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METHOD OF PROCESSING PHOTOGRAPHIC ELEMENTS

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4 Claims. (Cl. 95—88)

This invention relates to an auxiliary or stop bath suitable for use with developed photographic elements before an acid hardening fixing bath. Such stop baths are usually employed between developing and fixing. The type of bath here dealt with is designed particularly to immediately precede an acid hardening fixing bath.

In the following copending applications Serial No. 588,502, filed January 22, 1932 by R. S. Becker; Serial No. 626,203, filed July 29, 1932 by myself; and in Serial No. 635,060, filed September 27, 1932 also by me, there have been described developers and fixing baths containing certain boron compounds and the effect of such compounds in acid hardening fixing baths has been disclosed.

The present invention deals with the use of boron compounds in baths which are used preliminary to acid hardening fixing baths. I have found that beneficial effects on the acid hardening fixing bath are conferred by certain boron compounds present in a preliminary or stop bath, the effects being due to the fact that these compounds are carried over in small amounts into the fixing bath by the developed films, plates or prints.

It has been previously shown that the addition of certain boron compounds to an acid hardening fixing bath such, for example, as one containing potassium alum and acetic acid, extends the pH range over which hardening takes place and raises the pH value at which sludging occurs. It is well known that as an acid hardening fixing bath is subjected to more and more use the acid in it gradually becomes neutralized by the alkaline developer carried over into it. The pH of the solution accordingly rises. Satisfactory hardening with the usual hardening agents such as alum occurs only during a certain range of pH value. As the pH of the solution increases beyond this useful range the bath ceases to exert satisfactory hardening.

At the same time, as the bath becomes more alkaline and the pH value rises, a precipitate begins to be thrown out and this phenomenon is commonly known as sludging since the precipitate slowly accumulates in the bottom of the tray or tank as a very finely divided sludge. The bath may also become more or less cloudy. The precipitate or sludge probably consists of basic aluminum sulfite, aluminum hydroxide or aluminum oxide, either singly or in mixture, depending on conditions. The boron compounds which I employ raise the pH value at which sludging occurs as well as increase the hardening life. These compounds, therefore, have a very useful effect in prolonging the life of the fixing bath and result in convenience and economy since it is not necessary to replace the fixing bath so soon.

The present invention is based on the observation that these advantages may be secured to a considerable degree by putting the boron compound in a preliminary or stop bath, it not being necessary to put them in the fixing bath itself.

Compounds which are especially useful are boric acid, borax, boron triacetate, glycol borate, phenyl borate, and the glyceryl esters of boric acid. These substances are made into water solutions and in most cases have preferably added to them an organic acid such as acetic acid, propionic acid or butyric acid. A solution so prepared may then be used, for example, as a stop bath between developing and fixing. While other procedures may, of course, be employed, the use of a stop bath is particularly advantageous where large numbers of photographic prints are to be developed, fixed and hardened.

While a large number of such baths may be compounded, the following embodiments of my invention are sufficient for purposes of illustration.

Formula I

Borax	50 grams
Acetic acid glacial	20 c.c.
Water to	1000 c.c.

Formula II

Boric acid	30 grams
Water to	1000 c.c.

Formula III

Boron triacetate	60 grams
Water to	1000 c.c.

Formula IV

Phenyl borate	50 grams
Acetic acid glacial	10 c.c.
Water to	1000 c.c.

While the exact composition of these stop baths is usually variable over a considerable range, concentrations of the order I have given work the best. If a large amount of material is to be handled or if a fixed procedure is to be followed it will be well to determine by trial a definite developer, stop bath, and hardening fixing bath which will be well suited to the particular conditions. This is not a procedure which requires more than a little experience.

The formulas I have given are satisfactory for several common acid hardening fixing baths containing potassium aluminum and acetic acid, as these fixing baths are now used.

The boron compounds which I have mentioned, in common with most boron compounds that are soluble in water, decompose to give boric acid in solution. Solutions containing these compounds may, therefore, be said to contain boric acid or the borate ion.

It will be evident that a large number of preliminary or stop baths of different proportions and constitutions may be compounded in accordance with my disclosure. I consider as included within my invention all modifications and equivalents coming within the scope of the appended claims.

What I claim is:

1. A method of processing photographic elements which comprises developing said elements in an alkaline developer, immersing them in a stop bath containing in solution a compound yielding the borate ion, and then fixing the elements in an acid hardening fixing bath containing alum.

2. A method of processing photographic elements which comprises developing said elements in an alkaline developer, immersing them in a stop bath substantially free from developer and a fixing agent and containing in solution a substance yielding the borate ion and then fixing the elements in an acid hardening fixing bath containing alum.

3. A method of processing photographic elements which comprises submitting them to an alkaline developing bath, then to a stop bath comprising predominantly an ester of boric acid and an organic acid selected from the group consisting of acetic acid, propionic acid and butyric acid and then to an acid hardening fixing bath containing alum.

4. A method of processing photographic elements which comprises submitting them to an alkaline developing bath, then to a stop bath comprising predominantly an ester of boric acid and an organic acid and then to an acid hardening fixing bath containing alum.

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