Method for a recessed spin head to improve copper plating on substrate panels

Disclosed is a method for a recessed spin head to improve copper plating on substrate panels. Benefits include improved functionality and improved reliability.

Background

Conventional copper plating processes for substrate panels use stationary plating racks, which are dipped into electrolytic copper baths, with the front and back of the panel being plated simultaneously. This procedure results in copper thickness variation across the substrate panel.

The stationary nature of the plating process causes significant nonuniformity and limits electrical current distribution on the panel surface. The single-plating solution is typically optimized for the front. As a result, larger dimples (recesses) occur in larger vias on the panel's back, reducing the effective contact area for land-grid array (LGA) socket pins on the pad.

Description

The disclosed method is a spinning head on which substrate panels are placed for electrolytic copper plating. By spinning the substrate panel during electrolytic plating, the electrical current distribution on the panel is more uniform, reducing the copper thickness variation on the substrates. The spin head has a recessed area bounded by an o-ring seal to which the panel is clamped. The o-ring seal and recess enables the isolation of one side of the panel from the plating process, enabling the substrate panels to be plated on one side at a time. This approach improves control of the plating thickness and enables the use of different plating solutions for the panel front and back (see Figure 1).

The disclosed method includes a spin head that contains electrical contacts to deliver current from the cathode to copper plate substrate panels. The head is spun by a motorized assembly and shaft. The head has a recessed area on the surface surrounded by an o-ring seal to which the substrate panel can be clamped. One side of the panel can be insulated from the plating process while the opposite side is being plated. After panel attachment, the spin head is lowered into an electrolytic copper plating bath. The substrate panel (cathode) is placed in close proximity to a submerged stationary anode. Redundant spin heads in different filled-via plating solutions are used to plate the front and backs of the panels in sequential steps (see Figure 2).

The key elements of the disclosed method include:

- Spinning head to improve uniformity of the limiting current distribution at the panel surface
- Recessed area with an o-ring seal to isolate one side of the substrate panel during electrolytic plating
- Different plating solutions for panel front and back filled vias to reduce recessed areas

Advantages

The disclosed method provides advantages, including:

- Improved functionality due to enabling separate via filling solutions on the front and back of substrate panels
- Improved functionality due to providing an increased LGA socket pin contact area on the LGA pad
- Improved electrical performance due to improving the copper thickness uniformity
- Improved reliability due to reducing unit warpage due to improved front/back copper thickness uniformity

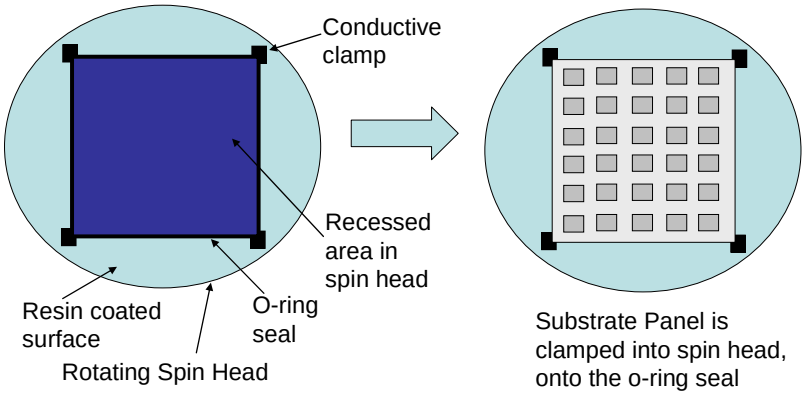

Fig. 1

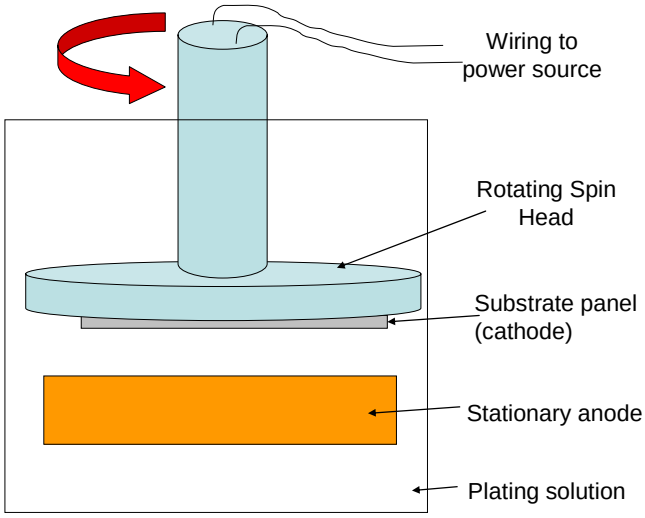

Fig. 2

Disclosed anonymously