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METHOD OF PREPARING DIAZO PHOTO-LITHOGRAPHIC PLATES

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This invention relates to a process for fixing lithographic plates. The fixing process of the present invention relates particularly to the fixing of lithographic plates prepared from a type of light sensitive material which has been put on the market only recently. This light sensitive material consists of a layer of a light sensitive diazo compound coated on a base. To form the lithographic plates, the light sensitive material is exposed to light through a master. The diazo compound is decomposed into a greasy ink receptive substance in the light struck areas. Thus positive ink receptive images are obtained from negative masters and vice versa negative ink receptive images are obtained from positive masters.

Diazo compounds which are especially suitable in the light sensitive layer for this type of photosensitive material are the condensation products of diazo-diarylamines with formaldehyde. Cellulose acetate foils which have been saponified on their surface may be used as the base material. It is not necessary to add hardenable colloids such as glue to the light sensitive layer since the light decomposition products of these diazo compounds are in themselves ink receptive.

The undecomposed diazo compounds are not ink receptive but nevertheless it is necessary to remove them from the areas which have not been struck by light or to fix the plate in some other manner. If this is not done, the diazo compound in these areas will become partially decomposed during use of the plate so that these areas will gradually "scum up" and accept more and more of the greasy ink. It has been the practice to wash the undecomposed diazo compound from these lithographic printing plates with water. Treatment with sodium thiosulfate has also been proposed. These procedures have not, however, proven fully satisfactory in practice. The removal of the last remnants of the undecomposed diazo compound by washing with water is difficult, and even washing for a long time does not guarantee the complete removal of the undecomposed diazo compound. Neither does the treatment with thiosulfate result in an entirely satisfactory fixation. In these cases a strong tendency to scum develops more or less quickly during printing operations.

It has now been found that it is possible to fix lithographic plates which have been produced from light sensitive materials of the type described by treating the material, after its exposure behind a master, with a solution of a water soluble azo coupling component which contains hydrophilic groups and which will react with the remaining undecomposed diazo compound to form a hydrophilic azo dye which does not accept the greasy ink. It may be desirable to wash the exposed plate with water before treating it with the fixing solution which contains an azo coupling component in order to remove some or most of the undecomposed diazo compound.

It is advantageous using a solution of pH not greater than 9.0 because more alkaline solutions tend to soften the saponified surface of cellulose acetate foils so that they are more subject to damage. Furthermore, if the solution is not strongly alkaline, it is not necessary to wash it off the plate before installing the plate on the press and running the plate on the press with the fountain solution which is generally acid.

The new fixing process renders innocuous the remnants of the diazo compound which were not decomposed during the exposure by reason of their having been protected by the opaque parts of the master.

Azo coupling components containing sulfonic groups are especially well suited for this procedure. Those coupling components of high coupling energy are of particular advantage, since such energy permits their coupling to form azo dyes without the use of alkali. For example, sulfonic acids of compounds belonging to the pyrazolone series or their salts are very suitable; e. g. 1-(4'-sulfophenyl)-3-methyl-pyrazolone-(5), or its salts. Good results are also obtained for example with 2,3-dihydroxynaphthalene - 6 - sulfonic acid, 1,8 - dihydroxynaphthalene - 4 - sulfonic acid, 1,5 - dihydroxynaphthalene - 3,7 - disulfonic acid, 1,8 - dihydroxy -naphthalene-3,6 - disulfonic acid, 1 - amino - 8 - dihydroxynaphthalene - 3,6 - disulfonic acid (H-acid), or with the salts of these acids. Although it does not contain a sulfonic group, phloroglucinol may also be used as an azo coupling component according to the present invention. However, it should preferably be used in the form of a freshly prepared solution.

The hydrophilic azo coupling components to be used according to this invention are generally applied in the form of aqueous solutions. Other ingredients may be added to these solutions, for example, coupling-accelerating agents, buffer salts, glycerin, triethylene glycol, and other water-soluble softeners.

The following examples are inserted to illustrate the present invention:

(1) A superficially saponified cellulose acetate foil, saponified to a depth of 5 to 7 microns is coated with an aqueous solution containing three percent of the zinc chloride double salt of the condensation product of 1 mol of 4-diazodiphenyl-amine with 1 mol of formaldehyde and dried. This condensation product may be produced in sulfuric acid of 60° Bé. The light sensitive material is exposed to light under a negative master. The exposed material is then treated with a solution of a pH of about 6.8 that has been produced by dissolving in 100 cc. of water, 5 g. of 1-(4'-sulfophenyl)-3-methyl-pyrazolone-(5), 5 g. of trisodium phosphate, and 10 g. of triethylene glycol. Finally, the fixed plate is inked on an offset lithographic printing machine. A positive printing plate is thus obtained which is not affected by further exposure to light. It is not necessary to rinse or wash off the plate after treatment with the fixing solution because the pH of the fixing solution is on the acid side of the neutral point.

(2) A superficially saponified cellulose acetate foil, rendered light sensitive as described in Example 1, is exposed to light under a negative master and then washed with water. In order to achieve a complete coupling of the remaining diazo compound there is applied an aqueous solution of a pH of about 8.4 containing five percent of sodium - 2,3 - dihydroxynaphthalene - 6 - sulfonate, one half percent of soda, and ten percent of glycerin. The plate is finally prepared for the press according to the procedure of Example 1.

The fixing of the plate can also be carried out after the plate has been installed on the press. One method of doing this is to add the coupling component to the fountain solution.

Having thus described our invention what is claimed is:

1. The process of forming lithographic printing plates from a saponified acetate foil coated with an ink repellent diazo compound which decomposes into a greasy ink receptive substance upon exposure to light said compound being obtained by the condensation of diazo-diarylamine with formaldehyde, comprising the steps of exposing said foil to a light image, treating the foil after exposure to light with an aqueous solution containing a water soluble azo coupling component of high coupling energy containing hydrophilic groups which couples with the undecomposed diazo compound in the unexposed areas to form an ink repellent dye, and thereafter applying ink in the presence of water to said foil.

2. The process of forming lithographic printing plates

from a saponified acetate foil coated with an ink repellent diazo compound obtained by the condensation of a diazo-diarylamine with formaldehyde and which decomposes into a greasy ink receptive substance upon exposure to light comprising the steps of, exposing said foil to a light image, treating the plate after exposure to light with an aqueous solution containing an azo coupling component of the pyrazolone series of high coupling energy containing hydrophilic groups which couples with the undecomposed diazo compound in the unexposed areas to form an ink repellant dye, and thereafter applying ink in the presence of water to said foil.

3. The process of forming lithographic printing plates from a saponified acetate foil coated with the condensation product of an ink repellent diazo-diarylamine with formaldehyde which decomposes into a greasy ink receptive substance upon exposure to light comprising the steps of, exposing said material to a light image, treating the plate after exposure to light with an aqueous solution containing an azo coupling component selected from the group consisting of compounds of the pyrazolone series of high coupling energy containing a sulfonic acid group and their salts which couples with the undecomposed diazo compound in the unexposed areas to form an ink repellant dye, and thereafter applying ink in the presence of water to said foil.

4. The process of forming lithographic printing plates from a saponified acetate foil coated with the condensation product of an ink repellent diazo-diarylamine with formaldehyde which decomposes into a greasy ink receptive substance upon exposure to light comprising the steps of, exposing said material to a light image, treating the plate after exposure to light with an aqueous solution containing an azo coupling component selected from the group consisting of high energy components containing a sulfonic acid group and their salts which couples with the undecomposed diazo compound in the unexposed areas to form an ink repellant dye, and thereafter applying ink in the presence of water to said foil.

5. The process of forming lithographic printing plates from a saponified acetate foil coated with the condensation product of an ink repellent diazo-diarylamine with formaldehyde which decomposes into a greasy ink receptive substance upon exposure to light comprising the steps of, exposing said material to a light image, treating the plate after exposure to light with an aqueous solution containing an azo coupling component selected from the group consisting of dihydroxy-naphthalene sulfonic acids and their salts which couples with the undecomposed diazo compound in the unexposed areas to form an ink repellant dye, and thereafter applying ink in the presence of water to said foil.

6. The process of forming lithographic printing plates from a saponified acetate foil coated with the condensation product of an ink repellent diazo-diarylamine with formaldehyde which decomposes into a greasy ink receptive substance upon exposure to light comprising the steps of, exposing said material to a light image, treating the plate after exposure to light with an aqueous solution containing an azo coupling component selected from the group consisting of 2,3-dihydroxynaphthalene-6-sulfonic acid and its salts which couples with the undecomposed diazo compound in the unexposed areas to form an ink repellant dye, and thereafter applying ink in the presence of water to said foil.

7. The process of forming lithographic printing plates from a saponified acetate foil coated with the condensation product of an ink repellent diazo-diarylamine with formaldehyde which decomposes into a greasy ink receptive substance upon exposure to light comprising the steps of, exposing said material to a light image, treating the plate after exposure to light with an aqueous solution containing an azo coupling component selected from the group consisting of 1,5-dihydroxynaphthalene-3,7-disulfonic acid and its salts, and thereafter applying ink in the presence of water to said foil.

8. The process of forming lithographic printing plates from a saponified acetate foil coated with the condensation product of an ink repellent diazo-diarylamine with formaldehyde which decomposes into a greasy ink receptive substance upon exposure to light comprising the steps of, exposing said material to a light image, treating the plate after exposure to light with an aqueous solution containing an azo coupling component selected from the group consisting of 1,8-dihydroxynaphthalene-3,6-disulfonic acid and its salts, and thereafter applying ink in the presence of water to said foil.

9. The process of forming lithographic printing plates from a saponified acetate foil coated with the condensation product of an ink repellent diazo-diarylamine with formaldehyde which decomposes into a greasy ink receptive substance upon exposure to light comprising the steps of, exposing said material to a light image, treating the plate after exposure to light with an aqueous solution containing an azo coupling component selected from the group consisting of 1,8-dihydroxynaphthalene-4-sulfonic acid and its salts, and thereafter applying ink in the presence of water to said foil.

10. The process of forming a lithographic printing plate from a saponified acetate foil having a surface thereof coated with an ink repellent diazo compound which decomposes into a greasy ink receptive substance upon exposure to light obtained by the condensation of a diazo-diarylamine with formaldehyde comprising the steps of exposing the coated surface of said foil to a light image, after exposure treating said coated surface with an aqueous solution containing a sulfonated phenylmethyl pyrazolone which couples with the undecomposed diazo compound in the unexposed areas to form an ink repellant dye, and thereafter applying ink on said coated surface in the presence of water.

11. The process of forming a lithographic printing plate from a saponified acetate foil having a surface thereof coated with an ink repellent diazo compound obtained by the condensation of a diazo-diarylamine with formaldehyde comprising the steps of, exposing the coated surface of said foil to a light image whereby those areas of said coated surface which are struck by light become ink receptive and the remaining areas of said coated surface are unaffected, treating at least said remaining areas with an aqueous solution of a sulfonated phenylmethyl pyrazolone to prevent said remaining areas from becoming ink receptive and thereafter applying ink in the presence of water on said areas struck by light.

12. The process of forming a lithographic printing plate from a saponified acetate foil having a surface thereof coated with the condensation product of an ink repellent diazo-diarylamine with formaldehyde comprising the steps of, exposing the coated surface of said foil to a light image whereby those areas of said coated surface which are struck by light become ink receptive and the remaining areas of said coated surface are unaffected, treating the plate after exposure to light with an aqueous solution containing an azo coupling component selected from the groups consisting of the sulfonic acids of the pyrazolone series, the sulfonic acids of poly-hydroxynaphthalenes and the sulfonic acids of amino-hydroxynaphthalenes to prevent said remaining areas from becoming ink receptive, and thereafter applying ink in the presence of water on said areas struck by light.

13. The process of forming a lithographic printing plate from a saponified acetate foil having a surface thereof coated with the condensation product of an ink repellent diazo-diarylamine with formaldehyde comprising the steps of, exposing the coated surface of said foil to a light image whereby those areas of said coated surface which are struck by light become ink receptive and the remaining areas of said coated surface are unaffected, treating at least said remaining areas with an aqueous solution containing an azo coupling component selected from the group consisting of 1-(4'-sulfophenyl)-3-methyl pyrazolone-(5)- and its salts to prevent said remaining areas from becoming ink receptive, and thereafter applying ink in the presence of water on said areas struck by light.

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