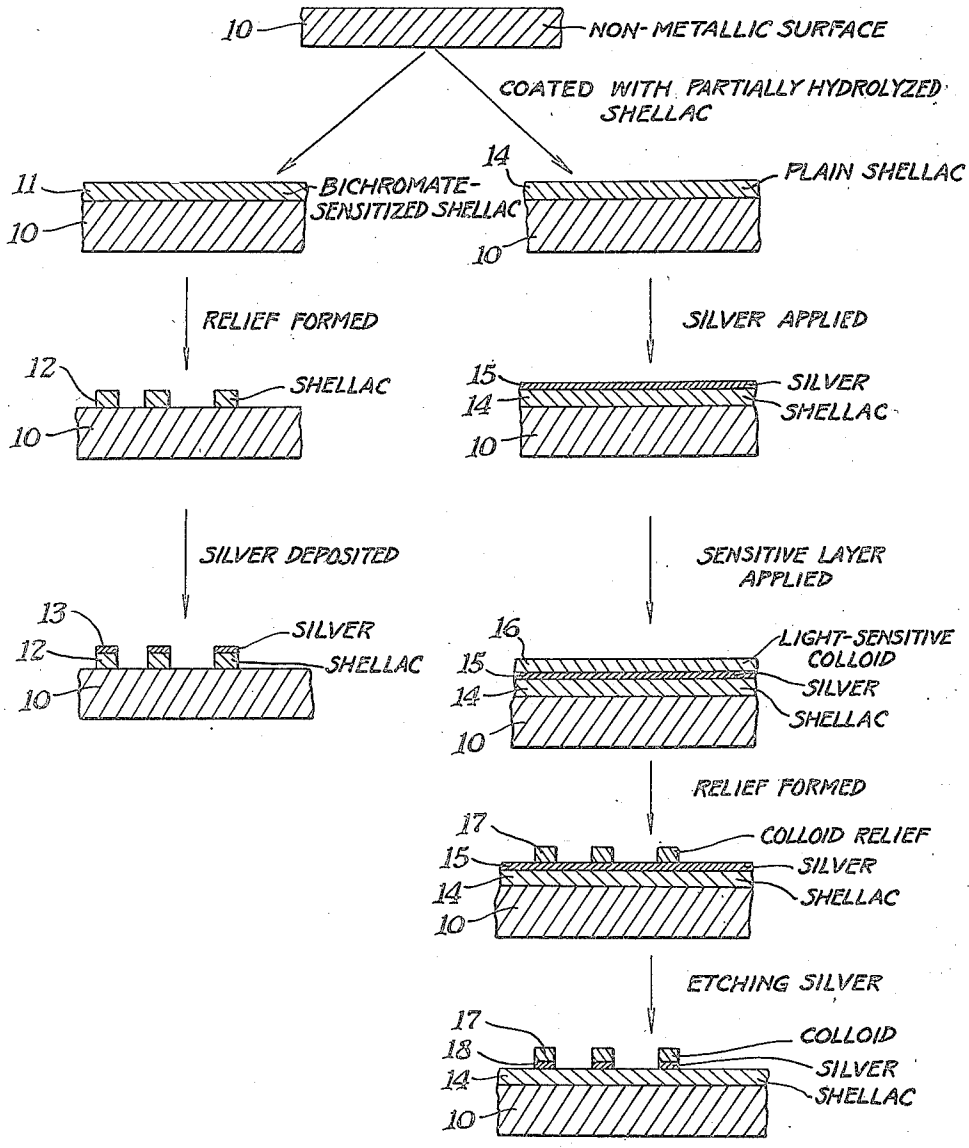
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METHOD OF PLATING NONMETALLIC SURFACES

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METHOD OF PLATING NONMETALLIC SURFACES

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This invention relates to the plating of non-metallic surfaces.

Most non-metallic surfaces will not satisfactorily accept a plating layer such as silver, hence it is very difficult to plate such surfaces with, for instance, silver or copper.

According to the present invention we apply to such a surface a layer of a partially hydrolysed resin, such as partially hydrolysed shellac (see U. S. Patent 2,199,978), which is such that it can then be plated by chemical deposition of an electrical conducting substance such as silver.

According to the present invention there is provided the method of chemically depositing a layer of silver on a support wherein there is first applied to the support a partially hydrolysed shellac on which silver can then be deposited.

The accompanying drawing shows sectional views of the steps of treating a material according to my invention.

The invention can be applied with advantage to the forming of a design or image in metal, such as silver by the following procedures:

(1) First form the design or image in partially hydrolysed shellac and then deposit silver or the like chemically thereon.

(2) First protect a surface of partially hydrolysed shellac where silver is not required so that the unprotected parts form the desired design or image and thereafter chemically deposit silver or the like on such unprotected areas.

(3) First deposit silver or the like all over the surface of some partially hydrolysed shellac and thereafter remove the silver where not required to form the design or image.

One way of forming a photographic image by method (1) is to produce a relief image in the partially hydrolysed resin by making it light sensitive with bichromate and after exposure dissolving out unhardened parts with commercial ethyl alcohol, or by coating on it a bichromated fish glue and after forming a relief image in the latter, the parts of the resin so laid bare are dissolved out with commercial ethyl alcohol. The hardened fish glue can then be removed for instance with a mixture of 50% lactic acid and 50% water.

The design or image formed in any of the above indicated ways can be thickened by electro-plating metal, such as copper or silver on it.

Example.—Coat the material which is to form the support for the silvered design with a solution made as follows:

Make a stock solution of 40 grams of hard lac resin having a softening point of 90° C. to 95° C.

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and an acid value of 60 (sold by A. F. Suter Company, London) which is a partially hydrolysed shellac in 100 ccs. of commercial ethyl alcohol.

Mix together:

	ccs.
Lac solution	30
Commercial ethyl alcohol	30
Ammonia .880	10
Distilled water	30

To 100 ccs. of this mixture add 4 ccs. of a 20% solution of ammonium bichromate in distilled water, shaking vigorously.

As a guide to the coating thickness, a flat rectangular sheet 8" x 6" can be coated by whirling in a horizontal plane at 500 R. P. M.

The coated material is thoroughly dried and exposed behind a line negative of the design to be silvered. This hardens the shellac where it is exposed, sufficiently to make it relatively insoluble in commercial ethyl alcohol.

The next operation is to dissolve the unhardened parts of the image away. This is done by rocking the material bearing the shellac layer in a bath made from 1 gram of crystal violet in 1000 ccs. of commercial ethyl alcohol. The alcohol is repeatedly drained off the material until the image is seen to be clear when all the loose dye solution is washed off with a spray of water.

The material is next washed in four changes of distilled water and then silvered by rocking it in the following mixture for five minutes:

Solution A

Silver nitrate, 30 grams
Distilled water to 1000 ccs.
Add ammonia until precipitate formed just redissolves.

Solution B

Rochelle salt, 40 grams
Water to 1600 ccs.

Solution C

Rochelle salt, 20 grams
Water to 800 ccs.
Bring to boil, add 2.5 grams silver nitrate and continue boiling for 10 minutes.

To make the said mixture take:
Solution A, 10 vols.
Solution B, 9 vols.
Solution C, 1 vol.

The material is finally washed in four changes of distilled water and dried.

Electrical resistances can be made by forming an image of the desired resistance in partially hydrolysed shellac (Process Engraver's "Cold Top Enamel") on an insulating material such as a phenol-formaldehyde resin impregnated cloth, silvering such image and then electroplating with copper.

My invention will now be described with reference to the accompanying drawing.

As shown therein, a non-metallic surface 10 may be treated in either of two ways by coating it with partially hydrolysed shellac. As shown in the left-hand side of the flow sheet, the partially hydrolysed shellac is bichromate-sensitized and coated as a layer 11 on the non-metallic surface 10. A relief image is formed in the bichromate-sensitized shellac layer by exposure under an image and washing out the unexposed portion of the layer to form relief image 12. Silver is then deposited on the relief image 12 as shown at 13, preferably by reducing a solution of silver nitrate to metallic silver in contact with the shellac relief image.

As shown at the right-hand side of the drawing, the partially hydrolysed shellac may be a plain shellac layer 14 and after coating on the non-metallic surface 10, a layer of silver 15 is applied to the shellac layer. A light-sensitive colloid layer 16 is then applied to the silver layer 15 and a relief image 17 formed in the sensitive layer by exposure under an image and washing out the unexposed portions of the layer. The silver is then laid bare to leave silver image portions 18 beneath the colloid relief image portions 17.

The invention is useful in a large variety of ways. For instance multicoloured designs may be produced with it. An example of such a design is as follows. This employs the above mentioned Cold Top Enamel which is a substance which can be readily dyed. A large selection of dyes exist which can be used since most ethyl alcohol soluble dyes are satisfactory, such as methyl violet and Sudan III. A line design in several colours is first drawn. A glass sheet is coated with a layer of Cold Top Enamel (partially hydrolysed shellac), hardened by exposure to light and silver is chemically deposited on it all over, for instance, using a mixture as given in the above example. This silvered surface is then coated with a layer of bichromated fish glue and printed under a colour separation positive of one of the colours of the said design. The unhardened fish glue is next washed out and the remainder is dried. The areas of silver so laid bare are then removed by treatment with an alcoholic etching solution, such as one of ferric nitrate. The Cold Top Enamel so laid bare is then dyed in a spirit-water solution of a dye. The enamel so dyed is then re-silvered. The fish glue is next removed and then the plate is re-coated with a fresh layer of bichromated fish glue, and the sequence of operations repeated using a different dye. Such sequence can be repeated for as many colours as required. Finally the whole of the silver can be removed leaving a multi-coloured design in the enamel, or if the silver is not removed then the plate forms a useful decorative mirror (viewed from the rear) with the design in colours on it.

Where we refer above to the use of fish glue for forming relief images, it is usually possible as an alternative to use other methods of forming relief images in a substance such as glue or gelatine, for instance, sensitive gelatino-silver halide emulsion can be used and an image formed therein by so-called tanning development or by tanning the gelatine by using a bichromate bleach bath for dissolving a silver image formed therein, or by etch-bleaching a silver image in gelatine.

What I claim is:

1. The method of forming a design or image in silver on a non-metallic surface, which comprises uniformly coating said surface with partially hydrolysed shellac having a softening point of 90° C. to 95° C. and an acid value of 60, and forming silver in image form on said shellac by reducing a solution of silver nitrate to metallic silver in contact with said shellac.

2. The method of forming a design or image in silver on a non-metallic surface, which comprises uniformly coating said surface with partially hydrolysed shellac having a softening point of 90° C. to 95° C. and an acid value of 60, applying a layer of silver to the shellac layer thus formed, by reducing a solution of silver nitrate to metallic silver in contact with said shellac layer, applying a light-sensitive colloid layer to said silver layer, forming a relief image in said light-sensitive colloid layer by exposure to light and washing out unexposed portions of said layer and etching out the silver in the portions of the sensitive layer thus laid bare.

3. The method of forming a design or image in silver on a non-metallic surface, which comprises uniformly coating said surface with a bichromate-sensitized partially hydrolysed shellac having a softening point of 90° C. to 95° C. and an acid value of 60, forming a relief image in said shellac layer by exposing a portion of said layer to light and washing out the unexposed portion of said layer, and then depositing silver on the residual portion of said shellac layer by reducing a solution of silver nitrate to metallic silver in contact with said shellac.

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