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## PATENT SPECIFICATION



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501,001

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(Divided out of No. 500,826).

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### COMPLETE SPECIFICATION

#### Process for Colour Photography

We, KODAK LIMITED, a Company registered under the Laws of Great Britain, of Kodak House, Kingsway, London, W.C.2. (Assignees of KARL SCHLIZEL, of Ottendorfgasse 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 multi-layer colour photography.

It is known that the selective processing of reversed silver halide images in three layers, not containing colour formers, carried on a single support, can be accomplished by the controlled penetration of processing baths. (See specifications Nos. 427,518; 427,520; 454,498; 454,499 and 454,622).

The present invention is concerned with processes in which the selective processing of the silver halide images is accomplished by selectively rendering the reversed images in the layers, resulting from the reversal process, developable by separate exposures and successively colour developing them.

In particular it relates to a process of producing colour developed reversed images in a three-layer photographic element of the kind whose upper layer is not specially colour sensitized and which contains a colour sensitizer in the middle layer which is resistant to the action of photographic developing baths and of mild silver-oxidizing baths and a yellow filter dyestuff in the upper layer or between the upper layer and the middle layer. Such an element and certain methods for the colour processing thereof are described and claimed in Application No. 26471/38 (Serial No. 501,002) of even date. The middle layer is usually yellow and green sensitive and the lower layer red sensitive. This order of the layers may be changed, if a very sharp blue image is desired, by having the middle emulsion sensitive to red and

orange and the lower emulsion to yellow and green. This variation has 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; for example, 4:4'-dichloro-2:2':8-triethylthiacarbocyanine chloride is suitable. The three layers may be coated on the same side of the support or the red- or yellow - green - sensitive emulsion can be situated alone on the back of the support and the two others on the front.

In the process of the present invention it is assumed that both the colour sensitizers are stable at least to a neutral black developer and to the first weakly alkaline colour developer. This is true of most known sensitizers.

The advantage of this process is that the sensitizer of the bottom layer need not be resistant to silver-oxidising baths. This makes the choice of suitable sensitizers much wider.

According to the present invention, the process of producing colour developed reversed images in a three-layer photographic element of the kind defined above, consists in developing the first latent images to silver, then removing the silver without destruction of the yellow filter dyestuff, then exposing the reversed silver halide image in the middle layer only by means of light of a colour to which it is selectively sensitized from either side, and colour developing it, then exposing the reversed silver halide image in the upper layer by means of blue light from the top and colour developing it and finally exposing and colour developing the reversed silver halide image in the lower layer.

The residual silver halide may be used for reversal development or this may be converted in one or more layers to silver chloride in a fine state of sub-division as described and claimed in co-pending application No. 26472/38 (Serial No. 501,003).

It will be seen that this invention is characterized by the feature that the initially reduced silver is removed before

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the re-exposure of any of the reversed silver halide images and is thereby distinguished from the processes described and claimed in application No. 26471/38 (Serial No. 501,002) of even date.

5 With sensitization of the lower layer exclusively for red or for red and orange, and sensitization of the middle layer to yellow and green by means of a sensitizer which alone is resistant to silver-oxidising baths, the process is, in general, as follows:—

10 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 a bisulphite.

15 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 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.

20 The removal of the initially reduced silver may be effected by completely dissolving it with oxidizing agents and washing it out. It is sufficient if at least the silver of the upper layer and all or a part of the silver of the middle layer is removed in this manner when the residual silver halide of the middle layer is to be exposed from above.

25 The middle layer is exposed to yellow light from either side and developed purple, then the upper layer is exposed

to blue light and developed yellow and finally the lower layer is exposed to blue, white or (if the removal of the initially reduced silver has not extended to the bottom layer) to red light and developed blue-green. 60

If the red-sensitive emulsion is in the middle layer, then the above described procedure is correspondingly changed, i.e. the middle layer is exposed to red light from either side and developed blue-green, the upper layer is exposed to blue light and developed yellow and finally the lower layer is exposed to blue, white or (if the removal of the initially reduced silver has not extended to the bottom layer) to yellow light and developed purple. 65

70 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 what we claim is:— 75

1. A process of producing colour-developed reversed images in a three-layer photographic element of the kind hereinbefore defined which consists in developing the first latent images to silver, then removing the silver without destruction of the yellow filter dyestuff, then exposing the reversed silver halide image in the middle layer only by means of light of a colour to which it is selectively sensitized from either side, and colour developing it, then exposing the reserved silver halide image in the upper layer by means of blue light from the top and colour developing it and finally exposing and colour developing the reversed silver halide image in the lower layer. 80

2. Process as claimed in claim 1, in which for the first development all the layers are impregnated with the developing agent in high concentration and are then treated with weak alkali to effect development. 85

3. Process as claimed in claim 1, in which for the first development all the layers are impregnated at a low temperature, as herein described, with concentrated developing solution and are then heated to effect development. 90

Dated this 9th day of September, 1938.

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