

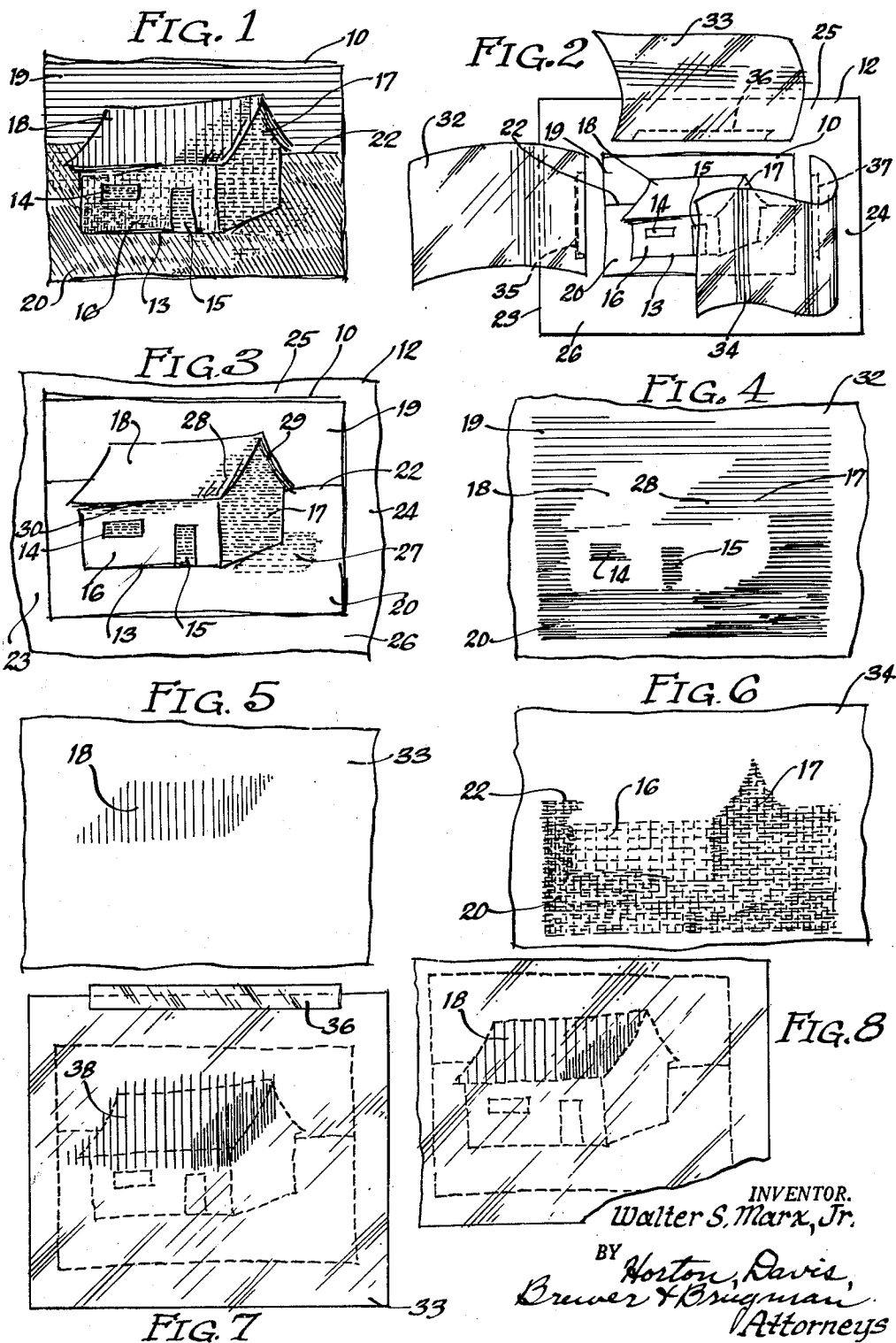
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METHOD OF COLOR REPRODUCTION

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METHOD OF COLOR REPRODUCTION

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This invention relates to a method of color reproduction, and more particularly to a method of preparing and using art copy for obtaining printed reproductions thereof in full color without the necessity of making the usual photographic color separations through colored light filters.

One of the general objects of this invention is to provide an efficient and effective method which is much less expensive than those now commonly in use for creating and accomplishing the printed reproduction of art copy in color.

My method comprehends the use, in art copy, of a transparent color medium adapted to use on colorless transparent film-type overlay sheets to produce combinable color-separated overlay sheets which are each suited to reproduction as individual halftone plates that are combinable for full color printing purposes.

Another object of my invention is to provide a method of color reproduction in which screened halftone negatives can be made on orthochromatic film from pre-separated color parts of art copy, thereby avoiding color separation by light filters and the less readily controlled processing of panchromatic film.

It is another object of this invention to provide a method of color reproduction of art copy, which method eliminates both the use and the inefficiencies of color-separation filters, and thereby avoids the later corrective steps which are necessary to compensate for the inefficiencies of color-separation filters.

This invention further has within its purview the provisions of a method of printed reproduction by a halftone process which utilizes art copy comprising a composite of transparent separable color layers on substantially colorless transparent film overlay sheets and each of which color layers embodies an absorbent of ultraviolet light, so that halftone screen pattern can be eliminated from the uncolored highlight and/or background areas by an additional exposure made with ultraviolet light and with the screen removed.

As another object, my invention comprehends the provision of a method of reproduction which includes the use of art copy made up of a plurality of different transparent monochromatic color images on sheets of transparent film-type material that are relatively stable dimensionally under various normal conditions of use and are made to register with a line drawing on paper, and each of which color images, as well as the line drawing, is individually reproducible for composite reproduction.

In the production of art copy of the type to which reference has been made, this method has within its purview the use of transparent color materials which are desirably quick drying in character to the extent that they will dry to a flexible solid form in a matter of a few minutes to conserve the artist's time and which can be quickly and roughly blocked over areas larger than those which are finally to be colored by making a few quick brush strokes, and then readily and selectively removed to coincide sharply and precisely to the desired outline or contour.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings in which similar characters of reference indicate similar parts throughout the several views.

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FIG. 1 is an exemplary illustration of finished art copy depicted symbolically as being in full color, and affords an illustrative example of art copy produced by my preferred method, as disclosed herein;

FIG. 2 is a front elevational view of basic components utilized in the production of art copy by my disclosed method and includes a base sheet having thereon a key drawing in black and white and having hingedly secured thereto a plurality of substantially colorless, transparent film-type overlays which are each of a size to cover the key black and white drawing.

FIG. 3 is an illustration of the key drawing, as rendered in black and white, with intermediate shades of gray;

FIG. 4 is an illustration of one of the transparent overlay sheets, as rendered in a transparent blue coloring material, while utilizing the key drawing as a guide for the placement of the color;

FIG. 5 is an illustration of another of the transparent film-type overlay sheets, as rendered in red, while utilizing the key drawing to indicate the area to which color is applied;

FIG. 6 is an illustration similar to FIGS. 4 and 5, and shows the rendition of a yellow overlay, as made on one of the transparent film-type sheets, while utilizing the key drawing as a guide;

FIG. 7 illustrates one of the transparent film-type sheets overlaying the key drawing and having transparent red coloring material applied thereto by a quick brush stroke or strokes in a manner such that it overlays the area which is finally to be covered, in accordance with a preferred manner of utilizing a portion of my method, as disclosed herein; and

FIG. 8 is a view similar to FIG. 7, but indicating the red coloring material after portions of that applied as illustrated in FIG. 7 have been removed to bring the coloring material into register with the portion of the key drawing which is to be reproduced in red.

The accompanying drawings depict exemplary components and steps, for illustrative purposes, which are adapted to use in preparing art copy and making halftone reproductions therefrom in full color, without the aid of color-separation filters as in isolating primary colors for the usual methods of color printing. While the exemplary illustrations assume that the final reproductions are to be made to embody the colors of three primary hues and combinations thereof, in addition to a black and white rendering for outline purposes and for changing the values of the hues along the gray scale by the variation of the gray content of the color hues, it may be readily understood that many illustrations for commercial or other purposes may require only one or two of the color hues for full reproduction of the coloring of the original art copy. In the latter instance, the unneeded primary color hue or hues, or the reproduction of the black and white key drawing may be eliminated.

Having reference to the drawings for the consideration of the materials utilized, FIG. 2 depicts a preferred basic arrangement of parts for the preparation of art copy, wherein a black and white key or base drawing 10 is made, in a desired size, on a sheet 12 of white opaque material, such as one of the usual and commonly used types of artist's board. In the disclosed key or base drawing 10, the exemplary pictorial representation includes a house 13 having a window 14, a door 15, a front wall 16 in which the window 14 and door 15 are located, an end wall 17 and a roof 18. Within the picture format, the house is surrounded by a sky area 19 and a foreground area 20 which are divided by a horizon line 22. Outside of the format of the base or key drawing 10, the artist's board is desirably provided with side marginal portions 23 and 24 and top and bottom marginal portions 25 and 26.

As depicted in FIG. 3, the limits of the format, the outline of the house 13 including the window 14 and door 15, and the horizon line 22 are drawn in black lines. To add depth, contours and realism to the base or key drawing, the end wall 17 of the house and the window 14 and door 15 are shaded by washes in appropriate shades of gray. Also, a shadow area 27 in the foreground adjacent the end wall 17 of the house, end portions 28 and 29 of the roof and a portion 30 of the front wall adjacent the lower edge of the roof are also shaded by gray washes.

For adding color to the base or key drawing for reproduction purposes by my disclosed method which avoids the necessity of later color separations through color separation filters for producing halftone plates, I hingedly secure to the marginal portions of the artist's board, at positions spaced from the format of the key or base drawing 10, overlay sheets 32, 33 and 34 of substantially colorless and transparent film-type material which are each of a size individually to overlay the full format of the base or key drawing. The terms "substantially colorless" and "colorless," as used herein, refer to the fact or provision that the overlay sheets have no hue or color in themselves which will change or pollute the colors applied thereto and the making of color separated reproductions therefrom for the purposes of the process and that would be visually discernible in the final reproduction. Although the film-type overlay sheets 32, 33 and 34 may be secured in place by various means, such as staples or thumb tacks, the illustrative disclosure of FIG. 2 shows the sheets hingedly secured to separate marginal portions 23, 24 and 25 of the artist's board by strips 35, 36 and 37 of an adhesive material, such as pressure-adhesive tape which holds the sheets firmly and accurately in position, as well as providing a hinge for swinging the individual sheets to positions over or away from the base or key drawing. It may be observed that by having the individual transparent sheets 32, 33 and 34 secured to the artist's board at positions spaced from separate sides of the base or key drawing, the sheets can be individually manipulated relative to the drawing and relative to one another without interference.

As one very satisfactory material adapted to use for the substantially colorless, transparent film-type material of the overlay sheets 32, 33 and 34, I have used the clear polyester sheets, such, for example, as the sheet material commonly known commercially as "Mylar" produced by E. I. du Pont de Nemours & Co. (Inc.) of Wilmington 98, Delaware. This material, in addition to being substantially colorless, clear and transparent, is impervious to most solvents, so that coloring material cannot pass therethrough to the base or key drawing. "Mylar" is also durable, flexible and very stable in various conditions of temperature and moisture. It also provides a surface to which a transparent coloring material of a desirable type will adhere and from which it can be removed readily without damage to the transparent film-type sheet.

As has been indicated, the three overlay sheets of transparent film-type material are provided for making full color renditions for reproduction with the three primary hues, blue (Cyan), red (Magenta) and yellow each applied to individual sheets of the transparent film-type material, so that each hue is individually applied in preparing the art copy and is individually used in making the line and/or halftone plates for reproduction purposes. By utilizing transparent coloring materials, the colors are mixed for visual observation when they overlay one another and can be viewed in their combined aspect in the original art copy, as well as when reproduced by printing.

Although the particular composition and ingredients of the transparent coloring material used in the method disclosed in this application are not being claimed specifically as a part of this invention, a brief and exemplary disclosure directed to that phase of the materials used or

usable in carrying out the steps of my method is presented herein for clarity and completeness in the understanding of the method. It may be observed that the coloring material has been made to embody certain unusual characteristics which are particularly suited to the method herein disclosed and which are utilized in the practice of the method.

In addition to being transparent, so that preselected hues mix or combine visually when applied separately to individual sheets of transparent film-type material and viewed in superimposed relationship against a white background, the coloring materials used in this method embody an absorbent of ultraviolet light in the wavelength range between 340 and 410 millimicrons, are desirably quick drying to a relatively hard and flexible condition to facilitate use, and are readily softenable by the application thereto of a liquid which is not a solvent of the coloring materials; the coloring materials, when thus softened, being easily removable to sharply defined limits without dilution or deterioration of the color adjacent the position of removal.

Considered generally, and for exemplary purposes, a coloring material composition adapted to uses in carrying out the herein disclosed method may consist of:

(1) A resin, or combination of resins to serve as a binder or film former.

(2) A solvent, or blend of solvents, for the selected resin, to provide fluidity to the coloring material.

(3) A hydrophilic agent, or combination of such agents (for attracting a liquid other than a solvent of the coloring material, after it has dried and hardened, to soften the coloring material and thereby permit ease of removal thereof) which, in this illustrative example, attracts water into the dried and hardened film of coloring material to effect the ease of removal, as by scribing in a manner and with an instrument which is harmless to the surface to which the coloring material is applied. The hydrophilic agent may also serve as a plasticizer or softener for the film of coloring material, or other plasticizers may be added.

(4) An absorbent, or group of absorbents, of ultraviolet light within the wavelength range of 340 to 410 millimicrons.

(5) A dye, or dyes, to provide the desired hue in the coloring material.

As a more specific example of a coloring material suited to use in my disclosed method and embodying ingredients of the types outlined is as follows.

Solvent blend:

Blend—	By volume
2-ethoxyethanol ("Cellosolve")	percent— 25
1-methoxy-2-propanol	do— 15
Isopropanol (99%)	do— 60

Solids:

(Plasticizer)—coconut oil	gram— 0.05
(Hydrophilic agent)—"Triton GR5"	ml— 2.00
(Resin)—ethyl cellulose, 7 cps.	grams— 2.80
(Ultraviolet absorbers)—	
4-methyl, 7 diethyl amino coumarin	gram— 0.30
2,2',4,4' tetrahydroxy benzo-phenone	grams— 2.30
(Dyes)—	
Victoria Blue B" (Du Pont)	gram— 0.40
Methyl Violet 2B (National Aniline)	do— 0.09

"Triton GR5," referred to herein, is an anionic surfactant produced by Rohm and Haas Company of Philadelphia. It is lard-like sulfonated alkyl ester of a higher alcohol, e.g., lauryl, and is supplied in a solution of 60% active material in 20% water and 20% isopropanol (all by volume).

The foregoing exemplary formulation provides a good combination of commercial dyestuffs to produce a tri-stimulus blue. A satisfactory red coloring material is

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made in the same formulation by using (instead of the blue dyes) 0.47 gram of Azosol Fast Red BE (General Aniline and Film Corporation) and .11 gram of para rosaniline acetate. A satisfactory tri-stimulus yellow is made, in like manner, by using 1.0 gram of Azosol Fast Yellow GRA (General Aniline and Film Corporation).

Referring again to the drawings, FIG. 4 represents the blue (Cyan) overlay, as produced by the artist on the transparent film-type sheet 32, while that film-type sheet is placed over the key or base drawing 10. The portions of the base drawing covered by shades of blue on the film-type sheet 32 include the sky area 19, the foreground 20, portions of the window 14 and door 15 and portions of the shaded areas of the end wall 17 and roof 18.

FIG. 5 depicts the red (Magenta) overlay, as produced on the transparent film-type sheet 33, while that sheet overlays the key or base drawing 10. In this instance, the red (Magenta) hue is applied to the exterior of the roof 18 of the house. It may be observed that by applying the red (Magenta) coloring material over the full area of the roof, that hue will overlay the blue in the shaded end portion of the roof when the overlays on the film-type sheets 32 and 33 overlay one another in register with the base of key drawing. This will, of course, produce a combination or purple hue, and the latter hue will be darkened along the gray scale at the portion 28 of the roof which is shaded by a gray wash on the base or key drawing.

FIG. 6 illustrates the yellow overlay as produced by the application of yellow coloring material to the film-type sheet 34. On this overlay, while the film-type sheet 34 overlays the base or key drawing, various intensities of yellow coloring material are applied to the foreground area 20, the front wall 16, including the door and window areas and the end wall 17. When the film-type sheets 32 and 34 overlap one another in contact with the base or key drawing, it may be understood that the foreground area will appear as green, since the blue on the sheet 32 will visually combine with the yellow on the sheet 34. The front wall 16 will appear as yellow and the end wall 17 will have areas of green and yellow, both of which are grayed by the wash applied to that wall on the base or key drawing. When the three transparent film-type sheets are placed one over the other in register with the base or key drawing, the composite result will appear in its full range of hues and values as indicated in FIG. 1. Furthermore, when reproduced in the manner and by the method herein disclosed, the reproduction of the original art copy will appear in its full range of hues and values, also as shown in FIG. 1.

As has been indicated herein, my preferred coloring materials which are adapted for use in this disclosed method are transparent and are also softenable for ease of removal by the application thereto of a liquid other than a solvent of the coloring material. Being readily removable in selected areas or portions without causing dilution or damage to the unremoved coloring material after it has once dried, it has been found expedient, in the application of the coloring material, to quickly brush onto an area which is to be covered, a desired primary hue, without particular regard to the limits of the area to be covered, and to cover all of that area with some overlap into the surrounding or adjacent area of the film-type sheet to which the coloring material is applied. The color thus applied will flow to a smooth even coating over the area and will dry to a firm, durable and hard, although flexible, applied layer, as depicted at 38 in FIG. 7. After being thus applied and dried, the coloring material which overlaps the desired portion which is to be colored can be readily removed, with coloring material of the type disclosed herein, by moistening any convenient portion of the entire area with water to soften the dried layer without dissolving or diluting the coloring material. The softened coloring material can then be removed to bring the color into exact registry with the desired por-

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tion of the base or key drawing by scribing or frictionally removing the marginal portions with the aid of a tool, such as an orangewood stick, a pencil or a cotton swab without in any way imparting damage to the transparent film-type sheet which carries the coloring material. In this manner, the coloring material is brought into registry with the base or key drawing, as shown in FIG. 8.

With transparent coloring materials of the desired hues selectively applied to predetermined areas of the transparent film-type sheets, with separate primary hues on each of the film-type sheets required for producing art copy having a desired range of hues, the art copy is ready for the further steps of my method which are required for the production of line and/or halftone printing plates suitable for reproduction purposes. Having the primary hues already separated from the base or key drawing and from one another, each may be reproduced photo-mechanically without the necessity of the use of color-separation filters for separating the several hues. Furthermore, by avoiding the necessity of the use of the color separating light filters in the reproduction process, the handwork which is ordinarily required on the printing plates to compensate for the inefficiencies of the color-separation filters is completely avoided.

Individual line and/or halftone negatives, and eventually individual printing plates are made from each of the individual film-type sheets having the separated hues thereon and from the base or key drawing. The base or key drawing may be reproduced in either line or halftone, as required by the original art copy. In either event, the original or key drawing may be reproduced by photographing it on orthochromatic film which is practically insensitive to red. If a line reproduction is to be made, the base or key drawing is photographed directly, without using a halftone screen, while if a halftone negative is required, a halftone screen is utilized.

Since orthochromatic film is practically insensitive to red, the film-type overlay sheet carrying the red coloring material can be reproduced by making a halftone negative of that individual sheet photographically with the sheet placed against a white background. This can be accomplished by photographing the film-type sheet carrying the red coloring material through a halftone screen without the aid of a light filter. Similarly, halftone negatives can be made on orthochromatic film from the film-type sheets carrying the blue and yellow coloring material, but in these instances, contrast filters are desirable to record the full scale of value intensities in each overlay. The halftone negative for the film-type sheet carrying the blue coloring material may be made on orthochromatic film through a Wratten Filter No. 15 (G), giving approximately five times normal exposure with arc lamps or two and one-half times normal exposure with tungsten lamps. The film-type sheet carrying the yellow coloring material may be reproduced on orthochromatic film by photographing it through a Wratten Filter No. 32, with four times normal exposure with arc lamps or five times normal exposure with tungsten lamps. The Wratten filters to which reference has been made are obtainable from Eastman Kodak Company of Rochester, New York.

One of the advantages in the use of orthochromatic film is that it can be developed with the aid of visual inspection under a red safelight to obtain optimum reproduction fidelity, instead of being developed without inspection by a time and temperature method, as required for panchromatic film which must be used when color separation negatives are made through color separation filters. A further aid in optimum reproduction fidelity in the developing process when orthochromatic film is used (so that visual inspection is possible) is the use of a gray scale or step-wedge having gray shades in steps from white to black and having a coating of a suitable ultraviolet light absorbing material thereon placed along one side of the art copy when it is photographed, and which will serve

as a gauge or measure useable in estimating the stage of development during the processing by visual inspection. This affords a means for balancing the exposures and processing of the negatives of a set. By affording a comparison of gray shades, it eliminates many problems arising from differences of color and brings the negatives into proper and balanced relationships with one another when the halftone exposures are made in the manner described.

It has been pointed out that each of the hues of coloring material used in the practice of my disclosed method in its preferred aspects embodies an absorber of ultraviolet light. This ultraviolet light absorbing characteristic which is imparted to the coloring material by the inclusion of the absorber therein is utilized to effect the production of clear (dotless) highlight areas, while leaving the full halftone reproduction in colored and shaded areas. To effect this result a supplementary exposure is made by ultraviolet light and with the halftone screen removed, and in register with each halftone exposure. This is accomplished by using light sources, such as standard carbon arc lamps or mercury vapor arc lamps, which radiate amply across both the visible and ultraviolet spectrum, thereby to provide an adequate quantity of ultraviolet, blue and yellow light to permit the use of complementary filters for making the exposures for the blue and yellow negatives, in addition to furnishing the ultraviolet light for the exposure by which screen pattern is removed from the highlight areas.

During the supplementary exposure by which dot pattern is removed from the highlight areas, the halftone screen is not only removed from the camera, but a filter is used at the camera which passes ultraviolet light while absorbing visible light. It may be readily understood that since the coloring materials used absorb ultraviolet light, and particularly since the light passes through such coloring material twice in travelling from the source to the reflective background and back to the camera, the corresponding areas on the negative are unaffected by the ultraviolet exposure, while ultraviolet light is freely reflected from the white backing sheet through uncolored areas of the art copy, to eliminate halftone pattern from corresponding areas of the negative when the ultraviolet exposure is made with the halftone screen removed.

It is considered worthy of note that my herein disclosed method affords the ample ability and efficiency for recording and holding open halftone dots or pattern in the areas of the negative corresponding to the very light values on the blue and yellow overlays, while providing for the recording of ample negative density in highlighted areas on the same negative.

In some instances, it may be found desirable to use two transparent film-type sheets for carrying parts or added amounts of the same primary hue. In this instance, those two transparent film-type sheets are photographed together to make a single composite halftone negative and color plate. The two transparent film-type sheets must, of course, be in register when photographed and the general procedure of making the halftone negative from the two sheets is the same as that used when the color is on a single sheet, utilizing both an exposure through a halftone screen and an unscreened exposure with ultraviolet light.

From the foregoing description and reference to the accompanying drawings, it may be readily understood that I have provided a method of color reproduction which has many advantages to both the artist in the preparation of the art copy and the photoengraver or lithographer in the preparation and processing of letterpress or lithographic printing plates used for reproduction of the art copy. The coloring materials are quick drying and can be rapidly used. They can be kept strictly in register with a base or key drawing by the application of color to desired areas and then scribing the color to lines of register with the aid of a liquid softener which does not dilute or deteriorate the applied color. Also, color can be

readily removed from either marginal or particularly defined areas without any damage to either the key drawing or the sheet to which the color is applied. Art copy produced by the disclosed method is subject to reproduction on orthochromatic film with the aid of visual inspection during processing and with a considerable saving of both time and expense, as well as without the necessity of producing color separation negatives through light filters on panchromatic film. Color corrective masking and the need for skilled handwork on the halftone plates are both eliminated by the inherent preseparation of the color afforded by this method and by the incorporation of an ultraviolet light absorbent in the coloring material which makes possible the use of a supplementary unscreened exposure for eliminating the dot pattern from highlight and background areas. Furthermore, the plates produced by this method result in the production of printed copy which is clear, sharp and crisp, with a live brilliance and color purity which is seldom achieved in the reproductions made with color separation filters.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A method of multi-color reproduction and wherein a plurality of hues are separated in art copy as prepared, said method comprising the steps of making a monochromatic guide drawing on a base surface which reflects ultraviolet light, covering the guide drawing with an overlay sheet of substantially colorless and transparent film-type material which transmit ultraviolet light, applying transparent liquid coloring material containing an absorbent of ultraviolet light and of a hue different than that of the guide drawing to said overlay sheet in register with a portion of the guide drawing, separating said overlay sheet from the base art copy, and photographically producing separate and individual negatives directly from said base art copy and said overlay sheet on orthochromatic film, the photographic production of a negative from said overlay sheet being characterized by the steps of making one photographic exposure of the overlay sheet against a white backing which is reflective of ultraviolet light and through a halftone screen with light principally made up of wavelengths other than ultraviolet, and making a second photographic exposure without the halftone screen and with light limited substantially to the ultraviolet wavelength range to provide clear delineation between color and noncolor areas and to effect removal of halftone dots from the non-color areas.

2. A method of multi-color reproduction as defined in claim 1, and wherein said transparent liquid coloring material is initially applied to an area overlapping said portion of the guide drawing with which it is to register, and then parts of the coloring material are removed to effect said register.

3. A method of multi-color reproduction as defined in claim 1, and wherein the transparent liquid coloring material applied to said overlay sheet has a hue other than black or red, said one exposure which is made through a halftone screen is also made through a light filter having a color which is substantially the complement of the hue being photographed, and the negatives produced by said exposures are developed to the desired density by visual inspection of the film during development with the aid of non-actinic light.

4. A method of multi-color reproduction as defined in claim 1, and wherein said hue of the transparent liquid coloring material applied to the overlay sheet is red, said one photographic exposure which is made through a halftone screen is made on orthochromatic film without a light filter, and then after the second photographic exposure the development of the orthochromatic film is accomplished with the aid of visual inspection during development in non-actinic light.

5. A method of multi-color reproduction wherein a plurality of primary color hues are separated in the preparation of art copy by the application of coloring

material of each of the primary color hues used to a separate sheet of substantially colorless transparent material, said method comprising the steps of applying transparent coloring material of each primary hue used and containing an absorbent of ultraviolet light to a selected portion of a separate and individual sheet of substantially colorless transparent material which transmits ultraviolet light, mounting each sheet of substantially colorless transparent material having the transparent coloring material thereon against a sheet of white backing material which reflects ultraviolet light, making two photographic exposures of each mounted sheet on orthochromatic film while using a light source which emits light in both the visible and ultraviolet spectrum ranges, one of said two exposures being made by light in both the visible and ultraviolet ranges and through a halftone screen, and the other of said exposures being made with the halftone screen removed and with the light substantially restricted to the ultraviolet range, said other of the exposures being made to increase the negative intensity of areas of the film not included in the image of the colored portion of the transparent sheet, thereby to provide delineation of even lightly colored parts of the colored portion and effect removal of the halftone screen pattern from the photographic image of the uncolored area, and effecting balance between the densities of negatives produced by said exposures by visual inspection during development with the aid of non-actinic light.

6. A method of multi-color reproduction as defined in claim 5, and wherein said coloring material used on each sheet of substantially colorless transparent material is temporarily softenable and is initially applied to an area of the sheet of substantially colorless transparent material which is larger than said selected portion, said coloring material is temporarily softened, and while temporarily softened parts of the coloring material are removed to effect the reduction of the area thereof to said selected portion.

7. A method of multi-color reproduction and wherein a plurality of hues are separated in art copy as prepared, said method comprising the steps of making a monochromatic guide drawing on a base surface which reflects ultraviolet light, covering the guide drawing with an overlay sheet of substantially colorless and transparent film-type material which transmits ultraviolet light, manually creating an image of transparent coloring material containing an absorbent of ultraviolet light and of a hue different than that of the guide drawing on said overlay sheet, which image is in register with a portion of the guide drawing, separating said overlay sheet from the base art copy, and photographically producing separate and individual negatives directly from said base art copy and said overlay sheet, the photographic production of a negative from said overlay sheet being characterized by the steps of making one photographic exposure of the overlay sheet on orthochromatic film against a backing which is reflective of ultraviolet light and through a halftone screen with light principally made up of wavelengths other than ultraviolet, and making a second photographic exposure in register with the said one photographic exposure on the same film without the halftone screen and with light limited substantially to the ultraviolet wavelength range to provide clear delineation between individual color areas and non-color areas and to effect removal of half tone dots from the non-color areas, and controlling the density of the negatives produced by the visual inspection thereof in non-actinic light during development.

8. A method of multi-color reproduction as defined in claim 7, and wherein said image of transparent coloring material initially overlaps said portion of the guide drawing with which it is to register, and then parts of the coloring material are softened and then removed to effect said register.

9. A method of multi-color reproduction as defined in claim 7, and wherein the transparent coloring material of said image on said overlay sheet has a hue other than black or red, said one exposure which is made through a halftone screen is also made through a light filter having a color which is substantially the complement of the hue being photographed, and said one exposure has a duration which compensates for the presence of said light filter.

10. A method of multi-color reproduction wherein a plurality of primary color hues are separated in the preparation of art copy by the use on individual separate sheets of substantially colorless transparent material of coloring material of each of the primary color hues, said method comprising the steps of preparing individual sheets of substantially colorless transparent material which transmits ultraviolet light by manually defining on each sheet a selected area of one of the primary hues used and which contains an absorbent of ultraviolet light, mounting each sheet of substantially colorless transparent material having the transparent coloring material thereon against a sheet of backing material which reflects ultraviolet light, making two photographic exposures of each mounted sheet on orthochromatic film while using a light source which emits light in both the visible and ultraviolet spectrum ranges, one of said two exposures being made by light in both the visible and ultraviolet ranges and through a halftone screen, and the other of said exposures being made with the halftone screen removed and with the light substantially restricted to the ultraviolet range, said other of the exposures being made to increase the negative density of areas of the film not included in the image of the colored portion of the transparent sheet, thereby to provide delineation of even lightly colored parts of the colored portion and effect removal of the halftone screen pattern from the photographic image of the uncolored area, and finally balancing the negative densities resulting from the exposures of the separated color hues by visual inspection during development in non-actinic light.

References Cited in the file of this patent

UNITED STATES PATENTS

2,071,136	Mzeinzinger	Feb. 16, 1937
2,273,567	Fishel	Feb. 17, 1942
2,304,942	Marx	Dec. 15, 1942
2,336,590	Bourges	Dec. 14, 1943
2,353,867	Balcomb	July 18, 1949
2,628,903	Kott	Feb. 17, 1953
2,907,657	Kott	Oct. 6, 1959
3,025,627	Misturini	Mar. 20, 1962

FOREIGN PATENTS

51,116	Germany	Feb. 15, 1890
17,638	Great Britain	of 1905

OTHER REFERENCES

The Lithographers Manual, vol. 1, pages 4:82-83 and the 4 page insert between, Waltwin Pub. Co., 317 W. 45th St., N.Y. 36, N.Y., January 1958.

"The Fluorographic Drop-Out Method for Half-Tone Highlight," The Photoengraver's Bulletin, March 1959, pp. 39-42.