

UNITED STATES PATENT OFFICE

2,214,446

PHOTOGRAPHIC DEVELOPMENT OF
SILVER HALIDE LAYERS

Fritz Albers and Hans Nitze, Leverkusen-Wiesdorf, Gustav Schaum, Leverkusen-I. G. Werk, and Edith Weyde, Cologne-Niehl, Germany, assignors, by mesne assignments, to General Aniline & Film Corporation, New York, N. Y., a corporation of Delaware

No Drawing. Application May 6, 1939, Serial No. 272,132. In Germany May 10, 1938

6 Claims. (Cl. 95—6)

Our present invention relates to photographic development of silver halide layers.

It has been proposed to incorporate a developing substance in a photographic silver halide layer before the sensitive layer is exposed and after exposure to develop the image in an alkaline solution, for instance potassium carbonate or sodium carbonate.

This proposition was for the purpose of simplifying the developing operation, since only an alkaline solution would be required for the development. The time needed for the development, as compared with the usual procedure, is not, however, essentially shortened, so that nothing in respect to rapid development is attained by the proposition. A great disadvantage of sensitive layers containing the developing substance is their deterioration during storage.

It is one object of our invention to provide a photographic silver halide layer containing a developing substance and an organic compound which prevents fog, i. e., a stabilizer.

Another object of this invention is the provision of a photographic sensitive layer which contains a developing substance and in addition to said substance a stabilizer in such concentration that the layer is stable in storage and capable of development with caustic alkali without production of fog.

Further objects of our invention will appear more in detail from the following description.

By a sufficient addition of organic stabilizers which are described for instance in the U. S. Patents Nos. 1,696,830, dated December 25, 1928, 1,758,576 and 1,758,577, dated May 13, 1930, the use of caustic alkaline solutions which are necessary for rapid development becomes possible, since without these stabilizers there is easily produced by caustic alkalies a general grey or dichroic fog in a developed layer already containing a developing substance. The presence of the organic compound also provides the hitherto lacking stability in storage of the photographic layers containing a developing substance.

For obtaining the desired effect there may be added, for example, to 1 liter of photographic silver halide emulsion either 0.1 gram of 2,6-dimercapto-4-keto-3,5-diphenylpenthiophene or 1 gram of nitrobenzimidazole or a mixture of 0.5 gram of nitrobenzimidazole and 0.05 gram of 2,6-dimercapto-4-keto-3,5-diphenylpenthiophene.

The development of a photographic silver halide layer of this invention with a caustic alkali solution occupies only a few seconds so that it is possible to develop such a layer in a machine in a

very short time, for instance by applying the developer by means of rollers.

It will be seen that the invention is a combination of three known expedients, namely addition of a developing substance to a photographic layer, simultaneous addition of an organic compound of the kind specified in a sufficient concentration, and development of the latent image with caustic alkali. The combination achieves rapid development free from fog of layers which are stable in storage.

Developing substances suitable for the invention are, for example, the known organic compounds, such as 1-hydroxy-4-methylaminobenzenesulfate and hydroquinone, either alone or in admixture with each other.

The organic stabilizers may be added to the emulsion or any intermediate or protective layer or even to the photographic paper or the surfacing baryta.

For development there may be used, for example, a caustic soda solution of 1 per cent strength.

We claim:

1. A stable photographic silver halide emulsion containing a developing agent and a small amount of an organic compound capable of preventing fog selected from the class consisting of organic compounds containing sulfur, capable of forming a stable silver salt with the group —SAG and having no higher solubility than silver chloride and organic compounds containing nitrogen, said emulsion being capable of development in caustic alkalis without development of fog.

2. A stable photographic silver halide emulsion containing a developing agent and a small amount of 2,6-dimercapto-4-keto-3,5-diphenylpenthiophene.

3. A stable photographic silver halide emulsion containing a developing agent and a small amount of nitrobenzimidazole.

4. A stable photographic silver halide emulsion containing a developing agent and a small amount of a mixture of nitrobenzimidazole and 2,6-dimercapto-4-keto-3,5-diphenylpenthiophene.

5. A stable photographic light-sensitive material comprising a silver halide emulsion containing a developing agent and a small amount of an organic compound capable of preventing fog selected from the class consisting of organic compounds containing sulfur, capable of forming a stable silver salt with the group —SAG and having no higher solubility than silver chloride and organic compounds containing nitrogen, said

emulsion being capable of development in caustic alkalis without development of fog.

5 6. The process of developing an exposed photographic silver halide emulsion containing a developing agent and a small amount of an organic compound capable of preventing fog, selected from the class consisting of organic compounds containing sulfur, capable of forming a stable silver salt with the group —SAg and hav-

ing no higher solubility than silver chloride and organic compounds containing nitrogen, which comprises subjecting said emulsion to the action of a solution of caustic alkali.

5
FRITZ ALBERS.
HANS NITZE.
GUSTAV SCHAUM.
EDITH WEYDE.