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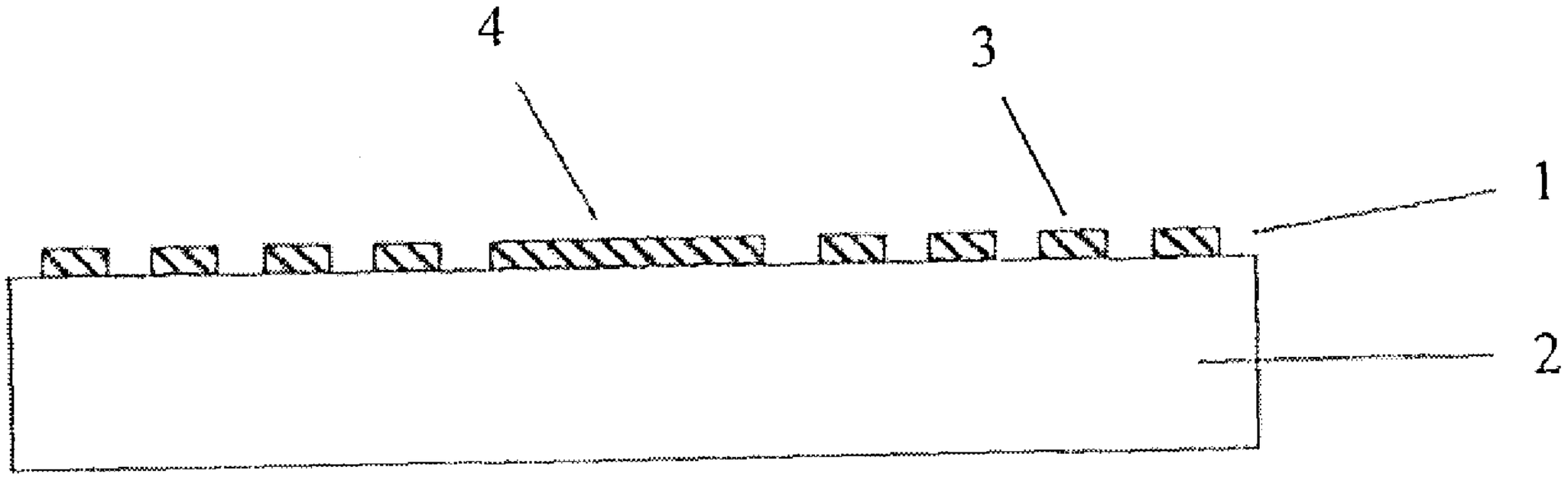
(72) **Inventeur/Inventor:**
HEIM, MANFRED, DE

(73) **Propriétaire/Owner:**
GIESECKE & DEVRIENT GMBH, DE

(74) **Agent:** R. WILLIAM WRAY & ASSOCIATES

(54) **Titre : ELEMENT DE SECURITE A COUCHE TRAMEE COMPOSEE D'ELEMENTS DE TRAME**
(54) **Title: SECURITY ELEMENT HAVING A SCREENED LAYER COMPOSED OF GRID ELEMENTS**




(57) **Abrégé/Abstract:**
The invention relates to a security element comprising at least one light- permeable substrate (2) on which a substantially opaque, rastered layer (1) of raster elements (3) is placed. According to the invention, at least one thin, continuous, substantially opaque line (4) that has the shape of at least one alphanumeric character, a graphic element, or a pattern is arranged within the substantially opaque, rastered layer of raster elements. Such lines have a minimum width of 0.1 to 5 mm, preferably 0.2 to 0.7 mm, even more preferably about 0.5 mm. Planar zones without recesses can also be used instead of lines such that the formed alphanumeric character, pattern, or graphic element is visible only in rear illumination but not in front illumination. The image displayed by the security element in front illumination is thus different from the image displayed in rear illumination, at least when viewed from the side of the substantially opaque, rastered layer.

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(71) Anmelder *(für alle Bestimmungsstaaten mit Ausnahme von US)*: **GIESECKE & DEVRIENT GMBH** [DE/DE]; Prinzregentenstrasse 159, 81677 München (DE).

(72) Erfinder; und
(75) Erfinder/Anmelder *(nur für US)*: **HEIM, Manfred** [DE/DE]; Auguste-Wittig Strasse 52, 83646 Bad Tölz (DE).

(74) Anwalt: **ZEUNER, Stefan**; Zeuner & Summerer, Hedwigstrasse 9, 80636 München (DE).

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**Erklärungen gemäß Regel 4.17**:

— *hinsichtlich der Berechtigung des Anmelders, ein Patent zu beantragen und zu erhalten (Regel 4.17 Ziffer ii)*

— *hinsichtlich der Berechtigung des Anmelders, die Priorität einer früheren Anmeldung zu beanspruchen (Regel 4.17 Ziffer iii)*

— *Erfindererklärung (Regel 4.17 Ziffer iv)*

**Veröffentlicht**:

— *mit internationalem Recherchenbericht (Artikel 21 Absatz 3)*

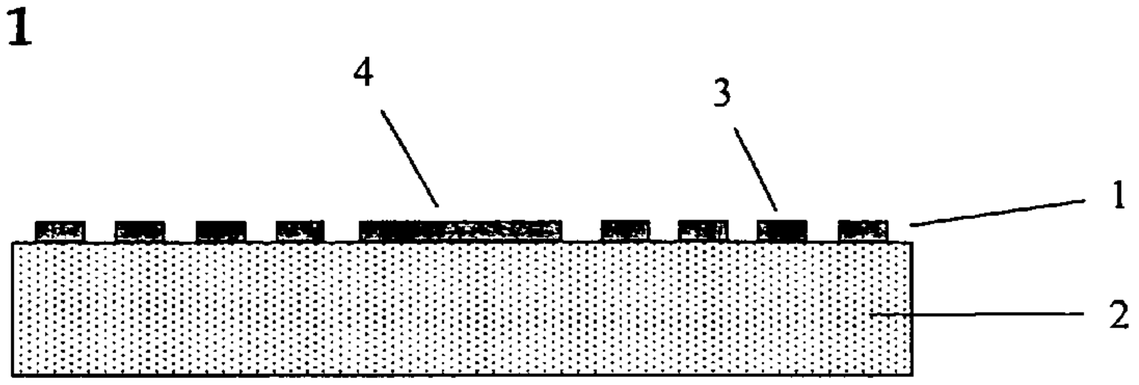
— *vor Ablauf der für Änderungen der Ansprüche geltenden Frist; Veröffentlichung wird wiederholt, falls Änderungen eingehen (Regel 48 Absatz 2 Buchstabe h)*

*[Fortsetzung auf der nächsten Seite]*

**(54) Title**: SECURITY ELEMENT COMPRISING A RASTERED LAYER ON A LIGHT-PERMEABLE SUBSTRATE

**(54) Bezeichnung** : SICHERHEITSELEMENT MIT GERASTERTER SCHICHT AUF EINEM LICHTDURCHLÄSSIGEN SUBSTRAT

**Fig. 1**




**(57) Abstract**: The invention relates to a security element comprising at least one light-permeable substrate (2) on which a substantially opaque, rastered layer (1) of raster elements (3) is placed. According to the invention, at least one thin, continuous, substantially opaque line (4) that has the shape of at least one alphanumeric character, a graphic element, or a pattern is arranged within the substantially opaque, rastered layer of raster elements. Such lines have a minimum width of 0.1 to 5 mm, preferably 0.2 to 0.7 mm, even more preferably about 0.5 mm. Planar zones without recesses can also be used instead of lines such that the formed alphanumeric character, pattern, or graphic element is visible only in rear illumination but not in front illumination. The image displayed by the security element in front illumination is thus different from the image displayed in rear illumination, at least when viewed from the side of the substantially opaque, rastered layer.

**(57) Zusammenfassung**: Die Erfindung betrifft ein Sicherheitselement aus mindestens einem lichtdurchlässigen Substrat (2), auf dem sich eine im Wesentlichen opake, gerasterte Schicht (1) aus Rasterelementen (3) befindet. Erfindungsgemäß ist innerhalb der im Wesentlichen opaken, gerasterten Schicht aus Rasterelementen mindestens eine dünne, durchgehende, im Wesentlichen opake Linie (4) angeordnet, die die Form mindestens eines alphanumerischen Zeichens,

*[Fortsetzung auf der nächsten Seite]*

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einer Graphik oder eines Musters aufweist. Solche Linien haben Linienbreiten von mindestens 0,1 mm bis 5 mm, vorzugsweise von 0,2 mm bis 0,7 mm, besonders bevorzugt von etwa 0,5 mm. Anstelle von Linien können auch flächenhafte Bereiche ohne Aussparung verwendet werden, so dass das gebildete alphanumerische Zeichen, Muster oder die Graphik lediglich in Durchlicht, nicht jedoch in Auflicht erkennbar ist. Das Sicherheitselement zeigt damit, mindestens von der Seite der im Wesentlichen opaken, gerasterten Schicht aus betrachtet, in Aufsicht ein anderes Erscheinungsbild als in Durchsicht.

# Security Element Having a Screened Layer Composed of Grid Elements

The present invention relates to a security element composed of at least one light-transmitting substrate on which a substantially opaque, screened layer composed of grid elements is located.

Security elements composed of at least one light-transmitting substrate on which a substantially opaque, screened layer composed of grid elements is located are known from the background art.

For example, from EP 1503907 A1 is known a thin-film element composed of a reflective, a dielectric and a partially transmissive or absorbing layer. Here, the absorbing layer is contiguously vapor deposited or imprinted and partially ablated again by means of ablation methods such as etching, laser ablation and spark erosion. Furthermore, a partial application of the partially transmissive layer is possible through vapor deposition with evaporation masks designed in the form of patterns. The partially transmissive layer thus consists of a substantially opaque, screened layer composed of grid elements.

From EP 1 415 828 A1 is known a security feature for a document, the security feature consisting of a first and a second pattern. Here, the first pattern is arranged on a first surface of the document and consists of a first sub-image and a first background pattern. The second pattern consists of a second sub-image and a second background pattern and is arranged on a second surface of the document that lies opposite the first surface. The first pattern and the second pattern produce a so-called see-through register: if the first pattern is aligned with the second pattern through the accordingly sufficiently transparent document, the first sub-image and the second sub-

image produce a complete image. In return, the complete image disappears when the first pattern is not aligned with the second pattern.

From EP 0 251 253 A2 is known a security document having a carrier and a hologram attached to the carrier. In addition, a display composed of liquid crystal can be located below the hologram.

This object of the present invention is to develop a generic security element in such a way that the protection vis-à-vis counterfeits is further increased.

According to the present invention, within the substantially opaque, screened layer composed of grid elements, at least one thin, solid, substantially opaque line is arranged that exhibits the form of at least one alphanumeric character, a graphic or a pattern. Such lines have line widths of at least 0.1 mm to 5 mm, preferably of 0.2 mm to 0.7 mm, particularly preferably about 0.5 mm. The thin, solid, substantially opaque line can also be formed by an extensive region without any gap.

The security element thus displays, at least when viewed from the side of the substantially opaque, screened layer, in top view, a different appearance than when looked through.

The security element according to the present invention is preferably applied on a data carrier having a light-transmitting, preferably translucent and particularly preferably transparent region. Here, the data carrier is especially

a value document, such as a banknote, a security paper, a credit or identification card, a passport, a certificate and the like, a label, packaging or another element for product protection. The light-transmitting region is, for example, a window in the form of a through opening that is covered by a light-transmitting, preferably translucent, particularly preferably transparent, foil. Thus, the security element according to the present invention is visible from both sides of the data carrier.

Here, transparent is understood to mean a transmittance of at least 90% of the impinging light, and translucent a transmittance of under 90%, preferably between 80% and 20%. Within the meaning of the present invention, a substantially opaque layer has a transmittance of less than 20%, preferably under 10% and particularly preferably about 0%.

The substantially opaque, screened layer preferably consists of a plurality of grid elements. Here, the grid elements are either gaps in the substantially opaque layer and thus form a kind of negative image, or they are substantially opaque, spaced apart basic pattern elements and thus form a kind of positive image.

Within the meaning of the present invention, viewing in reflected light is illuminating the security element from one side and viewing the security element from the same side. Thus, a viewing in reflected light occurs, for example, when the front of the security element is illuminated and also viewed.

Within the meaning of the present invention, viewing in transmitted light is illuminating a security element from one side and viewing the security element from another side, especially the opposing side. Thus, a viewing in

transmitted light occurs, for example, when the reverse of the security element is illuminated and the front of the security element is viewed. The light thus shines through the security element.

In a particularly preferred embodiment, the grid elements are arranged stochastically and/or in grid form. Within the meaning of the present invention, a grid is a uniform or non-uniform distribution of grid elements, the grid elements being spaced apart from one another.

Here, through continuous and location-dependent variation of the density or size of the grid elements, more complex patterns up to halftone images can be produced in transmitted light.

Here, the individual grid elements are executable in arbitrary shapes. If particular forms of the grid elements are chosen, then this can even constitute an additional security feature, for example grid elements in the form of a text or a micrographic.

The share of the total area of the plurality of grid elements with respect to the total surface area of the security element is 10% to 40%, preferably about 20%.

The substantially opaque, screened layer preferably consists of metal or of a printed layer.

If the substantially opaque, screened layer consists of metal, the surface of the substrate to which the grid elements are applied can, at least in sub-regions, be provided with embossed diffractive patterns or an embossing lacquer layer having diffractive patterns embossed in it. In this case, the

metallic grid elements reflect the impinging light such that the diffractive patterns form a hologram, subwavelength grating or blazed grating or a matte pattern.

Likewise, at least one translucent, liquid crystal layer can be applied over the substantially opaque, screened layer.

Furthermore, at least one optically variable thin-film layer consisting of at least one dielectric layer can be applied over the substantially opaque, screened layer. If the substantially opaque, screened layer composed of grid elements is developed as a reflective layer, the thin-film layer additionally exhibits at least one partially transmissive layer. If, in contrast, the substantially opaque, screened layer composed of grid elements is developed as a partially transmissive layer, the thin-film layer additionally exhibits at least one reflective layer. In both cases, the resulting thin-film layer thus consists of a reflective layer, a middle dielectric layer and a partially transmissive layer, and in addition, also the reflective layer or partially transmissive layer that lies opposite the grid elements can exhibit grid elements or gaps.

Especially the following are used as materials for the respective layers of the interference-capable thin-film layer:

- for the reflective layer, reflective substances, especially metals such as aluminum, silver or copper,
- for the dielectric layer, $SiO_2$ (silicon dioxide), $ZrO_2$ (zirconium dioxide), $MgF_2$ (magnesium difluoride) or $TiO_2$ (titanium dioxide) or other transparent substances, such as very thin and extremely uniformly imprinted transparent lacquers,

- for the partially transmissive layer, chrome and/or nickel, iron, silver, gold, or alloys thereof, such as Inconel™ (Ni-Cr-Fe).

Further materials for the respective layers of the interference-capable structure and especially their respective layer thicknesses are listed in publications WO 01/03945 A1, US 6,586,098 B1 and US 6,699,313 B2.

The individual layers of the security element can be imprinted and/or vapor deposited onto a substrate, for example by means of known printing methods or by means of vacuum deposition, such as sputtering, reactive sputtering, physical vapor deposition or chemical vapor deposition. Here, absorber materials, dielectrics and reflector materials are imprinted and/or vapor deposited onto the substrate in, in each case, stacked or overlapping layers.

The metals that may be used for the reflective and partially transmissive layer are required in very thin layers having layer thicknesses of about 5 nm to 100 nm. These layers are preferably applied by means of vacuum deposition, the relevant metal being heated up and evaporated, in a vacuum, by means of a heating device, for example a resistor or an electron beam. The metal then separates out as a thin layer on a foil moving past. For the application of the dielectric layer, having layer thicknesses between 100 nm and 1 µm, the various variants of the vacuum vapor deposition method are likewise appropriate. To produce uniform colors, it is necessary here to keep the layer thickness extremely uniform, which especially sputtering or also well controlled thermal or electron beam vapor deposition methods provide. Alternatively, the transparent dielectric can also be applied in the form of a

transparent ink by means of a printing method. Here, however, extreme care is necessary in the coating process to ensure the required layer thickness uniformity, with a tolerance of, for example, ± 2%.

For the patterning or demetalization of the layers, advantageously the known methods such as washing processes, etching, oil ablation, lift-off or laser demetalization are used.

For the sake of better comprehensibility, the illustrations in the following figures are highly schematized and do not reflect the real conditions. Especially the proportions shown in the figures do not correspond to the actual ratios and serve solely to improve clarity. Furthermore, for the sake of better comprehensibility, the embodiments described in the following examples are reduced to the essential core information. In practical implementation, significantly more complex patterns or images can be used.

Specifically, the figures depict schematically:

Fig. 1 a security element according to the present invention, composed of at least one light-transmitting substrate on which a substantially opaque, screened layer composed of grid elements and a thin, solid, substantially opaque line is located, in side view,

Fig. 2 the inventive security element from fig. 1, in top view, with the thin, solid, substantially opaque line forming a five-pointed star,

Fig. 3 the inventive security element from fig. 1, that, together with two further layers that are applied to the substantially opaque, screened

layer composed of grid elements, forms an optically variable thin-film layer, in side view,

Fig. 4 a security element according to the present invention, in which, on a substrate, an embossing lacquer having an embossing pattern is applied on which the substantially opaque, screened layer composed of grid elements and a thin, solid, substantially opaque line are located, in side view.

Fig. 1 shows an inventive security element composed of at least one light-transmitting substrate 2 on which a substantially opaque, screened layer 1 composed of grid elements 3 and a thin, solid, substantially opaque line 4 is located, in side view.

The grid elements 3 are executed to be circular and/or line-shaped, the circular gaps exhibiting a diameter of 10 micrometers to 100 micrometers, preferably of 30 micrometers to 50 micrometers, and the line-shaped gaps a width of 30 micrometers to 70 micrometers.

Fig. 2 shows the inventive structure pursuant to fig. 1 in transmitted light, viewed from the side of the reflective layer 3. Within the grid elements 3 is located a thin, solid line 4 in the form of a five-pointed star. This line exhibits a width of 0.1 mm to 5 mm, such that the line is sufficiently conspicuous in transmitted light. In reflected light, it is not perceptible for a viewer, nearly independently of its line width. Thus, in transmitted light, the viewer sees the star, and in reflected light, no star.

Fig. 3 shows the inventive security element from fig. 1, that, together with two further layers 5 and 6 that are applied to the grid elements 3 and the line

4, forms an optically variable thin-film layer. Here, the layer 5 forms a dielectric layer. The layer 6 and the grid elements 3 together with the line 4 form the reflective layer or the partially transmissive layer.

The layer 6 is executed to be either contiguous or, additionally, as depicted in fig. 3, composed of grid elements in the region 7.

The security element according to the present invention is particularly advantageously combined with known optically active micropatterns, such as diffractive embossed holograms, zero-order gratings, refractive micropatterns, such as blazed gratings and the like.

Fig. 4 shows an example of such a combination with an embossed hologram. On the substrate 2 is applied an embossing lacquer 8 having an embossing pattern. On the embossing lacquer 8 is located the substantially opaque, screened layer 1 composed of grid elements 3 together with the thin, solid, substantially opaque line 4.

# Claims

1. A security element composed of at least one light-transmitting substrate (2) on which a substantially opaque, screened layer (1) composed of grid elements (3) is located, characterized in that, within the substantially opaque, screened layer (1), at least one thin, solid, substantially opaque line (4) in the form of at least one alphanumeric character, a graphic or a pattern is arranged, and the security element, at least when viewed from the side of the substantially opaque, screened layer (1), in top view, displays a different appearance than when looked through.

2. The security element according to claim 1, characterized in that the thin, solid, substantially opaque line (4) exhibits a width of 0.1 mm to 5 mm.

3. The security element according to claim 1, characterized in that the thin, solid, substantially opaque line (4) exhibits a width of 0.2 mm to 0.7 mm.

4. The security element according to claim 1, characterized in that the thin, solid, substantially opaque line (4) exhibits a width of 0.5 mm.

5. The security element according to claim 1, characterized in that the thin, solid, substantially opaque line (4) is formed by an extensive region without any gap.

6. The security element according to any one of claims 1 to 5, characterized in that the substantially opaque, screened layer (1) consists of a plurality of grid elements (3), and the grid elements

- are gaps in the substantially opaque layer (1) or
- are substantially opaque, spaced apart basic pattern elements.

7. The security element according to claim 6, characterized in that the grid elements (3) can have an arbitrary form and be arranged stochastically.

8. The security element according to claim 6, characterized in that the grid elements (3) can have an arbitrary form and be arranged in grid form.

9. The security element according to claim 6, characterized in that the grid elements (3) can have an arbitrary form and vary locally in their diameter or their separation from one another.

10. The security element according to any one of claims 7, 8 or 9, characterized in that the grid elements (3) are executed to be circular and circular grid elements (3) exhibit a diameter of 10 micrometers to 100 micrometers.

11. The security element according to any one of claims 7, 8 or 9, characterized in that the grid elements (3) are executed to be circular and circular grid elements (3) exhibit a diameter of 30 micrometers to 50 micrometers.

12. The security element according to any one of claims 7, 8 or 9, characterized in that the grid elements (3) are executed to be line-shaped and line-shaped grid elements (3) exhibit a width of 30 micrometers to 70 micrometers.

13. The security element according to any one of claims 1 to 12, characterized in that the share of the total area of the grid elements (3) with respect to the total surface area of the security element is 10% to 40%.

14. The security element according to any one of claims 1 to 13, characterized in that the share of the total area of the grid elements (3) with respect to the total surface area of the security element is 20%.

15. The security element according to any one of claims 1 to 14, characterized in that the substantially opaque, screened layer (1) consists of metal.

16. The security element according to any one of claims 1 to 15, characterized in that over the substantially opaque, screened layer (1) is applied at least one optically variable thin-film layer consisting of at least one dielectric layer (5) and at least one partially transmissive or reflective layer (6).

17. The security element according to any one of claims 1 to 15, characterized in that over the substantially opaque, screened layer (1) is applied at least one light-transmitting, liquid crystal layer.

18. The security element according to claim 15, characterized in that the surface of the substrate to which the substantially opaque, screened layer (1) composed of grid elements (3) is applied exhibits, at least in sub-regions, embossed diffractive patterns or an embossing lacquer layer (8) having diffractive patterns embossed in it.

19. A method for manufacturing a security element according to any one of claims 1 to 18, characterized in that the grid elements (3) are imprinted or vapor deposited on the light-transmitting substrate (2) or are produced by demetalization from a layer that, at least in sub-regions, is contiguously vapor deposited on the substrate (2).

20. The method according to claim 19, characterized in that the vapor deposition of the grid elements (3) occurs by means of vacuum deposition.

21. The method according to claim 19, characterized in that the vapor deposition of the grid elements (3) occurs by means of sputtering, reactive sputtering, physical vapor deposition or chemical vapor deposition.

22. The method according to any one of claims 19, 20 or 21, characterized in that the demetalization occurs by means of washing processes, etching, oil ablation, lift-off or laser demetalization.

Fig. 1

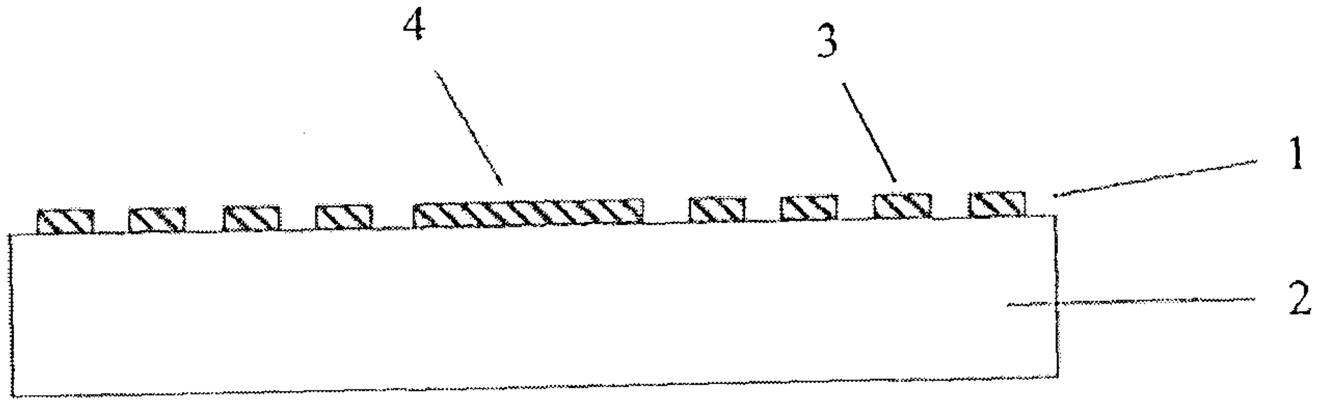



Fig. 2

Fig. 3

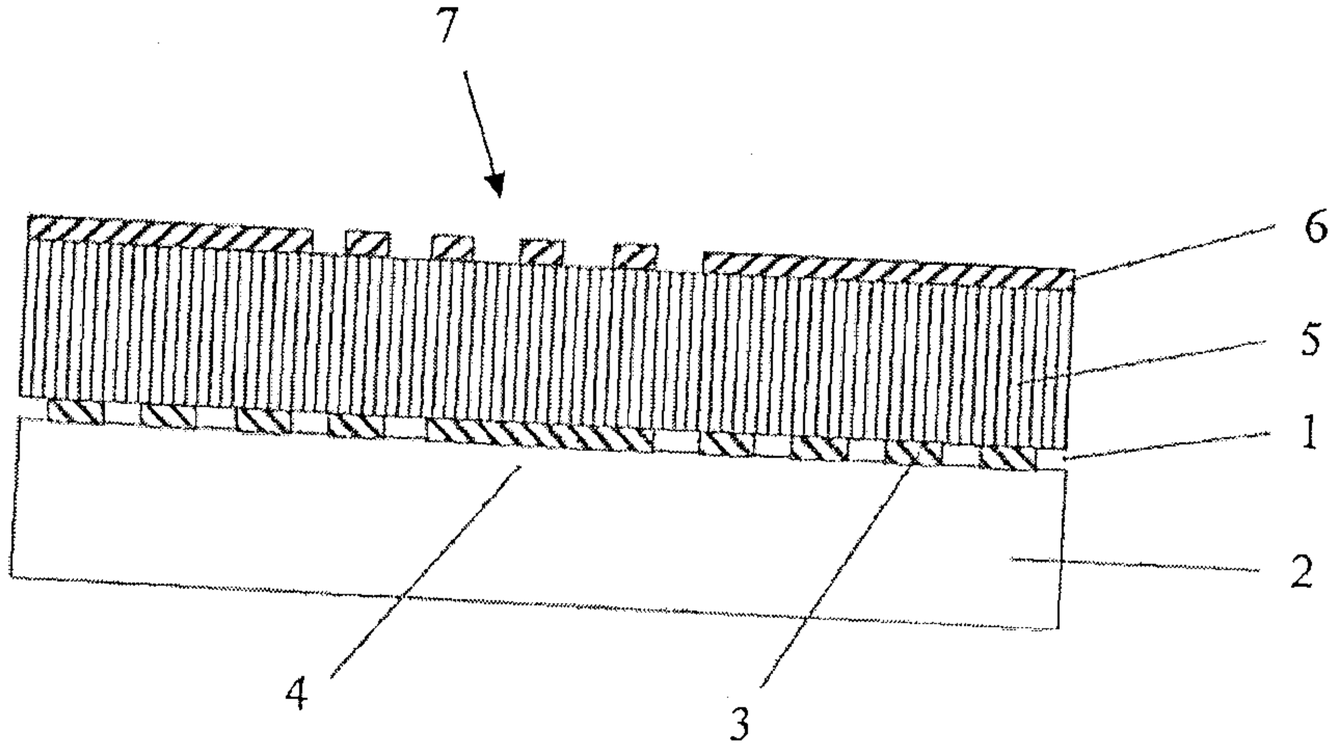
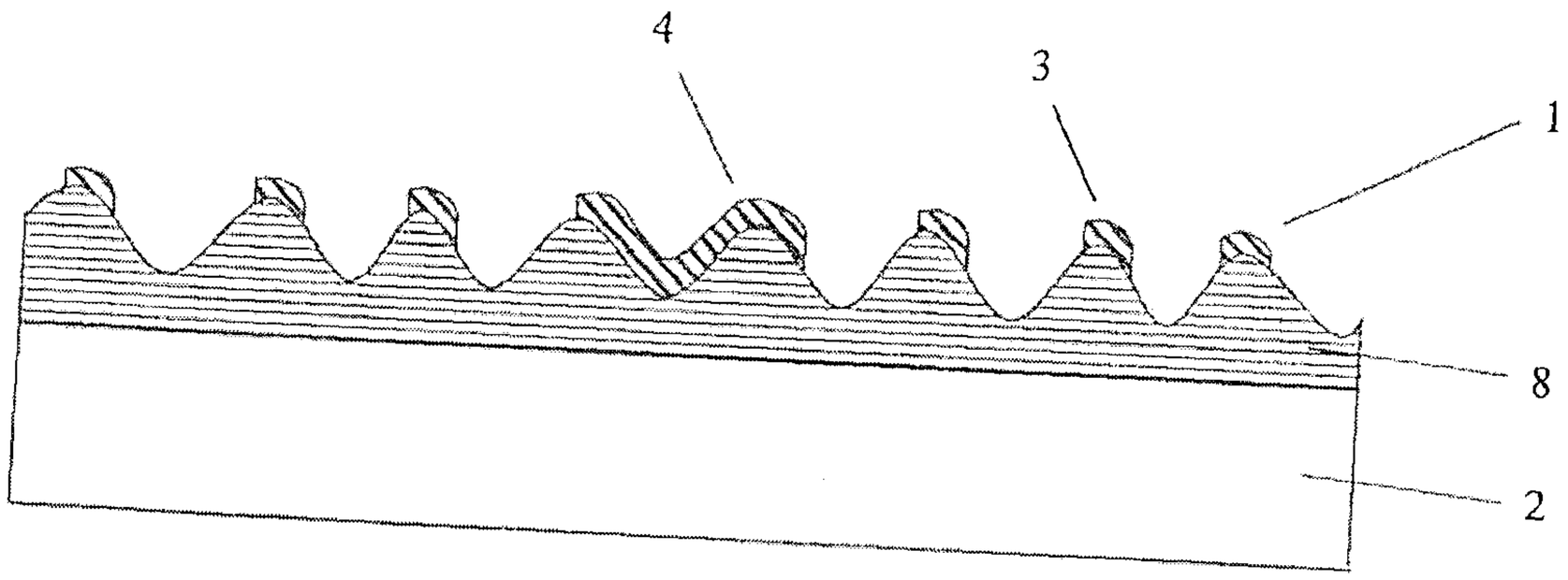
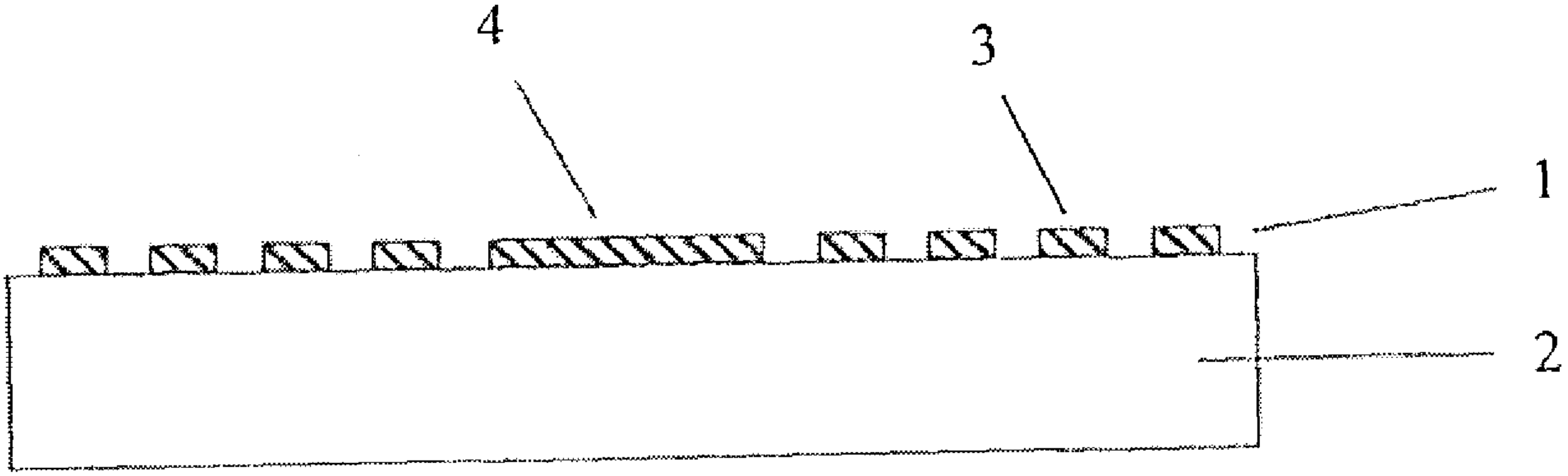



Fig. 4

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