

PATENT SPECIFICATION

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COMPLETE SPECIFICATION.

Improvements in Color Photography.

We, KELLEY COLOR LABORATORY, INC., a corporation organized under and existing by virtue of the laws of the State of New Jersey, United States of America, and having a principal place of business at 1010, Palisade Avenue, Town of Palisade, County of Bergen, State of New Jersey, Manufacturers, Assignees of WILLIAM VAN DOREN KELLEY, a citizen of the United States of America, of the City of Jersey City, County of Hudson, State of New Jersey, United States of America, and DOMINICK TRONOLONE, a citizen of the United States of America, of the Town of Fort Lee, County of Bergen, State of New Jersey, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to color-photography and particularly has reference to the production of a plurality of colored registered images in a single coating on a transparent carrier.

Heretofore quite a few processes have been proposed for forming what is known as a color-photograph, that is, a photograph which exhibits an image of a subject wherein a color appears in kind and position corresponding to the coloring of the subject.

For making coloured photographs or photographic motion picture film it has heretofore been proposed to form two registered super-imposed images in the same picture space and in the same sensitive colloid layer, one being formed of one color and the other being formed of a substantially complementary color. It has heretofore been proposed to secure one of the colors by a toning process and the other by a dyeing process or both by a dyeing process. Prior Specification No. 193,069 (William Van Doren Kelley)

describes a method of color photography of the character under notice and this specification also refers to other methods already proposed prior to the date of the said application. According to an already proposed method two differently colored images consisting of metallic salts are formed in the same colloid layer. The present invention differs however from this proposed method in that the colloid layer is not resensitized before printing the second image, but the second image is printed in the residue of the original sensitive layer left after printing and developing the first image. Neither image is dyed but both images are toned with metallic salts and the film is immersed in a clearing bath of ammonium bromide and potassium bichromate after the conversion of the first image and before the development of the second image. The present invention consequently consists in producing two images in the same colloid layer and converting each to a salt of metal of different color each image being independently developed with an immersion in a bath containing a bromide and a bichromate after the first conversion and before the second development, the colloid layer not being resensitized before printing the second image.

From the foregoing it will be appreciated that the present invention provides an improved process by which two substantially complementary colored super-imposed images in the same picture space, in a single coating on one side only of a carrier, may be obtained by methods which involve the toning with metallic salts of two images without degradation of either.

The objects and advantages of the invention will appear as the description of a particular manipulation involving the novel features of applicants' inven-

tion progresses and the novel features will be particularly pointed out in the appended claims.

In order to carry out applicant's process it will be necessary to secure two images one representative of one color in a subject and the other representative of a substantially complementary color of the subject. These images of course must be suitable to be used as negatives and in the further description of this process will be referred to as negatives. One will be designated the blue-green negative and the other the red negative. There are many ways of securing these negatives well known to those skilled in this art and as applicants' process does not depend upon the particular methods used for securing the negatives no particular manner of securing them will be described and pointed out.

Having secured the negatives, one is placed in contact with the back of a transparent support carrying a single emulsion coating. If motion pictures are being dealt with, then the negative would be placed in contact with the celluloid; that is, in contact with the uncoated side of the film and further, ordinary motion picture stock film would be used it being unnecessary to use any dye in the emulsion to act as a light retardant. The negative having been placed in contact with the back of the film a printing light is then allowed to shine therethrough and a latent image formed in the emulsion coating. In thus forming a latent image in the emulsion coating care is taken to so regulate the intensity of the printing light and the time of printing that if possible the light sensitive material in the emulsion which will be acted upon, will be substantially only that positioned in substantially the lower thickness of the emulsion coating.

After the printing with one negative through the back of the carrier the latent image is developed for about three minutes. The particular developing bath considered by applicants to be most efficacious in enabling them to secure the desired result is neutral or acid and would be made up as follows:

55	Diamidophenol (amidol) - - - -	5 G.
	Sodium sulphite - - - - -	30 G.
	Potassium bromide - - - - -	.94 G.
	Potassium iodide 10% solution	1.2 c.c.
	Water - - - - -	1 L.

After developing, the print should be washed for 5 minutes, then if the image is to be formed as a blue-green image, the print should be placed in what we term the color-forming bath. A satisfactory color-forming bath to develop a

blue-green in the image is formed as follows: 65

	Oxalic acid - - - - -	5 G.	
	Vanadium oxalate 10% solution	15 c.c.	
	Ferric and ammonium oxalate	14 G.	
	Potassium ferricyanide - - - -	5 G.	70
	Water - - - - -	1 L.	

The print should be allowed to remain in the blue-green color forming bath for 15 minutes and then washed for five minutes. 75

After the print has been washed it should be cleared. The applicants allow the clearing bath to act for ten minutes and find that a suitable clearing bath would be as follows: 80

	Ammonium bromide - - - - -	12 G.
	Potassium bichromate - - - - -	12 G.
	Water - - - - -	2 L.

After the print has been cleared it should be washed for ten minutes and dried. This drying must of course take place in the dark, or in a room illuminated by a light having no effect upon the light sensitive material in the emulsion, that is, in most cases with a ruby light. 85

After the print has been dried a second latent image is then to be formed in the emulsion coating. This second latent image is to be formed by printing from the other negative by placing the same in contact with the emulsion and allowing a printing light to shine therethrough. The intensity of the printing light and the time of printing will be preferably so regulated that the color image formed by further manipulation resulting will be substantially complementary to the first color formed. 90

After the latent image is formed in the emulsion it is placed in the developing bath hereinbefore described and developed for three minutes, after which it is washed for five minutes and fixed in sodium thiosulfate 600 g., water 1 L. and then washed for fifteen minutes. 95

The film now containing a blue-green image and a reduced black silver image is placed in the red color forming bath. A red-orange color forming bath found suitable and preferred by the applicants would be formed as follows: 100

	Uranium nitrate - - - - -	9 G.	
	Potassium oxalate - - - - -	4 G.	
	Hydrochloric acid - - - - -	8 c.c.	
	Potassium ferricyanide - - - -	3.5 G.	120
	Water - - - - -	1 L.	

The developed image would be allowed to remain in the red-orange color forming bath for five minutes and then washed for five minutes. 125

After the print has been last washed it would be fixed for five minutes in a bath formed as follows:

Sodium thiosulphate	-	-	600 G.
5 Potassium metabisulphite	-	-	60 G.
Water	-	-	1 L.

After fixing, the print would be washed for ten minutes and then dried, thus completing the formation of the color photograph, that is, a transparent carrier having a coating on one side only and in that coating in the same picture area two registered super-imposed, substantially complementary colored images.

15 Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

20 1. In color photography, producing two images in the same colloid layer and converting each to a salt of metal of different color each image being independently developed with an immersion in a bath containing a bromide and a bichromate after the first conversion and before the second development, the colloid layer not being resensitized before printing the second image but the second image being printed in the residue of the original sensitive layer left after printing and developing the first image.

2. A method of color photography according to Claim 1 according to which an amidol developer is employed for the independent development of each of the two images.

3. In color photography, the production in a colloid layer of a silver print which is converted to a salt of iron then bathed in a bath containing bichromate and bromide, dried and a second silver print produced without resensitizing in the same colloid layer in registry with the first and the latter converted to a salt

of uranium without affecting the color of the first image.

4. In color photography according to Claim 3 developing the two silver images independently in an amidol developer.

5. In carrying out the method set forth in Claim 2 first forming a silver image in the colloid layer, toning that image substantially a blue-green, clearing with a bath of ammonium bromide and potassium bichromate in water solution, forming another silver image in the same colloid layer, and toning that image substantially a red-orange without affecting the color of the first image.

6. A process according to Claim 1 wherein the first image is printed on the layer through its transparent support from a red record negative, developed with amidol, and toned in a bath containing vanadium oxalate, ferric-ammonium oxalate, oxalic acid, and potassium ferricyanide, the layer is then cleared in a bath containing ammonium bromide and potassium bichromate and after washing and drying, the second image is printed on the front of the layer from a blue-green record negative, developed with amidol, fixed in hypo toned in a bath containing uranium nitrate, potassium oxalate, hydrochloric acid, and potassium ferricyanide and finally fixed in acid hypo.

7. In color photography the production of two substantially complementary colored superimposed images in the same picture space in a single coating on one side only of a carrier substantially as hereinbefore described.

Dated this 30th day of January, 1925.

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