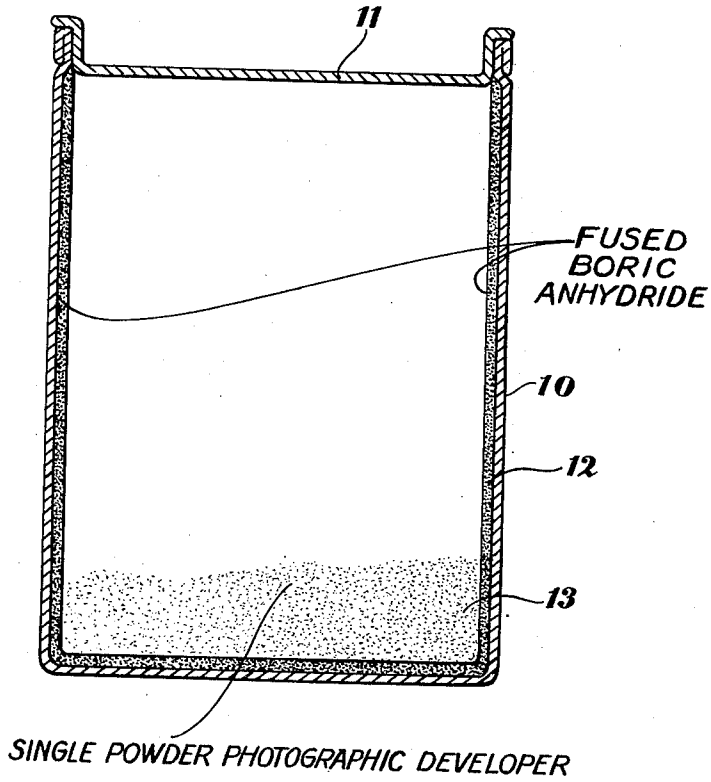
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METHOD OF PACKAGING AND STABILIZING SINGLE-POWDER DEVELOPERS

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METHOD OF PACKAGING AND STABILIZING SINGLE-POWDER DEVELOPERS

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This invention relates to single-powder photographic developers, and more particularly to a method of packaging and stabilizing the single-powder mixture to prevent disadvantageous interaction between the organic developer component and the basic component of the single-powder mixture.

Single-powder developer mixtures may contain an organic developer component or mixtures of such components, including monomethyl-paraaminophenol sulfate (elon or metol), hydroquinone, p-aminophenol hydrochloride, p-aminophenol sulfate, pyrogallol, parahydroxyphenyl glycine, catechol, diaminophenol hydrochloride and others, with an alkali component, a stabilizing component, an oxidizing preventer and an anti-fogging component. The alkali component may be the stable hydrate of an alkali carbonate, a desiccated alkali carbonate, an alkali metaborate, or an alkali sulfite. Generally the stable alkali carbonate monohydrate is preferred. The oxidation preventing component may be an alkali sulfite, and the anti-fogging component may be potassium bromide or iodide. Stabilizing components for such a single-powder developer are disclosed in Patent 2,384,592 of September 11, 1945, and include maleic anhydride, salicylic acid, alkali metabisulfite, benzoic anhydride, orthobenzoic sulfamide, phthalamide and phthalic anhydride. The latter has outstanding stabilizing properties in the presence of either sodium carbonate or borax and has been employed considerably more than the other stabilizers mentioned in that patent.

While the stabilizing effect of the phthalic anhydride is very good, it has been employed most successfully in developer compositions having as the alkali component either sodium carbonate or sodium sulfite, or mixtures thereof. Less success has been attained in the case of the important class of developers containing sodium metaborate as the alkali ingredient. Also, the presence of phthalic anhydride in the single-powder developer involves other considerations which are not too desirable.

In the first place, phthalic anhydride is slowly soluble in water. Furthermore, it is impossible to employ it in the presence of benzotriazole, the latter being a desirable component of certain developer mixtures. But the greatest disadvantage of employing phthalic anhydride in single-powder developer mixtures, which contain alkali carbonates and sulfite, is that phthalic anhydride may react, due in part to temperature effects with these basic substances and form

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gas under sufficient pressure to distend the hermetically sealed can in which the developer powder is packaged, and often cause a portion of the powder to be ejected with some violence as the package is opened.

In the copending application by William J. Rogers, Serial No. 210,284, filed February 9, 1951, entitled "Stabilizing Agent for Single Powder Photographic Developers" now U. S. Patent 2,606,118 of August 5, 1952, the effective and improved stabilization of single-powder photographic developers is accomplished by intimately mixing boric anhydride with the other components of the single-powder developer mixture.

We have now found a unique way of employing boric anhydride to stabilize the same type of single-powder photographic developers without actually incorporating the boric anhydride stabilizer into the mixture.

An object, therefore, of the present invention is a novel method of stabilizing single-powder photographic developers with boric anhydride.

Another object of this invention is a novel method of packaging and a novel package for single-powder photographic developers.

Other objects will appear hereinafter.

In accordance with the present invention we have found an alternative method of employing boric anhydride to stabilize single-powder photographic developers as well as a novel method for packaging such powders in a novel package.

We have found that instead of incorporating the powdered boric anhydride as the stabilizing component into the photographic developer mixture, the same beneficial stabilizing effect may be achieved by fusing an equivalent amount of boric anhydride onto the inside of the container in which the single-powder developer is to be subsequently packaged. This is a surprising discovery and although the theory of its operation is not completely understood it nevertheless is an effective method for preserving single-powder developers against self-deterioration.

Our method may be employed with glass and metal containers and with plastic or other types of containers which will withstand the heat necessary to fuse the boric anhydride. An effective procedure to fuse the boric anhydride onto the inner surfaces of the container, is to dust the desired amount onto the inner surfaces of the container which has been heated somewhat above the fusing temperature of the boric anhydride. The fused coating may, however, be formed by placing the boric anhydride on the surface and subsequently heating the container

to the fusing temperature, or by flowing molten boric anhydride onto the surfaces to be coated. As soon as the fusion takes place, or the surface is coated with the molten substance, the container is cooled to normal temperatures to set the coating. The single-powder photographic developer is then added to the container and the cover sealed thereon in accordance with the usual practice in this art. An amount of boric anhydride up to 10% of the total weight of the other constituents may be employed effectively. No particular advantage is found when a larger amount is employed.

The following examples will serve further to illustrate the method of packaging and stabilizing single-powder developer mixtures according to our invention:

Example 1

A metal can was heated to 577° C. and 4.2 grams of boric anhydride was sprinkled over the interior surface of the can. The hot can caused the boric anhydride to become molten and flow in a thin coating over the inner surface of the can. The can was then cooled to room temperature and the fused coating adhered thereto.

A thoroughly mixed single-powder photographic developer composition comprising:

	Grams
Elon (monomethyl p-amino phenol sulfate)	5.1
Anhydrous sodium sulfite	45.0
Hydroquinone	12.0
Sodium carbonate monohydrate	81.3
Potassium bromide	1.9

was placed in the can and the cover hermetically sealed thereon. After prolonged storage at temperatures as high as 100° F. no interaction between the components of the mixture was evident, and the mixture had unimpaired developing properties thus showing that boric anhydride coating on the inside of the can was effective in preventing deterioration of the developer. A check sample placed in a plain can having no boric anhydride coating therein and heated to 100° F. was found to have reacted, was discolored and had diminished developing properties.

Example 2

A glass bottle was heated to 557° C. and the inner surface sprinkled with 2.2 grams of boric anhydride which became fused to the can surface. After cooling to room temperature a thoroughly mixed single-powder photographic developer composition comprising:

	Grams
Sodium sulfite	50
Sodium carbonate monohydrate	54
Potassium bromide	1
Pyrogallol	6.4

was placed in the coated bottle and sealed therein. On exposure to extremes of temperature in the vicinity of 100° F. it was found that the boric anhydride effectively stabilized the single-powder against disadvantageous chemical reaction. The powder then was used successfully as a developer. A check sample stored in an untreated bottle was very badly deteriorated.

Example 3

A glass bottle was heated to 577° C. and a coating of 2.9 grams of fused boric anhydride formed thereon as explained herein.

To the cold bottle was added a single-powder photographic developer composition containing:

	Grams
p-hydroxy phenyl glycine	8.4
Sodium sulfite	50.0
Sodium carbonate monohydrate	54.0
Potassium bromide	1.0

The bottle was sealed and exposed to a temperature of 110° F. for ten hours. The single-powder was then employed in a developing process and was found to be unchanged and to have undiminished developing properties. A check sample in an uncoated bottle showed evidence of deterioration under similar treatment.

In preparing a developer solution, the compositions of the above examples should be dissolved in water to make one liter of solution.

In the accompanying drawing there is shown an elevation view in section of a container comprising a body **10** and a tight fitting cover **11**. The inner walls of the container have a coating **12** of fused boric anhydride thereon. A single-powder photographic developer is shown as **13**.

By our novel process the advantages of employing a boric anhydride stabilizer actually mixed in the single-powder developer as shown in Patent 2,606,118, supra, can be attained by merely coating the inside of the container with a fused boric anhydride coating. This unexpected discovery permits single-powder mixtures having highly reactive ingredients to be stabilized against reaction without actually mixing the boric anhydride stabilizer throughout the powder.

We claim:

1. The method of stabilizing a single-powder photographic developer composition containing an organic silver halide developer and a photographically compatible basic ingredient selected from the group consisting of alkali sulfites and carbonates which comprises packaging the developer composition in a closed container having a coating on the interior surface thereof of fused boric anhydride.

2. The method of stabilizing a single-powder photographic developer composition containing an organic silver halide developer, an alkali carbonate, and an alkali sulfite which comprises packaging the developer composition in a closed container having a coating on the interior surface thereof of fused boric anhydride.

3. The method of stabilizing a single-powder photographic developer composition containing monomethyl p-aminophenol sulfate, hydroquinone, anhydrous sodium sulfite, sodium carbonate monohydrate and potassium bromide which comprises packaging the developer composition in a closed container having a coating on the interior surface thereof of fused boric anhydride.

4. The method of stabilizing a single-powder photographic developer composition containing monomethyl p-aminophenol sulfate, hydroquinone, anhydrous sodium sulfite and potassium bromide which comprises packaging the developer composition in a closed container having a coating on the interior surface thereof of fused boric anhydride.

5. The method of stabilizing a single-powder photographic developer composition containing pyrogallol, sodium sulfite, sodium carbonate monohydrate and potassium bromide which comprises packaging the developer composition in a closed container having a coating on the interior surface thereof of fused boric anhydride.

6. The method of stabilizing a single-powder photographic developer composition containing parahydroxy phenyl glycine, sodium sulfite, sodium carbonate monohydrate and potassium bromide which comprises packaging the developer composition in a closed container having a coating on the interior surface thereof of boric anhydride.

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