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PHOTOGRAPHIC RESIST AND PROCESS OF PHOTOGRAPHIC ETCHING

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This invention relates to a new resist for photographic purposes and to a novel process of photographic etching.

Of the very considerable number of processes of transferring decorative designs to metals by means of the usual light sensitive organic resists, a very large proportion have been solutions of organic compounds in volatile solvents and the deposited organic films have consisted of substances which, for the purpose, I may define as hydrophobic colloids. For the purpose of this disclosure that definition will be used.

In making a new series of resists it has been found that these new resists may be made and used at a much lower cost than most of the prior resists of the hydrophobic colloid type. These new resists are hydrophiles and their solutions are made up in water. In the course of the process, however, they become both water and alkali insoluble and may, therefore, be used for transferring designs to metals or other surfaces for decorative purposes by etching in an alkaline electrolyte in an electroetching bath.

It has been known that ordinary shellac is soluble in an alkaline etching bath and therefore may not be used as a resist even though the shellac itself may be somewhat light sensitive. It is also well known that alkaline shellac solutions are light sensitive and have been used for a long period of time in industry where light sensitivity has been the main factor.

It has been found and proved by experiments that the light sensitive alkaline shellac may be developed by means of tannic acid or tannic-like substances to obtain resists which are insoluble in an alkaline etching bath.

In carrying out the process of preparing these new resists and in using the same for decorative purposes the detailed description thereof is as follows:—

It is preferred to use 5 grams of borax and dissolve it in 100 cc. of water, and to this solution there is added 15 grams of powdered bleached wax-free shellac. When the shellac has gone into solution in the borax, there is added 5 cc. of 28% ammonia water and then 15 cc. of ammonium bichromate solution, made by dissolving 20 grams of crystalline ammonium bichromate in 100 cc. of water.

With the shellac solution made as above described, metal surfaces which one may desire to decorate, are coated in any desirable manner by painting on one or more coats, or, for small surfaces, by flowing on the solution on a spinning table and spinning off the excess. The so-covered surface is now exposed to a light image by means of an arc projection machine, the light passing through a screen bearing a design. Those portions of the coated surface exposed to the light are rendered insoluble and the resulting exposed plate is developed by being washed in ordinary denatured alcohol, commonly sold as completely denatured alcohol formula #5, which contains a small quantity of pyridine and wood alcohol in addition to ethyl alcohol. The light exposure time that has been found best is, on an average, one minute, although for small work, good images are obtained in 15 seconds, and the resist is fast for all practical purposes, therefore.

It has been found to be of advantage to add to the alcohol used for developing the image a few drops of a dye solution, such for instance as fuchsine dye as the operation of this dye affords a ready means for judging the degree of development as it stains the resist.

After development, the plate is dried on a spinning table or by other means, and is then placed in alcoholic tannic acid made by dissolving 50 grams of tannic acid in 100 cc. of a solution composed of 50 cc. of water and 50 cc. of denatured alcohol. After one to two minutes, that portion of the resist remaining on the plate has absorbed sufficient of the tannic acid to render the shellac insoluble after heating. It is then removed and the excess tannic acid washed off in a gentle stream of water. Again the work is dried on the spinning table and it is then baked on a hot plate until the shellac-tannic acid resist has been rendered completely insoluble, and this point may be judged by the color, which turns to a deep green. Any

other parts of the metal work exposed are now coated with an asphaltum paint and the work may then be electroetched in a sodium cyanide bath in the known manner. After etching, the work is completed by removing the resist by dissolving, buffing and polishing.

In the above outlined process, it is to be understood that it is not to be restricted to the use of pure tannic acid, since tannin-bearing and tannin-like substances may have a similar effect; thus, quebracho and caoutchouc extracts and other substances capable of combining with alkaline shellac to render it insoluble, have been found suitable. It is possible to replace the shellac, but with a lesser degree of success in my hands, with alkaline solutions of kindred natural gums; thus, in some degree, an alkaline solution of certain alkali soluble copals, such as Congo, will produce images which can be developed with tannin and tannin-like products.

It is obvious, also, to those skilled in the art, that direct light through a screen superimposed upon the plate bearing the resist, may be used in place of the arc projection machine, as described above.

The immersion of the developed shellac image in the tannic acid or tannin solution brings about in some measure the insolubility of the combination and the shellac film definitely absorbs a portion of the tannin, being then in some measure alkali-resistant, but the desired degree of alkali resistance is usually not reached until the film is heated, which thereby brings about probably both condensation and polymerization of the two substances, the resulting polymerized film being practically totally insoluble in all alkaline media which may be encountered in the etching bath.

It will be seen from the foregoing description that there has been produced a new resist and a new process of photographic etching, both of which permit the desired decorative effect on metals by using a much cheaper resist and the process does not require the particular care heretofore necessary. It will also be seen that by the preparation of a resist which is water soluble at the beginning of the process and which changes to a water and alkaline insoluble compound during the process of manufacturing, a very material saving in cost and time are obtained. These advantages are of material assistance in the practical procedure in decorating metals or other desired surfaces, and constitute material improvements over the prior resists and their uses.

It is to be understood that the foregoing description of the improved resist and the process of use thereof may be varied to some extent, but such variations and changes as may be desired are considered as being within the scope of the invention as would be permitted by the broad interpretation of the following claims.

What is claimed is:—

1. As the body of an alkali-insoluble resist for photo etching, the reaction product of shellac with tannin-bearing substances.

2. As a body of an alkali-insoluble resist for photo etching, the reaction product of a light sensitive alkaline shellac with tannin-bearing substances.

3. A resist for decorative purposes consisting of the reaction product of light sensitive alkaline shellac and tannic acid.

4. A resist consisting of a polymer of shellac and tannic acid.

5. As a body of a resist for photo etching, the combination of shellac and tannic acid, the combination being susceptible of subsequent polymerization to render the same insoluble to an alkaline etching bath.

6. As a body of a resist for photo etching, the reaction product of a light sensitive alkaline shellac and tannin-bearing substance, the combination being susceptible of subsequent polymerization to render the same insoluble to an alkaline etching bath.

7. As a body of a resist for photo etching, the reaction product of a light sensitive alkaline shellac and tannic acid, the combination being susceptible of subsequent polymerization to render the same insoluble to an alkaline etching bath.

8. A photographic resist that is insoluble in an alkaline etching solution, said resist being a polymerized reaction product of light sensitive alkaline shellac and tannic acid.

9. In an etching process the step of rendering a water soluble film insoluble to an alkaline etching solution by treating the film with tannic acid, and the step of heating the film after treatment with tannic acid to condense and polymerize the same.

10. The process of decorating surfaces which includes the deposition upon the surface to be decorated of a water-soluble film which is light sensitive, projecting an image thereon by means of light, developing the image in denatured alcohol, and subsequently rendering the image insoluble in alkali by treatment with a tannin-containing substance.

11. The process of decorating surfaces which includes the deposition upon the surface to be decorated of a water-soluble film which is light sensitive, projecting an image thereon by means of light, developing the image in denatured alcohol, rendering the image insoluble in alkali by treatment with a tannin-bearing substance, and subsequently polymerizing the combination by heat.

12. In the process of decorating metals, the steps of forming an image in a light sensitive hydrophile which has been placed on the surface to be decorated, immersing the hydrophile with the image formed therein in a so-

lution of a second hydrophile capable of combining therewith, and rendering the combined film insoluble in alkalis by means of heat.

13. In an etching process, the steps of coating a surface to be decorated with a light sensitive water soluble material, exposing said material to a projected design, developing said material in denatured alcohol, rendering said material insoluble to an alkaline solution, heating said material to condense and polymerize it, and etching.

14. The process of decorating surfaces, the steps of coating a surface with a light sensitive alkaline shellac, exposing the same to a light projected design, developing said coating, subjecting the coating to a tannin solution, drying the same, heating the same, and etching in a solution of sodium cyanide.

15. In the process of decorating metal surfaces, the steps of coating the surface with a water soluble solution comprising a light sensitive alkaline shellac, exposing said coating to a design projected by light, adding a small amount of dye material, immersing the coating in tannic acid, removing the same and washing in water, drying the same, baking the coating, and etching in a sodium cyanide bath.

This specification signed this 19th day of January, 1927.

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