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PROCESS OF MAKING A LITHOGRAPHIC PRINTING PLATE

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FIG. 1A. UNEXPOSED FILM



FIG. 1B. AFTER EXPOSURE & PROCESSING OF PHOTOGRAPHIC EMULSION

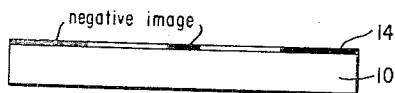


FIG. 1C. APPLICATION OF DIAZO OR OTHER PLATE COATING



FIG. 1D. EXPOSURE OF PLATE COATING

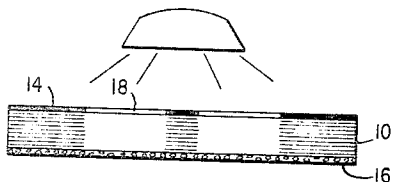


FIG. 1E. AFTER PROCESSING OF PLATE COATING; FINISHED PLATE

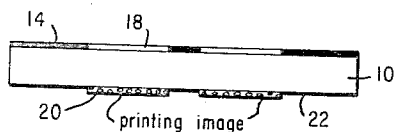


FIG. 2A. CONSTRUCTION OF PLATE



FIG. 2B. AFTER EXPOSURE & PROCESSING OF PHOTOGRAPHIC EMULSION; DYE DISSOLVED IN PROCESSING SOLUTIONS

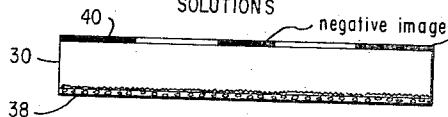


FIG. 2C. EXPOSURE THROUGH PHOTOGRAPHIC IMAGE TO DIAZO COATING

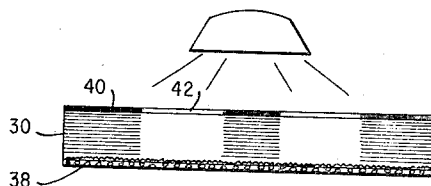
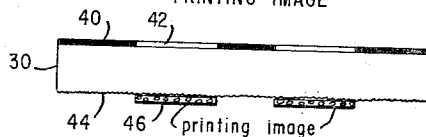


FIG. 2D. AFTER PROCESSING OF DIAZO PRINTING IMAGE



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1

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PROCESS OF MAKING A LITHOGRAPHIC PRINTING PLATE

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This invention relates to preparation of plates for printing by the offset, planographic or lithographic method.

Conventionally, when printing by the lithographic, offset or planographic method, the original design or printed matter which is to be reproduced is photographed to provide a film negative. The film is then placed in contact with a plate which may consist of metal, paper or plastic to which has been applied a light sensitive coating.

Light is then directed through the film to the plate to expose the plate coating. Only the clear or non-image portions of the film will pass the light, and when the unexposed portion of the plate coating is removed a positive image is formed on the plate. The plate coating is generally ink-receptive and the non-image or non-coated area of the plate is hydrophilic (water receptive). The plate is placed in an offset press and water is fed to the plate from one set of rollers and ink from another set. Applying the principle that water and grease do not mix, the background, or water receptive portion of the plate rejects the ink, and the image area accepts the ink and rejects the water. The ink image is transferred, or "offset" to a cylinder covered with a rubber blanket, which in turn transfers it to paper.

It is an object of this invention to prepare a lithographic printing plate using as the plate the original film with an image exposed thereon.

A further object is to provide a process by which the same film can be used for both the original photograph and as the printing plate.

Another object is to provide a printing plate so constructed that a photographic image can be formed on one surface of the plate from an original design or print, and a printing image formed on the opposite surface of the plate.

Another object is to provide a novel method of forming a design for printing purposes on a polyester base.

The foregoing and other objects are achieved by the provision of a film having a dimensionally stable base of plastic such as polyester, polystyrene or polycarbonate. A photographic image, for example a negative image, is formed on the emulsion of the film and the opposite surface of the film is coated with a light-sensitive plate coating which may be of the diazo type. The plate coating is applied to the side of the film which will give the desired orientation of the design to be reproduced when the coating is exposed through the opposite side. The plate coating is then exposed to light directed through the photographic image from the other side of the film.

The original photographic image may be a positive, in which case the plate coating may be of the type commonly referred to as "positive working" plate coatings. Positive working plate coatings and processes of the diazo and other types may be exposed from a positive photographic image to produce a positive plate image. It may also be desirable in some cases to form a negative printing image on the plate coating from the photographic image. Accordingly, as employed throughout the following description, the term "photographic image" is intended to apply to either a positive or negative image.

Instead of applying the plate coating to the side of the

2

film base opposite the photographic image, the plate coating may be applied to the same side as the photographic emulsion, that is, the plate coating may be applied over the photographic image. This would have some advantages, namely, the intimate contact between the image and the plate coating, and avoidance of the necessity of "projecting" the image through the base of the film. In any case the plate coating may be applied to either side of the film base.

Exposure of the plate coating renders the exposed portion of the plate coating capable of being further processed or developed into a finished press plate. After processing the plate coating, the non-image portion of the film is water receptive and the image portion formed by the plate coating is ink receptive.

Re-use of the plate for purposes of remaking the worn or damaged printing image, or selectively printing different portions of the design is accomplished by removing the used plate image and recoating the plate. The plate is then exposed and processed in a manner described above. The reexposure and re-use of the plate is possible due to the fact that the identical design or portions of it, in exactly the same orientation, is formed on the back of the plate and is consequently in proper orientation for the reexposure. Where a separate plate medium is used, difficult problems of orientation and registration of one image to another are encountered.

When sensitizing the plate with the plate coating, selected areas of the image or design may be sensitized with the exclusion of other areas. This would be extremely difficult where a separate plate medium is employed since it would be almost impossible to define the proper areas.

In a modification of the invention, a photographic emulsion is applied to one side of a base over a soluble anti-halation dye layer with the opposite side of the film having applied thereto a plate coating. The anti-halation dye layer permits the photographic emulsion to be exposed without exposing the plate coating on the opposite side of the film. Processing of the photographic emulsion dissolves the anti-halation dye and leaves a photographic image on the front surface of the film. Thereafter, exposure through the image forms a printing image on the plate coating at the opposite side of the film.

Other objects and advantages will become apparent from the following description and examples taken in connection with the accompanying drawings, in which FIGS. 1A through 1E are sectional views of a film base at the various stages of the process of the invention and FIGS. 2A through 2D are sectional views illustrating the process employing a pre-sensitized film.

With reference to FIGS. 1A through 1E, a film base of dimensionally stable plastic which is light permeable such as polyester, polystyrene or polycarbonate, is coated on one side with an emulsion such as silver halide. Many films are provided with frosted or grained surfaces which render them translucent. Accordingly, the term "light permeable" as employed herein includes both materials which are transparent and materials which are translucent. The film is exposed and processed to form a photographic image, in this case a negative image 14 on emulsion 12 (FIG. 1B).

The film is then coated on the opposite side from the image with a light sensitive lithographic plate coating 16 (FIG. 1C). Prior to the application of plate coating 16, the parts of the design on the opposite side of the film can be opaqued, taped or treated to remove portions of image 14. Removal of the unwanted parts of image portion 14 can be accomplished with scraping tools or by the use of chemical reducers or etching solutions such as sodium hypochlorite. Additions can also be made to the de-

sign by stripping the open, or non-image areas 18 with separate films of the design changes.

When the design changes have been completed and the plate coating applied to the side of the film opposite the design, the coated film is placed in front of a light source with the negative image adjacent the light (FIG. 1D). The light passes through the non-image portions 18 and exposes the plate coating 16 but is prevented from passing through the image portions 14. Accordingly, a positive image is formed on the rear face of the base by the exposure of plate coating 16. The non exposed portions of the plate coating are removed and a positive printing image 20 is formed on the rear face of the base with the non image portion 22 corresponding to the image portion 14 on the front face of the base. The non image portion of the film is hydrophilic and the image portion 20 is ink receptive. The plate may then be placed on a printing press and run similarly to any other lithographic plate. Again, it should be pointed out that the terms "negative" and "positive" as employed in the above description are terms of convenience only and should not be construed in a limiting sense.

As pointed out previously, plate coating 16 may be applied to the same side of base 10 as image 14. In this case the plate coating would be applied on top of the image 14 and would be exposed through the uncoated side, i.e., the side opposite that illustrated in FIG. 1D.

A specific example of the invention will now be described which is illustrative only.

Example

A sheet of polyethylene terephthalate polyester film having a silver halide photographic emulsion is exposed, developed, fixed, washed and dried to form a negative image.

A diazo sensitizer, consisting of a 3% solution of a formaldehyde condensation product of 1 diazo, 4,4' diphenylamine in ethyl alcohol is applied by pouring a pool of the solution in the center of the film and spreading it evenly over the surface with a dampened cellulose sponge. The coating is allowed to dry thoroughly. The diazo sensitized film is then placed in a vacuum frame with the sensitized surface furthest from the light source and exposed to a 90 amp arc lamp placed five feet from the surface of the printing frame for a period of three minutes.

A developer, consisting of one gallon of 6 degree Bé. gum arabic and 2 ounces of phosphoric acid is applied to the exposed plate image with a cheese cloth pad saturated with the solution. The object is to remove the unexposed coating, thus de-sensitizing the non-image area.

Keeping the film surface wet by applying a dampened sponge, a stiff, greasy litho ink is rubbed into the image area. The film is mounted on a Multilith model 1250 offset press in the same manner as any plate.

A fountain solution is prepared by mixing 20% sodium dioctyl sulfosuccinate, 3% sodium salt of carboxy methyl cellulose, and .01% sodium hydroxide in water. One part of this solution to 20 parts water is used in the fountain of the press dampening system.

The plate is wiped with a cotton pad saturated with a full strength solution of the above concentrate and is then rolled up and printed using ordinary offset inks and paper.

Diazo sensitizers generally consist of aqueous solutions of water soluble light sensitive diazonium compounds. The percent of diazonium compound can vary between 1 and 5%. The diazonium compounds are of a class of diazo resins formed by reaction between para-diazodiphenyl amine and formaldehyde and are disclosed in U.S. Patent 2,063,631. Any of the well known diazo sensitizers may be applied to the film base. The sensitizer may be either the diazonium compound dissolved in ethyl alcohol or plain water.

FIGS. 2a, b, c and d illustrate a photographic film and

printing plate incorporated into a single unit. The film base is identified by reference numeral 30 and consists of plastic material such as polyester, polystyrene or polycarbonate having a grained hydrophilic surface 32. Applied to the front surface of the base is a soluble anti-halation dye layer which in turn is coated with a photographic emulsion 36. The rear surface 32 of the base is covered by a plate coating 33. Thus a printing plate and photographic film is incorporated into a single unit.

The photographic emulsion is exposed in the usual manner and the anti-halation dye layer 34 prevents the light from exposing the plate coating 33 on the rear surface of the film base. In most cases the anti-halation dye layer may be unnecessary since the amount of time required to expose the photographic emulsion is substantially less than the time required to expose the plate coating. When the photographic emulsion is processed, the anti-halation dye layer is dissolved in the developing solutions and a negative image 40 is formed on the front face of the film.

The plate coating 38 is then exposed through the film base to form a positive, printing image on the rear face of the film base as previously described. The image portion of the design on the front face prevents the passage of light and the non-image portions 42 permits the light to expose the plate coating.

The plate coating is then processed to remove the non-exposed portions and form a hydrophilic surface 44 and a positive image, ink-receptive surface 46 for printing. The grained surface 32 performs the function of carrying the water necessary on the non printing area of the press plate. However where a film is used not having this grain, the gelatin or other colloidal material in the film emulsion performs this function instead.

It should be understood that the initial photographic image on the front face of the film can be formed by other processes than the conventional silver halide emulsion. For example other methods of forming the negative image are the diazo, electrostatic, electro chemical, silver stabilization, and photo polymers. For the purpose of forming the initial photographic image on the opposite face of the film from the printing image, any of the above processes may conceivably be used.

It will be understood that the examples and modifications included herein are illustrative only and that the invention is not limited to the specific examples illustrated. Various alterations and modifications can be made without departing from the scope of the invention as defined by the appended claim.

What is claimed is:

A method of preparing a unitary lithographic printing plate comprising:

coating one face of a light permeable plastic base selected from the group consisting of polyester, polystyrene and polycarbonate with a soluble anti-halation dye and a photographic emulsion over the anti-halation coating on one face, said light permeable plastic base having a grained hydrophilic surface on the opposite face;

applying a light sensitive plate coating comprising a dilute solution of a diazo formaldehyde condensation product to the other face of the base;

exposing the photographic emulsion to light projected from a design to render portions of the emulsion insoluble;

applying a developer to said one face to remove the unexposed portions of the emulsion and the anti-halation dye forming the photographic image of the design on said one face;

exposing said other side to light projected through the base from said one side to render portions to the plate coating insoluble and developing the plate coating to remove the unexposed portions of the plate coating and form a reproduceable printing image on said other side of the base.

5

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6

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