In WO 2016/010415, in the name of the applicant, a security document is described comprising a set of lenses below which the authentication image is provided at a pitch that differs from the pitch of the lenses, such that a Moiré magnifying effect is achieved.
WO 2011/074956, in the name of the applicant describes a security document in which below a set of cylindrical lenses, an image is laser engraved in an out of focus manner in order to reduce transient black patterns appearing on tilting of the image.
WO 2015/030575 describes a security document, in particular a passport, in which a transparent window is provided onto which an authentication image is formed. The authentication is also formed in the underlying layer adjacent the transparent window.

The above authentication images provide a security feature which enables detection of unauthorized alterations to the main image. At the same time, the authentication image cannot be easily altered without being noticed due to its complex structure and the special optical effects that are produced by the authentication image.

It is an object of the present invention to provide a security document with a main image and an authentication image of the above described type that allows rapid and reliable detection of unauthorized alterations to the main image.

It is also an object of the present invention to provide a security document having an authentication image that is resistant to unauthorized alterations and that allows easy and reliable detection of such alterations.

Summary of the invention

Hereto in the security document in accordance with the present invention, the first authentication image is a positive image corresponding with the first image with picture elements having brightness values that correspond to the brightness values of the identification image and the second authentication image is a negative image corresponding with the first image, with picture elements having brightness values that correspond to a reversed brightness scale that is obtained by making the brightest picture elements in the positive brightness scale appear darkest and the darkest picture elements appear brightest,

- providing an identification image in an image processing unit, the identification image having image elements with predetermined brightness values on a positive brightness scale,
- providing in the image processor unit a positive authentication image corresponding with the first image with picture elements having brightness values that correspond to the brightness values of the identification image and a negative authentication image corresponding with the first image, with picture elements having brightness values that correspond to a reversed brightness scale in which the brightest picture elements in the positive brightness scale appear darkest and the darkest picture elements appear brightest, and
- laser engraving the first and second authentication images through the cylindrical lenses in the image layer at different angles such that both the identification image and the first authentication image can be observed at a perpendicular viewing direction while the second authentication image can be observed at a non-perpendicular viewing direction.

In the image processor the negative image can be easily derived by reversing the scale of the brightness values of the positive image.

Because the angles of the positive and negative authentication images differ from the perpendicular viewing direction, a perspective distortion causes a shift and a change in width of the images. The width, height and shape of the images is changed in a trapezoid way. A correction can be made to compensate for this distortion by changing the width of at least one of the positive and negative images and shifting the position of the image sideways so that the eyes of the positive and negative authentication images are again aligned.

In order to prevent stereoscopic viewing of the positive and negative authentication images, they are laser engraved at mutually different angles with respect to the perpendicular viewing direction. A perspective view correction is carried out for at least one the authentication images in the image processing unit.

Brief description of the drawings

Some embodiments of a security document according to the invention will by way of non-limiting example be explained in detail with reference to the accompanying drawing. In the drawings: