United States Patent [19]

Leclair

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[54] **COPY SHEET CONTAINING SILVER SOAP AND AN ORGANIC PEROXYGEN OXIDIZING COMPOUND**

[75] Inventor: **Albert W. Leclair,** Hudson, N.H.

[73] Assignee: **Nashua Corp.,** Nashua, N.H.

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[51] **Int. Cl.** **G03c 1/02,** G03c 1/76, G03c 3/00, B41m 5/00

[58] **Field of Search** ..... 96/67, 114.1; 117/36.7, 117/36.8, 36.9; 250/65 T

[56] **References Cited**

UNITED STATES PATENTS

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Primary Examiner—Norman G. Torchin
Assistant Examiner—Richard L. Schilling
Attorney, Agent, or Firm—Kenway & Jenney

[57] ABSTRACT

An organic peroxygen oxidizing compound is incorporated in a silver soap containing white copy sheet of a two-sheet system to enhance the image contrast and reduce coloring of background areas.

5 Claims, No Drawings

COPY SHEET CONTAINING SILVER SOAP AND AN ORGANIC PEROXYGEN OXIDIZING COMPOUND

BACKGROUND TO THE INVENTION

This invention relates to thermographic copy systems of the two-sheet, or dual-spectrum, type. Systems of this type utilize a light sensitive intermediate sheet and a separate white copy sheet having a coating which contains a silver soap. The intermediate sheet carries a light-sensitive reducing agent for the silver soap, characterized by its ability to be rendered inactive as a reducing agent upon exposure to visible or ultraviolet light. Systems of this type are disclosed in U.S. Pat. No. 3,094,417, in U.S. Pat. No. 3,619,237 and in pending application Ser. No. 37,050, filed May 13, 1970, now U.S. Pat. No. 3,653,907.

In the two-sheet thermographic copying process, a copy of a document is made by first exposing the document to the intermediate sheet, conveniently by placing the two in contact with the side of the intermediate sheet carrying the reducing agent in contact with the document, and exposing the assembly to light from the intermediate side, that is to say by reflex illumination. This exposure results in inactivation of the reducing agent in the intermediate sheet in the light exposed regions, leaving unexposed areas corresponding to the dark areas of the document, which areas still contain active reducing agent. The intermediate sheet is then placed in contact with the silver-soap coating on the white copy sheet, and the two are heated to cause transfer of the reducing agent to the white sheet, and darkening through the reduction of silver soap in the areas corresponding to the dark areas of the document.

It has been found that the white copy sheet may show a tendency to darken in background areas. This is believed to be caused by the presence of reducing materials in these areas, which may be present because some mild reducing agent may be part of the white sheet formulation; the presence of reducing agent in these areas may also be accounted for by migration from the intermediate sheet during the development stage, because of incomplete inactivation during the initial exposure.

BRIEF DESCRIPTION

This invention is based on the discovery that the incorporation in the white copy sheet coating of an organic peroxygen compound of the oxidizing type gives improved contrast in the copy and greatly reduces age-darkening of the background areas.

Notwithstanding that the presence of an oxidizing reagent in the white sheet would appear to counteract the color forming reaction between the reducing agent and silver soap the peroxygen compound does not appreciably reduce the intensity of color in the copy image.

The white copy sheet is normally formulated to contain the silver soap plus free fatty acid, such as silver stearate-stearic acid, or silver behenate-behenic acid, an auxiliary mild reducing agent such as 2,6 dicyclohexyl cresol, or 2,6 ditertiary butyl cresol, a toner such as phthalazonone, phthalimide, or succinimide, fillers such as zinc oxide and silicone dioxide and a resin binder. Although formulations containing the foregoing ingredients will provide decent copies, these copies, will often darken in the background areas. However, a small amount of the organic peroxygen oxidizing compound will greatly reduce this darkening, thereby improving the characteristics of the copy and also improve the constrast, actually giving images of darker color in many situations.

Suitable peroxygen compounds are commercially available as oxidizing type organic peroxygen compounds including 2,5 dimethyl hexane 2,5 dihydroperoxide, cumene hydroperoxide tert-butyl hydroperoxide, benzoyl peroxide, tert-butyl peroctoate, aliphatic acyl peroxides, e.g., lauroyl peroxide and ketone peroxides such as bis (1-hydroxy cyclohexyl) peroxide, and 1-hydroxy 1′ hydroperoxy dicyclo-hexyl-peroxide. Generally the amount of the organic peroxygen compound should be by weight one-fifth to one-half the amount of silver soap (exclusive of fatty acid) by weight.

Examples setting forth various preferred formulations are set forth below.

A typical and representative basic formulation for a white copy sheet consists of the following:

Ethyl acetate	1,200 g
Stearic Acid	10.5 g
Zinc Oxide	248 g
Silver Stearate	54 g
Polyvinyl Acetate (V 800)	60 g
Cellulose Acetate Butyrate	40 g

Additionally, a toner is preferably included such as phthalazonone, 15 g, or phthalimide 30 g.

The ingredients are ball milled together for about 12 hours. For purposes of these examples the mixture containing phthalazonone is designated as A mix, and that containing phthalimide as B mix.

After the milling operation there is added an auxiliary mild reducing agent, either 2,6 dicyclohexyl cresol or 2,6 di-tertiary butyl cresol (IONOL). Samples were made up with and without the addition of the organic peroxygen oxidizing compound. In making up these samples, four 100 g. lots of A mix and four of B mix were collected. To two of each there was added 1 g. of 2,6 dicyclohexyl cresol and to the other two, 1. g. of Ionol. To one of each of these there was added 1 g of 2,5 dimethyl hexane 2,5 dihydroperoxide (Luperox 2,5—2,5 sold by the Lucidol Division of Pennwalt Corporation.)

The mixes were then coated onto separate base sheets of paper, each to a dry coating weight of 5 pounds per ream (3,000 sq. ft.). Samples of the white sheet were then tested utilizing the intermediate sheet described in U.S. Pat. No. 3,619,237 (Ex. 3) in a 3M Dual Spectrum copier.

The samples are tabulated below.

A MIX

	Examples			
	1	2	3	4
	Parts by Weight			
Mix	100	100	100	100
2,6 Dicyclohexyl Cresol	1	1	—	—
Ionol	—	—	1	1
Luperox	—	1	—	1

	B MIX			
	Examples			
	5	6	7	8
	Parts by Weight			
Mix	100	100	100	100
2,6 Dicyclohexyl Cresol	1	1	—	—
Ionol	—	—	1	1
Luperox	—	1	—	1

In each example the sheet containing the Luperox showed markedly improved contrast over the sheet not containing Luperox. In each case background was noticeably lighter while the colored portions were not significantly reduced and sometimes increased in color intensity. In all cases the contrast was far superior in the sheets containing Luperox.

Although Luperox is preferred, the other peroxygen compounds mentioned above, believed to be representative of these commercially available as "oxidizing" type, peroxygen compounds, may be employed with advantage, in place of Luperox.

Although the foregoing Examples were made using an intermediate sheet containing 2(p-chlorophenyl) acetoacetonitrile (Ex. 3, U.S. Pat. No. 3,619,237) as the light-sensitive reducing agent, use can also be made of intermediate sheets carrying other reducing agents known to the art.

Having thus disclosed my invention and described in detail preferred embodiments thereof, I claim and desire to secure by Letters Patent:

1. In a copy sheet product which includes a reducible normally solid silver soap that is reducible by a light sensitive reducing agent such as 2(p-chlorophenyl) acetoacetonitrile to produce a colored image, the improvement comprising an organic peroxygen oxidizing compound in said sheet in reactive association with said silver soap in a small but effective amount sufficient to enhance the contrast between said image and its background.

2. The copy sheet product defined by claim **1.**

3. The copy sheet product defined by claim **1** wherein a toner is present selected from the group consisting of phthalazonone and phthalimide.

4. The copy sheet product defined by claim **1** wherein an organic auxiliary mild reducing agent is present selected from the group consisting of 2,6, dicyclohexyl cresol and 2,6, ditertiary butyl cresol.

5. The copy sheet product defined by claim **1** wherein a toner selected from the group consisting of phthalazonone and phthalimide and an organic auxiliary mild reducing agent selected from the group consisting of 2,6, dicyclohexyl cresol and 2,6, ditertiary butyl cresol are present.

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