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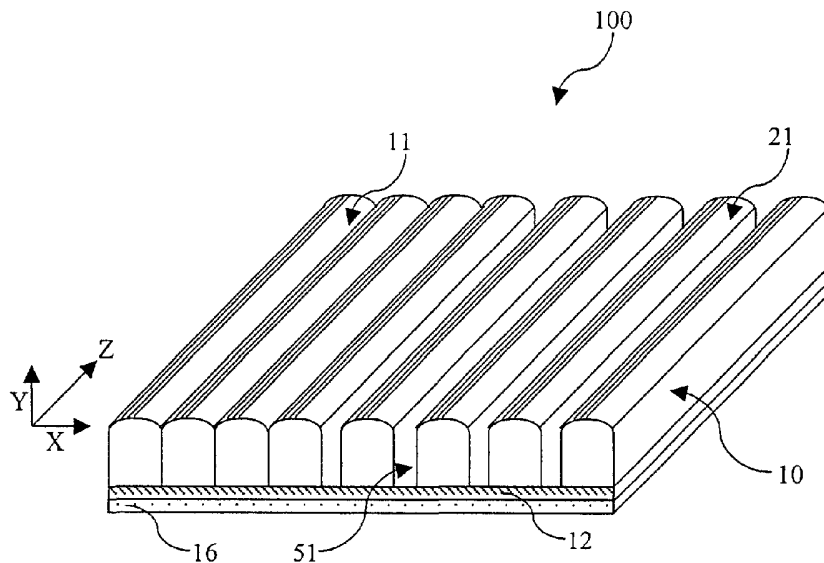
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(54) Title: TAMPERPROOF AND COUNTERFEIT-RESISTANT STRUCTURE



(57) Abstract: A tamperproof structure (100) includes an information-containing structure (12) and a transparent structure (10). The transparent structure includes a first plurality of lenticules (11) and a second plurality of lenticules (21), both formed on an outer surface of the transparent structure. The first plurality of lenticules are non-parallel and/or non-uniform, with respect to the second plurality of lenticules. The information-containing structure includes information to be viewed through the transparent structure.



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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Tamperproof and Counterfeit-Resistant Structure

Field of the Invention

The present invention relates in general to tamperproof and counterfeit-resistant structures. In particular, the present invention relates to tamperproof and counterfeit-resistant identification cards and/or commercial paper.

Background of the Invention

It is known to use a lenticular sheet or film having a plurality of semi-cylindrical convex lenses or lenticles extending parallel and being uniform to one another on a top surface of a transparent plastic sheet. The lenticular sheet overlays an image (e.g., a specially formatted image). As such, the lenticular sheet is used to refract the image such that an observer sees the image as a three-dimensional image, or sees an image that changes (e.g., motions) as the observer changes his or her position with respect to the lenticular sheet.

It is also known to use, for security purposes, such a lenticular sheet, having lenticles extending parallel and being uniform to one another, in security cards such as credit cards and identification cards. Such security cards, including a lenticular sheet, are designed to be simple to authenticate (i.e., are readable/viewable by both humans and machines), inexpensive, and highly tamper-proofed and counterfeit-resistant.

It is further known that a security card cannot be, at the very least, easily modified and/or reproduced. In addition, it is known that it cannot be modified and/or reproduced

such that, even if not perfectly modified and/or reproduced, it is usable in place of an original card. For example, if a fake credit card is sufficiently authentic-looking as to be accepted by a store clerk, it probably matters little that a skilled person can distinguish the fake card from the original card.

5 Lenticular sheets, however, are becoming more and more available, for example, because of their increasing commercial viability. As such, "standard" lenticular sheets can now be easily purchased "over-the-counter." Characteristics of such standard lenticular sheets include having each and every lenticule extending parallel and being uniform to one another, characteristics also shared by lenticules used in known security
10 cards. As such, these standard lenticular sheets could be used, for example, to attempt to modify and/or reproduce a security card, in order to produce a sufficiently authentic-looking fake security card.

 Accordingly, an improved tamperproof and/or counterfeit-resistant structure is needed that is incapable of being modified, reproduced, duplicated, and/or simulated, for
15 example, using standard lenticular sheets.

Summary

 One embodiment of the present invention provides a tamperproof structure. The tamperproof structure includes an information-containing structure and a transparent
20 structure. The transparent structure includes a first plurality of lenticules and a second plurality of lenticules, both formed on an outer surface of the transparent structure. The first plurality of lenticules are non-parallel and/or non-uniform, with respect to the second

plurality of lenticules. The information-containing structure includes information to be viewed through the transparent structure.

Brief Description of the Drawings

5 In the drawings, like reference numerals represent similar parts of the illustrated embodiments of the present invention throughout the several views and wherein:

FIG. 1 depicts a partial perspective view of an embodiment of a tamperproof structure;

10 FIG. 2 depicts a partial cross-sectional view of the tamperproof structure of FIG. 1;

FIG. 3 depicts a side view of an embodiment of a tamperproof structure, including a first plurality of lenticules containing one of a convex and a concave shaped lenticule, and a second plurality of lenticules containing the other one of the convex and the concave shaped lenticule;

15 FIG. 4 depicts a side view of an embodiment of a tamperproof structure, including a first plurality, a second plurality, and a third plurality of lenticules;

FIG. 5A depicts a partial front view of an embodiment of a tamperproof structure;

20 FIGS. 5B, 5C, 5D, and 5E depict a front view of the tamperproof structure of FIG. 4A, viewed at varying angles, and illustrating both selectively and constantly visible images encoded thereon;

FIG. 6 depicts a partial perspective view of another embodiment of a tamperproof structure, where an information-containing structure is applied onto an inner surface of the transparent structure; and

FIG. 7 depicts a partial front view of another embodiment of a tamperproof structure, including a lenticule containing a first portion and a second portion.

Detailed Description

FIG. 1 depicts a partial perspective view of an embodiment of a tamperproof structure 100. The tamperproof structure 100 includes an information-containing structure 12, and a lenticular structure or transparent structure 10. Lenticules may be formed on the outer surface of the transparent structure 10, for example, by molding (e.g., injection molding, and compression molding), embossing, machining, extruding, and/or casting, all of which are well-known. The transparent structure 10 includes a first plurality of lenses or lenticules 11 and a second plurality of lenses or lenticules 21. The first plurality of lenticules 11 may include, for example, a hundred adjacent parallel lenses per inch of the transparent structure 10. The second plurality of lenticules 21 may include, for example, sixty adjacent parallel lenses per inch of the transparent structure 10.

The first plurality of lenticules 11 and/or the second plurality of lenticules 21 may include a plurality of parallel uniformly spaced, shaped, and/or sized lenticules. The first plurality of lenticules 11 (e.g., each of the first plurality of lenticules 11) may be non-parallel, and/or non-uniform, with respect to the second plurality of lenticules 21 (e.g.,

each of the second plurality of lenticules 21). FIG. 1 illustrates the first plurality of lenticules 11 as including parallel non-uniform lenticules, with respect to the second plurality of lenticules 21. The first plurality of lenticules 11 (e.g., each of the first plurality of lenticules 11) may also be non-uniformly spaced, shaped, and/or sized, with respect to the second plurality of lenticules 21 (e.g., each of the second plurality of lenticules 21).

First, each of the first plurality of lenticules 11 may include (i) a convex and/or a concave shaped lenticule, and/or (ii) a (substantially) spherical and/or an (substantially) aspherical shaped lenticule. In addition, each of the second plurality of lenticules 21 may include (i) a convex and/or a concave shaped lenticule, and/or (ii) a (substantially) spherical and/or an (substantially) aspherical shaped lenticule. The first plurality of lenticules 11 may be uniformly or non-uniformly shaped, with respect to the second plurality of lenticules 21. FIG. 1 illustrates the first plurality of lenticules 11 and the second plurality of lenticules 21 as including convex and spherical shaped lenticules. The first plurality of lenticules 11 and the second plurality of lenticules 21 may also include (semi) cylindrical, and/or fly eye lenses, or any other array of lenses refracting images to present information, for example, to a human's eyes.

Second, each of the first plurality of lenticules 11 may include a lenticule with or without a shoulder. In addition, each of the second plurality of lenticules 21 may include a lenticule with or without a shoulder. A shoulder may include a portion of the transparent structure 10, for example, configured as a passage or a cavity, coupling adjacent lenticules (e.g., shoulder 51 illustrated in FIG. 1). The first plurality of lenticules

11 may be uniformly or non-uniformly spaced, with respect to the second plurality of lenticules 21. FIG. 1 illustrates the first plurality of lenticules 11 as including lenticules without a shoulder and the second plurality of lenticules 21 as including lenticules with a shoulder 51. FIG. 1 also illustrates the first plurality of lenticules 11 as being non-
5 uniformly spaced, with respect to the second plurality of lenticules 21.

Third, each of the first plurality of lenticules 11 may include a lenticule having a first sized width (e.g., along x-axis), a first sized length (e.g., along z-axis), and a first sized height (e.g., along y-axis) (see, for example, FIG. 1 for an exemplary orientation of the x, y, and z axis with respect to a lenticule). In addition, each of the second plurality of
10 lenticules 21 may include a lenticule having a second sized width, a second sized length, and a second sized height. The first plurality of lenticules 11, individually and/or in combination, may be uniformly or non-uniformly sized, with respect to the second plurality of lenticules 21. FIG. 1 illustrates the first plurality of lenticules 11 as containing a non-uniformly sized width, and uniformly sized length and height, with respect to the
15 second plurality of lenticules 21.

The information-containing structure 12 includes information to be viewed through the transparent structure 10 (e.g., a plurality of the lenticules 11, 21 of the transparent structure 10), for example, as a three-dimensional, flip and/or morphing image. In addition, the information of the information-containing structure 12 can be
20 selectively visible and not visible by viewing the tamperproof structure 100 from different angles about an axis of rotation parallel to at least one of the lenticules 11, 21 of the transparent structure 10 (see FIG. 5).

The information-containing structure 12 may include an information-containing layer (e.g., an image-containing substrate layer such as, for example, a printable paper). The transparent structure 10 may include a transparent layer, and may overlay the information-containing layer. The transparent layer may include an inner surface. The information-containing layer may include a photographic emulsion, affixed to the inner surface of the transparent layer, and may contain information photographically recorded thereon, for example, through the overlying transparent layer as is well-known. In addition, the information-containing structure 12 may be applied (e.g., printed, bonded, and/or pressed) onto the inner surface of the transparent structure 10 (see FIG. 6).

Furthermore, the information-containing structure 12 may include a memory (e.g., a smart card and/or a smart chip) (not shown). The memory may include read-only memory (ROM), random-access memory (RAM), nonvolatile memory, an optical disk, a magnetic tape, and/or magnetic disk. The information in the memory may be programmed when the tamperproof structure 100 is manufactured or via a machine-readable medium at a later date as is well-known.

The information-containing structure 12 may contain one or more images. The tamperproof structure 100 may be imaged (e.g., printed, pressed, photographically recorded, and/or by other well-known imaging methods) with information unique to the owner/user of the tamperproof structure 100 such as, for example, a photograph, a signature, biometrics (e.g., biological attributes), a social security number, and/or an account number. Biometrics may include a fingerprint, bone shape print of hand and/or face, voiceprint, saliva, DNA, velocity and/or pressure print of handwriting, infrared

temperature print of face, and/or print of retina. The images may be continuous, which may be visible from all angles of view, and/or may be data-containing bands (e.g., data-containing pixel arrays), in which an image(s) may be visible depending upon the angle of view. The angle(s) to view a selectively visible image(s) may be about an axis
5 substantially parallel to one or more lenticules.

At least a plurality of the data-containing bands may be positioned under and parallel to at least a plurality of the lenticules 11, 21 of the transparent structure 10 such that the information of the information-containing structure 12 can be viewed through the lenticules 11, 21 of the transparent structure 10. The angle(s) to view a selectively visible
10 image(s) may include a continuous range(s) of angles, which may be relatively broad or narrow, depending upon the number of bands under a lenticule. The tamperproof structure 100 may include, for example, a hundred or more adjacent parallel lenses per inch of the transparent structure 10, and may include, for example, from two to eight image bands under each lens.

15 The information-containing structure 12 may include a first image and a second image. The data-containing bands of the information-containing structure 12 may be positioned under and parallel to at least a plurality of the lenticules 11, 21 of the transparent structure 10 such that one of the first image and the second image of the information-containing structure 12 can be visible, and the other one of the first image
20 and the second image of the information-containing structure 12 can be not visible from an angle of view about an axis of rotation parallel to at least one of the lenticules 11, 21 of the transparent structure 10.

FIG. 2 depicts a partial cross-sectional view of the tamperproof structure 100, including image bands 13, 14, 15 on the information-containing structure 12. The image bands 13, 14, 15 may form separately visible images, for example, when viewed from angles 13a, 14a and 15a, respectively.

5 The information-containing structure 12 may be covered with a white reflective coating and/or backed with a plastic laminate 16. The plastic laminate 16 may contain on its outer surface a magnetic strip (not shown) such as, for example, magnetic strips used in well-known machine-readable cards.

The information of the information-containing structure 12 may be unique to a
10 particular person assigned to the tamperproof structure 100. As described above, the information of the information-containing structure 12 may include biometric attributes of the particular person assigned to the tamperproof structure 100. At least one of the images visible, through the transparent structure 10, may contain information that is unique such as biometric attributes to the person assigned to the tamperproof structure
15 100 to verify the identity of the holder of the tamperproof structure 100.

In addition, the information of the information-containing structure 12 may be unique to a particular entity (e.g., government or business) assigning the tamperproof structure 100 such as, for example, a logo, a proprietary background, and/or an identifying image. An entity may also position data-containing bands, corresponding to a
20 proprietary background (e.g., a black background), under concave shaped (e.g., saw tooth-like) lenticules of the transparent structure 10 such that the background can be viewed through the concave shaped lenticules. Furthermore, the information of the

information-containing structure 12 may include a bar code. Moreover, the information of the information-containing structure 12 may be made of at least one light sensitive pigment (e.g., ink), for example, including a proprietary color(s).

As such, the information of the information-containing structure 12, for example,
5 may be inspected by a human and/or a machine to authenticate the tamperproof structure 100. The transparent structure 10 itself (e.g., the first plurality of lenticules 11 and/or the second plurality of lenticules 21) may also be inspected by a human and/or a machine to authenticate the tamperproof structure 100. The transparent structure 10, for example, may include at least one pigment (e.g., a light sensitive (or phantom) pigment), including
10 a proprietary color(s), used to authenticate the tamperproof structure 100.

As described above, each of the first plurality of lenticules 11 may include one of a convex and a concave shaped (e.g., a saw tooth-like) lenticule, while each of the second plurality of lenticules 21 may include the other one of the convex and the concave shaped lenticule (see, for example, FIG. 3). In addition, the first plurality of lenticules 11 include
15 non-parallel lenticules and/or non-uniform lenticules, with respect to the second plurality of lenticules 21. Thus, the first plurality of lenticules 11 and/or the second plurality of lenticules 21 of the transparent structure 10 may be tactually inspected to authenticate the tamperproof structure 10.

The person verifying the tamperproof structure 100 may then utilize a plurality of
20 information, including information derived from the look and/or feel of the tamperproof structure 100 such as, for example, the look and feel of the transparent structure 10 itself, to determine the authenticity of the tamperproof structure 100. The look and feel of the

transparent structure 10 may range from simple to complex, according to the preference of the issuer of the tamperproof structure 100. Accordingly, the tamperproof structure 100 is incapable of being modified, reproduced, duplicated, and/or simulated, for example, using standard lenticular sheets without any attempt to do so being readily
5 apparent.

FIG. 4 illustrates another embodiment of a tamperproof structure 100, including a plurality (e.g., more than a first plurality and a second plurality) of groups of lenticules. The plurality of groups of lenticules may be formed on the outer surface of the transparent structure 10. The plurality of groups of lenticules may also form a plurality of
10 configurations, e.g., from simple to complex, on the transparent structure 10, according to the preference of the issuer of the tamperproof structure 100.

The transparent structure 100 may include a first plurality 11, a second plurality 21, and a third plurality 31 of lenticules, each formed on the outer surface of the transparent structure 10. The first plurality 11, the second plurality 21, and/or the third
15 plurality 31 of lenticules may include a plurality of parallel uniformly spaced, shaped, and/or sized lenticules, relative to the first plurality 11, the second plurality 21, and/or the third plurality 31 of lenticules. The third plurality 31 of lenticules may be (i) non-parallel, and/or (ii) non-uniform, with respect to the first plurality 11 and/or the second plurality 21 of lenticules. Also, the third plurality 31 of lenticules (e.g., each of the third plurality
20 of lenticules) may be non-uniformly (i) spaced, (ii) shaped, (iii) sized in width, and/or (iv) sized in height, with respect to the first plurality 11 and/or the second plurality 21 of lenticules.

The first plurality 11, the second plurality 21, and/or the third plurality 31 of lenticules, for example, may be placed at any desired location within the transparent structure 10. The first plurality 11, the second plurality 21, and/or the third plurality 31 of lenticules, among others, may also be, in whole or in part, superimposed (e.g., overlapped) to form a more complex transparent structure 10. FIG. 4 illustrates the first plurality 11 and the second plurality 21 of lenticules as being superimposed.

Another embodiment of a tamperproof structure 100 may include an information-containing structure 12 and a transparent structure 10. The transparent structure 10 may include a first lenticule 11 and a second lenticule 21, both formed on an outer surface of the transparent structure 10 (see, for example, FIG. 1). The first lenticule 11 may be (i) non-parallel, (ii) non-uniformly spaced, (iii) non-uniformly shaped, and (iv) non-uniformly sized, with respect to the second lenticule 21. The information-containing structure 12 may include information to be viewed through the transparent structure 10.

The transparent structure 10 may also include a third lenticule 11 and a fourth lenticule 21, both formed on the outer surface of the transparent structure 10. The third lenticule 11 may be (i) parallel, (ii) uniformly spaced, (iii) uniformly shaped, and/or (iv) uniformly sized, with respect to the first lenticule 11. The fourth lenticule 21 may be (i) parallel, (ii) uniformly spaced, (iii) uniformly shaped, and/or (iv) uniformly sized, with respect to the second lenticule 21. The first lenticule 11 and the third lenticule 11 may be (i) non-parallel, (ii) non-uniformly spaced, (iii) non-uniformly shaped, and/or (iv) non-uniformly sized, with respect to the second lenticule 21 and/or the fourth lenticule 21.

FIG. 5A depicts a partial front view of another embodiment of a tamperproof structure 100. The transparent structure 10 includes a first plurality of parallel lenticules 11 and a second plurality of parallel lenticules 21, both formed on an outer surface of the transparent structure 10. FIG. 5A illustrates the first plurality of lenticules 11 as including
5 non-parallel and non-uniform lenticules, with respect to the second plurality of lenticules 21. For example, the first plurality of lenticules 11 includes non-uniformly spaced lenticules (e.g., non-uniformly spaced shoulder) and non-uniformly sized (e.g., non-uniformly sized in length) lenticules, with respect to the second plurality of lenticules 21. The first plurality of lenticules 11 also includes uniformly shaped lenticules (e.g., convex
10 shaped lenticules) and uniformly sized in width and in height lenticules, with respect to the second plurality of lenticules 21.

FIGS. 5B, 5C, 5D, and 5E depict a front view of the tamperproof structure 100 of FIG. 5A, viewed at varying angles, and illustrating (covertly, using a light sensitive pigment, and/or overtly, using a pigment) selectively and/or constantly visible images
15 encoded and/or applied thereon. An information-containing structure 12 (e.g., an image-containing substrate layer) may include a bar code 23. As such, FIG. 5 illustrates the bar code 23, which may be applied as a continuous image or as a series of bands (e.g., a selectable visible image), for example, on the image-containing substrate layer. FIG. 5 illustrates the bar code 23 as a constantly visible image, which may be viewed whether
20 the tamperproof structure 100 is turned about its optically active (e.g., parallel to a particular lenticule) or optically inactive (e.g., perpendicular to a particular lenticule) axis. The bar code 23 may be viewed and/or read by humans and/or machines.

FIG. 5B illustrates the tamperproof structure 100 viewed from a first angle from which a first portion of information (e.g., signature) and the bar code 23 are visible. FIG. 5C illustrates the tamperproof structure 100 viewed from a second angle from which a second portion of information (e.g., a logo) and the bar code 23 are visible. The first portion and the second portion of information may be selectively visible by viewing the tamperproof structure 100 from a first angle and a second angle, respectively, about an axis of rotation parallel to a first plurality of lenticules 11 of the transparent structure 10.

FIG. 5D illustrates the tamperproof structure 100 viewed from a third angle from which a third portion of information (e.g., a fingerprint) and the bar code 23 are visible. FIG. 5E illustrates the tamperproof structure 100 viewed from a fourth angle from which a fourth portion of information (e.g., a background) and the bar code 23 are visible. The third portion and the fourth portion of information may be selectively visible by viewing the tamperproof structure 100 from a third angle and a fourth angle, respectively, about an axis of rotation parallel to a second plurality of lenticules 21 of the transparent structure 10.

The multiple selectively visible images may also be encoded and/or superimposed (e.g., be visible from different angles on the same portion of the tamperproof structure 100) as is well-known. By employing overlapping and/or separately visible images, the uniqueness of the tamperproof structure 100 may be made even more readily apparent to users and/or accepting entities thereof. Overlapping images may also render even more tamperproof and counterfeit-resistant the tamperproof structure 100, since, for example,

information related to the user may not be forged without compromising the composite-image(s) of the tamperproof structure 100.

FIG. 7 depicts a partial front view of another embodiment of a tamperproof structure 100, including an information-containing structure 12 (not shown) and a transparent structure 10. The transparent structure 10 may include a lenticule 41, formed on an outer surface of the transparent structure 10. The lenticule 41 may contain a first portion 61 and a second portion 62. The lenticule 41 may be a one-piece lenticule. Also, the first portion 61 of the lenticule 41 may be integral with the second portion 62 of the lenticule 41.

10 The first portion 61 of the lenticule 41 may be (i) non-parallel, and/or (ii) non-uniform, with respect to the second portion 62 of the lenticule 41. The first portion 61 of the lenticule 41 may also be (i) non-uniformly spaced, (ii) non-uniformly shaped, and/or (iii) non-uniformly sized, with respect to the second portion 62 of the lenticule 41. The first portion 61 and/or the second portion 62 of the lenticule 41 of the transparent structure 10 may be (tactually) inspected to authenticate the tamperproof structure 100. The information-containing structure 12 may include information to be viewed through the transparent structure 10.

20 Thus, personnel authenticating (e.g., verifying and/or accepting) tamperproof structures may inspect (e.g., view) images (e.g., selectively visible images) through a transparent structure 10 of a tamperproof structure 100, and/or feel (e.g., feel the texture) of the transparent structure 10 to be alerted of attempts to modify, reproduce, duplicate, and/or simulate an authentic tamperproof structure 100.

The tamperproof structure 100 may include a tamperproof card, used at least in part to identify a particular person assigned to the tamperproof card. The tamperproof card may be used, for example, as a security card, a credit card, a debit card, a driver's license, an identification card, a passport, a time-and-attendance card, and/or an access-control card. The tamperproof structure may also include a tamperproof paper (e.g., commercial paper). The tamperproof paper may be used as currency (e.g., a \$1 bill), securities (e.g., stocks and bonds), a bank note, a money order, and/or a check (e.g., a certified check). The format and/or structure of the tamperproof structure 100, including the transparent structure 10, may be configured according to the preference of the issuer of the tamperproof structure 100. For example, the transparent structure 10 may include a thickness ranging from 8 mil to 200 mil (e.g., 8 mil, 10 mil, 11 mil, 22 mil, and/or 23 mil), and may be made of a material(s) used in well-known lenticular sheets.

The foregoing presentation of the described embodiments is provided to enable any person skilled in the art to make or use the present invention. Various modifications to these embodiments are possible, and the generic principles presented herein may be applied to other embodiments as well. As such, the present invention is not intended to be limited to the embodiments shown above, and/or any particular configuration of structure but rather is to be accorded the widest scope consistent with the principles and novel features disclosed in any fashion herein.

20

What is Claimed is:

1. A tamperproof structure comprising:

an information-containing structure; and

a transparent structure including a first lenticule and a second lenticule, both
5 formed on an outer surface of the transparent structure,

wherein the first lenticule is constructed and arranged to be at least one of (i) non-parallel, (ii) non-uniformly spaced, (iii) non-uniformly shaped, (iv) non-uniformly sized in width, and (v) non-uniformly sized in height, with respect to the second lenticule, and

wherein the information-containing structure includes information to be viewed
10 through the transparent structure.

2. The tamperproof structure of claim 1,

wherein the transparent structure also includes a third lenticule, and a fourth lenticule, both also formed on the outer surface of the transparent structure,

15 wherein the third lenticule is constructed and arranged to be at least one of (i) parallel, (ii) uniformly spaced, (iii) uniformly shaped, (iv) uniformly sized in width, and (v) uniformly sized in height, with respect to the first lenticule,

wherein the fourth lenticule is constructed and arranged to be at least one of (i) parallel, (ii) uniformly spaced, (iii) uniformly shaped, (iv) uniformly sized in width, and
20 (v) uniformly sized in height, with respect to the second lenticule, and

wherein each of the first lenticule and the third lenticule are constructed and arranged to be at least one of (i) non-parallel, (ii) non-uniformly spaced, (iii) non-

uniformly shaped, (iv) non-uniformly sized in width, and (v) non-uniformly sized in height, with respect to each of the second lenticule and the fourth lenticule.

3. The tamperproof structure of claim 1,

5 wherein the transparent structure also includes a third lenticule, and a fourth lenticule, both also formed on the outer surface of the transparent structure,

wherein the third lenticule is constructed and arranged to be uniformly spaced and shaped, with respect to the first lenticule,

10 wherein the fourth lenticule is constructed and arranged to be uniformly spaced and shaped, with respect to the second lenticule, and

wherein each of the first lenticule and the third lenticule are constructed and arranged to be at least one of (i) non-uniformly spaced, and (ii) non-uniformly shaped, with respect to each of the second lenticule and the fourth lenticule.

15 4. The tamperproof structure of claim 1, wherein at least one of (i) the first lenticule and (ii) the second lenticule of the transparent structure is tactually inspected to authenticate the tamperproof structure.

20 5. The tamperproof structure of claim 1, wherein the information of the information-containing structure, and at least one of (i) the first lenticule and (ii) the second lenticule of the transparent structure are used to authenticate the tamperproof structure.

6. The tamperproof structure of claim 1,
wherein the first lenticule includes one of a convex and a concave shaped
lenticule, and

5 wherein the second lenticule includes the other one of the convex and the concave
shaped lenticule.

7. The tamperproof structure of claim 1, wherein the tamperproof structure
includes a tamperproof card, used at least in part to identify a particular person assigned
10 to the tamperproof card.

8. The tamperproof structure of claim 1, wherein the tamperproof structure
includes a tamperproof commercial paper.

15 9. A tamperproof structure comprising:
an information-containing structure; and
a transparent structure including a first plurality of lenticules and a second
plurality of lenticules, both formed on an outer surface of the transparent structure,
wherein each of the first plurality of lenticules are constructed and arranged to be
20 at least one of (i) non-parallel, and (ii) non-uniform, with respect to each of the second
plurality of lenticules, and

wherein the information-containing structure includes information to be viewed through the transparent structure.

10. The tamperproof structure of claim 9, wherein the information of the
5 information-containing structure is viewed, through the transparent structure, as a three-dimensional image.

11. The tamperproof structure of claim 9, wherein the information of the
information-containing structure is selectively visible and not visible by viewing the
10 tamperproof structure from different angles about an axis of rotation parallel to at least one of the lenticules of the transparent structure.

12. The tamperproof structure of claim 9,
wherein the transparent structure includes an inner surface, and
15 wherein the information-containing structure is applied onto the inner surface of the transparent structure.

13. The tamperproof structure of claim 12, wherein the information-containing structure is applied, through printing, onto the inner surface of the transparent
20 structure.

14. The tamperproof structure of claim 9,

wherein the information-containing structure includes an information-containing layer,

wherein the transparent structure includes a transparent layer, and is constructed and arranged to overlay the information-containing layer, and

5 wherein the transparent layer includes an inner surface, and

wherein the information-containing layer includes a photographic emulsion, affixed to the inner surface of the transparent layer, and contains information photographically recorded thereon through the overlying transparent layer.

10 15. The tamperproof structure of claim 9,

wherein the information-containing structure includes data-containing bands, and

wherein at least a plurality of the data-containing bands are constructed and arranged to be positioned under and parallel to at least a plurality of the lenticules of the transparent structure such that the information of the information-containing structure is viewed through at least a plurality of the lenticules of the transparent structure.

16. The tamperproof structure of claim 15,

wherein the information-containing structure includes a first image and a second image, and

20 wherein the data-containing bands of the information-containing structure are constructed and arranged to be positioned under and parallel to at least a plurality of the lenticules of the transparent structure such that one of the first image and the second

image of the information-containing structure is visible, and the other one of the first image and the second image of the information-containing structure is not visible from an angle of view about an axis of rotation parallel to at least one of the lenticules of the transparent structure.

5

17. The tamperproof structure of claim 9, wherein the information of the information-containing structure is unique to a particular person assigned to the tamperproof structure.

10

18. The tamperproof structure of claim 17, wherein the information of the information-containing structure includes biometric attributes of the particular person assigned to the tamperproof structure.

15

19. The tamperproof structure of claim 9, wherein the information of the information-containing structure includes a bar code.

20

20. The tamperproof structure of claim 9, wherein the information of the information-containing structure is unique to a particular entity assigning the tamperproof structure.

21. The tamperproof structure of claim 9, wherein the information of the information-containing structure is used to authenticate the tamperproof structure.

22. The tamperproof structure of claim 9, wherein at least one of (i) the first plurality of lenticules and (ii) the second plurality of lenticules of the transparent structure is used to authenticate the tamperproof structure.

5

23. The tamperproof structure of claim 22, wherein the at least one of (i) the first plurality of lenticules and (ii) the second plurality of lenticules of the transparent structure is tactually inspected to authenticate the tamperproof structure.

10

24. The tamperproof structure of claim 9, wherein the information of the information-containing structure and at least one of (i) the first plurality of lenticules and (ii) the second plurality of lenticules of the transparent structure are both used to authenticate the tamperproof structure.

15

25. The tamperproof structure of claim 9,
wherein each of the first plurality of lenticules includes one of a convex and a concave shaped lenticule, and

wherein each of the second plurality of lenticules includes the other one of the convex and the concave shaped lenticule.

20

26. The tamperproof structure of claim 9, wherein the tamperproof structure includes a tamperproof card, used at least in part to identify a particular person assigned to the tamperproof card.

5 27. The tamperproof structure of claim 9, wherein the tamperproof structure includes a tamperproof commercial paper.

28. The tamperproof structure of claim 9,
wherein at least one of (i) the first plurality of lenticules and (ii) the second
10 plurality of lenticules includes a plurality of parallel uniformly spaced lenticules, and
wherein each of the first plurality of lenticules are constructed and arranged to be
at least one of non-uniformly (i) spaced, (ii) shaped, (iii) sized in width, and (iv) sized in
height, with respect to each of the second plurality of lenticules.

15 29. The tamperproof structure of claim 9,
wherein at least one of (i) the first plurality of lenticules and (ii) the second
plurality of lenticules includes a plurality of parallel uniformly shaped lenticules, and
wherein each of the first plurality of lenticules are constructed and arranged to be
at least one of non-uniformly (i) spaced, (ii) shaped, (iii) sized in width, and (iv) sized in
20 height, with respect to each of the second plurality of lenticules.

30. The tamperproof structure of claim 9,

wherein at least one of (i) the first plurality of lenticules and (ii) the second plurality of lenticules includes a plurality of parallel uniformly sized lenticules, and

wherein each of the first plurality of lenticules are constructed and arranged to be at least one of non-uniformly (i) spaced, (ii) shaped, (iii) sized in width, and (iv) sized in height, with respect to each of the second plurality of lenticules.

31. The tamperproof structure of claim 9,

wherein both (i) the first plurality of lenticules and (ii) the second plurality of lenticules include a plurality of parallel uniformly spaced, shaped, and sized lenticules, and

wherein each of the first plurality of lenticules are constructed and arranged to be at least one of non-uniformly (i) spaced, (ii) shaped, (iii) sized in width, and (iv) sized in height, with respect to each of the second plurality of lenticules.

32. The tamperproof structure of claim 9,

wherein the transparent structure further includes a third plurality of lenticules, formed on the outer surface of the transparent structure, and

wherein each of the third plurality of lenticules are constructed and arranged to be at least one of (i) non-parallel, and (ii) non-uniform, with respect to each of the first plurality and the second plurality of lenticules.

33. The tamperproof structure of claim 29,

wherein (i) the first plurality of lenticules, (ii) the second plurality of lenticules, and (iii) the third plurality of lenticules include at least one of (i) a plurality of parallel uniformly spaced lenticules, (ii) a plurality of parallel uniformly shaped lenticules, and (iii) a plurality of parallel uniformly sized lenticules, and

5 wherein each of the third plurality of lenticules are constructed and arranged to be at least one of non-uniformly (i) spaced, (ii) shaped, (iii) sized in width, and (iv) sized in height, with respect to each of the first plurality and the second plurality of lenticules.

34. The tamperproof structure of claim 9, wherein the transparent structure
10 includes at least one pigment.

35. The tamperproof structure of claim 9, wherein the transparent structure includes at least one light sensitive pigment.

15 36. The tamperproof structure of claim 9, wherein the information of the information-containing structure is made of at least one light sensitive pigment.

37. A tamperproof structure comprising:
an information-containing structure; and
20 a transparent structure including a lenticule, formed on an outer surface of the transparent structure,
wherein the lenticule contains a first portion and a second portion,

wherein the first portion of the lenticule is constructed and arranged to be at least one of (i) non-parallel, and (ii) non-uniform, with respect to the second portion of the lenticule, and

wherein the information-containing structure includes information to be viewed
5 through the transparent structure.

38. The tamperproof structure of claim 37, wherein the first portion of the lenticule is constructed and arranged to be at least one of (i) non-uniformly spaced, (ii) non-uniformly shaped, and (iii) non-uniformly sized, with respect to the second portion
10 of the lenticule.

39. The tamperproof structure of claim 37, wherein the transparent structure is inspected to authenticate the tamperproof structure.

15 40. The tamperproof structure of claim 39, wherein at least one of (i) the first portion and (ii) the second portion of the lenticule of the transparent structure is tactually inspected to authenticate the tamperproof structure.

41. The tamperproof structure of claim 37,
20 wherein the first portion of the lenticule includes one of a convex and a concave shaped lenticule, and

wherein the second portion of the lenticule includes the other one of the convex and the concave shaped lenticule.

42. The tamperproof structure of claim 37, wherein the tamperproof structure
5 includes a tamperproof card, used at least in part to identify a particular person assigned to the tamperproof card.

43. The tamperproof structure of claim 37, wherein the tamperproof structure includes a tamperproof commercial paper.

10

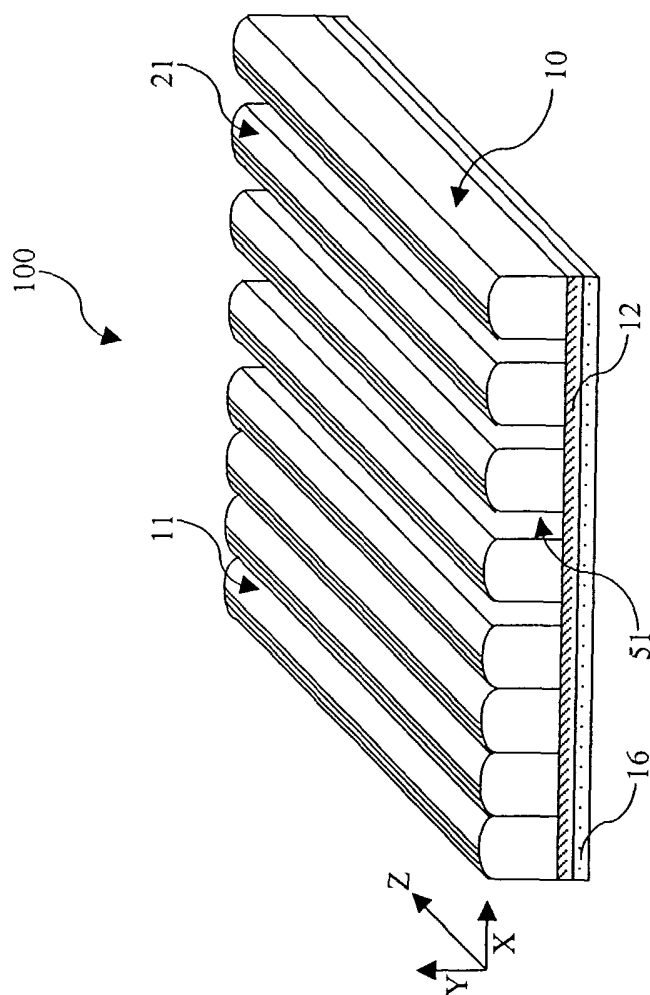


FIG. 1

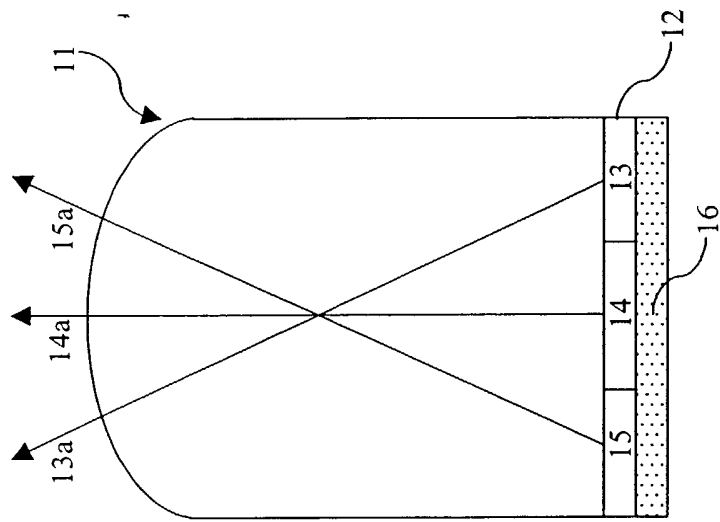
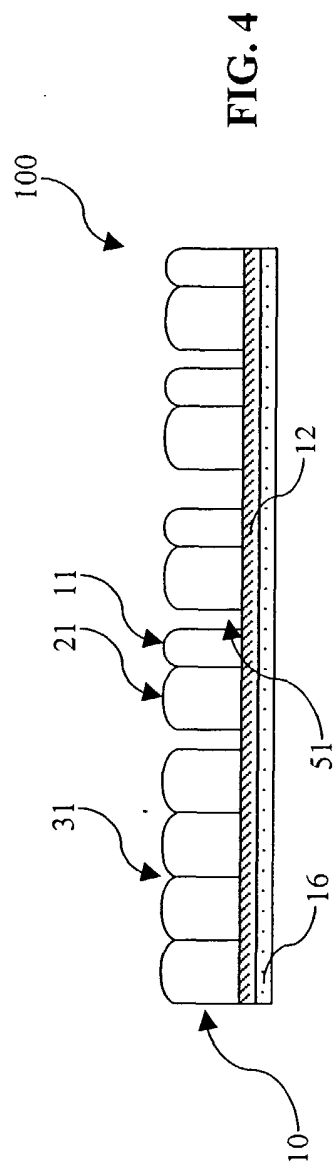
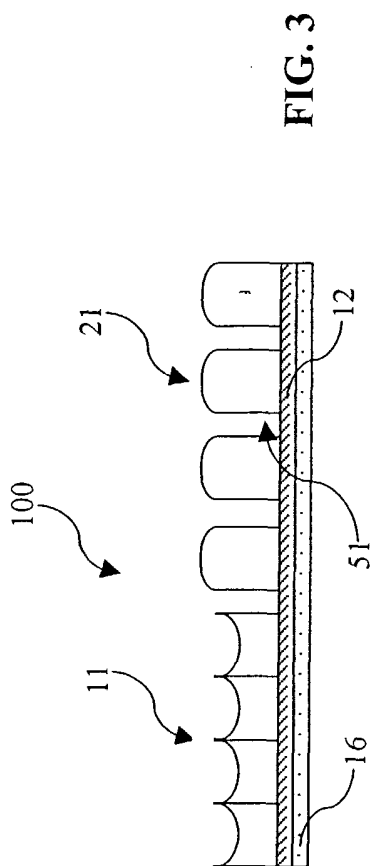
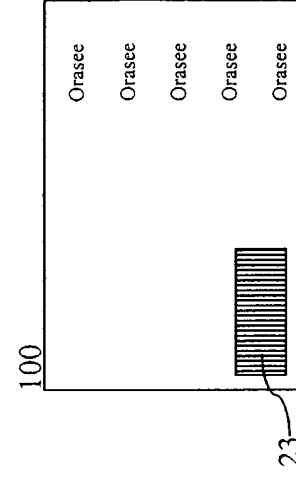
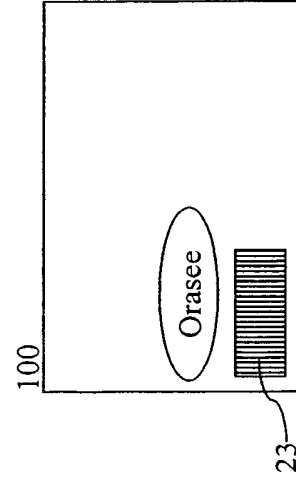
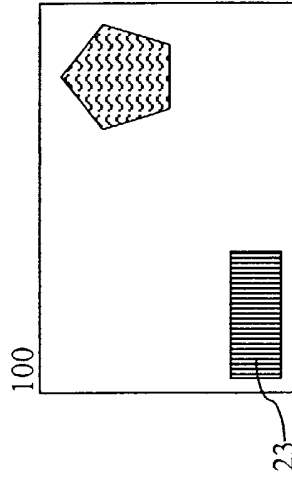
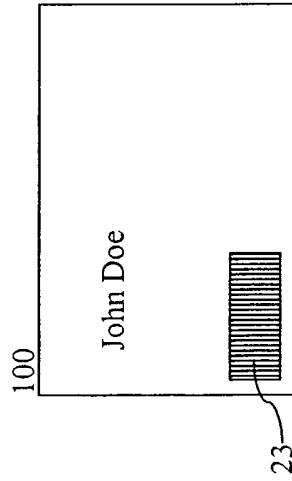
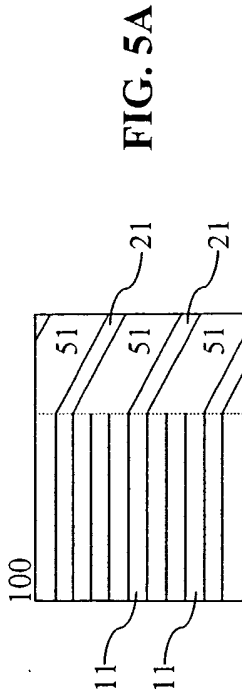


FIG. 2





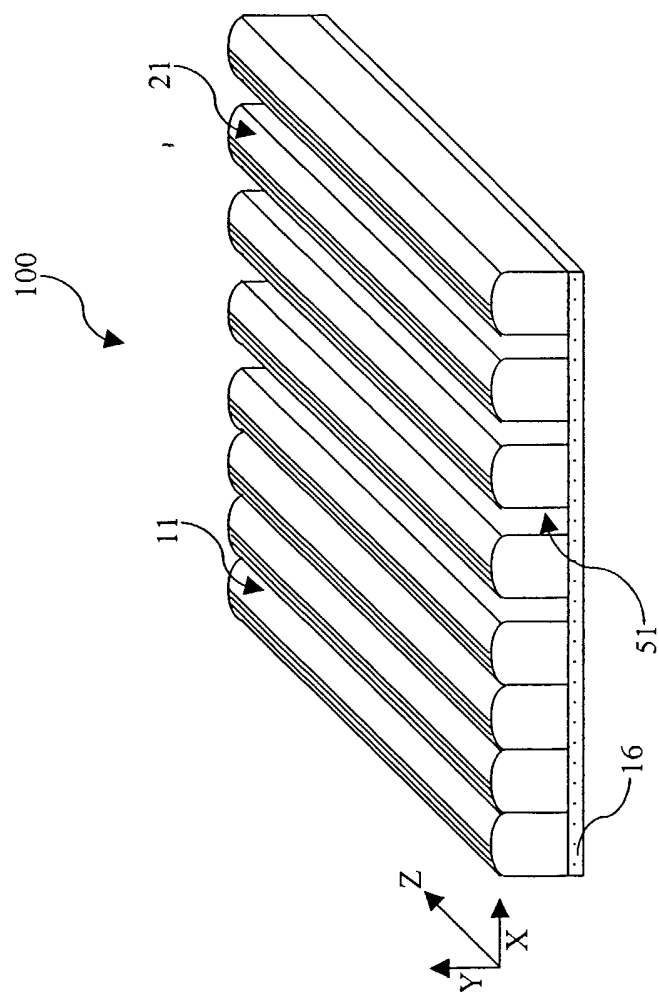


FIG. 6

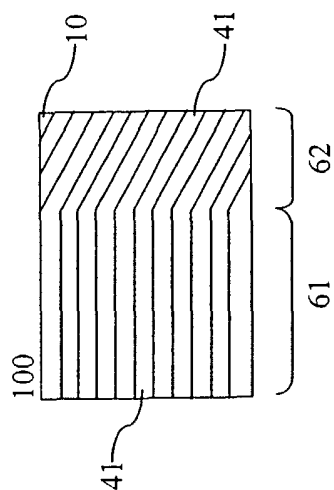


FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US08/07840

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G02B 27/10; B32B 3/28; B65D 33/28
US CL : 359/619, 621, 623, 624; 428/167, 916; 383/72
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 359/619, 621, 623, 624; 428/167, 916; 383/72

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

USPTO APS EAST
search terms: tamperproof, tamper, counterfeit, resistant, lenticule, lenses

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5,772,248 A (PHILLIPS) 30 June 1998 (30.06.1998), see entire document.	1-43
A	US 5,704,651 A (PHILLIPS) 6 January 1998 (06.01.1998), see entire document.	1-43
A	US 5,873,604 A (PHILLIPS) 23 February 1999 (23.02.1999), see entire document.	1-43
A	US 6,110,864 A (LU) 29 August 2000 (29.08.2000), see entire document.	1-43
A	US 4,869,946 A (CLAY) 26 September 1989 (26.09.1989), see entire document.	1-43

Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 17 JUNE 2003	Date of mailing of the international search report 02 SEP 2003
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