

What is claimed is:

CLAIMS

1. A dispensing system for dispensing viscous material on an electronic substrate, the dispensing system comprising:

a frame;

5 a support coupled to the frame, the support being configured to receive and support an electronic substrate during a dispense operation;

a dispensing unit assembly configured to dispense viscous material; and

a gantry coupled to the frame, the gantry being configured to support the dispensing unit assembly and to move the dispensing unit assembly in x-axis and y-axis
10 directions,

wherein the dispensing unit assembly includes

a support bracket secured to the gantry,

a movable bracket rotatably coupled to the support bracket by a first strain wave gear system configured to enable the rotation of the movable bracket with
15 respect to the support bracket about a first axis, and

a dispensing unit rotatably coupled to the movable bracket by a second strain wave gear system configured to enable the rotation of the dispensing unit with respect to the movable bracket about a second axis generally perpendicular to the first axis.

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2. The dispensing system of claim 1, wherein the movable bracket is configured to rotate with respect to the support bracket up to an entire 360 degrees and the dispensing unit is configured to rotate with respect to the movable bracket up to an entire 360 degrees.

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3. The dispensing system of claim 1, wherein the second strain wave gear system includes a mounting plate configured to receive and support the dispensing unit.

4. The dispensing system of claim 1, wherein the support bracket is L-shaped
30 in construction having a first portion coupled to the gantry and a second portion that extends perpendicularly from the first portion.

5. The dispensing system of claim 4, wherein the second portion of the support bracket supports the first strain wave gear system.

5 6. The dispensing system of claim 4, wherein the gantry includes a beam configured to move in a y-axis direction, and a carriage coupled to the beam, the carriage being configured to move in an x-axis direction.

7. The dispensing system of claim 6, wherein the carriage includes a z-axis
10 drive mechanism, the first portion of the support bracket being secured to the z-axis drive mechanism to provide z-axis movement of the dispensing unit.

8. The dispensing system of claim 1, wherein each of the first strain wave
gear system and the second strain wave gear system includes
15 a housing,
a circular spline supported by the housing,
a wave generator supported by the housing, the wave generator being
positioned within the circular spline,
a flexible spline having a spline portion disposed between the circular
20 spline and the wave generator and a base portion extending from the spline
portion, and
a mounting hub secured to the base portion of the flexible spline.

9. The dispensing system of claim 8, wherein the housing is configured to
25 support a motor to drive the rotation of the components of the strain wave gear system.

10. The dispensing system of claim 8, wherein the housing of the first strain
wave gear system is secured to the second portion of the support bracket and the housing
of the second strain wave gear system is secured to the movable bracket.

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11. The dispensing system of claim 1, further comprising a vision system coupled to one of the frame and the gantry to capture at least one image of the electronic substrate.

5 12. The dispensing system of claim 11, further comprising a controller configured to control dispensing unit assembly, the gantry and the vision system to perform a dispense operation on the electronic substrate.

10 13. The dispensing system of claim 1, wherein the first strain wave gear system and the second strain wave gear system are coupled to a controller of the dispensing system to control the operation of the first and second strain wave gear systems.

15 14. A method of dispensing viscous material on an electronic substrate, the method comprising:
delivering an electronic substrate to a dispense position;
capturing at least one image of the electronic substrate;
analyzing the at least one image of the electronic substrate to determine a position of the electronic substrate; and
20 performing a dispense operation by rotating a dispensing unit coupled to a support bracket by a movable bracket, the movable bracket being rotatably coupled to the support bracket by a first strain wave gear system configured to enable the rotation of the movable bracket with respect to the support bracket about a first axis, the dispensing unit being rotatably coupled to the movable bracket by a second strain wave gear system
25 configured to enable the rotation of the dispensing unit with respect to the movable bracket about a second axis generally perpendicular to the first axis.

15 15. The method of claim 14, wherein the movable bracket is configured to rotate with respect to the support bracket up to an entire 360-degrees and the dispensing unit is configured to rotate with respect to the movable bracket up to an entire 360 degrees.

16. The method of claim 14, wherein the support bracket is L-shaped in construction having a first portion coupled to the gantry and a second portion that extends perpendicularly from the first portion, and wherein the second portion of the support
5 bracket supports the first strain wave gear system.

17. The method of claim 16, wherein the gantry includes a beam configured to move in a y-axis direction, and a carriage coupled to the beam, the carriage being configured to move in an x-axis direction.
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18. The method of claim 17, wherein the carriage includes a z-axis drive mechanism, the first portion of the support bracket being secured to the z-axis drive mechanism to provide z-axis movement of the dispensing unit.

15 19. The method of claim 14, wherein each of the first strain wave gear system and the second strain wave gear system includes

a housing,
a circular spline supported by the housing,
a wave generator supported by the housing, the wave generator being
20 positioned within the circular spline,
a flexible spline having a spline portion disposed between the circular spline and the wave generator and a base portion extending from the spline portion, and
a mounting hub secured to the base portion of the flexible spline.

25 20. The method of claim 14, wherein the first strain wave gear system and the second strain wave gear system are coupled to a controller of the dispensing system to control the operation of the first and second strain wave gear systems.

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