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(54) **Method for preparing a security document with a toner accepting layer**

(57) The present invention provides a method for preparing a security document comprising the step of printing with a laser printer on an imaging element comprising a support and a toner accepting layer, characterized in that said toner accepting layer is a layer comprising a copolymer of ethylene and acrylic acid.

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Description

1. Field of the invention.

The present invention relates to a print, more particularly to a tamperproof identification document.

2. Background of the invention.

Identification documents essentially comprise a card or sheet material containing information retaining to the bearer. Generally a portion of the information is in the form of a photograph. Identification cards (I.D. cards) are used e.g. to establish a person's authorization to conduct certain activities (driver's licence) or the authorization to have access to certain areas (employee I.D. cards) or to engage in credit transactions (I.D. credit cards).

In view of the widespread use of I.D. cards, especially in commercial transactions such as cashing checks, credit purchases, etc., it is important that the information contained in the I.D. card cannot be altered and that the I.D. card gives maximum protection against counterfeiting by alteration and/or replacement of its data and photograph.

Many of these security documents are nowadays prepared by digitally recording by means of a black-and-white laser printer. However an increasing number of these security documents are recorded in full color with color laser printers. The obtained color image is fixed by means of moderately heated fixation rollers which are treated with a silicone oil in order to prevent that the color toner should adhere to said fixation rollers during the fixation. However during said fixation some of the silicone oil adheres to the toner accepting layer. This is the cause of different problems.

First of all, the adhesion of the color toner to the toner accepting layer is weak, so that by scratching the image can be removed. Further on said accepting layer after it is printed with toner can not be laminated anymore due to the fact that silicone oil is present. These problems also arise with black toners although not to such an extent.

3. Summary of the invention.

It is an object of the present invention to provide a method for producing a security document which has a strong adhesion of a toner, especially of a color toner to the toner accepting layer.

It is a further object of the present invention to provide a method for producing a security document wherein the accepting layer after it is printed with toner can be laminated to a strong laminate.

According to the present invention there is provided a method for preparing a security document comprising the step of printing with a laser printer on an imaging element comprising a support and a toner accepting

layer, characterized in that said toner accepting layer is a layer comprising a copolymer of ethylene and acrylic acid.

4. Detailed Description of the Invention.

A toner accepting layer in the present disclosure is every layer capable of accepting toner from laser color printing equipment. Said toner may be a black toner but is preferably a color toner. According to the invention said toner accepting layer is a layer comprising a copolymer of ethylene and acrylic acid. Preferably said layer is a layer comprising at least 80 % by weight of said copolymer, more preferably said layer consist of said copolymer.

A copolymer of ethylene and acrylic acid according to the invention comprises preferably between 10% and 50 % by weight of acrylic acid, more preferably between 13 % and 35 % by weight of acrylic acid, most preferably between 17 % and 25 % by weight of acrylic acid.

A copolymer of ethylene and acrylic acid according to the invention has preferably a melt index between 100 and 10000, more preferably a melt index between 300 and 3000. A copolymer of ethylene and acrylic acid according to the invention has preferably a weight average molecular weight between 10000 and 100000, more preferably between 15000 and 30000.

A copolymer of ethylene and acrylic acid according to the invention is preferably used at a pH between 3 and 10, more preferably at a pH between 6 and 9. In order to obtain said pH, a solution or dispersion of a copolymer according to the invention is completely or partially neutralized with an alkali base or buffer salt or more preferably with ammonia.

Copolymers of ethylene and acrylic acid are commercially available under the name of PRIMACOR from Dow Chemicals, Michigan, USA.

A toner accepting layer according to the invention is preferably present in a weight between 0.5 g/m² and 30 g/m², more preferably between 1.0 g/m² and 15 g/m², most preferably between 2.0 g/m² and 8.0 g/m².

The support in accordance with the invention is preferably a flexible support. Said flexible support can be transparent or opaque.

The opaque support is e.g. an opaque paper support or resin coated paper support, e.g. polyolefin coated paper and polyethylene coated paper of which the polyethylene layer may contain opacity providing pigments such as white TiO₂ particles as described e.g. in EP-A 324 192. Preferably security paper is used.

Other opaque supports that may be used are resin supports containing in their resin mass dispersed white pigments, e.g. TiO₂, or are such resin supports that contain said pigments dispersed in the resin mass in the presence of light-straying microvoids as described e.g. in EP 349152. Organic resins used for manufacturing said supports, e.g. by extrusion, are polycarbonate, polyester, preferably poly(ethylene terephthalate) or

poly(ethylene naphthalate), poly (methylacrylaat-styrene-acrylonitrile), poly (acrylonitrile-butadiene-styrene), polyamides, polyethersulfones, polyetherketones, polystyrene, poly-Alpha-olefins such as polypropylene or polyethylene, polyvinyl acetals and homo- and copolymers of vinyl chloride. Further are mentioned cellulose esters e.g. cellulose triacetate.

Transparent or translucent supports may be transparent or translucent organic resins e.g. the resins cited above. Preferred transparent or translucent supports are films of polyesters such as poly(ethylene terephthalate) or of poly-Alpha-olefins such as polyethylene.

The toner accepting layer may be present contiguous to the support. Preferably there are layers present between the toner accepting layer according to the invention and the support. Such layers can be subbing layers to improve the adhesion between the support and the toner accepting layer. Such layer can also be an information carrier, at least part of the information being present in the toner image receiving layer.

It is required when said imaging element is used as a security document to laminate said imaging element either by laminating a laminating foil against the support of the imaging element or by providing a laminating foil at one outer side of the imaging element and another laminating foil at the other outer side of the imaging element and laminating these laminating foils together. The use of a pouch structure wherein only the border parts of the plastic sheets are sealed is not preferred for security documents because they are not sufficiently tamper-proof since after cutting around the edge the pouch can be opened and some information can be removed or transformed before resealing the pouch.

Therefore, to avoid said shortcoming a "security seal" is established between the toner accepting layer of the document and the laminating foil. As described in US-P 4,151,666 the security seal makes that if one should succeed in the removal of the plastic cover sheet also a substantial portion of the information containing part of the document should be removed too so that a damaged part remains adhering partly or totally to said plastic cover sheet.

In a security document according to the invention comprising a toner accepting layer comprising a copolymer of ethylene and acrylic acid an effective security seal is easily made between the toner accepting layer and a laminating foil when a laminating foil is laminated to the toner accepting layer.

One laminating foil can be a single layer of an organic resin e.g. a polyethylene, a polypropylene film or a polyester film.

A laminating foil has preferably a thickness of only 0.050 to 0.200 mm. A sheet of that thickness can still be manipulated easily in a mechanical printing process, e.g. offset or intaglio printing, and can receive security or verification marks in the form of e.g. a watermark, finger prints, printed patterns known from bank notes, coded information, e.g. binary code information, signa-

ture or other printed personal data or marks that may be applied with livid crystals, fluorescent pigments, nacreous pigments giving special light-reflection effects, and/or visibly legible or ultraviolet-legible printing inks as described e.g. in GB-P 1,518,946 and US-P 4,105,333.

Further security features are infrared-absorbing markings, mildly radioactive isotope patterns, magnetic dots or strips and electronic microcircuits hidden from visibility.

At least one of the laminating foils and optionally both of the laminating elements comprises an outer resin layer and an inner resin layer. By "inner resin layer" of a laminating element comprising an inner and an outer resin layer is meant the resin layer which after lamination is nearest to the toner accepting layer. The "outer resin layer" is then the layer of said laminating element which after lamination becomes an outside layer of said security document.

Said outer resin layer can be any transparent or translucent organic resin e.g. cellulose acetate film, poly(vinyl acetal) film, polystyrene film, polycarbonate film or polyvinyl chloride film. Preferably said outer resin layer is a poly(ethylene terephthalate) film, more preferably an oriented poly(ethylene terephthalate) film.

Said inner resin layer can be any transparent or translucent melt-adhesive layer comprising an organic resin having a lower glass transition temperature (T_g) and melting temperature (T_m) than the outer resin layer. Preferably the glass transition temperature of the resin comprised in the inner resin layer is at least 20°C, more preferably at least 40°C lower than the glass transition temperature of the resin comprised in the outer resin layer. Most preferably said inner resin layer is a polyalkylene layer, particularly preferably a polyethylene layer. In this connection reference is made to the T_g values of polyethylene, polypropylene, polyvinyl chloride and polyethylene terephthalate being -20°C, +5°C, +80°C and +67°C respectively (see J.Chem. Educ., Vol. 61, No. 8. August 1984, p. 668).

In a preferred embodiment the toner accepting layer is coated on a laminating foil which after the generation of information on or in the toner accepting layer can be laminated to a support, preferably a flexible opaque support, most preferably paper such as security paper.

The optical information can be partly applied directly on the support of the information carrier by printing techniques. Suitable printing processes are e.g. planographic offset printing, gravure printing, intaglio printing, screen printing, flexographic printing, relief printing, tampon printing, ink jet printing, laser printing, thermal transfer printing, dye diffusion thermal transfer printing and toner-transfer printing from electro(photo)graphic recording materials.

On said support can be applied security or verification marks in the form of e.g. a watermark, finger prints, printed patterns known from bank notes, coded informa-

tion, e.g. binary code information, signature or other printed personal data or marks or layers that may be applied with liquid crystals, fluorescent pigments, nacreous pigments giving special light-reflection effects, and/or visibly legible or ultraviolet-legible printing inks as described e.g. in GB-P 1,518,946 and US-P 4,105,333.

The image on said imaging element is at least partially generated in or on the toner accepting layer by exposure of the imaging element to a laser printer, preferably a color laser printer followed by a fixation, preferably a thermal fixation of the obtained image.

The following example illustrates the present invention without however limiting it thereto.

All parts, ratios and percentages are by weight unless otherwise stated.

EXAMPLE

Preparation of imaging element I (comparison imaging element)

A 65 µm thick transparent polyethylene terephthalate film is coated with a layer comprising 0.5 g/m² of gelatine and a latex of polyester-polyurethane at 400 mg/m² of solid product. Thereon was coated a layer containing 0.7 g/m² of carboxymethylcellulose, 1.4 g/m² of gelatine, 3.10⁻³ mmole/m² of silver sulphide nuclei, 18.10⁻³ mmole/m² of nickel sulphide nuclei and 1.7g/m² of a nacreous pigment. On top of said layer is coated a layer containing 0.5 g/m² of gelatine.

Preparation of imaging element II (imaging element according to the invention)

A 65 µm thick transparent polyethylene terephthalate film is coated with a layer comprising 0.35 g/m² of gelatine, 1,50 g/m² of a nacreous pigment and 3.4 g/m² of a copolymer of ethylene and acrylic acid (7:1). On said layer was coated a layer comprising 4 g/m² of a copolymer of ethylene and acrylic acid (7:1).

Preparation and evaluation of the imaged material.

An identical image was in an identical way recorded and fixed on the two imaging elements with a color laser printer Phaser 550 from Tektronix, Oregon, USA. The adhesion of the image was qualitatively evaluated by scratching with a fingernail across the image. The image obtained with imaging element I (comparison element) was easily removed while the image obtained with imaging element II (element according to the invention) stayed intact even after vigorous scratching.

When said imaged elements are laminated to a security paper support, said paper support can be delaminated from the imaged element without damage to the support in the case of imaging element I while there is serious damage to the support in the case of imaging

element II.

Claims

1. A method for preparing a security document comprising the step of printing with a laser printer on an imaging element comprising a support and a toner accepting layer, characterized in that said toner accepting layer is a layer comprising a copolymer of ethylene and acrylic acid.
2. A method for preparing a security document according to claim 1 wherein said toner accepting layer comprises at least 80 % by weight of said copolymer.
3. A method for preparing a security document according to claim 1 or 2 wherein said copolymer comprises between 10% and 50 % by weight of acrylic acid.
4. A method for preparing a security document according to claim 3 wherein said copolymer comprises between 13 % and 35 % by weight of acrylic acid.
5. A method for preparing a security document according to any of claims 1 to 4 wherein said copolymer has a weight average molecular weight between 10000 and 100000.
6. A method for preparing a security document according to any of claims 1 to 5 wherein said toner accepting layer has a pH between 3 and 10.
7. A method for preparing a security document according to any of claims 1 to 6 wherein said toner accepting layer is present in a weight between 0.5 g/m² and 30 g/m²,
8. A method for preparing a security document according to any of claims 1 to 6 wherein said support is a flexible transparent or opaque support.
9. A method for preparing a security document according to any of claims 1 to 8 wherein
 - the support of the imaging element is a flexible transparent support,
 - said imaging element is after imaging with a laser printer laminated to paper e.g. security paper.



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EUROPEAN SEARCH REPORT

Application Number
EP 97 20 3597

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.6)
Y	DE 195 10 974 A (DRESCHER) * column 2, line 5 - line 10; claims 1,5,6 *	1-9	G03G7/00
Y	US 5 045 426 A (T.MAIERSON) * column 1, line 6 - column 2, line 26; claim 19 * * column 7, line 31 - column 8, line 7 *	1-9	
Y	EP 0 424 343 A (INTERNATIONAL PAPER) * column 4, line 45 - line 54; claims 1,2 * * page 6, line 1 - line 43; example 22 *	1-9	
Y	DE 24 54 047 A (COPYER) * claims 1,3,4; example 1 *	1-9	
Y	DE 29 52 322 A (AGFA-GEVAERT) * claim 1 *	9	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			G03G B32B
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		26 February 1998	Vanhecke, H
CATEGORY OF CITED DOCUMENTS		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	
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			

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