United States Patent [19]

Gallo

[11] **3,869,205**

[45] **Mar. 4, 1975**

[54] **ILLUMINATION SOURCE FOR XEROGRAPHIC EXPOSURE**

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[22] Filed: **Aug. 29, 1973**

[21] Appl. No.: **392,581**

[52] **U.S. Cl.** **355/67**

[51] **Int. Cl.** **G03b 27/54**

[58] **Field of Search** 355/3, 4, 17, 67, 71, 83, 355/88, 37, 70, 113, 114, 115, 116, 117, 118, 119, 120, 121

[56] **References Cited**

UNITED STATES PATENTS

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[57] **ABSTRACT**

A zerographic system and process in which illumination is by means of a light source emitting yellow light, preferably the narrow emission bands of the low pressure sodium vapor lamp.

3 Claims, No Drawings

ILLUMINATION SOURCE FOR XEROGRAPHIC EXPOSURE

BACKGROUND OF THE INVENTION

This invention relates to illumination in a xerographic system and process, particularly illumination in a reflective imaging process.

In the prior art, photocopy objects are typically illuminated by light sources such as fluorescent lamps which emit either discrete light of various wavelengths across the visible spectrum or white light. Such illumination is, of course, perfectly satisfactory to provide object contrast and the photoreceptors in general use are sensitive to some or all of this radiation. Fluorescent sources, however, have three inherent deficiencies. First, the efficiency of the phosphor is usually on the order of 50 percent. Second, the efficiency of the lamp degrades with increasing power, eventually to the point of yielding less light at high powers than at lower powers. Third, the efficiency of the phosphor degrades with time and with heat, particularly at high powers. It should be noted here that it is high powers that are required for most xerographic applications.

The majority of documents are black-on-white, or, if in color, are red-on-white, or blue-on-white. The reason is that these color combinations have a high contrast in the spectral region where the human eye is sensitive. That is, the spectral response of the human eye to blue-on-white and red-on-white documents is high. The human eye thus resembles a yellow sensitive photoconductor because it is also most sensitive in the yellow. Conversely, yellow-on-white documents are rare because they yield a low spectral response in the human eye. Since most objects to be copied are purposely high contrast objects to the human eye, the most useful photoconductor is one whose spectral sensitivity resembles that of the human eye. This is because most paper and ink combinations are designed for maximum response in the human eye.

SUMMARY OF THE INVENTION

It is an object of this invention to provide a light source for xerography which provides suitable document contrast and emits light in a spectral region corresponding to a desirable "yellow"-sensitive photoreceptor, while being substantially more efficient than fluorescent sources.

Briefly, this invention is practiced by the use of low pressure sodium vapor light sources, directed onto a xerographic object.

For a better understanding of this invention, reference is made to the following, more detailed description.

DESCRIPTION

A typical, xerographic photocopier includes an object surface or platen, a projection lens, and an image plane or photoreceptor. Light sources are provided to illuminate the object or document which is imaged on the photoreceptor by the projection lens. This is all well known and is given by way of background.

The spectral reflectivity of the object (i.e., paper and characters) and the spectral sensitivity of the photoreceptor are both important factors in creating and recording contrast.

Reflectivity of black ink is very low over a wide spectral range and the reflectivity of white paper is high throughout the visible range. Thus, there is high contrast in a black-white document illuminated by any visible light. Colors other than black which are commonly used in business documents are blue and red. The reflectivities of these colors vary throughout the visible spectrum, but both have relatively low reflectivity in the yellow portion of the spectrum. Therefore, a document bearing blue or red inks will be clearly visible (i.e., have good contrast) in yellow light. This is a practical result because of the fact that blue and red are the most common colors used in documentation, after black. It should be pointed out here that there will not be color fidelity; indeed, the black, blue, and red characters will all appear black in yellow light. The purpose here, however, is to make black-on-white copies of red-on-white, blue-on-white, and black-on-white originals, and with yellow illumination there will be contrast on all such originals to enable copying.

It has been found that the yellow emission of low pressure sodium lamps produces good contrast of black, blue, and red characters on white background. Conversely, a yellow ink on white background provides little or no contrast and therefore is not copyable in yellow light. Similarly, a green ink on white background provides little contrast and will copy poorly when illuminated by sodium emission. However, when limited to the black, blue, and red, the most common document colors, the sodium lamp illumination provides excellent contrast for black and white copying.

It has also been found that the more common photoconductive materials such as, for example, arsenic triselenide and modifications thereof, cadmium sulfoselenide, zinc oxide, polyvinyl carbazole trinitro fluorenone, and tellurium, are yellow-sensitive and therefore respond as well to the sodium vapor discharge as to ordinary white light.

Finally, the low pressure sodium vapor lamp is advantageous over prior art fluorescent sources, and is presently preferred as the light source in the system described above, because being a vapor discharge light source which directly emits the atomic spectrum, it is inherently about twice as efficient as a fluorescent source which must contend with the inefficiency of the phosphor (about 50 percent). The fluorescent lamps are also limited to undesirably low powers.

The illumination by low pressure sodium lamps in a xerographic photoreceptor as described provides high contrast for black and white copying of the vast majority of common business documents, is well matched to spectral sensitivity of many important photoreceptors, and is much more efficient illumination than fluorescent or incandescent sources can provide.

The foregoing description of this invention is given by way of illustration and not of limitation. The concept and scope of the invention are limited only by the following claims and equivalents thereof which may occur to others skilled in the art.

What is claimed is:

1. A xerographic system including an object surface, projection lens, an image surface in conjugate relationship to said object surface, and illumination means to irradiate objects disposed on said object surface for optimum object contrast,

said illumination means being a narrow emission band light source emitting light in the yellow portion of the visible spectrum as the result of a sodium vapor discharge, and

a yellow-sensitive photoreceptor at said image surface.

2. A xerographic system including an object surface, a projection lens, a yellow-sensitive photoreceptor surface in conjugate relationship to said object surface, and illumination means to irradiate varicolored objects at said object surface to obtain light-dark object contrast without color fidelity,

said illumination means being a narrow emission band light source emitting light in the yellow portion of the visible spectrum as the result of a sodium vapor discharge.

3. A xerographic system as defined in claim 2 in which said photoreceptor surface includes a photoconductive material of arsenic triselenide.

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Disclaimer

3,869,205.—*Charles F. Gallo,* Penfield, N.Y. ILLUMINATION SOURCE FOR XEROGRAPHIC EXPOSURE. Patent dated Mar. 4, 1975. Disclaimer filed Mar. 3, 1983, by the assignee, *Xerox Corp.*

Hereby enters this disclaimer to claims 1 and 2 of said patent.

[*Official Gazette October 4, 1983.*]

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