June 22, 1943. J. J. ORMOND 2,322,540

METHOD OF MAKING PRINTING MEMBERS

Filed Oct. 25, 1940

Fig. 1.

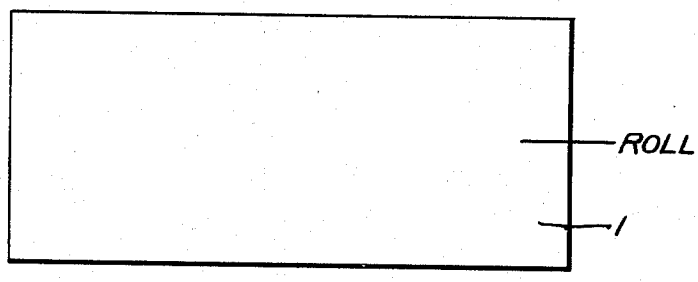


Fig. 2.

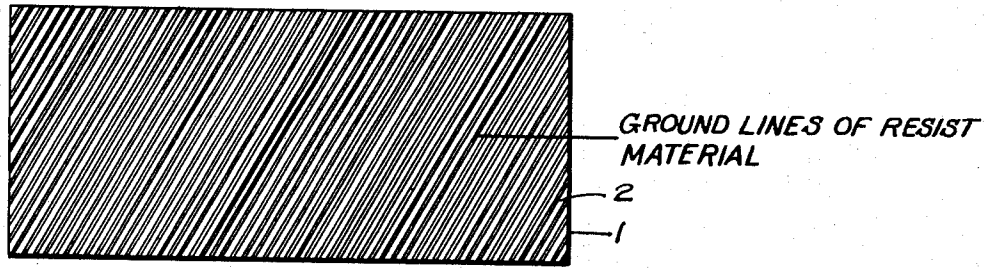


Fig. 3.

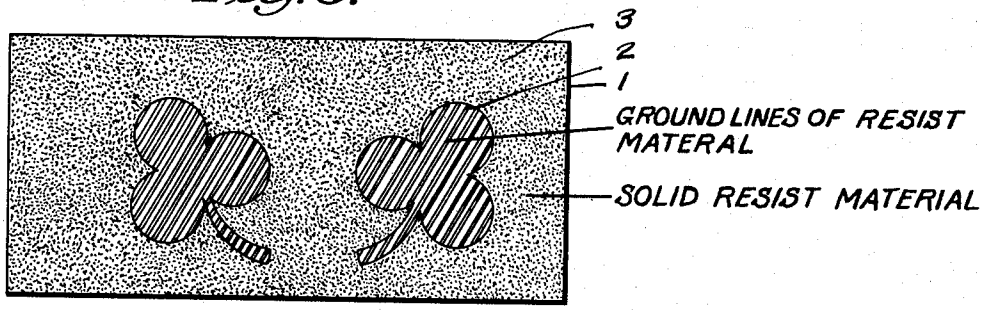
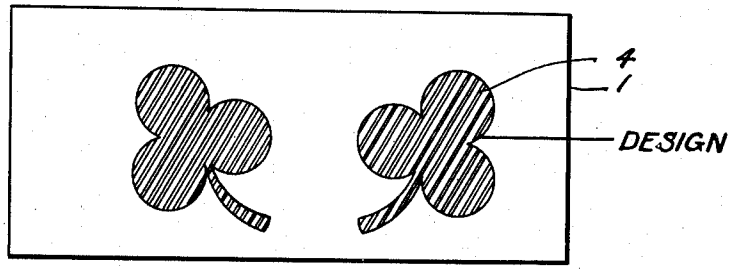


Fig. 4.



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METHOD OF MAKING PRINTING MEMBERS

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4 Claims. (Cl. 95—5.3)

This invention relates to methods of making printing members and more especially to methods of preparing printing members for mechanically reproducing multicolor subject matter.

It is a principal object of the present invention to improve methods of making printing plates and other printing members, and to devise new methods of applying and treating acid resist materials in connection with etching, with a view to eliminating some procedures now employed and to facilitating others, whereby very considerable saving in time and materials is effected, better quality of printing is obtained, and a wider range of color values secured. The invention also aims to combine a quick method of making a set of color printing plates with a novel method of applying resist material to printing members to be engraved. It is a further object of the invention to introduce an improved method of engraving particularly suited to the preparation of printing rolls for printing on textile materials, to present a novel method of forming a grained printing surface, and to indicate improved methods of registering printing members.

A more complete understanding of the invention and its objects will be had from the following description, and the novel features will be more particularly pointed out in the appended claims.

In the accompanying drawing:

Figure 1 is an elevational view of a printing roll;

Fig. 2 is another elevational view illustration application of resist material;

Fig. 3 is still another elevational view illustrating a second application of resist material; and

Fig. 4 is an elevational view illustrating a finished roll.

In accordance with the method of the invention, novel preparation of a set of printing plates for mechanically reproducing multicolor subject matter is effected. This consists in photographing multicolor subject matter with color film of the type made up of a plurality of superimposed layers of emulsions, each of which is sensitive to light of a particular color. One example of a color film of the type referred to is "Kodachrome." Exposure of a film of this type provides a color negative which according to well known procedures is developed to form a transparent colored dye reproduction of the subject matter which may be considered as a color positive. Since each of the colors in the original subject matter is present in the color positive, it is possible to carry out in a dark room a series of exposures through the color positive and separate color filters on printing plates containing coatings of light-sensitive material. By the method of the invention, a light-sensitive material is provided which can be suitably exposed by light passing through the color positive and the color filter, and which is of a character adapted to resist acid. By this means, an acid-resisting ground is selectively applied on a plate surface and etching may thereafter be satisfactorily effected in the usual manner, to provide relief printing plates having raised or printing portions corresponding to color sections in the color positive. One example of a material which is suitably sensitive to light passed through the color positive and the filter, and which is also suitably acid-resisting, consists of a mixture of a thinned light-sensitive asphalt and rosin.

The method of exposing with a color positive and color filter may be employed for making various types of plates other than relieved or engraved plates, as for example intaglio printing plates or surface printing plates such as lithographic printing plates. The film exposure of light-sensitive coatings on printing members by means of a color positive of the character described may be effected by employing a size of color film large enough to permit contact exposure of the color positive with the sensitized surface coating, or a smaller size of color film may be used and the colored image projected and enlarged to a desired size corresponding to the areas of the light-sensitive coating on the plate at the time of exposure.

I may desire to make printing members of the various types referred to by the use of the color positive to form color separation negatives of conventional character. For example, I may mount the color positive described above in a camera projecting apparatus, which projects an image of the several color sections of a given subject matter upon the surface of a sheet on which an outline of each of the color sections may be readily marked out. The sheet containing the outline may then be reduced in size and photographed to provide a photographic negative containing all of the outline of the several color sections. This negative is then exposed by contact or projection means with a sensitized plate which is etched in the usual manner to provide a master printing plate carrying each of the colored sections in the subject matter. The master plate is then employed to print a number of separate positives, each of which carries the out-

lines of all of the color sections. In doing this, the master plate is inked with a special colored ink, such as a blue ink which does not photograph. Sections of any desired color may then be separately filled in with an opaque material on separate sheets, which provides reproductions of the several color sections. These may be separately photographed without the undesired blue lines of the remaining color sections appearing, to provide negatives of each color section. The negatives are then utilized to make respective color plates in the usual manner.

The use of the color film is important in each of the procedures referred to for making printing plates. By exposing the special light-sensitive resist on a printing plate through a contact color positive and color filter, the time and expense usually encountered in preparing color separation negatives are avoided. This provides the quickest way of making plates. By projecting the complete multicolor design upon a drawing surface in a greatly enlarged form, relatively fast tracing of the color sections is possible. When the color sections are returned to their normal size, very fine lines result which tend to mask imperfections or irregularities. This provides a quick way of making color separation negatives.

The use of a developed multicolor positive film in quickly making printing plates is of great advantage in connection with a further aspect of the invention, dealing with the making of printing rolls. According to the usual method of making printing rolls, for multicolor subject matter, separate tracing plates of those parts of the subject matter included by each color are prepared and utilized with a pantograph to inscribe by hand an outline in an acid-resisting ground coated on the surface of a printing roll. The rolls are then etched to form outlines of the several color sections. It is then necessary to form the parts of the roll surface included within each design outline with a grain, which is effected by knurling or milling tools, and which serves to allow the roll to retain suitable amounts of a light ink, such as a vat dye, to give proper color strength.

In accordance with the invention, I apply acid resist materials with mechanical printing means on the surface of a roll 1. I first prepare a special printing element which is formed to print lines having a grain or pattern corresponding to the lines of a scored ground conventionally employed in etching textile printing rolls. For use with this printing element I prepare a special acid resist 2 of a relatively thin character, and this resist material is applied in selective amounts over the entire surface of the roll 1.

I then prepare a number of printing plates of conventional form, corresponding to the outlines of the different color sections of a multicolor design. In so doing, I may make the plates in a conventional manner. Preferably I make use of a developed multi-color positive film of the subject matter, to take the place of color separation negatives, thereby facilitating preparation of the plates. These plates are so etched that the parts which take ink correspond to the areas surrounding the design parts, and the parts of the plate which correspond to the design portions do not take ink. A plate thus prepared is inked with a special acid-resisting ink material 3, which is of a relatively heavier character than the acid-resisting ink employed in the first above mentioned instance. A positive ink image of one particular color section of the multicolor design is then printed over the first applied resist material on the transfer blanket. The blanket member is employed to offset the positive image directly on the surface of the roll 1 already carrying the first acid resist material. This forms areas of solid ground material on the surface of the roll 1 which constitutes positive image portions of one color section to be engraved. Separate printing rolls to be engraved are similarly prepared with resist material in accordance with remaining color sections of the original multicolor design. Thereafter the bare portions of the roll surfaces inside of the positive resist images, and between the lines of the first applied resist material, are etched to form a grain 4 in accordance with a design and the resist materials are removed.

The special acid-resist materials may comprise an ink of conventional character to which has been added an acid-resisting ingredient. In a preferred embodiment of the method, a resist material is employed consisting of a greasy ink composed of carbon and linseed oil, of the general character of a letterpress ink, to which has been added small amounts of powdered rosin. Other types of inks may be similarly rendered resistant to acids as by the use of waxes and other materials. Other methods of combining acid-resistant reagents with ink may also be resorted to, as for example, positive ink images formed as described may be covered with powdered rosin, or dragon's blood, and heated. A relatively thin resist must be utilized to function properly with the printing element which forms a grain image, while a relatively heavier resist must be used with the printing members which form solid design sections.

The transfer blanket is preferably composed of rubber, although materials such as gelatin and others may be employed. A transfer blanket particularly adapted for use with the printing members and acid-resisting materials above noted consists of a thin rubber blanket, generally corresponding to a lithographic offset blanket. The blanket, plates, and inking materials specified are effective in transferring suitable amounts of the ink material to the surface of a printing roll, such as a copper roll, in a smooth, uniform film, presenting smooth outlines of the design portions. Application of the inking materials to the printing members may be carried out in any convenient manner, such as by supporting the printing plate in a chase or other suitable member, and passing thereover an inking roll supported in a gear rack. The resist ink image may be printed on the transfer blanket by rolling the latter member over the inked printing members, utilizing gearing to insure positive register. The resist materials may then be offset by rolling the transfer blanket against the surface of a copper roll to be engraved, with each of these members being held in gear in some suitable manner. A separate offsetting operation is carried out for each color section and its respective printing roll to be engraved.

An important feature of the invention is the step of applying, by mechanical printing means, acid-resisting materials on printing members to be engraved. It will be noted that this may be carried out by the use of various kinds of mechanical printing members. A relatively heavy acid-resist material may be applied from conventional printing plates of various types as already described. A relatively light resist material may

be further applied by the use of printing elements above referred to in connection with applying the resist material in selective amounts in the form of a grain or a pattern. The printing element is separately prepared with a suitable grain formation as for example, in the preferred embodiment of the invention, the printing element is formed with a series of lines cut into its surface. The spacing of the lines for different films or plates may vary in accordance with the gradation or weight of color which is desired to be printed. These lines generally correspond to the lines formed by cutting through a ground coating with knurling tools. They are preferably obtained by an engraving machine of conventional character such as is employed in forming pictorial engravings by line cuts. If desired, however, the lines may be formed in other ways as by photographic printing means.

In use the printing elements are covered with acid-resist material which is applied after the usual manner of inking a relief plate. The resist material is then printed on the surface of a transfer member to provide minute amounts of ink material corresponding to the lines of a desired ground. The spaced apart lines of acid resisting material when offset on the surface of a roll, such as a copper roll, allows an acid etch to penetrate between them and form a series of etched lines in the surface of the roll. Printing elements having differently spaced lines may be employed to apply resist material in different patterns on the same roll. By using different line spacings or dot arrangements, or different sizes of design sections, it is possible to greatly vary the depth of shades of a single color which is to be printed by its respective roll. The printing elements are preferably composed of a material such as Celluloid or other plastic materials. They may also be formed from flexible sheet metal and other substances.

Several advantages are obtained by the method described. The step of mechanically printing acid-resist material on a printing member to be engraved eliminates the need of etching a separate outline of the design as effected by the conventional method above described. In the conventional procedure, it is necessary to form a separate ground and employ a separate etching step, and the etched outline resulting must be protected while the design surface is etched to form a grain. All of this is obviated in the present invention since the edge of the positive ink image serves as an efficient stop line for checking etching action of acid at the outline of the design, and the etching of a grained surface and the outline may thus occur simultaneously. In addition, the mechanical application of the outlines from a printing plate furnishes a smoothness of contour greatly superior to that obtained in the outlines which are painted in by hand. The step of selectively applying a ground to exposed design surfaces of a copper roll by means of a special cut plate is a very substantial improvement over the older procedure of applying a special ground over the entire roll surface and then scoring the entire ground covered roll surface with a knurling tool. The selective printing of ground material is cheaper and faster. Better range of color values may also be obtained by utilizing a number of the films or plates, each of which has the cut lines or dots spaced apart in different amounts. The use of printing plates for applying ink images allows perfect register of the design portions of each of the rolls to be maintained at all times, thus improving the accuracy of the work and simplifying the handling of the rolls, and their adjustment in printing presses.

Various other methods of mechanically applying resist material, other than that noted, may be resorted to. For instance, lines or other grain formations of acid resist may be applied directly on the surface of a roll to be engraved either before or after the solid background portions of resist material are applied to the roll. Also, use of printing elements to apply resist material in the form of a grain may be resorted to, in connection with forming various other types of printing members. Similarly, the application of solid portions of resist material may be utilized with conventional methods of forming a ground, as by coating a roll with a light ground material, then scoring the coating with a knurling tool, then offsetting a section of solid resist material over this ground, and then etching. It may also be desired to utilize the step of selectively applying resist material from a lined plate for other printing purposes, and other forms of films or plates than those of the line type may be resorted to. Graining, within a positive ink image, may also be effected in other ways as by the carbon tissue process, blasting, and other procedures. Other means of offsetting or transferring acid-resisting material on the surfaces of rolls may further be resorted to. For example, acid-resisting material may be printed from a printing plate on a supporting sheet, which is thereafter applied around a printing roll surface. The supporting sheet may then be removed, leaving the ink image on the roll. The supporting sheet may also be composed of a material, such as a plastic, which can be readily dissolved away, for example by ether or other solvent. This also leaves a satisfactory ink image on a roll surface. Use of a supporting sheet is further desirable in respect to promoting quick and accurate register by utilizing the paper backing for markings in locating them on a roll surface. Designs for several color rolls are maintained in perfect register with one another in this way.

The method of the invention may also be modified to secure an etched outline corresponding to the outline conventionally obtained by a pantograph. For example, a set of printing rolls may be covered with coatings of a light-sensitive acid resist such as, for instance, an asphalt which is sensitive to strong light. The coatings are allowed to dry and covered with a powdery material such as talc. A set of color printing plates prepared as described above are then inked with a greasy ink such as a lithographic ink, and outlines, for the designs of each of the colors, are separately printed over the coatings of light-sensitive material on the printing rolls. The outlines thus effected are covered with an opaque powder which completely shuts out light from the light-sensitive acid resist coating underlying the outlines. The covered rolls are then exposed to light, and in some cases heat, to harden the light-sensitive acid resist in those areas uncovered by the greasy ink outline. Thereafter the greasy ink, opaque powder and unhardened parts of the coating covered by the greasy ink outline are dissolved away by a solvent such as turpentine, leaving bare metal surfaces corresponding to the outlines printed. The rolls are then etched and the resist material

thereafter removed. The areas within the outlines thus etched in the roll surface may be provided with a grain in the manner already described, making use of specially engraved films or other means such as the knurling tools referred to. I may also desire to apply lines of greasy ink within the outlines at the same time the outlines are printed so that all etching is done at one time.

It is pointed out that this method of securing an outline is very fast compared with preparing tracing plates and using the pantograph to cut through a ground. The formation of outlines on printing rolls in actual practice may require from one to two days under the conventional process, while with the method of the invention, the entire operation, including preparation of the plates, may be effected in less than one day.

By the methods of the invention, various improvements and advantages are obtained. Exposed and developed color film is utilized in a novel manner to make printing plates, and from them printing rolls. The inaccuracy of hand work is eliminated, and application of acid resist materials is effected by mechanical printing means in several ways. The acid resist may be printed as a positive image of each color section. It may also be printed to present just an outline of each color section. Finally the acid material may be printed within the outline of a color section, either separately or in conjunction with the other applications noted. A greater range of shades for a given color may be secured, which greatly enhances the value of the color printing member for use with cloth. The cost of preparation of the rolls is materially reduced, and the time necessary to get a job completed and assembled in a color printing press is greatly shortened. This feature is of considerable importance in connection with firms requiring quick duplication of patterns found to be successful in the open market.

While I have shown preferred embodiments of the invention, it should be understood that various changes and modifications may be resorted to, without departing from the spirit of the invention as defined by the appended claims.

Having described my invention, I claim:

1. That improvement in methods of making printing rolls for multicolor subject matter which consists in preparing a printing element with printing portions corresponding to a grain formation, applying from the printing element a relatively light acid resist on the surface of a transfer roll, then preparing a set of color printing plates for the said multicolor subject matter by selectively exposing light-sensitive resist coatings on each of the plates to light passed through a color filter and a transparent color positive of the subject matter, applying from one of the plates a relatively heavy acid resist material over the said first applied resist material on the transfer roll surface, simultaneously offsetting the relatively light and relatively heavy offset materials on a printing roll surface, then offsetting relatively light acid resist material and relatively heavy acid resist material corresponding to each of the remaining color printing plates on respective printing rolls, then etching the rolls and removing the acid resist materials.

2. That improvement in methods of making printing rolls for multicolor subject matter which consists in preparing a printing element with printing portions adapted to reproduce a grained surface, applying from the printing element a relatively light acid resist material in a grain formation over the entire surface of a transfer member, then applying selective amounts of a relatively heavy acid resist material over the first applied light resist material on the transfer member, offsetting both of the said resist materials on the surface of a printing roll to be etched, then etching the roll, and then removing the resist materials.

3. In a method of preparing a set of printing rolls with printing surfaces for multicolor subject matter the steps which include applying on the rolls acid resist material in the form of a positive image of each of the respective color sections of the multicolor subject matter, and then applying a second acid resist material in the uncovered areas of the rolls and over the said first resist material in selective amounts, and then etching.

4. In a method of making a printing member the steps which comprise applying with mechanical printing means on the surface of the printing member a series of lines of acid resist material, and then applying upon the said series of lines of acid resist material other lines of a second acid resist material which are spaced apart a different amount than the said first lines thereby to vary the color retentive ability of the printing member when it is etched in the spaces between the lines.

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