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(54) **SYSTEM WITH SECURITY FEATURE**

(57) The present invention relates to a system with a security feature comprising:
i) a substrate,
ii) a first ink layer, which is adhered on at least a part of the outer surface of the substrate,
iii) at least one intermediate layer, which is adhered on at least a part of the outer surface of the first ink layer,
iv) a second ink layer, which is adhered on at least a part of the outer surface of the at least one intermediate layer, and
v) a cover layer, which is adhered on at least a part of the outer surface of the second ink layer,
wherein the layers are adhered to each other so that the second ink layer remains adhered to the cover layer, when the cover layer is removed from the substrate, whereas the first ink layer remains adhered to the substrate, and wherein the first ink layer and/or at least one of the at least one intermediate layer has an optical element, which is not or only partially visible as long as the cover layer is not removed from the substrate, but visible when the cover layer is removed from the substrate.

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Description

[0001] The present invention relates to a system with a security feature, such as to a security feature comprising package, sachet or article provided with an etiquette, such as to a security feature comprising folding box package covered with a plastic film.

[0002] Packages, sachets, articles provided with an etiquette and the like are widely used. Exemplarily, packages are used virtually in all areas of live for temporarily storing products. For instance, most of the commercially distributed consumer products are enclosed in a package, which is often made of paper, cardboard or the like, so as to cover, protect and/or preserve the product. Such packages are predominantly printed with an ink and/or varnish, in order to improve the optical appearance of the package and in order to present information about the enclosed product. Particularly cosmetic products, food, sweets, chocolate, beverages, cigarettes and other consumer products are distributed in folding box packages covered with a plastic film or the like. While the folding box packages shall enclose and protect the product, the plastic film shall be applied around and partially sealed with the package to show the customer that the packed product is unused. In addition, the plastic film improves the outer appearance of the packed product and protects the product for instance against environmental factors, such as humidity, oxygen and UV radiation.

[0003] In particular prestigious consumer products, such as perfumes, candies, chocolates, cosmetics, electronic products, pharmaceutical products and medical devices, automotive spare parts, alcoholic beverages or products charged with comparable high tax, such as cigarettes, are often forged, since the profit margin for such forged products is high. However, conventional packages, such as packages sealed with a plastic film, do not allow a customer to identify a forged package by visual marks.

[0004] The same applies analogous for sachets and for other articles and particularly for prestigious articles. An example therefore are spare parts, particularly spare parts of brand manufactures, such as spare parts of automobiles, household appliances, electronic devices, such as notebooks, and the like. Such spare parts are typically provided with an etiquette providing information about the spare part and/or manufacturer, wherein this etiquette may be easily copied or forged, respectively.

[0005] A principal possibility to complicate that an article is coped by unauthorized persons and to facilitate a person to determine, whether it is genuine or forged, is to provide one or more security features on the article and/or on its package. For this purpose, in principle the security features may be used, which are known from security articles, such as security features being known for banknotes, bank cards, credit cards, driving licences and the like. However, these security features are usually complicated and expensive to be produced and to be provided on an article or package, respectively. Moreover, often the detection requires devices or equipment, such as UV lamps, or the like. Apart therefrom, such security features are not optical attractive and do not enable the customer to judge about the origin of the respective product.

[0006] In view of this, the object underlying the present invention is to provide a system, such as an article and/or package, such as for instance a folding box package sealed with a plastic film or the like, which contains at least one security feature, which at least complicates that the system is copied by an unauthorized person and which facilitates a person to determine, whether the system is genuine or forged, which is easy to manufacture and to provide on an article and/or package and which preferably also improves the optical appearance of the article and/or package.

[0007] In accordance with the present invention, this objective is achieved by providing a system with a security feature comprising:

i) a substrate,
ii) a first ink layer, which is adhered on at least a part of the outer surface of the substrate,
iii) at least one intermediate layer, which is adhered on at least a part of the outer surface of the first ink layer,
iv) a second ink layer, which is adhered on at least a part of the outer surface of the at least one intermediate layer, and
v) a cover layer, which is adhered on at least a part of the outer surface of the second ink layer,

wherein the layers are adhered to each other so that the second ink layer remains adhered to the cover layer, when the cover layer is removed from the substrate, whereas the first ink layer remains adhered to the substrate, and wherein the first ink layer and/or at least one of the at least one intermediate layer has an optical element, which is not or only partially visible as long as the cover layer is not removed from the substrate, but visible when the cover layer is removed from the substrate.

[0008] By providing two ink layers being separated from each other by at least one intermediate layer and by providing an outer cover layer onto the substrate in a way that the second ink layer remains adhered to the cover layer, when the cover layer is removed from the substrate, whereas the first ink layer remains adhered to the substrate, and wherein the first ink layer and/or at least one of the at least one intermediate layer has an optical element, which is not or only partially visible as long as the cover layer is not removed from the substrate, but visible when the cover layer is removed from the substrate, a security feature is realized for such a system in an easy manner. A suitable example therefore is a perfume package in the form of a folding cardboard box sealed with an outer plastic film as cover layer. For instance, the lower first ink layer on the cardboard box,

which is actually the substrate, comprises a text, such as the product name, the name of the manufacturer or the like. This text is covered in the unopened package by the upper second ink layer, which is for instance a printing ink layer masking any lower layer. The intermediate layer is in this case a transparent varnish layer or adhesive, such as a laminating adhesive. Thus, the text provided in the lower first ink layer is not visible on the unopened package. When the customer opens the package by removing or peeling off, respectively, the plastic film, the second ink layer adhered to the plastic film is removed together with the plastic film so that the lower first ink layer is optically released and the text of this layer is visible for the customer. Alternatively to the aforementioned embodiment, the lower first ink layer may comprise a first icon and the upper second ink layer may be partially transparent (so that the below icon of the first ink layer remains visible) and comprise a second icon forming together with the first icon an overall icon so that a customer sees, when he views the unopened package, the overall icon. After opening the package by removing or peeling off, respectively, the plastic film, the second ink layer adhered to the plastic film is removed together with the plastic film so that only the first icon remains visible thus changing the overall appearance of the package. Another example for the system in accordance with the present invention is a printed spare part of an automobile, such as a printed interieur strip. In this case, the substrate is the body of the interieur strip, onto which an ink layer comprising a text, such as the name of the automobile manufacturer, is provided. The text is covered for instance with a plastic film or etiquette (which is the cover layer), which is printed on its inner surface with a printing ink (which is the second ink layer), onto which an adhesive layer (which is the intermediate layer) is provided. As long as the printed plastic film or etiquette, respectively, is provided on at least the text of the printed substrate, the text provided in the first ink layer is not visible. When the customer removes the plastic film or etiquette, respectively, the plastic film or etiquette, respectively, together with the second ink layer is removed together with the plastic film so that the lower first ink layer is optically released and the text of this layer is visible for the customer. Apart from being an optical interesting effect and from improving the quality impression of the article and/or package, this solution at least complicates that the article and/or package is copied by an unauthorized person and facilitates a person to determine, whether the article and/or package is genuine or forged.

[0009] An optical element is defined in accordance with the present invention as an element being visible with the human eye, such as a text, a picture, an icon, an image, a photo, a barcode or the like.

[0010] The structure, according to which one layer is adhered to another layer, such as that the second ink layer is adhered to the cover layer, means in accordance with the present invention that the one layer is directly adhered to the other layer or that the one layer is indirectly adhered to the other layer. The latter means that one or more further layers may be between the layer being indirectly adhered to the other layer. For instance, a sealable varnish layer may be arranged between the second ink layer and the cover layer, wherein this sealable varnish causes the adhesion between both layers so that the second ink layer is indirectly adhered to the cover layer.

[0011] Moreover, the outer surface of the substrate is the layer being opposite to the inner surface of the substrate encasing the cavity, the outer surface of the first ink layer is the layer being opposite to the inner surface of the first ink layer, with which the first ink layer is adhered on the substrate, the outer surface of the at least one intermediate layer is the layer being opposite to the inner surface of the at least one intermediate layer, with which the at least one intermediate layer is adhered on the first ink layer, and the outer surface of the second ink layer is the layer being opposite to the inner surface of the second ink layer, with which the second ink layer is adhered on the at least one intermediate layer.

[0012] The system in accordance with the present invention may comprise as substrate an arbitrary article, an arbitrary package layer, such as a cardboard, a paper, a film, such as a film made of white oriented polypropylene, or the like.

[0013] For instance, the substrate is a sheet, such as metal sheet, such as beverage can, which is at least partially printed with an ink forming the first ink layer. The first ink layer may comprise as optical element a barcode or text, such as the name of the manufacturer. At least on a part of this optical element, preferably on the whole optical element and for instance on the whole first ink layer, a plastic film or etiquette, respectively, may be provided, wherein on the inner surface of the plastic film or etiquette, respectively, an ink layer forming the second ink layer, such as a white ink layer, is provided, and, wherein on the inner surface of the second ink layer an intermediate layer, such as a sealing varnish or an adhesive, such as laminating adhesive, is provided. Thus, the plastic film or etiquette, respectively, is arranged on the first ink layer of the substrate with the intermediate layer.

[0014] Alternatively, the substrate may be an article, such as a spare part, such as particularly a spare part of an automobile, of a household appliance, of an electronic device, such as a notebook, or the like. An ink forming the first ink layer is printed on at least a part of the outer surface of the article, wherein the first ink layer comprises for example a barcode or text, such as the name of the manufacturer, as optical element. At least on a part of this optical element, preferably on the whole optical element and for instance on the whole first ink layer, a plastic film or etiquette, respectively, may be provided, wherein on the inner surface of the plastic film or etiquette, respectively, an ink layer forming the second ink layer, such as a white ink layer, is provided, and, wherein on the inner surface of the second ink layer an intermediate lay-

er, such as a varnish or an adhesive, such as laminating adhesive, is provided. Thus, the plastic film or etiquette, respectively, is arranged on the first ink layer of the substrate with the intermediate layer.

[0015] In accordance with a particularly preferred embodiment of the present invention, the system is a package and the substrate is a package substrate encasing a cavity for the storage of the article to be packed. In accordance with this particularly preferred embodiment, the present invention refers to a package comprising:

i) a package substrate encasing a cavity for the storage of the article to be packed,
ii) a first ink layer, which is adhered on at least a part of the outer surface of the package substrate,
iii) at least one intermediate layer, which is adhered on at least a part of the outer surface of the first ink layer,
iv) a second ink layer, which is adhered on at least a part of the outer surface of the at least one intermediate layer, and
v) a cover layer, which is adhered on at least a part of the outer surface of the second ink layer,

wherein the layers are adhered to each other so that the second ink layer remains adhered to the cover layer, when the cover layer is removed from the package substrate, whereas the first ink layer remains adhered to the package substrate, and wherein the first ink layer and/or at least one of the at least one intermediate layer has an optical element, which is not or only partially visible as long as the cover layer is not removed from the package substrate, but visible when the cover layer is removed from the package substrate.

[0016] Subsequently, the present invention is in more detail described with reference to the package of this particularly preferred embodiment. However, the features described subsequently for the package do also apply for the aforementioned embodiments, in which the substrate of the system is a sheet, such as metal sheet, such as beverage can, or, in which the substrate of the system is an article, such as a spare part, such as particularly a spare part of an automobile, of a household appliance, of an electronic device, such as a notebook, or the like.

[0017] In order to achieve that the second ink layer remains adhered to the cover layer, when the cover layer is removed or peeled off, respectively, from the package substrate, the adhesion strengths of the adjacent layers may be adjusted so that the adhesion strength between any two adjacent layers of the layers arranged between the first ink layer and the second ink layer is the lowest of all of the adhesion strengths between two adjacent layers in the package. For instance, the adhesion strength of the first ink layer to the intermediate layer may be the lowest of all adhesion strengths of adjacent layers of the package. Alternatively, the package may comprise two or more intermediate layers, wherein the adhesion strength of one of the intermediate layers to another one of the intermediate layers is the lowest of all adhesion strengths of adjacent layers of the package. The interface with the lowest adhesion is easily visible when the cover layer is removed.

[0018] In view of this, it is preferred in accordance with a preferred embodiment of the present invention that in the package:

i) the adhesion strength of the second ink layer to the cover layer as well as the adhesion strength of the first ink layer to the package substrate is higher than the adhesion strength of the second ink layer to at least one of the at least one intermediate layer or
ii) the adhesion strength of the second ink layer to the cover layer, the adhesion strength of the first ink layer to the package substrate as well as the adhesion strength of the second ink layer to all of the at least one intermediate layer(s) is higher than the adhesion strength of at least one of the at least one intermediate layer to the first ink layer or
iii) at least two intermediate layers are provided, wherein the adhesion strength of the second ink layer to the cover layer, the adhesion strength of the first ink layer to the package substrate as well as the adhesion strength of the second ink layer to the uppermost of the at least two intermediate layers is higher than the adhesion strength of the uppermost intermediate layer to a lower of the at least two intermediate layers or
iv) the adhesion strength of the second ink layer to the cover layer, the adhesion strength of the first ink layer to the package substrate as well as the adhesion strength of the second ink layer to at least one of the at least one intermediate layer is higher than the cohesive strength of at least one of the at least one intermediate layer or the cohesive strength of the first ink layer.

[0019] In the case of option i), the package will break at any interface located between the second ink layer and the first ink layer, in the case of option ii) the system will break at any interface located between the first ink layer and any intermediate layer, in the case of option iii) at any interface located between the outermost intermediate layer and the first ink layer, and in the case of option iv) within an intermediate layer or within the first ink layer.

[0020] As set out above, the present invention is particularly suitable for folding box packages covered with a plastic film. Therefore, it is preferred that the cover layer is a plastic film. Most preferably, the cover layer is a sealable plastic film. In this case, the second ink layer may be easily sealable too, and firmly adhered to the plastic film. If the plastic film is not sealable, a sealable layer or adhesive layer, such as a sealable varnish layer should be arranged between the second ink layer and the cover layer so as to cause the adhesion of the second ink layer to the cover layer.

[0021] Good results are in particular obtained, when the cover layer is a plastic film, which is made of a polymer being selected from the group consisting of polyolefines, polystyrenes, polyesters, polyamides, polylactic acids, polyvinyl chlorides and arbitrary combinations of two or more of the aforementioned plastic materials. Particularly preferably, the plastic film is made of a polymer being selected from the group consisting of oriented polypropylenes, polyethylenes, polystyrenes, polyethylene terephthalates, polyamides, polylactic acids, polyvinyl chlorides and arbitrary combinations of two or more of the aforementioned plastic materials. Most preferred is oriented polypropylene.

[0022] In accordance with an alternative, less preferred embodiment of the present invention, the cover layer is a paper, which is coated on its inner surface with a sealable varnish layer and/or with an adhesive layer. Suitable examples for sealable varnishes are those based on aqueous or solvent-based ethyl vinyl acetate, cellophane, grafted polypropylene resins, polyurethanes, polyolefines, polyesters, polyacrylates, polyvinyl chloride resins, acrylate dispersions, styrene-acrylate-copolymer dispersions as well as natural and synthetic latex dispersions.

[0023] Concerning the kind of ink forming the second ink layer, the present invention is not particularly limited. Good results are in particular obtained, when the second ink layer is a sealable ink layer, because it may then be easily adhered to the cover layer. Otherwise, as set out above, a sealable varnish layer and/or an adhesive layer may be provided between both layers so as to cause the adhesion between the cover layer and the second ink layer. However, a sealable varnish layer and/or an adhesive layer may be even provided between the cover layer and the second ink layer, when the second ink layer is a sealable ink layer and the cover layer is a sealable cover layer. In this case, the sealable varnish layer and/or adhesive layer may be used in order to further increase the adhesion strength between the cover layer and the second ink layer.

[0024] In a further development of the idea of the present invention it is preferred that the second ink layer is a full screen layer, which preferably completely covers any below layer (thus layer avoiding that any lower layer is visible). The second ink layer is preferably adhered to at least that part of the outer surface of the outermost intermediate layer, at which or below which the optical element is provided in at least one of the intermediate layers and/or in the first ink layer. Of course, the second ink layer may cover the whole outer surface of the outermost intermediate layer. In these embodiments, the second ink layer preferably optically completely covers the below optical element, which is therefore not visible as long as the package is unopened, i.e. as long as the cover layer is not removed from the package.

[0025] In accordance with an alternative embodiment of the present invention, the second ink layer may be at least partially transparent at least at that part of the outer surface of the outermost intermediate layer, at which or below which the optical element is provided in at least one of the intermediate layers and/or in the first ink layer. This may be accomplished for instance by choosing a second ink layer with a quite low pigment concentration and/or by applying the second ink layer in a low halftone degree, such as a 20% halftone, onto the outermost surface of the at least one intermediate layer. In these embodiments, the second ink layer does not optically cover or at least not completely optically cover the below optical element. On account of this reason, if the second ink layer also provides an optical element, the combination of all optical elements provided in the second ink layer, the intermediate layer(s) and the first ink layer is visible as long as the package is unopened. After removal of the cover layer with the adhered second ink layer, only the remaining optical elements from the intermediate layer(s) and the first ink layer are visible, so that the appearance of the package changes after removal of the cover layer.

[0026] The second ink layer may be applied onto the outermost intermediate layer and onto the cover layer, respectively, by any known method. Exemplarily, printing, coil coating, spray coating, dip coating, curtain coating, roller coating, wire coating and flow coating are mentioned as suitable methods for applying the second ink layer onto the outermost intermediate layer and onto the cover layer, respectively.

[0027] In principle, the present invention is not particularly limited with regard to the nature of the second ink layer. Particularly suitable are layers made of a printing ink, such as of an offset ink, an intaglio ink, a flexographic ink, an inkjet ink, a digital ink, a screen printing ink or a toner.

[0028] The ink of the second ink layer is preferably composed of one or more pigments, one or more binders, one or more solvents and optionally one or more additives.

[0029] Any pigment may be used for the ink of the second ink layer, which is compatible with the other components of the ink and which has the desired color and coverage degree.

[0030] Also, any suitable binder may be used for the ink of the second ink layer. Suitable examples therefore are binders, which are selected from the group consisting of polyesters, polyethers, polyurethanes, aqueous polyurethanes, polyamides, polyacrylates, maleinate resins, collophonium resins, petroleum resins, ketonic resins, alkyd resins, collophonium modified phenolic resins, hydrocarbon resins, silicates, silicones, silanes, phenolic resins, urea resins, melamine resins, polyterpene resins, polyvinylalcohols, polyvinylacetates, polyvinylchloride, polyvinyl butyrate, polyvinylethers, polyvinylpropionates, polymethacrylates, polystyrenes, styrene-acrylate copolymers, polyolefines, coumarone-indene resins, aromatic formaldehydre resins, carbamide acid resins, sulfonamide resins, ethyl vinyl acetates, chlorinated resins, nitrocellulose, CAB (cellulose acetate butyrate), CAP

(cellulose acetate propionate), cellulose compounds, rubbers, radiation curing resins and arbitrary combinations of two or more of the aforementioned binders. Preferred binders for an offset ink are collophonium resins, petroleum resins, alkyd resins, maleinate resins and acrylate resins, whereas suitable examples for binders for solvent based inks are nitrocelluloses, polyurethanes, polyamides, polyesters, alkyd resins, maleinate resins, acrylate resins, ketonic resins, polyvinyl butyrate and polyvinyl chloride. Suitable binders for water soluble inks are styrene-acrylate copolymer, poly(meth)acrylates, aqueous polyurethane, maleic resins, vinyl acetates, sulfopolyesters, polyesters, polyvinyl alcohols, natural resins, caseins, shellacs, sulfonated lignins, starch-based resins, polyvinylidene chlorides (PVDC), modified celluloses, polyvinylpyrrolidons, aqueous polyamides and arbitrary combinations of two or more of the aforementioned binders.

[0031] The present invention is not particularly limited concerning the kind of solvent used in the second ink, as long as the solvent is compatible with the other components of the ink. Suitable solvents are those, which are selected from the group consisting of mineral oils, vegetable oils, fatty acid esters, alcohols, esters, ethers, glycols, water, aromatic compounds, water, monomers and oligomers with hydroxy, carboxy, alkoxy, amino, acrylic or vinyl functionality and arbitrary combinations of two or more of the aforementioned solvents.

[0032] Furthermore, the ink of the second ink layer may contain one or more additives. Examples for such additives are those selected from the group consisting of rheological additives, adhesives, defoamers, slip additives, anti-corrosion additives, gloss additives, waxes, wetting agents, curing agents, chelating agents, photoinitiators, inhibitors, desiccants, stabilizers, emulsifiers, pH adjustment additives, abrasion resistance additives, plasticizers, antistatic additives, preservatives, light protection agents, matting agents and arbitrary combinations of two or more of the aforementioned additives.

[0033] In accordance with the present invention, the package comprises between the lower first ink layer and the upper second ink layer at least one intermediate layer. The function of the intermediate layer(s) is to protect the first ink layer from abrasion and/or to provide a site of fracture, when the cover layer is removed or peeled off, respectively, from the package and/or to comprise an optical element. Preferably, one to three and more preferably one or two intermediate layers are provided between the two ink layers of the package. Furthermore, it is preferred that at least one of the at least one intermediate layer has an optical element and preferably an optical element being selected from the group consisting of texts, pictures, icons, images, photos, barcodes and arbitrary combinations of two or more of the aforementioned optical elements.

[0034] The at least one intermediate layer may comprise one or more ink layers, in particular one or more ink layers, which partially or completely cover the first ink layer and/or the second ink layer. The first ink layer may comprise one or more metallic pigments, particularly flaky metallic pigments, such as leafing pigments of silver or brass.

[0035] In accordance with a first particularly preferred embodiment of the present invention, the at least one intermediate layer consists of one layer, which is made of a varnish and preferably of a release varnish. Preferably, the varnish protects the first ink layer from abrasion and has a lower adhesion strength to the second ink layer than to the first ink layer, a lower adhesion strength to the second ink layer than the adhesion strength between the cover layer and the second ink layer as well as a lower adhesion strength to the second ink layer than the adhesion strength between the first ink layer and the package substrate. It is particularly preferred in this embodiment that the varnish layer is a full screen layer. In this embodiment, the first ink layer comprises an optical element, such as text, icon, image, photo, barcode or the like. The varnish layer is adhered to at least that part of the first ink layer, at which the optical element is provided in the first ink layer. Of course, the varnish layer may cover the whole outer surface of the first ink layer. Thus, a person cannot see the optical element of the first ink layer on the unopened package, but the optical element gets visible after removal of the cover layer, since the second ink layer is removed together with the cover layer. Suitable examples for varnishes are those based on silicon-acrylate systems, on nitrocellulose-polyamide systems, on nitrocellulose-silicone-systems or on styrene acrylate-silicone systems or combinations thereof. Particularly suitable are UV curing varnishes.

[0036] In accordance with a second, alternatively preferred embodiment of the present invention, the at least one intermediate layer comprises - and preferably consists of - a first lower varnish layer and a second upper varnish layer, wherein the second varnish is preferably a release varnish, and wherein the first varnish is preferably an UV lacquer. Lower and higher have to be understood in this connection viewed in the direction from substrate (lower end) to the cover layer (upper end). Lower may also be denoted as inner (part of package) and upper as outer (part of the package). Preferably, the second ink layer has a lower adhesion strength to the second upper varnish layer than to the cover layer, a lower adhesion strength to the second upper varnish layer than the adhesion strength between the second upper varnish layer and the first lower varnish layer, a lower adhesion strength to the second upper varnish layer than the adhesion strength between the first lower varnish layer and first ink layer as well as a lower adhesion strength to the second upper varnish layer than the adhesion strength between the first ink layer and the package substrate. While the upper release varnish forms a site of fracture, because the interface between the upper release varnish layer and the lower varnish layer has the lowest adhesion strength of all adjacent layers of the package, the lower varnish protects the first ink layer against abrasion. It is

particularly preferred in this embodiment that the both varnish layers are full screen layers and that the first ink layer comprises an optical element, such as text, icon, image, photo, barcode or the like. The varnish layers are adhered to at least that part of the first ink layer, at which the optical element is provided in the first ink layer. The adjustment of adhesion strengths between the different layers may be achieved by carefully selecting the correct polarity of the respective varnish and/or ink layers. The lowest adhesion strength is found between those layers with the highest differences in polarity, e.g. between silicon containing lacquers and nitrocellulose-based inks or varnishes.

[0037] In accordance with a third, alternatively preferred embodiment of the present invention, the at least one intermediate layer comprises - and preferably consists of - a first lower silver layer and a second upper varnish layer. Preferably, the second upper varnish is a release varnish and the silver layer is a leafing silver layer. The leafing silver layer forms the site of fracture in the package, since the cohesion in the leafing silver layer is lower than the adhesions strengths between any of two adjacent layers of the package. Thus, when the cover layer is removed from the package substrate, the leafing silver layer breaks and splits into a lower part remaining attached to the first ink layer and into an upper part remaining attached to the release varnish layer. It is further preferred in this embodiment that the leafing silver layer comprises an optical element, such as a text. The first ink layer may or may not comprise in this embodiment an optical element. For instance, the first ink layer is in this embodiment a full screen layer.

[0038] Independent from whether at least one of the at least one intermediate layer has an optical element or not, the first ink layer may be a (preferably full screen) layer without optical element or may comprise an optical element, such as an optical element being selected from the group consisting of texts, pictures, icons, images, photos, barcodes and arbitrary combinations of two or more of the aforementioned optical elements. In order to provide the optical element in the first ink layer, the first ink may be only partially applied onto the package substrate, namely at the surface parts of the package substrate forming the optical element, i.e. text, icon or the like. This is in principle a positive optical element formed by the ink. Alternatively, the first ink may be partially applied onto the package substrate, namely on all surface parts of the package substrate except those forming the optical element. This is in principle a negative optical element, i.e. the optical element is formed by the surface of the package substrate. Still alternatively, the first ink layer may be composed of two different inks, a first ink forming the optical element and a second ink having a different color than the first ink and covering the remaining part of the package substrate, which is not covered by the first ink.

[0039] Likewise to the second ink layer, the ink of the first ink layer is preferably a printing ink and/or preferably composed of one or more pigments, one or more binders, one or more solvents and optionally one or more additives. Any pigment may be used for the ink of the first ink layer, which is compatible with the other components of the ink and which has the desired color and coverage degree. As binder, solvent and optional additives, the respective compounds mentioned above with regard to the second ink may be preferably used.

[0040] In a further development of the idea of the present invention, it is suggested that the second ink layer has an optical element and preferably an optical element being selected from the group consisting of texts, pictures, icons, images, photos, barcodes and arbitrary combinations of two or more of the aforementioned optical elements. In this embodiment, i) the first ink layer and/or at least one of the at least one intermediate layer has an optical element and ii) the second ink layer has an optical element. It is preferred in this embodiment that the upper second ink layer is partially transparent so that all optical elements, i.e. that of the second ink layer and that of first ink layer and/or at least one of the at least one intermediate layer, are seen when viewing the package. Thus, all optical elements form together an overall icon and a person sees, when he views the unopened package, the overall icon. After opening the package by removing or peeling off, respectively, the cover layer or plastic film, respectively, the second ink layer adhered to the plastic film is removed together with the plastic film so that only the other icon(s) remain(s) visible thus changing the overall appearance of the package.

[0041] The first ink layer may comprise one ink or two or more different inks, which partially or completely cover the substrate. The first ink layer may comprise as pigment one or more metallic pigments, particularly flaky metallic pigments, such as leafing pigments of silver or brass.

[0042] Most preferably, the package in accordance with the present invention is composed according to one of the three following embodiments.

[0043] In accordance with the first most preferred embodiment of the present invention, the package is composed as follows from the inner to the outer or from the bottom to top, respectively:

- substrate, preferably made of paper, cardboard, metallized board, plastic film, metal foil, metalized plastic, sheet metal and more preferably made of paper or cardboard,
- first ink layer, which is preferably a full screen layer,
- as lower intermediate layer a leafing silver layer including an optical element, preferably a text or picture,
- as upper intermediate layer a layer made of release varnish, which is preferably a full screen layer,
- second ink layer, which is preferably a full screen layer, and
- a sealable substrate, preferably made of oriented polypropylene, polyethylene, polystyrene, polyethylene terephthalate, polyamide, polylactic acid, poly-

vinyl chloride or paper being coated with a sealable varnish and more preferably made of oriented polypropylene.

[0044] In accordance with the second most preferred embodiment of the present invention, the package is composed as follows from the inner to the outer or from the bottom to top, respectively:

- substrate, preferably made of paper, cardboard, metallized board, plastic film, metal foil, metalized plastic, sheet metal and more preferably made of paper or cardboard,
- first ink layer with an optical element, preferably a text or picture,
- as lower intermediate layer a (preferably full screen) layer made of UV curing varnish,
- as upper intermediate layer a (preferably full screen) layer made of release varnish,
- (preferably full screen) second ink layer and
- a sealable substrate, preferably made of oriented polypropylene, polyethylene, polystyrene, polyethylene terephthalate, polyamide, polylactic acid, polyvinyl chloride or paper being coated with a sealable varnish and more preferably made of oriented polypropylene.

[0045] In accordance with the third most preferred embodiment of the present invention, the package is composed as follows from the inner to the outer or from the bottom to top, respectively:

- substrate, preferably made of paper, cardboard, metallized board, plastic film, metal foil, metalized plastic, sheet metal and more preferably made of paper or cardboard,
- first ink layer with an optical element, preferably a text or picture,
- as intermediate layer a (preferably full screen) layer made of UV curing varnish,
- (preferably full screen) second ink layer and
- a sealable substrate, preferably made of oriented polypropylene, polyethylene, polystyrene, polyethylene terephthalate, polyamide, polylactic acid, polyvinyl chloride or paper being coated with a sealable varnish and more preferably made of oriented polypropylene.

[0046] The present invention is not particularly limited with regard to the kind of the package substrate. In particular, good results are obtained, when the package substrate is made of a material being selected from the group consisting of papers, cardboards, metallized boards, plastic films, metal foils, metalized plastics, sheet metals and arbitrary combinations of two or more of the aforementioned materials. Most preferably, the package substrate is made of paper, of coated paper, of cardboard or of coated cardboard.

[0047] More preferably, the package in accordance with the present invention is a rigid or flexible package box covered with a plastic film, such as a package for cosmetics, such as perfume, creme, lotion or shampoo, for food, such as candy or chocolate, for beverage, such as lemonade cans or whisky bottles, and for cigarettes.

[0048] A further aspect of the present invention is a method for preparing a package, which comprises the following steps:

i) providing a package substrate encasing a cavity for the storage of the article to be packed,
ii) applying a first ink layer on at least a part of the outer surface of the package substrate,
iii) applying at least one intermediate layer on at least a part of the outer surface of the first ink layer,
iv) applying a second ink layer on at least a part of the outer surface of the at least one intermediate layer, and
v) applying a cover layer on at least a part of the outer surface of the second ink layer, which is opposite to the inner surface of the second ink layer,

wherein the layers are adhered to each other so that the second ink layer remains adhered to the cover layer, when the cover layer is removed from the package substrate, whereas the first ink layer remains adhered to the package substrate, and wherein the first ink layer and/or at least one of the at least one intermediate layer has an optical element, which is not or only partially visible as long as the cover layer is not removed from the package substrate, but visible when the cover layer is removed from the package substrate.

[0049] The preferred materials and further characteristics for the single layers mentioned above for the package are also preferred for the method.

[0050] All intermediate layers and ink layers may be applied by a method being selected from the group consisting of printing, coil coating, spray coating, dip coating, curtain coating, roller coating, wire coating and flow coating.

[0051] The cover layer, i.e. a plastic foil or paper being coated with sealable varnish, preferably a sealable plastic foil and more preferably a sealable foil made of oriented polypropylene, is applied and preferably sealed to the second ink layer. The sealing may be performed with a conventional sealing apparatus, which may be a one-sealing-bracket apparatus or a two-sealing-bracket apparatus. Preferably, the sealing pressure is 200 to 600 N/cm^2 and more preferably 200 to 400 N/cm^2, such as about 350 N/cm^2, The sealing temperature lies preferably between 90 and 170°C, more preferably between 100 and 160°C, still more preferably between 110 and 150°C and most preferably between 120 and 140°C, such as for instance at about 130°C. The sealing time preferably amounts to 0.1 to 10 seconds, preferably to 0.1 to 5 seconds, more preferably to 0.1 to 2 seconds and most preferably to 0.25 to 0.75 seconds, such as about 0.5 sec-

onds. Alternatively, an adhesive layer, such as in particular a laminating adhesive, may be provided on the second ink layer being provided on the cover layer.

[0052] Subsequently, the present invention is described with reference to examples, which are illustrative, but not limiting for the present invention.

Example 1

[0053] A laminate with the following layers has been prepared:

1. Invercote T (Iggesund), which is coated paper (package substrate),
2. Grey ink (first ink layer) GTOB 58GC546710 (hubergroup),
3. Leafing silver layer (intermediate layer) 06GB407185 (hubergroup) with a text as optical element,
4. Release lacquer (intermediate layer) 50GL567600 (hubergroup),
5. White ink (second ink layer) 77GP321043 (hubergroup),
6. Hot sealable lacquer (Michem® Flex HS-100 E (Michelman)),
7. Film of oriented polypropylene (cover layer) from Petroplast.

[0054] The ink and intermediate layers have been applied using a Labratester 180 apparatus from Nobert Schläfli AG with a Labra plate 18 with applying 2 g/m^2, viscosity 15s DIN 4 cup, EtOH/EAc 1:1 used as solvent for viscosity adjustment.

[0055] The UV curing varnish was cured with a Technigraf Aktiprint Mini 18 UV dryer UN50029 and a light system type 6303516, UVC-tube 4/120, 230 Volt, 8 Amp., 50 Hz//31 mm UV lamp with an irradiance of 1 W/cm^2.

[0056] The film of oriented polypropylene was sealed with the paper using a one-sealing-bracket apparatus (Kopp laboratory sealer SGPE 3000, smooth bar) using a sealing pressure of 350 N/cm^2 and a sealing temperature of 130°C for 0.5 seconds.

[0057] Afterwards, the plastic film has been removed from the package and it was found that the second ink layer was removed together with the plastic film so that the text of the intermediate layer 3. became visible.

Example 2

[0058] Analog to example 1, the following laminate has been prepared:

1. Incarda silk (Iggesund), which is coated cardboard (package substrate),
2. Grey ink (first ink layer) GTOB 58GC546710 with a text as optical element (hubergroup),
3. UV lacquer (intermediate layer) 60GUCP1244M (hubergroup),
4. Release lacquer (intermediate layer) 50GL567600 (hubergroup),
5. Cyan ink (second ink layer) 53GC330354 (hubergroup),
6. Hot sealable lacquer (Michem® Flex HS-100 E (Michelman)),
7. Film of oriented polypropylene (cover layer) from Petroplast.

[0059] Afterwards, the plastic film has been removed from the package and it was found that the second ink layer was removed together with the plastic film so that the text of the first ink layer became visible.

Example 3

[0060] Analog to example 1, the following laminate has been prepared:

1. Invercote T (Iggesund), which is coated paper (package substrate),
2. Black PLUS (first ink layer) 59GP366910 (hubergroup),
3. Leafing silver ink layer (intermediate layer) 06GB407185 (hubergroup) with a text as optical element,
4. Release lacquer (intermediate layer) 50GL567600 (hubergroup),
5. White ink (second ink layer) 77GP321043 (hubergroup),
6. Hot sealable lacquer (Michem® Flex HS-100 E (Michelman)),
7. Film of oriented polypropylene (cover layer) from Petroplast.

[0061] Afterwards, the plastic film has been removed from the package and it was found that the second ink layer was removed together with the plastic film so that the text of the intermediate layer became visible.

Example 4

[0062] Analog to example 1, the following laminate has been prepared:

1. Koppa Gloss (Iggesund), which is cardboard (package substrate),
2. Black PLUS (first ink layer) 59GP366910 (hubergroup) with a text as optical element,
3. UV lacquer (intermediate layer) 60GUCP1244M (hubergroup),
4. Release lacquer (intermediate layer) 50GL567600 (hubergroup),
5. Magenta PLUS (second ink layer) 52GC366901 (hubergroup),
6. Hot sealable lacquer (Michem® Flex HS-100 E (Michelman)),
7. Film of oriented polypropylene (cover layer) from

Petroplast.

[0063] Afterwards, the plastic film has been removed from the package and it was found that the second ink layer was removed together with the plastic film so that the text of the first ink layer became visible.

Example 5

[0064] Analog to example 1, the following laminate has been prepared:

1. Koppa Gloss (Iggesund), which is cardboard (package substrate),
2. Black PLUS (first ink layer) 59GP366910 (hubergroup) with a text as optical element,
3. UV lacquer (intermediate layer) 60GUCP1244M (hubergroup),
4. Magenta PLUS (second ink layer) 52GC366901 (hubergroup),
5. Hot sealable lacquer (Michem® Flex HS-100 E (Michelman)),
6. Film of oriented polypropylene (cover layer) from Petroplast.

[0065] Afterwards, the plastic film has been removed from the package and it was found that the second ink layer was removed together with the plastic film so that the text of the first ink layer became visible.

Example 6

[0066] Analog to example 1, the following laminate has been prepared:

1. Koppa Gloss (Iggesund), which is cardboard (package substrate),
2. Black PLUS 59GP366910 (first ink layer)
3. Leafing silver ink layer (intermediate layer) 06GB407185 (hubergroup) with a text as optical element,
4. Release lacquer (intermediate layer) 50GL567600 (hubergroup),
5. Magenta PLUS (second ink layer) 52GC366901 (hubergroup),
6. Film of oriented polypropylene (cover layer) from Petroplast.

[0067] Afterwards, the plastic film has been removed from the package and it was found that the second ink layer was removed together with the plastic film so that the text of the intermediate layer became visible.

Claims

1. A system with a security feature comprising:

i) a substrate,
ii) a first ink layer, which is adhered on at least a part of the outer surface of the substrate,
iii) at least one intermediate layer, which is adhered on at least a part of the outer surface of the first ink layer,
iv) a second ink layer, which is adhered on at least a part of the outer surface of the at least one intermediate layer, and
v) a cover layer, which is adhered on at least a part of the outer surface of the second ink layer,

wherein the layers are adhered to each other so that the second ink layer remains adhered to the cover layer, when the cover layer is removed from the substrate, whereas the first ink layer remains adhered to the substrate, and wherein the first ink layer and/or at least one of the at least one intermediate layer has an optical element, which is not or only partially visible as long as the cover layer is not removed from the substrate, but visible when the cover layer is removed from the substrate.

2. The system in accordance with claim 1, wherein the substrate is a sheet, preferably a metal sheet, a film or an article, preferably a spare part of an automobile, of a household appliance or of an electronic device.

3. The system in accordance with claim 1, wherein the system is a package and the substrate is a package substrate encasing a cavity for the storage of the article to be packed.

4. The system in accordance with claim 1 or 2, wherein:

i) the adhesion strength of the second ink layer to the cover layer as well as the adhesion strength of the first ink layer to the substrate is higher than the adhesion strength of the second ink layer to at least one of the at least one intermediate layer or
ii) the adhesion strength of the second ink layer to the cover layer, the adhesion strength of the first ink layer to the substrate as well as the adhesion strength of the second ink layer to all of the at least one intermediate layer(s) is higher than the adhesion strength of at least one of the at least one intermediate layer to the first ink layer or
iii) at least two intermediate layers are provided, wherein the adhesion strength of the second ink layer to the cover layer, the adhesion strength of the first ink layer to the substrate as well as the adhesion strength of the second ink layer to the uppermost of the at least two intermediate layers is higher than the adhesion strength of the uppermost intermediate layer to a lower of the at least two intermediate layers or

iv) the adhesion strength of the second ink layer to the cover layer, the adhesion strength of the first ink layer to the substrate as well as the adhesion strength of the second ink layer to at least one of the at least one intermediate layer is higher than the cohesive strength of at least one of the at least one intermediate layer or the cohesive strength of the first ink layer.

5. The system in accordance with any of the preceding claims, wherein the cover layer is a plastic film and preferably a sealable plastic film.

6. The system in accordance with claim 4 or 5, wherein the cover layer is a plastic film, which is selected from the group consisting of oriented polypropylenes, polyethylenes, polystyrenes, polyethylene terephthalates, polyamides, polylactic acids, polyvinyl chlorides and arbitrary combinations of two or more of the aforementioned plastic materials.

7. The system in accordance with any of the preceding claims, wherein the second ink layer is a sealable ink layer.

8. The system in accordance with any of the preceding claims, wherein between the cover layer and the second ink layer a sealable varnish layer and/or adhesive layer is provided.

9. The system in accordance with any of the preceding claims, wherein the at least one intermediate layer consists of one layer, which is made of a varnish and preferably of a release varnish, wherein the varnish has a lower adhesion strength to the second ink layer than to the first ink layer, a lower adhesion strength to the second ink layer than the adhesion strength between the cover layer and the second ink layer as well as a lower adhesion strength to the second ink layer than the adhesion strength between the first ink layer and the substrate.

10. The system in accordance with any of claims 1 to 9, wherein the at least one intermediate layer comprises a first lower varnish layer and a second upper varnish layer, wherein the second ink layer has a lower adhesion strength to the second upper varnish layer than to the cover layer, a lower adhesion strength to the second upper varnish layer than the adhesion strength between the second upper varnish and the first lower varnish layer, a lower adhesion strength to the second upper varnish layer than the adhesion strength between the first lower varnish layer and first ink layer as well as a lower adhesion strength to the second upper varnish layer than the adhesion strength between the first ink layer and the substrate, wherein the second varnish is preferably a release varnish, and wherein the first varnish is preferably an UV lacquer.

11. The system in accordance with any of claims 1 to 9, wherein the at least one intermediate layer comprises a first lower silver layer and a second upper varnish layer, wherein the second varnish is preferably a release varnish, and wherein the silver layer is preferably a leafing silver layer.

12. The system in accordance with any of the preceding claims, wherein at least one of the at least one intermediate layer has an optical element and preferably an optical element being selected from the group consisting of texts, pictures, icons, images, photos, barcodes and arbitrary combinations of two or more of the aforementioned optical elements.

13. The system in accordance with any of the preceding claims, wherein the first ink layer has an optical element and preferably an optical element being selected from the group consisting of texts, pictures, icons, images, photos, barcodes and arbitrary combinations of two or more of the aforementioned optical elements.

14. The system in accordance with any of the preceding claims, wherein the second ink layer has an optical element and preferably an optical element being selected from the group consisting of texts, pictures, icons, images, photos, barcodes and arbitrary combinations of two or more of the aforementioned optical elements.

15. The system in accordance with any of the preceding claims, wherein package is a rigid or flexible folding box covered with a plastic film, which is preferably selected from the group consisting of cigarette packages, cosmetic packages, food packages and beverage packages.

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EUROPEAN SEARCH REPORT

Application Number
EP 18 20 8410

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	WO 2005/047411 A2 (BSECURE LTD [IL]; LIEBER NAFTALI [IL] ET AL.) 26 May 2005 (2005-05-26)	1-14	INV. B65D77/00 G09F1/00
Y	* page 4, line 10 - page 6, line 14; figures *	15	G09F3/00

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TECHNICAL FIELDS SEARCHED (IPC)

B65D
G09F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 May 2019	Ibarrola Torres, O

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