Aug. 8, 1933. J. E. THORNTON 1,921,050

DYE PRINTING PLATE AND SENSITIZED MATERIAL THEREFOR

Original Filed June 16, 1930 2 Sheets-Sheet 1

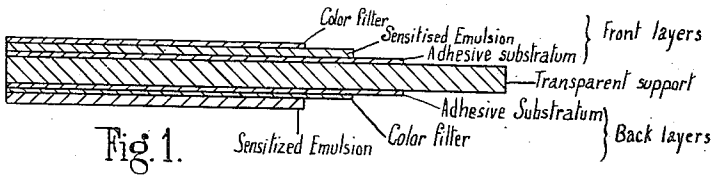



Fig. 1.

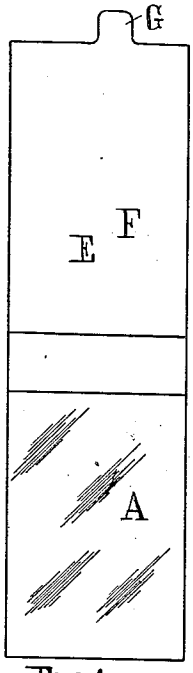



Fig. 4.

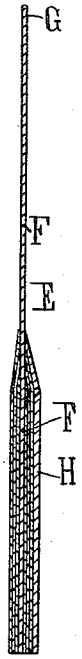



Fig. 5.

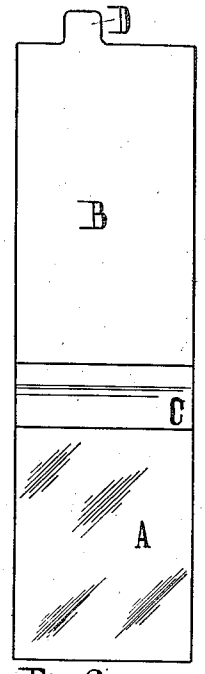



Fig. 2.

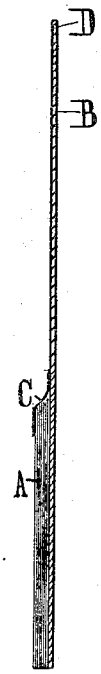



Fig. 3.

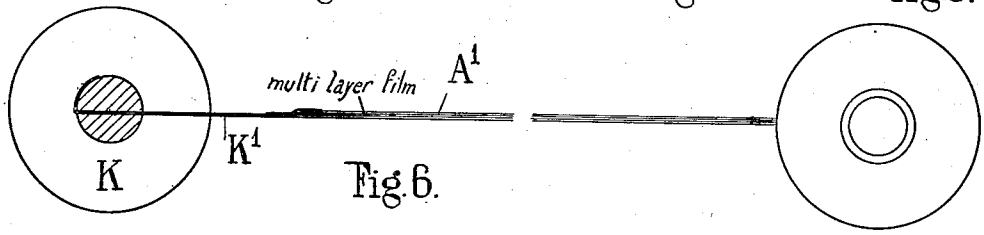



Fig. 6.

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Aug. 8, 1933. J. E. THORNTON 1,921,050

DYE PRINTING PLATE AND SENSITIZED MATERIAL THEREFOR

Original Filed June 16, 1930 2 Sheets-Sheet 2

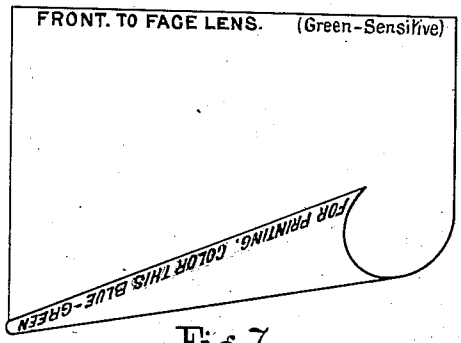



Fig.7.

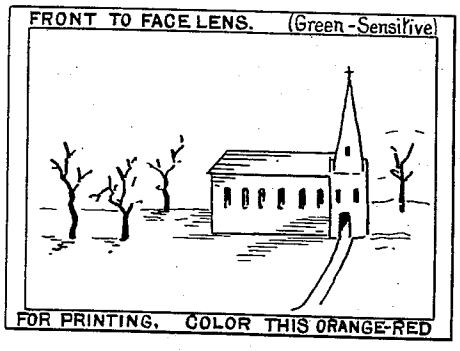



Fig.8.

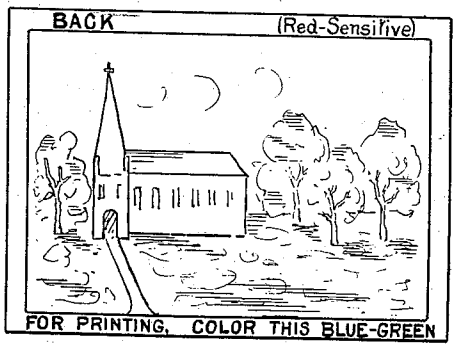



Fig.9.

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Patented Aug. 8, 1933

1,921,050

# UNITED STATES PATENT OFFICE

1,921,050

## DYE PRINTING PLATE AND SENSITIZED MATERIAL THEREFOR

John Edward Thornton, Jersey, British Isles

Original application June 16, 1930, Serial No. 461,638, and in Great Britain July 3, 1929. Divided and this application April 22, 1932. Serial No. 606,984

9 Claims. (Cl. 95—2)

This invention consists in a duplex dye-plate for simultaneously printing two component-color record images at one operation by dye-impression printing methods, upon two dye-absorbent surfaces, from a pair of images photographically formed upon opposite sides of the dye-plate; and in an improved photographic sensitized film-material of special type for producing such duplex dye-plates and its construction or arrangement for use in roll-film, film-packs, or glass-plate cameras.

This duplex dye-plate and special film-material are for use in carrying out a new process of two-color photography which is fully described in its entirety in my concurrent application Serial No. 461,638 filed June 16, 1930.

In carrying out the present invention the special film-material described in this specification is used for making two complementary color records, in the camera, by one exposure through one lens upon opposite sides of the film, one record on the front and the other on the back of the film.

By subsequent development and other treatment of the two records on the opposite sides of the one film simultaneously the exposed film is converted into a duplex dye-plate having a pair of complementary images upon opposite sides, each in accurate superimposed register with the other, and each image comprising a dye-resisting negative-area of hardened colloid and a dye-absorbing positive-area of non-hardened colloid.

The production of the positive from the duplex dye-plate does not form part of the present invention and will not be described in detail, but is described fully in specification Serial No. 606,985 filed April 22, 1932. Briefly, for this purpose the plate is dyed with one color upon one side and another color upon the other side and is printed from by placing it between the two leaves of duplex positive material having absorbent surfaces and placed under pressure contact, whereupon the two dyes are withdrawn from the duplex dye-plate and absorbed into the two surfaces of the positive material, thus producing two images thereon, each in a different color.

At a subsequent stage these two transferred dye-images are combined to form a single complete picture in colors, by cementing together the two faces of the positive material so that the two images are enclosed. The thin foil carrying the complete picture in colors may then be cemented to a white support for viewing by reflected light, or to a transparent support for viewing by transmitted light.

*State of the art*

Single dye-plates with an image upon one side for use in making single positive images by dye-impression printing methods are well-known.

Two-color film-material for simultaneously photographing a pair of two-color images upon two films placed one behind the other, and subsequently using them as two separate dye-plates is also known.

Two-color film-material for simultaneously photographing a pair of two-color images upon a "stripping-film" composed of two films or parts which could be ultimately separated by stripping them apart, and subsequently using them as two separate dye-plates, are also known.

Negative sensitive material is also known comprising a support sensitized with complementary color sensitive emulsions on opposite sides, intended to simultaneous exposure from one side in a camera with one lens only and with no prisms. In such type of sensitive material it has been proposed to stain the front emulsion layer or the celluloid support to act as a color-filter.

It has also been proposed to provide an intermediate color filtering layer instead of staining the front emulsion layer or the celluloid support.

Color sensitive material of the above referred to type is also known in which the complementary emulsions on opposite sides are not only color sensitive but are of different speeds in order to secure balanced density of images.

With such types of sensitive material after photographing or printing a pair of images upon the two complementary color sensitive emulsions, each image is subsequently colored with a different dye to complete a two-color picture.

But so far as I am aware it is new to simultaneously photograph a pair of images upon opposite sides of a single film as aforesaid and then convert it into a double dye-plate intended to be used for simultaneously printing, by dye-impression printing methods, a pair of prints upon a pair of dye-receptive surfaces or leaves at one operation by pressure contact. And it is new to construct a film with the whole of the features in combination as hereinafter described which are necessary for producing such two dye-impression prints from one dye-plate at one operation.

In making two-color dye-impression prints hitherto two separate dye-plates, each with a single image upon one side only were used; and two separate dye-impressions or transfers were made at two separate operations, from these two single dye-plates, the second transfer being made

over the first, both transfers on to the one absorbent surface. Owing to variation in size of the images, due to different expansion of one or the other films or absorbent receiving surface, it was difficult or even impossible to always secure accurate registration of the respective colored images.

*The present invention*

The most important advantage of the duplex dye-plate and improved sensitized film-material for making it, which comprise the subject of this invention, is the accurate register and identical size of the two images secured by exposure, development and treatment of both images simultaneously upon one piece of film.

The duplex dye-plate and film-material are intended for use with any desired group of two colors.

The two colors preferred for most subjects are the complementary pair of orange-red and blue-green, which give in the finished picture a color range sufficiently wide for a variety of subjects, including portraits, flesh tints, clothing, gardens, flowers and the like.

The invention is not however restricted for use with the particular color combination mentioned. For special purposes, such for example as the production of decorative and advertising designs other than landscapes or portraits and the like, any other combination of two colors may be used, and they need not necessarily be a complementary pair.

But any variation of the above described group of complementary colors involves corresponding variations in the color filters used in combination with the two sensitized layers of the film, and also in their relative positions, and also in the nature of the emulsion layers used. Such variations are hereinafter described in detail.

*Making the duplex dye-plate*

The complete process for production of the duplex dye-plate is described in full detail in the parent specification Serial No. 461,638 but to make this present specification clear and complete is briefly repeated herein as follows:—

The hereinafter described sensitized film-material, which is complete in itself with one support, two substratums, two color-sensitive emulsion layers and two color-filters, is placed in any ordinary camera of glass-plate, film-pack or roll-film description, with its correct side towards the lens, and one exposure is made through one lens, on to the one combination film by which means an image for one color is formed upon the front sensitive layer and an image for the other color is formed upon the back sensitive layer.

The exposed film is next developed in a dark room under ordinary conditions usual in developing panchromatic sensitive films, and with any ordinary developer of the type which has no tanning effect upon gelatine. The film is next placed into an oxidizing bath of any of the known types which harden gelatine in direct ratio to the amount of metallic silver present in the developed image, and finally the film is placed in the usual fixing bath to dissolve the non-reduced silver salts, then well-washed and dried.

When perfectly dry each image will consist of areas of dye-resisting hardened gelatine and areas of dye-absorbing soft or unhardened gelatine, and if treated with a solution of suitable dye the soft gelatine areas only will absorb the dye and the hardened areas will reject it. As the dye-plate is of duplex construction, with a different color-component image upon each side, the plate is dyed with a different color upon each side by placing it between two dye-pads each charged with a different color, in a press as described in the parent specification.

Dye-impression prints are then made from the colored duplex dye-plate by placing it between two absorbent leaves of a special positive-material, and the whole placed under pressure, all as described in the parent specification and in a further divisional application Serial No. 606,985 filed April 22, 1932.

*Construction of the sensitized film material*

I will now describe in detail the duplex sensitized film-material, which is used in the first case for taking the two-color-component negative-images simultaneously by one exposure in the camera, and which, after suitable development and treatment, eventually becomes the duplex dye-plate.

The invention will be described with reference to the accompanying drawings:—

Fig. 1 is a greatly magnified longitudinal section through the film.

Fig. 2 is a front elevation of film with light-proof backing and manipulating tab for use in a film pack camera.

Fig. 3 is a vertical section of same.

Fig. 4 is a front elevation of further arrangement.

Fig. 5 is a vertical section of same.

Fig. 6 is a plan of film with light-proof backing and spools for use in a roll-film camera.

Fig. 7 shows a piece of sensitive material before exposure.

Figs. 8 and 9 show the front and back sides respectively of the film material after exposure.

According to the invention any suitable transparent support may be used if sufficiently thin to bring the two sensitive emulsions fairly near together. For a flexible film material suitable for roll-film or film-pack celluloid of about 2/1000 of an inch thick forms a good support; the same material can also be used by the professional portrait photographer though some will probably prefer a stiffer support, such as celluloid of about 5/1000 of an inch thick. The invention is also suitable for use with the semi-automatic portrait machines which produce while-you-wait photographs in strip form, and for that purpose a support of 2/1000 of an inch thick is useful. The invention is also useful for kinematograph films, in which case it is preferable to use celluloid of about 5/1000 of an inch thick, but it may be thinner.

The transparent support is first coated upon both sides with an adhesive substratum of known type as used for making emulsions adhere to a support.

One side of the substratumed support is coated with a gelatino-silver-bromide emulsions which is color-sensitized to make it sensitive to light-rays of one complementary color of the pair, and the other side is coated with a gelatino-silver-bromide or chloride emulsion which is color sensitized to make it more particularly sensitive to light-rays of the other complementary color of the pair.

It is extremely important that the emulsions should be made without the addition of the usual hardening agent to the gelatine, as the latter must remain dye-absorbent.

These emulsions, after being coated and dried

upon their central transparent support, are hereinafter described as sensitive layers.

The film is printed upon both sides with suitable lettering, or marks to indicate which side is to be used for each color of dye in subsequent operations, and to indicate the front side.

Fig. 7 shows a piece of the sensitive film-material before exposure, printed upon opposite sides with indexes to show which are the red and green sensitized sides, and also to show which is the front side to be placed facing the lens of the camera when photographing.

The index lettering shown only in Fig. 7 is preferably printed in visible opaque lettering, by any known method of mechanical printing and ink or coloring matter to render it visible in the dark room. Such lettering may remain permanently on the film, but it is preferred to use a soluble ink that will wash off during the operations of developing, fixing, and washing.

Figs. 8 and 9 show the front and back sides of the film-material after it has been exposed, developed, and hardened, and thereby converted into a duplex dye-plate. In Fig. 8 the green-sensitive film has only recorded those portions of the picture which have to be represented by orange-red coloring in building up the 2-color positive. In the process of development additional wording has appeared which instructs the printer to apply red coloring to that side of the duplex dye-plate.

In Fig. 9 the red-sensitive film has only recorded those portions of the picture which have to be represented by blue-green coloring in printing the positive, and during development the instructions have appeared which indicate that that side must have green coloring applied.

These instructions shown only in Figs. 8 and 9, are produced by the manufacturer of the sensitive film printing the necessary wording thereon by exposure through a negative; such exposed matter then develops up black at the same time that the picture components are developed.

But the instructions appearing on Figs. 8 and 9 may be printed by any other means, such as in permanent ink or coloring from type matter, or in any other suitable manner.

*Arrangements and modifications of the sensitized layers and filters of the film material*

Several workable variations of these sensitive layers are feasible within the scope of the invention, and it is not specially restricted to any particular grouping or color-sensitizing or speed of the sensitive layers; provided the color-sensitiveness and speed of one sensitized layer of the pair are complementary to those of the other, and will preserve the color balance and relative silver density of both images; and also provided that the pair of images formed upon the duplex film by exposure, development and treatment are capable of producing a pair of complementary prints by suitable dyeing and transferring methods.

To ensure that the two component images of the same picture, made by the one exposure, shall be sufficiently different from each other that one will correctly represent the red-orange-yellow portion of the picture and the other correctly represent the blue-green portion; and also to ensure that equal image-density of silver deposit (and subsequently, equal dye-resisting values in the gelatine) will be secured in both images by the same exposure-time and the same development-time (and subsequently by the same gelatine-hardening time) for both images; the two emulsion layers are therefore made different in character, in speed, in silver-content, in their treatment during manufacture, and also in the color-sensitizing agent used for each. All these adjustments are suitably chosen and made in known manner, but are extremely important in this film, which requires the utmost delicacy of adjustment in its layers to form a satisfactory dye-plate that will print evenly from both sides by dye-impression printing methods.

As a further necessity for securing correct representation of color values, the film is provided with self-contained color filters through which the light passes and is filtered before it reaches and affects each of its own particular sensitive layer. One filter controls the front sensitive layer and the other filter controls the back sensitive layer. These filters may be of various known arrangements, constructions and methods of manufacture. In one arrangement the front filter is formed of a separate layer of dye-colored colloid applied to the surface of the front sensitive layer; or it may be formed by dyeing the sensitive layer itself. The back filter may be formed by dyeing the sensitive back-layer itself, but is preferably formed by dyeing the back of the central transparent celluloid support. Or it may be formed by an intermediate layer placed between the transparent support and the sensitive back layer. The color and disposition of these filter layers depends upon the particular arrangement adopted for the two sensitive layers; that is to say it depends upon whether the orange-red sensitive layer is placed at the front or at the rear of the film, and similarly for any other preferred pair of colors.

No claim is made for any particular one of these modifications or arrangements of the layers, the color sensitizing thereof, the relative speeds, the silver contents or the relative positions and coloring of the filters. Each of these are known factors separately used in one or another of previous color systems, having been described in various patents and technical literature ranging over a long period down to the present time. Therefore any of these known factors or variations can be applied in the manufacture of sensitive material used in the production of a duplex dye-plate according to the present invention.

It may, however be stated in general terms that earlier investigators using a pair of plates or films face-to-face have generally preferred to place the blue-green sensitive layers at the front and the orange-red sensitive layer at the rear; whilst later investigators using a pair of plates or films face-to-face advocate placing the orange-red sensitive layer at the front and the blue-green sensitive layer at the rear; but this latter arrangement is not new, having been proposed by some of the earlier investigators.

The front filter is required for filtering out the intense blue or blue-violet light-rays to prevent their reaching the sensitive layers. This filter is of yellow or orange-color, and instead of comprising either a thin colored colloid layer applied to the front of the film, and forming part thereof, or a deep dyeing of the front layer itself, it may be a separate filter of colored glass, celluloid, or gelatine, placed before or behind the lens or immediately before the film.

It will therefore be understood that, although the invention describes a film comprising three layers, namely two sensitive layers and a dividing

transparent support, it does in fact comprise additional layers for light-filtration purposes, and substratum layers for adhesive purposes but they all form an homogeneous part of the one film which is used for conversion into a duplex dye-plate.

Hereinafter the term "front layer" means the layer which will be turned towards the lens when placed in the camera.

In the preferred form of film-material the front layer is so sensitized that it is affected only by light rays of green and blue-green color, and the back layer is so sensitized that it is affected only by light rays of red and orange-red color. In this arrangement the front layer is of comparatively slower speed, and is made as transparent as posible in order to pass as much light as possible through to the back layer, which is comparatively of very high speed.

When photographing in the camera upon such a film the light rays from the object first strike and affect the blue-green sensitive layer on the front of the film and then pass through the front layer and affect the orange-red sensitive back layer.

In an alternative form of the film-material the relative positions of the two emulsions are reversed, the front layer being of high speed and color-sensitized to be affected by the orange-red light rays, and the back layer is color-sensitized to be affected by the blue-green light-rays and its speed needs to be higher than in the first arrangement.

As it is necessary in a complementary two color process which uses orange-red and blue-green to cut out the ultra-violet and blue-violet light rays a compensating filter of deep yellow or orange color must be used. This may be used on the lens of the camera, either in front or behind or at the diaphragm position. Or it may be placed in the camera immediately before the film-holder.

Or the compensating color filter may be formed upon the surface of the front layer of the film itself by a suitable dye.

In a modification the whole front layer may be stained right through its entire thickness instead of being colored only on the surface.

In one or other of the foregoing arrangement of layers it may be necessary to use an additional filter immediately in front of the second or back sensitized layer. This can be effected in various ways. For instance the transparent support may be dyed a suitable color. Or the back layer itself may be dyed. Or a dyed layer may be placed between the support and back layer.

The dyes used for color-sensitizing for filter-coloring may be any of those well-known and now used for these purposes. The invention is not limited to the use of any particular dyes, and as improved dyes are produced they may, if suitable, be substituted for those now commonly used in sensitized material manufacture.

Other minor modifications may be made, including the following, all of which have been suggested by earlier two-color investigators when two separate films were used:—

By suitable adjustment of the color-sensitizers of the blue-green emulsion when placed at the front a yellow filter on its face may be dispensed with entirely.

The front emulsion if for blue-green may be of such character and color that it becomes in effect a sufficiently good filter for the back emulsion as to dispense with the need for any intermediate filter layer.

Still another possible modification comprises one emulsion sensitive to violet, blue and blue-green and the other sensitive to yellow, orange and red.

Other combinations either of complementary or non-complementary colors, could be used where the process is required for decorative printing and designs other than portraits, landscapes, or other forms of photographs, and these may be any particular combination of colors desired. Monochrome photographs or designs can also be produced by using in combination two shades or tones of the same color.

*Mounting of the sensitized film-material*

The sensitized duplex film-material from which the duplex dye-plate is formed can be made up or mounted in a variety of ways, for use in the various standard types of cameras.

No claim is made for the methods of mounting or construction other than to the combination therewith of the particular type of sensitized film-material herein described.

The duplex film may be made up in the daylight loading form of film-packs originally invented by me and now extensively used by both amateur and professional photographers. This form of film pack comprises a thin light-proof case having an exposure opening at the front, a division with compensating spring plate inside, and light-tight valve through which pass pull-tabs for manipulating the films inside.

Each duplex dye-film A Figs. 2 and 3 is secured by a flexible strip C along its top edge to a lightproof paper backing B or separator which is extended over the internal division and down at the back of the film-pack and terminates in the aforesaid pull-tab D. The pack generally contains a dozen films each separated by its lightproof paper backing strip, and the front film is protected before use by a similar light-proof strip.

It has already been proposed, in my own and other patent specifications, to employ color-films in film-packs but in those cases three films, each sensitized for a different color, were attached to and manipulated by one light-proof backing strip, the three films being exposed simultaneously, then developed as three separate negatives for producing prints by three-color processes. In such construction various objections arose, one of which was the difficulty of getting three films and a backing strip to turn over the rounded nose of the division plate in the very limited space available. But in the present invention that difficulty does not exist because two images are photographed upon one duplex film, and that one duplex film is as easy to attach and to manipulate as the one film of ordinary non-curling type now used for monochrome photography.

In an old known modification of film for use in a film pack to which the present invention is applicable, the lightproof backing strip comprises a single layer at the portion placed between the films of the front compartment and a double layer at the portion used for the manipulating tab in the back compartment. But the free end of this double portion is brought over the nose of the dividing plate, and is cemented to the front face of the duplex dye-film near its top edge. By this means the usual extra adhesive strip is dispensed with and a smooth face is represented by the paper strip at the pull-over point, instead of the edge of a third strip which is liable to catch and prevent a smooth pull-over,

and thus a smooth unobstructed pull can be effected.

In another known form of film for film-packs to which this invention is also applicable the manipulating tab G forms part of the film E itself, as shown in Figs. 4 and 5, being merely an extension of the central transparent support F upon which the two emulsions are coated at one part and the support is left uncoated at the other part, the emulsion layers tapering off as shown. The back of such film is rendered temporarily lightproof by the addition of an opaque gelatine detachable coating or layer H. By this method the total thickness of the bunch of films inside the pack is considerably reduced, and a far better tab-film is produced than in the form using a paper-strip.

For the amateur-photographer the duplex dye-film is conveniently made up in the form of roll-film cartridges (Fig. 6) comprising a flanged spool K, a long strip or wrapper of opaque paper $K^1$ attached to the spool, a shorter strip of the very flexible duplex dye-film $A^1$ attached to the wrapper $K^1$ by an adhesive paper strip at the forward end and left loose at the other end to be attached thereto by the usual adhesive strip or other device before development. The methods of attachment may be any of those well-known and the outside or back face of the opaque wrapper may bear index numbers or other marks according to any of the well-known systems now in use.

An old known modification of the above described standard form of roll-film cartridge comprises a flanged spool, a strip of duplex dye-film, and an extension strip at both ends, made of paper or of film, to form leaders and opaque end wrappers. The back of the film itself is made lightproof by the application of an opaque gelatine layer which is coated on to the back surface of the back emulsion during manufacture of the film, but between the two is coated a soluble gum layer which will dissolve in the developer and allow the opaque gelatine layer to float off. The index figures and markings are printed upon or in this opaque gelatine layer instead of upon a paper wrapper as in the previously described arrangement.

For use in dark-slides, plate-holders, changing-boxes or other glass plate using apparatus the duplex dye-film is made up as a film-plate by securing it to a rigid backing board by any of the well-known methods which permit of easy detachment for development. In one method the film is secured to its backing plate by a removable binding strip at its edges. In another method the backing plate is coated with a tacky adhesive and the film pressed into contact therewith all over its back surface. In another method the film is attached by a layer of gum, soluble in the developing or other solutions. The backing board is made of sufficient stoutness to resist the pressure of the spring in the dark slide, or it may be stiffened by corrugations for that purpose.

*Exposure indicators and color indicators*

Both sides of the duplex film-material are lettered to indicate which side must be dyed red and which green, so that the operator has only to note these indexes carefully in carrying out the dyeing operations and in correctly placing the film in the camera for exposure.

The methods for applying different dyes to opposite sides of the film-material when using it as a duplex dye-plate and again transferring the dyes to other surfaces, are described in my concurrent specification Serial No 606,985 filed April 22, 1932.

*Kinematograph duplex dye-plates*

Kinematograph continuous film-strip material for producing duplex dye-prints on duplex positive material comprising two thin positive films is constructed in the same manner as the material for ordinary (non-kinematograph) photographs.

What I claim as my invention and desire to protect by Letters Patent is:—

1. A sensitized film material for producing a duplex dye plate comprising:—(*a*) a transparent support of waterproof and dye-separating material, and an adhesive substratum upon each opposite side of the support; (*b*) a sensitive gelatino-silver emulsion layer upon one side of the support, and color-sensitized to render it selectively sensitive to light-rays of one color-group; (*c*) another sensitive gelatino-silver emulsion layer upon the other side of the support, and color-sensitized to render it selectively sensitive to light-rays of another color-group complementary to the first color-group; (*d*) one emulsion being relatively slow and the other emulsion relatively rapid in speed; (*e*) one emulsion having a relatively smaller and the other emulsion a relatively larger silver-content; (*f*) the two emulsion layers having their different characteristics, speed ratio and silver contents so adjusted, and being combined with color-filters, so chosen, that the two layers will yield by one exposure and development, two component images having the same density and dye absorbing value; (*g*) both emulsions being made of non-hardened dye-absorbent colloid; (*h*) both emulsions being non-strippable and permanently adhered to their central support; (*j*) a suitable color-filter, applied as a layer before and formed upon, the front emulsion-layer, to filter the light-rays which affect the front emulsion layer; (*k*) another suitable color-filter, applied as a layer before the back emulsion layer, or formed as part of the transparent support before such back emulsion layer, to filter the light-rays which affect the back emulsion layer; (*l*) color indexes to indicate the dye-color to be applied to the front and the back when used as a duplex dye-plate, and to indicate the front side for exposure in the camera; and (*m*) mounting or manipulating devices combined with the film-material, adapting it for use in roll-film, film-pack, or flat-plate forms of cameras.

2. A duplex dye-plate of the special film-material of claim 1 for two-color photography, having a pair of different but complementary color-component images photographically formed upon opposite sides thereof for simultaneously printing two images at one operation by dye-impression printing methods, upon two dye-absorbent surfaces.

3. A duplex dye-plate of the special film-material of claim 1 having upon opposite sides a pair of photographically formed images, each of which comprises a negative-image-area of dye-resisting hardened colloid and a positive-image-area of dye-absorbing non-hardened colloid.

4. A duplex dye plate of the special film-material of claim 1 comprising:—(*a*) a central transparent support of waterproof material which will isolate or separate two different dyes applied to opposite sides; (*b*) a photographically produced

image upon one side representing one color-component of a picture; (c) another photographically produced image upon the other side representing the other color-component of the same picture; and (d) a set of color indexes for indicating the dye-colors to be applied to opposite sides of the dye-plate; each of the images comprising a dye-resisting negative-area of hardened colloid and a dye-absorbing positive-area of non-hardened colloid.

5. In the production of a duplex dye-plate of the special film material of claim 4 and for use in a film-pack, a film comprising an opaque backing strip with extended pull tab, a leaf of the improved film-material and a flexible hinge strip securing the sensitized leaf to the opaque backing strip.

6. In the production of a duplex dye-plate of the special film material of claim 4 for use in a film-pack, a leaf of the improved film material, an opaque soluble or detachable layer applied to the back of the back emulsion layer, and a pull tab formed by an extension of the central support.

7. In the production of a duplex dye-plate of the special film material of claim 4 for use in a roll-film camera, a film comprising a long opaque backing wrapper, a strip of the improved film-material, and a flexible hinge-strip securing one end of the film-material to the opaque backing wrapper.

8. In the production of a duplex dye-plate of the special film material of claim 4 for use in a roll-film camera, a strip of the improved film-material, an opaque soluble or detachable layer applied to the back of the back emulsion layer of said material, part of an opaque wrapper secured to one end of the film-strip and the other part of an opaque wrapper secured to the other end of the film-strip and index numbers printed upon the opaque soluble or detachable layer.

9. In the production of a duplex dye-plate of the special film material of claim 4 for use as flat film-plates in dark slides or other apparatus, a film comprising a rigid backing plate, a leaf of the improved film-material, and means for detachably securing the leaf to the backing plate.

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