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(72) Inventor: **LESUR, Jean-Luc**
92190 Meudon (FR)

(74) Representative: **Lotaut, Yacine Diaw**
Gemalto SA
Intellectual Property Department
6, rue de la Verrerie
92190 Meudon (FR)

(71) Applicant: **GEMALTO SA**
92190 Meudon (FR)

(54) **METHOD FOR OPTIMIZING A COLOUR LASER IMAGE AND DOCUMENT ON WHICH A COLOUR LASER IMAGE IS PRODUCED IN THIS WAY**

(57) The present invention generally relates to a method of forming a color laser image with a white or light color background, and a document having a final color laser personalized image made thereon in this way. The invention provides an assembly comprising a transparent protection layer over color subpixels printed on a laser markable layer. A first laser beam passes through the protection layer, through the subpixels and forms the gray levels of the final personalized image in the laser markable layer. A second laser with a single wavelength, preferably with a high-energy wavelength in the blue or ultraviolet spectrum, penetrates into the subpixels forming the light color of the background image and is absorbed by the color pigments which lose their absorption property, at least partially resulting in light color image representing the background of the final personalized image.

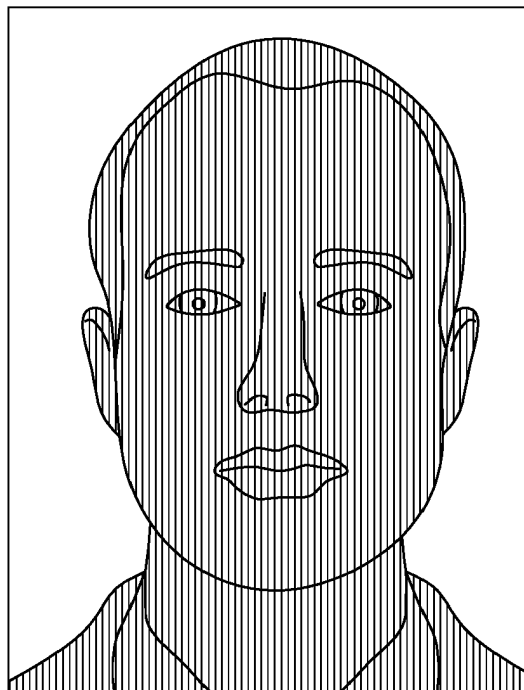


Fig. 5

Description

TECHNICAL FIELD

[0001] The present invention generally relates to a method of forming a color laser image with a white background, and a document having a color laser image made thereon in this way.

[0002] Particularly, the present invention relates to a personalization method of secure documents by selectively producing gray levels pixel by laser carbonization and by revealing white level pixels under the influence of laser radiation with specific wavelengths and also products produced with use of methods of this type, in particular such as secured documents, for example personalized pages for passports, identity cards and other identification cards, etc..

BACKGROUND ART

[0003] Many forms of physical media require both mass-production and end-user personalization. For example, identity cards may need to be produced for very large population pools, yet every individual card has to uniquely identify the person carrying the card. The high-volume manufacturing phase may be performed on relatively expensive equipment because the equipment cost may be amortized over very large production runs. On the other hand, the end-user personalization may be preferably carried out at customer locations in relatively low volumes, thus, requiring much lower equipment costs.

[0004] For many identity cards, security of all information on the card, whether digitally recorded or physical features of the card, is of paramount importance. The security is sometimes tied to some features that reveal whether the media has physically been tampered with. One mechanism for thwarting attempts to tamper with identity cards is lamination. By securing the physical media in a lamination layer that may not be delaminated without destroying the physical pristineness of the media goes very far to protect the security integrity of media.

[0005] One very important mechanism for tying an individual to an identity object is the placement of a person's photograph on the identity object. Driver's licenses, passports, identity cards, employee badges, etc., all usually bear the image of the individual to whom the object is connected.

[0006] A known technique for personalizing an identity card post-issuance with a photograph, is to define on a selected part of a physical medium, such as for example a plastic substrate, a matrix of pixels made up of subpixels in primary colors defining a color coding system. An example of color coding system is described in the document WO 2011/045180.

[0007] A 'color coding system' is a set of N colors (possibly primary colors) that make it possible to define any visible color when they are combined with each other.

As non-limitative examples, the system may be the so-called RGB (Red, Green, Blue) system or the so-called YMC (Yellow, Magenta, Cyan) system or the so-called YMCRGB (Yellow, Magenta, Cyan, Red, Green, Blue) system.

[0008] This type of matrix constitutes a diagram or a chart that is designed to contribute to the definition of an image in color, for example a face. In fact, when the matrix has been printed on the physical medium, for example by the ink jet method, a transparent light-sensitive layer is deposited over it.

[0009] A laser beam carbonizes the surfaces of subpixels, creating non-reflective, black surfaces that form the gray levels of the personalized image. This known technique thus enables a latent image to be personalized, which latent image is constituted by subpixels. That personalized image is obtained by interaction between the subpixels and non-reflective black surfaces produced by the laser carbonization that serves to form the gray levels of the final personalized image.

[0010] The image as personalized in this way is observed by reflection through the transparent protection layer. The personalized image must be sufficiently reflective to enable it to be observed in ambient light without having recourse to an additional light source.

[0011] However, one of the drawbacks of that method lies in the color of the background of the personalized image. Indeed, it is known that when small adjacent surfaces are printed, herein "subpixels", and if these surfaces are sufficiently small, the eye can integrate the light beams derived from these three (or more) subpixels and sees a color which is the composition of the light beams produced by the reflection of white light on these three subpixels. This composition is said to be additive since there is no mixing of colors but mere mixing of colored light beams derived from the three subpixels. The same composition is obtained with any primary color of subpixels, in particular the RGB colors or YMC colors whose color space is included in that of the RGB triplet. As a result, the additive composition of subpixels printed with independent colors is perceived by the eye as an undesired background colouring of the security document being more or less close to white. Using subpixels and the gray levels produced by laser carbonization to form the personalized image lead to reduce the color gamut as it is not possible to reach a full white gradient.

[0012] If a pure white background is requested for the security document, a known solution is to add a white pigment (or other reactive product) to the composition for manufacturing the laser markable layer. The aim of adding this white pigment (or other product) is to strongly illuminate the colors of the subpixels. The white subpixel (W) added to the three RGB or YMC subpixels is to reinforce both the luminosity of the image and its white component. It is generally proposed that the four subpixels RGBW or YMCW form a square.

[0013] Although the known solution are advantageous in some respects, those structure of subpixels present

some disadvantages. Indeed, the subpixel printing technology is not able to prevent overlapping of the RGBW or YMCW colors which may generate a grey color background detrimental to the quality of the image because of the fact that adding white sub-pixels space between color line reduce color contrast.

[0014] FIG. 1 illustrates the final personalization image resulting from a carbonization of the surfaces of subpixels wherein the primary color of each subpixel is set on the color coding scheme YMCW. As illustrated by FIG. 1, the background is not pure white.

[0015] Therefore, it would be desirable to improve the color laser marking system for producing security documents with improved background image quality (pure white color) without increasing the complexity of the laser marking apparatus or the recording material.

[0016] There is a need to produce a full white gradient background for the personalized image formed from the structure of subpixels.

SUMMARY OF THE INVENTION

[0017] The following summary of the invention is provided in order to provide a basic understanding of some aspects and features of the invention. This summary is not an extensive overview of the invention and as such it is not intended to particularly identify key or critical elements of the invention or to delineate the scope of the invention. Its sole purpose is to present some concepts of the invention in a simplified form as a prelude to the more detailed description that is presented below.

[0018] The present invention addresses the aforementioned drawbacks of the prior art by improving the quality of the white color of the background of the final personalized image.

[0019] To do this, the invention provides in a first step a forming phase of a personalized color laser images from an assembly comprising a transparent protection layer over a printed latent image constituted by color subpixels printed by offset or inkjet, or any technique known to persons skilled in the art, and a laser beam that passes through the protection layer, through or over the subpixels of the latent image, and forms the gray levels of a final personalized image in the laser markable layer, the assembly being laminated on a medium. In the remainder hereof the term laser markable layer material shall designate any material which darkens under the effect of a laser beam using adapted wavelength.

[0020] The gray levels that lead to the latent image being personalized in order to form the final image are calculated with the help of a software that takes an original image, segments it into subpixels, calculates the corresponding color shades, and determines the gray levels that are to be carbonized for the color subpixels of the latent image in order to obtain the relative color shades as those in the original image.

[0021] The gray levels of the personalized image are obtained by a degree of blackening that is made propor-

tional to the energy deposited by the laser by means of linearizing software, known to the person skilled in the art, and also by varying the areas of the carbonization.

[0022] By way of non-limiting example, the laser markable layer materials that form the gray levels of the personalized image by being carbonized under the effect of a laser beam may be constituted by polycarbonates, certain treated polyvinyl chlorides, treated acrylonitrile-butadiene-styrenes, or treated polyethylene terephthalates.

[0023] The present invention provides also in a second step a whitening phase of a background of the personalized image. The subpixels that lead to the background of the personalized image are calculated with the help of a software that takes an original image, segments it into subpixels, selects the subpixels forming the lightest colors representing the image background, and determines the whitening levels to be used for selected color subpixels of the latent image in order to obtain a full white or a light color.

[0024] The selected subpixels are whitened by laser treatment using a single irradiation frequency. This process eliminates the subpixels ability to absorb light, resulting in a white mark. The whitening effect is implemented by virtue of the pigments altering their color by color change when the laser treatment is carried out.

[0025] In an embodiment, the whitening phase is made through a bleaching process wherein the laser beam penetrates into the selected background subpixels and is absorbed by color pigments. The pigments of the subpixel are bleached independently of their color. Under irradiation with intensive laser radiation, the pigment of these subpixels lose their absorption property, at least partially. In this way, they may be bleached, at least partially. When the pigments change chemically, this causes the color of the material to change.

[0026] In another embodiment, the color subpixel is covered with a transparent layer wherein during the whitening process, the laser beam forms over alterable selected locations of said transparent layer substantially white opaque hiding more or less the subpixels and forming the image light color representing the background of the final personalized image.

[0027] After the location of each light color sub-pixel is determined and then the latter is whitened by means of a laser beam with a single wavelength, preferably with a high-energy wavelength in the blue or ultraviolet spectrum.

[0028] Furthermore, the present invention also relates to a data carrier having a character, pattern, symbol and/or image produced according to a method as described above. Such data carriers are preferably an identification card, credit card, passport, user credentials or a name badge.

[0029] To achieve those and other advantages, and in accordance with the purpose of the invention as embodied and broadly described, the invention proposes a method for producing a final personalized image in an image area on a physical media, comprising the following

steps:

- printing a print-pixel pattern on a substrate surface of the physical media wherein the print-pixel pattern comprises a plurality of printpixels, each printpixel being composed of a plurality of differently-colored subpixels;
- covering the print-pixel pattern with a protection transparent layer wherein a first laser beam passes through the transparent protection layer forming a gray levels of the final personalized image in the image area by carbonizing the color effect of individual pigment particles of the subpixels, and wherein
- irradiating of the protection transparent layer with a second laser at a single frequency adapted to passes through the transparent protection layer, and produce a white levels requested for light color of the final personalized image in the image area.

[0030] In other various methods, the formation of the gray levels and the production of the white levels are carried out at the same time or sequentially in any order.

[0031] In other various methods, the method of the present invention comprises the following steps:

segmenting an original image into subpixels, and from the segmented original image:

- determining the subpixels of the print-pixel pattern forming the personalized image in the image area,
- for each subpixel forming the personalized image, determining the gray levels that are to be carbonized under said subpixel in order to obtain a relative color shades as those in the original image.

[0032] In other various methods, the method of the present invention comprises the following steps:

segmenting an original image into subpixels, and from the segmented original image:

- determining the subpixels of the print-pixel pattern forming a background in the image area,
- for each subpixel forming the background, calculating the white levels that are to be bleached under said subpixel in order to destroy it in their color effect by the second laser, to produce a certain macroscopic white or light color effect.

[0033] In other various methods, the method of the present invention comprises the following steps:

segmenting an original image into subpixels, and from the segmented original image:

- determining the subpixels of the print-pixel pat-

- tern forming a background in the image area,
- arranging a transparent to white opaque layer at least over the subpixels forming the background in the image area,
- for each subpixel forming the background, calculating the white opaque levels of the transparent to white opaque layer that are to be altered by the second laser for hiding said subpixel forming the light color of the background image.

[0034] In other various methods, the second laser with a single frequency is a high energy wavelength in the blue or ultraviolet spectrum.

[0035] In other various methods, the first laser and the second laser are the same laser.

[0036] In other various methods, each subpixels of the print-pixel corresponds to a unique color of a primary color.

[0037] In other various methods, the print-pixel pattern is printed on a surface of a laser markable layer. Said laser markable layer is laminated on the physical medium.

[0038] In other various methods, the final personalized image is letters, numbers, pictures, digital photographs, designs or machine readable information.

[0039] The present invention is also related to an identity card having a multi-colored final personalized image on a substrate having printed print-pixel pattern which are arranged thereon, wherein said multi-colored final personalized image and a white background of said personalized image are produced according to the method of said present invention described herein.

[0040] In other various methods, the identity card is an identification card, credit card, passport, user credentials or a name badge.

BRIEF DESCRIPTION OF THE DRAWINGS

[0041] The following detailed description will be better understood with the drawings, in which:

FIG. 1 illustrates a final personalized image of the prior art formed from a carbonization by a laser beam of subpixels in the coding scheme color YMCW.

FIG. 2 is a top of view of an identity card according to an embodiment of the technology described herein.

FIG. 3 is a cross section view of the identity card illustrated in FIG. 2.

FIG. 4 is an illustration of an embodiment of a print pixel grid.

FIG. 5 illustrates a final personalized image according to an embodiment of the technology described herein, wherein the final personalized image is formed from a carbonization process and a whitening process through subpixels in the coding scheme color RGBW.

DETAILED DESCRIPTION OF THE EMBODIMENTS OF THE INVENTION

[0042] The present invention is not specific to any particular hardware or software implementation, and is at a conceptual level above specifics of implementation. It is to be understood that various other embodiments and variations of the invention may be produced without departing from the spirit or scope of the invention. The following is provided to assist in understanding the practical implementation of particular embodiments of the invention.

[0043] The same elements have been designated with the same referenced numerals in the different drawings. For clarity, only those elements and steps which are useful to the understanding of the present invention have been shown in the drawings and will be described.

[0044] Moreover, when an action is said to be performed by a device, it is in fact executed by a microprocessor in this device controlled by instruction codes recorded in a program memory on said device. An action is also ascribed to an application or software. This means that part of the instruction codes making up the application or software are executed by the microprocessor.

[0045] Reference throughout the specification to "an embodiment" or "another embodiment" means that a particular feature, structure, or characteristic described in connection with an embodiment is included in at least one embodiment of the subject matter disclosed. Thus, the appearance of the phrases "in an embodiment" or "in another embodiment" in various places throughout the specification is not necessarily referring to the same embodiment. Further, the particular features, structures or characteristics may be combined in any suitable manner in one or more embodiments.

[0046] An embodiment of the invention, provides a mechanism by which physical media such as identification cards, bank cards, smart cards, passports, value papers, etc. may be personalized in a post-manufacturing environment. This technology may be used to place images onto such articles inside a lamination layer after the lamination layer has been applied.

[0047] Herein, the purpose of providing a clear narrative, the term identity card is used to refer to the entire class of physical media to which the herein-described techniques may be applied even if some such physical media are not "cards" in a strict sense. Without limiting the application of the term *identity card* it is intended to include all such alternatives including but not limited to smart cards (both contact and contactless smart cards), driver's licenses, passports, government issued identity cards, bankcards, employee identification cards, security documents, personal value papers such as registrations, proofs of ownership, etc.

[0048] FIG. 2 is a top-view of an identity card 10 according to one embodiment of the technology described herein. The identity card 10 may be formed of PVC (polyvinyl chloride) or PC (poly carbonate) material or any

other suitable material on which information can be printed. Briefly, the identity card 10 is provided with an image area 11 that is constructed from several layers of material located between a substrate (e.g., a PC core) and a lamination layer. The bottom layer of these image-area layers is a print-pixel grid see Figure 4 which comprises a plurality of specifically arranged areas having distinct colors. The print-pixel grid is covered by a transparent layer as illustrated in FIG.3. The structure of the print-pixel grid and the process of manipulating these layers to produce an image and a white background are discussed in greater detail herein below.

[0049] FIG. 3 is a cross-section view of an embodiment for the identity card 10. A laser markable layer 14 is created on a body 13 of the identity card 10. As non-limiting examples, the laser markable layer 14 may be polycarbonates, certain treated polyvinyl chlorides (PVCs), treated acrylonitrile-butadiene-styrenes (ABSs), and treated polyethylene terephthalates (PETs) or it may be any other suitable plastic material which includes a chemical which can react with a laser to produce desirable markings.

[0050] The laser markable layer 14 may be situated over the print pixel grid 15 or under it. The print pixel grid 15 are printed by offset printing, by ink-jet printing, or by any other technique. The laser markable layer 14 could be separated from the pixel grid by another transparent layer according to the laser wavelength.

[0051] In an embodiment, a transparent layer may be situated between the laser markable layer 14 and the print pixel grid 15.

[0052] The print pixel grid 15 is covered at least with a lamination layer 12. The lamination layer 12 provides security in that it protects a personalized image 16 produced in the image area 11 from physical manipulation. The personalized image 16 can be letters, numbers, symbols, pictures, digital photographs, designs or machine readable information.

[0053] The lamination layer 12 is transparent to the laser beam used to produce a black surface by carbonization process forming the grey level of the final personalized image 16 in the laser markable layer 14. The lamination layer 12 may be transparent or not to the laser beam used to produce light color surface by whitening process forming the background 17 of the final personalized image 16 in the laser markable layer 14.

[0054] The assembly comprising the lamination protective layer, the print pixel grid 15, and the laser markable layer 14 is bonded under pressure on the document medium of the identity card 10. This bonding operation is known as "lamination" by the person skilled in the art. In other words, the lamination layer 12, the laser markable layer 14, and the print pixel grid 15 are laminated on the body 13 of the identity card 13.

[0055] In an embodiment, a transparent to white opaque layer may be arranged over the print pixel grid 15 at least in the area of the laser markable layer 14 forming the background 17 of the final personalized im-

age 16. The transparent to opaque layer may be selectively altered to some level of white opaque. The transparent to white opaque layer is translucent or transparent allowing the viewing of the print pixel grid 15 and hides the print pixel grid 15 to a white opaque after the whitening process. In this embodiment, the transparent to white opaque layer is covered by the lamination layer 12.

[0056] FIG. 4 illustrates an embodiment of a structure of the print-pixel grid 15. The print-pixel grid 15 is composed of an array of print-pixels 18. A print-pixel 18 corresponds to one pixel or a set of pixels in an image file. In a real-life print-pixel grid 15, a grid having many more print-pixels in each dimension would be necessary for producing a meaningful image.

[0057] Each print-pixel 18 may comprise at least triplets of color subpixels. The colors of the subpixels are preferably selected from colors that are independent, i.e. mixing any two of them cannot lead to a third subpixel color being formed.

[0058] In an embodiment, each subpixels of the print-pixel 18 corresponds to a unique color of a primary color of red, green and blue (RGB). In another embodiment, each subpixels of the print-pixel 18 corresponds to a unique color of a primary color of cyan, magenta and yellow (CMY). In another embodiment, each subpixels of the print-pixel 18 corresponds to a unique color of a primary color of red, green, blue and white (RGBW) or cyan, magenta, yellow and white (CMYW). In another embodiment, each print-pixel 18 can comprise subpixels each corresponding to a unique color, e.g., cyan, magenta, yellow and black (CMYK). In another embodiment, each print-pixel 18 can comprise subpixels each corresponding to a unique color, e.g., cyan, magenta, yellow, black, red, green, blue and white (CMYKRGBW). There are many more possible different color coding system. All such alternatives must be considered equivalents to the color coding system illustrated here as examples.

[0059] In the embodiment illustrated at FIG.4, each print-pixel comprises 3 subpixels 19, 20 and 21 each corresponding to a unique color, e.g., green, blue, and red (GBR). For the purpose of being able to produce various color combinations, each subpixel 18, 19 and 20 is subdivided into a plurality of sub-subpixels 22, in the aim to reproduce close similar effects as the selected set of pixel of the original image.

[0060] The term *print-pixel* is used herein to the equivalent of a pixel or a set of pixel in a digital image that is printed in the print-pixel grid and having a plurality of subpixels that each form a portion of the print-pixel that cover the image area 11. A *subpixel* is a single-color area of the *print-pixel*. A *sub-subpixel* is a single addressable location in a *subpixel*. Thus, a *subpixel* is composed of one or more *sub-subpixels*.

[0061] In an embodiment, as illustrated in FIG. 3, the print-pixel grid 15 comprises print-pixels 18 which are composed of rectangular subpixels 19, 20 and 21. In another embodiment, the print-pixel grid 15 comprises print-pixels 18 which are composed of hexagonal subpixels

19, 20 and 21. In another embodiment, the print-pixel grid 15 comprises print-pixels 18 which are composed of circles subpixels 19, 20 and 21. In an embodiment, the print pixel grid 15 can comprise color subpixels and non-colored subpixels. Non-colored subpixels serve to increase the reflectivity of the final personalized image 16. In an embodiment, the color subpixels and the non-colored subpixels are organized in parallel columns or in small areas that are uniformly distributed.

[0062] There are many more possible different print-pixel structures. All such alternatives must be considered equivalents to the print-pixel structures illustrated here as examples.

[0063] In an embodiment, the print pixel grid 15 is printed on the laser markable layer 14. Alternatively, it may be printed on the lamination layer 12. The lamination layer 12 is laminated onto the assembly. In an embodiment, the print pixel grid is printed by color on different layers which are assembly with good registration before lamination process.

[0064] During personalization phase of the identity card, in a first step, a controlling device of the personalization system takes an original image, segments it into subpixels. From this segmentation, it is determined the subpixels forming a latent image and the subpixels forming the background. For each subpixel forming the latent image the controlling device calculates the corresponding color shades, and determines the gray levels that are to be carbonized in the laser markable layer under said subpixel of the latent image in order to obtain the relative color shades as those in the original image.

[0065] In an embodiment, for each subpixel forming the background the controlling device calculates the white levels that are to be bleached in the laser markable layer under said subpixel in order to obtain light color background. The controlling device calculates the white levels that are to be bleached in the laser markable layer under said subpixel in order to obtain the expected light color. If in another embodiment, the print pixel grid is covered by the transparent to white opaque layer, the controlling device calculates the white opaque levels of the transparent to white opaque layer to be reached during the whitening process.

[0066] In a second step, the laser beam is producing the gray levels by carbonizing the transparent laminate layer sheet to form the personalized image 16. The laser beam carbonizes a certain thickness of the sheet of the laser markable layer 14 with varying intensities or areas over each subpixel so as to form non-reflective, black volumes that cause gray levels to appear in the final personalized image 16. The degree of blackening is made proportional to the energy delivered by the laser, with the help of linearizing software known to the person skilled in the art. The energy delivered by the laser is then adjusted so as to produce all of the shades of gray required to form an attractive color laser image. The result of this carbonization process enables a latent image to be personalized, which latent image is constituted by subpixels.

[0067] In an embodiment, during personalization phase of the identity card, in a third step, a whitening process by bleaching method may be applied to the print pixel grid 15. This bleaching process is a lightening process wherein each subpixel is bleached by means of a laser beam with a single wavelength, preferably with a high-energy wavelength in the blue or ultraviolet spectrum.

[0068] During this third step of the personalization phase, a processing protocol for the laser receives the information on which subpixel pigment are to be locally influenced in their color effect by the laser in a targeted manner, in particular destroyed in their color effect (bleached or hided) by the laser, as a function of the location coordinates to produce a certain macroscopic white or light color background effect for the personalized image 16 produced by grey level.

[0069] During this third step, one subpixel lie in the beam cone or focal area of the laser within a certain period for the bleaching process, all other color components being situated in the shadow of the laser light during the same period.

[0070] In an embodiment, when the transparent to white opaque layer is arranged over the print pixel grid 15, during the third step, a whitening process by hiding the print pixel grid with a light or a white opaque may be applied to the transparent to white opaque layer. In this case, the processing protocol for the laser receives the information on the subpixels forming the background. In the area of the background subpixels, the transparent to opaque layer is selectively altered to some level of white opaque by a laser wavelength in the blue or ultraviolet spectrum. The transparent to white opaque layer hides the print pixel grid 15 to a white opaque after the whitening process. In an embodiment, all 3 types of pigment of the subpixel are whitened at only one wavelength in the UV to Blue range (in an example 355 nm but not limited to).

[0071] In an embodiment, the second step and the third step of the personalization phase can be carried out at the same time or sequentially. The sequentially order of carrying out the second step and the third step of the personalization phase is defined according to the implementation of the personalization process.

[0072] In an embodiment, the whitening phase and the carbonization phase are processed by one unique laser with different wavelength.

[0073] FIG. 5 illustrates the final personalization image resulting from a carbonization of the surfaces of subpixels wherein the primary color of each subpixel is set on the color coding scheme RGBW and a whitening process of the background subpixels with a laser wavelength in the blue laser spectrum.

[0074] With the present invention, one laser is used for forming the latent image and another laser is used for the whitening process of the different pigments of the print pixel grid 15. Using only one wavelength for the whitening process thus achieves a considerable reduction in the cost of the technical system instead of having

at least 3 wavelengths for bleaching 3 primary colors.

Claims

1. A method for producing a final personalized image in an image area on a physical media, comprising the following steps:

- printing a print-pixel pattern on a substrate surface of the physical media wherein the print-pixel pattern comprises a plurality of printpixels, each printpixel being composed of a plurality of differently-colored subpixels;

- covering the print-pixel pattern with a protection transparent layer wherein a first laser beam passes through the transparent protection layer forming a gray levels of the final personalized image in the image area by carbonizing the color effect of individual pigment particles of the subpixels, and wherein

- irradiating of the protection transparent layer with a second laser at a single frequency adapted to passes through the transparent protection layer, and produce a white levels requested for light color of the final personalized image in the image area.

2. The method according to the previous claim, wherein the formation of the gray levels and the production of the white levels are carried out at the same time or sequentially in any order.

3. The method according to any of the previous claims, wherein from a segmented original image the following steps are performed:

- determining the subpixels of the print-pixel pattern forming the personalized image in the image area,

- for each subpixel forming the personalized image, determining the gray levels that are to be carbonized under said subpixel in order to obtain a relative color shades as those in the original image.

4. The method according to any previous claims, wherein from the segmented original image the following steps are performed:

- determining the subpixels of the print-pixel pattern forming a background of the personalized image in the image area,

- for each subpixel forming the background, calculating the white levels that are to be bleached under said subpixel in order to destroy it in their color effect by the second laser, to produce a certain macroscopic white or light color effect.

5. The method according to claims 1 to 3, wherein:
 - determining the subpixels of the print-pixel pattern forming a background of the personalized image in the image area, 5
 - arranging a transparent to white opaque layer at least over the subpixels forming the background in the image area,
 - for each subpixel forming the background, calculating the white opaque levels of the transparent to white opaque layer that are to be altered by the second laser by hiding said subpixel with a light color of the transparent to white opaque layer forming the background image. 10
6. The method according to any previous claims, wherein the second laser with a single frequency is a high energy wavelength in the blue or ultraviolet spectrum. 15
7. The method according to any of the previous claims, wherein the first laser and the second laser are the same laser. 20
8. The method according to any previous claims, wherein each subpixels of the printpixel corresponds to a unique color of a primary color. 25
9. The method according to any previous claims, wherein the printpixel pattern is printed on a surface of a laser markable layer. 30
10. The method according to any previous claims, wherein the laser markable layer is laminated on the physical medium. 35
11. The method according to any previous claims, wherein the final personalized image is letters, numbers, pictures, digital photographs, designs or machine readable information. 40
12. An identity card having a multi-colored final personalized image on a substrate having printed print-pixel pattern which are arranged thereon, wherein said multi-colored final personalized image and a white background of said personalized image are produced according to claims 1 to 11. 45
13. The identity card according to the previous claim, wherein the identity card is an identification card, credit card, passport, user credentials or a name badge. 50

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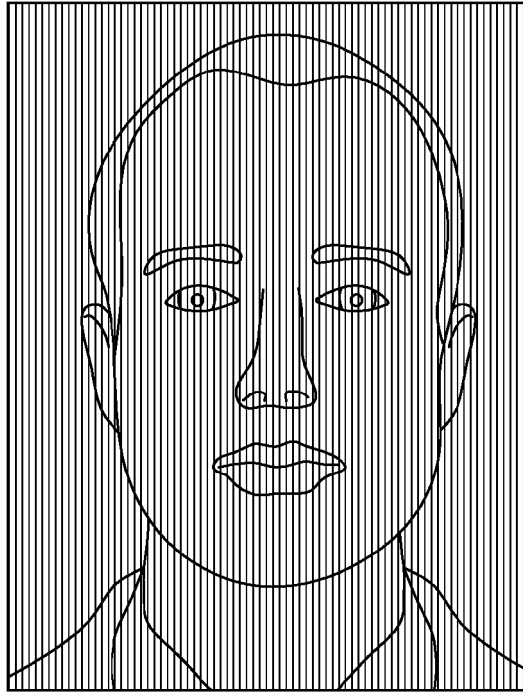


Fig. 1 PRIOR ART

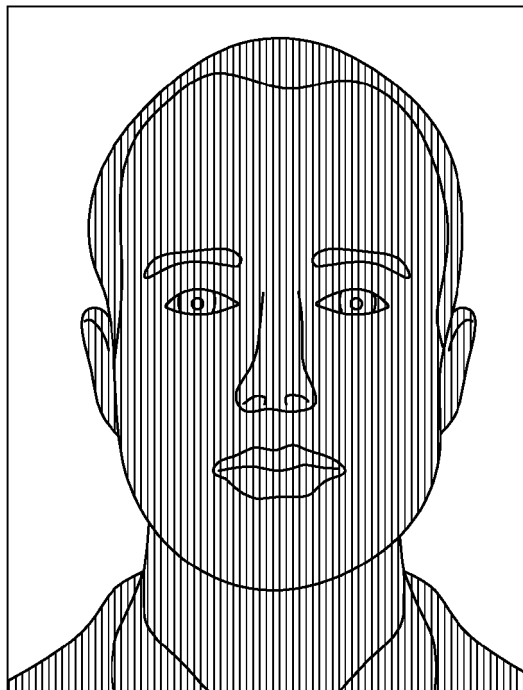


Fig. 5

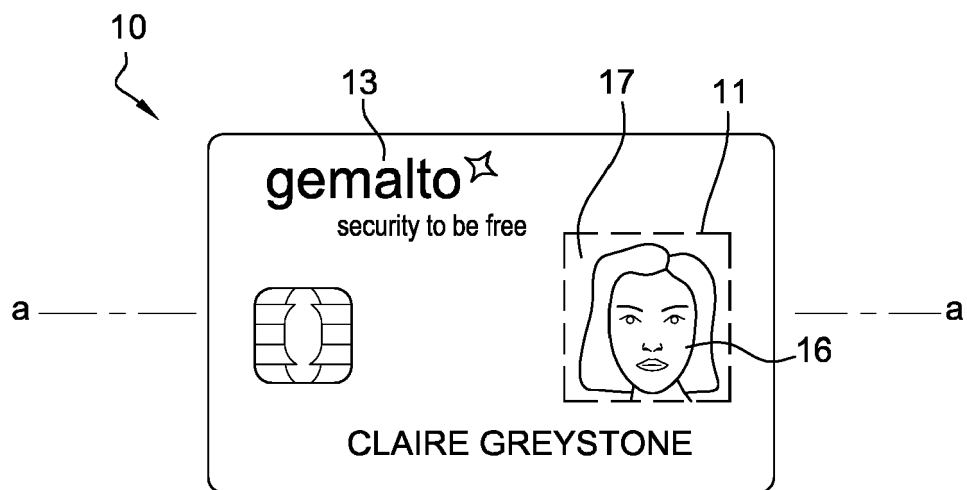


Fig. 2

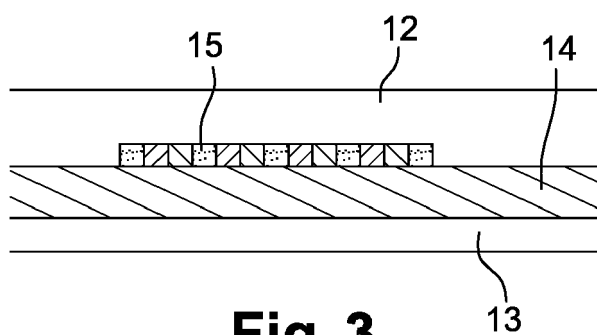


Fig. 3

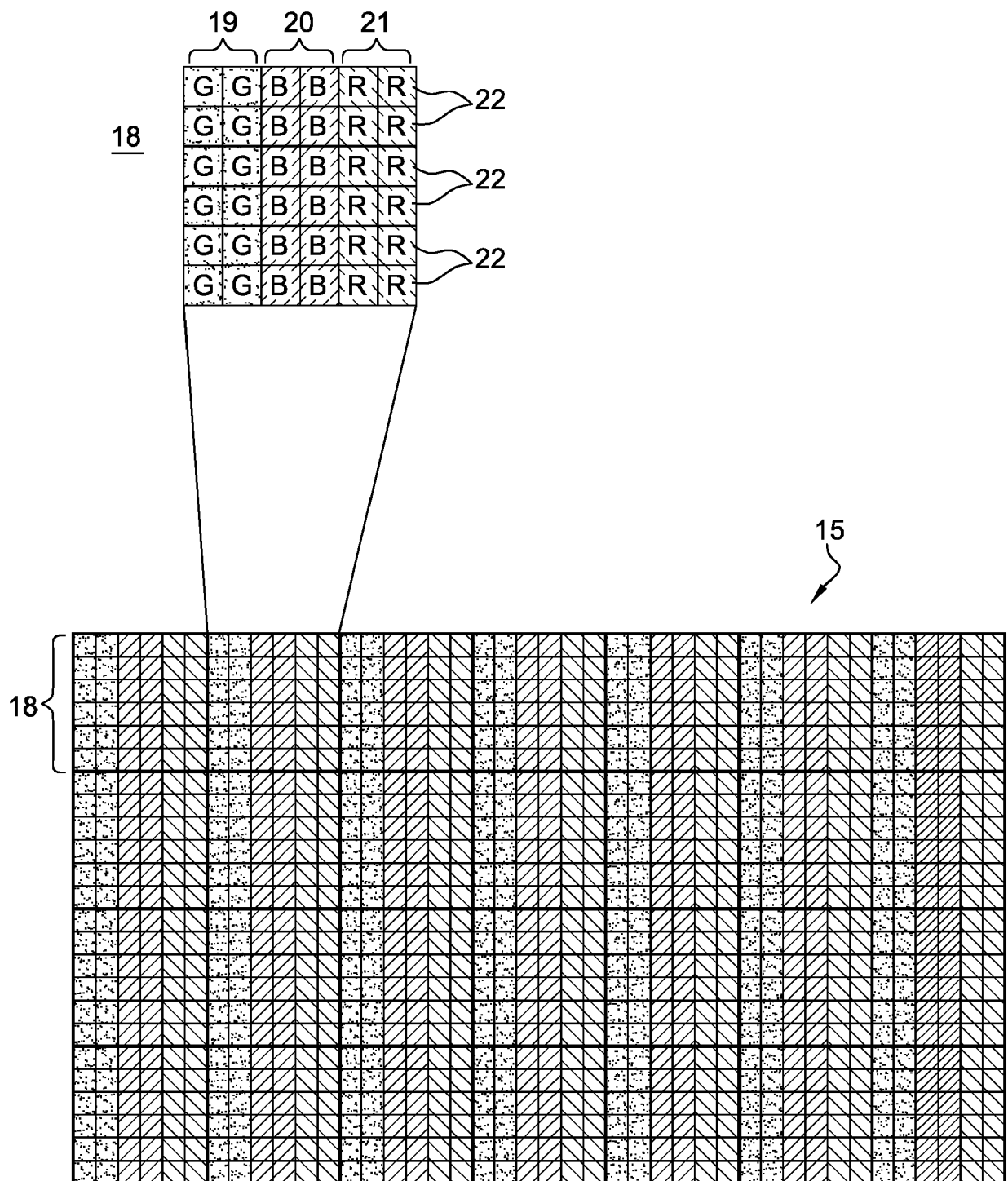


Fig. 4



EUROPEAN SEARCH REPORT

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	WO 2011/045180 A1 (GEMALTO SA [FR]; LEIBENGUTH JOSEPH [FR]; LESUR JEAN-LUC [FR]; BOMBAY B) 21 April 2011 (2011-04-21) * the whole document * * especially paragraph 49 and figure 3(c) *	1-13	INV. B41M5/26 ADD. B41M5/28
A	WO 2012/062505 A1 (UNICA TECHNOLOGY AG [CH]; GOLDAU RAINER [CH]; SCHAEFER KLAUS [CH]) 18 May 2012 (2012-05-18) * the whole document * * especially page 5 line 11 to page 9 line 5 *	1-13	
A	JP 2003 266942 A (SONY CORP) 25 September 2003 (2003-09-25) * abstract *	1-13	
			TECHNICAL FIELDS SEARCHED (IPC)
			B41M
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 27 September 2017	Examiner Vogel, Thomas
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			



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CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing claims for which payment was due.

☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due and for those claims for which claims fees have been paid, namely claim(s):

☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for those claims for which no payment was due.

LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

☐ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.

☒ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.

☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:

☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:

☐ The present supplementary European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims (Rule 164 (1) EPC).



LACK OF UNITY OF INVENTION
SHEET B

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The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-13

A method for producing a final personalized image in an image area on a physical media, wherein white levels are produced in image areas of the final personalized image.

1.1. claims: 4(completely); 6-13(partially)

A method for producing a final personalized image wherein in the second step selected subpixels are bleached to produce white.

1.2. claims: 5(completely); 6-13(partially)

A method for producing a final personalized image wherein in the second step a transparent to opaque layer is altered to produce white.

Please note that all inventions mentioned under item 1, although not necessarily linked by a common inventive concept, could be searched without effort justifying an additional fee.

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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