

CHROME PLATING JIG

FIELD OF THE INVENTION

[0001] The present invention relates to jigs for use with substrates to be chromed.

BACKGROUND

[0002] Chrome plating has been a trusted industry solution for surface treatment processes in the fields of semiconductor, rubber and plastic mould, aerospace, medical, textile and precision engineering. Chrome plating may be used for decorative purposes. But most importantly, chrome plating is used to make products which require high wear, erosion and corrosion resistance.

[0003] A known chrome plating process utilises a chromic acid based electrolyte. The substrate to be coated is made the cathode and with the passage of a DC current via lead anodes, chromium metal builds on the surface of the substrate. Platinised titanium is used as the electrode in the process to create a homogeneous and uniform chrome deposit that has an accuracy within 1 micron.

[0004] However, a limitation of this known process is its inability to cover the very narrow runner and gating areas, i.e. gate holes having minimum diameter of 3 mm. This shortcoming leads to certain coating quality inconsistencies such as the coating peeling off, double-tone coating, often seen as white patches and uneven or uncoated substrate surface.

[0005] Therefore, there exists a need for a chrome plating jig that addresses the above problems or at least provides a novel jig for use with substrates to be chromed.

SUMMARY OF THE INVENTION

[0006] According to a first aspect of the invention, a jig for use with a substrate to be chromed is described, the substrate having dimples and receiving detents. The jig comprises

a base having a base surface, and a plurality of electrode pins secured to the base surface by a securing mechanism, the plurality of electrode pins extending from the base surface. The jig further comprises a plurality of positioning blocks on the base surface for fitting into the receiving detents of the substrate; the plurality of positioning blocks extending from the base surface. Wherein when the jig is affixed to the substrate by fitting in the positioning blocks into the receiving detents, the positioning blocks are dimensioned to form a separation between the substrate and the base surface such that each of the plurality of electrode pins extends substantially into one dimple of the substrate and are prevented from contacting an inner surface of the dimple.

[0007] Preferably, each of the plurality of electrode pins has a pin head and an elongate body.

[0008] Preferably, the pin head has a diameter of 3 mm and a length of 2 mm.

[0009] Preferably, the elongate body has a diameter of 1 mm and a length of 18.3 mm.

[0010] According to a second aspect of the invention, a method for chroming a substrate having dimples and receiving detents is described. The method comprises the steps of assembling a jig by securing with a securing mechanism a plurality of electrode pins to a base surface of a base, the plurality of electrode pins extending from the base surface; and affixing the jig to the substrate by fitting in a plurality of positioning blocks on the base surface into the receiving detents of the substrate, the positioning blocks being dimensioned to form a separation between the substrate and the base surface such that each of the plurality of electrode pins extends substantially into one dimple of the substrate and are prevented from contacting an inner surface of the dimple. The method further comprises the steps of placing the jig and substrate into a chroming tank; and supplying electrical power to a cable bar on the jig.

[0011] The invention will now be described in detail with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The accompanying figures illustrate disclosed embodiment(s) and serve to explain principles of the disclosed embodiment(s). It is to be understood, however, that these drawings are presented for purposes of illustration only, and not for defining limits of the application.

[0013] Figure 1 shows a top view of a substrate;

[0014] Figure 2 shows a perspective view of a chrome plating jig in accordance with the present embodiment;

[0015] Figure 3 shows a cross-sectional view of the chrome plating jig of Figure 2 when fitted with the substrate of Figure 1 in accordance with the present embodiment;

[0016] Figure 4 shows a cross-sectional view of an electrode pin; and

[0017] Figure 5 shows a flowchart which depicts a method of using the chrome plating jig to chrome a substrate.

[0018] Exemplary, non-limiting embodiments of the present application will now be described with references to the above-mentioned figures.

DETAILED DESCRIPTION

[0019] Referring to Figure 1, a top view of substrate 100 is shown. Substrate 100 is to be chromed. Substrate 100 has dimples 102. Dimples 102 may be slight depressions or indentations in surface 108 of substrate 100. Dimples 102 may vary in dimension. Dimples 102 may be as small as 3mm in diameter. Preferably substrate 100 is a cavity plate. Substrate 100 has receiving detents 104 on surface 108.

[0020] Figure 2 shows a perspective view of chrome plating jig 200 in accordance with the present embodiment. Chrome plating jig 200 has base 206 having base surface 208. Chrome plating jig 200 has electrode pins 202. Electrode pins 202 are secured to base surface

208 by a securing mechanism 302 (visible in Fig. 3). Securing mechanism 302 can be a screw mechanism. It is important that the electrode pins are well fixed and rigid in position with optimized torque control in order to get uniform conductivity over the electrode pins. Securing mechanism 302 ensures that electrode pins 202 are fixed and rigid in position. Electrode pins 202 extend transversely from base surface 208. Chrome plating jig 200 also has positioning blocks 204. Positioning blocks 204 extend transversely from base surface 208.

[0021] Figure 3 shows a cross-sectional view of chrome plating jig 200 when fitted with or affixed to substrate 100 in accordance with the present embodiment. Positioning blocks 204 are interference fitted into receiving detents 104 to secure substrate 100 to chrome plating jig 200. Positioning blocks 204 also separates base surface 208 from substrate 100 and are dimensioned such each of the electrode pins 202 extends substantially into one dimple 102 but are prevented from contacting inner surface 106 of dimple 102. It is important that electrode pins 202 do not come into contact with inner surface 106 of dimple 102. It is also important that the electrode pins 202 do not contact substrate 100. This is to prevent poor coating. Furthermore, if electrode pins 202 come into contact with inner surface 106 of dimple 102 during the chroming process, it may cause inner surface 106 to have burnt marks and may even cause a short circuit. Chrome plating jig 200 therefore advantageously holds electrode pins 202 in place to achieve maximum chroming effect of the dimples 102, resulting in a uniformly coated substrate. Chrome plating jig 200 also has cable bar 304.

[0022] Figure 4 shows a cross-sectional view of electrode pin 202. Electrode pin 202 has a pin head 401 and elongate body 402. The diameter and length of pin head 401 can be 3 mm and 2 mm respectively. The diameter and length of elongate body 402 can be 1 mm and 18.3 mm respectively.

[0023] Figure 5 depicts a method of chroming a substrate in a preferred embodiment of the invention. In step 501, a visual inspection is performed on substrate 100, to look out for dents, scratches, crack lines, rust and any other compound on the substrate that might affect the quality of the bars after chroming. The visual inspection may also include dimensional measurement of substrate 100 using measuring equipment such as Microscopes, Slip Gauges, Vernier Calipers, Micrometers or the like.

[0024] In step 502, substrate 100 is degreased with chemicals in a degrease tank to remove all traces of oil and dirt. This degreasing process can last 10-20 minutes. The temperature in the degrease tank can be kept at 55°C. Substrate 100 is then rinsed with water to remove the chemicals.

[0025] In step 503, substrate 100 is affixed to chrome plating jig 200. This is done by fitting positioning blocks 204 on chrome plating jig 200 into receiving detents 104 on substrate 100 (as shown in figure 3). When chrome plating jig 200 is fitted with substrate 100, each of the electrode pins 202 extends substantially into one dimple 102. Positioning block 204 also separates base surface 208 from substrate 100 and maintains a gap between electrode pins 202 and inner surface 106 of dimples 102.

[0026] In step 504, an electrical power source is connected to cable bar 304 of chrome plating jig 200.

[0027] In step 505, substrate 100 fitted with chrome plating jig 200 is placed into a chroming tank. The chroming tank contains an electrolyte. The electrolyte can be a mixture of chromic acid crystals and water, with 250-300 grams of chromic acid crystals for every litre of water. It is important that substrate 100 fitted with chrome plating jig 200 is fully submerged within the electrolyte. Optionally, the voltage being supplied by the electrical power source to cable bar 304 of chrome plating jig 200 is 3.5 to 3.75 Volts. Optionally, the current being supplied by the electrical power source to cable bar 304 of chrome plating jig 200 is 65 to 70 amps. Optionally, the temperature within the electrolyte is kept at 60°C.

[0028] In another preferred embodiment, the invention further comprises a support jig. Substrate 100 may be mounted onto the support jig by a fastening mechanism. Substrate 100 is mounted onto the support jig with surface 108 exposed to enable chrome plating jig 200 to be fitted with substrate 100.

CLAIMS

1. A jig for use with a substrate to be chromed, the substrate having dimples and receiving detents, the jig comprising:
 - a base having a base surface;
 - a plurality of electrode pins secured to the base surface by a securing mechanism, the plurality of electrode pins extending from the base surface;
 - a plurality of positioning blocks on the base surface for fitting into the receiving detents of the substrate; the plurality of positioning blocks extending from the base surface;wherein when the jig is affixed to the substrate by fitting in the positioning blocks into the receiving detents, the positioning blocks are dimensioned to form a separation between the substrate and the base surface such that each of the plurality of electrode pins extends substantially into one dimple of the substrate and are prevented from contacting an inner surface of the dimple.
2. The jig of claim 1, wherein each of the plurality of electrode pins has a pin head and an elongate body.
3. The jig of claim 2 wherein the pin head has a diameter of 3 mm and a length of 2 mm.
4. The jig of claim 2 wherein the elongate body has a diameter of 1 mm and a length of 18.3 mm.
5. A method for chroming a substrate having dimples and receiving detents, the method comprising the steps of:
 - assembling a jig by securing with a securing mechanism a plurality of electrode pins to a base surface of a base, the plurality of electrode pins extending from the base surface;
 - affixing the jig to the substrate by fitting in a plurality of positioning blocks on the base surface into the receiving detents of the substrate, the positioning blocks being dimensioned to form a separation between the substrate and the base surface such that each of the plurality of electrode pins extends substantially into one dimple of the substrate and are prevented from contacting an inner surface of the dimple;

placing the jig and substrate into a chroming tank; and
supplying electrical power to a cable bar on the jig.