

**METHOD FOR FORMING A CURED RESIN  
COATING HAVING A DESIRED PATTERN ON  
THE SURFACE OF A SUBSTRATE**

This invention relates to a method for forming a cured resin coating having a desired pattern on the surface of a substrate.

With a striking increase in recent years in the production of IC and LSI, there has been an increasing demand for lead frames and film carriers for mounting these electronic elements and connecting and wiring their terminals. In addition, connectors or connecting terminals of various shapes are being produced in great quantities because they are essential to various kinds of electronic component parts or electronic instruments and appliances.

Substrates for lead frames or connectors are made of phosphor bronzes, beryllium copper, nickel silvers, stainless steel, etc., and to insure complete electrical contact and long-term durability of the connecting or contacting parts of terminals of elements, plating of silver, gold and other noble metals is essential.

It has been the previous practice to apply noble metal plating to the entire surface of such a substrate, punch the plated substrate into a suitable shape during the mounting or production of elements, and then recover the plated noble metal from the unwanted parts. However, for saving resources and simplifying the process steps, it is desirable to make electronic component parts from those substrates which are plated in a desired pattern only at specified parts of small area which are to be bonded or contacted.

These substrates have heretofore been supplied in the form of metal strips when they are intended for the discontinuous manufacture of such electronic component parts. In order to produce them efficiently on a mass-production basis by a continuous process, such substrates should be supplied in the form of a long roll of strip.

The present invention provides means for meeting these requirements.

In order to produce a long roll of metal strip plated in a desired pattern, it is necessary to mask at least one surface of the metal strip with a resin coating having a pattern which is complementary to the pattern to be placed. Formation of a resin coating having such a complementary pattern on the substrate may be effected by bonding a masking material for masking the pattern to be plated to a substrate and thereafter coating the entire surface of the substrate with a resist coating composition. The manufacturing process according to this method requires large equipment or man power and much time.

A printing technique would be available for applying the resist coating composition to the substrate in the complementary pattern. However, by an ordinary printing technique, the thickness of the resist coat inevitably becomes thin, and it is difficult to ensure a sufficient resist effect. The thickness of the resist coat would become sufficient if a screen printing method is used. But this method cannot provide an elaborate pattern.

These problems are not limited to the formation of a plated pattern in the production of electronic component parts, but arise commonly when an elaborate pattern is desired in the making of printed circuit boards, or in the processing of the surfaces of various substrates such as metals, plastics, ceramics, glass, and wood by

various physical or chemical means such as plating, etching, honing, coloring and modification.

It is an object of this invention therefore to provide a method for forming on various substrates a cured resin coating having an elaborate pattern and a sufficient resisting effect.

According to this invention, the above object is achieved by a method for forming a cured resin coating having a desired pattern on the surface of a substrate, which comprises

a first step of applying a coating of an ultraviolet light-curable resin to the surface of the substrate;

a second step of pre-curing said coating by irradiating ultraviolet light thereto;

a third step of applying a printed layer of a predetermined pattern partly to the surface of the pre-cured coating with a light-insensitive non-transparent printing ink;

a fourth step of irradiating ultraviolet light to the product obtained in the third step to cure completely that part of the pre-cured coating on which the printed layer is absent, while that part of the pre-cured coating which exists beneath the printed layer is maintained intact; and

dissolving or peeling the printed layer and the pre-cured layer existing beneath it, whereby the resin coating having the desired pattern which is in a complementary relation to the pattern of said printed layer is formed on the surface of the substrate.

The individual steps of the method of this invention are described below in detail with reference to the accompanying drawings in which:

FIG. 1 is a diagrammatical side view showing the entire steps of the method of this invention;

FIGS. 2, 3, 4 and 5 are sectional rough views of the products obtained by the second, third, fourth and fifth steps of the method of the invention, respectively; and FIGS. 6 and 7 are sectional rough views illustrating the uses of the product of this invention.

#### FIRST STEP

Referring to FIG. 1, a substrate 1, for example a sheet or film made of such a material as metals or plastics is disposed at a starting end of a continuous manufacturing line for producing a long roll of strip, and is continuously delivered to the line. Both surfaces of the substrate 1 are entirely coated by a coating device 2 with an ultraviolet light-curable resin paint 3 having a resist effect. In the drawing, both surfaces of the substrate 1 are coated by using a dipping-type coating device, but whether to coat one or both surfaces of the substrate may be properly determined depending upon the end use of the final pattern. Accordingly, the coating device 2 that can be used in this invention is not limited to the illustrated embodiment, and various devices such as a roll coater, a knife coater or a spray coater capable of coating one or both surfaces can be used. Furthermore, in the illustrated embodiment, the substrate is a continuous structure, but it may also be a discontinuous structure such as a plate or sheet. In the latter case, the material which makes up the substrate may also be glass or ceramics. When a discontinuous substrate is used, a part of the manufacturing line such as the coating device and a transportation device may be changed in design to conform to the discontinuous substrate. The ultraviolet light-curable paint 3 has a resist effect against various processing techniques such as plating, soldering and etching, and can be formed by using various known