

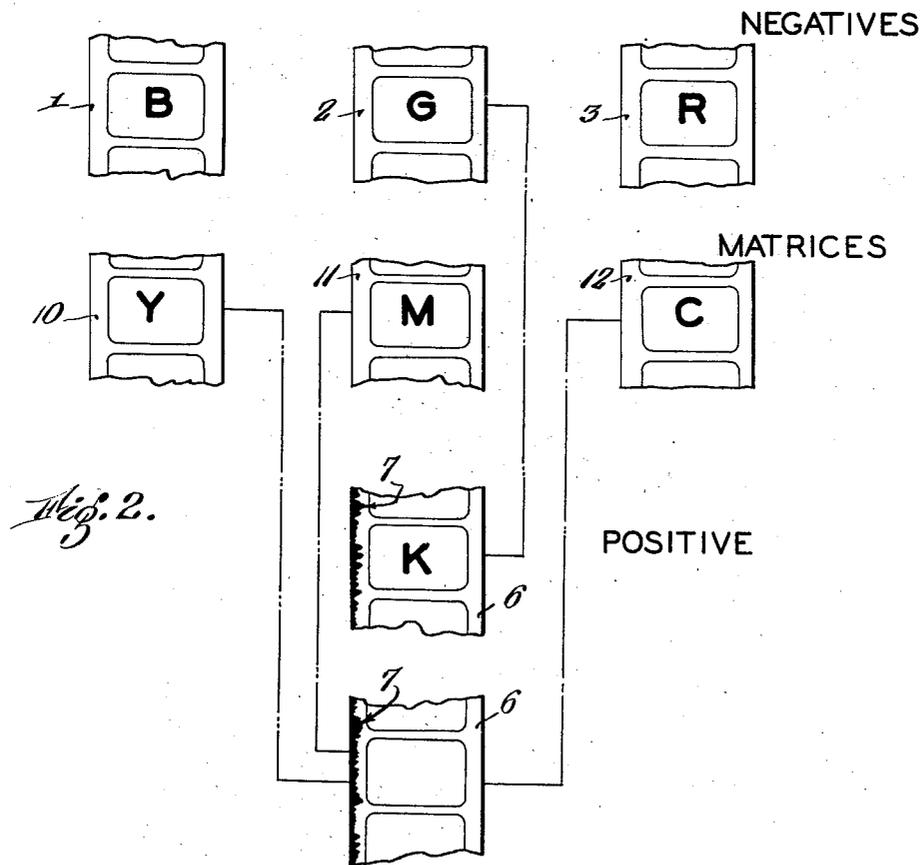
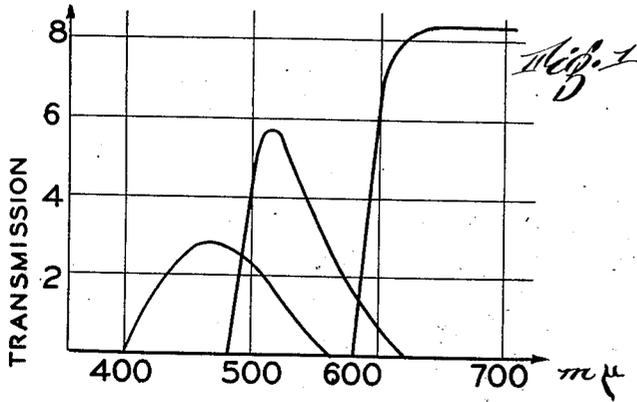
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SUBTRACTIVE COLOR PHOTOGRAPHY

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SUBTRACTIVE COLOR PHOTOGRAPHY

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2 Claims. (Cl. 95—2)

It is known to combine subtractive three-color reproductions with black or gray key prints in order to improve the definition of the final print and to obtain actually black portions without the necessity of especially balancing and controlling the color aspects for this purpose. It has also been proposed to use one of the color separation negatives or a combination thereof for making the key print instead of making a special exposure for this purpose. The present invention is an improvement of these known methods and some of its objects are to utilize the known advantages of the key print and at the same time to balance the color aspect prints by means of the key print, to utilize overlapping taking filters without unbalancing any color in the final print, to make well balanced three-color positives with key prints from three-color separation negatives, to make colored cinematographic films with silver sound track and key print for the pictures in a simple comparatively inexpensive and commercially feasible manner, and to eliminate unbalance of the middle range of the spectral colors in color separation reproductions. Other objects will be apparent from the following description and the accompanying drawing in which:

Fig. 1 is a diagram showing the transmission curves of filters for color separation photography;

Fig. 2 is a schematical illustration of an embodiment of the present invention.

In the course of experimentation with three-color photography I have found that in the final positive the colors of the middle range of the spectrum are not rendered as correctly as those of the marginal ranges. This is probably due to imperfect color separation in this range caused by the double overlap of the taking filters in this range since, as well known in the art, it is not possible to obtain sharply cut filtering means, and in order to obtain the maximum light intensity which is very necessary in color separation photography a certain overlap of the filters as shown in Fig. 1 must be tolerated. Consequently the middle range of the spectrum is finally rendered not only with the printing colors corresponding to the ideal color separation but also with other colors actually not belonging there, which results in a general graying down or lowering in key of this range, corresponding to the superimposition of colors adding up to black.

It is well known in the art that a subtractively produced color print can be much improved by

adding a so-called key print, which supplies in a convenient manner the desirable definition otherwise afforded by three-color processes only with many difficulties and therefore only at a much greater expense. With a key print in the form of an image assuring the best obtainable sharpness, as for example a silver image, the color aspects need only be perfect as far as color rendition is concerned and it is not necessary to perfect them with a view to obtaining maximum definition and correct rendering of the blacks. This is the more important as these two requirements, namely correct color rendition and correct rendering of the blacks together with good definition, are in many cases exclusive of each other or at least very difficult to reconcile.

I have found that the introduction of a key print according to this invention also corrects the imperfect rendering of the middle range referred to above. Using the terms commonly employed for the dominating hues of the corresponding spectral ranges, the taking ranges for the negatives are separated with the aid of blue, green and red taking filters and the subtractive positives obtained from these negatives are printed with the complementary colors, yellow, magenta and cyan respectively. A black and white key print corresponding to the overall color intensities of the scene, as for example one taken through a yellow filter on a panchromatic emulsion, darkens the various partial prints of the positive to an equal degree; and with such a key print the middle range will be lower in key just as in a pure three-color print. Now according to the present invention I use the negative obtained through the green filter for making the key print positive. Since an object having colors predominantly of the middle range of the spectrum (herein called a green object) is reproduced with the cyan and yellow of the positive, the reproduction of such an object is not further darkened by the key print produced from the green negative, which is also printed in magenta, whereas the positive reds and blues are controlled by the magenta print made from the green negative and, since this magenta print coincides in its density distribution with the key print, the positive reds and blues become lower in key and are in this manner brought into better balance with the greens.

Having now described my invention in a general manner I shall proceed to give a more detailed description of one of the possible concrete embodiments thereof with reference to Fig. 2 of the drawing.

With an appropriate arrangement (such as for example described in detail and claimed in my co-pending application Serial No. 460,161, filed June 14, 1930) consisting of a light splitting optical system which permits the exposure of three films, through suitable filters, I take three color separation negatives B, G, R, on films 1, 2, 3, with taking ranges according to Fig. 1. As indicated in Fig. 2, from the negative G I make a positive print K in the ordinary silver bromide emulsion of a film 6, preferably under-exposing this print since the beneficial function of the key print is mainly in the higher densities. A gamma of approximately unity is to be preferred for the key print which makes it possible to print it together with a photographic sound track positive 7, sound tracks requiring such a gamma. This has the additional advantage of utilizing a necessary step in the manufacture of sound films for the picture film, thereby eliminating any extra cost for the key print of the improved picture record. From the color separation negatives I produce printing matrices 10, 11 and 12, with positive images Y, M and C, preferably according to methods disclosed in various patents to the Technicolor Motion Picture Corporation. From these matrices I print by imbibition, transferring dyes from the matrices in consecutive steps to the gelatine emulsion already containing the key print and, if desired, the sound track. It is of course understood that it may be preferable in certain cases to print the sound track from one or several matrices together with the color aspects

as disclosed in the co-pending application of L. T. Troland, Serial No. 327,420, filed December 20, 1928 and assigned to the same assignee. In this manner I obtain a final positive P containing a key print and three color components which are balanced by the key print and also having all the well known desirable features of a three-color positive with key print.

It should be understood that the present disclosure is for the purpose of illustration only and that this invention includes all modifications and equivalents which fall within the scope of the appended claims.

I claim:

1. The method of making color photographs which comprises making three color separation negatives of different spectral ranges of a scene, making a black and white positive key print from the color negative of the intermediate spectral range and superimposing thereon positives of the color separation negatives in colors complementary to the respective taking ranges.

2. The method of making color photographs which comprises taking color separation negatives of the overlapping red green and blue spectral ranges of a scene, photographically printing from the green negative, in a silver halide emulsion, an under-exposed key print, developing it to a gamma of approximately unity and superimposing thereon by imbibition positive prints of said color separation negatives in cyan, magenta and yellow.

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