Patented Apr. 15, 1941 2,238,547

UNITED STATES PATENT OFFICE

2,238,547

PHOTOGRAPHIC DFVELOPER

William H. Wood, Bedford, Ohio, assignor to Harris-Seybold-Potter Company

No Drawing. Application June 6, 1939, Serial No. 277,675

3 Claims. (Cl. 95—88)

Customarily, an alkaline agent is employed with a silver halide developer, this having the function of providing necessary control of the hydrogen ion concentration. The alkalies used have been sodium carbonate, sodium phosphate, sodium borate, sodium metaborate, caustic soda, caustic potash, etc. I have now found, however, that by suitable means it becomes possible to adjust the pH of developers in desired range particularly satisfactorily, and also obtain other advantages in addition, while being free from the tendency of various of the known alkalies to damage gelatin surfaces if used in concentration.

To the accomplishment of the foregoing and related ends, the invention, then, comprises the features hereinafter fully described, and particularly pointed out in the claims, the following description setting forth in detail certain illustrative embodiments of the invention, these being indicative however, of but a few of the various ways in which the principle of the invention may be employed.

In accordance with the invention, I employ in connection with a developing agent, potassium pyrophosphate, that is, tetra potassium pyrophosphate, $K_4P_2O_7.3H_2O$, or $K_4P_2O_7$, depending upon whether water of crystallization is present or absent. This agent, as a component of a silver halide developer, activates the developer as an alkaline activator, and is especially advantageous over borates for instance, in its high solubility properties. It adds particularly to the usefulness of fine grain developers also. It may thus be included in a developer for its alkaline action, especially favorable over previously known alkaline agents. But besides, it has a peculiar hardening or toughening action upon the gelatin. Thus under developing conditions where rather high temperatures may be encountered, a control upon the hardening of the gelatin may be had. According to the concentration of the potassium pyrophosphate employed, functioning thereof may be directed to emphasize whichever action is desired, or both functions may be obtained. The potassium pyrophosphate is extremely soluble in water, and it may be used in minimum amounts or up to 60% or saturation. Especially where the main effect desired is a hardening of the film, these high concentrations may be applied.

As an example:

Metol	2 grams
Sodium sulphite	120 grams
Hydroquinone	6 grams
Potassium pyrophosphate	4 grams
Potassium bromide	2 cc. of a 10% solution

Water up to 1 liter.

The developing time may be 10 to 15 minutes.

If in the above formula the amount of potassium pyrophosphate be raised to 40 grams, the action of the developer may be speeded up so as to allow operation in three or four minutes, but the grain is not as fine as under the first conditions.

As another example:

Paraphenylenediamine	10 grams
Glycin	10 grams
Sodium sulphite	180 grams
Potassium pyrophosphate	4 grams
Potassium bromide	2 cc. of a 10% solution

Water up to 1 liter.

The developing time may be 10 to 15 minutes. A particularly fine grain effect may be had.

As another example:

Sodium sulphite	100 grams
Potassium pyrophosphate	75 grams
Glycin	15 grams
Potassium bromide	2 cc. of a 10% solution

Water up to 1 liter.

Similar developing time as in the preceding example may be employed, and it is noticed that such time is very much reduced as compared with the normal requirements of a glycin type developer.

Other modes of applying the principle of the invention may be employed, change being made as regards the details described, provided the features stated in any of the following claims, or the equivalent of such, be employed.

I therefore particularly point out and distinctly claim as my invention:

1. In a process of the character described, developing photographic images and hardening the gelatinous surfaces with a silver halide developer in the presence of a potassium salt embodying potassium pyrophosphate.

2. In a photographic process, hardening the gelatinous surfaces in the presence of a silver halide developer by a potassium salt comprising potassium pyrophosphate.

3. A photographic silver halide developer having in association a hardener containing a potassium salt comprising potassium pyrophosphate.

WILLIAM H. WOOD.