PHOTOGRAPHIC REGISTRATION AND COMPOSITING RESISTS FOR
ETCHING GRAVURE CYLINDERS

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This invention relates to a method of and apparatus for preparing resists suitable for use in etching gravure cylinders.

Conventionally, such resists are prepared from "carbon tissue." This term designates paper having a gelatin coating. Before use this gelatin coating is rendered light sensitive by treatment with a dichromate solution. This "sensitized" carbon tissue is characterized by low light sensitivity, as compared with conventional silver halide-gelatin emulsions used in ordinary photographic films. For instance, at a light intensity of 20 foot candles, similar results are obtained by exposing sensitized carbon tissue for 5 hours; a fast silver halide emulsion for 40 seconds; and a slow silver halide emulsion for 2 or 3 minutes. In other terms, equivalent exposure is obtained by exposing carbon tissue to an amount of light energy on the order of 350,000 foot candle seconds; a fast silver halide emulsion to 800 foot candle seconds; and a slow silver halide emulsion to about 2,000 to 3,000 foot candle seconds. The range of speeds extending from "fast" to "slow" as applied to silver halide-gelatin emulsions in this paragraph is hereinafter referred to as "camera speed."

When sensitized carbon tissue is used to prepare a gravure resist, conventional or standard practice involves first making a photographic negative from the original art copy, then preparing a positive from this negative, and finally exposing the carbon tissue to contact printing with this positive under intense illumination. One reason, among others, why this procedure is conventional is the fact that any enlargement or reduction in size of the original copy must be taken care of in the photographic negative or positive is prepared, since the conventional contact printing exposure of the carbon tissue does not permit any enlargement or reduction in size.

The present invention is particularly concerned with the reproduction of copy of the type furnished for the gravure printing of catalogues. Catalogue pages contain both text or type matter and a number of separate illustrations, the various parts of all this matter being positioned properly ("in register") with respect to each other on each printed page. The copy, as furnished to the printer, is made up of two separate parts: text or type matter and art work. The text or type matter is prepared for use in making a resist in the form of one or more positive transparencies. The term "transparency" signifies a transparent sheet of cellulose acetate or the like carrying the text matter as opaque type applied thereto by any suitable conventional method; for instance, by printing from a type form or by photocomposition. The type copy is, as a rule, of the exact size to be reproduced on the printed page. The art copy is made up of one, or usually more than one, piece of art work, each, as a rule, of a size requiring the same enlargement or reduction in size before the resist is made. Specifically, the art copy usually consists of a light drawing or reduction in order at least to effect proper proportioning with respect to the type matter. For instance, the art copy may require a size reduction from 1½ to 1 while the type copy is furnished in the exact size to be reproduced. For preparation of a resist according to the present invention, this art work is mounted on suitable sheet material as described in detail hereinafter.

The present invention provides a method and a photographic device for use in preparing gravure resists from the original copy described in the preceding paragraph. The invention may be used in the preparation of a resist directly from the copy or in the preparation of the intermediate negative or positive produced in the conventional method of making gravure resists, as mentioned hereinabove.

According to the present invention, the separate pieces of art work are mounted on an at least slightly translucent sheet, in the relative positions in which they are to appear on the printed page. This sheet must be white, and should transmit at least 5 percent of white light. For this purpose, so called "artist's board" may be used. That side of the sheet carrying the art work is hereinafter referred to as the front side, the other side as the rear side. The rear side of the sheet is opaque exclusively behind the art copy, so that no light can penetrate the art copy while at least a small amount of light can still penetrate the slightly translucent sheet outside the art copy. Such opaquing can be carried out by any suitable conventional method, as by manual application of an opaque ink, by application of opaque tape, or by application of an opaque mask. If desired, the art work itself can be opaqued on its rear side before it is mounted on the translucent sheet.

The above described translucent sheet carrying the art work and the transparency carrying the type matter are both placed in the photographic printing device of the present invention, for effecting simultaneous or concurrent printing exposure thereof on a light sensitive film.

In the photographic printing device of the present invention, the sheet carrying the art copy is illuminated on both sides. The art copy is projection printed on the light sensitive film exclusively by reflected light. Note that the opaquing of the rear side of the art work prevents penetration of the art work by the light illuminating the rear side of the translucent sheet. However, this light can penetrate the sheet in question outside the art copy, so that these outside sheet areas, under the influence of both reflected and transmitted light, will print when exposed to light. The printed areas were brilliantly white, and, therefore, also more white than any part of the art work. In this manner, the background around the art work is "dropped out" and reproduces as a uniformly white surface surpassing the whiteness of any part of the art work. It should be remembered, in this connection, that a photographic negative is obtained in the printing step described in this paragraph, and that this negative, after development and when used as a resist, will protect the gravure cylinder against etching proportionally to the amount of exposure locally received by the light sensitive film. Hence, white copy areas, which permit intense exposure, yield lightly etched cylinder areas, and these lightly etched cylinder areas transmit only small amounts of ink to the paper being printed. The same is true when the negative is not used directly as a resist but is reproduced photographically as a positive which is then used to make a resist.

At the same time as the art copy is projection printed on the light sensitive film, with its background dropped out, the type matter is contact printed on the film. For this purpose, and before the film is exposed, the transparency carrying the type matter in the form of opaque characters is placed on the film in proper relative position or register with respect to the art copy, so that the type matter will be reproduced in the desired position on the printed page.

It will be noted that the type matter is printed on the film in its original size. The art copy, on the other hand, may be enlarged, or reduced, as desired, as it is projection printed. In exceptional cases, the art work may be printed in its original size. Both type and art copy are
printed in a single exposure, which also serves to drop out the art background.

The photographic printing device of the invention is illustrated diagrammatically in the accompanying drawings, in which:

FIG. 1 is a plan view of the device;
FIG. 2 is a section taken substantially as indicated along the line 2—2 of FIG. 1; and
FIG. 3 is an end elevation as indicated by the line 3—3 of FIG. 2, except part of the enclosure broken away. As shown in the drawing, the device in question includes a box-like enclosure indicated generally at 10 and having vertical side walls 12 and 14, and vertical end walls 16 and 18 all connected to a horizontal bottom 20. The end wall 16 is continued upwardly by a glass wall 22 which slopes inwardly at about 45°, while the other end wall 18 is continued upwardly by a glass wall 24 also inclined inwardly at about 45°. Note that the glass wall 24 is larger in area than the glass wall 22. The top of the device is closed by offset horizontal walls 26 and 28 connected by a vertical wall 30. The box-like structure 10 defined by the above described elements is light tight except for the glass walls 22 and 24.

Within the enclosure 10 suitable light sources such as sets 32 and 34 of fluorescent tubes are provided for directly and uniformly illuminating the glass wall 24 and also for illuminating the glass wall 22 by means described as follows. A tubular shield 36, of rectangular cross sectional shape, has one end of the same size as the glass wall 22 attached to the edges of the latter and extends inwardly into the box 10 in a direction normal to the glass wall 22. As shown, the shield tapers towards the inner, unattached end, and there supports a lens system 38 and a reflecting reversing prism 40.

The device of the drawings further includes a movable cover 42 for the glass wall 22 supported by a bracket 44, and a movable cover 46 for the glass wall 24, flanged as indicated at 48 and supported by a bracket 50. A source of light, such as a set of fluorescent light bulbs, is supported from the flanges 48 within the enclosure defined by these flanges, the cover 46 and the glass wall 24. A transparent plate 54 overlies the glass wall 24 beneath the cover 46, for urging thereagainst a translucent sheet 56 carrying the art work (as described hereinafter) with its front side contacting the glass wall 24. A tubular cover or carrying the type matter is indicated in the drawings by the reference numeral 58, and a light sensitive film by the reference numeral 60; and these are supported, as shown, with the transparency contacting the glass wall 22, the film contacting the transparency, and both held down by the cover 42.

The optical system of the device of the drawing is so arranged as to project onto the film 60 and unversed image of the art work on the sheet 56, at any desired reduction in size, or, if necessary, any desired enlargement, or, exceptionally, without any change in size. For this purpose, the optical system may include any conventional lens system 38 and reflecting reversing prism 40.

In the use of the apparatus, the sheet 56 is first fixed on the glass wall 24 as by taping it, the transparency 58 is similarly disposed on the glass wall 22, and a translucent sheet is placed over transparency 58, in place of the sensitive film 60. The device may then be used as a viewer, by inspecting the translucent sheet to see the relative positions of the sheet 56 and the transparency 58, since an image of the art work on the sheet 56 is projected through the glass wall 22 onto the translucent sheet, and at the same time, the transparency 58 is seen through the sheet. At this time, the relative positions of the sheet 56 and of the transparency 58 may be adjusted for proper registration.

When register has been obtained, the translucent sheet is removed, the film 60 is superimposed over the transparency 58, and the cover 42 is placed on top of the film to hold them both firmly against the glass wall 22. The cover 42 may be opaque, to exclude all external light from the film 60. On the other hand, it is often preferred to dispose the left portion of the enclosure 10 within a darkroom, which permits the use of a translucent cover 42 and eliminates the need for a separate translucent sheet when the images of the sheet 56 and the transparency 58 are being adjusted for registration.

The cover 42 and plate 54 may be replaced, if desired, with other conventional devices for holding the sheets or films firmly against the glass walls 22 and 24; for instance, conventional vacuum frames, which may be transparent or opaque, as required.

When the transparency 58 and the sheet 56 have been disposed in proper registration, the film 60 has been placed over the transparency, the cover 42, and transparent plate 54 have been disposed over the film 60 and the sheet 56, respectively, the cover 46 carrying lamps 58 in closed and the film 60 is exposed by using only the light from the light sources 32, 34 and 52. This exposure is carried out under such conditions as are appropriate in view of the light sources, film and copy being used, as will be apparent to anyone skilled in the art.

When some type matter takes the form of reverse type (white type on a black or gray background), supplied in the form of a positive transparency, the transparency 58 may be replaced by the transparency carrying the reverse type, and a second exposure of the film 60 may then be carried out exactly as described hereinabove, but with sheet 56 removed and a translucent sheet substituted therefor.

For preparing a resist directly from the copy, i.e., without preparing an intermediate negative and positive, as is done conventionally, the light sensitive film mentioned hereinabove may be sensitized carbon tissue or, preferably, a silver halide-gelatin emulsion of camera speed supported by a strippable backing film or layer. This emulsion may be panchromatic, orthochromatic, or blue sensitive. Examples of such films are disclosed in U.S. Patent Nos. 2,628,903, 2,638,417, 2,650,877, 2,650,878, 2,907,567 and 2,976,147. In such films, the exposed emulsion areas are selectively hardened and after development from the desired resist.

For preparing a finished resist directly from copy, other and further steps are required besides the exposure previously described. For instance, a screening exposure of the film must be carried out before the second exposure of the present invention. In the case of exposed carbon tissue, the further treatments and steps are conventional and so well known in the art that no description thereof is needed. The further treatment of a light sensitive film containing a silver halide-gelatin emulsion includes developing, fixing, washing, selective hardening, drying, laying down on the cylinder, and removal of the stripable support before etching is done. All these steps are carried out in conventional fashion; for instance, as disclosed in the above identified U.S. patents. Further, as may be desired, the film (either carbon tissue or a silver halide-gelatin emulsion) may be subjected to supplemental exposures, as for compressing the density range of the finished resist, or for insuring equal density of type matter and heavy portions of the art copy, and the like. Such supplemental exposures are within the skill of the art.

The present invention may also be used in the preparation of the above noted negative and positive reproductions conventionally made (on a light sensitive silver halide-gelatin emulsion) in the course of making a resist. Specifically, in making such a negative reproduction, it need not be made of the exact size of the finished resist, since it may be enlarged or reduced when the positive reproduction is made. In this specific case, the present invention may be used for establishing precise proportions as between type matter and art copy, without necessarily having the type matter (on the positive reproduction) of the exact size desired in the resist. It is possible, therefore, in such a case, to have the original
The present invention may also be applied to the preparation of an autostereoscopic photographic reproduction of the original copy, for subsequent use in the preparation of a resist. Many details may be varied without departing from the principles of this invention, which are set forth in the appended claims. While this invention has been disclosed and described as specifically applied to the preparation of gravure resists, it should be understood that it may be used whenever it is desired to drop out background to art copy combined with type matter as described hereinabove.

I claim:

1. In a method of preparing a gravure resist or the like, the steps comprising providing first copy in the form of a transparency, providing opaque second copy mounted on a slightly translucent sheet which provides a background for the second copy, and concurrently exposing a light sensitive film to contact printing through said transparency and to projection printing both with light reflected from said second copy and with light transmitted through said translucent sheet, whereby the background of said second copy is dropped out as said first copy and second copy are reproduced on said film.

2. In a method of preparing a gravure resist or the like, the steps comprising providing a light sensitive film, providing art copy in the form of separate pieces of opaque art work mounted on the front side of a translucent sheet, disposing said film in a photographic printing device, disposing said transparency in said printing device in front of said film for contact printing on said film of said type matter, disposing said sheet in said printing device spaced from said film for projection printing on said film of said art work, and concurrently illuminating said transparency and both front and rear sides of said sheet while projecting on said film an image of said art work, whereby said art work is printed on said film with its background dropped out.

3. A method of preparing a gravure resist directly from copy, said method comprising providing a film having a front layer of light sensitive resist-forming silver halide-gelatin emulsion of camera speed and also having a stripable supporting rear layer, providing type copy in the form of a positive transparency to be reproduced in its original size, providing art copy in the form of separate pieces of art work, mounting said pieces of art work on the front side of a translucent sheet, opaquing the rear sides of said pieces of art work, disposing said transparency in contact with the front side of said film, disposing said sheet in spaced relationship to said transparency and in a position such that an image of said art work may be projected onto said film in registration with the type copy of said transparency, and concurrently making a photographic printing exposure of said film through said transparency and a photographic projection printing exposure of said film with light reflected from said art work and projected through said transparency onto said film, said translucent sheet being simultaneously illuminated from the rear, whereby the background of said art work is dropped out.

4. The method of claim 1 in which the first copy is type copy and the second copy is art copy.

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