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PRODUCTION OF REVERSAL IMAGES

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5 Claims. (Cl. 95—88)

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This invention relates to an improvement in a process for the manufacture of photographic reversal images.

In the specification of Patent Number 2,352,014 and of patent application Ser. No. 606,040, now abandoned, I have described a process for the production of photographic reversal images by diffusion of silver halide, from a developed silver halide emulsion layer into a receiving layer insensitive to light, in which the diffused silver halide is at once reduced to metallic silver.

The two layers may both be mounted on one support and are separated after the diffusion and development. As a rule a two-layer material is used, the lower layer being hardened, while the top-layer having a very low melting-point is removed after complete diffusion by means of warm water. This warm water treatment must be carried out in the darkroom which is rather inconvenient.

It is an object of this invention to avoid the warm water treatment and thereby to speed up the entire process.

This object is accomplished by the simple means of adding to the diffusion bath a substance which in solution is a solvent for gelatine.

According to my invention, the diffusion of the silver halide and the removal of the emulsion layer are performed in a bath which contains gelatine solvents such as thiocyanates or organic sulphonic acids, which are used in the gelatine industry, e. g. for keeping glue fluid (Ullmann Encyclopaedia, Bd. 5, p. 599). For the production of washing-out reliefs, similar salts, e. g. ammonium carbonate, have been proposed (British Patent 319,077).

The method, according to this invention, offers many advantages: While the process described in my prior patent and patent application mentioned above requires four treating-baths, viz. a developing bath, a diffusion-bath, a warm-water bath, and a toning-bath, the new process according to this invention dispenses with the highly undesirable manipulation with warm water in the dark-room. The ensuing shortening of the processing time is particularly valuable for a quick determination of the exact time required for exposure (proofexposure).

By dissolving the emulsion layer during the diffusion, the diffusion is stopped automatically, so that the time required for the diffusion of different images becomes uniform, and consequently more uniform images are obtained. It also renders unnecessary a time control of the manipulation in the diffusion-bath (such as may be required for a fixing bath). This is of particular commercial importance for the output per unit of time when producing a large number of images.

The use of a single bath for carrying out the

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two steps of diffusion and of dissolving and removal of the gelatine not only saves time, but also renders it possible to obtain several gradations when starting from a single photographic emulsion, depending on the rate of diffusion of the image and the rate of solution of the emulsion layer, which may both be influenced within wide limits by the nature and the concentration of the gelatine-solvents and of the solvents for silver halide.

Substances which restrain the diffusion of bleaching and other liquors, into the photographic emulsion, as described e. g. in Patent 2,059,884, may also be added to the diffusion and dissolving bath whereby to restrain its diffusion and to reduce the image-gradation.

It is also possible to add to the gelatine-dissolving and diffusion bath, chemical-toning agents, e. g. selenium compounds, so that the production of a direct positive image takes place in only two treating baths.

The diffusion and dissolving bath is soiled by the dissolved gelatine. This drawback although as a rule not affecting the final result may be avoided by so compounding the bath that the gelatine layer is not washed away but is only affected to such an extent that it can be washed away subsequently with cold water or can be removed in cold water by light rubbing.

In order to prevent the salts which are often used in high concentration from crystallizing in the diffusion bath, I may add substances containing an ionizable OH group, for instance as described in Patent Number 2,366,496, which prevent crystallization from occurring such as for instance an alkali metal hydroxide or other bases such as hydrocarbon substituted ammonium hydroxides or sulfonium hydroxides.

In practicing my invention, I may proceed for instance as set out in the examples hereinafter.

Example 1

On a material consisting of (a) a support, (b) a hardened receiving layer which contains reduction nuclei, (c) an unhardened light-sensitive emulsion layer, a colored diapositive is printed in an enlarger.

The exposed material is developed 1½ minutes in a developer of the following composition:

Water	1000 cm. ³
Metol	1.5 g.
Sodium sulphite	
(cryst.)	50 g. or anhydrous 25 g.
Hydroquinone	6 g.
Sodium carbonate	
(cryst.)	100 g. or anhydrous 40 g.
Potassium bromide	1 g.

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The developed product is treated in a bath of the following composition:

Water	cm. ³	1000
Alpha naphthalene sodium sulphonate	g	100
Sodium thiosulphate	g	5

After 2 minutes the emulsion layer can be removed in cold water. The yellow-brown reversal image formed may be colored by toning in e. g. a known gold thiocyanate bath.

Example 2

On a material consisting of (a) a support of waterproof paper, (b) a hardened receiving layer which contains reduction nuclei, (c) an unhardened light-sensitive emulsion layer with steep gradation, a line image, for instance a text, is reproduced.

The exposed material is developed 1 minute in a hard-developer of the following composition:

Water	1000 cm. ³
Potassium hydroxide	25 g.
Sodium sulphite	
(cryst.)	200 g. or anhydrous 100 g.
Potassium bromide	3 g.
Hydroquinone	55 g.

The developed product is treated 2 minutes in a bath which is composed as follows:

A. Water	cm. ³	1000
Potassium thiocyanate	g	100
Sodium thiosulphate	g	5
B. Water	cm. ³	100
Sodium sulphite (anhydrous)	g	15
Selenium	g	2.5

Solution B is prepared by heating until complete solution and by filtration. For use, 50 cm.³ of solution B are added to 1000 cm.³ of solution A. After treatment in the bath, the emulsion layer is dissolved and a positive black-brown text image is obtained, which need not be treated further.

Example 3

On a material, consisting of (a) a support, (b) a hardened light-sensitive emulsion layer, which contains reduction nuclei, (c) an unhardened light-sensitive emulsion layer, a drawing is reproduced by contact, for example, a design for textile printing. The exposed material is developed for 4 minutes in a developer of the following composition:

Water	1000 cm. ³
Metol	1.5 g.
Sodium sulphite	
(cryst.)	50 g. or anhydrous 25 g.
Hydroquinone	6 g.
Sodium carbonate	
(cryst.)	100 g. or anhydrous 40 g.
Potassium bromide	1 g.

The developed product is treated 5 minutes in a bath composed as follows:

Water	cm. ³	1000
Potassium thiocyanate	g	100
Sodium thiosulphate	g	200

In this bath, a deep-brown positive image is formed in the emulsion layer (b) which is separated from the negative formed in the same layer during the development, by a small transparent line; at the same time, the emulsion layer is dissolved and fixed out and the upper emulsion layer (c) is removed by dissolution. The contour

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image thus obtained, may be put to further use immediately after washing and drying. The term "receiving layer" used in the claims here appended is intended to mean a layer consisting of a material or materials insensitive to light and containing a colloidal heavy metal or an insoluble sulfide of such metal or a fogged silver halide emulsion.

Various changes may be made in the operation of this process and in the materials used in this operation without departing from the invention or sacrificing the advantages thereof.

I claim:

1. Process for the production of a photographic reversal image in a photographic material containing two layers spread on the same support, the top layer being an unhardened light-sensitive silver halide gelatine emulsion layer, the bottom layer being a hardened receiving layer, which comprises exposing said light-sensitive layer to light treating the so exposed material with a silver halide developer to develop the exposed silver halide and then treating the said material containing silver halide developer with an aqueous solution of a thiosulphate and gelatine solvent selected from the group consisting of thiocyanates and organic sulphonic acids, said solvent being present in a concentration of approximately 100 grams per liter.

2. The process of claim 1 in which the gelatine solvent is potassium thiocyanate.

3. The process of claim 1, in which the gelatine solvent is alpha naphthalene sodium sulfonate.

4. The process of claim 1, in which the gelatine solvent solution also contains a chemical toning substance.

5. The process of claim 1, in which the gelatine solvent solution also contains a crystallisation-preventing substance containing an ionizable OH-group in its molecule.

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