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(54) **Data carrier and method for manufacturing a data carrier**

(57) A data carrier is disclosed comprising one or more elements comprising symbols, text, graphics or combinations thereof arranged on a surface. The elements are arranged on the surface as microscopic surface irregularities including protrusions, recesses or protrusions and recesses as compared to other parts of the element. The elements comprise areas having recesses or protrusions, such that said recesses or protrusions have different recess depths/protrusion heights at the dif-

ferent areas of the element, and the one or more areas are visible to a viewer only at predetermined angles of light reflection at least partly deviating from the other areas. Alternatively, the recesses or protrusions may have different grating directions at the different areas of the element, wherein the one or more areas are visible to a viewer only at predetermined angles of light reflection at least partly deviating from the other areas.

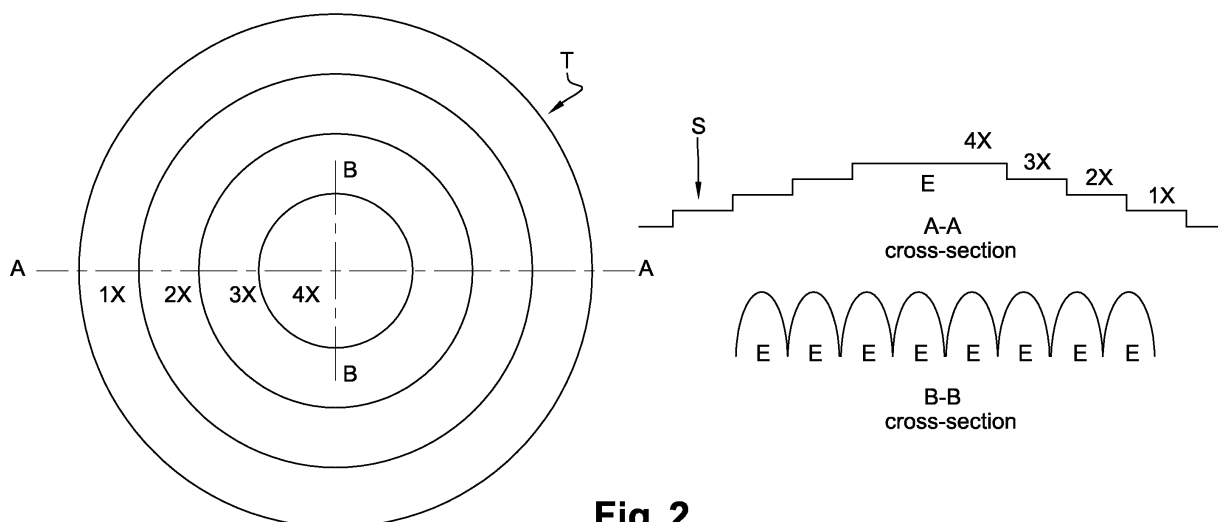


Fig. 2

Description

FIELD OF THE INVENTION

[0001] The invention relates to a data carrier and more particularly to improving the security of a data carrier by making forgery more difficult.

BACKGROUND OF THE INVENTION

[0002] Previously there are known secure documents with elements comprising text, symbols, graphics, or combinations of these. Such elements are utilized on secure documents in order to make forgery as difficult as possible. Different production methods have been developed in order to produce elements that are very difficult to reproduce (for a forger) and require different types of technical skills.

[0003] Secure documents such as identification documents may include different techniques for anti-counterfeiting the documents. These techniques include surface embossings (e.g. obtained mechanically or by etching).

[0004] However, the texts and/or graphics obtained mechanically or by etching are quite rough and always remain visible to the eye.

[0005] DOVIDs are diffractive separately originated elements based on separated material patches applied inside or onto the surface of e.g. cards. DOVIDs enable producing various visual effects: movement, colours, morphing, and hiding and revealing texts/graphics depending on the orientation of light or viewing angle.

[0006] However, a problem with DOVIDs is that they are expensive to produce and typically need to be applied one by one as patches originated onto a specific material other than a typical plastic substrate of a data carrier.

BRIEF DESCRIPTION OF THE INVENTION

[0007] An object of the present invention is to provide a method and an arrangement so as to alleviate the above disadvantages. The objects of the invention are achieved by a method and a data carrier which are characterized by what is stated in the independent claims. Further embodiments of the invention are disclosed in the dependent claims.

[0008] An aspect of the invention relates to a data carrier comprising one or more elements comprising symbols, text, graphics or combinations thereof arranged on a surface, wherein the elements are arranged on the surface as microscopic surface irregularities including protrusions, recesses or protrusions and recesses as compared to other parts of the element, wherein the elements comprise one or more areas having recesses or protrusions, such that said recesses or protrusions have different recess depths or protrusion heights respectively at the different areas of the element, wherein the one or more areas are visible to a viewer only at predetermined angles of light reflection at least partly deviating from the

other areas.

[0009] A further aspect of the invention relates to a data carrier comprising one or more elements comprising symbols, text, graphics or combinations thereof arranged on a surface, wherein the elements are arranged on the surface as microscopic surface irregularities including protrusions, recesses or protrusions and recesses as compared to other parts of the elements, wherein the elements comprise one or more areas having recesses or protrusions, such that said recesses or protrusions have different grating directions at the different areas of the element, wherein the one or more areas are visible to a viewer only at predetermined angles of light reflection at least partly deviating from the other areas.

[0010] A still further aspect of the invention relates to a method for manufacturing a data carrier, the method comprising generating one or more elements comprising symbols, text, graphics or combinations thereof on a surface, wherein the elements are arranged on the surface as microscopic surface irregularities including protrusions, recesses or protrusions and recesses as compared to other parts of the element, wherein the elements comprise one or more areas having recesses or protrusions, such that said recesses or protrusions have different recess depths or protrusion heights respectively at the different areas of the element, wherein the one or more areas are visible to a viewer only at predetermined angles of light reflection at least partly deviating from the other areas.

[0011] A still further aspect of the invention relates to a method for manufacturing a data carrier, the method comprising generating one or more elements comprising symbols, text, graphics or combinations thereof arranged on a surface, wherein the elements are arranged on the surface as microscopic surface irregularities including protrusions, recesses or protrusions and recesses as compared to other parts of the elements, wherein the elements comprise one or more areas having recesses or protrusions, such that said recesses or protrusions have different grating directions at the different areas of the element, wherein the one or more areas are visible to a viewer only at predetermined angles of light reflection at least partly deviating from the other areas.

[0012] Although the various aspects, embodiments and features of the invention are recited independently, it should be appreciated that all combinations of the various aspects, embodiments and features of the invention are possible and within the scope of the present invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] In the following the invention will be described in greater detail by means of preferred embodiments with reference to the attached drawings, in which

Figure 1 illustrates the size of surface irregularities according to an exemplary embodiment;

Figure 1b illustrates surface embossed grating with areas having different surface embossing heights; Figure 2 illustrates a top view and cross-sectional views of embossed gratings with different surface embossing heights;

Figure 3a and 3b illustrate surface embossed elements with different surface embossing heights as appearing with different angles of light reflection;

Figure 4 illustrates surface embossed elements with different grating directions as appearing with different angles of light reflection;

Figure 5 illustrates a surface embossed element with areas having different grating directions;

Figure 6 and 7 illustrate surface embossed areas having different grating directions.

DETAILED DESCRIPTION OF THE INVENTION

[0014] Optical variable devices (OVD) are images/patterns/elements that exhibit various optical effects, such as movement or colour changes. DOVIDs (diffractive optical variable image device) are based on diffractive optical structures, giving an appearance of different patterns, colours, and designs depending on the amount of light striking DOVID and viewing angle. OVDs and DOVIDs may be manufactured by printing and/or embossing. It is not possible to photocopy or scan OVDs/DOVIDs, and they cannot be accurately replicated or reproduced. OVDs/DOVIDs may be used as security devices and anti-counterfeiting measures on money, credit cards, passports, health insurance cards, driver's licences, and identification cards.

[0015] An exemplary embodiment relates to a technology based on material (lamination plate) processing accuracy of picosecond lasers. Laser processing is a form of laser-assisted etching or engraving removing copper or other metal from a plate's surface. A laser beam may have a spot size of 20 μm and may be moved with far smaller steps. The spot may have e.g. a Gaussian (i.e. TEM_{00}) power distribution, and due to a threshold power for the engraving to start, the actual marking may be much finer as well. In terms of depth accuracy e.g. 1 μm deep grooves or spots may be obtained. Such shallow grooves reflect light only in limited angles, and the maximum angle of reflection grows with increasing groove depth. By alternating groove depth and angle, it is possible to achieve effects visible at or within well controlled angles. These characteristics may be repeated onto a surface of plastic laminates and in case of transparent plastics (a window element for example) the transmitted light provides further effects at different viewing/lighting angles. Further strengths of such features are that dimensions of the grooves are so small that these are not visible to a naked eye and not even with a loupe, and that the grooves may be integrated directly into an otherwise normal looking surface as surface embossing (i.e. surface relief) having a sort of finishing touch. If the grooves are so small that they are not visible to the naked

eye, they may be added to a smooth surface, and/or to be a part of another surface embossing design.

[0016] Appearance of an optically variable surface embossed element depends on the angle and direction of observation. In an exemplary embodiment, the change of appearance is achieved by surface embossed gratings with different heights. A higher surface embossing is visible from a significantly wider viewing angle than a lower surface embossing. This causes the appearance of the surface embossing to change when the angle of observation is changed, meaning that different parts of the surface embossing become visible/disappear when the light reflects differently from the surface embossings of different heights. The appearance of a surface embossed area also changes when the direction of the surface embossed grating is varied and the viewing direction is changed. Figure 1a illustrates the size of surface irregularities E according to an exemplary embodiment. Figure 1b illustrates surface embossed grating with areas R1, R2 having different surface embossing heights. Figure 2 illustrates a top view T and cross-sectional views A-A, B-B of surface embossed gratings with different surface embossing heights 4x, 3x, 2x, 1x (the cross-sectional views being taken from lines A-A, B-B of the top view T, respectively). Figure 3a and 3b illustrate surface embossed elements with different surface embossing heights as appearing with different angles of light reflection. Figures 1a and 1b illustrate surface embossed grating in two different heights, wherein the height difference between the higher and lower surface embossing is illustrated. Typically the height of the lower surface embossing (upper part (area R1) of the "star" in Figure 1b) is about 1 μm to 1,5 μm and the height of the higher surface embossing (area R1) is about 2 μm to 3 μm . This kind of precise height alteration may be achieved with a laser ablation process.

[0017] This kind of surface embossing enables that only the higher surface embossing becomes visible in a couple of very specific angles and directions of observation (see Figures 3a and 3b illustrating the difference in appearance between surface embossed areas of two different heights (of the same sample)). This allows concealing design elements (such as a text "UTO" in Figure 3a/3b) in a larger group of smaller objects (such as the "stars" in Figure 1b and 3a/3b). If any other viewing angle is used, "UTO" blends into the "stars" and the surface embossed surface looks homogeneous.

[0018] In an exemplary embodiment, if more than two different surface embossing heights are used, each of the different heights becomes visible at separate angles (see Figure 2). This enables creating "motion", animation or other transformation of the image seen when the viewing angle to the surface embossing is changed.

[0019] The motion may be also generated by using surface embossing of the same height but altering the direction of the grating between embossed areas (see Figures 4, 5, 6 and 7). Figure 4 illustrates surface embossed elements with different grating directions as appearing

with different angles of light reflection. Figure 5 illustrates an surface embossed element with areas R3, R4, R5, R6, R7, R8, R9 having different grating directions. Figure 6 and 7 illustrate surface embossed areas R3, R4, R5 etc. having different grating directions.

[0020] In addition to these applications, the surface of the surface embossed elements may diffract light (divides white light into separate colours).

[0021] According to an exemplary embodiment, an enhanced laser processing capability enables introducing the above effects onto a laminate surface of cards and datapages (e.g. a paper-like document), potentially also other than polycarbonate.

[0022] In an exemplary embodiment, the effect is obtained onto the plastic surface by hot-embossing using a tool with the above effects arranged to the tool surface, by lamination with the above effects arranged into the surface of the lamination plate, by introducing a separate film onto the surface (before or after lamination), the film comprising these effects, or by injection moulding from a surface of a mould. A large variety of materials may be used.

[0023] In identification documents, a surface layer typically comprises plastics. However, in an exemplary embodiment, coated paper may be used instead, having a surface structure with a desired effect stamped on it (by printing with engraving press, where printing plates may be used that are manufactured in the same way as the lamination plates disclosed herein). In this context, so called security foils may be used that are laminated onto the surface of the paper after individualized printing.

[0024] The surface embossed image according to an exemplary embodiment provides a surface embossed security feature for anti-counterfeiting of secure documents (data carriers) such as identification cards, passports, health insurance cards, driver's licences, money, credit cards etc.

[0025] An exemplary embodiment enables implementing optical variability into surface embossed elements E, thus making surface embossing/surface reliefs more difficult to replicate. An exemplary embodiment enables improving protection against removal attempts on graphical personalization. By means of an exemplary embodiment, latent images may be taken to a completely different level with the image disappearing from selected angles and different designs appearing from others. An exemplary embodiment allows combining the latent imagery with tactile features (sensed with finger tips) while one normally is not able to achieve both in one.

[0026] An exemplary embodiment enables a low budget manufacturing process by preparing the lamination plates (or moulds) and performing a normal lamination process of the secure document.

[0027] Thus, in an exemplary embodiment, surface embossings (i.e. surface reliefs) refer to surface irregularities comprising protrusions. In an exemplary embodiment, grooves refer to surface irregularities comprising recesses. In an exemplary embodiment, these surface

irregularities are of microscopic scale. In an exemplary embodiment, the surface irregularities are elongated or point-shaped.

[0028] In an exemplary embodiment, a data carrier comprises one or more elements comprising e.g. symbols, text, graphics or combinations thereof arranged on a surface S. The elements are arranged on the surface as microscopic surface irregularities. These surface irregularities E may include grooves E (i.e. recesses E) that deviate from other parts of the element and/or from the surface (e.g. the actual surface level of the data carrier). Alternatively the surface irregularities may include surface embossings E (i.e. protrusions E) deviating from the other parts of the element and/or from the surface, or a combination of recesses and protrusions. The elements comprise one or more areas R1, R2 having recesses E or protrusions E, such that said recesses E or protrusions E have different recess depths or protrusion heights respectively at the different areas R1, R2 of the element. The different areas R1, R2 having the different recess depths or protrusion heights are visible to a viewer only at predetermined angles of light reflection at least partly deviating from each other (i.e. in Figure 1b, area R1 is visible to a viewer only at predetermined angles of light reflection which angles are at least partly different from the angles of light reflection at which area R2 is visible to a viewer).

[0029] In an exemplary embodiment, a data carrier comprises one or more elements comprising e.g. symbols, text, graphics or combinations thereof arranged on a surface S. The elements are arranged on the surface as microscopic surface irregularities. These surface irregularities E may include grooves E (i.e. recesses E) that deviate from other parts of the element and/or from the surface (e.g. the actual surface level of the data carrier). Alternatively the surface irregularities may include surface embossings E (i.e. protrusions E) deviating from the other parts of the element and/or from the surface, or a combination of recesses and protrusions. The elements comprise one or more areas R1, R2 having recesses E or protrusions E, such that said recesses E or protrusions E have different grating directions (grating direction refers to the direction of the grooves/surface embossings in relation to each other) at the different areas R3, R4, R5, R6, R7, R8, R9 of the element. The different areas R1, R2 having the different recess depths or protrusion heights are visible to a viewer only at predetermined angles of light reflection at least partly deviating from each other (i.e. in Figures 5, 6 and 7 area R3 is visible to a viewer only at predetermined angles of light reflection which angles are at least partly different from the angles of light reflection at which areas R4, R5 etc. are visible to a viewer).

[0030] In an exemplary embodiment, the data carrier comprises elongated (longitudinal) surface irregularities. Another option is that the surface irregularities are point-shaped. By means of point-shaped grooves/surface embossings a photographic effect is achievable. The varia-

tions between darker and lighter parts of the elements are achievable having areas that are not grooved/surface embossed. The areas that are not grooved/surface embossed are visible to a viewer as lighter areas, and the areas with grooves/surface embossings are visible to a viewer as darker areas. This is the case if the support (or background) is of light colour, e.g. white (the surface (and the surface irregularities) may be transparent). If the support (or background) is of dark colour, e.g. black, the areas that are not grooved/surface embossed are visible to a viewer as darker areas, and the areas with grooves/surface embossings are visible to a viewer as lighter areas. If the support (or background) is transparent, the grooved/embossed areas may be visible to a viewer as lighter areas. Basically areas without surface irregularities are visible to a viewer as areas with a different tone value compared to areas having exemplary microscopic surface irregularities.

[0031] In an exemplary embodiment, the surface irregularities are light diffractive. By means of diffractive grooves/surface embossings a coloured effect is achievable. The diffractive effect may be achieved by selecting a suitable (small enough) size of the grooves/surface embossings and/or between the grooves/surface embossings (which size/distance may be material-dependent).

[0032] In an exemplary embodiment, the surface irregularities are light dispersive (they act like prisms).

[0033] In an exemplary embodiment, the data carrier comprises e.g. polycarbonate material, PVC material and/or polyester material.

[0034] In an exemplary embodiment, the surface irregularities are of a microscopic size. For example, a recess depth/protrusion height of about 1 μm to 15 μm , preferably about 1 μm to 3 μm , may be used. The distance between protrusion apexes (the highest point) may be about 1 μm to 50 μm , preferably about 12 μm to 25 μm . Similarly, the distance between recess valleys (the lowest point) may be about 1 μm to 50 μm , preferably about 12 μm to 25 μm .

[0035] In an exemplary embodiment, the data carrier comprises personalization data (e.g. a photograph, birthday information, personal identification information etc.) inside the data carrier, such that the personalization data is at least partially covered by said one or more elements.

[0036] In an exemplary embodiment, a method for manufacturing a data carrier is provided. The method comprises generating one or more elements comprising e.g. symbols, text, graphics or combinations thereof on a surface S. The elements are arranged on the surface as microscopic surface irregularities. These surface irregularities E may include grooves E (i.e. recesses E) that deviate from other parts of the element and/or from the surface (e.g. the actual surface level of the data carrier). Alternatively the surface irregularities may include surface embossings E (i.e. protrusions E) deviating from the other parts of the element and/or from the surface, or a combination of recesses and protrusions. The elements comprise one or more areas R1, R2 having re-

cesses E or protrusions E, such that said recesses E or protrusions E have different recess depths or protrusion heights respectively at the different areas R1, R2 of the element. The different areas R1, R2 having the different recess depths or protrusion heights are visible to a viewer only at predetermined angles of light reflection at least partly deviating from each other (i.e. in Figure 1b, area R1 is visible to a viewer only at predetermined angles of light reflection which angles are at least partly different from the angles of light reflection at which area R2 is visible to a viewer).

[0037] In an exemplary embodiment, a method for manufacturing a data carrier is provided. The method comprises generating one or more elements comprising e.g. symbols, text, graphics or combinations thereof arranged on a surface S. The elements are arranged on the surface as microscopic surface irregularities. These surface irregularities E may include grooves E (i.e. recesses E) that deviate from other parts of the element and/or from the surface (e.g. the actual surface level of the data carrier). Alternatively the surface irregularities may include surface embossings E (i.e. protrusions E) deviating from the other parts of the element and/or from the surface, or a combination of recesses and protrusions. The elements comprise one or more areas R1, R2 having recesses E or protrusions E, such that said recesses E or protrusions E have different grating directions (grating direction refers to the direction of the grooves/surface embossings in relation to each other) at the different areas R3, R4, R5, R6, R7, R8, R9 of the element. The different areas R1, R2 having the different recess depths or protrusion heights are visible to a viewer only at predetermined angles of light reflection at least partly deviating from each other (i.e. in Figures 5, 6 and 7 area R3 is visible to a viewer only at predetermined angles of light reflection which angles are at least partly different from the angles of light reflection at which areas R4, R5 etc. are visible to a viewer).

[0038] In an exemplary embodiment, the method comprises providing a laser-engraved metal plate (i.e. a lamination plate). A plastic body is pressed by the metal plate under high temperature and pressure to generate the elements. Instead of a laser-engraved lamination plate, an etched or mechanically obtained engraved lamination plate may be used.

[0039] In an exemplary embodiment, the method comprises laser-engraving a plastic body to generate the elements. Instead of laser-engraving the plastic, etching or mechanical engraving of the plastic may be utilized.

[0040] In an exemplary embodiment, the method comprises providing a laser-engraved injection mould, and injection moulding a plastic body by the laser-engraved injection mould to generate the elements. Instead of a laser-engraved injection mould, an etched or mechanically obtained engraved injection mould may be used.

[0041] In an exemplary embodiment, a spot size of e.g. about 1 μm to 50 μm , preferably about 6 μm to 20 μm , of a laser beam is used for laser-engraving. The spot

may have a Gaussian power distribution (i.e. TEM_{00}), for example. Another option is that the spot has e.g. a TEM_{10} or any other suitable power distribution.

[0042] In an exemplary embodiment, personalization data is provided inside the secure document by using a laser marking technique (laser personalization technique). The personalization data (e.g. a photograph (see Figure 4), birthday information, personal identification information etc.) may be added at least partially under said one or more elements.

[0043] In an exemplary embodiment, the grooved/surface embossed area may include a single groove/surface embossing, the grating direction of which differs from the grating direction of another area.

[0044] In an exemplary embodiment, the grooved/surface embossed area may include a single groove/surface embossing, the depth/height of which differs from the groove depth/surface embossing height of another area.

[0045] It will be obvious to a person skilled in the art that, as the technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

Claims

1. A data carrier comprising one or more elements comprising symbols, text, graphics or combinations thereof arranged on a surface, wherein the elements are arranged on the surface as microscopic surface irregularities including protrusions, recesses or protrusions and recesses as compared to other parts of the element, wherein the elements comprise one or more areas having recesses or protrusions, such that said recesses or protrusions have different recess depths or protrusion heights respectively at the different areas of the element, wherein the one or more areas are visible to a viewer only at predetermined angles of light reflection at least partly deviating from the other areas.
2. A data carrier comprising one or more elements comprising symbols, text, graphics or combinations thereof arranged on a surface, wherein the elements are arranged on the surface as microscopic surface irregularities including protrusions, recesses or protrusions and recesses as compared to other parts of the elements, wherein the elements comprise one or more areas having recesses or protrusions, such that said recesses or protrusions have different grating directions at the different areas of the element, wherein the one or more areas are visible to a viewer only at predetermined angles of light reflection at least partly deviating from the other areas.
3. A data carrier as claimed in claim 1 or 2, **characterized in that** said microscopic surface irregularities comprise line-shaped and/or point-shaped surface irregularities.
4. A data carrier as claimed in claim 1, 2 or 3, **characterized in that** said microscopic surface irregularities are light diffractive.
5. A data carrier as claimed in any of claims 1 to 4, **characterized in that** it comprises one or more of polycarbonate material, PVC material or polyester material.
6. A data carrier as claimed in any of claims 1 to 5, **characterized in that** said microscopic surface irregularities are obtainable by lamination, laser-engraving, injection moulding, etching, or mechanical engraving.
7. A data carrier as claimed in any of claims 1 to 6, **characterized in that** the recess depth is about 1 μm to 15 μm , preferably about 1 μm to 3 μm .
8. A data carrier as claimed in any of claims 1 to 7, **characterized in that** the protrusion height is about 1 μm to 15 μm , preferably about 1 μm to 3 μm .
9. A data carrier as claimed in any of claims 1 to 8, **characterized in that** a distance between protrusion apexes and/or recess valleys is about 1 μm to 50 μm , preferably about 12 μm to 25 μm .
10. A data carrier as claimed in any of claims 1 to 9, **characterized in that** it comprises areas without the surface irregularities, such that the areas without surface irregularities are visible to a viewer as areas with a different tone value compared to areas having the microscopic surface irregularities.
11. A data carrier as claimed in any of claims 1 to 10, **characterized in that** it comprises personalization data inside the secure document, such that the personalization data is at least partially covered by said one or more elements.
12. Method for manufacturing a data carrier, the method comprising generating one or more elements comprising symbols, text, graphics or combinations thereof on a surface, wherein the elements are arranged on the surface as microscopic surface irregularities including protrusions, recesses or protrusions and recesses as compared to other parts of the element, wherein the elements comprise one or more areas

having recesses or protrusions, such that said recesses or protrusions have different recess depths or protrusion heights respectively at the different areas of the element,
 wherein the one or more areas are visible to a viewer only at predetermined angles of light reflection at least partly deviating from the other areas.

13. Method for manufacturing a data carrier, the method comprising generating one or more elements comprising symbols, text, graphics or combinations thereof arranged on a surface,
 wherein the elements are arranged on the surface as microscopic surface irregularities including protrusions, recesses or protrusions and recesses as compared to other parts of the elements,
 wherein the elements comprise one or more areas having recesses or protrusions, such that said recesses or protrusions have different grating directions at the different areas of the element,
 wherein the one or more areas are visible to a viewer only at predetermined angles of light reflection at least partly deviating from the other areas.
14. A method as claimed in claims 12 or 13, **characterized in that** the method comprises
 providing a metal plate,
 laminating a plastic body by the metal plate to generate said elements.
15. A method as claimed in claims 12 or 13, **characterized in that** the method comprises
 engraving a plastic body to generate said elements
16. A method as claimed in claims 12 or 13, **characterized in that** the method comprises
 providing an injection mould,
 injection moulding a plastic body by the injection mould to generate said elements.
17. A method as claimed in any of claims 12 to 16, **characterized by** obtaining the microscopic surface irregularities by lamination, laser-engraving, injection moulding, etching, or mechanical engraving.
18. A method as claimed in any of claims 12 to 17, **characterized by** obtaining the metal plate by laser-engraving, etching, or mechanical engraving.
19. A method as claimed in any of claims 12 to 18, **characterized by** obtaining the injection mould by laser-engraving, etching, or mechanical engraving.
20. A method as claimed in any of claims 17 to 19, **characterized in that** the method comprises using a spot size of about 1 μm to 50, preferably about 6 μm to 20 μm , of a laser beam.

21. A method as claimed in claim 20, **characterized in that** the spot has a TEM_{00} or TEM_{10} power distribution.

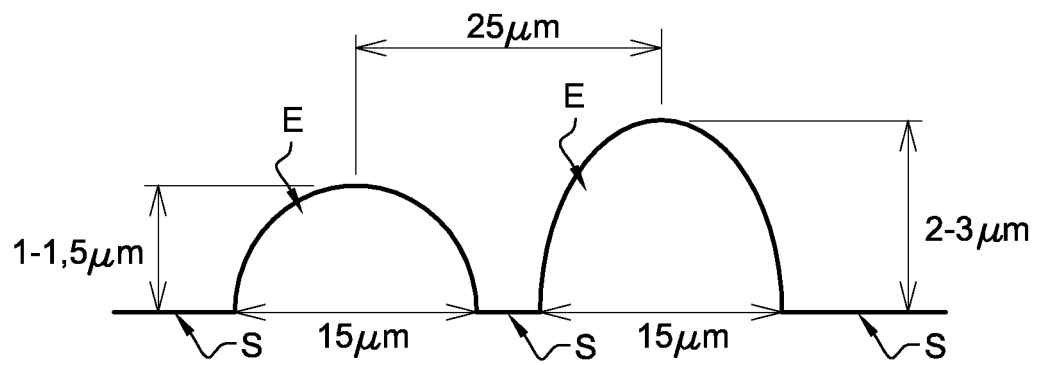


Fig. 1a

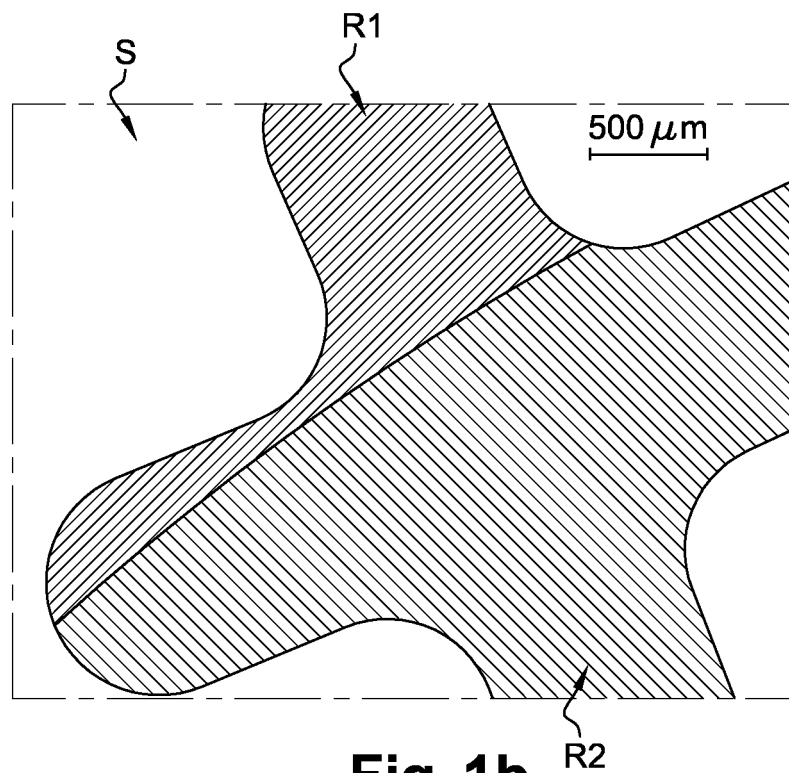
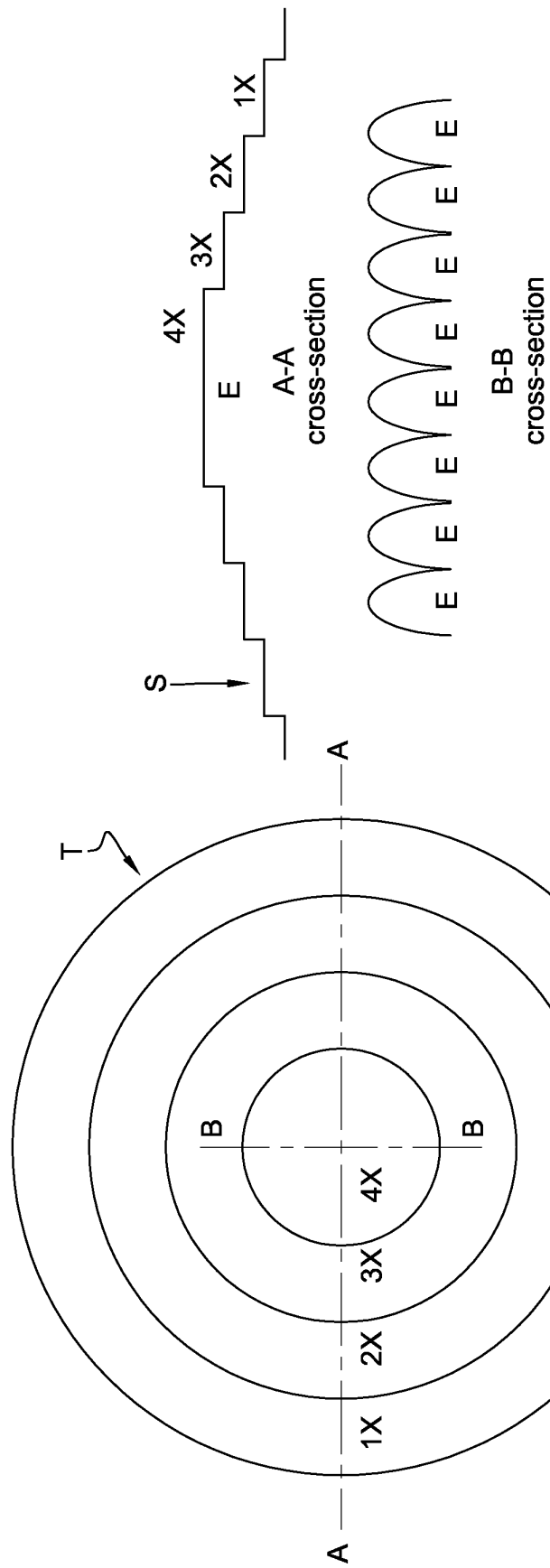


Fig. 1b



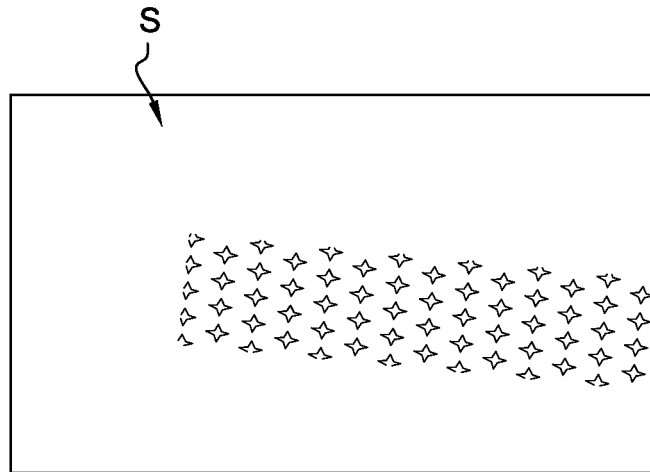


Fig. 3a

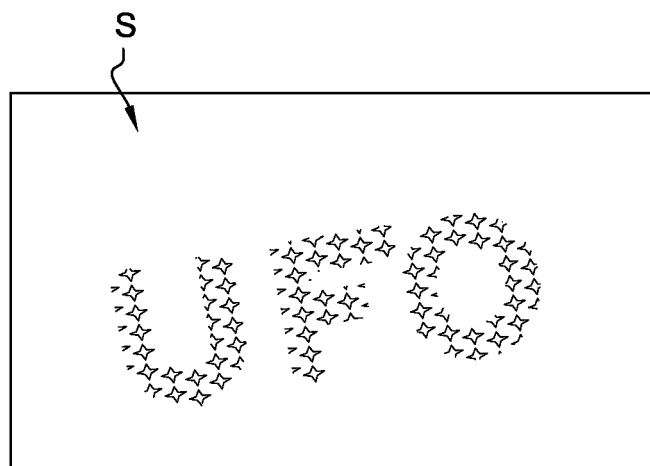


Fig. 3b

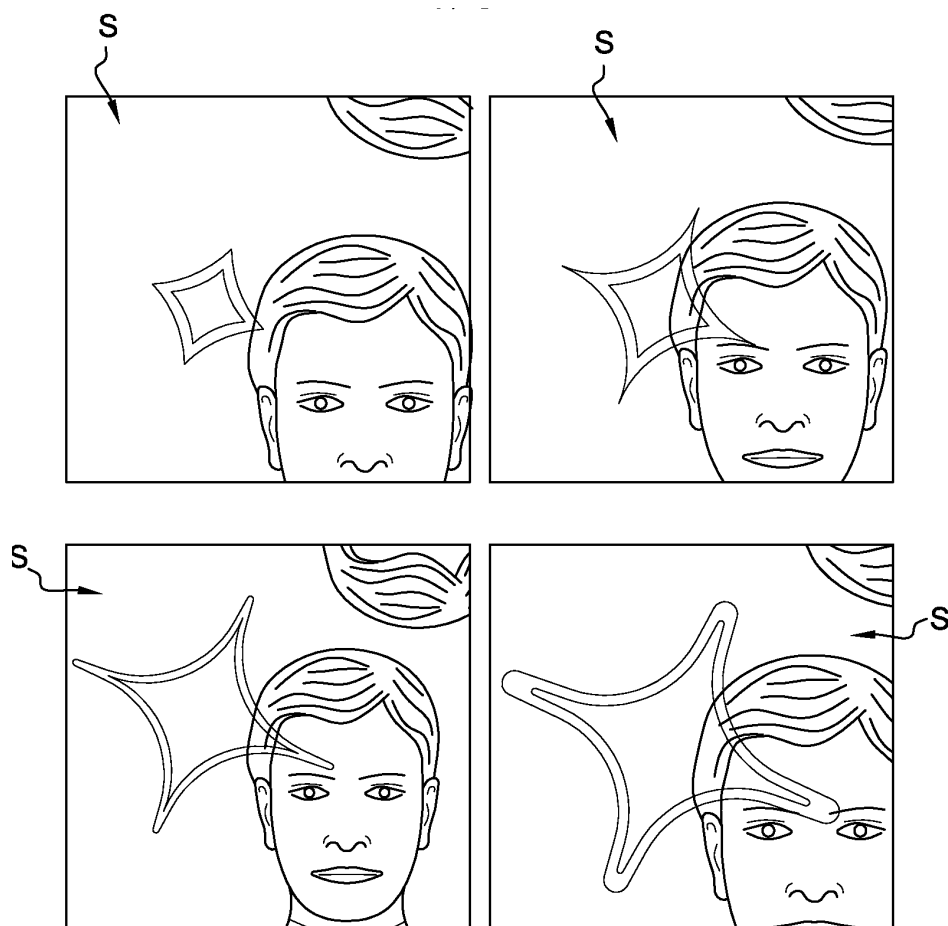


Fig. 4

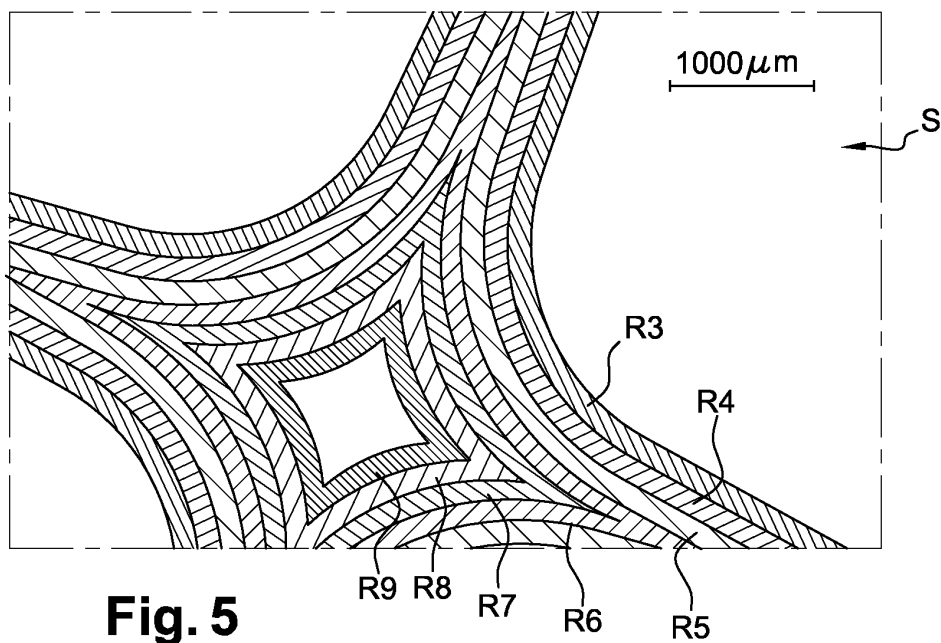


Fig. 5

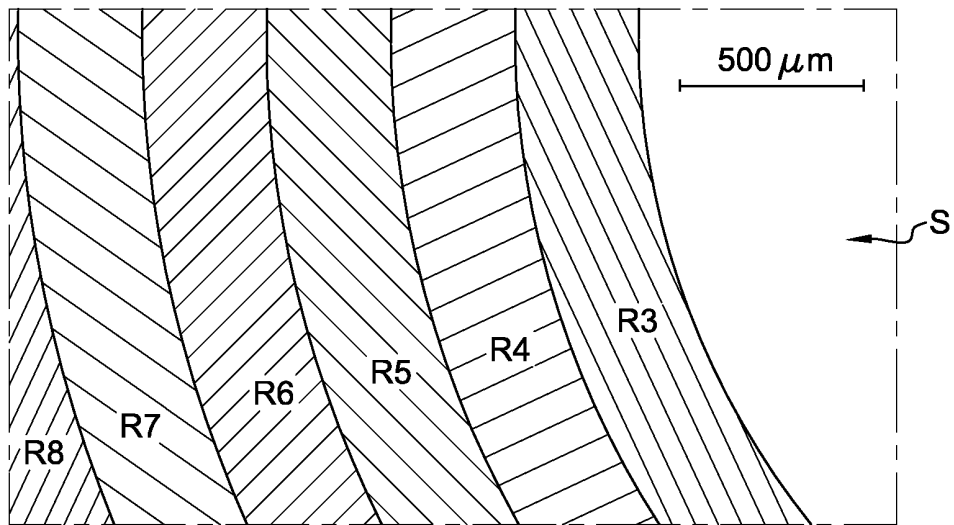


Fig. 6

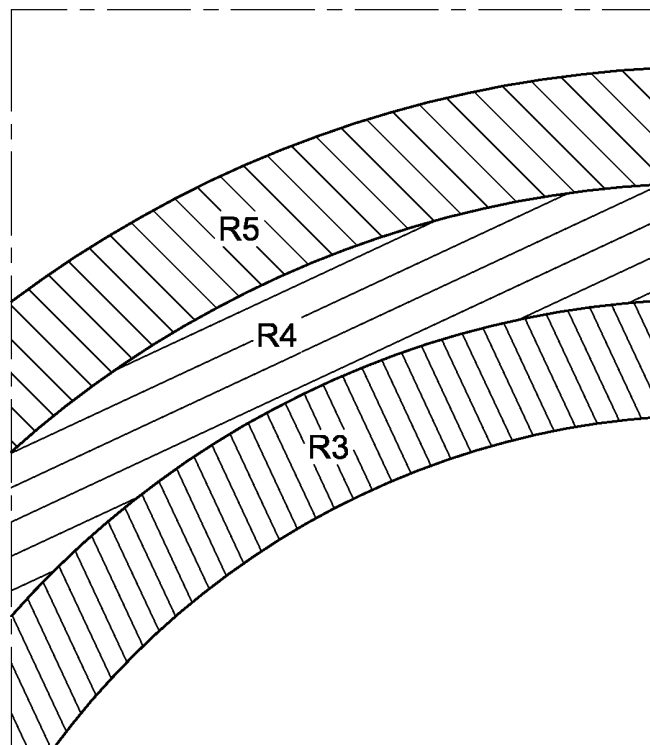


Fig. 7



EUROPEAN SEARCH REPORT

Application Number
EP 14 30 5470

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	US 2006/181077 A1 (KAULE WITTICH [DE] ET AL) 17 August 2006 (2006-08-17)	1,3-12, 14-21	INV. B42D25/00
Y	* figures 9,15 *	2,13	
Y	DE 10 2012 105571 A1 (OVD KINEGRAM AG [CH]) 2 January 2014 (2014-01-02)	2,13	
	* figures 9a,9b *		
			TECHNICAL FIELDS SEARCHED (IPC)
			B42D
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		1 December 2014	Langbroek, Arjen
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