AMENDED SPECIFICATION

Reprinted as amended in accordance with the Decision of the Superintending Examiner, acting for the Comptroller-General, dated the twenty-fourth day of March, 1941, under Section 11 of the Patents and Designs Acts, 1907 to 1939.

PATENT SPECIFICATION

Application Date: Oct. 8, 1935. No. 27765/35. **468,560**

Complete Specification Left: Nov. 9, 1936.

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PROVISIONAL SPECIFICATION

Improvements in and relating to Colour Photography

We, KODAK LIMITED, a British Company, of Kodak House, Kingsway, London, W.C.2, and RAYMOND EDWIN CROWTHER, a British Subject, of 41, Belmont Road, Bushey, Hertfordshire, do hereby declare the nature of this invention to be as follows:—

This invention relates to improvements in colour photography.

It is known, in colour photographic processes, to employ multi-layer photographic elements especially films having a plurality of emulsion layers sensitized to different colours on a single support, the emulsion layers being either all on the same side of the support or distributed between the two sides thereof. By exposure of such an element in a camera or printing machine latent images are produced in the respective layers corresponding to the colours to which the layers are sensitive. It is necessary then to process the element to produce coloured images in the layers corresponding to the latent images or their reversed images.

Two entirely different methods are known for producing coloured images in processes of this kind. In one of these methods the layers are initially essentially uncoloured (i.e. they are either colourless or any colour they may contain is wholly removable) and the coloured images are produced during subsequent processing e.g. by colour development, mordanting, imbibition or the like. Such a process is hereinafter termed a " colour producing process " or " colour production ". In the other of these methods the layers are each uniformly coloured by a colouring matter which is adapted to be decolourised and/or removed selectively in either the exposed or unexposed portions, e.g. by bleaching out the colour in the exposed area with the catalytic aid of the silver produced by development of the latent image. Such a process is hereinafter termed a " colour suppressing process " or " colour suppression ".

The present applicants have found that valuable and unexpected advantages can be secured in colour photographic processes by employing these two processes in combination with one another. They have devised a new or improved photographic element and a new or improved method of producing coloured photographic records which are of particular value in the production of natural colour pictures by employing elements especially films in which the layers are respectively sensitized to colours covering substantially the whole of the visible spectrum.

The applicants have devised a sensitive element especially a film having a single support carrying at least three emulsion layers sensitized to different colours, of which layers one at least is uncoloured while one at least is coloured with a colouring matter adapted to be decolourised and/or removed selectively in either the exposed or unexposed areas. Thus there may be, for example, three or four emulsion layers and all may be upon the same side of the support or they may be distributed between both sides of the support e.g. one on one side and two on the other, two on each side or three on one side and one on the other.

The applicants have also devised a method of producing coloured photographic records, especially natural colour pictures, by exposing a sensitive element having at least three differentially colour sensitive layers, one at least of which is essentially uncoloured and one at least of which is coloured, and by producing coloured images in the uncoloured layer or layers by " colour production " and in the coloured layer or layers by " colour suppression ".

Such a method of producing colour photographs by a combination of the "colour producing process" with the "colour suppressing process" possesses numerous advantages among which may be mentioned that in contrast to the use of a "colour producing process" alone fewer processing steps are required and a greater range of colours is available. It is possible to use colours or shades of colours in a "colour suppression process", especially reds, which are difficult to obtain in a "colour production process". In contrast to the use of a "colour suppressing process" alone, it is possible to give uncoloured layers quite a high degree of transparency enabling a larger amount of light to fall upon the rearmost layer or layers. Moreover, it is easier to obtain emulsions of a high speed when colouring matters are not incorporated therein.

It is desirable that the layer or layers which is or are coloured shall be furthest from the objective, i.e. the uncoloured layer or layers should lie between the coloured layer or layers and the objective. The distribution of the layers in relation to the support is not material to the present invention and is determined by other considerations, e.g. convenience of application of the particular methods of processing selected. The order of the layers is determined in part by their spectral sensitivity and in part by the method of processing adopted e.g. since all the emulsions normally employed are sensitive to blue light, the layer which is to record the blue colour sensation should be nearest to the objective.

The invention will be described in greater detail in the two examples which follow to which, however, the invention is not limited.

EXAMPLE 1.

The film consists of a support of celluloid, cellulose acetate or the like upon the same side of which three gelatino-silver halide emulsion layers are successively coated. The lower layer contains a known green sensitizer and is uniformly dyed in known manner with a colouring matter, preferably of a minus green colour, suitable for "colour suppression". The middle layer is uncoloured and contains a known red sensitizer and the upper layer comprises a blue sensitive emulsion. Between some or all of the layers there may be layers of clear gelatine, clear enough to permit adequate exposure of the layer therebeneath. Such layers may facilitate subsequent processing as indicated in Specification 427,518. These layers may be coloured with decolourable colouring matter to serve as filters for the layers beneath. In particular there may be a layer beneath the blue sensitive layer containing decolourable yellow colour, as described in co-pending application No. 26523/34 (Serial No. 444,198); and additional gelatine layers may be provided on one or both sides of this yellow filter layer to prevent wandering of the yellow colouring matter into adjacent sensitive emulsions. The yellow filter layers described in co-pending applications Nos. 27418/34 (Serial No. 447,748), 10601/35 (Serial No. 456,279), and 26382/35 (Serial No. 446,234) may be employed.

The two top layers are preferably more dilute in silver halide than the bottom layer and may be of finer grained emulsion, to give greater transparency. The total thickness of the layers is preferably no thicker than that of the single coating employed in ordinary black and white film, e.g. motion picture film.

The film, after exposure, is processed by first developing the latent images in all the layers to silver.

The colour in the bottom layer is selectively destroyed by known oxidising or reducing agents with the catalytic aid of the silver of the image. Sodium formaldesulphoxylate may be mentioned as a reducing agent. Chromic acid, quinone or potassium permanganate may be mentioned as oxidising agents. The images in the upper layers are selectively processed to colour either directly or after reversal of the images therein. In this processing use may be made of the methods and means described in the specifications of Patents Nos. 376,838, 427,516, 427,518, 427,520 and of copending applications Nos. 9869/35 (Serial No. 454,498), 9870/35 (Serial No. 454,499), 8918/35 (Serial No. 458,664), 8919/35 (Serial No. 458,665) and 8920/35 (Serial No. 452,233). On finally removing the silver and/or silver halide from all the layers a record in three colours, either positive or negative, is obtained.

EXAMPLE 2.

The film has four layers two of which may be on each side of the support although it is preferable to have all four layers on the same side of the support. The layers may be selectively sensitized to different colours covering substantially the whole of the visible spectrum or the arrangement may be as follows. On one side are two layers, the upper of which is blue sensitive and the lower green sensitive; on the other side are two layers of which that next to the support is red sensitive and the outer one panchromatic and dyed with neutral black dye. One of the other three layers is also coloured suitably for the "colour suppressing pro-

cess " e.g. the red sensitive layer. Upon " colour suppression " faint black image is produced in the fourth layer which assists in getting better colour saturation in the finished picture. As in example 1 intermediate layers and/or filter layers may be provided. If, as is preferable, the four layers are on the same side of the support, it is desirable to have the black layer nearest to the support.

After exposure, the latent images in all the layers are developed to silver whereafter a coloured image in one layer and a faint black image in the black dyed layer are formed by " colour suppression " and coloured images are formed in the other layers by " colour production."

It is not neecssary to have black in the fourth layer. The spectral sensitivities of the four layers may be so chosen that each is sensitive to a wave band in the visible spectrum. The black colour is preferable because it also gives an excellent anti-halation layer.

It is possible, by choosing an emulsion of higher sensitivity for the bottom layer, to have two coloured layers and one uncoloured layer, in a three-layer element.

The invention is not, of course, limited to films but may be applied to photographic elements in which the emulsion layers are supported on glass, paper or other material, transparent or not.

In all cases the general sensitivity of elements made according to this invention is much higher than the sensitivity of elements in which all the layers are coloured and the processing is easier and considerably shorter than when all the layers are uncoloured.

Dated this 8th day of October, 1935.

W. P. THOMPSON & CO.,
12, Church Street, Liverpool, 1,
Chartered Patent Agents.

COMPLETE SPECIFICATION

Improvements in and relating to Colour Photography

We, KODAK LIMITED, a British Company, of Kodak House, Kingsway, London, W.C.2, and RAYMOND EDWIN CROWTHER, a British Subject, of 41, Belmont Road, Bushey, Hertfordshire, 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 improvements in colour photography.

It is known, in colour photographic processes, to employ multi-layer photographic elements especially films having a plurality of emulsion layers sensitized to different colours inseparably coated on a single support, the emulsion layers being either all on the same side of the support or distributed between the two sides thereof. By exposure of such an element in a camera or printing machine latent images are produced in the respective layers corresponding to the colours to which the layers are sensitive. It is necessary then to process the element to produce coloured images in the layers corresponding to the latent images or their reversed images.

Two entirely different methods are known for producing coloured images in processes of this kind. In one of these methods the layers are initially essentially uncoloured (i.e. they are either colourless or any colour they may contain is wholly removable) and the coloured images are produced during subsequent processing e.g. by colour development, mordanting, imbibition or other processes involving introduction of colour into the layer after exposure. Such a process is hereinafter termed a " colour producing process " or " colour production ". These expressions do not, however, include processes in which colour forming substances which would seriously reduce the sensitivity of the emulsions are present in the layers before exposure. In the other of these methods the layers are each uniformly coloured by a colouring matter which is adapted to be decolourised and/or removed selectively in either the exposed or unexposed portions, e.g. by bleaching out the colour in the exposed area with the catalytic aid of the silver produced by development of the latent image. Such a process is hereinafter termed a " colour suppressing " process or " colour suppression ".

In its most important aspect the present invention is concerned with colour photographic processes employing what is termed the " natural order of sensitivity " i.e. in which the image (positive or negative) in each layer is processed to the minus colour of the colour to which the layer was sensitive and of which the image therein is a record. It has, so far proved impossible to employ the colour suppression process for camera exposure elements coloured according to the " natural order of sensitivity ". Printing elements have been proposed requiring light outside the visible spectrum for

the exposure of one or more of the layers.

The employment of the two before mentioned processes in combination gives many advantages including the possibility of working according to the natural order of sensitivity and the resultant possibility of obtaining elements suitable for camera exposure other than those having all the layers uncoloured or those of the so-called " polyfolia " type, i.e., in which the layers have to be separated before processing.

To secure these advantages the applicants have devised new or improved photographic elements and new or improved methods of producing coloured photographic records which are of particular value in the production of natural colour pictures.

The applicants have devised a sensitive element especially a film having inseparably coated on a single support at least three emulsion layers sensitized to different colours, covering substantially the whole of the visible spectrum, of which layers at least the one first hit by incident light is uncoloured and free from colour-forming substances while at least the one last hit by incident light is coloured with a colouring matter adapted to be decolourised and/or removed selectively in either the exposed or unexposed areas. Thus there may be, for example, three or four emulsion layers and all may be upon the same side of the support or they may be distributed upon both sides of the support e.g. one on one side and two on the other side, two on each side or three on one side and one on the other.

After exposing such an element to a multi. coloured object illuminated by white light coloured images can be produced in the uncoloured layer or layers by " colour production " and in the coloured layer or layers by " colour suppression ".

Such a method of producing colour photographs which combines the " colour producing process " with the " colour suppressing process," possesses numerous advantages over other methods hitherto known or used for the processing of elements having a plurality of layers inseparably coated on a single support among which may be mentioned that in contrast to the use of a " colour producing process " alone fewer processing steps are required and a greater range of colours is available. It is possible to use colours or shades of colours in a " colour suppression process " which are difficult to obtain in a " colour production process ". In contrast to the use of a " colour suppressing process " alone, it is possible to give uncoloured layers quite a high degree of transparency enabling a larger amount of light to fall upon the rearmost layer or layers. Moreover, it is easier to obtain emulsions of a high speed when colouring matters are not incorporated therein.

Although the uncoloured layer or layers lies or lie between the coloured layer or layers and the objective, distribution of the layers in relation to the support is not material to the present invention and is determined by other considerations, e.g. convenience of application of the particular methods of processing selected. The order of the layers is determined in part by their spectral sensitivity and in part by the method of processing adopted e.g. since all the emulsions normally employed are sensitive to blue light, the layer which is to record the blue colour sensation must be nearest to the objective.

The method of the present invention for the colour processing of a photographic element, especially a film, having inseparably coated on a single support at least three emulsion layers containing latent image records covering substantially the whole of the visible spectrum at least one of which layers is uncoloured and free from colour forming bodies and at least one of which is coloured, consists in producing the coloured image or images in the uncoloured layer or layers by development with a colour forming developer and producing the coloured image or images in the coloured layer or layers by decolourising and/or removing the colour selectively in either the exposed or unexposed areas. A colour forming developer is one which contains in addition to the developing agent for silver, a colour former adapted to produce a colour along with the silver during development (see specification No. 376,838 for example). The latent image or images in the uncoloured layer or layers may be treated for the production of reversed images which are thereafter coloured by means of a colour forming developer, in which case the colour in the coloured layer or layers is decolourised and/or removed selectively in the exposed areas.

The invention will be described in greater detail in the examples which follow to which, however, the invention is not limited.

EXAMPLE 1.

The film consists of a support of celluloid, cellulose acetate or the like transparent material upon the same side of which three gelatine-silver halide emulsion layers are successively coated. The lower layer contains a known red sensitizer such as 8-methyl-2:2^1-diethyl-3:4:3^1:4^1 - dibenzthiocarbocyanine bro-

mide (see Specification No. 378,885), and is uniformly dyed in known manner with a minus red colouring matter suitable for "colour suppression", e.g. colloidally dispersed indigo. The middle layer is uncoloured and contains a known green sensitizer such as 1:2¹-diethyl-5:6-benzthiopseudocyanine iodide (see specification No. 385,267) and the upper layer comprises a blue sensitive emulsion. Between some or all of the layers there may be layers of clear gelatine, clear enough to permit adequate exposure of the layer therebeneath. Such layers may facilitate subsequent processing as indicated in Specification 427,518. These layers may be coloured with decolourable colouring matter to serve as filters for the layers beneath. In particular there may be a layer beneath the blue sensitive layer containing decolourable yellow colour, such as is used for a similar purpose in the film described in application No. 26523/34 (Serial No. 444,198); and additional gelatine layers may be provided on one or both sides of this yellow filter layer to prevent wandering of the yellow colouring matter into adjacent sensitive emulsions. The yellow filter layers described in co-pending applications Nos. 27418/34 (Serial No. 447,748), 10601/35 (Serial No. 456,279), and 26382/35 (Serial No. 446,234) may be employed. Beneath the red sensitive emulsion there may be similarly placed a gelatine layer dyed with removable magenta dyestuff.

The two top layers are preferably more dilute in silver halide than the bottom layer and may be of finer grained emulsion, to give the greater transparency. The total thickness of the layers is preferably no thicker than that of the single coating employed in ordinary black and white film, e.g. motion picture film.

Alternatively, if the bottom layer is sensitized to green and the middle layer to red, the green sensitized layer may be dyed minus green with algol pink BBK (Schultz, Farbstofftabbelen No. 1221). In this case the filter layers over the bottom layer will be dyed blue green.

Alternatively where the bottom layer is red sensitive it may be dyed with a dye which is convertible to a blue green colour e.g. Niagara Blue G (Schultz, Farbstofftabellen No. 491). Although this dye is transparent to red light it can be converted to a satisfactory blue green colour by treatment with an organic base such as pyridine.

The film first above described, after exposure from the emulsion side to a multicolour object illuminated by white light, e.g. a coloured subject under ordinary daylight or other white light, or to a multi coloured printing element transmitting light from a source of white light, is processed by first developing the latent images in all the layers to silver. A suitable developer is the following

Water (52° C.) - - -	2 litres
Elon - - - -	8.8 grams
Sodium Sulphite (anh.) -	384 ,,
Hydroquinone - - -	35.2 ,,
Sodium Carbonate (anh.) -	192 ,,
Potassium Bromide - -	20 ,,

Cold water to make 4 litres.
The film is then washed.

The colour in the bottom layer is selectively destroyed by known oxidising or reducing agents with the catalytic aid of the silver of the image.

The images in the upper layers are then selectively processed to colour after reversal of the images therein. In this processing use may be made of the method and means described in the specifications of Patents Nos. 376,838, 437,516, 427,518, 427,520 and of applications Nos. 9869/35, (serial No. 454,498), 9870/35 (serial No. 454,499), 8918/35 (serial No. 458,664), 8919/35 (serial No. 458,665) and 8920/35 (serial No. 453,233).

In producing a positive the negative silver image must be removed from these layers with a solution which does not attack the dye image in the lowest layer or fix out the silver halide image. Such a bath may be:

Potassium bichromate -	50 grams
Sulphuric acid (conc.) -	100 cc.
Water - - - - -	1 litre

This solution is diluted one part with ten parts of water for use.

The film is then washed, exposed to white light and developed in an ordinary elon-hydroquinone developer producing reversed silver images in all three layers, fixed if necessary again washed and then submitted to a bleach converting silver to silver chloride for a time sufficient to complete the action in the top two layers only, without affecting the lowest layer. A suitable solution is:

Glycerine - - - -	500 cc.
Iso-propyl alcohol - -	1000 cc.
Water - - - -	75 cc.
Quinone - - - -	5 gms.
Hydrochloric acid (conc.) -	20 cc.

The following stop bath may be used to arrest the action of this bath at the proper point.

Sodium bicarbonate - -	15 gms.
Iso-propyl alcohol - -	1000 cc.
Glycerine - - - -	1000 cc.
Water - - - -	1000 cc.

The film is then washed and the bleached images in the top two layers processed respectively to magenta and yellow by the methods described in detail in specification No. 440,032 for the colour processing by colour development of two upper layers lying over a third layer which has already been coloured.

The silver in all three layers is now oxidized with the following solution:

Potassium ferricyanide -	20 gms.
Sodium carbonate - -	5 gms.
Sodium chloride - -	5 gms.
Water to - - - -	1000 cc.

It is then fixed in hypo. The film is washed, and then dried.

It may be more convenient, in the above example to remove the silver from the top two layers by controlled diffusion of a reversing solution, i.e. a solution which will remove silver but leave silver salt, immediately after the first development step.

In the above example a positive is produced. For such direct production of a positive the colour must be destroyed where the silver is present but for the production of a negative the colour must remain only where the silver is present. In the latter case there may be a negative catalytic effect of the silver which retards colour destruction, in which event the film may first be fixed or the oxidising action of the residual silver halide may be utilized. Sodium Formaldehyde. sulphoxylate may be mentioned as a reducing agent. Chromic acid, quinone or potassium permanganate may be mentioned as oxidising agents.

Where any of the layers contains both silver and reducible silver salt, e.g. where a positive is to be produced and the film is not fixed, then an oxidising or reducing agent must be employed which will not detrimentally effect the silver or the silver halide respectively. Where the dye to be selectively decolourised is an azo dye, for example a 5% solution of hydrobromic acid may be used.

Example 2.

The film has four layers two of which may be on each side of the support although it is preferable to have all four layers on the same side of the support. The layers may be selectively sensitised to different colours covering substantially the whole of the visible spectrum or the arrangement may be as follows. On one side are two layers, the upper of which is blue sensitive and the lower green sensitive; on the other side are two layers of which that next to the support is red sensitive and the outer one panchromatic and dyed with neutral black dye. The red sensitive layer is also coloured suitably for the "colour suppressing process". Upon "colour suppression," a faint image is produced in the fourth layer which assists in getting better colour saturation in the finished picture. As in example 1 intermediate layers and/or filter layers may be provided. If, as is preferable, the four layers are on the same side of the support, it is desirable to have the black layer nearest to the support.

After exposure, the latent images in all the layers are developed to silver whereafter a coloured image in one layer and a faint black image in the black dyed layer are formed by "colour suppression" and coloured images are formed in the other layers by "colour production," the processing being substantially as in Example 1.

It is not necessary to have black in the fourth layer. The spectral sensitivities of the four layers may be so chosen that each is sensitive to a waveband in the visible spectrum. The black colour is preferable because it also gives an excellent antihalation layer.

It is possible, by choosing an emulsion of higher sensitivity for the bottom layer, to have two coloured layers and one uncoloured layer in a three-layer element, the processing of which is indicated briefly in the following examples 3 and 5.

Example 3.

The film may be that described in Example 1 the middle (green sensitive) layer being coloured with a decolourable magenta dyestuff, such as algol pink BBK which can be catalytically reduced, where the silver image develops.

Such a film, after exposure from the emulsion side may be processed to a positive by the following method.

1. Develop the latent images in all the layers to silver.
2. Wash.
3. Dry.
4. Reverse the image in the top layer by controlled diffusion of a reversing agent, e.g. Farmer's reducer, and of a developer (controlled diffusion of a nucleus forming developer, see Specification No. 341,183, may be employed).
5. Fix and wash.
6. Process the bottom two layers with a suitable reducing agent such as sodium stannite.
7. Wash.

8. Convert the silver to silver halide.
9. Wash.
10. Dry.
11. Expose to white light.
12. Develop top layer by controlled diffusion of a yellow colour forming developer.
13. Remove all silver and fix if necessary.
14. Wash and dry.

EXAMPLE 4.

A film consisting of a support on which is first coated a magenta coloured green sensitive layer and then an uncoloured red sensitive layer with finally an uncoloured blue sensitive layer is exposed from the emulsion side and processed as follows:—

1. Develop all the layers to silver.
2. Wash.
3. Remove all the silver and wash.
4. Re-expose all the layers and redevelop, wash and fix.
5. Wash.
6. Process to produce a dye image in the bottom, using a bleach bath which bleaches the dye where the silver is absent.
7. Wash and dry.
8. Convert the silver in the top two layers to silver halide by controlled diffusion of a hydrohalide bleach bath.
9. Expose to light and develop the top two layers by controlled diffusion with a blue green colour forming developer.
10. Wash, dry, and bleach top layer by controlled diffusion.
11. Expose to light and re-develop top layer by controlled diffusion with a yellow colour forming developer.
12. Remove all silver.

EXAMPLE 5.

For negative processing the emulsions may be as in Example 3 but coated on the support in the reverse order. The film is then exposed from the support side. The processing may be as follows:—

1. Develop the images in all the layers to silver.
2. Wash and dry.
3. Remove silver from the top two layers, e.g. by the aid of Farmer's reducer employing controlled penetration.
4. Wash.
5. Dry.
6. Redevelop the top two layers by controlled diffusion of a nucleus forming developer (see Specification No. 341,183).
7. Fix and wash.
8. Process the top two layers with a suitable reducing agent such as sodium stannite.
9. Wash.
10. As step 3.
11. Convert the silver image in the bottom layer to silver halide and redevelop it with a yellow colour forming developer.
12. Remove the silver and fix if necessary.
13. Wash and dry.

The invention is not, of course, limited to films but may be applied to photographic elements in which the emulsion layers are supported on glass, paper or other material, transparent or not.

In all cases the general sensitivity of elements made according to this invention is much higher than the sensitivity of elements in which all the layers are coloured and the processing is easier and considerably shorter than when all the layers are uncoloured.

We are aware that in Specification No. 483,463 there is described and claimed (1) a light sensitive multi-layer material, more particularly a recording material for taking multi-colour pictures, comprising a front layer which is colourless and blue sensitive, a second layer which is dyed yellow and sensitized either to green or to red and a third layer coloured with a colour which absorbs those light rays for which the second layer is sensitized, the third layer being sensitized to red or to green respectively and all the layers being carried on one or both sides of a single support, (2) a process of producing a multi-colour image which consists in effecting exposure on a multi-layer light-sensitive material comprising a front layer which is colourless and blue sensitive, a second layer which is dyed yellow and sensitized either to green or to red, and a third layer coloured with a colour which absorbs those light rays for which the second layer is sensitized, the third layer being sensitized to red or to green respectively, all the layers being carried on one or both sides of a single support, and transforming the material after exposure into a three-colour image by local destruction of the dyestuff in the predyed layers and by the formation of a dyestuff image in the uncoloured front layer.

We are also aware that in Specification No. 483,464 there is described and claimed a process for producing multi-coloured prints in a light-sensitive multi-layer material comprising a front layer which is colourless and blue sensitive, a second layer which is dyed yellow and is sensitized either to green or to red, and a third layer coloured with a colour which absorbs those light rays for which the second layer is sensitized, the third layer being sensitized to red or green respectively and all the layers being carried on a single support, which is characterized in that the part image obtained during the taking of the picture by the action of light rays for which the front layer of the multi-layer

printing material is sensitive, is printed into the second layer of this printing material and that the part image obtained during exposure by light rays for which the multi-layer printing material in the second layer is sensitized, is printed into the third layer of the said printing material, whereas the part image obtained by the action of light for which the third layer of the multi-layer printing material is sensitized is printed into the front layer of said printing material, whereafter coloured part images in the pre-dyed layers are produced by selective colour destruction and a part image in the colourless front layer is produced in a colour which absorbs the light rays for which the third layer of the printing material is sensitized.

We make no claim herein to any light-sensitive multi-layer material comprising a front layer which is colourless and blue sensitive, a second layer which is dyed yellow and sensitized either to green or to red and a third layer coloured with a colour which absorbs those light rays for which the second layer is sensitized, the third layer being sensitized to red or to green respectively; nor do we claim any method of producing coloured photographic records in such a material by local destruction of the dyestuff in the pre-dyed layers and by the formation of a dyestuff image in the uncoloured front layer except when such formation of a dyestuff image is effected by means of a colour forming developer.

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, subject to the foregoing disclaimer, what we claim is:—

1. A sensitive element, especially a film, having inseparably coated on a single support at least three emulsion layers sensitized to different colours covering substantially the whole of the visible spectrum, of which layers at least the one first hit by incident light is uncoloured and free from colour forming substances while at least the one last hit by incident light is coloured with colouring matter adapted to be decolourised and/or removed selectively in either the exposed or unexposed areas.

2. A sensitive element as claimed in claim 1 in which the layers are distributed between the front and rear sides of the support.

3. A sensitive element as claimed in claim 1 or 2 in which at least three layers are on the same side of the support.

4. A sensitive element as claimed in any of the preceding claims, in which the layer first hit by incident light is sensitive to blue, and not to red or green.

5. A sensitive element as claimed in any of the preceding claims in which the coloured layer or layers is or are coloured complementarily to the colour to which it is or they are respectively sensitized.

6. A sensitive element as claimed in any of the preceding claims in which the only selectively colour sensitized layer coloured with a colouring matter adapted to be decolourized and/or removed selectively in either the exposed or unexposed areas is that last hit by incident light.

7. A sensitive element as claimed in any of claims 1 to 5, in which the only layers coloured with colouring matter adapted to be decolourized and/or removed selectively in either the exposed or unexposed areas are the two last hit by incident light, and the colour of the first of these two is such as to permit passage of light to which the layer last hit by incident light is sensitive.

8. A sensitive element as claimed in claim 7, in which the layer last hit by incident light is a panchromatic emulsion dyed black with a colouring matter which is decolourable or removable selectively in either the exposed or unexposed areas.

9. A method for the colour processing of a photographic element, especially a film, having inseparably coated on a single support at least three emulsion layers containing latent image records of colours covering substantially the whole of the visible spectrum, of which layers at least one is uncoloured and free from colour forming bodies and at least one is coloured, which consists in producing the coloured image or images in the uncoloured layer or layers by development with a colour forming developer and producing the coloured image or images in the coloured layer or layers by decolourising and/or removing the colour selectively in either the exposed or unexposed areas.

10. A method as claimed in claim 9 in which the latent image or images in the uncoloured layer or layers is or are treated for the production of reversed images which are thereafter coloured by means of a colour forming developer and the colour in the coloured layer or layers is decolourised and/or removed selectively in the exposed areas.

11. A method as claimed in claim 9 or 10 in which the coloured images are produced in colours complementary to the colours of which they are records.

12. A method as claimed in claim 11 in which the coloured images are produced in colours complementary to the colours to which the layers in which they are respectively contained were sensitive.

13. The new or improved sensitive elements, especially films, for colour

photography, as particularly described in the foregoing examples.

14. The new or improved methods of producing coloured photographic records, as particularly described in the foregoing examples.

Dated this 7th day of November, 1936.

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