Claims

1. A security element (10) for a security document (100), wherein the security element (10) comprises

- a substrate (9) with a surface (O),

- at least a first, a second, a third and a fourth pattern (M1, M2, M3, M4) with a first, a second, a third and a fourth pattern angle (phi1, phi2, phi3, phi4), each pattern (M1, M2, M3, M4) comprising an embossed structure (P1, P2, P3, P4) on the substrate (9), wherein the embossed structures (P1, P2, P3, P4) are ~~structured~~ designed such that when the substrate surface (O) is viewed straight on, the patterns (M1, M2, M3, M4) are visible and when the substrate surface (O) is viewed at an oblique angle from at least one predetermined viewing direction, at least a part of at least one of the patterns (M1, M2, M3, M4) is occluded by at least a part of at least one of the embossed structures (P1, P2, P3, P4) such that a visual latent image effect occurs when the viewing of the substrate surface (O) is changed between straight on and oblique,

- a first security information item (I1) configured as a first localized distribution of the first and second patterns (M1, M2), the first distribution comprising a first area (B1) and a second area (B2) of the substrate (9), wherein the first pattern (M1) is disposed in at least part of the first area (B1) and wherein the second pattern (M2) is disposed in at least part of the second area (B2), ~~and~~

- a second security information item (I2) configured as a second localized distribution of the third and fourth patterns (M3, M4), the second distribution comprising a third area (B3) and a fourth area (B4) of the substrate (9), wherein the third pattern (M3) is disposed in at least part of the third area (B3)

and wherein the fourth pattern (M4) is disposed in at least part of the fourth area (B4),

~~characterized in that~~wherein the first security information item (I1) and the second security information item (I2) are arranged at least partially overlapping,

wherein the security element (10) further comprises~~ing~~:

- first grid cells (RZ1), wherein the first pattern (M1) and the second pattern (M2) are exclusively arranged in the first grid cells (RZ1), and

- second grid cells (RZ2), wherein the third pattern (M3) and the fourth pattern (M4) are exclusively arranged in the second grid cells (RZ2),

wherein the first grid cells (RZ1) and the second grid cells (RZ2) are arranged next to one another in a non-overlapping fashion on the substrate (9),

wherein the first grid cells (RZ1) and the second grid cells (RZ2) are arranged in a first and in a second direction (99,98) parallel to the substrate (9) on at least a part of the substrate (9) in a mutually alternating fashion,

wherein the first grid cells (RZ1) and the second grid cells (RZ2) each comprise first grid cell types (RZA) and second grid cell types (RZB), and

wherein the first grid cell types (RZA) are designed such that they surround the second grid cell types (RZB).

2. The security element (10) according to claim 1, wherein the first area (B1) and the third area (B3) are designed to be at least partially overlapping and/or wherein the second area (B2) and the fourth area (B4) are designed to be at least partially overlapping.

3. The security element (10) according to one of the preceding claims, wherein at least one of the

patterns (M1, M2, M3, M4) further comprises a grid (R1, R2, R3, R4), in particular a printed grid (R1, R2, R3, R4), with at least one dye that contrasts with the substrate (9).

4. The security element (10) according to claim 3, wherein at least one of the grids (R1, R2, R3, R4) comprises at least two dyes which contrast with the substrate (9) and with one another.

5. The security element (10) according to ~~one of~~ claim~~s~~ 3 or 4, wherein at least one of the grids (R1, R2, R3, R4), in particular all grids (R1, R2, R3, R4), is disposed on one side, in particular predominantly on one side, in particular exclusively on one side of the embossed structure (P1, P2, P3, P4) associated with the respective grid (R1, R2, R3, R4).

6. The security element (10) according to one of the preceding claims, wherein at least one of the patterns (M1, M2, M3, M4) is designed such that it has a linear shape at least in areas.

~~7. The security element (10) according to one of the preceding claims, further comprising first grid cells (RZ1),~~

~~wherein the first pattern (M1) and the second pattern (M2) are arranged in the first grid cells (RZ1), and~~

~~in particular wherein the first pattern (M1) and the second pattern (M2) are exclusively arranged in the first grid cells (RZ1).~~

~~8. The security element (10) according to one of the preceding claims, further comprising second grid cells (RZ2),~~

~~wherein the third pattern (M3) and the fourth pattern (M4) are arranged in the second grid cells (RZ2), and~~

~~in particular wherein the third pattern (M3) and the fourth pattern (M4) are exclusively arranged in the second grid cells (RZ2).~~

~~9. The security feature element (10) according to claims 7 and 8, wherein the first grid cells (RZ1) and the second grid cells (RZ2) are arranged next to one another in a non-overlapping fashion on the substrate (9).~~

~~10. The security feature element (10) according to claim 9, wherein the first grid cells (RZ1) and the second grid cells (RZ2) are arranged at least in a first direction (99) parallel to the substrate (9), in particular in a first and a second direction (99, 98) parallel to the substrate (9), on at least a part of the substrate (9) in a mutually alternating fashion.~~

~~11~~7. The security element (10) according to one of the preceding claims ~~9 or 10~~, wherein the first grid cells (RZ1) and the second grid cells (RZ2) are arranged on the substrate (9) in a periodically-repeating fashion, at least on part of the substrate (9), ~~parallel to the substrate (9) at least in a first direction (99), in particular~~ parallel to the substrate (9) in a first and a second direction (99, 98).

~~12. The security element (10) according to one of claims 9 through 11, wherein at least the first grid cells (RZ1) and the second grid cells (RZ2) comprise first grid cell types (RZA) and second grid cell types (RZB), respectively, wherein the first grid cell types (RZA) are designed such that they surround the second grid cell types (RZB).~~

~~13~~8. The security element ~~(10)~~ according to one of the preceding ~~one of~~ claims ~~9 through 12~~, wherein the first and the second grid cells (RZ1, RZ2) are designed such that a total area covered by the first grid cells (RZ1) is from 50 to 150%, in particular from 70% to 130%, in particular from 98% to 102% of a total area covered by the second grid cells (RZ2).

~~14~~9. The security element (10) according to one of the preceding claims, wherein a pattern width of the first, second, third and/or the fourth pattern (M1, M2, M3, M4) is between 30 and 60 lines per centimeter, in particular between 40 and 60 lines per centimeter, in particular between 48 and 52 lines per centimeter.

~~15~~10. The security element (10) according to one of the preceding claims, wherein an angle difference between the first and the second pattern angle (phi1, phi2), between the second and the third pattern angle (phi2, phi3) and between the third and the fourth pattern angle (phi3, phi4) is at least 15°.

~~16~~11. The security element (10) according to claim ~~15~~10, wherein an angle difference between the first and the second pattern angle (phi1, phi2) and between the third and the fourth pattern angle (phi3, phi4) is 90° and wherein an angle difference between the second and the third pattern angle (phi2, phi3) is 45°.

~~17~~12. The security element (10) according to one of the preceding claims, further comprising a third security information item (I3), wherein the third security information item (I3) is designed as a localized variation of at least the first, the second, the third or the fourth pattern (M1, M2, M3, M4), in particular of the first and the second pattern (M1, M2).

~~18~~13. The security element (10) according to claim ~~17~~12, wherein the variation of the pattern (M1, M2, M3, M4) is designed as a modulation of a pattern parameter, in particular a modulation of a line width and/or an embossed structure depth.

~~19~~14. The security element (10) according to one of the preceding claims, further comprising a fifth pattern (M5) and a fourth security information item (I4), which is configured as a combination of the fifth pattern (M5) with at least one pattern (M1, M2, M3, M4) from the group consisting of the first, the second, the third and the fourth pattern (M1, M2, M3, M4).

15. The security element according to one of claims 1 to 14, wherein for each pair of a first and a second grid cell (RZ1, RZ2), the pair comprising a first grid cell type (RZA) and a second grid cell type (RZB) being surrounded by the first grid cell type (RZA), either

- the first pattern (M1) and the second pattern (M2) are arranged exclusively in the first grid cell type (RZA) and the third pattern (M3) and the fourth pattern (M4) are arranged exclusively in the second grid cell type (RZB) or

- the first pattern (M1) and the second pattern (M2) are arranged exclusively in the second grid cell type (RZB) and the third pattern (M3) and the fourth pattern (M4) are arranged exclusively in the first grid cell type (RZA).

~~20~~16. A security document (10) comprising a security element (1) according to one of the preceding claims.

~~21~~17. A method for producing a security element (1) according to one of claims 1 to ~~19~~15, comprising the following steps:

- applying a first pattern (M1) at a first pattern angle (phi1), including a first embossed structure (P1), onto at least part of a first area (B1) of a substrate (9),

- applying a second pattern (M2) at a second pattern angle (phi2), including a second embossed structure (P2), onto at least part of a second area (B2) of a substrate (9),

- applying a third pattern (M3) at a third pattern angle (phi3), including a third embossed structure (P3), onto at least part of a third area (B3) of a substrate (9),

- applying a fourth pattern (M4) at a fourth pattern angle (phi4), including a fourth embossed structure (P4), onto at least part of a fourth area (B4) of a substrate (9).

~~22~~18. The method according to claim ~~21~~17, further comprising the following step:

- applying a first, a second, a third and/or a fourth grid (R1, R2, R3, R4), each of which is associated with one of the patterns (M1, M2, M3, M4), onto the substrate (9).

~~23~~19. A method for examining the authenticity of a security document (10) according to claim ~~20—~~16 comprising a security element (1) according to one of claims 1 to ~~19~~15, the method comprising the following steps:

- viewing the security document (10) from a first viewing direction (A) and comparing a first viewed intensity distribution with a first template,

- viewing the security document (10) from a second viewing direction (B) and comparing a second viewed intensity distribution with a second template,

- using the first and the second viewed intensity distributions~~,~~ for classifying the security document (10) as authentic or inauthentic.

Claims

1. A security element (10) for a security document (100), wherein the security element (10) comprises

- a substrate (9) with a surface (O),

- at least a first, a second, a third and a fourth pattern (M1, M2, M3, M4) with a first, a second, a third and a fourth pattern angle (phi1, phi2, phi3, phi4), each pattern (M1, M2, M3, M4) comprising an embossed structure (P1, P2, P3, P4) on the substrate (9), wherein the embossed structures (P1, P2, P3, P4) are designed such that when the substrate surface (O) is viewed straight on, the patterns (M1, M2, M3, M4) are visible and when the substrate surface (O) is viewed at an oblique angle from at least one predetermined viewing direction, at least a part of at least one of the patterns (M1, M2, M3, M4) is occluded by at least a part of at least one of the embossed structures (P1, P2, P3, P4) such that a visual latent image effect occurs when the viewing of the substrate surface (O) is changed between straight on and oblique,

- a first security information item (I1) configured as a first localized distribution of the first and second patterns (M1, M2), the first distribution comprising a first area (B1) and a second area (B2) of the substrate (9), wherein the first pattern (M1) is disposed in at least part of the first area (B1) and wherein the second pattern (M2) is disposed in at least part of the second area (B2),

- a second security information item (I2) configured as a second localized distribution of the third and fourth patterns (M3, M4), the second distribution comprising a third area (B3) and a fourth area (B4) of the substrate (9), wherein the third pattern (M3) is disposed in at least part of the third area (B3)

and wherein the fourth pattern (M4) is disposed in at least part of the fourth area (B4),

wherein the first security information item (I1) and the second security information item (I2) are arranged at least partially overlapping,

wherein the security element (10) further comprises:

- first grid cells (RZ1), wherein the first pattern (M1) and the second pattern (M2) are exclusively arranged in the first grid cells (RZ1), and

- second grid cells (RZ2), wherein the third pattern (M3) and the fourth pattern (M4) are exclusively arranged in the second grid cells (RZ2),

wherein the first grid cells (RZ1) and the second grid cells (RZ2) are arranged next to one another in a non-overlapping fashion on the substrate (9),

wherein the first grid cells (RZ1) and the second grid cells (RZ2) are arranged in a first and in a second direction (99,98) parallel to the substrate (9) on at least a part of the substrate (9) in a mutually alternating fashion,

wherein the first grid cells (RZ1) and the second grid cells (RZ2) each comprise first grid cell types (RZA) and second grid cell types (RZB), and

wherein the first grid cell types (RZA) are designed such that they surround the second grid cell types (RZB).

2. The security element (10) according to claim 1, wherein the first area (B1) and the third area (B3) are designed to be at least partially overlapping and/or wherein the second area (B2) and the fourth area (B4) are designed to be at least partially overlapping.

3. The security element (10) according to one of the preceding claims, wherein at least one of the patterns (M1, M2, M3, M4) further comprises a grid (R1,

R2, R3, R4), in particular a printed grid (R1, R2, R3, R4), with at least one dye that contrasts with the substrate (9).

4. The security element (10) according to claim 3, wherein at least one of the grids (R1, R2, R3, R4) comprises at least two dyes which contrast with the substrate (9) and with one another.

5. The security element (10) according to claim 3 or 4, wherein at least one of the grids (R1, R2, R3, R4), in particular all grids (R1, R2, R3, R4), is disposed on one side, in particular predominantly on one side, in particular exclusively on one side of the embossed structure (P1, P2, P3, P4) associated with the respective grid (R1, R2, R3, R4).

6. The security element (10) according to one of the preceding claims, wherein at least one of the patterns (M1, M2, M3, M4) is designed such that it has a linear shape at least in areas.

7. The security element (10) according to one of the preceding claims, wherein the first grid cells (RZ1) and the second grid cells (RZ2) are arranged on the substrate (9) in a periodically-repeating fashion, at least on part of the substrate (9), parallel to the substrate (9) in a first and a second direction (99, 98).

8. The security element according to one of the preceding claims, wherein the first and the second grid cells (RZ1, RZ2) are designed such that a total area covered by the first grid cells (RZ1) is from 50 to 150%, in particular from 70% to 130%, in particular from 98% to 102% of a total area covered by the second grid cells (RZ2).

9. The security element (10) according to one of the preceding claims, wherein a pattern width of the first, second, third and/or the fourth pattern (M1, M2, M3, M4) is between 30 and 60 lines per centimeter, in particular between 40 and 60 lines per centimeter, in particular between 48 and 52 lines per centimeter.

10. The security element (10) according to one of the preceding claims, wherein an angle difference between the first and the second pattern angle (phi1, phi2), between the second and the third pattern angle (phi2, phi3) and between the third and the fourth pattern angle (phi3, phi4) is at least 15°.

11. The security element (10) according to claim 10, wherein an angle difference between the first and the second pattern angle (phi1, phi2) and between the third and the fourth pattern angle (phi3, phi4) is 90° and wherein an angle difference between the second and the third pattern angle (phi2, phi3) is 45°.

12. The security element (10) according to one of the preceding claims, further comprising a third security information item (I3), wherein the third security information item (I3) is designed as a localized variation of at least the first, the second, the third or the fourth pattern (M1, M2, M3, M4), in particular of the first and the second pattern (M1, M2).

13. The security element (10) according to claim 12, wherein the variation of the pattern (M1, M2, M3, M4) is designed as a modulation of a pattern parameter, in particular a modulation of a line width and/or an embossed structure depth.

14. The security element (10) according to one of the preceding claims, further comprising a fifth

pattern (M5) and a fourth security information item (I4), which is configured as a combination of the fifth pattern (M5) with at least one pattern (M1, M2, M3, M4) from the group consisting of the first, the second, the third and the fourth pattern (M1, M2, M3, M4).

15. The security element according to one of claims 1 to 14, wherein for each pair of a first and a second grid cell (RZ1, RZ2), the pair comprising a first grid cell type (RZA) and a second grid cell type (RZB) being surrounded by the first grid cell type (RZA), either

- the first pattern (M1) and the second pattern (M2) are arranged exclusively in the first grid cell type (RZA) and the third pattern (M3) and the fourth pattern (M4) are arranged exclusively in the second grid cell type (RZB) or

- the first pattern (M1) and the second pattern (M2) are arranged exclusively in the second grid cell type (RZB) and the third pattern (M3) and the fourth pattern (M4) are arranged exclusively in the first grid cell type (RZA).

16. A security document (10) comprising a security element (1) according to one of the preceding claims.

17. A method for producing a security element (1) according to one of claims 1 to 15, comprising the following steps:

- applying a first pattern (M1) at a first pattern angle (phi1), including a first embossed structure (P1), onto at least part of a first area (B1) of a substrate (9),

- applying a second pattern (M2) at a second pattern angle (phi2), including a second embossed

structure (P2), onto at least part of a second area (B2) of a substrate (9),

- applying a third pattern (M3) at a third pattern angle (phi3), including a third embossed structure (P3), onto at least part of a third area (B3) of a substrate (9),

- applying a fourth pattern (M4) at a fourth pattern angle (phi4), including a fourth embossed structure (P4), onto at least part of a fourth area (B4) of a substrate (9).

18. The method according to claim 17, further comprising the following step:

- applying a first, a second, a third and/or a fourth grid (R1, R2, R3, R4), each of which is associated with one of the patterns (M1, M2, M3, M4), onto the substrate (9).

19. A method for examining the authenticity of a security document (10) according to claim 16 comprising a security element (1) according to one of claims 1 to 15, the method comprising the following steps:

- viewing the security document (10) from a first viewing direction (A) and comparing a first viewed intensity distribution with a first template,

- viewing the security document (10) from a second viewing direction (B) and comparing a second viewed intensity distribution with a second template,

- using the first and the second viewed intensity distributions for classifying the security document (10) as authentic or inauthentic.