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(54) **COUNTERFEIT-PROTECTED DATA CARRIER**

FÄLSCHUNGSSICHERER DATENTRÄGER

SUPPORT D'INFORMATIONS PROTÉGÉ CONTRE LES CONTREFAÇONS

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Description

Technical Field

[0001] The invention relates to counterfeit-protected data carriers for protecting against counterfeit printed products, such as security papers, bank notes, identity documents, both paper and polymer based.

Description of Prior Art

[0002] A method for manufacturing security papers disclosed in DE 3208204 A1 relates to the protection against unauthorized copying by offset printing. Data carrier is a transparent paper or another transparent carrier material with periodic or almost periodic patterns consisting of dots or lines applied to both sides thereof. In application, images on the front and reverse sides of the carrier are precisely registered using two-sided printing machines. Therefore, this method provides for a periodic structure of lines, which has the appearance of fine lines when the structure is properly correlated in transmitted light, but moire patterns appear at a slight displacement of the structure in a case of forgery.

[0003] The disadvantage of this approach is that the elements on the front and reverse sides must be precisely registered, and this fact complicates the manufacturing process as it necessitates the use of only the double-sided printing equipment and increases the likelihood of defective products. It should also be noted that the use of double-sided printing due to process peculiarities makes infeasible the use of images with a line width less than 40 μm.

[0004] A similar approach is disclosed in US 6,494,491 B1, 17.12.2002, wherein to provide a latent image the graphical elements forming a security element are arranged such that part of the elements are slightly displaced with respect to each other. Latent image can be recovered using a transparent material with a grid applied thereon, said grid corresponding to the position of non-displaced graphical elements. When the material is superimposed on the carrier, the grid elements cover the non-displaced graphical elements of the carrier and the latent image appears as positive. When the transparent material is superimposed with a displacement such that the grid elements cover displaced elements, the latent image appears as negative.

[0005] The disadvantage of this approach is the necessity to register the transparent material with the printed portion without skew, which complicates identification of the security element by an unskilled user.

[0006] Also known is a security element (US 2012/182443A1) which comprises: an optical system, comprising: a transparent or translucent substrate (2), on the side of a first surface (2a, 2b) of the substrate (2) is a combined image (I) comprising a plurality of encoded interleaved images (II), a exposing screen (4) placed on top of the combined image, enabling the encoded images (I1) to be observed during a change in the direction of observing the security element (1) relative to the optical system, the exposing screen (4) being: located on the side of the first surface (2a, 2b), the combined image then being located between the exposing screen (4) and the substrate (2), in which case the security element (1) comprises, on the side of the second surface (2a, 2b), a reflective surface that enables the encoded images (I1) to be observed through exposing screen (4).

[0007] The similar design of security device for authenticating documents and valuable products is known from US 2010/314861A1, the security device may be applied to any support, including transparent synthetic materials and traditional opaque materials such as paper, wherein a compound layer incorporated into a valuable item to be protected from counterfeits comprises a base layer of given layout parameters, a revealing layer of given layout parameters and a gap between them.

[0008] An object with a surface region that generates an optical effect having the purpose of increasing proof against counterfeit is disclosed in US 6 494 491B1, wherein the surface region that generates the optical effect exhibits at least two image patterns (12, 14) separated distance (d) from each other by means of a transparent layer of material (10) and, upon altering viewing angle ([alpha]), the perceived overall image formed by the overlapping of the image patterns (12, 14) is altered, and the distance (d) between the image patterns (12, 14) defined by a thickness of the material layer (10) and distance (a) between two neighboring image elements (16) forming the image patterns (12, 14) are adjusted with respect to each other such that the image patterns (12, 14) exhibit moire interference effects.

[0009] Also, known is a data carrier (WO 00/20216A1), the data carrier having a printed image that is produced by means of a gravure process. The printed image comprises at least one first colour surface with a first colour coating thickness and a second colour surface adjacent to the first colour surface and provided with a second colour coating thickness, whereby the thicknesses of the two colour coatings are different. The first and second colour surfaces are divided by a sharp borderline that is invisible to the naked eye and the colour coating thickness of both colour surfaces corresponds to a minimum thickness in the region of the borderline.

[0010] US2006/151989A1 discloses a security device comprising a sheet including: a reflective layer; a substantially transparent or translucent layer, the layers being in permanently fixed disposition to each other within the sheet; a blind embossed transitory image formed through the substantially transparent or translucent layer onto the reflective layer, at least part of which is visible through the transparent or translucent layer at least at some viewing angles.

[0011] All of the above mentioned technical solutions: US 2012/182443A1, US 2010/314861A1, US 6 494 491B1, WO 00/20216A1, US2006/151989A1 do not provide security elements having printed graphic elements

formed by intaglio printing process with providing flatness of the data carrier after printing with providing variable optical effects and/or motion effect as achieved by the claimed invention. Document 2386544 C1, 20.04.2010, discloses a security element for printed products, comprising a multilayer transparent polymer film with a first screened image formed on the upper surface of the upper layer of the film, having a resolution of the same order of magnitude as the film thickness, and a second screened image formed on the lower surface of one of underlying layers of the polymeric film and/or on the surface of the product being protected, on which the security element is positioned, and the second screened image is positioned such that when viewed in reflected light at different angles or in transmitted light, the image gradually changes from positive to negative or vice versa, wherein the first and second screened image is transparent and/or translucent, and/or reflective and/or luminescent, and/or embossed. A method of manufacturing the security element comprises applying images to the surface of film layers by methods of local carbonization and/or laser beam engraving in surface layers of the film having a thickness of 1-10 μm, and/or by thermal diffusion copying methods.

[0012] The disadvantage of this approach is the restrictions on the method of forming the screen elements; in particular, such elements cannot be formed without the use of laser treatment, which significantly limits the range of application in protected printed products.

Summary of the Invention

[0013] The object of the invention is to enhance the security of products through the use of high-resolution images that are infeasible by digital printing devices and commercial printing, and to provide a novel variable optical effect and/or motion effect, as well as to improve the production effectiveness and reduce the cost of the security element owing to forming the screen by printing.

[0014] The object is attained owing to the features set forth in claim 1. Preferred embodiments of the inventive data carrier are defined in dependent claims. A counterfeit-protected data carrier according to the invention is defined in claim 1. The thickness of the transparent portion of the data carrier can range from 10 to 40 μm.

[0015] The transparent portion of the data carrier can be formed by a single layer or a multilayer polymer film, transparent or partially dyed in the bulk or on the surface; or a specially impregnated paper; or a filigree watermark.

[0016] The image can be formed by broken or curved lines, or dots, or strokes, or graphic primitives, or a combination thereof.

[0017] A counterfeit-protected data carrier may be produced by applying graphic elements in the form of a line screen to at least one transparent portion of the carrier to form a periodic structure, wherein the graphic elements are applied by printing to both sides of the carrier, and the elements are mutually arranged such that they form an image exhibiting an optically variable effect.

[0018] The graphic elements are applied by intaglio printing provided the following conditions are observed: the depth of engraving hatch should not exceed 14 μm and the width of the graphic elements should match the order of magnitude of the thickness of the data carrier. The resulting data carrier must retain its flatness, and the thickness of the ink layer is in the range of from 3 to 9 μm.

Brief Description of the Drawings

List of Figures

[0019]

Fig. 1 shows a structure of a transparent portion in a manufacturing process.

Figs. 2-3 show an arrangement of graphical elements on the front and reverse sides of the transparent portion.

Fig. 4 shows an embodiment of a structure of a transparent portion in a manufacturing process, and a process of formation of a hidden image.

Figs. 5-8 show how an image is obtained when observing the carrier in transmitted light at various angles of inclination.

Fig. 9 shows an embodiment of a structure of a transparent portion in a manufacturing process using special inks.

Fig. 10 shows a structure of a transparent portion in a manufacturing process that does not fall within the scope of claim 1.

Fig. 1 shows an embodiment of a structure of a transparent portion of a carrier produced by a first method. Graphic elements 2, 3 are applied to a transparent portion of a carrier 1 by printing.

Fig. 2 shows an embodiment of an image on one side of data carrier, containing a background image. The image consists of equally spaced straight lines having a constant width.

Fig. 3 shows an embodiment of an image on one side of a data carrier. It consists of straight lines having a constant width. In contrast to Fig. 2, part of the lines forming a background image 4 and part of the lines forming a hidden latent image 5 are displaced relative to each other.

Fig. 4 shows an embodiment of a structure of a transparent portion of the carrier produced by a method, and how a negative image can be obtained when the carrier is viewed in transmitted light at appropriate angle to the surface of the carrier.

Part of graphic elements 5 on the front side of the carrier are displaced relative to the other elements forming the background 4. When viewing the carrier in transmitted light at angle α to the surface of the carrier, the observer sees a dark background 4a and a bright image 5a.

Fig. 5 shows the resulting image in which additional

information is visible when the carrier is viewed in transmitted light, and the angle of viewing is such that elements on the reverse side overlap clearances between elements on the front side positioned without displacement, thereby forming a bright image on a dark background.

Fig. 6 shows the resulting image, in which the angle of inclination of the carrier ensures overlapping by the reverse side elements the clearances between the front side elements positioned with displacement, which leads to formation of a dark image on a bright background.

Figs. 7-8 show the resulting image at different angles, in which graphical elements of the front and reverse sides are angled relative to each other, which leads to formation of a moire pattern. Changing the angle of inclination of the carrier provides motion of the moire pattern over the element.

Fig. 9 shows an image obtained under UV or IR light.

Fig. 10 shows an example of a structure of a transparent portion of a carrier 6 that does not fall within the scope of claim 1.

[0020] Graphical elements are applied to the front side 8 by printing, while printing on the reverse side 7 is omitted; the graphical elements are produced by partial demetallization within the transparent material.

Best Embodiments of the Invention

[0021] The invention is illustrated by the following examples.

[0022] Example 1 (Figs. 1, 2, 3, 4, 5, 6, 7, 8, 9).

[0023] A counterfeit-protected data carrier (Fig. 1) comprises a transparent portion 1, to which graphic elements 2 and 3 are applied by printing. Graphic elements 2 comprise a background image (Fig. 2), and graphic elements 3 applied to the other side comprise a hidden image 4 and a background image 5 (Fig. 3).

[0024] When viewing the carrier in reflected light a uniformly colored field is observed. When viewing the same in transmitted light, as shown in Fig. 4, at different angles, the image changes from positive to negative and vice versa (Figs. 5 and 6).

[0025] If graphical elements (Fig. 2, 3) are applied at an angle to each other, when the carrier is viewed in transmitted light at different angles, motion of moire fringes can be observed as shown in Figs. 7 and 8.

[0026] If graphic elements are printed on the front or reverse side (Figs. 2 and 3) using a special ink, coloring can be observed under UV or IR light in at least a portion of the element, as shown in Fig. 9.

[0027] Therefore, the inventive data carrier offers an optical variable effect. Information displayed on the surface of the transparent portion is hidden in reflected light and visible in transmitted light. This allows both the machine- readable authenticity control and visual inspection of the carrier, while greatly enhancing the effectiveness of visual inspection.

[0028] The printed graphic elements of the claimed counterfeit-protected data carrier are high-resolution graphic elements, that are infeasible by digital printing devices and commercial printing; printing the elements does not require monitoring the accurate registration of the front and reverse sides, and the technological process is improved owing to the omission of additional steps, in particular, laser engraving, which reduces the cost of the counterfeit-protected data carrier. Application of graphic elements by traditional printing does not require extra processing steps and additional equipment.

Industrial Applicability

[0029] The invention can be used for protection against forgery of printed products, such as security papers, bank notes, identity documents, both paper and polymer-based; it ensures more efficient authenticity control of data carriers both visually and using an equipment.

Claims

1. A counterfeit-protected data carrier having at least one transparent portion (1) which is formed by a single-layer or multilayer polymer film, the transparent portion (1) has graphic elements(2, 3) disposed on both sides thereof in the form of a high-resolution line screen, said graphic elements (2, 3) forming a periodic structure, the elements (2, 3) are mutually arranged such that they form an image which is hidden when viewed in reflected light and visible when viewed in transmitted light; furthermore, when viewed from a different direction in transmitted light the image changes from positive to negative and vice versa, and/or the color of the image changes completely or partially, and/or the effect of motion of monochrome or multi-colored moire fringes appears; the graphic elements (2, 3) are printed graphic elements, and the width of the graphic elements (2, 3) and the clearance between the graphic elements (2, 3) are proportionate to the thickness of the data carrier, and the thickness of an ink layer comprising the graphic elements (2, 3) is in the range of from 3 to 9 μm, **characterized in that** the printed graphic elements are formed by an intaglio printing process with providing flatness of the data carrier after printing.

2. A data carrier according to claim 1, **characterized in that** the transparent portion (1) of the data carrier formed by a single-layer or multilayer polymer film is transparent or partially colored in the bulk or on the surface, or partially demetalized; or a specially impregnated paper.

3. A data carrier according to claim 1 or 2, **characterized in that** the image is formed by broken or curved

lines, or dots, or strokes, or graphic primitives, or a combination thereof with the proviso of high resolution.

4. A data carrier according to claim 1 or 2, **characterized in that** said graphic elements (2, 3) on the front and reverse side are computer readable at least at some portions.

5. A data carrier according to claim 1 or 2, **characterized in that** said graphic elements (2, 3) are printed graphic elements formed by an intaglio printing process with special inks and are computer readable and/or luminescent under UV light and/or IR metameric which exhibit identical optical characteristics in the daylight and different absorption in IR light.

Patentansprüche

1. Ein fälschungssicherer Datenträger der mindestens einen transparenten Abschnitt (1) aufweist, welcher aus einem einschichtigen oder mehrschichtigen Polymerfilm gebildet ist, wobei der transparente Abschnitt (1) grafische Elemente (2, 3) aufweist, die beidseitig davon, in der Form eines hochauflösenden Linienrasters angeordnet sind, wobei die grafischen Elemente (2, 3) eine periodische Struktur bilden, und wobei die grafischen Elemente (2, 3) so zueinander angeordnet sind, um ein Bild zu formen, welches ausgeblendet ist wenn es in reflektiertem Licht betrachtet wird und sichtbar ist wenn es in Durchlicht betrachtet wird; darüber hinaus, wenn es von einer anderen Richtung aus in reflektiertem Licht betrachtet wird, verändert sich das Bild von positiv auf negativ und umgekehrt, und/oder die Farbe des Bildes verändert sich vollkommen oder teilweise, und/oder es erscheint der Bewegungseffekt von monochromen oder mehrfarbigen Moire-Streifen; die grafischen Elemente (2, 3) sind gedruckte grafische Elemente, und die Breite der grafischen Elemente (2, 3) und der Abstand zwischen den grafischen Elementen (2, 3) sind proportional zur Dicke des Datenträgers, und die Dicke einer, die grafischen Elemente (2, 3) umfassenden Tintenschicht liegt im Bereich von 3 bis 9 μm, **dadurch gekennzeichnet dass** die gedruckten grafischen Elemente durch ein Tiefdruckverfahren ausgebildet sind, welches eine Flachheit des Datenträgers nach dem Drucken bietet.

2. Ein Datenträger nach Anspruch 1, **dadurch gekennzeichnet dass** der, aus einem einschichtigen oder mehrschichtigen Polymerfilm gebildete transparente Abschnitt (1) des Datenträgers transparent oder in der Masse oder auf der Oberfläche teilweise farbig, oder teilweise demetallisiert ist, oder ein speziell imprägniertes Papier ist.

3. Ein Datenträger nach Ansprüchen 1 oder 2, **dadurch gekennzeichnet dass** das Bild aus gestrichelten oder gekrümmten Linien, oder Punkten, oder Strichen, oder Grafikprimitiven oder einer Kombination davon gebildet ist, unter der Voraussetzung einer hohen Auflösung.

4. Ein Datenträger nach Ansprüchen 1 oder 2, **dadurch gekennzeichnet dass** die grafischen Elemente (2, 3) an der Vorderseite und Rückseite zumindest an bestimmten Abschnitten computerlesbar sind.

5. Ein Datenträger nach Ansprüchen 1 oder 2, **dadurch gekennzeichnet dass** in den grafischen Elementen (2, 3) gedruckte grafische Elemente vorhanden sind, die durch ein Tiefdruckverfahren mit Spezialtinten ausgebildet und computerlesbar und/oder unter UV-Licht lumineszierend und/oder IR-metamerisch sind, die identische optische Eigenschaften bei Tageslicht und unterschiedliche Absorption bei IR-Licht aufweisen.

Revendications

1. Support de données protégé contre la falsification ayant au moins une partie transparente (1) qui est formée par un film polymère monocouche ou multicouche, la partie transparente (1) comportant des éléments graphiques (2, 3) disposés sur ses deux côtés sous la forme d'une trame linéaire haute résolution, lesdits éléments graphiques (2, 3) formant une structure périodique, les éléments (2, 3) étant agencés mutuellement de sorte qu'ils forment une image qui est cachée lorsqu'elle est vue en lumière réfléchie et visible vu en lumière transmise; de plus, lorsqu'elle est regardée d'une direction différente sous une lumière transmise, l'image change de positif en négatif et inversement, et/ou la couleur de l'image change complètement ou partiellement, et/ou il apparaît un effet de mouvement de franges moirées monochromes ou multicolores ; les éléments graphiques (2, 3) sont des éléments graphiques imprimés, et la largeur des éléments graphiques (2, 3) et l'intervalle entre les éléments graphiques (2, 3) sont proportionnels à l'épaisseur du support de données, et l'épaisseur de la couche d'encre comprenant les éléments graphiques (2, 3) est situé dans la plage de 3 à 9 μm, **caractérisé en ce que** les éléments graphiques imprimés sont réalisés par un procédé d'impression en taille douce en assurant la planéité du support de données après impression.

2. Support de données selon la revendication 1, **caractérisé en ce que** la partie transparente (1) du support de données formée par un film polymère monocouche ou multicouche est transparente ou partiellement colorée dans la masse ou sur la surface, ou

partiellement dépourvue de métallisation ; ou un papier spécialement imprégné.

3. Support de données selon la revendication 1 ou 2, **caractérisé en ce que** l'image est formée par des lignes brisées ou incurvées, ou des points, ou des traits, ou des primitives graphiques, ou une combinaison de celles-ci à condition que la résolution soit élevée.

4. Support de données selon la revendication 1 ou 2, **caractérisé en ce que** lesdits éléments graphiques (2, 3) sur les faces avant et arrière sont lisibles par ordinateur au moins dans certaines zones.

5. Support de données selon la revendication 1 ou 2, **caractérisé en ce que** lesdits éléments graphiques (2, 3) sont des éléments graphiques imprimés formés par un procédé d'impression en taille douce avec des encres spéciales et sont lisibles par ordinateur et/ou sont luminescentes sous lumière UV et/ou sont métamériques en infrarouge en présentant des caractéristiques optiques identiques en lumière du jour et une absorption différente en lumière IR.

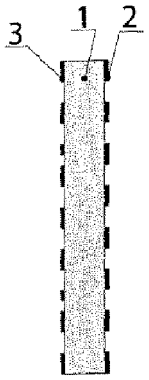

Fig. 1

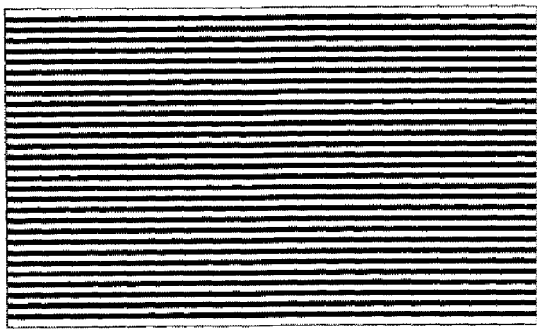

Fig. 2

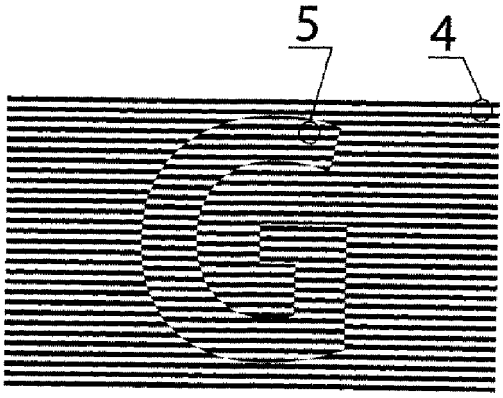

Fig. 3

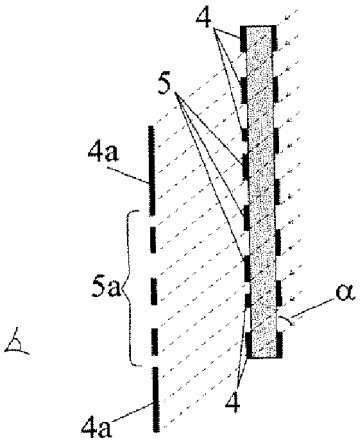

Fig. 4

Fig. 5

Fig. 6

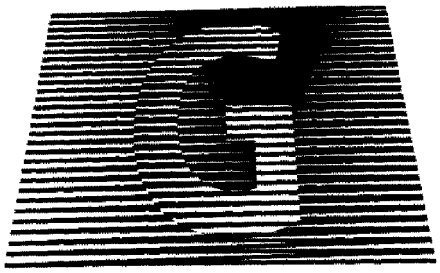

Fig. 7

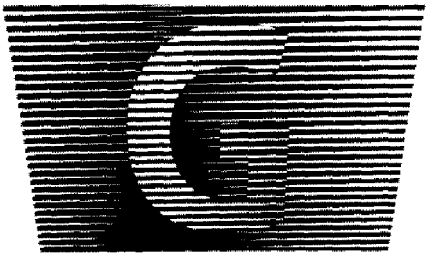

Fig. 8

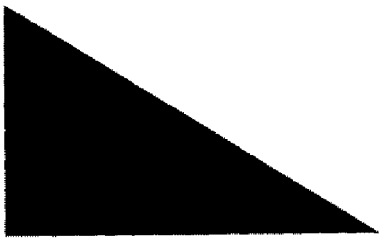

Fig. 9

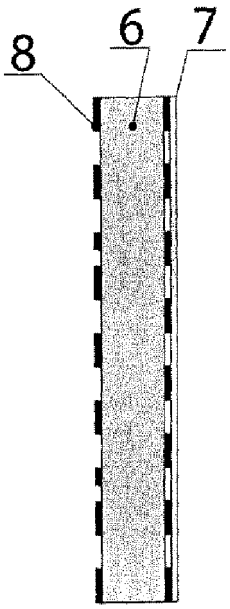

Fig. 10

REFERENCES CITED IN THE DESCRIPTION

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