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ETCHING SOLUTION FOR LITHOGRAPHIC PLATES

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1 Claim. (Cl. 101—149.2)

This invention relates to a desensitizing etch for lithographic plates particularly useful in the preparation of lithographic printing plates highly resistant to wear, having copper printing areas and water-receptive chromium non-printing areas.

Planographic printing plates are generally produced on rather soft materials such as stone, zinc or aluminum. Other metals such as copper and stainless steel have been tried. The surface is divided into the printing areas, which repel water and thus attract ink, and into non-printing areas which are treated to attract water, and which repel ink when wet; in printing the plate is wet, and then inked, the ink being attracted only to the printing areas, and the design is transferred to an offset blanket from which the actual printing is done. With ordinary lithographic deep etch metal plates, the surface is ordinarily grained; the plate is then coated with a light-sensitive gelatin or gum arabic film, which is developed into a resist, and the plate is then etched to produce the ink-receiving portions. The plate is then inked, the remainder of the resist stripped, and the uninked portions of the plate treated to be water-attracting, and so ink-repellant when wet.

The principal advantage of conventional lithographic plates is their low cost, as compared to either typographic or intaglio plates. This advantage of economy is lost, however, in long runs, since new plates must ordinarily be prepared somewhere between 5,000 and 100,000 impressions, due to rapid wearing of the image areas of the plates. The worn plate must then be regrained to remove the design, and an entirely new printing surface produced. A great deal of work has been done in attempting to overcome this rapid wearing of planographic plates, by using harder metals such as copper, stainless steel and even chromium; but hard plates comparable in cost with ordinary soft planographic plates have not been made heretofore.

I have discovered a very cheap and economical method of producing planographic printing plates with hard surfaces. My method comprises graining a base metal plate or cylinder, plating the grained base with copper, preferably to a depth of about .0005 inch or less, and then plating a deposit of chromium on the copper to a depth of about .0002 inch or less. This plate is then coated with a bichromated gelatin, gum arabic, or polyvinyl alcohol solution, and the coating exposed to light through a half tone, line or other suitable positive. The unexposed portion of the coating is then washed out, leaving the chromium exposed in the printing areas. The plate is then etched down to the copper, with an etch which dissolves chromium but does not attack copper, and has no effect on the exposed portion of the light-sensitive coating. The etch is washed off with anhydrous alcohol and dried; the entire plate coated with a water-resistant coating, which is dried; a developing ink is applied and dried; the remainder of the light-sensitive coating is then stripped with water or an aqueous solution, and the chromium etched with a desensitizing solution, to make it water-receptive and grease-repellant. The plate is then ready for printing.

My new plate is a hard grained surface having a copper printing layer, covered by a water-receptive chromium layer in all but the printing areas.

When a run is over, the chromium can be dissolved with the same etching material used in the plate-making operation, and the cleaned plate need only be chromium-plated again to have a surface available for a new plate. Because of the low cost of the base plate, the resultant finished plate compares very favorably in cost with conventional soft planographic plates.

The planographic plate comprises a base member, preferably of steel or the like, which is grained in conventional fashion by a graining machine. The grained base member is then copper-plated to yield a grained copper layer, and a smooth back copper layer, which protects the plate against rusting. Over this layer is plated a deposit of chromium. A sensitized coating is then laid down on the chromium, and exposed to light in conventional fashion through a positive transparency.

This light-sensitive coating can be prepared in any desired manner. A typical solution comprises 3 ounces of a solution of—

	cc.
16.5° Baumé gum arabic solution	500
16.5° Baumé ammonium bichromate solution	230
28% ammonium hydroxide	25

mixed with 1 ounce of 10% polyvinyl alcohol.

It is preferably coated on the plate by spinning.

After exposure, the positive is removed, and the imperfections in the non-printing areas of the plate are painted out with lacquer in conventional fashion. The plate is then treated in conventional fashion with a developing solution to remove the unexposed light-sensitive coating,

leaving the resist on the portions of the plate where it has been hardened by the light passing through the positive. A satisfactory developing solution comprises 950 cc. of 40° Baumé calcium chloride solution and 50 cc. of 85% lactic acid syrup, adjusted with water to 37° Baumé.

The plate, having bare metal in desired spots, is now etched with a fluid which dissolves chromium, but does not attack copper or the hardened light-sensitive coating. A satisfactory solution comprises 3 volumes of propylene glycol to 1 of 37% hydrochloric acid. This makes an exceptionally good deep etch solution for stainless steel plates as well as for my new plate; the solution has a fast action on stainless steel and chromium without affecting copper or the developed resist.

The plate is then washed with anhydrous alcohol, which removes the lacquer, together with the deep etch solution. The entire plate is then coated with a thin film of liquid asphaltum, or varnish. A typical varnish is—

Phenol aldehyde resin	grams	70
Dimethyl phthalate	do	10
Furfural	do	95
Benzaldehyde	do	25

This is allowed to dry, and the plate is linked with a conventional developing ink comprising a conventional carbon black linseed oil lithographic ink thinned with turpentine; the coating and the ink protect the copper against the final desensitizing operation. The entire plate is then treated with warm water, which dissolves the set gum arabic, gelatin or polyvinyl alcohol. It is then treated with a solution which both etches the surface and yields a coating thereon, comprising 1 ounce of a solution of—

Basic chromium sulfate	grams	40
Phosphoric acid 85%	do	12
Water	cc	500

and 8 ounces of 14° Baumé gum arabic solution.

The solution is then dried, leaving the plate comprising the grained base covered with a copper layer, which in turn is covered with a chromium layer in the non-printing areas, and with varnish and ink in the printing areas.

While I have shown the use of certain chemical solutions to perform various steps in the process, these solutions may in general be replaced by others. The light-sensitive coating may be of any conventional type; and the solution used to develop the coating and remove the unexposed portions must be chosen so as to dissolve only the unexposed portion of the particular coating; the type of solution used is well known to the art.

Any solution which attacks chromium without affecting the resist or copper may be used for etching to the copper. Mixture of aqueous hydrochloric acid with completely water-miscible glycols gives a satisfactory etch, provided the glycol contains more carbon atoms than hydroxyl groups (e. g. propylene glycol, diethylene glycol), and provided the volume ratio of glycol to aqueous acid is between about 6 to 1 and 3 to 1.

The coating varnish and developing ink may be varied as desired, and so may the final desensitizing etch. However, my desensitizing etch makes possible the elimination of one conventional operation. In ordinary practice, the plate is etched, the etching solution removed, and the etched surface coated with a layer of gum arabic. By using a mixture of basic chromium sulfate and phosphoric acid, together with a gum arabic solution, both operations may be combined.

The desensitizing solution may be varied over that shown above, while retaining the desirable properties of yielding both a desensitizing etch and a coating, provided the following range of proportions is observed: ½ to 1½ volumes of a solution of—

Basic chromium sulfate	grams	40–80
85% phosphoric acid	do	6–18
Water	cc	500

4 to 12 volumes of 14° Baumé gum arabic solution (at 25° C.).

Other variations may of course be made in my invention without departing from the scope of my invention, which is described in the claim.

This application is a division of U. S. application Serial Number 321,205, filed February 28, 1940, now Patent No. 2,291,854.

I claim:

A desensitizing etch for lithographic plates which is capable of producing a water-attracting surface, consisting of a mixture of basic chromium sulfate, phosphoric acid, gum arabic and water, in the range of proportions—½ to 1½ volumes of a solution of—

Basic chromium sulfate	grams	40–80
Phosphoric acid	do	6–18
Water	cc	500

4 to 12 volumes of 14° Baumé gum arabic solution (at 25° C.).

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