

3,368,897

VISCOUS PRE-DEVELOPMENT SOLUTION FOR REWIND PROCESSING

Walter F. Burrows, Greene, N.Y., assignor to General Aniline & Film Corporation, New York, N.Y., a corporation of Delaware

No Drawing. Filed Dec. 8, 1964, Ser. No. 416,887
5 Claims. (Cl. 96-50)

ABSTRACT OF THE DISCLOSURE

Process for rewind processing of silver halide photographic film—not later than the initial developing stage—in an aqueous solution containing a polyvinyl alkyl ether-polycarboxylic acid anhydride copolymer, a water-soluble cellulose derivative, or a polymethacrylic acid organic thickening agent.

This invention relates to photography and in particular to a processing technique having improved and advantageous characteristics. More particularly, this invention relates to improved processing solutions for the pre-bath employed in rewind processing.

As is well known, the handling, winding, unwinding and rewinding of photographic film presents numerous problems characteristic to this field. One of these problems is encountered when wound or rolled photographic film becomes stuck together and further damaged when developed and/or further treated in a typical rewind processor, e.g., a commercially available Morse B-5 rewind processor, and when employing conventional processing solutions.

According to this rewind processing technique, a rewind processor is loaded with exposed film, i.e., either color or black and white film, which has been wound or rolled on a spool or on similar means. The processor is equipped with drive means which unwinds and rewinds said wound film as many times as required in the processing technique utilized. The, thus, loaded processor is submerged in a first tank of processing solution and the drive means thereof is activated so as to effect unwinding of the film through the processing solution. Generally, as many tanks containing the necessary solutions are utilized as there are processing steps in the entire operation. In order to accomplish the desired result, the loaded processor unit is moved from tank to tank, and the film loaded within the processor is unwound or rewound while submerged within each particular tank employed in the processing.

In the processing of a typical exposed film, e.g., an Anscochrome Reversal Film, the following steps may be utilized in the processing procedure.

Step No.:	Process step
1	Pre-bath.
2	First developer.
3	First shortstop.
4	Wash.
5	Re-exposure.
6	Color developer.
7	Second shortstop.
8	Wash.
9	Bleach.
10	Wash.
11	Fix.
12	Wash.
13	Stabilizer.

As heretofore mentioned, numerous problems have been encountered during processing in the above manner. Specifically, one of these problems is poor slippage of the film which produces friction and sticking in amounts

sufficiently great to cause jamming of the processor and even breakage of the film.

There have appeared suggestions in the prior art for treating photographic film to improve the slippage and non-sticking characteristics thereof during rewind processing. One such technique proposes the use of slippage substance incorporated into the developer solution. The various materials employed up to the present time, however, have not proved entirely satisfactory for a number of reasons. Thus, in some cases, the slippage substances adversely affect the sensitivity of the film and in most instances the substances are just not effective for their intended purpose when employed in the treating baths in which the photographic film is processed.

It is, accordingly, an object of this invention to provide substantially complete relief from sticking during rewind processing of photographic film.

It is a further object of this invention to provide a method of processing photographic film to increase the slippage characteristics thereof and overcome the problems heretofore encountered.

Other objects and advantages of this invention will appear to those skilled in the art from the detailed description thereof given below.

The objects of the invention are attained by adding an organic thickening agent in an amount of from about 0.5 to 5.0 grams/liter of the first processing solution which the photographic film enters during processing. In accordance with the invention the organic thickening agent is preferably added to a pre-bath solution which the film enters prior to entering the first developer solution. It is also contemplated by the invention to add the organic thickening agent to the first developer solution instead of, or in addition to, adding said organic thickening agent to the pre-bath solution.

In accordance with the present invention the organic thickening agent employed includes, for example, a polyvinyl alkyl, e.g., C₁-C₃ alkyl, ether-polycarboxylic acid anhydride copolymer or a water soluble cellulose derivative. Non-limiting examples of the former group of thickening agents include the polyvinyl methyl ether-maleic anhydride polymers and the like. Non-limiting examples of the latter group include the cellulose ethers selected from the group consisting of carboxy-methyl cellulose and hydroxyethyl cellulose, and the alkali metal, ammonium and quaternary ammonium salts thereof and of preferred water-soluble cellulose derivative within the carboxymethyl cellulose, and hydroxyethyl cellulose. The last mentioned group comprises carboxymethyl cellulose and the sodium salt thereof. Also contemplated for use as the organic thickening agent may be similar acting high molecular weight polymers such as, for example, polymethacrylic acid and the like.

While the amount of organic thickening agent employed is defined above as being from about 0.5 to 5.0 grams/liter of processing solution in which it is employed, it is to be understood that such amounts may be varied depending on the efficacy of the particular agent employed. Thus, if desired, lesser or greater amounts of organic thickening agent may be employed, but experimental use has found that 0.5 to 5.0 gram/liter of solution to be the most advantageous as regarding efficiency, cost, etc.

When employed as a pre-bath solution the organic thickening agent is employed as an aqueous solution. Preferably from 25 to 75 grams/liter, specifically 50 grams/liter of sodium sulfate is incorporated into the pre-bath solution so as to attain optimum results.

As mentioned above, the present invention contemplates the use of the organic thickening agent in conjunction with the developer solution utilized. The developers contemplated herein contain the usual developer com-

ponents, such as the developing agent, i.e., metol, phenidone, hydroquinone, p-aminophenol, hydrochloride, pyragallol and the like; a preservative or anti-oxidant, such as an alkali metal sulfite, i.e., sodium sulfite, potassium sulfite, potassium metabisulfite and the like; an alkali energizer such as sodium carbonate, borax or the like; and an anti-fogging agent such as potassium bromide and the like.

The organic thickening agent is added to the developer composition in an amount ranging from about 0.5 to 5.0 grams/liter, that is, in an amount within the range similar to that employed in the pre-bath solution.

The following examples will serve to illustrate the invention, but it is to be understood that the invention is not restricted thereto.

EXAMPLE 1

This example serves to illustrate a typical rewind processing pre-bath (Step No. 1, above) solution employing the novel formula of the present invention. Accordingly, a pre-bath solution was prepared having the following ingredients:

Ingredient:	Amount
Polyvinyl methyl ether maleic anhydride copolymer	gram-- 1.0
Water	liter-- 1.0

Anscochrome Reversal Film was loaded into a Morse B-5 rewind processor and processed generally in accordance with the 13-step procedure outlined above. Except for the pre-bath solution, conventional processing solutions were utilized for the remainder of the process steps.

The photographic film was rewound in the pre-bath solution and successfully swollen without damage being encountered during the remaining conventional processing. Thus, the film was subjected to the remaining procedure steps with excellent processing results accruing.

EXAMPLE 2

This example is presented to illustrate a preferred rewind processing pre-bath solution. Such solution was prepared consisting of:

Ingredient:	Amount
Sodium sulfate (anhydrous)	grams-- 50.0
Polyvinyl methyl ether maleic anhydride copolymer	do-- 2.0
Water	liter-- 1.0

Anscochrome Reversal Film was processed in a manner similar to that of Example 1 and the 13-step procedure outlined above. The film was successfully swollen without damage and further processed with excellent results ensuing.

EXAMPLE 3

This example illustrates a first developer (Step No. 2, above) solution for rewind processing which embodies the inventive concept herein. In accordance with this invention the solution was prepared constituting the following ingredients:

Ingredient:	Amount
Sodium pyrophosphate	grams-- 1.0
Carboxy methyl cellulose	do-- 1.0
Metol	do-- 3.0
Sodium sulfite	do-- 50.0
Hydroquinone	do-- 6.0
Sodium carbonate	do-- 40.0
Potassium bromide	do-- 2.0
Sodium thiocyanate	do-- 2.0
Water to make	liter-- 1.0

Exposed photographic film, similar to that employed in Examples 1 and 2, was processed in the same rewind processor, utilizing the above first developer solution. No

sticking or friction damage was encountered upon completion of the initial rewind processing steps, i.e. Steps 1 and 2. The resulting processed film had excellent characteristics.

EXAMPLE 4

This example is inserted so as to compare a conventional pre-bath solution to that of the instant invention. Accordingly, a pre-bath solution consisting of the following ingredients was prepared:

Ingredient:	Amount
Dow Corning Silicone Emulsion #36 (a dimethyl silicone dispersion)	ml-- 9.0
Tergitol TMN (a reaction product of trimethylnonan-4 and 12 moles of ethylene oxide)	ml-- 2.0
Sodium sulfate (anhydrous)	grams-- 50.0
Water to make	liters-- 1.0

Exposed photographic film, similar to that employed in the foregoing examples, was loaded into a Morse rewind processor and submerged into a pre-bath tank containing the above solution. The film was swollen therein and damage typical of that resulting from film sticking was encountered. The limited success of this prior art processing procedure accents the advantageous results accruing from the instant invention as demonstrated by Examples 1, 2 and 3.

The present invention is not limited to the detailed description thereof contained herein, but includes all modifications that fall within the scope of the appended claims.

What is claimed is:

1. In the rewind processing of silver halide photographic film wherein the rewind processor unit is loaded with exposed film, moved from tank to tank and the film is unwound and rewound while submerged in each processing tank, the improvement which comprises subjecting said film to an aqueous processing solution at a stage not later than the initial development of the film, said solution containing from 0.5 to 5.0 grams per liter of an organic thickening agent selected from the group consisting of polyvinylalkyl ether-polycarboxylic acid anhydride copolymers, water-soluble cellulose derivatives and polymethacrylic acid.

2. The process of claim 1 in the said aqueous solution contains from about 25 to 75 grams per liter of sodium sulfate.

3. The process of claim 1, wherein the rewind treatment in said aqueous processing solution is a pretreatment preceding the initial development stage of the rewind processing.

4. The process of claim 3, wherein said aqueous solution contains about 50 grams per liter of sodium sulfate.

5. The process of claim 1, wherein said organic thickening agent is a carboxymethyl cellulose.

References Cited

UNITED STATES PATENTS

60	1,158,615	11/1915	Wright	95-94
	2,998,400	8/1961	French	260-29.6
	3,220,838	11/1965	Humphlett et al.	96-61

OTHER REFERENCES

65	Modern Photography, March 1953, 54-4, 116-7 (Anso Abstract #111-11b).
	Photo Dictionary: New York, Morgan & Morgan, Inc. 1957, p. 116, TR9, P52.

70 J. TRAVIS BROWN, *Acting Primary Examiner.*

NORMAN G. TORCHIN, *Examiner.*

C. E. DAVIS, *Assistant Examiner.*

Disclaimer

3,368,897.—*Walter F. Burrows*, Greene, N.Y. VISCOUS PRE-DEVELOPMENT SOLUTION FOR REWIND PROCESSING. Patent dated Feb. 13, 1968. Disclaimer filed Sept. 30, 1982, by the assignee, *Eastman Kodak Co.*

Hereby enters this disclaimer to all claims of said patent.
[*Official Gazette March 1, 1983.*]