(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 586 093 A1**

(12) **EUROPEAN PATENT APPLICATION**

(21) Application number : **93306055.0**

(51) Int. Cl.[5] : **G03G 9/09**

(22) Date of filing : **30.07.93**

(30) Priority : **04.08.92 US 924472**

(43) Date of publication of application :
09.03.94 Bulletin 94/10

(84) Designated Contracting States :
DE FR GB NL

(71) Applicant : **MOORE BUSINESS FORMS, INC.**
300 Lang Boulevard
Grand Island New York 14072-1697 (US)

(72) Inventor : **Monovoukas, Christos A.**
Pentelis Strasse No. 7, Christiana Ct. Apt. 501
Tricheroussa, Limassol (CY)
Inventor : **Pickett, John**
5581 Kippen Drive
East Amherts, New York 14051 (US)

(74) Representative : **Spence, Anne et al**
Fry, Heath & Spence St. Georges House 6
Yattendon Road
Horley Surrey RH6 7BS (GB)

(54) **A toner composition including a fluorescent pigment.**

(57) A monocomponent conductive toner for use in non-impact printing which fluoresces under UV or black light. The toner has a normal appearance as black lettering when imaged onto a substrate but when exposed to UV or black light it fluoresces. The toner is useful as a security feature to indicate tampering or forging of documents.

EP 0 586 093 A1

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a conductive monocomponent security toner which fluoresces under UV or black light. The invention further relates to an ion deposition type (MIDAX) security toner for use in non-impact printing which fluoresces or becomes visible under UV, black light or other electromagnetic energy, i.e. the non-visible spectrum.

Description of The Prior Art

Monocomponent toners are toners in which a magnetically attractable material is contained within the toner particles. Thus, a monocomponent toner does not require a magnetic carrier material as does a dual component toner system which uses non magnetic toner particles.

A variety of prior art toner systems employ fluorescent materials. The uses for the fluorescent materials vary widely as does the manner in which the fluorescent material is included within the toner system.

IBM Technical Disclosure Bulletin Vol. 21, No. 4, September 1978 describes a toner for use in identifying the copy machine from which a copy was produced or for establishing that a particular document is not an original. The toner of the IBM Disclosure is for a copy machine and is thus a dual component toner. The magnetic carrier material remains within the development section and is used to triboelectrically charge the toner component to provide printing.

As an alternative to the type of toner described above, U.S. Patent No. 4,443,527 to Heikens et al. describes a monocomponent toner which is dyed to form a colored toner composition. The toner particles comprise a magnetically attractable core. A masking layer is then applied to effectively conceal or mask the color of the magnetic core material. Finally, a coloring material, including a fluorescent material is added to cause the toner to produce an image having a color such as red, blue or yellow under ordinary daylight conditions.

Finally, fluorescent materials have been used in toners to produce invisible images which are detectable only under UV light. Japanese application No. 62-258,721 describes such a two component toner. When white paper is used, a white pigment and white conductive powder are applied to the toner composition to create an image which matches the color of the paper used. This process is also described for yellow paper.

Accordingly, prior art applications of fluorescent materials in dual component systems interfered with the conductive properties of the toner. The introduction of a fluorescent component into a dual component system upsets the balance of charge that exists between the two components, driving the balance toward one polarity and making the formation of clear crisp images difficult.

SUMMARY OF THE INVENTION

It is therefore an object of the present invention to overcome these and other difficulties encountered in the prior art.

Another object of the present invention to provide a monocomponent conductive toner which fluoresces or becomes visible upon exposure to UV, black light or other electromagnetic radiation in the non-visible spectrum.

A further object of the invention is to provide a monocomponent conductive toner for use in non-impact printing which fluoresces or becomes visible upon exposure to UV, black light or other electromagnetic radiation in the non-visible spectrum.

These and other objects have been achieved by the present invention which relates to a conductive monocomponent toner. A fluorescent pigment particle is mixed in with the monocomponent toner particle and attaches to the toner particle by cohesive forces. When the toner is imaged onto the paper it appears as black lettering and has a normal appearance. Under UV light, black light or other electromagnetic radiation in the non-visible spectrum, the lettering fluoresces.

In contrast to prior art dual component systems, the present invention provides a monocomponent conductive toner wherein a fluorescent pigment is mixed therewith, attaching to the toner particles by cohesive forces. Thus, the inclusion of the fluorescent material does not interfere with the conductive properties of the toner, thereby allowing a clear crisp image to be produced, which has the further advantage of fluorescing under UV or black light.

This is a particular advantage for MIDAX imaging because other non-impact printing systems rely on triboelectrification of the toner whose developing properties are adversely affected by the addition of any external additive, such as fluorescent dyes.

Additional objects and advantages of the invention will be set forth in part in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention will be realized and attained by means of the elements and combination particularly pointed out in the appended claims.

DETAILED DESCRIPTION

The present invention adds an important security feature to a monocomponent, conductive toner by fluorescing or becoming visible under UV, black light or other electromagnetic radiation in the non-visible

spectrum, without altering the functionality of the toner. Thus, any tampering or forgery can be easily detected by exposing the document to UV or black light.

Standard black MIDAX toner may include particles having magnetically attractive material therein, a binder and a pigment. Toner is considered conductive if the bulk resistivity is less than 10^{10} ohm-cm. Standard black MIDAX toner is conductive, having a resistivity of from about 10^5 to about 10^9 ohm-cm.

Applications for the present invention include enhanced security of documents using MIDAX Intelligent imaging, among them MICR (Magnetic Ink Character Recognition) and OCR (Optical Character Recognition). This type of security feature did not heretofor exist with MIDAX Intelligent imaging because standard MIDAX toner does not fluoresce under UV light.

Both MICR and OCR are enhanced by using the MIDAX toner of the present invention. With the toner according to the present invention, it would be possible to determine, under UV radiation, whether characters had been tampered with or forged. In an alternative embodiment, MICR and OCR are enhanced by printing with the toner of the invention on black paper. Thus, characters which would be invisible to the human eye under regular light would be quite vivid and easy to read under UV radiation.

On type of MIDAX toner is produced by Coates and is a monocomponent, magnetic conductive toner. This is in contrast to nonconductive or photoconductive toners, such as dual component toners, which require triboelectric charges. Conductive toners are toners which conduct electric charge through their mass due to the conductivity of their formulation (i.e., naturally conductive materials that make up the toner). Photoconductive toner refers to toners used in a printing process in which a photoconductor is used to form the electronic image. Generally, photoconductive material is material that becomes conductive once illuminated. Once the illumination ceases, it can no longer conduct electricity. By contrast to the present invention, photoconductive toner processes conduct electric charge triboelectrically (i.e. by constant rubbing and mixing in the toner hopper, the toner exhibits conductivity on its surface).

The monocomponent toner comprises particles having magnetically attractable material therein. This magnetically attractable material may be one single magnetically attractable particle or a binder containing magnetically attractable particles. The magnetically attractable particles include materials known for use in monocomponent toners or mixtures thereof including iron, nickel, chromium dioxide, magnetite, gamma-ferrioxide and ferrites. The magnetically attractable particles are preferably iron oxide, and more preferably magnetite, and generally have a particle size from about 0.05 μ to about 5.0 μ and more particularly from about 0.1 μ to about 1.0 μ.

The binder may be selected from any known suitable binder for use in monocomponent toner formulations. Suitable binders include polystyrene, polyvinyl chloride, polyacrylates and polymethacrylates, polyolefins, ethylene vinyl acetate, polyester resins, polyamides, epoxy resins and mixtures thereof. The binder is preferably selected from polyolefins, ethylene vinyl acetate and polyamides.

The toner particles are mixed with a fluorescent pigment which attaches to the toner particles by a cohesive force. The resultant toner appears as black lettering when imaged onto paper and viewed under normal daylight. When viewed under a UV, black light or other electromagnetic radiation in the non-visible spectrum, the lettering fluoresces.

Fluorescent pigments for use in the present invention include those pigments which will attach to the toner particles without interfering with the conductive properties of the toner required for imaging. Suitable fluorescent pigments include LUMOGEN YELLOW S 0790 produced by BASF, Holland, MI. This pigment exhibits a yellow-green fluorescence when exposed to UV light. Other pigments can be used that exhibit other colors under suitable electromagnetic radiation having a wave length in the non-visible spectrum, such as alzadine pigment and Pigment Yellow 101 C.I. #48052.

The fluorescent pigment is mixed with the toner in an amount of from about 0.1 parts to about 10 parts per 100 parts of toner. More preferably, the pigment is added in an amount of from about 0.1 parts to about 5 parts per 100 parts of toner. Most preferably, the pigment is added in an amount of from about 0.9 parts to about 2.5 parts per 100 parts of toner.

MIDAX printing is a high speed, non-impact printing process whereby a dry monocomponent toner is used to develop an electric image. The image is created on a dielectric drum which rotates towards the developing station where the toner is kept to develop the image. The developed image is then transfixed to a substrate, such as plain paper, or by pressure. The residual toner on the drum is cleaned, and the process repeats with a new image.

The following examples are illustrative of the invention embodied herein.

EXAMPLE 1

A fluorescent dye has been post added to a standard MIDAX toner. To 250 grams of standard toner, 2.5 grams of a fluorescent dye LUMOGEN YELLOW S 0790 from BASF, Holland, MI was blended for one minute in a high speed mixer. The mixer was a type chemical blender with a mixing propeller and a blender cup. The mixing process was done in the dry state and took place in small, short intervals so as not to heat up the toner and melt it. Melting the toner and binding it to the pigment was undesirable because

then the solid mixing had to be crushed to powder again. The mixing process started with powder and ended with a powder mix.

The fluorescent dye adhered to the toner particles by cohesive forces. The resulting toner was used to develop an image on a MIDAX 300 printer and transferred to OCR #24 paper. The samples were found to have the same image quality and optical density as standard MIDAX and when viewed under UV light exhibited a high degree of yellow-green fluorescence.

Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention disclosed herein. It is intended that the specification and examples be considered as exemplary only with a true scope and spirit of the invention being indicated by the following claims.

Claims

1. A monocomponent conductive toner comprising,
   a conductive toner particle and a fluorescent pigment,
   characterised in that said fluorescent pigment is attached to the toner particle by cohesive forces.

2. The toner according to claim 1, characterised in that the fluorescent pigment is an alzadine pigment.

3. The toner according to claim 2, characterised in that the fluorescent pigment is LUMOGEN YELLOW.

4. The toner according to claim 1, wherein the conductive toner particle comprises a magnetically attractable material and a binder.

5. The toner according to claim 4, wherein the magnetically attractable material is selected from iron, nickel, chromium dioxide, gamma-ferrioxide or ferrites and mixtures thereof.

6. The toner according to claim 5, wherein the magnetically attractable material is a ferrite.

7. The toner according to claim 4, wherein the binder is selected from polystyrene, polyvinyl chloride, polyacrylates and polymethacrylates, polyester resins, polyamides or epoxy resins and mixtures thereof.

8. A method of imaging comprising,
   providing a monocomponent conductive toner and imaging the toner onto a substrate by non-impact printing, characterised in that the toner is in accordance with any of claims 1 to 7.

9. A method of producing a monocomponent conductive toner which fluoresces under UV or black light comprising
   mixing a fluorescent pigment with a conductive toner particle,
   characterised in that said fluorescent pigment attaches to said conductive toner particle by cohesive forces.

10. A method according to claim 9 characterised in that the toner is in accordance with any of claims 2 to 7.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 93 30 6055

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
D,X	EP-A-0 075 346 (OCÉ-NEDERLAND B.V.) * page 3, line 2 - line 19; claims 1-16; example 1 * ---	1,4-10	G03G9/09
X	EP-A-0 350 099 (OCÉ-NEDERLAND B.V.) * page 3, line 19 - line 41 * * page 4, line 30 - line 45; claims 1-6 * ---	1,4,5, 7-10	
X	EP-A-0 156 408 (OCÉ-NEDERLAND B.V.) * page 2, line 6 - line 10 * * page 3, line 15 - line 22 * * page 6, line 9 - line 22; claims 1-8 * ---	1,4-10	
X	US-A-4 865 937 (DOMENIC SANTILLI, JOHN W. MAY) * column 3, line 24 - line 40 * * column 5, line 43 - line 61 * * column 8, line 38 - line 40; claim 1 * ---	1,4,7-10	
X	DATABASE WPI Week 8427, Derwent Publications Ltd., London, GB; AN 84-168831 (27) & JP-A-59 093 456 (KONISHIROKU PHOTO KK) 29 May 1984 * abstract * ---	1,4-10	TECHNICAL FIELDS SEARCHED (Int.Cl.5) G03G
X	DATABASE WPI Week 7631, Derwent Publications Ltd., London, GB; AN 76-58694X (31) & JP-A-51 069 635 (RICOH KK) 17 June 1976 * abstract * -----	1,3,8-10	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 November 1993	Hindia, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)