ABSTRACT: This invention pertains to a process for producing surfaces of desired and specified texture and/or physical, chemical, electrical and/or optical properties involving use of a viscous liquid treating composition.
METHOD OF SURFACE COATING

This invention relates to novel and improved methods for the manufacture of articles provided with a surface of certain, specified and desired mechanical, chemical, electrical or optical properties.

Another object of this invention is to produce surfaces of a desired texture and finish.

A further object is to completely seal in or encapsulate the surface or a portion of the surface of an article provided with an imprint or pattern, relief image or the like.

A further object of this invention is to provide improved nameplates, dials, decorative sheet material and the like which are rugged and durable, have a surface which can withstand atmospheric or other corrosive effects and/or rough mechanical handling and/or possess surface properties which are independent of the properties of the base material.

Another object is the manufacture of improved printed circuits.

Other objects and advantages of the invention will be set forth in part herein and in part will be obvious herefrom or may be learned by practice with the invention.

It is known to protect surfaces and to achieve certain surface properties by lacquering. The finish achieved depends on the properties of the lacquer used; dust accumulated during the hardening period is, however, a major problem for producing perfect, smooth or glossy surfaces. Another shortcoming of this known concept is the rather very limited range of surface texture and patterns achievable, and its complete inadequacy for producing plane surfaces on a base member provided with a relief or raised pattern.

It is also known to protect the surface of prints made on paper or other materials by laminating or gluing a suitable plastic foil to such surface. One of the main defects of this concept is the tendency to delaminate in use or if exposed to heat.

These and other disadvantages of the prior art are overcome by the present invention.

According to this invention a process for producing surfaces of desired and specified texture and/or mechanical, chemical, electrical and/or optical properties has been discovered which comprises providing the surface of an article or selected portions of it with a layer of a viscous, liquid, solvent-free or substantially solvent-free composition having heat, radiation or other hardening properties, and bringing the surface of this coating into temporary, close contact with the surface of a material not adhering to the surface of the coating in its hardened condition, the surface of the said temporary top layer, in contact with the coating being provided with the mirror image of the surface finish and/or texture desired and specified for the surface of the coating in its hardened condition; and applying heat, radiation or other suitable means for hardening said coating; and subsequently removing said temporary top layer of material.

Preferably, the coating composition is applied in its unpolymerized state and is polymerized or cross-linked after its surface has been brought into close contact with the transfer surface of the temporary top layer material provided with the mirror image of the desired pattern, etc.

Suitable materials for use as temporary top layer may be selected from the group of sheet materials, film or foils consisting of polyethylene, polyvinylchloride, polyvinylfluoride, polyester, polytetrafluoroethylene and metals.

In certain cases it has been found advisable to employ a release agent for facilitating stripping of the temporary top layer material after the coating has been hardened. Alternatively, a thin film or mold-release paper may be used together with a suitable backing. In such case the surface of the mold-release material contacting the coating is provided with the mirror image of the desired texture and finish.

For the manufacture of nameplates, dials, etc. as well as in many other cases the coating composition will be selected from the group of materials producing a translucent or transparent end product of polymerization, polycondensation or cross-linking.

The finish, pattern or texture of the transfer surface of the temporary top layer material may be produced by well-known mechanical, chemical, photochemical, printing or other means.

If the preferred embodiment of the invention, the temporary top layer material is arranged in a given distance from the original surface of the article to this way producing a coating layer of a specified and closely controlled thickness. For encapsulating surfaces provided with a raised pattern or relief or imprint, the distance between the two surfaces is selected to produce a coating layer of adequate thickness and is kept at constant with respect to the background surface of the base member provided with such raised pattern, in the like.

This can be achieved by the use of a temporary top layer material in the form of a band of foil or film and applied to the surface provided with the coating by means of spring loaded roller.

This version of the invention is particularly suitable for the manufacture of printed wiring boards provided with a coating, e.g. a masking layer having a plane surface.

The range of suitable coating materials is not limited to the ones mentioned above; this material may also be a monomer combination, a two-component composition or a material to be applied in its molten state.

Preferred materials are the ones selected from the group consisting of polyesters, polyester, melamine, carbamide, polycrylics, polynmethacrylics, polystyrene and mixtures of the foregoing.

In the preferred embodiment of the invention coating the surface, applying the temporary top layer material, hardening and removing the temporary layer is done in a continuous manner.

The following figures are included to schematically illustrate two embodiments of the present invention.

FIG. 1 shows the articles to be coated 1 on a support 2, e.g., a conveyor belt, 3 and 3' are two transport rollers, with roller 3' serving as a guide roller for the temporary top layer material 5. Roller 3 and 3' are kept at a certain distance this way controlling the thickness of the layer of coating material 4 formed on the surface 1. In a preferred embodiment roller 3' is spring loaded and the thickness of the layer formed is controlled by the pressure between the two rollers 3 and 3'.

FIG. 2 shows a similar arrangement but suitable for simultaneously coating FIG. 2 shows a similar arrangement but suitable for simultaneously coating both sides of an article 1. In this embodiment a transport belt arrangement 6 is employed to feed the work to the coating section and the two sheets or belts of temporary top layer material serve at the same time for providing further transportation. The coating material 4 is applied in the well-known manner. In this embodiment both transport rollers 3 and 3' act at the same time as the guide roller for application of the temporary top layer material 5.

The following examples illustrate typical applications of the invention:

EXAMPLE 1

A laminate having printed circuit conductors on one or both sides is coated with a solvent-free epoxy resin composition and subsequently provided with a temporary top layer consisting of polyester film and arranged in such distance from the original surface to the laminate to produce a coating layer of a thickness sufficient for encapsulating the conductors and producing a plane surface; the this way formed sandwich is exposed to heat to fully cure the epoxy resin composition and the temporary top layer material is stripped from the finished product.

EXAMPLE 2

A nameplate is formed by embossing a sheet of metallized paper and coating its surface with a melamine resin composition; the surface of this layer is provided with a temporary top layer consisting of polytetrafluoroethylene and arranged in a

3,607,380
distance from the surface of the paper base adequate for forming a coating of a thickness sufficient to produce a smooth, level surface. The surface of the tetrafluoroethylene film in contact with the coating layer is provided with the mirror image of the surface texture and finish desired for the finished nameplate.

The invention is not limited to nameplates, dials or printed wiring boards or to the specific steps and methods described.

What is claimed is:

1. A process of producing a new article of manufacture comprising coating the surface or selected portions of the surface of an article with a layer of viscous, liquid, unpolymerized composition hardenable by polymerization or cross-linking, bringing the surface of the said coating layer into temporary, close contact with the surface of a material not adhering to the coating layer in its hardened state, said surface being provided with the mirror image of the coating in its hardened state; hardening said coating by polymerization or cross-linking; and subsequently removing the said temporary top layer or material.

2. The process as claimed in claim 1 wherein the temporary top layer consists of a member selected from the group consisting of polyethylene, polyvinylchloride, polyvinylfluoride, polyester, polytetrafluoroethylene, and metal sheet materials, films or foils.

3. The process of claim 1 wherein a mold-release agent for facilitating stripping of the temporary top layer material after the coating has been hardened is provided between the surface of the coating layer and the material of the temporary top layer.

4. The process of claim 1 wherein the temporary top layer consists of a mold release agent for facilitating stripping of the temporary top layer material after the coating has been hardened which is in the form of a thin film or mold-release paper and a suitable backing material.

5. The process of claim 4 wherein the surface of the mold-release agent in contact with the surface of the coating is provided with the mirror image of the desired surface texture and finish.

6. The process as claimed in claim 1 wherein the coating material in its hardened condition is transparent or translucent.

7. The process as claimed in claim 1 wherein the surface of the temporary top layer in contact with the coating is arranged in a defined, given distance from the original surface of the uncoated article this way producing a coating layer of a specified and closely controlled thickness.

8. The process as claimed in claim 1 wherein the original surface is encapsulated by the coating, application of the temporary top layer, hardening of the coating and removal of the temporary top layer is performed on a continuous basis.

9. The process as claimed in claim 8 wherein the coating layer is of a thickness sufficient to produce a plane surface on a relief pattern surface.

10. The process as claimed in claim 1 wherein the article to be coated possesses the form of flat sheets or a band and the coating, application of the temporary top layer, hardening of the coating and removal of the temporary top layer is performed on a continuous basis.

11. A process for the manufacture of printed circuits comprising producing a first or a first and a second circuit conductor pattern adhered to the surface or surfaces of a suitable base member; coating the surface or selected portions of the surface with a layer of viscous, liquid, unpolymerized composition hardenable by polymerization or cross-linking; bringing the surface of the said coating layer into temporary contact with the surface of a material not adhering to the coating in its hardened condition and possessing the surface texture desired for the coating layer to form a temporary top layer, said material of the top layer being arranged in such defined distance from the surface of the base member to produce a coating layer having a plane surface; hardening the coating material by polymerization or cross-linking; and removing the temporary top layer from the hardened surface.

12. A process for the manufacture of nameplates, dials, decorative sheet material and the like comprising producing on the surface of a suitable material a desired imprint, surface image, relief or pattern, coating the surface or selected portions of the said surface with a coating consisting of a viscous, liquid, unpolymerized composition hardenable by polymerization or cross-linking; bringing the surface of the said layer into the close contact with the surface of a material not adhering to the coating in its hardened condition and having its surface in contact with the coating provided with the mirror image of the surface finish and texture specified for the finished product, providing for a distance between the surface of the coating and the said material forming the temporary top layer adequate for producing a coating layer of specified thickness and sufficient to fully encapsulate the original surface; hardening the coating material by polymerization or cross-linking; and removing the temporary top layer from the hardened surface.