

[54] **PHOTOGRAVURE PROCESS FOR PREPARING A GRAVURE PRESS FOR MULTICOLOR PRINTING**

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[58] Field of Search **101/211; 356/173, 176, 356/177; 96/30, 31, 32**

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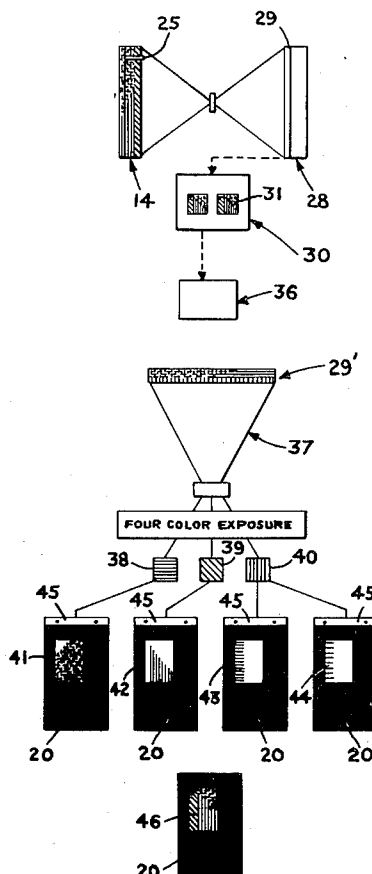
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[57] **ABSTRACT**

A color percentage breakdown is made of the original art work in conformance with the color breakdown of

the inks which will be employed in printing such art work. A color negative of the original art work is then made and placed in a color analyzer capable of producing a positive television image from the negative. The settings of the analyzer are adjusted until the television image is as close as possible to the original art work. The color settings so arrived at on the analyzer are corrected to conform to the readings of the color percentage breakdown made of the original art work. These corrected color settings are fed into a negative translator capable of producing for each color in the original art work the exposure condition required to make a separate picture print of such color. The negative translator is used with an enlarger and a three color filter to successively expose sheets of color print paper sensitive to the required color lights necessary to produce separate color prints, a key color print and a master color print of the original art work. The master color print is compared with the original art work and if any corrections are to be made this is done either by retouching the color prints, or by manipulating the dials of the color negative analyzer to readjust the color balance in the television image, whereupon new separate and master color prints are made using the thus adjusted dial readings of the color negative analyzer. The corrected positive paper color prints are then converted into paper color black and white negatives which are employed to provide the images to be inked on the printing cylinders of the press.

8 Claims, 8 Drawing Figures



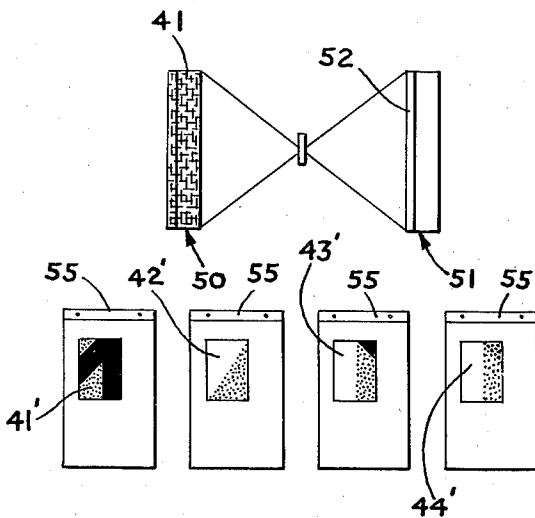
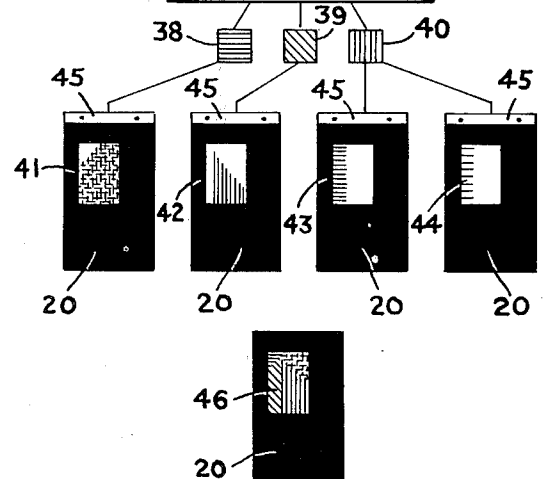
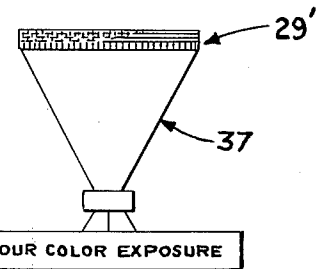
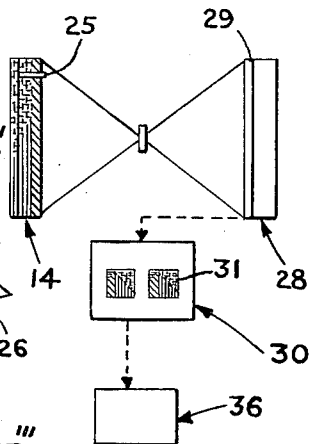
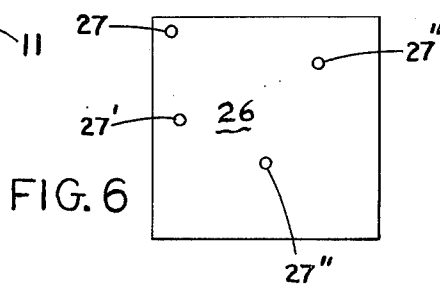
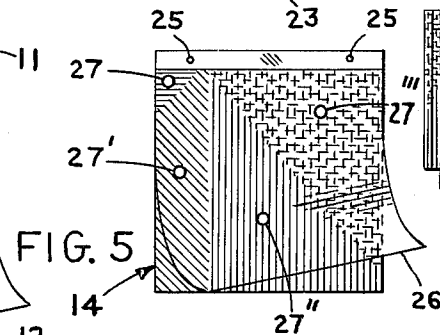
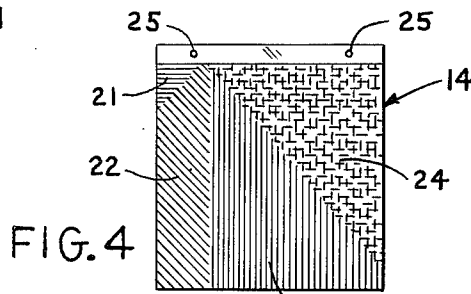
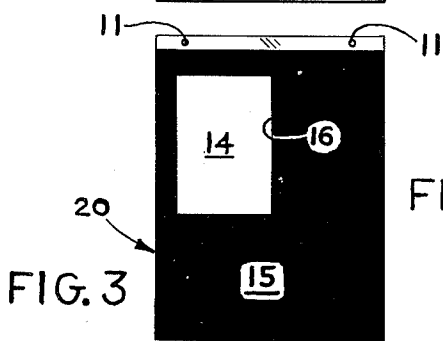
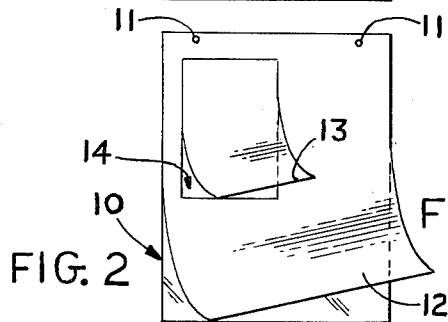
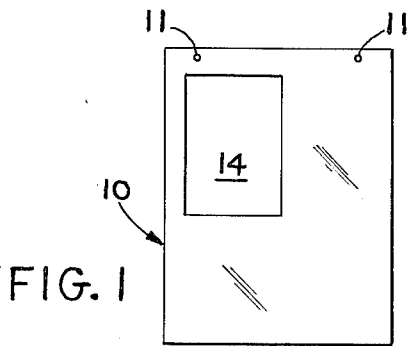


FIG. 8

FIG. 7

PHOTOGRAVURE PROCESS FOR PREPARING A GRAVURE PRESS FOR MULTICOLOR PRINTING

This invention relates to multicolor printing by a gravure press and more particularly to a photogravure process for preparing the color prints which are employed in the production of multicolor images on the printing cylinder of a gravure press.

The preparation of color prints of the indicated type in accordance with present practice is a tedious and costly procedure as it involves a large number of steps and the use of costly color separation machines. Further, from the time work is commenced on an original layout submitted by a customer it usually takes a week's time when following present practices before a colored copy of the proposed final print can be submitted to a customer for his consideration.

A primary object of this invention is to provide an improved method which will enable a color print to be produced on a gravure press within 24 hours after a customer has submitted an original layout.

Another object of the invention is to provide an improved photogravure method having substantially fewer steps than those now required in the practice of presently known photogravure methods and capable of being carried out with the use of inexpensive materials.

A further object of the invention is to provide an improved photogravure method capable of being practiced without the use of expensive color separation machines.

Other objects of the invention as well as the advantages thereof will appear from the following description when read in connection with the accompanying drawings, in which

FIG. 1 is a diagrammatic plan view of an original art layout;

FIG. 2 is a view similar to FIG. 1 and showing the layout overlaid with a prepunched clear film;

FIG. 3 shows a prepunched black sheet of paper superimposed on the layout and film of FIG. 2, the film and black sheet together forming a mask to be employed in making the color prints;

FIG. 4 is an enlarged plan view of the original art in the layout of FIG. 1;

FIG. 5 is a plan view indicating the manner in which the color percentage breakdown of the original art is recorded on clear film;

FIG. 6 is a plan view of the clear film on which such recordation is made;

FIG. 7 is an exploded diagrammatic view illustrating the steps employed in making the color prints from the original art; and

FIG. 8 is an exploded diagrammatic view illustrating the making of the color negatives for use in forming the printing cylinder.

It is believed advisable to initially point out that under the practice presently followed by the art, when the usual printing establishment receives from a customer either the original artwork which is to be printed, or a dummy or layout provided with original artwork, such establishment first causes a color transparency copy to be made of the work that has been submitted by the customer. The color transparency film on which such copy is produced is usually made by an outside laboratory and when it is received from the latter, is put on a scanning machine capable of bringing the size of the copy to the size of the original work and of making

a series of separated negatives of the red, yellow, blue and black colors in the work. Instead of using a scanning machine, it is also a common procedure for printing establishments to use the original reflective art copy instead of having a transparency made and put the reflective art copy on a copy board on which has been mounted a camera of known construction capable of producing a series of color separation negatives of red, yellow, blue and black.

Whichever of the above described procedures is utilized, the resulting color separation negatives of red, yellow, blue and black are sent to a layout department of the printing establishment where they are assembled with all of the other elements of the original layout so that such assembly conforms to the original layout. In order to bring the coloring of the original art depicted by such assembly into as close conformance as possible with the original artwork, the assembly is sent to the establishment's retouch department where the required color corrections on each negative is made to bring about this result. The retouched color separations are then sent to a photographic department equipped to make a positive film print from each of the red, yellow, blue and black retouched negatives. The positives thus obtained are sent back to the retouch department where the red, blue, yellow and black are checked colorwise with the original color breakdown of the original art work. This is done by the use of a densimeter which gives the density readings and these readings are compared with the original color breakdown and the positives are then marked up for additional correction. These corrected positives are then sent to a department for mounting them in a layout arrangement known as an "imposition layout" and which conforms to the printed layout which is to be produced in a particular book or magazine. This imposition layout is then sent to the department for making the rotogravure or roto film. At this department, each of the color separated positives in the composition layout is exposed to obtain negatives of such positive prints. These rotofilm negatives are sent to what is known as the "lay down" department in the establishment where each is precisely located on the printing cylinder to be used in printing its particular color and adhered thereto with the film of photographic material thereof in contact with the surface of the cylinder and the film backing of such negative covering the film material.

After each negative rotofilm has been properly secured in position on a printing cylinder in the manner stated, the backings of such rotofilm are removed, leaving the photographic material on the cylinder. The photographic material on each cylinder is dried and then subjected to the customary acid treatment to etch in each cylinder the image to which is to be applied the particular color ink for which it was made in the printing operation. The thus etched four color cylinders are mounted in the proving press and a composite printing of the layout made. A sample of this composite printing is compared with the original artwork and if it is found to be substantially satisfactory, it is sent to the customer for comment.

Usually however, the sample of the initial master or composite print is found to be so far removed from the original art work that it cannot be sent to the customer without first making certain color corrections. This is done by first marking up specimens of the composite and separation proof prints to bring them as close as

possible into conformance with the original work. The color correction marked composite and separation proof prints are then sent back to the retouch department where the actual color corrections are made on the yellow, red, blue and black original positives to bring them to the condition indicated on the marked proof sheets. After being so corrected the original positives are sent back to the mounting department to be remounted in proper position and registration. The completed mounting is sent back to the roto film department where new exposed roto films are made of the yellow, red, blue and black. The above described procedure with respect to the laydown, etching and printing is then followed.

It is evident that the practice of the foregoing procedure is tedious, costly and time consuming and because of such factors unsatisfactory for both the customer and the printer. These disadvantages of the present practice of preparing a gravure press for the printing of multicolor prints are avoided by the use, in accordance with the present invention, of known readily available color print paper and working with color instead of the black and white tones of the color separations employed in the present practice. It has been found that when working with such color positive prints cleaner separations can be made in fewer steps than possible with the usual practice of making color separations with the use of film so that it is possible to provide a more accurate reproduction of the original art work in a relatively short period of time.

In accordance with the present invention, the original layout 10 which is sent by the customer and which is of the correct size, is used initially to prepare a mask which is of the same size as the original layout and which is to be employed in the making of positive color separation prints and a master color print of the original artwork or illustration 14 of the layout. In employing the original layout 10 for such purposes, it is mounted on lugs 11,11 provided on a suitable backing and overlaid with a 0.004 Cronar clear film 12 which is of the same size as the original layout and is also mounted on the lugs 11,11. The film is prepunched to provide an opening 13 which is similar in shape to and in registration with the multi-colored illustrated area 14 of the layout. Superimposed on and adhered to the clear film 12 is a sheet 15 of black paper similar in size to the film 12 and prepunched to provide an opening 16 having a shape similar to the illustration 14 and the film opening 13 and in registration therewith. The composite sheet composed of the film 12 and the black sheet 15 form a mask 20 which is to be utilized in covering unexposed sheets of Ektacolor print paper of the same size as the original layout during the making of the separate prints of the colors in the illustration 14 and the master color print thereof.

In FIG. 4 of the drawings, the original art illustration 14 is shown for the purposes of illustration as containing four color areas, i.e., a blue area 21, a green area 22, an orange area 23 and a yellow area 24. In the preparation for making color separations of the illustration 14, the latter is mounted on the pegs 25 of a copy board and over such illustration is placed a 0.004 Cronar clear film 26 prepunched to be received by the pegs 25 and having an illustration covering area similar to the area of the illustration 14 (FIG. 5). On this clear film 26 is recorded the color percentage breakdown of the illustration using a conventional swatch book or color

chart containing the color breakdown of the inks being used in the printing plant to which the customer sent his layout. Thus, as shown more clearly in FIG. 6 of the drawings, the operator may mark the portions of the film 26 covering each colored area of the illustration with a circle having marked on the film in association therewith the color percentage breakdown for its associated area. For example, the film 26 may be marked with a circle 27 for the blue area and having marked in association therewith the notation "blue 1.60," for the green area a circle 27' and the notation "yellow 0.80, blue 0.40", for the orange area a circle 27'' and the notation "yellow 0.60, red 0.30" and for the yellow area a circle 27''' and the notation "yellow 0.35 red 0.30".

After the color breakdown of illustration 14 has been so recorded on the clear film 26, the latter is removed from such original art illustration and a picture is taken of illustration 14 by a camera 28 loaded with an unexposed Kodacolor or Ektacolor film negative 29 or any other suitable known color photographic film. It is known that color negatives of this type are each constituted of a plurality of cyan, magenta and yellow color layers which are subtractive colors and contain a filter and masking system to cause a separation of the colors of the illustration during the exposure of such negative. Then the exposed negative 29 has been processed in the customary manner, it is placed in a machine 30 capable of transposing the exposure on the negative 29 into a high quality positive television image, such as the image 31 shown in FIG. 7 of the drawings. Any suitable television color analyzer, such as the Kodak Video color negative analyzer, can be utilized for this purpose. The television image 31 is then compared with the original art work and if any of the colors in the image are off, the settings on the machine 30 which are calibrated, are manipulated to adjust the color balance, brightness and density of the image and also to change the red, green and blue values of the image to bring it into conformity with the original art work as much as possible. After this has been done, the settings on the machine 30 are readjusted using the color ink readings which were recorded on the film 26, to correct such settings for the television image of the original art work into settings which take into account the color breakdown of the inks which will be used in the printing of such color image.

The thus adjusted settings on the Kodak color negative analyzer 30 are then used to produce the exposure conditions required to make separate picture prints of the colors which are contained in the original art copy 14, but in which prints the colors are shown as made with dyes conforming to the ink readings on the film 26. The proper exposure conditions for making each color print is obtained by feeding data obtained from the analyzer 30 into a negative translator 36 of the type make by the Eastman Kodak Company. The exposure conditions for such colors are then utilized to control the exposure needed to make a print of such color using an enlarger 37 of conventional construction. Thus, in the use of these two devices, the exposed Ektacolor or Kodacolor negative 29' is placed in the enlarger 37 for any reduction or enlargement in size required to bring the color exposures to the size of the opening 16 in the mask 20. The intensity of the light for each color which has been determined by the negative translator 36, is then directed on the enlarger 37; the color balance for each print being adjusted in accor-

dance with the readings in the Video color negative analyzer 30. The four color exposures made with the use of the translator 36 and enlarger 37 are passed through tricolor filters of known construction, such as the one made by the Eastman Kodak Company. Such tricolor filters are usually constituted of a blue filter 38, a green filter 39 and a red filter 40. The light passes from the filters on each exposure to one of four prepunched pieces 41, 42, 43 and 44 of unexposed color print paper. The color print paper pieces 41-44 are each mounted successively on the male lugs or the vacuum holding surface of a conventional register board 45 provided in the enlarger 37. Any suitable existing color print paper sensitive to blue, green and red light may be employed to make the pieces 41-44, such as the Eastman Kodak Ektacolor print paper. On top of each unexposed print paper piece during the exposure thereof is placed the initially made mask 20.

It will be understood from the foregoing that during the separate exposures of the color prints 41-44 in the enlarger 37, each of the three colors which go to make up the original art piece 14 is exposed on one of three color prints, for example the color prints 41, 42 and 43. In addition a fourth color print 44 is exposed to form a blue key color print. While in FIG. 7 of the drawings there has been shown for purposes of illustration all of the four color prints 41-44, it is to be understood, that such prints are exposed one at a time on the register board 45 provided in the enlarger 37. It will also be understood that such individual color prints are made by the exposure of one color sensitive layer only on each of the color print papers 41-44 with the use of the tricolor filters 38-40. Thus, the yellow layer of the print 41 is exposed by using the blue filter 38 to make the yellow color positive print; the red layer of the print 42 is exposed by using the green filter 39 to make the red color positive print, and the blue layer of the print 43 is exposed by using the red filter 40 to make the blue color positive print. The half strength blue color positive is formed on the print 44 by using the red filter 40 to expose the blue layer of such print 44.

A fifth Ektacolor color print paper piece 46 is then mounted on the enlarger 37 with the mask 20 and all of the individual color layers thereof are subjected to exposure by using the three blue, green and red color filters 38, 39 and 40, respectively, individually to expose each of such color layers and thereby make one master color positive print of the television image produced by the analyzer 30. In making such successive exposures to form the master color print, the exposure data from the translator 36 is also used. The resulting master color print 46 is then compared with the original art copy 14 to determine if any color correction is needed. If the positive master color print 46 is found to closely conform to the original art copy it is sent to the customer for comment before the printing cylinders are prepared for printing the work. If it is required either as a result of such check, or because the customer from his examination of the master color print requests it, to make a correction in any of the colors in the master color print, this can be done in either of two ways. Thus, if the correction is of a minor nature, or can readily be accomplished by retouching one of the positive color prints 41-44, this would be the simplest procedure to follow. On the other hand, if the correction is of a more complicated nature, or the customer desires to see a corrected master color print before pro-

ceeding to the printing of the layout, the required correction for any color is made by manipulating the dials of the color negative analyzer 30 to readjust the color balance in the television image to the extent desired.

When the image makes a satisfactory showing, the readjusted settings of the analyzer 30 are fed into the translator 36 in the manner above described to obtain the new exposure conditions needed in the enlarger 37 to make an adjusted master color print. During the making of the new master color print there may be made the new color prints 41-44, or the making of such prints can await the approval by the customer of the new master color print. It is also advisable when the adjustment of the readings on the analyzer 30 have been obtained, to make at that time an adjustment of the readings on the film 26 so that the inks employed in the plant to make the printing will conform to the readjusted settings on the analyzer 30.

It will be noted from the foregoing, that in the practice of the method of this invention, the operator is working at all times in color and not in black and white, to bring the color prints from which the printing cylinders are made, into the condition in which a printed composite thereof will conform to the desired reproduction of the original art work. Thus, initial readings and settings are made to produce in color using the inks employed by the plant, prints which can readily be compared with the original art work. Ordinarily, it may prove more practical to make first a positive master color print and have it approved before making the color prints of the separate colors in the art work. But other operators may feel it more desirable to proceed as above described and make all five color prints at the same time. Whichever procedure is followed, any corrections, whether made on the positive prints of the individual colors, or by going back to adjust the settings of the analyzer 30 to conform to the color ink readings required to bring the colors of the prints into conformance with color changes desired by the customer using the color inks employed in the plant, such changes are made in color and not in black and white. This renders it easier for the operator to process the work and enables him to arrive more speedily at accurate printable images for reproducing the original art work in printed form. The accuracy of these reproductions is further assured by the fact that in the practice of the process of this invention there is made a two step separation of the colors in the original work. As previously indicated the fact that the type of color negative employed in the use of the camera 28 is constituted of a plurality of layers of the colors cyan, magenta and yellow, there occurs when such exposed negative is mounted in the enlarger 37 to form the positive color prints 41-44, an initial separation of the colors in the original art work due to such color layers in the exposed negative, and such separations are subjected to the exposures corrected to the readings made for the inks employed in the printing plant. A secondary separation takes place when the light beams are passed through the tricolor filter 38, 39 and 40 of the enlarger 37. This two step separation will provide cleaner and sharper separations on the color prints, thereby making possible more accurate reproductions of the color images forming the original art work.

When the positive yellow, red, blue and blue key color prints 41-44, respectively, have in the manner above described been placed in a form satisfactory to

the customer before starting any work on the construction of the printing cylinders, they are then utilized to produce the required images on the printing cylinders of the gravure press to be employed in making the printed reproductions of the original work. To accomplish this the color prints 41-44 are first converted into individual negatives. As is shown in FIG. 8 of the drawings, this may be done by successively placing each of the yellow, red, blue and blue key positives 41-44 on the copy vacuum board 50 of a conventional large camera 51 loaded with an unexposed paper negative 52 suitable for the positive being photographed, for example, the yellow positive 41. The paper negatives 52 are of the same size as the positives 41-44 and like the latter are prepunched to enable them to be mounted on a register board 55. Also in making such paper negatives, the exposure time used for making each negative is that computed by the color translator 36 using the original exposure data recorded on the record sheet 26, or the corrected settings of the analyzer 30 and employed in making the final color positives 41-44. There is also taken into consideration the light source of the camera and the necessary adjustment of exposure time to lamp distance. In this manner the exposures utilized are of such correctness that there is obtained in black and white tone on the negatives the true color tone of the individual color positives. The four individual color paper black and white negatives obtained in this fashion of yellow, red, blue and blue key, are designated 41', 42', 43' and 44', respectively, in FIG. 8 of the drawings. These individual color paper black and white negatives may now be mounted on the scanning cylinder of known electronic printing cylinder engraving mechanism to form the images on the printing cylinders for the type of gravure printing press in which they are to be installed.

The above description is primarily concerned with the original art work of the layout. In preparing the remainder of the layout for printing, a black prepunched mask, is prepared in the manner of the mask 20 except that instead of the opening 16 in the latter, such mask is made with an opening conforming to the area occupied by the remainder of the layout. If the remainder of the layout is constituted of black print, a thin based black negative film of 0.004 Cronar, prepunched to the size of the original layout, is subjected for exposure using the layout covered by the layout mask. This exposed negative is placed over the blue key negative 51 when the latter is mounted on the scanning cylinder of the engraving mechanism when forming the half tone image cylinder to be employed in the gravure press. In the event that the remainder of the layout is varicolored, for example, constituted of color print and background, separate color and master prints are prepared following the procedure above described with respect to the original art work, but employing the above mentioned layout mask in the preparation of the positives and negatives of such layout remainder.

What is claimed is:

1. The method of preparing a gravure press for multi-color printing which comprises making a record of the color percentage breakdown of an original art work using means showing the color breakdown of the inks

to be used in printing the original art work, preparing a negative of the original art work using a given color photographic film, placing the color negative in a color analyzer capable of producing a positive color image therefrom, correcting the settings made on the color analyzer to produce such image to conform to the readings in said record of color percentage breakdown, feeding the corrected color analyzer settings into a negative translator capable of producing the exposure conditions for the colors in the original art work, using said color negative and such exposure conditions and given color filters to produce on color print paper positives of the separate colors in the original art work and of a composite of such colors, checking and correcting the colors of such color positives to bring them into conformance with the desired reproduction of the original art work, and preparing from the final corrected positives paper black and white negatives for use in forming the required images on the printing cylinders for reproducing the original art work.

2. The method defined in claim 1, including preparing for the original layout a mask having an opening revealing only the original art work appearing on such layout, and covering with said mask each of the pieces of color print paper during the exposure thereof to the light passing through the color filters.

3. The method defined in claim 1, including controlling the light directed through the color negative to the color print paper to bring the color exposure to the size of the opening in the mask.

4. The method defined in claim 2, in which said paper negatives are made of a size similar to the size of the original layout, and covering with said mask said paper negatives during the exposures thereof to produce the exposed black and white negatives of the original art work.

5. The method defined in claim 1, in which a positive colored television image is produced from said color negative, adjusting the settings of the color analyzer to obtain a high quality image, and bringing such television image into as close conformity to the original art work as possible before correcting such analyzer settings.

6. The method defined in claim 1, including retouching the color print paper positives of the separate colors in the original art work to bring them into a condition necessary for the desired reproduction of the original art work.

7. The method defined in claim 1, including after a check of the color print paper positives readjusting the settings of the color analyzer to readjust the color balance of the image produced thereby, feeding such readjusted color analyzer settings into the negative translator to obtain new exposure conditions, and utilizing such new exposure conditions to produce new color print paper positives.

8. The method defined in claim 7, including revising said record of the color percentage breakdown to conform to the readjusted color analyzer settings, and using printing inks conforming to such revised record readings in the reproduction of the original art work.

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