Dec. 13, 1966 T. T. BRYAN 3,291,603

COLOR PROOFING CONSTRUCTIONS AND THEIR USE

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FIG. 1

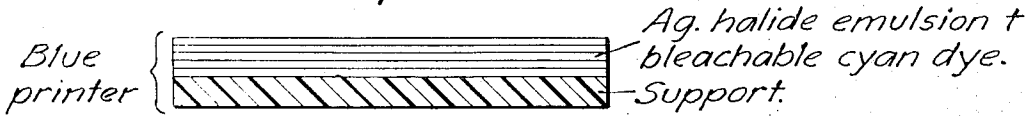


FIG. 2

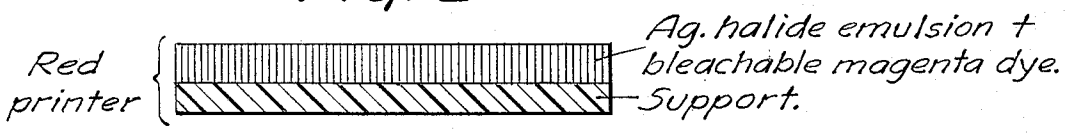
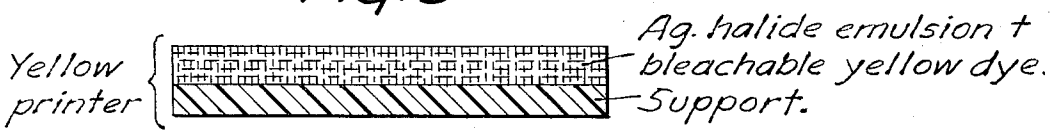


FIG. 3



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COLOR PROOFING CONSTRUCTIONS AND THEIR USE

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Continuation of application Ser. No. 216,552, Aug. 13, 1962. This application Nov. 29, 1963, Ser. No. 328,775
4 Claims. (Cl. 96—20)

This application is a continuation of my application Serial No. 216,552, filed August 13, 1962, now abandoned.

This invention relates to a color proofing material and its use. In one aspect, this invention relates to a system for color proofing the color separations used in intaglio and other printing processes for reproducing visual images. In another aspect this invention relates to a novel photographic film construction for use in the color proofing system herein described.

It is therefore an object of this invention to provide a novel photographic film construction suitable for use in color proofing of continuous tone color separation positives.

Yet another object of this invention is to provide a simple photographic film construction which can conveniently and inexpensively be processed in color proofing.

Another object of this invention is to provide a positive-positive color proofing system.

Still another object of this invention is to provide a technique for color proofing positive color separations which can be viewed either by transmitted or reflected light.

Other objects and advantages of the invention will become apparent from the disclosure herein.

The novel color proofing system of this invention utilizes a film construction, hereinafter referred to as a "printer," having a support which is preferably transparent and which can be any of the suitable plastic materials, with or without suitable subbing treatment or coating, on which is superimposed a light sensitive silver halide emulsion coating containing uniformly dispersed therein at least two colored dyestuffs which can be decolorized or bleached in the presence of metallic silver. Such decolorizable dyestuffs are described in conjunction with the dye-bleach process, and in United States Patent No. 2,020,775, a process of this type is disclosed in which azo dyes are employed in multilayer coatings to produce colored images by bleaching the dyes in the presence of silver images. This multilayer construction is exposed and the silver image is developed, after which the sheet is subjected to the action of a bath which destroys the dye locally in proportion to the metallic deposit of the photographic image. Such bleachable dyestuffs and their development are well known and are described in German Patent No. 1,097,270, United States Patent Nos. 2,020,775; 2,612,448; 2,644,753; 2,844,574; Reissue No. 23,357, and others.

For full color proofing a set of color separation positives, at least three color proofs are required. Using a standard exposure and dye-bleach development technique, the blue printer (containing a cyan-colored bleachable dyestuff) is exposed through the red color separation positive and developed to produce a cyan (or red subtractive primary) record in the non-exposed areas. Similarly, the red printer (containing a magenta-colored bleachable dyestuff) is exposed through the green color separation positive and developed to produce a magenta (or green subtractive primary) record in the non-exposed areas, and the yellow printer (containing a yellow-colored bleachable dyestuff) is exposed through the blue color separation positive and developed to produce a yellow (or blue subtractive primary) record in the non-exposed areas. If desired, a black printer may be prepared by including all three cyan, magenta and yellow bleachable dyestuffs in the photosensitive silver halide emulsion layer, exposing through a black separation positive and developing in the same manner as with the blue, red and yellow printers. Undyed film may also be used to prepare the black printer using a black separation negative. When these printers are superimposed in register, one upon the others, the full color information of the combined separation negatives is restored, permitting an accurate proof of the final print which the separations will provide when the appropriate masters or plates are prepared therefrom. When the proofing films or printers are tansparent, they may be supeimposed in any order. If the proofing is made by reflected, rather than transmitted, light, one of the printers may be provided with an opaque white support or backing, e.g., paper, etc. The printer with the opaque support (usually the yellow printer) is placed at the bottom of the superimposed printers for proofing.

The silver halide emulsions of all printer sheets are preferably similarly sensitized. Color blind (i.e., no added sensitizer) emulsions and orthochromatic emulsions (e.g., green and blue sensitized) are particularly advantageous, since their processing can be accomplished under suitable safe light provisions.

Effective use of the color proofing system of this invention requires that the colors of the respective printers closely approximate or match the corresponding actual printing inks used in the gravure process. Since many commercial inks depart from true cyan, magenta and yellow, the bleachable dyestuffs in the various color printers of this invention are modified accordingly to match the blue, red and yellow inks used by the printing trade. Hence, for example, a small quantity (e.g., less than 10 weight percent of the cyan dye) of a bleachable magenta dyestuff is added to the cyan emulsion coating of the blue printer to provide a blue matching the blue gravure ink. Similarly, a small amount of bleachable yellow dyestuff is added to the magenta-colored emulsion coating of the red printer to provide a color to match the red gravure ink. Through blending of two or more bleachable dyestuffs in this manner, a wide range of commercially available inks can be accurately matched in color on the corresponding color proofing printers. When using two or more bleachable dyestuffs in the silver halide emulsion layer the dyestuffs desirably are bleachable without a significant change in hue over the range of density values. In general, over a 1.3 range of density values, the hue shift should not exceed about 20 percent is preferably below about 15 percent.

The following procedure can be used to determine the hue shift resulting from the relative bleaching rates of two or more bleachable dyes. Various film samples are prepared by coating a photographic emulsion onto a transparent film base, each sample incorporating into the emulsion a different, single bleachable dyestuff at the desired maximum density level. In all other respects the emulsion, coating thickness and procedures, are maintained constant in all samples. Each sample is then exposed in the same manner to a continuous tone step wedge with an approximate density of 1.3 density units. All samples are then processed similarly. With the samples then superimposed in register, light transmitted through the superimposed maximum density steps provides the desired color. Visual observation of the light transmitted through the remaining superimposed steps will permit detection of hue change or hue shift, which can be measured by known techniques.

Illustrative silver halide emulsions containing bleachable dyestuffs which may be coated onto supports by techniques known in the photographic art are as follows:

1100 grams of silver nitrate solution in 11 liters of water is added over a 15 minute period to a solution containing 220 grams of gelatin, 121 grams sodium chloride and 815 grams potassium bromide in 11 liters of water. The resultant blend is ripened for 10 minutes at 55° C. 2400 grams of sodium sulfate are added to effect precipitation, and the supernatent liquid is poured off. This material is then redispersed in 1430 grams gelatin in 5720 ccs. of water. After cooling to 25° C. and overnight refrigeration, the material is shredded, washed in a solution of 0.1 gram of potassium bromide in a gallon of deionized water. The temperature is then adjusted to 50° C., 31.4 ccs. of 0.1% $Na_2S_2O_3$ is added, and the mixture is digested for 70 minutes at 50° C. After adding the conventional stabilizers and preservative, the emulsion is permitted to cool. To prepare a red-dyed emulsion the following formulation can be prepared:

(A) *Red-dyed emulsion*

500 grams of silver halide emulsion described above.

20 grams gelatin in 630 cc. water.

8 cc. of a wetting agent 12 weight percent aqueous solution of an aliphatic polyoxyethylene ether alcohol derived from a branched chain tridecanol and 9 mols of ethylene oxide.

82 cc. of 5 weight percent aqueous solution of saponin.

77 cc. of a 5 weight percent aqueous solution of mucochloric acid.

250 cc. of 2 weight percent aqueous solution of the breachable magenta dyestuff described in Example 7 of United States Patent No. 2,644,753.

100 cc. of a 1 weight percent aqueous solution of Milling Yellow G (Acid Yellow 44, Color Index No. 23900).

An emulsion for matching the blue color of a commercial printing ink is as follows:

(B) *Blue-dyed emulsion*

500 grams of silver halide emulsion described above.

40 grams gelatin in 600 cc. water.

8 cc. of 12 weight percent aqueous solution of wetting agent described in Formulation A.

82 cc. of 5 weight percent aqueous solution of saponin.

7 cc. of 5 weight percent aqueous solution of mucochloric acid.

265 cc. of a 2 weight percent aqueous solution of the bleachable cyan dyestuff set forth in Example 3 of United States Patent No. 2,612,496.

86 cc. of a 2 weight percent aqueous solution of the bleachable magenta dyestuff described in Formulation A.

Although the foregoing description is directed to the admixture of two or more bleachable dyestuffs, some commercially available bleachable dyestuffs contain two or more bleachable dyestuff components and are also useful.

Various other embodiments of the present invention will be apparent to those skilled in the art without departing from the scope thereof,

I claim:

1. A color proofing process which comprises:

(1) exposing through a red color separation positive a blue printer comprising a transparent support having a silver halide emulsion coating in which is uniformly dispersed a bleachable dyestuff system to provide a cyan color therein, said bleachable dyestuff system being capable of selective decolorization in the presence of reduced silver,

(2) developing said blue printer by dye-bleach technique to produce a positive image in said cyan color,

(3) exposing through a green color separation positive a red printer comprising a transparent support having a silver halide emulsion coating in which is uniformly dispersed a bleachable dyestuff system to provide a magenta color therein, said bleachable dyestuff system being capable of selective decolorization in the presence of reduced silver,

(4) developing said red printer by dye-bleach technique to produce a positive image in said magenta color,

(5) exposing through a blue color separation positive a yellow printer comprising a transparent support having a silver halide emulsion coating in which is uniformly dispersed a bleachable dyestuff system to provide a yellow color therein, said bleachable dyestuff system being capable of selective decolorization in the presence of reduced silver,

(6) developing said yellow printer by dye-bleach technique to produce a positive image in said yellow color, and

(7) superimposing all of said printers in register and viewing the resultant full color proof.

2. The color proofing process of claim 1 in which one of said printers has a white, opaque support.

3. The color proofing process of claim 1 in which a black printer is included in said superimposed printers to view the resultant full color proof.

4. The color proofing process of claim 1 in which a black printer is included in said superimposed printers to view the resultant full color proof, said black printer being prepared by exposing through a black separation positive a film construction comprising a transparent support having a black-colored silver halide emulsion coating in which is uniformly dispersed a bleachable cyan dyestuff, a bleachable magenta dyestuff and a bleachable yellow dyestuff, said bleachable dyestuffs being capable of simultaneous decolorization without a change of hue in the presence of reduced silver.

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