Claims

What is claimed is:

1. A system comprising:

a placement head, the placement head including a spindle assembly, the spindle assembly including a spindle capable of receiving one of a plurality of nozzles for attachment; and

a nozzle changer, the nozzle changer including a revolver capable of holding a plurality of nozzles;

wherein a position of the nozzle changer is changeable in response to movement of the spindle assembly, and

wherein the spindle includes a spindle magnet, at least one of the plurality of nozzles includes a magnetic nozzle attachment component, and the spindle magnet and the magnetic nozzle attachment component are configured to provide a magnetic attraction between the spindle magnet and the magnetic nozzle attachment component.

2. The nozzle changer system of claim 1, further wherein the position of the nozzle changer is changeable using a cam mechanism.

3. The nozzle changer system of claim 1, further wherein the nozzle changer pivots about a fixed central axis when the spindle assembly moves in the Z-axis.

4. The nozzle changer system of claim 1, further wherein the position of the nozzle changer is changeable by force from a component of the spindle assembly.

5. The nozzle changer system of claim 1, wherein the revolver is capable of holding a plurality of nozzles is configured to rotate to align any one of the plurality of nozzles with the spindle.

6. The nozzle changer system of claim 2, wherein the cam mechanism biases the nozzle changer away from the spindle when the spindle assembly is in a non-retracted, lowered position along the Z-axis.

7. The nozzle changer system of claim 1, wherein the nozzle changer is configured to move toward the spindle when the spindle assembly is moved into a retracted, raised position along the Z-axis.

8. The nozzle changer system of claim 1, wherein the revolver is capable of holding a plurality of nozzles includes a nozzle holder magnet configured to provide a magnetic attraction between the nozzle holder magnet and the magnetic nozzle attachment component.

9. The nozzle changer system of claim 1, further wherein the revolver has two empty nozzle holders when a nozzle of the plurality of nozzles is attached to the spindle.

10. A method comprising:

providing a placement head, the placement head including a spindle assembly, the spindle assembly including a spindle, wherein the spindle includes a spindle magnet;

receiving, by the spindle, a first nozzle;

attaching, by the spindle, the first nozzle;

providing a nozzle changer, the nozzle changer including a revolver;

holding, by the revolver, a plurality of nozzles, wherein at least one of the plurality of nozzles includes a magnetic nozzle attachment component;

moving, by the spindle assembly;

changing the position of the nozzle changer in response to movement of the spindle assembly; and providing a magnetic attraction between the spindle magnet and the magnetic nozzle attachment component.

11. The method of claim 10, further comprising:

retaining, by the nozzle changer, the first nozzle so that the first nozzle is no longer attached to the spindle; and

retaining, by the revolver, a second nozzle.

12. The method of claim 11, further comprising:

rotating, by the revolver, to align the second nozzle beneath the spindle after the first nozzle is no longer attached to the spindle.

13. The method of claim 12, further comprising:

moving, by the spindle assembly, a second time; and

retaining, by the spindle, the second nozzle as the spindle assembly moves the second time.

14. The method of claim 13, further comprising:

changing the position of the nozzle changer a second time in response to movement of the spindle assembly the second time.

15. The method of claim 13, wherein the step of attaching, by the spindle, the first nozzle is accomplished by magnetic attraction between the spindle magnet and the first nozzle.

16. The method of claim 11, wherein at least one of the steps of retaining by the nozzle changer the first nozzle and retaining, by the revolver, a second nozzle, is accomplished by magnetic attraction.

17. The method of claim 10, wherein at least one of the steps of retaining by the nozzle changer the first nozzle and retaining, by the revolver, a second nozzle, is accomplished by a detent mechanism.

18. The method of claim 10, further comprising:

providing a revolver with two empty nozzle holders when the first nozzle is attached to the spindle.

19. A system comprising:

a placement head, the placement head including a spindle assembly and a nozzle changer;

wherein the spindle assembly includes a spindle capable of receiving one of a plurality of nozzles for attachment,

wherein the nozzle changer includes a revolver capable of holding a plurality of nozzles;

wherein the spindle assembly and nozzle changer move with the placement head; and

wherein the nozzle changer and the spindle assembly are separably movable on the placement head, and

wherein the spindle includes a spindle magnet, at least one of the plurality of nozzles includes a magnetic nozzle attachment component, and the spindle magnet and the magnetic nozzle attachment component are configured to provide a magnetic attraction between the spindle magnet and magnetic nozzle attachment component.