The invention relates to a method for producing a security element and a transfer film. The transfer film comprises a base film (10) comprising a first carrier film (11) and single or multi-ply decal layer. A first adhesive layer (30) and a second carrier film (40) are applied to the surface of the first carrier film (11) facing away from the decal layer, such that the first adhesive layer (30) is disposed between the first carrier film (11) and the second carrier film (40). The first adhesive layer (30) is activated in a first area (31).
(57) Abrégé(suite)/Abstract(continued):
covering at least one first partial area (21) of the base film (10), and the first adhesive layer is not activated, not provided, only partially provided, or deactivated in a second area (32) adjacent to said first area (31). The first carrier film (11) is then at least partially separated along the boundary line defining the at least one first partial area (21) and separating the at least one first partial area (21) from a second partial area (22) of the base film (10). A second part of the base film (10) comprising the second partial area (22) is pulled off of the second carrier film (40), wherein the base film (10) adheres to the second carrier film (40) in the at least one first partial area (21) due to the activated first adhesive layer, and a first part of the base film (10) comprising the at least one first partial area (21) remains on the second carrier film (40).
Abstract

The invention relates to a method for producing a security element, and to a transfer film. The transfer film has a base film (10) having a first carrier film (11) and a single- or multi-ply decorative layer. A first adhesive layer (30) is applied to that surface of the first carrier film (11) which faces away from the decorative layer, and a second carrier film (40) is applied in such a way that the first adhesive layer (30) is arranged between the first carrier film (11) and the second carrier film (40). The first adhesive layer (30) is activated in a first region (31), which at least partly covers at least one first partial region (21) of the base film (10), and the first adhesive layer (30) is not activated, not provided, only partly provided or deactivated, however, in a second region (32) adjoining said region (31). The first carrier film (11) is then at least partly severed along the boundary line defining the at least one first partial region (21) and separating the at least one first partial region (21) from a second partial region (22) of the base film (10). A second part of the base film (10), said second part comprising the second partial region (22), is removed from the second carrier film (40), wherein, in the at least one first partial region (21) the base film (10) adheres to the second carrier film (40) on account of the activated first adhesive layer and a first part of the base film (10), said first part comprising the at least one first partial region (21), remains on the second carrier film (40).

(Figure 5)
Method for producing a security element and transfer film

5 The invention relates to a method for producing a security element, and to a transfer film, in particular a hot embossing film, for transferring one or a plurality of multilayer bodies onto a target substrate.

10 In order to apply a security element to security documents, for example, passports, credit cards or banknotes, use is made, inter alia, of transfer films, in particular hot embossing films. Thus, by way of example, DE 100 13 410 A1 describes the production of a multilayer body that forms an identity card, a credit card or the like, in which a security element is introduced between two adjacent covering layers, said security element being formed by the decorative layer of a hot embossing film. The security element comprises a transparent lacquer layer, into which a diffraction-optically active structure is impressed. The transparent lacquer layer is furthermore provided with a reflection-increasing layer, which is a metal layer or a dielectric layer. Furthermore, the security element has an adhesive layer, by means of which the security element is fixed to the lower covering layer. For this purpose, the hot embossing film is placed onto the lower covering layer and pressed onto the covering layer by means of an embossing die with action of heat and pressure in the region in which the decorative layer of the hot embossing film is to be transferred onto the covering layer. Upon removal of the carrier film of the hot embossing film, this partial region of the decorative layer continues to adhere to the lower covering layer, and the remaining partial regions of the decorative layer are removed together with the
carrier film.

During such transfer of the decorative layer of a hot embossing film from a carrier film onto a substrate, the decorative layer of the embossing film is torn along the boundary line defining that partial region of the decorative layer which is to be transferred. This can lead to edge jagging particularly when using transfer films having thicker layers and layers having specific properties, for example layers having a particularly high toughness.

The invention is based on the object, then, of specifying an improved method for producing a decorative element or a security element and an improved transfer film.

This object is achieved by a method for producing a security element, wherein the method involves providing a base film having a first carrier film and a single- or multi-ply decorative layer enabling the decorative layer to be separated from the first carrier film, wherein a first adhesive layer is applied to that surface of the first carrier film which faces away from the decorative layer, and a second carrier film is applied in such a way that the first adhesive layer is arranged between the first carrier film and the second carrier film, wherein the first adhesive layer is activated in a first region, which at least partly covers at least one first partial region of the base film, and the first adhesive layer is not activated, not provided, only partly provided or deactivated, however, in a second region adjoining said region, wherein the first carrier film is at least partly severed along the boundary line defining the at least one first partial region and separating the at least one first partial region from a second partial region of the base film, wherein a second part of the base
film, said second part comprising the second partial region is removed from the second carrier film, wherein, in the at least one partial region the base film adheres to the second carrier film on account of the activated first adhesive layer and a first part of the base film, said first part comprising the at least one first partial region, remains on the second carrier film. This object is furthermore achieved by a transfer film in particular a hot embossing film, for transferring one or a plurality of multilayer bodies to a target substrate, wherein the transfer film has a base film having a first carrier film and a single- or multi-ply decorative layer enabling the decorative layer to be separated from the first carrier film, wherein the transfer film furthermore has a second carrier film and a first adhesive layer applied to that surface of the first carrier film which faces away from the decorative layer, wherein the first adhesive layer is arranged between the first carrier film and the second carrier film, in that the first adhesive layer is activated in a first region, which at least partly covers at least one first partial region of the base film, such that the base film adheres to the second carrier film in the at least one first partial region, and the first adhesive layer is not activated, not provided, only partly provided or deactivated, however, in a second partial region adjoining the at least one first partial region, and wherein the first carrier film is severed along the boundary line defining the at least one first partial region and separating the at least one first partial region from a second partial region of the base film, and a part of the base film that comprises the second partial region is removed from the second carrier film.

The invention makes it possible to provide a security element which can be transferred onto a security document, for example a banknote or an ID document, by
means of a customary transfer method and which avoids “jagging” arising as a result of the fracture of the decorative layer in the edge region of the transferred multilayer body. Furthermore, it is possible that the adhesion and structural properties of the decorative layer can be chosen substantially independently of the requirements of the transfer process and in this way for example the optical properties, the resistance to environmental influences and the security with respect to counterfeiting and manipulation of the security element can be improved further. Furthermore, the method according to the invention is distinguished by the fact that the register accuracy with which security elements can be transferred onto a target substrate is improved further.

In addition, different forms of the transfer film can be transferred with one die form. The outer form of the patch does not have to correspond to the outer form of the hot embossing die. Preferably, in this case, the hot embossing die is chosen to be larger than that part of the base film that is to be transferred. By way of example, a star-shaped patch is transferred by means of a round, larger die. Alongside a hot embossing die used to carry out hot embossing by means of embossing pressure and heat, it is also possible to employ an ultrasonic embossing die with a correspondingly configured counter-pressure bearing used to carry out hot embossing by means of embossing pressure and ultrasound as an alternative form of energy.

Advantageous configurations of the invention are designated in the dependent claims.

In accordance with one preferred embodiment of the invention, the base film has a release layer arranged between the first carrier film and the decorative layer. Furthermore, it is also possible for the material and/or the surface constitution of the first
carrier film and of that layer of the decorative layer which faces the first carrier film to be chosen such that the decorative layer can be released from the first carrier film. This makes it possible that by means of the transfer film according to the invention, a partial region of a film body which only comprises a partial region of the decorative layer and - optionally - an adhesive layer and does not concomitantly comprise the assigned partial region of the first carrier film can be applied to a target substrate. This is advantageous particularly when thin and mechanical inherently unstable layer plies are intended to be transferred onto the target substrate.

In accordance with a further preferred embodiment of the invention, no release layer is contained between the first carrier film and the decorative layer. In accordance with this embodiment, the first adhesive layer and a second adhesive layer arranged between the decorative layer and the target substrate are chosen such that the adhesive strength brought about by the activated first adhesive layer between the first carrier film and the second carrier film is lower than the adhesive strength brought about by the activated second adhesive layer between the decorative layer and the target substrate. It is thereby possible, after the activation of the second adhesive layer, to remove the second carrier film from the first partial region of the base film and thus to apply the entire first partial region of the base film, i.e. decorative layer and first carrier layer, to the target substrate by means of a transfer process. Consequently, the method according to the invention makes it possible to transfer mechanically stable film bodies onto a target substrate. In this case, it is furthermore also possible to transfer said film bodies not only in the form of a strip, but with any desired shaping, for example as a patch, onto a banknote.
In this case, it is particularly advantageous to transfer the film body onto a window of a banknote and thus to completely or partly close or cover the window. It is thereby possible to use security elements with see-through properties, with different images in top view and see-through view, with different images upon viewing the front side and rear side of the substrate, or with moiré images. Combinations of different optical effects are also possible. The generic term window is intended to encompass transparent or semitransparent regions of a substrate and/or substrates having one or a plurality of holes or having one or a plurality of cutouts.

Thus, it is possible to choose the shaping of the film bodies to be smaller in terms of the longitudinal extents thereof, and thus to minimize the deformation of the banknote as a result of a different extent of the paper and of the film on account of the smaller sealed area. In this case, that part of the security element which covers the region of the window can have either parts of the 2nd adhesive layer or no adhesive, be coated with a lacquer partly or wholly over the area or be printed partly or wholly over the area.

In order to minimize even further the deformation of the banknote as a result of a different extent of the paper and of the film, it is furthermore advantageous to apply a sealing layer on that side of the target substrate which lies opposite the film body, said sealing layer preferably having an area extent similar or identical to that of the film body and being arranged in a manner largely overlapping the film body, such that the target substrate is covered equally on both sides by the film body and the sealing layer. The thickness or strength of the sealing layer can be identical to the thickness or strength of the film body or different therewith. In this case, the outer contour
form of the film bodies on the opposite sides of the target substrate can be different. In this case, the sealing layer can be formed by a sealing film body or by a sealing lacquer layer. The sealing layer is intended primarily to seal the regions of the target substrate which surround the window, but can also be provided in the region of the window. By way of example, the sealing layer can either be applied before the introduction of the window, for example by stamping or cutting, and be severed and removed together with the target substrate during the introduction of the window. An alternative variant is to apply the sealing layer after the introduction of the window, such that the sealing layer also covers the free rear side of the film body in the region of the window. In this case, the sealing layer can likewise seal, in particular the perpendicular cut edges of the window in order there, too, to prevent the penetration of moisture. The sealing layer, in the same way as the film body, can have security elements, which can overlap the security elements of the film body, such that a plurality of security elements in combination can produce optical effects, in particular.

Furthermore, it is also possible to provide a further security feature by means of the configuration of the contour form of the transferred film body. By way of example, the contour form can have filigree motifs and/or motifs having small parts. In this case, the contour form of the transferred film body can be similar to the contour form of the window or different therefrom.

It has proved to be worthwhile for the first adhesive layer to be applied to the first carrier film and for the second carrier film then to be applied to the first adhesive layer. However, it is also possible for the first adhesive layer to be applied to the second
carrier film and for the film body comprising the second carrier film and the first adhesive layer then to be applied to the first carrier film and the first adhesive layer thus to be applied to the first carrier film with the aid of the second carrier film.

In accordance with one preferred embodiment of the invention, an adhesive layer that can be activated by electromagnetic radiation, in particular an adhesive layer consisting of a UV-activatable adhesive, which can be activated by irradiation with UV light, is used as the first adhesive layer. This firstly affords the advantage that the activation of the first adhesive layer in the first region can be controlled in a precisely targeted manner. Furthermore, it has been found that when an adhesive layer of this type is used, release of the first carrier film from the second carrier film during a subsequent transfer process can be reliably prevented and the transfer result can thus also be improved further.

Preferably, the first adhesive layer is applied to that surface of the carrier film which faces away from the decorative layer over the whole area of the at least one first partial region and in the second partial region. In this case, the activation of the first adhesive layer in the first region is then subsequently effected before the removal of the second part of the base film. In this case, the first adhesive layer can be applied to the first carrier film for example by means of a printing method, for example intaglio printing or screen printing, but also by means of being poured on, sprayed on or by doctor blade.

The first adhesive layer is preferably activated by irradiation in the first region after the application of the second carrier film, such that the second carrier film adheres to the first carrier film in the first
region. In this case, the material of the first adhesive layer is preferably chosen with respect to the first carrier film and the second carrier film such that the adhesion between first carrier film and second carrier film after the activation of the first adhesive layer, even at room temperature (20°C) is higher than the adhesion - imparted by the release layer - between decorative layer and first carrier film. Furthermore, the material of the first adhesive layer is preferably chosen with respect to the first carrier film and the second carrier film such that the adhesion between the first carrier film and the second carrier film with the first adhesive layer not activated is lower than the adhesion - imparted by the release layer - between first carrier film and decorative layer both at room temperature (20°C) and at embossing temperature (180°C).

Furthermore, it has proved to be advantageous that the adhesion properties between the first adhesive layer and first and/or second carrier film are adapted by applying primers, adhesion promoters or by corona, flame or plasma treatment of the first and/or second carrier film.

In accordance with one particular exemplary embodiment of the invention, the first adhesive layer is irradiated by a radiation source arranged at a distance in the direction of that side of the second carrier film which faces away from the decorative layer. In this case, the radiation source is preferably arranged at a distance of more than 10 mm from the second carrier film. A UV radiation source, which exposes the first adhesive layer with collimated light, preferably with UV light, is preferably used as the radiation source. By way of example, UV lamps with a downstream collimator or else a laser are or is thus suitable as the radiation source.
Such exposure of the first adhesive layer makes it possible to choose the exposure of the first adhesive layer independently of the configuration of the decorative layer of the base film. Preferably, the second carrier film in this case consists of a material which is largely transparent for the wavelength range of the radiation source used for the exposure.

Selective exposure of the first adhesive layer in the desired regions, for example the selective irradiation of the first adhesive layer in the first region for activating the first adhesive layer in the first region, can be obtained by corresponding driving of the radiation source or by arrangement of an exposure mask in the beam path between the radiation source and the first adhesive layer.

Furthermore, it is also possible to deactivate the first adhesive layer by exposure in the second region. Thus, it is possible, for example, to use a corresponding adhesive for the first adhesive layer, which adhesive can be deactivated by means of UV radiation, for example. Furthermore, it is also possible to use a UV-activatable adhesive for the first adhesive layer, which adhesive cures upon irradiation with UV light, and to irradiate the first adhesive layer before the application of the second carrier film in the second region. The first adhesive layer is thus cured before the application of the second carrier film in the second region, such that, after the application of the second carrier film, adhesion of the second carrier film in the second region is no longer possible since the first adhesive layer has already been cured and thus deactivated in said region.

In accordance with one preferred embodiment of the invention, a laser is used as the radiation source, which laser is controlled such that the first adhesive
layer is irradiated in the first region but not in the second region, and/or is irradiated in the second region but not in the first region. This can be obtained, for example, by corresponding driving of an actuator that determines the position of the laser or the deflection angle of the laser beam.

In accordance with a further preferred exemplary embodiment of the invention, an exposure mask is arranged in the beam path between radiation source and first adhesive layer, said exposure mask being shaped and arranged such that the first adhesive layer is irradiated in the first region but not in the second region or the first adhesive layer is irradiated in the second region but not in the first region. In this case, the exposure mask can be part of a drum or belt exposure device, for example, through which the film web is formed, from second carrier film, first adhesive layer, second carrier film, release layer and decorative layer is guided.

In accordance with a further preferred exemplary embodiment of the invention, the decorative layer is used for controlling the irradiation of the first adhesive layer.

For this purpose, preferably, the first adhesive layer is irradiated by a radiation source arranged in the direction of that side of the decorative layer which faces away from the first carrier film, said radiation source being arranged at a distance from the decorative layer. The first decorative layer is thus arranged in the beam path between radiation source and first adhesive layer. Preferably, the decorative layer has an opaque layer provided in the first or second region and not provided in the second or the first region, respectively, said layer being used as a masking layer for controlling the irradiation of the first adhesive
layer. It is thus possible, for example, to use a metallic reflection layer of the decorative layer additionally as a masking layer for controlling the irradiation of the first adhesive layer. It is thereby possible to control the exposure of the first adhesive layer with register accuracy with respect to the design of the decorative layer.

preferably, in a first irradiation step, before the application of the second carrier film, the first adhesive layer is irradiated by a radiation source arranged in the direction of that side of the decorative layer which faces away from the first carrier film, said radiation source being arranged at a distance from the decorative layer, through the decorative layer acting as a masking layer and is deactivated in the second region. in a second irradiation step, after the application of the second carrier film, the first adhesive layer is irradiated by a radiation source arranged in the direction of that side of the second carrier film which faces away from the first carrier film, said radiation source being arranged at a distance from the second carrier film, and is activated in the first region.

the exposure of the first adhesive layer can - as described above - be effected in one stage. however, it is also possible for the exposure to be effected in a plurality of stages. it is thus possible, for example, that in a first exposure step the adhesive layer is indeed activated, but the adhesive is not yet fully cured. after the removal of the second part of the base film, the remaining film with the second carrier film and the first part of the base film is then subsequently irradiated wherein the first adhesive layer fully cures.

in accordance with a further preferred embodiment of
the invention, the decorative layer has marks that can be used for determining the first and second regions of the first adhesive layer and/or for determining the first and second partial regions of the base film. These marks therefore constitute register marks. The marks can be shaped from a printing material, from a surface relief, from a magnetic substance or an electrically conductive substance. The marks can thus be, for example, optically readable register marks that differ from the background in terms of their color value, their opacity or their reflection properties. The marks can also be a macroscopic or diffractive relief structure that deflects the incident light in a predefined angular range and optically differ from the background region by virtue of these properties. However, the register marks can also be register marks that can be detected by means of a magnetic sensor or a sensor that detects the electrical conductivity. The marks are detected, for example, by means of an optical sensor, and the severing of the carrier film, the activation of the first adhesive layer, the deactivation of the first adhesive layer and/or the application of the first adhesive layer are/is then controlled by means of the marks. Thus, the decorative layer has optically readable register marks, for example, which controls the irradiation of the first adhesive layer and preferably also the severing of the first carrier layer along the boundary line between the at least one first partial region and the second partial region. Register-accurate activation both of the first adhesive layer and also register-accurate severing of the carrier film with respect to the design of the decorative layer are also possible as a result.

The marks are preferably arranged in the second partial region of the base film. In this case, the marks can be shaped as lines or strips, for example, which preferably run transversely with respect to the
longitudinal direction of the film web which forms the base film. In this case, the marks are preferably arranged between two first regions of the base film.

Preferably, each first part of the base film is furthermore assigned one or a plurality of register marks.

Furthermore, it is also possible for the first adhesive layer to be formed by a hot melt adhesive layer or by an adhesive layer that can be activated by pressure. Furthermore it is also possible for the first adhesive layer to be formed by a latent reactive adhesive layer, preferably by a latent reactive hot melt adhesive layer. A latent reactive adhesive layer is an adhesive layer which has not yet fully cured after activation and whose complete curing and hence development of the full adhesive strength are achieved only after a pre-defined time duration proceeding from activation under predefined ambient conditions. If, for example, a latent reactive hot melt adhesive layer or a latent reactive cold-setting adhesive layer is involved, then the adhesive layer, in a first step, is activated by temperature and/or pressure and in this case, obtains between 10% and 90% of the maximum adhesive strength. After a predetermined time dependent on the adhesive composition, for example, 10 minutes to 72 hours, the adhesive layer then fully cures and develops its full adhesive strength. Thus, by way of example, after the removal of the second part of the base film, the remaining film with the second carrier film and the first part of the base film is stored for a predefined time at room temperature and, if appropriate, elevated temperature, in order to cure the latent reactive adhesive layer and complete curing of the latent reactive adhesive layer is thus obtained. Activation of the first adhesive layer should be understood in this context, in particular, to mean an effect on the
adhesive layer which causes the adhesive layer to initiate a chemical reaction that leads to an at least 10% increase in the adhesive strength after the chemical reaction has largely been concluded.

The latent reactive adhesive used can also be a micro-encapsulated reactive adhesive, such as can be obtained e.g. under the designation Purbond HCMO from Ebnöther AG, Sempach, Switzerland. Such an adhesive can be applied to the first or second carrier film for example in a powder coating method at temperatures of between approximately 60 and 70°C, wherein the fixing that takes place at this temperature forms a lacquer-like adhesive layer that is not yet activated. By means of heat and/or pressure being exerted, the microcapsules are broken open and the adhesive cures in this region.

In accordance with one preferred exemplary embodiment of the invention, the first adhesive layer consists of a hot melt adhesive, and the first adhesive layer is activated by means of a heated embossing die in the first region, but not in the second region, before the removal of the second part of the base film.

Furthermore, it is also advantageous if the first adhesive layer is deactivated in the second region by means of overprinting with a deactivation layer, or the first adhesive layer is printed onto the first and/or second carrier film in the first region, but not in the second region. Furthermore it is also possible for the first adhesive layer to be applied with a different area density in the first region and in the second region, such that the average adhesive strength per unit area, in particular per cm², differs in the first and second regions. Preferably, in this embodiment, the first adhesive layer is printed in a punctiform pattern in the first and/or second area region, wherein the difference in the area density can be obtained by
varying the point sizes and/or the grid widths between the adhesive points. Furthermore, it is also possible, for this purpose, to apply the adhesive layer over the whole area in the first region and to apply the adhesive layer only in the form of a punctiform grid in the second region or not to apply the first adhesive layer in the second region and to apply the adhesive layer in a punctiform grid in the first region. The average area occupancy of the first and/or second carrier film with the first adhesive layer differs in the first region from that in the second region by at least 15% in this case. These methods make it possible to obtain the advantages of the invention cost-effectively by means of a printing method, for example by means of intaglio printing.

Preferably, the second carrier film is laminated onto the base film by means of two opposite rollers.

In accordance with one preferred exemplary embodiment, the decorative layer, the release layer and the first carrier film are completely severed along the boundary line defining the at least one first partial region. In this case, it is also possible for the second carrier film, too, to be partly severed as well. Preferably, however, care should be taken in this case to ensure that the second carrier film is severed to the extent of less than 50%, preferably to the extent of less than 90%.

The first carrier film is preferably severed by means of stamping, for example by means of a rotary stamp or by means of a laser.

Preferably, the first carrier film is severed in register with the boundary line between the first and second regions. On the other hand, the method according to the invention does not require high register
accuracy between the process that structures the first adhesive layer (exposure, printing, embossing) and the severing process (stamping) such that cost-effective industrial-scale processes can be used.

Furthermore, it is advantageous that the film body formed by the base film, the second carrier film and the first adhesive layer is processed by means of a hot embossing die, which simultaneously activates the first adhesive layer in the first partial region and at least partly stamps through the first carrier film along the boundary line defining the at least one first partial region. This results in a very high register accuracy between these two processes and furthermore reduces the number of processing steps.

In accordance with one preferred exemplary embodiment of the invention, after the removal of the second part of the base film the remaining film with the second carrier film and the first part of the base film is used as a transfer film, in particular hot embossing film, for the protection of security documents. This transfer film provides a security element for the protection of security documents.

Furthermore, it is possible for this transfer film to have a multiplicity of first partial regions each comprising a security element for the protection of a security document, which is used by means of transfer onto a security document for the protection of said security document.

For this purpose, after the removal of the second part of the base film, the remaining film with the second carrier film and the first part of the base film is placed onto a target substrate, one or a plurality of first partial regions of the base film are applied to the target substrate by activation of an adhesive layer
arranged between the decorative layer and the target substrate, and the multilayer body comprising the first carrier film, the first adhesive layer and the second carrier film is removed from the decorative layer of the applied one or a plurality of first partial regions of the base film.

For this purpose, a second adhesive layer is applied on that side of the decorative layer which faces away from the first carrier film, said second adhesive layer preferably being a hot melt adhesive layer. Furthermore, it is also possible for the second adhesive layer to be a cold-setting adhesive layer or a latent reactive hot melt adhesive layer.

Preferably, different adhesives are used for the first adhesive layer and for the second adhesive layer. Thus it is possible, for example, to use a cold-setting adhesive for the first adhesive layer and a hot melt adhesive for the second adhesive layer. If hot melt adhesive layers are used as the first and as the second adhesive layer, it is advantageous to choose hot melt adhesive layers having different activation temperatures, wherein the activation temperature of the first adhesive layer is higher than that of the second adhesive layer. The transfer result is thereby improved.

Preferably, a transparent plastic film having a thickness of more than 6 μm, preferably having a thickness of between 6 μm and 250 μm, is used as the second carrier film. However, it is also possible to use a paper substrate or Teslin® (matt, white, uncoated single-ply polyethylene film) as the second carrier film. Preferably, a plastic film having a thickness of between 4 μm and 75 μm is used as the first carrier film.
In accordance with one preferred exemplary embodiment of the invention, two or more first partial regions are provided and each of the first partial regions is enclosed by the second partial region shaped as a continuous region. This facilitates removal of the second region of the base film.

Preferably, the first region covers at least 50% of each first partial region, with further preference more than 70% of each first partial region. It is furthermore also possible for the first region to completely cover each first partial region. Furthermore, the second partial region covers the first region by less than 5%. This measure further ensures that the second part of the base film can be removed with high reliability.

In accordance with one preferred exemplary embodiment of the invention, the decorative layer has one or a plurality of layers that generate an optically variable effect. The decorative layer thus preferably has a replication lacquer layer having a surface structure impressed into the replication lacquer layer, for example, a diffractive surface structure, a microlens structure, a matt structure or a symmetrical or asymmetrical blazed grating. In this case, a microlens structure can comprise spherical lenses or cylindrical lenses, for example. Examples of such security elements with a microlens structure are so-called moiré magnifiers. Furthermore, the decorative layer preferably has a reflection layer, which with further preference is shaped in a patterned fashion in the form of a first information item. The decorative layer furthermore preferably has a volume hologram layer, to which a volume hologram is written. The decorative layer furthermore preferably has a thin-film layer element for generating a viewing-angle-dependent color shift effect. Such a thin-film layer element comprises,
for example, an absorption layer, a spacer layer and a reflection layer, wherein the spacer layer has a layer thickness in the range of λ/2 or λ/4 of a light wavelength λ of a light in the visible frequency range. Furthermore, it is also possible for such a thin-film layer element to comprise a sequence of a plurality of layers having different refractive indices, which in each case meet the λ/2 or λ/4 condition. Preferably, the decorative layer has a color layer shaped in a patterned fashion in the form of a second information item. Said color layer is preferably an opaque color layer or a color layer containing optically variable pigments, for example, thin-film layer pigments or liquid crystal pigments. The decorative layer can furthermore also have a liquid crystal layer, preferably a cholesteric liquid crystal layer or a nematic liquid crystal layer or a combination of cholesteric and/or nematic liquid crystal layers. Furthermore, the decorative layer can also have two or more color layers or any desired combination of the layers mentioned above.

The invention is explained by way of example below on the basis of a plurality of exemplary embodiments with the aid of the accompanying drawings.

Figure 1a shows a schematic sectional illustration of a base film.

Figure 1b shows a schematic plan view of the base film according to figure 1a.

Figure 1c shows a schematic plan view of a further embodiment of a base film.

Figure 2 to figure 6 show schematic sectional illustrations for elucidating the method steps of the
method according to the invention.

Figure 7 and figure 8 show schematic sectional illustrations for elucidating the use of a transfer film according to the invention.

Figure 1a shows a base film 10 having a carrier film 11, a release layer 12 and a decorative layer 13, which comprises a protective lacquer layer 14, a replication lacquer layer 15, a reflection layer 16 and an adhesive layer 17.

The carrier film 11 is preferably a PET, PEN or BOPP film having a thickness of 6 µm to 125 µm. The release layer and the decorative layer are then constructed successively on the carrier film 11 by the application of further layers. For this purpose, firstly the release layer 12 is applied to the carrier film 11. The release layer 12 preferably consists of a waxy material which is softened in particular by the heat occurring during a hot embossing process and enables the decorative layer to be reliably separated from the carrier film 11. The thickness of the release layer is preferably between 0.01 µm and 1.2 µm. The protective lacquer layer 14 is subsequently applied with a layer thickness of between 0.5 µm and 1.5 µm. In this case, it is also possible for the protective lacquer layer 14 to perform the function of the release layer 12 and, accordingly, both to enable the decorative layer 13 to be separated from the carrier film 11 and to protect the decorative layer 13 against mechanical influencing and environmental influences. In this case it is also possible for the protective lacquer layer 13 to be colored or to contain micro- and nanoparticles.

The replication lacquer layer 15 consists of a thermoplastic lacquer into which a surface structure is
impressed by means of heat and pressure by the action of an embossing tool. Furthermore, it is also possible for the replication lacquer layer 15 to be formed by a UV-crosslinkable lacquer and for the surface structure to be impressed into the replication lacquer layer 15 by means of UV replication.

The replication lacquer layer 15 preferably has a layer thickness of between 0.5 μm and 15 μm. The surface structure impressed into the replication lacquer layer is preferably a diffractive surface structure, for example a hologram, Kinegram® or some other diffraction-optically active grating structure. Such surface structures usually have a distance between the structure elements in the range of 0.1 μm to 4 μm. Furthermore, it is also possible for the surface structure to be a macroscopic surface structure, for example a microlens array or a blazed grating.

The reflection layer 16 is applied to the replication lacquer layer 15 after the surface relief has been impressed. The reflection layer 16 is preferably a metal layer composed of chromium, copper, silver or gold or an alloy of such metals, which is vapor-deposited in vacuo with a layer thickness of 0.01 μm to 0.04 μm. It is also possible for the reflection layer 16 to be formed by a transparent reflection layer, for example a thin or finely structured metallic layer or an HRI or LRI layer (HRI = High Refraction Index; LRI = Low Refraction Index). Such a dielectric reflection layer consists, for example, of a vapor-deposited layer composed of a metal oxide, metal sulfide, titanium dioxide, etc., having a thickness of 10 nm to 50 nm.

Furthermore, it is also possible here instead of or in addition to the layers 14 to 16, in the decorative layer, to introduce even further layers that generate an optically variable effect, for example a thin-film
layer system, a layer composed of a crosslinked cholesteric liquid crystal material or a color layer. Furthermore, it is also possible for the decorative layer to comprise one or a plurality of electrically conductive or semiconductor layers that realize an electrical circuit or an electrical component, for example an RF resonant circuit or an RFID tag. This can involve a metallic layer, for example, which is applied either by vapor deposition or by printing and is subsequently reinforced by electrolytic growth. In particular, the reflection layer 16 can simultaneously serve as an electrically conductive layer, which, for this purpose, can likewise be subsequently reinforced electrolytically. Furthermore, the decorative layer 13 can comprise one or a plurality of layers composed of a magnetic material or an electroluminescent material.

The adhesive layer 17 is subsequently applied with a layer thickness of approximately 0.3 mm to 0.5 μm. The adhesive layer 17 preferably consists of a thermally activatable adhesive and is applied to the layer 16 over the whole area, for example by means of a doctor blade.

As indicated in figure 1a and figure 1b, the base film 10, and hence also the decorative layer 13, has two first partial regions 21 and a second partial region 22 enclosing the first partial regions 21. In this case, the first partial regions constitute that part of the decorative layer which is to be transferred as a security element onto a target substrate, for example a security document.

Preferably, the relief structure impressed into the replication lacquer layer 15 is chosen such that it generates a predefined optically variable information item in the first partial regions 21. The surface structure impressed in the first partial regions 21
thus preferably differs from the surface structure impressed into the replication lacquer layer 15 in the partial region 21. Furthermore, the reflection layer 16 is provided in a patterned fashion and partially, and provides a second predefined information item in the first partial regions 21. Preferably, the patterned configuration of the reflection layer 16 in the first partial regions 21 thus also differs from that in the second partial region 22. Preferably, the reflection layer 16 is not provided in the second partial region 22. The optional further optically active layers of the decorative layer 13 are also preferably shaped in a manner maintaining register with the partial regions 21 and provide further information items in the partial regions 21, such that the shaping of this layer in the first partial regions 21 likewise differs from that in the second partial region 22.

Furthermore, it is also possible for a multiplicity of first partial regions to be provided, which are enclosed by a continuous second partial region enclosing the first partial regions. This is shown by way of example in figure 1c, which illustrates a base film 10' with first partial regions 21' and a second partial region 22'.

In a first step illustrated in figure 2, an adhesive layer 30 is applied to that side of the carrier film 11 which lies opposite the decorative layer 13. In this case, the adhesive layer 30 is applied to the carrier film 11 over the whole area. Furthermore, it is also possible for the adhesive layer 30 to be applied to the carrier film 11 only partially, for example in the form of a point grid, as has already been described above.

The adhesive layer 30 is a UV-activatable adhesive. The adhesive that can be used for the adhesive layer 30 has the following composition, for example:
Dicyclopentyloxyethyl methacrylate 50 - 60%
2-hydroxyethyl methacrylate 8%
Trimethylolpropane triacrylate 40 - 30%
5 (3-(2,3-epoxypropoxy)propyl)trimethoxysilane 1%
Irgacure 184 (CIBA) 1 - 2%

The adhesive layer 30 is applied to the carrier film 11 with a layer thickness of 0.1 µm to 10 µm by means of a printing method, by means of pouring or by means of a doctor blade.

In a second second step illustrated in figure 3, a carrier film 40 is applied to the adhesive layer 13. The carrier film 40 is a transparent plastic film, which preferably consists of PET, PVC, PEN or BOPP film and has a layer thickness of 6 µm to 250 µm.

In a third step illustrated in figure 4, a first region of the adhesive layer 30 is activated by exposure. For this purpose, the film structure consisting of the carrier film 40, the adhesive layer 30, the carrier film 11, the release layer 12 and the decorative layer 13, as shown in figure 4, is exposed with UV light 5 in the region 31. For this purpose a collimated light source is used which is on that side of the carrier film 40 which faces away from the carrier film 11, and is at a distance from the carrier film 40. In this case, an exposure mask is arranged in the beam path between the light source and the adhesive layer 30, said exposure mask covering the region 32 and thus enabling selective exposure of the region 31. The exposure source and the exposure mask are preferably part of a drum exposure device over which the film body shown in figure 4 is guided. As shown in figure 4, the exposure mask is in this case shaped and arranged such that the region 31 largely covers the first partial regions 21 and is positioned within the scope of a
register tolerance of preferably 0.1 mm to 2.0 mm with respect to the first partial regions 21.

In the region 32, the adhesive layer 30 is not exposed by UV light and therefore not activated.

In a fourth step illustrated in figure 5, the decorative layer 13, the release layer 12 and the carrier film 11 are severed along the boundary lines defining the first partial regions 21 and separating the first partial regions 21 from the partial region 22. These layers are preferably severed by means of a stamp that introduces corresponding cutouts 61 into the film body consisting of the layers 30 and 17 to 11. As indicated in figure 5, it is also possible in this case for the stamping depth to be chosen such that the carrier film 40 is partly severed as well. Furthermore, it is also possible for the carrier film 11 not to be severed completely but rather only partly. This can be done firstly in the form that the regions in which the carrier film 11 is completely severed or not severed alternate along the boundary line, or that the carrier film 11 is not severed in its entire thickness, but rather only for example in 80% of its thickness.

In a fifth step, that part of the base film 10 which comprises the partial region 22 is removed from the carrier film 40, wherein, on account of the adhesive layer 30 activated in the region 31, the base film still adheres to the carrier film 40 in the first partial regions 21 and remains on the carrier film 40. After putting on the “grating” this results in the multilayer body 1 shown in figure 6, which multilayer body can be used as a security element or as a transfer film for applying a security element to a target substrate. As illustrated in figure 6, in this case residues of the non-activated material of the adhesive layer 30 remain on the carrier film 40 in the region
32. If appropriate, subsequent exposure of the film is effected.

As illustrated with reference to figure 7 and figure 8, the multilayer body 1 can be used as a transfer film for applying a security element 23 to a target substrate 70. For this purpose, the multilayer body 1 is placed onto the target substrate 70 and the adhesive layer 17 is activated in a first partial region by means of a correspondingly shaped hot embossing die 71. The multilayer body comprising the carrier film 40, the adhesive layer 30 and the carrier film 11 is subsequently removed from the applied region of the decorative layer 13 such that the security element 23 remains on the target substrate 70, as shown in figure 8.
Claims:

1. A method for producing a security element (1, 2) wherein the method involves providing a base film (10) having a first carrier film (11) and a single- or multi-ply decorative layer (13), characterized in that a first adhesive layer (30) is applied to that surface of the first carrier film (11) which faces away from the decorative layer (13), and a second carrier film (40) is applied in such a way that the first adhesive layer (30) is arranged between the first carrier film (11) and the second carrier film (40), in that the first adhesive layer (30) is activated in a first region (31), which at least partly covers at least one first partial region (21) of the base film (10), and the first adhesive layer (30) is not activated, not provided, only partly provided or deactivated, however, in a second region (32) adjoining said region (31), in that the first carrier film (11) is at least partly severed along the boundary line defining the at least one first partial region (21) and separating the at least one first partial region (21) from a second partial region (22) of the base film (10), and in that a second part of the base film (10), said second part comprising the second partial region (22) is removed from the second carrier film (40), wherein, in the at least one partial region (21) the base film (10) adheres to the second carrier film (40) on account of the activated first adhesive layer and a first part of the base film (10), said first part comprising the at least one first partial region (21), remains on the second carrier film (40).
2. The method as claimed in claim 1, characterized
   in that the base film (10) has a release layer (12) arranged between the first carrier film (11) and the decorative layer (13), said release layer enabling the decorative layer (13) to be separated from the first carrier film (11).

3. The method as claimed in claim 1, characterized
   in that the first adhesive layer (30) is applied to the first carrier film (11) over the whole area in the at least one first partial region (21) and in the second partial region (22) and is activated before the removal of the second part of the base film (10) in the first region (31).

4. The method as claimed in any of the preceding claims, characterized
   in that an adhesive layer that can be activated by electromagnetic radiation, in particular by irradiation with UV light, is used as the first adhesive layer (30).

5. The method as claimed in claim 4, characterized
   in that the first adhesive layer (30) is activated by irradiation in the first region (31) after the application of the second carrier film (40).

6. The method as claimed in either of claims 4 and 5, characterized
   in that the first adhesive layer (30) is deactivated in the second region (32) before the application of the second carrier film (40).

7. The method as claimed in any of the preceding
claims, characterized
in that the deactivation of the first adhesive layer (30) is effected by irradiation of the first adhesive layer (30) in the second region (32).

8. The method as claimed in any of claims 4 to 7, characterized
in that the first adhesive layer (30) is irradiated by a radiation source arranged in the direction of that side of the second carrier film (40) which faces away from the decorative layer, said radiation source being arranged at a distance from the second carrier film (40).

9. The method as claimed in any of claims 4 to 8, characterized
in that the first adhesive layer (30) is irradiated by a radiation source arranged in the direction of that side of the decorative layer which faces away from the first carrier film, said radiation source being arranged at a distance from the decorative layer.

10. The method as claimed in any of claims 4 to 9, characterized
in that a laser is used as the radiation source and the laser is controlled such that the first adhesive layer (30) is exposed in the first region (31) but not in the second region (32), and/or is irradiated in the second region (32) but not in the first region (31).

11. The method as claimed in any of claims 4 to 10, characterized
in that an exposure mask is arranged in the beam path between radiation source and first adhesive layer (30), said exposure mask being shaped and arranged such that the first adhesive layer (30)
is irradiated in the first region (31) but not in the second region (32) or the first adhesive layer (30) is irradiated in the second region (32) but not in the first region (31).

12. The method as claimed in any of claims 4 to 11, characterized in that the first adhesive layer (30) is irradiated through the decorative layer and one or a plurality of layers of the decorative layer are configured as a masking layer for controlling the irradiation of the first adhesive layer (30).

13. The method as claimed in claim 12, characterized in that an opaque layer of the decorative layer, said opaque layer being provided in the first or second region and not provided in the second or first region, respectively, is used as a masking layer for controlling the irradiation of the first adhesive layer (30).

14. The method as claimed in either of claims 12 and 13, characterized in that, in a first irradiation step, before the application of the second carrier film, the first adhesive layer is irradiated by a radiation source arranged in the direction of that side of the decorative layer which faces away from the first carrier film, said radiation source being arranged at a distance from the decorative layer, through the decorative layer acting as a masking layer and is deactivated in the second region, and, in a second irradiation step, after the application of the second carrier film, the first adhesive layer is irradiated by a radiation source arranged in the direction of that side of the second carrier film which faces away from the first carrier film,
said radiation source being arranged at a distance from the second carrier film, and is activated in the first region.

15. The method as claimed in any of claims 1 to 3, characterized in that a hot melt adhesive is used as the first adhesive layer and the first adhesive layer is activated by means of a heated embossing die in the first region, but not in the second region, before the removal of the second part of the base film.

16. The method as claimed in any of claims 1 to 3, characterized in that a latent reactive hot melt adhesive is used as the first adhesive layer and the first adhesive layer is activated by means of a heated embossing die in the first region, but not in the second region, before the removal of the second part of the base film.

17. The method as claimed in any of the preceding claims, characterized in that the first adhesive layer is deactivated in the second region by means of overprinting with a deactivation layer.

18. The method as claimed in any of the preceding claims, characterized in that the first adhesive layer is printed onto the first and/or second carrier film in the first region, but not in the second region.

19. The method as claimed in any of the preceding claims, characterized
in that the first adhesive layer is printed onto the first and/or second carrier film in the first region and in a partial region of the second region, wherein the area of the partial region preferably takes up less than 50% of the area of the second region.

20. The method as claimed in any of the preceding claims, characterized in that the decorative layer (13) and the first carrier film (11) are completely severed along the boundary line defining the at least one first partial region.

21. The method as claimed in any of the preceding claims, characterized in that the second carrier film (40) is severed to the extent of less than 50%.

22. The method as claimed in any of the preceding claims, characterized in that the first carrier film is severed by means of stamping.

23. The method as claimed in any of the preceding claims, characterized in that the film body formed by the base film, the second carrier film and the first adhesive layer is processed by means of a hot embossing die, which simultaneously activates the first adhesive layer in the first region and at least partly stamps through the first carrier film along the boundary line defining the at least one first partial region.
24. The method as claimed in any of the preceding claims,
characterized
in that the decorative layer contains marks and
the marks are used for determining the first and
second regions of the first adhesive layer and/or
for determining the first and second partial
regions of the base film.

25. The method as claimed in claim 24,
characterized
in that the severing of the first carrier film,
the activation of the first adhesive layer, the
deactivation of the first adhesive layer and/or
the application of the first adhesive layer are/is
controlled by means of detection of the marks.

26. The method as claimed in claim 24 or 25,
characterized
in that the marks contain a printing material, a
surface relief, a magnetic material and/or an
electrically conductive material.

27. The method as claimed in any of claims 24 to 26,
characterized
in that the marks are arranged in the second
partial region of the base film.

28. The method as claimed in any of claims 24 to 27,
characterized
in that the marks are detected by means of an
optical sensor, by means of a magnetic sensor, a
mechanical sensor and/or by means of a sensor that
detects the conductivity.

29. The method as claimed in any of the preceding
claims,
characterized
in that after the removal of the second part of
the base film (10) the remaining film (1) with the second carrier film (40) and the first part of the base film (10) is used as a transfer film, in particular hot embossing film, for the protection of security documents.

30. The method as claimed in any of the preceding claims, characterized in that after the removal of the second part of the base film (10) the remaining film (1) with the second carrier film (40) and the first part of the base film (10) is subsequently irradiated.

31. The method as claimed in any of the preceding claims, characterized in that a latent reactive adhesive is used as the first adhesive layer, and in that after the removal of the second part of the base film (10) the remaining film (1) with the second carrier film (40) and the first part of the base film (10) is stored for a defined time at room temperature and/or elevated temperature in order to cure the latent reactive adhesive.

32. The method as claimed in any of the preceding claims, characterized in that after the removal of the second part of the base film (10) the remaining film with the second carrier film (40) and the first part of the base film (10) is placed onto a target substrate (70), one or a plurality of first partial regions (21) of the base film are applied to the target substrate (70) by activation of an adhesive layer (17) arranged between the decorative layer (13) and the target substrate (70), and the multilayer body comprising the first carrier film (11), the
first adhesive layer (30) and the second carrier film (40) is removed from the decorative layer (13) of the applied one or a plurality of first partial regions of the base film.

33. The method as claimed in any of the preceding claims, characterized in that a second adhesive layer (17) is applied on that side of the decorative layer (13) which faces away from the first carrier film (11).

34. The method as claimed in any of the preceding claims, characterized in that the second adhesive layer is a hot melt adhesive layer.

35. The method as claimed in any of the preceding claims, characterized in that the second adhesive layer is a cold-setting adhesive layer.

36. The method as claimed in any of the preceding claims, characterized in that the second adhesive layer is a latent reactive hot melt adhesive layer.

37. The method as claimed in either of claims 23 and 24, characterized in that different adhesives are used for the first adhesive layer (30) and the second adhesive layer (17).

38. The method as claimed in either of claims 24 and 25,
characterized
in that hot melt adhesive layers having different activation temperatures are used as first and second adhesive layers, wherein the activation temperature of the first adhesive layer is higher than that of the second adhesive layer.

39. A transfer film (1) in particular a hot embossing film, for transferring one or a plurality of multilayer bodies (23) to a target substrate (70), wherein the transfer film (1) has a base film (10) having a first carrier film (11) and a single- or multi-ply decorative layer (13), characterized
in that the transfer film (1) furthermore has a second carrier film (40) and a first adhesive layer (30) applied to that surface of the first carrier film (1) which faces away from the decorative layer, wherein the first adhesive layer (30) is arranged between the first carrier film (11) and the second carrier film (40), in that the first adhesive layer (30) is activated in a first region (31), which at least partly covers at least one first partial region (21) of the base film, such that the base film (10) adheres to the second carrier film (40) in the at least one first partial region (21), and the first adhesive layer (30) is not activated, not provided, only partly provided or deactivated, however, in a second partial region (22) adjoining the at least one first partial region (21), and in that the first carrier film (11) is severed along the boundary line defining the at least one first partial region (21) and separating the at least one first partial region (21) from a second partial region (22) of the base film, and a part of the base film that comprises the second partial region (22) is removed from the second carrier film (40).
40. The transfer film as claimed in claim 39, characterized
in that the base film (10) has a release layer (12) arranged between the first carrier film (11) and the decorative layer (13), said release layer enabling the decorative layer (13) to be separated from the first carrier film (11).

41. The transfer film as claimed in claim 39, characterized
in that the transfer film has a second adhesive layer, which is applied on that surface of the decorative layer which faces away from the second carrier film, and in that the adhesive strength brought about by the activated first adhesive layer (30) between the first carrier film and the second carrier film is lower than the adhesive strength brought about by the activated second adhesive layer between the decorative layer (13) and the target substrate.

42. The transfer film (1) as claimed in either of claims 39 and 41, characterized
in that the second carrier film (40) is a plastic film having a thickness of more than 6 μm.

43. The transfer film (1) as claimed in any of claims 39 to 42, characterized
in that the first carrier film (10) is a plastic film having a thickness of more than 4 μm.

44. The transfer film (1) as claimed in any of claims 39 to 43, characterized
in that two or more first partial regions (21) are provided and each of the first partial regions (21) is enclosed by the second partial region (22)
shaped as a continuous region.

45. The transfer film as claimed in any of claims 39 to 44, characterized in that the first region (31) covers at least 50% of each first partial region (21), preferably more than 70% of each first partial region (21).

46. The transfer film (1) as claimed in any of claims 39 to 45, characterized in that the first region (31) completely covers each first partial region (21).

47. The transfer film (1) as claimed in any of claims 39 to 46, characterized in that the second partial region (22) covers the first region (31) by less than 5%.

48. The transfer film (1) as claimed in any of claims 39 to 47, characterized in that the decorative layer (13) has one or a plurality of layers (15, 16) that generate an optically variable effect.

49. The transfer film (1) as claimed in any of claims 39 to 48, characterized in that the decorative layer (13) has a replication lacquer layer having a surface structure impressed into the replication lacquer layer, in particular selected from the group of diffractive surface structure, lens structure, matt structure and blazed grating.

50. The transfer film as claimed in any of claims 39
to 49, characterized
in that the decorative layer (13) has a reflection layer (16) in particular a reflection layer shaped in a patterned fashion in the form of a first information item.

51. The transfer film as claimed in any of claims 39 to 50, characterized
in that the decorative layer has a thin-film layer element for generating a viewing-angle-dependent color shift effect.

52. The transfer film as claimed in any of claims 39 to 51, characterized
in that the decorative layer has a color layer shaped in a patterned fashion in the form of a second information item.
Fig. 1a

Fig. 2

ERSATZBLATT (REGEL 26)
Fig. 1b

Fig. 1c

ERSATZBLATT (REGEN 26)
Fig. 3

Fig. 4

ERSATZBLATT (REGEL 26)