim 8, wherein the shaft is at least partially contained within a housing, wherein the housing is movably coupled with the guides of the support.

10. The transfer apparatus of claim 9, wherein a first end of the bellows is coupled with the baseplate, and wherein a second end of the bellows is coupled with the housing.

11. The transfer apparatus of claim 9, further comprising a second drive coupled with a base of the support, wherein the second drive is configured to drive the housing vertically along the guides of the support providing vertical translation of the shaft.

12. The transfer apparatus of claim 11, wherein the second drive is laterally offset from the first drive, and wherein the second drive is axially aligned with the first drive.

13. The transfer apparatus of claim 7, wherein the lateral translation apparatus comprises a first stage coupled with the baseplate and translatable in a first lateral direction, and  
5 wherein the bellows at least partially extends through the first stage.

14. The transfer apparatus of claim 13, wherein the lateral translation apparatus comprises a second stage translatable in a second lateral direction orthogonal to the first lateral direction, and wherein the second stage is vertically aligned with and coupled with the first stage, and wherein the bellows at least partially extends through the second stage.

10 15. A substrate processing system comprising:  
a transfer region housing defining a transfer region fluidly coupled with a plurality of processing regions, wherein a sidewall of the transfer region housing defines a sealable access for providing and receiving substrates, and wherein a base of the transfer region housing defines an aperture;

15 a plurality of substrate supports disposed within the transfer region; and  
a transfer apparatus comprising:

a baseplate defining a central aperture, wherein the baseplate is coupled with an exterior of the base of the transfer region housing, and wherein the central aperture of the baseplate extends about the aperture through the base of the transfer  
20 region housing;

a shaft, a distal end of which at least partially extends through the central aperture of the baseplate;

a lateral translation apparatus coupled with the baseplate, the lateral translation apparatus configured to provide at least one direction of lateral movement of  
25 the shaft within the central aperture of the baseplate;

a bellows coupled with the baseplate and axially aligned with the central aperture of the baseplate, wherein the shaft at least partially extends through the bellows;  
and

an end effector coupled with the shaft at the distal end of the shaft within the transfer region, the end effector comprising a plurality of arms configured to support substrates.