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(54) Method for producing tactile security features on security documents

(57) According to the invention, a laser beam is focused on a predetermined surface area of a paper-based substrate of a security document, particularly a banknote, for providing tactile structures on the surface area. The laser beam is generated from a laser capable of ris-

ing the paper fibers of the paper-based substrate so as to provide embossed structures (60) without removing of the surface layers. A Nd:YAG laser with frequency quadrupled wavelength (266 nm) is most appropriate to provide structures on the paper-based substrate of the banknote.

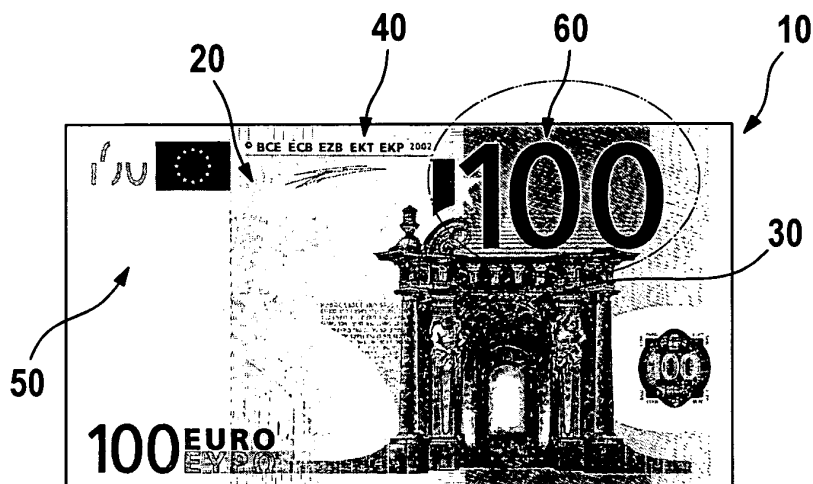


Fig. 2

Description

Background of the invention

[0001] The present invention relates to a method for producing safety features on security documents, particularly banknotes, comprising a paper-based substrate.

[0002] The identification and/or authentication of banknotes is a long-standing problem. In order to solve this goal, security means for banknotes have been developed and are being developed to allow users and/or machines to discriminate among genuine and forged banknotes and/or to discriminate among different values of banknotes.

[0003] In the security printing industry there are used special papers, special inks and patterns, the inclusion of watermarks and security threads as well. For example, some of these techniques are disclosed in US-A-4, 462 866, US-A-4 652 015, US-A-4 943 093 and US-A-5 161 829.

[0004] Laser techniques prevailingly applying CO₂ gas lasers and Nd:YAG (Neodimium Doped Yttrium Garnet) solid state lasers playing a key role in industrial material processing are commonly used to code, mark, etch, engrave, weld or cut components or products which are manufactured from a variety of materials. While CO₂ lasers for reasons of costs and the available power mainly being used for cutting plain sheet metal and for welding applications, operating at radiation power over 20 kW, the Nd:YAG lasers, with regard to its good crystal parameters being the most widely used laser crystal for solid-state crystal material. Nd:YAG lasers are widely spread and equally available for radiation power at multi-kW range, but operating at lower radiation power ranges Nd:YAG lasers are used for cutting and marking of micro-mechanic and electronic components.

[0005] Marking by lasers is accomplished via colour change and surface structuring. Papers, cardboards etc. are laser marked either by removing a paint and revealing a different coloured base material or by carbonizing the paper/cardboard material. The latter gives a brownish contrast. The laser commonly used for marking papers and cardboards are CO₂ lasers.

[0006] Most applications for markings are usually performed using CO₂-lasers at wavelengths of 9.3-10.6 μm corresponding to infrared light, while Nd:YAG lasers in turn are commonly used at the fundamental wavelength of 1064 nm.

[0007] In the security printing industry lasers are also used as marking means for identification and/or authentication. Typical applications are marking of smart cards such as ID cards, phone cards for cellular phone and credit cards. There are basically two different ways of marking these cards. Due to the extreme short pulses the lower layer of so called multi layer cards can be marked by changing the colour of the pigments without touching the transparent top layer. The other way of marking is to create a kind of recast on the top layer. This

kind of marking can be found, e.g., on all European EC cards where the name, card and account number is marked that way.

[0008] CO₂ lasers are also used in the security printing industry for perforating security documents. Microperforations are a way of increasing the security of banknotes. Some high-denomination Swiss banknotes are microperforated. But these laser-based microperforations have no tactile information so far.

[0009] Tactile features are routinely used in the security printing industry to help visually impaired people in recognizing and identifying valuable documents as well as a method for preventing security document counterfeiting. Conventional printing methods, such as intaglio or silk-screen, are used to add a tactile structure on valuable documents.

[0010] It is an object of the present invention to provide a method for producing safety features on paper-based security documents, particularly banknotes, allowing users and/or machines to discriminate among genuine and counterfeited banknotes and/or to discriminate among different values of banknotes.

[0011] This object is solved with the features of claim 1. Preferred embodiments are the subject matter of the dependent claims.

[0012] According to the invention, a laser beam is focused on a predetermined surface area of the paper-based substrate for providing tactile structures on the surface area. The laser beam is generated from a laser capable of rising the paper fibers of the paper-based substrate so as to provide embossed structures without removing the surface layers. It is an essential feature of the laser beam that the relief of the paper-based substrate is changed for providing the embossed structure without burning the paper-based substrate, so that its colour does not change.

[0013] The embossed structures may be provided on a predetermined surface area on one side or both sides of the paper-based substrate. The predetermined surface area may define a picture, text, character etc.

[0014] According to a first aspect of the invention, a low energetic laser is preferably used for providing the embossed structures on the paper-based substrate.

[0015] Due to statements of experts based on executed experiments Nd:YAG lasers performed at the fundamental wavelength are not suitable in order to achieve a noticeable tactility on paper-based substrates, neither in continuous nor in pulse mode, even using different pulse widths, pulse frequencies and/or repetition rates. However, the experiments performed by the inventor have shown that a Nd:YAG laser with frequency quadrupled wavelength (266 nm) is most appropriate to get a tactility on paper-based substrates. The effect achieved when using this laser is a selective rising of the paper fibers which were processed by the laser beam leading to an increase of surface area in order to provide embossed structures.

[0016] According to a further aspect of the invention

the surface area of the paper-based substrate is printed. Since the surface area on which the printing is provided being the same surface area as the surface area on which the embossed structure is provided, the surface area has both visible and tactile properties.

[0017] The surface area may be processed with the laser beam either before or after printing the document. According to a further aspect of the invention, in a first step a printing method, particularly intaglio or silk-screen, is used for providing a tactile structure on said area of said substrate and in a second step said area already having said tactile structure is processed with said laser beam for improving the tactile properties of the conventionally processed paper-based substrate.

[0018] The embossed structure is preferably protected by a protective layer applied on the surface area, which maintains the rising of the fibers.

[0019] For the purpose of illustrating the present invention, there is shown in the accompanying drawings an embodiment which is presently preferred; it being understood that the invention is not limited to the precise arrangement and instrumentalities shown.

Fig. 1 is a view of a banknote comprising a predetermined printed surface area, and

Fig. 2 the banknote of Fig. 1 comprising a predetermined printed surface area processed with the method according to the invention.

[0020] Fig. 1 shows a view of the front side of a banknote. The banknote comprises a paper-based substrate 10. On the front side 20 as well as the reverse side of the paper-based substrate there is provided a graphical design printing 30. The banknote comprises further security means, such as a security thread 40 made of a metal strip and a hologram 50.

[0021] The graphical design printing comprises different graphical structures on different surface areas of the paper-based substrate. One of the graphical structures is the value of the bank note. The number "100" is printed using conventional printing methods, such as intaglio or silk-screen, providing a visible and tactile structure 60.

[0022] According to the invention, a laser beam of a Nd:YAG laser with frequency quadrupled wavelength (266 nm) is focused on the predetermined area of the paper-based substrate, on which the number "100" is printed. As a result of the processing of the paper-based substrate with the laser beam the tactility of the predetermined surface area is improved.

Claims

1. A method for producing safety features on security documents comprising a paper-based substrate with the step of providing tactile structures on the paper-based substrate, **characterized in that** a laser

beam is focused on a surface area of the paper-based substrate, the laser beam being generated from a laser capable of rising the paper fibres of the paper-based substrate so as to provide embossed structures without removing of the surface layers.

2. A method according to claim 2, **characterized in that** a low energetic laser is used for providing said embossed structures on said paper-based substrate.

3. A method according to claim 1 or 2, **characterized in that** a Nd:YAG (Neodimium Doped Yttrium Garnet) solid state laser with a frequency-quadrupled wavelength (266 nm) is used for providing said embossed structures on said paper-based substrate.

4. A method according to claim 1 to 3, **characterized in that** a printing is provided on the surface area of said paper-based substrate, the surface area on which the printing is provided being the same surface area as the surface area on which the embossed structure is provided.

5. A method according to claim 4, **characterized in that** in a first step the printing is provided on said surface area of said paper-based substrate and in a second step the embossed structure is provided on said surface area of said paper-based substrate.

6. A method according to claim 5, **characterized in that** in the first step a printing method is used for providing a tactile structure on said area of said substrate and in the second step said area already having said tactile structure is processed with said laser beam for increasing the tactility of said tactile structure.

7. A method according to claim 4, **characterized in that** in a first step the embossed structure is provided on said surface area of said paper-based substrate and in a second step the printing is provided on said surface area of said paper-based substrate.

8. A method according to one of claims 1 to 7, **characterized in that** a protective layer is applied on said surface area of said paper-based substrate.

9. A method according to one of claims 1 to 8, **characterized in that** said security document is a banknote comprising said paper-based substrate.

10. A method according to one of claims 1 to 9, **characterized in that** said paper-based substrate is a sheet of paper.

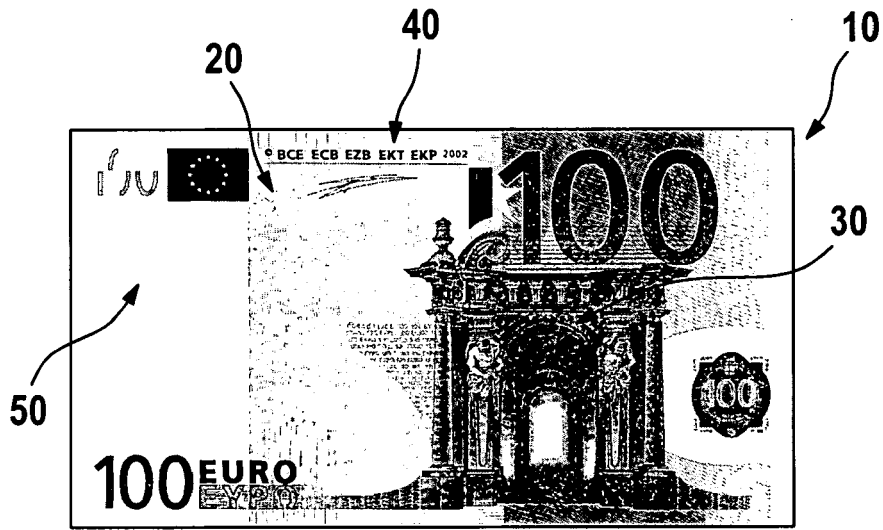


Fig. 1

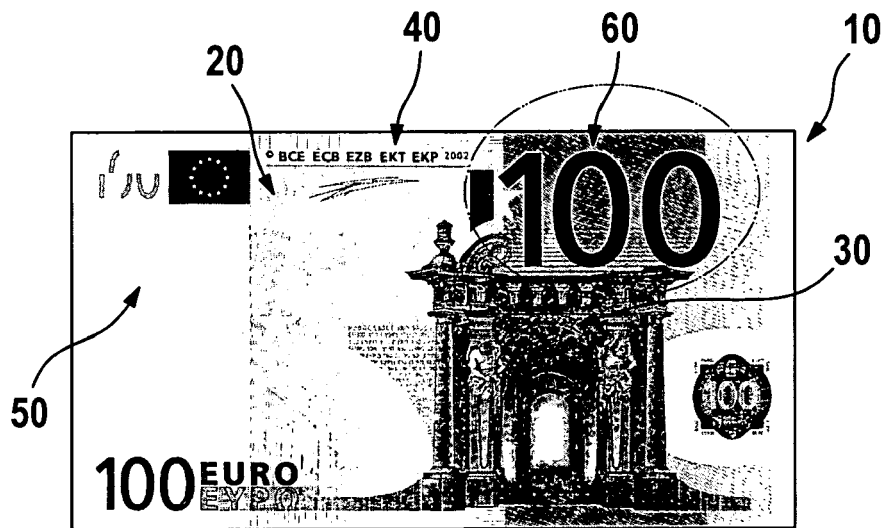


Fig. 2



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.7)
X	DE 102 32 786 A1 (GIESECKE & DEVRIENT GMBH) 12 February 2004 (2004-02-12) * paragraphs [0012], [0013], [0019], [0032], [0032] - [0037], [0046] * * figure 2 *	1-10	B41M3/14 B42D15/00
X	DE 102 47 591 A1 (GIESECKE & DEVRIENT GMBH) 22 April 2004 (2004-04-22) * paragraphs [0013] - [0016], [0019], [0023] - [0025], [0042], [0044], [0049], [0050] * * figure 2 *	1-10	
A	US 4 740 269 A (BERGER ET AL) 26 April 1988 (1988-04-26) * column 1, line 50 - column 3, line 28 *	1-10	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			B41M B42D D21H
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 21 March 2005	Examiner Patosuo, S
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 04 02 7803

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 The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-03-2005

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