CLAIMS

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

a frame;

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

a dispensing unit configured to dispense viscous material including solder paste, the dispensing unit having a nozzle;

a gantry assembly coupled to the frame, the gantry assembly including a gantry configured to support the dispensing unit and to move the dispensing unit in x-axis, y-axis and z-axis directions and a tilt and rotate subassembly configured to tilt and rotate the dispensing unit; and

a controller configured to control dispensing unit and the gantry assembly to perform a dispense operation on the electronic substrate, the controller being configured to control the dispensing unit to dispense material from the nozzle of the dispensing unit at a flow rate configured to deposit a desired amount or density of material on the electronic substrate along a three-dimensional path,

wherein the controller further is configured to move the nozzle of the dispensing unit at a constant speed with respect to a component mounted on the electronic substrate, the controller being configured to move the nozzle to achieve a constant speed of up to 1000 mm/second, and

wherein the controller further is configured to dispense material from the nozzle of the dispensing unit at a flow rate configured to deposit a desired amount of density of material on the electronic substrate, the controller being configured to dispense material from the nozzle to achieve a flow rate of up to 2000 mg/second.

2. The dispensing system of claim 1, wherein the flow rate is between 0.05 mg/sec and 10 mg/sec.

3. The dispensing system of claim 1, wherein the flow rate is controlled by controlling a pressure of material within the dispensing unit.

4. The dispensing system of claim 1, wherein the controller further is configured to coordinate the movement of the gantry assembly and the tilt and rotate subassembly to position and orient the nozzle of the dispensing unit a predetermined distance and an orientation from the electronic substrate while dispensing material.

5. The dispensing system of claim 4, wherein the predetermined distance is up to 5.0 mm.

6. The dispensing system of claim 1, wherein the controller further is configured to maintain the nozzle of the dispensing unit a predetermined angle with respect to a horizontal plane of the electronic substrate.

7. The dispensing system of claim 6, wherein the predetermined angle is between 0° and 90°.

8. The dispensing system of claim 1, wherein the constant speed is between 20 mm/sec and 200 mm/sec.

9. The dispensing system of claim 1, wherein the controller further is configured to calibrate a dispense location of a nozzle of the dispensing unit with respect to a vision system by dispensing on the electronic substrate provided on the support.

10. The dispensing system of claim 9, wherein the controller includes or has access to a database having a table of nozzle to vision system orientations.

11. The dispensing system of claim 10, wherein the controller is configured to calibrate an orientation of the nozzle based on in part an interpolation of known positions and orientations.

12. A method of dispensing viscous material on an electronic substrate with the dispensing system of claim 1, the method comprising:

delivering an electronic substrate to a dispense position in the dispensing system;

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

performing a dispense operation by tilting and rotating the dispensing unit of the dispensing system, the dispensing unit being coupled to the gantry,

wherein performing the dispense operation includes dispensing material from the nozzle of the dispensing unit at a flow rate configured to deposit a desired amount or density of material on the electronic substrate along a three-dimensional path.

13. The method of claim 12, wherein the flow rate is up to 2000 mg/sec.

14. The method of claim 12, wherein dispensing material from the nozzle of the dispensing unit at a flow rate is controlled by controlling a pressure of material within the dispensing unit.

15. The method of claim 12, further comprising coordinating the movement of the gantry assembly and the tilt and rotate subassembly to position and orient a nozzle of the dispensing unit a predetermined distance and an orientation from the electronic substrate while dispensing material.

16. The method of claim 15, wherein performing the dispense operation includes maintaining the nozzle of the dispensing unit a predetermined angle with respect to a horizontal plane of the electronic substrate.

17. The method of claim 12, wherein performing the dispense operation includes moving the nozzle of the dispensing unit at a constant speed with respect to the electronic substrate.