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MAKING PHOTOGRAPHIC SILHOUETTE RECORDS

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Fig. 2

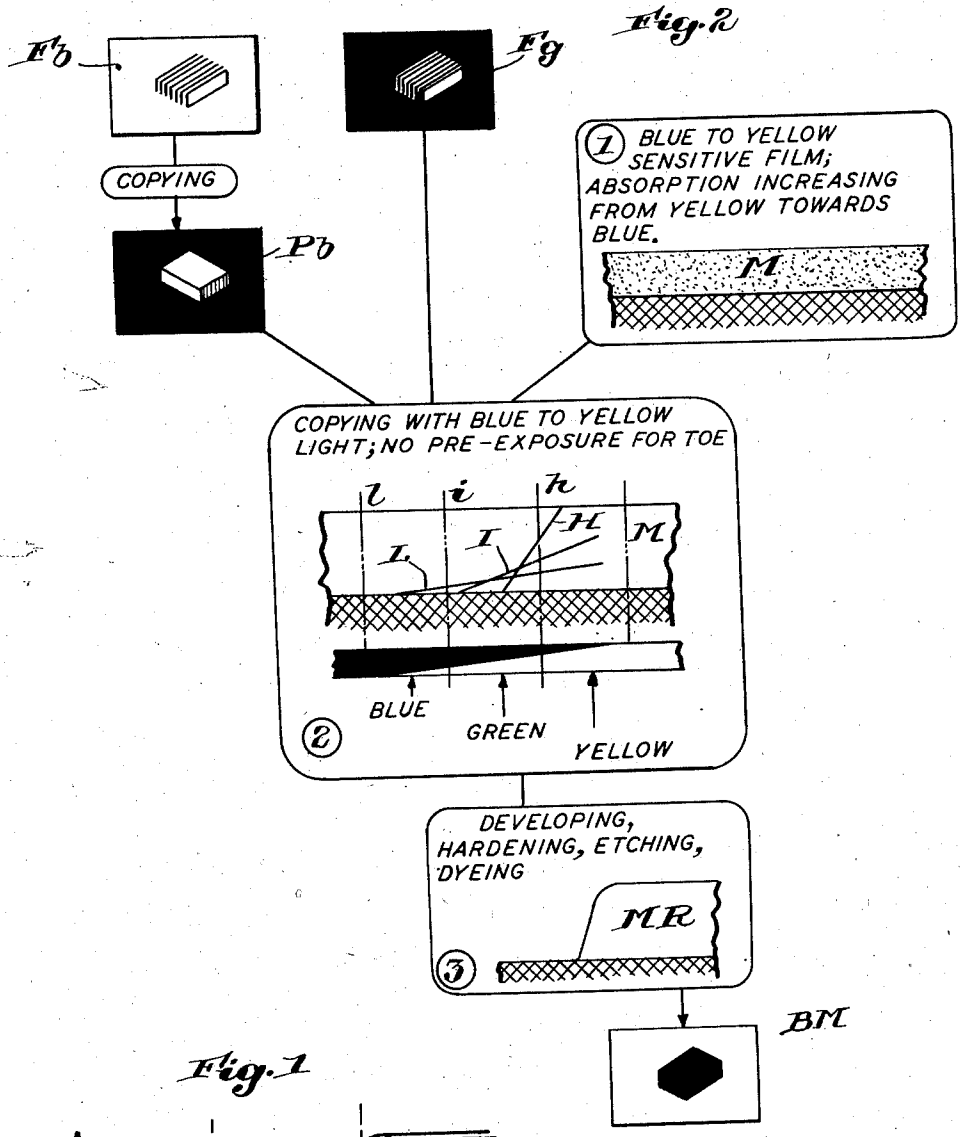
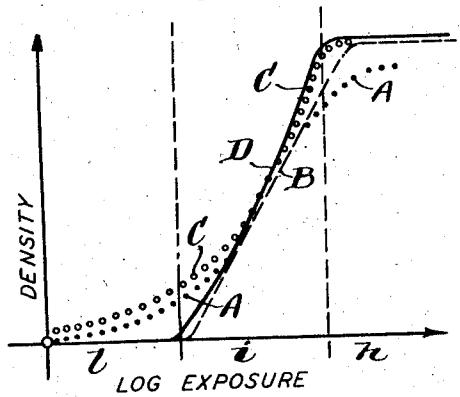


Fig. 1



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MAKING PHOTOGRAPHIC SILHOUETTE RECORDS

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6 Claims. (Cl. 95—5)

Photographic processes may present problem which make it desirable to exaggerate differences in densities of photographic records; for example, so-called traveling mattes used for producing certain types of composite motion picture film (as for example described in copending application Serial No. 285,067, filed July 18, 1939, of Leslie W. Oliver) require the differentiation of a record field into a high density and low density area, without detail in these areas. Similar problems may arise in the production of silhouette effects for pictorial purposes, or of sound tracks of the varying width type, or, generally speaking, whenever it is desired to obtain records consisting of areas of maximum density difference on respective sides of a contour.

In the above-mentioned especially important example of traveling mattes, the areas corresponding to original exposure values above a certain intermediate value should be substantially opaque for printing light, and the areas corresponding to densities below that value should be practically transparent.

It is one of the principal objects of the present invention to provide a method of making silhouette records of the above-mentioned type with the aid of a specially prepared emulsion in a particular manner devised to produce records of extreme contrast. In one aspect, the invention contemplates the differentiation of a photographic record into comparatively extremely high and extremely low density areas corresponding to exposure values above and below, respectively, an intermediate value. In another aspect the invention provides a method of making silhouette traveling mattes for purposes of producing special process motion picture film. These and other objects and aspects of the invention will be apparent from the following description of a practical embodiment thereof illustrating the genus of the invention and referring to a drawing in which:

Fig. 1 is a log exposure-density diagram characterizing one feature of the invention; and

Fig. 2 is the flow diagram of a photographic process incorporating the invention.

With reference to Fig. 1, the characteristics of photographic material used in carrying out this invention will first be described as far as they have a bearing thereon. As well known, ordinary silver halide emulsions have a log exposure-density characteristic of the general shape indicated at A of Fig. 1, with a comparatively straight intermediate portion *i* and much more flat low density ("toe") and high density portions *l* and *h*, respectively. According to well-known processes, the emulsion portions containing exposed silver halide can be hardened, the unexposed portions etched off, and the remaining relief colored with dyes. The characteristic curves of such reliefs, relatively to light of the range which the dyes therein contained absorb, have for practical purposes no toe and a straight intermediate portion which passes rather abruptly into a constant density portion, as shown at B of Fig. 1. Such reliefs are extensively used as matrices, by dyeing them and transferring their dye to blank films. However, due also to peculiarities of the dye transfer process the above relief characteristic is rather unsuitable for these purposes, and ways of improving its shape have therefore been proposed.

As disclosed in Patent No. 1,677,665 of July 17, 1928, to Eastman A. Weaver, relief records having a toe can be obtained by pre-exposing or flashing a silver emulsion through its support with light which it absorbs. Patent No. 1,804,727 of May 12, 1931, likewise to Eastman A. Weaver, teaches a method of obtaining gelatine reliefs whose varying thicknesses represent a characteristic curve having an upwardly concave configuration. This method involves dyeing the film and printing it with two light ranges differently absorbed by the emulsion so that the light of the one range penetrates deeper than the other. An improvement of this method is described in Patent No. 2,044,864, of June 23, 1936, to Leonard T. Troland. By combining the flashing and differential absorption methods (using the same absorption property of the emulsion for purposes of pre-exposure flashing as well as differential absorption), a relief having a toe and an upwardly concave intermediate-towards-high density region, as shown at C of Fig. 1, can be obtained. Dye transfer (imbibition) prints made with such matrices have a characteristic fairly similar to that of a silver record according to A of Fig. 1. It should be especially noted that the characteristic C corresponds to the varying gelatine thickness of a relief, and the transmission of a dyed relief, or a silver record exposed through such a dyed relief, whereas the actually desired characteristic of the dye transfer record conforms to A of Fig. 1, the differences being due to the above-mentioned peculiarities of the dye transfer process.

In accordance with the invention, the light transmission properties of a film of the above type which, however, has not been pre-exposed or flashed, at least not to a degree applied for

purposes of the above Patent No. 1,677,665, are utilized for making silhouette records, as will now be described.

In Fig. 2, *Fb* and *Fg* are blue and green recording negatives, respectively, of a foreground object with backing, of the nature described in the above copending application, Serial No. 285,067. As explained in that application, it may be desirable to photograph, in natural colors, a given foreground action against a background object field, background and foreground to be taken separately; for example, the foreground may be a magic carpet flying with a person thereon in front of a fanciful background.

For that purpose, a background object field is illuminated with white light containing the blue, green and red spectral ranges. The foreground, for example a magic carpet set, is likewise illuminated with white light, and has a uniform backing showing as little detail as possible. This backing may be painted yellow, with a pigment reflecting substantially only the green and red spectral ranges, and in that case would be illuminated with green and red light.

Both background and foreground with backing are separately photographed with a color separation camera or on integral pack film, according to well-known methods.

There will now exist two sets of blue, green and red recording negatives, which comprise the above-mentioned blue and green recording foreground with backing negatives *Fb* and *Fg*, which alone need be considered for purposes of explaining the present invention. As described in the above-mentioned copending application, the background field may be illuminated as customary for pictures of this type, but the foreground scene with backing, which are recorded on *Fb* and *Fg*, should be illuminated in such a manner that the green reflection from the backing (colored and illuminated with minus blue light as mentioned above) is at no point of less intensity and preferably at all points of higher intensity than the green reflection from any point of the foreground.

Therefore, the backing area of negative *Fb* will be essentially clear, since this blue recording film has not received any light from the minus blue backing. On the other hand, the corresponding areas of green recording film *Fg* will be rather dense, having been exposed to the green and red spectral ranges reflected from the backing. The foreground proper will be recorded as usual on color separation negatives of this type but, because of the above-mentioned precaution, the foreground area of negative *Fg* will nowhere have a density higher than the density of its backing area.

From the blue and green foreground negatives two mattes are now made, for example according to the method indicated in Fig. 2, as follows: A positive *Pb* is printed from the blue recording foreground negative *Fb*, and a light sensitive film is then consecutively exposed to negative *Fg* and positive *Pb*. Since the backing area on both *Fg* and *Pb* is of high density, the latent record of this new print BM, herein referred to as background matte, will have low exposure values in the backing area, with little detail. On the other hand, the consecutive printing of a positive and a negative of the foreground scene will furnish a rather highly exposed latent record of the foreground area of matte BM.

In the finished matte, the photographic contrast of background and foreground areas should be as high as possible, in order to magnify small exposure differences between these areas, so that, in the present embodiment, the minus blue backing will be rendered transparent in the matte, and the foreground area uniformly opaque.

According to the invention, and as indicated at 1 of Fig. 2, a record of this type is provided by printing negative *Fg* and positive *Pb* on a film sensitized to blue, blue-green, green and yellow light with a conventional sensitizing dye as for example erythrosine, and dyed, per 100 g. gelatine, with Tartrazine 10 g., Rose bengal 0.75 g., and acid magenta 0.125 g. An emulsion of this type is sensitive to a light range from blue to yellow, inclusive, strongly absorbs the blue range, absorbs the green range, and to a slighter degree absorbs the yellow range. Therefore, its exposure with light including the blue to yellow ranges will have the above-described effect of differential penetration, which is also indicated at 2 of Fig. 2 where lines L, I and H indicate the depth of penetration of the blue, green and yellow light ranges, respectively, the envelope of these lines representing the exposure. It should be noted that the curve is actually even flatter in the low density region than possible to show in a schematical straight line diagram and that the subsequent etching step will remove the gelatine in this region if the above-explained flashing technique is omitted.

After the film has been exposed to records *Pb* and *Fg* as mentioned above, precautions having been taken that any preexposure or flashing is avoided, it is developed, in a hardening pyro developer, as for example, described in Patent No. 1,535,700, dated April 28, 1925, to Leonard T. Troland, and bleached to silver ferro cyanide in a ferri cyanide bath as described in U. S. Patent No. 1,919,673 of July 25, 1933, to Troland and Eaton. This bleaching reaction produces still further hardening of the developed gelatine portions, corresponding to considerable effective intensification of the original record. The unhardened gelatine is then removed in a bath of hot water leaving the record in hardened gelatine and silver ferro cyanide. In this manner a gelatine relief is obtained which conforms to curve D of Fig. 1 and is indicated at 3 of Fig. 2.

This relief is then dyed for example with yellow dye as Brilliant Paper Yellow Concentrated (Schultz, 7th ed. #724). If desired, the density of the residual silver ferro cyanide record may be increased by redeveloping it, in well-known manner, to form a silver or silver sulphide record. The resulting record will be essentially clear or fully transparent for actinic light in the low exposure area, and in the high exposure region substantially opaque for light affecting the usual positive emulsions. Prints made on silver emulsions from such dyed reliefs will therefore likewise have a characteristic curve, as indicated at D of Fig. 1. Due to this shape, low intensity exposures will up to a certain intermediate value result in a substantially clear record area, whereas, beginning with that intermediate exposure value, the corresponding densities will rapidly increase. In other words, for practical purposes, exposure intensities up to a given intermediate value (which can, to a certain degree, be selected at will) are not recorded, whereas substantially all intensities beyond that value will produce opaque areas, there being only a very short half tone region corresponding to an intermediate exposure range *i*; exposures below and above this range *i* producing no den-

sities or practically opaque densities, respectively.

The film MB produced in this manner will therefore constitute a true and effective mask with any detail of the foreground field as well as of the backing being eliminated, the area of the former being for printing purposes opaque gelatine, and that of the latter substantially clear Celluloid from which the gelatine is etched off.

Matte MB may then be copied on a further film, if desired according to the above-described procedure; a second or foreground matte with opaque backing and clear foreground areas, respectively, being obtained in this manner.

As described in the above copending application, three matrix films of the type commonly used for that purpose are now exposed to the background negatives, each exposure being limited by means of background matte BM to the background area exclusive of the foreground area represented in the matte by its uniformly opaque silhouette. Therefore, this exposure furnishes latent records of the background combined with an unexposed foreground area. The matrix films are then exposed to the foreground negatives, including *Fb* and *Fg*, through the foreground matte which screens the previously exposed background area but permits exposure of the foreground area recorded on the foreground negatives. The three matrix films are then developed and converted into gelatine reliefs, from which the final positive is printed according to the well-known imbibition process, this positive constituting a combined record, in natural colors, of separately photographed background and foreground object fields.

It was found that, with the above-described method, from a negative having two areas of densities differing as slightly as about 0.05 silver density, a print can be made in which all gelatine is removed from the area corresponding to the higher negative density, whereas the lower density area of the negative is in the print represented by a dyed gelatine layer having an effective light stopping power equivalent to approximately 1.0 silver density.

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. Method of producing photographic silhouette records which comprises taking a record having a density range including high light as well as shade values, copying said record on an emulsion whose density range includes high light as well as shade values and corresponds to an exposure range constituting a comparatively short intermediate section of the exposure range of said record, developing said emulsion and forming a dye record from the gelatine portions of said film which received an exposure within and above said intermediate section.

2. Method of producing photographic silhouette records which comprises taking a record having a density range substantially divided into two record area groups whose densities are on either side respectively of a density value corresponding to an intermediate exposure value, copying said record on an emulsion whose complete density range corresponds to a comparatively short exposure range including said intermediate exposure value, developing said emulsion, and forming therein a dye record from the gelatine which received an exposure within and above said short exposure range.

3. Method of producing photographic silhouette records which comprises taking a record, copying said record on a substantially unpreexposed emulsion sensitive for two spectral ranges and absorbing less light of one of said ranges than of the other range, with light containing both ranges, developing and hardening the exposed gelatine portions of said emulsion, removing the non-exposed gelatine portions thereof thereby providing a relief record, coloring said relief record with strongly light absorbing dye, and copying said relief record with light absorbed by said dye.

4. Method of producing photographic silhouette records which comprises taking a record, copying said record on a substantially unpreexposed emulsion sensitive for two spectral ranges and absorbing less light of one of said ranges than of the other range, with light containing both ranges, developing and hardening the exposed gelatine portions of said emulsion, bleaching the developed silver of said emulsion, removing the non-exposed gelatine portions thereof, thereby providing a gelatine relief record, coloring said gelatine relief with strongly light absorbing dye, treating said bleached silver record to render it light absorbent, and copying said relief and light absorbent silver record with light absorbed by said dye.

5. Method of producing a photographic silhouette which comprises sensitizing a photographic film for two spectral ranges, dyeing it to absorb one of said ranges stronger than the other, copying on said film a record having high density areas and low density areas with light of said two ranges of such intensity that the high density areas of said record are only slightly reproduced on said film due to high absorption in the film of one of said ranges and the low density areas of said record are strongly reproduced due to high transmission in the film of the other range, developing said film, substantially removing from the film the gelatine over the areas corresponding to said high densities, and rendering the remaining gelatine substantially opaque.

6. Method of producing a photographic silhouette which comprises sensitizing a photographic film for two spectral ranges, dyeing it to absorb one of said ranges stronger than the other, copying on said film substantially without preexposure a record having high density areas and low density areas with light of said two ranges of such intensity that the high density areas of said record are only slightly reproduced on said film due to high absorption in the film of one of said ranges and the low density areas of said record are strongly reproduced due to high transmission in the film of the other range, developing said film, substantially removing from the film the gelatine over the areas corresponding to said high densities, and rendering the remaining gelatine substantially opaque.

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