CLAIMS

1. A method for manufacturing a z-directed component for insertion into a mounting hole in a printed circuit board, comprising:

depositing a liquid based material onto a top surface of a rotatable plate, the top surface of the rotatable plate having at least one cavity formed thereon defining the shape of a layer of the z-directed component;

spinning the rotatable plate to level a top surface of the liquid based material in the at least one cavity;

curing the liquid based material to form the layer of the z-directed component;

applying a conductive material to at least one surface of the formed layer;

forming the z-directed component, the z-directed component including a stack of component layers that includes the formed layer.

2. The method of claim 1, further comprising placing a physical mask on the top surface of the rotatable plate to form the cavity thereof.

3. The method of claim 1, further comprising forming a photoresist layer on the top surface of the rotatable plate to form the cavity thereof.

4. The method of claim 1, wherein the cavity is recessed in the top surface of the rotatable plate.

5. The method of claim 1, wherein applying the conductive material to the at least one surface of the formed layer includes:

applying a mask to a top surface of the formed layer that restricts the application of conductive material to selected portions of the formed layer; and

screening conductive material through the mask onto the formed layer.

6. The method of claim 5, wherein the mask includes one of a physical mask placed on the top surface of the formed layer and a photoresist layer applied to and developed on the top surface of the formed layer.

7. The method of claim 1, wherein applying the conductive material to the at least one surface of the formed layer includes spin coating a top surface of the formed layer with liquid conductive material and then selectively etching conductive material from the top surface of the formed layer.

8. The method of claim 1, wherein applying the conductive material to the at least one surface of the formed layer includes selectively jetting the conductive material onto the formed layer.

9. The method of claim 1, wherein applying the conductive material to the at least one surface of the formed layer includes applying a seed layer of conductive material onto a predetermined portion of the formed layer and then applying additional conductive material by an electrolysis technique.

10. The method of claim 1, wherein applying the conductive material to the at least one surface of the formed layer includes:

positioning the formed layer in a constraining plate having a side wall surface that is spaced from a side wall channel in the formed layer forming a gap therebetween; and

applying conductive material in the gap formed between the side wall surface of the constraining plate and the side wall channel in the formed layer to plate the side wall channel in the formed layer with the conductive material.

11. The method of claim 1, wherein forming the z-directed component includes heating and compressing a stack of component layers to form an aggregate part.

12. The method of claim 1, wherein a bottom portion of the cavity includes a tapered rim around a periphery thereof that forms a corresponding taper in a bottom surface of the layer.

13. A method for manufacturing a z-directed component for insertion into a mounting hole in a printed circuit board, comprising:

depositing a liquid based material onto a top surface of a rotatable plate, the rotatable plate having a first cavity portion formed thereon defining the shape of a first layer of the z-directed component;

spinning the rotatable plate to level a top surface of the liquid based material in the first cavity portion;

curing the liquid based material to form the first layer of the z-directed component;

applying a conductive material to at least one surface of the first formed layer;

forming a second cavity portion on top of the first cavity portion defining the shape of a second layer of the z-directed component and depositing additional liquid based material onto the top surface of the rotatable plate;

spinning the rotatable plate to level a top surface of the liquid based material in the second cavity portion;

curing the liquid based material to form the second layer of the z-directed component stacked on top of the first layer; and

forming the z-directed component, the z-directed component including a stack of component layers that includes the first and second layers.

14. The method of claim 13, wherein the first cavity portion is formed in a first plate and the second cavity portion is formed in a second plate, the second plate being stacked on top of the first plate so that the second layer of the z-directed component is formed stacked on top of the first layer.

15. The method of claim 13, wherein the first cavity portion is formed in a cavity in the rotatable plate, the bottom surface of the first cavity portion is formed by a raisable elevator therein, and the second cavity portion is formed by lowering the elevator to create additional space in the cavity in the rotatable plate after the first layer of the z-directed component is formed so that the second layer of the z-directed component is formed stacked on top of the first layer.

CLAIMS

1. A method for manufacturing a z-directed component for insertion into a mounting hole in a printed circuit board, comprising:

depositing a liquid based material onto a top surface of a rotatable plate, the top surface of the rotatable plate having at least one cavity formed thereon defining the shape of a layer of the z-directed component;

spinning the rotatable plate to level a top surface of the liquid based material in the at least one cavity;

curing the liquid based material to form the layer of the z-directed component;

applying a conductive material to at least one surface of the formed layer;

forming the z-directed component, the z-directed component including a stack of component layers that includes the formed layer,

wherein applying the conductive material to the at least one surface of the formed layer includes:

positioning the formed layer in a constraining plate having a side wall surface that is spaced from a side wall channel in the formed layer forming a gap therebetween; and

applying conductive material in the gap formed between the side wall surface of the constraining plate and the side wall channel in the formed layer to plate the side wall channel in the formed layer with the conductive material.

2. The method of claim 1, further comprising placing a physical mask on the top surface of the rotatable plate to form the cavity thereof.

3. The method of claim 1, further comprising forming a photoresist layer on the top surface of the rotatable plate to form the cavity thereof.

4. The method of claim 1, wherein the cavity is recessed in the top surface of the rotatable plate.

5. The method of claim 1, wherein applying the conductive material to the at least one surface of the formed layer includes:

applying a mask to a top surface of the formed layer that restricts the application of conductive material to selected portions of the formed layer; and

screening conductive material through the mask onto the formed layer.

6. The method of claim 5, wherein the mask includes a physical mask placed on the top surface of the formed layer.

7. The method of claim 5, wherein the mask includes a photoresist layer applied to and developed on the top surface of the formed layer.

8. The method of claim 7, wherein screening conductive material through the mask onto the formed layer includes spin coating liquid conductive material on top of the photoresist layer.

9. The method of claim 1, wherein applying the conductive material to the at least one surface of the formed layer includes spin coating a top surface of the formed layer with liquid conductive material and then selectively etching conductive material from the top surface of the formed layer.

10. The method of claim 1, wherein applying the conductive material to the at least one surface of the formed layer includes selectively jetting the conductive material onto the formed layer.

11. The method of claim 1, wherein applying the conductive material to the at least one surface of the formed layer includes applying a seed layer of conductive material onto a predetermined portion of the formed layer and then applying additional conductive material by an electrolysis technique.

12. The method of claim 1, wherein forming the z-directed component includes heating and compressing a stack of component layers to form an aggregate part.

13. The method of claim 1, wherein a bottom portion of the cavity includes a tapered rim around a periphery thereof that forms a corresponding taper in a bottom surface of the layer.

14. The method of claim 1, further comprising:

inserting the z-directed component into the mounting hole in the printed circuit board; and

applying an adhesive to a surface of the printed circuit board external to the mounting hole, the adhesive contacting a surface of the z-directed component when the z-directed component is inserted into the mounting hole to prevent rotational and translational movement of the z-directed component relative to the printed circuit board after insertion.

15. The method of claim 1, further comprising forming a strip of conductive material along a side surface of the formed z-directed component that connects to one of a top surface and a bottom surface of the z-directed component to form a conductive bridge between the respective top or bottom surface of the z-directed component and a trace on the printed circuit board.

16. A method for manufacturing a z-directed component for insertion into a mounting hole in a printed circuit board, comprising:

depositing a liquid based material onto a top surface of a rotatable plate, the rotatable plate having a first cavity portion formed thereon defining the shape of a first layer of the z-directed component;

spinning the rotatable plate to level a top surface of the liquid based material in the first cavity portion;

curing the liquid based material to form the first layer of the z-directed component;

applying a conductive material to at least one surface of the first formed layer;

forming a second cavity portion on top of the first cavity portion defining the shape of a second layer of the z-directed component and depositing additional liquid based material onto the top surface of the rotatable plate;

spinning the rotatable plate to level a top surface of the liquid based material in the second cavity portion;

curing the liquid based material to form the second layer of the z-directed component stacked on top of the first layer; and

forming the z-directed component, the z-directed component including a stack of component layers that includes the first and second layers,

wherein the first cavity portion is formed in a first plate and the second cavity portion is formed in a second plate, the second plate being stacked on top of the first plate so that the second layer of the z-directed component is formed stacked on top of the first layer.

17. A method for manufacturing a z-directed component for insertion into a mounting hole in a printed circuit board, comprising:

depositing a liquid based material onto a top surface of a rotatable plate, the rotatable plate having a first cavity portion formed thereon defining the shape of a first layer of the z-directed component;

spinning the rotatable plate to level a top surface of the liquid based material in the first cavity portion;

curing the liquid based material to form the first layer of the z-directed component;

applying a conductive material to at least one surface of the first formed layer;

forming a second cavity portion on top of the first cavity portion defining the shape of a second layer of the z-directed component and depositing additional liquid based material onto the top surface of the rotatable plate;

spinning the rotatable plate to level a top surface of the liquid based material in the second cavity portion;

curing the liquid based material to form the second layer of the z-directed component stacked on top of the first layer; and

forming the z-directed component, the z-directed component including a stack of component layers that includes the first and second layers,

wherein the first cavity portion is formed in a cavity in the rotatable plate, the bottom surface of the first cavity portion is formed by a raisable elevator therein, and the second cavity portion is formed by lowering the elevator to create additional space in the cavity in the rotatable plate after the first layer of the z-directed component is formed so that the second layer of the z-directed component is formed stacked on top of the first layer.