

PATENT SPECIFICATION



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COMPLETE SPECIFICATION

Improvements in Colour Photographic Elements and Processing thereof

We, KODAK LIMITED, a Company registered under the laws of Great Britain, of Kodak House, Kingsway, London, W.C.2 (Assignees of KARL SCHINZEL, of Otten-dorfergasse No. 12, Troppau (Silesia), Czechoslovakia, (formerly residing in Vienna, Austria), a Citizen of the Republic of Austria), 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 colour photographic elements having three differentially colour sensitive layers superimposed on a single support and to methods of colour processing such materials.

In particular the invention relates to processes for producing coloured images in photographic elements having three differentially colour sensitized silver halide layers inseparably superimposed on a single support by methods involving selective re-exposure of the layers, that is the making of positive coloured images by use of the residual silver halide after the usual black development, or of negative coloured images by use of the three silver halide images obtained after general development, fixation and rehalogenisation of the negative silver images. The silver halide in either case has to be independently developed in the respective layers to the corresponding component images. It is known that such independent development of silver halide present in three such layers on a single support presents difficulties which are not encountered in the case of tri-pack material where the emulsion layers are separated for processing. The invention also includes multi-layer photographic elements suitable for the process of the present invention.

In our application No. 33290/38 of even date we have claimed a process for producing coloured reversed colour component images in a colour photographic element of the kind having three differentially colour sensitized layers inseparably superimposed on a single support in which the middle layer is protected on both sides against the action of the blue light by yellow dyestuffs which remain after or-

dinary development or after development and removal of the silver or its reconversion to the silver salt, but are capable of subsequent removal or destruction. In that process blue light is used for exposure of the reversed silver halide images in the outer layers. With the aid of the elements of the present invention, ultra-violet light can be used for exposure of silver halide in one or both outer layers.

According to the present invention there is provided a method for the colour processing of an element having three differentially colour sensitive silver halide emulsion layers inseparably superimposed on a single support and between two adjacent layers or surrounding the middle layer or in one of the outer layers an ultra-violet absorbing substance which is resistant to photographic developing baths or to photographic developing and mild silver-oxidising baths, which includes developing all the latent images to silver and exposing the residual silver halide of a layer containing or overlying the ultra-violet absorbing substance only by means of ultra-violet light. According to a further feature of the invention there is provided a method for the colour processing of an element having three differentially colour sensitive silver halide emulsion layers inseparably superimposed on a single support and between two adjacent layers or surrounding the middle layer or in one of the outer layers an ultra violet absorbing substance which is resistant to photographic developing and fixing and mild silver-oxidising baths which includes developing all the latent images to silver, fixing them, reconvertng all the silver to silver halide and exposing the silver halide of a layer containing or overlying the ultra-violet absorbing substance only by means of ultra-violet light.

In one form of the invention as applied to reversal processing, the residual halide in the lower layer is exposed to light to which it is still selectively sensitive and is then colour developed, then the residual silver halide in the upper layer is exposed to ultra-violet light and colour developed and finally the residual silver

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halide in the middle layer is processed to colour.

The invention also includes a colour photographic element suitable for treatment by the above described methods having three differentially colour sensitive silver halide layers inseparably superimposed on a single support and between two adjacent layers, or in one of the outer layers, a colourless ultra-violet absorbing substance which is resistant to photographic developing baths or to photographic developing and mild silver-oxidising baths or to photographic developing and fixing and mild silver-oxidising baths. The colour photographic element having three differentially colour sensitized silver halide layers superimposed on a single support may have the middle layer protected on both sides against the action of ultra-violet light by such a colourless ultra-violet absorbing substance. The colourless ultra-violet absorbing substance may be present in a layer between the upper and middle layers and in a layer between the middle and lower layers. It may be present in a layer which is absorptive of blue light, i.e. it may be used in association with a yellow colouring matter which may or may not resist photographic developing baths or photographic developing and mild silver-oxidising baths.

The invention also includes a colour photographic element in which a colourless ultra-violet absorbing substance is present in a filter layer between the lower layer and the middle layer and a yellow filter is present between the top layer and the middle layer.

We use the word "colourless" to mean that the slight amount of visible colour, if any, is insufficient to have any material effect on the actinic value of visible light passing therethrough.

Other features of the invention will be apparent from the following description.

For convenience we shall, after describing the three materials, describe three-colour reversal development first, and then three-colour redevelopment. The same material can also be used for the making of prints from pictures known under the Registered Trade Mark "Autochrome", and also from lenticular screen pictures, especially those of the bi-pack type, and it may be employed for printing from three superimposed latent images by means of three separation negatives or diapositives made from them or from a bi-pack with insertion of the corresponding filter or by projection on the chromosome.

THE THREE-LAYER MATERIAL.

The upper layer is generally blue-violet sensitive, the middle layer yellow and green sensitive, and the lower layer red

sensitive. In order to limit diffusion to a minimum, it is advisable to make the two upper layers as thin as possible, about 0.005—0.01 mm., requiring the use of very fine-grain emulsions, relatively poor in silver, for three-colour reversal development.

The filter layers surrounding the middle layer are composed of strongly swelling gelatine, so that the individual layers are spaced away from one another from each other during the chemical reactions. These filter layers are kept so thin, 0.01 mm. and less, that no undesirable increase of light scattering ensues, despite the fact that they may swell up tenfold. The lower layer can have the normal thickness of 0.02 mm. or for reversal development 0.01—0.015 mm. so that the total thickness of the three layers is about 0.025—0.04 mm. While the two upper layers require developers producing intensively dyed images, less intensity is required for the lower layer, since this layer may contain considerably more silver salide than the upper and middle layers.

In order to obtain a vigorous, well-graded blue image, which is of primary importance for the character of the colour photograph, coating of the lower red-sensitive emulsion (or infra-red sensitive for printing elements) of an average thickness of about 0.02 mm. using a highly sensitive emulsion of medium soft gradation, preferably sensitized only for red and orange, is recommended. Above this, a yellow and green-sensitive emulsion of medium sensitivity and a thickness of not more than 0.01 mm. is coated, and over that a not specially sensitized emulsion also of medium sensitivity and a thickness of 0.005—0.01 mm. For this purpose, a transparent, coarse-grain silver bromide emulsion can be used. Finest grain emulsions, are, however, to be preferred, because their blue and blue-green sensitivity can be strongly increased by modern sensitizers (see, for example, British Patent No. 376,746).

The order of the three layers just described can be changed, if a very sharp blue image is desired, by having the upper emulsion sensitive to blue-violet, the middle emulsion to red and orange and the lower emulsion to yellow and green; in which case they are developed lemon-yellow, green-blue and purple respectively. It is less desirable to arrange the layers so that the upper emulsion is red sensitive, the middle emulsion yellow-green sensitive and the lower emulsion blue sensitive, because although there are red sensitizers produced to-day, which in stronger concentration sensitize better for red than blue, and this effect can still be

increased by adding desensitizers for blue, nevertheless, there is, as a rule, an unavoidably greater increase in general sensitivity.

5 These variations have been made possible by the fact that red sensitizers which do not sensitize to green and yellow but very strongly sensitize to the extreme orange red, in addition to the genuine red, can now be made; 44:4¹-dichloro-2:2¹:8-triethylthiacarbocyanine chloride is suitable.

10 The insertion of a yellow filter, transmitting also red rays, between the blue-sensitive and the middle yellow-green or red-orange-sensitive layers is generally necessary for exposure purposes, because there are no means at present permitting complete suppression of the blue-sensitivity of the two other emulsions. A green filter between the middle and lower layers is generally unnecessary for exposure purposes, and a red-orange filter is very seldom required since many of the present-day red-orange sensitizers are without effect in the green and yellow parts of the spectrum.

25 The ultra-violet absorbing substances employed in the elements processed according to the methods of the present invention serve as filters to facilitate the differential processing of the layers after exposure and must therefore be stable to the developer or to the developer and mild oxidising agents serving for removal of the silver, or to the developer, fixing bath and rehalogenising bath. They must be also capable of subsequent removal by acids, bases, oxidation or reduction if their presence in the finished picture is undesirable.

40 These filters may be incorporated by various methods.

45 The use of intermediate layers as colour filters is recommended, because strongly swelling gelatine layers between the silver halide emulsion layers appear necessary for reasons of development-technique.

50 The middle silver halide layer may be surrounded by filter or emulsion layers absorbing ultra-violet and containing colourless or correctly coloured filter-substances absorbing ultra-violet, if desired in addition to the usual filter dye. Since a yellow filter layer under, or yellow colouring of the blue-sensitive emulsion is essential for purposes of exposure, a filter layer absorbing ultra-violet alone can only be interposed between the middle and lower layer.

60 The triple layer with yellow coloured blue-sensitive emulsion or with a special yellow filter layer, or both, or an additional intermediate and colourless gelatine layer, may also be treated thoroughly, after coating, in a solution of the sub-

stance absorbing ultra-violet. If the present division of the spectrum into three regions is adopted, the amount of filter dye, or the intensity of the colour in all the variations previously described, must be adjusted so that as little as possible, or no blue light at all, reaches the middle layer during exposure.

70 If the triple layer contains at least one yellow filter layer, or a yellow-dyed blue-sensitive silver halide emulsion layer, the ultra-violet absorbing substances required in the remaining layers can be introduced by bathing the element in solutions of substances absorbing the ultra-violet, after development.

80 From the preceding it appears that diffusion of yellow filter dye into the adjacent layers is perhaps without special detriment, but is best avoided in the interest of as true reproduction as possible; the red filter dye must, however, be water-insoluble or non-diffusing. Coloured filter dyes which are insoluble in themselves are added to the gelatine in a highly dispersed state or are precipitated in it. Water-soluble dyes are added to the layers in the form of insoluble salts, or precipitated in the gelatine solution as such. Colouring of the filter layers with water-soluble substantive and high colloidal dyes, is also satisfactory without conversion into the insoluble dye salt. Slight diffusion of the dye is harmless, unless it is capable of sensitizing or reducing the sensitivity. The filter dyes may be precipitated as mentioned hereinafter.

100 Solution or destruction of the colourless substances absorbing ultra-violet is necessary only if fluorescence is too obtrusive in the finished picture or if they discolour on prolonged exposure to light.

105 Suitable substances absorbing ultra-violet are aesculine, quinine, anethol, triphenylmethane, cumarone, acetaminquinoline, hydroxyquinoline sulphonic acids, hydroxy-naphthoic acids, naphthol-sulphonic acids, naphthylamine sulphonic acid and the analogous substitution products of anthracene, but others known from the literature may be used, or their insoluble salts, esters, anilides and other derivatives.

120 If the ultra-violet filter substances are acid, they may be precipitated in gelatine by means of inorganic bases or organic bases especially the isochromatic basic dyes, such as auramine (Rowe's Colour Index No. 655), acridine yellow, benzoflavine or thio-flavine; if they are basic they may be precipitated in gelatine by high molecular weight sulphonic acids, such as diazo light yellow 2 G (Rowe's Colour Index No. 654), di(*p*-aminobenzoyl)- α -naphthylamine sulphonic acid, anthra-

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quinone sulphonic acid or by complex inorganic acids such as phospho-tungstic acid, silico-tungstic acid, phosphomolybdic acid or their salts or their reduction products. Such precipitation of filter dyestuffs is described and claimed in co-pending Application No. 34982/38 of even date.

The use of a filter substance absorbing ultra-violet enables a layer or layers in front of it to be exposed without exposure of the layer or layers behind it by the use of ultra-violet light. Ultra-violet light is particularly suitable for exposure (a) because silver halide emulsions are inherently sensitive to this light and can therefore be exposed successfully even if any colour sensitizers which may have been present have been removed or destroyed and (b) because finely divided silver is substantially transparent to ultra-violet light and therefore a layer may be substantially uniformly exposed by this light even when it or an overlying layer contains developed silver. It will be understood that we make no claim herein to elements in which the ultra-violet substances themselves are coloured, although the methods of processing herein described and claimed may be employed with such elements.

THREE-COLOUR REVERSAL DEVELOPMENT.

After camera or printing exposure, the super-imposed latent images are first of all developed to the three black component silver images by an ordinary, non-tanning, preferably neutral developer, such as ferrous oxalate, amidol or diamido-*o*-cresol. Most other organic developers in solutions containing sodium carbonate are also suitable, since they do not noticeably harm the colour sensitivity and, if necessary, this can be at least partially restored by a known reagent such as an alkali sulphite or bisulphite.

In order to avoid the undesirable effect of local under-exposure in the lower layers it is best to saturate all three layers first in a solution of the developing agent (which does not act in the absence of alkali) of a considerably stronger concentration than usual, and then to develop in solutions of sodium carbonate, ammonia or other weak alkalies such as alkali bicarbonate, borax, trisodium phosphate or sodium aminoacetate. Alternatively, a concentrated developing solution can be allowed to diffuse into all the layers at as low a temperature as it is possible to employ without alteration in composition of the solution and the development process started or accelerated by warming the layers to room temperature or above.

Further treatment may be carried out in different ways. The greatest difficulty is to make the residual silver halide of the

middle layer developable without influencing the other two existing component images. One advantage of the present invention is that this can be done without necessarily employing sensitizers which withstand the ordinary general development. If the middle layer is surrounded by two filters which are impermeable to ultra-violet light, such light can be used to make the residual silver halide of the upper and lower layers developable. The middle component image can be developed, even without the action of light, by the use of energetically acting colour developers. It is, of course, assumed that both filter dyes are stable to the developer and are destroyed only later by acids, bases, oxidation or reduction.

The residual silver halide is generally used directly for reversal development. It may, however, be first converted in one or more layers to silver chloride in a fine state of subdivision as described and claimed in co-pending Application No. 26472/38.

For reversal, the initially reduced silver may be removed by completely dissolving it with oxidising agents and washing it out.

Even if only one ultra-violet filter is present, selective exposure of the layers may be accomplished without the aid of sensitizers which are resistance to photographic developing and mild silver-oxidising baths.

Thus, in an element where the top layer is not specially colour-sensitized, the lower layer is sensitized exclusively for red or for red and orange and the middle layer for yellow and green and there is a colourless or yellow layer not transmitting ultra-violet between the top layer and the middle layer, reversal processing may be as follows.

The lower layer is exposed to red light after general black development and is developed green-blue and treated further according to one of the following methods.

It would be simplest to expose the middle layer to ultra-violet light through the lower uniformly blackened layer, and through the green-blue dye which does not absorb ultra-violet and to develop purple. This requires long exposure, however, since the lower layer absorbs most of the light. Even if it were possible to expose the upper layer to blue light through the persistence of the yellow in the filter layer this would not be advisable because the primarily reduced silver prevents a complete exposure throughout the depth of the upper layer and therefore some residual silver halide will be left and developed in the colour of the middle layer, if this is developed later. By use of

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ultra-violet light for exposure of the residual silver halide of the upper layer, this disadvantage is eliminated, according to the invention.

5 It is, therefore, better to expose the upper layer at once to ultra-violet light and develop it yellow.

The middle purple component image is then obtained by one of the following methods.

10 (a) The residual silver halide is treated with a colour developer which acts so vigorously on addition of ammonia or alkali or of alcohol or acetone preferably
15 without air, that the residual silver halide is reduced without exposure after prolonged treatment. This method is particularly suitable if the middle layer consists of silver chloride as described and
20 claimed in Application No. 13250/37. The residual silver bromide of the middle layer can, however, be reduced without exposure by most leuco-vat dyes in alkaline solution, especially with alcohol or acetone
25 in the solution and the dye formed is precipitated on the image. Residues of the latent images in the two other layers can be destroyed previously by the action of mild oxidising agents, such as a mixture
30 of potassium ferricyanide and ammonia. A process of colour development with leuco vat dyes is described and claimed in Application No. 35101/38 of even date.

(b) Previously reduced silver is removed and if desired the filter dyes are
35 destroyed by oxidation or acid. The residual silver halide of the middle layer is then exposed from both sides to white, blue, or better, ultra-violet light, or to
40 soft X-rays and developed purple, and finally the silver removed with Farmer's reducer.

(c) The residual silver bromide can be reduced to black silver without exposure
45 by means of a vigorous ordinary developer, or of any organic or inorganic reducing agent and this then converted into highly dispersed silver chloride, by bichloride of mercury, which can be colour developed even without exposure.

(d) The residual silver halide of the middle layer is made developable by exposure, from the bottom or from both
50 sides to ultra-violet light or better still, soft X-rays, and the corresponding component image is developed. This is possible, because the very fine-grain silver existing in the lower layer is very transparent to
55 ultra-violet light.

(e) The residual silver bromide of the middle layer is converted into silver iodide or one of its complex salts, if necessary, after prior removal of the metallic silver, and this is coloured purple, or green-blue
60 by mordanting dyes. The metallic silver is

removed now if this has not already been done. The dyes can be made insoluble before any removal of the mordanting agent by suitable precipitants, such as alkali phosphotungstate, (as described and
70 claimed in Application No. 35100/38 of even date). If, however, the middle layer consists of silver chloride, its residue can be converted into silver ferrocyanide, and further into red nickel dimethyl-glyoxime
75 or into yellow titanium ferrocyanide, which latter yields a green-blue image with blue basic dyes. The silver ferrocyanide originating from the silver chloride, can also be converted into other
80 suitable non-tanning mordanting bodies, which are coloured purple or green-blue by basic dyes and may also be removed after insolubilization of the dyes in order to attain greater transparency.

85 Exposure through the back in all previous cases must be somewhat prolonged, since ultra-violet light is partially absorbed by celluloid, unless a very thin support or one of material permeable to
90 ultra-violet, such as cellulose acetate or regenerated cellulose, is used.

With supports coated on both sides, the support itself or a layer coated directly thereon can contain colourless substances
95 absorbing ultra-violet.

If the lower filter layer is one absorbing ultra-violet, the lower emulsion layer can be exposed to ultra-violet light from below and the further processing can be
100 carried out as above.

If two ultra-violet filter layers are arranged one on each side of the middle silver halide layer, the upper layer and then the lower layer are first exposed to
105 ultra-violet light and colour developed and then by intensive exposure from both sides to soft X-rays or ultra-violet light (if necessary, after prior removal or destruction of the substances absorbing ultra-
110 violet), the middle layer is made developable and developed in colour; finally, all silver and remaining unused salt is removed. The upper layer absorbing ultra-violet can be coloured yellow, for example,
115 by nitrosodimethylaniline. The middle layer can, of course, be made developable by white or coloured light, according to the sensitivity of the layer, after removing the silver of both other layers.

120 If a layer absorbing ultra-violet exists between the upper and middle layers and an orange red filter layer between middle and lower silver halide layers, the lower component image can be exposed with blue
125 light and the upper one with ultra-violet light, in either order, and the middle one according to one of the methods previously described.

If an ultra-violet absorbing filter layer 130

- is arranged between the middle and lower silver halide layers, and a yellow filter between the middle and upper layers, the lower layer is exposed to ultra-violet rays, the upper to blue light. The ultra-violet absorbing substances can, of course, also be added to the upper and lower sensitive emulsion layers instead of to an intermediate layer.
- 5 If the red-sensitized layer is in the middle, the procedures described above can be employed with appropriate modification.
- 10 If the ultra-violet absorbing substance is resistant to photographic developing, fixing and mild silver-oxidising baths, the present invention may be employed in the production of negatives by developing all the images to silver fixing them and reconverting them to silver halide and then proceeding as above.
- 15 Thus, a three-layer element in which the middle layer is surrounded by colourless ultra-violet-absorbing substances or by a colourless ultra-violet absorbing substance and a yellow filter is useful in the production of component colour images by redevelopment. In this process the element is fixed, and the initially reduced silver is reconverted to silver chloride or silver bromide and then independently made developable and redeveloped. Thus with an element having a yellow filter between the upper and middle emulsions and an ultra-violet absorbing filter between the middle and lower emulsions, the processing may be as follows.
- 20 After simultaneous general black development of all three emulsions, the residual silver halide is fixed out and then the reduced silver is reconverted into silver chloride or silver bromide. The upper emulsion is now exposed to blue light and the lower to ultra-violet light in succession and developed in the proper colour, then the middle emulsion is directly developed in colour with a vigorous developer. Finally, all reduced silver is removed, the filter dyes are destroyed or washed out if the fluorescence of the ultra-violet absorbing substance is too noticeable in the finished image.
- 25 It will be apparent that in this modification the filter colouring matters must be stable not only to the developer but to the oxidising agent for reconverting the silver to silver salt.
- 30 Instead of arranging special filter layers on both sides of the middle emulsion, it would be less desirable to mix ultra-violet absorbing substances with the upper and lower emulsions or with the lower emulsion when the upper one is coloured yellow. It is best to retain the lower ultra-violet absorbing intermediate layer, if the blue-sensitive emulsion itself is coloured yellow instead of the upper yellow filter layer.
- 35 The filter colouring matters required for exposure need not survive the development and rehalogenation if ultra-violet absorbing substances which are not attacked in these operations are added to the corresponding layers.
- 40 It was found that the yellow-green sensitizers of the middle emulsion, such as erythrosine, rhodamine B and 6G, the dyes "777", "666", "555" (U.S. Specification No. 1,897,866) and numerous other pseudocyanines and pinacyanols are rather difficult to wash out and are stable to mild oxidizing agents, and are also absorbed by reduced silver to such an extent that after the subsequent conversion into silver chloride or silver bromide, certain colour sensitivity remains. The middle layer may, therefore, when such stable sensitizer is used, be exposed to the light to which it is selectively sensitive and developed in colour, then the two outer layers are exposed to ultra-violet light, the middle layer being protected by the surrounding filters. In order to make the regenerated silver halide of the middle emulsion accessible to ordinary light, one can also, after colour development of the two outer emulsions remove the reduced silver and expose the middle layer after removal or destruction of the filters. If desired only one outer layer may be colour developed and treated in this way if the other filter is left intact.
- 45 The images obtained are complementary negatives but it is to be observed that the method is applicable to reversal development.
- 50 In a modification of the colour photographic element suitable for printing purposes, the middle layer which is protected against the action of ultra-violet light on both sides by two filter layers absorbing ultra-violet or by ultra-violet absorbing substances present in the outer layers is alone sensitized for yellow or red (i.e., the lower layer need not be specially colour sensitized). In such event, very transparent and fine-grain emulsions can be used and all three emulsion layers or at least the middle one can consist of silver chloride. In contact or optical printing from three-colour images, uniform gradation can be obtained by the use of different colour filters, and variation of exposure time. In the case of black component negatives printing is first effected with coloured light on the sensitized middle layer and with ultra-violet light on the two other layers.
- 55 Having now particularly described and ascertained the nature of our said invention and in what manner the same is to

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be performed, we declare that what we claim is:—

1. Method for the colour processing of an element having three differentially colour sensitive silver halide emulsion layers inseparably superimposed on a single support and between two adjacent layers or surrounding the middle layer or in one of the outer layers an ultra-violet absorbing substance which is resistant to photographic developing baths or to photographic developing and mild silver oxidising baths, which includes developing all the latent images to silver and exposing the residual silver halide of a layer containing or overlying the ultra-violet absorbing substance only by means of ultra-violet light.

2. Method for the colour processing of an element having three differentially colour sensitive silver halide emulsion layers inseparably superimposed on a single support and between two adjacent layers or surrounding the middle layer or in one of the outer layers an ultra-violet, absorbing substance which is resistant to photographic developing and fixing and mild silver-oxidising baths, which includes developing all the latent images to silver, fixing them, reconvertng all the silver to silver halide and exposing the silver halide of a layer containing or overlying the ultra-violet absorbing substance only by means of ultra-violet light.

3. Method as claimed in Claim 1 in which the lowest layer of the element contains a sensitizer resistant to photographic developing baths, according to which the residual silver halide in the lower layer is exposed to light to which it is still selectively sensitive and is then colour developed, then the residual silver halide in the upper layer is exposed to ultra-violet light and colour developed and finally the residual silver halide in the middle layer is processed to colour.

4. Method as claimed in Claim 3 in which the residual silver halide in the middle layer is made developable by exposure from the bottom or from both sides to ultra-violet light or soft X-rays for which the lower layer is permeable.

5. Method as claimed in Claim 1 or 2 in which two ultra-violet filter layers are arranged on both sides of the middle silver halide layer and in which the outer layers are exposed in succession to ultra-violet light and colour developed and the middle layer is finally processed to colour.

6. Method as claimed in Claim 5 in which the middle layer is intensively exposed from both sides to soft X-rays or ultra-violet light (if necessary after prior removal or destruction of the substances absorbing ultra-violet).

7. Method as claimed in Claim 1 in which there is an ultra-violet absorbing filter between the middle and lower silver halide layers and a yellow filter between the upper and middle layers and in which the lower layer is exposed to ultra-violet light and colour developed and the upper layer is exposed to blue light and colour developed and the middle layer is finally processed to colour.

8. Method as claimed in Claim 1 in which there is an ultra-violet absorbing filter between the upper and middle silver halide layers and an orange-red filter between the lower and middle silver halide layers and in which the lower silver halide layer is exposed to blue light and the upper one to ultra-violet light, in either order, and each colour developed after exposure, and finally the middle layer is colour processed.

9. Method as claimed in Claim 3 or 8 in which the middle layer is intensively exposed to ultra-violet light or soft X-rays (if necessary after destroying or removing the filter substances) and is then colour developed and finally the silver is removed from all the layers.

10. A colour photographic element having three differentially colour sensitive silver halide emulsion layers inseparably superimposed on a single support and between two adjacent layers or in one of the outer layers a colourless ultra-violet absorbing substance which is resistant to developing baths or to developing mild oxidising baths or to developing and fixing and mild oxidising baths.

11. A colour photographic element having three differentially colour sensitized silver halide emulsion layers superimposed on a single support in which the middle layer is protected on both sides against the action of ultra-violet light by colourless ultra-violet absorbing substances which are resistant to ordinary developing baths or to developing and mild oxidising baths or to developing and fixing and mild oxidising baths.

12. A colour photographic element as claimed in Claim 11 in which the colourless ultra-violet absorbing substance is present in a layer between the upper and middle layers and in a layer between the middle and lower layers.

13. A colour photographic element as claimed in Claim 12 in which the layer between the upper and middle layers contains a yellow filter colouring matter.

14. A colour photographic element as claimed in Claim 10 in which a colourless ultra-violet absorbing substance is present in a filter layer between the lower layer and the middle layer and a yellow filter layer is present between the top layer and

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the middle layer.

15. A colour photographic element as claimed in Claim 10, in which the ultra-violet absorbing substance is situated in a layer between the upper layer and the middle layer which also contains a yellow filter colouring matter.

16. A colour photographic element as claimed in Claim 15, in which the lowest layer contains a colour sensitizer resistant to photographic developing baths.

17. A modification of the colour photographic element claimed in Claim 11 and suitable for printing in which the middle

layer, which is protected on both sides against the action of ultra-violet light by colourless ultra-violet absorbing substances which are resistant to ordinary developing baths or to developing and mild silver-oxidising baths or to developing and fixing and mild silver-oxidising baths, is alone sensitized for yellow or red (i.e. the lower layer is not specially colour sensitized).

Dated this 30th day of November, 1938.
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Chartered Patent Agents,
12, Church Street, Liverpool, 1.